United States Environmental Protection Agency
Acid Rain Division (6204J) Washington, D.C. 20460
EPA/430-R-99-009b June 1999



EPA Flow Reference Method Testing and Analysis: Findings Report

Appendices

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EPA FLOW REFERENCE METHOD TESTING AND ANALYSIS

FINDINGS REPORT

Appendices

Prepared for

U.S. Environmental Protection Agency
Acid Rain Division, 6204J
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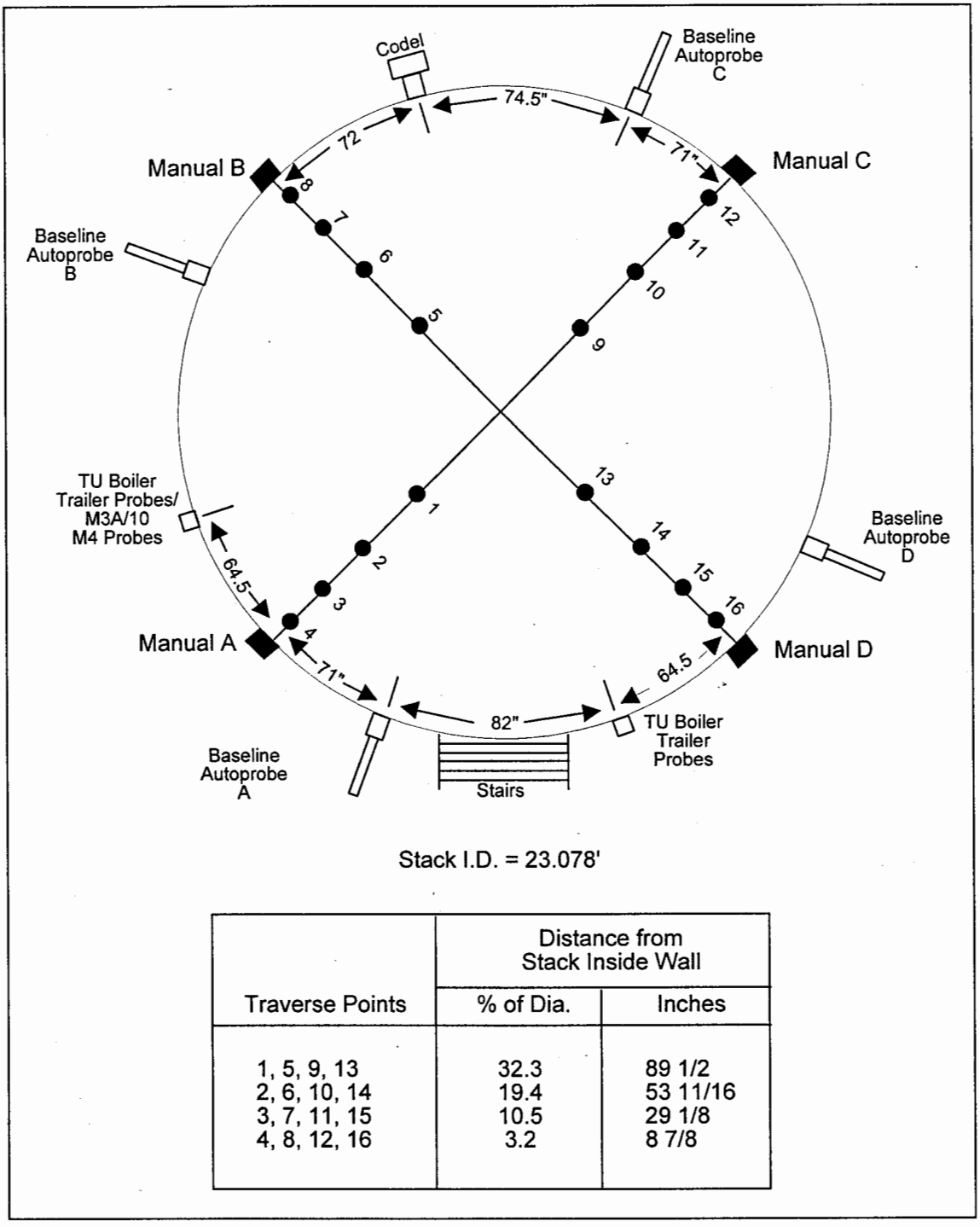
June 1999

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Appendix A.
Stack Diagrams and Plots of Yaw and Pitch Angles

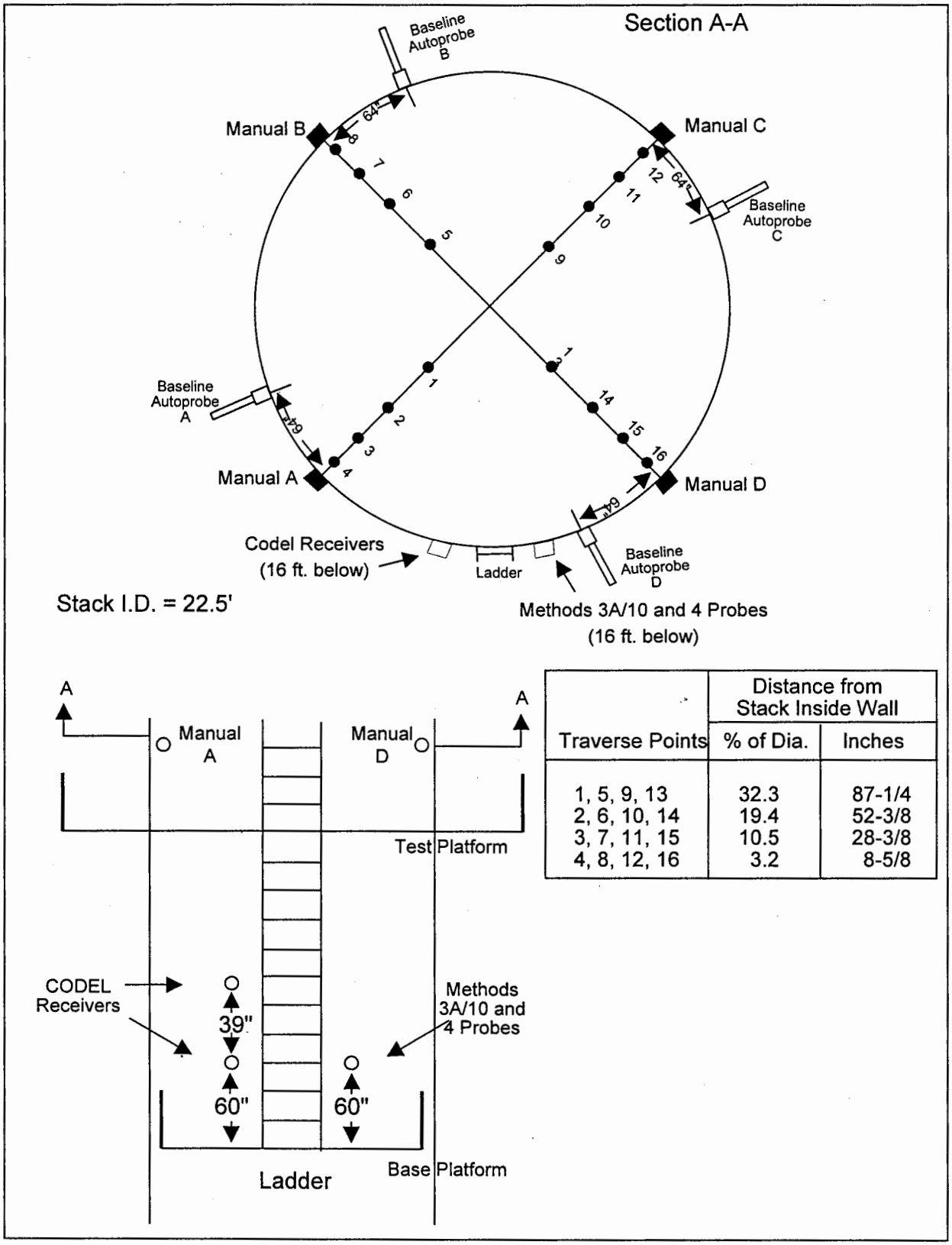
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Figures A-1 through A-3 present diagrams of the stacks at the DeCordova, Lake Hubbard, and Homer City sites, respectively.



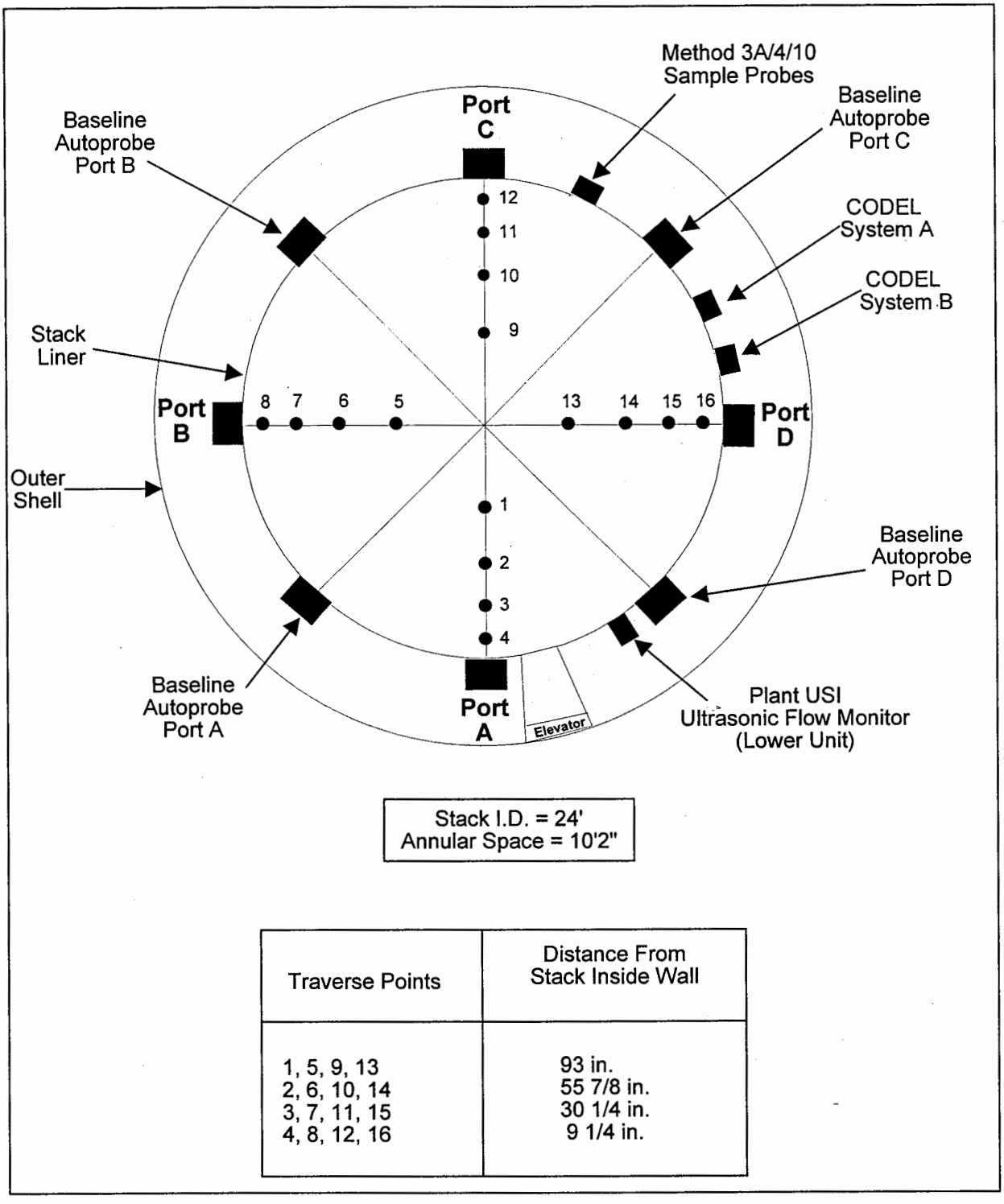
Traverse Points	Distance from Stack Inside Wall	
	% of Dia.	Inches
1, 5, 9, 13	32.3	89 1/2
2, 6, 10, 14	19.4	53 11/16
3, 7, 11, 15	10.5	29 1/8
4, 8, 12, 16	3.2	8 7/8

Figure A-1. DeCordova stack diagram.



Traverse Points	Distance from Stack Inside Wall	
	% of Dia.	Inches
1, 5, 9, 13	32.3	87-1/4
2, 6, 10, 14	19.4	52-3/8
3, 7, 11, 15	10.5	28-3/8
4, 8, 12, 16	3.2	8-5/8

Figure A-2. Lake Hubbard stack diagram.



Traverse Points	Distance From Stack Inside Wall
1, 5, 9, 13	93 in.
2, 6, 10, 14	55 7/8 in.
3, 7, 11, 15	30 1/4 in.
4, 8, 12, 16	9 1/4 in.

Figure A-3. Homer City stack diagram.

Figures A-4 through A-9 use box-and-whisker[1] plots to illustrate the yaw angles in degrees measured by all probe types over all Matrix A and B runs at each of the three sites. The measurements were made at each traverse point at each of the four test ports. The first figure of the two for each site shows the yaw angles measured across the stack diameter between Ports A and C, and the second figure shows the angles measured between Ports B and D.

Figures A-10 through A-15 illustrate the pitch angles in degrees measured by all probe types over all Matrix A and B runs at each of the three sites. The measurements were made at each traverse point at each of the four test ports. The first figure of the two for each site shows the pitch angles measured across the stack diameter between Ports A and C, and the second figure shows the angles measured between Ports B and D.

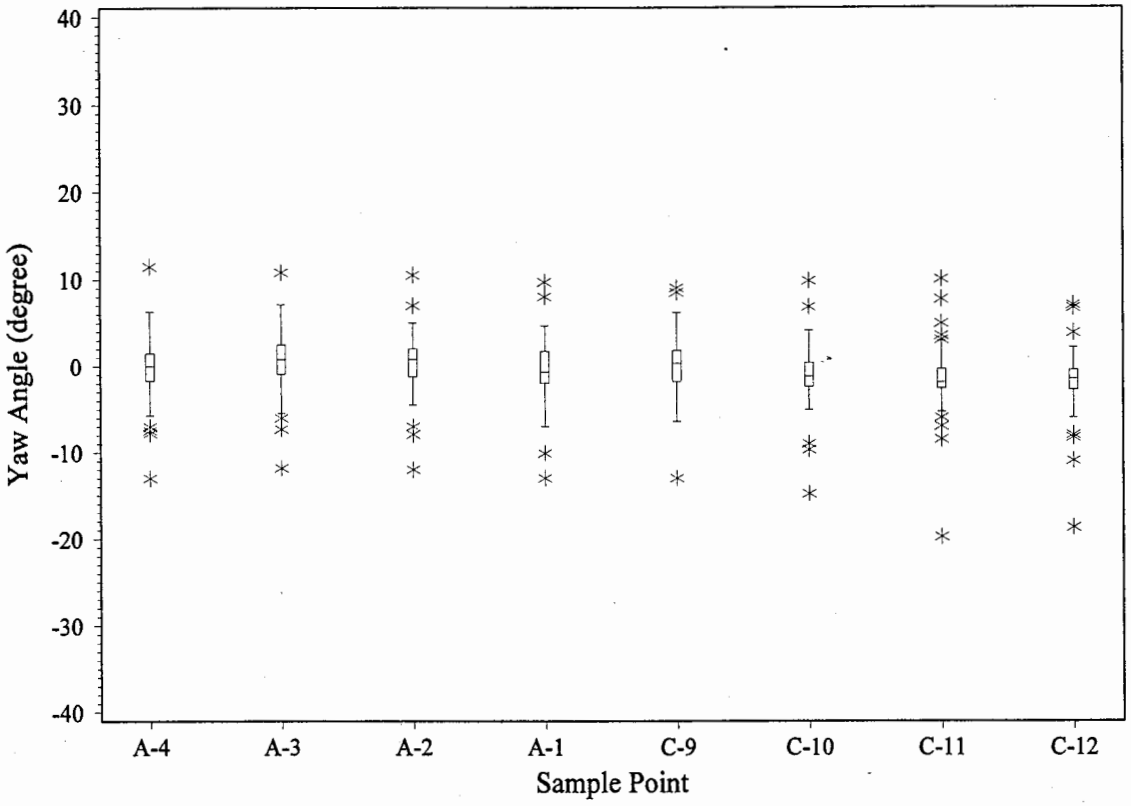


Figure A-4. DeCordova: Yaw angles obtained by all probe types at Test Ports A and C.

[1] As noted in Section 3.1.1, the box-and-whisker plot is a useful tool for displaying the distribution of a data set. The plots show the median (middle horizontal line), and the 25th and 75th percentiles (lower and upper horizontal lines of the boxes), and the minimum and maximum values. Potential outliers are indicated by asterisks (*). The criterion for identifying the potential outliers is any value beyond the distance of 1.5 times the interquartile range (75th percentile minus the 25th percentile) from the box, which is represented by the whiskers projecting from each end of the box.

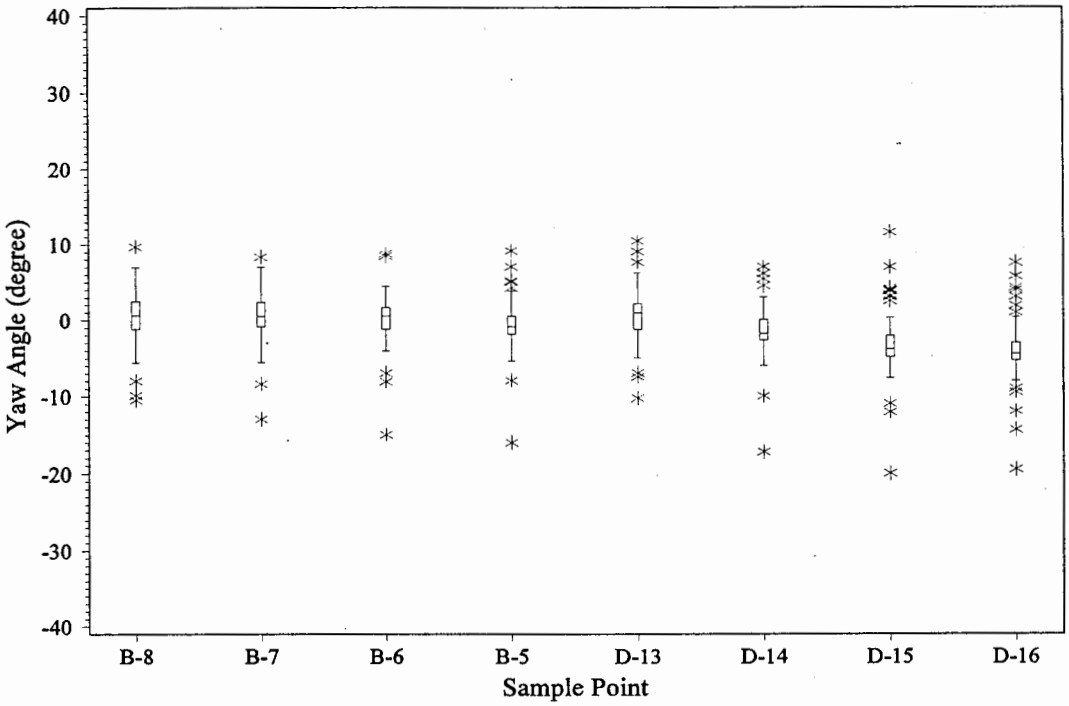


Figure A-5. DeCordova: Yaw angles obtained by all probe types at Test Ports B and D.

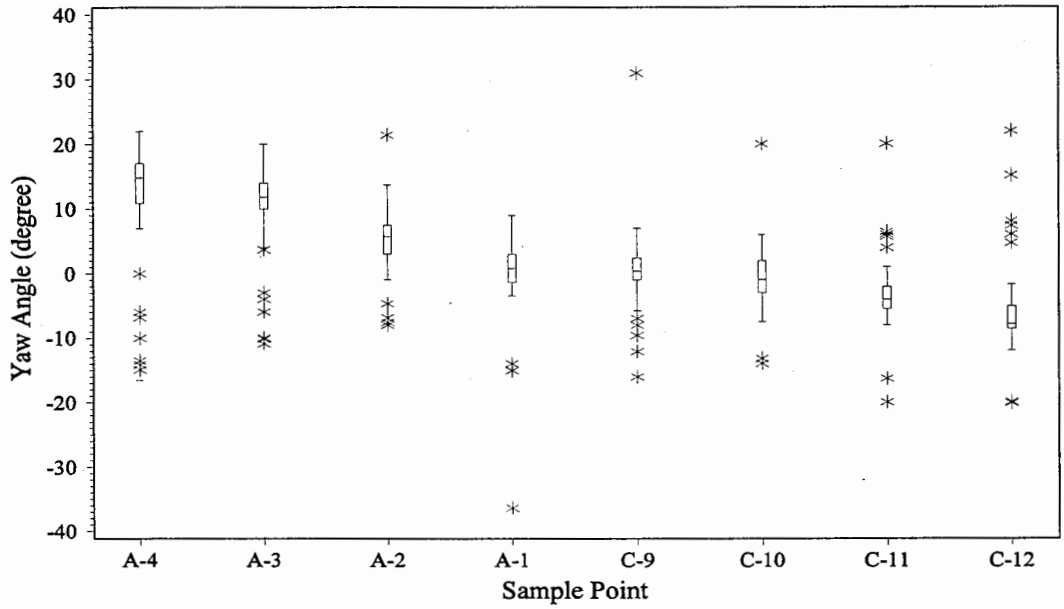


Figure A-6. Lake Hubbard: Yaw angles obtained by all probe types at Test Ports A and C.

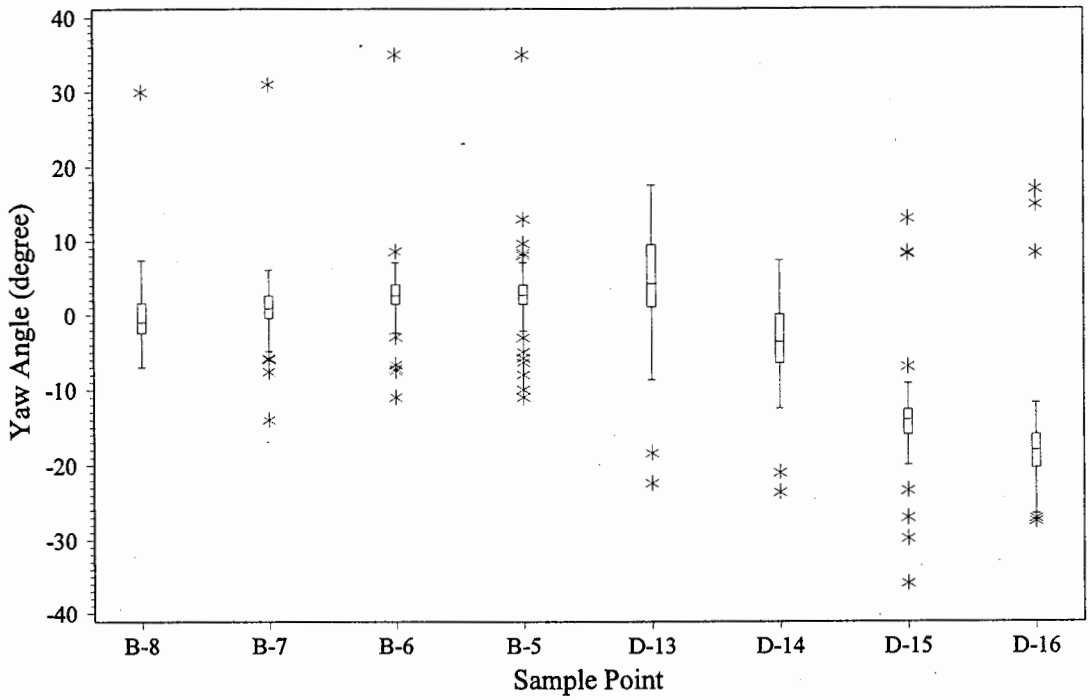


Figure A-7. Lake Hubbard: Yaw angles obtained by all probe types at Test Ports B and D.

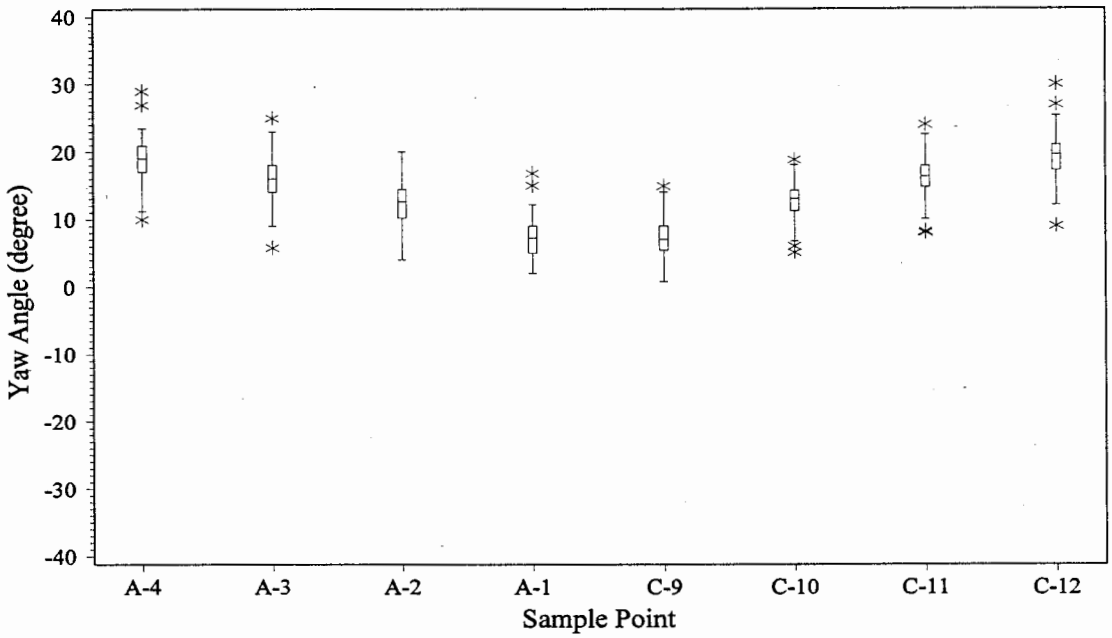


Figure A-8. Homer City: Yaw angles obtained by all probe types at Test Ports A and C.

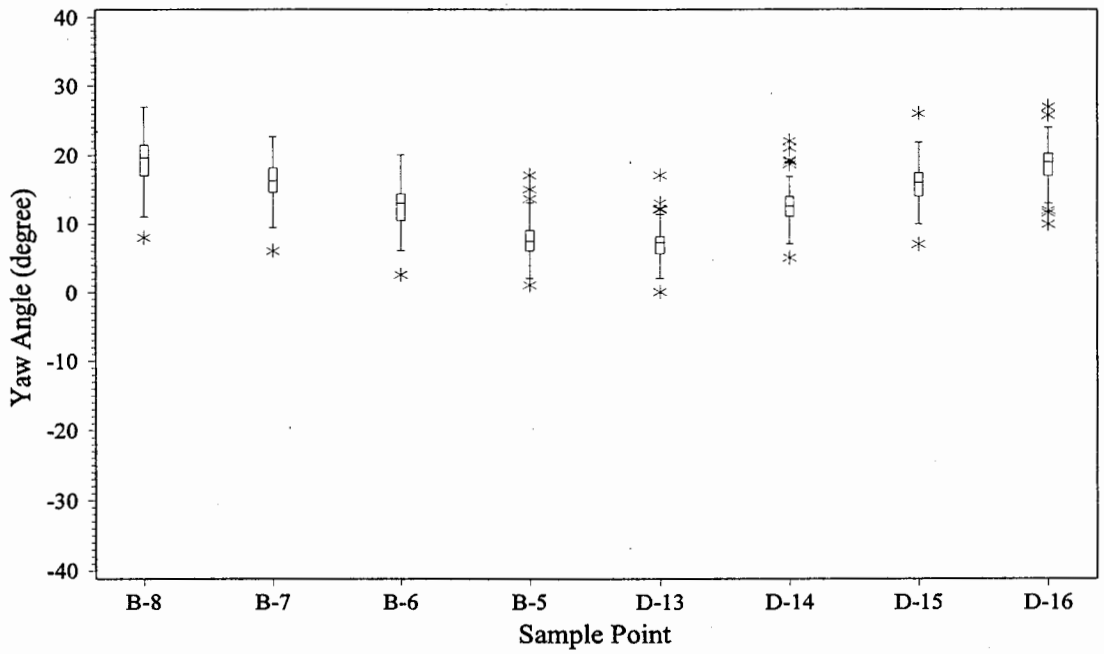


Figure A-9. Homer City: Yaw angles obtained by all probe types at Test Ports B and D.

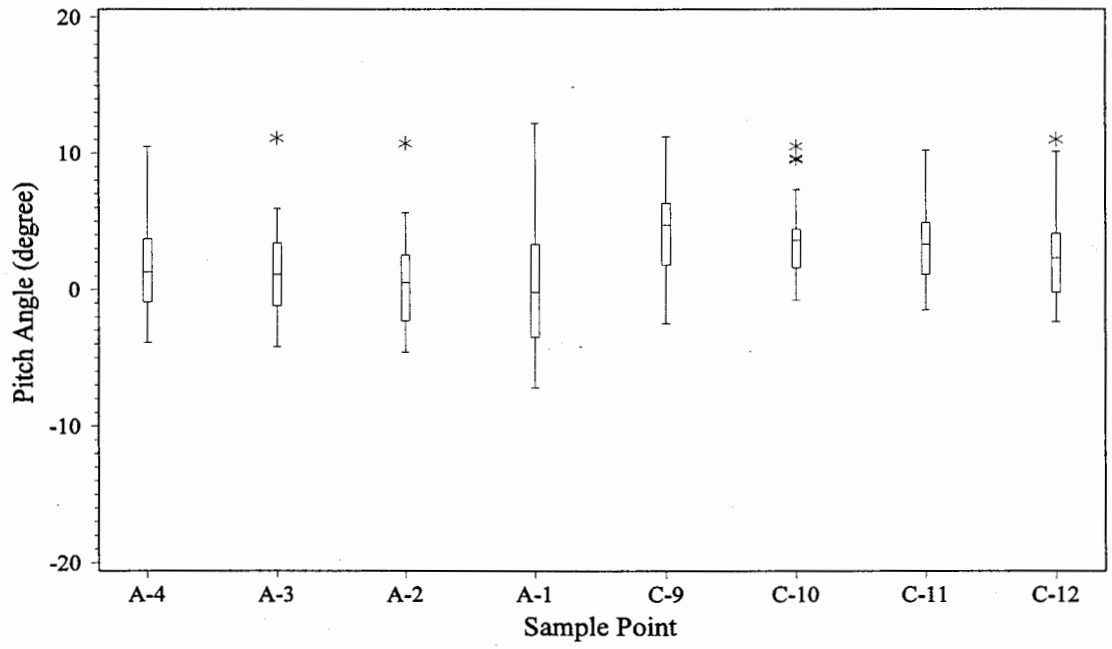


Figure A-10. DeCordova: Pitch angles obtained by all probe types at Test Ports A and C.

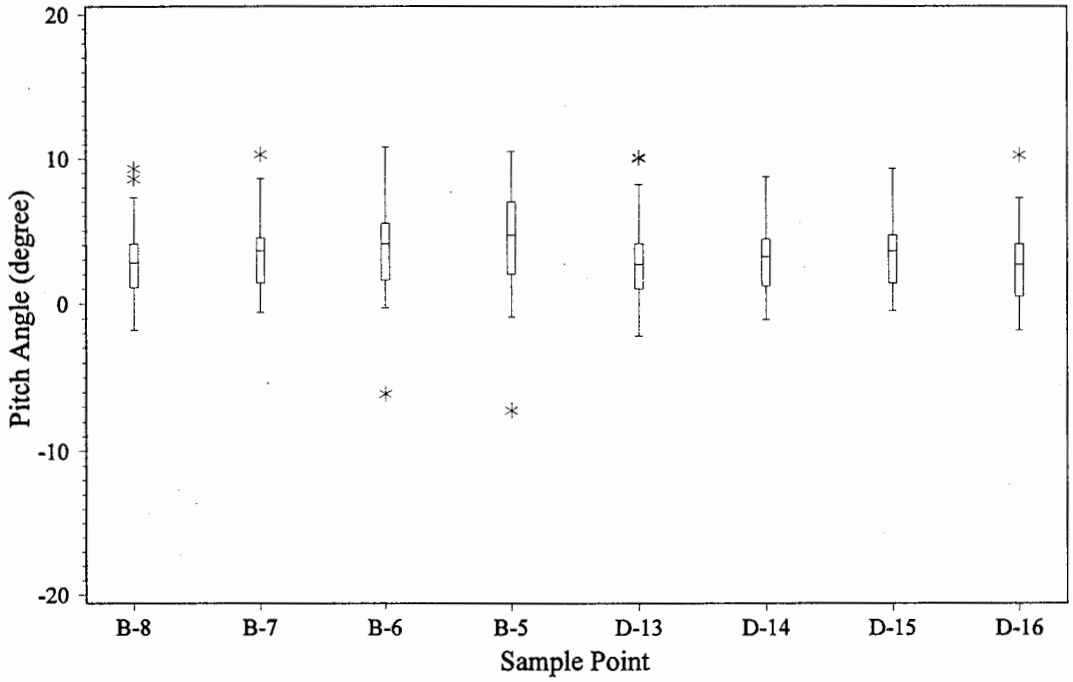


Figure A-11. DeCordova: Pitch angles obtained by all probe types at Test Ports B and D.

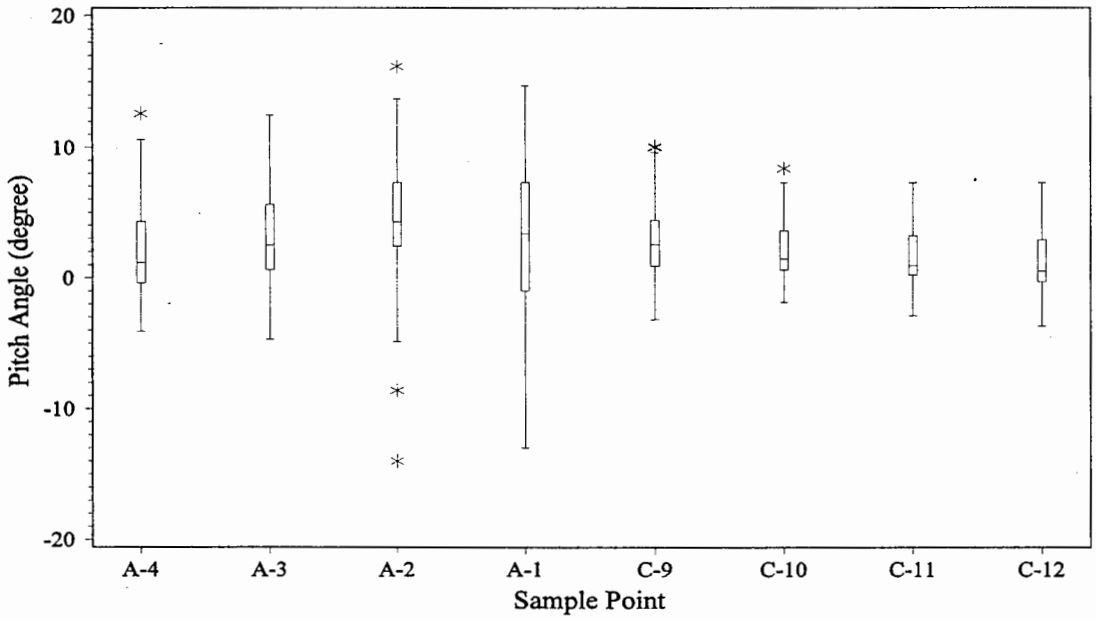


Figure A-12. Lake Hubbard: Pitch angles obtained by all probe types at Test Ports A and C.

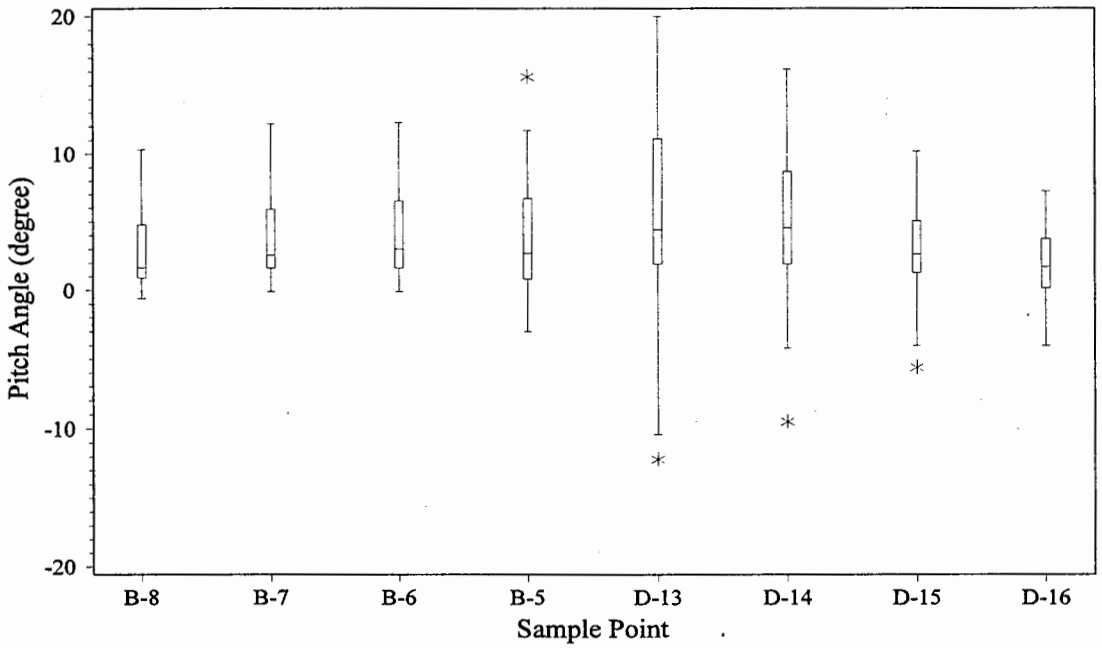


Figure A-13. Lake Hubbard: Pitch angles obtained by all probe types at Test Ports B and D.

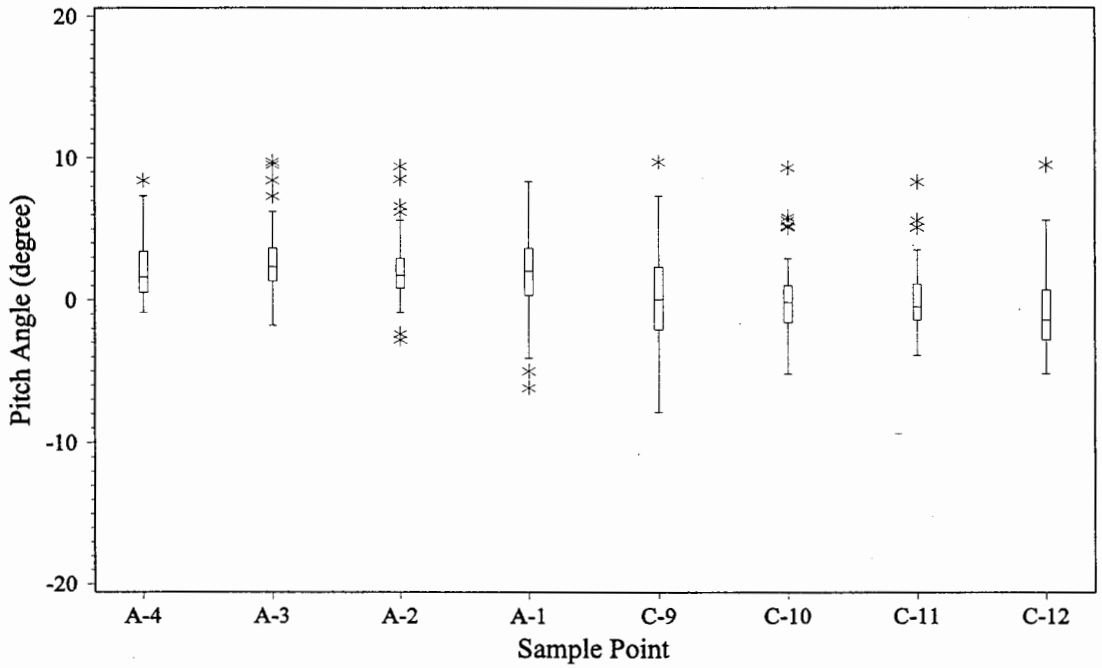


Figure A-14. Homer City: Pitch angles obtained by all probe types at Test Ports A and C.

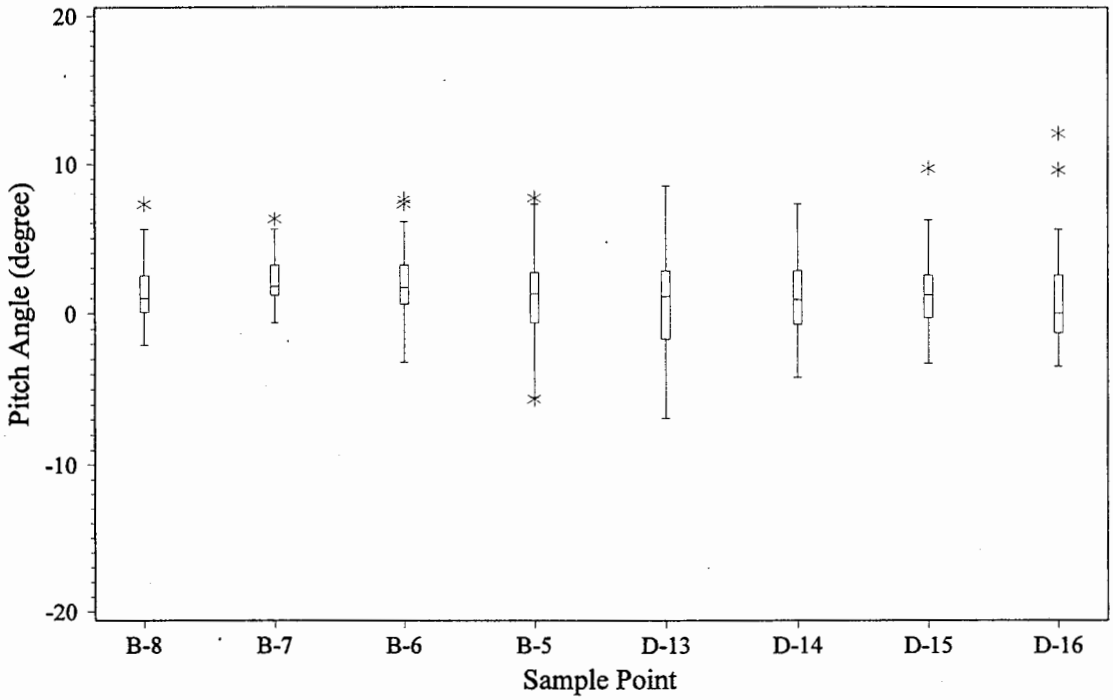


Figure A-15. Homer City: Pitch angles obtained by all probe types at Test Ports B and D.

Appendix B.
Probe Diagrams

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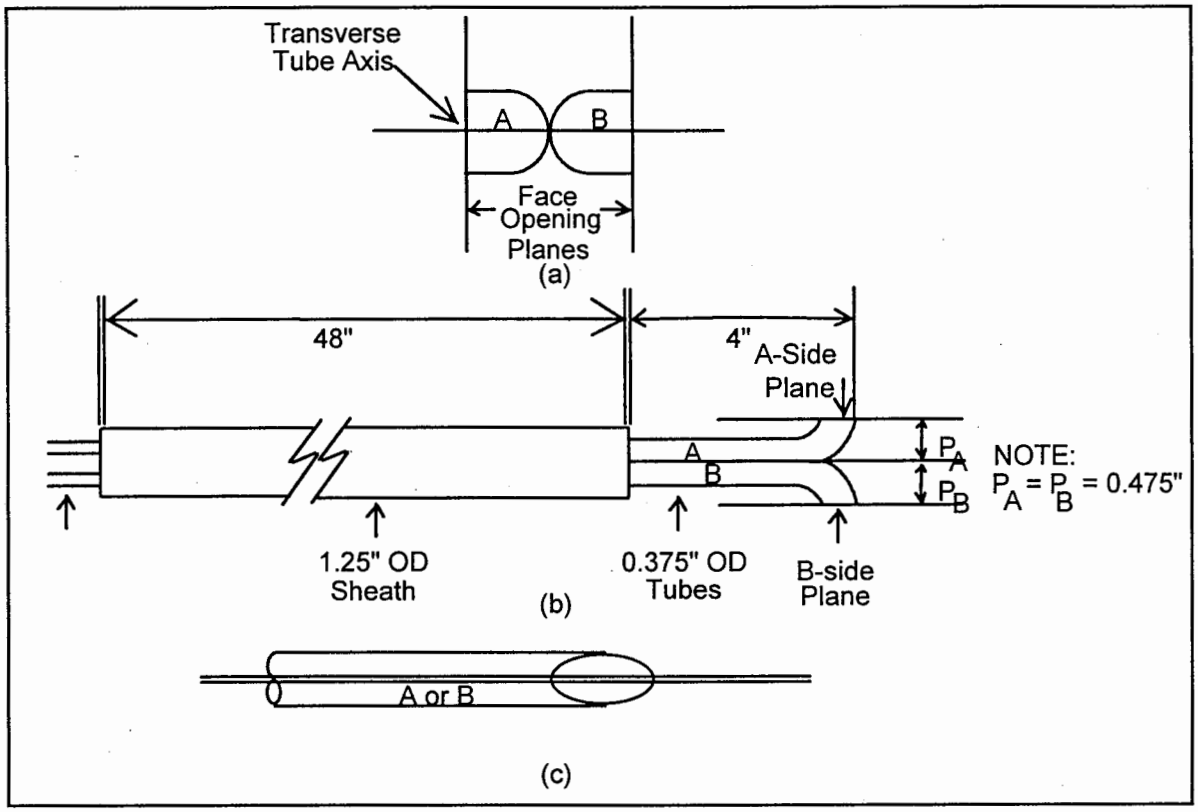


Figure B-1. Type S probe.

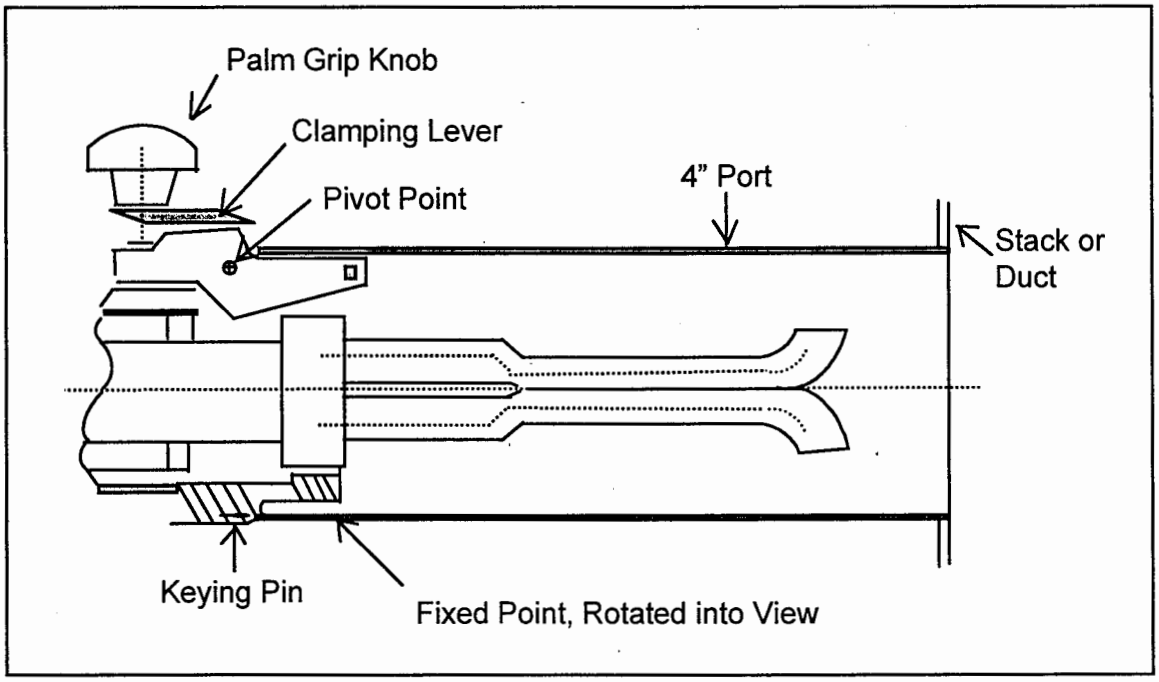


Figure B-2. Type S Autoprobe.

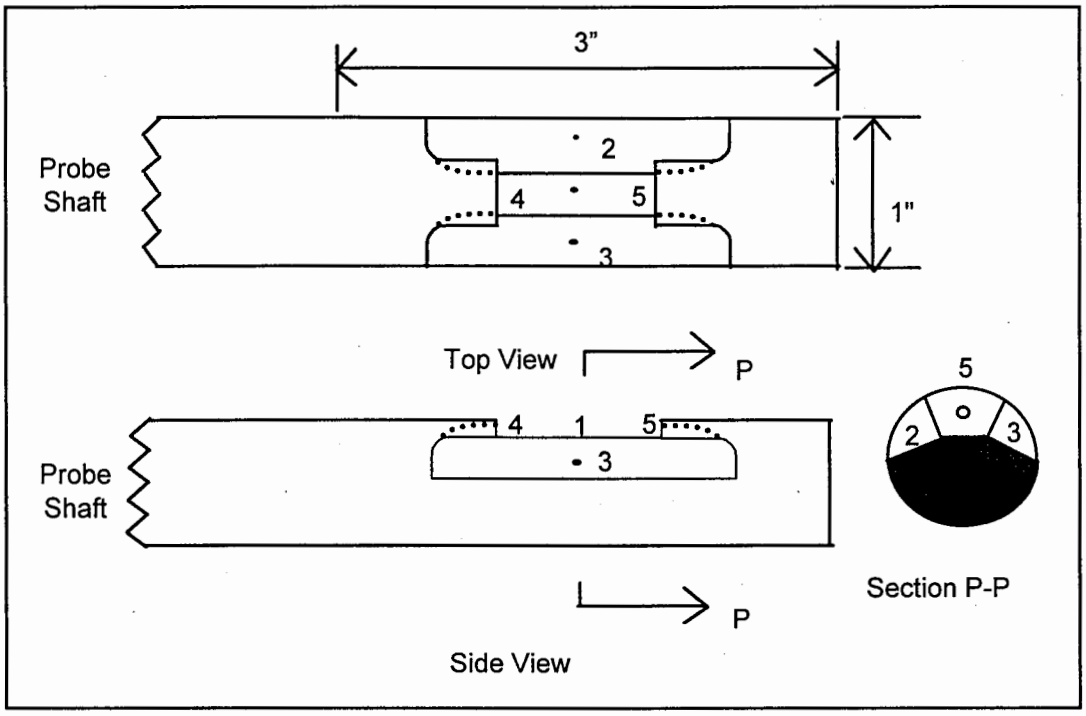


Figure B-3. Top, side, and cross-sectional views of DAT probe.

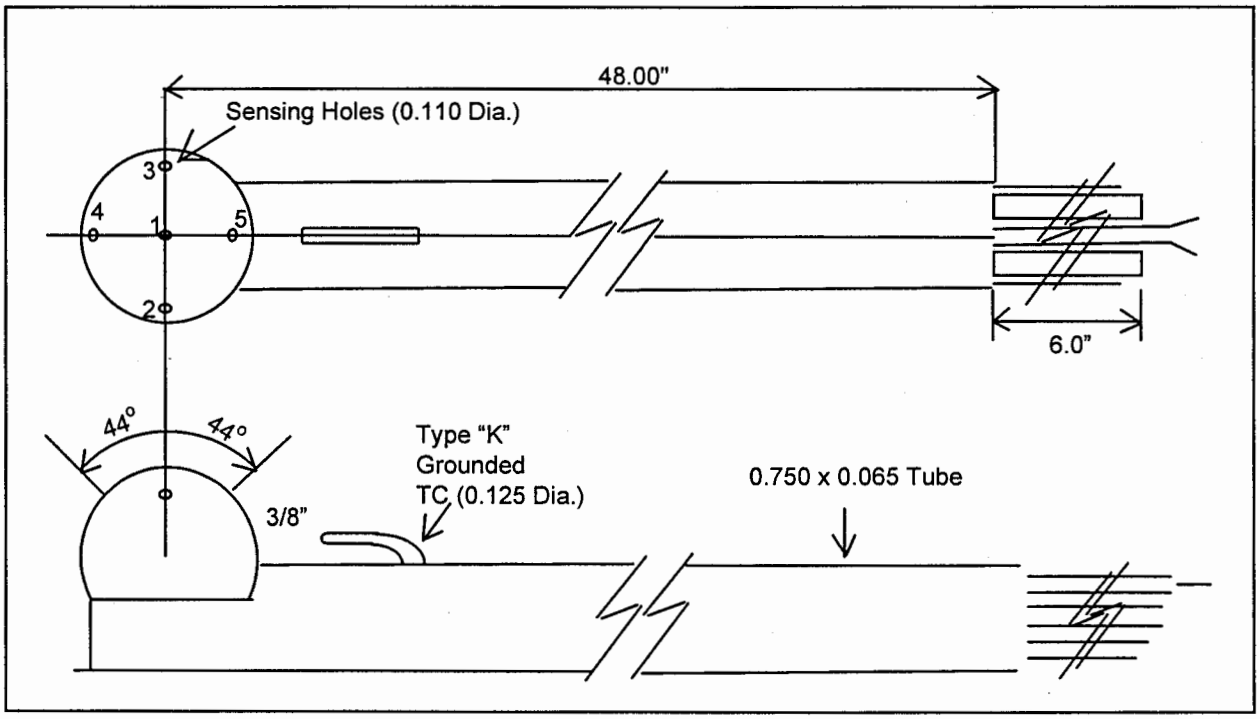


Figure B-4. Front and side views of spherical probe.

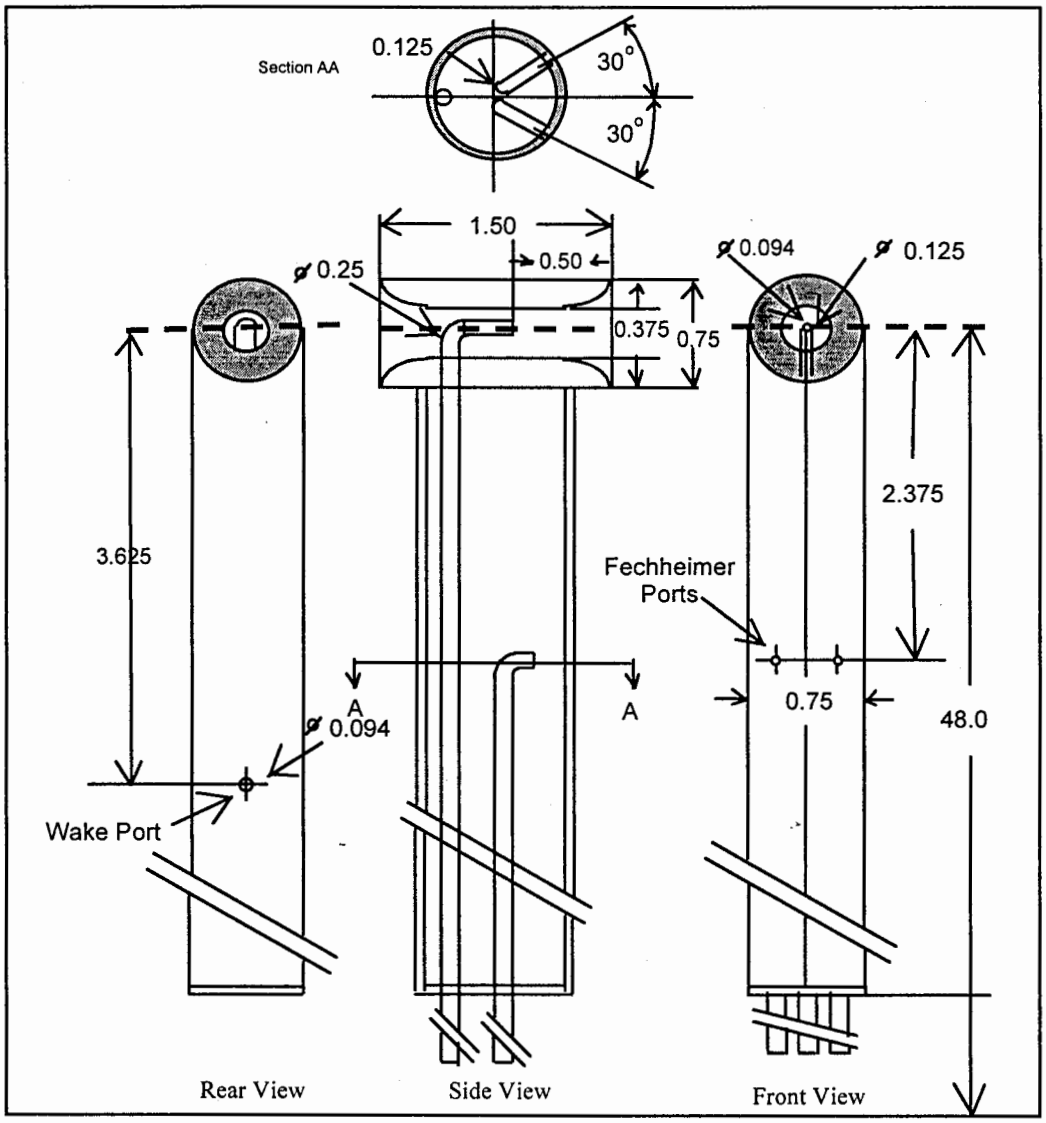


Figure B-5. Modified Kiel probe.

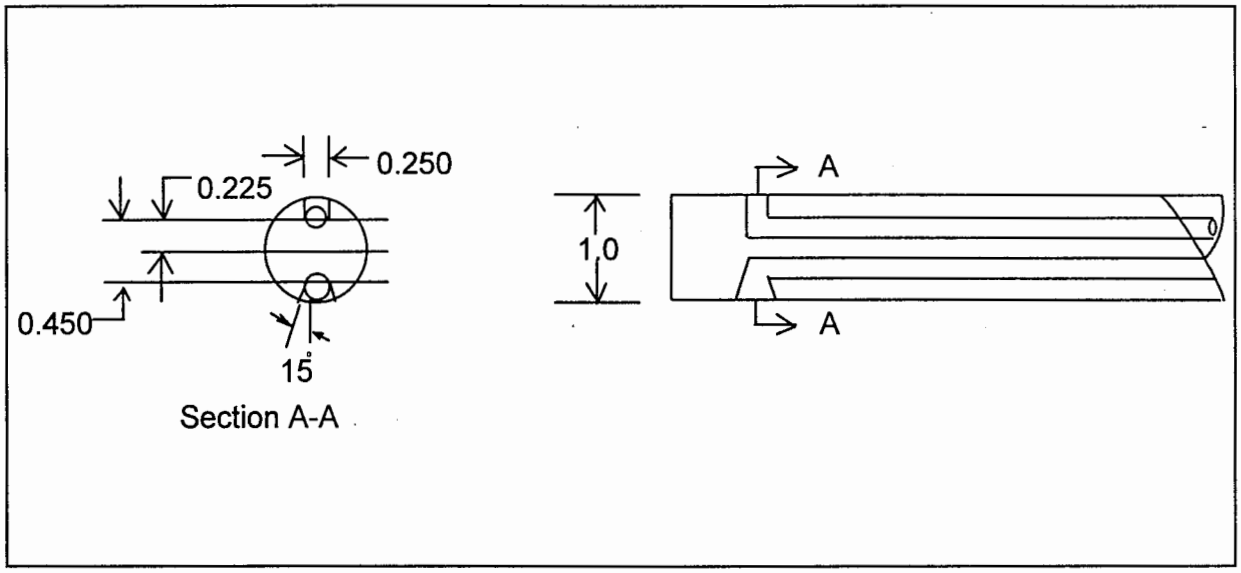


Figure B-6. French probe.

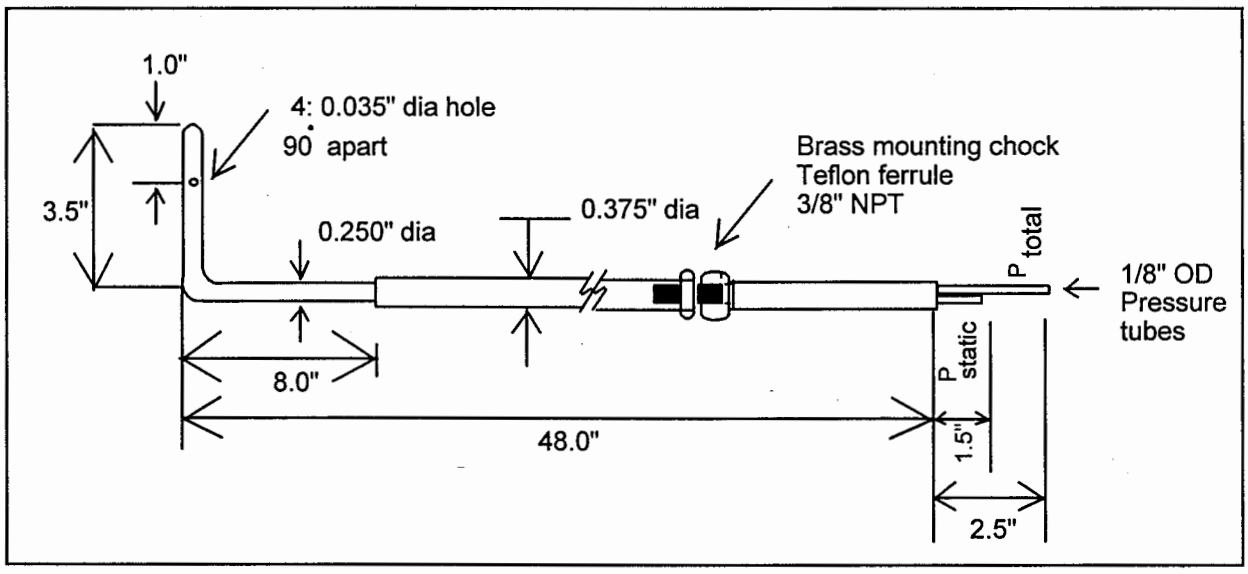


Figure B-7. Prandtl probe.

Appendix C1.
North Carolina State University
Pre- and Post-Test Probe Calibrations

INTRODUCTION

Appendix C1 contains the test plan for probe calibration at North Carolina State University's Merrill Subsonic Wind Tunnel, located on campus in Raleigh, North Carolina. The Test Plan appears on pages C1-3 and C1-4. Appendix C1 also contains the results of the calibrations, which begin on page C1-5.

TEST PLAN FOR PROBE CALIBRATION
Merrill Subsonic Wind Tunnel, North Carolina State University
March 10-14, 1997

PURPOSE

The pitot probes that will be used during the collaborative flow field test program will be calibrated at the Merrill Subsonic Wind Tunnel at North Carolina State University in Raleigh, North Carolina during March 10-14, 1997. The purpose of the calibration effort is to provide standardized calibrations of these probes before the field test. Each test contractor selected for this project will be provided a Type S probe and a DAT probe. Cadmus will provide four copies of the modified Kiel, spherical, and French probes. USI is expected to provide two copies of the Autoprobe, one equipped with a Type S probe tip and the other with a modified Type S probe tip. These probes will be received by Cadmus and delivered to the wind tunnel facility on March 10.

The probes will be calibrated in accordance with current requirements in Method 2[1] and draft Method 2F.[2] In addition, as part of an evaluation of possible revisions to the calibration procedures in these two methods, probe calibrations will also be performed at additional velocities to cover the full velocity range epxected in the field. These possible method revisions are outlined in Appendices F and G to the Draft Test Plan.[3] The two sets of resulting calibration data will be compared.

CALIBRATION PROCEDURES

One- and Two-Dimensional Pitot Probes. The Type S, modified Kiel, modified S, and French probes will be calibrated at 50 ft/sec in accordance with the current provision in Section 4.1.2.3 of Method 2. Three repetitions will be performed; a calibration factor will be derived for each repetition, and the three resulting factors will be averaged. Both the A side and B side of the Type S and modified S probes will be calibrated.

Method 2, Section 4.1.2.3 also includes a provision to determine calibration factors at other velocities between 10 and 83 ft/sec. In the interest of calibrating the one- and two-dimensional probes over the full velocity range, a second set of calibration factors will be determined at 30 and 90 ft/sec. According to the possible method revisions regarding probe calibrations, the difference between the 30 ft/sec (minimum velocity) and 90 ft/sec (maximum velocity) calibration factors must be ≤3%, relative to the minimum velocity. If the difference is greater than 3%, the calibration must be repeated at a velocity point mid-way between the minimum and maximum velocities. The resulting calibration factor determined in the mid-point velocity is compared to both the minimum and maximum velocity calibration factors. The difference between the minimum and mid-point velocity calibration factors, and the mid-point and maximum velocity calibration factors must be ≤3% to be considered acceptable. This procedure is continued until the percent change in calibration factors between two velocities is ≤3%.

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1 40 CFR 60, Appendix A, Method 2—Determination of stack gas velocity and volumetric flow rate (Type S pitot tube).

2 40 CFR 60, Appendix A, Method 2F—Determination of stack gas velocity and volumetric flow rate with three-dimensional probes.

3 The Cadmus Group, Inc., 1997, Flow Reference Method Testing and Analysis: Field Test Plan, Texas Utilities' DeCordova Steam Electric Station. EPA/430/R-97-024. 85 pages plus appendices.

As part of the equipment set-up before the probe is inserted into the wind tunnel section, a procedure is included in the possible revisions to verify that the yaw angle measurement device installed on the probe is properly aligned with the pitot probe head. This procedure applies to the set-up of all the pitot probes.

Three-Dimensional Pitot Probes. The DAT and spherical probes will be calibrated according to the current version of draft Method 2F, although physical limitations of the Merrill Subsonic Wind Tunnel prevent calibrating the probes at pitch angles beyond ±30 degrees. Calibration curves will be determined at two velocities, one between 20 and 40 ft/sec and one between 40 and 60 ft/sec. These calibration results will be averaged to obtain the set of curves for each probe. In addition, calibration curves will be developed at 90 ft/sec.

The proposed schedule of probe calibrations and the respective procedures are outlined in the following table.

Table 1. Pitot Probe Calibrations

Probe Type	Probe ID	Date Received	Date of Calibration	Calibration Procedure	
				Current	Proposed
Wind Tunnel					TM2-1, TM2F-1
Modified Kiel	MKF-1	2/25/97	3/10/97	Method 2	TM2-2,3,4
	MKF-2	2/25/97	3/10/97	Method 2	TM2-2,3,4
	MKF-3	2/25/97	3/10/97	Method 2	TM2-2,3,4
	MKR-4	2/25/97	3/10/97	Method 2	TM2-2,3,4
Type S	KEA-S	3/10/97	3/11/97	Method 2	TM2-2,3,4
	TSA-S	3/10/97	3/11/97	Method 2	TM2-2,3,4
	ENT-S	3/10/97	3/11/97	Method 2	TM2-2,3,4
	MET-S	3/10/97	3/11/97	Method 2	TM2-2,3,4
French	F-1			Method 2	TM2-4
	F-2			Method 2	TM2-4
	F-3			Method 2	TM2-4
	F-4			Method 2	TM2-4
DAT	KEA-D	3/10/97	3/11/97	Draft Method 2F	TM2F-1
	TSA-D	3/10/97	3/11/97	Draft Method 2F	TM2F-1
	ENT-D	3/10/97	3/11/97	Draft Method 2F	TM2F-1
	MET-D	3/10/97	3/13/97	Draft Method 2F	TM2F-1
Spherical	SPH-1	3/7/97	3/12/97		TM2F-1
	SPH-2	3/12/97	3/14/97		TM2F-1
	SPH-3	3/12/97	3/14/97		TM2F-1
	SPH-4	3/12/97	3/14/97		TM2F-1
Autoprobe Type S	AS-1			Method 2	TM2-2,3,4
Autoprobe Mod S	AMS-2			Method 2	TM2-2,3,4

Table C1-1. One- and Two-Dimensional Probe Calibration Summary at 60 fps

Probe Type	Probe Identification	Pre-Test Calibration Results		Post-Test Calibration Results		Percent Difference [a]
		C_p	Date	C_p	Date	
Prandtl	PR-1	0.976	5/25/97	0.982	11/8/97	0.6
	PR-2	0.970	5/25/97	0.970	11/8/97	0.0
	PR-3	0.967	5/25/97	0.972	11/8/97	-0.4
	PR-4	0.976	5/25/97	0.970	11/8/97	-0.6
French	FR-1	0.711	4/17/97	0.705	11/8/97	-0.8
	FR-2	0.704	4/17/97	0.699	11/8/97	-0.7
	FR-3	0.710	4/17/97	0.711	11/8/97	0.1
	FR-4	0.708	4/17/97	0.699	11/8/97	-1.3
Type S	S-10	0.802	5/25/97	0.790	11/8/97	-1.5
	S-11	0.803	5/25/97	0.797	11/8/97	-0.7
	S-12	0.801	5/25/97	0.796	11/8/97	-0.6
	S-13	0.801	5/25/97	0.797	11/8/97	-0.5
Autoprobe Type S	026	0.785	5/13/97	0.784	10/15/97	-0.1
	027	0.788	3/12/97	0.785	10/15/97	-0.4
	028	0.783	5/12/97	0.779	10/15/97	-0.5
	033	0.789	5/13/97	0.780	10/15/97	-1.1
	036	0.770	3/12/97	0.775	10/15/97	0.6
Modified Kiel	MK-1	0.736	3/12/97	0.734	11/8/97	-0.3
	MK-2	0.736	3/12/97	0.747	11/8/97	1.5
	MK-3	0.736	3/12/97	0.746	11/8/97	1.4
	MK-4	0.736	3/12/97	0.744	11/8/97	1.1

[a] % Difference = $[(Cp^{post} - Cp^{pre}) / Cp^{pre}] * 100$

Table C1-2. DAT Probe Calibration Summary (30-60 fps averaged)

Pitch Angle	Pre-Test Calibration			Post-Test Calibration			% Difference
	Probe	F1	F2	Probe	F1	F2	F2
-30	E-DAT	-0.55946	1.04235	E-DAT	-0.47729	1.04146	0.1
-25	05/25/97	-0.43517	1.02490	09/17/97	-0.41179	1.02660	-0.2
-20		-0.35548	1.01817		-0.33238	1.01820	-0.0
-15		-0.28140	1.00623		-0.27050	1.00592	0.0
-10		-0.17126	0.99572		-0.17458	0.99515	0.1
-5		-0.10619	0.99204		-0.09484	0.99446	-0.2
0		-0.05449	0.98433		-0.04309	0.98117	0.3
5		0.00791	0.97923		0.02609	0.97781	0.1
10		0.06735	0.97514		0.07471	0.97584	-0.1
15		0.15966	0.97628		0.18289	0.97622	0.0
20		0.22679	0.95808		0.23620	0.96001	-0.2
25		0.31414	0.94441		0.31763	0.95254	-0.9
30		0.40879	0.95042		0.49202	0.96902	-1.9
-30	K-DAT	-0.68366	1.08274	K-DAT	-0.67962	1.09017	-0.7
-25	03/13/97	-0.53514	1.04772	09/17/97	-0.51028	1.07095	-2.2
-20		-0.38907	1.02911		-0.39533	1.04927	-1.9
-15		-0.29354	1.01388		-0.27409	1.03074	-1.6
-10		-0.22701	1.00863		-0.19434	1.02551	-1.6
-5		-0.16521	1.00729		-0.14155	1.01992	-1.2
0		-0.08359	1.00645		-0.07720	1.01573	-0.9
5		-0.00608	1.00163		-0.03789	1.01276	-1.1
10		0.04304	0.99667		0.04340	1.00771	-1.1
15		0.13856	0.98513		0.10894	0.99405	-0.9
20		0.23173	0.98168		0.20755	1.00064	-1.9
25		0.33906	1.00172		0.27048	1.01247	-1.1
30		0.44635	1.01031		0.42102	1.03204	-2.1
-30	C-DAT	-0.54879	1.03769	C-DAT	-0.52181	1.06801	-2.8
-25	08/07/97	-0.42505	1.00453	09/18/97	-0.40618	1.04594	-4.0
-20		-0.35192	0.98691		-0.32820	1.02184	-3.4
-15		-0.25193	0.97818		-0.22282	1.02023	-4.1
-10		-0.14827	0.97927		-0.16584	1.01749	-3.8
-5		-0.09505	0.98101		-0.09747	1.01995	-3.8
0		-0.04098	0.97955		-0.03737	1.01671	-3.7
5		0.02275	0.98103		0.02572	1.01470	-3.3
10		0.08979	0.97961		0.08663	1.01136	-3.1
15		0.16595	0.97110		0.17102	1.00686	-3.6
20		0.24319	0.96034		0.25366	1.00621	-4.6
25		0.37280	0.97692		0.33780	1.01476	-3.7
30		0.47163	0.99260		0.43037	1.03342	-3.9
-30	T-DAT	-0.64595	1.07959	T-DAT	-0.61006	1.08948	-0.9
-25	03/14/97	-0.53893	1.06998	09/18/97	-0.49503	1.07029	-0.0
-20		-0.40658	1.04652		-0.40612	1.05069	-0.4
-15		-0.30316	1.02052		-0.32021	1.01940	0.1
-10		-0.20668	1.01114		-0.19589	1.00938	0.2
-5		-0.13538	1.00685		-0.10389	1.00686	-0.0
0		-0.07167	1.00394		-0.03684	1.00477	-0.1
5		-0.02026	1.00323		0.00205	1.00477	-0.2
10		0.02334	1.00394		0.07111	1.00519	-0.1
15		0.11560	0.99734		0.15823	1.00060	-0.3
20		0.25523	0.98912		0.24249	0.99736	-0.8
25		0.35550	1.00249		0.32914	0.98776	1.5
30		0.45797	1.00969		0.45190	1.00371	0.6

Table C1-3. Spherical Probe Calibration Summary (30-60 fps averaged)

Pitch	Pre-Test Calibration *			Intermediate Calibration			Post-Test Calibration			% Difference
Angle	Probe	F1	F2	Probe	F1	F2	Probe	F1	F2	Pre-Post F2
-30	SPH-1	-2.38799	1.12548	SPH-1	-1.93040	1.12251	SPH-1	-2.12646	1.17587	-4.3
-25		-2.14541	1.05004		-1.83801	1.03858		-1.95761	1.09101	-3.8
-20	06/29/97	-1.80653	0.99224	07/21/97	-1.53868	0.98466	10/28/97	-1.65031	1.02602	-3.3
-15		-1.42286	0.96512		-1.29876	0.95611		-1.38776	0.99855	-3.3
-10		-1.04694	0.95246		-0.97775	0.94212		-1.00297	0.98009	-2.8
-5		-0.63685	0.94915		-0.57819	0.94212		-0.69172	0.98173	-3.3
0		-0.31415	0.95277		-0.26003	0.94737		-0.34915	0.98672	-3.4
5		0.13275	0.96303		0.06566	0.95392		0.01025	0.98857	-2.6
10		0.49841	0.97829		0.50441	0.96653		0.26544	0.99892	-2.1
15		0.92976	0.99400		0.92845	0.98278		0.87006	1.01677	-2.2
20		1.27145	1.01690		1.35201	1.00809		1.32029	1.04538	-2.7
25		1.61653	1.04999		1.80687	1.05235		1.74062	1.08355	-3.1
30		2.06988	1.10600		2.23567	1.10095		2.13709	1.13068	-2.2
-30	SPH-2	-2.18026	1.14150	SPH-2	-2.08635	1.13054	SPH-2	-2.14775	1.17257	-2.6
-25		-1.98234	1.05111		-1.90517	1.03394		-1.94227	1.07439	-2.2
-20	06/29/97	-1.59614	1.00342	07/22/97	-1.59600	0.99375	11/06/97	-1.65462	1.02820	-2.4
-15		-1.30356	0.98071		-1.31398	0.96827		-1.35578	1.00790	-2.7
-10		-0.98092	0.96705		-0.99720	0.95041		-0.90879	0.99823	-3.1
-5		-0.62883	0.96845		-0.61766	0.94814		-0.63303	0.99718	-2.9
0		-0.27370	0.97507		-0.30734	0.95814		-0.26920	1.00100	-2.6
5		0.12399	0.98114		0.11111	0.96438		0.05729	1.00640	-2.5
10		0.60275	0.99192		0.45330	0.97831		0.47572	1.01637	-2.4
15		0.99608	1.00979		0.98732	1.00219		0.98936	1.03248	-2.2
20		1.40159	1.03565		1.42513	1.02240		1.37530	1.05809	-2.1
25		1.81905	1.06767		1.82264	1.06062		1.84329	1.09745	-2.7
30		2.20996	1.11737		2.31002	1.11405		2.25874	1.14724	-2.6
-30	SPH-3	-2.21549	1.16774	SPH-3	-2.11338	1.15938	SPH-3	-2.23533	1.18953	-1.8
-25		-2.11927	1.05616		-1.96712	1.06097		-2.01675	1.08661	-2.8
-20	06/28/97	-1.72721	1.00509	07/21/97	-1.66268	1.00229	11/06/97	-1.74154	1.02635	-2.1
-15		-1.37358	0.97732		-1.34759	0.97395		-1.49391	1.00552	-2.8
-10		-1.10372	0.96548		-1.05489	0.96441		-1.10075	0.99151	-2.6
-5		-0.75947	0.96476		-0.61937	0.95958		-0.74510	0.99066	-2.6
0		-0.41687	0.96580		-0.33181	0.96063		-0.33037	0.99234	-2.7
5		0.04105	0.97000		0.02716	0.96868		-0.03384	0.99864	-2.9
10		0.30878	0.97683		0.43532	0.98095		0.25483	1.00292	-2.6
15		0.88338	0.99665		0.90221	0.99413		0.63445	1.01380	-1.7
20		1.24675	1.01814		1.30130	1.01215		1.24244	1.03652	-1.8
25		1.66540	1.05104		1.71228	1.04880		1.61737	1.06755	-1.5
30		2.06270	1.08417		2.25304	1.09507		2.09201	1.11341	-2.6
-30	SPH-4	-2.08713	1.10587	SPH-4	-2.12684	1.12867	SPH-4	-2.20009	1.16874	-5.4
-25		-1.86295	1.04054		-1.90125	1.04885		-1.92268	1.07962	-3.6
-20	06/26/97	-1.56293	0.99281	07/22/97	-1.58568	0.99225	11/28/97	-1.60999	1.02322	-3.0
-15		-1.25847	0.96657		-1.31890	0.96585		-1.32574	0.99006	-2.4
-10		-0.94059	0.94542		-0.96442	0.94409		-0.89706	0.97509	-3.0
-5		-0.56367	0.94215		-0.56336	0.93952		-0.60567	0.97170	-3.0
0		-0.23145	0.95037		-0.30957	0.94799		-0.25178	0.97607	-2.6
5		0.11469	0.96590		0.10231	0.95749		0.06062	0.98572	-2.0
10		0.59277	0.98980		0.46950	0.97727		0.32925	0.99217	-0.2
15		0.97094	0.99874		0.93066	0.99304		0.82478	1.01502	-1.6
20		1.40269	1.01415		1.33912	1.00609		1.33843	1.03856	-2.4
25		1.81247	1.04518		1.75939	1.04174		1.77231	1.06775	-2.1
30		2.24986	1.09113		2.12869	1.09136		2.15674	1.12065	-2.6

*** June calibration was performed after probes were repaired from damage caused during DeCordova field test.**

Table C1-3. Spherical Probe Calibration Summary (30-60 fps averaged)

Pitch	Pre-Test Calibration			Post-Test Calibration			% Difference
Angle	Probe	F1	F2	Probe	F1	F2	Pre-Post F2
-30	SPH-5	-2.36273	1.15973	SPH-5	-2.27879	1.19951	-3.3
-25		-1.98180	1.10083		-1.95097	1.13528	-3.0
-20	08/05/97	-1.52585	1.04352	11/07/97	-1.54001	1.08156	-3.5
-15		-1.21261	1.00888		-1.10060	1.05388	-4.3
-10		-0.84405	0.98941		-0.73793	1.02990	-3.9
-5		-0.47727	0.97399		-0.44354	1.02344	-4.8
0		-0.14946	0.97380		-0.18369	1.02205	-4.7
5		0.16701	0.97109		0.19631	1.01459	-4.3
10		0.73431	0.97126		0.50876	1.01732	-4.5
15		1.14505	0.97794		1.08404	1.02480	-4.6
20		1.54697	1.00917		1.48072	1.03773	-2.8
25		1.86646	1.03728		1.86276	1.07463	-3.5
30		2.22527	1.07082		2.10885	1.09140	-1.9
-30	SPH-6	-2.20126	1.10818	SPH-6	-2.16231	1.14134	-2.9
-25		-1.80808	1.04908		-1.81260	1.08237	-3.1
-20	08/05/97	-1.48715	1.00684	11/07/97	-1.49662	1.04584	-3.7
-15		-1.20594	0.98311		-1.18116	1.02707	-4.3
-10		-0.88099	0.95954		-0.76907	1.01371	-5.3
-5		-0.49550	0.95373		-0.48800	1.00490	-5.1
0		-0.20909	0.95542		-0.18109	1.00400	-4.8
5		-0.00411	0.95238		0.15412	1.00183	-4.9
10		0.50948	0.95784		0.53255	1.00731	-4.9
15		0.98226	0.96658		0.99557	1.01355	-4.6
20		1.45093	0.99187		1.38745	1.03072	-3.8
25		1.87197	1.03567		1.81183	1.07877	-4.0
30		2.28192	1.09027		2.25039	1.12163	-2.8
-30	SPH-7	-2.18313	1.10291	SPH-7	-2.18520	1.15387	-4.4
-25		-1.77559	1.04240		-1.80142	1.09037	-4.4
-20	08/06/97	-1.42573	1.00288	11/07/97	-1.44563	1.04902	-4.4
-15		-1.13332	0.98092		-1.09269	1.02596	-4.4
-10		-0.79488	0.96509		-0.83170	1.01677	-5.1
-5		-0.45889	0.96264		-0.53457	1.01245	-4.9
0		-0.13738	0.96300		-0.18819	1.01494	-5.1
5		0.24224	0.96336		0.13233	1.01375	-5.0
10		0.53482	0.97475		0.50150	1.01774	-4.2
15		1.14499	0.98950		0.98704	1.02570	-3.5
20		1.60306	1.02618		1.42972	1.04411	-1.7
25		1.98815	1.06522		1.89976	1.09336	-2.6
30		2.44725	1.12477		2.32735	1.13959	-1.3
-30	SPH-8	-2.03732	1.15027	SPH-8	-2.35084	1.19240	-3.5
-25		-2.00632	1.08264		-1.95211	1.12833	-4.0
-20	08/06/97	-1.61283	1.03761	11/07/97	-1.63320	1.08383	-4.3
-15		-1.29069	1.00966		-1.28440	1.04855	-3.7
-10		-0.87066	0.98752		-0.90671	1.03263	-4.4
-5		-0.59880	0.97867		-0.62033	1.02223	-4.3
0		-0.23741	0.97650		-0.24374	1.02366	-4.6
5		0.11752	0.97796		0.04126	1.02593	-4.7
10		0.52630	0.98580		0.29266	1.02939	-4.2
15		1.03210	0.99681		0.70049	1.03535	-3.7
20		1.48985	1.02399		1.32750	1.05388	-2.8
25		1.89947	1.05740		1.74116	1.08455	-2.5
30		2.38501	1.11258		2.13603	1.13172	-1.7

ATTACHMENT A.

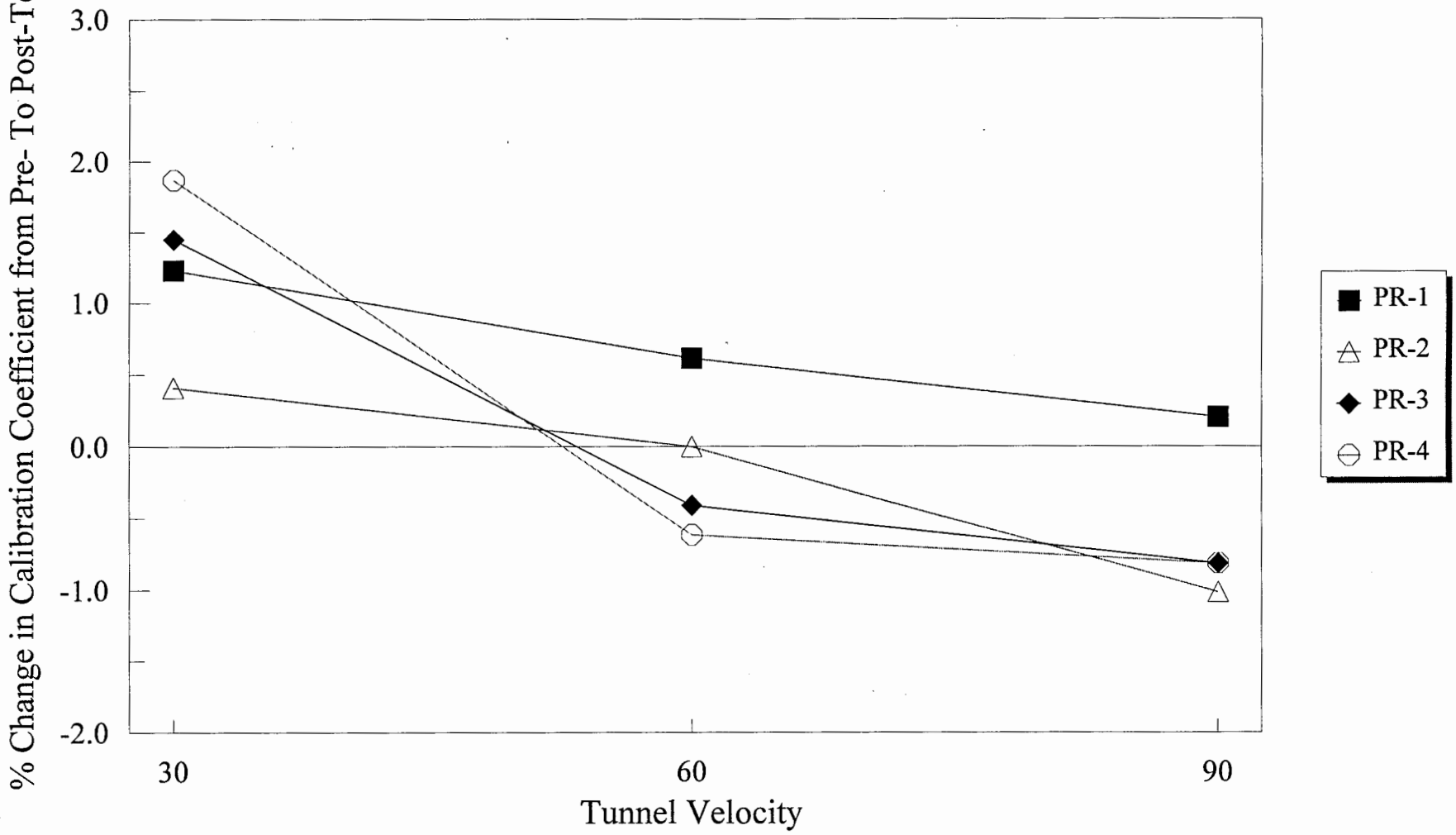
Prandtl Probe Calibration Data

Table C1-4. Prandtl Probe Calibration Results

Probe I.D.	Velocity Point	Pre-Test Calibration			Post-Test Calibration			% Change in Cp
		Calibration Factor, Cp	Average Yaw Angle	Calibration Date	Calibration Factor, Cp	Average Yaw Angle	Calibration Date	
PR-1	30	0.975	NA	5/25/97	0.987	NA	11/8/97	1.2
	60	0.976			0.982			0.6
	90	0.985			0.987			0.2
	Avg.	0.979			0.985			0.7
PR-2	30	0.975	NA	5/25/97	0.979	NA	11/8/97	0.4
	60	0.970			0.970			0.0
	90	0.985			0.975			-1.0
	Avg.	0.977			0.975			-0.2
PR-3	30	0.967	NA	5/25/97	0.981	NA	11/8/97	1.4
	60	0.967			0.972			0.5
	90	0.983			0.975			-0.8
	Avg.	0.972			0.976			0.4
PR-4	30	0.964	NA	5/25/97	0.982	NA	11/8/97	1.9
	60	0.976			0.970			-0.6
	90	0.983			0.975			-0.8
	Avg.	0.974			0.976			-0.2

Figure C1-1. Prandtl Probe Calibration Coefficients

NCSU Wind Tunnel Calibrations -- May and November 1997



CAL-SUM.WK4

Table C1-5. Wind Tunnel Calibration - 05/25/97

Prandtl Probe: PR-1

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.58	1	N	30	0.195	NA	0.205	87	0.975		
	2	N	30	0.195	NA	0.205	87	0.975		
	3	N	30	0.195	NA	0.205	88	0.975		
	1	N	60	0.781	NA	0.820	86		0.976	
	2	N	60	0.781	NA	0.820	87		0.976	
	3	N	60	0.781	NA	0.820	87		0.976	
	1	N	90	1.757	NA	1.810	88			0.985
	2	N	90	1.757	NA	1.810	89			0.985
	3	N	90	1.757	NA	1.810	89			0.985

Avg. =		0.975	0.976	0.985
% Diff.	(30,90)			1.0
	(30,60)			0.1
	(60,90)			1.0
Meth. 2 Avg. =				0.976
Rev. Meth. 2 Avg. =				0.980

* Null angle measured from flat.

Table C1-6. Wind Tunnel Calibration - 11/08/97

Prandtl Probe: PR-1

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.46	1	N	30	0.195	NA	0.200	89	0.987		
	2	N	30	0.195	NA	0.200	90	0.987		
	3	N	30	0.195	NA	0.200	91	0.987		
	1	N	60	0.781	NA	0.820	90		0.976	
	2	N	60	0.781	NA	0.810	90		0.982	
	3	N	60	0.781	NA	0.800	91		0.988	
	1	N	90	1.757	NA	1.810	91			0.985
	2	N	90	1.757	NA	1.800	92			0.988
	3	N	90	1.757	NA	1.800	93			0.988

Avg. =		0.987	0.982	0.987
% Diff.	(30,90)			0.0
	(30,60)			-0.6
	(60,90)			0.5
Meth. 2 Avg. =				0.982
Rev. Meth. 2 Avg. =				0.987

* Null angle measured from flat.

Table C1-7. Wind Tunnel Calibration - 05/25/97

Prandtl Probe: PR-2

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.58	1	N	30	0.195	NA	0.205	86	0.975		
	2	N	30	0.195	NA	0.205	87	0.975		
	3	N	30	0.195	NA	0.205	88	0.975		
	1	N	60	0.781	NA	0.830	87		0.970	
	2	N	60	0.781	NA	0.830	87		0.970	
	3	N	60	0.781	NA	0.830	88		0.970	
	1	N	90	1.757	NA	1.810	88			0.985
	2	N	90	1.757	NA	1.810	89			0.985
	3	N	90	1.757	NA	1.810	89			0.985

Avg. =		0.975	0.970	0.985
% Diff.	(30,90)			1.0
	(30,60)			-0.5
	(60,90)			1.6
Meth. 2 Avg. =				0.970
Rev. Meth. 2 Avg. =				0.980

* Null angle measured from flat.

Table C1-8. Wind Tunnel Calibration - 11/08/97

Prandtl Probe: PR-2

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.46	1	N	30	0.195	NA	0.206	89	0.973		
	2	N	30	0.195	NA	0.205	91	0.975		
	3	N	30	0.195	NA	0.200	91	0.987		
	1	N	60	0.781	NA	0.830	90		0.970	
	2	N	60	0.781	NA	0.830	91		0.970	
	3	N	60	0.781	NA	0.830	91		0.970	
	1	N	90	1.757	NA	1.850	92			0.975
	2	N	90	1.757	NA	1.850	92			0.975
	3	N	90	1.757	NA	1.850	92			0.975

Avg. =		0.979	0.970	0.975
% Diff.	(30,90)			-0.4
	(30,60)			-0.9
	(60,90)			0.5
Meth. 2 Avg. =				0.970
Rev. Meth. 2 Avg. =				0.977

* Null angle measured from flat.

Table C1-9. Wind Tunnel Calibration - 05/25/97

Prandtl Probe: PR-3

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.58	1	N	30	0.195	NA	0.208	88	0.968		
	2	N	30	0.195	NA	0.209	88	0.966		
	3	N	30	0.195	NA	0.208	88	0.968		
	1	N	60	0.781	NA	0.820	88		0.976	
	2	N	60	0.781	NA	0.820	89		0.976	
	3	N	60	0.781	NA	0.820	89		0.976	
	1	N	90	1.757	NA	1.820	90			0.983
	2	N	90	1.757	NA	1.820	90			0.983
	3	N	90	1.757	NA	1.820	90			0.983

Avg. =		0.967	0.976	0.983
% Diff.	(30,90)			1.6
	(30,60)			0.9
	(60,90)			0.7
Meth. 2 Avg. =				0.976
Rev. Meth. 2 Avg. =				0.975

* Null angle measured from flat.

Table C1-10. Wind Tunnel Calibration - 11/08/97

Prandtl Probe: PR-3

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.46	1	N	30	0.195	NA	0.204	89	0.978		
	2	N	30	0.195	NA	0.202	90	0.983		
	3	N	30	0.195	NA	0.202	91	0.983		
	1	N	60	0.781	NA	0.830	90		0.970	
	2	N	60	0.781	NA	0.820	91		0.976	
	3	N	60	0.781	NA	0.830	91		0.970	
	1	N	90	1.757	NA	1.850	92			0.975
	2	N	90	1.757	NA	1.850	92			0.975
	3	N	90	1.757	NA	1.850	93			0.975
							Avg. =	0.981	0.972	0.975
							% Diff. (30,90)			-0.7
							(30,60)			-0.9
							(60,90)			0.3
							Meth. 2 Avg. =			0.972
							Rev. Meth. 2 Avg. =			0.978

* Null angle measured from flat.

Table C1-11. Wind Tunnel Calibration - 05/25/97

Prandtl Probe: PR-4

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.58	1	Y	30	0.195	NA	0.210	87	0.964		
	2	Y	30	0.195	NA	0.210	88	0.964		
	3	Y	30	0.195	NA	0.210	88	0.964		
	1	Y	60	0.781	NA	0.820	88		0.976	
	2	Y	60	0.781	NA	0.820	89		0.976	
	3	Y	60	0.781	NA	0.820	89		0.976	
	1	Y	90	1.757	NA	1.820	89			0.983
	2	Y	90	1.757	NA	1.820	89			0.983
	3	Y	90	1.757	NA	1.820	90			0.983

Avg. =		0.964	0.976	0.983
% Diff.	(30,90)			2.0
	(30,60)			1.3
	(60,90)			0.7
Meth. 2 Avg. =				0.976
Rev. Meth. 2 Avg. =				0.973

Table C1-12. Wind Tunnel Calibration - 11/08/97

Prandtl Probe: PR-4

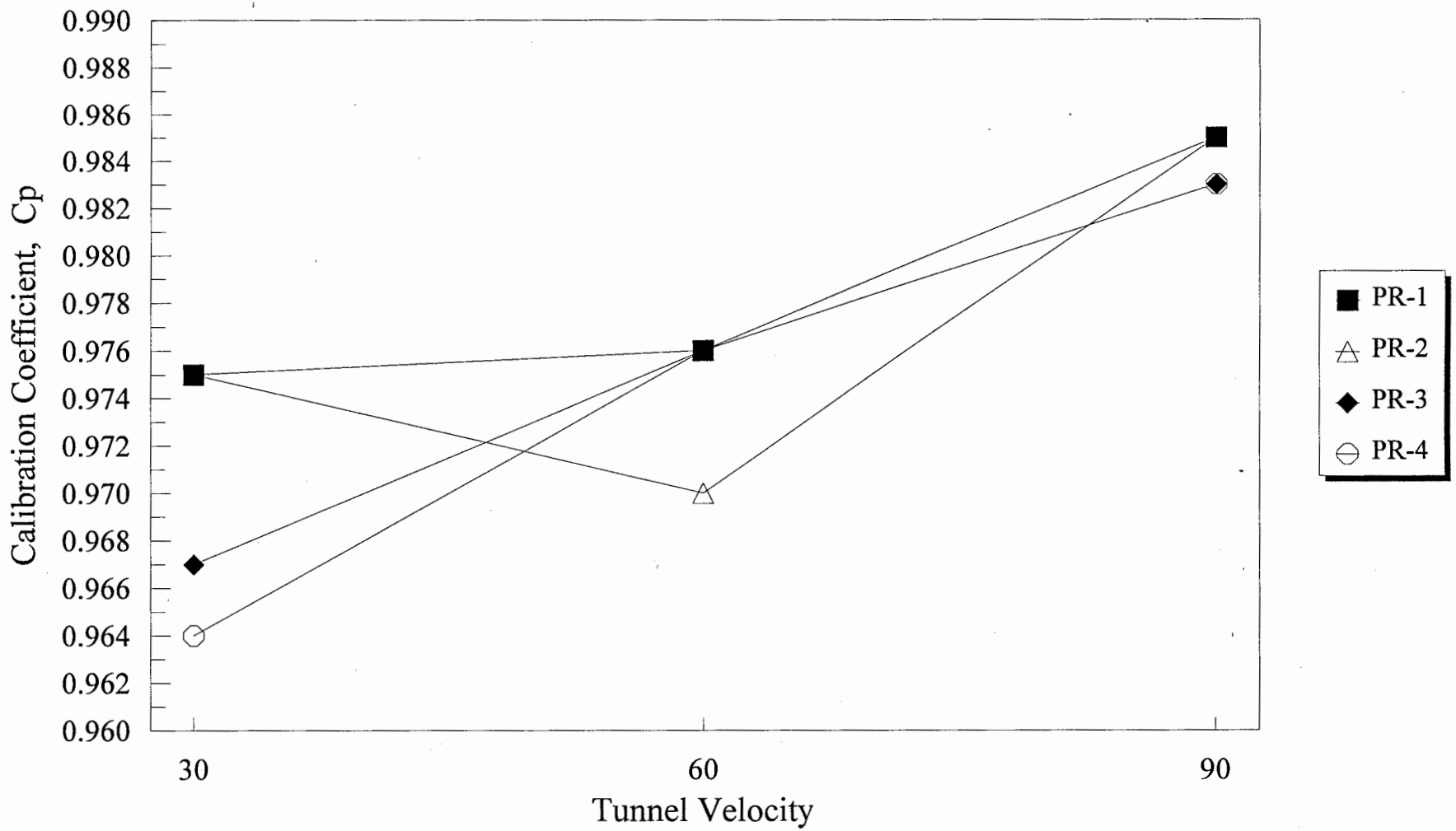
P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.41	1	N	30	0.195	NA	0.205	90	0.975		
	2	N	30	0.195	NA	0.201	91	0.985		
	3	N	30	0.195	NA	0.201	91	0.985		
	1	N	60	0.781	NA	0.830	90		0.970	
	2	N	60	0.781	NA	0.830	91		0.970	
	3	N	60	0.781	NA	0.830	92		0.970	
	1	N	90	1.757	NA	1.850	92			0.975
	2	N	90	1.757	NA	1.850	92			0.975
	3	N	90	1.757	NA	1.850	93			0.975

Avg. =		0.982	0.970	0.975
% Diff.	(30,90)			-0.7
	(30,60)			-1.2
	(60,90)			0.5
Meth. 2 Avg. =				0.970
Rev. Meth. 2 Avg. =				0.978

* Null angle measured from flat.

Figure C1-2. Prandtl Probe Calibration Coefficients

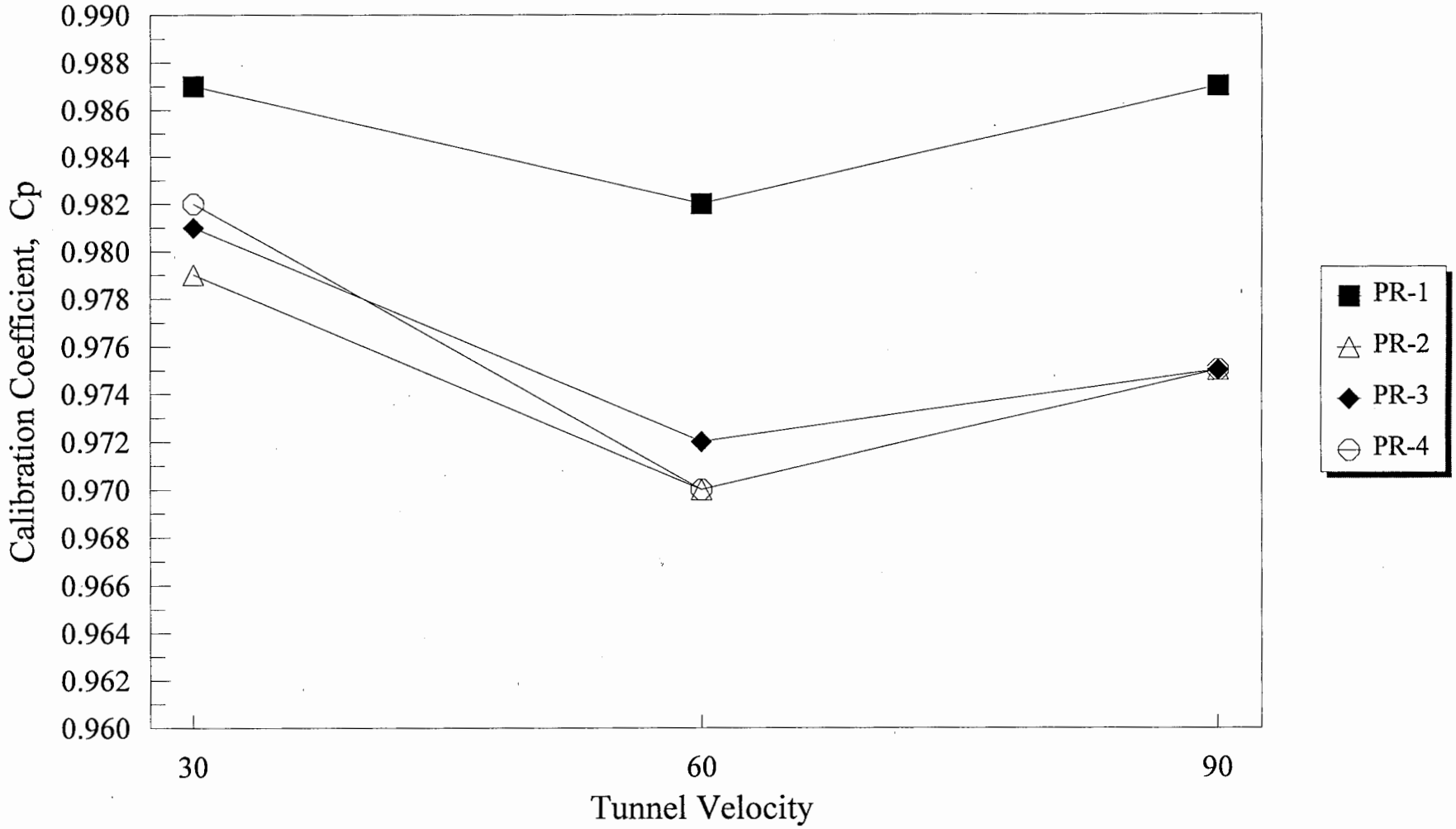
NCSU Wind Tunnel Calibrations -- 5/25/97



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Figure C1-3. Prandtl Probe Calibration Coefficients

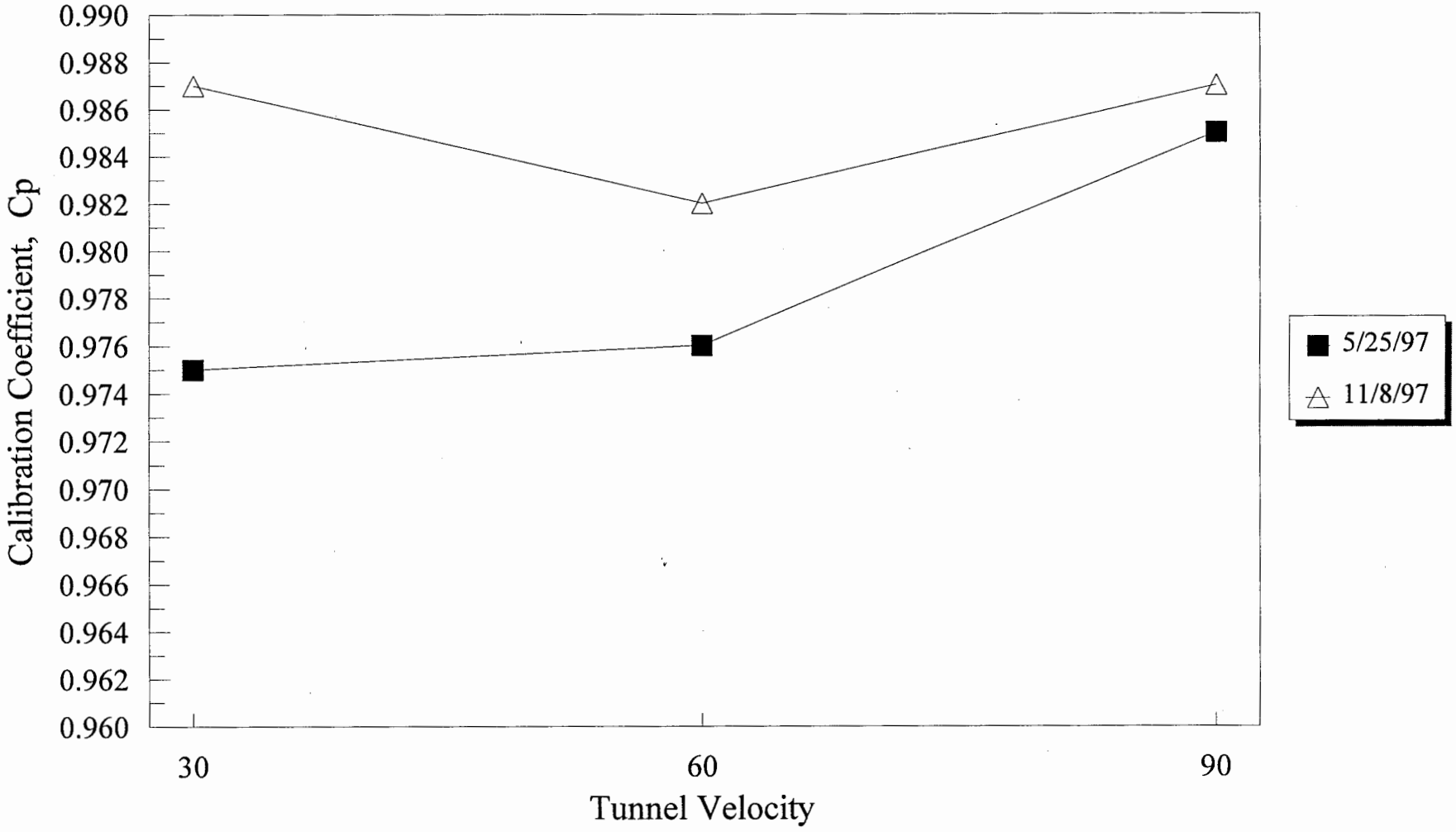
NCSU Wind Tunnel Calibrations -- 11/8/97



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Figure C1-4. Prandtl Probe PR-1 Calibration Coefficients

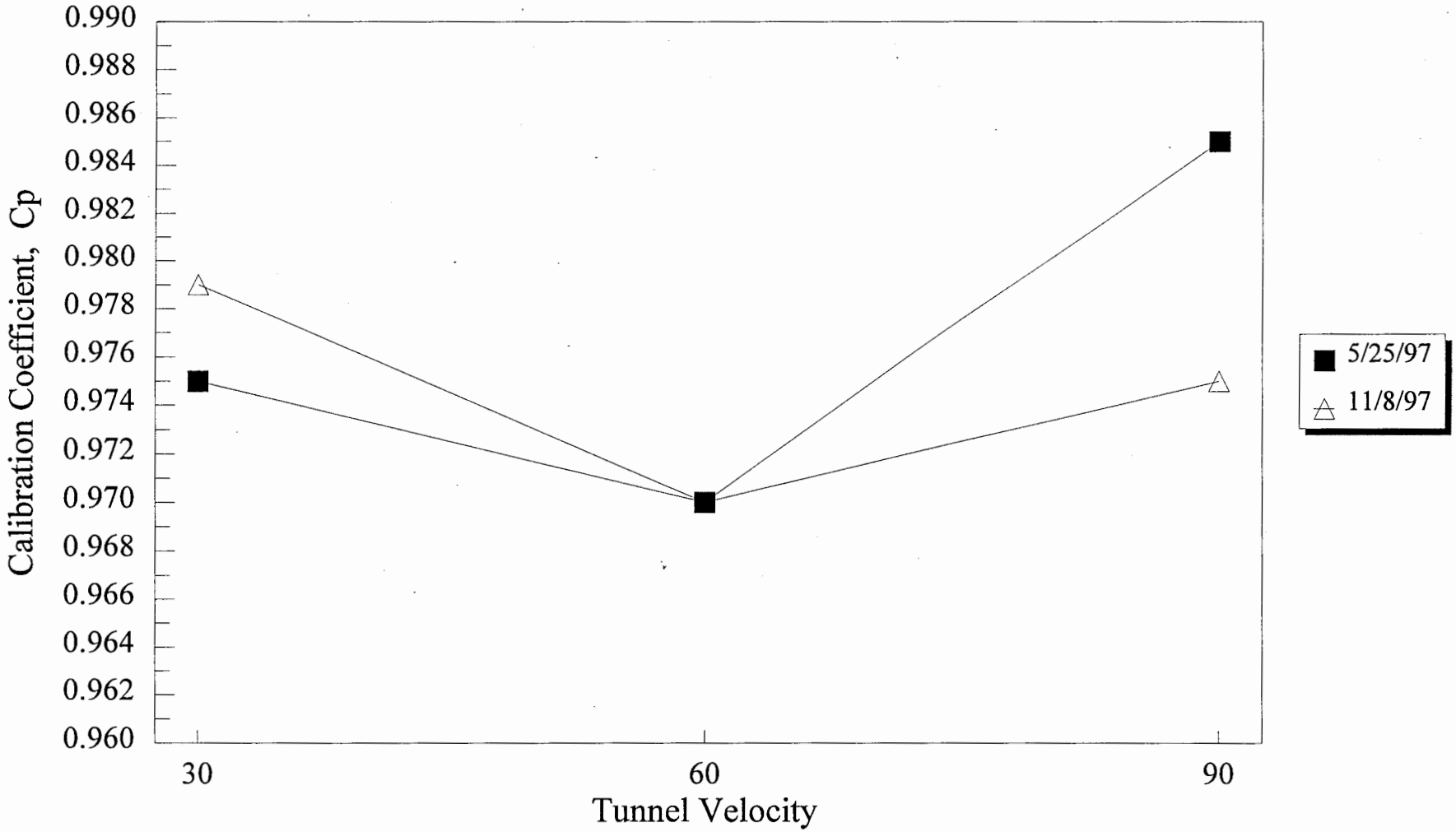
NCSU Wind Tunnel Calibrations



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Figure C1-5. Prandtl Probe PR-2 Calibration Coefficients

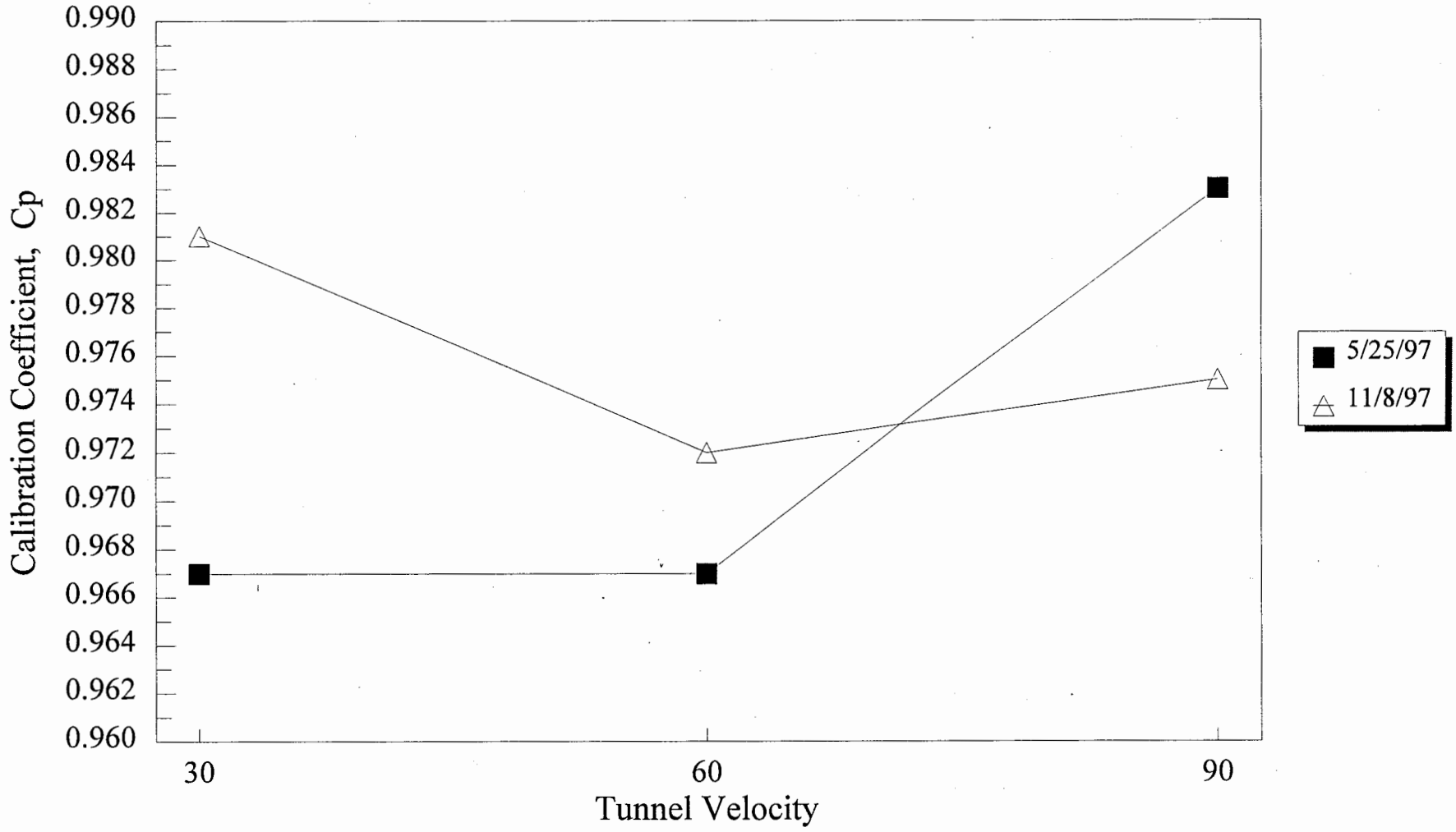
NCSU Wind Tunnel Calibrations



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Figure C1-6. Prandtl Probe PR-3 Calibration Coefficients

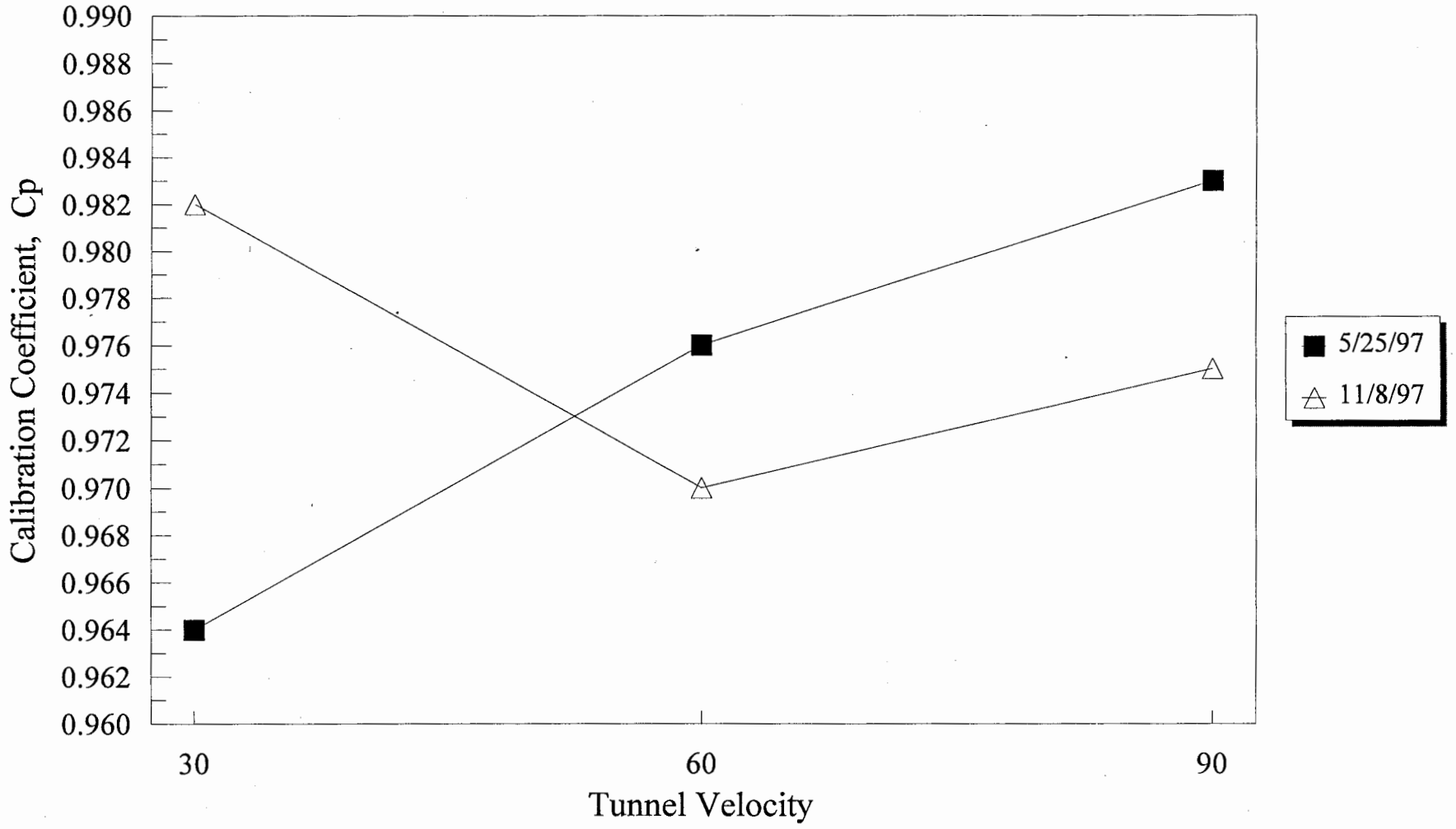
NCSU Wind Tunnel Calibrations



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Figure C1-7. Prandtl Probe PR-4 Calibration Coefficients

NCSU Wind Tunnel Calibrations



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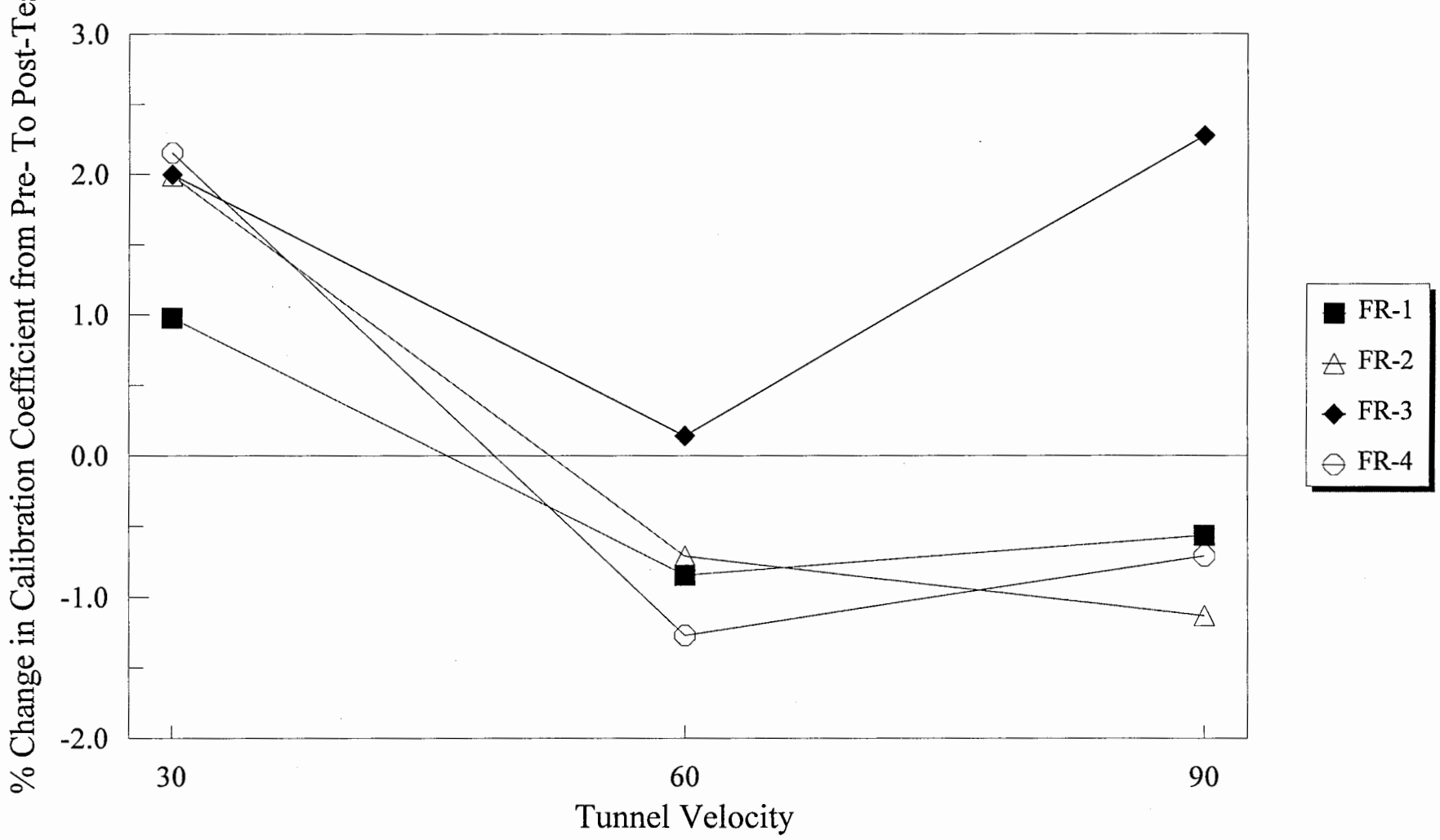
French Probe Calibration Data

Table C1-13. French Probe Calibration Results

Probe I.D.	Velocity Point	Pre-Test Calibration			Post-Test Calibration			% Change in Cp
		Calibration Factor, Cp	Average Yaw Angle	Calibration Date	Calibration Factor, Cp	Average Yaw Angle	Calibration Date	
FR-1	30	0.715	NA	4/17/97	0.722	NA	11/8/97	1.0
	60	0.711			0.705			-0.8
	90	0.708			0.704			-0.6
	Avg.	0.711			0.710			-0.1
FR-2	30	0.704	NA	4/17/97	0.718	NA	11/8/97	2.0
	60	0.704			0.699			-0.7
	90	0.707			0.699			-1.1
	Avg.	0.705			0.705			0.0
FR-3	30	0.701	NA	4/17/97	0.715	NA	11/8/97	2.0
	60	0.710			0.711			0.1
	90	0.703			0.719			2.3
	Avg.	0.705			0.715			1.5
FR-4	30	0.697	NA	4/17/97	0.712	NA	11/8/97	2.2
	60	0.708			0.699			-1.3
	90	0.704			0.699			-0.7
	Avg.	0.703			0.703			0.0

Figure C1-8. French Probe Calibration Coefficients

NCSU Wind Tunnel Calibrations -- April and November 1997



CAL-SUM.WK4

Table C1-14. Wind Tunnel Calibration - 04/17/97

French Probe: FR-1

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.41	1	N	30	0.196	NA	0.380	75	0.718		
	2	N	30	0.196	NA	0.385	75	0.714		
	3	N	30	0.196	NA	0.385	75	0.714		
	1	N	60	0.784	NA	1.550	75		0.711	
	2	N	60	0.784	NA	1.550	75		0.711	
	3	N	60	0.784	NA	1.550	76		0.711	
	1	N	90	1.764	NA	3.550	77			0.705
	2	N	90	1.764	NA	3.500	79			0.710
	3	N	90	1.764	NA	3.500	80			0.710

Avg. =		0.715	0.711	0.708
% Diff.	(30,90)			-1.0
	(30,60)			-0.5
	(60,90)			-0.4
Meth. 2 Avg. =				0.711
Rev. Meth. 2 Avg. =				0.712

* Null angle measured from flat.

Table C1-15. Wind Tunnel Calibration - 11/08/97

French Probe: FR-1

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.46	1	N	30	0.195	NA	0.385	85	0.712		
	2	N	30	0.195	NA	0.368	86	0.728		
	3	N	30	0.195	NA	0.369	88	0.727		
	1	N	60	0.781	NA	1.570	87		0.705	
	2	N	60	0.781	NA	1.580	88		0.703	
	3	N	60	0.781	NA	1.570	89		0.705	
	1	N	90	1.757	NA	3.550	89			0.704
	2	N	90	1.757	NA	3.550	90			0.704
	3	N	90	1.757	NA	3.550	91			0.704

Avg. =		0.722	0.705	0.704
% Diff.	(30,90)			-2.6
	(30,60)			-2.4
	(60,90)			-0.2
Meth. 2 Avg. =				0.705
Rev. Meth. 2 Avg. =				0.713

* Null angle measured from flat.

Table C1-16. Wind Tunnel Calibration - 04/17/97

French Probe: FR-2

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.41	1	N	30	0.196	NA	0.395	76	0.704		
	2	N	30	0.196	NA	0.395	77	0.704		
	3	N	30	0.196	NA	0.395	77	0.704		
	1	N	60	0.784	NA	1.600	77		0.700	
	2	N	60	0.784	NA	1.580	78		0.704	
	3	N	60	0.784	NA	1.570	78		0.707	
	1	N	90	1.764	NA	3.530	80			0.707
	2	N	90	1.764	NA	3.540	81			0.706
	3	N	90	1.764	NA	3.520	82			0.708
						Avg. =		0.704	0.704	0.707
						% Diff.	(30,90)			0.4
							(30,60)			-0.1
							(60,90)			0.5
						Meth. 2 Avg. =				0.704
						Rev. Meth. 2 Avg. =				0.706

* Null angle measured from flat.

Table C1-17. Wind Tunnel Calibration - 11/08/97

French Probe: FR-2

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.46	1	N	30	0.195	NA	0.390	88	0.707		
	2	N	30	0.195	NA	0.370	89	0.726		
	3	N	30	0.195	NA	0.375	90	0.721		
	1	N	60	0.781	NA	1.600	89		0.699	
	2	N	60	0.781	NA	1.640	90		0.690	
	3	N	60	0.781	NA	1.560	90		0.708	
	1	N	90	1.757	NA	3.600	90			0.699
	2	N	90	1.757	NA	3.600	91			0.699
	3	N	90	1.757	NA	3.590	91			0.700
						Avg. =		0.718	0.699	0.699
						% Diff.	(30,90)			-2.7
							(30,60)			-2.7
							(60,90)			0.0
						Meth. 2 Avg. =				0.699
						Rev. Meth. 2 Avg. =				0.709

* Null angle measured from flat.

Table C1-18. Wind Tunnel Calibration - 04/17/97

French Probe: FR-3

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.41	1	N	30	0.196	NA	0.400	79	0.700		
	2	N	30	0.196	NA	0.400	79	0.700		
	3	N	30	0.196	NA	0.395	79	0.704		
	1	N	60	0.784	NA	1.560	79		0.709	
	2	N	60	0.784	NA	1.550	80		0.711	
	3	N	60	0.784	NA	1.560	80		0.709	
	1	N	90	1.764	NA	3.600	82			0.700
	2	N	90	1.764	NA	3.580	83			0.702
	3	N	90	1.764	NA	3.530	85			0.707

Avg. =		0.701	0.710	0.703
% Diff.	(30,90)			0.2
	(30,60)			1.2
	(60,90)			-0.9
Meth. 2 Avg. =				0.710
Rev. Meth. 2 Avg. =				0.702

* Null angle measured from flat.

Table C1-19. Wind Tunnel Calibration - 11/08/97

French Probe: FR-3

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.46	1	N	30	0.195	NA	0.385	88	0.712		
	2	N	30	0.195	NA	0.375	90	0.721		
	3	N	30	0.195	NA	0.385	90	0.712		
	1	N	60	0.781	NA	1.550	89		0.710	
	2	N	60	0.781	NA	1.550	90		0.710	
	3	N	60	0.781	NA	1.540	91		0.712	
	1	N	90	1.757	NA	3.400	90			0.719
	2	N	90	1.757	NA	3.400	91			0.719
	3	N	90	1.757	NA	3.400	92			0.719

Avg. =			0.715	0.711	0.719
% Diff.	(30,90)				0.6
	(30,60)				-0.6
	(60,90)				1.2
Meth. 2 Avg. =					0.711
Rev. Meth. 2 Avg. =					0.717

* Null angle measured from flat.

Table C1-20. Wind Tunnel Calibration - 04/17/97

French Probe: FR-4

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.41	1	N	30	0.196	NA	0.405	81	0.696		
	2	N	30	0.196	NA	0.404	81	0.697		
	3	N	30	0.196	NA	0.401	81	0.699		
	1	N	60	0.784	NA	1.560	81		0.709	
	2	N	60	0.784	NA	1.570	82		0.707	
	3	N	60	0.784	NA	1.560	82		0.709	
	1	N	90	1.764	NA	3.580	83			0.702
	2	N	90	1.764	NA	3.550	85			0.705
	3	N	90	1.764	NA	3.550	86			0.705

Avg. =		0.697	0.708	0.704
% Diff.	(30,90)			1.0
	(30,60)			1.6
	(60,90)			-0.6
Meth. 2 Avg. =				0.708
Rev. Meth. 2 Avg. =				0.701

* Null angle measured from flat.

Table C1-21. Wind Tunnel Calibration - 11/08/97

French Probe: FR-4

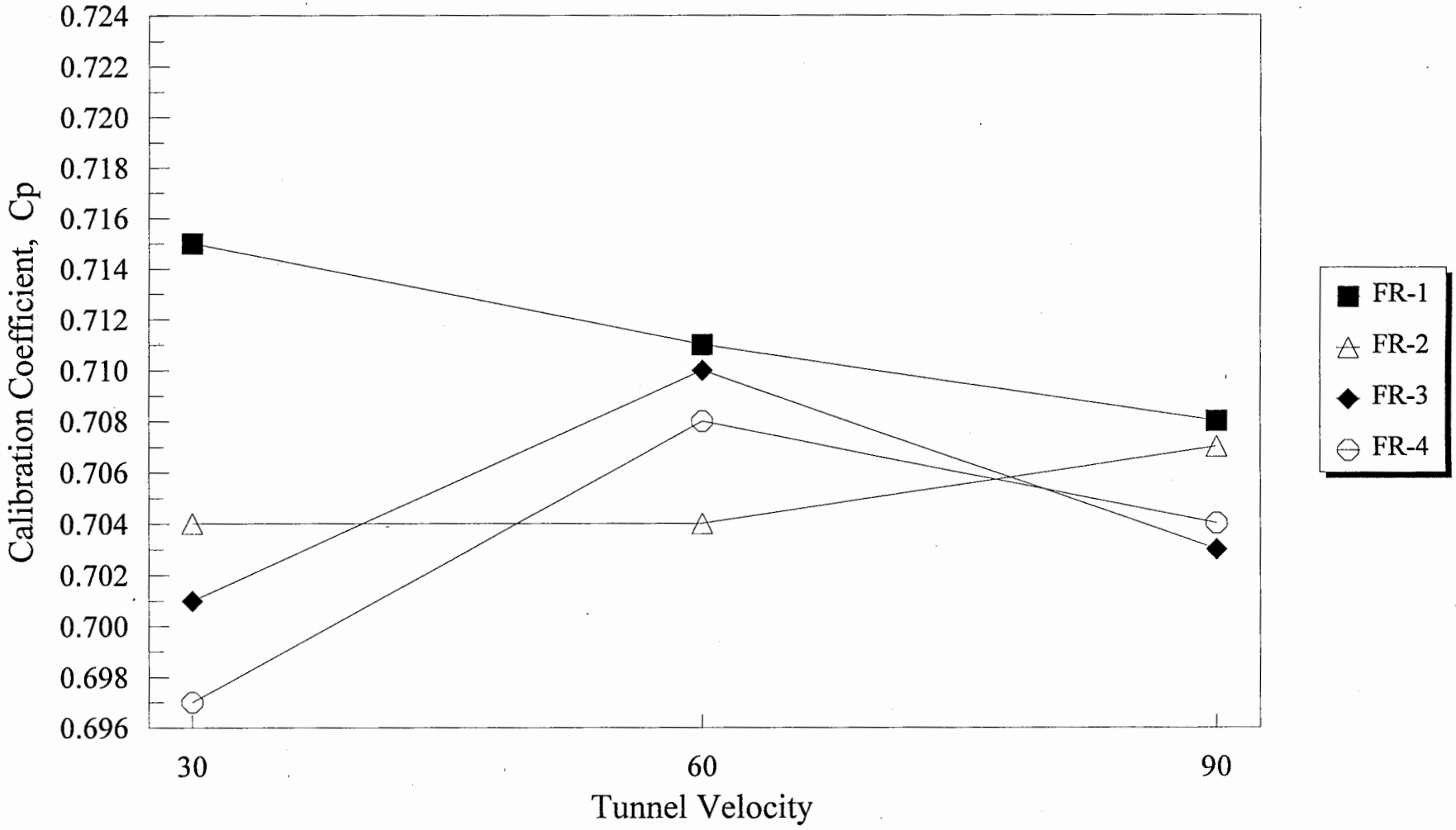
P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.46	1	N	30	0.195	NA	0.385	89	0.712		
	2	N	30	0.195	NA	0.385	90	0.712		
	3	N	30	0.195	NA	0.385	91	0.712		
	1	N	60	0.781	NA	1.600	90		0.699	
	2	N	60	0.781	NA	1.600	91		0.699	
	3	N	60	0.781	NA	1.590	91		0.701	
	1	N	90	1.757	NA	3.600	91			0.699
	2	N	90	1.757	NA	3.600	92			0.699
	3	N	90	1.757	NA	3.600	92			0.699

Avg. =		0.712	0.699	0.699
% Diff.	(30,90)			-1.8
	(30,60)			-1.7
	(60,90)			-0.1
Meth. 2 Avg. =				0.699
Rev. Meth. 2 Avg. =				0.705

* Null angle measured from flat.

Figure C1-9. French Probe Calibration Coefficients

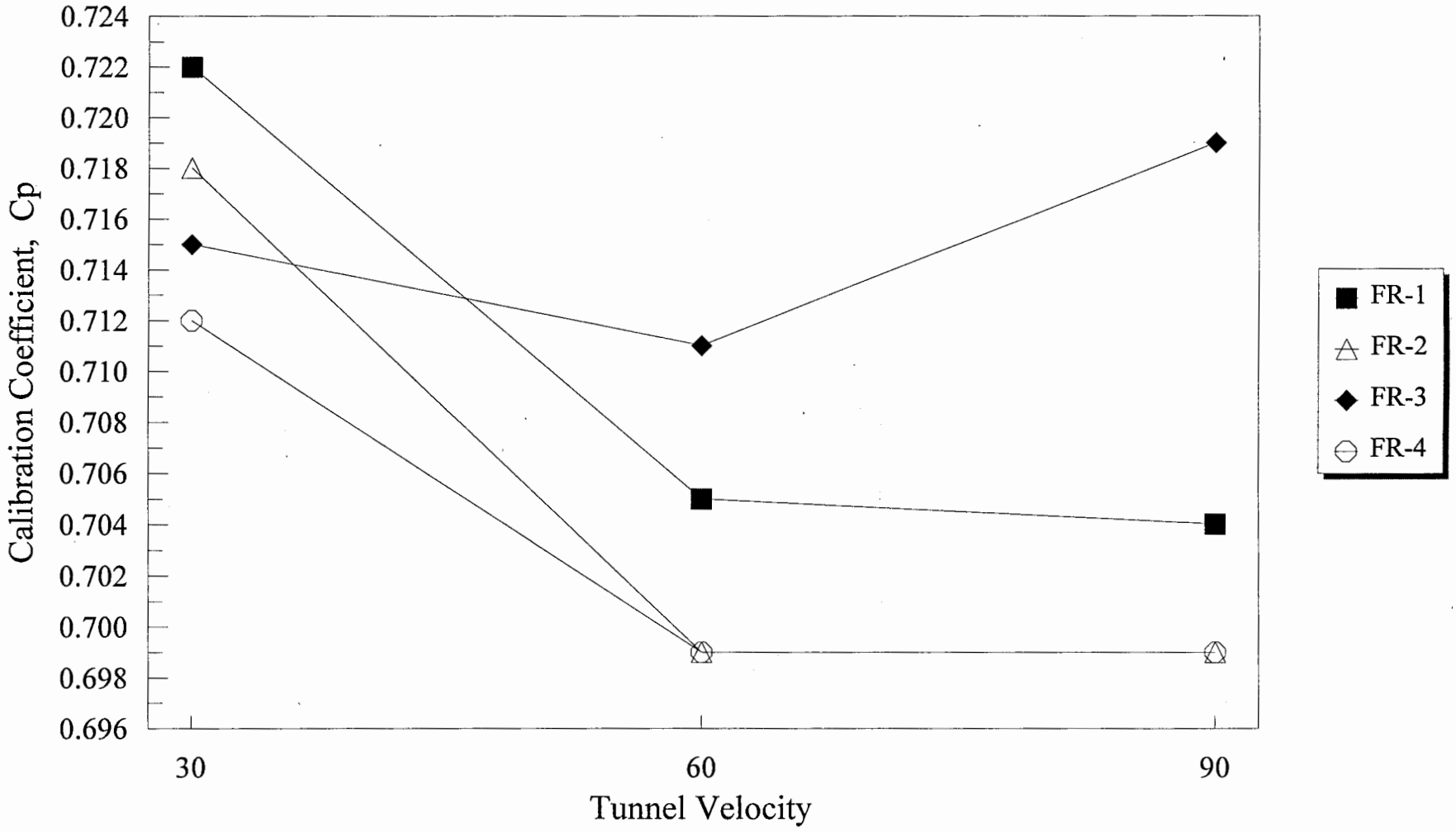
NCSU Wind Tunnel Calibrations -- 4/17/97



CAL-SUM.WK4

Figure C1-10. French Probe Calibration Coefficients

NCSU Wind Tunnel Calibrations -- 11/8/97



CAL-SUM.WK4

Figure C1-11. French Probe FR-1 Calibration Coefficients

NCSU Wind Tunnel Calibrations

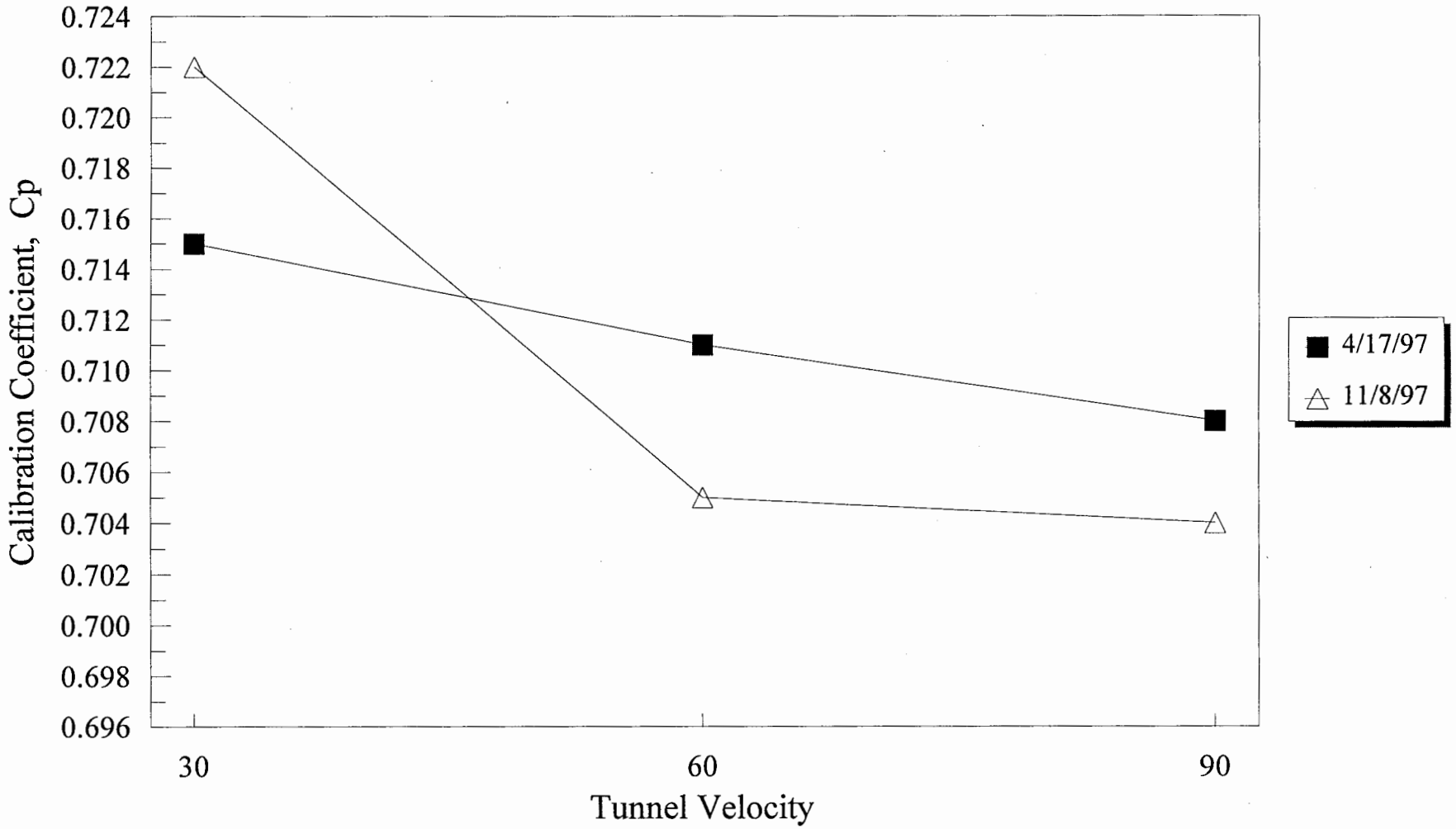


Figure C1-12. French Probe FR-2 Calibration Coefficients

NCSU Wind Tunnel Calibrations

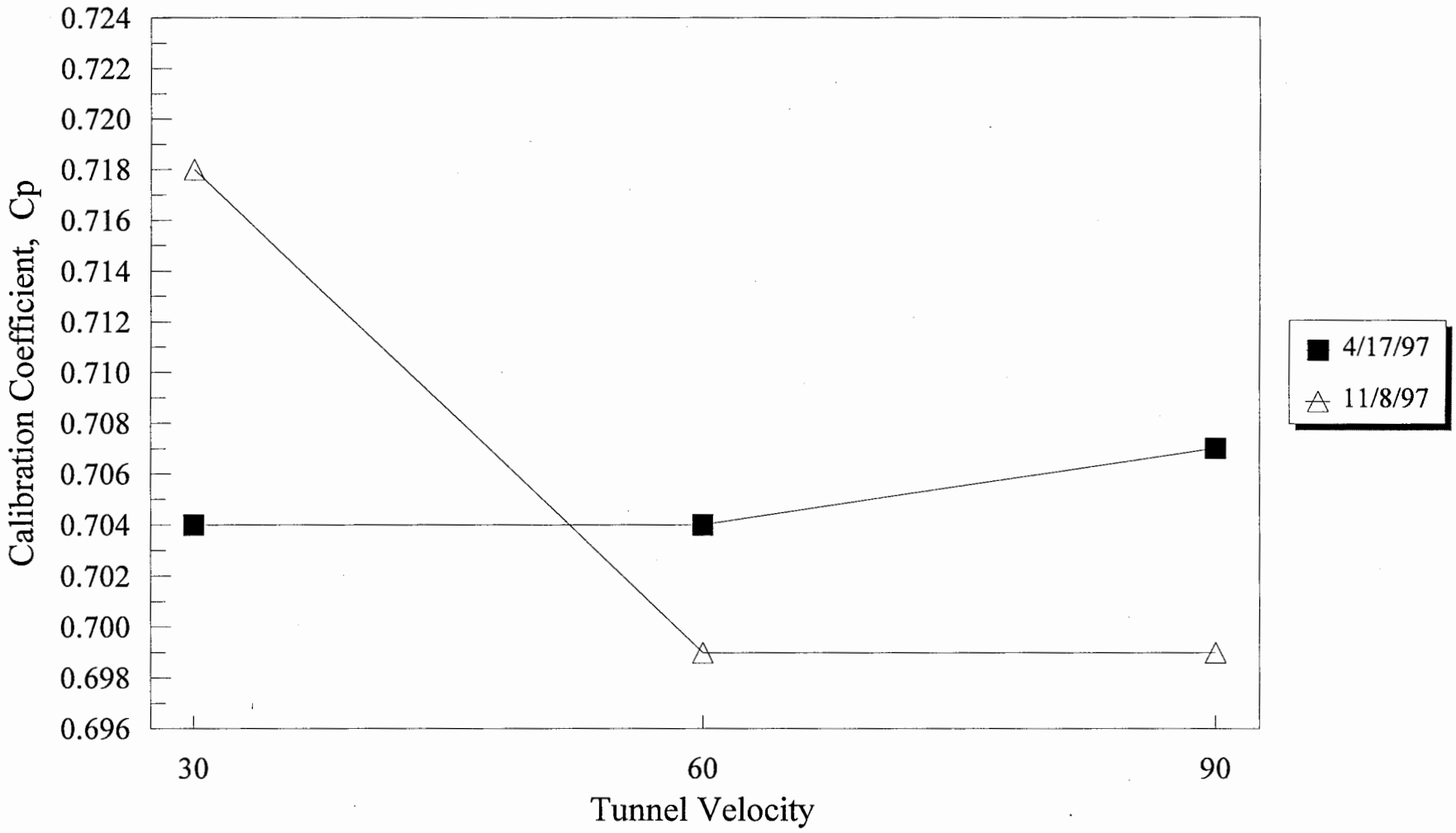


Figure C1-13. French Probe FR-3 Calibration Coefficients

NCSU Wind Tunnel Calibrations

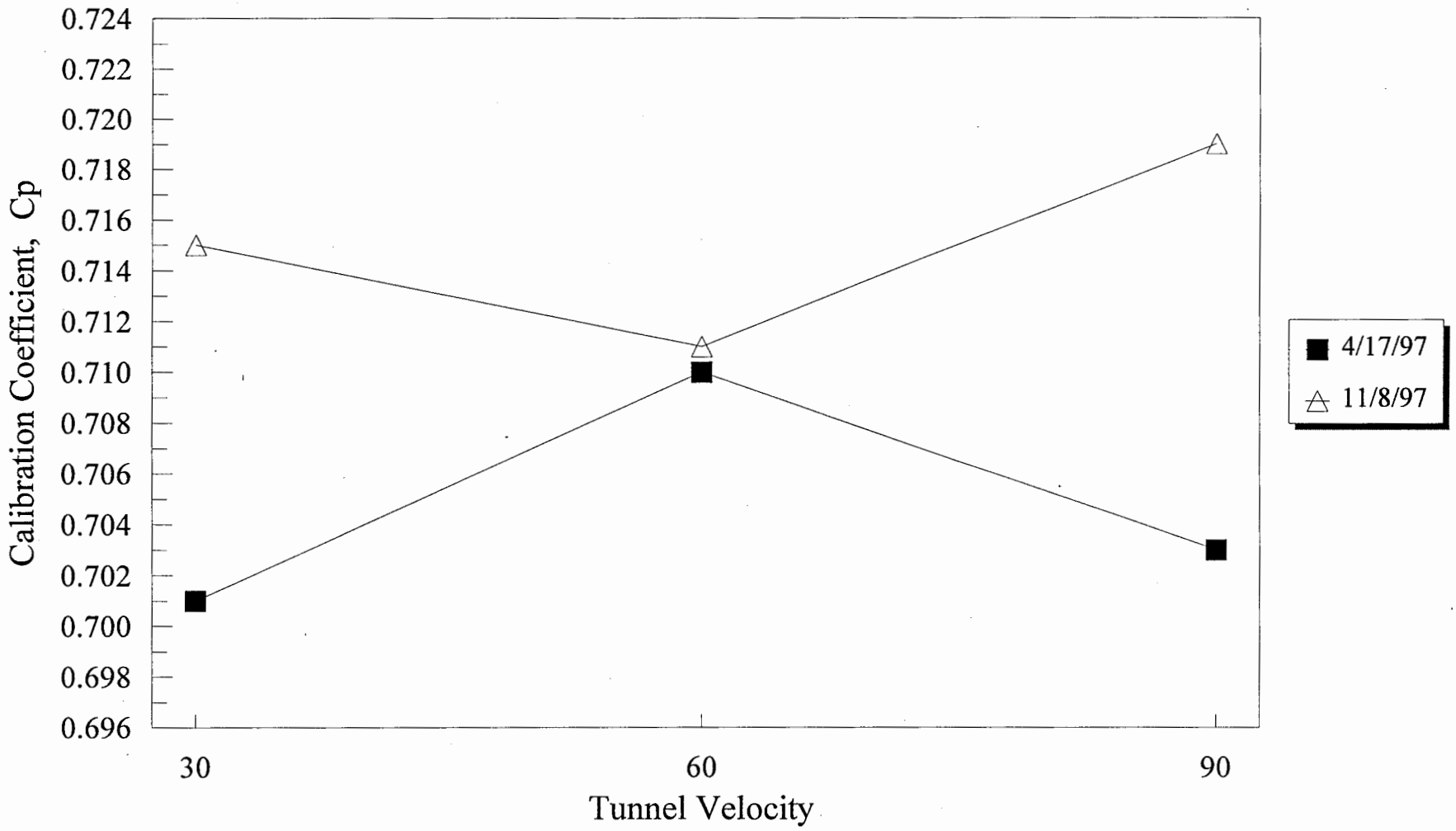
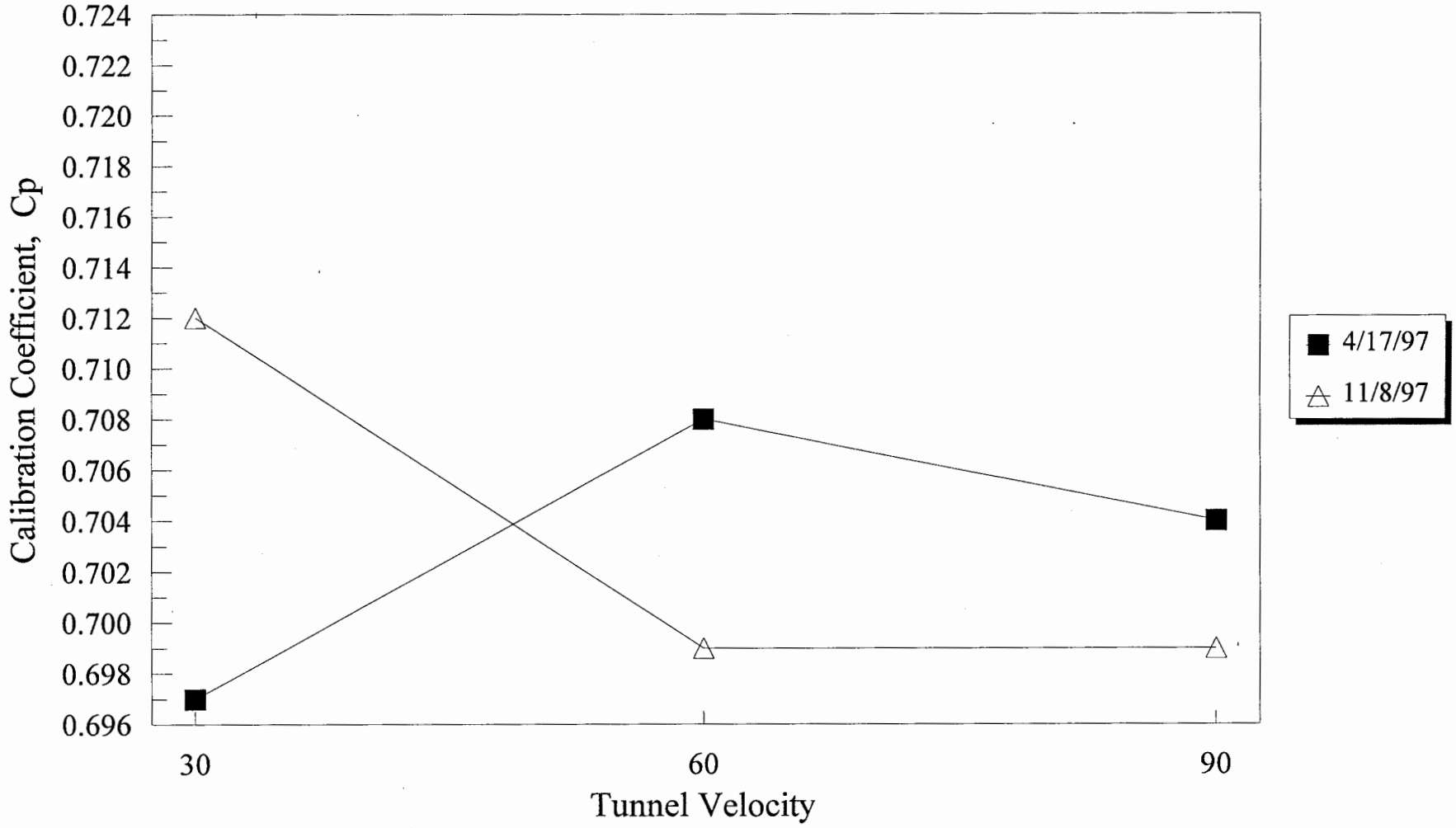


Figure C1-14. French Probe FR-4 Calibration Coefficients

NCSU Wind Tunnel Calibrations



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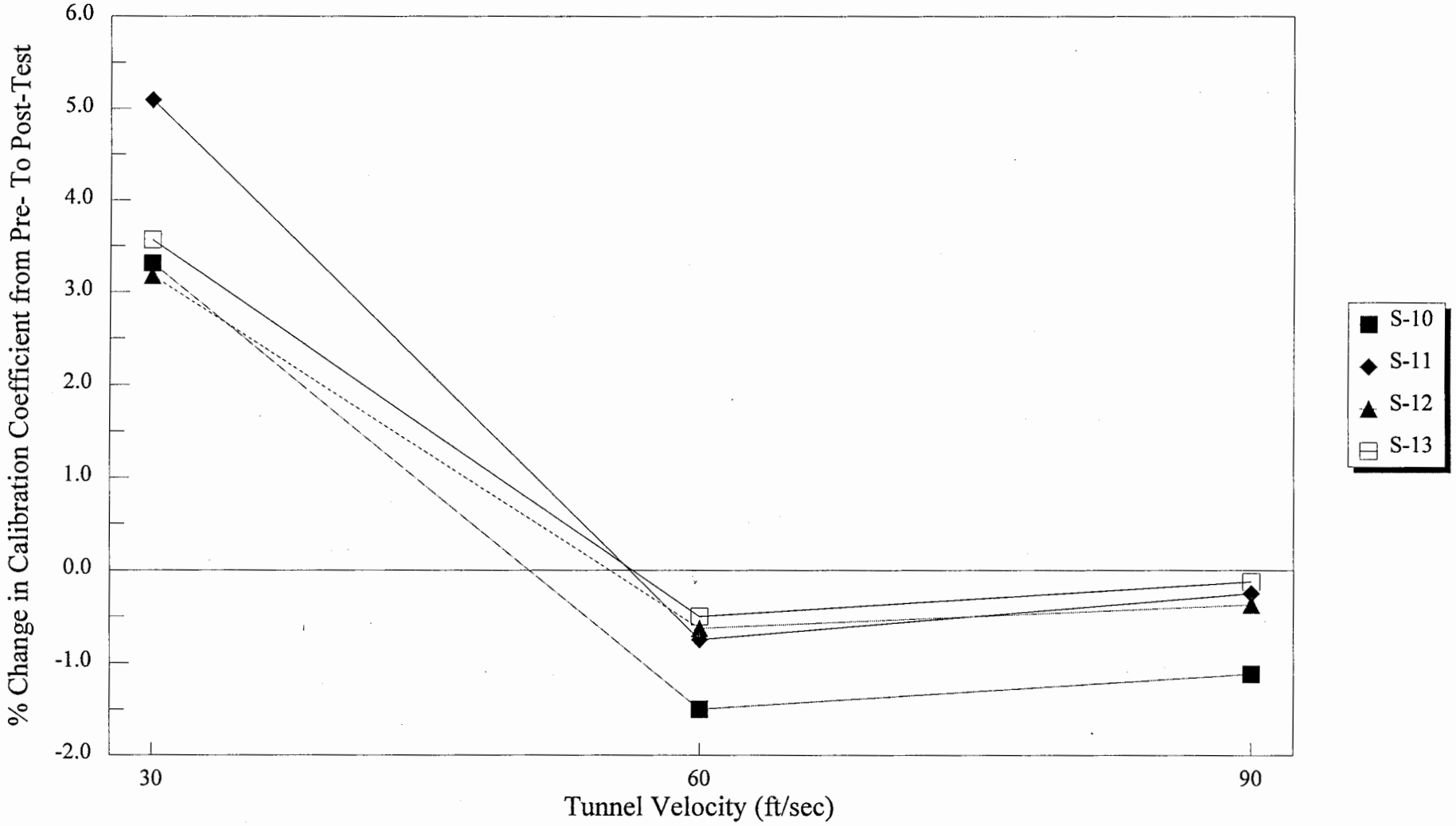
Type S Probe Calibration Data

Table C1-22. Type S Probe Calibration Results

Probe I.D.	Velocity Point	Pre-Test Calibration (Pre-DeCordova) Calibration Factor, Cp	Average Yaw Angle	Calibration Date	Calibration Pre-T/C Well Modification Calibration Factor, Cp	Average Yaw Angle	Calibration Date	% Change in Cp from 5/25	Calibration Post-T/C Well Modification Calibration Factor, Cp	Average Yaw Angle	Calibration Date	% Change in Cp from pre-post mod	Post-Test Calibration (Post Homer City) Calibration Factor, Cp	Average Yaw Angle	Calibration Date	% Change in Cp from 5/25 cal
S-10	30	0.785	0.1	5/25/97	0.769	-0.1	6/26/97	-2.0	0.756	0.2	6/26/97	-1.7	0.811	0.0	11/8/97	3.3
	60	0.802	0.3		0.793	0.3		-1.1	0.790	-0.4		-0.4	0.790	0.2		-1.5
	90	0.807	-0.4		0.802	-0.5		-0.6	0.799	-0.4		-0.4	0.798	0.0		-1.1
	Avg.	0.798	0.0		0.788	-0.1		-1.3	0.782	-0.2		-0.8	0.800	0.1		0.2
S-11	30	0.785	-2.0	5/25/97	0.773	-4.7	6/26/97	-1.5	0.765	-4.5	6/26/97	-1.0	0.825	0.0	11/8/97	5.1
	60	0.803	-3.2		0.796	-4.6		-0.9	0.791	-4.2		-0.6	0.797	0.0		-0.7
	90	0.807	-2.9		0.804	-4.1		-0.4	0.801	-3.9		-0.4	0.805	-0.1		-0.2
	Avg.	0.798	-2.7		0.791	-4.5		-0.9	0.786	-4.2		-0.7	0.809	-0.0		1.3
S-12	30	0.787	0.5	5/25/97	0.761	-0.3	6/26/97	-3.3	0.763	-0.2	6/26/97	0.3	0.812	-0.1	11/8/97	3.2
	60	0.801	0.7		0.790	0.5		-1.4	0.797	-0.2		0.9	0.796	0.0		-0.6
	90	0.807	-1.0		0.803	-0.4		-0.5	0.803	-0.3		0.0	0.804	-0.1		-0.4
	Avg.	0.798	0.1		0.785	-0.1		-1.7	0.788	-0.2		0.4	0.804	-0.1		0.7
S-13	30	0.785	-7.7	5/25/97	0.775	-7.9	6/26/97	-1.3	0.772	-8.0	6/26/97	-0.4	0.813	0.1	11/8/97	3.6
	60	0.801	-7.7		0.797	-7.9		-0.5	0.797	-7.9		0.0	0.797	0.0		-0.5
	90	0.808	-8.0		0.805	-7.8		-0.4	0.806	-7.9		0.1	0.807	0.0		-0.1
	Avg.	0.798	-7.8		0.792	-7.9		-0.7	0.792	-7.9		-0.1	0.806	0.0		1.0

Figure C1-15. Type S Probe Calibration Coefficients

NCSU Wind Tunnel Calibrations -- May and November 1997



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Table C1-23. Wind Tunnel Calibration - 05/25/97

Type S Probe: S-10

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.6	1	Y	30	0.195	0.0	0.320	74	0.781		
	2	Y	30	0.195	0.1	0.315	75	0.787		
	3	Y	30	0.195	0.2	0.315	75	0.787		
	1	Y	60	0.781	0.4	1.220	76		0.800	
	2	Y	60	0.781	0.3	1.210	77		0.803	
	3	Y	60	0.781	0.1	1.210	77		0.803	
	1	Y	90	1.757	-0.5	2.700	82			0.807
	2	Y	90	1.757	-0.4	2.700	83			0.807
	3	Y	90	1.757	-0.4	2.700	84			0.807
						Avg. =		0.785	0.802	0.807
						% Diff.	(30,90)			2.8
							(30,60)			2.2
							(60,90)			0.5
						Meth. 2 Avg. =				0.802
						Rev. Meth. 2 Avg. =				0.796

* Null angle measured from flat.

Table C1-24. Wind Tunnel Calibration - 6/26/97

Type S Probe: S-10

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.77	1	Y	30	0.195	-0.2	0.335	76	0.763		
	2	Y	30	0.195	0.3	0.330	78	0.769		
	3	Y	30	0.195	-0.4	0.325	80	0.775		
	1	Y	60	0.781	0.5	1.240	77		0.794	
	2	Y	60	0.781	0.4	1.250	79		0.790	
	3	Y	60	0.781	0.0	1.240	80		0.794	
	1	Y	90	1.757	-0.5	2.740	80			0.801
	2	Y	90	1.757	-0.6	2.720	82			0.804
	3	Y	90	1.757	-0.3	2.730	84			0.802

Avg. =		0.769	0.793	0.802
% Diff.	(30,90)			4.4
	(30,60)			3.1
	(60,90)			1.2
Meth. 2 Avg. =				0.793
Rev. Meth. 2 Avg. =				0.785

* Null angle measured from flat.

Table C1-25. Wind Tunnel Calibration - 6/26/97

Type S Probe: S-10-MOD

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.73	1	Y	30	0.195	0.1	0.342	84	0.755		
	2	Y	30	0.195	0.0	0.340	84	0.757		
	3	Y	30	0.195	0.4	0.341	84	0.756		
	1	Y	60	0.781	-0.1	1.250	85		0.790	
	2	Y	60	0.781	-0.5	1.250	86		0.790	
	3	Y	60	0.781	-0.6	1.250	86		0.790	
	1	Y	90	1.757	-0.6	2.750	89			0.799
	2	Y	90	1.757	-0.4	2.760	90			0.798
	3	Y	90	1.757	-0.1	2.750	91			0.799

Avg. =		0.756	0.790	0.799
% Diff.	(30,90)			5.6
	(30,60)			4.5
	(60,90)			1.1
Meth. 2 Avg. =				0.790
Rev. Meth. 2 Avg. =				0.778

* Null angle measured from flat.

Table C1-26. Wind Tunnel Calibration - 11/08/97

Type S Probe: S-10

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.45	1	Y	30	0.195	-0.1	0.299	88	0.808		
	2	Y	30	0.195	0.0	0.295	90	0.813		
	3	Y	30	0.195	0.0	0.295	90	0.813		
	1	Y	60	0.781	0.2	1.250	89		0.790	
	2	Y	60	0.781	0.3	1.250	90		0.790	
	3	Y	60	0.781	0.2	1.250	91		0.790	
	1	Y	90	1.757	0.0	2.750	92			0.799
	2	Y	90	1.757	0.2	2.770	92			0.796
	3	Y	90	1.757	-0.1	2.750	93			0.799

Avg. =		0.811	0.790	0.798
% Diff.	(30,90)			-1.6
	(30,60)			-2.6
	(60,90)			1.0
Meth. 2 Avg. =				0.790
Rev. Meth. 2 Avg. =				0.805

Table C1-27. Wind Tunnel Calibration - 05/25/97

Type S Probe: S-11

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.60	1	Y	30	0.195	-2.1	0.320	79	0.781		
	2	Y	30	0.195	-2.1	0.315	79	0.787		
	3	Y	30	0.195	-1.8	0.315	79	0.787		
	1	Y	60	0.781	-3.6	1.210	80		0.803	
	2	Y	60	0.781	-3.1	1.210	80		0.803	
	3	Y	60	0.781	-3.0	1.210	81		0.803	
	1	Y	90	1.757	-3.1	2.700	83			0.807
	2	Y	90	1.757	-2.8	2.700	85			0.807
	3	Y	90	1.757	-2.8	2.690	86			0.808
						Avg. =		0.785	0.803	0.807
						% Diff.	(30,90)			2.9
							(30,60)			2.4
							(60,90)			0.5
						Meth. 2 Avg. =				0.803
						Rev. Meth. 2 Avg. =				0.796

* Null angle measured from flat.

Table C1-28. Wind Tunnel Calibration - 6/26/97

Type S Probe: S-11

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.77	1	Y	30	0.195	-4.4	0.330	80	0.769		
	2	Y	30	0.195	-4.8	0.325	82	0.775		
	3	Y	30	0.195	-4.8	0.325	83	0.775		
	1	Y	60	0.781	-4.7	1.240	81		0.794	
	2	Y	60	0.781	-4.6	1.230	83		0.797	
	3	Y	60	0.781	-4.6	1.230	84		0.797	
	1	Y	90	1.757	-4.1	2.720	84			0.804
	2	Y	90	1.757	-4.1	2.720	85			0.804
	3	Y	90	1.757	-4.1	2.720	86			0.804

Avg. =		0.773	0.796	0.804
% Diff.	(30,90)			4.0
	(30,60)			3.0
	(60,90)			1.0
Meth. 2 Avg. =				0.796
Rev. Meth. 2 Avg. =				0.788

* Null angle measured from flat.

Table C1-29. Wind Tunnel Calibration - 6/26/97

Type S Probe: S-11-MOD

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.73	1	Y	30	0.195	-4.5	0.340	80	0.757		
	2	Y	30	0.195	-4.4	0.325	83	0.775		
	3	Y	30	0.195	-4.6	0.335	84	0.763		
	1	Y	60	0.781	-4.4	1.250	82		0.790	
	2	Y	60	0.781	-4.3	1.250	84		0.790	
	3	Y	60	0.781	-4.0	1.240	84		0.794	
	1	Y	90	1.757	-3.9	2.750	85			0.799
	2	Y	90	1.757	-3.9	2.740	86			0.801
	3	Y	90	1.757	-3.9	2.730	87			0.802

Avg. =		0.765	0.791	0.801
% Diff.	(30,90)			4.7
	(30,60)			3.5
	(60,90)			1.2
Meth. 2 Avg. =				0.791
Rev. Meth. 2 Avg. =				0.783

Table C1-30. Wind Tunnel Calibration - 11/08/97

Type S Probe: S-11

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.45	1	Y	30	0.195	0.0	0.290	90	0.820		
	2	Y	30	0.195	-0.1	0.285	91	0.827		
	3	Y	30	0.195	0.0	0.285	91	0.827		
	1	Y	60	0.781	0.0	1.230	90		0.797	
	2	Y	60	0.781	0.0	1.230	91		0.797	
	3	Y	60	0.781	0.0	1.230	92		0.797	
	1	Y	90	1.757	0.0	2.700	93			0.807
	2	Y	90	1.757	0.0	2.720	93			0.804
	3	Y	90	1.757	-0.2	2.710	94			0.805

Avg. =		0.825	0.797	0.805
% Diff.	(30,90)			-2.4
	(30,60)			-3.4
	(60,90)			1.1
Meth. 2 Avg. =				0.797
Rev. Meth. 2 Avg. =				0.815

* Null angle measured from flat.

Table C1-31. Wind Tunnel Calibration - 05/25/97

Type S Probe: S-12

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.58	1	Y	30	0.195	0.6	0.315	81	0.787		
	2	Y	30	0.195	0.5	0.315	81	0.787		
	3	Y	30	0.195	0.5	0.315	81	0.787		
	1	Y	60	0.781	0.8	1.220	83		0.800	
	2	Y	60	0.781	0.7	1.220	83		0.800	
	3	Y	60	0.781	0.7	1.210	83		0.803	
	1	Y	90	1.757	-1.0	2.700	88			0.807
	2	Y	90	1.757	-0.9	2.700	88			0.807
	3	Y	90	1.757	-1.1	2.700	89			0.807
								Avg. =	0.787	0.801	0.807
								% Diff. (30,90)			2.5
								(30,60)			1.8
								(60,90)			0.7
								Meth. 2 Avg. =			0.801
								Rev. Meth. 2 Avg. =			0.797

* Null angle measured from flat.

Table C1-32. Wind Tunnel Calibration - 6/26/97

Type S Probe: S-12

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.77	1	Y	30	0.195	-0.7	0.340	73	0.757		
	2	Y	30	0.195	0.3	0.340	75	0.757		
	3	Y	30	0.195	-0.5	0.330	77	0.769		
	1	Y	60	0.781	0.5	1.250	74		0.790	
	2	Y	60	0.781	0.6	1.250	76		0.790	
	3	Y	60	0.781	0.3	1.250	78		0.790	
	1	Y	90	1.757	-0.7	2.740	78			0.801
	2	Y	90	1.757	-0.2	2.720	79			0.804
	3	Y	90	1.757	-0.4	2.720	80			0.804

Avg. =		0.761	0.790	0.803
% Diff.	(30,90)			5.5
	(30,60)			3.8
	(60,90)			1.6
Meth. 2 Avg. =				0.790
Rev. Meth. 2 Avg. =				0.782

* Null angle measured from flat.

Table C1-33. Wind Tunnel Calibration - 6/26/97

Type S Probe: S-12-MOD

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.73	1	Y	30	0.195	-0.4	0.335	83	0.763		
	2	Y	30	0.195	-0.1	0.335	82	0.763		
	3	Y	30	0.195	-0.2	0.335	83	0.763		
	1	Y	60	0.781	-0.4	1.230	84		0.797	
	2	Y	60	0.781	-0.3	1.230	84		0.797	
	3	Y	60	0.781	0.0	1.230	84		0.797	
	1	Y	90	1.757	-0.4	2.750	86			0.799
	2	Y	90	1.757	-0.2	2.720	88			0.804
	3	Y	90	1.757	-0.3	2.700	88			0.807

Avg. =		0.763	0.797	0.803
% Diff.	(30,90)			5.3
	(30,60)			4.4
	(60,90)			0.8
Meth. 2 Avg. =				0.797
Rev. Meth. 2 Avg. =				0.783

* Null angle measured from flat.

Table C1-34. Wind Tunnel Calibration - 11/08/97

Type S Probe: S-12

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.45	1	Y	30	0.195	0.0	0.299	90	0.808		
	2	Y	30	0.195	0.0	0.295	91	0.813		
	3	Y	30	0.195	-0.2	0.293	92	0.816		
	1	Y	60	0.781	0.2	1.230	91		0.797	
	2	Y	60	0.781	0.2	1.240	92		0.794	
	3	Y	60	0.781	-0.3	1.230	93		0.797	
	1	Y	90	1.757	0.0	2.750	93			0.799
	2	Y	90	1.757	-0.4	2.700	94			0.807
	3	Y	90	1.757	0.1	2.700	95			0.807

Avg. =		0.812	0.796	0.804
% Diff.	(30,90)			-1.0
	(30,60)			-2.0
	(60,90)			1.1
Meth. 2 Avg. =				0.796
Rev. Meth. 2 Avg. =				0.808

* Null angle measured from flat.

Table C1-35. Wind Tunnel Calibration - 05/25/97

Type S Probe: S-13

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.58	1	Y	30	0.195	-7.83	0.319	84	0.782		
	2	Y	30	0.195	-7.70	0.315	84	0.787		
	3	Y	30	0.195	-7.70	0.315	83	0.787		
	1	Y	60	0.781	-7.60	1.220	84		0.800	
	2	Y	60	0.781	-7.60	1.220	85		0.800	
	3	Y	60	0.781	-7.80	1.210	85		0.803	
	1	Y	90	1.757	-8.10	2.700	87			0.807
	2	Y	90	1.757	-7.90	2.690	89			0.808
	3	Y	90	1.757	-8.00	2.690	91			0.808
							Avg. =	0.785	0.801	0.808
							% Diff. (30,90)			2.9
							(30,60)			2.0
							(60,90)			0.8
							Meth. 2 Avg. =			0.801
							Rev. Meth. 2 Avg. =			0.796

* Null angle measured from flat.

Table C1-36. Wind Tunnel Calibration - 6/26/97

Type S Probe: S-13

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.77	1	Y	30	0.195	-8.4	0.330	81	0.769		
	2	Y	30	0.195	-7.5	0.320	84	0.781		
	3	Y	30	0.195	-7.9	0.323	85	0.777		
	1	Y	60	0.781	-7.9	1.230	82		0.797	
	2	Y	60	0.781	-7.9	1.230	84		0.797	
	3	Y	60	0.781	-7.9	1.230	85		0.797	
	1	Y	90	1.757	-7.6	2.700	86			0.807
	2	Y	90	1.757	-7.9	2.720	87			0.804
	3	Y	90	1.757	-8.0	2.720	87			0.804
							Avg. =	0.775	0.797	0.805
							% Diff. (30,90)			3.8
							(30,60)			2.8
							(60,90)			1.0
							Meth. 2 Avg. =			0.797
							Rev. Meth. 2 Avg. =			0.790

* Null angle measured from flat.

Table C1-37. Wind Tunnel Calibration - 6/26/97

Type S Probe: S-13-MOD

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.73	1	Y	30	0.195	-8.1	0.335	76	0.763		
	2	Y	30	0.195	-7.8	0.325	80	0.775		
	3	Y	30	0.195	-8.1	0.322	81	0.778		
	1	Y	60	0.781	-8.0	1.230	78		0.797	
	2	Y	60	0.781	-7.9	1.230	81		0.797	
	3	Y	60	0.781	-7.7	1.230	82		0.797	
	1	Y	90	1.757	-8.3	2.710	82			0.805
	2	Y	90	1.757	-7.9	2.700	84			0.807
	3	Y	90	1.757	-7.6	2.700	84			0.807

Avg. =		0.772	0.797	0.806
% Diff.	(30,90)			4.4
	(30,60)			3.2
	(60,90)			1.2
Meth. 2 Avg. =				0.797
Rev. Meth. 2 Avg. =				0.789

* Null angle measured from flat.

Table C1-38. Wind Tunnel Calibration - 11/08/97

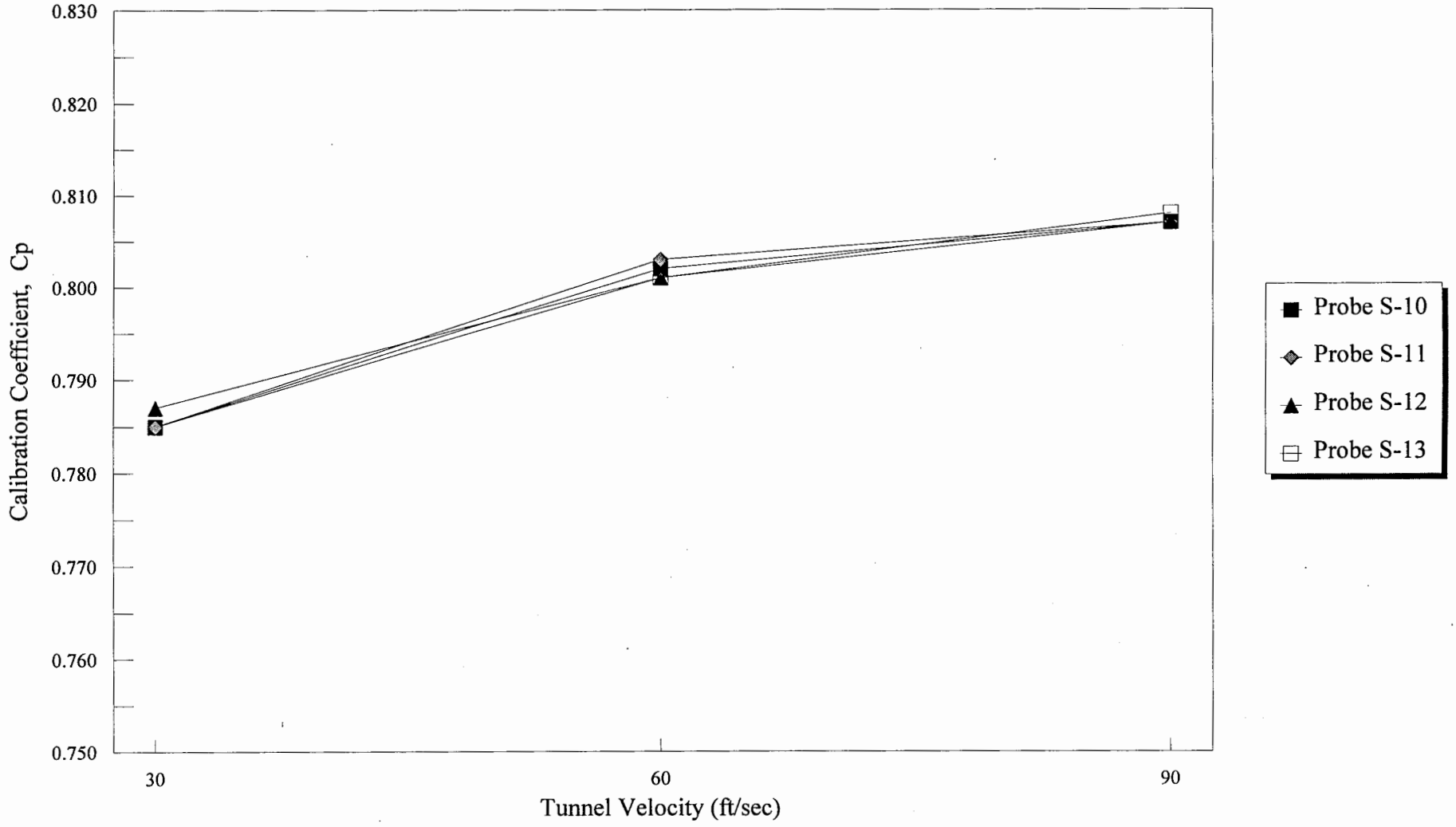
Type S Probe: S-13

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.45	1	Y	30	0.195	0.0	0.299	91	0.808		
	2	Y	30	0.195	0.1	0.293	92	0.816		
	3	Y	30	0.195	0.2	0.293	92	0.816		
	1	Y	60	0.781	0.0	1.230	92		0.797	
	2	Y	60	0.781	0.2	1.230	93		0.797	
	3	Y	60	0.781	-0.3	1.230	93		0.797	
	1	Y	90	1.757	-0.2	2.700	94			0.807
	2	Y	90	1.757	0.3	2.700	94			0.807
	3	Y	90	1.757	-0.1	2.700	95			0.807
							Avg. =	0.813	0.797	0.807
							% Diff. (30,90)			-0.8
							(30,60)			-2.0
							(60,90)			1.2
							Meth. 2 Avg. =			0.797
							Rev. Meth. 2 Avg. =			0.810

* Null angle measured from flat.

Figure C1-16. Type S Probe Calibration Coefficients

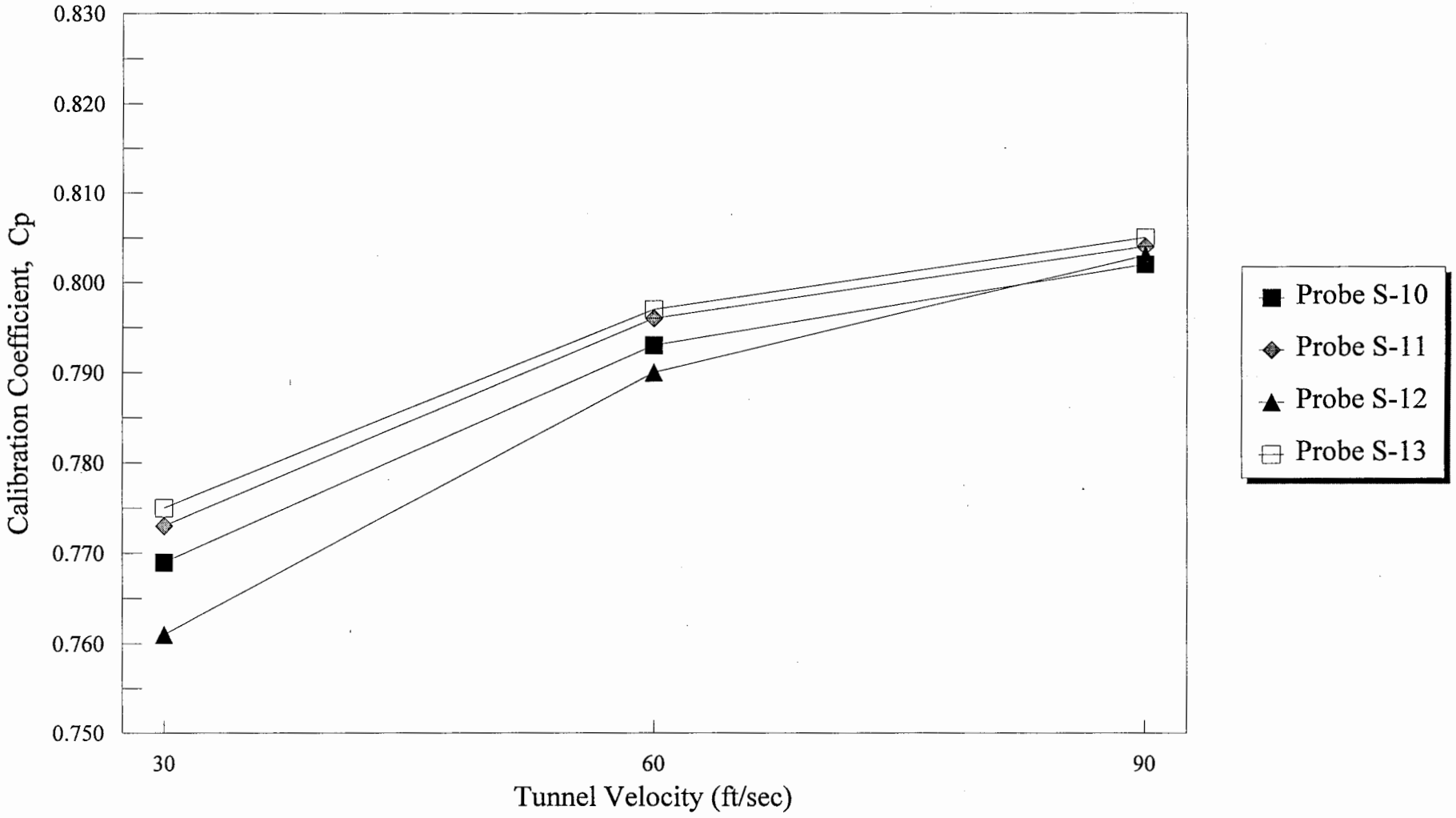
Wind Tunnel Calibration 5/25/97



CAL-SUM.WK4

Figure C1-17. Type S Probe Calibration Coefficients

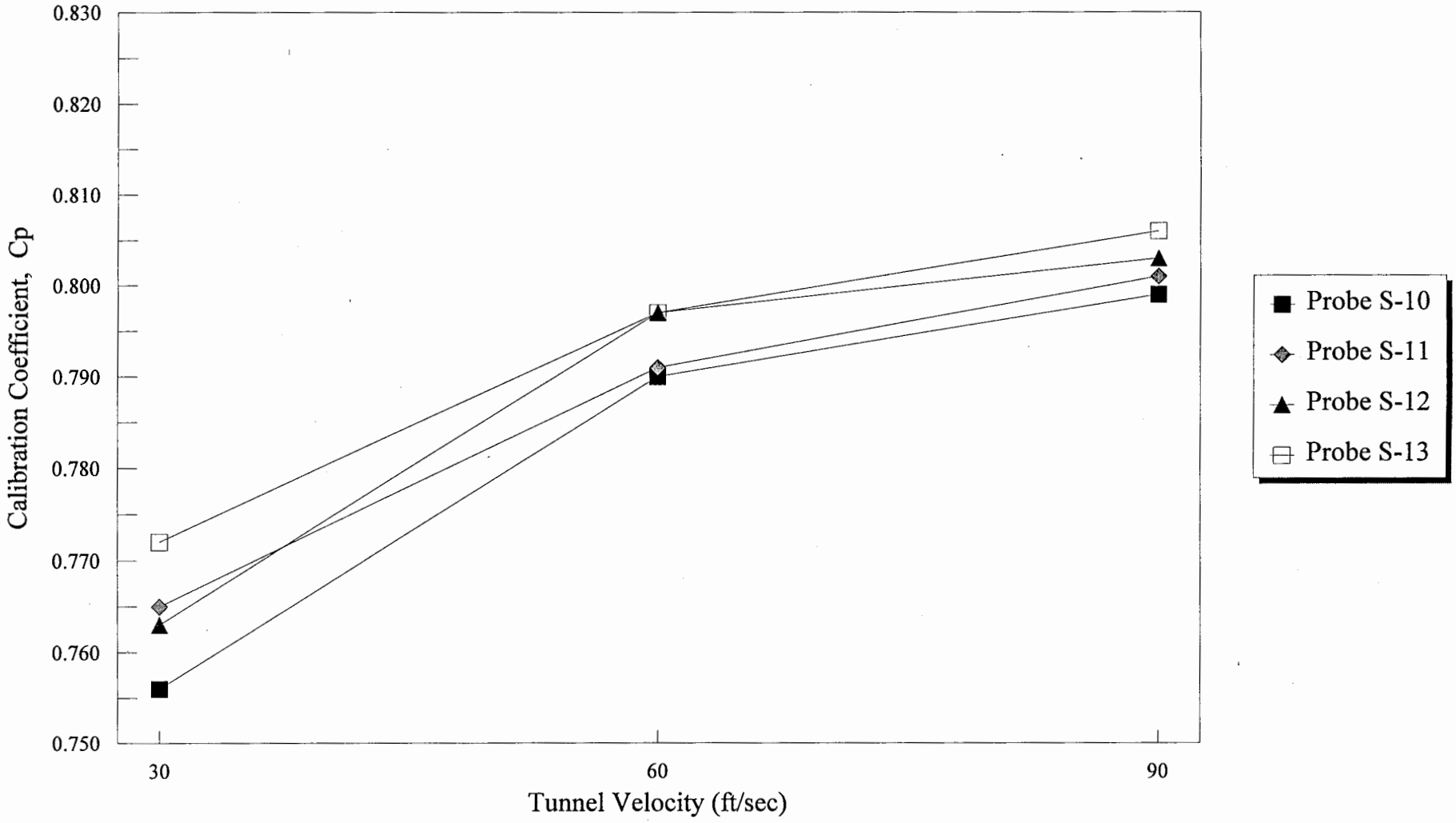
Wind Tunnel Calibration 6/26/97 -- Pre-modification to T/C



CAL-SUM.WK4

Figure C1-18. Type S Probe Calibration Coefficients

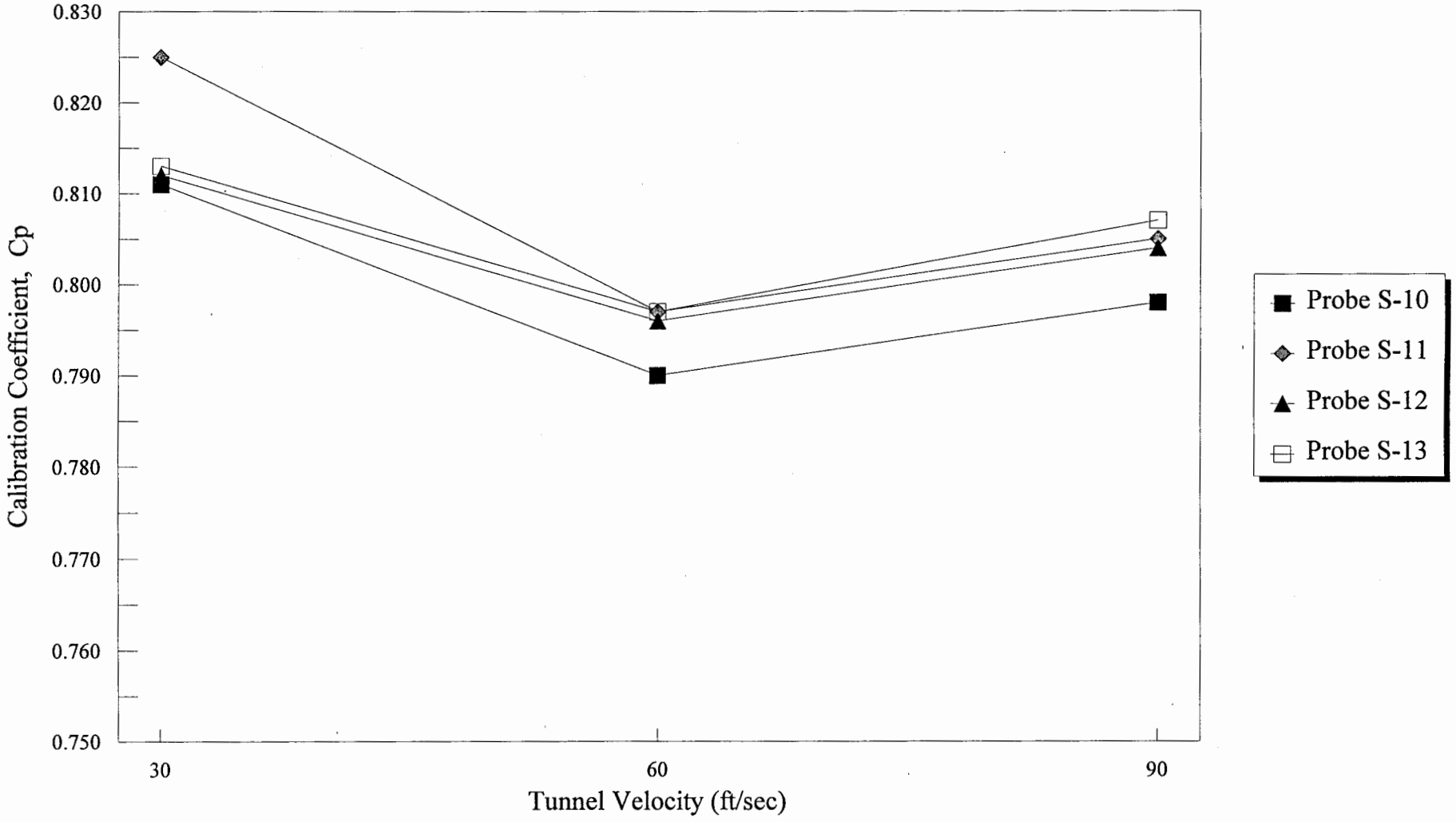
Wind Tunnel Calibration 6/26/97 -- Post-modification to T/C



CAL-SUM.WK4

Figure C1-19. Type S Probe Calibration Coefficients

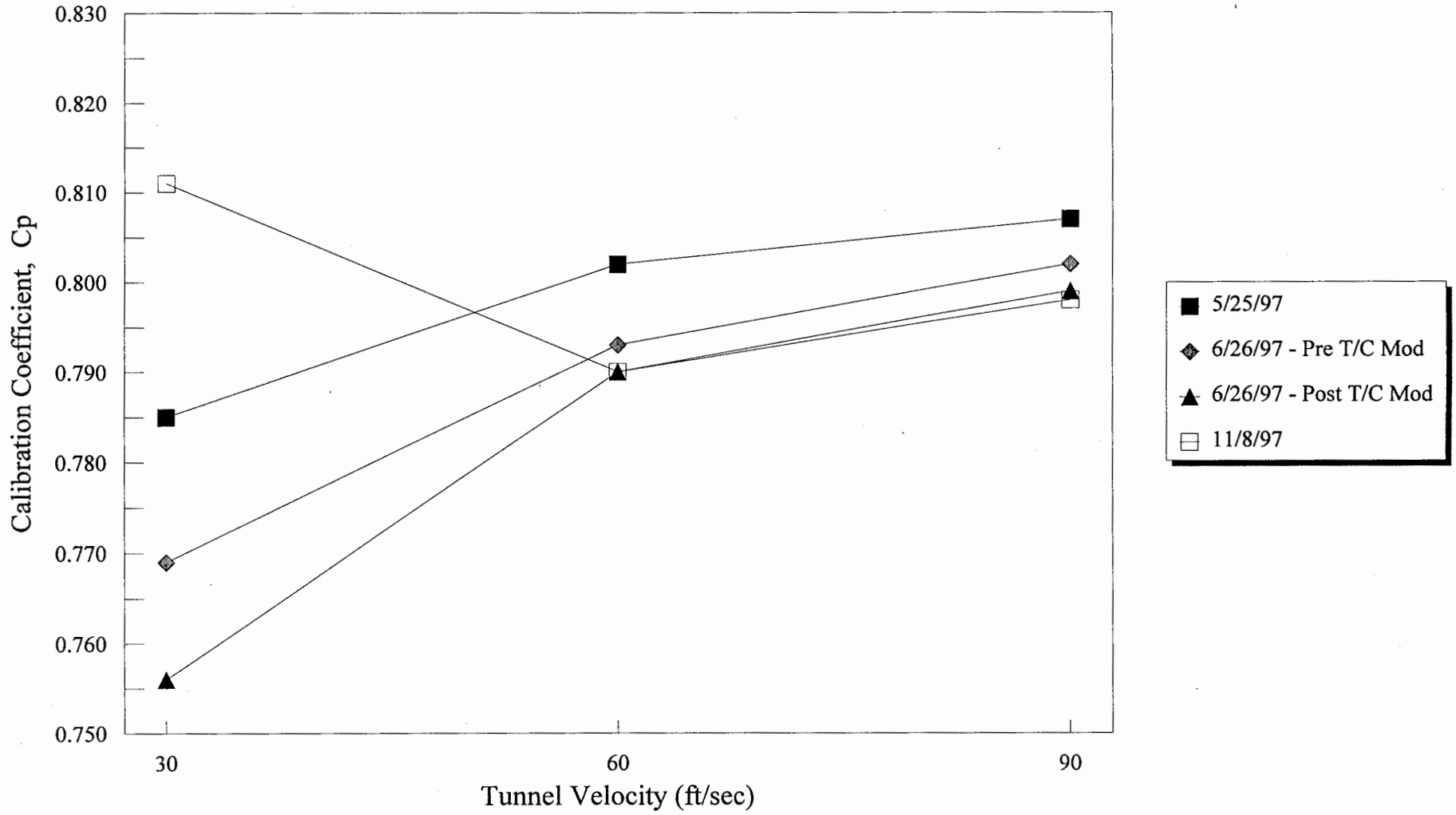
Wind Tunnel Calibration 11/8/97



CAL-SUM.WK4

Figure C1-20. Type S Probe S-10 Calibration Coefficients

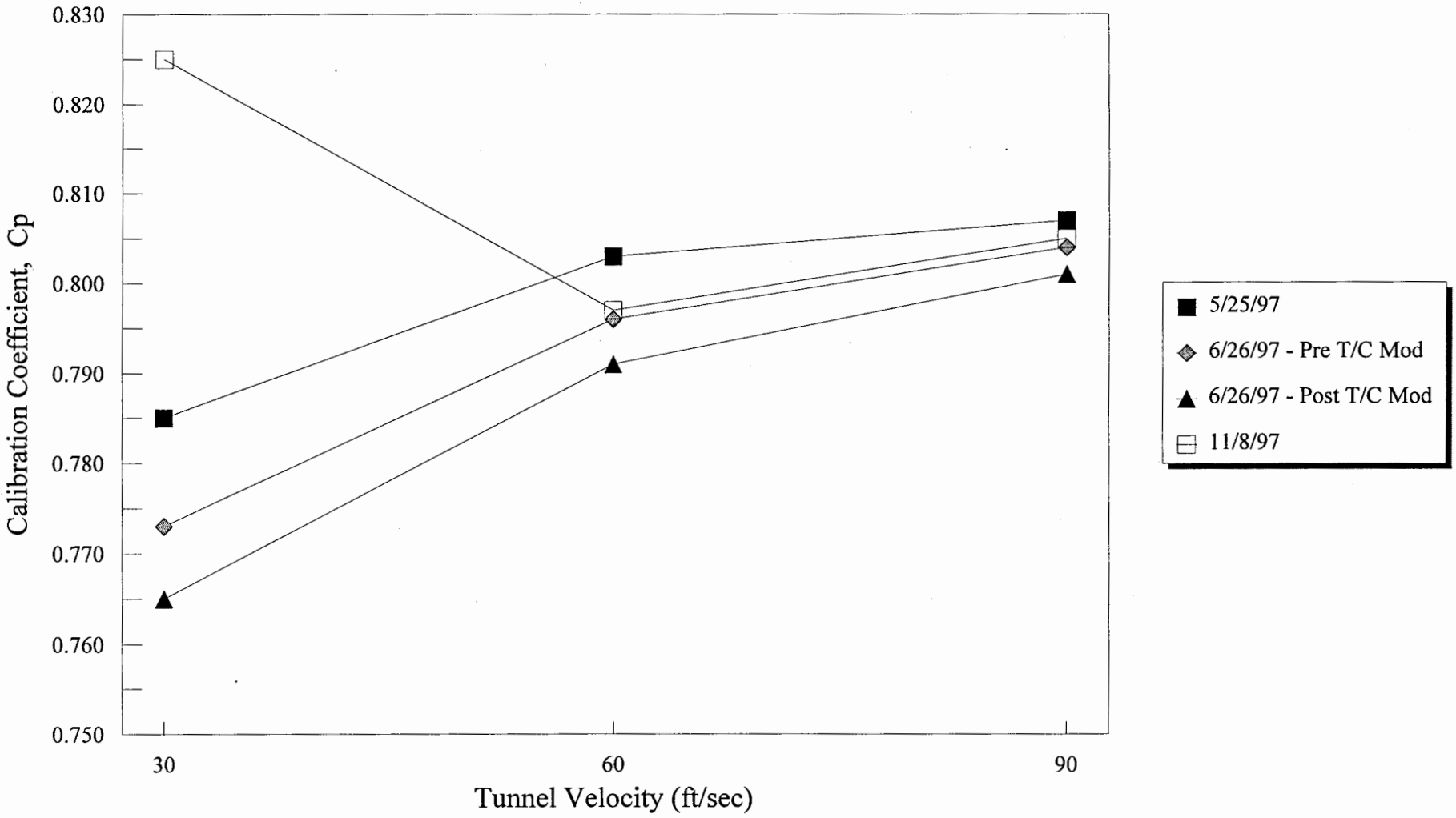
NCSU Wind Tunnel Calibrations



CAL-SUM.WK4

Figure C1-21. Type S Probe S-11 Calibration Coefficients

NCSU Wind Tunnel Calibrations



CAL-SUM.WK4

Figure C1-22. Type S Probe S-12 Calibration Coefficients
NCSU Wind Tunnel Calibrations

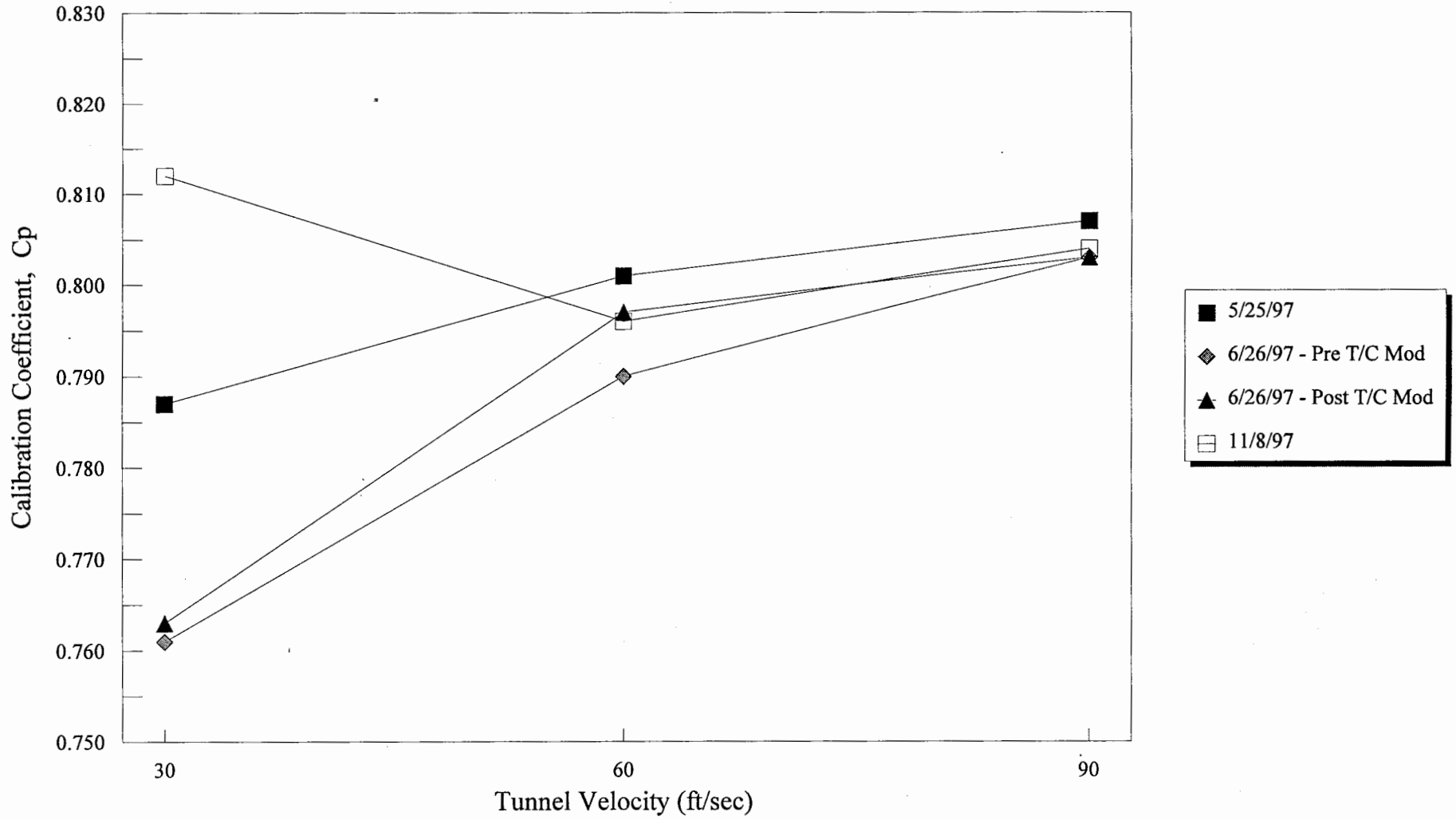
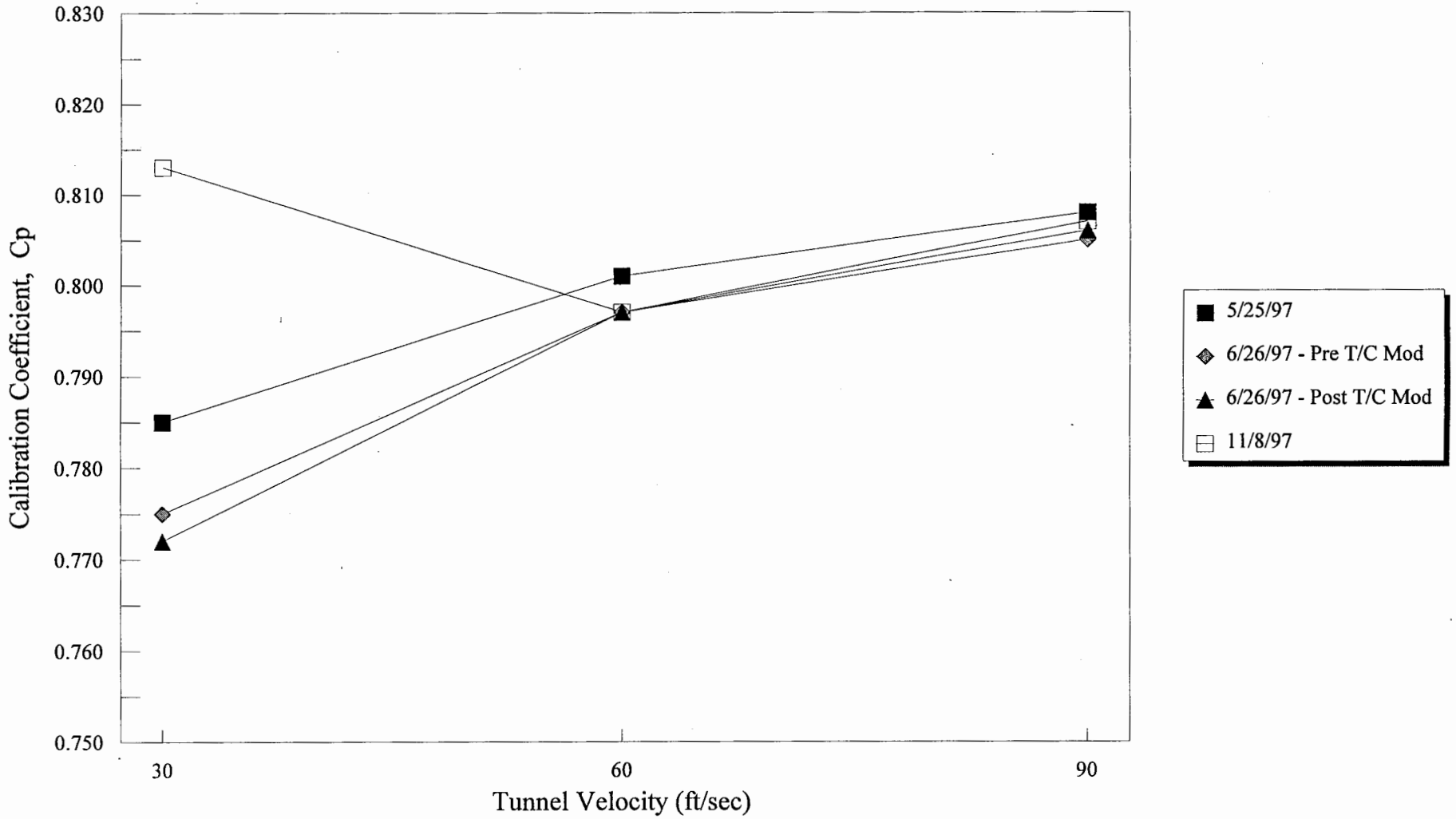


Figure C1-23. Type S Probe S-13 Calibration Coefficients

NCSU Wind Tunnel Calibrations



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ATTACHMENT D.

Autoprobe Type S Calibration Data

Table C1-39. USTI Autoprobe Type S Calibration Results

		Pre-Test Calibration			Post-Test Calibration			
Probe I.D.	Velocity Point	Calibration Factor, Cp	Average Yaw Angle	Calibration Date	Calibration Factor, Cp	Average Yaw Angle	Calibration Date	% Change in Cp
26	30	0.781	2.8	5/13/97	0.802	-1.4	10/15/97	2.7
	60	0.785	4.1		0.784	-1.2		-0.1
	90	0.794	4.6		0.793	-1.3		-0.1
	Avg.	0.787	3.8		0.793	-1.3		0.8
27	30	0.786	1.1	3/12/97	0.801	-3.5	10/15/97	1.9
	60	0.788	0.2		0.785	4.6		-0.4
	90	0.787	4.3		0.795	3.4		1.0
	Avg.	0.787	1.9		0.794	1.5		0.8
28	30	0.778	4.3	5/12/97	0.794	3.3	10/15/97	2.1
	60	0.783	5.3		0.779	3.4		-0.5
	90	0.789	6.0		0.792	3.8		0.4
	Avg.	0.783	5.2		0.788	3.5		0.6
33	30	0.771	0.2	5/13/97	0.796	2.8	10/15/97	3.2
	60	0.789	3.4		0.780	3.6		-1.1
	90	0.795	5.6		0.788	4.4		-0.9
	Avg.	0.785	3.1		0.788	3.6		0.4
36	30	0.766	0.1	3/12/97	0.781	2.2	10/15/97	2.0
	60	0.770	0.3		0.775	3.2		0.6
	90	0.783	1.2		0.785	3.2		0.3
	Avg.	0.773	0.5		0.780	2.9		0.9

Figure C1-24. USTI Autoprobe Type S Calibration Coefficients

NCSU Wind Tunnel Calibrations -- March/May and October 1997

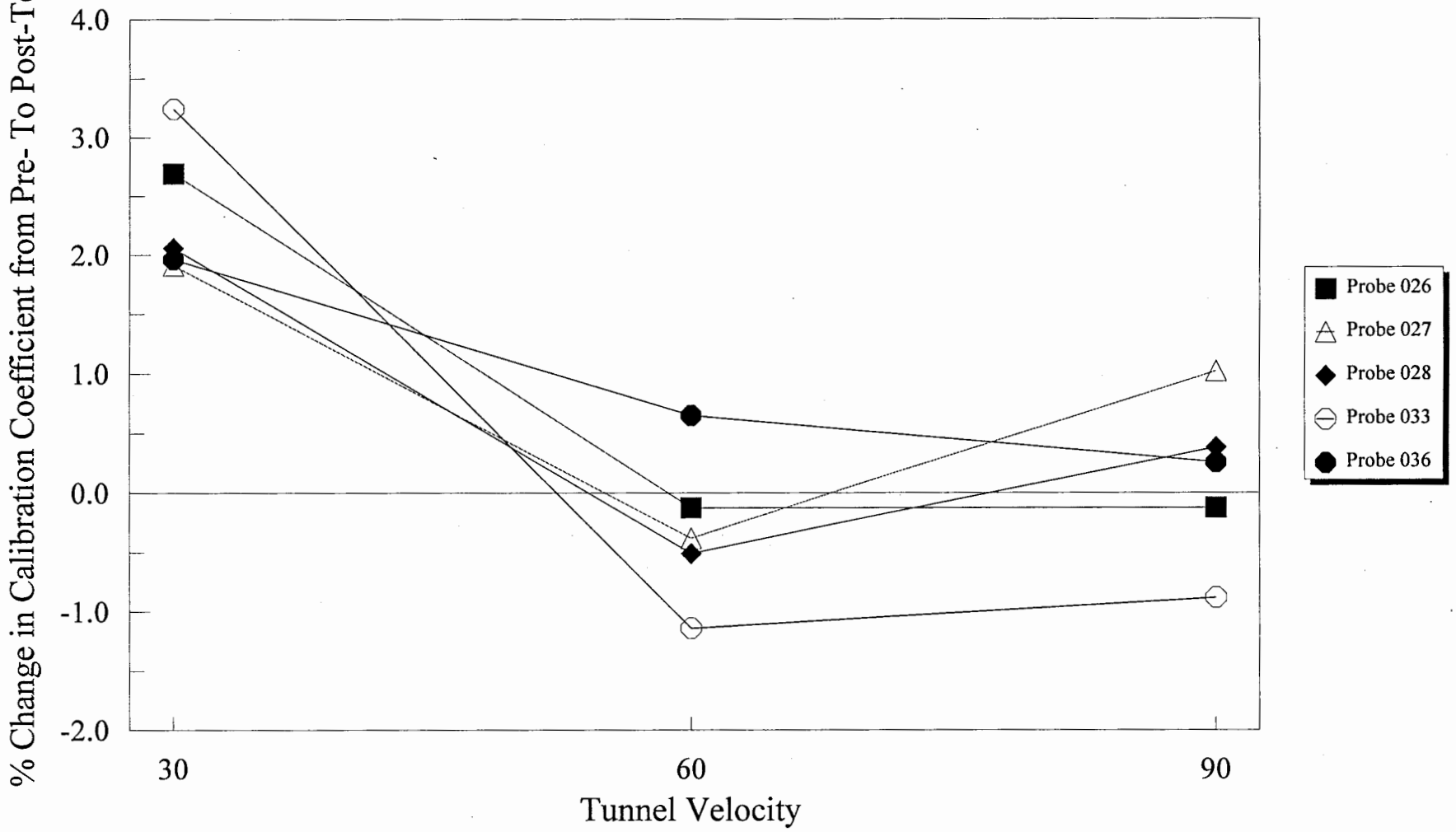


Table C1-40. Wind Tunnel Calibration - 05/13/97

Autoprobe Type S: Serial No. 026

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.49	1	Y	30	0.195	2.9	0.320	82	0.781		
	2	Y	30	0.195	2.6	0.320	82	0.781		
	3	Y	30	0.195	2.8	0.320	82	0.781		
	1	Y	60	0.781	4.1	1.270	82		0.784	
	2	Y	60	0.781	4.2	1.270	83		0.784	
	3	Y	60	0.781	3.9	1.260	83		0.787	
	1	Y	90	1.757	4.5	2.800	86			0.792
	2	Y	90	1.757	4.5	2.790	87			0.794
	3	Y	90	1.757	4.7	2.780	88			0.795

Avg. =		0.781	0.785	0.794
% Diff.	(30,90)			1.7
	(30,60)			0.6
	(60,90)			1.1
Meth. 2 Avg. =				0.785
Rev. Meth. 2 Avg. =				0.787

* Null angle measured from flat.

Table C1-41. Wind Tunnel Calibration - 10/15/97

Autoprobe Type S: Serial No. 026

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.96	1	Y	30	0.195	-1.4	0.310	85	0.793		
	2	Y	30	0.195	-1.2	0.300	87	0.806		
	3	Y	30	0.195	-1.6	0.300	88	0.806		
	1	Y	60	0.781	-1.0	1.27	86		0.784	
	2	Y	60	0.781	-1.1	1.27	87		0.784	
	3	Y	60	0.781	-1.4	1.27	88		0.784	
	1	Y	90	1.757	-1.5	2.79	89			0.794
	2	Y	90	1.757	-1.3	2.80	90			0.792
	3	Y	90	1.757	-1.2	2.80	91			0.792

Avg. =		0.802	0.784	0.793
% Diff.	(30,90)			-1.2
	(30,60)			-2.2
	(60,90)			1.1
Meth. 2 Avg. =				0.784
Rev. Meth. 2 Avg. =				0.797

* Null angle measured from flat.

Table C1-42. Wind Tunnel Calibration - 03/12/97

Autoprobe Type S - Serial No. 027

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
30.02	1	Y	30	0.195	1.2	0.316	86	0.786		
	2	Y	30	0.195	1.2	0.315	88	0.787		
	3	Y	30	0.195	0.8	0.315	88	0.787		
	1	Y	50	0.542	0.1	0.88	87		0.785	
	2	Y	50	0.542	0.3	0.87	88		0.789	
	3	Y	50	0.542	0.2	0.87	89		0.789	
	1	Y	90	1.757	4.1	2.80	90			0.792
	2	Y	90	1.757	4.2	2.88	90			0.781
	3	Y	90	1.757	4.5	2.84	91			0.787

Avg. =		0.786	0.788	0.787
% Diff.	(30,90)			0.0
	(30,50)			0.2
	(50,90)			-0.2
Meth. 2 Avg. =				0.788
Rev. Meth. 2 Avg. =				0.786

* Null angle measured from flat.

Table C1-43. Wind Tunnel Calibration - 10/15/97

Autoprobe Type S: Serial No. 027

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.9	1	Y	30	0.195	-6.00	0.306	82	0.798		
	2	Y	30	0.195	2.10	0.302	84	0.804		
	3	Y	30	0.195	-6.60	0.305	85	0.800		
	1	Y	60	0.781	3.10	1.27	83		0.784	
	2	Y	60	0.781	3.80	1.26	85		0.787	
	3	Y	60	0.781	7.00	1.27	86		0.784	
	1	Y	90	1.757	4.10	2.75	86			0.799
	2	Y	90	1.757	3.00	2.80	88			0.792
	3	Y	90	1.757	3.10	2.80	88			0.792
							Avg. =	0.801	0.785	0.795
							% Diff. (30,90)			-0.7
							(30,60)			-1.9
							(60,90)			1.2
							Meth. 2 Avg. =			0.785
							Rev. Meth. 2 Avg. =			0.798

* Null angle measured from flat.

Table C1-44. Wind Tunnel Calibration - 05/13/97

Autoprobe Type S: Serial No. 028

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.49	1	Y	30	0.195	3.8	0.323	80	0.777		
	2	Y	30	0.195	4.7	0.323	80	0.777		
	3	Y	30	0.195	4.5	0.320	80	0.781		
	1	Y	60	0.781	5.7	1.280	81		0.781	
	2	Y	60	0.781	5.1	1.270	82		0.784	
	3	Y	60	0.781	5	1.272	82		0.784	
	1	Y	90	1.757	6.0	2.840	85			0.787
	2	Y	90	1.757	5.9	2.820	86			0.789
	3	Y	90	1.757	6.0	2.800	87			0.792
							Avg. =	0.778	0.783	0.789
							% Diff. (30,90)			1.4
							(30,60)			0.6
							(60,90)			0.8
							Meth. 2 Avg. =			0.783
							Rev. Meth. 2 Avg. =			0.784

Table C1-45. Wind Tunnel Calibration - 10/15/97

Autoprobe Type S: Serial No. 028

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.88	1	Y	30	0.195	2.8	0.314	80	0.788		
	2	Y	30	0.195	3.4	0.305	82	0.800		
	3	Y	30	0.195	3.8	0.308	83	0.796		
	1	Y	60	0.781	3.3	1.30	81		0.775	
	2	Y	60	0.781	3.7	1.28	83		0.781	
	3	Y	60	0.781	3.3	1.28	84		0.781	
	1	Y	90	1.757	3.9	2.80	83			0.792
	2	Y	90	1.757	3.7	2.80	85			0.792
	3	Y	90	1.757	3.7	2.80	86			0.792
							Avg. =	0.794	0.779	0.792
							% Diff. (30,90)			-0.3
							(30,60)			-1.9
							(60,90)			1.7
							Meth. 2 Avg. =			0.779
							Rev. Meth. 2 Avg. =			0.793

* Null angle measured from flat.

Table C1-46. Wind Tunnel Calibration - 05/13/97

Autoprobe Type S: Serial No. 033

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.42	1	Y	30	0.195	0.00	0.335	73	0.763		
	2	Y	30	0.195	0.40	0.325	74	0.775		
	3	Y	30	0.195	0.30	0.325	74	0.775		
	1	Y	60	0.781	2.90	1.25	76		0.790	
	2	Y	60	0.781	3.20	1.25	76		0.790	
	3	Y	60	0.781	4.00	1.26	77		0.787	
	1	Y	90	1.757	6.00	2.78	80			0.795
	2	Y	90	1.757	5.00	2.77	82			0.796
	3	Y	90	1.757	5.70	2.78	83			0.795
							Avg. =	0.771	0.789	0.795
							% Diff. (30,90)			3.2
							(30,60)			2.4
							(60,90)			0.8
							Meth. 2 Avg. =			0.789
							Rev. Meth. 2 Avg. =			0.783

Table C1-47. Wind Tunnel Calibration - 10/15/97

Autoprobe Type S: Serial No. 033

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.9	1	Y	30	0.195	1.6	0.31	84	0.793		
	2	Y	30	0.195	3.6	0.31	85	0.800		
	3	Y	30	0.195	3.2	0.31	86	0.794		
	1	Y	60	0.781	3.4	1.28	85		0.781	
	2	Y	60	0.781	3.9	1.29	86		0.778	
	3	Y	60	0.781	3.6	1.28	87		0.781	
	1	Y	90	1.757	4.4	2.82	88			0.789
	2	Y	90	1.757	4.6	2.83	89			0.788
	3	Y	90	1.757	4.2	2.83	90			0.788
							Avg. =	0.796	0.780	0.788
							% Diff. (30,90)			-0.9
							(30,60)			-2.0
							(60,90)			1.1
							Meth. 2 Avg. =			0.780
							Rev. Meth. 2 Avg. =			0.792

* Null angle measured from flat

Table C1-48. Wind Tunnel Calibration - 03/12/97

Autoprobe Type S - Serial No. 036

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
30.02	1	Y	30	0.195	0.0	0.335	81	0.763		
	2	Y	30	0.195	0.1	0.330	81	0.769		
	3	Y	30	0.195	0.1	0.333	81	0.765		
	1	Y	50	0.542	0.3	0.93	81		0.763	
	2	Y	50	0.542	0.2	0.90	82		0.776	
	3	Y	50	0.542	0.3	0.91	82		0.772	
	1	Y	90	1.757	0.4	2.86	86			0.784
	2	Y	90	1.757	1.7	2.88	90			0.781
	3	Y	90	1.757	1.6	2.86	92			0.784

Avg. =		0.766	0.770	0.783
% Diff.	(30,90)			2.3
	(30,50)			0.6
	(50,90)			1.6
Meth. 2 Avg. =				0.770
Rev. Meth. 2 Avg. =				0.774

* Null angle measured from flat.

Table C1-49. Wind Tunnel Calibration - 10/15/97

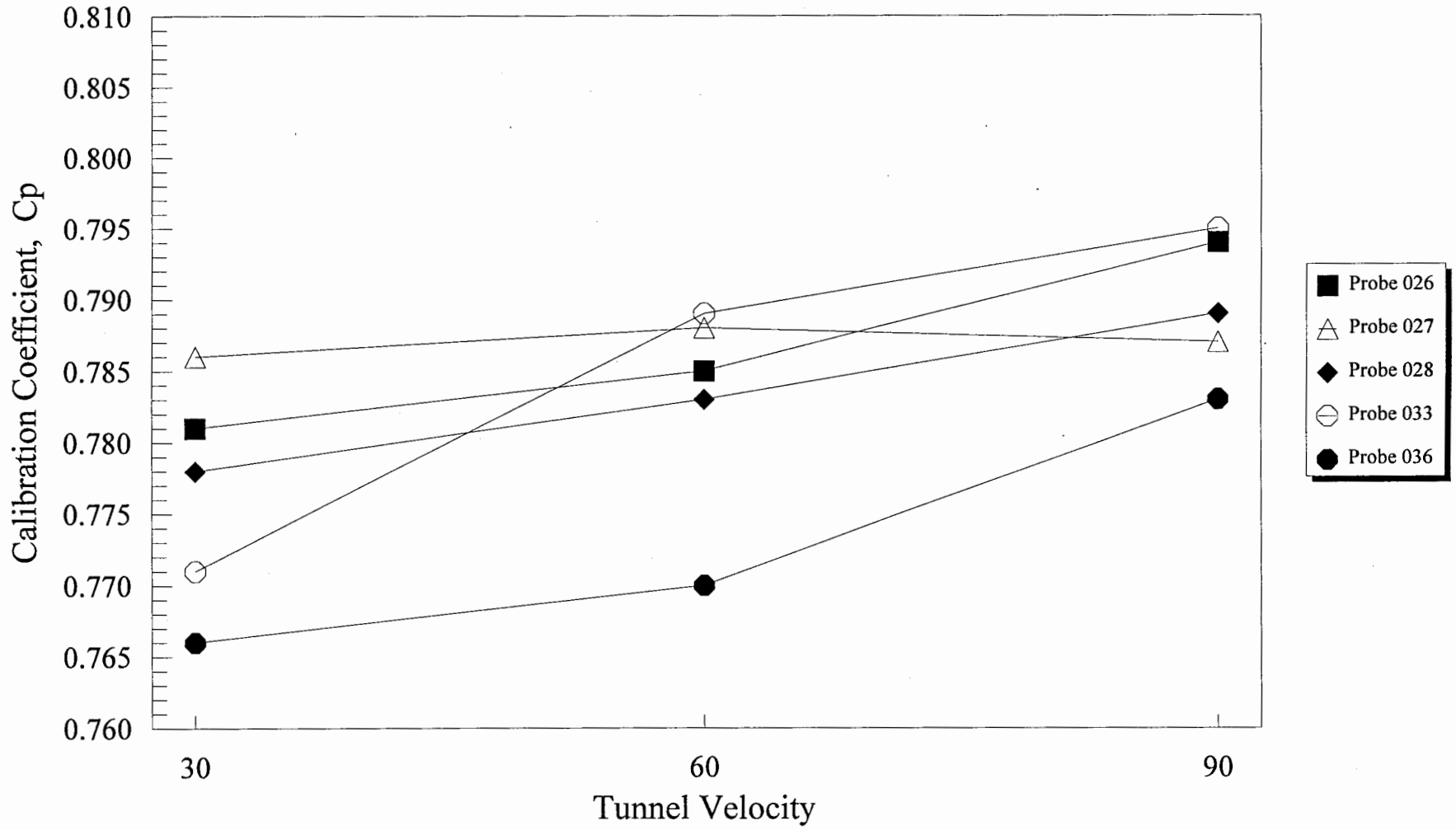
Autoprobe Type S: Serial No. 036

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle*	P_s	T	Cp @ 30 fps	Cp @ 60 fps	Cp @ 90 fps
29.88	1	Y	30	0.195	2.0	0.320	75	0.781		
	2	Y	30	0.195	1.9	0.320	79	0.781		
	3	Y	30	0.195	2.7	0.320	80	0.781		
	1	Y	60	0.781	2.9	1.300	77		0.775	
	2	Y	60	0.781	3.2	1.300	80		0.775	
	3	Y	60	0.781	3.4	1.300	81		0.775	
	1	Y	90	1.757	3.1	2.850	81			0.785
	2	Y	90	1.757	3.2	2.860	83			0.784
	3	Y	90	1.757	3.3	2.850	84			0.785
							Avg. =	0.781	0.775	0.785
							% Diff. (30,90)			0.5
							(30,60)			-0.7
							(60,90)			1.2
							Meth. 2 Avg. =			0.775
							Rev. Meth. 2 Avg. =			0.783

* Null angle measured from flat.

Figure C1-25. USTI Autoprobe Type S Calibration Coefficients

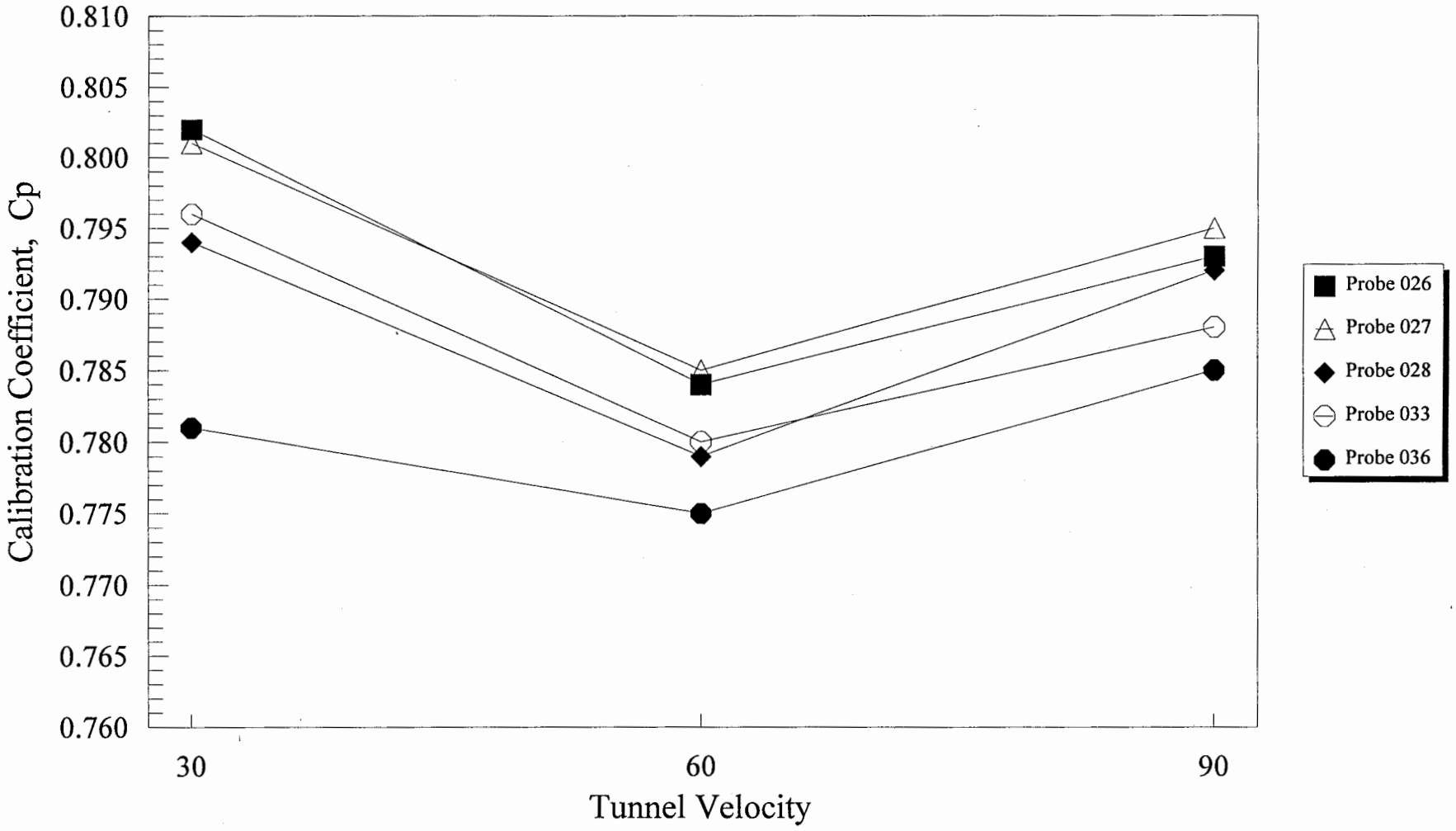
NCSU Wind Tunnel Calibrations -- 5/13/97



CAL-SUM.WK4

Figure C1-26. USTI Autoprobe Type S Calibration Coefficients

NCSU Wind Tunnel Calibrations -- 10/15/97



CAL-SUM.WK4

Figure C1-27. USTI Autoprobe Type S 026 Calibration Coefficients

NCSU Wind Tunnel Calibrations

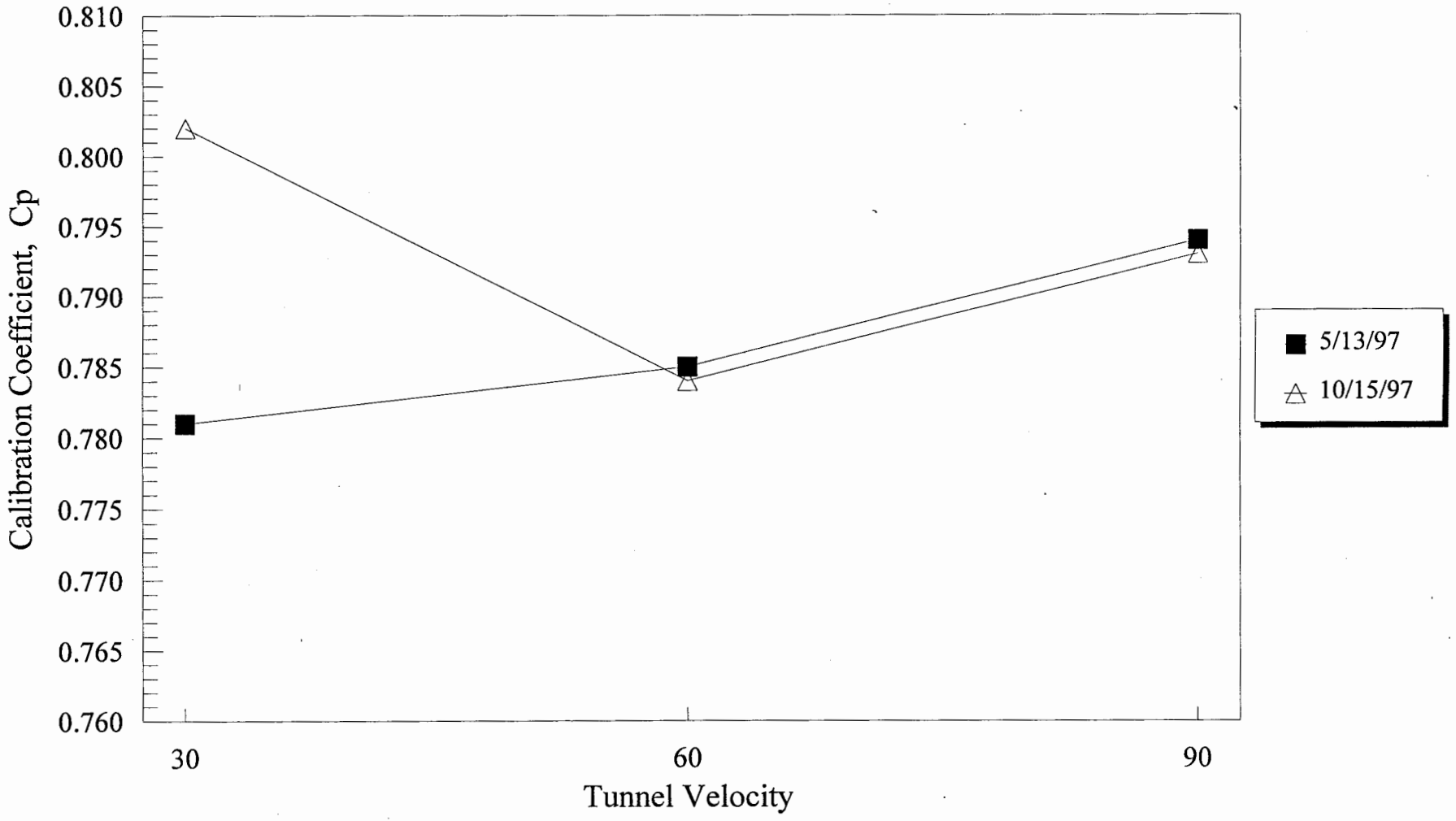


Figure C1-28. USTI Autoprobe Type S 027 Calibration Coefficients

NCSU Wind Tunnel Calibrations

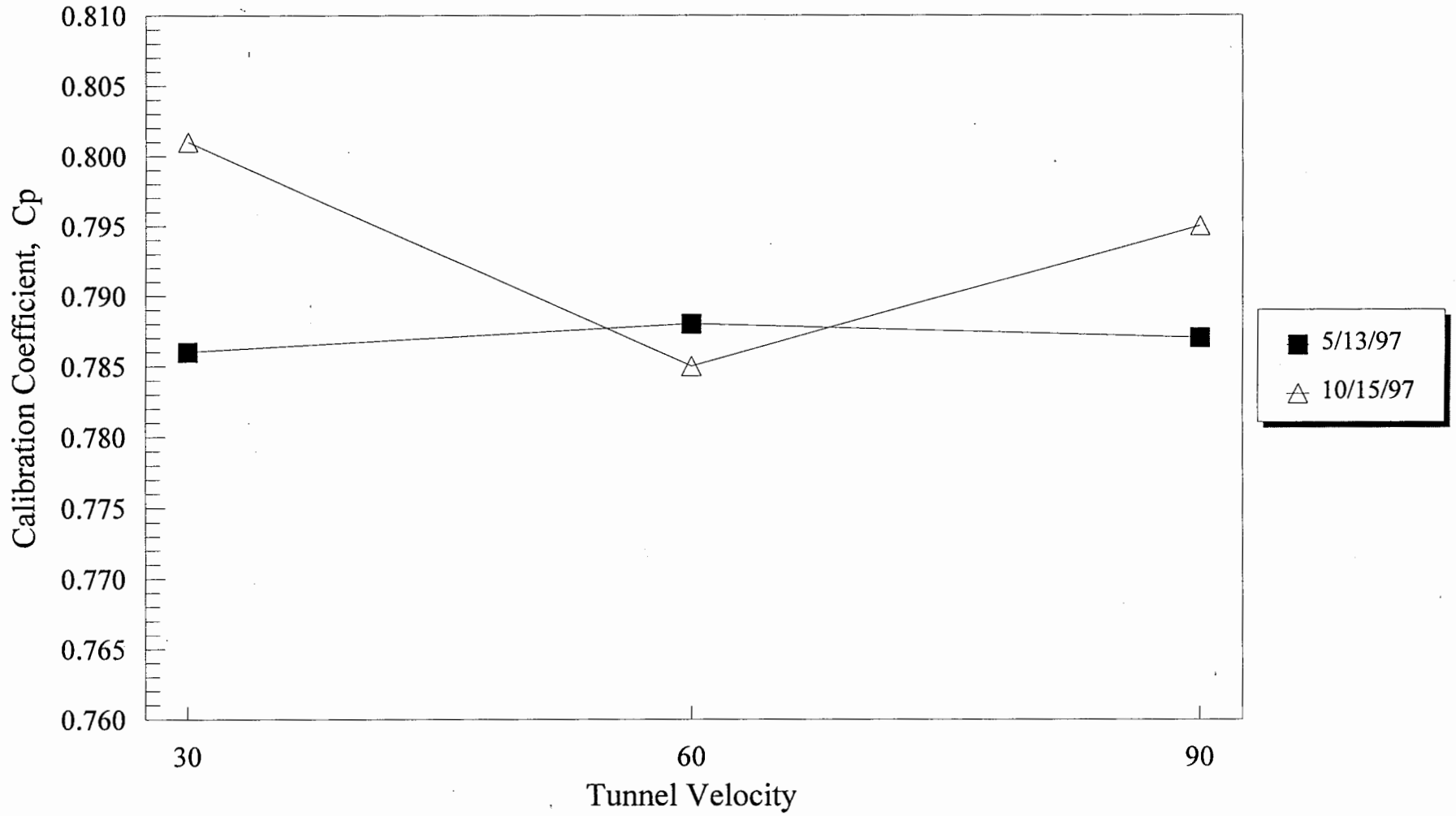
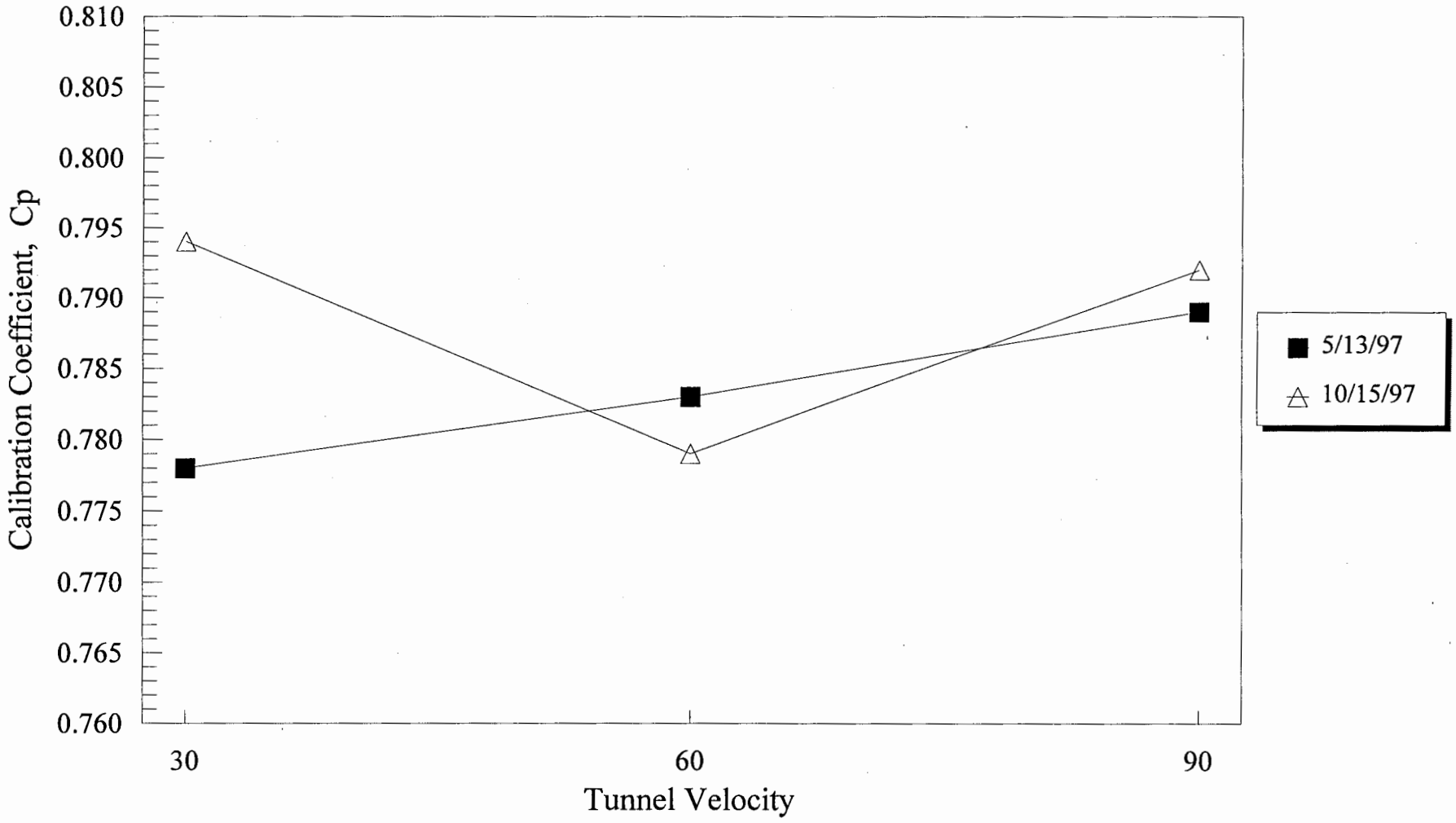


Figure C1-29. USTI Autoprobe Type S 028 Calibration Coefficients

NCSU Wind Tunnel Calibrations



CAL-SUM.WK4

Figure C1-30. USTI Autoprobe Type S 033 Calibration Coefficients

NCSU Wind Tunnel Calibrations

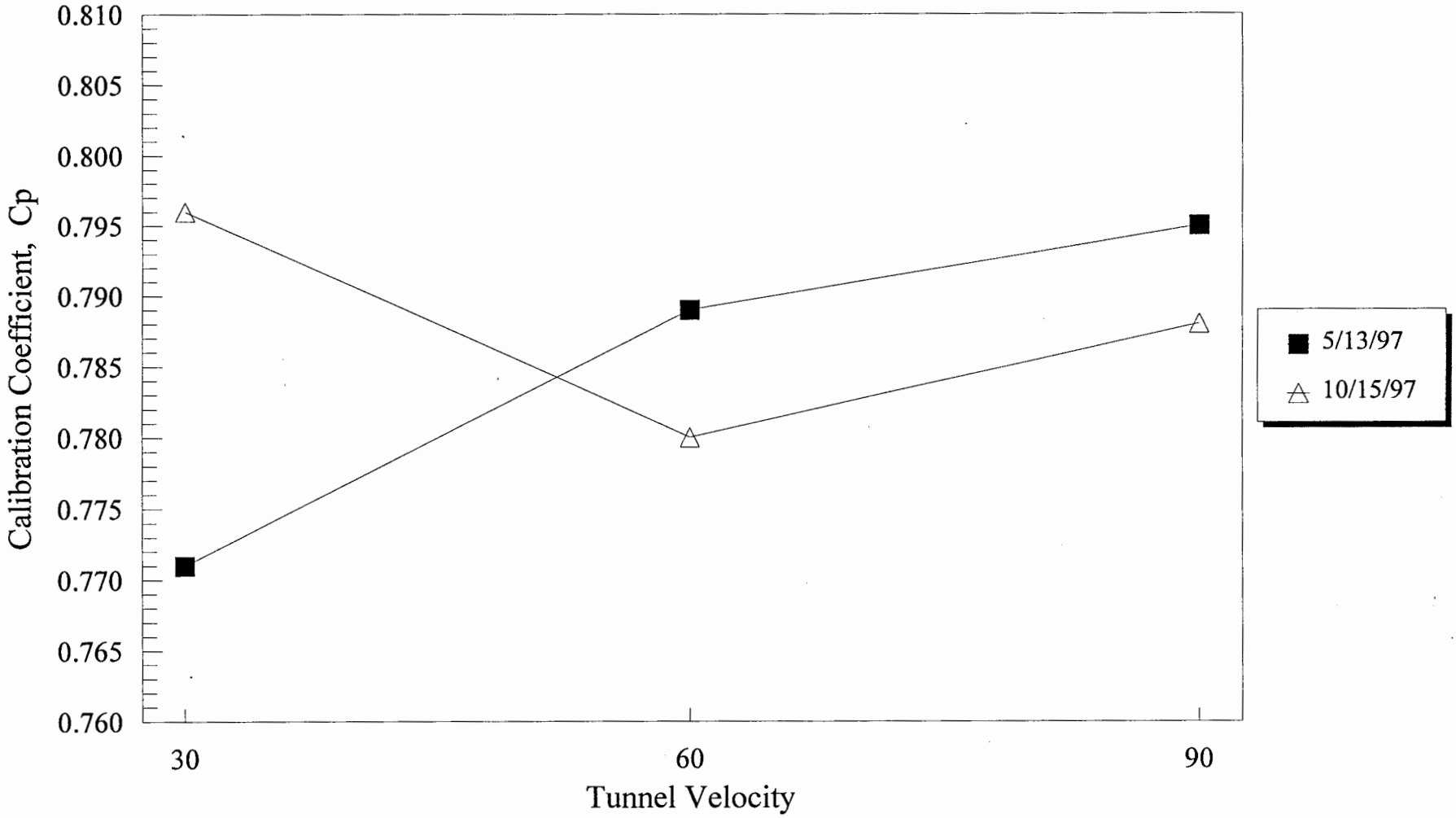
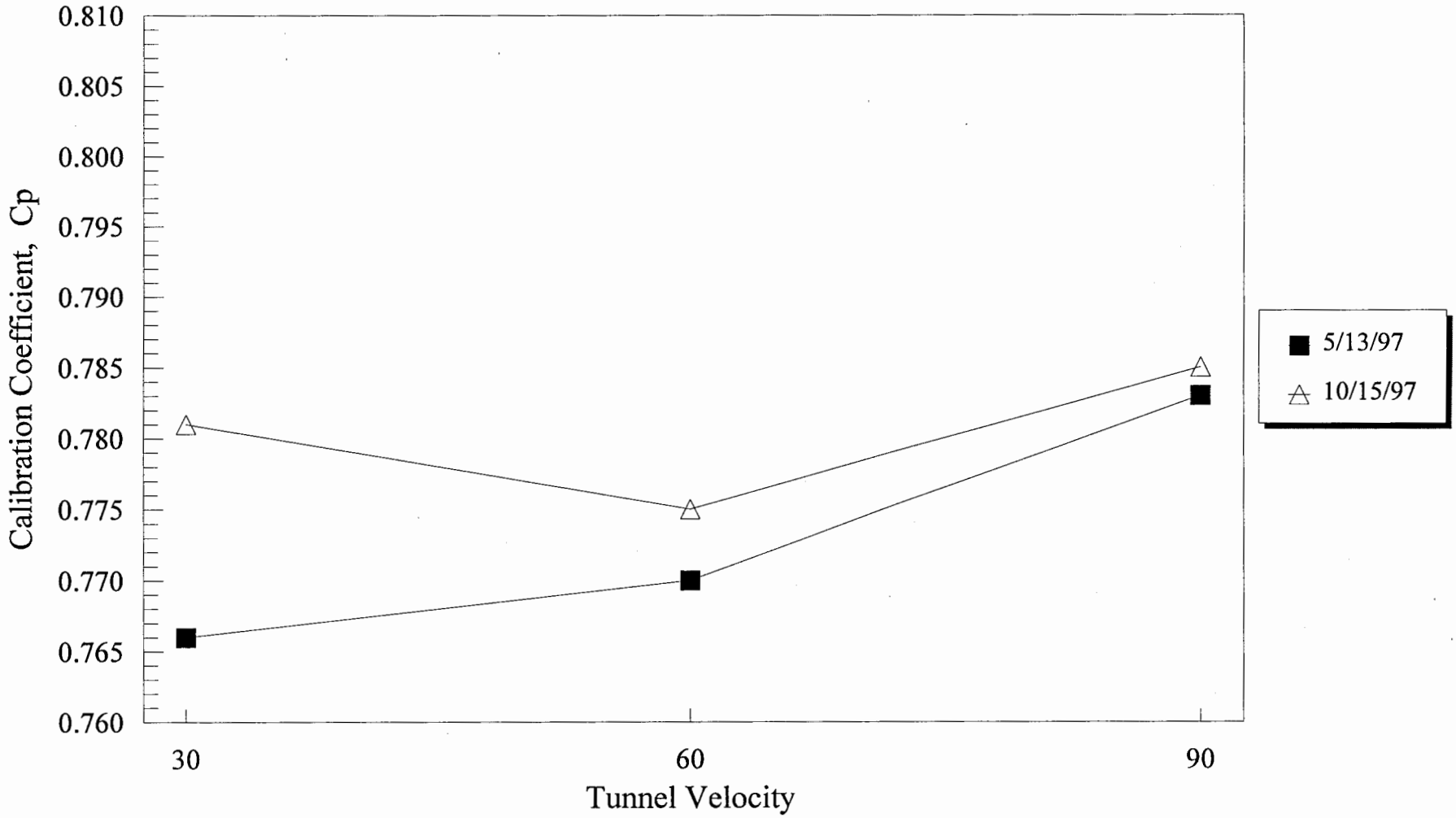


Figure C1-31. USTI Autoprobe Type S 036 Calibration Coefficients

NCSU Wind Tunnel Calibrations



ATTACHMENT E.

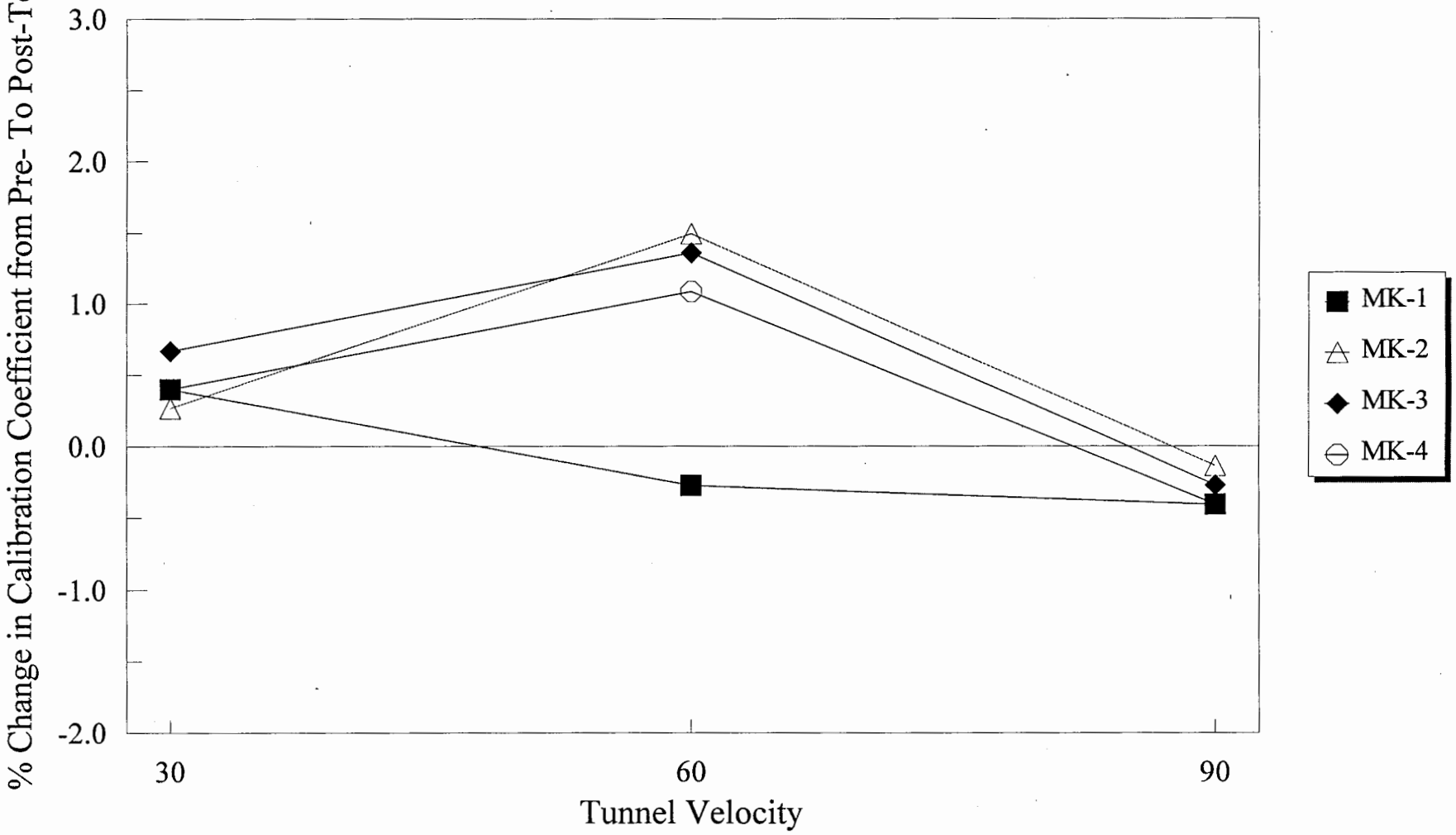
Modified Kiel Probe Calibration Data

Table C1-50. Modified Kiel Probe Calibration Data

		Pre-Test Calibration			Post-Test Calibration			
Probe I.D.	Velocity Point	Calibration Factor, Cp	Average Yaw Angle	Calibration Date	Calibration Factor, Cp	Average Yaw Angle	Calibration Date	% Change in Cp
MK-1	30	0.745	0.4	3/12/97	0.748	-2.5	11/8/97	0.4
	60	0.736	0.0		0.734	-3.0		-0.3
	90	0.735	-0.1		0.732	-2.8		-0.4
	Avg.	0.739	0.1		0.738	-2.8		-0.1
MK-2	30	0.748	-0.3	3/12/97	0.750	0.4	11/8/97	0.3
	60	0.736	-0.1		0.747	0.3		1.5
	90	0.734	-0.2		0.733	0.3		-0.1
	Avg.	0.739	-0.2		0.743	0.3		0.5
MK-3	30	0.747	0.1	3/12/97	0.752	7.8	11/8/97	0.7
	60	0.736	0.0		0.746	7.8		1.4
	90	0.733	-0.2		0.731	7.8		-0.3
	Avg.	0.739	0.0		0.743	7.8		0.6
MK-4	30	0.749	0.0	3/12/97	0.752	2.9	11/8/97	0.4
	60	0.736	0.1		0.744	3.0		1.1
	90	0.735	-0.2		0.732	2.9		-0.4
	Avg.	0.740	0.0		0.743	2.9		0.4

Figure C1-32. Modified Kiel Probe Calibration Coefficients

NCSU Wind Tunnel Calibrations -- March and November 1997



CAL-SUM.WK4

Table C1-51. Wind Tunnel Calibration - 03/12/97

Modified Kiel Probe: MK-1

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
30.02	1	Y	30	0.195	0.4	0.350	83	0.746		
	2	Y	30	0.195	0.3	0.349	83	0.748		
	3	Y	30	0.195	0.4	0.355	83	0.741		
	1	Y	50	0.542	0.0	1.000	83		0.736	
	2	Y	50	0.542	0.1	1.000	83		0.736	
	3	Y	50	0.542	-0.2	1.000	83		0.736	
	1	Y	90	1.757	0.0	3.250	86			0.735
	2	Y	90	1.757	-0.2	3.250	88			0.735
	3	Y	90	1.757	-0.2	3.260	89			0.734
							Avg. =	0.745	0.736	0.735
							% Diff. (30,90)			-1.4
							(30,50)			-1.2
							(50,90)			-0.2
							Meth. 2 Avg. =			0.736
							Rev. Meth. 2 Avg. =			0.740

Table C1-52. Wind Tunnel Calibration - 11/08/97

Modified Kiel Probe: MK-1

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
29.45	1	Y	30	0.195	-2.9	0.355	87	0.741		
	2	Y	30	0.195	-1.7	0.345	88	0.752		
	3	Y	30	0.195	-2.9	0.345	89	0.752		
	1	Y	50	0.781	-3.1	1.450	88		0.734	
	2	Y	50	0.781	-2.9	1.450	88		0.734	
	3	Y	50	0.781	-3.1	1.450	89		0.734	
	1	Y	90	1.757	-2.5	3.250	89			0.735
	2	Y	90	1.757	-2.9	3.300	90			0.730
	3	Y	90	1.757	-2.9	3.290	91			0.731
							Avg. =	0.748	0.734	0.732
							% Diff. (30,90)			-2.2
							(30,50)			-1.9
							(50,90)			-0.3
							Meth. 2 Avg. =			0.734
							Rev. Meth. 2 Avg. =			0.740

Table C1-53. Wind Tunnel Calibration - 03/12/97

Modified Kiel Probe: MK-2

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
30.02	1	Y	30	0.195	-0.3	0.345	85	0.752		
	2	Y	30	0.195	-0.3	0.350	84	0.746		
	3	Y	30	0.195	-0.2	0.350	84	0.746		
	1	Y	50	0.542	0.0	1.000	85		0.736	
	2	Y	50	0.542	-0.1	1.000	85		0.736	
	3	Y	50	0.542	-0.1	1.000	85		0.736	
	1	Y	90	1.757	-0.1	3.300	87			0.730
	2	Y	90	1.757	-0.3	3.250	89			0.735
	3	Y	90	1.757	-0.2	3.240	90			0.736
							Avg. =	0.748	0.736	0.734
							% Diff. (30,90)			-1.9
							(30,50)			-1.6
							(50,90)			-0.3
							Meth. 2 Avg. =			0.736
							Rev. Meth. 2 Avg. =			0.741

Table C1-54. Wind Tunnel Calibration - 11/08/97

Modified Kiel Probe: MK-2

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
29.45	1	Y	30	0.195	0.4	0.349	87	0.748		
	2	Y	30	0.195	0.4	0.345	89	0.752		
	3	Y	30	0.195	0.4	0.345	89	0.752		
	1	Y	50	0.781	0.4	1.400	88		0.747	
	2	Y	50	0.781	0.3	1.400	89		0.747	
	3	Y	50	0.781	0.3	1.400	90		0.747	
	1	Y	90	1.757	0.3	3.270	90			0.733
	2	Y	90	1.757	0.3	3.280	91			0.732
	3	Y	90	1.757	0.3	3.270	92			0.733

Avg. =		0.750	0.747	0.733
% Diff.	(30,90)			-2.4
	(30,50)			-0.5
	(50,90)			-1.9
Meth. 2 Avg. =				0.747
Rev. Meth. 2 Avg. =				0.742

Table C1-55. Wind Tunnel Calibration - 03/12/97

Modified Kiel Probe: MK-3

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
30.02	1	Y	30	0.195	0.3	0.349	77	0.748		
	2	Y	30	0.195	-0.1	0.350	77	0.746		
	3	Y	30	0.195	0.2	0.349	77	0.748		
	1	Y	50	0.542	0.0	1.000	77		0.736	
	2	Y	50	0.542	0.1	1.000	77		0.736	
	3	Y	50	0.542	-0.2	1.000	77		0.736	
	1	Y	90	1.757	-0.1	3.300	81			0.730
	2	Y	90	1.757	-0.2	3.250	84			0.735
	3	Y	90	1.757	-0.2	3.260	85			0.734
							Avg. =	0.747	0.736	0.733
							% Diff. (30,90)			-1.9
							(30,50)			-1.5
							(50,90)			-0.4
							Meth. 2 Avg. =			0.736
							Rev. Meth. 2 Avg. =			0.740

Table C1-56. Wind Tunnel Calibration - 11/08/97

Modified Kiel Probe: MK-3

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
29.45	1	Y	30	0.195	7.8	0.345	88	0.752		
	2	Y	30	0.195	7.7	0.345	89	0.752		
	3	Y	30	0.195	7.8	0.345	90	0.752		
	1	Y	50	0.781	7.8	1.410	89		0.744	
	2	Y	50	0.781	7.8	1.400	90		0.747	
	3	Y	50	0.781	7.8	1.400	90		0.747	
	1	Y	90	1.757	7.8	3.290	91			0.731
	2	Y	90	1.757	7.8	3.290	91			0.731
	3	Y	90	1.757	7.7	3.280	92			0.732

Avg. =		0.752	0.746	0.731
% Diff.	(30,90)			-2.7
	(30,50)			-0.8
	(50,90)			-2.0
Meth. 2 Avg. =				0.746
Rev. Meth. 2 Avg. =				0.741

Table C1-57. Wind Tunnel Calibration - 03/12/97

Modified Kiel Probe: MK-4

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
30.02	1	Y	30	0.195	0.2	0.344	81	0.753		
	2	Y	30	0.195	0.1	0.348	80	0.749		
	3	Y	30	0.195	-0.4	0.350	80	0.746		
	1	Y	50	0.542	0.0	1.000	81		0.736	
	2	Y	50	0.542	0.1	1.000	81		0.736	
	3	Y	50	0.542	0.1	1.000	81		0.736	
	1	Y	90	1.757	-0.3	3.250	85			0.735
	2	Y	90	1.757	-0.4	3.260	87			0.734
	3	Y	90	1.757	-0.1	3.250	88			0.735

Avg. =			0.749	0.736	0.735
% Diff.	(30,90)				-1.9
	(30,50)				-1.7
	(50,90)				-0.2
Meth. 2 Avg. =					0.736
Rev. Meth. 2 Avg. =					0.742

Table C1-58. Wind Tunnel Calibration - 11/08/97

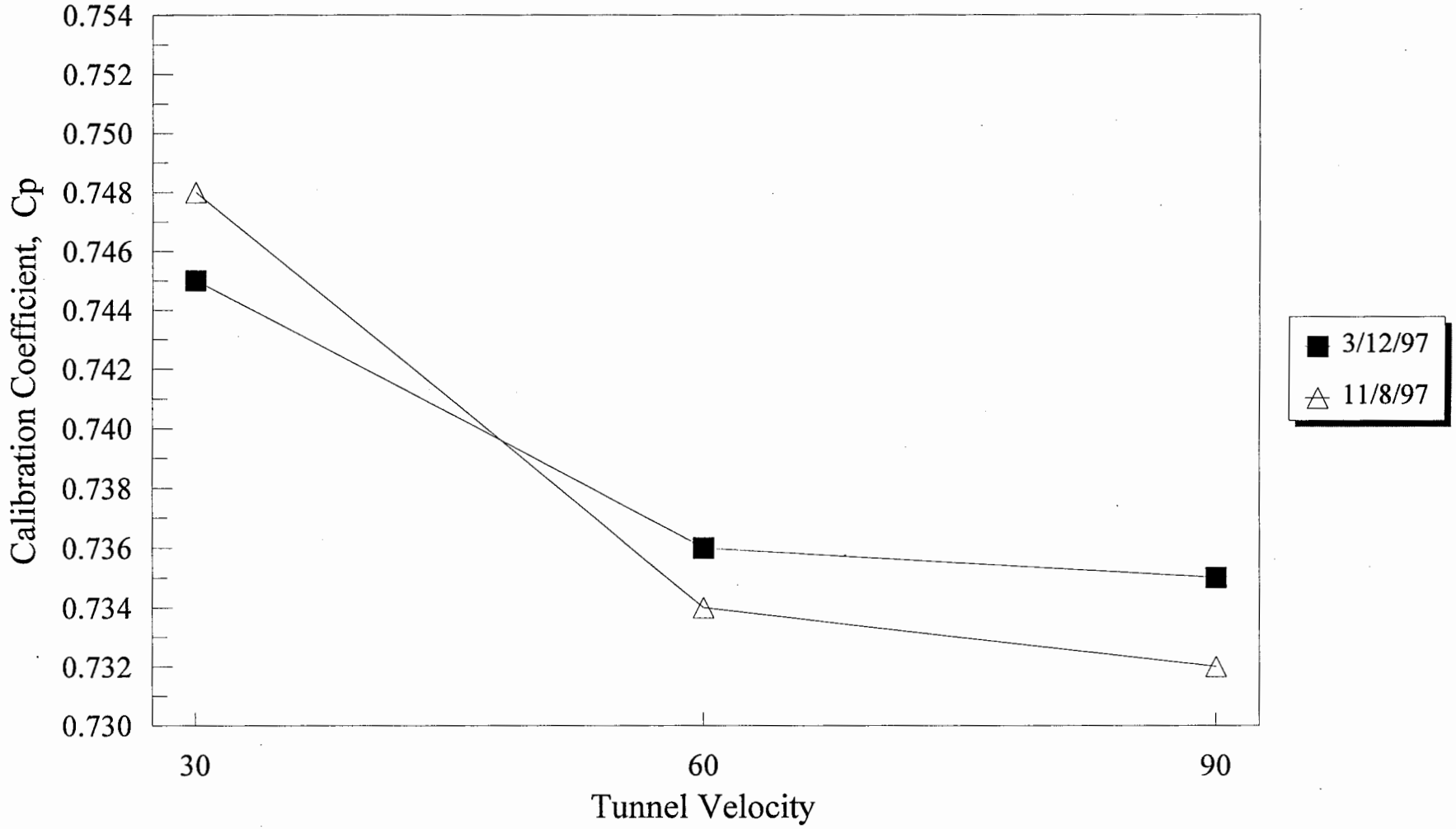
Modified Kiel Probe: MK-4

P_Bar	Rep #	Yaw Null?	Nom. Vel.	P_p	Yaw Angle	P_s	T	Cp @ 30 fps	Cp @ 50 fps	Cp @ 90 fps
29.45	1	Y	30	0.195	2.9	0.345	89	0.752		
	2	Y	30	0.195	2.9	0.345	89	0.752		
	3	Y	30	0.195	3.0	0.344	90	0.753		
	1	Y	50	0.781	3.0	1.420	89		0.742	
	2	Y	50	0.781	3.0	1.400	90		0.747	
	3	Y	50	0.781	2.9	1.410	90		0.744	
	1	Y	90	1.757	2.8	3.290	91			0.731
	2	Y	90	1.757	2.9	3.280	92			0.732
	3	Y	90	1.757	3.0	3.280	92			0.732

Avg. =		0.752	0.744	0.732
% Diff.	(30,90)			-2.7
	(30,50)			-1.1
	(50,90)			-1.7
Meth. 2 Avg. =				0.744
Rev. Meth. 2 Avg. =				0.742

Figure C1-33. Modified Kiel Probe MK-1 Calibration Coefficients

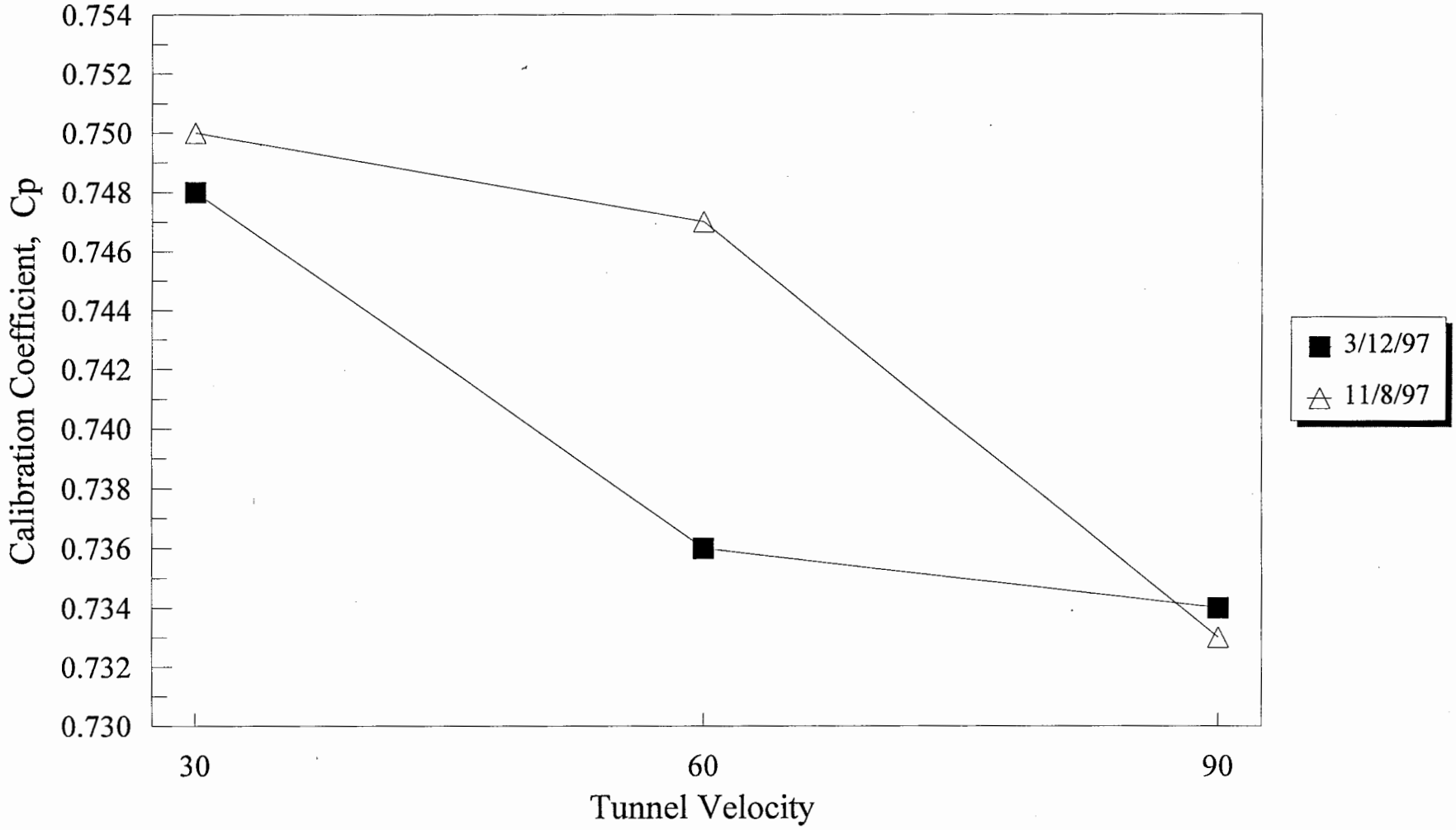
NCSU Wind Tunnel Calibrations



CAL-SUM.WK4

Figure C1-34. Modified Kiel Probe MK-2 Calibration Coefficients

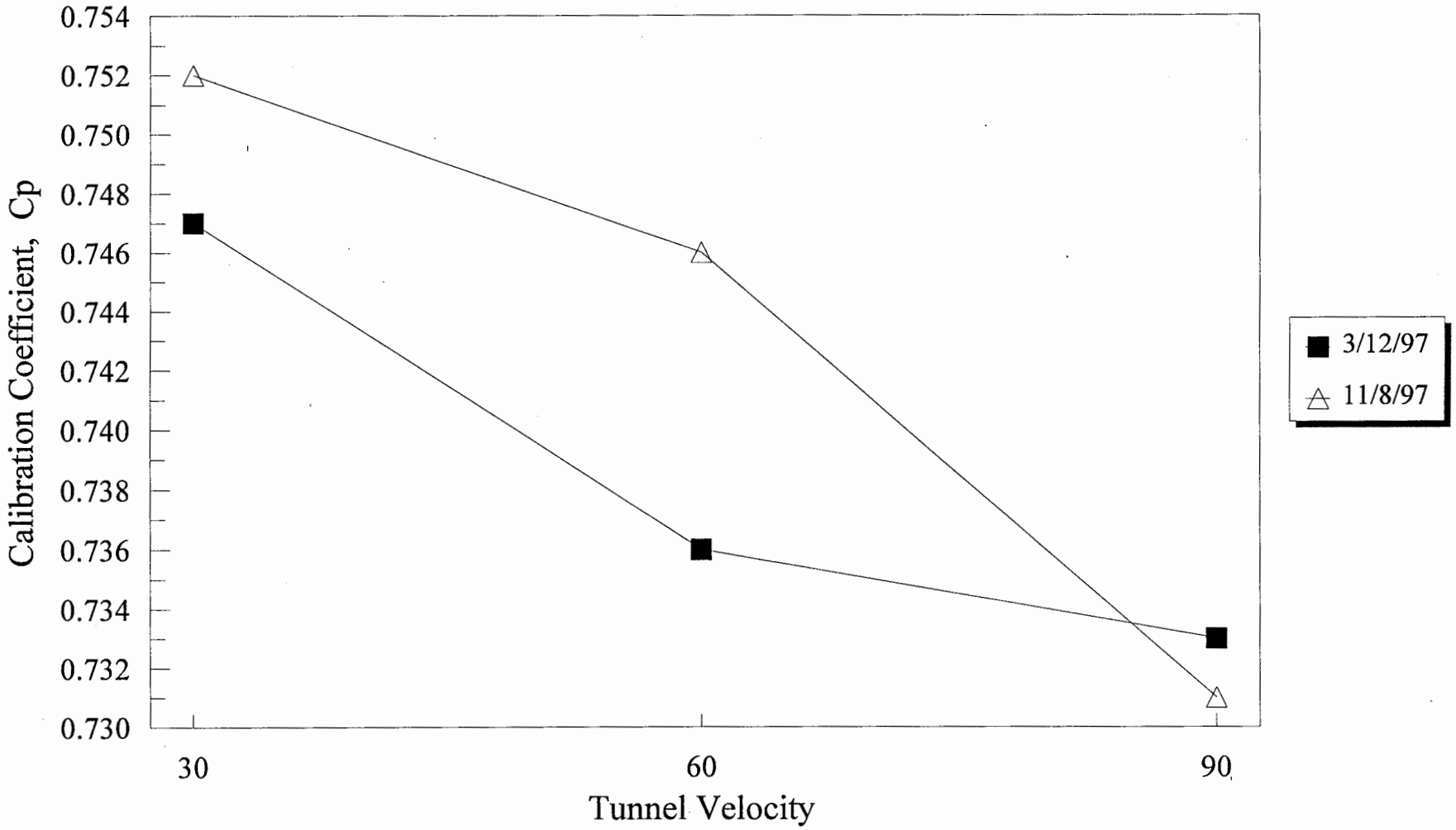
NCSU Wind Tunnel Calibrations



CAL-SUM.WK4

Figure C1-35. Modified Kiel Probe MK-3 Calibration Coefficients

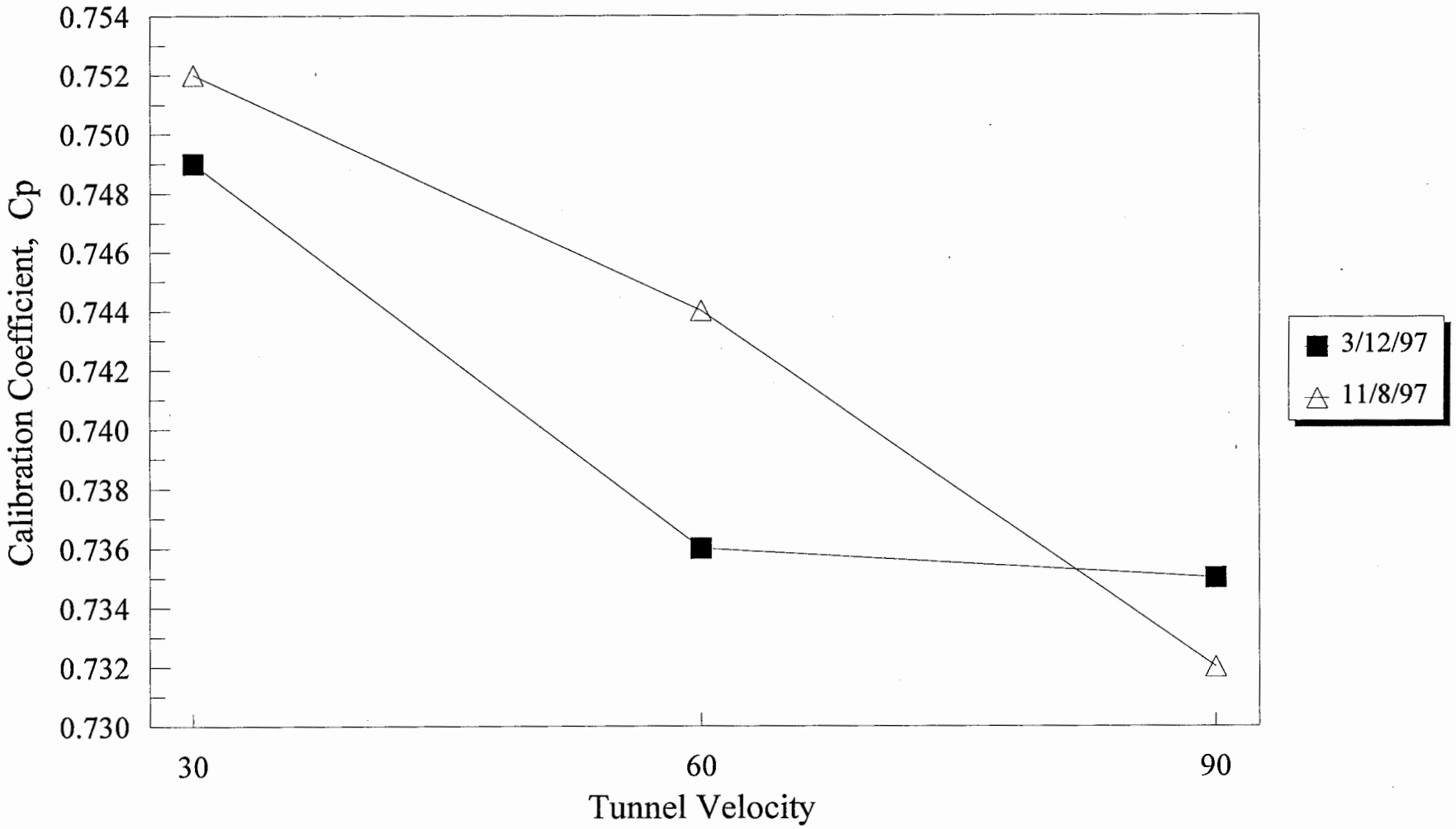
NCSU Wind Tunnel Calibrations



CAL-SUM.WK4

Figure C1-36. Modified Kiel Probe MK-4 Calibration Coefficients

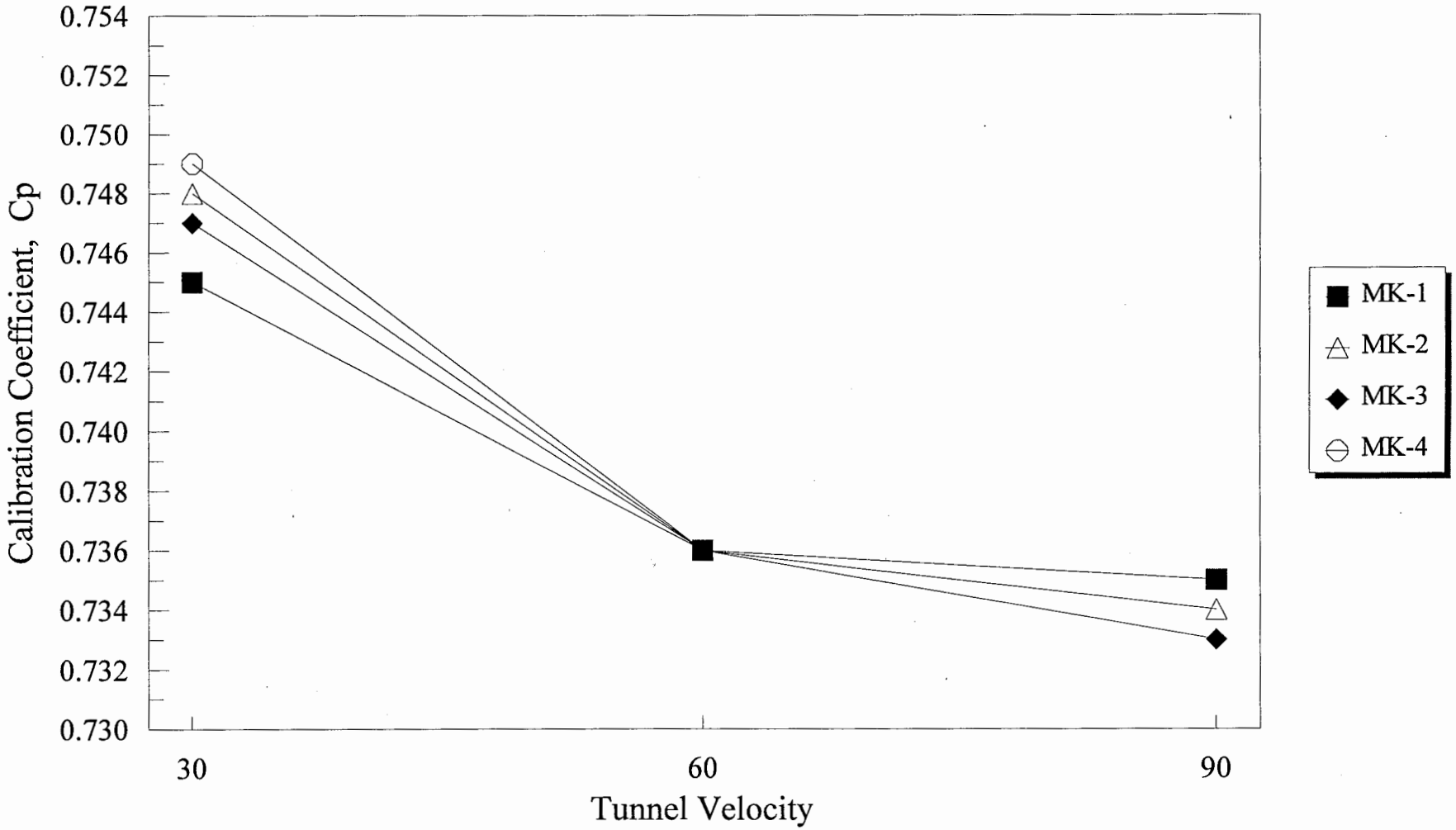
NCSU Wind Tunnel Calibrations



CAL-SUM.WK4

Figure C1-37. Modified Kiel Probe Calibration Coefficients

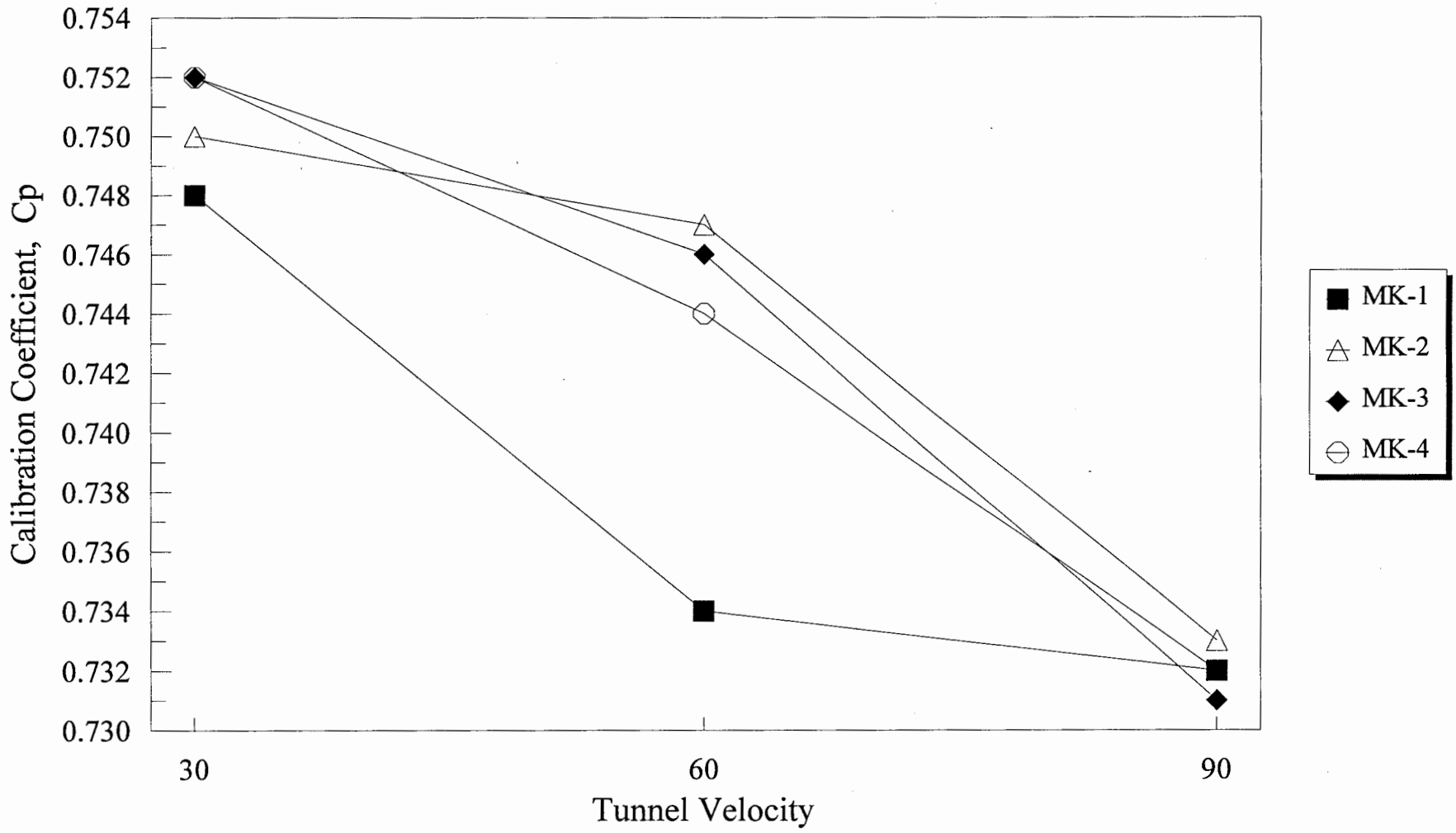
NCSU Wind Tunnel Calibrations -- 3/12/97



CAL-SUM.WK4

Figure C1-38. Modified Kiel Probe Calibration Coefficients

NCSU Wind Tunnel Calibrations -- 11/8/97



CAL-SUM.WK4

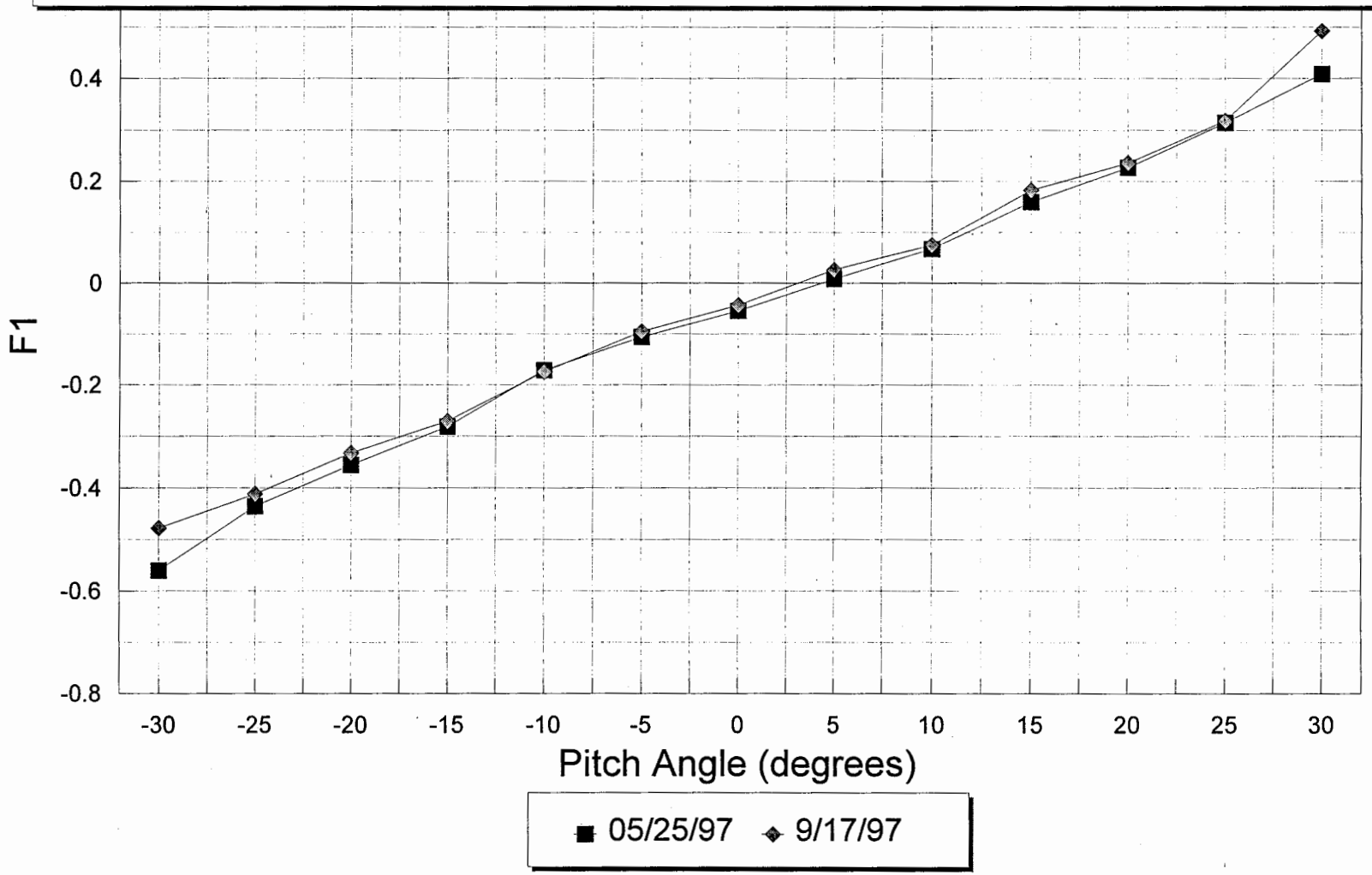
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ATTACHMENT F.

E-DAT Probe Calibration Data

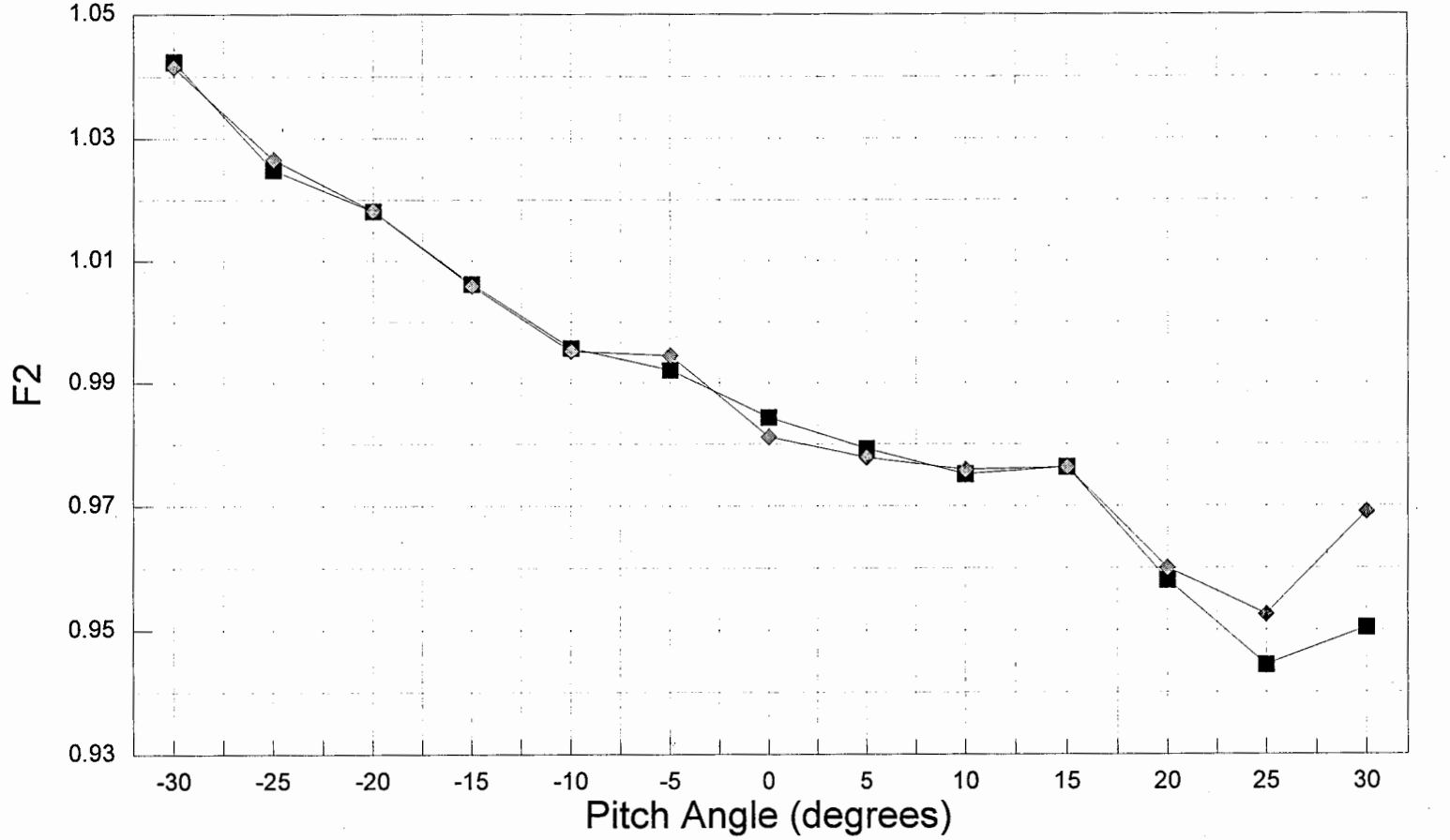
Figure C1-39. E-DAT: Avg. (30-60 fps) F1 vs. Pitch Angle

Pre- and Post-Test NCSU Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

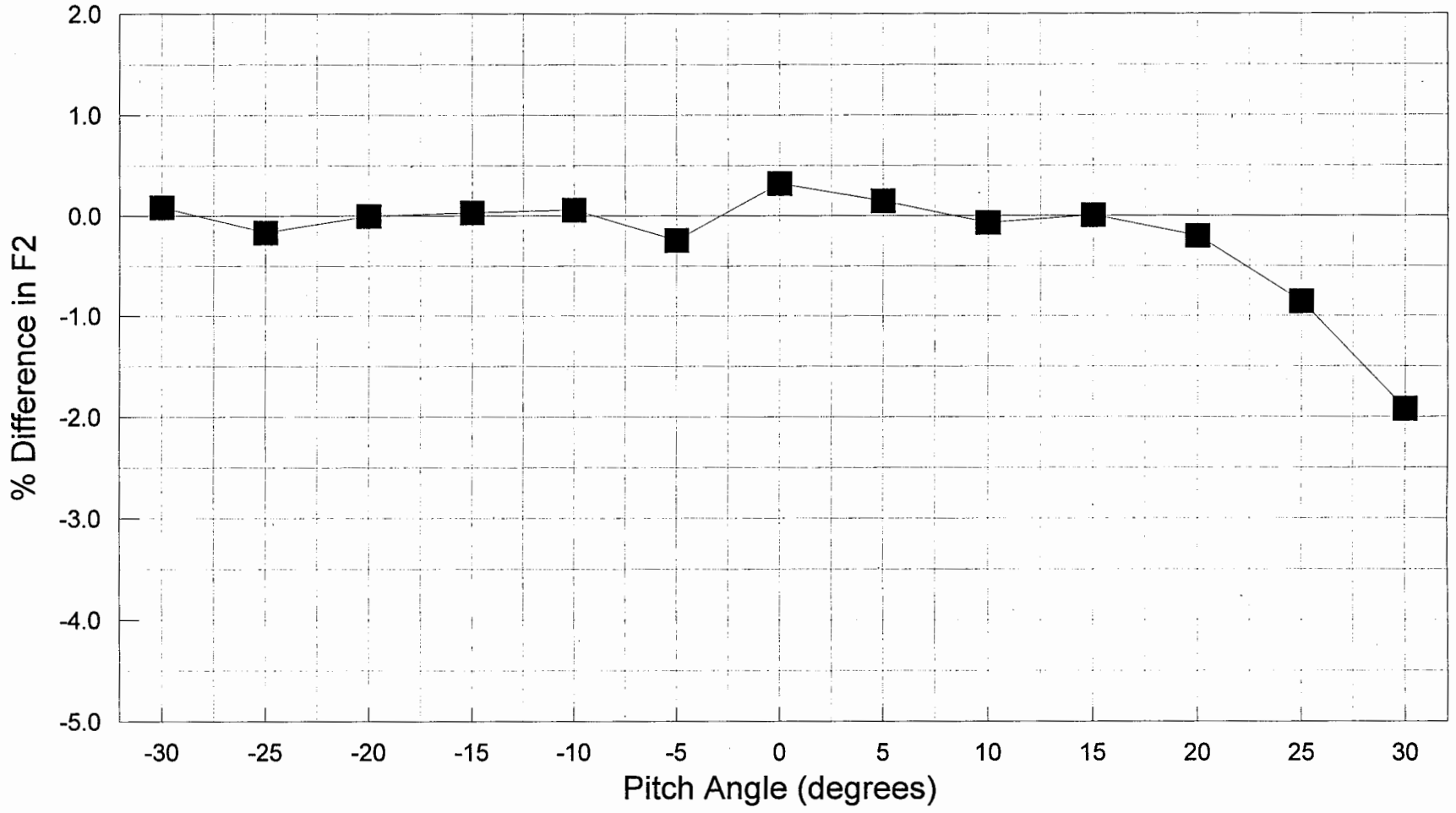
Figure C1-40. E-DAT: Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post-Test NCSU Wind Tunnel Calibration



Note: Each point represents the mean of three replicates.

Figure C1-41. E-DAT: Percent Difference in F2

NCSU Pre- and Post-Test Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-59. Entropy DAT Probe Calibrations at NC State Wind Tunnel

Pitch Angle	30 fps / Pre-test 30-60 Calibration			30 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	26.51	30.23	27.02	27.66	30.31	26.83	4.35	0.27	-0.70
-25	23.98	30.76	28.05	25.40	30.86	27.82	5.91	0.32	-0.81
-20	18.60	30.65	28.99	19.83	30.74	28.85	6.62	0.28	-0.49
-15	14.47	30.92	29.93	15.09	30.95	29.87	4.24	0.11	-0.19
-10	9.61	31.19	30.74	9.58	31.18	30.74	-0.28	-0.02	-0.01
-5	5.85	31.27	31.07	6.53	31.35	31.12	11.53	0.26	0.18
0	1.69	31.08	31.05	1.97	31.09	31.05	17.00	0.04	-0.01
5	5.79	30.97	30.76	4.96	30.97	30.80	-14.31	-0.02	0.15
10	10.36	31.06	30.54	9.62	31.08	30.62	-7.20	0.04	0.26
15	15.05	30.90	29.83	13.83	30.99	30.08	-8.13	0.28	0.85
20	18.92	31.02	29.33	17.76	31.19	29.69	-6.12	0.55	1.20
25	24.75	30.95	28.09	24.25	31.19	28.43	-2.03	0.78	1.18
30	29.97	30.64	26.54	27.97	31.02	27.39	-6.68	1.23	3.21

Pitch Angle	60 fps / Pre-test 30-60 Calibration			60 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.92	59.47	51.54	30.02	59.46	51.49	0.35	-0.01	-0.11
-25	25.04	60.25	54.57	27.21	60.66	53.92	8.63	0.69	-1.20
-20	21.23	60.17	56.09	22.69	60.34	55.67	6.87	0.28	-0.74
-15	16.16	59.94	57.55	17.18	60.07	57.36	6.31	0.22	-0.33
-10	9.44	59.41	58.52	9.72	59.45	58.52	2.98	0.06	0.01
-5	3.67	59.05	58.88	4.51	59.17	58.94	23.08	0.19	0.10
0	1.01	59.60	59.58	1.24	59.56	59.54	23.72	-0.07	-0.06
5	4.37	59.76	59.56	3.10	59.70	59.60	-29.08	-0.09	0.06
10	8.86	59.68	58.93	7.81	59.69	59.10	-11.83	0.03	0.27
15	15.33	59.54	57.41	14.08	59.65	57.85	-8.13	0.19	0.77
20	20.83	59.77	55.87	20.26	60.03	56.31	-2.72	0.42	0.79
25	25.16	60.12	54.41	24.75	60.62	55.05	-1.64	0.84	1.17
30	29.69	60.35	52.43	27.59	61.02	54.08	-7.08	1.11	3.16

Pitch Angle	90 fps / Pre-test 30-60 Calibration			90 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.01	88.34	76.50	30.01	88.31	76.46	0.00	-0.04	-0.04
-25	25.61	89.59	80.78	27.93	90.31	79.79	9.06	0.81	-1.24
-20	18.37	89.36	84.80	19.85	89.65	84.32	8.01	0.33	-0.56
-15	13.82	88.52	85.95	14.24	88.57	85.83	3.10	0.06	-0.13
-10	10.19	88.07	86.68	10.09	88.02	86.66	-0.99	-0.06	-0.03
-5	4.85	87.74	87.30	5.09	87.78	87.29	4.97	0.04	-0.01
0	1.42	88.31	88.28	0.65	88.14	88.13	-54.22	-0.20	-0.17
5	4.72	89.51	89.16	3.50	89.44	89.24	-25.97	-0.08	0.08
10	10.30	88.94	87.50	9.67	89.01	87.74	-6.12	0.07	0.27
15	16.12	88.49	85.01	14.62	88.85	85.97	-9.29	0.41	1.13
20	21.89	87.56	81.24	21.45	88.01	81.91	-2.01	0.52	0.82
25	25.30	88.94	80.41	25.02	89.71	81.29	-1.09	0.87	1.09
30	27.85	89.54	79.17	26.58	90.43	80.87	-4.56	0.99	2.15

Figure C1-42. Entropy DAT Probe Pre- and Post-Test Calibrations

NC State Wind Tunnel

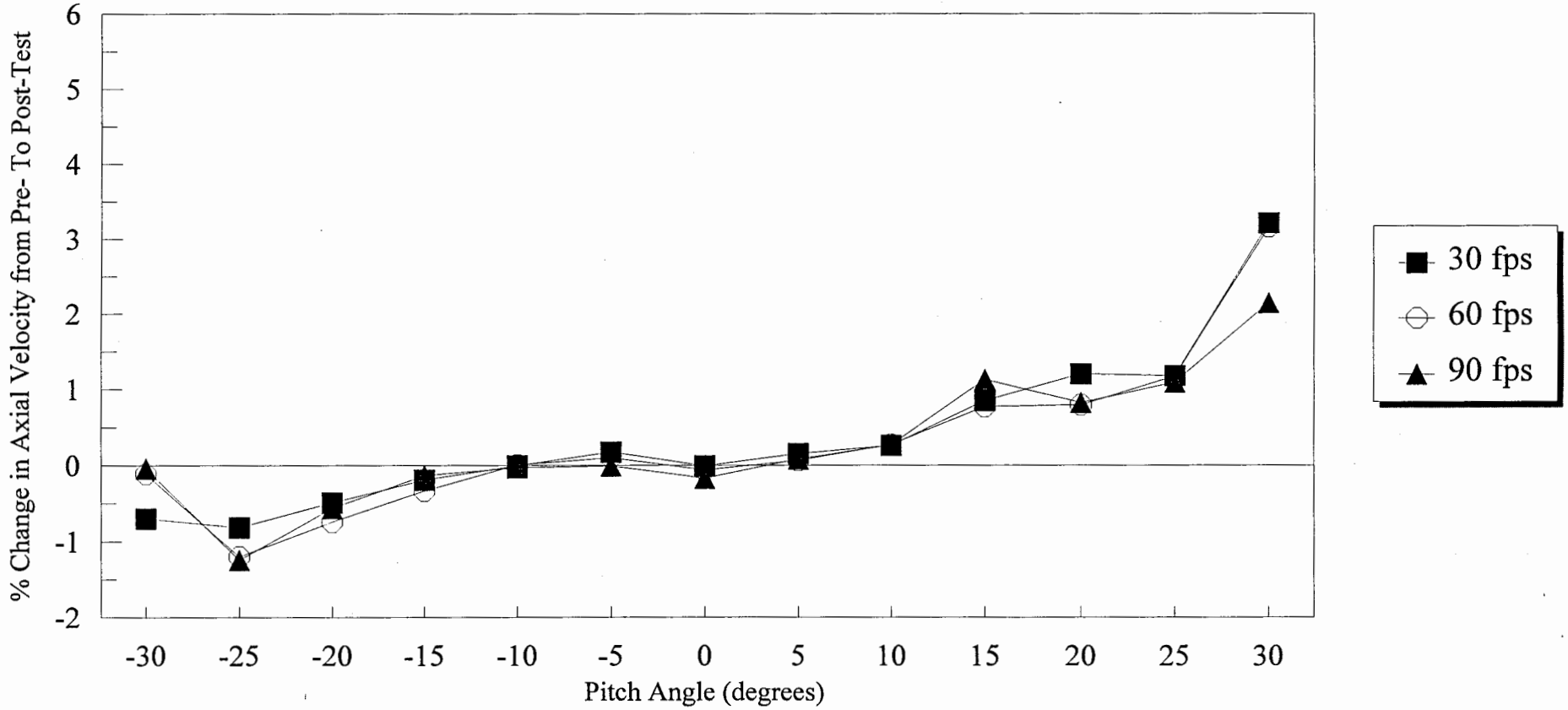


Table C1-60. Entropy DAT Pre-test Calibrations - 30 fps

Probe: **Entropy DAT / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 05/25/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.60	Probe ID:	E_DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.60	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.53%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**29.38**	Last Row:	61
Average Yaw Angle:	0.4		
Average Pitch Angle:	15.8	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.8		0
Resultant Angle Standard Deviation:	8.95		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.5	-0.120	0.180	91	-30.0	30.0	0.1956	30.43	26.35
	-25	-0.6	-0.100	0.190	90	-28.7	28.7	0.2046	31.10	27.29
	-20	-0.6	-0.080	0.195	90	-23.4	23.4	0.2040	31.05	28.49
	-15	-0.5	-0.060	0.200	90	-16.3	16.3	0.2037	31.03	29.79
	-10	-0.6	-0.040	0.210	90	-10.9	10.9	0.2090	31.43	30.86
	-5	-0.6	-0.035	0.210	90	-9.6	9.7	0.2081	31.36	30.92
	0	-0.2	-0.020	0.210	90	-3.9	3.9	0.2060	31.21	31.13
	5	-0.3	-0.010	0.214	90	0.6	0.7	0.2071	31.29	31.29
	10	-0.5	0.010	0.215	89	8.2	8.3	0.2050	31.11	30.78
	15	-0.4	0.025	0.215	89	12.7	12.7	0.2047	31.08	30.32
	20	-0.4	0.040	0.218	89	16.8	16.8	0.2051	31.11	29.78
	25	-0.5	0.060	0.225	89	22.3	22.3	0.2039	31.01	28.70
	30	-2.7	0.090	0.224	89	29.6	29.7	0.2022	30.88	26.82
2	-30	-0.6	-0.080	0.185	91	-24.8	24.8	0.1942	30.33	27.52
	-25	-0.1	-0.075	0.190	91	-22.5	22.5	0.1983	30.64	28.32
	-20	-0.1	-0.060	0.191	91	-17.2	17.2	0.1954	30.42	29.06
	-15	-0.2	-0.050	0.200	91	-13.6	13.6	0.2013	30.88	30.01
	-10	-0.2	-0.030	0.207	91	-8.0	8.0	0.2046	31.13	30.83
	-5	-0.2	-0.020	0.210	91	-3.9	3.9	0.2060	31.23	31.16
	0	-0.1	-0.010	0.210	91	0.6	0.6	0.2032	31.02	31.02
	5	-0.3	0.010	0.211	91	8.3	8.3	0.2012	30.87	30.54
	10	-0.2	0.020	0.213	91	11.4	11.4	0.2027	30.98	30.37
	15	-0.2	0.035	0.210	91	15.5	15.5	0.1994	30.73	29.61
	20	-0.2	0.050	0.220	92	20.0	20.0	0.2019	30.95	29.08
	25	0.0	0.075	0.226	92	25.9	25.9	0.2021	30.96	27.84
	30	-2.5	0.095	0.215	92	30.0	30.1	0.1942	30.35	26.26
3	-30	-0.2	-0.080	0.186	90	-24.7	24.7	0.1895	29.93	27.19
	-25	-0.2	-0.070	0.190	90	-20.8	20.8	0.1974	30.55	28.55
	-20	-0.1	-0.055	0.194	90	-15.1	15.1	0.1966	30.48	29.42
	-15	-0.1	-0.050	0.200	90	-13.6	13.6	0.2013	30.85	29.99
	-10	-0.2	-0.035	0.205	90	-10.0	10.0	0.2032	31.00	30.53
	-5	0.0	-0.020	0.210	90	-3.9	3.9	0.2060	31.21	31.13
	0	0.0	-0.010	0.210	90	0.6	0.6	0.2032	31.00	30.99
	5	0.0	0.010	0.210	90	8.3	8.3	0.2002	30.77	30.44
	10	-0.1	0.020	0.215	90	11.4	11.4	0.2046	31.10	30.49
	15	-0.1	0.040	0.215	90	17.0	17.0	0.2019	30.90	29.55
	20	-0.1	0.050	0.221	91	20.0	20.0	0.2029	31.00	29.14
	25	-0.4	0.075	0.225	91	26.0	26.0	0.2012	30.87	27.74
	30	-2.3	0.090	0.220	91	30.0	30.1	0.1987	30.68	26.55

		Res		Vdir	Vax
Average	-30	26.51		30.23	27.02
	-25	23.98		30.76	28.05
	-20	18.60		30.65	28.99
	-15	14.47		30.92	29.93
	-10	9.61		31.19	30.74
	-5	5.85		31.27	31.07
	0	1.69		31.08	31.05
	5	5.79		30.97	30.76
	10	10.36		31.06	30.54
	15	15.05		30.90	29.83
	20	18.92		31.02	29.33
	25	24.75		30.95	28.09
	30	29.97		30.64	26.54

Table C1-61. Entropy DAT Post-test Computations - 30 fps

Probe: **Entropy DAT / Post-Test 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 09/17/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.60	Probe ID:	E-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.60	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.53%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**29.48**	Last Row:	61
Average Yaw Angle:	0.4		
Average Pitch Angle:	15.7	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.7		0
Resultant Angle Standard Deviation:	8.93		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.5	-0.120	0.180	91	-30.0	30.0	0.1952	30.41	26.33
	-25	-0.6	-0.100	0.190	90	-30.0	30.0	0.2061	31.21	27.03
	-20	-0.6	-0.080	0.195	90	-24.9	24.9	0.2054	31.16	28.26
	-15	-0.5	-0.060	0.200	90	-17.4	17.4	0.2047	31.11	29.69
	-10	-0.6	-0.040	0.210	90	-10.8	10.8	0.2087	31.41	30.85
	-5	-0.6	-0.035	0.210	90	-9.5	9.5	0.2079	31.35	30.92
	0	-0.2	-0.020	0.210	90	-5.0	5.0	0.2077	31.33	31.21
	5	-0.3	-0.010	0.214	90	-0.4	0.5	0.2064	31.24	31.24
	10	-0.5	0.010	0.215	89	7.1	7.1	0.2052	31.12	30.88
	15	-0.4	0.025	0.215	89	11.9	11.9	0.2048	31.09	30.42
	20	-0.4	0.040	0.218	89	15.1	15.1	0.2077	31.30	30.23
	25	-0.5	0.060	0.225	89	21.9	21.9	0.2062	31.19	28.94
	30	-2.7	0.090	0.224	89	27.4	27.5	0.2067	31.23	27.69
2	-30	-0.6	-0.080	0.185	91	-26.6	26.6	0.1968	30.53	27.30
	-25	-0.1	-0.075	0.190	91	-23.9	23.9	0.1995	30.74	28.10
	-20	-0.1	-0.060	0.191	91	-18.5	18.5	0.1966	30.51	28.93
	-15	-0.2	-0.050	0.200	91	-13.9	13.9	0.2015	30.89	29.98
	-10	-0.2	-0.030	0.207	91	-8.1	8.1	0.2049	31.15	30.84
	-5	-0.2	-0.020	0.210	91	-5.0	5.0	0.2077	31.36	31.24
	0	-0.1	-0.010	0.210	91	-0.4	0.4	0.2026	30.98	30.98
	5	-0.3	0.010	0.211	91	7.2	7.2	0.2014	30.88	30.64
	10	-0.2	0.020	0.213	91	10.9	10.9	0.2029	31.00	30.44
	15	-0.2	0.035	0.210	91	14.3	14.3	0.2001	30.78	29.84
	20	-0.2	0.050	0.220	92	19.2	19.2	0.2039	31.10	29.38
	25	0.0	0.075	0.226	92	25.4	25.4	0.2056	31.24	28.21
	30	-2.5	0.095	0.215	92	28.6	28.7	0.1999	30.80	27.02
3	-30	-0.2	-0.080	0.186	90	-26.4	26.4	0.1904	30.00	26.87
	-25	-0.2	-0.070	0.190	90	-22.3	22.3	0.1985	30.63	28.34
	-20	-0.1	-0.055	0.194	90	-16.1	16.1	0.1973	30.54	29.35
	-15	-0.1	-0.050	0.200	90	-13.9	13.9	0.2015	30.86	29.95
	-10	-0.2	-0.035	0.205	90	-9.8	9.8	0.2030	30.98	30.53
	-5	0.0	-0.020	0.210	90	-5.0	5.0	0.2077	31.33	31.21
	0	0.0	-0.010	0.210	90	-0.4	0.4	0.2026	30.95	30.95
	5	0.0	0.010	0.210	90	7.2	7.2	0.2004	30.78	30.54
	10	-0.1	0.020	0.215	90	10.8	10.8	0.2048	31.11	30.56
	15	-0.1	0.040	0.215	90	15.3	15.3	0.2045	31.09	29.99
	20	-0.1	0.050	0.221	91	19.1	19.1	0.2050	31.16	29.45
	25	-0.4	0.075	0.225	91	25.5	25.5	0.2048	31.14	28.12
	30	-2.3	0.090	0.220	91	27.6	27.7	0.2033	31.03	27.47

		Res	Vdir	Vax
Average	-30	27.66	30.31	26.83
	-25	25.40	30.86	27.82
	-20	19.83	30.74	28.85
	-15	15.09	30.95	29.87
	-10	9.58	31.18	30.74
	-5	6.53	31.35	31.12
	0	1.97	31.09	31.05
	5	4.96	30.97	30.80
	10	9.62	31.08	30.62
	15	13.83	30.99	30.08
	20	17.76	31.19	29.69
	25	24.25	31.19	28.43
	30	27.97	31.02	27.39

Table C1-62. Entropy DAT Pre-test Computations - 60 fps

Probe: **Entropy DAT / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **60 fps** Cal Date: 05/25/97

Number Of Points: 39

Barometric Pressure, in. Hg:	29.60	Probe ID:	E_DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.60	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**56.57**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.2		0
Resultant Angle Standard Deviation:	9.86		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.1	-0.400	0.720	92	-29.8	29.9	0.7815	60.89	52.81
	-25	-1.2	-0.300	0.730	92	-23.5	23.5	0.7638	60.20	55.20
	-20	-0.1	-0.265	0.730	92	-20.5	20.5	0.7577	59.96	56.17
	-15	-0.5	-0.195	0.750	92	-14.0	14.0	0.7563	59.90	58.11
	-10	-0.2	-0.080	0.750	92	-5.0	5.0	0.7381	59.18	58.95
	-5	0.0	-0.045	0.750	92	-0.5	0.5	0.7279	58.77	58.76
	0	-0.3	-0.020	0.790	92	2.3	2.4	0.7617	60.12	60.07
	5	-0.2	0.020	0.800	92	6.4	6.4	0.7653	60.26	59.88
	10	-0.1	0.075	0.800	92	11.4	11.4	0.7612	60.10	58.90
	15	-0.3	0.145	0.800	92	16.6	16.6	0.7534	59.79	57.29
	20	-0.4	0.210	0.830	93	21.5	21.5	0.7554	59.92	55.75
	25	-0.4	0.280	0.850	93	25.8	25.8	0.7597	60.09	54.10
	30	-3.9	0.330	0.850	93	28.9	29.2	0.7657	60.33	52.68
2	-30	-1.3	-0.400	0.720	93	-29.8	29.9	0.7815	60.94	52.85
	-25	-0.4	-0.320	0.730	93	-25.1	25.1	0.7675	60.40	54.68
	-20	-0.4	-0.280	0.740	93	-21.4	21.4	0.7701	60.50	56.31
	-15	-0.3	-0.230	0.740	93	-17.0	17.0	0.7564	59.96	57.34
	-10	-0.2	-0.160	0.745	93	-12.0	12.0	0.7448	59.50	58.20
	-5	-0.3	-0.090	0.750	93	-6.1	6.1	0.7393	59.28	58.94
	0	0.0	-0.040	0.770	93	0.2	0.2	0.7457	59.54	59.54
	5	0.0	-0.010	0.780	93	3.3	3.3	0.7505	59.73	59.62
	10	-0.1	0.030	0.780	93	7.6	7.6	0.7447	59.50	58.98
	15	-0.1	0.120	0.780	93	14.7	14.7	0.7433	59.44	57.50
	20	-0.4	0.190	0.820	93	20.3	20.3	0.7515	59.76	56.06
	25	-0.1	0.280	0.850	93	25.8	25.8	0.7597	60.09	54.10
	30	-3.0	0.350	0.850	93	30.0	30.1	0.7678	60.41	52.24
3	-30	-1.0	-0.480	0.670	91	-30.0	30.0	0.6756	56.57	48.98
	-25	-0.4	-0.340	0.720	91	-26.5	26.5	0.7640	60.15	53.84
	-20	-0.5	-0.280	0.730	92	-21.8	21.8	0.7603	60.06	55.78
	-15	-0.4	-0.235	0.740	92	-17.4	17.4	0.7580	59.97	57.21
	-10	-0.2	-0.150	0.750	92	-11.3	11.3	0.7477	59.56	58.40
	-5	0.0	-0.075	0.750	92	-4.4	4.4	0.7367	59.12	58.95
	0	0.0	-0.045	0.760	92	-0.5	0.5	0.7374	59.15	59.15
	5	-0.2	-0.010	0.770	92	3.3	3.3	0.7409	59.29	59.19
	10	-0.3	0.030	0.780	92	7.6	7.6	0.7447	59.44	58.92
	15	-0.4	0.120	0.780	92	14.7	14.7	0.7433	59.39	57.44
	20	-0.2	0.196	0.820	92	20.7	20.7	0.7497	59.64	55.79
	25	-0.4	0.250	0.850	92	23.9	23.9	0.7632	60.17	55.03
	30	-4.0	0.340	0.850	92	29.5	29.8	0.7669	60.32	52.35

		Res	Vdir	Vax
Average	-30	29.92	59.47	51.54
	-25	25.04	60.25	54.57
	-20	21.23	60.17	56.09
	-15	16.16	59.94	57.55
	-10	9.44	59.41	58.52
	-5	3.67	59.05	58.88
	0	1.01	59.60	59.58
	5	4.37	59.76	59.56
	10	8.86	59.68	58.93
	15	15.33	59.54	57.41
	20	20.83	59.77	55.87
	25	25.16	60.12	54.41
	30	29.69	60.35	52.43

Table C1-63. Entropy DAT Post-test Computations - 60 fps

Probe: **Entropy DAT / Post-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 09/17/97

Number Of Points: 39

Barometric Pressure, in. Hg:	29.60	Probe ID:	E-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.60	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**56.73**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	16.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.2		0
Resultant Angle Standard Deviation:	9.94		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.1	-0.400	0.720	92	-30.0	30.0	0.7809	60.87	52.70
	-25	-1.2	-0.300	0.730	92	-24.9	25.0	0.7692	60.41	54.76
	-20	-0.1	-0.265	0.730	92	-21.9	21.9	0.7617	60.11	55.76
	-15	-0.5	-0.195	0.750	92	-14.5	14.5	0.7571	59.93	58.04
	-10	-0.2	-0.080	0.750	92	-5.7	5.7	0.7419	59.33	59.03
	-5	0.0	-0.045	0.750	92	-1.6	1.6	0.7285	58.79	58.76
	0	-0.3	-0.020	0.790	92	1.3	1.3	0.7592	60.02	60.00
	5	-0.2	0.020	0.800	92	4.9	4.9	0.7650	60.24	60.02
	10	-0.1	0.075	0.800	92	10.9	10.9	0.7619	60.12	59.04
	15	-0.3	0.145	0.800	92	14.9	14.9	0.7624	60.14	58.11
	20	-0.4	0.210	0.830	93	21.0	21.0	0.7625	60.20	56.19
	25	-0.4	0.280	0.850	93	25.3	25.3	0.7731	60.62	54.78
	30	-3.9	0.330	0.850	93	27.0	27.3	0.7821	60.97	54.19
2	-30	-1.3	-0.400	0.720	93	-30.0	30.0	0.7809	60.92	52.75
	-25	-0.4	-0.320	0.730	93	-27.0	27.0	0.7785	60.83	54.18
	-20	-0.4	-0.280	0.740	93	-22.9	22.9	0.7745	60.67	55.89
	-15	-0.3	-0.230	0.740	93	-18.3	18.3	0.7608	60.13	57.10
	-10	-0.2	-0.160	0.745	93	-12.1	12.1	0.7445	59.49	58.17
	-5	-0.3	-0.090	0.750	93	-6.6	6.6	0.7420	59.39	59.00
	0	0.0	-0.040	0.770	93	-0.9	0.9	0.7447	59.50	59.49
	5	0.0	-0.010	0.780	93	2.2	2.2	0.7487	59.65	59.61
	10	-0.1	0.030	0.780	93	6.3	6.3	0.7450	59.51	59.15
	15	-0.1	0.120	0.780	93	13.7	13.7	0.7432	59.43	57.75
	20	-0.4	0.190	0.820	93	19.6	19.6	0.7579	60.02	56.55
	25	-0.1	0.280	0.850	93	25.3	25.3	0.7731	60.62	54.78
	30	-3.0	0.350	0.850	93	27.7	27.8	0.7858	61.11	54.03
3	-30	-1.0	-0.480	0.670	91	-30.0	30.0	0.6764	56.60	49.01
	-25	-0.4	-0.340	0.720	91	-29.6	29.6	0.7792	60.75	52.81
	-20	-0.5	-0.280	0.730	92	-23.2	23.2	0.7649	60.24	55.36
	-15	-0.4	-0.235	0.740	92	-18.8	18.8	0.7628	60.16	56.95
	-10	-0.2	-0.150	0.750	92	-11.3	11.3	0.7470	59.53	58.37
	-5	0.0	-0.075	0.750	92	-5.3	5.3	0.7418	59.32	59.07
	0	0.0	-0.045	0.760	92	-1.6	1.6	0.7379	59.17	59.14
	5	-0.2	-0.010	0.770	92	2.2	2.2	0.7391	59.21	59.17
	10	-0.3	0.030	0.780	92	6.3	6.3	0.7450	59.45	59.10
	15	-0.4	0.120	0.780	92	13.7	13.7	0.7432	59.38	57.70
	20	-0.2	0.196	0.820	92	20.2	20.2	0.7553	59.86	56.19
	25	-0.4	0.250	0.850	92	23.6	23.6	0.7747	60.63	55.57
	30	-4.0	0.340	0.850	92	27.4	27.6	0.7839	60.99	54.03

		Res	Vdir	Vax
Average	-30	30.02	59.46	51.49
	-25	27.21	60.66	53.92
	-20	22.69	60.34	55.67
	-15	17.18	60.07	57.36
	-10	9.72	59.45	58.52
	-5	4.51	59.17	58.94
	0	1.24	59.56	59.54
	5	3.10	59.70	59.60
	10	7.81	59.69	59.10
	15	14.08	59.65	57.85
	20	20.26	60.03	56.31
	25	24.75	60.62	55.05
	30	27.59	61.02	54.08

Table C1-64. Entropy DAT Pre-test Computations - 90 fps

Probe: **Entropy DAT / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **90 fps** Cal Date: 05/25/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.60	Probe ID:	E_DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.60	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	5.13%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	92 _F
Average Axial Velocity, ft/sec:	**84.06**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.2		0
Resultant Angle Standard Deviation:	9.34		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.8	-0.890	1.550	88	-30.0	30.0	1.6841	89.06	77.12
	-25	-0.8	-0.720	1.600	89	-25.6	25.6	1.6876	89.23	80.47
	-20	-0.5	-0.550	1.620	90	-18.9	18.9	1.6710	88.88	84.07
	-15	-0.7	-0.420	1.630	91	-13.9	13.9	1.6430	88.21	85.61
	-10	-0.4	-0.300	1.630	91	-10.6	10.6	1.6201	87.59	86.10
	-5	-0.5	-0.225	1.640	92	-7.4	7.4	1.6197	87.66	86.93
	0	-0.6	-0.065	1.700	92	1.3	1.4	1.6427	88.28	88.25
	5	-0.5	-0.020	1.750	93	3.5	3.5	1.6835	89.45	89.29
	10	-0.5	0.125	1.750	93	10.2	10.2	1.6642	88.94	87.52
	15	0.2	0.310	1.730	93	16.5	16.5	1.6312	88.05	84.44
	20	0.0	0.450	1.770	94	21.6	21.6	1.6102	87.56	81.43
	25	-0.8	0.580	1.850	95	25.0	25.0	1.6504	88.73	80.43
	30	-3.9	0.690	1.860	95	28.0	28.3	1.6717	89.30	78.66
2	-30	-1.2	-0.900	1.550	98	-30.0	30.0	1.6841	89.87	77.81
	-25	-0.8	-0.700	1.600	98	-25.1	25.1	1.6818	89.81	81.32
	-20	-0.2	-0.520	1.640	98	-17.4	17.4	1.6796	89.75	85.64
	-15	-0.5	-0.380	1.630	97	-12.8	12.8	1.6353	88.48	86.28
	-10	-0.1	-0.270	1.640	97	-9.5	9.5	1.6248	88.19	86.99
	-5	-0.2	-0.080	1.650	97	0.5	0.5	1.5971	87.44	87.44
	0	-0.2	-0.050	1.700	96	2.0	2.0	1.6403	88.54	88.48
	5	-0.2	0.060	1.750	96	7.2	7.2	1.6719	89.38	88.67
	10	-0.4	0.150	1.730	96	11.0	11.1	1.6459	88.69	87.04
	15	-0.3	0.300	1.730	95	16.0	16.0	1.6364	88.35	84.92
	20	-0.4	0.480	1.800	94	22.3	22.3	1.6309	88.12	81.54
	25	-0.8	0.600	1.870	94	25.4	25.4	1.6694	89.16	80.56
	30	-4.4	0.700	1.900	92	27.9	28.2	1.7070	89.99	79.32
3	-30	-0.9	-0.900	1.550	92	-30.0	30.0	1.5623	86.09	74.55
	-25	-0.6	-0.740	1.600	93	-26.1	26.1	1.6934	89.71	80.56
	-20	-0.3	-0.550	1.630	94	-18.8	18.8	1.6802	89.44	84.68
	-15	-0.5	-0.450	1.640	94	-14.7	14.7	1.6583	88.86	85.96
	-10	-0.3	-0.300	1.650	95	-10.5	10.5	1.6392	88.43	86.95
	-5	-0.4	-0.210	1.650	95	-6.6	6.6	1.6277	88.12	87.53
	0	-0.2	-0.075	1.680	96	0.8	0.8	1.6251	88.12	88.12
	5	-0.2	-0.020	1.750	96	3.5	3.5	1.6835	89.69	89.53
	10	-0.2	0.110	1.750	96	9.6	9.6	1.6651	89.20	87.95
	15	-0.2	0.300	1.750	97	15.9	15.9	1.6572	89.07	85.67
	20	-0.1	0.450	1.740	97	21.8	21.8	1.5807	86.99	80.76
	25	-0.5	0.600	1.850	97	25.5	25.5	1.6523	88.94	80.25
	30	-3.5	0.650	1.857	98	26.9	27.1	1.6643	89.34	79.53

		Res	Vdir	Vax
Average	-30	30.01	88.34	76.50
	-25	25.61	89.59	80.78
	-20	18.37	89.36	84.80
	-15	13.82	88.52	85.95
	-10	10.19	88.07	86.68
	-5	4.85	87.74	87.30
	0	1.42	88.31	88.28
	5	4.72	89.51	89.16
	10	10.30	88.94	87.50
	15	16.12	88.49	85.01
	20	21.89	87.56	81.24
	25	25.30	88.94	80.41
	30	27.85	89.54	79.17

Table C1-65. Entropy DAT Post-test Computations - 90 fps

Probe: **Entropy DAT / Post-Test 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 09/17/97

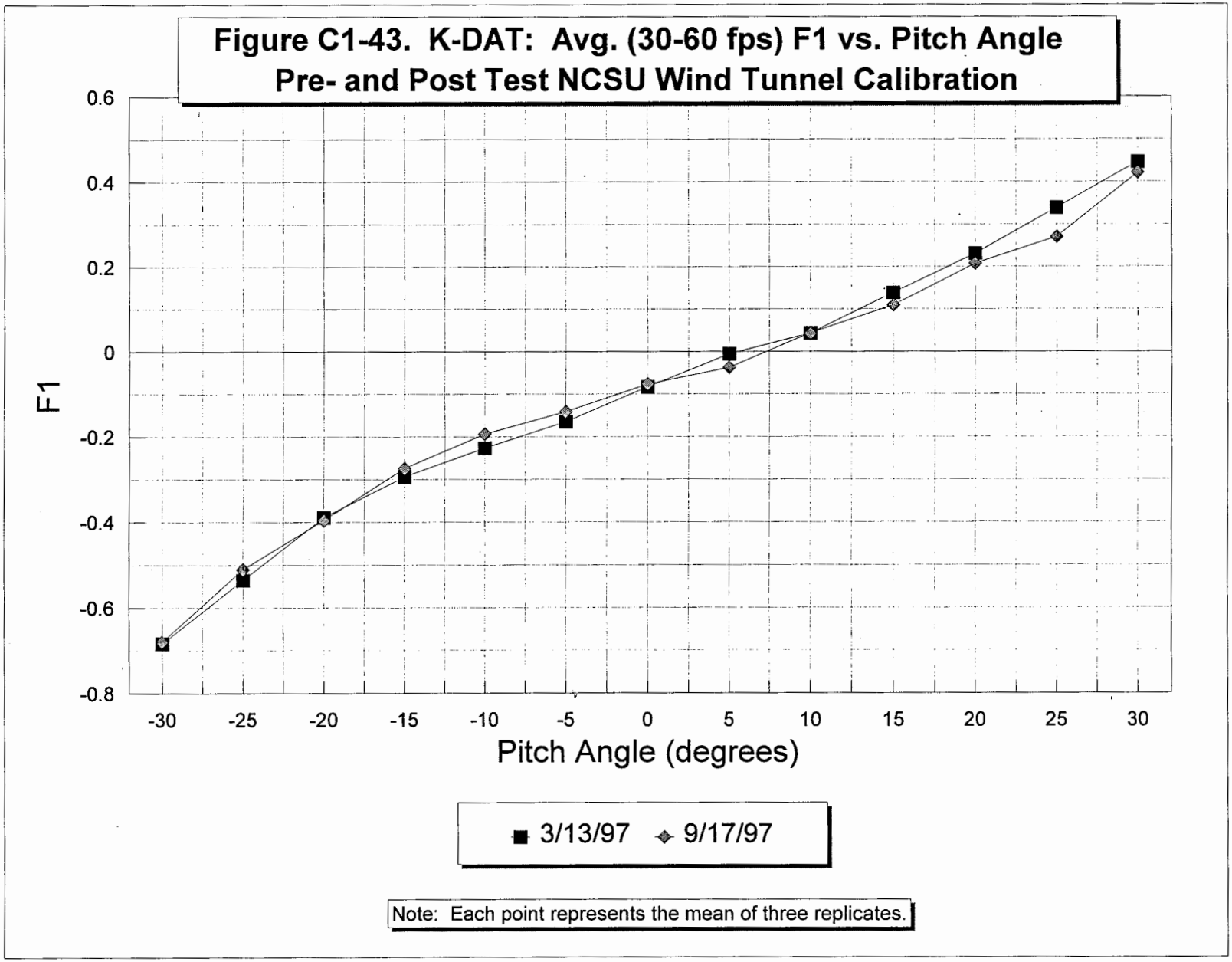
Number Of Points:	39		
Barometric Pressure, in. Hg:	29.60	Probe ID:	E-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.60	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	5.13%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	92 _F
Average Axial Velocity, ft/sec:	**84.27**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.0	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.1		0
Resultant Angle Standard Deviation:	9.67		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.8	-0.890	1.550	88	-30.0	30.0	1.6812	88.99	77.06
	-25	-0.8	-0.720	1.600	89	-27.9	27.9	1.7149	89.96	79.48
	-20	-0.5	-0.550	1.620	90	-20.4	20.5	1.6820	89.17	83.55
	-15	-0.7	-0.420	1.630	91	-14.3	14.3	1.6447	88.25	85.50
	-10	-0.4	-0.300	1.630	91	-10.5	10.5	1.6177	87.53	86.06
	-5	-0.5	-0.225	1.640	92	-7.7	7.7	1.6231	87.75	86.97
	0	-0.6	-0.065	1.700	92	0.4	0.7	1.6358	88.10	88.09
	5	-0.5	-0.020	1.750	93	2.3	2.3	1.6794	89.34	89.27
	10	-0.5	0.125	1.750	93	9.7	9.7	1.6669	89.01	87.74
	15	0.2	0.310	1.730	93	14.8	14.8	1.6487	88.52	85.57
	20	0.0	0.450	1.770	94	21.1	21.1	1.6257	87.98	82.08
	25	-0.8	0.580	1.850	95	24.7	24.8	1.6799	89.52	81.29
	30	-3.9	0.690	1.860	95	26.5	26.8	1.7057	90.20	80.52
2	-30	-1.2	-0.900	1.550	98	-30.0	30.0	1.6812	89.79	77.75
	-25	-0.8	-0.700	1.600	98	-27.0	27.0	1.7056	90.44	80.60
	-20	-0.2	-0.520	1.640	98	-18.8	18.8	1.6902	90.03	85.25
	-15	-0.5	-0.380	1.630	97	-13.1	13.1	1.6357	88.49	86.20
	-10	-0.1	-0.270	1.640	97	-9.4	9.4	1.6238	88.17	86.99
	-5	-0.2	-0.080	1.650	97	-0.5	0.6	1.5930	87.33	87.32
	0	-0.2	-0.050	1.700	96	1.0	1.0	1.6344	88.38	88.36
	5	-0.2	0.060	1.750	96	5.8	5.8	1.6721	89.39	88.92
	10	-0.4	0.150	1.730	96	10.6	10.6	1.6476	88.73	87.23
	15	-0.3	0.300	1.730	95	14.6	14.6	1.6486	88.68	85.83
	20	-0.4	0.480	1.800	94	21.9	21.9	1.6493	88.62	82.24
	25	-0.8	0.600	1.870	94	25.1	25.1	1.6978	89.91	81.42
	30	-4.4	0.700	1.900	92	26.5	26.8	1.7415	90.90	81.14
3	-30	-0.9	-0.900	1.550	92	-30.0	30.0	1.5639	86.14	74.59
	-25	-0.6	-0.740	1.600	93	-28.9	28.9	1.7243	90.53	79.27
	-20	-0.3	-0.550	1.630	94	-20.3	20.3	1.6917	89.75	84.16
	-15	-0.5	-0.450	1.640	94	-15.3	15.3	1.6620	88.96	85.80
	-10	-0.3	-0.300	1.650	95	-10.4	10.4	1.6367	88.36	86.91
	-5	-0.4	-0.210	1.650	95	-7.0	7.0	1.6327	88.25	87.58
	0	-0.2	-0.075	1.680	96	-0.2	0.3	1.6187	87.95	87.95
	5	-0.2	-0.020	1.750	96	2.3	2.3	1.6794	89.59	89.51
	10	-0.2	0.110	1.750	96	8.8	8.8	1.6681	89.28	88.24
	15	-0.2	0.300	1.750	97	14.5	14.5	1.6676	89.35	86.52
	20	-0.1	0.450	1.740	97	21.4	21.4	1.5968	87.43	81.42
	25	-0.5	0.600	1.850	97	25.2	25.2	1.6808	89.70	81.17
	30	-3.5	0.650	1.857	98	25.9	26.1	1.6958	90.18	80.95

		Res	Vdir	Vax
Average	-30	30.01	88.31	76.46
	-25	27.93	90.31	79.79
	-20	19.85	89.65	84.32
	-15	14.24	88.57	85.83
	-10	10.09	88.02	86.66
	-5	5.09	87.78	87.29
	0	0.65	88.14	88.13
	5	3.50	89.44	89.24
	10	9.67	89.01	87.74
	15	14.62	88.85	85.97
	20	21.45	88.01	81.91
	25	25.02	89.71	81.29
	30	26.58	90.43	80.87

ATTACHMENT G.

K-DAT Probe Calibration Data


Figure C1-43. K-DAT: Avg. (30-60 fps) F1 vs. Pitch Angle
Pre- and Post Test NCSU Wind Tunnel Calibration
F1
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-30
-25
-20
-15
-10
-5
0
5
10
15
20
25
30
Pitch Angle (degrees)
3/13/97
9/17/97
Note: Each point represents the mean of three replicates.

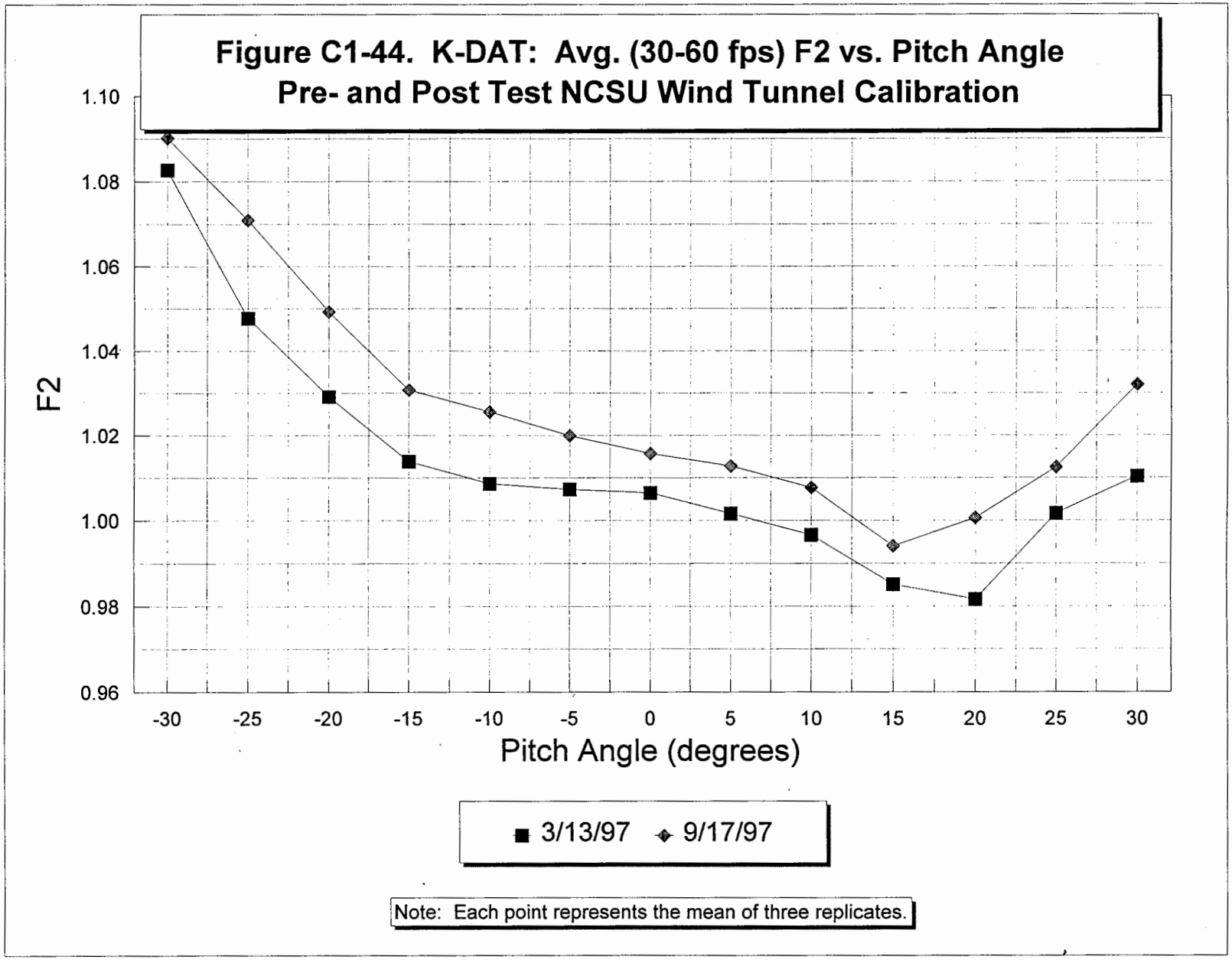
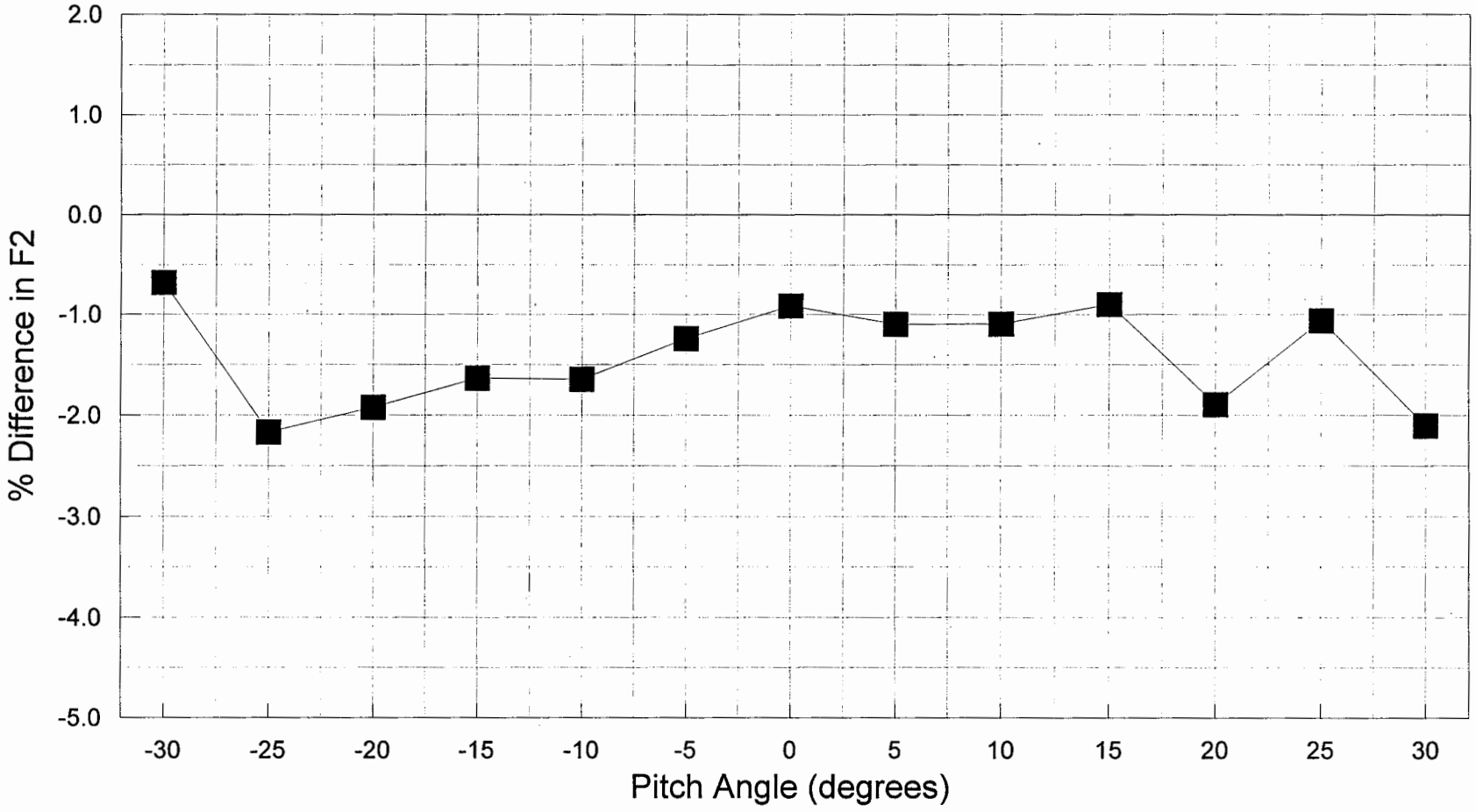

Figure C1-44. K-DAT: Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test NCSU Wind Tunnel Calibration
F2
1.10
1.08
1.06
1.04
1.02
1.00
0.98
0.96
-30
-25
-20
-15
-10
-5
0
5
10
15
20
25
30
Pitch Angle (degrees)
3/13/97
9/17/97
Note: Each point represents the mean of three replicates.

Figure C1-45. K-DAT: Percent Difference in F2

NCSU Pre- and Post-Test Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-66. KEA DAT Probe Calibrations at NC State Wind Tunnel

Pitch Angle	30 fps / Pre-test 30-60 Calibration			30 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.94	30.01	26.26	29.11	30.45	26.61	0.59	1.47	1.31
-25	27.06	31.02	27.58	27.31	31.45	27.91	0.92	1.40	1.21
-20	21.89	30.64	28.40	22.31	31.32	28.94	1.91	2.22	1.89
-15	16.78	30.54	29.18	17.42	31.12	29.66	3.77	1.91	1.64
-10	10.79	30.40	29.80	12.48	30.94	30.17	15.67	1.79	1.23
-5	7.81	30.42	30.03	9.29	30.91	30.37	19.01	1.59	1.11
0	6.04	30.37	30.19	8.05	30.79	30.47	33.20	1.37	0.91
5	7.59	30.45	30.15	8.42	30.80	30.45	11.03	1.16	0.99
10	9.98	30.49	29.93	11.09	30.85	30.18	11.10	1.19	0.84
15	11.90	30.58	29.71	13.27	30.96	29.92	11.57	1.26	0.70
20	18.89	30.25	28.60	20.93	30.86	28.78	10.78	1.99	0.64
25	23.98	30.26	27.63	26.24	30.91	27.71	9.42	2.14	0.29
30	28.51	30.21	26.54	29.50	30.88	26.88	3.48	2.21	1.26

Pitch Angle	60 fps / Pre-test 30-60 Calibration			60 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	27.94	56.54	49.96	28.31	57.53	50.66	1.34	1.76	1.40
-25	22.47	58.48	54.03	22.87	59.80	55.08	1.76	2.25	1.94
-20	16.35	58.73	56.21	17.07	59.86	57.12	4.36	1.92	1.63
-15	11.68	59.27	57.95	13.32	60.39	58.71	14.00	1.88	1.31
-10	8.99	59.42	58.57	11.07	60.44	59.23	23.09	1.72	1.13
-5	3.84	59.27	59.02	4.95	60.04	59.63	29.06	1.30	1.04
0	3.85	59.06	58.92	5.51	59.65	59.36	43.12	1.00	0.74
5	7.46	58.92	58.29	7.91	59.52	58.85	6.12	1.02	0.95
10	10.60	58.76	57.50	12.24	59.29	57.70	15.46	0.90	0.35
15	17.30	59.11	56.44	18.68	60.03	56.87	7.94	1.56	0.77
20	20.96	59.89	55.92	23.49	61.28	56.18	12.09	2.32	0.47
25	26.06	59.27	53.24	28.04	60.51	53.40	7.58	2.08	0.30
30	30.02	59.40	51.43	30.02	60.68	52.54	0.00	2.15	2.15

Pitch Angle	90 fps / Pre-test 30-60 Calibration			90 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	26.98	86.52	77.07	27.47	87.90	77.96	1.82	1.58	1.15
-25	22.57	88.31	81.52	22.88	90.26	83.11	1.38	2.21	1.95
-20	19.48	88.55	83.45	19.57	90.29	85.04	0.48	1.96	1.90
-15	12.45	89.04	86.79	13.94	90.71	87.95	11.94	1.88	1.33
-10	5.60	88.90	88.23	7.13	90.19	89.19	27.45	1.45	1.08
-5	2.24	88.86	88.73	3.10	89.89	89.61	38.78	1.15	1.00
0	2.94	88.86	88.71	4.23	89.69	89.35	43.98	0.93	0.72
5	9.46	88.49	87.28	9.66	89.45	88.18	2.09	1.09	1.03
10	13.51	88.02	85.58	15.01	88.55	85.53	11.06	0.61	-0.05
15	18.19	88.87	84.42	19.70	90.49	85.16	8.33	1.82	0.89
20	21.42	89.33	83.16	24.32	91.45	83.34	13.52	2.38	0.22
25	25.66	89.20	80.40	27.75	91.01	80.54	8.15	2.03	0.18
30	30.03	89.51	77.50	30.03	91.44	79.17	0.00	2.15	2.15

Figure C1-46. KEA DAT Probe Pre- and Post-Test Calibrations

NC State Wind Tunnel

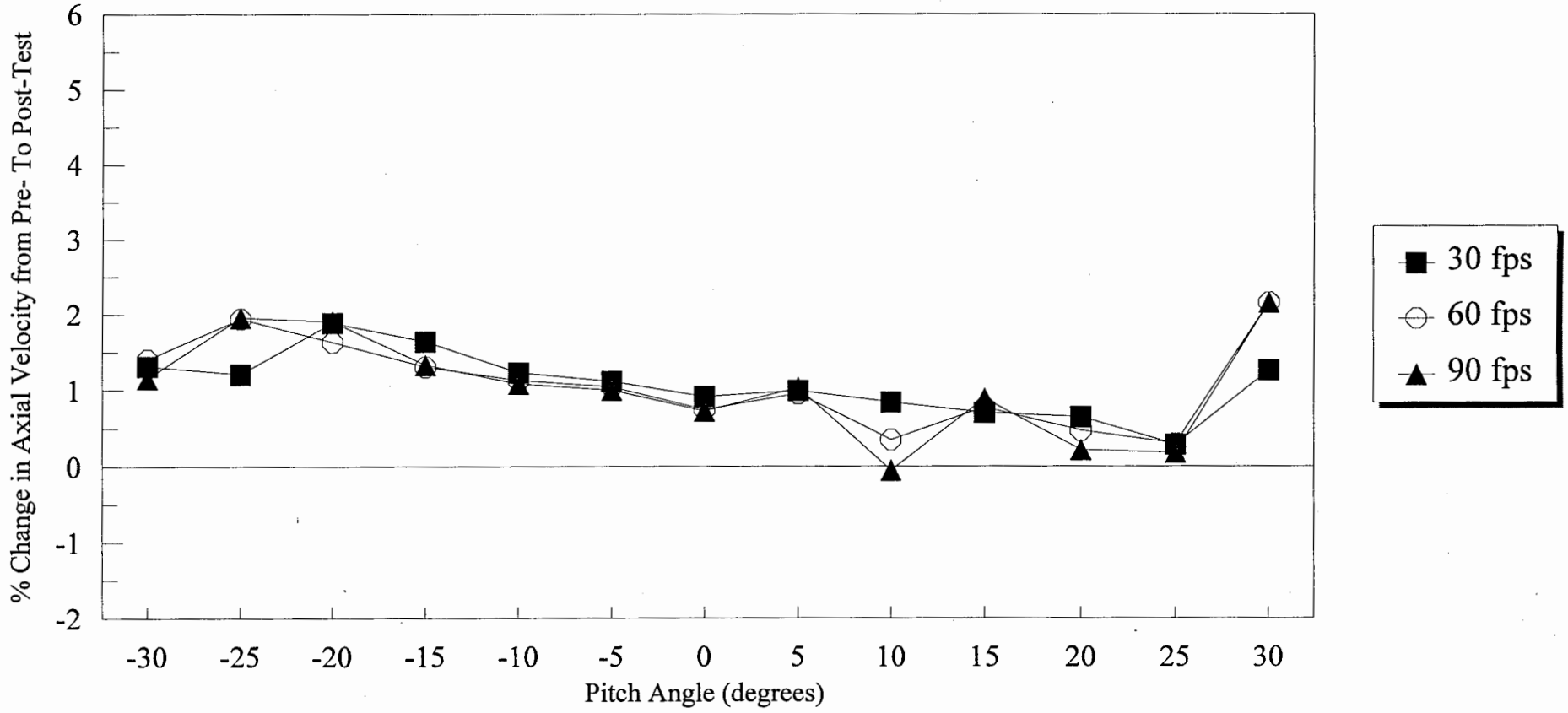


Table C1-67. KEA DAT Pre-test Computations - 30 fps

Probe: **KEA DAT / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 03/13/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	30.12	Probe ID:	K-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	30.12	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.84%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	84 _F
Average Axial Velocity, ft/sec:	**28.77**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.9	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.9	**SCFM Wet:**	
Resultant Angle Standard Deviation:	8.96		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	P4-P5	P1-P2	Gas					
Rep	Angle	Angle			Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.6	-0.120	0.170	82	-30.0	30.0	0.1993	30.21	26.16
	-25	0.8	-0.115	0.180	82	-28.5	28.5	0.2070	30.78	27.05
	-20	0.8	-0.085	0.184	82	-22.5	22.5	0.1984	30.14	27.84
	-15	0.8	-0.065	0.190	82	-17.5	17.6	0.1983	30.13	28.73
	-10	0.9	-0.055	0.190	82	-14.7	14.7	0.1952	29.89	28.91
	-5	0.9	-0.045	0.195	82	-10.3	10.3	0.1985	30.14	29.66
	0	0.9	-0.030	0.195	82	-4.3	4.4	0.1978	30.09	30.00
	5	0.8	0.005	0.198	82	8.2	8.2	0.1974	30.06	29.75
	10	1.7	0.010	0.200	82	10.4	10.5	0.1983	30.13	29.63
	15	0.9	0.030	0.205	82	15.4	15.4	0.1988	30.17	29.08
	20	1.7	0.050	0.205	82	20.6	20.6	0.1985	30.14	28.21
	25	0.9	0.070	0.200	82	25.5	25.5	0.2010	30.34	27.38
	30	0.8	0.080	0.190	82	28.8	28.8	0.1932	29.74	26.05
2	-30	0.5	-0.110	0.187	87	-26.8	26.8	0.2103	31.17	27.82
	-25	0.6	-0.090	0.193	87	-22.6	22.7	0.2083	31.03	28.63
	-20	0.6	-0.070	0.195	87	-18.4	18.4	0.2046	30.75	29.17
	-15	0.5	-0.050	0.197	87	-12.0	12.0	0.2013	30.49	29.82
	-10	0.6	-0.035	0.199	87	-5.9	5.9	0.2020	30.55	30.39
	-5	0.3	-0.020	0.200	87	-1.0	1.0	0.2027	30.60	30.59
	0	1.4	0.000	0.200	87	5.6	5.8	0.2004	30.43	30.27
	5	1.3	0.010	0.205	87	10.3	10.4	0.2034	30.65	30.15
	10	1.3	0.030	0.210	87	15.2	15.3	0.2037	30.68	29.60
	15	1.2	0.040	0.210	88	17.8	17.8	0.2030	30.65	29.18
	20	1.3	0.050	0.205	88	20.6	20.6	0.1985	30.31	28.37
	25	1.3	0.070	0.200	88	25.5	25.5	0.2010	30.50	27.52
	30	0.2	0.094	0.195	88	30.0	30.0	0.1990	30.35	26.29
3	-30	1.1	-0.160	0.170	88	-30.0	30.0	0.1774	28.66	24.81
	-25	1.4	-0.130	0.180	88	-30.0	30.0	0.2110	31.25	27.06
	-20	1.4	-0.100	0.190	88	-24.7	24.7	0.2081	31.04	28.19
	-15	1.4	-0.080	0.195	88	-20.7	20.8	0.2076	31.00	28.98
	-10	0.9	-0.050	0.200	88	-11.7	11.8	0.2042	30.74	30.10
	-5	0.9	-0.050	0.197	88	-12.0	12.0	0.2013	30.52	29.85
	0	0.8	-0.040	0.199	88	-7.9	7.9	0.2022	30.59	30.30
	5	0.8	-0.030	0.200	88	-4.1	4.1	0.2029	30.64	30.56
	10	0.9	-0.030	0.200	88	-4.1	4.2	0.2029	30.64	30.56
	15	0.9	-0.010	0.205	87	2.2	2.4	0.2068	30.91	30.88
	20	0.8	0.030	0.205	87	15.4	15.4	0.1988	30.31	29.22
	25	1.0	0.050	0.200	87	20.9	20.9	0.1941	29.95	27.98
	30	0.7	0.075	0.200	87	26.7	26.7	0.2018	30.54	27.29

		Res	Vdir	Vax
Average	-30	28.94	30.01	26.26
	-25	27.06	31.02	27.58
	-20	21.89	30.64	28.40
	-15	16.78	30.54	29.18
	-10	10.79	30.40	29.80
	-5	7.81	30.42	30.03
	0	6.04	30.37	30.19
	5	7.59	30.45	30.15
	10	9.98	30.49	29.93
	15	11.90	30.58	29.71
	20	18.89	30.25	28.60
	25	23.98	30.26	27.63
	30	28.51	30.21	26.54

Table C1-68. KEA DAT Post-test Computations - 30 fps

Probe: **KEA DAT / Post-Test 30-60 Calibration**
Velocity Point: **30 fps**
Cal Date: 09/17/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	30.12	Probe ID:	K-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	30.12	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.84%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	84 _F
Average Axial Velocity, ft/sec:	**29.08**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	18.1	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	18.1	**SCFM Wet:**	
Resultant Angle Standard Deviation:	8.69		0

			Readings, in.H2O							
	Pitch	Yaw	----------	----------	Gas	<< ANGLES >>			Velocities, ft/sec	
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.6	-0.120	0.170	82	-30.0	30.0	0.2020	30.41	26.34
	-25	0.8	-0.115	0.180	82	-28.8	28.8	0.2121	31.16	27.31
	-20	0.8	-0.085	0.184	82	-22.9	22.9	0.2075	30.82	28.39
	-15	0.8	-0.065	0.190	82	-17.8	17.8	0.2060	30.71	29.23
	-10	0.9	-0.055	0.190	82	-15.6	15.7	0.2028	30.47	29.34
	-5	0.9	-0.045	0.195	82	-12.3	12.3	0.2060	30.71	30.01
	0	0.9	-0.030	0.195	82	-6.2	6.2	0.2034	30.51	30.33
	5	0.8	0.005	0.198	82	8.9	8.9	0.2015	30.37	30.01
	10	1.7	0.010	0.200	82	10.5	10.6	0.2025	30.45	29.93
	15	0.9	0.030	0.205	82	16.9	16.9	0.2036	30.53	29.21
	20	1.7	0.050	0.205	82	22.9	22.9	0.2081	30.86	28.42
	25	0.9	0.070	0.200	82	27.6	27.7	0.2092	30.95	27.41
	30	0.8	0.080	0.190	82	30.0	30.0	0.2024	30.44	26.36
2	-30	0.5	-0.110	0.187	87	-27.3	27.3	0.2181	31.74	28.20
	-25	0.6	-0.090	0.193	87	-23.1	23.1	0.2180	31.73	29.19
	-20	0.6	-0.070	0.195	87	-18.5	18.5	0.2124	31.33	29.71
	-15	0.5	-0.050	0.197	87	-13.7	13.7	0.2088	31.06	30.17
	-10	0.6	-0.035	0.199	87	-8.3	8.3	0.2085	31.04	30.71
	-5	0.3	-0.020	0.200	87	-1.8	1.8	0.2069	30.92	30.91
	0	1.4	0.000	0.200	87	7.3	7.5	0.2042	30.71	30.45
	5	1.3	0.010	0.205	87	10.4	10.5	0.2077	30.98	30.46
	10	1.3	0.030	0.210	87	16.7	16.8	0.2085	31.03	29.71
	15	1.2	0.040	0.210	88	19.1	19.2	0.2098	31.16	29.43
	20	1.3	0.050	0.205	88	22.9	22.9	0.2081	31.03	28.58
	25	1.3	0.070	0.200	88	27.6	27.7	0.2092	31.12	27.56
	30	0.2	0.094	0.195	88	30.0	30.0	0.2077	31.01	26.85
3	-30	1.1	-0.160	0.170	88	-30.0	30.0	0.1843	29.21	25.29
	-25	1.4	-0.130	0.180	88	-30.0	30.0	0.2139	31.47	27.24
	-20	1.4	-0.100	0.190	88	-25.5	25.5	0.2187	31.81	28.71
	-15	1.4	-0.080	0.195	88	-20.6	20.7	0.2159	31.61	29.57
	-10	0.9	-0.050	0.200	88	-13.5	13.5	0.2118	31.31	30.45
	-5	0.9	-0.050	0.197	88	-13.7	13.8	0.2088	31.08	30.19
	0	0.8	-0.040	0.199	88	-10.4	10.4	0.2095	31.14	30.62
	5	0.8	-0.030	0.200	88	-5.8	5.9	0.2084	31.06	30.90
	10	0.9	-0.030	0.200	88	-5.8	5.9	0.2084	31.06	30.90
	15	0.9	-0.010	0.205	87	3.6	3.7	0.2106	31.19	31.13
	20	0.8	0.030	0.205	87	16.9	16.9	0.2036	30.67	29.34
	25	1.0	0.050	0.200	87	23.4	23.4	0.2035	30.66	28.14
	30	0.7	0.075	0.200	87	28.5	28.5	0.2106	31.19	27.42

		Res		Vdir	Vax
Average	-30	29.11		30.45	26.61
	-25	27.31		31.45	27.91
	-20	22.31		31.32	28.94
	-15	17.42		31.12	29.66
	-10	12.48		30.94	30.17
	-5	9.29		30.91	30.37
	0	8.05		30.79	30.47
	5	8.42		30.80	30.45
	10	11.09		30.85	30.18
	15	13.27		30.96	29.92
	20	20.93		30.86	28.78
	25	26.24		30.91	27.71
	30	29.50		30.88	26.88

Table C1-69. KEA DAT Pre-test Computation - 30 fps

Probe: **KEA DAT / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **60 fps** Cal Date: 03/13/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	30.12	Probe ID:	K-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	30.12	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.95%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	84 _F
Average Axial Velocity, ft/sec:	**55.96**	Last Row:	61
Average Yaw Angle:	0.8		
Average Pitch Angle:	15.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.0		0
Resultant Angle Standard Deviation:	9.22		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.3	-0.400	0.650	84	-27.7	27.7	0.7397	58.30	51.62
	-25	0.5	-0.310	0.680	83	-22.3	22.3	0.7322	57.95	53.62
	-20	0.5	-0.240	0.720	83	-17.1	17.1	0.7495	58.63	56.04
	-15	0.6	-0.170	0.750	83	-10.0	10.0	0.7630	59.16	58.26
	-10	0.6	-0.135	0.750	83	-6.2	6.2	0.7615	59.10	58.75
	-5	1.0	-0.075	0.750	82	-1.0	1.4	0.7600	58.98	58.97
	0	0.4	-0.010	0.750	82	4.5	4.5	0.7531	58.72	58.53
	5	1.1	0.040	0.750	82	10.5	10.6	0.7432	58.33	57.33
	10	0.8	0.105	0.750	82	15.1	15.1	0.7278	57.72	55.73
	15	0.8	0.145	0.750	81	17.9	18.0	0.7249	57.55	54.75
	20	1.1	0.205	0.800	81	21.1	21.2	0.7782	59.63	55.61
	25	1.1	0.260	0.770	81	24.9	25.0	0.7723	59.40	53.86
	30	1.1	0.350	0.750	80	30.0	30.0	0.7655	59.09	51.16
2	-30	0.7	-0.380	0.650	88	-26.7	26.7	0.7297	58.12	51.93
	-25	0.6	-0.350	0.690	89	-24.0	24.1	0.7523	59.06	53.94
	-20	0.8	-0.300	0.730	89	-20.7	20.8	0.7773	60.04	56.14
	-15	0.7	-0.230	0.730	89	-16.1	16.1	0.7555	59.19	56.86
	-10	0.8	-0.210	0.750	89	-14.0	14.0	0.7693	59.73	57.95
	-5	0.8	-0.160	0.750	89	-8.9	8.9	0.7626	59.46	58.74
	0	0.8	-0.090	0.750	89	-2.2	2.4	0.7603	59.38	59.32
	5	0.8	-0.040	0.750	89	2.0	2.1	0.7569	59.24	59.20
	10	0.7	-0.030	0.750	88	2.8	2.9	0.7556	59.14	59.06
	15	0.8	0.130	0.800	89	16.3	16.3	0.7750	59.95	57.54
	20	0.9	0.180	0.800	89	19.6	19.7	0.7713	59.81	56.32
	25	0.9	0.280	0.750	89	26.6	26.6	0.7567	59.24	52.96
	30	1.3	0.350	0.750	89	30.0	30.0	0.7655	59.58	51.59
3	-30	0.9	-0.400	0.600	89	-29.4	29.4	0.6104	53.20	46.33
	-25	0.1	-0.290	0.690	89	-21.1	21.1	0.7365	58.44	54.53
	-20	0.6	-0.170	0.700	89	-11.2	11.2	0.7139	57.54	56.44
	-15	0.6	-0.160	0.750	89	-8.9	8.9	0.7626	59.46	58.75
	-10	0.4	-0.140	0.750	89	-6.7	6.7	0.7617	59.43	59.02
	-5	1.0	-0.070	0.750	89	-0.6	1.2	0.7599	59.36	59.35
	0	0.9	-0.010	0.750	89	4.5	4.6	0.7531	59.10	58.90
	5	0.8	0.030	0.760	89	9.6	9.7	0.7555	59.19	58.35
	10	0.9	0.090	0.780	89	13.8	13.8	0.7613	59.42	57.70
	15	0.9	0.150	0.800	88	17.6	17.6	0.7735	59.84	57.02
	20	1.1	0.220	0.800	88	22.0	22.0	0.7838	60.23	55.83
	25	1.1	0.280	0.750	88	26.6	26.6	0.7567	59.18	52.91
	30	1.1	0.350	0.750	88	30.0	30.0	0.7655	59.53	51.54

		Res	Vdir	Vax
Average	-30	27.94	56.54	49.96
	-25	22.47	58.48	54.03
	-20	16.35	58.73	56.21
	-15	11.68	59.27	57.95
	-10	8.99	59.42	58.57
	-5	3.84	59.27	59.02
	0	3.85	59.06	58.92
	5	7.46	58.92	58.29
	10	10.60	58.76	57.50
	15	17.30	59.11	56.44
	20	20.96	59.89	55.92
	25	26.06	59.27	53.24
	30	30.02	59.40	51.43

Table C1-70. KEA DAT Post-test Computations - 60 fps

Probe: **KEA DAT / Post-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 09/17/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	30.12	Probe ID:	K-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	30.12	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.95%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	84 _F
Average Axial Velocity, ft/sec:	**56.56**	Last Row:	61
Average Yaw Angle:	0.8		
Average Pitch Angle:	17.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.2		0
Resultant Angle Standard Deviation:	8.98		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.3	-0.400	0.650	84	-28.1	28.1	0.7623	59.18	52.20
	-25	0.5	-0.310	0.680	83	-22.6	22.6	0.7651	59.24	54.67
	-20	0.5	-0.240	0.720	83	-17.4	17.5	0.7785	59.75	57.00
	-15	0.6	-0.170	0.750	83	-12.0	12.0	0.7920	60.27	58.94
	-10	0.6	-0.135	0.750	83	-8.6	8.7	0.7864	60.06	59.37
	-5	1.0	-0.075	0.750	82	-1.8	2.0	0.7760	59.60	59.57
	0	0.4	-0.010	0.750	82	6.5	6.5	0.7670	59.25	58.87
	5	1.1	0.040	0.750	82	10.8	10.8	0.7585	58.93	57.88
	10	0.8	0.105	0.750	82	16.6	16.6	0.7442	58.37	55.94
	15	0.8	0.145	0.750	81	19.3	19.3	0.7495	58.52	55.24
	20	1.1	0.205	0.800	81	23.9	23.9	0.8158	61.05	55.82
	25	1.1	0.260	0.770	81	27.2	27.3	0.8031	60.58	53.85
	30	1.1	0.350	0.750	80	30.0	30.0	0.7988	60.36	52.27
2	-30	0.7	-0.380	0.650	88	-27.2	27.2	0.7574	59.21	52.66
	-25	0.6	-0.350	0.690	89	-24.9	24.9	0.7905	60.55	54.93
	-20	0.8	-0.300	0.730	89	-20.7	20.7	0.8083	61.22	57.27
	-15	0.7	-0.230	0.730	89	-16.7	16.7	0.7851	60.34	57.79
	-10	0.8	-0.210	0.750	89	-15.2	15.3	0.7982	60.84	58.69
	-5	0.8	-0.160	0.750	89	-11.2	11.2	0.7907	60.55	59.39
	0	0.8	-0.090	0.750	89	-3.3	3.4	0.7780	60.07	59.96
	5	0.8	-0.040	0.750	89	3.0	3.1	0.7710	59.79	59.70
	10	0.7	-0.030	0.750	88	4.7	4.8	0.7695	59.68	59.47
	15	0.8	0.130	0.800	89	17.7	17.7	0.7962	60.76	57.88
	20	0.9	0.180	0.800	89	21.4	21.4	0.8063	61.15	56.93
	25	0.9	0.280	0.750	89	28.4	28.4	0.7893	60.50	53.20
	30	1.3	0.350	0.750	89	30.0	30.0	0.7988	60.86	52.70
3	-30	0.9	-0.400	0.600	89	-29.6	29.6	0.6336	54.20	47.12
	-25	0.1	-0.290	0.690	89	-21.1	21.1	0.7666	59.62	55.63
	-20	0.6	-0.170	0.700	89	-13.0	13.1	0.7407	58.61	57.09
	-15	0.6	-0.160	0.750	89	-11.2	11.2	0.7907	60.55	59.40
	-10	0.4	-0.140	0.750	89	-9.3	9.3	0.7875	60.43	59.64
	-5	1.0	-0.070	0.750	89	-1.3	1.6	0.7754	59.96	59.94
	0	0.9	-0.010	0.750	89	6.5	6.6	0.7670	59.64	59.24
	5	0.8	0.030	0.760	89	9.8	9.8	0.7721	59.84	58.97
	10	0.9	0.090	0.780	89	15.3	15.4	0.7714	59.81	57.67
	15	0.9	0.150	0.800	88	19.0	19.0	0.7989	60.81	57.50
	20	1.1	0.220	0.800	88	25.2	25.2	0.8210	61.65	55.79
	25	1.1	0.280	0.750	88	28.4	28.4	0.7893	60.44	53.15
	30	1.1	0.350	0.750	88	30.0	30.0	0.7988	60.81	52.65

		Res	Vdir	Vax
Average	-30	28.31	57.53	50.66
	-25	22.87	59.80	55.08
	-20	17.07	59.86	57.12
	-15	13.32	60.39	58.71
	-10	11.07	60.44	59.23
	-5	4.95	60.04	59.63
	0	5.51	59.65	59.36
	5	7.91	59.52	58.85
	10	12.24	59.29	57.70
	15	18.68	60.03	56.87
	20	23.49	61.28	56.18
	25	28.04	60.51	53.40
	30	30.02	60.68	52.54

Table C1-71. KEA DAT Pre-test Computations - 90 fps

Probe: **KEA DAT / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **90 fps** Cal Date: 03/13/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	30.12	Probe ID:	K-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	30.12	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.69%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**84.06**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.1	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.2	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.21		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.4	-0.900	1.450	94	-27.9	27.9	1.6540	87.98	77.76
	-25	0.6	-0.650	1.600	93	-20.6	20.6	1.7018	89.16	83.46
	-20	0.7	-0.600	1.600	93	-19.3	19.3	1.6872	88.77	83.80
	-15	0.6	-0.400	1.660	92	-11.0	11.1	1.6925	88.83	87.18
	-10	0.5	-0.270	1.670	92	-4.8	4.8	1.6943	88.88	88.57
	-5	0.7	-0.140	1.680	91	0.0	0.7	1.7017	88.99	88.99
	0	0.7	-0.030	1.680	91	4.2	4.3	1.6880	88.63	88.38
	5	0.6	0.060	1.680	90	9.3	9.3	1.6713	88.11	86.96
	10	0.7	0.180	1.700	89	13.3	13.3	1.6631	87.82	85.46
	15	0.6	0.320	1.750	89	17.4	17.4	1.6927	88.60	84.55
	20	1.0	0.480	1.770	88	21.8	21.9	1.7316	89.53	83.09
	25	1.1	0.600	1.700	87	25.6	25.7	1.7097	88.88	80.11
	30	1.3	0.800	1.670	86	30.0	30.0	1.7046	88.66	76.77
2	-30	0.5	-0.900	1.450	87	-27.9	27.9	1.6540	87.42	77.27
	-25	0.4	-0.800	1.500	88	-24.9	24.9	1.6459	87.28	79.14
	-20	0.5	-0.680	1.570	89	-21.5	21.5	1.6810	88.29	82.14
	-15	0.6	-0.550	1.650	90	-17.1	17.1	1.7175	89.32	85.38
	-10	0.4	-0.400	1.650	91	-11.2	11.2	1.6827	88.49	86.82
	-5	0.7	-0.280	1.650	91	-5.4	5.4	1.6745	88.28	87.88
	0	0.5	-0.130	1.660	92	0.3	0.6	1.6804	88.51	88.51
	5	0.5	0.070	1.680	94	9.9	9.9	1.6693	88.38	87.07
	10	0.6	0.180	1.700	94	13.3	13.3	1.6631	88.22	85.85
	15	0.7	0.320	1.750	95	17.4	17.4	1.6927	89.08	85.01
	20	0.7	0.450	1.750	95	21.2	21.2	1.7029	89.35	83.30
	25	0.8	0.600	1.700	95	25.6	25.7	1.7097	89.52	80.70
	30	1.2	0.780	1.690	96	30.0	30.0	1.7250	90.01	77.93
3	-30	0.2	-0.800	1.480	96	-25.2	25.2	1.5090	84.18	76.18
	-25	0.9	-0.700	1.550	96	-22.1	22.2	1.6672	88.49	81.95
	-20	0.7	-0.550	1.600	96	-17.6	17.6	1.6709	88.58	84.42
	-15	0.6	-0.360	1.660	95	-9.2	9.2	1.6880	88.96	87.81
	-10	0.4	-0.160	1.680	95	-0.7	0.8	1.7021	89.33	89.32
	-5	0.6	-0.140	1.680	95	0.0	0.6	1.7017	89.31	89.31
	0	0.5	-0.040	1.700	94	3.9	3.9	1.7093	89.43	89.22
	5	0.8	0.060	1.700	94	9.2	9.2	1.6914	88.96	87.81
	10	0.9	0.200	1.700	93	13.9	13.9	1.6583	88.01	85.42
	15	1.0	0.400	1.760	92	19.8	19.8	1.6967	88.94	83.69
	20	1.0	0.450	1.750	92	21.2	21.2	1.7029	89.11	83.07
	25	0.9	0.600	1.700	91	25.6	25.7	1.7097	89.20	80.40
	30	1.4	0.800	1.700	91	30.0	30.0	1.7352	89.87	77.80

		Res	Vdir	Vax
Average	-30	26.98	86.52	77.07
	-25	22.57	88.31	81.52
	-20	19.48	88.55	83.45
	-15	12.45	89.04	86.79
	-10	5.60	88.90	88.23
	-5	2.24	88.86	88.73
	0	2.94	88.86	88.71
	5	9.46	88.49	87.28
	10	13.51	88.02	85.58
	15	18.19	88.87	84.42
	20	21.42	89.33	83.16
	25	25.66	89.20	80.40
	30	30.03	89.51	77.50

Table C1-72. KEA DAT Post-test Computations - 90 fps

Probe: **KEA DAT / Post-Test 30-60 Calibration**
Velocity Point: **90 fps**
Cal Date: 09/17/97

Number Of Points: 39

Barometric Pressure, in. Hg:	30.12	Probe ID:	K-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	30.12	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.69%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**84.93**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	17.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.3		0
Resultant Angle Standard Deviation:	9.21		

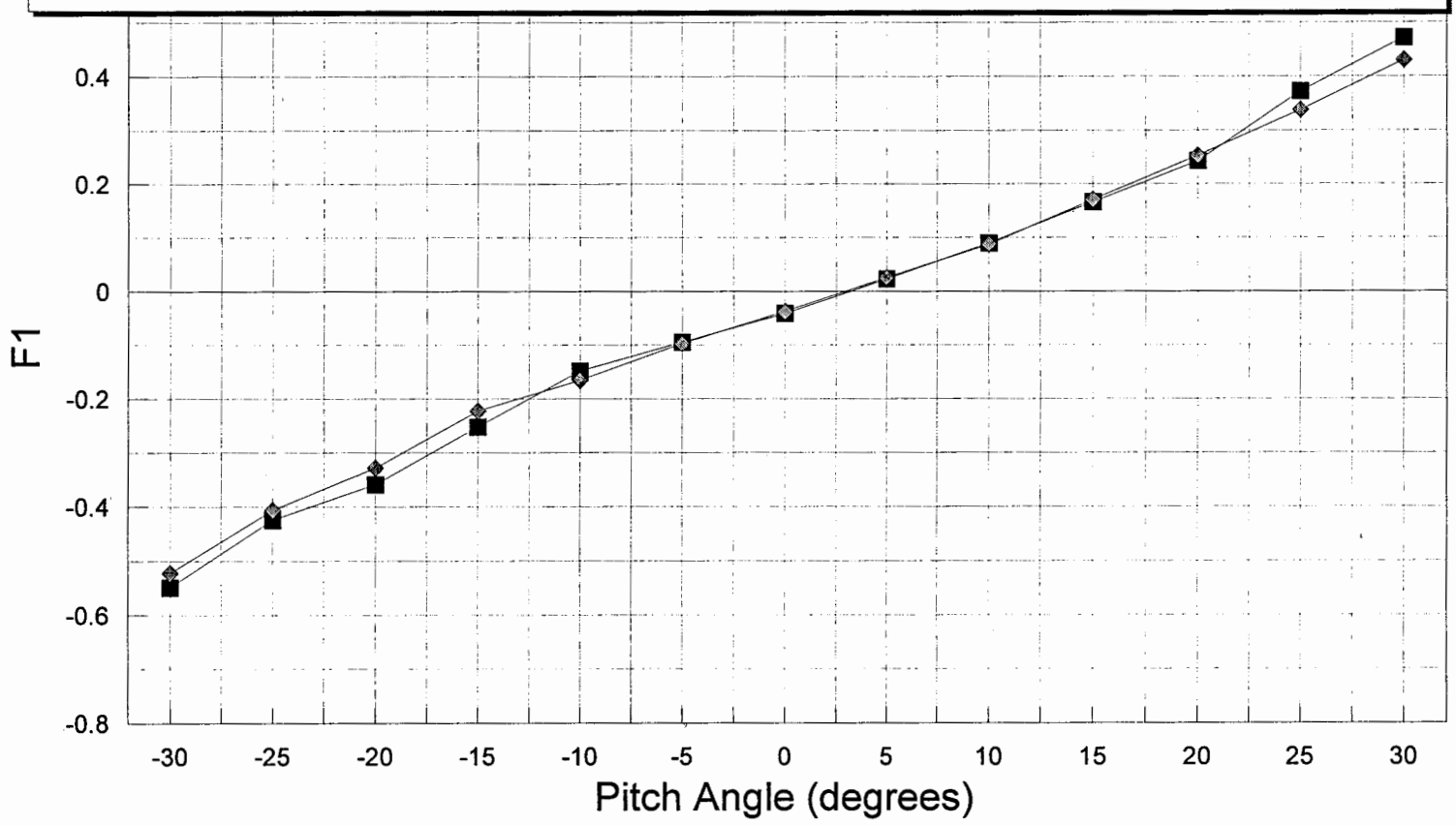
			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.4	-0.900	1.450	94	-28.3	28.3	1.7023	89.25	78.61
	-25	0.6	-0.650	1.600	93	-20.5	20.5	1.7685	90.89	85.14
	-20	0.7	-0.600	1.600	93	-19.2	19.2	1.7512	90.44	85.42
	-15	0.6	-0.400	1.660	92	-12.9	12.9	1.7562	90.49	88.19
	-10	0.5	-0.270	1.670	92	-6.9	6.9	1.7445	90.19	89.53
	-5	0.7	-0.140	1.680	91	-0.5	0.8	1.7346	89.85	89.84
	0	0.7	-0.030	1.680	91	6.2	6.3	1.7189	89.44	88.91
	5	0.6	0.060	1.680	90	9.5	9.5	1.7076	89.07	87.83
	10	0.7	0.180	1.700	89	14.8	14.8	1.6820	88.32	85.39
	15	0.6	0.320	1.750	89	18.7	18.8	1.7465	89.99	85.21
	20	1.0	0.480	1.770	88	25.0	25.0	1.8148	91.65	83.04
	25	1.1	0.600	1.700	87	27.7	27.8	1.7799	90.68	80.25
	30	1.3	0.800	1.670	86	30.0	30.0	1.7787	90.57	78.42
2	-30	0.5	-0.900	1.450	87	-28.3	28.3	1.7023	88.69	78.11
	-25	0.4	-0.800	1.500	88	-25.7	25.7	1.7289	89.46	80.62
	-20	0.5	-0.680	1.570	89	-21.6	21.6	1.7522	90.14	83.78
	-15	0.6	-0.550	1.650	90	-17.4	17.5	1.7841	91.04	86.85
	-10	0.4	-0.400	1.650	91	-13.0	13.0	1.7460	90.14	87.82
	-5	0.7	-0.280	1.650	91	-7.7	7.7	1.7264	89.64	88.83
	0	0.5	-0.130	1.660	92	-0.1	0.5	1.7129	89.37	89.36
	5	0.5	0.070	1.680	94	9.9	9.9	1.7064	89.36	88.03
	10	0.6	0.180	1.700	94	14.8	14.8	1.6820	88.72	85.78
	15	0.7	0.320	1.750	95	18.7	18.8	1.7465	90.48	85.68
	20	0.7	0.450	1.750	95	23.9	23.9	1.7851	91.48	83.60
	25	0.8	0.600	1.700	95	27.7	27.7	1.7799	91.34	80.84
	30	1.2	0.780	1.690	96	30.0	30.0	1.8000	91.94	79.61
3	-30	0.2	-0.800	1.480	96	-25.9	25.9	1.5658	85.75	77.14
	-25	0.9	-0.700	1.550	96	-22.4	22.5	1.7414	90.43	83.57
	-20	0.7	-0.550	1.600	96	-17.9	17.9	1.7353	90.27	85.91
	-15	0.6	-0.360	1.660	95	-11.4	11.4	1.7508	90.60	88.80
	-10	0.4	-0.160	1.680	95	-1.4	1.5	1.7373	90.24	90.22
	-5	0.6	-0.140	1.680	95	-0.5	0.8	1.7346	90.18	90.17
	0	0.5	-0.040	1.700	94	5.9	5.9	1.7406	90.25	89.77
	5	0.8	0.060	1.700	94	9.5	9.5	1.7280	89.92	88.68
	10	0.9	0.200	1.700	93	15.4	15.5	1.6818	88.63	85.42
	15	1.0	0.400	1.760	92	21.6	21.6	1.7754	90.98	84.60
	20	1.0	0.450	1.750	92	23.9	24.0	1.7851	91.23	83.37
	25	0.9	0.600	1.700	91	27.7	27.8	1.7799	91.02	80.55
	30	1.4	0.800	1.700	91	30.0	30.0	1.8107	91.80	79.48

		Res	Vdir	Vax
Average	-30	27.47	87.90	77.96
	-25	22.88	90.26	83.11
	-20	19.57	90.29	85.04
	-15	13.94	90.71	87.95
	-10	7.13	90.19	89.19
	-5	3.10	89.89	89.61
	0	4.23	89.69	89.35
	5	9.66	89.45	88.18
	10	15.01	88.55	85.53
	15	19.70	90.49	85.16
	20	24.32	91.45	83.34
	25	27.75	91.01	80.54
	30	30.03	91.44	79.17

ATTACHMENT H.

C-DAT Probe Calibration Data

Figure C1-47. C-DAT: Avg. (30-60 fps) F1 vs. Pitch Angle
Pre- and Post Test NCSU Wind Tunnel Calibration



Note: Each point represents the mean of three replicates.

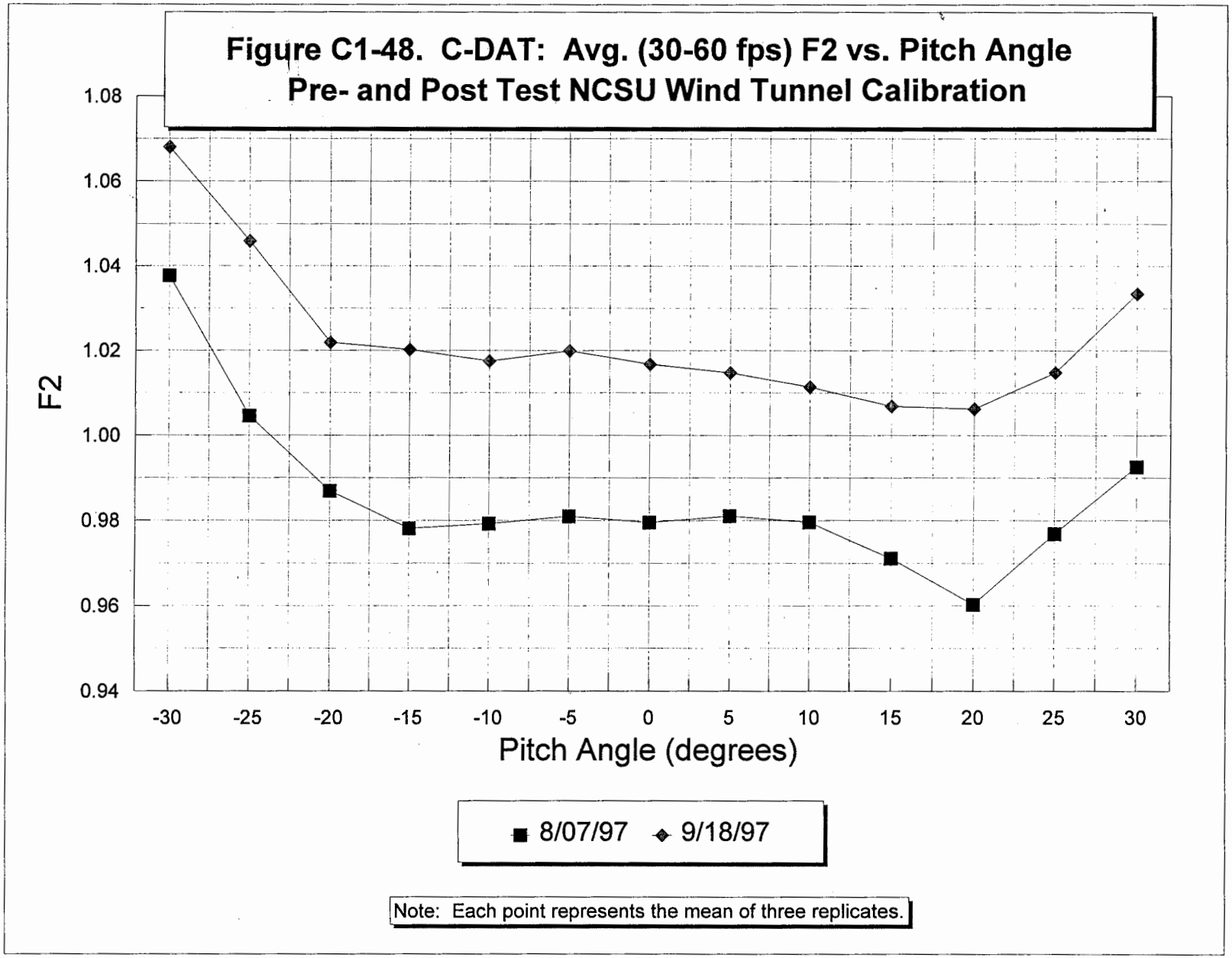
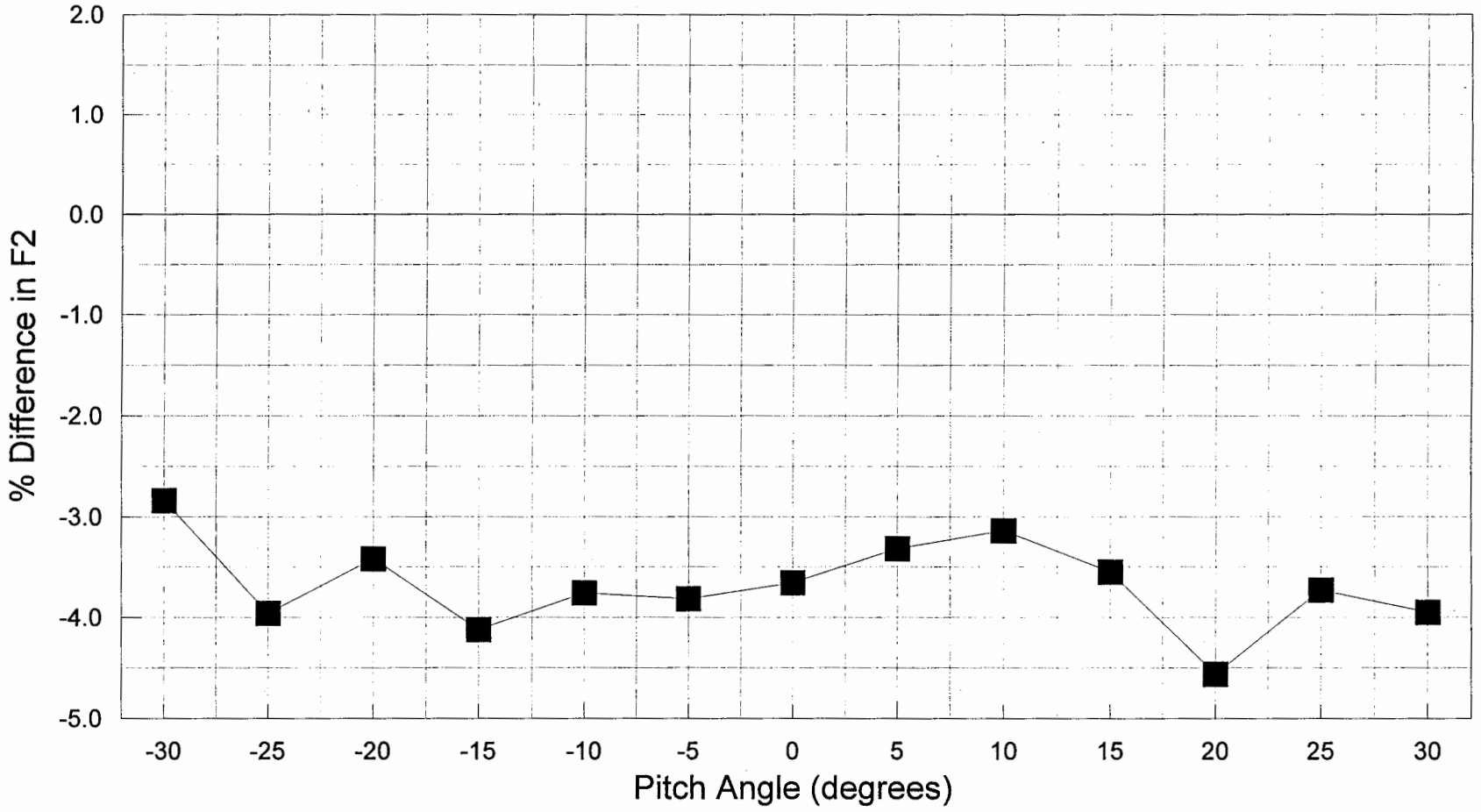

Figure C1-48. C-DAT: Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test NCSU Wind Tunnel Calibration
F2
1.08
1.06
1.04
1.02
1.00
0.98
0.96
0.94
-30
-25
-20
-15
-10
-5
0
5
10
15
20
25
30
Pitch Angle (degrees)
8/07/97
9/18/97
Note: Each point represents the mean of three replicates.

Figure C1-49. C-DAT: Percent Difference in F2

NCSU Pre- and Post-Test Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-73. Cadmus DAT Probe 3D-3 Calibrations at NC State Wind Tunnel

Pitch Angle	30 fps / Pre-test 30-60 Calibration			30 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	26.75	30.10	26.78	27.25	31.25	27.71	1.88	3.82	3.47
-25	24.89	31.42	28.41	25.98	32.64	29.25	4.40	3.87	2.95
-20	20.43	31.38	29.38	21.79	32.73	30.36	6.62	4.28	3.33
-15	15.51	31.49	30.33	16.85	32.81	31.39	8.66	4.19	3.49
-10	10.67	31.40	30.82	10.79	32.68	32.04	1.20	4.08	3.95
-5	7.50	31.27	30.89	7.13	32.50	32.14	-4.90	3.93	4.07
0	4.09	31.33	31.25	3.91	32.53	32.45	-4.52	3.82	3.84
5	3.80	31.28	31.12	3.99	32.42	32.24	4.96	3.63	3.62
10	7.31	31.36	31.05	7.19	32.45	32.13	-1.54	3.45	3.47
15	12.28	31.66	30.89	12.28	32.78	31.99	-0.03	3.53	3.56
20	18.31	31.36	29.75	18.00	32.69	31.07	-1.68	4.26	4.43
25	24.47	31.04	28.25	26.12	32.43	29.12	6.73	4.50	3.09
30	29.73	31.26	27.15	30.03	32.58	28.21	0.98	4.21	3.90

Pitch Angle	60 fps / Pre-test 30-60 Calibration			60 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.93	56.94	49.83	29.79	58.99	51.19	2.97	3.60	2.74
-25	23.81	57.84	52.92	24.98	60.47	54.81	4.92	4.54	3.58
-20	20.11	58.09	54.53	21.41	60.45	56.26	6.47	4.07	3.17
-15	14.57	57.85	55.95	15.67	60.24	57.96	7.59	4.13	3.58
-10	7.18	57.87	57.32	7.05	60.18	59.62	-1.83	3.98	4.01
-5	2.03	57.86	57.82	2.12	60.10	60.05	4.75	3.87	3.87
0	1.80	57.98	57.95	1.65	60.13	60.10	-8.69	3.70	3.71
5	6.59	57.85	57.42	6.56	59.81	59.36	-0.41	3.39	3.38
10	12.27	57.57	56.21	12.21	59.57	58.19	-0.46	3.48	3.51
15	17.67	57.23	54.53	17.19	59.67	57.00	-2.72	4.27	4.54
20	20.89	58.36	54.52	20.74	61.05	57.09	-0.72	4.60	4.70
25	25.87	58.47	52.58	27.66	61.16	54.13	6.95	4.61	2.94
30	29.93	57.91	50.19	30.01	60.31	52.22	0.28	4.14	4.05

Pitch Angle	90 fps / Pre-test 30-60 Calibration			90 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	27.06	84.80	75.50	28.02	88.23	77.88	3.54	4.05	3.15
-25	23.50	86.21	79.03	24.69	90.06	81.82	5.04	4.47	3.52
-20	17.76	86.23	82.10	19.06	89.71	84.77	7.33	4.03	3.25
-15	13.72	86.27	83.80	14.83	89.94	86.92	8.11	4.25	3.73
-10	10.99	86.21	84.61	10.39	89.68	88.15	-5.48	4.02	4.18
-5	2.75	87.20	87.02	2.59	90.56	90.40	-5.92	3.85	3.88
0	2.48	86.49	86.38	2.35	89.64	89.54	-4.93	3.64	3.66
5	5.68	86.62	86.12	5.59	89.60	89.09	-1.59	3.44	3.45
10	11.12	86.21	84.57	11.17	89.11	87.40	0.45	3.37	3.35
15	18.52	85.40	80.97	17.98	89.20	84.84	-2.89	4.45	4.77
20	21.69	86.99	80.82	21.96	90.92	84.30	1.28	4.52	4.30
25	22.56	87.83	81.04	23.37	91.79	84.11	3.59	4.51	3.79
30	29.59	86.18	74.94	30.02	89.84	77.79	1.47	4.26	3.80

Figure C1-50. Cadmus DAT Probe (3D-3) Pre- and Post-Test Calibrations

NC State Wind Tunnel

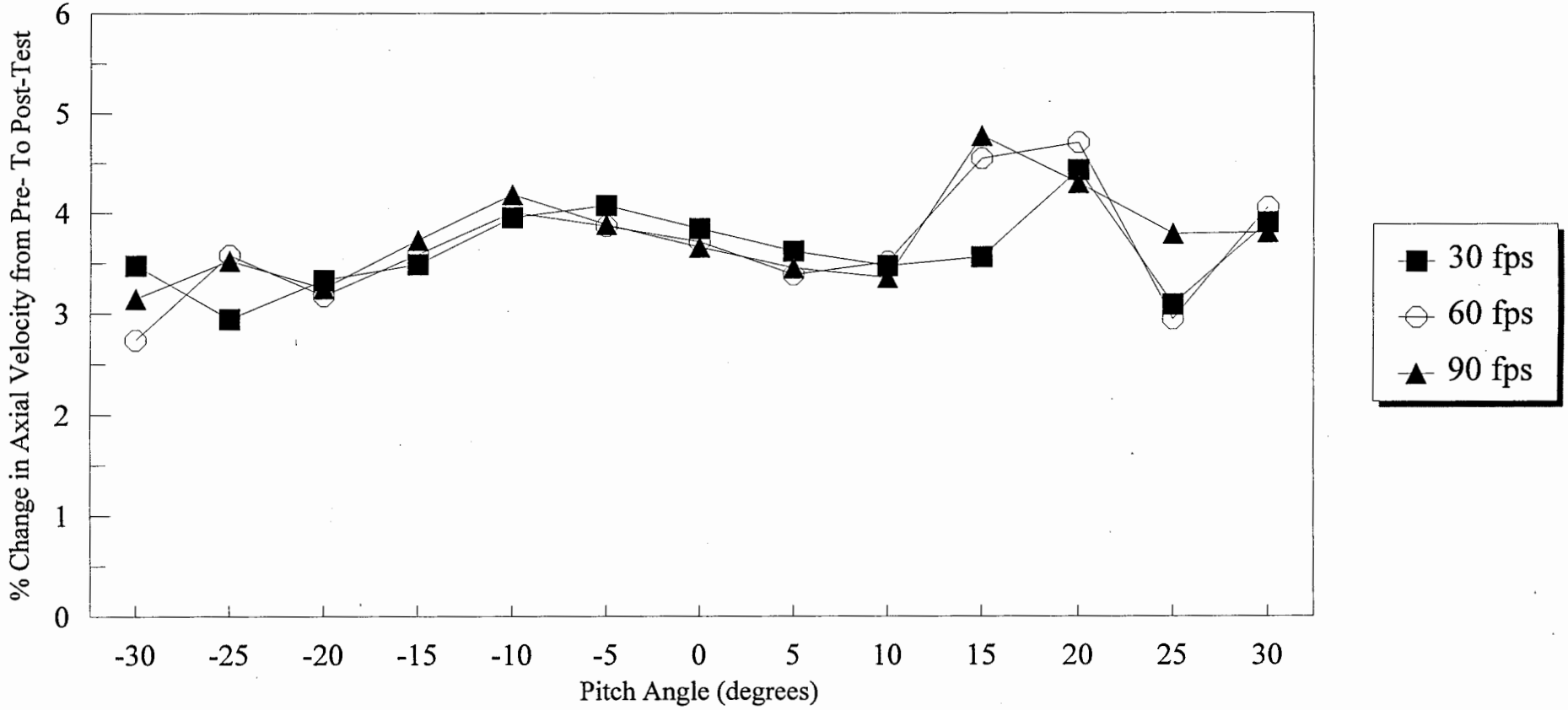


Table C1-74. Cadmus 3D-3 Pre-test Compuations - 30 fps

Probe: **Cadmus 3D-3 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 08/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	C-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**29.70**	Last Row:	61
Average Yaw Angle:	0.4		
Average Pitch Angle:	15.8	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.8		0
Resultant Angle Standard Deviation:	9.27		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.070	0.197	79	-20.2	20.2	0.1922	29.69	27.86
	-25	0.1	-0.070	0.210	79	-19.1	19.1	0.2039	30.58	28.90
	-20	0.2	-0.065	0.215	79	-17.5	17.5	0.2076	30.86	29.43
	-15	0.2	-0.050	0.218	79	-13.9	13.9	0.2087	30.94	30.03
	-10	0.0	-0.025	0.215	79	-7.0	7.0	0.2066	30.79	30.56
	-5	-0.1	-0.010	0.215	79	-0.5	0.5	0.2064	30.77	30.77
	0	-0.1	0.000	0.215	78	3.2	3.2	0.2067	30.77	30.72
	5	-0.1	0.020	0.215	79	10.2	10.2	0.2062	30.75	30.27
	10	-0.1	0.026	0.216	79	12.0	12.0	0.2058	30.73	30.06
	15	0.0	0.045	0.226	79	17.1	17.1	0.2111	31.12	29.74
	20	0.0	0.060	0.222	79	21.0	21.0	0.2062	30.76	28.71
	25	-0.1	0.080	0.212	79	25.2	25.2	0.2026	30.49	27.58
	30	1.1	0.100	0.215	78	29.7	29.7	0.2114	31.11	27.03
2	-30	-0.1	-0.135	0.190	90	-30.0	30.0	0.2046	30.95	26.80
	-25	0.3	-0.105	0.205	90	-28.5	28.5	0.2166	31.85	27.98
	-20	0.4	-0.085	0.215	89	-23.0	23.0	0.2139	31.61	29.11
	-15	-0.1	-0.060	0.225	89	-15.7	15.7	0.2159	31.76	30.57
	-10	0.4	-0.050	0.225	89	-13.6	13.6	0.2154	31.73	30.84
	-5	0.6	-0.035	0.223	88	-10.4	10.4	0.2138	31.58	31.06
	0	-0.4	-0.020	0.221	88	-4.6	4.6	0.2126	31.49	31.39
	5	-0.1	-0.010	0.220	88	-0.4	0.4	0.2111	31.38	31.38
	10	0.5	0.010	0.222	88	6.7	6.7	0.2135	31.55	31.34
	15	0.3	0.020	0.230	88	9.8	9.8	0.2207	32.09	31.62
	20	-0.1	0.050	0.231	88	18.3	18.3	0.2147	31.65	30.05
	25	0.0	0.075	0.224	87	23.5	23.5	0.2117	31.39	28.78
	30	1.1	0.100	0.215	87	29.7	29.7	0.2114	31.37	27.25
3	-30	-0.8	-0.130	0.197	88	-30.0	30.0	0.1886	29.66	25.68
	-25	-0.1	-0.100	0.210	87	-27.1	27.1	0.2178	31.84	28.36
	-20	0.3	-0.080	0.220	87	-20.8	20.8	0.2155	31.68	29.61
	-15	0.8	-0.065	0.225	87	-16.8	16.9	0.2167	31.76	30.40
	-10	0.4	-0.040	0.225	87	-11.4	11.4	0.2156	31.68	31.06
	-5	0.4	-0.040	0.222	87	-11.5	11.5	0.2127	31.47	30.84
	0	0.5	-0.020	0.225	87	-4.4	4.5	0.2165	31.75	31.65
	5	0.7	-0.010	0.225	87	-0.3	0.8	0.2159	31.71	31.70
	10	-0.3	0.000	0.226	87	3.2	3.2	0.2173	31.81	31.75
	15	0.2	0.020	0.226	87	9.9	9.9	0.2169	31.78	31.30
	20	-1.2	0.040	0.229	87	15.6	15.6	0.2154	31.67	30.50
	25	-0.8	0.080	0.220	87	24.6	24.7	0.2095	31.23	28.38
	30	1.7	0.100	0.214	87	29.8	29.8	0.2106	31.31	27.16

		Res	Vdir	Vax
Average	-30	26.75	30.10	26.78
	-25	24.89	31.42	28.41
	-20	20.43	31.38	29.38
	-15	15.51	31.49	30.33
	-10	10.67	31.40	30.82
	-5	7.50	31.27	30.89
	0	4.09	31.33	31.25
	5	3.80	31.28	31.12
	10	7.31	31.36	31.05
	15	12.28	31.66	30.89
	20	18.31	31.36	29.75
	25	24.47	31.04	28.25
	30	29.73	31.26	27.15

Table C1-75. Cadmus 3D-3 Post-test Computations - 30 fps

Probe: **Cadmus 3D-3 / Post-Test 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 09/18/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	C-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**30.78**	Last Row:	61
Average Yaw Angle:	0.4		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.3	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.62		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.070	0.197	79	-21.7	21.7	0.2091	30.97	28.77
	-25	0.1	-0.070	0.210	79	-20.3	20.3	0.2200	31.77	29.79
	-20	0.2	-0.065	0.215	79	-18.8	18.8	0.2243	32.08	30.37
	-15	0.2	-0.050	0.218	79	-15.3	15.3	0.2270	32.27	31.12
	-10	0.0	-0.025	0.215	79	-6.4	6.4	0.2234	32.01	31.81
	-5	-0.1	-0.010	0.215	79	-0.8	0.8	0.2225	31.95	31.94
	0	-0.1	0.000	0.215	78	3.0	3.0	0.2217	31.86	31.82
	5	-0.1	0.020	0.215	79	10.4	10.4	0.2198	31.75	31.23
	10	-0.1	0.026	0.216	79	12.0	12.0	0.2202	31.78	31.09
	15	0.0	0.045	0.226	79	16.7	16.7	0.2290	32.41	31.05
	20	0.0	0.060	0.222	79	21.0	21.0	0.2255	32.17	30.03
	25	-0.1	0.080	0.212	79	27.1	27.1	0.2218	31.90	28.39
	30	1.1	0.100	0.215	78	30.0	30.0	0.2296	32.43	28.08
2	-30	-0.1	-0.135	0.190	90	-30.0	30.0	0.2167	31.85	27.58
	-25	0.3	-0.105	0.205	90	-29.6	29.6	0.2330	33.03	28.72
	-20	0.4	-0.085	0.215	89	-24.3	24.3	0.2337	33.05	30.12
	-15	-0.1	-0.060	0.225	89	-17.1	17.1	0.2345	33.10	31.64
	-10	0.4	-0.050	0.225	89	-14.9	15.0	0.2342	33.08	31.96
	-5	0.6	-0.035	0.223	88	-9.3	9.4	0.2310	32.83	32.39
	0	-0.4	-0.020	0.221	88	-4.4	4.4	0.2297	32.73	32.64
	5	-0.1	-0.010	0.220	88	-0.7	0.7	0.2276	32.58	32.58
	10	0.5	0.010	0.222	88	6.6	6.6	0.2281	32.62	32.40
	15	0.3	0.020	0.230	88	10.0	10.0	0.2352	33.12	32.62
	20	-0.1	0.050	0.231	88	17.7	17.7	0.2340	33.04	31.47
	25	0.0	0.075	0.224	87	24.8	24.8	0.2305	32.76	29.73
	30	1.1	0.100	0.215	87	30.0	30.0	0.2296	32.70	28.31
3	-30	-0.8	-0.130	0.197	88	-30.0	30.0	0.2051	30.93	26.78
	-25	-0.1	-0.100	0.210	87	-28.0	28.0	0.2357	33.12	29.24
	-20	0.3	-0.080	0.220	87	-22.3	22.3	0.2347	33.06	30.59
	-15	0.8	-0.065	0.225	87	-18.1	18.2	0.2347	33.05	31.41
	-10	0.4	-0.040	0.225	87	-11.0	11.1	0.2332	32.95	32.34
	-5	0.4	-0.040	0.222	87	-11.3	11.3	0.2301	32.73	32.10
	0	0.5	-0.020	0.225	87	-4.3	4.3	0.2339	33.00	32.90
	5	0.7	-0.010	0.225	87	-0.6	0.9	0.2328	32.92	32.91
	10	-0.3	0.000	0.226	87	3.0	3.0	0.2331	32.94	32.90
	15	0.2	0.020	0.226	87	10.1	10.1	0.2311	32.80	32.29
	20	-1.2	0.040	0.229	87	15.2	15.3	0.2321	32.88	31.72
	25	-0.8	0.080	0.220	87	26.4	26.4	0.2289	32.64	29.24
	30	1.7	0.100	0.214	87	30.0	30.0	0.2285	32.62	28.24

		Res		Vdir	Vax
Average	-30	27.25		31.25	27.71
	-25	25.98		32.64	29.25
	-20	21.79		32.73	30.36
	-15	16.85		32.81	31.39
	-10	10.79		32.68	32.04
	-5	7.13		32.50	32.14
	0	3.91		32.53	32.45
	5	3.99		32.42	32.24
	10	7.19		32.45	32.13
	15	12.28		32.78	31.99
	20	18.00		32.69	31.07
	25	26.12		32.43	29.12
	30	30.03		32.58	28.21

Table C1-76. Cadmus 3D-3 Pre-test Computations - 60 fps

Probe: **Cadmus 3D-3 / Pre-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 08/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	C-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.89%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	84 _F
Average Axial Velocity, ft/sec:	**54.75**	Last Row:	61
Average Yaw Angle:	0.5		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.3		0
Resultant Angle Standard Deviation:	9.63		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.350	0.670	80	-28.9	28.9	0.7118	57.20	50.06
	-25	-0.5	-0.300	0.710	80	-24.8	24.8	0.7156	57.35	52.05
	-20	-0.5	-0.280	0.730	81	-22.2	22.2	0.7221	57.66	53.40
	-15	-0.5	-0.225	0.750	81	-17.4	17.4	0.7238	57.73	55.09
	-10	-0.4	-0.140	0.750	81	-11.9	11.9	0.7186	57.52	56.30
	-5	-0.4	-0.060	0.750	82	-3.6	3.6	0.7212	57.68	57.56
	0	-0.8	-0.030	0.750	82	0.1	0.8	0.7197	57.62	57.61
	5	0.0	0.000	0.750	82	3.2	3.2	0.7210	57.67	57.58
	10	-0.7	0.060	0.750	82	9.3	9.3	0.7200	57.63	56.88
	15	-0.7	0.150	0.750	82	17.2	17.2	0.7004	56.84	54.30
	20	-0.9	0.200	0.800	83	20.3	20.3	0.7392	58.45	54.82
	25	-0.4	0.260	0.770	83	23.6	23.6	0.7282	58.01	53.14
	30	-1.2	0.350	0.750	83	29.7	29.8	0.7378	58.39	50.69
2	-30	-0.4	-0.360	0.670	89	-29.5	29.5	0.7172	57.89	50.37
	-25	-0.6	-0.290	0.720	89	-23.5	23.5	0.7188	57.96	53.16
	-20	-0.4	-0.250	0.750	89	-19.1	19.1	0.7281	58.33	55.13
	-15	-0.6	-0.160	0.750	89	-13.1	13.2	0.7182	57.93	56.41
	-10	-0.3	-0.070	0.750	89	-4.8	4.9	0.7217	58.07	57.86
	-5	-0.2	-0.040	0.750	88	-1.1	1.2	0.7201	57.96	57.94
	0	-0.8	-0.010	0.760	88	2.2	2.3	0.7302	58.36	58.31
	5	0.0	0.050	0.750	88	8.3	8.3	0.7204	57.97	57.37
	10	-0.4	0.120	0.750	88	14.6	14.6	0.7082	57.48	55.62
	15	-0.5	0.160	0.770	88	17.7	17.7	0.7175	57.85	55.11
	20	-0.5	0.220	0.800	88	21.2	21.2	0.7441	58.91	54.91
	25	-0.8	0.300	0.760	88	26.1	26.1	0.7305	58.37	52.41
	30	-1.0	0.350	0.720	88	30.0	30.0	0.7094	57.52	49.81
3	-30	-0.3	-0.350	0.690	88	-28.3	28.3	0.6659	55.73	49.06
	-25	-0.5	-0.290	0.730	88	-23.1	23.1	0.7269	58.23	53.56
	-20	-0.3	-0.250	0.750	88	-19.1	19.1	0.7281	58.28	55.08
	-15	-0.1	-0.160	0.750	88	-13.1	13.1	0.7182	57.88	56.36
	-10	-0.2	-0.070	0.750	88	-4.8	4.8	0.7217	58.02	57.81
	-5	-0.6	-0.040	0.750	88	-1.1	1.3	0.7201	57.96	57.94
	0	-0.7	-0.010	0.750	88	2.2	2.3	0.7206	57.97	57.93
	5	-0.2	0.050	0.750	87	8.3	8.3	0.7204	57.92	57.31
	10	-0.9	0.100	0.750	87	12.9	12.9	0.7126	57.60	56.15
	15	-0.5	0.160	0.750	87	18.1	18.1	0.6977	56.99	54.18
	20	-0.9	0.210	0.770	87	21.1	21.2	0.7158	57.73	53.84
	25	-0.8	0.330	0.770	87	27.8	27.8	0.7483	59.02	52.20
	30	-0.5	0.350	0.730	86	30.0	30.0	0.7192	57.81	50.07

		Res	Vdir	Vax
Average	-30	28.93	56.94	49.83
	-25	23.81	57.84	52.92
	-20	20.11	58.09	54.53
	-15	14.57	57.85	55.95
	-10	7.18	57.87	57.32
	-5	2.03	57.86	57.82
	0	1.80	57.98	57.95
	5	6.59	57.85	57.42
	10	12.27	57.57	56.21
	15	17.67	57.23	54.53
	20	20.89	58.36	54.52
	25	25.87	58.47	52.58
	30	29.93	57.91	50.19

Table C1-77. Cadmus 3D-3 Post-test Computations - 60 fps

Probe: **Cadmus 3D-3 / Post-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 09/18/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	C-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.89%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	84 _F
Average Axial Velocity, ft/sec:	**56.77**	Last Row:	61
Average Yaw Angle:	0.5		
Average Pitch Angle:	16.7	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.7		0
Resultant Angle Standard Deviation:	10.00		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.350	0.670	80	-30.0	30.0	0.7642	59.27	51.33
	-25	-0.5	-0.300	0.710	80	-25.7	25.7	0.7814	59.93	54.00
	-20	-0.5	-0.280	0.730	81	-23.5	23.6	0.7881	60.24	55.22
	-15	-0.5	-0.225	0.750	81	-18.7	18.7	0.7825	60.02	56.87
	-10	-0.4	-0.140	0.750	81	-11.8	11.8	0.7780	59.85	58.58
	-5	-0.4	-0.060	0.750	82	-3.5	3.6	0.7788	59.94	59.82
	0	-0.8	-0.030	0.750	82	-0.2	0.8	0.7755	59.81	59.81
	5	0.0	0.000	0.750	82	3.0	3.0	0.7735	59.73	59.65
	10	-0.7	0.060	0.750	82	9.5	9.5	0.7677	59.51	58.70
	15	-0.7	0.150	0.750	82	16.8	16.8	0.7600	59.21	56.69
	20	-0.9	0.200	0.800	83	19.8	19.8	0.8100	61.19	57.57
	25	-0.4	0.260	0.770	83	25.0	25.0	0.7929	60.53	54.87
	30	-1.2	0.350	0.750	83	30.0	30.0	0.8010	60.84	52.68
2	-30	-0.4	-0.360	0.670	89	-30.0	30.0	0.7642	59.76	51.75
	-25	-0.6	-0.290	0.720	89	-24.8	24.8	0.7861	60.61	55.02
	-20	-0.4	-0.250	0.750	89	-20.3	20.3	0.7856	60.59	56.81
	-15	-0.6	-0.160	0.750	89	-14.2	14.2	0.7800	60.37	58.53
	-10	-0.3	-0.070	0.750	89	-4.7	4.7	0.7799	60.37	60.17
	-5	-0.2	-0.040	0.750	88	-1.3	1.3	0.7766	60.19	60.17
	0	-0.8	-0.010	0.760	88	1.9	2.1	0.7844	60.49	60.45
	5	0.0	0.050	0.750	88	8.4	8.4	0.7688	59.88	59.25
	10	-0.4	0.120	0.750	88	14.3	14.4	0.7612	59.59	57.73
	15	-0.5	0.160	0.770	88	17.2	17.2	0.7802	60.32	57.62
	20	-0.5	0.220	0.800	88	21.3	21.3	0.8135	61.60	57.40
	25	-0.8	0.300	0.760	88	28.1	28.1	0.8005	61.10	53.91
	30	-1.0	0.350	0.720	88	30.0	30.0	0.7689	59.89	51.86
3	-30	-0.3	-0.350	0.690	88	-29.4	29.4	0.7199	57.95	50.50
	-25	-0.5	-0.290	0.730	88	-24.4	24.4	0.7945	60.87	55.42
	-20	-0.3	-0.250	0.750	88	-20.3	20.3	0.7856	60.53	56.76
	-15	-0.1	-0.160	0.750	88	-14.2	14.2	0.7800	60.32	58.48
	-10	-0.2	-0.070	0.750	88	-4.7	4.7	0.7799	60.31	60.11
	-5	-0.6	-0.040	0.750	88	-1.3	1.5	0.7766	60.19	60.17
	0	-0.7	-0.010	0.750	88	1.9	2.0	0.7741	60.09	60.05
	5	-0.2	0.050	0.750	87	8.4	8.4	0.7688	59.83	59.19
	10	-0.9	0.100	0.750	87	12.8	12.8	0.7634	59.62	58.13
	15	-0.5	0.160	0.750	87	17.6	17.6	0.7598	59.48	56.70
	20	-0.9	0.210	0.770	87	21.1	21.2	0.7826	60.36	56.30
	25	-0.8	0.330	0.770	87	29.9	29.9	0.8218	61.85	53.61
	30	-0.5	0.350	0.730	86	30.0	30.0	0.7796	60.19	52.13

		Res	Vdir	Vax
Average	-30	29.79	58.99	51.19
	-25	24.98	60.47	54.81
	-20	21.41	60.45	56.26
	-15	15.67	60.24	57.96
	-10	7.05	60.18	59.62
	-5	2.12	60.10	60.05
	0	1.65	60.13	60.10
	5	6.56	59.81	59.36
	10	12.21	59.57	58.19
	15	17.19	59.67	57.00
	20	20.74	61.05	57.09
	25	27.66	61.16	54.13
	30	30.01	60.31	52.22

Table C1-78. Cadmus 3D-3 Pre-test Computations - 90 fps

Probe: **Cadmus 3D-3 / Pre-Test 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 08/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	C-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.98%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	91 _F
Average Axial Velocity, ft/sec:	**82.07**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	15.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.0		0
Resultant Angle Standard Deviation:	8.87		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.2	-0.750	1.500	93	-28.0	28.1	1.5751	86.10	75.99
	-25	-0.8	-0.640	1.600	93	-23.3	23.3	1.5953	86.65	79.59
	-20	-0.1	-0.500	1.630	93	-17.7	17.7	1.5750	86.10	82.00
	-15	-1.1	-0.350	1.650	92	-13.1	13.1	1.5801	86.16	83.91
	-10	0.0	-0.250	1.650	92	-10.2	10.2	1.5822	86.22	84.87
	-5	-0.5	-0.070	1.750	91	0.1	0.5	1.6792	88.74	88.74
	0	-0.1	0.000	1.650	91	3.2	3.2	1.5863	86.25	86.12
	5	-0.4	0.100	1.650	90	7.8	7.8	1.5854	86.15	85.35
	10	-1.1	0.210	1.650	90	12.5	12.5	1.5699	85.73	83.69
	15	-0.7	0.370	1.650	89	18.8	18.8	1.5301	84.56	80.05
	20	-1.1	0.470	1.700	88	21.3	21.3	1.5819	85.90	80.02
	25	-0.9	0.620	1.800	87	23.9	23.9	1.7052	89.10	81.45
	30	-1.1	0.750	1.640	85	29.3	29.3	1.6085	86.38	75.33
2	-30	-0.7	-0.700	1.510	90	-26.6	26.6	1.5555	85.33	76.33
	-25	-0.2	-0.670	1.550	91	-25.3	25.3	1.5702	85.81	77.59
	-20	-0.7	-0.550	1.620	92	-19.4	19.4	1.5744	86.01	81.13
	-15	-0.8	-0.410	1.640	93	-14.9	14.9	1.5693	85.94	83.04
	-10	-0.6	-0.330	1.630	93	-12.6	12.6	1.5613	85.73	83.65
	-5	-0.5	-0.180	1.640	93	-6.4	6.4	1.5768	86.15	85.61
	0	-0.5	-0.070	1.650	94	-0.1	0.5	1.5833	86.41	86.40
	5	-0.5	-0.020	1.650	94	2.3	2.3	1.5854	86.46	86.39
	10	-0.3	0.130	1.650	95	9.2	9.2	1.5842	86.51	85.40
	15	-0.6	0.350	1.650	95	18.0	18.0	1.5355	85.17	81.00
	20	-1.0	0.550	1.720	95	23.0	23.0	1.6189	87.45	80.51
	25	-1.2	0.400	1.700	96	19.5	19.5	1.5714	86.24	81.28
	30	-1.3	0.740	1.560	96	30.0	30.0	1.5370	85.29	73.84
3	-30	0.4	-0.700	1.510	99	-26.6	26.6	1.4461	82.95	74.19
	-25	-0.8	-0.600	1.580	99	-21.9	21.9	1.5600	86.15	79.93
	-20	-0.9	-0.450	1.640	99	-16.1	16.1	1.5755	86.58	83.17
	-15	-0.9	-0.350	1.650	99	-13.1	13.1	1.5801	86.71	84.45
	-10	-0.7	-0.250	1.650	98	-10.2	10.2	1.5822	86.69	85.32
	-5	-1.3	-0.060	1.650	98	0.4	1.3	1.5836	86.72	86.70
	0	-0.1	0.010	1.650	98	3.7	3.7	1.5867	86.81	86.63
	5	-0.4	0.080	1.670	97	6.9	6.9	1.6055	87.24	86.61
	10	-0.4	0.190	1.650	97	11.7	11.7	1.5743	86.39	84.61
	15	-1.2	0.380	1.700	97	18.7	18.8	1.5768	86.46	81.87
	20	-0.8	0.460	1.750	96	20.8	20.8	1.6225	87.63	81.93
	25	-0.9	0.610	1.730	96	24.2	24.2	1.6424	88.16	80.39
	30	1.2	0.750	1.630	94	29.4	29.4	1.6001	86.86	75.65

		Res	Vdir	Vax
Average	-30	27.06	84.80	75.50
	-25	23.50	86.21	79.03
	-20	17.76	86.23	82.10
	-15	13.72	86.27	83.80
	-10	10.99	86.21	84.61
	-5	2.75	87.20	87.02
	0	2.48	86.49	86.38
	5	5.68	86.62	86.12
	10	11.12	86.21	84.57
	15	18.52	85.40	80.97
	20	21.69	86.99	80.82
	25	22.56	87.83	81.04
	30	29.59	86.18	74.94

Table C1-79. Cadmus 3D-3 Post-test Computations - 90 fps

Probe: **Cadmus 3D-3 / Post-Test 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 09/18/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	C-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.98%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	91 _F
Average Axial Velocity, ft/sec:	**85.15**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.3		0
Resultant Angle Standard Deviation:	9.26		

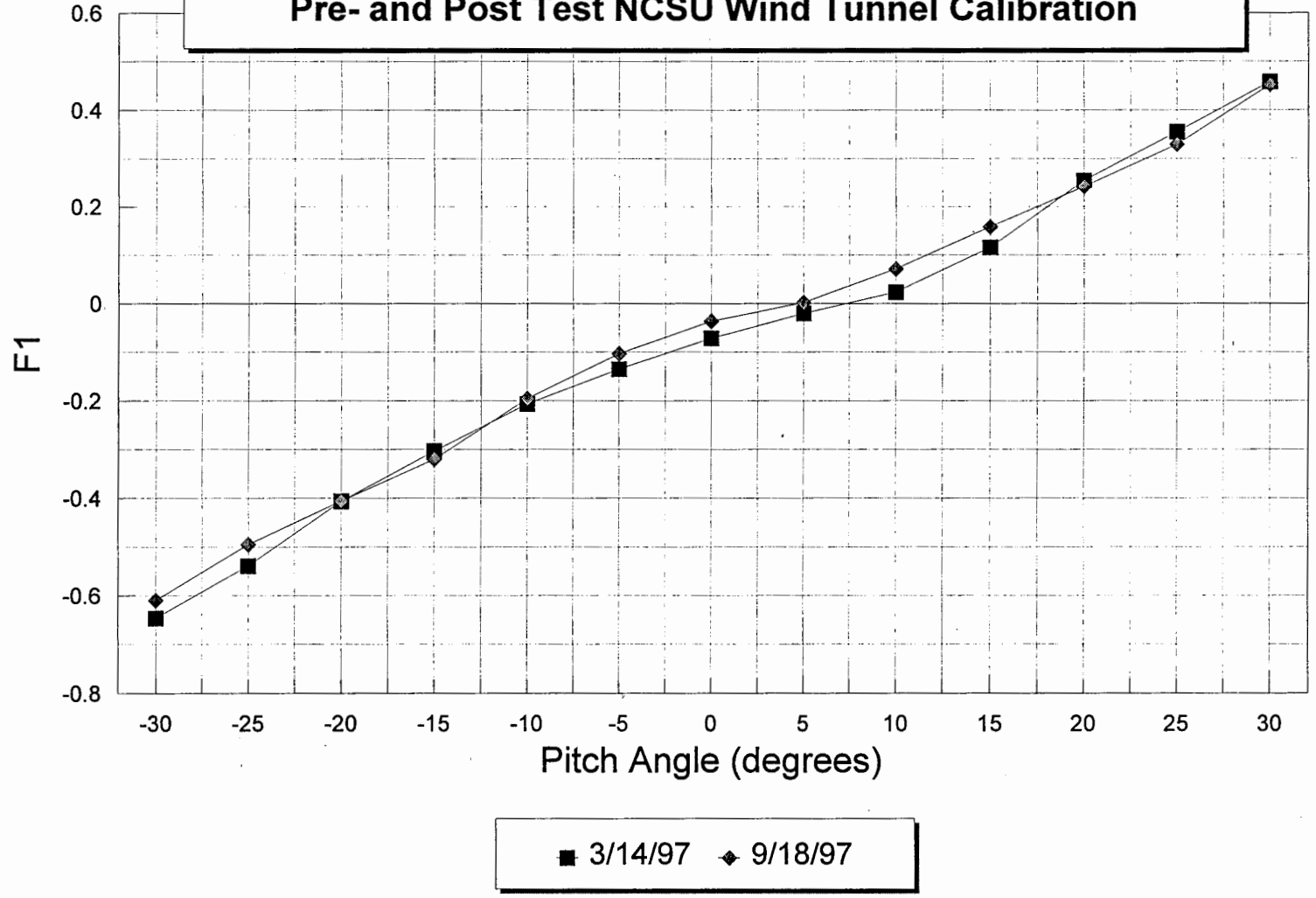
			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw			Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.2	-0.750	1.500	93	-29.1	29.1	1.6978	89.39	78.12
	-25	-0.8	-0.640	1.600	93	-24.6	24.6	1.7441	90.60	82.37
	-20	-0.1	-0.500	1.630	93	-19.0	19.0	1.7009	89.48	84.61
	-15	-1.1	-0.350	1.650	92	-14.1	14.1	1.7157	89.78	87.08
	-10	0.0	-0.250	1.650	92	-9.0	9.0	1.7100	89.63	88.54
	-5	-0.5	-0.070	1.750	91	-0.2	0.5	1.8095	92.12	92.12
	0	-0.1	0.000	1.650	91	3.0	3.0	1.7016	89.33	89.21
	5	-0.4	0.100	1.650	90	7.9	7.9	1.6925	89.01	88.17
	10	-1.1	0.210	1.650	90	12.4	12.5	1.6805	88.70	86.61
	15	-0.7	0.370	1.650	89	18.2	18.2	1.6713	88.37	83.94
	20	-1.1	0.470	1.700	88	21.4	21.4	1.7291	89.81	83.62
	25	-0.9	0.620	1.800	87	25.4	25.4	1.8585	93.02	84.05
	30	-1.1	0.750	1.640	85	30.0	30.0	1.7514	90.14	78.05
2	-30	-0.7	-0.700	1.510	90	-27.5	27.5	1.6869	88.86	78.83
	-25	-0.2	-0.670	1.550	91	-26.1	26.1	1.7120	89.60	80.45
	-20	-0.7	-0.550	1.620	92	-20.7	20.7	1.7032	89.46	83.66
	-15	-0.8	-0.410	1.640	93	-16.3	16.3	1.7084	89.67	86.06
	-10	-0.6	-0.330	1.630	93	-13.2	13.2	1.6934	89.28	86.91
	-5	-0.5	-0.180	1.640	93	-5.9	5.9	1.7046	89.57	89.10
	0	-0.5	-0.070	1.650	94	-0.4	0.7	1.7065	89.70	89.70
	5	-0.5	-0.020	1.650	94	2.0	2.1	1.7029	89.61	89.55
	10	-0.3	0.130	1.650	95	9.4	9.4	1.6891	89.33	88.14
	15	-0.6	0.350	1.650	95	17.5	17.5	1.6716	88.86	84.75
	20	-1.0	0.550	1.720	95	23.9	23.9	1.7648	91.30	83.44
	25	-1.2	0.400	1.700	96	18.9	18.9	1.7217	90.26	85.38
	30	-1.3	0.740	1.560	96	30.0	30.0	1.6660	88.79	76.88
3	-30	0.4	-0.700	1.510	99	-27.5	27.5	1.5701	86.43	76.68
	-25	-0.8	-0.600	1.580	99	-23.3	23.3	1.7018	89.98	82.63
	-20	-0.9	-0.450	1.640	99	-17.4	17.5	1.7097	90.19	86.03
	-15	-0.9	-0.350	1.650	99	-14.1	14.1	1.7157	90.35	87.63
	-10	-0.7	-0.250	1.650	98	-9.0	9.0	1.7100	90.12	89.01
	-5	-1.3	-0.060	1.650	98	0.1	1.3	1.7055	90.00	89.98
	0	-0.1	0.010	1.650	98	3.4	3.4	1.7010	89.88	89.72
	5	-0.4	0.080	1.670	97	6.8	6.8	1.7153	90.18	89.54
	10	-0.4	0.190	1.650	97	11.7	11.7	1.6826	89.32	87.46
	15	-1.2	0.380	1.700	97	18.2	18.2	1.7220	90.35	85.83
	20	-0.8	0.460	1.750	96	20.5	20.6	1.7751	91.65	85.82
	25	-0.9	0.610	1.730	96	25.8	25.8	1.7920	92.09	82.90
	30	1.2	0.750	1.630	94	30.0	30.0	1.7408	90.60	78.44

		Res	Vdir	Vax
Average	-30	28.02	88.23	77.88
	-25	24.69	90.06	81.82
	-20	19.06	89.71	84.77
	-15	14.83	89.94	86.92
	-10	10.39	89.68	88.15
	-5	2.59	90.56	90.40
	0	2.35	89.64	89.54
	5	5.59	89.60	89.09
	10	11.17	89.11	87.40
	15	17.98	89.20	84.84
	20	21.96	90.92	84.30
	25	23.37	91.79	84.11
	30	30.02	89.84	77.79

ATTACHMENT I.

T-DAT Probe Calibration Data

Figure C1-51. T-DAT: Avg. (30-60 fps) F1 vs. Pitch Angle Pre- and Post Test NCSU Wind Tunnel Calibration



Note: Each point represents the mean of three replicates.

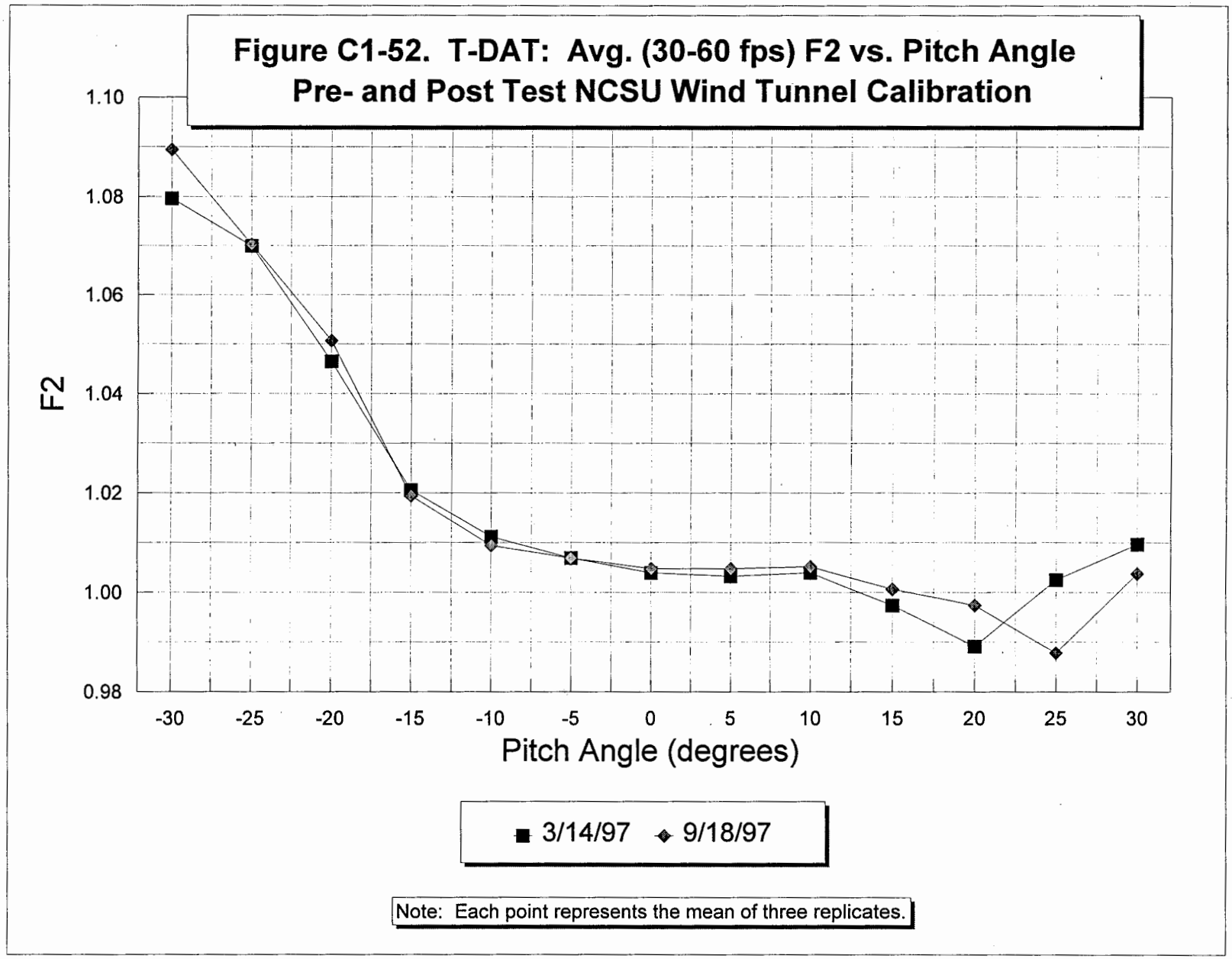
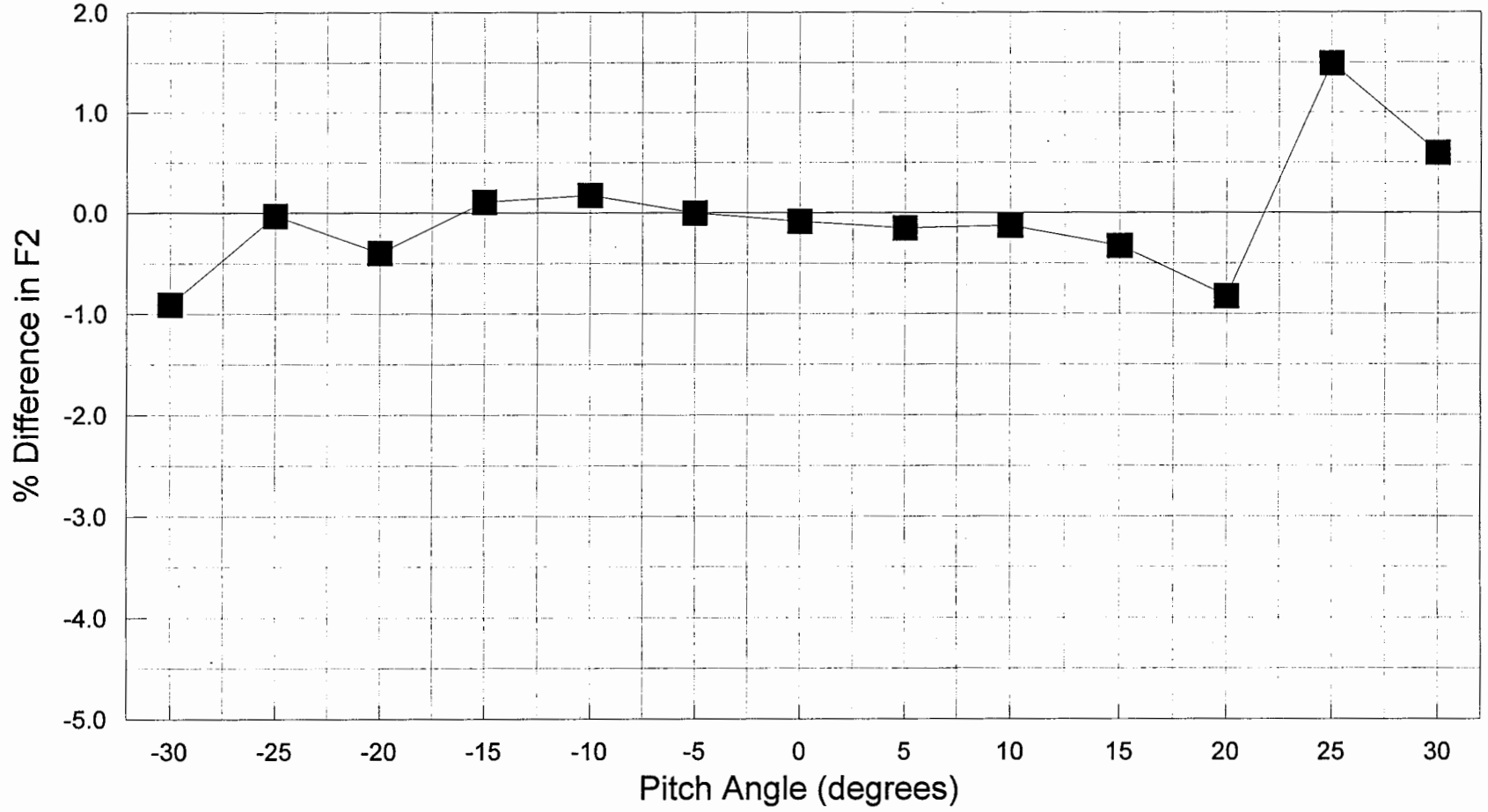

Figure C1-52. T-DAT: Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test NCSU Wind Tunnel Calibration
F2
1.10
1.08
1.06
1.04
1.02
1.00
0.98
-30
-25
-20
-15
-10
-5
0
5
10
15
20
25
30
Pitch Angle (degrees)
3/14/97
9/18/97
Note: Each point represents the mean of three replicates.

Figure C1-53. T-DAT: Percent Difference in F2

NCSU Pre- and Post-Test Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-80. TSA DAT Probe Calibrations at NC State Wind Tunnel

Pitch Angle	30 fps / Pre-test 30-60 Calibration			30 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.61	30.30	26.59	29.23	30.46	26.58	2.16	0.54	-0.03
-25	26.07	30.56	27.32	25.95	30.74	27.50	-0.45	0.61	0.66
-20	24.40	30.89	28.04	25.40	31.12	27.97	4.13	0.72	-0.27
-15	18.03	30.82	29.22	18.38	30.89	29.19	1.97	0.21	-0.10
-10	12.33	30.63	29.84	12.31	30.56	29.81	-0.17	-0.23	-0.10
-5	7.30	30.64	30.33	8.48	30.63	30.27	16.25	-0.02	-0.22
0	4.80	30.74	30.61	5.45	30.76	30.58	13.56	0.08	-0.11
5	6.72	30.66	30.39	7.03	30.71	30.47	4.51	0.16	0.27
10	8.30	30.62	30.14	9.01	30.69	30.24	8.52	0.25	0.32
15	10.80	30.53	29.81	10.41	30.64	30.01	-3.67	0.37	0.68
20	19.46	30.51	28.75	19.41	30.60	28.83	-0.27	0.31	0.29
25	24.12	30.42	27.73	25.04	30.26	27.39	3.82	-0.52	-1.23
30	28.39	30.47	26.78	28.76	30.23	26.49	1.30	-0.77	-1.09

Pitch Angle	60 fps / Pre-test 30-60 Calibration			60 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	22.66	57.03	52.63	23.97	57.20	52.27	5.76	0.30	-0.68
-25	20.53	58.18	54.44	21.06	58.39	54.41	2.59	0.36	-0.06
-20	14.38	58.64	56.60	14.64	58.69	56.57	1.83	0.09	-0.06
-15	11.24	59.78	58.55	11.50	59.66	58.41	2.23	-0.21	-0.23
-10	6.34	59.67	59.23	7.74	59.69	59.10	22.01	0.04	-0.21
-5	3.70	59.52	59.29	4.38	59.58	59.28	18.17	0.09	-0.01
0	6.00	59.42	59.01	4.95	59.50	59.27	-17.53	0.13	0.44
5	8.87	59.42	58.48	6.89	59.61	59.04	-22.39	0.32	0.95
10	11.65	59.09	57.54	9.50	59.34	58.16	-18.50	0.42	1.06
15	17.37	59.57	56.84	16.41	59.95	57.47	-5.57	0.64	1.12
20	21.28	60.17	56.05	22.21	60.22	55.74	4.33	0.09	-0.55
25	26.01	59.73	53.66	26.85	59.26	52.86	3.21	-0.79	-1.49
30	30.29	59.64	51.50	30.29	59.29	51.19	0.00	-0.59	-0.59

Pitch Angle	90 fps / Pre-test 30-60 Calibration			90 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	24.09	87.06	79.45	25.75	87.46	78.73	6.89	0.46	-0.90
-25	22.44	88.90	82.17	23.66	89.49	81.97	5.42	0.66	-0.24
-20	17.78	89.55	85.26	17.35	89.48	85.39	-2.40	-0.08	0.15
-15	10.77	89.58	87.69	11.11	89.49	87.63	3.16	-0.11	-0.07
-10	7.17	89.13	88.19	8.27	89.13	88.05	15.33	-0.01	-0.15
-5	7.36	89.33	88.59	7.28	89.36	88.59	-1.04	0.02	-0.00
0	3.97	89.10	88.73	3.97	89.23	88.98	-0.03	0.14	0.28
5	7.46	88.85	88.01	4.60	89.01	88.64	-38.32	0.18	0.72
10	13.10	88.57	86.23	10.47	88.96	87.43	-20.12	0.44	1.39
15	17.38	89.41	85.30	16.41	89.98	86.24	-5.62	0.64	1.11
20	21.12	90.22	84.15	22.01	90.37	83.78	4.25	0.17	-0.45
25	*	*	*	*	*	*			
30	*	*	*	*	*	*			

* Probe could not be nulled within +/- 0.2 inches H2O at 90 fps during pre-test calibration.

Figure C1-54. TSA DAT Probe Pre- and Post-Test Calibrations

NC State Wind Tunnel

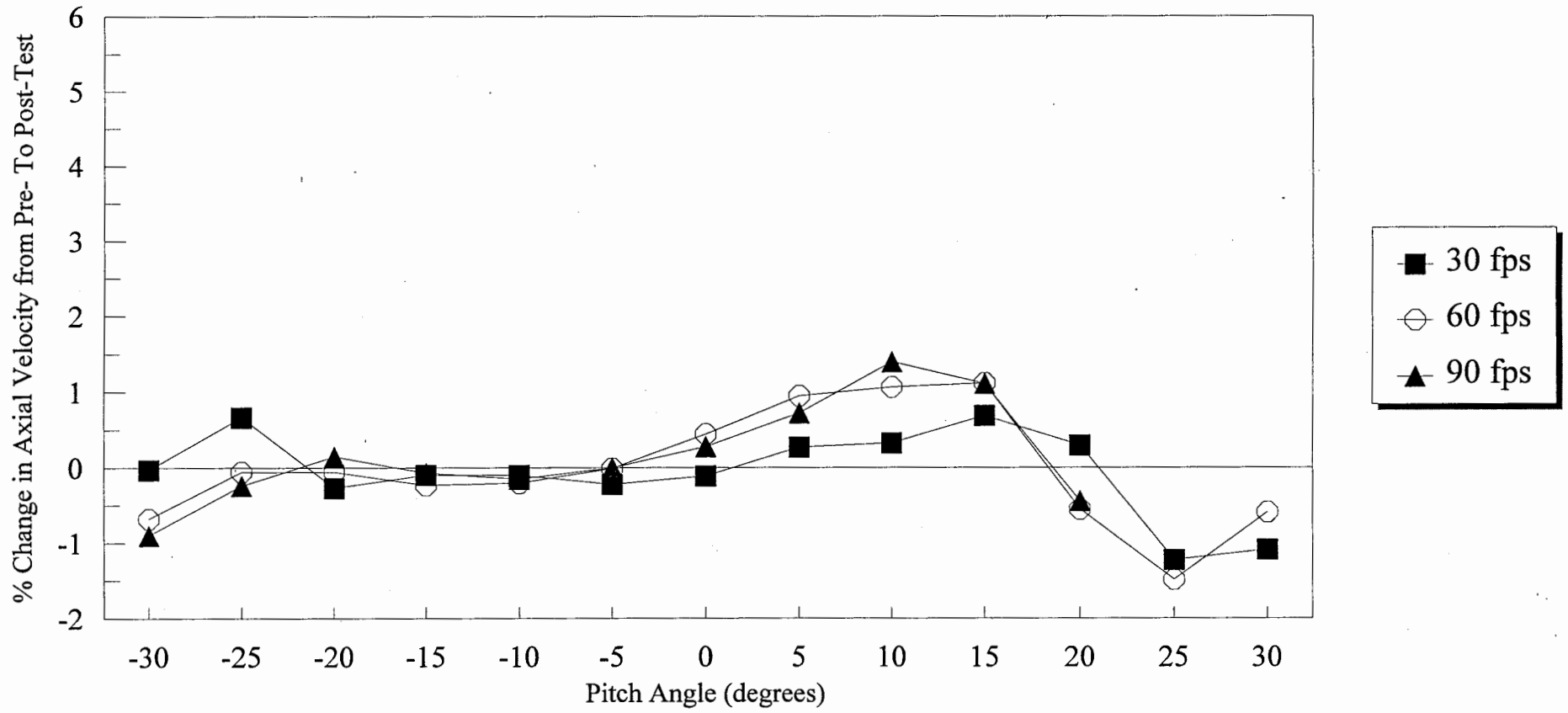


Table C1-81. TSA DAT Pre-test Computations - 30 fps

Probe: **TSA DAT / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 03/14/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	T-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	82 _F
Average Axial Velocity, ft/sec:	**28.89**	Last Row:	61
Average Yaw Angle:	1.3		
Average Pitch Angle:	16.8	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.9	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.55		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.8	-0.100	0.180	79	-25.8	25.8	0.2067	30.88	27.81
	-25	0.9	-0.070	0.190	79	-18.2	18.2	0.2043	30.71	29.18
	-20	0.8	-0.070	0.192	79	-18.0	18.0	0.2061	30.84	29.33
	-15	0.9	-0.050	0.195	79	-12.6	12.6	0.2013	30.48	29.74
	-10	0.8	-0.030	0.196	79	-6.2	6.3	0.1991	30.32	30.13
	-5	0.8	-0.020	0.197	79	-2.3	2.5	0.1991	30.31	30.29
	0	0.8	-0.010	0.200	79	2.1	2.3	0.2015	30.49	30.47
	5	1.7	0.010	0.200	79	11.4	11.6	0.2008	30.44	29.83
	10	1.6	0.030	0.200	79	16.2	16.3	0.1981	30.24	29.02
	15	1.6	0.040	0.200	79	18.0	18.1	0.1970	30.15	28.66
	20	2.3	0.060	0.200	79	22.2	22.3	0.1980	30.23	27.96
	25	3.0	0.080	0.195	79	27.7	27.8	0.1975	30.19	26.70
	30	2.9	0.090	0.195	79	30.0	30.1	0.1988	30.29	26.20
2	-30	0.9	-0.170	0.170	88	-30.0	30.0	0.1981	30.49	26.40
	-25	0.4	-0.120	0.170	88	-30.0	30.0	0.1981	30.49	26.41
	-20	0.4	-0.100	0.173	88	-26.8	26.8	0.1994	30.59	27.29
	-15	0.6	-0.070	0.187	88	-18.4	18.5	0.2017	30.76	29.18
	-10	0.5	-0.060	0.197	88	-15.1	15.1	0.2053	31.04	29.97
	-5	0.5	-0.040	0.197	88	-9.7	9.8	0.2013	30.74	30.29
	0	0.1	-0.030	0.200	88	-6.0	6.0	0.2031	30.87	30.70
	5	1.0	-0.020	0.199	87	-2.3	2.5	0.2011	30.69	30.66
	10	1.1	-0.030	0.200	87	-6.0	6.1	0.2031	30.84	30.67
	15	2.1	0.010	0.200	87	11.4	11.6	0.2008	30.67	30.04
	20	2.1	0.040	0.205	87	17.8	18.0	0.2020	30.76	29.26
	25	2.3	0.060	0.200	87	22.2	22.3	0.1980	30.46	28.17
	30	3.1	0.090	0.195	87	30.0	30.1	0.1988	30.51	26.39
3	-30	1.3	-0.160	0.180	88	-30.0	30.0	0.1858	29.53	25.57
	-25	1.3	-0.150	0.170	87	-30.0	30.0	0.1981	30.46	26.38
	-20	0.2	-0.110	0.180	87	-28.4	28.4	0.2086	31.26	27.50
	-15	0.2	-0.090	0.185	87	-23.0	23.0	0.2082	31.23	28.74
	-10	0.2	-0.060	0.190	87	-15.6	15.6	0.1991	30.54	29.41
	-5	1.0	-0.040	0.199	87	-9.6	9.7	0.2033	30.86	30.42
	0	1.1	-0.030	0.200	87	-6.0	6.1	0.2031	30.84	30.67
	5	1.1	-0.030	0.200	87	-6.0	6.1	0.2031	30.84	30.67
	10	1.1	-0.020	0.200	87	-2.2	2.5	0.2021	30.77	30.74
	15	1.5	-0.020	0.200	87	-2.2	2.7	0.2021	30.77	30.73
	20	2.2	0.040	0.202	87	18.0	18.1	0.1990	30.53	29.02
	25	2.2	0.060	0.202	87	22.1	22.2	0.1999	30.60	28.33
	30	2.2	0.070	0.199	87	24.8	24.9	0.1998	30.59	27.75

		Res	Vdir	Vax
Average	-30	28.61	30.30	26.59
	-25	26.07	30.56	27.32
	-20	24.40	30.89	28.04
	-15	18.03	30.82	29.22
	-10	12.33	30.63	29.84
	-5	7.30	30.64	30.33
	0	4.80	30.74	30.61
	5	6.72	30.66	30.39
	10	8.30	30.62	30.14
	15	10.80	30.53	29.81
	20	19.46	30.51	28.75
	25	24.12	30.42	27.73
	30	28.39	30.47	26.78

Table C1-82. TSA DAT Post-test Computations - 30 fps

Probe: **TSA DAT / Post-Test 30-60 Calibration**
Velocity Point: **30 fps**
Cal Date: 09/18/97

Number Of Points: 39

Barometric Pressure, in. Hg:	29.71	Probe ID:	T-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	82 _F
Average Axial Velocity, ft/sec:	**28.87**	Last Row:	61
Average Yaw Angle:	1.3		
Average Pitch Angle:	17.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.3		0
Resultant Angle Standard Deviation:	9.42		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.8	-0.100	0.180	79	-27.6	27.6	0.2101	31.14	27.59
	-25	0.9	-0.070	0.190	79	-17.8	17.8	0.2043	30.71	29.24
	-20	0.8	-0.070	0.192	79	-17.6	17.6	0.2059	30.83	29.39
	-15	0.9	-0.050	0.195	79	-12.4	12.5	0.2006	30.43	29.71
	-10	0.8	-0.030	0.196	79	-7.7	7.7	0.1992	30.32	30.05
	-5	0.8	-0.020	0.197	79	-4.8	4.9	0.1997	30.36	30.25
	0	0.8	-0.010	0.200	79	-1.0	1.3	0.2021	30.54	30.53
	5	1.7	0.010	0.200	79	8.5	8.6	0.2020	30.54	30.19
	10	1.6	0.030	0.200	79	14.5	14.6	0.2004	30.41	29.43
	15	1.6	0.040	0.200	79	17.5	17.5	0.1996	30.35	28.94
	20	2.3	0.060	0.200	79	23.3	23.4	0.1964	30.11	27.63
	25	3.0	0.080	0.195	79	28.3	28.4	0.1943	29.95	26.33
	30	2.9	0.090	0.195	79	30.0	30.1	0.1964	30.11	26.04
2	-30	0.9	-0.170	0.170	88	-30.0	30.0	0.2018	30.77	26.65
	-25	0.4	-0.120	0.170	88	-30.0	30.0	0.2018	30.77	26.65
	-20	0.4	-0.100	0.173	88	-28.6	28.6	0.2033	30.89	27.12
	-15	0.6	-0.070	0.187	88	-18.1	18.2	0.2020	30.78	29.25
	-10	0.5	-0.060	0.197	88	-14.4	14.4	0.2042	30.96	29.99
	-5	0.5	-0.040	0.197	88	-10.3	10.3	0.2009	30.71	30.21
	0	0.1	-0.030	0.200	88	-7.5	7.5	0.2033	30.88	30.62
	5	1.0	-0.020	0.199	87	-4.7	4.9	0.2017	30.74	30.63
	10	1.1	-0.030	0.200	87	-7.5	7.6	0.2033	30.86	30.59
	15	2.1	0.010	0.200	87	8.5	8.7	0.2020	30.76	30.41
	20	2.1	0.040	0.205	87	17.2	17.3	0.2047	30.96	29.56
	25	2.3	0.060	0.200	87	23.3	23.4	0.1964	30.33	27.83
	30	3.1	0.090	0.195	87	30.0	30.1	0.1964	30.33	26.23
3	-30	1.3	-0.160	0.180	88	-30.0	30.0	0.1852	29.48	25.52
	-25	1.3	-0.150	0.170	87	-30.0	30.0	0.2018	30.74	26.62
	-20	0.2	-0.110	0.180	87	-30.0	30.0	0.2137	31.63	27.40
	-15	0.2	-0.090	0.185	87	-24.5	24.5	0.2112	31.45	28.61
	-10	0.2	-0.060	0.190	87	-14.8	14.8	0.1973	30.40	29.39
	-5	1.0	-0.040	0.199	87	-10.2	10.3	0.2029	30.83	30.34
	0	1.1	-0.030	0.200	87	-7.5	7.6	0.2033	30.86	30.59
	5	1.1	-0.030	0.200	87	-7.5	7.6	0.2033	30.86	30.59
	10	1.1	-0.020	0.200	87	-4.7	4.8	0.2027	30.81	30.70
	15	1.5	-0.020	0.200	87	-4.7	4.9	0.2027	30.81	30.70
	20	2.2	0.040	0.202	87	17.4	17.5	0.2016	30.73	29.31
	25	2.2	0.060	0.202	87	23.1	23.2	0.1985	30.49	28.02
	30	2.2	0.070	0.199	87	25.9	26.0	0.1953	30.25	27.18

		Res	Vdir	Vax
Average	-30	29.23	30.46	26.58
	-25	25.95	30.74	27.50
	-20	25.40	31.12	27.97
	-15	18.38	30.89	29.19
	-10	12.31	30.56	29.81
	-5	8.48	30.63	30.27
	0	5.45	30.76	30.58
	5	7.03	30.71	30.47
	10	9.01	30.69	30.24
	15	10.41	30.64	30.01
	20	19.41	30.60	28.83
	25	25.04	30.26	27.39
	30	28.76	30.23	26.49

Table C1-83. TSA DAT Pre-test Computations - 60 fps

Probe: **TSA DAT / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **60 fps** Cal Date: 03/14/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	T-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.86%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**56.45**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	15.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.4		0
Resultant Angle Standard Deviation:	8.75		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.1	-0.300	0.650	77	-22.1	22.1	0.7253	57.75	53.52
	-25	0.2	-0.300	0.670	77	-21.6	21.6	0.7441	58.50	54.40
	-20	0.2	-0.300	0.700	78	-20.8	20.8	0.7724	59.65	55.75
	-15	0.6	-0.230	0.730	78	-15.6	15.6	0.7648	59.36	57.17
	-10	0.5	-0.160	0.750	78	-10.3	10.4	0.7678	59.47	58.50
	-5	0.2	-0.140	0.750	78	-8.6	8.6	0.7650	59.36	58.70
	0	0.6	-0.070	0.750	79	-1.7	1.8	0.7574	59.13	59.10
	5	0.7	-0.040	0.750	79	1.8	1.9	0.7555	59.05	59.02
	10	0.4	-0.030	0.750	79	3.1	3.1	0.7553	59.04	58.95
	15	0.9	0.100	0.750	79	15.6	15.7	0.7445	58.62	56.44
	20	1.6	0.200	0.770	80	20.2	20.3	0.7543	59.06	55.39
	25	0.6	0.250	0.800	80	22.9	22.9	0.7949	60.63	55.86
	30	1.9	0.350	0.740	80	30.0	30.1	0.7544	59.06	51.12
2	-30	0.2	-0.310	0.660	90	-22.4	22.4	0.7385	58.97	54.53
	-25	0.2	-0.300	0.630	90	-22.6	22.6	0.7064	57.68	53.24
	-20	0.5	-0.160	0.700	90	-11.1	11.1	0.7187	58.18	57.08
	-15	0.3	-0.140	0.750	90	-8.6	8.6	0.7650	60.02	59.35
	-10	0.3	-0.090	0.750	90	-3.8	3.8	0.7593	59.80	59.67
	-5	0.4	-0.050	0.750	90	0.5	0.6	0.7558	59.66	59.66
	0	0.3	0.000	0.750	89	7.3	7.3	0.7553	59.59	59.10
	5	1.3	0.060	0.760	89	13.0	13.1	0.7600	59.77	58.22
	10	1.4	0.100	0.750	89	15.6	15.7	0.7445	59.16	56.95
	15	0.7	0.160	0.780	89	18.2	18.2	0.7677	60.07	57.06
	20	2.0	0.220	0.790	89	21.2	21.2	0.7778	60.47	56.36
	25	2.5	0.300	0.700	89	28.6	28.7	0.7107	57.80	50.72
	30	4.8	0.350	0.750	89	30.0	30.3	0.7646	59.95	51.74
3	-30	0.0	-0.300	0.600	89	-23.5	23.5	0.6286	54.36	49.84
	-25	0.1	-0.240	0.680	88	-17.4	17.4	0.7258	58.36	55.69
	-20	0.6	-0.160	0.700	88	-11.1	11.2	0.7187	58.07	56.98
	-15	0.5	-0.150	0.750	88	-9.5	9.5	0.7662	59.96	59.13
	-10	0.5	-0.100	0.750	88	-4.8	4.9	0.7602	59.73	59.51
	-5	0.6	-0.040	0.750	88	1.8	1.9	0.7555	59.54	59.51
	0	0.6	0.010	0.750	88	8.9	8.9	0.7557	59.55	58.84
	5	0.2	0.040	0.750	88	11.6	11.6	0.7527	59.43	58.21
	10	1.2	0.110	0.750	88	16.1	16.2	0.7433	59.06	56.73
	15	1.2	0.160	0.780	88	18.2	18.2	0.7677	60.02	57.00
	20	2.0	0.240	0.800	88	22.2	22.3	0.7922	60.97	56.40
	25	2.2	0.300	0.780	88	26.4	26.5	0.7871	60.77	54.39
	30	5.6	0.400	0.750	88	30.0	30.5	0.7646	59.90	51.63

		Res	Vdir	Vax
Average	-30	22.66	57.03	52.63
	-25	20.53	58.18	54.44
	-20	14.38	58.64	56.60
	-15	11.24	59.78	58.55
	-10	6.34	59.67	59.23
	-5	3.70	59.52	59.29
	0	6.00	59.42	59.01
	5	8.87	59.42	58.48
	10	11.65	59.09	57.54
	15	17.37	59.57	56.84
	20	21.28	60.17	56.05
	25	26.01	59.73	53.66
	30	30.29	59.64	51.50

Table C1-84. TSA DAT Post-test Computations - 60 fps

Probe: **TSA DAT / Post-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 09/18/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	T-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.86%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**56.44**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	15.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.4		0
Resultant Angle Standard Deviation:	9.06		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.1	-0.300	0.650	77	-23.1	23.1	0.7344	58.11	53.45
	-25	0.2	-0.300	0.670	77	-22.3	22.3	0.7527	58.83	54.41
	-20	0.2	-0.300	0.700	78	-21.3	21.3	0.7801	59.95	55.87
	-15	0.6	-0.230	0.730	78	-14.8	14.8	0.7580	59.09	57.13
	-10	0.5	-0.160	0.750	78	-10.7	10.7	0.7663	59.42	58.38
	-5	0.2	-0.140	0.750	78	-9.5	9.5	0.7638	59.32	58.50
	0	0.6	-0.070	0.750	79	-4.2	4.3	0.7598	59.22	59.06
	5	0.7	-0.040	0.750	79	-1.2	1.4	0.7579	59.15	59.13
	10	0.4	-0.030	0.750	79	-0.2	0.5	0.7573	59.12	59.12
	15	0.9	0.100	0.750	79	13.6	13.6	0.7529	58.95	57.30
	20	1.6	0.200	0.770	80	21.0	21.1	0.7630	59.40	55.43
	25	0.6	0.250	0.800	80	24.0	24.0	0.7835	60.19	54.97
	30	1.9	0.350	0.740	80	30.0	30.1	0.7455	58.71	50.82
2	-30	0.2	-0.310	0.660	90	-23.6	23.6	0.7482	59.36	54.41
	-25	0.2	-0.300	0.630	90	-23.9	23.9	0.7161	58.08	53.08
	-20	0.5	-0.160	0.700	90	-11.3	11.3	0.7169	58.11	56.98
	-15	0.3	-0.140	0.750	90	-9.5	9.5	0.7638	59.98	59.15
	-10	0.3	-0.090	0.750	90	-5.9	5.9	0.7610	59.87	59.55
	-5	0.4	-0.050	0.750	90	-2.2	2.3	0.7586	59.77	59.73
	0	0.3	0.000	0.750	89	4.7	4.7	0.7572	59.66	59.46
	5	1.3	0.060	0.760	89	10.4	10.5	0.7673	60.06	59.05
	10	1.4	0.100	0.750	89	13.6	13.6	0.7529	59.49	57.81
	15	0.7	0.160	0.780	89	17.8	17.8	0.7781	60.48	57.59
	20	2.0	0.220	0.790	89	22.1	22.2	0.7796	60.54	56.07
	25	2.5	0.300	0.700	89	29.0	29.1	0.7010	57.41	50.14
	30	4.8	0.350	0.750	89	30.0	30.3	0.7556	59.60	51.43
3	-30	0.0	-0.300	0.600	89	-25.2	25.2	0.6230	54.12	48.96
	-25	0.1	-0.240	0.680	88	-16.9	16.9	0.7234	58.26	55.75
	-20	0.6	-0.160	0.700	88	-11.3	11.3	0.7169	58.00	56.87
	-15	0.5	-0.150	0.750	88	-10.2	10.2	0.7646	59.90	58.96
	-10	0.5	-0.100	0.750	88	-6.6	6.6	0.7615	59.78	59.38
	-5	0.6	-0.040	0.750	88	-1.2	1.4	0.7579	59.64	59.62
	0	0.6	0.010	0.750	88	5.8	5.8	0.7573	59.61	59.30
	5	0.2	0.040	0.750	88	8.7	8.7	0.7576	59.63	58.94
	10	1.2	0.110	0.750	88	14.3	14.4	0.7518	59.40	57.53
	15	1.2	0.160	0.780	88	17.8	17.8	0.7781	60.43	57.53
	20	2.0	0.240	0.800	88	23.3	23.4	0.7857	60.72	55.73
	25	2.2	0.300	0.780	88	27.3	27.3	0.7722	60.20	53.47
	30	5.6	0.400	0.750	88	30.0	30.5	0.7556	59.54	51.32

		Res		Vdir	Vax
Average	-30	23.97		57.20	52.27
	-25	21.06		58.39	54.41
	-20	14.64		58.69	56.57
	-15	11.50		59.66	58.41
	-10	7.74		59.69	59.10
	-5	4.38		59.58	59.28
	0	4.95		59.50	59.27
	5	6.89		59.61	59.04
	10	9.50		59.34	58.16
	15	16.41		59.95	57.47
	20	22.21		60.22	55.74
	25	26.85		59.26	52.86
	30	30.29		59.29	51.19

Table C1-85. TSA DAT Pre-test Computations - 90 fps

Probe: **TSA DAT / Pre-Test 30-60 Calibration**
Velocity Point: **90 fps**
Pre-test Cal Date: 03/14/97

Number Of Points: 39

Barometric Pressure, in. Hg:	29.71	Probe ID:	T-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.54%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**85.80**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	11.7	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	13.9		0
Resultant Angle Standard Deviation:	7.23		

			Readings, in.H2O							
	Pitch	Yaw			Gas	<< ANGLES >>			Velocities, ft/sec	
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.800	1.450	83	-25.6	25.6	1.6636	87.95	79.32
	-25	0.2	-0.720	1.500	85	-22.8	22.8	1.6841	88.65	81.74
	-20	0.5	-0.600	1.560	86	-18.9	18.9	1.6907	88.91	84.09
	-15	0.8	-0.450	1.670	87	-13.3	13.3	1.7281	89.97	87.56
	-10	0.0	-0.350	1.660	88	-10.2	10.2	1.6986	89.28	87.86
	-5	0.3	-0.260	1.650	89	-6.6	6.6	1.6771	88.79	88.21
	0	0.4	-0.160	1.670	89	-1.9	1.9	1.6869	89.05	89.00
	5	0.8	-0.030	1.650	90	5.2	5.3	1.6608	88.44	88.06
	10	0.9	0.120	1.650	90	12.7	12.7	1.6514	88.19	86.03
	15	1.5	0.300	1.700	91	17.2	17.2	1.6789	89.00	85.00
	20	1.2	0.500	1.750	92	21.5	21.6	1.7263	90.33	84.02
	25									
	30									
2	-30	0.2	-0.750	1.470	97	-23.9	23.9	1.6671	89.17	81.51
	-25	0.2	-0.700	1.500	97	-22.3	22.3	1.6766	89.42	82.75
	-20	0.3	-0.520	1.560	96	-16.5	16.5	1.6491	88.61	84.98
	-15	1.0	-0.200	1.630	96	-4.0	4.1	1.6505	88.65	88.42
	-10	0.3	-0.140	1.630	96	-1.1	1.2	1.6450	88.50	88.48
	-5	0.2	0.000	1.690	95	7.3	7.3	1.7021	89.94	89.20
	0	0.6	0.020	1.650	95	8.7	8.7	1.6624	88.89	87.85
	5	0.6	0.070	1.630	94	11.1	11.1	1.6383	88.16	86.52
	10	1.1	0.200	1.670	93	15.1	15.2	1.6603	88.67	85.57
	15	1.2	0.400	1.730	92	19.1	19.2	1.6974	89.57	84.60
	20	1.7	0.500	1.750	91	21.5	21.6	1.7263	90.25	83.92
	25									
	30									
3	-30	0.4	-0.700	1.460	86	-22.8	22.8	1.5108	84.05	77.50
	-25	0.6	-0.700	1.500	87	-22.3	22.3	1.6766	88.62	82.00
	-20	0.2	-0.600	1.650	88	-17.9	17.9	1.7703	91.14	86.72
	-15	0.7	-0.500	1.660	89	-14.9	14.9	1.7282	90.14	87.10
	-10	0.1	-0.350	1.670	89	-10.2	10.2	1.7084	89.62	88.21
	-5	0.1	-0.300	1.660	90	-8.2	8.2	1.6920	89.27	88.36
	0	0.4	-0.100	1.680	91	1.2	1.2	1.6927	89.37	89.35
	5	0.7	-0.020	1.700	92	6.0	6.0	1.7115	89.94	89.45
	10	1.2	0.080	1.660	93	11.3	11.4	1.6672	88.85	87.10
	15	1.3	0.230	1.710	93	15.7	15.7	1.6971	89.65	86.29
	20	2.2	0.450	1.750	93	20.1	20.2	1.7130	90.07	84.52
	25									
	30									

		Res	Vdir	Vax
Average	-30	24.09	87.06	79.45
	-25	22.44	88.90	82.17
* Probe could not be nulled within +/- 0.2 inches H2O.	-20	17.78	89.55	85.26
	-15	10.77	89.58	87.69
	-10	7.17	89.13	88.19
	-5	7.36	89.33	88.59
	0	3.97	89.10	88.73
	5	7.46	88.85	88.01
	10	13.10	88.57	86.23
	15	17.38	89.41	85.30
	20	21.12	90.22	84.15
	25			
	30			

Table C1-86. TSA DAT Post-test Computations - 90 fps

Probe: **TSA DAT / Post-Test 30-60 Calibration**
Velocity Point: **90 fps**
Cal Date: 09/18/97

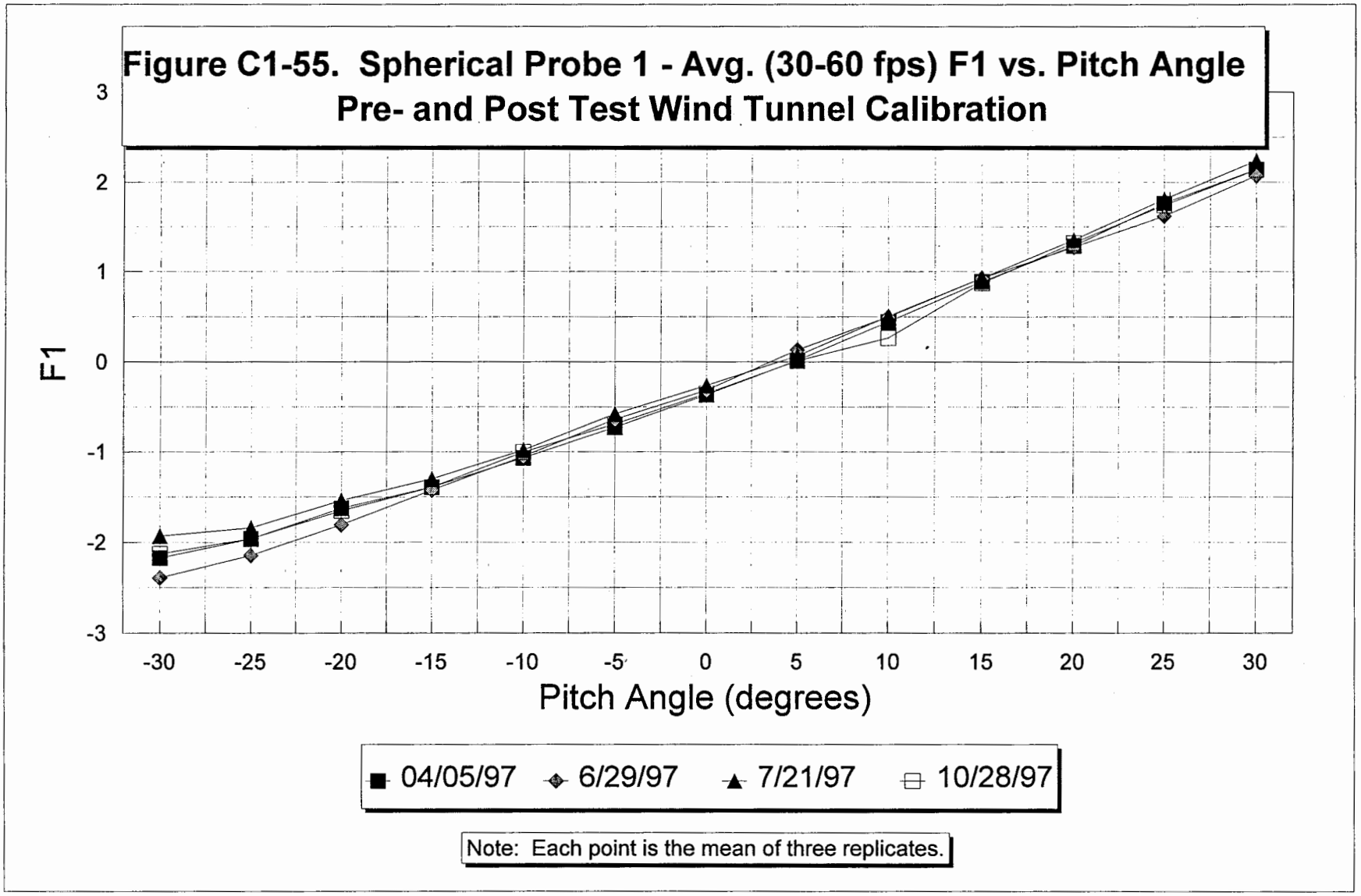
Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	T-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.54%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**85.95**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	11.6	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	13.7		0
Resultant Angle Standard Deviation:	7.77		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.800	1.450	83	-27.5	27.5	1.6906	88.66	78.67
	-25	0.2	-0.720	1.500	85	-24.2	24.2	1.7077	89.27	81.46
	-20	0.5	-0.600	1.560	86	-18.7	18.8	1.6969	89.07	84.34
	-15	0.8	-0.450	1.670	87	-13.0	13.0	1.7216	89.80	87.50
	-10	0.0	-0.350	1.660	88	-10.6	10.6	1.6953	89.19	87.67
	-5	0.3	-0.260	1.650	89	-7.9	7.9	1.6776	88.81	87.96
	0	0.4	-0.160	1.670	89	-4.4	4.4	1.6921	89.19	88.93
	5	0.8	-0.030	1.650	90	2.4	2.5	1.6658	88.57	88.49
	10	0.9	0.120	1.650	90	10.1	10.1	1.6669	88.60	87.22
	15	1.5	0.300	1.700	91	16.1	16.2	1.6997	89.55	86.02
	20	1.2	0.500	1.750	92	22.5	22.5	1.7241	90.28	83.39
	25									
	30									
2	-30	0.2	-0.750	1.470	97	-25.7	25.7	1.6920	89.83	80.97
	-25	0.2	-0.700	1.500	97	-23.4	23.4	1.6984	90.00	82.60
	-20	0.3	-0.520	1.560	96	-15.8	15.8	1.6366	88.27	84.95
	-15	1.0	-0.200	1.630	96	-6.0	6.1	1.6541	88.74	88.24
	-10	0.3	-0.140	1.630	96	-3.7	3.7	1.6506	88.65	88.47
	-5	0.2	0.000	1.690	95	4.7	4.7	1.7062	90.05	89.74
	0	0.6	0.020	1.650	95	5.7	5.8	1.6660	88.98	88.53
	5	0.6	0.070	1.630	94	8.0	8.0	1.6464	88.38	87.52
	10	1.1	0.200	1.670	93	12.8	12.8	1.6788	89.16	86.93
	15	1.2	0.400	1.730	92	19.3	19.4	1.7224	90.23	85.12
	20	1.7	0.500	1.750	91	22.5	22.6	1.7241	90.19	83.29
	25									
	30									
3	-30	0.4	-0.700	1.460	86	-24.1	24.1	1.5051	83.89	76.56
	-25	0.6	-0.700	1.500	87	-23.4	23.4	1.6984	89.19	81.85
	-20	0.2	-0.600	1.650	88	-17.5	17.5	1.7687	91.10	86.87
	-15	0.7	-0.500	1.660	89	-14.2	14.3	1.7199	89.92	87.15
	-10	0.1	-0.350	1.670	89	-10.6	10.6	1.7052	89.53	88.02
	-5	0.1	-0.300	1.660	90	-9.2	9.2	1.6899	89.21	88.07
	0	0.4	-0.100	1.680	91	-1.7	1.7	1.6985	89.52	89.48
	5	0.7	-0.020	1.700	92	3.2	3.3	1.7163	90.07	89.92
	10	1.2	0.080	1.660	93	8.3	8.4	1.6768	89.11	88.15
	15	1.3	0.230	1.710	93	13.6	13.7	1.7163	90.15	87.59
	20	2.2	0.450	1.750	93	20.8	21.0	1.7351	90.64	84.65
	25									
	30									

		Res		Vdir	Vax
Average	-30	25.75		87.46	78.73
	-25	23.66		89.49	81.97
* Probe could not be nulled within +/- 0.2 inches H2O.	-20	17.35		89.48	85.39
	-15	11.11		89.49	87.63
	-10	8.27		89.13	88.05
	-5	7.28		89.36	88.59
	0	3.97		89.23	88.98
	5	4.60		89.01	88.64
	10	10.47		88.96	87.43
	15	16.41		89.98	86.24
	20	22.01		90.37	83.78
	25				
	30				

ATTACHMENT J.

Spherical Probe SPH-1 Calibration Data


Figure C1-55. Spherical Probe 1 - Avg. (30-60 fps) F1 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration
F1
3
2
1
0
-1
-2
-3
-30
-25
-20
-15
-10
-5
0
5
10
15
20
25
30
Pitch Angle (degrees)
04/05/97
6/29/97
7/21/97
10/28/97
Note: Each point is the mean of three replicates.

SPHCMPR.WK4

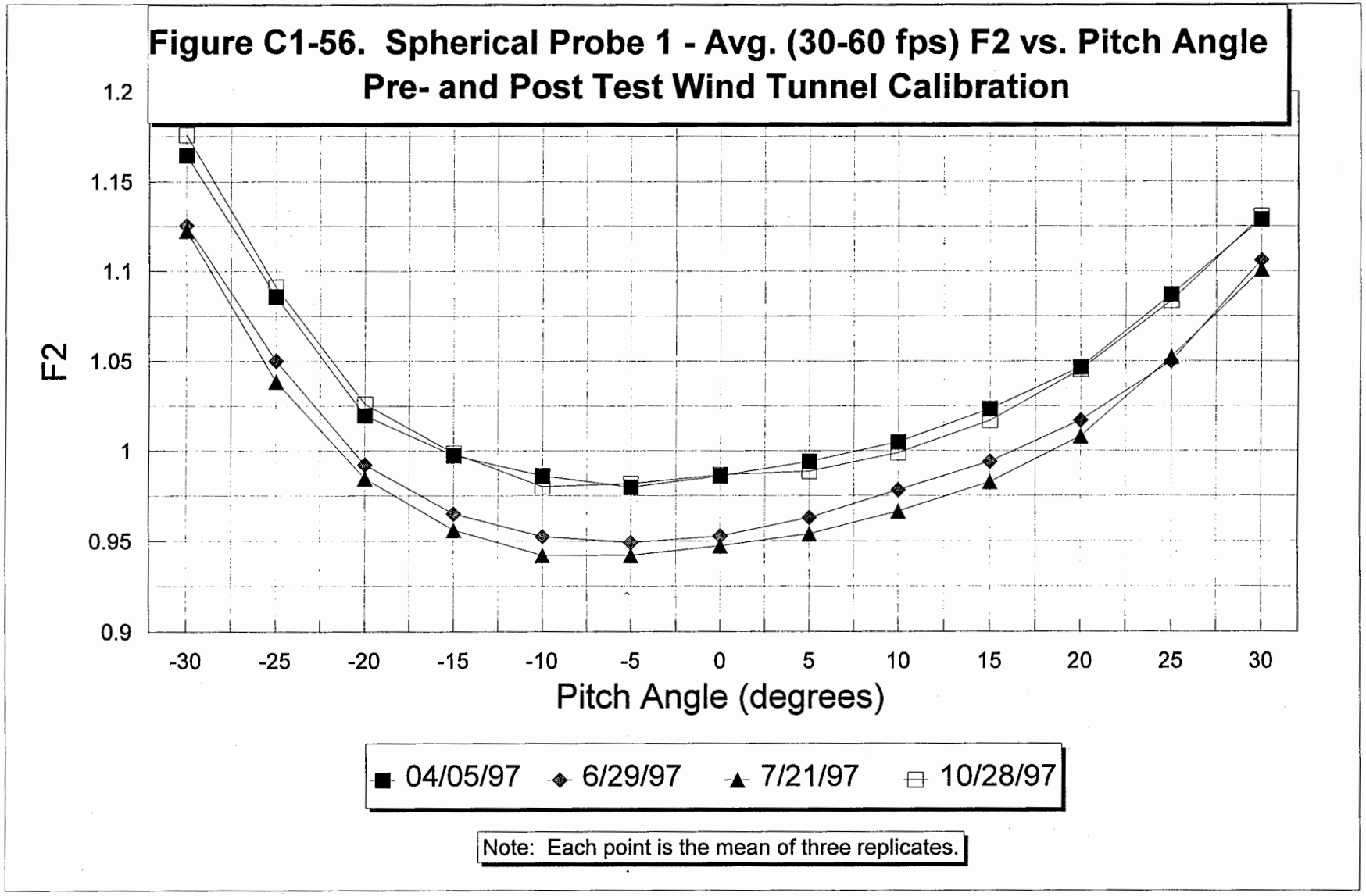
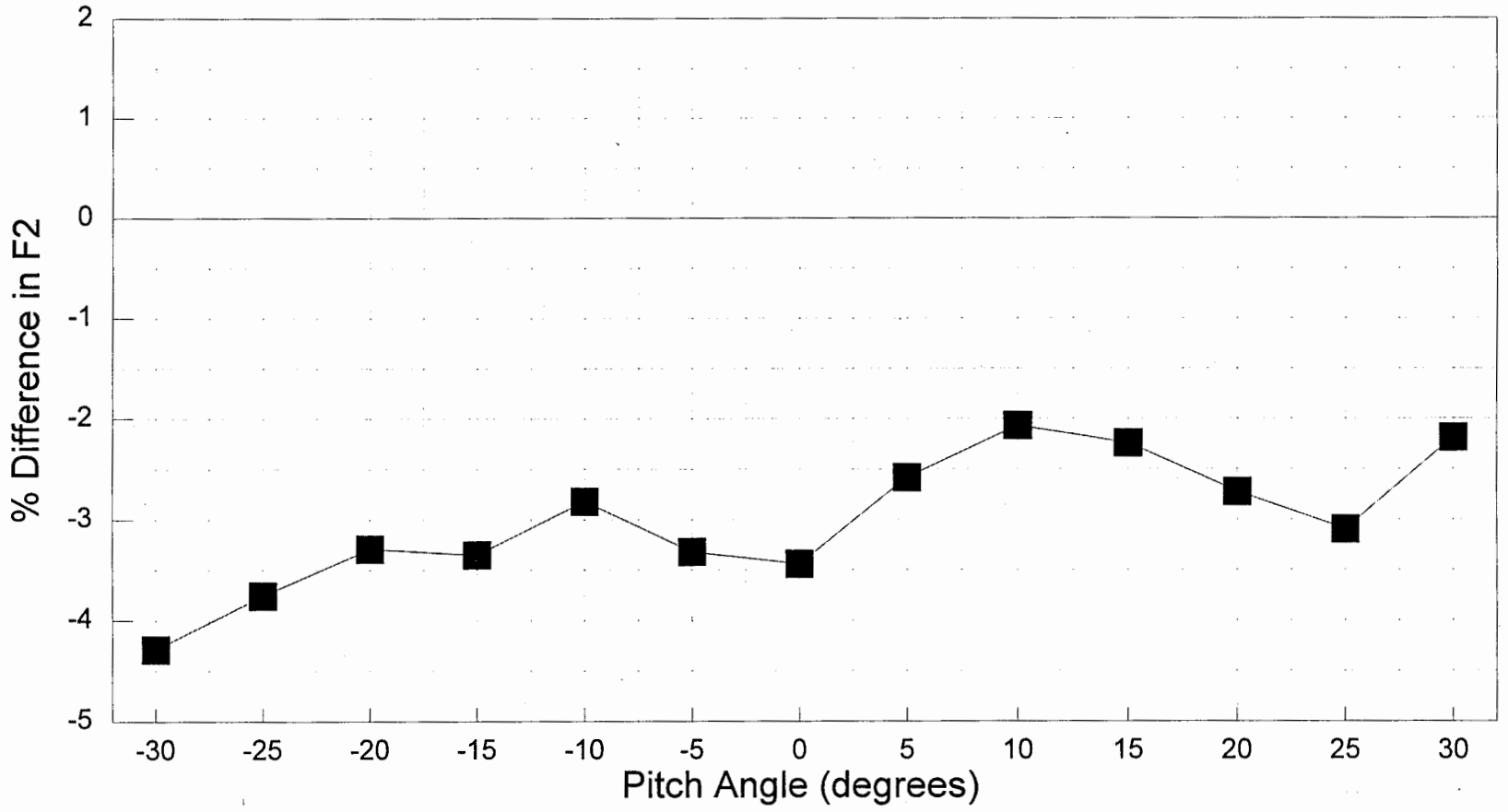

Figure C1-56. Spherical Probe 1 - Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration
F2
1.2
1.15
1.1
1.05
1
0.95
0.9
-30
-25
-20
-15
-10
-5
0
5
10
15
20
25
30
Pitch Angle (degrees)
04/05/97
6/29/97
7/21/97
10/28/97
Note: Each point is the mean of three replicates.

Figure C1-57. Spherical Probe 1: Percent Difference in F2 (Avg. 30-60 fps)
NCSU Pre- (6/29/97) and Post-Test (10/28/97) Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-87. Spherical Probe SPH-1 Calibrations at NC State Wind Tunnel June and October 1997

Pitch Angle	30 fps / June / 30-60 Calibration			30 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.80	29.38	25.50	30.04	30.72	26.60	0.79	4.56	4.31
-25	25.16	30.90	27.97	29.83	34.41	29.86	18.55	11.38	6.76
-20	19.91	30.94	29.09	22.39	32.93	30.45	12.42	6.44	4.67
-15	15.28	30.81	29.72	16.06	32.01	30.76	5.10	3.90	3.50
-10	9.93	30.73	30.27	10.49	31.67	31.14	5.56	3.06	2.88
-5	4.66	30.72	30.62	3.92	31.80	31.72	-15.92	3.51	3.61
0	1.85	30.82	30.80	1.97	31.88	31.85	6.53	3.44	3.42
5	5.19	30.85	30.72	7.52	31.81	31.53	44.68	3.11	2.63
10	9.74	30.99	30.51	11.90	31.88	31.18	22.13	2.87	2.20
15	15.58	31.03	29.87	16.02	31.82	30.57	2.83	2.54	2.34
20	20.42	31.03	29.08	19.80	31.79	29.90	-3.02	2.43	2.84
25	24.15	30.83	28.13	22.83	31.50	29.03	-5.46	2.17	3.20
30	29.23	30.78	26.86	28.27	31.26	27.53	-3.28	1.55	2.49

Pitch Angle	60 fps / June / 30-60 Calibration			60 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.74	55.55	48.24	30.02	58.11	50.31	0.95	4.61	4.30
-25	25.01	58.71	53.20	30.02	65.74	56.92	20.02	11.97	6.99
-20	20.20	58.67	55.07	22.75	62.66	57.78	12.63	6.79	4.93
-15	14.77	58.78	56.84	15.36	60.97	58.79	3.98	3.72	3.43
-10	10.17	58.91	57.98	10.73	60.75	59.69	5.50	3.12	2.93
-5	5.36	58.92	58.67	4.63	60.96	60.76	-13.64	3.45	3.57
0	0.93	58.76	58.75	0.89	60.87	60.86	-4.70	3.58	3.58
5	5.05	58.73	58.49	7.35	60.55	60.04	45.54	3.11	2.64
10	10.06	58.39	57.49	11.99	60.03	58.72	19.22	2.82	2.15
15	14.75	58.51	56.57	15.43	60.04	57.87	4.64	2.62	2.30
20	19.59	58.40	55.02	19.15	59.87	56.56	-2.25	2.51	2.79
25	25.64	58.82	53.02	24.22	59.95	54.67	-5.56	1.92	3.11
30	29.92	58.32	50.55	29.63	59.49	51.70	-0.98	2.00	2.29

Pitch Angle	90 fps / June / 30-60 Calibration			90 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.82	82.15	71.26	30.01	85.60	74.13	0.64	4.20	4.02
-25	24.71	87.41	79.41	29.90	98.06	85.00	21.02	12.18	7.05
-20	19.84	87.31	82.12	22.32	92.97	86.00	12.49	6.49	4.73
-15	14.72	87.50	84.63	15.29	90.75	87.53	3.87	3.71	3.43
-10	10.00	87.70	86.37	10.56	90.43	88.89	5.64	3.10	2.92
-5	6.13	87.65	87.15	5.60	90.57	90.14	-8.61	3.33	3.43
0	1.23	87.67	87.65	1.28	90.76	90.73	3.84	3.52	3.52
5	5.47	87.81	87.41	8.07	90.58	89.69	47.41	3.16	2.61
10	10.43	87.72	86.26	12.26	90.17	88.11	17.61	2.79	2.14
15	13.89	87.32	84.76	14.74	89.58	86.63	6.13	2.59	2.20
20	19.46	88.21	83.15	19.06	90.38	85.41	-2.06	2.47	2.73
25	25.77	88.68	79.86	24.35	90.35	82.31	-5.50	1.88	3.07
30	30.01	88.46	76.60	29.84	90.31	78.34	-0.57	2.09	2.26

Figure C1-58. Spherical Probe SPH-1 Pre- and Post-Test Calibrations

NC State Wind Tunnel -- June and October 1997

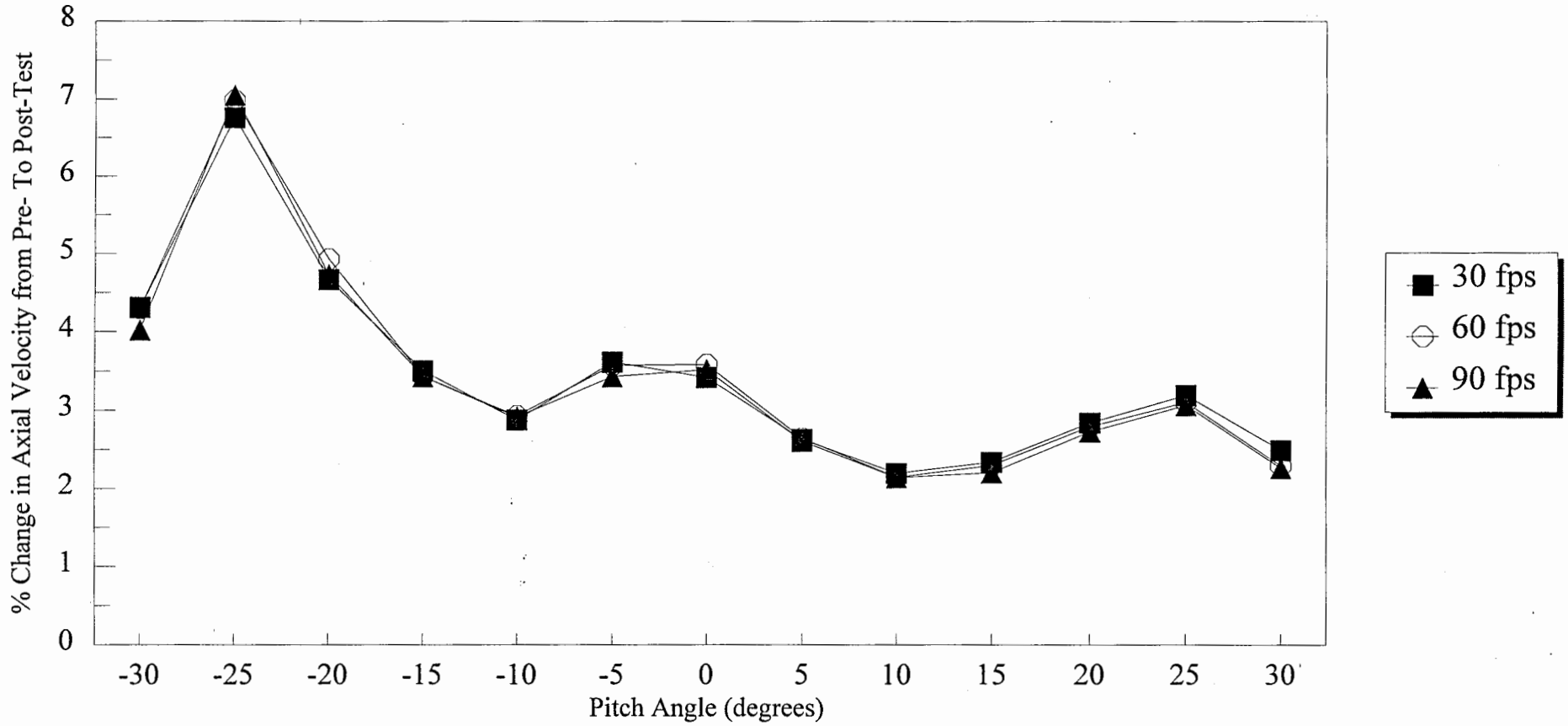


Table C1-88. Spherical Probe SPH-1 Calibrations at NC State Wind Tunnel June and July 1997

Pitch Angle	30 fps / June / 30-60 Calibration			30 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.80	29.38	25.50	30.04	29.46	25.51	0.79	0.28	0.04
-25	25.16	30.90	27.97	30.04	32.95	28.53	19.38	6.64	2.00
-20	19.91	30.94	29.09	24.51	32.24	29.33	23.07	4.21	0.83
-15	15.28	30.81	29.72	18.01	31.02	29.50	17.84	0.69	-0.74
-10	9.93	30.73	30.27	10.96	30.47	29.92	10.38	-0.83	-1.16
-5	4.66	30.72	30.62	5.46	30.48	30.34	17.07	-0.77	-0.89
0	1.85	30.82	30.80	2.37	30.60	30.57	27.72	-0.72	-0.74
5	5.19	30.85	30.72	5.87	30.61	30.44	13.01	-0.80	-0.92
10	9.74	30.99	30.51	9.93	30.66	30.17	1.90	-1.07	-1.11
15	15.58	31.03	29.87	15.36	30.67	29.56	-1.43	-1.19	-1.06
20	20.42	31.03	29.08	19.38	30.59	28.86	-5.08	-1.42	-0.76
25	24.15	30.83	28.13	22.27	30.36	28.09	-7.79	-1.55	-0.15
30	29.23	30.78	26.86	27.25	30.14	26.79	-6.76	-2.10	-0.27

Pitch Angle	60 fps / June / 30-60 Calibration			60 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.74	55.55	48.24	30.02	55.69	48.22	0.95	0.26	-0.40
-25	25.01	58.71	53.20	30.02	62.75	54.34	20.02	6.89	2.13
-20	20.20	58.67	55.07	24.68	61.07	55.49	22.22	4.08	0.77
-15	14.77	58.78	56.84	17.21	59.03	56.38	16.54	0.42	-0.80
-10	10.17	58.91	57.98	11.26	58.45	57.33	10.71	-0.78	-1.13
-5	5.36	58.92	58.67	6.10	58.48	58.14	13.74	-0.76	-0.89
0	0.93	58.76	58.75	1.46	58.36	58.34	56.20	-0.68	-0.70
5	5.05	58.73	58.49	5.74	58.26	57.96	13.62	-0.80	-0.91
10	10.06	58.39	57.49	10.03	57.68	56.80	-0.32	-1.20	-1.19
15	14.75	58.51	56.57	14.70	57.84	55.94	-0.32	-1.15	-1.12
20	19.59	58.40	55.02	18.72	57.63	54.59	-4.44	-1.32	-0.79
25	25.64	58.82	53.02	23.55	57.84	53.02	-8.17	-1.67	-0.01
30	29.92	58.32	50.55	28.88	57.53	50.37	-3.48	-1.35	-0.35

Pitch Angle	90 fps / June / 30-60 Calibration			90 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.82	82.15	71.26	30.01	82.03	71.04	0.64	-0.14	-0.31
-25	24.71	87.41	79.41	30.02	93.70	81.18	21.52	7.27	2.24
-20	19.84	87.31	82.12	24.24	90.66	82.68	22.18	3.87	0.69
-15	14.72	87.50	84.63	17.13	87.85	83.95	16.38	0.40	-0.80
-10	10.00	87.70	86.37	11.06	87.01	85.40	10.62	-0.79	-1.13
-5	6.13	87.65	87.15	6.89	86.93	86.30	12.40	-0.82	-0.97
0	1.23	87.67	87.65	1.61	87.06	87.02	30.09	-0.70	-0.72
5	5.47	87.81	87.41	6.16	87.12	86.61	12.54	-0.79	-0.91
10	10.43	87.72	86.26	10.41	86.68	85.24	-0.12	-1.18	-1.18
15	13.89	87.32	84.76	13.89	86.32	83.79	-0.03	-1.15	-1.14
20	19.46	88.21	83.15	18.62	86.98	82.41	-4.33	-1.39	-0.88
25	25.77	88.68	79.86	23.67	87.17	79.84	-8.13	-1.70	-0.03
30	30.01	88.46	76.60	28.75	87.09	76.36	-4.21	-1.55	-0.32

Figure C1-59. Spherical Probe SPH-1 Pre- and Intermediate Calibrations

NC State Wind Tunnel -- June and July 1997

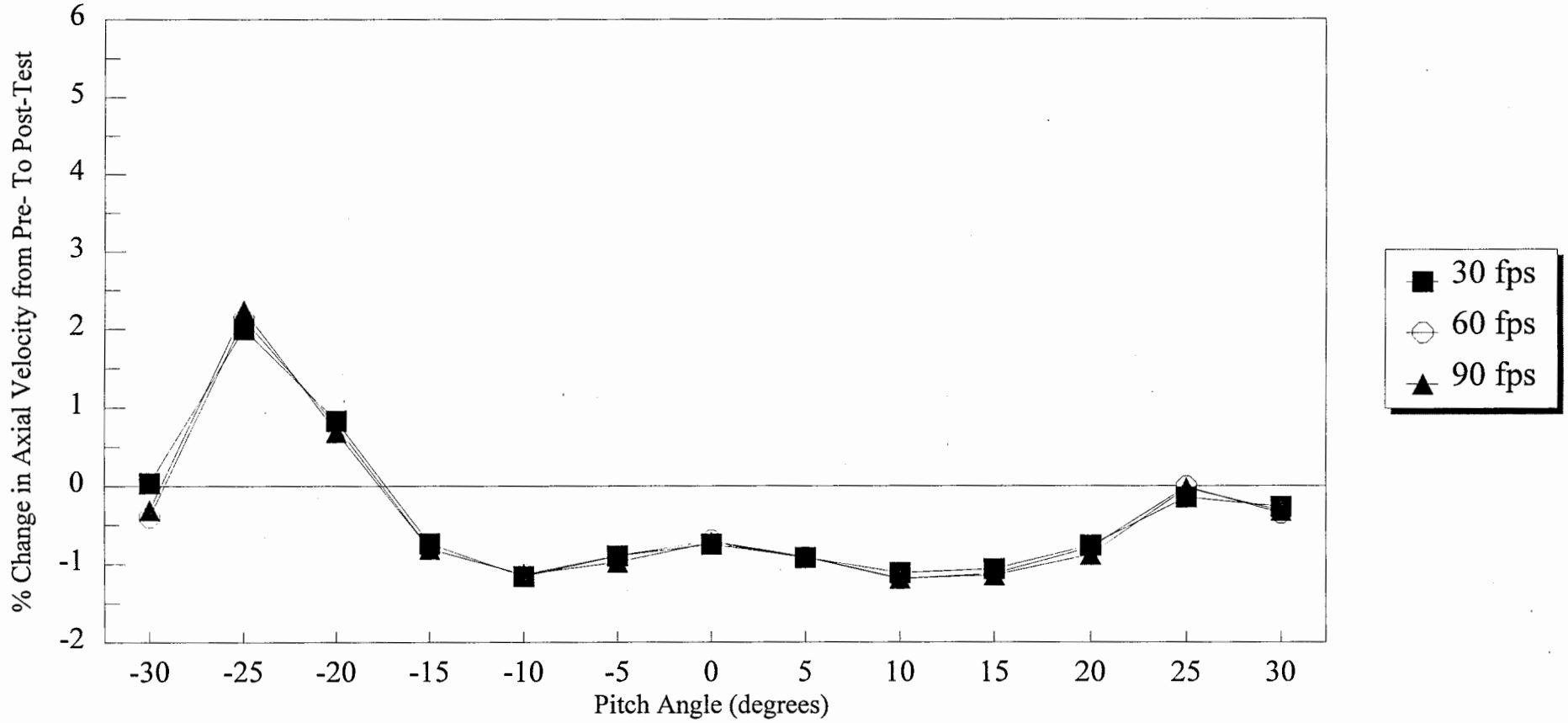


Table C1-89. Spherical Probe SPH-1 Calibrations at NC State Wind Tunnel July and October 1997

Pitch Angle	30 fps / June / 30-60 Calibration			30 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.04	29.46	25.51	30.04	30.72	26.60	0.00	4.27	4.27
-25	30.04	32.95	28.53	29.83	34.41	29.86	-0.70	4.44	4.66
-20	24.51	32.24	29.33	22.39	32.93	30.45	-8.65	2.14	3.80
-15	18.01	31.02	29.50	16.06	32.01	30.76	-10.81	3.19	4.27
-10	10.96	30.47	29.92	10.49	31.67	31.14	-4.37	3.92	4.08
-5	5.46	30.48	30.34	3.92	31.80	31.72	-28.18	4.32	4.54
0	2.37	30.60	30.57	1.97	31.88	31.85	-16.59	4.19	4.20
5	5.87	30.61	30.44	7.52	31.81	31.53	28.03	3.95	3.58
10	9.93	30.66	30.17	11.90	31.88	31.18	19.85	3.98	3.34
15	15.36	30.67	29.56	16.02	31.82	30.57	4.32	3.77	3.44
20	19.38	30.59	28.86	19.80	31.79	29.90	2.18	3.90	3.63
25	22.27	30.36	28.09	22.83	31.50	29.03	2.53	3.77	3.35
30	27.25	30.14	26.79	28.27	31.26	27.53	3.74	3.73	2.76

Pitch Angle	60 fps / June / 30-60 Calibration			60 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.02	55.69	48.22	30.02	58.11	50.31	0.00	4.34	4.34
-25	30.02	62.75	54.34	30.02	65.74	56.92	0.00	4.75	4.75
-20	24.68	61.07	55.49	22.75	62.66	57.78	-7.84	2.60	4.13
-15	17.21	59.03	56.38	15.36	60.97	58.79	-10.78	3.28	4.26
-10	11.26	58.45	57.33	10.73	60.75	59.69	-4.71	3.92	4.11
-5	6.10	58.48	57.14	4.63	60.96	60.76	-24.07	4.25	4.50
0	1.46	58.36	58.34	0.89	60.87	60.86	-38.99	4.29	4.31
5	5.74	58.26	57.96	7.35	60.55	60.04	28.10	3.94	3.59
10	10.03	57.68	56.80	11.99	60.03	58.72	19.61	4.07	3.38
15	14.70	57.84	55.94	15.43	60.04	57.87	4.98	3.81	3.46
20	18.72	57.63	54.59	19.15	59.87	56.56	2.29	3.88	3.62
25	23.55	57.84	53.02	24.22	59.95	54.67	2.84	3.65	3.12
30	28.88	57.53	50.37	29.63	59.49	51.70	2.59	3.40	2.65

Pitch Angle	90 fps / June / 30-60 Calibration			90 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.01	82.03	71.04	30.01	85.60	74.13	0.00	4.35	4.35
-25	30.02	93.77	81.18	29.90	98.06	85.00	-0.41	4.58	4.70
-20	24.24	90.68	82.68	22.32	92.97	86.00	-7.94	2.52	4.01
-15	17.13	87.85	83.95	15.29	90.75	87.53	-10.75	3.30	4.27
-10	11.06	87.01	85.40	10.56	90.43	88.89	-4.51	3.92	4.09
-5	6.89	86.93	86.30	5.60	90.57	90.14	-18.69	4.18	4.44
0	1.61	87.06	87.02	1.28	90.76	90.73	-20.18	4.25	4.27
5	6.16	87.12	88.61	8.07	90.58	89.69	30.98	3.98	3.55
10	10.41	86.68	85.24	12.26	90.17	88.11	17.76	4.03	3.36
15	13.89	86.32	83.79	14.74	89.58	86.63	6.16	3.78	3.39
20	18.62	86.98	82.41	19.06	90.38	85.41	2.38	3.91	3.64
25	23.67	87.17	79.84	24.35	90.35	82.31	2.86	3.64	3.10
30	28.75	87.09	76.36	29.84	90.31	78.34	3.80	3.70	2.59

Figure C1-60. Spherical Probe SPH-1 Intermediate and Post-Test Calibrations

NC State Wind Tunnel -- July and October 1997

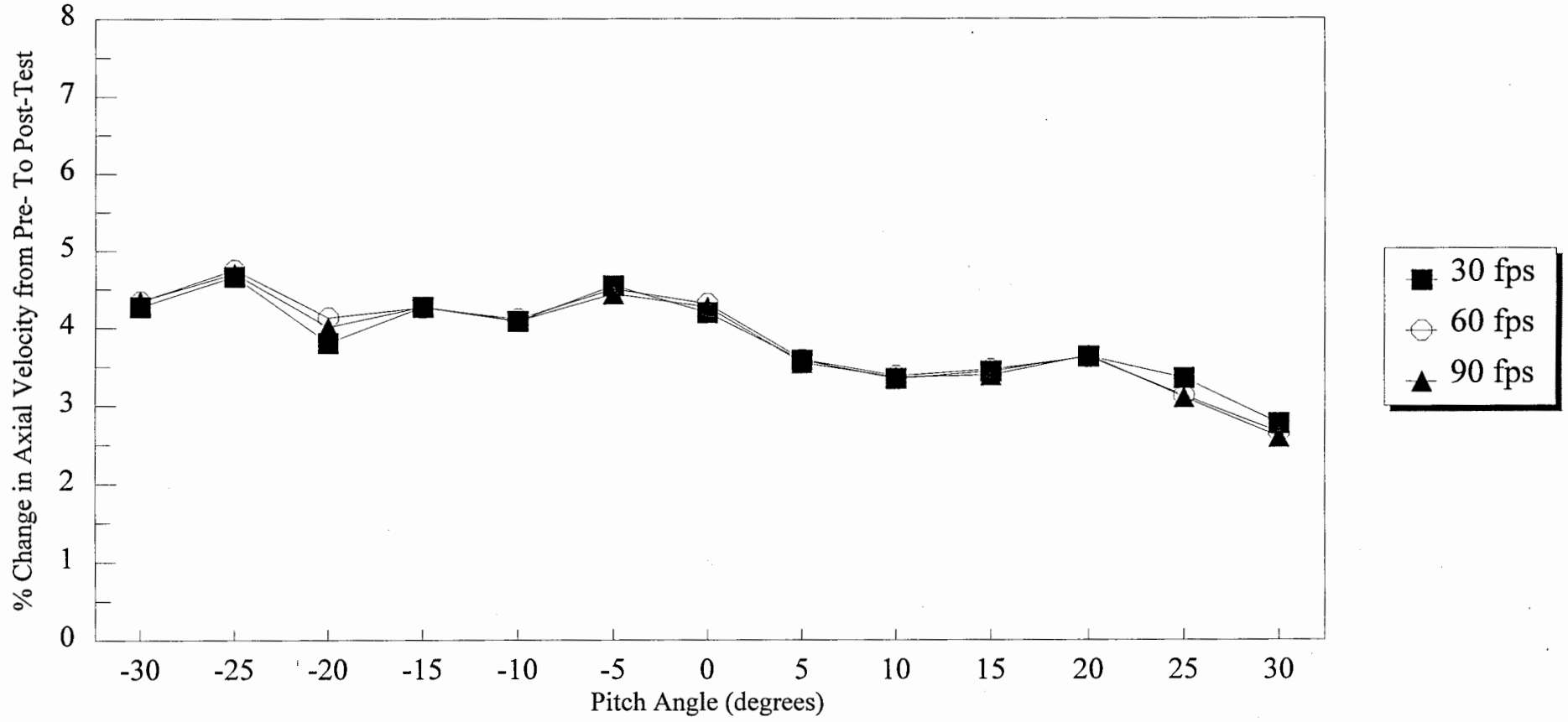


Table C1-90. Spherical SPH-1 Pre-test Computations - 30 fps

Probe: **Spherical SPH-1 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 06/29/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.61%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**29.16**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.2		0
Resultant Angle Standard Deviation:	9.26		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.6	-0.390	0.160	84	-30.0	30.0	0.2027	30.63	26.52
	-25	1.6	-0.400	0.183	84	-25.8	25.9	0.2068	30.94	27.84
	-20	1.3	-0.380	0.220	84	-19.0	19.0	0.2142	31.49	29.77
	-15	1.3	-0.320	0.220	84	-15.4	15.5	0.2059	30.88	29.76
	-10	0.9	-0.240	0.224	84	-10.3	10.4	0.2036	30.70	30.20
	-5	0.9	-0.140	0.225	84	-4.8	4.9	0.2028	30.64	30.53
	0	0.9	-0.085	0.225	84	-1.0	1.3	0.2039	30.73	30.72
	5	0.9	0.020	0.220	84	4.5	4.6	0.2036	30.71	30.61
	10	0.8	0.070	0.217	84	7.6	7.6	0.2046	30.78	30.51
	15	0.5	0.180	0.210	84	14.2	14.2	0.2064	30.91	29.97
	20	0.5	0.250	0.200	84	19.7	19.7	0.2062	30.90	29.09
	25	0.5	0.290	0.190	84	23.7	23.7	0.2061	30.89	28.28
	30	0.4	0.340	0.170	84	29.2	29.2	0.2048	30.79	26.87
2	-30	1.5	-0.390	0.165	83	-29.5	29.5	0.2063	30.88	26.87
	-25	1.4	-0.400	0.190	83	-24.4	24.4	0.2068	30.92	28.15
	-20	0.8	-0.370	0.205	83	-20.0	20.0	0.2018	30.54	28.70
	-15	0.8	-0.310	0.219	83	-14.9	14.9	0.2039	30.70	29.66
	-10	0.8	-0.230	0.225	83	-9.7	9.7	0.2040	30.71	30.27
	-5	0.6	-0.125	0.225	83	-3.7	3.8	0.2031	30.64	30.57
	0	0.6	-0.020	0.223	83	2.5	2.6	0.2046	30.75	30.72
	5	0.6	0.050	0.220	83	6.3	6.3	0.2057	30.83	30.65
	10	0.6	0.170	0.215	83	13.4	13.4	0.2103	31.17	30.33
	15	0.5	0.240	0.205	83	18.5	18.5	0.2092	31.09	29.48
	20	0.6	0.280	0.200	84	21.9	21.9	0.2119	31.32	29.07
	25	0.4	0.300	0.185	84	25.1	25.1	0.2042	30.75	27.86
	30	0.2	0.340	0.170	84	29.2	29.2	0.2048	30.79	26.87
3	-30	1.5	-0.390	0.164	83	-29.8	29.8	0.1535	26.63	23.10
	-25	1.6	-0.400	0.186	83	-25.1	25.2	0.2057	30.84	27.91
	-20	1.4	-0.380	0.205	83	-20.7	20.7	0.2052	30.80	28.80
	-15	1.2	-0.320	0.220	83	-15.4	15.5	0.2059	30.85	29.73
	-10	1.1	-0.230	0.226	83	-9.6	9.7	0.2049	30.77	30.33
	-5	1.1	-0.150	0.229	83	-5.2	5.3	0.2064	30.88	30.75
	0	1.1	-0.090	0.229	83	-1.2	1.6	0.2075	30.97	30.95
	5	1.1	0.020	0.225	83	4.5	4.6	0.2082	31.02	30.92
	10	0.7	0.080	0.220	83	8.2	8.2	0.2081	31.02	30.70
	15	0.7	0.180	0.213	83	14.0	14.0	0.2092	31.09	30.16
	20	0.7	0.250	0.200	83	19.7	19.7	0.2062	30.87	29.07
	25	0.7	0.290	0.190	83	23.7	23.7	0.2061	30.86	28.26
	30	0.4	0.340	0.170	83	29.2	29.2	0.2048	30.76	26.85

		Res	Vdir	Vax
Average	-30	29.80	29.38	25.50
	-25	25.16	30.90	27.97
	-20	19.91	30.94	29.09
	-15	15.28	30.81	29.72
	-10	9.93	30.73	30.27
	-5	4.66	30.72	30.62
	0	1.85	30.82	30.80
	5	5.19	30.85	30.72
	10	9.74	30.99	30.51
	15	15.58	31.03	29.87
	20	20.42	31.03	29.08
	25	24.15	30.83	28.13
	30	29.23	30.78	26.86

Table C1-91. Spherical SPH-1 Intermediate Computation - 30 fps

Probe: **Spherical SPH-1 / Intermediate 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 07/21/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.61%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**29.05**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	17.0	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.0		0
Resultant Angle Standard Deviation:	9.36		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.6	-0.390	0.160	84	-30.0	30.0	0.2016	30.55	26.45
	-25	1.6	-0.400	0.183	84	-30.0	30.0	0.2306	32.68	28.29
	-20	1.3	-0.380	0.220	84	-23.2	23.2	0.2284	32.52	29.90
	-15	1.3	-0.320	0.220	84	-18.2	18.3	0.2090	31.11	29.54
	-10	0.9	-0.240	0.224	84	-11.5	11.5	0.2006	30.47	29.86
	-5	0.9	-0.140	0.225	84	-5.6	5.6	0.1997	30.41	30.26
	0	0.9	-0.085	0.225	84	-1.9	2.1	0.2011	30.52	30.50
	5	0.9	0.020	0.220	84	5.3	5.4	0.2005	30.47	30.34
	10	0.8	0.070	0.217	84	7.9	8.0	0.2005	30.47	30.18
	15	0.5	0.180	0.210	84	14.2	14.2	0.2017	30.56	29.63
	20	0.5	0.250	0.200	84	18.8	18.8	0.2008	30.49	28.87
	25	0.5	0.290	0.190	84	21.9	21.9	0.1997	30.41	28.21
	30	0.4	0.340	0.170	84	27.3	27.3	0.1963	30.15	26.80
2	-30	1.5	-0.390	0.165	83	-30.0	30.0	0.2079	31.00	26.84
	-25	1.4	-0.400	0.190	83	-30.0	30.0	0.2394	33.26	28.80
	-20	0.8	-0.370	0.205	83	-24.4	24.5	0.2186	31.79	28.94
	-15	0.8	-0.310	0.219	83	-17.4	17.5	0.2061	30.86	29.44
	-10	0.8	-0.230	0.225	83	-10.7	10.7	0.2005	30.44	29.91
	-5	0.6	-0.125	0.225	83	-4.6	4.7	0.1999	30.39	30.29
	0	0.6	-0.020	0.223	83	2.6	2.7	0.2016	30.52	30.49
	5	0.6	0.050	0.220	83	6.8	6.9	0.2022	30.57	30.35
	10	0.6	0.170	0.215	83	13.4	13.4	0.2054	30.81	29.98
	15	0.5	0.240	0.205	83	17.9	17.9	0.2039	30.70	29.22
	20	0.6	0.280	0.200	84	20.5	20.5	0.2052	30.82	28.86
	25	0.4	0.300	0.185	84	23.0	23.0	0.1980	30.28	27.88
	30	0.2	0.340	0.170	84	27.3	27.3	0.1963	30.15	26.80
3	-30	1.5	-0.390	0.164	83	-30.0	30.0	0.1558	26.84	23.23
	-25	1.6	-0.400	0.186	83	-30.0	30.0	0.2344	32.91	28.49
	-20	1.4	-0.380	0.205	83	-25.8	25.9	0.2274	32.42	29.17
	-15	1.2	-0.320	0.220	83	-18.2	18.3	0.2090	31.08	29.51
	-10	1.1	-0.230	0.226	83	-10.6	10.7	0.2013	30.50	29.98
	-5	1.1	-0.150	0.229	83	-6.0	6.1	0.2033	30.65	30.48
	0	1.1	-0.090	0.229	83	-2.1	2.4	0.2046	30.75	30.72
	5	1.1	0.020	0.225	83	5.3	5.4	0.2050	30.78	30.65
	10	0.7	0.080	0.220	83	8.4	8.4	0.2038	30.69	30.36
	15	0.7	0.180	0.213	83	14.0	14.0	0.2044	30.74	29.82
	20	0.7	0.250	0.200	83	18.8	18.8	0.2008	30.47	28.84
	25	0.7	0.290	0.190	83	21.9	21.9	0.1997	30.38	28.18
	30	0.4	0.340	0.170	83	27.3	27.3	0.1963	30.12	26.78

		Res		Vdir	Vax
Average	-30	30.04		29.46	25.51
	-25	30.04		32.95	28.53
	-20	24.51		32.24	29.33
	-15	18.01		31.02	29.50
	-10	10.96		30.47	29.92
	-5	5.46		30.48	30.34
	0	2.37		30.60	30.57
	5	5.87		30.61	30.44
	10	9.93		30.66	30.17
	15	15.36		30.67	29.56
	20	19.38		30.59	28.86
	25	22.27		30.36	28.09
	30	27.25		30.14	26.79

Table C1-92. Spherical SPH-1 Post-test Computations - 30 fps

Probe: **Spherical SPH-1 / Post-Test 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 10/28/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.61%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**30.16**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.0		0
Resultant Angle Standard Deviation:	9.32		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.6	-0.390	0.160	84	-30.0	30.0	0.2212	32.01	27.71
	-25	1.6	-0.400	0.183	84	-30.0	30.0	0.2530	34.23	29.63
	-20	1.3	-0.380	0.220	84	-21.3	21.3	0.2392	33.28	31.01
	-15	1.3	-0.320	0.220	84	-16.3	16.3	0.2225	32.10	30.80
	-10	0.9	-0.240	0.224	84	-10.9	10.9	0.2166	31.67	31.10
	-5	0.9	-0.140	0.225	84	-4.0	4.1	0.2173	31.72	31.64
	0	0.9	-0.085	0.225	84	-0.4	1.0	0.2189	31.83	31.83
	5	0.9	0.020	0.220	84	6.6	6.6	0.2164	31.66	31.44
	10	0.8	0.070	0.217	84	10.5	10.5	0.2173	31.72	31.19
	15	0.5	0.180	0.210	84	14.9	14.9	0.2169	31.69	30.63
	20	0.5	0.250	0.200	84	19.2	19.2	0.2167	31.68	29.91
	25	0.5	0.290	0.190	84	22.5	22.5	0.2152	31.57	29.17
	30	0.4	0.340	0.170	84	28.3	28.3	0.2112	31.27	27.54
2	-30	1.5	-0.390	0.165	83	-30.0	30.0	0.2281	32.47	28.11
	-25	1.4	-0.400	0.190	83	-29.4	29.4	0.2581	34.54	30.09
	-20	0.8	-0.370	0.205	83	-22.5	22.5	0.2300	32.60	30.12
	-15	0.8	-0.310	0.219	83	-15.5	15.5	0.2197	31.86	30.70
	-10	0.8	-0.230	0.225	83	-10.3	10.3	0.2165	31.64	31.13
	-5	0.6	-0.125	0.225	83	-3.0	3.1	0.2177	31.72	31.68
	0	0.6	-0.020	0.223	83	3.6	3.7	0.2177	31.72	31.66
	5	0.6	0.050	0.220	83	9.3	9.3	0.2188	31.80	31.39
	10	0.6	0.170	0.215	83	14.3	14.4	0.2213	31.98	30.98
	15	0.5	0.240	0.205	83	18.3	18.3	0.2200	31.89	30.27
	20	0.6	0.280	0.200	84	20.9	21.0	0.2216	32.04	29.92
	25	0.4	0.300	0.185	84	23.6	23.6	0.2129	31.40	28.78
	30	0.2	0.340	0.170	84	28.3	28.3	0.2112	31.27	27.54
3	-30	1.5	-0.390	0.164	83	-30.0	30.0	0.1658	27.69	23.97
	-25	1.6	-0.400	0.186	83	-30.0	30.0	0.2572	34.48	29.85
	-20	1.4	-0.380	0.205	83	-23.3	23.3	0.2345	32.92	30.22
	-15	1.2	-0.320	0.220	83	-16.3	16.3	0.2225	32.07	30.77
	-10	1.1	-0.230	0.226	83	-10.2	10.2	0.2174	31.70	31.19
	-5	1.1	-0.150	0.229	83	-4.5	4.6	0.2209	31.96	31.85
	0	1.1	-0.090	0.229	83	-0.6	1.3	0.2227	32.08	32.07
	5	1.1	0.020	0.225	83	6.5	6.6	0.2213	31.98	31.77
	10	0.7	0.080	0.220	83	10.8	10.8	0.2208	31.95	31.38
	15	0.7	0.180	0.213	83	14.8	14.8	0.2199	31.88	30.82
	20	0.7	0.250	0.200	83	19.2	19.2	0.2167	31.65	29.88
	25	0.7	0.290	0.190	83	22.5	22.5	0.2152	31.54	29.15
	30	0.4	0.340	0.170	83	28.3	28.3	0.2112	31.24	27.52

		Res		Vdir	Vax
Average	-30	30.04		30.72	26.60
	-25	29.83		34.41	29.86
	-20	22.39		32.93	30.45
	-15	16.06		32.01	30.76
	-10	10.49		31.67	31.14
	-5	3.92		31.80	31.72
	0	1.97		31.88	31.85
	5	7.52		31.81	31.53
	10	11.90		31.88	31.18
	15	16.02		31.82	30.57
	20	19.80		31.79	29.90
	25	22.83		31.50	29.03
	30	28.27		31.26	27.53

Table C1-93. Spherical SPH-1 Pre-test Computations - 60 fps

Probe: **Spherical SPH-1 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **60 fps** Cal Date: 06/29/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.84%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**55.38**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.2		0
Resultant Angle Standard Deviation:	9.41		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.2	-1.400	0.590	85	-29.7	29.7	0.7413	58.64	50.93
	-25	-1.2	-1.440	0.670	85	-25.1	25.1	0.7405	58.61	53.07
	-20	-0.9	-1.350	0.750	85	-19.9	19.9	0.7377	58.50	54.99
	-15	-0.7	-1.100	0.800	85	-14.4	14.4	0.7427	58.70	56.86
	-10	-0.7	-0.860	0.830	85	-9.9	9.9	0.7528	59.09	58.22
	-5	-0.7	-0.540	0.840	85	-5.1	5.1	0.7568	59.25	59.01
	0	-0.6	-0.250	0.820	85	0.1	0.6	0.7447	58.78	58.77
	5	-0.2	0.090	0.800	85	4.8	4.8	0.7412	58.64	58.43
	10	0.5	0.400	0.770	85	10.2	10.3	0.7381	58.51	57.58
	15	-0.6	0.740	0.750	85	15.8	15.8	0.7468	58.86	56.62
	20	-0.4	0.910	0.720	84	19.9	19.9	0.7438	58.69	55.18
	25	0.0	1.150	0.670	84	26.1	26.1	0.7565	59.18	53.15
	30	-0.3	1.250	0.610	84	29.8	29.8	0.7428	58.65	50.90
2	-30	-1.3	-1.370	0.580	85	-29.5	29.5	0.7245	57.97	50.46
	-25	-1.1	-1.450	0.680	85	-24.8	24.8	0.7467	58.85	53.41
	-20	-1.1	-1.370	0.750	85	-20.3	20.3	0.7437	58.73	55.08
	-15	-0.9	-1.150	0.800	85	-15.2	15.2	0.7468	58.86	56.79
	-10	-0.9	-0.900	0.820	85	-10.7	10.7	0.7466	58.85	57.82
	-5	-0.7	-0.550	0.820	85	-5.4	5.5	0.7392	58.56	58.29
	0	-0.6	-0.330	0.820	85	-1.4	1.5	0.7428	58.70	58.68
	5	-0.5	0.050	0.810	86	4.2	4.2	0.7487	58.99	58.82
	10	0.7	0.350	0.770	86	9.4	9.4	0.7342	58.41	57.62
	15	0.7	0.600	0.750	86	13.5	13.5	0.7340	58.41	56.79
	20	0.5	0.850	0.710	86	18.9	18.9	0.7271	58.13	54.99
	25	0.2	1.100	0.670	86	25.3	25.3	0.7432	58.77	53.14
	30	-0.2	1.300	0.600	86	30.0	30.0	0.7339	58.40	50.58
3	-30	1.0	-1.400	0.580	86	-30.0	30.0	0.5385	50.02	43.31
	-25	1.1	-1.440	0.670	86	-25.1	25.1	0.7405	58.66	53.12
	-20	1.2	-1.370	0.750	86	-20.3	20.3	0.7437	58.79	55.13
	-15	-0.8	-1.120	0.800	86	-14.7	14.7	0.7440	58.80	56.87
	-10	-0.8	-0.850	0.820	86	-9.9	9.9	0.7438	58.79	57.92
	-5	-0.7	-0.560	0.830	86	-5.5	5.5	0.7482	58.97	58.70
	0	-0.7	-0.260	0.820	86	-0.0	0.7	0.7443	58.81	58.81
	5	-0.5	0.170	0.790	86	6.1	6.1	0.7379	58.56	58.22
	10	0.6	0.410	0.760	86	10.5	10.5	0.7296	58.23	57.26
	15	-0.6	0.680	0.740	86	14.9	14.9	0.7306	58.27	56.31
	20	-0.4	0.900	0.710	86	19.9	19.9	0.7338	58.40	54.89
	25	0.2	1.100	0.660	86	25.6	25.6	0.7365	58.50	52.78
	30	-0.2	1.300	0.590	86	30.0	30.0	0.7217	57.91	50.15

		Res	Vdir	Vax
Average	-30	29.74	55.55	48.24
	-25	25.01	58.71	53.20
	-20	20.20	58.67	55.07
	-15	14.77	58.78	56.84
	-10	10.17	58.91	57.98
	-5	5.36	58.92	58.67
	0	0.93	58.76	58.75
	5	5.05	58.73	58.49
	10	10.06	58.39	57.49
	15	14.75	58.51	56.57
	20	19.59	58.40	55.02
	25	25.64	58.82	53.02
	30	29.92	58.32	50.55

Table C1-94. Spherical SPH-1 Intermediate Computations - 60 fps

Probe: **Spherical SPH-1 / Intermediate 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 07/29/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.84%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**55.15**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	17.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.1		0
Resultant Angle Standard Deviation:	9.58		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.2	-1.400	0.590	85	-30.0	30.0	0.7434	58.72	50.85
	-25	-1.2	-1.440	0.670	85	-30.0	30.0	0.8442	62.58	54.18
	-20	-0.9	-1.350	0.750	85	-24.4	24.4	0.7986	60.86	55.44
	-15	-0.7	-1.100	0.800	85	-16.6	16.6	0.7454	58.80	56.35
	-10	-0.7	-0.860	0.830	85	-10.9	10.9	0.7407	58.62	57.55
	-5	-0.7	-0.540	0.840	85	-5.8	5.9	0.7456	58.81	58.50
	0	-0.6	-0.250	0.820	85	-0.7	0.9	0.7348	58.38	58.38
	5	-0.2	0.090	0.800	85	5.5	5.5	0.7300	58.19	57.92
	10	0.5	0.400	0.770	85	10.2	10.2	0.7202	57.80	56.89
	15	-0.6	0.740	0.750	85	15.7	15.7	0.7296	58.18	56.01
	20	-0.4	0.910	0.720	84	19.0	19.0	0.7241	57.90	54.76
	25	0.0	1.150	0.670	84	24.0	24.0	0.7298	58.13	53.10
	30	-0.3	1.250	0.610	84	27.8	27.8	0.7116	57.40	50.76
2	-30	-1.3	-1.370	0.580	85	-30.0	30.0	0.7308	58.22	50.41
	-25	-1.1	-1.450	0.680	85	-30.0	30.0	0.8568	63.04	54.59
	-20	-1.1	-1.370	0.750	85	-24.8	24.8	0.8059	61.14	55.49
	-15	-0.9	-1.150	0.800	85	-17.9	17.9	0.7570	59.26	56.38
	-10	-0.9	-0.900	0.820	85	-11.9	11.9	0.7360	58.43	57.17
	-5	-0.7	-0.550	0.820	85	-6.2	6.2	0.7278	58.11	57.77
	0	-0.6	-0.330	0.820	85	-2.2	2.3	0.7323	58.28	58.24
	5	-0.5	0.050	0.810	86	4.9	5.0	0.7369	58.52	58.30
	10	0.7	0.350	0.770	86	9.4	9.5	0.7172	57.73	56.95
	15	0.7	0.600	0.750	86	13.5	13.5	0.7172	57.73	56.14
	20	0.5	0.850	0.710	86	18.2	18.2	0.7085	57.38	54.52
	25	0.2	1.100	0.670	86	23.2	23.2	0.7198	57.84	53.17
	30	-0.2	1.300	0.600	86	29.2	29.2	0.7172	57.73	50.40
3	-30	1.0	-1.400	0.580	86	-30.0	30.0	0.5404	50.11	43.39
	-25	1.1	-1.440	0.670	86	-30.0	30.0	0.8442	62.64	54.23
	-20	1.2	-1.370	0.750	86	-24.8	24.8	0.8059	61.20	55.54
	-15	-0.8	-1.120	0.800	86	-17.1	17.1	0.7500	59.04	56.42
	-10	-0.8	-0.850	0.820	86	-10.9	10.9	0.7318	58.32	57.26
	-5	-0.7	-0.560	0.830	86	-6.2	6.2	0.7367	58.51	58.16
	0	-0.7	-0.260	0.820	86	-0.9	1.1	0.7345	58.42	58.41
	5	-0.5	0.170	0.790	86	6.7	6.7	0.7254	58.06	57.66
	10	0.6	0.410	0.760	86	10.4	10.4	0.7120	57.52	56.57
	15	-0.6	0.680	0.740	86	14.9	14.9	0.7142	57.61	55.67
	20	-0.4	0.900	0.710	86	19.0	19.0	0.7144	57.62	54.48
	25	0.2	1.100	0.660	86	23.5	23.5	0.7124	57.54	52.78
	30	-0.2	1.300	0.590	86	29.6	29.6	0.7105	57.46	49.95

		Res	Vdir	Vax
Average	-30	30.02	55.69	48.22
	-25	30.02	62.75	54.34
	-20	24.68	61.07	55.49
	-15	17.21	59.03	56.38
	-10	11.26	58.45	57.33
	-5	6.10	58.48	58.14
	0	1.46	58.36	58.34
	5	5.74	58.26	57.96
	10	10.03	57.68	56.80
	15	14.70	57.84	55.94
	20	18.72	57.63	54.59
	25	23.55	57.84	53.02
	30	28.88	57.53	50.37

Table C1-95. Spherical SPH-1 Post-test Computations - 60 fps

Probe: **Spherical SPH-1 / Post-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 10/28/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.84%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**57.28**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	17.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.1		0
Resultant Angle Standard Deviation:	9.60		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.2	-1.400	0.590	85	-30.0	30.0	0.8158	61.52	53.26
	-25	-1.2	-1.440	0.670	85	-30.0	30.0	0.9264	65.55	56.76
	-20	-0.9	-1.350	0.750	85	-22.4	22.5	0.8398	62.42	57.68
	-15	-0.7	-1.100	0.800	85	-14.8	14.9	0.7967	60.79	58.76
	-10	-0.7	-0.860	0.830	85	-10.4	10.5	0.7999	60.91	59.90
	-5	-0.7	-0.540	0.840	85	-4.3	4.3	0.8108	61.33	61.15
	0	-0.6	-0.250	0.820	85	0.6	0.9	0.7987	60.87	60.86
	5	-0.2	0.090	0.800	85	7.0	7.0	0.7884	60.48	60.02
	10	0.5	0.400	0.770	85	12.1	12.1	0.7800	60.15	58.81
	15	-0.6	0.740	0.750	85	16.3	16.3	0.7868	60.41	57.98
	20	-0.4	0.910	0.720	84	19.4	19.4	0.7815	60.15	56.75
	25	0.0	1.150	0.670	84	24.7	24.7	0.7835	60.23	54.72
	30	-0.3	1.250	0.610	84	28.9	28.9	0.7657	59.54	52.13
2	-30	-1.3	-1.370	0.580	85	-30.0	30.0	0.8019	60.99	52.81
	-25	-1.1	-1.450	0.680	85	-30.0	30.0	0.9402	66.04	57.18
	-20	-1.1	-1.370	0.750	85	-22.9	22.9	0.8488	62.75	57.80
	-15	-0.9	-1.150	0.800	85	-15.9	16.0	0.8061	61.15	58.79
	-10	-0.9	-0.900	0.820	85	-11.2	11.3	0.7950	60.73	59.56
	-5	-0.7	-0.550	0.820	85	-4.7	4.7	0.7908	60.57	60.36
	0	-0.6	-0.330	0.820	85	-0.8	1.0	0.7971	60.81	60.80
	5	-0.5	0.050	0.810	86	6.0	6.0	0.7950	60.78	60.44
	10	0.7	0.350	0.770	86	11.6	11.6	0.7770	60.09	58.87
	15	0.7	0.600	0.750	86	14.4	14.4	0.7722	59.91	58.01
	20	0.5	0.850	0.710	86	18.6	18.6	0.7644	59.60	56.48
	25	0.2	1.100	0.670	86	23.8	23.8	0.7738	59.97	54.86
	30	-0.2	1.300	0.600	86	30.0	30.0	0.7671	59.71	51.71
3	-30	1.0	-1.400	0.580	86	-30.0	30.0	0.5776	51.81	44.86
	-25	1.1	-1.440	0.670	86	-30.0	30.0	0.9264	65.61	56.81
	-20	1.2	-1.370	0.750	86	-22.9	22.9	0.8488	62.80	57.85
	-15	-0.8	-1.120	0.800	86	-15.2	15.3	0.7998	60.96	58.82
	-10	-0.8	-0.850	0.820	86	-10.4	10.5	0.7903	60.60	59.59
	-5	-0.7	-0.560	0.830	86	-4.8	4.8	0.8004	60.99	60.77
	0	-0.7	-0.260	0.820	86	0.4	0.8	0.7986	60.92	60.92
	5	-0.5	0.170	0.790	86	9.0	9.0	0.7851	60.40	59.65
	10	0.6	0.410	0.760	86	12.3	12.3	0.7708	59.85	58.48
	15	-0.6	0.680	0.740	86	15.5	15.6	0.7698	59.81	57.62
	20	-0.4	0.900	0.710	86	19.4	19.4	0.7710	59.86	56.45
	25	0.2	1.100	0.660	86	24.1	24.1	0.7655	59.64	54.44
	30	-0.2	1.300	0.590	86	30.0	30.0	0.7543	59.21	51.27

		Res		Vdir	Vax
Average	-30	30.02		58.11	50.31
	-25	30.02		65.74	56.92
	-20	22.75		62.66	57.78
	-15	15.36		60.97	58.79
	-10	10.73		60.75	59.69
	-5	4.63		60.96	60.76
	0	0.89		60.87	60.86
	5	7.35		60.55	60.04
	10	11.99		60.03	58.72
	15	15.43		60.04	57.87
	20	19.15		59.87	56.56
	25	24.22		59.95	54.67
	30	29.63		59.49	51.70

table C1-96. Spherical SPH-1 Post-test Computations - 90 fps

Probe: **Spherical SPH-1 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **90 fps** Cal Date: 06/29/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**82.82**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.3	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.26		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.6	-3.050	1.250	91	-30.0	30.0	1.5834	86.17	74.62
	-25	-1.3	-3.150	1.490	91	-24.5	24.6	1.6266	87.34	79.43
	-20	-0.9	-2.900	1.650	90	-19.4	19.4	1.6133	86.90	81.98
	-15	-0.8	-2.400	1.750	90	-14.3	14.3	1.6242	87.20	84.48
	-10	-0.7	-1.900	1.800	89	-10.1	10.1	1.6339	87.38	86.01
	-5	-0.5	-1.320	1.800	89	-6.2	6.2	1.6243	87.12	86.61
	0	-0.6	-0.600	1.800	89	-0.3	0.7	1.6333	87.36	87.35
	5	-0.5	0.290	1.770	89	5.4	5.4	1.6460	87.70	87.30
	10	0.4	1.000	1.710	88	11.0	11.0	1.6472	87.65	86.04
	15	0.2	1.500	1.650	88	14.8	14.8	1.6278	87.14	84.26
	20	-0.2	2.150	1.590	87	21.2	21.2	1.6696	88.17	82.22
	25	0.6	2.550	1.490	87	26.0	26.1	1.6803	88.45	79.46
	30	-0.9	2.900	1.370	86	30.0	30.0	1.6758	88.25	76.42
2	-30	-0.9	-3.000	1.250	91	-30.0	30.0	1.5834	86.17	74.62
	-25	-1.3	-3.150	1.480	91	-24.7	24.8	1.6230	87.25	79.21
	-20	-1.1	-3.000	1.640	92	-20.3	20.4	1.6276	87.45	81.98
	-15	-0.8	-2.500	1.750	92	-15.1	15.1	1.6314	87.55	84.53
	-10	-0.7	-1.850	1.800	92	-9.8	9.8	1.6324	87.58	86.30
	-5	-0.7	-1.330	1.820	93	-6.1	6.2	1.6422	87.92	87.41
	0	-0.6	-0.760	1.800	93	-1.7	1.8	1.6298	87.59	87.54
	5	-0.2	0.290	1.750	93	5.5	5.5	1.6277	87.53	87.13
	10	0.7	0.750	1.710	93	9.2	9.2	1.6283	87.54	86.42
	15	0.8	1.280	1.660	94	13.2	13.2	1.6212	87.43	85.13
	20	0.3	1.950	1.630	94	18.9	18.9	1.6691	88.71	83.93
	25	0.7	2.500	1.500	94	25.6	25.6	1.6738	88.84	80.14
	30	0.9	2.900	1.370	94	30.0	30.0	1.6758	88.89	76.98
3	-30	-0.9	-2.950	1.250	96	-29.4	29.4	1.1602	74.10	64.53
	-25	-1.0	-3.150	1.480	96	-24.7	24.8	1.6230	87.64	79.58
	-20	-1.0	-2.950	1.650	96	-19.8	19.8	1.6202	87.56	82.40
	-15	-0.8	-2.450	1.750	96	-14.7	14.7	1.6275	87.76	84.88
	-10	-0.8	-1.900	1.810	96	-10.0	10.1	1.6423	88.16	86.80
	-5	0.5	-1.300	1.810	96	-6.0	6.0	1.6329	87.91	87.42
	0	-0.5	-0.380	1.800	95	1.2	1.3	1.6421	88.08	88.05
	5	-0.4	0.300	1.770	95	5.5	5.5	1.6468	88.20	87.79
	10	0.7	1.000	1.700	95	11.0	11.1	1.6380	87.96	86.33
	15	0.8	1.350	1.650	95	13.7	13.7	1.6170	87.40	84.90
	20	0.5	1.850	1.600	95	18.3	18.3	1.6297	87.74	83.29
	25	0.7	2.500	1.490	95	25.7	25.7	1.6670	88.74	79.97
	30	0.9	2.900	1.350	94	30.0	30.0	1.6514	88.24	76.41

		Res		Vdir	Vax
Average	-30	29.82		82.15	71.26
	-25	24.71		87.41	79.41
	-20	19.84		87.31	82.12
	-15	14.72		87.50	84.63
	-10	10.00		87.70	86.37
	-5	6.13		87.65	87.15
	0	1.23		87.67	87.65
	5	5.47		87.81	87.41
	10	10.43		87.72	86.26
	15	13.89		87.32	84.76
	20	19.46		88.21	83.15
	25	25.77		88.68	79.86
	30	30.01		88.46	76.60

Table C1-97. Spherical SPH-1 Intermediate Computations - 90 fps

Probe: **Spherical SPH-1 / Intermediate 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 07/21/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**82.45**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	17.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.1		0
Resultant Angle Standard Deviation:	9.42		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.6	-3.050	1.250	91	-30.0	30.0	1.5750	85.95	74.43
	-25	-1.3	-3.150	1.490	91	-30.0	30.0	1.8774	93.83	81.24
	-20	-0.9	-2.900	1.650	90	-23.7	23.7	1.7314	90.03	82.45
	-15	-0.8	-2.400	1.750	90	-16.5	16.5	1.6291	87.33	83.72
	-10	-0.7	-1.900	1.800	89	-11.2	11.2	1.6092	86.72	85.05
	-5	-0.5	-1.320	1.800	89	-6.9	7.0	1.5977	86.40	85.77
	0	-0.6	-0.600	1.800	89	-1.2	1.3	1.6114	86.77	86.75
	5	-0.5	0.290	1.770	89	6.1	6.1	1.6202	87.01	86.51
	10	0.4	1.000	1.710	88	10.9	11.0	1.6077	86.60	85.02
	15	0.2	1.500	1.650	88	14.8	14.8	1.5913	86.15	83.30
	20	-0.2	2.150	1.590	87	20.0	20.0	1.6159	86.74	81.50
	25	0.6	2.550	1.490	87	24.0	24.0	1.6216	86.89	79.40
	30	-0.9	2.900	1.370	86	28.6	28.6	1.6208	86.79	76.18
2	-30	-0.9	-3.000	1.250	91	-30.0	30.0	1.5750	85.95	74.42
	-25	-1.3	-3.150	1.480	91	-30.0	30.0	1.8648	93.52	80.97
	-20	-1.1	-3.000	1.640	92	-24.9	24.9	1.7638	91.03	82.59
	-15	-0.8	-2.500	1.750	92	-17.7	17.7	1.6522	88.11	83.92
	-10	-0.7	-1.850	1.800	92	-10.8	10.8	1.6051	86.84	85.30
	-5	-0.7	-1.330	1.820	93	-6.9	6.9	1.6154	87.20	86.56
	0	-0.6	-0.760	1.800	93	-2.5	2.6	1.6064	86.95	86.86
	5	-0.2	0.290	1.750	93	6.1	6.1	1.6021	86.84	86.34
	10	0.7	0.750	1.710	93	9.2	9.3	1.5912	86.54	85.41
	15	0.8	1.280	1.660	94	13.1	13.2	1.5838	86.42	84.15
	20	0.3	1.950	1.630	94	18.2	18.2	1.6263	87.57	83.21
	25	0.7	2.500	1.500	94	23.5	23.5	1.6190	87.37	80.15
	30	0.9	2.900	1.370	94	28.6	28.6	1.6208	87.42	76.74
3	-30	-0.9	-2.950	1.250	96	-30.0	30.0	1.1637	74.21	64.26
	-25	-1.0	-3.150	1.480	96	-30.0	30.0	1.8648	93.94	81.34
	-20	-1.0	-2.950	1.650	96	-24.2	24.2	1.7496	90.99	83.01
	-15	-0.8	-2.450	1.750	96	-17.1	17.1	1.6407	88.12	84.21
	-10	-0.8	-1.900	1.810	96	-11.1	11.1	1.6173	87.49	85.83
	-5	0.5	-1.300	1.810	96	-6.8	6.8	1.6065	87.19	86.59
	0	-0.5	-0.380	1.800	95	0.8	0.9	1.6189	87.45	87.44
	5	-0.4	0.300	1.770	95	6.2	6.2	1.6208	87.50	86.99
	10	0.7	1.000	1.700	95	11.0	11.0	1.5988	86.90	85.30
	15	0.8	1.350	1.650	95	13.7	13.7	1.5801	86.39	83.93
	20	0.5	1.850	1.600	95	17.7	17.7	1.5887	86.63	82.53
	25	0.7	2.500	1.490	95	23.6	23.6	1.6115	87.25	79.96
	30	0.9	2.900	1.350	94	29.0	29.0	1.6075	87.06	76.15

		Res	Vdir	Vax
Average	-30	30.01	82.03	71.04
	-25	30.02	93.77	81.18
	-20	24.24	90.68	82.68
	-15	17.13	87.85	83.95
	-10	11.06	87.01	85.40
	-5	6.89	86.93	86.30
	0	1.61	87.06	87.02
	5	6.16	87.12	86.61
	10	10.41	86.68	85.24
	15	13.89	86.32	83.79
	20	18.62	86.98	82.41
	25	23.67	87.17	79.84
	30	28.75	87.09	76.36

Table C1-98. Spherical SPH-1 Post-test Computations - 90 fps

Probe: **Spherical SPH-1 / Post-Test 30-60 Calibration**

Velocity Point: **90 fps** Cal Date: 10/28/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**85.61**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	17.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.2		0
Resultant Angle Standard Deviation:	9.39		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.6	-3.050	1.250	91	-30.0	30.0	1.7283	90.03	77.96
	-25	-1.3	-3.150	1.490	91	-29.6	29.7	2.0392	97.79	84.98
	-20	-0.9	-2.900	1.650	90	-21.7	21.8	1.8162	92.21	85.64
	-15	-0.8	-2.400	1.750	90	-14.8	14.8	1.7422	90.31	87.31
	-10	-0.7	-1.900	1.800	89	-10.7	10.7	1.7380	90.12	88.55
	-5	-0.5	-1.320	1.800	89	-5.7	5.7	1.7341	90.02	89.57
	0	-0.6	-0.600	1.800	89	0.2	0.6	1.7528	90.50	90.50
	5	-0.5	0.290	1.770	89	8.0	8.0	1.7517	90.47	89.59
	10	0.4	1.000	1.710	88	12.6	12.6	1.7388	90.06	87.87
	15	0.2	1.500	1.650	88	15.4	15.4	1.7142	89.42	86.19
	20	-0.2	2.150	1.590	87	20.4	20.4	1.7474	90.20	84.55
	25	0.6	2.550	1.490	87	24.7	24.7	1.7410	90.03	81.82
	30	-0.9	2.900	1.370	86	29.7	29.8	1.7441	90.03	78.16
2	-30	-0.9	-3.000	1.250	91	-30.0	30.0	1.7283	90.03	77.96
	-25	-1.3	-3.150	1.480	91	-30.0	30.0	2.0464	97.96	84.82
	-20	-1.1	-3.000	1.640	92	-22.9	22.9	1.8579	93.43	86.04
	-15	-0.8	-2.500	1.750	92	-15.8	15.8	1.7601	90.94	87.50
	-10	-0.7	-1.850	1.800	92	-10.3	10.3	1.7333	90.24	88.77
	-5	-0.7	-1.330	1.820	93	-5.6	5.7	1.7534	90.85	90.40
	0	-0.6	-0.760	1.800	93	-1.1	1.2	1.7487	90.73	90.70
	5	-0.2	0.290	1.750	93	8.0	8.0	1.7322	90.29	89.40
	10	0.7	0.750	1.710	93	11.4	11.5	1.7239	90.08	88.29
	15	0.8	1.280	1.660	94	14.2	14.2	1.7064	89.70	86.96
	20	0.3	1.950	1.630	94	18.6	18.6	1.7548	90.96	86.20
	25	0.7	2.500	1.500	94	24.1	24.1	1.7397	90.57	82.66
	30	0.9	2.900	1.370	94	29.7	29.8	1.7441	90.69	78.73
3	-30	-0.9	-2.950	1.250	96	-30.0	30.0	1.2444	76.74	66.45
	-25	-1.0	-3.150	1.480	96	-30.0	30.0	2.0464	98.41	85.21
	-20	-1.0	-2.950	1.650	96	-22.2	22.3	1.8386	93.28	86.33
	-15	-0.8	-2.450	1.750	96	-15.2	15.3	1.7495	90.99	87.78
	-10	-0.8	-1.900	1.810	96	-10.6	10.6	1.7467	90.92	89.35
	-5	0.5	-1.300	1.810	96	-5.4	5.4	1.7440	90.85	90.44
	0	-0.5	-0.380	1.800	95	1.9	2.0	1.7550	91.05	91.00
	5	-0.4	0.300	1.770	95	8.1	8.1	1.7525	90.99	90.07
	10	0.7	1.000	1.700	95	12.7	12.7	1.7290	90.37	88.17
	15	0.8	1.350	1.650	95	14.6	14.6	1.7007	89.63	86.74
	20	0.5	1.850	1.600	95	18.2	18.2	1.7141	89.98	85.49
	25	0.7	2.500	1.490	95	24.3	24.3	1.7313	90.43	82.45
	30	0.9	2.900	1.350	94	30.0	30.0	1.7259	90.21	78.12

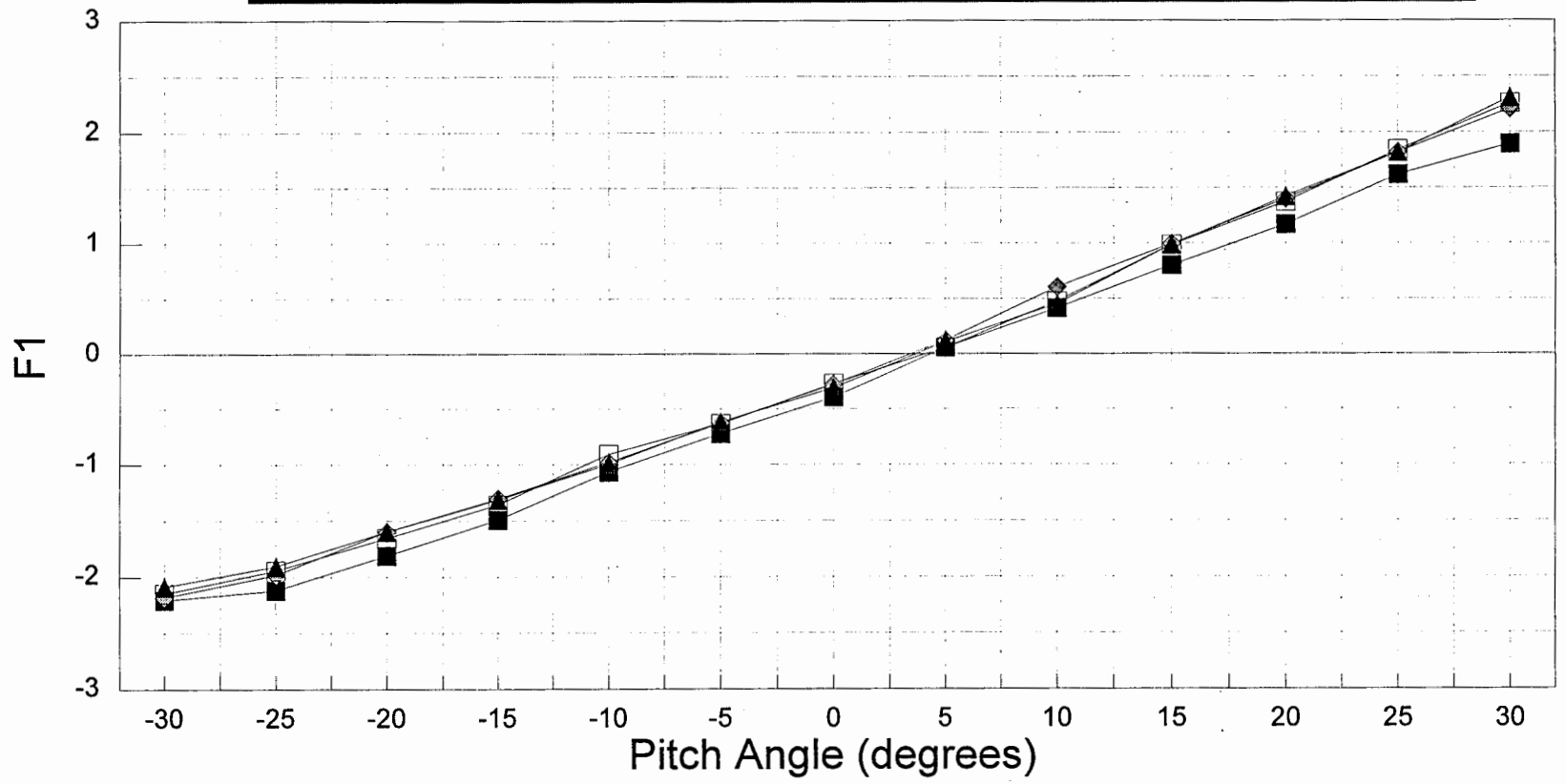
		Res	Vdir	Vax
Average	-30	30.01	85.60	74.13
	-25	29.90	98.06	85.00
	-20	22.32	92.97	86.00
	-15	15.29	90.75	87.53
	-10	10.56	90.43	88.89
	-5	5.60	90.57	90.14
	0	1.28	90.76	90.73
	5	8.07	90.58	89.69
	10	12.26	90.17	88.11
	15	14.74	89.58	86.63
	20	19.06	90.38	85.41
	25	24.35	90.35	82.31
	30	29.84	90.31	78.34

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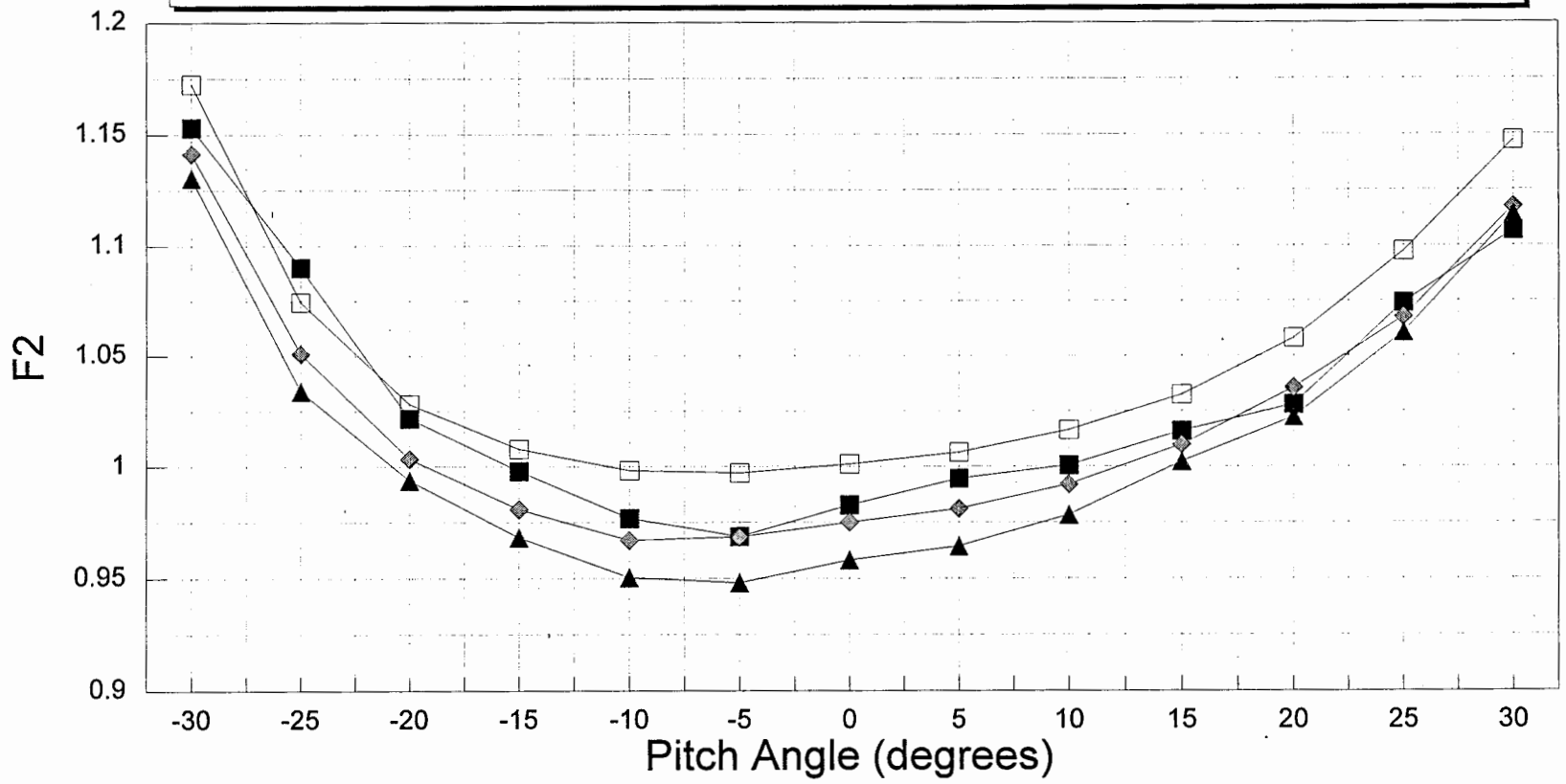
Spherical Probe SPH-2 Calibration Data

Figure C1-61. Spherical Probe 2 - Avg. (30-60 fps) F1 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration



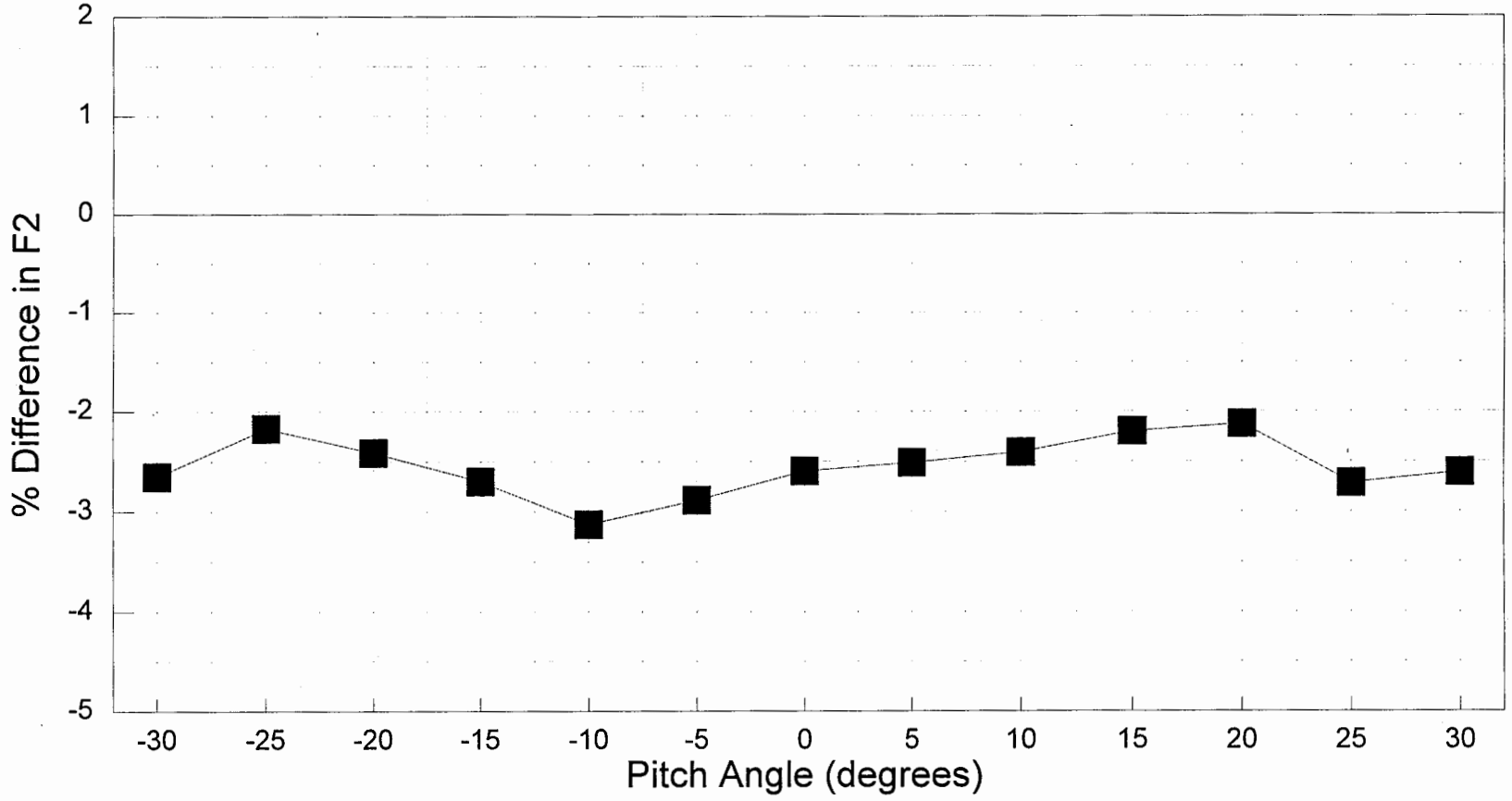
Note: Each point is the mean of three replicates.

Figure C1-62. Spherical Probe 2 - Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration



Note: Each point is the mean of three replicates.

Figure C1-63. Spherical Probe 2: Percent Difference in F2 (Avg. 30-60 fps) NCSU Pre- (6/29/97) and Post-Test (11/6/97) Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-99. Spherical Probe SPH-2 Calibrations at NC State Wind Tunnel June and November 1997

Pitch Angle	30 fps / June / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.58	29.09	25.29	29.86	29.87	25.90	0.95	2.68	2.42
-25	25.33	31.03	28.01	25.82	31.99	28.75	1.94	3.09	2.62
-20	19.36	30.48	28.74	18.56	31.12	29.48	-4.13	2.09	2.58
-15	15.46	30.53	29.42	14.81	31.31	30.26	-4.19	2.54	2.86
-10	10.54	30.57	30.05	11.20	31.56	30.95	6.29	3.23	3.02
-5	4.94	30.50	30.36	5.15	31.40	31.24	4.29	2.95	2.90
0	1.64	30.34	30.33	1.83	31.15	31.13	11.04	2.68	2.66
5	5.26	30.42	30.27	6.07	31.24	31.04	15.44	2.72	2.56
10	10.34	30.50	30.00	11.37	31.33	30.71	9.93	2.72	2.38
15	15.07	30.53	29.48	15.27	31.24	30.14	1.29	2.33	2.24
20	19.68	30.39	28.62	19.94	31.11	29.24	1.35	2.36	2.18
25	24.82	30.57	27.74	24.58	31.33	28.49	-0.96	2.51	2.70
30	29.50	30.52	26.56	29.10	31.23	27.29	-1.34	2.33	2.73

Pitch Angle	60 fps / June / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.59	55.55	48.30	30.07	57.25	49.54	1.64	3.06	2.58
-25	25.63	58.84	53.05	26.48	61.07	54.66	3.32	3.79	3.03
-20	20.46	58.78	55.07	19.61	59.90	56.43	-4.18	1.91	2.46
-15	14.74	58.56	56.63	14.25	60.14	58.29	-3.32	2.71	2.93
-10	9.71	58.58	57.73	10.56	60.50	59.48	8.78	3.29	3.02
-5	5.36	58.63	58.38	5.37	60.38	60.12	0.26	2.98	2.98
0	1.50	58.84	58.81	1.52	60.43	60.41	1.12	2.72	2.71
5	4.61	58.78	58.57	5.39	60.37	60.07	17.05	2.70	2.57
10	9.96	58.67	57.79	11.15	60.32	59.18	12.04	2.81	2.41
15	14.94	58.54	56.56	15.08	59.89	57.83	0.92	2.31	2.24
20	20.33	58.77	55.11	20.58	60.18	56.34	1.21	2.40	2.24
25	25.23	58.55	52.96	24.94	60.02	54.43	-1.17	2.52	2.77
30	29.86	58.20	50.48	29.48	59.56	51.85	-1.28	2.34	2.73

Pitch Angle	90 fps / June / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.93	82.55	71.54	30.10	85.14	73.65	0.57	3.13	2.95
-25	24.80	86.06	78.12	25.49	88.86	80.21	2.77	3.26	2.68
-20	21.63	88.89	82.63	21.15	90.62	84.51	-2.18	1.95	2.28
-15	11.70	87.53	85.72	12.05	90.29	88.30	3.01	3.15	3.01
-10	9.07	87.98	86.89	10.03	90.81	89.42	10.67	3.21	2.92
-5	5.26	88.50	88.12	5.33	91.13	90.72	1.34	2.97	2.96
0	1.24	88.48	88.45	1.25	90.85	90.83	0.93	2.68	2.68
5	5.26	88.54	88.15	6.11	90.95	90.41	16.11	2.72	2.56
10	11.02	88.75	87.11	12.02	91.18	89.18	9.11	2.75	2.38
15	14.74	88.06	85.16	14.91	90.11	87.08	1.11	2.32	2.25
20	19.94	88.22	82.93	20.20	90.32	84.76	1.31	2.38	2.21
25	25.23	87.61	79.25	24.95	89.83	81.45	-1.12	2.53	2.77
30	29.97	87.85	76.10	29.60	89.92	78.18	-1.23	2.35	2.73

Figure C1-64. Spherical Probe SPH-2 Pre- and Post-Test Calibrations

NC State Wind Tunnel -- June and November 1997

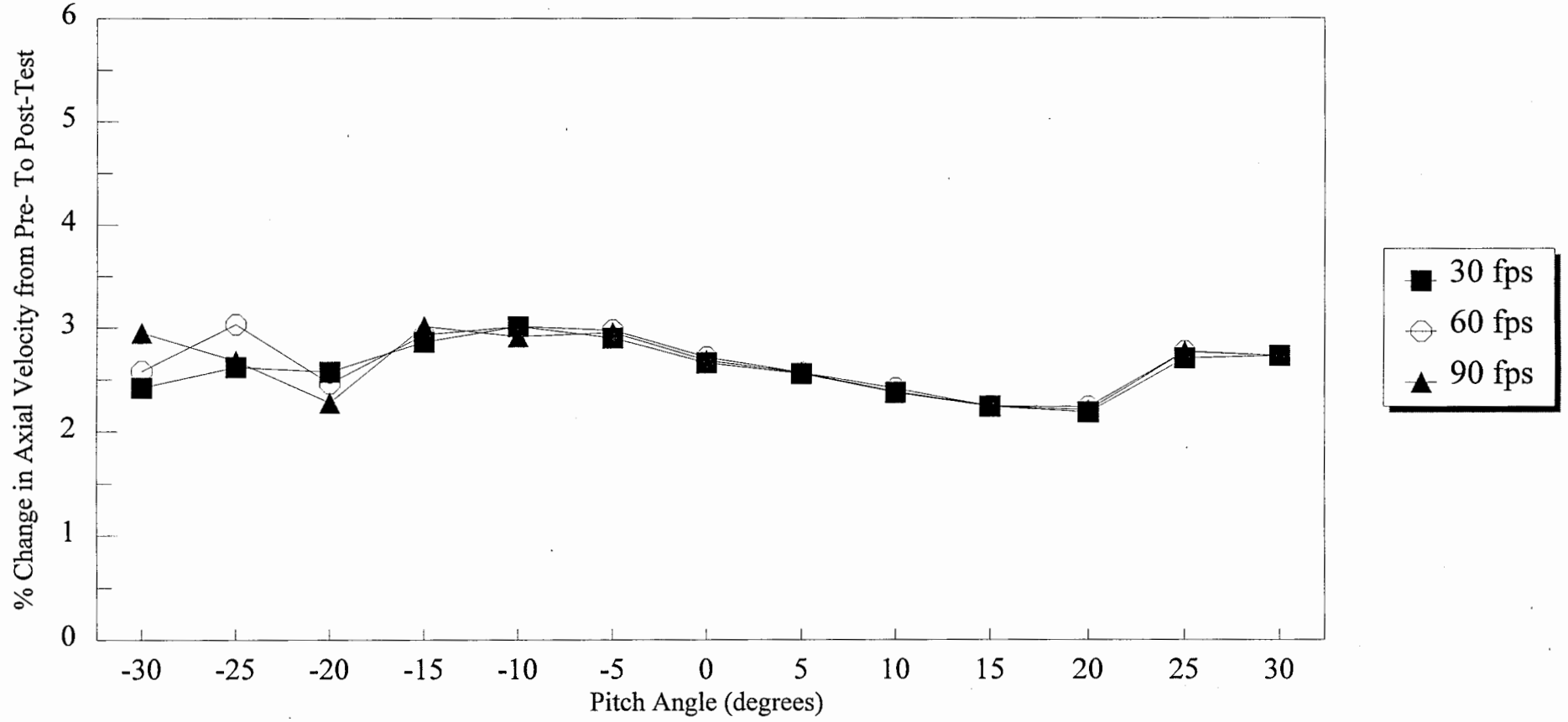


Table C1-100. Spherical Probe SPH-2 Calibrations at NC State Wind Tunnel June and July 1997

Pitch Angle	30 fps / June / 30-60 Calibration			30 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.58	29.09	25.29	30.05	28.78	24.91	1.57	-1.08	-1.49
-25	25.33	31.03	28.01	26.74	31.26	27.86	5.60	0.73	-0.55
-20	19.36	30.48	28.74	19.44	30.17	28.43	0.40	-1.03	-1.09
-15	15.46	30.53	29.42	15.30	30.13	29.05	-1.02	-1.32	-1.25
-10	10.54	30.57	30.05	10.34	30.05	29.55	-1.85	-1.71	-1.65
-5	4.94	30.50	30.36	4.88	29.91	29.78	-1.21	-1.92	-1.92
0	1.64	30.34	30.33	1.77	29.83	29.81	7.56	-1.69	-1.70
5	5.26	30.42	30.27	5.90	29.97	29.79	12.10	-1.47	-1.60
10	10.34	30.50	30.00	11.51	30.25	29.63	11.37	-0.83	-1.21
15	15.07	30.53	29.48	15.24	30.29	29.23	1.10	-0.77	-0.85
20	19.68	30.39	28.62	19.45	30.00	28.28	-1.14	-1.31	-1.17
25	24.82	30.57	27.74	24.69	30.32	27.54	-0.54	-0.82	-0.71
30	29.50	30.52	26.56	28.71	30.19	26.48	-2.67	-1.08	-0.32

Pitch Angle	60 fps / June / 30-60 Calibration			60 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.59	55.55	48.30	30.11	55.15	47.70	1.77	-0.73	-1.23
-25	25.63	58.84	53.05	27.69	60.11	53.22	8.04	2.16	0.32
-20	20.46	58.78	55.07	20.56	58.23	54.51	0.51	-0.94	-1.01
-15	14.74	58.56	56.63	14.57	57.76	55.91	-1.15	-1.36	-1.28
-10	9.71	58.58	57.73	9.52	57.53	56.74	-1.97	-1.78	-1.73
-5	5.36	58.63	58.38	5.48	57.42	57.15	2.36	-2.08	-2.10
0	1.50	58.84	58.81	1.35	57.81	57.80	-9.85	-1.74	-1.73
5	4.61	58.78	58.57	5.04	57.85	57.60	9.32	-1.58	-1.65
10	9.96	58.67	57.79	11.32	58.22	57.09	13.71	-0.77	-1.21
15	14.94	58.54	56.56	15.08	58.11	56.11	0.93	-0.73	-0.80
20	20.33	58.77	55.11	20.06	57.94	54.43	-1.34	-1.42	-1.25
25	25.23	58.55	52.96	25.14	58.12	52.61	-0.34	-0.72	-0.65
30	29.86	58.20	50.48	29.20	57.66	50.33	-2.19	-0.93	-0.29

Pitch Angle	90 fps / June / 30-60 Calibration			90 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.93	82.55	71.54	30.10	81.81	70.77	0.57	-0.90	-1.08
-25	24.80	86.06	78.12	26.54	87.19	77.99	6.99	1.31	-0.16
-20	21.63	88.89	82.63	22.02	88.11	81.68	1.84	-0.87	-1.15
-15	11.70	87.53	85.72	11.47	86.09	84.37	-1.93	-1.65	-1.57
-10	9.07	87.98	86.89	8.93	86.40	85.35	-1.55	-1.80	-1.76
-5	5.26	88.50	88.12	5.33	86.70	86.31	1.37	-2.03	-2.05
0	1.24	88.48	88.45	1.22	86.96	86.94	-1.37	-1.71	-1.71
5	5.26	88.54	88.15	5.75	87.18	86.72	9.29	-1.53	-1.62
10	11.02	88.75	87.11	12.15	88.13	86.15	10.32	-0.70	-1.10
15	14.74	88.06	85.16	14.92	87.43	84.48	1.21	-0.72	-0.80
20	19.94	88.22	82.93	16.69	87.02	81.93	-1.24	-1.36	-1.20
25	25.23	87.61	79.25	25.12	86.95	78.73	-0.44	-0.75	-0.66
30	29.97	87.85	76.10	29.14	86.90	75.90	-2.79	-1.08	-0.26

Figure C-65. Spherical Probe SPH-2 Pre- and Intermediate Calibrations

NC State Wind Tunnel -- June and July 1997

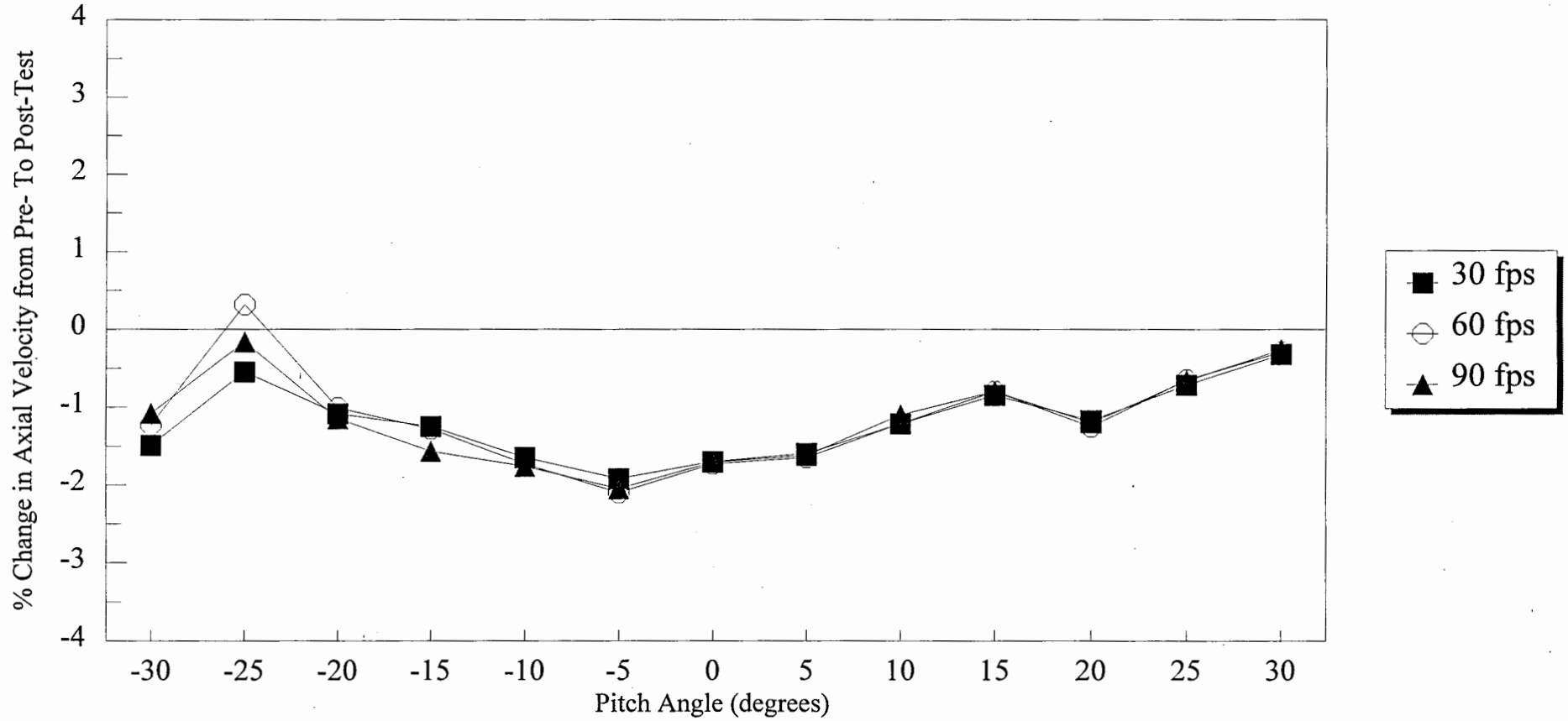


Table C1-101. Spherical SPH-2 Pre-test Computations - 30 fps

Probe: **Spherical SPH-2 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 06/29/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	2.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	74 _F
Average Axial Velocity, ft/sec:	**28.84**	Last Row:	61
Average Yaw Angle:	1.2		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.3	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.26		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.8	-0.350	0.155	70	-30.0	30.0	0.2020	30.20	26.16
	-25	-0.8	-0.350	0.180	70	-24.5	24.5	0.1971	29.84	27.15
	-20	-0.9	-0.300	0.198	70	-18.6	18.6	0.1969	29.82	28.26
	-15	-0.9	-0.270	0.205	70	-15.2	15.3	0.1976	29.88	28.82
	-10	-0.9	-0.200	0.210	70	-9.6	9.6	0.1964	29.79	29.37
	-5	-0.9	-0.080	0.210	70	-1.5	1.8	0.1988	29.97	29.96
	0	-0.7	-0.040	0.205	70	1.0	1.2	0.1954	29.71	29.70
	5	-0.6	0.060	0.205	70	6.8	6.8	0.1989	29.97	29.76
	10	-0.7	0.145	0.200	70	11.6	11.6	0.1990	29.98	29.37
	15	-0.6	0.200	0.195	70	15.4	15.4	0.1996	30.03	28.95
	20	-0.6	0.270	0.185	70	20.7	20.7	0.2002	30.07	28.13
	25	-0.5	0.330	0.175	70	25.9	25.9	0.2027	30.26	27.23
	30	-0.8	0.360	0.160	70	30.0	30.0	0.1998	30.04	26.01
2	-30	-2.7	-0.340	0.155	80	-30.0	30.1	0.2020	30.49	26.37
	-25	-2.8	-0.400	0.190	79	-28.1	28.2	0.2333	32.74	28.84
	-20	-2.0	-0.350	0.205	79	-21.4	21.5	0.2122	31.22	29.04
	-15	-1.9	-0.300	0.214	79	-16.7	16.8	0.2091	30.99	29.67
	-10	-1.9	-0.250	0.224	79	-12.1	12.2	0.2120	31.21	30.50
	-5	-1.1	-0.170	0.220	79	-7.0	7.1	0.2061	30.77	30.53
	0	-1.0	-0.070	0.215	79	-0.7	1.2	0.2040	30.61	30.61
	5	-1.0	-0.020	0.215	79	2.3	2.5	0.2056	30.73	30.70
	10	-1.0	0.090	0.210	79	8.2	8.2	0.2050	30.69	30.37
	15	-1.0	0.185	0.205	78	13.8	13.8	0.2073	30.83	29.93
	20	-1.0	0.250	0.193	78	18.7	18.7	0.2043	30.61	28.99
	25	-1.0	0.310	0.184	78	23.4	23.4	0.2058	30.72	28.19
	30	-1.1	0.360	0.169	78	29.0	29.0	0.2073	30.83	26.96
3	-30	-1.3	-0.340	0.160	78	-28.6	28.6	0.1542	26.59	23.34
	-25	-1.4	-0.350	0.190	78	-23.2	23.2	0.2032	30.52	28.05
	-20	-1.5	-0.300	0.204	78	-17.9	17.9	0.2015	30.39	28.92
	-15	-1.5	-0.270	0.215	78	-14.3	14.3	0.2059	30.73	29.77
	-10	-1.5	-0.210	0.220	78	-9.6	9.7	0.2058	30.72	30.28
	-5	-1.4	-0.150	0.220	78	-5.8	5.9	0.2062	30.75	30.59
	0	-1.0	-0.020	0.215	78	2.3	2.5	0.2056	30.70	30.67
	5	-1.0	0.055	0.210	78	6.4	6.5	0.2034	30.54	30.34
	10	-1.0	0.145	0.209	78	11.2	11.2	0.2074	30.84	30.25
	15	-1.0	0.215	0.200	78	16.0	16.0	0.2060	30.73	29.54
	20	-1.0	0.260	0.190	78	19.6	19.6	0.2030	30.51	28.74
	25	-1.0	0.330	0.180	78	25.2	25.2	0.2059	30.73	27.80
	30	-1.1	0.360	0.166	78	29.5	29.5	0.2053	30.69	26.71

		Res	Vdir	Vax
Average	-30	29.58	29.09	25.29
	-25	25.33	31.03	28.01
	-20	19.36	30.48	28.74
	-15	15.46	30.53	29.42
	-10	10.54	30.57	30.05
	-5	4.94	30.50	30.36
	0	1.64	30.34	30.33
	5	5.26	30.42	30.27
	10	10.34	30.50	30.00
	15	15.07	30.53	29.48
	20	19.68	30.39	28.62
	25	24.82	30.57	27.74
	30	29.50	30.52	26.56

Table C1-102. Spherical SPH-2 Intermediate Computations - 30 fps

Probe: **Spherical SPH-2 / Intermediate 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 07/22/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	2.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	74 _F
Average Axial Velocity, ft/sec:	**28.49**	Last Row:	61
Average Yaw Angle:	1.2		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.23		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.8	-0.350	0.155	70	-30.0	30.0	0.1981	29.91	25.90
	-25	-0.8	-0.350	0.180	70	-26.1	26.1	0.2006	30.10	27.03
	-20	-0.9	-0.300	0.198	70	-18.6	18.6	0.1927	29.50	27.96
	-15	-0.9	-0.270	0.205	70	-15.1	15.1	0.1923	29.47	28.46
	-10	-0.9	-0.200	0.210	70	-9.4	9.5	0.1896	29.26	28.87
	-5	-0.9	-0.080	0.210	70	-1.2	1.5	0.1918	29.44	29.43
	0	-0.7	-0.040	0.205	70	1.3	1.5	0.1889	29.21	29.20
	5	-0.6	0.060	0.205	70	7.7	7.7	0.1936	29.57	29.31
	10	-0.7	0.145	0.200	70	12.5	12.6	0.1962	29.77	29.06
	15	-0.6	0.200	0.195	70	15.4	15.4	0.1966	29.80	28.72
	20	-0.6	0.270	0.185	70	20.4	20.4	0.1947	29.65	27.79
	25	-0.5	0.330	0.175	70	25.6	25.7	0.1995	30.02	27.06
	30	-0.8	0.360	0.160	70	29.4	29.4	0.1963	29.78	25.94
2	-30	-2.7	-0.340	0.155	80	-30.0	30.1	0.1981	30.20	26.12
	-25	-2.8	-0.400	0.190	79	-30.0	30.1	0.2428	33.40	28.89
	-20	-2.0	-0.350	0.205	79	-21.8	21.9	0.2085	30.95	28.72
	-15	-1.9	-0.300	0.214	79	-16.6	16.7	0.2040	30.61	29.32
	-10	-1.9	-0.250	0.224	79	-11.9	12.0	0.2052	30.70	30.03
	-5	-1.1	-0.170	0.220	79	-7.0	7.1	0.1982	30.17	29.94
	0	-1.0	-0.070	0.215	79	-0.3	1.0	0.1971	30.09	30.09
	5	-1.0	-0.020	0.215	79	2.6	2.7	0.1987	30.21	30.18
	10	-1.0	0.090	0.210	79	9.6	9.7	0.2006	30.35	29.92
	15	-1.0	0.185	0.205	78	14.2	14.2	0.2044	30.61	29.67
	20	-1.0	0.250	0.193	78	18.5	18.5	0.1994	30.24	28.67
	25	-1.0	0.310	0.184	78	23.3	23.3	0.2019	30.43	27.95
	30	-1.1	0.360	0.169	78	28.2	28.2	0.2025	30.47	26.86
3	-30	-1.3	-0.340	0.160	78	-30.0	30.0	0.1501	26.23	22.71
	-25	-1.4	-0.350	0.190	78	-24.0	24.0	0.2000	30.28	27.66
	-20	-1.5	-0.300	0.204	78	-17.8	17.8	0.1969	30.05	28.60
	-15	-1.5	-0.270	0.215	78	-14.1	14.2	0.2002	30.30	29.38
	-10	-1.5	-0.210	0.220	78	-9.4	9.6	0.1986	30.18	29.76
	-5	-1.4	-0.150	0.220	78	-5.8	6.0	0.1979	30.13	29.96
	0	-1.0	-0.020	0.215	78	2.6	2.7	0.1987	30.18	30.15
	5	-1.0	0.055	0.210	78	7.2	7.3	0.1978	30.12	29.87
	10	-1.0	0.145	0.209	78	12.3	12.3	0.2045	30.62	29.92
	15	-1.0	0.215	0.200	78	16.0	16.0	0.2025	30.47	29.29
	20	-1.0	0.260	0.190	78	19.4	19.4	0.1976	30.10	28.40
	25	-1.0	0.330	0.180	78	25.1	25.1	0.2029	30.51	27.62
	30	-1.1	0.360	0.166	78	28.5	28.6	0.2004	30.32	26.62

		Res	Vdir	Vax
Average	-30	30.05	28.78	24.91
	-25	26.74	31.26	27.86
	-20	19.44	30.17	28.43
	-15	15.30	30.13	29.05
	-10	10.34	30.05	29.55
	-5	4.88	29.91	29.78
	0	1.77	29.83	29.81
	5	5.90	29.97	29.79
	10	11.51	30.25	29.63
	15	15.24	30.29	29.23
	20	19.45	30.00	28.28
	25	24.69	30.32	27.54
	30	28.71	30.19	26.48

Table C1-103. Spherical SPH-2 Post-test Computations - 30 fps

Probe: **Spherical SPH-2 / Post-Test 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 11/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	2.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	74 _F
Average Axial Velocity, ft/sec:	**29.59**	Last Row:	61
Average Yaw Angle:	1.2		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.4	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.08		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.8	-0.350	0.155	70	-30.0	30.0	0.2131	31.03	26.87
	-25	-0.8	-0.350	0.180	70	-25.1	25.1	0.2082	30.67	27.78
	-20	-0.9	-0.300	0.198	70	-17.7	17.7	0.2055	30.47	29.03
	-15	-0.9	-0.270	0.205	70	-14.6	14.6	0.2079	30.65	29.66
	-10	-0.9	-0.200	0.210	70	-10.5	10.5	0.2097	30.77	30.26
	-5	-0.9	-0.080	0.210	70	-1.5	1.8	0.2099	30.79	30.78
	0	-0.7	-0.040	0.205	70	1.1	1.3	0.2059	30.50	30.49
	5	-0.6	0.060	0.205	70	7.8	7.8	0.2100	30.80	30.51
	10	-0.7	0.145	0.200	70	12.4	12.4	0.2098	30.79	30.06
	15	-0.6	0.200	0.195	70	15.5	15.5	0.2089	30.72	29.60
	20	-0.6	0.270	0.185	70	20.9	20.9	0.2099	30.79	28.77
	25	-0.5	0.330	0.175	70	25.5	25.5	0.2128	31.00	27.98
	30	-0.8	0.360	0.160	70	29.9	29.9	0.2102	30.81	26.71
2	-30	-2.7	-0.340	0.155	80	-30.0	30.1	0.2131	31.32	27.09
	-25	-2.8	-0.400	0.190	79	-29.0	29.1	0.2526	34.06	29.77
	-20	-2.0	-0.350	0.205	79	-20.9	21.0	0.2204	31.82	29.70
	-15	-1.9	-0.300	0.214	79	-15.8	15.9	0.2188	31.70	30.49
	-10	-1.9	-0.250	0.224	79	-12.3	12.5	0.2252	32.17	31.41
	-5	-1.1	-0.170	0.220	79	-7.5	7.6	0.2190	31.72	31.44
	0	-1.0	-0.070	0.215	79	-0.8	1.3	0.2152	31.44	31.43
	5	-1.0	-0.020	0.215	79	2.7	2.9	0.2167	31.55	31.51
	10	-1.0	0.090	0.210	79	9.4	9.5	0.2165	31.53	31.10
	15	-1.0	0.185	0.205	78	14.2	14.2	0.2174	31.57	30.61
	20	-1.0	0.250	0.193	78	19.0	19.0	0.2139	31.32	29.62
	25	-1.0	0.310	0.184	78	23.3	23.3	0.2163	31.49	28.92
	30	-1.1	0.360	0.169	78	28.5	28.5	0.2166	31.51	27.70
3	-30	-1.3	-0.340	0.160	78	-29.4	29.5	0.1623	27.28	23.75
	-25	-1.4	-0.350	0.190	78	-23.3	23.3	0.2129	31.24	28.70
	-20	-1.5	-0.300	0.204	78	-16.9	17.0	0.2105	31.07	29.71
	-15	-1.5	-0.270	0.215	78	-13.9	14.0	0.2175	31.58	30.65
	-10	-1.5	-0.210	0.220	78	-10.5	10.6	0.2197	31.74	31.19
	-5	-1.4	-0.150	0.220	78	-5.9	6.0	0.2188	31.68	31.50
	0	-1.0	-0.020	0.215	78	2.7	2.9	0.2167	31.52	31.48
	5	-1.0	0.055	0.210	78	7.4	7.5	0.2148	31.38	31.11
	10	-1.0	0.145	0.209	78	12.1	12.2	0.2188	31.68	30.97
	15	-1.0	0.215	0.200	78	16.1	16.1	0.2156	31.44	30.20
	20	-1.0	0.260	0.190	78	19.9	19.9	0.2125	31.22	29.35
	25	-1.0	0.330	0.180	78	24.9	24.9	0.2165	31.51	28.57
	30	-1.1	0.360	0.166	78	28.9	28.9	0.2145	31.36	27.44

		Res	Vdir	Vax
Average	-30	29.86	29.87	25.90
	-25	25.82	31.99	28.75
	-20	18.56	31.12	29.48
	-15	14.81	31.31	30.26
	-10	11.20	31.56	30.95
	-5	5.15	31.40	31.24
	0	1.83	31.15	31.13
	5	6.07	31.24	31.04
	10	11.37	31.33	30.71
	15	15.27	31.24	30.14
	20	19.94	31.11	29.24
	25	24.58	31.33	28.49
	30	29.10	31.23	27.29

Table C1-104. Spherical SPH-2 Pre-test Computations - 60 fps

Probe: **Spherical SPH-2 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **60 fps** Cal Date: 06/29/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	2.99%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	76 _F
Average Axial Velocity, ft/sec:	**55.34**	Last Row:	61
Average Yaw Angle:	1.1		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.3	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.44		**0**

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw			Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-2.9	-1.280	0.580	72	-30.0	30.1	0.7558	58.54	50.63
	-25	-1.7	-1.350	0.670	72	-25.8	25.9	0.7621	58.78	52.89
	-20	-1.4	-1.200	0.740	72	-20.3	20.4	0.7499	58.31	54.66
	-15	-1.4	-1.000	0.770	72	-14.9	15.0	0.7403	57.94	55.96
	-10	-1.3	-0.770	0.800	73	-9.7	9.8	0.7483	58.30	57.45
	-5	-1.1	-0.500	0.800	73	-4.9	5.1	0.7504	58.39	58.16
	0	-1.1	-0.300	0.800	73	-1.4	1.8	0.7577	58.67	58.64
	5	-0.7	0.020	0.780	74	3.8	3.8	0.7486	58.37	58.24
	10	-1.0	0.430	0.760	74	9.6	9.7	0.7465	58.29	57.46
	15	-0.4	0.730	0.730	74	15.0	15.1	0.7447	58.22	56.22
	20	-0.5	1.000	0.700	74	20.3	20.3	0.7538	58.57	54.93
	25	-0.5	1.200	0.650	74	25.3	25.4	0.7458	58.26	52.65
	30	0.9	1.350	0.580	74	30.0	30.0	0.7241	57.41	49.71
2	-30	-2.6	-1.250	0.580	78	-29.4	29.5	0.7412	58.30	50.75
	-25	-1.9	-1.320	0.650	78	-26.2	26.3	0.7497	58.63	52.57
	-20	-1.5	-1.230	0.740	79	-20.9	20.9	0.7575	58.99	55.11
	-15	-1.5	-1.000	0.780	79	-14.7	14.7	0.7488	58.65	56.72
	-10	-1.2	-0.800	0.800	79	-10.3	10.4	0.7494	58.67	57.72
	-5	-1.2	-0.550	0.800	79	-5.8	6.0	0.7500	58.70	58.38
	0	-1.1	-0.300	0.800	79	-1.4	1.8	0.7577	59.00	58.97
	5	-1.0	-0.020	0.790	79	3.1	3.3	0.7570	58.97	58.87
	10	-1.1	0.420	0.770	79	9.4	9.5	0.7556	58.92	58.12
	15	-0.6	0.700	0.740	79	14.4	14.4	0.7512	58.74	56.90
	20	-0.6	1.000	0.710	79	20.1	20.1	0.7623	59.18	55.58
	25	-0.1	1.200	0.660	79	25.0	25.0	0.7523	58.79	53.28
	30	1.0	1.310	0.600	80	29.7	29.7	0.7447	58.54	50.86
3	-30	-2.6	-1.200	0.560	81	-29.1	29.2	0.5384	49.82	43.51
	-25	-1.7	-1.350	0.690	81	-24.7	24.7	0.7578	59.11	53.69
	-20	-1.4	-1.200	0.750	81	-20.0	20.1	0.7559	59.04	55.44
	-15	-1.5	-1.000	0.790	81	-14.4	14.5	0.7574	59.09	57.21
	-10	-1.2	-0.720	0.800	81	-8.9	8.9	0.7486	58.75	58.04
	-5	-1.0	-0.500	0.800	81	-4.9	5.0	0.7504	58.82	58.59
	0	-0.9	-0.220	0.790	81	-0.1	0.9	0.7510	58.84	58.84
	5	-0.9	0.220	0.780	80	6.7	6.7	0.7563	59.00	58.60
	10	-0.9	0.500	0.760	80	10.7	10.7	0.7516	58.81	57.78
	15	-0.6	0.750	0.730	80	15.4	15.4	0.7473	58.65	56.54
	20	-0.5	1.000	0.690	80	20.6	20.6	0.7454	58.57	54.83
	25	-0.3	1.200	0.650	80	25.3	25.3	0.7458	58.59	52.95
	30	0.9	1.320	0.600	80	29.9	29.9	0.7474	58.65	50.85

		Res	Vdir	Vax
Average	-30	29.59	55.55	48.30
	-25	25.63	58.84	53.05
	-20	20.46	58.78	55.07
	-15	14.74	58.56	56.63
	-10	9.71	58.58	57.73
	-5	5.36	58.63	58.38
	0	1.50	58.84	58.81
	5	4.61	58.78	58.57
	10	9.96	58.67	57.79
	15	14.94	58.54	56.56
	20	20.33	58.77	55.11
	25	25.23	58.55	52.96
	30	29.86	58.20	50.48

Table C1-105. Spherical SPH-2 Intermediate Computations - 60 fps

Probe: **Spherical SPH-2 / Intermediate 30-60 Calibration** Pre-test
Velocity Point: **60 fps** Cal Date: 07/22/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	2.99%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	76 _F
Average Axial Velocity, ft/sec:	**54.71**	Last Row:	61
Average Yaw Angle:	1.1		
Average Pitch Angle:	16.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.51		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-2.9	-1.280	0.580	72	-30.0	30.1	0.7413	57.98	50.14
	-25	-1.7	-1.350	0.670	72	-28.0	28.1	0.8011	60.27	53.18
	-20	-1.4	-1.200	0.740	72	-20.4	20.5	0.7358	57.76	54.12
	-15	-1.4	-1.000	0.770	72	-14.8	14.8	0.7206	57.16	55.26
	-10	-1.3	-0.770	0.800	73	-9.5	9.6	0.7223	57.28	56.47
	-5	-1.1	-0.500	0.800	73	-5.1	5.2	0.7192	57.16	56.92
	0	-1.1	-0.300	0.800	73	-1.1	1.5	0.7311	57.63	57.61
	5	-0.7	0.020	0.780	74	4.0	4.0	0.7235	57.38	57.24
	10	-1.0	0.430	0.760	74	11.1	11.1	0.7350	57.84	56.75
	15	-0.4	0.730	0.730	74	15.1	15.1	0.7341	57.80	55.79
	20	-0.5	1.000	0.700	74	20.0	20.0	0.7322	57.73	54.23
	25	-0.5	1.200	0.650	74	25.2	25.2	0.7348	57.83	52.31
	30	0.9	1.350	0.580	74	30.0	30.0	0.7198	57.24	49.56
2	-30	-2.6	-1.250	0.580	78	-30.0	30.1	0.7413	58.30	50.44
	-25	-1.9	-1.320	0.650	78	-28.5	28.5	0.7891	60.15	52.85
	-20	-1.5	-1.230	0.740	79	-21.1	21.1	0.7437	58.45	54.52
	-15	-1.5	-1.000	0.780	79	-14.5	14.6	0.7286	57.85	55.99
	-10	-1.2	-0.800	0.800	79	-10.0	10.1	0.7229	57.63	56.73
	-5	-1.2	-0.550	0.800	79	-5.9	6.0	0.7198	57.50	57.18
	0	-1.1	-0.300	0.800	79	-1.1	1.5	0.7311	57.95	57.93
	5	-1.0	-0.020	0.790	79	3.4	3.5	0.7316	57.97	57.87
	10	-1.1	0.420	0.770	79	10.9	10.9	0.7432	58.43	57.37
	15	-0.6	0.700	0.740	79	14.6	14.6	0.7405	58.33	56.44
	20	-0.6	1.000	0.710	79	19.8	19.8	0.7411	58.35	54.89
	25	-0.1	1.200	0.660	79	24.9	24.9	0.7419	58.38	52.93
	30	1.0	1.310	0.600	80	28.7	28.7	0.7265	57.83	50.71
3	-30	-2.6	-1.200	0.560	81	-30.0	30.1	0.5241	49.16	42.53
	-25	-1.7	-1.350	0.690	81	-26.4	26.5	0.7785	59.91	53.63
	-20	-1.4	-1.200	0.750	81	-20.1	20.1	0.7414	58.47	54.90
	-15	-1.5	-1.000	0.790	81	-14.2	14.3	0.7365	58.28	56.47
	-10	-1.2	-0.720	0.800	81	-8.7	8.8	0.7217	57.69	57.01
	-5	-1.0	-0.500	0.800	81	-5.1	5.2	0.7192	57.59	57.35
	0	-0.9	-0.220	0.790	81	0.3	1.0	0.7259	57.85	57.85
	5	-0.9	0.220	0.780	80	7.5	7.6	0.7360	58.20	57.69
	10	-0.9	0.500	0.760	80	11.9	11.9	0.7412	58.40	57.14
	15	-0.6	0.750	0.730	80	15.5	15.5	0.7359	58.20	56.09
	20	-0.5	1.000	0.690	80	20.3	20.3	0.7246	57.75	54.16
	25	-0.3	1.200	0.650	80	25.2	25.2	0.7348	58.15	52.60
	30	0.9	1.320	0.600	80	28.9	28.9	0.7289	57.92	50.72

		Res	Vdir	Vax
Average	-30	30.11	55.15	47.70
	-25	27.69	60.11	53.22
	-20	20.56	58.23	54.51
	-15	14.57	57.76	55.91
	-10	9.52	57.53	56.74
	-5	5.48	57.42	57.15
	0	1.35	57.81	57.80
	5	5.04	57.85	57.60
	10	11.32	58.22	57.09
	15	15.08	58.11	56.11
	20	20.06	57.94	54.43
	25	25.14	58.12	52.61
	30	29.20	57.66	50.33

Table C1-106. Spherical SPH-2 Post-test Computations - 60 fps

Probe: **Spherical SPH-2 / Post-Test 30-60 Calibration** Pre-test
Velocity Point: **60 fps** Cal Date: 11/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	2.99%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	76 _F
Average Axial Velocity, ft/sec:	**56.82**	Last Row:	61
Average Yaw Angle:	1.1		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.31		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw			Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-2.9	-1.280	0.580	72	-30.0	30.1	0.7975	60.13	52.01
	-25	-1.7	-1.350	0.670	72	-26.8	26.8	0.8257	61.19	54.60
	-20	-1.4	-1.200	0.740	72	-19.4	19.5	0.7789	59.43	56.02
	-15	-1.4	-1.000	0.770	72	-14.4	14.4	0.7803	59.48	57.61
	-10	-1.3	-0.770	0.800	73	-10.6	10.7	0.7990	60.25	59.20
	-5	-1.1	-0.500	0.800	73	-4.9	5.0	0.7956	60.12	59.89
	0	-1.1	-0.300	0.800	73	-1.5	1.8	0.7998	60.28	60.25
	5	-0.7	0.020	0.780	74	4.5	4.6	0.7892	59.93	59.74
	10	-1.0	0.430	0.760	74	10.9	10.9	0.7895	59.94	58.86
	15	-0.4	0.730	0.730	74	15.1	15.1	0.7793	59.55	57.49
	20	-0.5	1.000	0.700	74	20.6	20.6	0.7904	59.98	56.15
	25	-0.5	1.200	0.650	74	25.0	25.0	0.7834	59.71	54.10
	30	0.9	1.350	0.580	74	30.0	30.0	0.7634	58.94	51.04
2	-30	-2.6	-1.250	0.580	78	-30.0	30.1	0.7975	60.47	52.31
	-25	-1.9	-1.320	0.650	78	-27.2	27.2	0.8121	61.02	54.27
	-20	-1.5	-1.230	0.740	79	-20.1	20.2	0.7842	60.02	56.33
	-15	-1.5	-1.000	0.780	79	-14.2	14.3	0.7899	60.24	58.38
	-10	-1.2	-0.800	0.800	79	-11.0	11.1	0.8003	60.64	59.50
	-5	-1.2	-0.550	0.800	79	-6.0	6.1	0.7958	60.46	60.12
	0	-1.1	-0.300	0.800	79	-1.5	1.8	0.7998	60.62	60.59
	5	-1.0	-0.020	0.790	79	3.7	3.9	0.7980	60.55	60.41
	10	-1.1	0.420	0.770	79	10.7	10.7	0.7989	60.58	59.52
	15	-0.6	0.700	0.740	79	14.6	14.6	0.7868	60.12	58.18
	20	-0.6	1.000	0.710	79	20.4	20.4	0.7992	60.59	56.80
	25	-0.1	1.200	0.660	79	24.7	24.7	0.7919	60.31	54.78
	30	1.0	1.310	0.600	80	29.1	29.1	0.7775	59.82	52.26
3	-30	-2.6	-1.200	0.560	81	-29.9	30.0	0.5675	51.15	44.31
	-25	-1.7	-1.350	0.690	81	-25.3	25.4	0.8070	61.00	55.10
	-20	-1.4	-1.200	0.750	81	-19.1	19.1	0.7872	60.25	56.92
	-15	-1.5	-1.000	0.790	81	-14.0	14.1	0.7994	60.71	58.89
	-10	-1.2	-0.720	0.800	81	-9.8	9.9	0.7971	60.63	59.72
	-5	-1.0	-0.500	0.800	81	-4.9	5.0	0.7956	60.57	60.34
	0	-0.9	-0.220	0.790	81	-0.1	0.9	0.7914	60.41	60.40
	5	-0.9	0.220	0.780	80	7.7	7.7	0.7985	60.62	60.07
	10	-0.9	0.500	0.760	80	11.8	11.8	0.7940	60.45	59.17
	15	-0.6	0.750	0.730	80	15.5	15.5	0.7820	59.99	57.81
	20	-0.5	1.000	0.690	80	20.8	20.8	0.7817	59.98	56.07
	25	-0.3	1.200	0.650	80	25.0	25.0	0.7834	60.04	54.40
	30	0.9	1.320	0.600	80	29.3	29.3	0.7802	59.92	52.25

		Res		Vdir	Vax
Average	-30	30.07		57.25	49.54
	-25	26.48		61.07	54.66
	-20	19.61		59.90	56.43
	-15	14.25		60.14	58.29
	-10	10.56		60.50	59.48
	-5	5.37		60.38	60.12
	0	1.52		60.43	60.41
	5	5.39		60.37	60.07
	10	11.15		60.32	59.18
	15	15.08		59.89	57.83
	20	20.58		60.18	56.34
	25	24.94		60.02	54.43
	30	29.48		59.56	51.85

Table C1-107. Spherical SPH-2 Pre-test Compuations - 90 fps

Probe: **Spherical SPH-2 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **90 fps** Cal Date: 06/29/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**83.09**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	16.0	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.1	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.51		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-2.8	-2.750	1.260	82	-30.0	30.1	1.6418	87.09	75.33
	-25	-1.8	-2.800	1.450	82	-24.3	24.4	1.5831	85.52	77.88
	-20	-1.3	-2.800	1.630	82	-21.6	21.6	1.6915	88.39	82.18
	-15	-1.2	-1.890	1.750	81	-11.5	11.6	1.6509	87.25	85.47
	-10	-1.1	-1.660	1.780	81	-9.3	9.4	1.6653	87.63	86.46
	-5	-1.0	-1.140	1.790	80	-5.1	5.2	1.6787	87.90	87.53
	0	-1.0	-0.440	1.780	80	0.3	1.1	1.6938	88.29	88.28
	5	-0.8	0.400	1.750	79	6.1	6.1	1.6927	88.18	87.68
	10	-0.8	1.100	1.710	79	10.5	10.5	1.6888	88.08	86.59
	15	-0.4	1.640	1.630	79	15.1	15.1	1.6642	87.44	84.41
	20	-0.3	2.200	1.560	78	20.1	20.1	1.6754	87.65	82.31
	25	0.1	2.700	1.430	77	25.9	25.9	1.6575	87.10	78.36
	30	0.6	3.000	1.330	76	30.0	30.0	1.6605	87.10	75.42
2	-30	-2.6	-2.700	1.250	83	-29.5	29.6	1.6034	86.14	74.91
	-25	-2.0	-2.850	1.430	83	-25.3	25.3	1.5952	85.92	77.65
	-20	-1.2	-2.800	1.640	84	-21.4	21.5	1.6975	88.71	82.56
	-15	-1.3	-1.900	1.740	85	-11.7	11.8	1.6432	87.36	85.52
	-10	-1.3	-1.600	1.780	85	-8.8	8.9	1.6658	87.96	86.90
	-5	-1.2	-1.300	1.800	85	-6.3	6.4	1.6869	88.52	87.96
	0	-1.0	-0.650	1.770	86	-1.3	1.7	1.6769	88.34	88.30
	5	-0.9	-0.010	1.750	86	3.4	3.5	1.6778	88.36	88.20
	10	-0.8	1.210	1.700	87	11.4	11.4	1.6895	88.75	86.99
	15	-0.4	1.510	1.650	87	14.0	14.0	1.6703	88.24	85.63
	20	-0.2	2.100	1.580	87	19.1	19.1	1.6797	88.49	83.62
	25	0.1	2.600	1.450	88	24.7	24.7	1.6468	87.70	79.68
	30	0.8	2.950	1.330	88	30.0	30.0	1.6605	88.07	76.26
3	-30	-2.3	-2.800	1.250	91	-30.0	30.1	1.1792	74.42	64.39
	-25	-1.8	-2.850	1.460	91	-24.6	24.7	1.6018	86.73	78.82
	-20	-1.3	-2.840	1.640	91	-21.8	21.8	1.7076	89.55	83.15
	-15	-1.4	-1.900	1.750	90	-11.6	11.7	1.6517	87.99	86.16
	-10	-1.0	-1.600	1.780	90	-8.8	8.9	1.6658	88.36	87.30
	-5	-1.1	-1.000	1.800	90	-4.0	4.1	1.6930	89.08	88.85
	0	-1.0	-0.500	1.770	90	-0.1	1.0	1.6823	88.80	88.79
	5	-0.8	0.400	1.750	90	6.1	6.1	1.6927	89.08	88.57
	10	-0.8	1.180	1.720	90	11.1	11.1	1.7053	89.41	87.74
	15	-0.4	1.650	1.640	89	15.1	15.1	1.6744	88.51	85.45
	20	-0.2	2.250	1.550	89	20.6	20.6	1.6750	88.53	82.87
	25	-0.2	2.650	1.450	89	25.1	25.1	1.6563	88.03	79.71
	30	0.7	2.950	1.340	89	29.9	29.9	1.6699	88.39	76.63

		Res	Vdir	Vax
Average	-30	29.93	82.55	71.54
	-25	24.80	86.06	78.12
	-20	21.63	88.89	82.63
	-15	11.70	87.53	85.72
	-10	9.07	87.98	86.89
	-5	5.26	88.50	88.12
	0	1.24	88.48	88.45
	5	5.26	88.54	88.15
	10	11.02	88.75	87.11
	15	14.74	88.06	85.16
	20	19.94	88.22	82.93
	25	25.23	87.61	79.25
	30	29.97	87.85	76.10

Table C1-108. Spherical SPH-2 Intermediate Computations - 90 fps

Probe: **Spherical SPH-2 / Intermediate 30-60 Calibration** Pre-test
Velocity Point: **90 fps** Cal Date: 07/22/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**82.10**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.3	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.50		**0**

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-2.8	-2.750	1.260	82	-30.0	30.1	1.6104	86.25	74.61
	-25	-1.8	-2.800	1.450	82	-25.7	25.8	1.5934	85.79	77.26
	-20	-1.3	-2.800	1.630	82	-22.0	22.0	1.6620	87.62	81.24
	-15	-1.2	-1.890	1.750	81	-11.3	11.4	1.5964	85.80	84.11
	-10	-1.1	-1.660	1.780	81	-9.1	9.2	1.6065	86.07	84.96
	-5	-1.0	-1.140	1.790	80	-5.3	5.3	1.6095	86.07	85.69
	0	-1.0	-0.440	1.780	80	0.7	1.2	1.6372	86.80	86.78
	5	-0.8	0.400	1.750	79	6.7	6.8	1.6438	86.90	86.29
	10	-0.8	1.100	1.710	79	11.8	11.8	1.6654	87.47	85.62
	15	-0.4	1.640	1.630	79	15.2	15.2	1.6400	86.80	83.75
	20	-0.3	2.200	1.560	78	19.8	19.8	1.6285	86.41	81.29
	25	0.1	2.700	1.430	77	25.7	25.7	1.6309	86.40	77.87
	30	0.6	3.000	1.330	76	29.4	29.4	1.6334	86.38	75.22
2	-30	-2.6	-2.700	1.250	83	-30.0	30.1	1.5977	85.99	74.39
	-25	-2.0	-2.850	1.430	83	-27.4	27.5	1.6737	88.01	78.07
	-20	-1.2	-2.800	1.640	84	-21.8	21.8	1.6677	87.93	81.63
	-15	-1.3	-1.900	1.740	85	-11.5	11.6	1.5895	85.93	84.18
	-10	-1.3	-1.600	1.780	85	-8.7	8.8	1.6058	86.37	85.35
	-5	-1.2	-1.300	1.800	85	-6.4	6.5	1.6203	86.75	86.20
	0	-1.0	-0.650	1.770	86	-1.0	1.4	1.6184	86.78	86.76
	5	-0.9	-0.010	1.750	86	3.6	3.7	1.6217	86.87	86.69
	10	-0.8	1.210	1.700	87	12.4	12.4	1.6660	88.13	86.06
	15	-0.4	1.510	1.650	87	14.3	14.3	1.6467	87.62	84.89
	20	-0.2	2.100	1.580	87	18.9	18.9	1.6374	87.37	82.66
	25	0.1	2.600	1.450	88	24.6	24.6	1.6225	87.05	79.13
	30	0.8	2.950	1.330	88	29.1	29.1	1.6215	87.02	76.06
3	-30	-2.3	-2.800	1.250	91	-30.0	30.1	1.1403	73.18	63.32
	-25	-1.8	-2.850	1.460	91	-26.3	26.4	1.6398	87.75	78.63
	-20	-1.3	-2.840	1.640	91	-22.2	22.2	1.6782	88.78	82.18
	-15	-1.4	-1.900	1.750	90	-11.4	11.5	1.5975	86.54	84.80
	-10	-1.0	-1.600	1.780	90	-8.7	8.8	1.6058	86.76	85.75
	-5	-1.1	-1.000	1.800	90	-4.0	4.1	1.6250	87.28	87.05
	0	-1.0	-0.500	1.770	90	0.3	1.0	1.6262	87.31	87.29
	5	-0.8	0.400	1.750	90	6.7	6.8	1.6438	87.78	87.17
	10	-0.8	1.180	1.720	90	12.2	12.2	1.6816	88.79	86.78
	15	-0.4	1.650	1.640	89	15.2	15.2	1.6501	87.87	84.79
	20	-0.2	2.250	1.550	89	20.3	20.3	1.6284	87.29	81.85
	25	-0.2	2.650	1.450	89	25.1	25.1	1.6328	87.41	79.19
	30	0.7	2.950	1.340	89	28.9	28.9	1.6284	87.29	76.42

		Res	Vdir	Vax
Average	-30	30.10	81.81	70.77
	-25	26.54	87.19	77.99
	-20	22.02	88.11	81.68
	-15	11.47	86.09	84.37
	-10	8.93	86.40	85.35
	-5	5.33	86.70	86.31
	0	1.22	86.96	86.94
	5	5.75	87.18	86.72
	10	12.15	88.13	86.15
	15	14.92	87.43	84.48
	20	19.69	87.02	81.93
	25	25.12	86.95	78.73
	30	29.14	86.90	75.90

Table C1-109. Spherical SPH-2 Post-test Computations - 90 fps

Probe: **Spherical SPH-2 / Post-Test 30-60 Calibration** Pre-test
Velocity Point: **90 fps** Cal Date: 11/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**85.28**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	16.3	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.4	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.31		**0**

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-2.8	-2.750	1.260	82	-30.0	30.1	1.7324	89.46	77.38
	-25	-1.8	-2.800	1.450	82	-24.8	24.9	1.6683	87.79	79.65
	-20	-1.3	-2.800	1.630	82	-21.1	21.1	1.7580	90.12	84.05
	-15	-1.2	-1.890	1.750	81	-11.9	12.0	1.7568	90.00	88.04
	-10	-1.1	-1.660	1.780	81	-10.3	10.3	1.7755	90.48	89.02
	-5	-1.0	-1.140	1.790	80	-5.1	5.2	1.7800	90.51	90.14
	0	-1.0	-0.440	1.780	80	0.3	1.1	1.7849	90.63	90.62
	5	-0.8	0.400	1.750	79	7.0	7.1	1.7869	90.60	89.91
	10	-0.8	1.100	1.710	79	11.6	11.7	1.7849	90.55	88.68
	15	-0.4	1.640	1.630	79	15.2	15.2	1.7414	89.44	86.30
	20	-0.3	2.200	1.560	78	20.4	20.4	1.7564	89.74	84.13
	25	0.1	2.700	1.430	77	25.5	25.5	1.7395	89.23	80.51
	30	0.6	3.000	1.330	76	30.0	30.0	1.7494	89.40	77.44
2	-30	-2.6	-2.700	1.250	83	-30.0	30.1	1.7187	89.18	77.16
	-25	-2.0	-2.850	1.430	83	-26.2	26.3	1.7286	89.44	80.18
	-20	-1.2	-2.800	1.640	84	-20.9	20.9	1.7630	90.41	84.43
	-15	-1.3	-1.900	1.740	85	-12.0	12.1	1.7477	90.10	88.09
	-10	-1.3	-1.600	1.780	85	-9.8	9.9	1.7736	90.76	89.41
	-5	-1.2	-1.300	1.800	85	-6.6	6.7	1.7911	91.21	90.58
	0	-1.0	-0.650	1.770	86	-1.3	1.7	1.7699	90.75	90.71
	5	-0.9	-0.010	1.750	86	4.0	4.1	1.7688	90.73	90.49
	10	-0.8	1.210	1.700	87	12.3	12.3	1.7819	91.14	89.04
	15	-0.4	1.510	1.650	87	14.3	14.3	1.7511	90.35	87.56
	20	-0.2	2.100	1.580	87	19.4	19.4	1.7588	90.55	85.41
	25	0.1	2.600	1.450	88	24.5	24.5	1.7332	89.97	81.89
	30	0.8	2.950	1.330	88	29.5	29.5	1.7359	90.04	78.35
3	-30	-2.3	-2.800	1.250	91	-30.0	30.1	1.2549	76.77	66.43
	-25	-1.8	-2.850	1.460	91	-25.2	25.3	1.7006	89.37	80.80
	-20	-1.3	-2.840	1.640	91	-21.3	21.4	1.7765	91.34	85.05
	-15	-1.4	-1.900	1.750	90	-12.0	12.1	1.7572	90.76	88.76
	-10	-1.0	-1.600	1.780	90	-9.8	9.9	1.7736	91.18	89.83
	-5	-1.1	-1.000	1.800	90	-3.9	4.1	1.7928	91.67	91.44
	0	-1.0	-0.500	1.770	90	-0.2	1.0	1.7730	91.17	91.15
	5	-0.8	0.400	1.750	90	7.0	7.1	1.7869	91.52	90.82
	10	-0.8	1.180	1.720	90	12.0	12.1	1.8000	91.86	89.83
	15	-0.4	1.650	1.640	89	15.2	15.2	1.7521	90.54	87.37
	20	-0.2	2.250	1.550	89	20.8	20.8	1.7568	90.66	84.75
	25	-0.2	2.650	1.450	89	24.8	24.8	1.7422	90.29	81.94
	30	0.7	2.950	1.340	89	29.3	29.3	1.7430	90.31	78.74

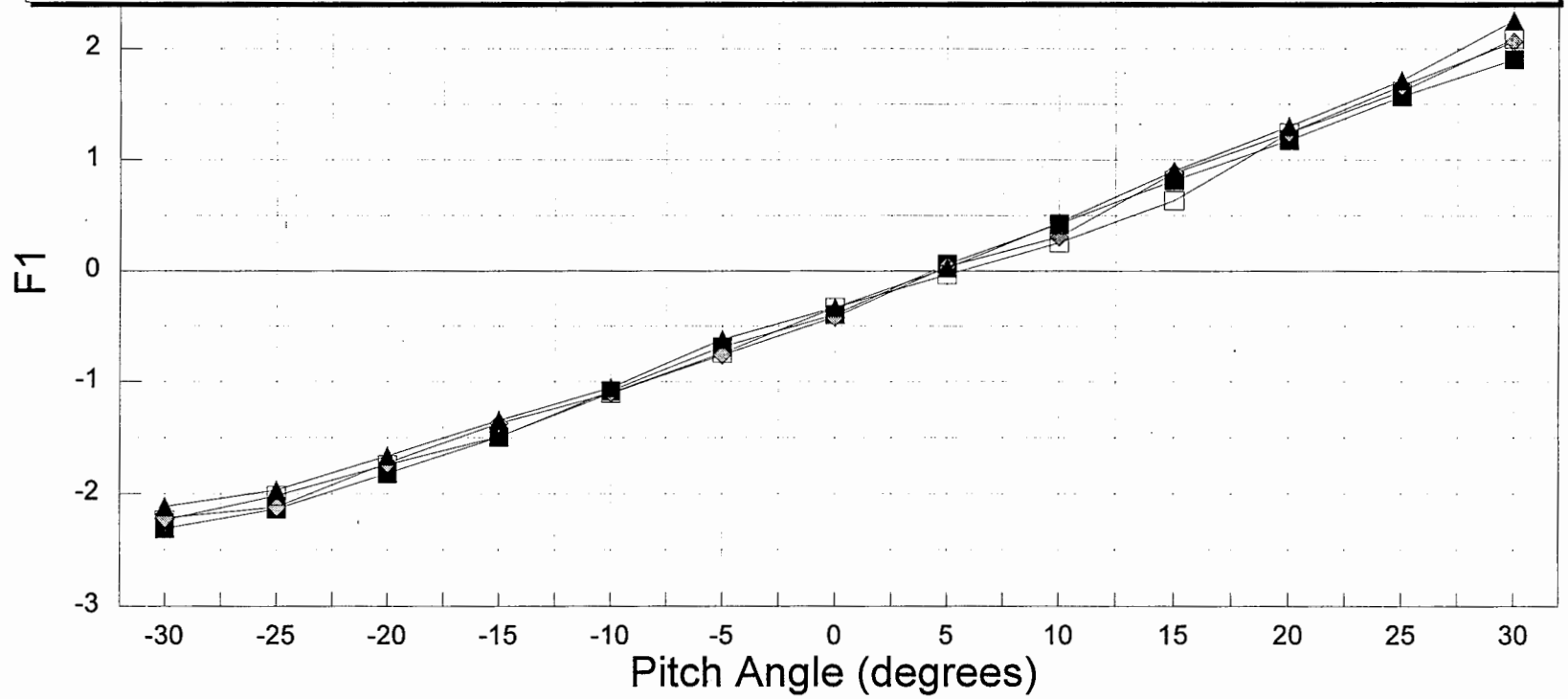
		Res	Vdir	Vax
Average	-30	30.10	85.14	73.65
	-25	25.49	88.86	80.21
	-20	21.15	90.62	84.51
	-15	12.05	90.29	88.30
	-10	10.03	90.81	89.42
	-5	5.33	91.13	90.72
	0	1.25	90.85	90.83
	5	6.11	90.95	90.41
	10	12.02	91.18	89.18
	15	14.91	90.11	87.08
	20	20.20	90.32	84.76
	25	24.95	89.83	81.45
	30	29.60	89.92	78.18

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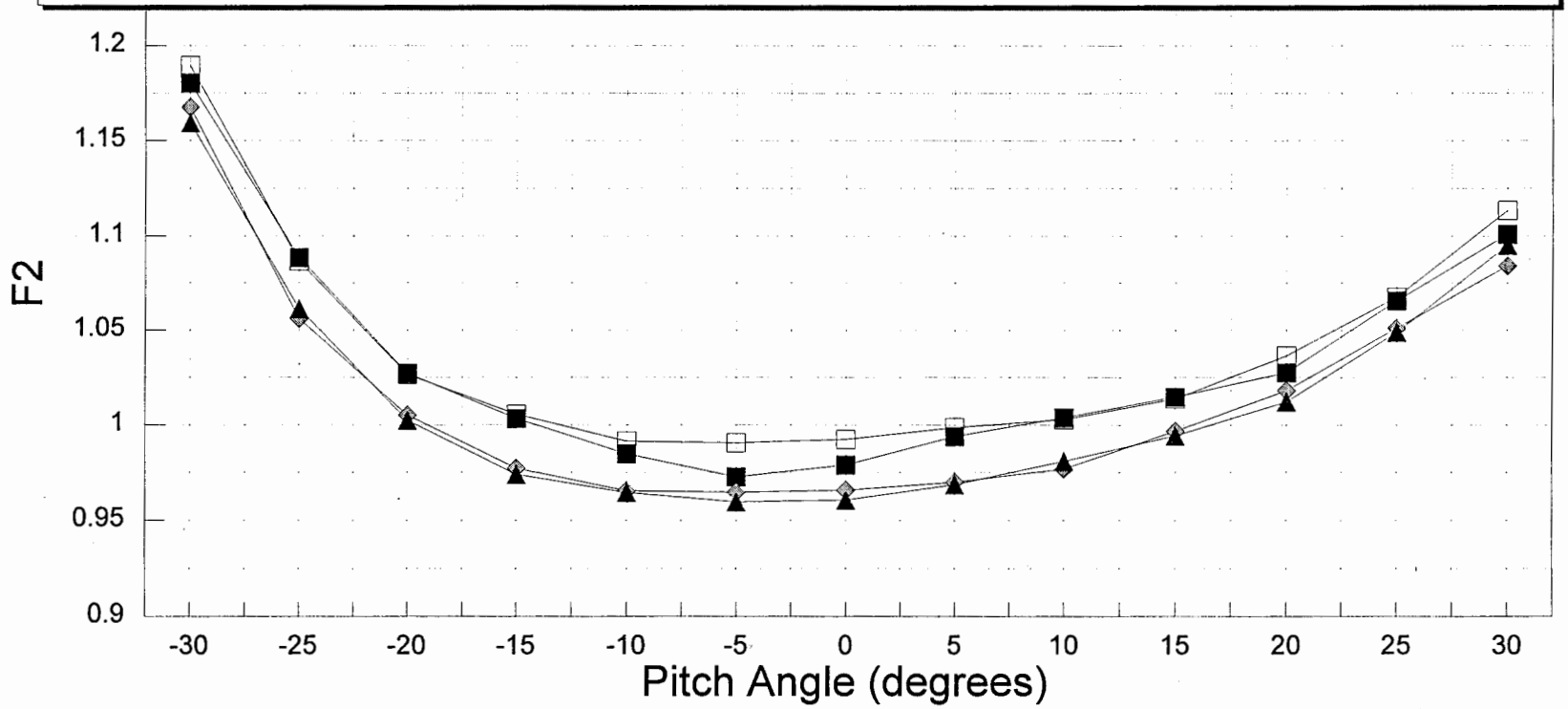
Spherical Probe SPH-3 Calibration Data

Figure C1-66. Spherical Probe 3 - Avg. (30-60 fps) F1 vs. Pitch Angle Pre- and Post Test Wind Tunnel Calibration



Note: Each point is the mean of three replicates.

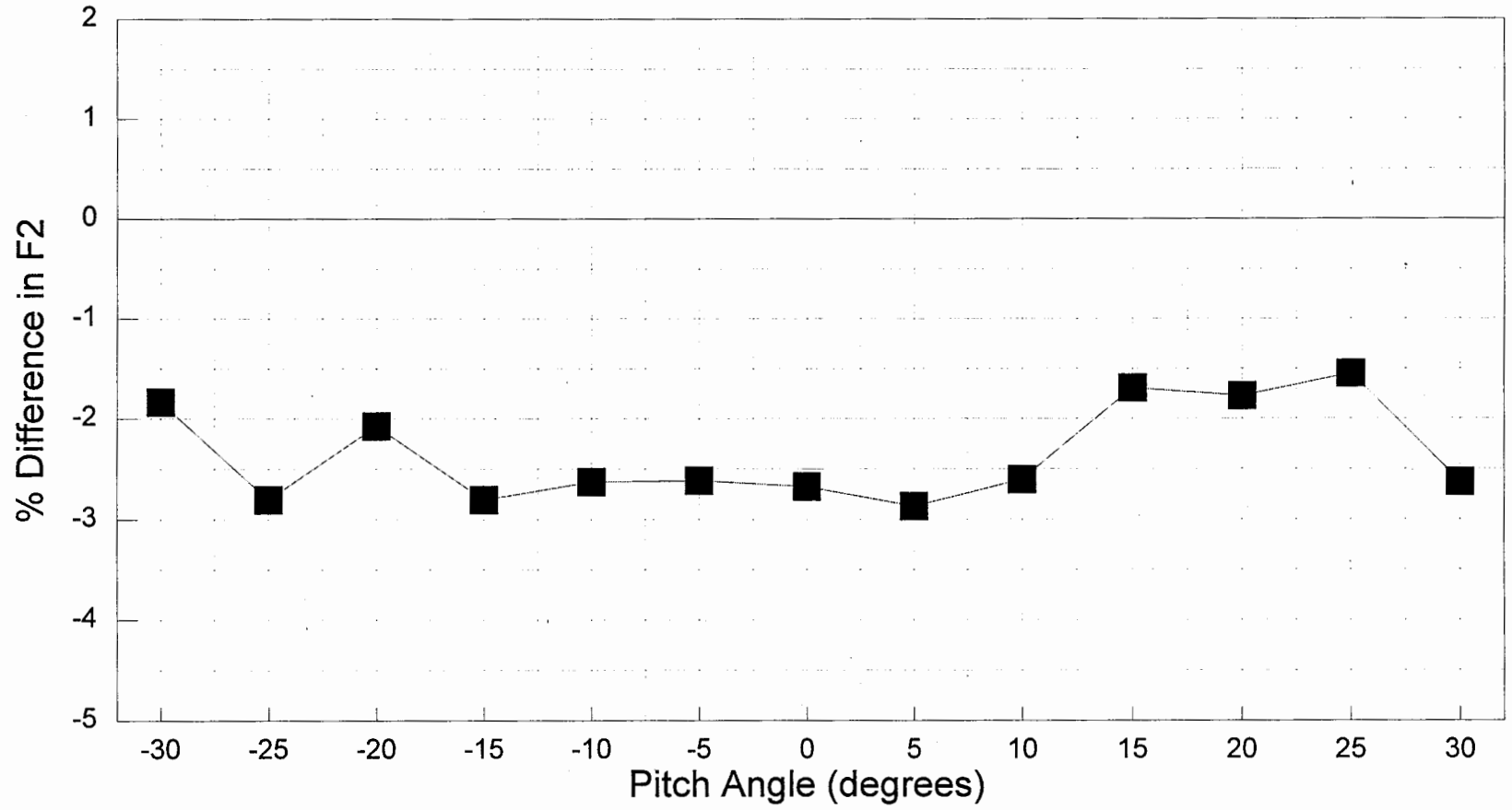
Figure C1-67. Spherical Probe 3 - Avg. (30-60 fps) F2 vs. Pitch Angle Pre- and Post Test Wind Tunnel Calibration



Note: Each point is the mean of three replicates.

Figure C1-68. Spherical Probe 3: Percent Difference in F2 (Avg. 30-60 fps)

NCSU Pre- (6/28/97) and Post-Test (11/6/97) Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-110. Spherical Probe SPH-3 Calibrations at NC State Wind Tunnel June and November 1997

Pitch Angle	30 fps / June / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.00	29.17	25.26	30.00	29.76	25.77	0.00	2.01	2.01
-25	28.16	32.78	28.89	28.89	33.94	29.71	2.60	3.54	2.86
-20	20.51	30.80	28.85	20.46	31.46	29.48	-0.23	2.14	2.17
-15	15.47	30.86	29.74	13.89	31.56	30.64	-10.19	2.30	3.04
-10	12.93	31.04	30.24	12.05	31.83	31.13	-6.80	2.55	2.92
-5	6.96	30.85	30.62	7.10	31.68	31.44	2.00	2.69	2.66
0	0.84	30.86	30.86	1.71	31.69	31.68	103.04	2.71	2.67
5	4.07	30.96	30.89	4.81	31.90	31.78	18.38	3.01	2.91
10	5.95	30.94	30.77	7.18	31.87	31.61	20.64	3.01	2.75
15	14.22	31.01	30.06	16.31	31.83	30.55	14.69	2.64	1.62
20	18.67	30.84	29.22	19.24	31.47	29.71	3.06	2.04	1.69
25	23.81	31.11	28.46	24.31	31.71	28.90	2.11	1.92	1.52
30	29.22	31.04	27.09	29.04	31.77	27.78	-0.62	2.38	2.56

Pitch Angle	60 fps / June / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	24.73	51.78	47.03	26.85	54.67	48.77	8.60	5.57	3.69
-25	23.99	58.55	53.48	25.64	61.83	55.70	6.90	5.60	4.14
-20	19.43	59.08	55.71	18.91	60.24	56.98	-2.69	1.96	2.27
-15	14.34	58.95	57.10	13.05	60.38	58.81	-8.97	2.43	3.00
-10	7.71	58.89	58.35	7.82	60.47	59.91	1.50	2.69	2.67
-5	3.04	58.87	58.79	3.55	60.46	60.34	16.94	2.69	2.64
0	0.61	58.82	58.81	0.44	60.39	60.39	-27.21	2.68	2.68
5	6.62	58.64	58.25	7.80	60.38	59.82	17.79	2.96	2.70
10	11.89	58.74	57.48	13.58	60.31	58.63	14.14	2.68	2.00
15	16.24	58.61	56.27	17.79	60.05	57.17	9.54	2.45	1.61
20	21.16	58.91	54.93	21.35	60.01	55.88	0.91	1.87	1.73
25	26.26	58.36	52.34	26.56	59.61	53.32	1.15	2.13	1.87
30	30.02	58.18	50.38	29.92	59.70	51.74	-0.33	2.61	2.72

Pitch Angle	90 fps / June / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.88	82.57	71.60	29.80	84.10	72.99	-0.27	1.85	1.94
-25	24.90	86.89	78.80	26.61	91.80	82.06	6.86	5.65	4.14
-20	20.88	88.83	82.99	20.99	90.95	84.91	0.54	2.40	2.31
-15	15.39	88.49	85.31	13.82	90.54	87.91	-10.18	2.32	3.05
-10	9.07	88.02	86.90	9.14	90.39	89.23	0.72	2.70	2.68
-5	3.88	88.64	88.44	4.25	91.02	90.77	9.48	2.69	2.64
0	1.08	88.36	88.34	0.90	90.74	90.72	-17.09	2.70	2.70
5	6.05	87.99	87.48	7.14	90.61	89.89	18.12	2.98	2.75
10	11.91	88.53	86.63	13.61	90.90	88.35	14.21	2.67	1.99
15	15.84	87.93	84.59	17.55	90.14	85.95	10.82	2.52	1.60
20	20.53	88.22	82.61	20.65	89.85	84.07	0.57	1.85	1.77
25	25.55	87.94	79.34	25.97	89.76	80.70	1.64	2.07	1.71
30	30.01	86.51	74.91	30.01	88.84	76.93	-0.00	2.70	2.70

Figure C1-69. Spherical Probe SPH-3 Pre- and Post-Test Calibrations

NC State Wind Tunnel -- June and November 1997

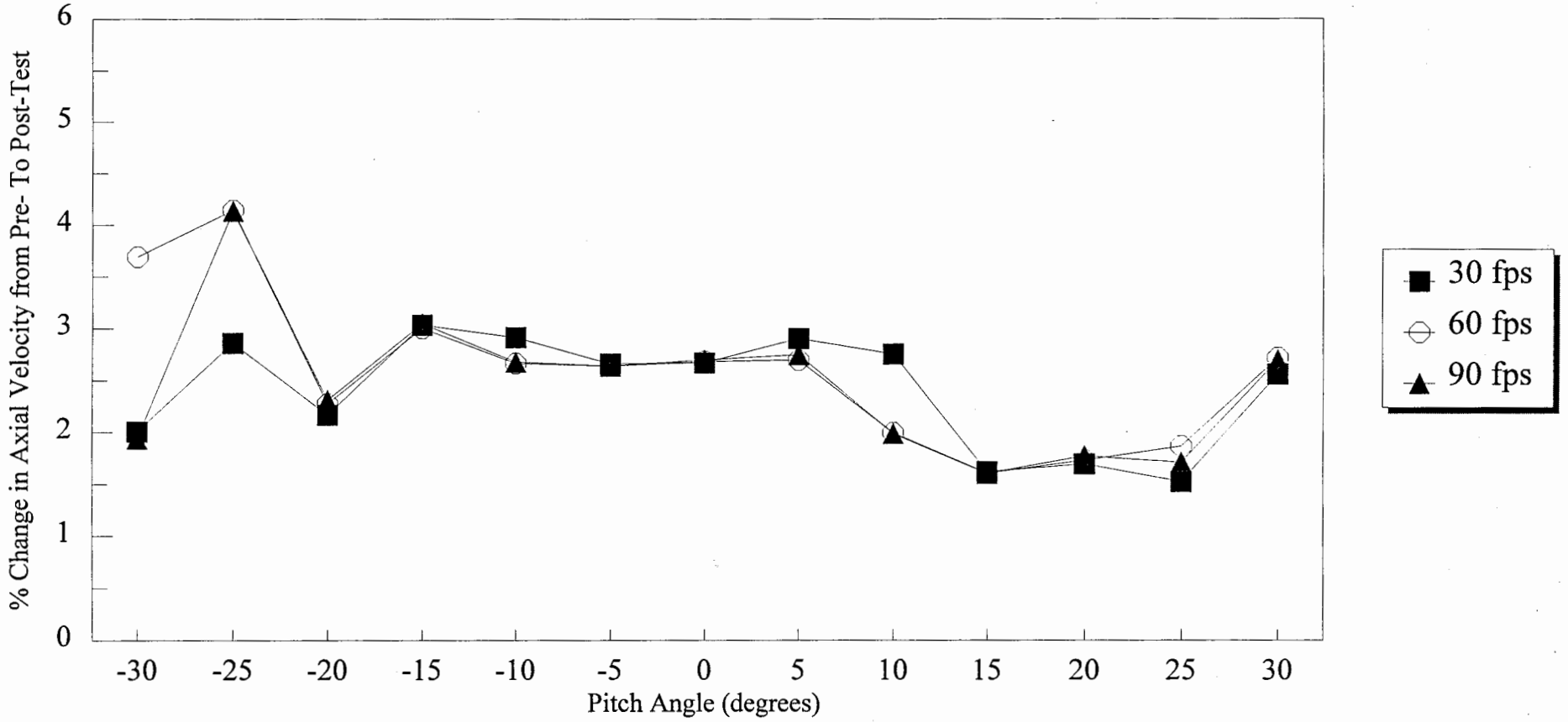


Table C1-111. Spherical Probe SPH-3 Calibrations at NC State Wind Tunnel June and July 1997

Pitch Angle	30 fps / June / 30-60 Calibration			30 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.00	29.17	25.26	30.00	29.02	25.13	0.00	-0.53	-0.53
-25	28.16	32.78	28.89	30.00	33.72	29.20	6.56	2.86	1.08
-20	20.51	30.80	28.85	21.71	31.18	28.97	5.87	1.22	0.40
-15	15.47	30.86	29.74	15.94	30.84	29.65	3.03	-0.06	-0.29
-10	12.93	31.04	30.24	13.54	31.00	30.13	4.68	-0.13	-0.37
-5	6.96	30.85	30.62	8.16	30.77	30.46	17.22	-0.25	-0.53
0	0.84	30.86	30.86	2.42	30.68	30.66	187.38	-0.57	-0.65
5	4.07	30.96	30.89	4.00	30.90	30.82	-1.64	-0.22	-0.21
10	5.95	30.94	30.77	5.79	30.91	30.76	-2.58	-0.07	-0.04
15	14.22	31.01	30.06	13.84	30.93	30.03	-2.68	-0.25	-0.09
20	18.67	30.84	29.22	18.11	30.62	29.11	-3.02	-0.70	-0.38
25	23.81	31.11	28.46	23.21	30.89	28.39	-2.49	-0.71	-0.26
30	29.22	31.04	27.09	27.67	30.88	27.35	-5.31	-0.50	0.98

Pitch Angle	60 fps / June / 30-60 Calibration			60 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	24.73	51.78	47.03	29.46	55.03	47.91	19.16	6.28	1.86
-25	23.99	58.55	53.48	27.57	62.31	55.14	14.92	6.41	3.11
-20	19.43	59.08	55.71	20.41	59.39	55.66	5.14	0.52	-0.10
-15	14.34	58.95	57.10	14.86	58.86	56.89	3.62	-0.14	-0.37
-10	7.71	58.89	58.35	8.75	58.77	58.08	13.51	-0.20	-0.46
-5	3.04	58.87	58.79	5.06	58.53	58.31	66.74	-0.57	-0.82
0	0.61	58.82	58.81	0.59	58.47	58.46	-3.15	-0.60	-0.60
5	6.62	58.64	58.25	6.24	58.61	58.27	-5.82	-0.05	0.03
10	11.89	58.74	57.48	10.98	58.69	57.62	-7.72	-0.09	0.24
15	16.24	58.61	56.27	15.89	58.34	56.11	-2.13	-0.46	-0.29
20	21.16	58.91	54.93	20.51	58.37	54.67	-3.05	-0.91	-0.48
25	26.26	58.36	52.34	25.49	58.03	52.38	-2.92	-0.57	0.08
30	30.02	58.18	50.38	28.83	58.18	50.97	-3.95	0.00	1.18

Pitch Angle	90 fps / June / 30-60 Calibration			90 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.88	82.57	71.60	30.00	82.34	71.30	0.41	-0.28	-0.41
-25	24.90	86.89	78.80	28.76	93.04	81.54	15.52	7.07	3.47
-20	20.88	88.83	82.99	22.19	90.06	83.39	6.29	1.39	0.48
-15	15.39	88.49	85.31	15.85	88.42	85.06	3.01	-0.07	-0.30
-10	9.07	88.02	86.90	9.97	87.96	86.62	9.86	-0.06	-0.32
-5	3.88	88.64	88.44	5.73	88.21	87.77	47.59	-0.49	-0.76
0	1.08	88.36	88.34	1.11	87.85	87.82	2.76	-0.58	-0.59
5	6.05	87.99	87.48	5.75	87.91	87.46	-4.97	-0.09	-0.03
10	11.91	88.53	86.63	11.00	88.46	86.83	-7.67	-0.09	0.24
15	15.84	87.93	84.59	15.53	87.56	84.36	-1.95	-0.42	-0.27
20	20.53	88.22	82.61	19.86	87.45	82.24	-3.24	-0.87	-0.45
25	25.55	87.94	79.34	24.93	87.42	79.28	-2.43	-0.59	-0.08
30	30.01	86.51	74.91	29.13	86.74	75.77	-2.96	0.26	1.15

Figure C1-70. Spherical Probe SPH-3 Pre- and Intermediate Calibrations

NC State Wind Tunnel -- June and July 1997

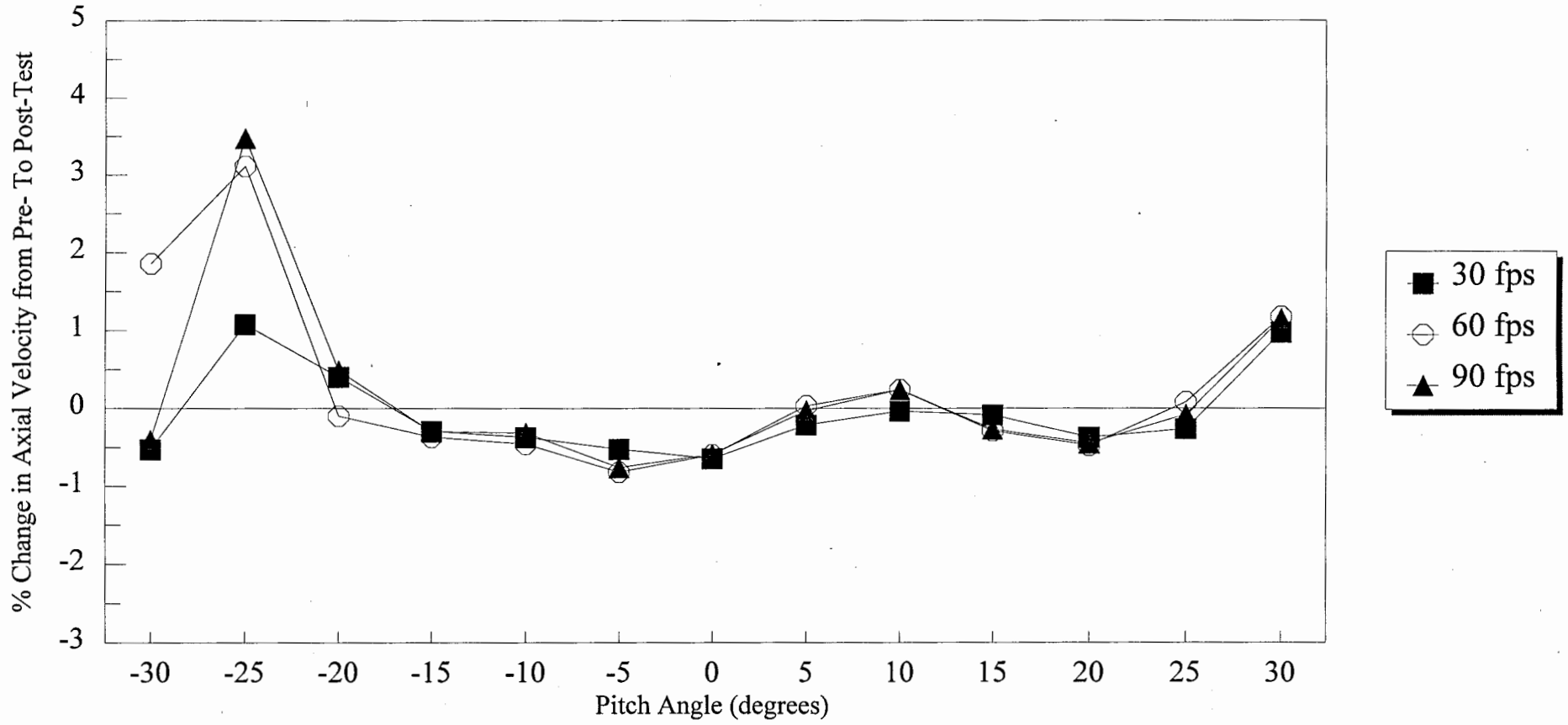


Table C1-112. Spherical SPH-3 Pre-test Computations - 30 fps

Probe: **Spherical SPH-3 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 06/28/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.77%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**29.30**	Last Row:	61
Average Yaw Angle:	0.2		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.2	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.65		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.350	0.150	83	-30.0	30.0	0.2045	30.77	26.64
	-25	-0.3	-0.400	0.185	83	-27.2	27.2	0.2268	32.40	28.81
	-20	-0.4	-0.350	0.200	83	-20.3	20.3	0.2033	30.67	28.77
	-15	-0.5	-0.300	0.215	83	-15.3	15.3	0.2061	30.88	29.79
	-10	-0.4	-0.260	0.220	83	-11.4	11.5	0.2065	30.92	30.30
	-5	-0.3	-0.200	0.220	83	-7.2	7.2	0.2049	30.79	30.55
	0	-0.3	-0.100	0.220	83	-0.5	0.6	0.2052	30.81	30.81
	5	-0.4	-0.010	0.220	82	4.1	4.1	0.2067	30.90	30.82
	10	-0.3	0.020	0.218	82	5.9	6.0	0.2057	30.82	30.66
	15	-0.4	0.170	0.210	82	14.4	14.4	0.2075	30.96	30.00
	20	-0.3	0.230	0.200	82	18.7	18.7	0.2050	30.77	29.15
	25	-0.4	0.300	0.190	82	24.0	24.0	0.2072	30.94	28.27
	30	0.0	0.360	0.175	82	29.9	29.9	0.2055	30.81	26.70
2	-30	-0.1	-0.350	0.150	87	-30.0	30.0	0.2045	30.88	26.74
	-25	-0.1	-0.400	0.176	87	-30.0	30.0	0.2400	33.45	28.97
	-20	-0.4	-0.350	0.200	87	-20.3	20.3	0.2033	30.78	28.87
	-15	-0.4	-0.300	0.210	87	-15.8	15.8	0.2024	30.72	29.56
	-10	-0.4	-0.290	0.218	87	-14.2	14.2	0.2074	31.10	30.15
	-5	-0.4	-0.200	0.220	87	-7.2	7.2	0.2049	30.91	30.66
	0	-0.4	-0.100	0.220	86	-0.5	0.7	0.2052	30.90	30.90
	5	-0.3	-0.010	0.220	86	4.1	4.1	0.2067	31.01	30.93
	10	-0.4	0.030	0.219	86	6.8	6.8	0.2071	31.04	30.83
	15	0.2	0.150	0.210	86	13.5	13.5	0.2062	30.97	30.12
	20	0.0	0.220	0.200	86	18.0	18.0	0.2038	30.80	29.29
	25	0.0	0.300	0.195	86	23.5	23.5	0.2114	31.36	28.77
	30	0.0	0.350	0.180	86	28.5	28.5	0.2078	31.10	27.32
3	-30	-0.5	-0.350	0.150	86	-30.0	30.0	0.1438	25.87	22.40
	-25	-0.6	-0.400	0.185	86	-27.2	27.2	0.2268	32.49	28.89
	-20	-0.1	-0.360	0.200	86	-20.9	20.9	0.2060	30.96	28.92
	-15	-0.4	-0.300	0.215	86	-15.3	15.3	0.2061	30.97	29.87
	-10	-0.4	-0.280	0.220	85	-13.1	13.1	0.2082	31.10	30.29
	-5	-0.1	-0.190	0.220	85	-6.5	6.5	0.2049	30.85	30.65
	0	-0.1	-0.110	0.220	85	-1.2	1.2	0.2051	30.87	30.86
	5	0.0	-0.010	0.220	85	4.1	4.1	0.2067	30.98	30.91
	10	0.0	0.010	0.219	85	5.1	5.1	0.2061	30.94	30.82
	15	0.0	0.180	0.210	85	14.8	14.8	0.2082	31.10	30.07
	20	0.0	0.240	0.200	85	19.4	19.4	0.2062	30.95	29.20
	25	0.0	0.300	0.190	85	24.0	24.0	0.2072	31.02	28.35
	30	-0.1	0.360	0.180	85	29.2	29.2	0.2096	31.20	27.23

		Res	Vdir	Vax
Average	-30	30.00	29.17	25.26
	-25	28.16	32.78	28.89
	-20	20.51	30.80	28.85
	-15	15.47	30.86	29.74
	-10	12.93	31.04	30.24
	-5	6.96	30.85	30.62
	0	0.84	30.86	30.86
	5	4.07	30.96	30.89
	10	5.95	30.94	30.77
	15	14.22	31.01	30.06
	20	18.67	30.84	29.22
	25	23.81	31.11	28.46
	30	29.22	31.04	27.09

Table C1-113. Spherical SPH-3 Inermediate Compuations - 30 fps

Probe: **Spherical SPH-3 / Intermediate 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 07/21/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.77%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**29.28**	Last Row:	61
Average Yaw Angle:	0.2		
Average Pitch Angle:	16.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.41		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.350	0.150	83	-30.0	30.0	0.2016	30.55	26.45
	-25	-0.3	-0.400	0.185	83	-30.0	30.0	0.2487	33.92	29.38
	-20	-0.4	-0.350	0.200	83	-21.4	21.4	0.2079	31.02	28.87
	-15	-0.5	-0.300	0.215	83	-15.8	15.8	0.2058	30.86	29.70
	-10	-0.4	-0.260	0.220	83	-12.2	12.2	0.2064	30.91	30.21
	-5	-0.3	-0.200	0.220	83	-8.3	8.3	0.2039	30.72	30.40
	0	-0.3	-0.100	0.220	83	-2.1	2.2	0.2028	30.64	30.62
	5	-0.4	-0.010	0.220	82	4.0	4.0	0.2057	30.83	30.75
	10	-0.3	0.020	0.218	82	5.8	5.8	0.2054	30.80	30.64
	15	-0.4	0.170	0.210	82	14.0	14.0	0.2065	30.88	29.96
	20	-0.3	0.230	0.200	82	18.1	18.1	0.2021	30.56	29.04
	25	-0.4	0.300	0.190	82	23.4	23.4	0.2043	30.72	28.20
	30	0.0	0.360	0.175	82	28.2	28.2	0.2036	30.67	27.03
2	-30	-0.1	-0.350	0.150	87	-30.0	30.0	0.2016	30.66	26.55
	-25	-0.1	-0.400	0.176	87	-30.0	30.0	0.2366	33.21	28.76
	-20	-0.4	-0.350	0.200	87	-21.4	21.4	0.2079	31.13	28.98
	-15	-0.4	-0.300	0.210	87	-16.3	16.3	0.2022	30.70	29.47
	-10	-0.4	-0.290	0.218	87	-14.7	14.7	0.2066	31.03	30.01
	-5	-0.4	-0.200	0.220	87	-8.3	8.3	0.2039	30.83	30.51
	0	-0.4	-0.100	0.220	86	-2.1	2.2	0.2028	30.72	30.70
	5	-0.3	-0.010	0.220	86	4.0	4.0	0.2057	30.94	30.87
	10	-0.4	0.030	0.219	86	6.3	6.4	0.2069	31.03	30.84
	15	0.2	0.150	0.210	86	13.0	13.0	0.2053	30.91	30.12
	20	0.0	0.220	0.200	86	17.5	17.5	0.2012	30.60	29.19
	25	0.0	0.300	0.195	86	22.9	22.9	0.2083	31.13	28.68
	30	0.0	0.350	0.180	86	27.1	27.1	0.2057	30.94	27.53
3	-30	-0.5	-0.350	0.150	86	-30.0	30.0	0.1436	25.85	22.38
	-25	-0.6	-0.400	0.185	86	-30.0	30.0	0.2487	34.02	29.46
	-20	-0.1	-0.360	0.200	86	-22.3	22.3	0.2118	31.40	29.06
	-15	-0.4	-0.300	0.215	86	-15.8	15.8	0.2058	30.94	29.78
	-10	-0.4	-0.280	0.220	85	-13.7	13.7	0.2076	31.06	30.17
	-5	-0.1	-0.190	0.220	85	-7.8	7.8	0.2037	30.76	30.48
	0	-0.1	-0.110	0.220	85	-2.9	2.9	0.2028	30.69	30.65
	5	0.0	-0.010	0.220	85	4.0	4.0	0.2057	30.91	30.84
	10	0.0	0.010	0.219	85	5.2	5.2	0.2057	30.91	30.78
	15	0.0	0.180	0.210	85	14.5	14.5	0.2070	31.01	30.02
	20	0.0	0.240	0.200	85	18.7	18.7	0.2031	30.71	29.08
	25	0.0	0.300	0.190	85	23.4	23.4	0.2043	30.81	28.28
	30	-0.1	0.360	0.180	85	27.7	27.7	0.2075	31.05	27.50

		Res	Vdir	Vax
Average	-30	30.00	29.02	25.13
	-25	30.00	33.72	29.20
	-20	21.71	31.18	28.97
	-15	15.94	30.84	29.65
	-10	13.54	31.00	30.13
	-5	8.16	30.77	30.46
	0	2.42	30.68	30.66
	5	4.00	30.90	30.82
	10	5.79	30.91	30.76
	15	13.84	30.93	30.03
	20	18.11	30.62	29.11
	25	23.21	30.89	28.39
	30	27.67	30.88	27.35

Table C1-114. Spherical SPH-3 Post-test Computations - 30 fps

Probe: **Spherical SPH-3 / Post-Test 30-60 Calibration**

Velocity Point: **30 fps** Cal Date: 11/06/97

Number Of Points: 39

Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.77%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**30.01**	Last Row:	61
Average Yaw Angle:	0.2		
Average Pitch Angle:	16.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.47		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.350	0.150	83	-30.0	30.0	0.2122	31.34	27.14
	-25	-0.3	-0.400	0.185	83	-28.3	28.3	0.2473	33.83	29.78
	-20	-0.4	-0.350	0.200	83	-20.2	20.2	0.2115	31.28	29.37
	-15	-0.5	-0.300	0.215	83	-13.7	13.8	0.2159	31.61	30.70
	-10	-0.4	-0.260	0.220	83	-11.0	11.0	0.2175	31.73	31.14
	-5	-0.3	-0.200	0.220	83	-7.3	7.3	0.2161	31.62	31.37
	0	-0.3	-0.100	0.220	83	-1.5	1.5	0.2164	31.65	31.64
	5	-0.4	-0.010	0.220	82	4.8	4.8	0.2193	31.83	31.72
	10	-0.3	0.020	0.218	82	7.2	7.2	0.2182	31.75	31.50
	15	-0.4	0.170	0.210	82	16.4	16.4	0.2187	31.78	30.48
	20	-0.3	0.230	0.200	82	19.2	19.2	0.2135	31.40	29.65
	25	-0.4	0.300	0.190	82	24.5	24.5	0.2153	31.53	28.70
	30	0.0	0.360	0.175	82	29.6	29.6	0.2157	31.56	27.43
2	-30	-0.1	-0.350	0.150	87	-30.0	30.0	0.2122	31.46	27.24
	-25	-0.1	-0.400	0.176	87	-30.0	30.0	0.2490	34.07	29.51
	-20	-0.4	-0.350	0.200	87	-20.2	20.2	0.2115	31.40	29.47
	-15	-0.4	-0.300	0.210	87	-14.2	14.2	0.2113	31.39	30.43
	-10	-0.4	-0.290	0.218	87	-12.9	12.9	0.2179	31.87	31.06
	-5	-0.4	-0.200	0.220	87	-7.3	7.3	0.2161	31.74	31.48
	0	-0.4	-0.100	0.220	86	-1.5	1.5	0.2164	31.74	31.72
	5	-0.3	-0.010	0.220	86	4.8	4.8	0.2193	31.94	31.83
	10	-0.4	0.030	0.219	86	8.0	8.0	0.2195	31.96	31.65
	15	0.2	0.150	0.210	86	15.7	15.7	0.2171	31.79	30.61
	20	0.0	0.220	0.200	86	18.8	18.8	0.2127	31.46	29.78
	25	0.0	0.300	0.195	86	23.9	23.9	0.2196	31.96	29.21
	30	0.0	0.350	0.180	86	28.4	28.4	0.2175	31.82	27.98
3	-30	-0.5	-0.350	0.150	86	-30.0	30.0	0.1506	26.47	22.93
	-25	-0.6	-0.400	0.185	86	-28.3	28.3	0.2473	33.92	29.86
	-20	-0.1	-0.360	0.200	86	-21.1	21.1	0.2161	31.71	29.59
	-15	-0.4	-0.300	0.215	86	-13.7	13.8	0.2159	31.69	30.79
	-10	-0.4	-0.280	0.220	85	-12.2	12.2	0.2190	31.89	31.17
	-5	-0.1	-0.190	0.220	85	-6.7	6.7	0.2160	31.68	31.46
	0	-0.1	-0.110	0.220	85	-2.0	2.0	0.2163	31.70	31.68
	5	0.0	-0.010	0.220	85	4.8	4.8	0.2193	31.92	31.80
	10	0.0	0.010	0.219	85	6.4	6.4	0.2189	31.89	31.69
	15	0.0	0.180	0.210	85	16.8	16.8	0.2194	31.92	30.56
	20	0.0	0.240	0.200	85	19.7	19.7	0.2142	31.54	29.71
	25	0.0	0.300	0.190	85	24.5	24.5	0.2153	31.62	28.78
	30	-0.1	0.360	0.180	85	29.0	29.0	0.2197	31.94	27.93

		Res		Vdir	Vax
Average	-30	30.00		29.76	25.77
	-25	28.89		33.94	29.71
	-20	20.46		31.46	29.48
	-15	13.89		31.56	30.64
	-10	12.05		31.83	31.13
	-5	7.10		31.68	31.44
	0	1.71		31.69	31.68
	5	4.81		31.90	31.78
	10	7.18		31.87	31.61
	15	16.31		31.83	30.55
	20	19.24		31.47	29.71
	25	24.31		31.71	28.90
	30	29.04		31.77	27.78

Table C1-115. Spherical SPH-3 Pre-test Computations - 60 fps

Probe: **Spherical SPH-3 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **60 fps** Cal Date: 06/28/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.86%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**55.30**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	15.8	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.8		**0**
Resultant Angle Standard Deviation:	9.17		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw			Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-1.150	0.550	84	-24.6	24.6	0.6093	53.15	48.31
	-25	-0.2	-1.300	0.670	84	-22.7	22.7	0.7152	57.58	53.12
	-20	-0.1	-1.240	0.750	84	-19.0	19.0	0.7490	58.93	55.73
	-15	-0.1	-1.000	0.790	84	-13.0	13.0	0.7473	58.86	57.35
	-10	-0.1	-0.750	0.800	84	-7.6	7.6	0.7452	58.78	58.26
	-5	0.0	-0.500	0.800	84	-3.0	3.0	0.7452	58.78	58.70
	0	0.3	-0.290	0.790	84	0.5	0.6	0.7376	58.48	58.48
	5	0.4	0.090	0.780	83	6.4	6.4	0.7368	58.39	58.03
	10	0.3	0.400	0.760	83	11.9	11.9	0.7364	58.38	57.13
	15	0.5	0.700	0.740	83	15.9	15.9	0.7406	58.54	56.31
	20	0.5	1.000	0.700	83	22.2	22.2	0.7463	58.77	54.42
	25	0.5	1.150	0.650	83	26.3	26.3	0.7301	58.13	52.10
	30	1.2	1.320	0.600	83	30.0	30.0	0.7053	57.13	49.47
2	-30	-0.5	-1.140	0.540	87	-24.9	24.9	0.6012	52.94	48.02
	-25	-0.5	-1.420	0.670	87	-25.0	25.0	0.7476	59.04	53.50
	-20	-0.1	-1.250	0.750	87	-19.1	19.1	0.7506	59.15	55.88
	-15	-0.1	-1.100	0.780	87	-15.5	15.5	0.7495	59.11	56.96
	-10	-0.1	-0.720	0.800	87	-7.0	7.0	0.7451	58.94	58.49
	-5	0.0	-0.500	0.800	87	-3.0	3.0	0.7452	58.94	58.86
	0	0.0	-0.290	0.800	87	0.6	0.6	0.7470	59.01	59.01
	5	0.4	0.090	0.780	86	6.4	6.4	0.7368	58.55	58.19
	10	0.4	0.400	0.770	86	11.8	11.8	0.7458	58.91	57.66
	15	0.3	0.750	0.730	86	17.0	17.0	0.7376	58.59	56.03
	20	0.4	0.950	0.710	86	21.1	21.1	0.7465	58.94	54.99
	25	0.4	1.150	0.650	86	26.3	26.3	0.7301	58.29	52.25
	30	0.9	1.300	0.630	86	30.0	30.0	0.7405	58.70	50.83
3	-30	-0.5	-1.150	0.550	87	-24.6	24.6	0.5203	49.25	44.76
	-25	-0.5	-1.400	0.680	87	-24.2	24.2	0.7475	59.03	53.83
	-20	-0.1	-1.290	0.740	87	-20.2	20.2	0.7507	59.16	55.52
	-15	-0.1	-1.050	0.780	87	-14.5	14.5	0.7432	58.86	56.99
	-10	-0.2	-0.800	0.800	87	-8.5	8.5	0.7454	58.95	58.30
	-5	0.0	-0.500	0.800	86	-3.0	3.0	0.7452	58.89	58.81
	0	-0.1	-0.290	0.800	86	0.6	0.6	0.7470	58.96	58.96
	5	-0.1	0.120	0.790	86	7.1	7.1	0.7477	58.99	58.54
	10	0.1	0.410	0.770	86	11.9	11.9	0.7465	58.94	57.66
	15	-0.4	0.700	0.740	86	15.9	15.9	0.7406	58.70	56.47
	20	0.6	0.910	0.720	86	20.2	20.2	0.7484	59.01	55.38
	25	0.5	1.160	0.660	86	26.2	26.2	0.7399	58.68	52.67
	30	1.0	1.330	0.630	86	30.0	30.0	0.7405	58.70	50.83

		Res	Vdir	Vax
Average	-30	24.73	51.78	47.03
	-25	23.99	58.55	53.48
	-20	19.43	59.08	55.71
	-15	14.34	58.95	57.10
	-10	7.71	58.89	58.35
	-5	3.04	58.87	58.79
	0	0.61	58.82	58.81
	5	6.62	58.64	58.25
	10	11.89	58.74	57.48
	15	16.24	58.61	56.27
	20	21.16	58.91	54.93
	25	26.26	58.36	52.34
	30	30.02	58.18	50.38

Table C1-116. Spherical SPH-3 Intermediate Compuations - 60 fps

Probe: **Spherical SPH-3 / Intermediate 30-60 Calibration**

Velocity Point: **60 fps** Cal Date: 07/21/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.86%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**55.42**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.51		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-1.150	0.550	84	-29.2	29.2	0.7208	57.81	50.45
	-25	-0.2	-1.300	0.670	84	-24.6	24.6	0.7470	58.85	53.53
	-20	-0.1	-1.240	0.750	84	-19.9	19.9	0.7522	59.06	55.55
	-15	-0.1	-1.000	0.790	84	-13.6	13.6	0.7453	58.78	57.13
	-10	-0.1	-0.750	0.800	84	-8.7	8.7	0.7421	58.66	57.99
	-5	0.0	-0.500	0.800	84	-5.1	5.1	0.7367	58.44	58.22
	0	0.3	-0.290	0.790	84	-0.6	0.7	0.7288	58.13	58.13
	5	0.4	0.090	0.780	83	6.1	6.1	0.7359	58.36	58.03
	10	0.3	0.400	0.760	83	11.0	11.0	0.7352	58.33	57.26
	15	0.5	0.700	0.740	83	15.5	15.6	0.7343	58.29	56.16
	20	0.5	1.000	0.700	83	21.5	21.6	0.7335	58.26	54.19
	25	0.5	1.150	0.650	83	25.5	25.5	0.7218	57.80	52.15
	30	1.2	1.320	0.600	83	29.5	29.5	0.7137	57.47	50.00
2	-30	-0.5	-1.140	0.540	87	-29.9	29.9	0.7240	58.10	50.35
	-25	-0.5	-1.420	0.670	87	-30.0	30.0	0.9006	64.80	56.11
	-20	-0.1	-1.250	0.750	87	-20.1	20.1	0.7546	59.31	55.71
	-15	-0.1	-1.100	0.780	87	-16.0	16.0	0.7486	59.08	56.79
	-10	-0.1	-0.720	0.800	87	-8.2	8.2	0.7414	58.79	58.19
	-5	0.0	-0.500	0.800	87	-5.1	5.1	0.7367	58.61	58.38
	0	0.0	-0.290	0.800	87	-0.5	0.5	0.7381	58.66	58.66
	5	0.4	0.090	0.780	86	6.1	6.1	0.7359	58.52	58.19
	10	0.4	0.400	0.770	86	10.9	10.9	0.7446	58.86	57.80
	15	0.3	0.750	0.730	86	16.6	16.6	0.7297	58.27	55.85
	20	0.4	0.950	0.710	86	20.4	20.5	0.7322	58.37	54.69
	25	0.4	1.150	0.650	86	25.5	25.5	0.7218	57.96	52.30
	30	0.9	1.300	0.630	86	28.2	28.3	0.7336	58.43	51.46
3	-30	-0.5	-1.150	0.550	87	-29.2	29.2	0.5189	49.18	42.92
	-25	-0.5	-1.400	0.680	87	-28.1	28.1	0.8586	63.27	55.79
	-20	-0.1	-1.290	0.740	87	-21.3	21.3	0.7671	59.80	55.71
	-15	-0.1	-1.050	0.780	87	-15.0	15.0	0.7398	58.73	56.73
	-10	-0.2	-0.800	0.800	87	-9.4	9.4	0.7431	58.86	58.07
	-5	0.0	-0.500	0.800	86	-5.1	5.1	0.7367	58.55	58.32
	0	-0.1	-0.290	0.800	86	-0.5	0.5	0.7381	58.61	58.60
	5	-0.1	0.120	0.790	86	6.5	6.5	0.7471	58.96	58.58
	10	0.1	0.410	0.770	86	11.0	11.0	0.7451	58.88	57.79
	15	-0.4	0.700	0.740	86	15.5	15.6	0.7343	58.45	56.31
	20	0.6	0.910	0.720	86	19.5	19.5	0.7352	58.49	55.12
	25	0.5	1.160	0.660	86	25.4	25.4	0.7315	58.34	52.69
	30	1.0	1.330	0.630	86	28.7	28.7	0.7391	58.65	51.44

		Res	Vdir	Vax
Average	-30	29.46	55.03	47.91
	-25	27.57	62.31	55.14
	-20	20.41	59.39	55.66
	-15	14.86	58.86	56.89
	-10	8.75	58.77	58.08
	-5	5.06	58.53	58.31
	0	0.59	58.47	58.46
	5	6.24	58.61	58.27
	10	10.98	58.69	57.62
	15	15.89	58.34	56.11
	20	20.51	58.37	54.67
	25	25.49	58.03	52.38
	30	28.83	58.18	50.97

Table C1-117. Spherical SPH-3 Post-test Computations - 60 fps

Probe: **Spherical SPH-3 / Post-Test 30-60 Calibration**

Velocity Point: **60 fps** Cal Date: 11/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.86%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**56.73**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.4		0
Resultant Angle Standard Deviation:	9.34		

			Readings, in.H2O							
	Pitch	Yaw			Gas	<< ANGLES >>			Velocities, ft/sec	
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-1.150	0.550	84	-26.7	26.7	0.6931	56.69	50.65
	-25	-0.2	-1.300	0.670	84	-23.6	23.6	0.7674	59.65	54.65
	-20	-0.1	-1.240	0.750	84	-18.2	18.2	0.7787	60.09	57.08
	-15	-0.1	-1.000	0.790	84	-12.1	12.1	0.7859	60.36	59.02
	-10	-0.1	-0.750	0.800	84	-7.7	7.7	0.7859	60.36	59.82
	-5	0.0	-0.500	0.800	84	-3.6	3.6	0.7859	60.36	60.25
	0	0.3	-0.290	0.790	84	-0.4	0.5	0.7777	60.05	60.05
	5	0.4	0.090	0.780	83	7.6	7.6	0.7813	60.13	59.61
	10	0.3	0.400	0.760	83	13.6	13.6	0.7764	59.94	58.27
	15	0.5	0.700	0.740	83	17.6	17.6	0.7782	60.01	57.21
	20	0.5	1.000	0.700	83	22.5	22.5	0.7748	59.88	55.33
	25	0.5	1.150	0.650	83	26.6	26.6	0.7616	59.37	53.08
	30	1.2	1.320	0.600	83	30.0	30.0	0.7438	58.67	50.80
2	-30	-0.5	-1.140	0.540	87	-27.2	27.2	0.6922	56.81	50.54
	-25	-0.5	-1.420	0.670	87	-27.3	27.4	0.8648	63.50	56.40
	-20	-0.1	-1.250	0.750	87	-18.5	18.5	0.7804	60.32	57.21
	-15	-0.1	-1.100	0.780	87	-13.9	13.9	0.7840	60.46	58.68
	-10	-0.1	-0.720	0.800	87	-7.2	7.2	0.7857	60.52	60.05
	-5	0.0	-0.500	0.800	87	-3.6	3.6	0.7859	60.53	60.41
	0	0.0	-0.290	0.800	87	-0.4	0.4	0.7876	60.59	60.59
	5	0.4	0.090	0.780	86	7.6	7.6	0.7813	60.30	59.77
	10	0.4	0.400	0.770	86	13.5	13.5	0.7863	60.49	58.82
	15	0.3	0.750	0.730	86	18.2	18.2	0.7723	59.95	56.94
	20	0.4	0.950	0.710	86	21.3	21.3	0.7746	60.04	55.95
	25	0.4	1.150	0.650	86	26.6	26.6	0.7616	59.53	53.23
	30	0.9	1.300	0.630	86	29.7	29.7	0.7772	60.14	52.23
3	-30	-0.5	-1.150	0.550	87	-26.7	26.7	0.5472	50.51	45.12
	-25	-0.5	-1.400	0.680	87	-26.0	26.0	0.8336	62.34	56.04
	-20	-0.1	-1.290	0.740	87	-20.0	20.0	0.7801	60.31	56.66
	-15	-0.1	-1.050	0.780	87	-13.1	13.1	0.7804	60.32	58.74
	-10	-0.2	-0.800	0.800	87	-8.6	8.6	0.7861	60.54	59.86
	-5	0.0	-0.500	0.800	86	-3.6	3.6	0.7859	60.47	60.36
	0	-0.1	-0.290	0.800	86	-0.4	0.4	0.7876	60.54	60.54
	5	-0.1	0.120	0.790	86	8.2	8.2	0.7922	60.72	60.09
	10	0.1	0.410	0.770	86	13.7	13.7	0.7869	60.51	58.80
	15	-0.4	0.700	0.740	86	17.6	17.6	0.7782	60.18	57.37
	20	0.6	0.910	0.720	86	20.3	20.3	0.7762	60.10	56.37
	25	0.5	1.160	0.660	86	26.5	26.5	0.7717	59.92	53.64
	30	1.0	1.330	0.630	86	30.0	30.0	0.7810	60.29	52.20

		Res	Vdir	Vax
Average	-30	26.85	54.67	48.77
	-25	25.64	61.83	55.70
	-20	18.91	60.24	56.98
	-15	13.05	60.38	58.81
	-10	7.82	60.47	59.91
	-5	3.55	60.46	60.34
	0	0.44	60.39	60.39
	5	7.80	60.38	59.82
	10	13.58	60.31	58.63
	15	17.79	60.05	57.17
	20	21.35	60.01	55.88
	25	26.56	59.61	53.32
	30	29.92	59.70	51.74

Table C1-118. Spherical SPH-3 Pre-test Computations - 90 fps

Probe: **Spherical SPH-3 / Pre-Test 30-60 Calibration** Pre-test
Velocity Point: **90 fps** Cal Date: 06/28/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.54%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**82.92**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.48		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.5	-2.800	1.190	91	-30.0	30.0	1.6227	87.29	75.60
	-25	-0.2	-3.000	1.400	90	-26.2	26.2	1.6468	87.86	78.82
	-20	0.0	-3.000	1.620	90	-21.6	21.6	1.6907	89.03	82.78
	-15	0.0	-2.450	1.730	90	-15.6	15.6	1.6639	88.32	85.06
	-10	0.0	-1.900	1.760	89	-9.6	9.6	1.6404	87.61	86.37
	-5	0.0	-1.240	1.790	89	-4.0	4.0	1.6668	88.31	88.09
	0	0.0	-0.500	1.780	89	1.5	1.5	1.6646	88.25	88.23
	5	0.0	0.250	1.740	88	6.9	6.9	1.6460	87.68	87.04
	10	0.2	1.000	1.700	88	12.4	12.4	1.6545	87.90	85.84
	15	0.7	1.610	1.640	88	16.4	16.4	1.6482	87.74	84.18
	20	0.8	2.150	1.570	87	21.5	21.5	1.6588	87.94	81.83
	25	0.9	2.550	1.470	86	25.9	25.9	1.6420	87.41	78.64
	30	0.9	2.950	1.370	85	30.0	30.0	1.6103	86.49	74.89
2	-30	-0.7	-2.650	1.200	88	-29.6	29.6	1.6142	86.83	75.47
	-25	-0.2	-3.000	1.440	88	-24.5	24.5	1.5924	86.24	78.45
	-20	0.0	-2.900	1.640	89	-20.5	20.5	1.6748	88.52	82.91
	-15	-0.1	-2.450	1.730	90	-15.6	15.6	1.6639	88.32	85.06
	-10	-0.1	-1.650	1.770	90	-7.5	7.5	1.6487	87.91	87.16
	-5	-0.1	-1.240	1.800	91	-4.0	4.0	1.6761	88.72	88.51
	0	-0.1	-0.850	1.780	91	-0.9	0.9	1.6597	88.28	88.27
	5	0.0	-0.020	1.750	92	4.4	4.4	1.6449	87.97	87.71
	10	0.0	0.830	1.740	92	11.5	11.5	1.6802	88.91	87.14
	15	-0.6	1.550	1.650	92	15.8	15.8	1.6500	88.11	84.78
	20	-0.7	2.000	1.600	93	20.0	20.1	1.6594	88.44	83.08
	25	-0.9	2.500	1.500	93	25.0	25.0	1.6574	88.38	80.08
	30	-1.0	2.900	1.350	93	30.0	30.0	1.5868	86.48	74.88
3	-30	-0.3	-2.700	1.190	95	-30.0	30.0	1.1445	73.58	63.72
	-25	-0.3	-2.950	1.450	95	-23.9	23.9	1.5844	86.57	79.14
	-20	-0.1	-2.900	1.640	94	-20.5	20.5	1.6748	88.93	83.28
	-15	-0.1	-2.400	1.750	94	-15.0	15.0	1.6712	88.83	85.82
	-10	-0.2	-1.970	1.780	94	-10.1	10.1	1.6597	88.52	87.16
	-5	0.0	-1.200	1.800	93	-3.6	3.6	1.6764	88.89	88.71
	0	0.0	-0.600	1.780	93	0.9	0.9	1.6629	88.53	88.52
	5	0.1	0.240	1.750	93	6.8	6.8	1.6549	88.32	87.70
	10	0.1	0.900	1.730	92	11.8	11.8	1.6757	88.79	86.90
	15	0.6	1.500	1.650	92	15.4	15.4	1.6440	87.95	84.80
	20	0.8	2.000	1.600	91	20.0	20.1	1.6594	88.28	82.92
	25	0.9	2.550	1.480	91	25.7	25.7	1.6501	88.03	79.29
	30	-1.0	2.950	1.360	90	30.0	30.0	1.5986	86.56	74.96

		Res	Vdir	Vax
Average	-30	29.88	82.57	71.60
	-25	24.90	86.89	78.80
	-20	20.88	88.83	82.99
	-15	15.39	88.49	85.31
	-10	9.07	88.02	86.90
	-5	3.88	88.64	88.44
	0	1.08	88.36	88.34
	5	6.05	87.99	87.48
	10	11.91	88.53	86.63
	15	15.84	87.93	84.59
	20	20.53	88.22	82.61
	25	25.55	87.94	79.34
	30	30.01	86.51	74.91

Table C1-119. Spherical SPH-3 Pre-test Computations - 90 fps

Probe: **Spherical SPH-3 / Pre-Test 30-60 Calibration**

Velocity Point: **90 fps** Cal Date: 07/21/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.54%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**83.03**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.9		0
Resultant Angle Standard Deviation:	9.54		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.5	-2.800	1.190	91	-30.0	30.0	1.5996	86.67	75.06
	-25	-0.2	-3.000	1.400	90	-30.0	30.0	1.8818	93.92	81.34
	-20	0.0	-3.000	1.620	90	-23.1	23.1	1.7493	90.55	83.29
	-15	0.0	-2.450	1.730	90	-16.1	16.1	1.6621	88.27	84.81
	-10	0.0	-1.900	1.760	89	-10.4	10.4	1.6397	87.59	86.15
	-5	0.0	-1.240	1.790	89	-5.8	5.8	1.6510	87.89	87.44
	0	0.0	-0.500	1.780	89	0.7	0.7	1.6465	87.77	87.77
	5	0.0	0.250	1.740	88	6.4	6.4	1.6446	87.64	87.09
	10	0.2	1.000	1.700	88	11.6	11.6	1.6503	87.80	85.99
	15	0.7	1.610	1.640	88	16.0	16.0	1.6326	87.32	83.94
	20	0.8	2.150	1.570	87	20.8	20.8	1.6280	87.12	81.42
	25	0.9	2.550	1.470	86	25.2	25.2	1.6230	86.91	78.62
	30	0.9	2.950	1.370	85	29.1	29.1	1.6178	86.69	75.75
2	-30	-0.7	-2.650	1.200	88	-30.0	30.0	1.6130	86.80	75.16
	-25	-0.2	-3.000	1.440	88	-29.0	29.0	1.8710	93.48	81.78
	-20	0.0	-2.900	1.640	89	-21.7	21.7	1.7164	89.62	83.25
	-15	-0.1	-2.450	1.730	90	-16.1	16.1	1.6621	88.27	84.81
	-10	-0.1	-1.650	1.770	90	-8.6	8.6	1.6416	87.72	86.74
	-5	-0.1	-1.240	1.800	91	-5.8	5.8	1.6601	88.29	87.84
	0	-0.1	-0.850	1.780	91	-2.5	2.5	1.6408	87.78	87.69
	5	0.0	-0.020	1.750	92	4.5	4.5	1.6392	87.82	87.55
	10	0.0	0.830	1.740	92	10.4	10.4	1.6784	88.86	87.39
	15	-0.6	1.550	1.650	92	15.5	15.5	1.6362	87.74	84.56
	20	-0.7	2.000	1.600	93	19.4	19.4	1.6317	87.69	82.73
	25	-0.9	2.500	1.500	93	24.4	24.5	1.6374	87.85	79.96
	30	-1.0	2.900	1.350	93	29.0	29.0	1.5929	86.65	75.75
3	-30	-0.3	-2.700	1.190	95	-30.0	30.0	1.1433	73.54	63.69
	-25	-0.3	-2.950	1.450	95	-27.3	27.3	1.7781	91.71	81.49
	-20	-0.1	-2.900	1.640	94	-21.7	21.7	1.7164	90.02	83.62
	-15	-0.1	-2.400	1.750	94	-15.4	15.4	1.6674	88.73	85.55
	-10	-0.2	-1.970	1.780	94	-10.9	10.9	1.6614	88.57	86.98
	-5	0.0	-1.200	1.800	93	-5.5	5.5	1.6592	88.43	88.02
	0	0.0	-0.600	1.780	93	-0.1	0.1	1.6425	87.99	87.99
	5	0.1	0.240	1.750	93	6.3	6.3	1.6534	88.28	87.73
	10	0.1	0.900	1.730	92	10.9	10.9	1.6729	88.72	87.11
	15	0.6	1.500	1.650	92	15.1	15.1	1.6317	87.62	84.59
	20	0.8	2.000	1.600	91	19.4	19.4	1.6317	87.54	82.58
	25	0.9	2.550	1.480	91	25.1	25.1	1.6309	87.51	79.24
	30	-1.0	2.950	1.360	90	29.2	29.2	1.6099	86.87	75.80

		Res	Vdir	Vax
Average	-30	30.00	82.34	71.30
	-25	28.76	93.04	81.54
	-20	22.19	90.06	83.39
	-15	15.85	88.42	85.06
	-10	9.97	87.96	86.62
	-5	5.73	88.21	87.77
	0	1.11	87.85	87.82
	5	5.75	87.91	87.46
	10	11.00	88.46	86.83
	15	15.53	87.56	84.36
	20	19.86	87.45	82.24
	25	24.93	87.42	79.28
	30	29.13	86.74	75.77

Table C1-120. Spherical SPH-3 Post-test Computations - 90 fps

Probe: **Spherical SPH-3 / Post-Test 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 11/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.54%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**84.96**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	17.0	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.0		0
Resultant Angle Standard Deviation:	9.50		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.5	-2.800	1.190	91	-30.0	30.0	1.6838	88.92	77.01
	-25	-0.2	-3.000	1.400	90	-27.9	27.9	1.8422	92.93	82.14
	-20	0.0	-3.000	1.620	90	-22.0	22.0	1.7892	91.58	84.91
	-15	0.0	-2.450	1.730	90	-14.0	14.0	1.7396	90.30	87.62
	-10	0.0	-1.900	1.760	89	-9.7	9.7	1.7301	89.97	88.69
	-5	0.0	-1.240	1.790	89	-4.4	4.4	1.7575	90.68	90.42
	0	0.0	-0.500	1.780	89	0.8	0.8	1.7566	90.66	90.65
	5	0.0	0.250	1.740	88	8.1	8.1	1.7444	90.26	89.37
	10	0.2	1.000	1.700	88	14.4	14.4	1.7427	90.22	87.39
	15	0.7	1.610	1.640	88	17.9	17.9	1.7292	89.87	85.53
	20	0.8	2.150	1.570	87	21.7	21.7	1.7215	89.59	83.23
	25	0.9	2.550	1.470	86	26.2	26.3	1.7116	89.25	80.04
	30	0.9	2.950	1.370	85	30.0	30.0	1.6984	88.82	76.91
2	-30	-0.7	-2.650	1.200	88	-29.4	29.4	1.6633	88.14	76.79
	-25	-0.2	-3.000	1.440	88	-26.5	26.5	1.8030	91.77	82.11
	-20	0.0	-2.900	1.640	89	-20.5	20.5	1.7479	90.43	84.72
	-15	-0.1	-2.450	1.730	90	-14.0	14.0	1.7396	90.30	87.62
	-10	-0.1	-1.650	1.770	90	-7.6	7.6	1.7387	90.28	89.48
	-5	-0.1	-1.240	1.800	91	-4.3	4.3	1.7673	91.10	90.84
	0	-0.1	-0.850	1.780	91	-1.8	1.8	1.7507	90.67	90.63
	5	0.0	-0.020	1.750	92	5.4	5.4	1.7464	90.64	90.24
	10	0.0	0.830	1.740	92	12.9	12.9	1.7725	91.32	89.00
	15	-0.6	1.550	1.650	92	17.5	17.5	1.7344	90.33	86.14
	20	-0.7	2.000	1.600	93	20.1	20.1	1.7211	90.07	84.57
	25	-0.9	2.500	1.500	93	25.5	25.5	1.7251	90.17	81.36
	30	-1.0	2.900	1.350	93	30.0	30.0	1.6736	88.81	76.90
3	-30	-0.3	-2.700	1.190	95	-30.0	30.0	1.1966	75.23	65.15
	-25	-0.3	-2.950	1.450	95	-25.4	25.4	1.7396	90.71	81.94
	-20	-0.1	-2.900	1.640	94	-20.5	20.5	1.7479	90.85	85.10
	-15	-0.1	-2.400	1.750	94	-13.4	13.4	1.7541	91.01	88.51
	-10	-0.2	-1.970	1.780	94	-10.1	10.1	1.7507	90.92	89.52
	-5	0.0	-1.200	1.800	93	-4.1	4.1	1.7677	91.28	91.05
	0	0.0	-0.600	1.780	93	-0.1	0.1	1.7527	90.89	90.89
	5	0.1	0.240	1.750	93	8.0	8.0	1.7541	90.93	90.05
	10	0.1	0.900	1.730	92	13.5	13.5	1.7667	91.17	88.65
	15	0.6	1.500	1.650	92	17.3	17.3	1.7306	90.23	86.16
	20	0.8	2.000	1.600	91	20.1	20.1	1.7211	89.90	84.42
	25	0.9	2.550	1.480	91	26.1	26.1	1.7196	89.86	80.68
	30	-1.0	2.950	1.360	90	30.0	30.0	1.6860	88.90	76.98

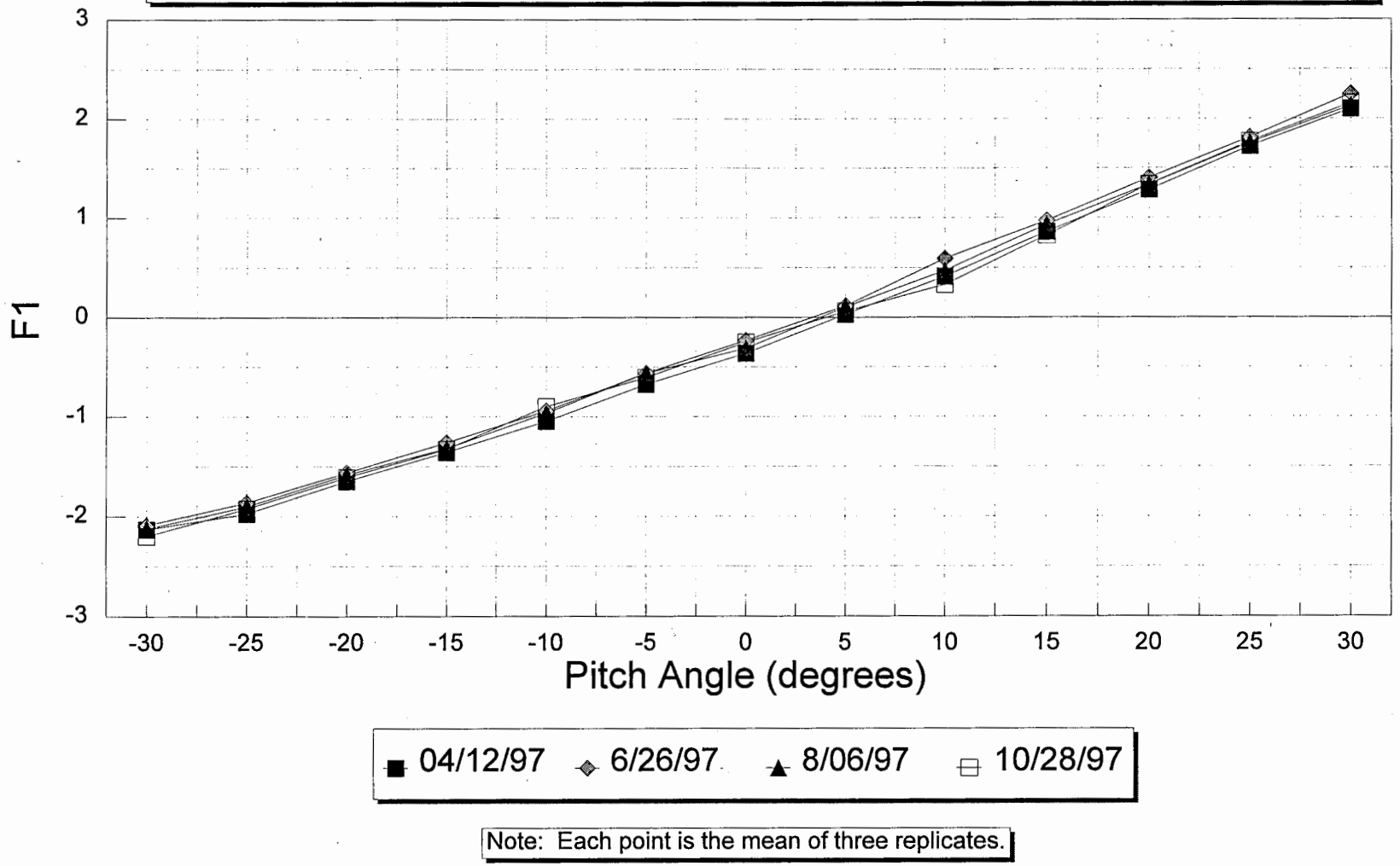
		Res	Vdir	Vax
Average	-30	29.80	84.10	72.99
	-25	26.61	91.80	82.06
	-20	20.99	90.95	84.91
	-15	13.82	90.54	87.91
	-10	9.14	90.39	89.23
	-5	4.25	91.02	90.77
	0	0.90	90.74	90.72
	5	7.14	90.61	89.89
	10	13.61	90.90	88.35
	15	17.55	90.14	85.95
	20	20.65	89.85	84.07
	25	25.97	89.76	80.70
	30	30.01	88.84	76.93

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ATTACHMENT M.

Spherical Probe SPH-4 Calibration Data

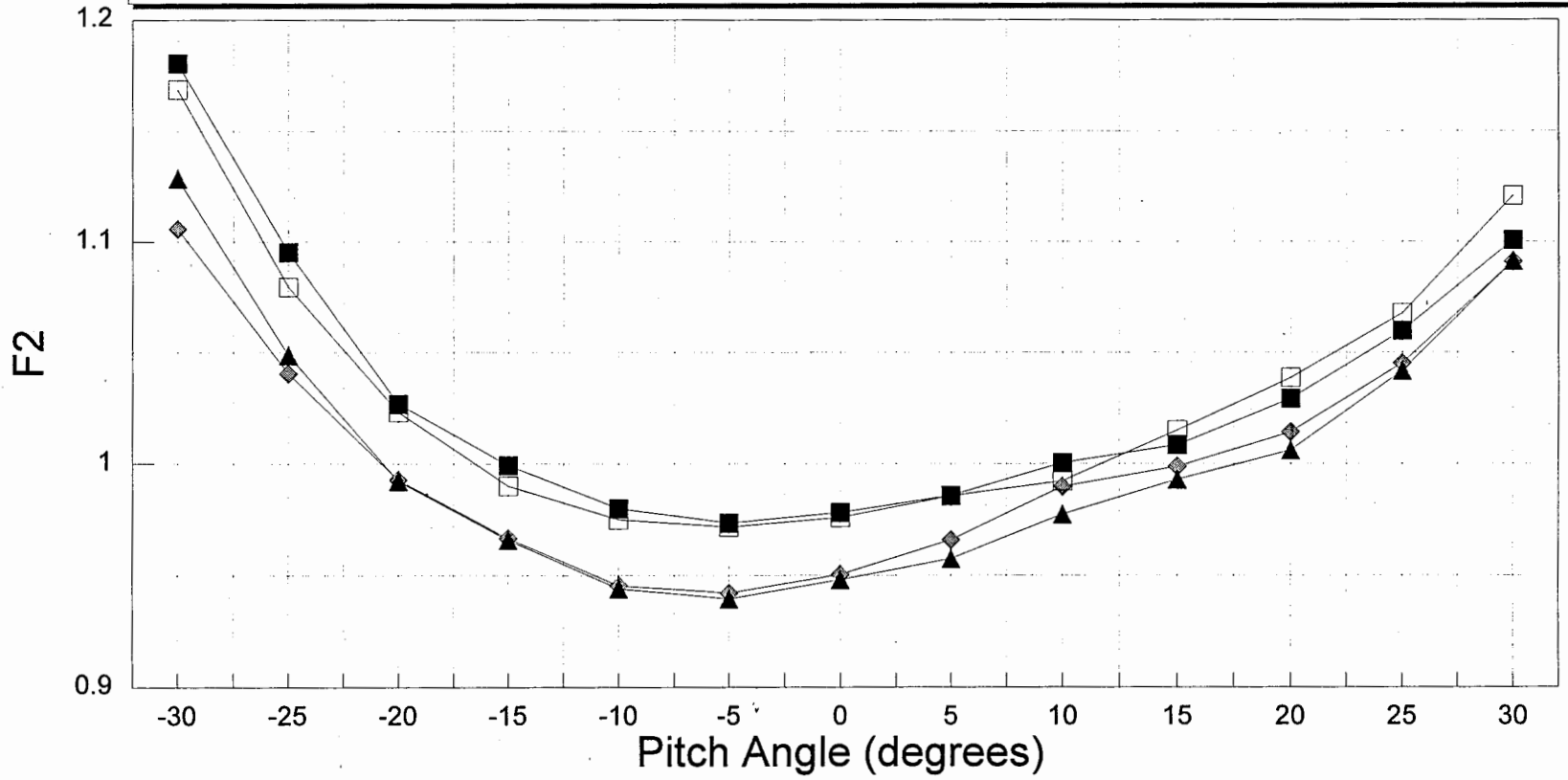
Figure C1-71. Spherical Probe 4 - Avg. (30-60 fps) F1 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration



Note: Each point is the mean of three replicates.

SPHCMPR.WK4

Figure C1-72. Spherical Probe 4 - Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration

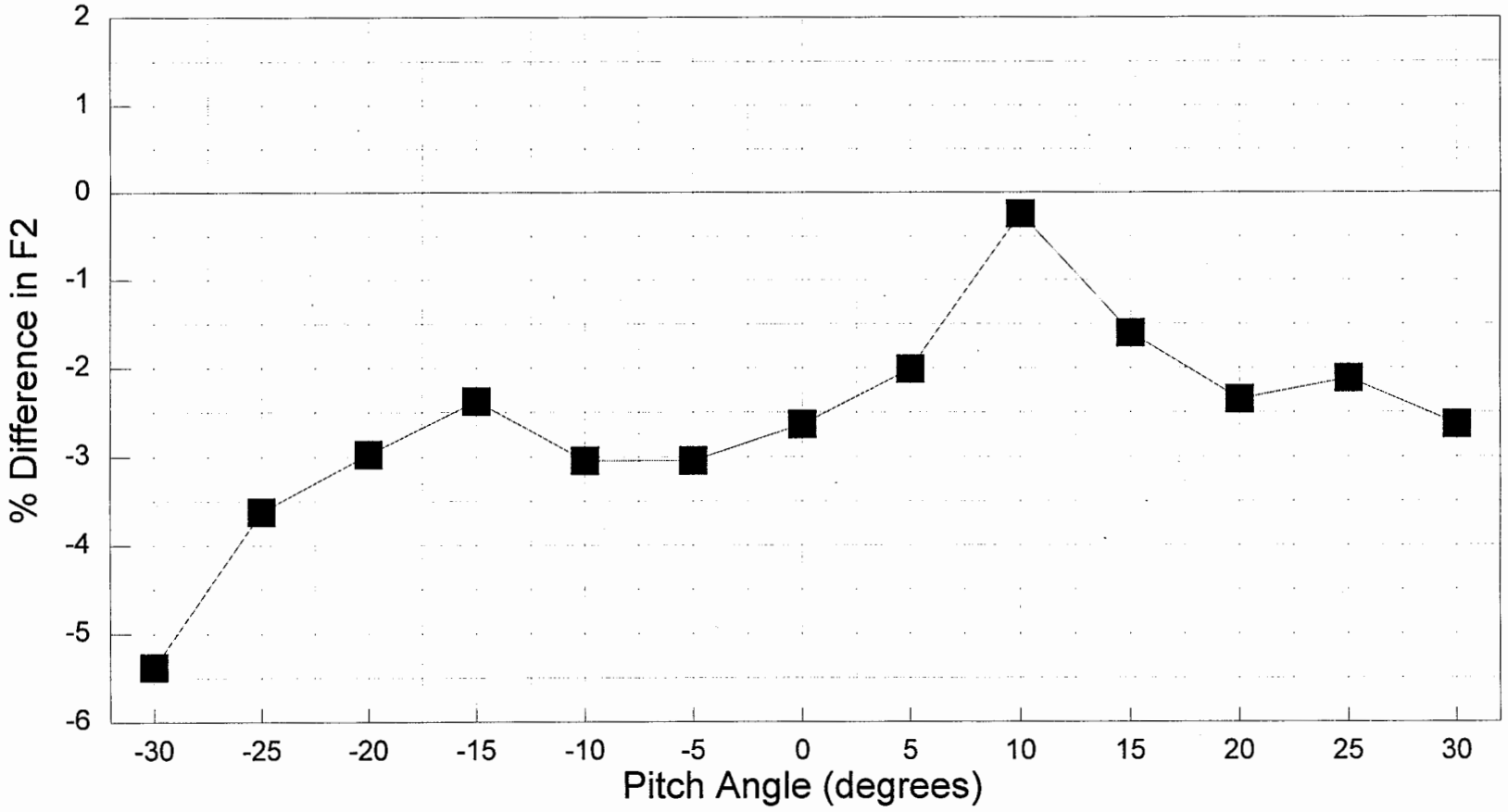


Note: Each point is the mean of three replicates.

SPHCMPR.WK4

Figure C1-73. Spherical Probe 4: Percent Difference in F2 (Avg. 30-60 fps)

NCSU Pre- (6/26/97) and Post-Test (11/28/97) Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-121. Spherical Probe SPH-4 Calibrations at NC State Wind Tunnel June and October 1997

Pitch Angle	30 fps / June / 30-60 Calibration			30 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	27.95	29.09	25.68	26.46	29.88	26.74	-5.33	2.71	4.09
-25	24.74	30.98	28.11	23.61	31.74	29.06	-4.60	2.44	3.39
-20	19.18	30.97	29.23	18.26	31.66	30.04	-4.82	2.23	2.78
-15	14.63	31.23	30.21	13.94	31.93	30.98	-4.68	2.24	2.56
-10	10.90	31.18	30.60	11.11	32.11	31.50	1.85	2.99	2.94
-5	4.55	31.22	31.10	4.13	32.17	32.06	-9.25	3.04	3.10
0	1.08	31.14	31.13	1.34	31.97	31.96	24.17	2.67	2.66
5	3.90	31.04	30.94	4.98	31.74	31.58	27.87	2.27	2.05
10	9.78	31.06	30.61	12.39	31.54	30.80	26.71	1.53	0.63
15	14.89	30.98	29.93	16.37	31.67	30.39	10.00	2.26	1.52
20	20.64	31.03	29.03	21.35	31.89	29.70	3.41	2.78	2.29
25	25.77	31.15	28.05	26.40	32.05	28.71	2.44	2.89	2.34
30	30.00	30.95	26.80	30.01	31.79	27.53	0.03	2.71	2.70

Pitch Angle	60 fps / June / 30-60 Calibration			60 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.00	56.44	48.88	29.25	58.51	51.05	-2.51	3.66	4.44
-25	25.70	59.31	53.43	24.55	60.74	55.25	-4.47	2.43	3.40
-20	20.84	59.09	55.23	20.05	60.47	56.81	-3.82	2.33	2.86
-15	15.43	58.36	56.25	14.62	59.62	57.68	-5.25	2.16	2.55
-10	9.29	58.59	57.82	9.81	60.45	59.57	5.53	3.19	3.03
-5	5.33	58.43	58.18	4.77	60.26	60.05	-10.52	3.13	3.22
0	1.11	58.51	58.50	0.98	60.16	60.15	-11.42	2.81	2.82
5	5.89	58.68	58.37	7.55	59.83	59.30	28.21	1.96	1.60
10	10.42	58.53	57.56	12.98	59.43	57.91	24.55	1.54	0.60
15	15.07	58.78	56.76	16.51	60.13	57.64	9.57	2.28	1.56
20	19.41	58.75	55.41	20.18	60.33	56.63	3.97	2.70	2.21
25	24.19	58.54	53.40	24.70	60.02	54.52	2.14	2.52	2.10
30	29.23	58.40	50.96	29.94	60.33	52.28	2.45	3.31	2.59

Pitch Angle	90 fps / June / 30-60 Calibration			90 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.00	82.52	71.46	29.72	85.90	74.61	-0.93	4.10	4.40
-25	28.28	91.05	80.16	26.58	93.11	83.26	-6.03	2.27	3.87
-20	22.29	89.48	82.78	21.45	91.68	85.31	-3.79	2.45	3.06
-15	15.68	88.08	84.80	14.70	89.81	86.87	-6.26	1.96	2.43
-10	10.38	87.36	85.92	10.77	90.11	88.51	3.73	3.14	3.02
-5	6.21	87.46	86.94	5.85	90.18	89.70	-5.83	3.11	3.18
0	1.28	87.85	87.82	0.92	90.35	90.34	-28.20	2.85	2.86
5	5.75	87.70	87.25	7.29	89.45	88.72	26.84	2.00	1.68
10	9.96	88.62	87.28	12.57	89.98	87.82	26.16	1.53	0.61
15	14.99	88.16	85.16	16.44	90.18	86.48	9.70	2.28	1.56
20	19.03	87.94	83.13	19.83	90.27	84.92	4.24	2.65	2.14
25	23.86	86.98	79.55	24.39	89.17	81.21	2.20	2.51	2.09
30	28.65	86.68	76.06	29.46	89.59	78.00	2.83	3.35	2.55

Figure C1-74. Spherical Probe SPH-4 Pre- and Post-Test Calibrations

NC State Wind Tunnel -- June and October 1997

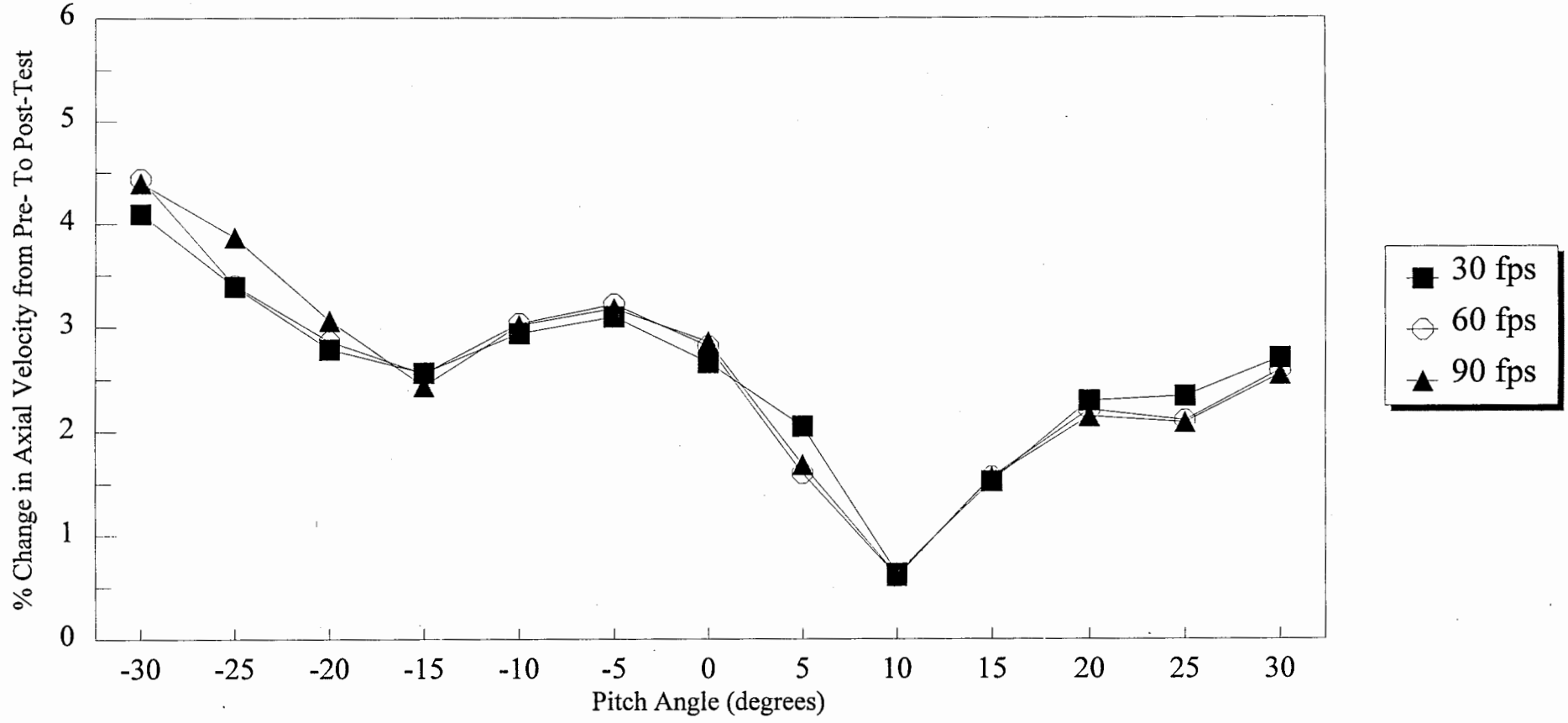


Table C-122. Spherical Probe SPH-4 Calibrations at NC State Wind Tunnel June and July 1997

Pitch Angle	30 fps / June / 30-60 Calibration			30 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	27.95	29.09	25.68	27.27	29.20	25.93	-2.42	0.37	0.96
-25	24.74	30.98	28.11	24.11	31.00	28.27	-2.55	0.06	0.58
-20	19.18	30.97	29.23	18.55	30.85	29.23	-3.28	-0.38	-0.02
-15	14.63	31.23	30.21	13.82	31.08	30.17	-5.51	-0.48	-0.12
-10	10.90	31.18	30.60	10.48	31.09	30.56	-3.88	-0.29	-0.14
-5	4.55	31.22	31.10	4.18	31.16	31.04	-8.07	-0.20	-0.18
0	1.08	31.14	31.13	1.62	31.08	31.06	49.81	-0.20	-0.22
5	3.90	31.04	30.94	4.45	30.88	30.77	14.27	-0.50	-0.57
10	9.78	31.06	30.61	11.04	30.83	30.26	12.95	-0.75	-1.15
15	14.89	30.98	29.93	15.44	30.83	29.71	3.72	-0.48	-0.74
20	20.64	31.03	29.03	21.38	30.96	28.83	3.58	-0.21	-0.71
25	25.77	31.15	28.05	26.63	31.32	28.00	3.34	0.55	-0.19
30	30.00	30.95	26.80	30.01	30.96	26.81	0.03	0.03	0.02

Pitch Angle	60 fps / June / 30-60 Calibration			60 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.00	56.44	48.88	29.89	57.06	49.47	-0.39	1.09	1.22
-25	25.70	59.31	53.43	24.97	59.31	53.76	-2.86	0.00	0.61
-20	20.84	59.09	55.23	20.44	58.88	55.17	-1.93	-0.36	-0.10
-15	15.43	58.36	56.25	14.60	58.08	56.19	-5.38	-0.49	-0.10
-10	9.29	58.59	57.82	9.04	58.48	57.75	-2.73	-0.18	-0.11
-5	5.33	58.43	58.18	5.30	58.27	58.02	-0.61	-0.27	-0.26
0	1.11	58.51	58.50	1.03	58.46	58.45	-6.59	-0.09	-0.08
5	5.89	58.68	58.37	6.31	58.23	57.87	7.22	-0.77	-0.85
10	10.42	58.53	57.56	11.69	58.06	56.85	12.11	-0.81	-1.23
15	15.07	58.78	56.76	15.61	58.50	56.34	3.60	-0.47	-0.73
20	19.41	58.75	55.41	20.14	58.49	54.91	3.78	-0.44	-0.90
25	24.19	58.54	53.40	24.85	58.59	53.17	2.77	0.09	-0.44
30	29.23	58.40	50.96	30.00	58.79	50.91	2.65	0.67	-0.10

Pitch Angle	90 fps / June / 30-60 Calibration			90 fps / July / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.00	82.52	71.46	30.00	83.56	72.36	0.00	1.26	1.26
-25	28.28	91.05	80.16	27.41	91.39	81.11	-3.07	0.38	1.18
-20	22.29	89.48	82.78	21.82	89.33	82.91	-2.12	-0.18	0.16
-15	15.68	88.08	84.80	14.73	87.59	84.71	-6.04	-0.57	-0.12
-10	10.38	87.36	85.92	10.02	87.12	85.79	-3.55	-0.28	-0.16
-5	6.21	87.46	86.94	6.14	87.24	86.73	-1.11	-0.25	-0.24
0	1.28	87.85	87.82	0.54	87.79	87.79	-57.55	-0.07	-0.04
5	5.75	87.70	87.25	6.13	87.02	86.52	6.57	-0.77	-0.84
10	9.96	88.62	87.28	11.24	87.94	86.25	12.83	-0.77	-1.19
15	14.99	88.16	85.16	15.52	87.75	84.54	3.58	-0.47	-0.72
20	19.03	87.94	83.13	19.74	87.51	82.36	3.77	-0.49	-0.93
25	23.86	86.98	79.55	24.52	87.00	79.15	2.77	0.02	-0.50
30	28.65	86.68	76.06	29.69	87.45	75.96	3.64	0.88	-0.13

Figure C1-75. Spherical Probe SPH-4 Pre- and Intermediate Calibrations
NC State Wind Tunnel

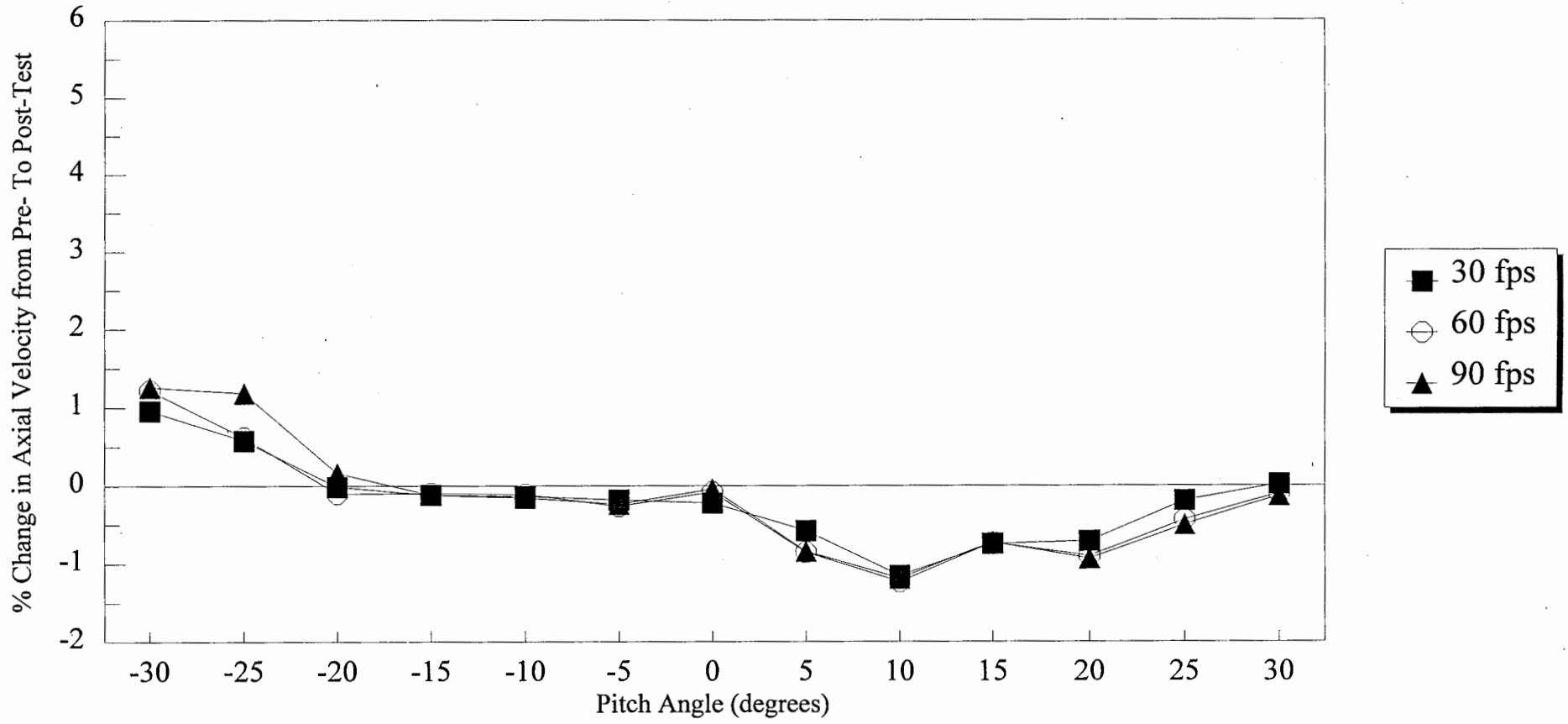


Table C1-123. Spherical SPH-4 Pre-test Computations - 30 fps

Probe: **Spherical SPH-4 / Pre-Test 30-60 Calibration**

Velocity Point: **30 fps** Cal Date: 06/26/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	82 _F
Average Axial Velocity, ft/sec:	**29.34**	Last Row:	61
Average Yaw Angle:	0.5		
Average Pitch Angle:	16.0	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.0	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.48		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.6	-0.330	0.175	82	-25.5	25.5	0.1920	29.85	26.94
	-25	-0.5	-0.340	0.195	82	-23.0	23.0	0.2036	30.74	28.29
	-20	-0.4	-0.300	0.210	82	-17.8	17.8	0.2022	30.64	29.17
	-15	-0.4	-0.260	0.225	82	-13.4	13.4	0.2073	31.02	30.17
	-10	-0.5	-0.220	0.230	82	-10.3	10.3	0.2060	30.92	30.43
	-5	-0.4	-0.140	0.234	82	-5.5	5.5	0.2078	31.06	30.92
	0	-0.5	-0.060	0.231	82	-0.4	0.7	0.2083	31.10	31.09
	5	-1.1	-0.040	0.225	82	0.8	1.3	0.2043	30.79	30.78
	10	-1.3	0.138	0.213	82	10.7	10.8	0.2092	31.16	30.61
	15	-0.9	0.186	0.205	82	14.2	14.2	0.2039	30.76	29.82
	20	-0.6	0.300	0.200	81	21.2	21.2	0.2087	31.10	28.99
	25	-0.6	0.360	0.189	81	26.1	26.1	0.2104	31.22	28.04
	30	-0.8	0.400	0.178	81	30.0	30.0	0.2118	31.32	27.13
2	-30	0.2	-0.350	0.166	92	-30.0	30.0	0.2030	30.98	26.83
	-25	0.1	-0.360	0.180	92	-28.1	28.1	0.2103	31.53	27.82
	-20	0.0	-0.350	0.210	91	-21.7	21.7	0.2140	31.78	29.52
	-15	0.6	-0.300	0.225	91	-16.2	16.2	0.2131	31.71	30.44
	-10	0.6	-0.270	0.235	90	-13.3	13.3	0.2163	31.92	31.06
	-5	0.6	-0.160	0.239	90	-6.4	6.4	0.2126	31.64	31.44
	0	-0.1	-0.035	0.230	90	1.1	1.1	0.2093	31.40	31.39
	5	1.4	0.000	0.229	90	3.3	3.6	0.2114	31.55	31.49
	10	0.7	0.100	0.215	90	8.7	8.7	0.2080	31.30	30.94
	15	1.0	0.200	0.214	89	14.5	14.6	0.2131	31.65	30.64
	20	-0.1	0.280	0.200	89	20.0	20.0	0.2057	31.09	29.22
	25	0.8	0.350	0.190	89	25.3	25.4	0.2088	31.33	28.31
	30	0.8	0.400	0.170	89	30.0	30.0	0.2024	30.85	26.71
3	-30	0.0	-0.330	0.164	81	-28.3	28.3	0.1511	26.45	23.29
	-25	-0.1	-0.340	0.194	81	-23.2	23.2	0.2031	30.68	28.20
	-20	-0.2	-0.300	0.208	81	-18.0	18.0	0.2008	30.50	29.00
	-15	-0.2	-0.270	0.223	81	-14.2	14.3	0.2070	30.97	30.01
	-10	-0.1	-0.200	0.228	81	-9.2	9.2	0.2036	30.71	30.32
	-5	0.0	-0.080	0.230	82	-1.8	1.8	0.2065	30.96	30.94
	0	0.1	-0.030	0.226	82	1.4	1.4	0.2060	30.92	30.91
	5	0.2	0.060	0.215	82	6.7	6.7	0.2040	30.77	30.56
	10	0.2	0.120	0.208	82	9.8	9.8	0.2035	30.73	30.28
	15	-0.3	0.210	0.200	82	15.9	15.9	0.2006	30.52	29.34
	20	-0.3	0.290	0.198	82	20.8	20.8	0.2056	30.89	28.88
	25	0.2	0.350	0.185	83	25.9	25.9	0.2054	30.90	27.80
	30	0.3	0.400	0.170	83	30.0	30.0	0.2024	30.68	26.57

		Res	Vdir	Vax
Average	-30	27.95	29.09	25.68
	-25	24.74	30.98	28.11
	-20	19.18	30.97	29.23
	-15	14.63	31.23	30.21
	-10	10.90	31.18	30.60
	-5	4.55	31.22	31.10
	0	1.08	31.14	31.13
	5	3.90	31.04	30.94
	10	9.78	31.06	30.61
	15	14.89	30.98	29.93
	20	20.64	31.03	29.03
	25	25.77	31.15	28.05
	30	30.00	30.95	26.80

Table C1-124. Spherical SPH-4 Intermediate Computations - 30 fps

Probe: **Spherical SPH-4 / Intermediate 30-60 Calibration**

Velocity Point: **30 fps** Cal Date: 07/22/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	82 _F
Average Axial Velocity, ft/sec:	**29.28**	Last Row:	61
Average Yaw Angle:	0.5		
Average Pitch Angle:	16.0	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.1		0
Resultant Angle Standard Deviation:	9.35		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.6	-0.330	0.175	82	-24.8	24.8	0.1915	29.81	27.07
	-25	-0.5	-0.340	0.195	82	-22.5	22.5	0.2033	30.71	28.37
	-20	-0.4	-0.300	0.210	82	-17.1	17.1	0.2004	30.49	29.15
	-15	-0.4	-0.260	0.225	82	-12.7	12.7	0.2056	30.89	30.13
	-10	-0.5	-0.220	0.230	82	-9.9	9.9	0.2050	30.84	30.38
	-5	-0.4	-0.140	0.234	82	-5.4	5.5	0.2067	30.98	30.84
	0	-0.5	-0.060	0.231	82	0.6	0.8	0.2081	31.08	31.08
	5	-1.1	-0.040	0.225	82	1.6	1.9	0.2035	30.73	30.72
	10	-1.3	0.138	0.213	82	11.9	12.0	0.2060	30.92	30.24
	15	-0.9	0.186	0.205	82	14.7	14.8	0.2018	30.61	29.59
	20	-0.6	0.300	0.200	81	21.9	21.9	0.2080	31.04	28.80
	25	-0.6	0.360	0.189	81	27.0	27.0	0.2130	31.41	27.99
	30	-0.8	0.400	0.178	81	30.0	30.0	0.2120	31.34	27.14
2	-30	0.2	-0.350	0.166	92	-29.6	29.6	0.2091	31.44	27.34
	-25	0.1	-0.360	0.180	92	-27.2	27.2	0.2117	31.63	28.14
	-20	0.0	-0.350	0.210	91	-21.3	21.3	0.2130	31.70	29.54
	-15	0.6	-0.300	0.225	91	-15.3	15.3	0.2105	31.52	30.40
	-10	0.6	-0.270	0.235	90	-12.6	12.6	0.2145	31.79	31.02
	-5	0.6	-0.160	0.239	90	-6.3	6.4	0.2115	31.56	31.37
	0	-0.1	-0.035	0.230	90	1.9	1.9	0.2083	31.32	31.30
	5	1.4	0.000	0.229	90	3.8	4.0	0.2089	31.37	31.29
	10	0.7	0.100	0.215	90	9.9	10.0	0.2052	31.09	30.62
	15	1.0	0.200	0.214	89	15.0	15.1	0.2111	31.50	30.42
	20	-0.1	0.280	0.200	89	20.7	20.7	0.2046	31.01	29.00
	25	0.8	0.350	0.190	89	26.1	26.1	0.2107	31.47	28.26
	30	0.8	0.400	0.170	89	30.0	30.0	0.2025	30.85	26.72
3	-30	0.0	-0.330	0.164	81	-27.5	27.5	0.1498	26.35	23.38
	-25	-0.1	-0.340	0.194	81	-22.6	22.6	0.2029	30.66	28.29
	-20	-0.2	-0.300	0.208	81	-17.3	17.3	0.1990	30.36	28.99
	-15	-0.2	-0.270	0.223	81	-13.5	13.5	0.2052	30.83	29.98
	-10	-0.1	-0.200	0.228	81	-8.9	8.9	0.2028	30.65	30.28
	-5	0.0	-0.080	0.230	82	-0.8	0.8	0.2061	30.93	30.93
	0	0.1	-0.030	0.226	82	2.1	2.1	0.2049	30.83	30.81
	5	0.2	0.060	0.215	82	7.4	7.4	0.2011	30.55	30.29
	10	0.2	0.120	0.208	82	11.2	11.2	0.2002	30.48	29.90
	15	-0.3	0.210	0.200	82	16.5	16.5	0.1988	30.37	29.13
	20	-0.3	0.290	0.198	82	21.5	21.5	0.2047	30.83	28.68
	25	0.2	0.350	0.185	83	26.8	26.8	0.2078	31.08	27.75
	30	0.3	0.400	0.170	83	30.0	30.0	0.2025	30.68	26.57

		Res		Vdir	Vax
Average	-30	27.27		29.20	25.93
	-25	24.11		31.00	28.27
	-20	18.55		30.85	29.23
	-15	13.82		31.08	30.17
	-10	10.48		31.09	30.56
	-5	4.18		31.16	31.04
	0	1.62		31.08	31.06
	5	4.45		30.88	30.77
	10	11.04		30.83	30.26
	15	15.44		30.83	29.71
	20	21.38		30.96	28.83
	25	26.63		31.32	28.00
	30	30.01		30.96	26.81

Table C1-125. Spherical SPH-4 Post-test Computations - 30 fps

Probe: **Spherical SPH-4 / Post-Test 30-60 Calibration**

Velocity Point: **30 fps** Cal Date: 10/28/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	82 _F
Average Axial Velocity, ft/sec:	**30.08**	Last Row:	61
Average Yaw Angle:	0.5		
Average Pitch Angle:	16.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.2		0
Resultant Angle Standard Deviation:	9.11		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.6	-0.330	0.175	82	-24.4	24.4	0.2015	30.58	27.85
	-25	-0.5	-0.340	0.195	82	-22.1	22.1	0.2140	31.52	29.19
	-20	-0.4	-0.300	0.210	82	-16.8	16.8	0.2109	31.29	29.95
	-15	-0.4	-0.260	0.225	82	-13.0	13.0	0.2179	31.80	30.98
	-10	-0.5	-0.220	0.230	82	-10.7	10.7	0.2196	31.93	31.37
	-5	-0.4	-0.140	0.234	82	-4.9	4.9	0.2210	32.03	31.91
	0	-0.5	-0.060	0.231	82	-0.1	0.5	0.2200	31.96	31.96
	5	-1.1	-0.040	0.225	82	1.2	1.6	0.2154	31.62	31.60
	10	-1.3	0.138	0.213	82	13.2	13.3	0.2160	31.66	30.81
	15	-0.9	0.186	0.205	82	15.8	15.8	0.2128	31.43	30.23
	20	-0.6	0.300	0.200	81	21.9	21.9	0.2203	31.95	29.65
	25	-0.6	0.360	0.189	81	26.7	26.7	0.2230	32.14	28.71
	30	-0.8	0.400	0.178	81	30.0	30.0	0.2235	32.18	27.87
2	-30	0.2	-0.350	0.166	92	-28.3	28.3	0.2158	31.94	28.11
	-25	0.1	-0.360	0.180	92	-26.4	26.4	0.2199	32.24	28.88
	-20	0.0	-0.350	0.210	91	-20.9	20.9	0.2244	32.54	30.40
	-15	0.6	-0.300	0.225	91	-15.1	15.1	0.2210	32.29	31.17
	-10	0.6	-0.270	0.235	90	-12.9	13.0	0.2275	32.73	31.90
	-5	0.6	-0.160	0.239	90	-6.1	6.1	0.2260	32.63	32.44
	0	-0.1	-0.035	0.230	90	1.6	1.6	0.2205	32.23	32.21
	5	1.4	0.000	0.229	90	4.0	4.3	0.2217	32.31	32.22
	10	0.7	0.100	0.215	90	11.4	11.4	0.2143	31.77	31.15
	15	1.0	0.200	0.214	89	16.1	16.1	0.2227	32.36	31.09
	20	-0.1	0.280	0.200	89	20.7	20.7	0.2175	31.97	29.91
	25	0.8	0.350	0.190	89	25.9	25.9	0.2206	32.20	28.96
	30	0.8	0.400	0.170	89	30.0	30.0	0.2135	31.68	27.43
3	-30	0.0	-0.330	0.164	81	-26.6	26.6	0.1588	27.13	24.25
	-25	-0.1	-0.340	0.194	81	-22.3	22.3	0.2136	31.46	29.11
	-20	-0.2	-0.300	0.208	81	-17.1	17.1	0.2096	31.16	29.79
	-15	-0.2	-0.270	0.223	81	-13.7	13.7	0.2168	31.69	30.80
	-10	-0.1	-0.200	0.228	81	-9.7	9.7	0.2167	31.68	31.23
	-5	0.0	-0.080	0.230	82	-1.4	1.4	0.2186	31.85	31.84
	0	0.1	-0.030	0.226	82	1.9	1.9	0.2169	31.73	31.71
	5	0.2	0.060	0.215	82	9.1	9.1	0.2111	31.30	30.91
	10	0.2	0.120	0.208	82	12.5	12.5	0.2095	31.18	30.44
	15	-0.3	0.210	0.200	82	17.2	17.2	0.2103	31.24	29.84
	20	-0.3	0.290	0.198	82	21.5	21.5	0.2171	31.74	29.54
	25	0.2	0.350	0.185	83	26.6	26.6	0.2176	31.81	28.45
	30	0.3	0.400	0.170	83	30.0	30.0	0.2135	31.51	27.29

		Res	Vdir	Vax
Average	-30	26.46	29.88	26.74
	-25	23.61	31.74	29.06
	-20	18.26	31.66	30.04
	-15	13.94	31.93	30.98
	-10	11.11	32.11	31.50
	-5	4.13	32.17	32.06
	0	1.34	31.97	31.96
	5	4.98	31.74	31.58
	10	12.39	31.54	30.80
	15	16.37	31.67	30.39
	20	21.35	31.89	29.70
	25	26.40	32.05	28.71
	30	30.01	31.79	27.53

Table C1-126. Spherical SPH-4 Pre-test Compuations - 60 fps

Probe: **Spherical SPH-4 / Pre-Test 30-60 Calibration**

Velocity Point: **60 fps** Cal Date: 06/26/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.61%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**55.44**	Last Row:	61
Average Yaw Angle:	0.4		
Average Pitch Angle:	16.3	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.3	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.26		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-1.330	0.630	83	-30.0	30.0	0.7705	59.85	51.83
	-25	0.1	-1.300	0.700	83	-24.9	24.9	0.7566	59.31	53.80
	-20	0.2	-1.200	0.750	83	-20.6	20.6	0.7482	58.98	55.21
	-15	-0.1	-1.050	0.760	84	-17.0	17.0	0.7258	58.15	55.60
	-10	0.1	-0.750	0.830	84	-9.5	9.5	0.7414	58.77	57.96
	-5	0.2	-0.460	0.830	84	-4.9	4.9	0.7371	58.60	58.39
	0	0.5	-0.170	0.810	84	0.3	0.6	0.7331	58.44	58.43
	5	1.0	0.090	0.800	84	5.0	5.1	0.7462	58.96	58.73
	10	1.1	0.450	0.750	85	10.1	10.2	0.7350	58.57	57.65
	15	1.1	0.680	0.750	85	14.2	14.2	0.7458	59.00	57.20
	20	-0.5	1.000	0.740	85	19.4	19.4	0.7584	59.49	56.11
	25	0.7	1.210	0.700	86	24.0	24.0	0.7555	59.43	54.30
	30	0.4	1.350	0.630	85	28.8	28.8	0.7349	58.56	51.33
2	-30	-0.2	-1.300	0.580	82	-30.0	30.0	0.7093	57.38	49.69
	-25	-0.2	-1.300	0.670	82	-26.7	26.7	0.7578	59.31	52.97
	-20	-0.3	-1.230	0.750	82	-21.3	21.3	0.7580	59.31	55.26
	-15	-0.3	-1.000	0.780	82	-15.4	15.4	0.7318	58.28	56.19
	-10	-0.3	-0.750	0.830	82	-9.5	9.5	0.7414	58.66	57.85
	-5	-0.3	-0.500	0.820	82	-5.6	5.6	0.7285	58.15	57.87
	0	-0.3	-0.300	0.820	83	-2.0	2.0	0.7355	58.48	58.44
	5	0.5	0.170	0.780	83	6.1	6.1	0.7356	58.48	58.15
	10	0.6	0.450	0.750	83	10.1	10.1	0.7350	58.46	57.55
	15	0.6	0.730	0.740	83	15.2	15.2	0.7390	58.62	56.57
	20	0.6	0.930	0.720	83	18.7	18.7	0.7348	58.45	55.36
	25	-0.2	1.150	0.670	83	23.8	23.8	0.7219	57.94	53.00
	30	0.1	1.350	0.620	83	29.2	29.2	0.7281	58.18	50.80
3	-30	-0.2	-1.320	0.610	84	-30.0	30.0	0.5826	52.09	45.11
	-25	-0.4	-1.300	0.690	83	-25.5	25.5	0.7562	59.30	53.53
	-20	-0.4	-1.200	0.750	83	-20.6	20.6	0.7482	58.98	55.21
	-15	-0.3	-0.950	0.800	83	-13.9	13.9	0.7402	58.67	56.95
	-10	-0.4	-0.700	0.820	83	-8.8	8.9	0.7318	58.33	57.64
	-5	-0.3	-0.500	0.830	83	-5.5	5.5	0.7373	58.55	58.28
	0	-0.4	-0.220	0.820	83	-0.6	0.7	0.7392	58.63	58.62
	5	0.4	0.200	0.780	83	6.5	6.5	0.7385	58.60	58.22
	10	-0.8	0.500	0.750	83	11.0	11.0	0.7374	58.55	57.48
	15	-0.8	0.770	0.740	83	15.8	15.8	0.7418	58.73	56.50
	20	-0.8	1.000	0.710	83	20.1	20.1	0.7309	58.30	54.75
	25	0.4	1.200	0.670	83	24.7	24.7	0.7297	58.25	52.90
	30	0.4	1.380	0.620	83	29.7	29.7	0.7348	58.45	50.76

		Res		Vdir	Vax
Average	-30	30.00		56.44	48.88
	-25	25.70		59.31	53.43
	-20	20.84		59.09	55.23
	-15	15.43		58.36	56.25
	-10	9.29		58.59	57.82
	-5	5.33		58.43	58.18
	0	1.11		58.51	58.50
	5	5.89		58.68	58.37
	10	10.42		58.53	57.56
	15	15.07		58.78	56.76
	20	19.41		58.75	55.41
	25	24.19		58.54	53.40
	30	29.23		58.40	50.96

Table C-127. Spherical SPH-4 Intermediate Computations - 60 fps

Probe: **Spherical SPH-4 / Intermediate 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 07/22/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.61%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**55.30**	Last Row:	61
Average Yaw Angle:	0.4		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.27		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-1.330	0.630	83	-29.7	29.7	0.7949	60.80	52.83
	-25	0.1	-1.300	0.700	83	-24.3	24.3	0.7588	59.40	54.13
	-20	0.2	-1.200	0.750	83	-20.2	20.2	0.7424	58.75	55.13
	-15	-0.1	-1.050	0.760	84	-16.2	16.2	0.7182	57.84	55.55
	-10	0.1	-0.750	0.830	84	-9.2	9.2	0.7387	58.66	57.90
	-5	0.2	-0.460	0.830	84	-4.8	4.8	0.7331	58.44	58.23
	0	0.5	-0.170	0.810	84	1.2	1.3	0.7315	58.37	58.36
	5	1.0	0.090	0.800	84	5.1	5.2	0.7343	58.48	58.24
	10	1.1	0.450	0.750	85	11.4	11.5	0.7229	58.08	56.92
	15	1.1	0.680	0.750	85	14.7	14.8	0.7384	58.70	56.76
	20	-0.5	1.000	0.740	85	20.1	20.2	0.7506	59.19	55.56
	25	0.7	1.210	0.700	86	24.6	24.6	0.7559	59.45	54.03
	30	0.4	1.350	0.630	85	30.0	30.0	0.7504	59.18	51.25
2	-30	-0.2	-1.300	0.580	82	-30.0	30.0	0.7389	58.56	50.71
	-25	-0.2	-1.300	0.670	82	-25.9	25.9	0.7572	59.28	53.34
	-20	-0.3	-1.230	0.750	82	-20.9	20.9	0.7533	59.13	55.25
	-15	-0.3	-1.000	0.780	82	-14.5	14.5	0.7243	57.98	56.14
	-10	-0.3	-0.750	0.830	82	-9.2	9.2	0.7387	58.55	57.79
	-5	-0.3	-0.500	0.820	82	-5.6	5.6	0.7246	57.99	57.72
	0	-0.3	-0.300	0.820	83	-1.1	1.1	0.7340	58.42	58.41
	5	0.5	0.170	0.780	83	6.6	6.6	0.7245	58.04	57.66
	10	0.6	0.450	0.750	83	11.4	11.4	0.7229	57.98	56.83
	15	0.6	0.730	0.740	83	15.7	15.7	0.7324	58.36	56.18
	20	0.6	0.930	0.720	83	19.4	19.4	0.7266	58.13	54.82
	25	-0.2	1.150	0.670	83	24.5	24.5	0.7221	57.94	52.73
	30	0.1	1.350	0.620	83	30.0	30.0	0.7385	58.60	50.75
3	-30	-0.2	-1.320	0.610	84	-30.0	30.0	0.5765	51.82	44.88
	-25	-0.4	-1.300	0.690	83	-24.7	24.7	0.7547	59.24	53.81
	-20	-0.4	-1.200	0.750	83	-20.2	20.2	0.7424	58.75	55.13
	-15	-0.3	-0.950	0.800	83	-13.1	13.1	0.7340	58.42	56.89
	-10	-0.4	-0.700	0.820	83	-8.6	8.6	0.7289	58.22	57.56
	-5	-0.3	-0.500	0.830	83	-5.5	5.5	0.7333	58.39	58.13
	0	-0.4	-0.220	0.820	83	0.5	0.6	0.7384	58.60	58.59
	5	0.4	0.200	0.780	83	7.1	7.1	0.7276	58.17	57.72
	10	-0.8	0.500	0.750	83	12.1	12.2	0.7263	58.11	56.81
	15	-0.8	0.770	0.740	83	16.3	16.4	0.7349	58.46	56.09
	20	-0.8	1.000	0.710	83	20.8	20.8	0.7272	58.15	54.35
	25	0.4	1.200	0.670	83	25.4	25.4	0.7332	58.39	52.73
	30	0.4	1.380	0.620	83	30.0	30.0	0.7385	58.60	50.75

		Res	Vdir	Vax
Average	-30	29.89	57.06	49.47
	-25	24.97	59.31	53.76
	-20	20.44	58.88	55.17
	-15	14.60	58.08	56.19
	-10	9.04	58.48	57.75
	-5	5.30	58.27	58.02
	0	1.03	58.46	58.45
	5	6.31	58.23	57.87
	10	11.69	58.06	56.85
	15	15.61	58.50	56.34
	20	20.14	58.49	54.91
	25	24.85	58.59	53.17
	30	30.00	58.79	50.91

Table C1-128. Spherical SPH-4 Post-test Computations - 60 fps

Probe: **Spherical SPH-4 / Post-Test 30-60 Calibration**

Velocity Point: **60 fps** Cal Date: 10/28/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.61%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**56.83**	Last Row:	61
Average Yaw Angle:	0.4		
Average Pitch Angle:	16.6	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.6	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.00		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-1.330	0.630	83	-28.4	28.4	0.8201	61.75	54.32
	-25	0.1	-1.300	0.700	83	-24.0	24.0	0.7985	60.93	55.69
	-20	0.2	-1.200	0.750	83	-19.8	19.8	0.7835	60.36	56.78
	-15	-0.1	-1.050	0.760	84	-16.0	16.0	0.7549	59.30	57.01
	-10	0.1	-0.750	0.830	84	-10.1	10.1	0.7895	60.65	59.71
	-5	0.2	-0.460	0.830	84	-4.3	4.3	0.7847	60.46	60.29
	0	0.5	-0.170	0.810	84	0.7	0.8	0.7738	60.04	60.03
	5	1.0	0.090	0.800	84	6.0	6.0	0.7793	60.25	59.92
	10	1.1	0.450	0.750	85	12.7	12.8	0.7571	59.44	57.97
	15	1.1	0.680	0.750	85	15.8	15.8	0.7785	60.27	57.99
	20	-0.5	1.000	0.740	85	20.1	20.2	0.7995	61.08	57.34
	25	0.7	1.210	0.700	86	24.5	24.5	0.7937	60.92	55.43
	30	0.4	1.350	0.630	85	29.8	29.8	0.7886	60.66	52.63
2	-30	-0.2	-1.300	0.580	82	-30.0	30.0	0.7923	60.64	52.51
	-25	-0.2	-1.300	0.670	82	-25.3	25.3	0.7895	60.53	54.72
	-20	-0.3	-1.230	0.750	82	-20.5	20.5	0.7938	60.70	56.86
	-15	-0.3	-1.000	0.780	82	-14.5	14.5	0.7622	59.48	57.59
	-10	-0.3	-0.750	0.830	82	-10.1	10.1	0.7895	60.53	59.60
	-5	-0.3	-0.500	0.820	82	-5.1	5.1	0.7743	59.95	59.71
	0	-0.3	-0.300	0.820	83	-1.6	1.6	0.7790	60.18	60.16
	5	0.5	0.170	0.780	83	7.9	7.9	0.7637	59.59	59.02
	10	0.6	0.450	0.750	83	12.7	12.7	0.7571	59.33	57.87
	15	0.6	0.730	0.740	83	16.6	16.6	0.7737	59.98	57.48
	20	0.6	0.930	0.720	83	19.5	19.6	0.7734	59.97	56.51
	25	-0.2	1.150	0.670	83	24.4	24.4	0.7586	59.39	54.10
	30	0.1	1.350	0.620	83	30.0	30.0	0.7786	60.17	52.11
3	-30	-0.2	-1.320	0.610	84	-29.3	29.3	0.6059	53.13	46.31
	-25	-0.4	-1.300	0.690	83	-24.4	24.4	0.7941	60.77	55.35
	-20	-0.4	-1.200	0.750	83	-19.8	19.8	0.7835	60.36	56.78
	-15	-0.3	-0.950	0.800	83	-13.4	13.4	0.7766	60.09	58.46
	-10	-0.4	-0.700	0.820	83	-9.3	9.3	0.7789	60.18	59.39
	-5	-0.3	-0.500	0.830	83	-5.0	5.0	0.7838	60.37	60.14
	0	-0.4	-0.220	0.820	83	-0.2	0.5	0.7809	60.26	60.26
	5	0.4	0.200	0.780	83	8.6	8.7	0.7651	59.65	58.97
	10	-0.8	0.500	0.750	83	13.4	13.4	0.7617	59.51	57.89
	15	-0.8	0.770	0.740	83	17.1	17.1	0.7774	60.12	57.46
	20	-0.8	1.000	0.710	83	20.8	20.8	0.7729	59.95	56.03
	25	0.4	1.200	0.670	83	25.2	25.2	0.7676	59.74	54.04
	30	0.4	1.380	0.620	83	30.0	30.0	0.7786	60.17	52.11

		Res	Vdir	Vax
Average	-30	29.25	58.51	51.05
	-25	24.55	60.74	55.25
	-20	20.05	60.47	56.81
	-15	14.62	59.62	57.68
	-10	9.81	60.45	59.57
	-5	4.77	60.26	60.05
	0	0.98	60.16	60.15
	5	7.55	59.83	59.30
	10	12.98	59.43	57.91
	15	16.51	60.13	57.64
	20	20.18	60.33	56.63
	25	24.70	60.02	54.52
	30	29.94	60.33	52.28

Table C1-129. Spherical SPH-4 Pre-test Computations - 90 fps

Probe: **Spherical SPH-4 / Pre-Test 30-60 Calibration**

Velocity Point: **90 fps** Cal Date: 06/26/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.23%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	86 _F
Average Axial Velocity, ft/sec:	**82.95**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.6	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.6		0
Resultant Angle Standard Deviation:	9.34		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.2	-2.900	1.280	95	-30.0	30.0	1.5654	86.25	74.70
	-25	0.0	-3.000	1.550	95	-26.6	26.6	1.7485	91.16	81.50
	-20	0.3	-2.850	1.650	95	-22.7	22.7	1.7141	90.26	83.24
	-15	0.5	-2.300	1.770	94	-15.7	15.7	1.6659	88.90	85.59
	-10	0.2	-1.800	1.810	94	-10.8	10.8	1.6302	87.94	86.37
	-5	0.2	-1.160	1.840	93	-5.9	5.9	1.6353	88.00	87.53
	0	0.1	-0.500	1.830	93	-0.6	0.6	1.6493	88.37	88.37
	5	1.2	0.300	1.750	92	5.6	5.7	1.6424	88.11	87.67
	10	1.0	1.000	1.700	92	10.0	10.0	1.6647	88.71	87.36
	15	0.8	1.630	1.670	91	15.1	15.1	1.6664	88.67	85.62
	20	0.5	2.070	1.600	90	18.7	18.7	1.6331	87.70	83.05
	25	0.8	2.550	1.500	90	23.6	23.6	1.6123	87.14	79.83
	30	0.9	2.930	1.400	89	28.2	28.2	1.6175	87.20	76.84
2	-30	0.1	-2.800	1.300	80	-30.0	30.0	1.5898	85.74	74.25
	-25	-0.3	-3.030	1.500	81	-28.5	28.5	1.7714	90.59	79.61
	-20	-0.2	-2.700	1.670	82	-20.9	20.9	1.6752	88.17	82.37
	-15	-0.3	-2.250	1.750	83	-15.4	15.5	1.6430	87.40	84.25
	-10	-0.3	-1.630	1.800	83	-9.5	9.5	1.6078	86.46	85.27
	-5	-0.2	-1.340	1.830	83	-7.2	7.2	1.6294	87.04	86.35
	0	-0.2	-0.580	1.820	84	-1.3	1.3	1.6364	87.31	87.29
	5	0.3	0.350	1.730	84	5.9	5.9	1.6288	87.11	86.64
	10	-0.8	0.880	1.730	85	9.1	9.2	1.6807	88.56	87.43
	15	0.5	1.500	1.650	86	14.2	14.2	1.6410	87.59	84.92
	20	-0.1	2.250	1.630	86	19.7	19.7	1.6738	88.46	83.26
	25	0.1	2.550	1.500	87	23.6	23.6	1.6123	86.90	79.62
	30	0.3	2.850	1.360	87	28.2	28.2	1.5721	85.81	75.60
3	-30	0.1	-2.950	1.300	85	-30.0	30.0	1.2235	75.56	65.44
	-25	0.0	-3.050	1.470	86	-29.7	29.7	1.7864	91.39	79.36
	-20	-0.3	-2.900	1.650	87	-23.2	23.2	1.7303	90.02	82.72
	-15	-0.2	-2.300	1.750	87	-15.9	15.9	1.6514	87.95	84.58
	-10	-0.2	-1.800	1.820	88	-10.8	10.8	1.6380	87.67	86.13
	-5	-0.2	-1.100	1.830	88	-5.5	5.5	1.6255	87.34	86.94
	0	-0.1	-0.650	1.830	89	-1.9	1.9	1.6423	87.87	87.82
	5	0.3	0.300	1.750	89	5.6	5.6	1.6424	87.87	87.45
	10	0.5	1.100	1.700	89	10.7	10.7	1.6698	88.60	87.05
	15	0.4	1.700	1.650	90	15.7	15.7	1.6529	88.23	84.94
	20	-0.1	2.050	1.600	90	18.6	18.6	1.6316	87.66	83.09
	25	0.3	2.600	1.480	90	24.3	24.3	1.6039	86.91	79.20
	30	0.5	3.000	1.360	91	29.5	29.5	1.6057	87.04	75.76

		Res	Vdir	Vax
Average	-30	30.00	82.52	71.46
	-25	28.28	91.05	80.16
	-20	22.29	89.48	82.78
	-15	15.68	88.08	84.80
	-10	10.38	87.36	85.92
	-5	6.21	87.46	86.94
	0	1.28	87.85	87.82
	5	5.75	87.70	87.25
	10	9.96	88.62	87.28
	15	14.99	88.16	85.16
	20	19.03	87.94	83.13
	25	23.86	86.98	79.55
	30	28.65	86.68	76.06

Table C1-130. Spherical SPH-4 Intermediate Computations - 90 fps

Probe: **Spherical SPH-4 / Intermediate 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 07/22/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.23%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	86 _F
Average Axial Velocity, ft/sec:	**82.78**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.7	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.7		0
Resultant Angle Standard Deviation:	9.43		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.2	-2.900	1.280	95	-30.0	30.0	1.6306	88.03	76.24
	-25	0.0	-3.000	1.550	95	-25.8	25.8	1.7460	91.09	82.04
	-20	0.3	-2.850	1.650	95	-22.2	22.2	1.7101	90.15	83.44
	-15	0.5	-2.300	1.770	94	-14.7	14.7	1.6471	88.40	85.49
	-10	0.2	-1.800	1.810	94	-10.4	10.4	1.6196	87.66	86.21
	-5	0.2	-1.160	1.840	93	-5.8	5.8	1.6268	87.77	87.31
	0	0.1	-0.500	1.830	93	0.4	0.5	1.6475	88.33	88.32
	5	1.2	0.300	1.750	92	5.9	6.1	1.6170	87.43	86.94
	10	1.0	1.000	1.700	92	11.3	11.3	1.6372	87.97	86.26
	15	0.8	1.630	1.670	91	15.6	15.6	1.6517	88.28	85.04
	20	0.5	2.070	1.600	90	19.4	19.5	1.6149	87.21	82.23
	25	0.8	2.550	1.500	90	24.3	24.3	1.6124	87.14	79.42
	30	0.9	2.930	1.400	89	29.5	29.5	1.6531	88.16	76.71
2	-30	0.1	-2.800	1.300	80	-30.0	30.0	1.6561	87.51	75.78
	-25	-0.3	-3.030	1.500	81	-27.6	27.6	1.7874	91.00	80.62
	-20	-0.2	-2.700	1.670	82	-20.5	20.5	1.6632	87.86	82.30
	-15	-0.3	-2.250	1.750	83	-14.5	14.5	1.6257	86.94	84.16
	-10	-0.3	-1.630	1.800	83	-9.3	9.3	1.6021	86.31	85.18
	-5	-0.2	-1.340	1.830	83	-7.1	7.1	1.6220	86.84	86.18
	0	-0.2	-0.580	1.820	84	-0.2	0.3	1.6346	87.26	87.26
	5	0.3	0.350	1.730	84	6.4	6.4	1.6041	86.44	85.91
	10	-0.8	0.880	1.730	85	10.4	10.5	1.6568	87.93	86.47
	15	0.5	1.500	1.650	86	14.8	14.8	1.6247	87.16	84.27
	20	-0.1	2.250	1.630	86	20.5	20.5	1.6616	88.14	82.56
	25	0.1	2.550	1.500	87	24.3	24.3	1.6124	86.90	79.21
	30	0.3	2.850	1.360	87	29.6	29.6	1.6069	86.76	75.47
3	-30	0.1	-2.950	1.300	85	-30.0	30.0	1.2098	75.14	65.07
	-25	0.0	-3.050	1.470	86	-28.8	28.8	1.8137	92.09	80.66
	-20	-0.3	-2.900	1.650	87	-22.7	22.7	1.7284	89.98	82.99
	-15	-0.2	-2.300	1.750	87	-14.9	14.9	1.6316	87.42	84.47
	-10	-0.2	-1.800	1.820	88	-10.3	10.3	1.6274	87.39	85.97
	-5	-0.2	-1.100	1.830	88	-5.5	5.5	1.6168	87.10	86.71
	0	-0.1	-0.650	1.830	89	-0.9	0.9	1.6393	87.79	87.78
	5	0.3	0.300	1.750	89	5.9	5.9	1.6170	87.19	86.72
	10	0.5	1.100	1.700	89	11.9	11.9	1.6439	87.91	86.01
	15	0.4	1.700	1.650	90	16.2	16.2	1.6376	87.82	84.32
	20	-0.1	2.050	1.600	90	19.3	19.3	1.6136	87.18	82.28
	25	0.3	2.600	1.480	90	25.0	25.0	1.6055	86.95	78.83
	30	0.5	3.000	1.360	91	30.0	30.0	1.6199	87.42	75.71

		Res	Vdir	Vax
Average	-30	30.00	83.56	72.36
	-25	27.41	91.39	81.11
	-20	21.82	89.33	82.91
	-15	14.73	87.59	84.71
	-10	10.02	87.12	85.79
	-5	6.14	87.24	86.73
	0	0.54	87.79	87.79
	5	6.13	87.02	86.52
	10	11.24	87.94	86.25
	15	15.52	87.75	84.54
	20	19.74	87.51	82.36
	25	24.52	87.00	79.15
	30	29.69	87.45	75.96

Table C1-131. Spherical SPH-4 Post-test Computations - 90 fps

Probe: **Spherical SPH-4 / Post-Test 30-60 Calibration**

Velocity Point: **90 fps** Cal Date: 10/28/97

Number Of Points: 39

Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.23%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	86 _F
Average Axial Velocity, ft/sec:	**85.06**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.9		0
Resultant Angle Standard Deviation:	9.05		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.2	-2.900	1.280	95	-30.0	30.0	1.7484	91.16	78.94
	-25	0.0	-3.000	1.550	95	-25.2	25.2	1.8210	93.03	84.15
	-20	0.3	-2.850	1.650	95	-21.9	21.9	1.8009	92.51	85.85
	-15	0.5	-2.300	1.770	94	-14.7	14.7	1.7318	90.64	87.67
	-10	0.2	-1.800	1.810	94	-11.1	11.1	1.7330	90.67	88.96
	-5	0.2	-1.160	1.840	93	-5.4	5.4	1.7384	90.73	90.32
	0	0.1	-0.500	1.830	93	-0.3	0.3	1.7425	90.84	90.84
	5	1.2	0.300	1.750	92	7.1	7.2	1.7096	89.89	89.19
	10	1.0	1.000	1.700	92	12.6	12.7	1.7142	90.02	87.83
	15	0.8	1.630	1.670	91	16.5	16.5	1.7443	90.72	86.99
	20	0.5	2.070	1.600	90	19.6	19.6	1.7190	89.98	84.78
	25	0.8	2.550	1.500	90	24.2	24.2	1.6948	89.34	81.50
	30	0.9	2.930	1.400	89	29.2	29.2	1.7313	90.22	78.77
2	-30	0.1	-2.800	1.300	80	-29.2	29.2	1.7323	89.50	78.15
	-25	-0.3	-3.030	1.500	81	-26.8	26.8	1.8538	92.67	82.75
	-20	-0.2	-2.700	1.670	82	-20.1	20.1	1.7527	90.19	84.69
	-15	-0.3	-2.250	1.750	83	-14.5	14.5	1.7106	89.18	86.33
	-10	-0.3	-1.630	1.800	83	-10.1	10.1	1.7125	89.23	87.85
	-5	-0.2	-1.340	1.830	83	-7.2	7.2	1.7331	89.77	89.07
	0	-0.2	-0.580	1.820	84	-0.9	1.0	1.7310	89.80	89.78
	5	0.3	0.350	1.730	84	7.6	7.6	1.6926	88.80	88.01
	10	-0.8	0.880	1.730	85	11.8	11.8	1.7317	89.90	87.99
	15	0.5	1.500	1.650	86	15.8	15.8	1.7130	89.49	86.10
	20	-0.1	2.250	1.630	86	20.5	20.5	1.7678	90.91	85.17
	25	0.1	2.550	1.500	87	24.2	24.2	1.6948	89.10	81.29
	30	0.3	2.850	1.360	87	29.2	29.2	1.6829	88.78	77.50
3	-30	0.1	-2.950	1.300	85	-30.0	30.0	1.2719	77.05	66.72
	-25	0.0	-3.050	1.470	86	-27.7	27.7	1.8750	93.63	82.87
	-20	-0.3	-2.900	1.650	87	-22.4	22.4	1.8199	92.33	85.38
	-15	-0.2	-2.300	1.750	87	-14.9	14.9	1.7140	89.60	86.60
	-10	-0.2	-1.800	1.820	88	-11.1	11.1	1.7419	90.41	88.73
	-5	-0.2	-1.100	1.830	88	-4.9	4.9	1.7281	90.05	89.72
	0	-0.1	-0.650	1.830	89	-1.5	1.5	1.7389	90.41	90.39
	5	0.3	0.300	1.750	89	7.1	7.1	1.7096	89.65	88.97
	10	0.5	1.100	1.700	89	13.2	13.2	1.7235	90.01	87.63
	15	0.4	1.700	1.650	90	17.0	17.0	1.7319	90.31	86.36
	20	-0.1	2.050	1.600	90	19.4	19.4	1.7172	89.93	84.80
	25	0.3	2.600	1.480	90	24.8	24.8	1.6841	89.06	80.83
	30	0.5	3.000	1.360	91	30.0	30.0	1.7080	89.77	77.74

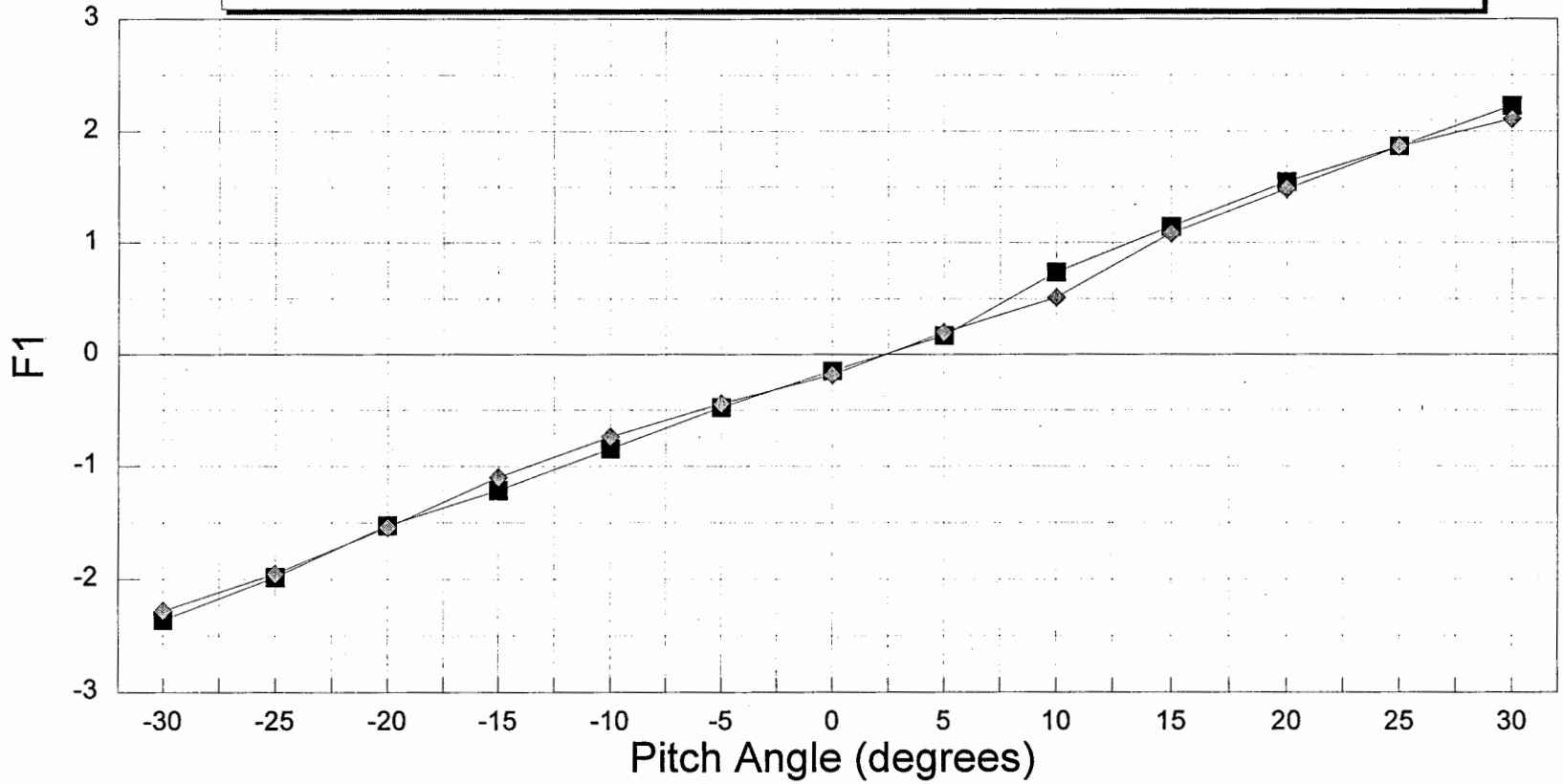
		Res	Vdir	Vax
Average	-30	29.72	85.90	74.61
	-25	26.58	93.11	83.26
	-20	21.45	91.68	85.31
	-15	14.70	89.81	86.87
	-10	10.77	90.11	88.51
	-5	5.85	90.18	89.70
	0	0.92	90.35	90.34
	5	7.29	89.45	88.72
	10	12.57	89.98	87.82
	15	16.44	90.18	86.48
	20	19.83	90.27	84.92
	25	24.39	89.17	81.21
	30	29.46	89.59	78.00

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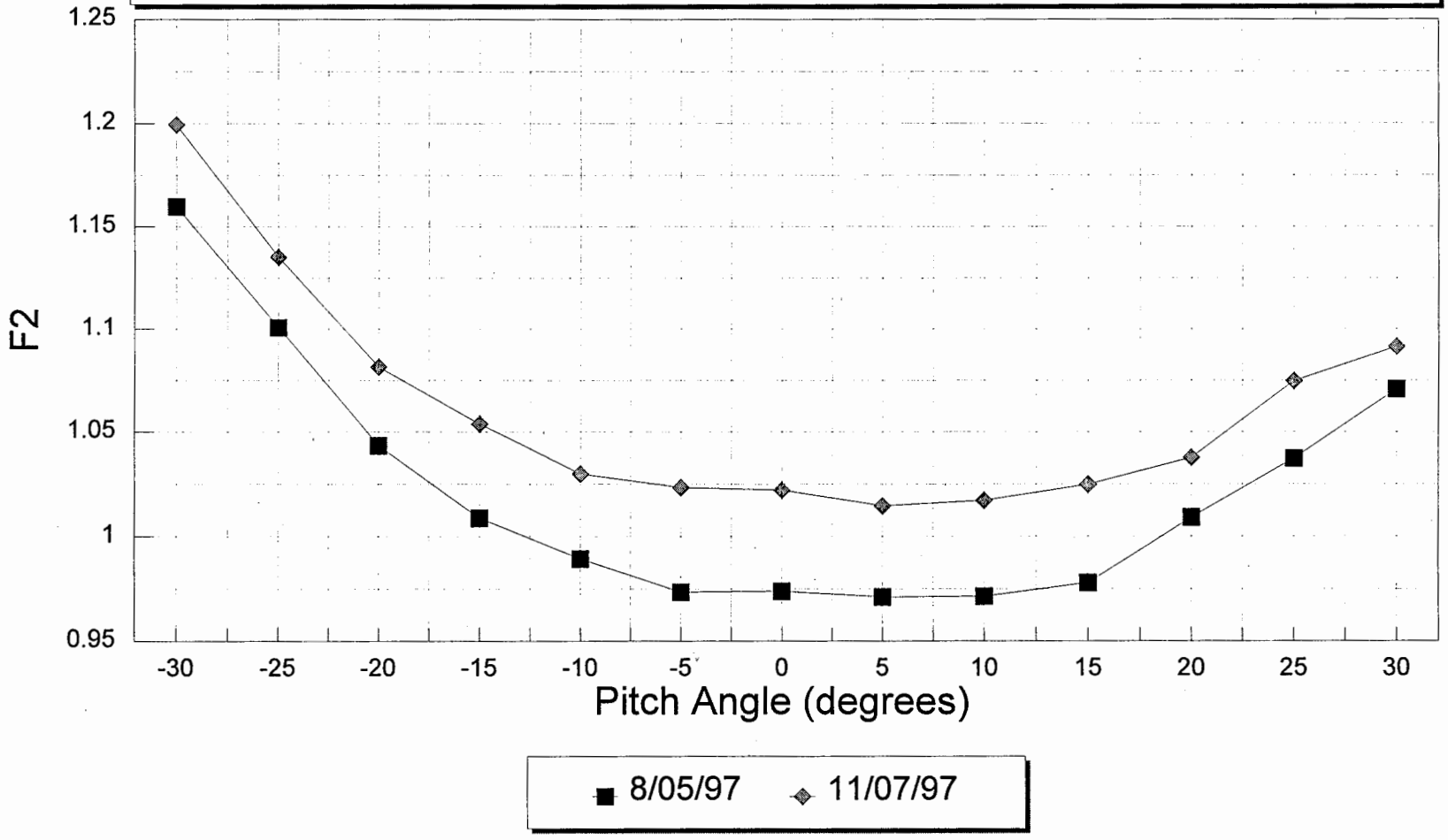
Spherical Probe SPH-5 Calibration Data

Figure C1-76. Spherical Probe 5 - Avg. (30-60 fps) F1 vs. Pitch Angle Pre- and Post Test Wind Tunnel Calibration



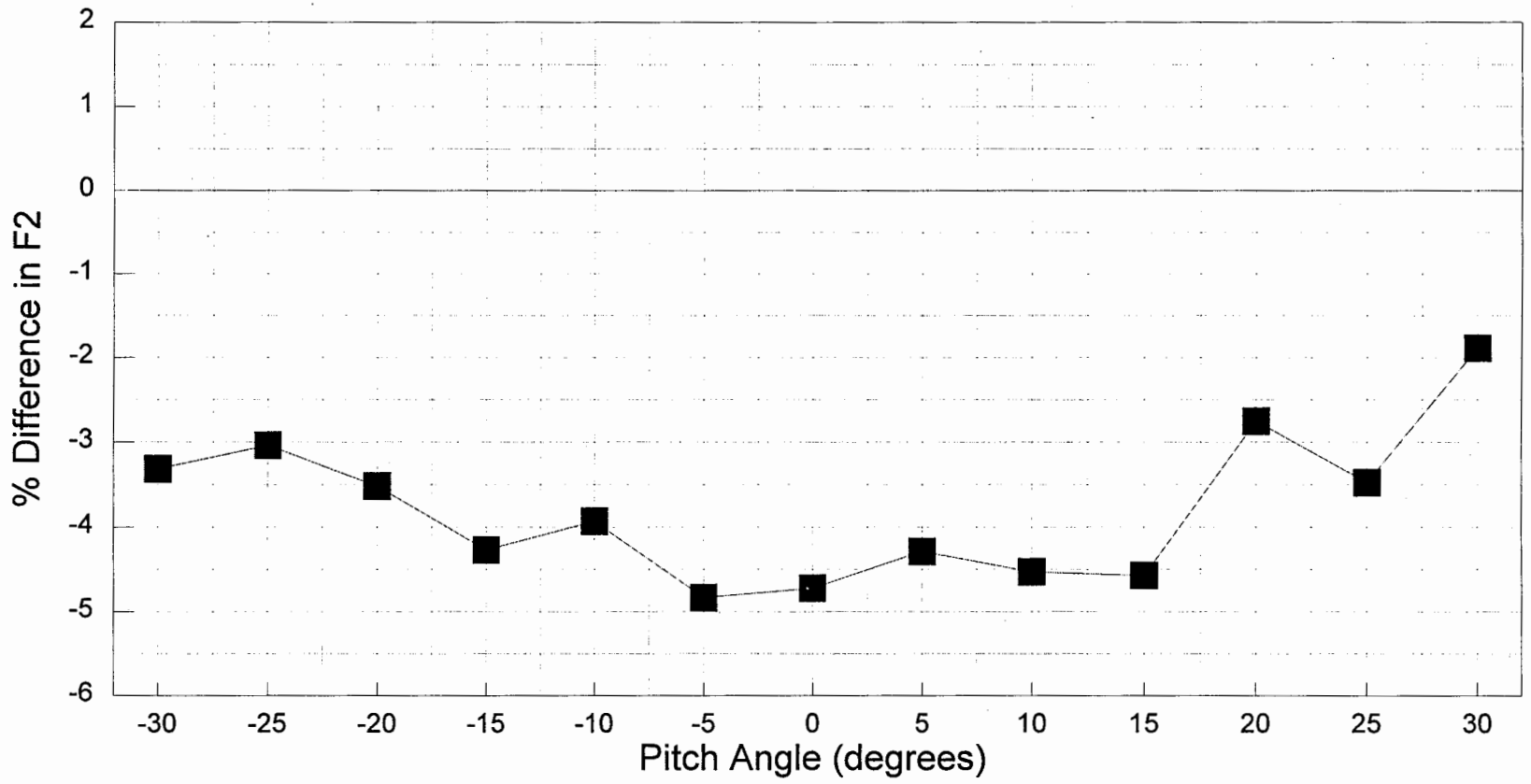
Note: Each point is the mean of three replicates.

Figure C1-77. Spherical Probe 5 - Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration



Note: Each point is the mean of three replicates.

Figure C1-78. Spherical Probe 5: Percent Difference in F2 (Avg. 30-60 fps) NCSU Pre- (8/5/97) and Post-Test (11/7/97) Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-132. Spherical Probe SPH-5 Calibrations at NC State Wind Tunnel August and November 1997

Pitch Angle	30 fps / August / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.55	29.42	25.60	29.90	30.69	26.61	1.19	4.32	3.95
-25	24.95	31.24	28.29	25.44	32.44	29.25	1.93	3.84	3.39
-20	20.24	31.21	29.28	20.10	32.30	30.34	-0.70	3.50	3.59
-15	16.89	31.62	30.23	17.58	33.01	31.45	4.08	4.41	4.06
-10	10.63	31.22	30.58	11.73	32.80	31.99	10.40	5.08	4.61
-5	5.46	31.35	31.17	6.16	32.87	32.62	12.74	4.85	4.66
0	2.72	31.16	31.12	2.70	32.68	32.65	-0.72	4.90	4.91
5	2.70	31.07	30.98	3.50	32.57	32.43	29.55	4.82	4.67
10	9.69	31.06	30.61	11.57	32.59	31.93	19.45	4.94	4.30
15	14.49	31.05	30.06	15.35	32.58	31.42	5.92	4.93	4.52
20	19.63	31.14	29.32	20.37	32.25	30.23	3.73	3.58	3.10
25	23.84	31.08	28.43	24.12	32.20	29.38	1.18	3.58	3.36
30	29.37	31.05	27.06	30.00	31.77	27.51	2.16	2.33	1.69

Pitch Angle	60 fps / August / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.75	55.61	48.75	29.82	58.24	50.52	3.74	4.73	3.63
-25	25.24	58.34	52.77	25.75	60.53	54.52	2.02	3.75	3.31
-20	19.63	58.21	54.83	19.59	60.34	56.85	-0.21	3.66	3.69
-15	13.45	57.92	56.32	14.90	60.85	58.80	10.73	5.06	4.40
-10	9.35	58.33	57.56	10.80	61.07	59.99	15.55	4.70	4.22
-5	4.35	58.22	58.04	4.79	61.16	60.93	10.20	5.05	4.98
0	1.37	58.20	58.18	1.38	61.01	60.99	0.39	4.84	4.84
5	5.48	58.54	58.22	6.42	61.29	60.82	17.19	4.70	4.47
10	10.55	58.52	57.53	12.36	61.46	60.04	17.08	5.03	4.36
15	15.52	58.65	56.51	16.30	61.45	58.98	5.00	4.78	4.38
20	20.66	58.36	54.60	21.39	60.39	56.23	3.50	3.48	2.98
25	26.02	58.45	52.51	26.59	60.44	54.03	2.17	3.42	2.89
30	29.81	58.14	50.45	30.00	59.33	51.38	0.63	2.04	1.85

Pitch Angle	90 fps / August / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.23	84.05	73.37	29.53	87.56	76.21	1.03	4.18	3.87
-25	26.35	89.05	79.79	27.04	92.62	82.49	2.61	4.01	3.38
-20	21.14	88.86	82.88	21.09	91.94	85.78	-0.23	3.47	3.50
-15	15.85	87.85	84.50	16.87	92.11	88.14	6.43	4.84	4.30
-10	9.57	87.65	86.43	11.03	91.80	90.10	15.21	4.73	4.25
-5	4.84	87.56	87.21	5.40	91.90	91.43	11.52	4.95	4.84
0	1.75	87.68	87.64	1.91	91.86	91.81	9.17	4.77	4.76
5	7.33	88.20	87.48	8.75	92.33	91.25	19.41	4.68	4.31
10	10.98	88.22	86.60	12.66	92.64	90.38	15.32	5.01	4.37
15	14.80	88.09	85.16	15.56	92.37	88.98	5.12	4.86	4.49
20	19.25	88.37	83.43	20.09	91.41	85.85	4.33	3.44	2.90
25	24.52	88.33	80.36	24.65	91.52	83.18	0.52	3.62	3.52
30	29.81	86.44	75.00	30.00	88.21	76.39	0.66	2.05	1.85

Figure C1-79. Spherical Probe SPH-5 Pre- and Post-Test Calibrations
NC State Wind Tunnel -- August and November 1997

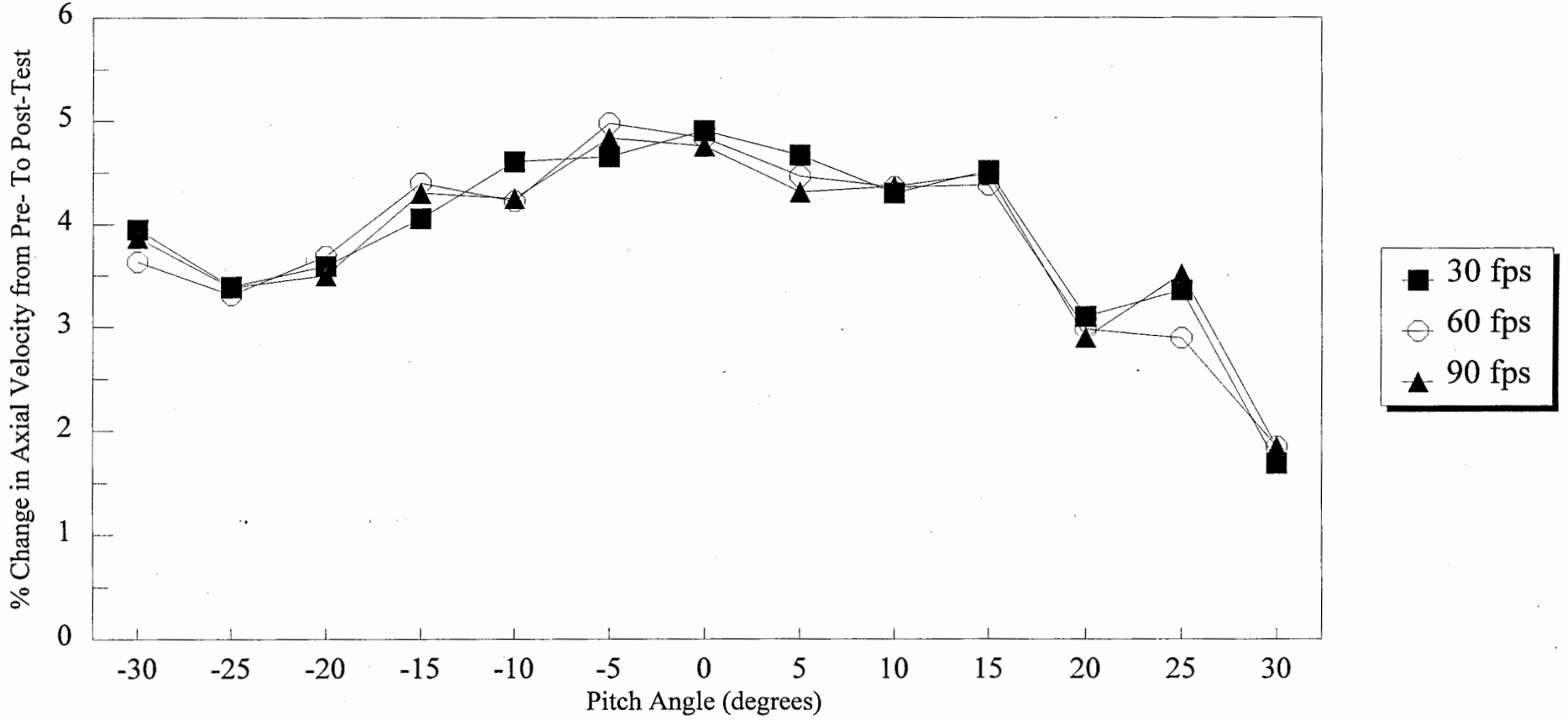


Table C1-133. Spherical SPH-5 Pre-test Computations - 30 fps

Probe: **Spherical SPH-5 / Pre-Test 30-60 Calibration**

Velocity Point: **30 fps** Cal Date: 08/05/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.61	Probe ID:	SPH-5
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.61	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.24%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	78 _F
Average Axial Velocity, ft/sec:	**29.44**	Last Row:	61
Average Yaw Angle:	0.2		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.2	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.43		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-0.350	0.155	73	-28.6	28.6	0.2028	30.48	26.75
	-25	-0.3	-0.300	0.175	73	-22.1	22.1	0.1995	30.22	28.01
	-20	-0.3	-0.290	0.190	73	-20.0	20.0	0.2069	30.78	28.93
	-15	-0.3	-0.230	0.202	73	-14.0	14.0	0.2040	30.57	29.66
	-10	-0.3	-0.090	0.210	73	-4.3	4.3	0.1992	30.20	30.12
	-5	0.1	-0.060	0.220	73	-1.9	1.9	0.2087	30.91	30.89
	0	0.1	0.010	0.219	73	3.1	3.1	0.2070	30.79	30.74
	5	0.1	0.100	0.218	73	7.6	7.6	0.2056	30.69	30.42
	10	0.1	0.175	0.217	73	10.9	10.9	0.2052	30.65	30.10
	15	0.1	0.250	0.214	72	15.3	15.3	0.2054	30.64	29.56
	20	0.1	0.333	0.200	72	21.8	21.8	0.2079	30.83	28.62
	25	0.1	0.336	0.192	72	23.2	23.2	0.2026	30.43	27.97
	30	-0.1	0.400	0.178	72	30.0	30.0	0.2041	30.54	26.45
2	-30	-0.4	-0.400	0.150	85	-30.0	30.0	0.2017	30.74	26.62
	-25	-0.3	-0.370	0.170	85	-27.6	27.6	0.2176	31.92	28.30
	-20	-0.2	-0.300	0.190	84	-20.6	20.6	0.2096	31.30	29.30
	-15	0.0	-0.290	0.205	84	-18.2	18.2	0.2181	31.92	30.32
	-10	-0.1	-0.250	0.212	84	-14.5	14.5	0.2150	31.70	30.69
	-5	0.0	-0.160	0.220	83	-8.4	8.4	0.2132	31.54	31.20
	0	-0.2	-0.070	0.221	83	-2.6	2.6	0.2096	31.27	31.24
	5	-0.2	-0.030	0.221	83	0.2	0.3	0.2095	31.27	31.26
	10	0.4	0.150	0.222	83	9.5	9.5	0.2094	31.26	30.83
	15	0.1	0.250	0.219	83	15.0	15.0	0.2094	31.26	30.20
	20	0.0	0.300	0.210	82	18.5	18.5	0.2100	31.27	29.65
	25	0.0	0.350	0.200	82	23.2	23.2	0.2110	31.35	28.82
	30	0.1	0.400	0.189	82	28.5	28.5	0.2127	31.47	27.66
3	-30	-0.7	-0.380	0.155	84	-30.0	30.0	0.1566	27.05	23.42
	-25	-0.2	-0.350	0.175	84	-25.2	25.2	0.2132	31.57	28.55
	-20	-0.1	-0.300	0.195	84	-20.1	20.1	0.2130	31.55	29.62
	-15	-0.1	-0.300	0.210	84	-18.4	18.4	0.2240	32.36	30.70
	-10	-0.1	-0.230	0.215	84	-13.1	13.1	0.2156	31.74	30.92
	-5	-0.1	-0.125	0.224	83	-6.1	6.1	0.2140	31.60	31.42
	0	-0.1	-0.070	0.223	83	-2.5	2.5	0.2115	31.41	31.38
	5	-0.1	-0.030	0.221	83	0.2	0.2	0.2095	31.27	31.26
	10	-0.1	0.130	0.222	83	8.7	8.7	0.2094	31.26	30.90
	15	-0.2	0.220	0.220	83	13.2	13.2	0.2094	31.26	30.42
	20	-0.1	0.300	0.210	83	18.5	18.5	0.2100	31.30	29.68
	25	-0.1	0.370	0.197	83	25.2	25.2	0.2124	31.48	28.49
	30	-0.3	0.400	0.182	83	29.6	29.6	0.2077	31.13	27.06

		Res	Vdir	Vax
Average	-30	29.55	29.42	25.60
	-25	24.95	31.24	28.29
	-20	20.24	31.21	29.28
	-15	16.89	31.62	30.23
	-10	10.63	31.22	30.58
	-5	5.46	31.35	31.17
	0	2.72	31.16	31.12
	5	2.70	31.07	30.98
	10	9.69	31.06	30.61
	15	14.49	31.05	30.06
	20	19.63	31.14	29.32
	25	23.84	31.08	28.43
	30	29.37	31.05	27.06

Table C1-134. Spherical SPH-5 Post-test Computations - 30 fps

Probe: **Spherical SPH-5 / Post-Test 30-60 Calibration**

Velocity Point: **30 fps** Cal Date: 11/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.61	Probe ID:	SPH-5
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.61	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.24%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	78 _F
Average Axial Velocity, ft/sec:	**30.60**	Last Row:	61
Average Yaw Angle:	0.2		
Average Pitch Angle:	16.8	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.8		0
Resultant Angle Standard Deviation:	9.35		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-0.350	0.155	73	-29.7	29.7	0.2215	31.85	27.67
	-25	-0.3	-0.300	0.175	73	-22.1	22.1	0.2135	31.27	28.97
	-20	-0.3	-0.290	0.190	73	-19.8	19.8	0.2219	31.88	29.98
	-15	-0.3	-0.230	0.202	73	-15.4	15.4	0.2254	32.13	30.97
	-10	-0.3	-0.090	0.210	73	-4.7	4.7	0.2199	31.74	31.63
	-5	0.1	-0.060	0.220	73	-1.7	1.7	0.2300	32.46	32.44
	0	0.1	0.010	0.219	73	3.0	3.0	0.2268	32.22	32.18
	5	0.1	0.100	0.218	73	9.2	9.2	0.2254	32.13	31.72
	10	0.1	0.175	0.217	73	12.6	12.6	0.2263	32.19	31.42
	15	0.1	0.250	0.214	72	16.1	16.1	0.2260	32.14	30.88
	20	0.1	0.333	0.200	72	22.4	22.4	0.2229	31.92	29.51
	25	0.1	0.336	0.192	72	23.5	23.5	0.2173	31.52	28.90
	30	-0.1	0.400	0.178	72	30.0	30.0	0.2120	31.13	26.96
2	-30	-0.4	-0.400	0.150	85	-30.0	30.0	0.2158	31.79	27.53
	-25	-0.3	-0.370	0.170	85	-28.4	28.4	0.2366	33.29	29.27
	-20	-0.2	-0.300	0.190	84	-20.5	20.5	0.2244	32.39	30.34
	-15	0.0	-0.290	0.205	84	-18.6	18.6	0.2363	33.24	31.51
	-10	-0.1	-0.250	0.212	84	-15.9	15.9	0.2377	33.33	32.06
	-5	0.0	-0.160	0.220	83	-9.8	9.8	0.2332	32.99	32.50
	0	-0.2	-0.070	0.221	83	-2.6	2.6	0.2312	32.84	32.81
	5	-0.2	-0.030	0.221	83	0.6	0.7	0.2304	32.79	32.79
	10	0.4	0.150	0.222	83	11.5	11.5	0.2307	32.81	32.16
	15	0.1	0.250	0.219	83	15.7	15.7	0.2308	32.82	31.59
	20	0.0	0.300	0.210	82	19.3	19.3	0.2254	32.40	30.57
	25	0.0	0.350	0.200	82	23.5	23.5	0.2264	32.47	29.77
	30	0.1	0.400	0.189	82	30.0	30.0	0.2251	32.38	28.04
3	-30	-0.7	-0.380	0.155	84	-30.0	30.0	0.1729	28.43	24.62
	-25	-0.2	-0.350	0.175	84	-25.7	25.7	0.2295	32.75	29.50
	-20	-0.1	-0.300	0.195	84	-20.0	20.0	0.2281	32.65	30.68
	-15	-0.1	-0.300	0.210	84	-18.7	18.7	0.2425	33.67	31.88
	-10	-0.1	-0.230	0.215	84	-14.6	14.6	0.2379	33.34	32.27
	-5	-0.1	-0.125	0.224	83	-6.9	6.9	0.2358	33.17	32.92
	0	-0.1	-0.070	0.223	83	-2.5	2.5	0.2333	32.99	32.96
	5	-0.1	-0.030	0.221	83	0.6	0.6	0.2304	32.79	32.79
	10	-0.1	0.130	0.222	83	10.7	10.7	0.2302	32.77	32.21
	15	-0.2	0.220	0.220	83	14.3	14.3	0.2306	32.80	31.78
	20	-0.1	0.300	0.210	83	19.3	19.3	0.2254	32.43	30.60
	25	-0.1	0.370	0.197	83	25.3	25.3	0.2279	32.61	29.48
	30	-0.3	0.400	0.182	83	30.0	30.0	0.2168	31.80	27.54

		Res	Vdir	Vax
Average	-30	29.90	30.69	26.61
	-25	25.44	32.44	29.25
	-20	20.10	32.30	30.34
	-15	17.58	33.01	31.45
	-10	11.73	32.80	31.99
	-5	6.16	32.87	32.62
	0	2.70	32.68	32.65
	5	3.50	32.57	32.43
	10	11.57	32.59	31.93
	15	15.35	32.58	31.42
	20	20.37	32.25	30.23
	25	24.12	32.20	29.38
	30	30.00	31.77	27.51

Table C1-135. Spherical SPH-5 Pre-test Computations - 60 fps

Probe: **Spherical SPH-5 / Pre-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 08/05/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.61	Probe ID:	SPH-5
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.61	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.46%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	80 _F
Average Axial Velocity, ft/sec:	**55.10**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.2		0
Resultant Angle Standard Deviation:	9.43		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-1.250	0.550	74	-28.8	28.8	0.7224	57.57	50.44
	-25	-0.3	-1.200	0.600	75	-25.2	25.2	0.7309	57.96	52.43
	-20	-0.3	-1.030	0.670	75	-20.1	20.1	0.7317	57.99	54.45
	-15	-0.6	-0.820	0.710	75	-14.2	14.2	0.7183	57.46	55.70
	-10	-0.4	-0.600	0.750	75	-9.4	9.4	0.7315	57.99	57.21
	-5	-0.4	-0.400	0.760	76	-5.7	5.7	0.7241	57.75	57.46
	0	-0.4	-0.160	0.770	76	-0.9	1.0	0.7302	57.99	57.98
	5	-0.3	-0.020	0.770	76	2.0	2.0	0.7286	57.93	57.89
	10	-0.3	0.580	0.775	77	10.2	10.2	0.7314	58.09	57.18
	15	-0.2	0.880	0.760	78	15.2	15.2	0.7283	58.02	56.00
	20	-0.1	1.100	0.730	78	19.5	19.5	0.7389	58.44	55.09
	25	-0.3	1.300	0.690	78	25.2	25.2	0.7448	58.68	53.07
	30	-0.2	1.420	0.650	78	29.4	29.4	0.7401	58.49	50.94
2	-30	-0.7	-1.250	0.550	85	-28.8	28.8	0.7224	58.16	50.96
	-25	-0.6	-1.200	0.600	85	-25.2	25.2	0.7309	58.50	52.92
	-20	-0.5	-1.000	0.670	85	-19.5	19.5	0.7245	58.25	54.91
	-15	-0.5	-0.720	0.720	85	-12.1	12.1	0.7167	57.93	56.64
	-10	-0.5	-0.590	0.750	85	-9.2	9.2	0.7306	58.49	57.73
	-5	-0.4	-0.300	0.770	84	-3.7	3.7	0.7304	58.43	58.31
	0	-0.3	-0.050	0.775	84	1.3	1.4	0.7338	58.57	58.55
	5	0.0	0.330	0.790	84	7.2	7.2	0.7451	59.01	58.55
	10	-0.3	0.640	0.780	84	11.0	11.1	0.7379	58.73	57.64
	15	0.0	0.950	0.770	84	16.1	16.1	0.7469	59.09	56.77
	20	0.0	1.150	0.680	84	22.3	22.3	0.7102	57.61	53.32
	25	-0.4	1.310	0.630	84	28.0	28.0	0.7043	57.37	50.67
	30	-0.3	1.440	0.625	83	30.0	30.0	0.7167	57.82	50.08
3	-30	-0.7	-1.240	0.550	86	-28.6	28.6	0.5565	51.09	44.86
	-25	-0.6	-1.200	0.600	86	-25.2	25.2	0.7309	58.56	52.96
	-20	-0.4	-1.000	0.675	85	-19.3	19.3	0.7282	58.40	55.12
	-15	-0.5	-0.820	0.720	85	-14.0	14.0	0.7272	58.36	56.62
	-10	-0.4	-0.600	0.750	85	-9.4	9.4	0.7315	58.53	57.74
	-5	-0.4	-0.300	0.770	85	-3.7	3.7	0.7304	58.48	58.36
	0	-0.3	-0.030	0.760	85	1.7	1.8	0.7193	58.04	58.01
	5	-0.3	0.330	0.780	85	7.3	7.3	0.7357	58.69	58.22
	10	-0.3	0.600	0.780	85	10.4	10.4	0.7367	58.73	57.76
	15	-0.3	0.900	0.770	85	15.3	15.3	0.7392	58.83	56.75
	20	-0.1	1.140	0.730	84	20.2	20.2	0.7454	59.02	55.38
	25	-0.2	1.300	0.700	84	24.9	24.9	0.7520	59.29	53.79
	30	-0.2	1.450	0.630	84	30.0	30.0	0.7224	58.11	50.32

		Res	Vdir	Vax
Average	-30	28.75	55.61	48.75
	-25	25.24	58.34	52.77
	-20	19.63	58.21	54.83
	-15	13.45	57.92	56.32
	-10	9.35	58.33	57.56
	-5	4.35	58.22	58.04
	0	1.37	58.20	58.18
	5	5.48	58.54	58.22
	10	10.55	58.52	57.53
	15	15.52	58.65	56.51
	20	20.66	58.36	54.60
	25	26.02	58.45	52.51
	30	29.81	58.14	50.45

Table C1-136. Spherical SPH-5 Post-test Computations - 60 fps

Probe: **Spherical SPH-5 / Post-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 11/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.61	Probe ID:	SPH-5
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.61	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.46%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	80 _F
Average Axial Velocity, ft/sec:	**57.24**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.9		0
Resultant Angle Standard Deviation:	9.38		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-1.250	0.550	74	-29.9	29.9	0.7898	60.20	52.18
	-25	-0.3	-1.200	0.600	75	-25.7	25.7	0.7868	60.14	54.17
	-20	-0.3	-1.030	0.670	75	-20.0	20.0	0.7835	60.01	56.40
	-15	-0.6	-0.820	0.710	75	-15.6	15.6	0.7938	60.40	58.17
	-10	-0.4	-0.600	0.750	75	-10.9	10.9	0.8019	60.71	59.63
	-5	-0.4	-0.400	0.760	76	-6.4	6.4	0.7989	60.66	60.28
	0	-0.4	-0.160	0.770	76	-0.5	0.6	0.8045	60.87	60.87
	5	-0.3	-0.020	0.770	76	2.1	2.1	0.7995	60.68	60.64
	10	-0.3	0.580	0.775	77	12.1	12.1	0.8070	61.02	59.67
	15	-0.2	0.880	0.760	78	15.9	15.9	0.8019	60.88	58.55
	20	-0.1	1.100	0.730	78	20.3	20.3	0.7900	60.43	56.66
	25	-0.3	1.300	0.690	78	25.4	25.4	0.7990	60.77	54.88
	30	-0.2	1.420	0.650	78	30.0	30.0	0.7743	59.82	51.81
2	-30	-0.7	-1.250	0.550	85	-29.9	29.9	0.7898	60.81	52.71
	-25	-0.6	-1.200	0.600	85	-25.7	25.8	0.7868	60.70	54.67
	-20	-0.5	-1.000	0.670	85	-19.5	19.5	0.7795	60.41	56.96
	-15	-0.5	-0.720	0.720	85	-13.6	13.6	0.7897	60.81	59.10
	-10	-0.5	-0.590	0.750	85	-10.7	10.7	0.8006	61.23	60.17
	-5	-0.4	-0.300	0.770	84	-4.0	4.0	0.8061	61.38	61.23
	0	-0.3	-0.050	0.775	84	1.6	1.6	0.8059	61.37	61.35
	5	0.0	0.330	0.790	84	8.5	8.5	0.8163	61.77	61.08
	10	-0.3	0.640	0.780	84	12.7	12.7	0.8137	61.67	60.16
	15	0.0	0.950	0.770	84	16.9	16.9	0.8164	61.77	59.11
	20	0.0	1.150	0.680	84	22.8	22.8	0.7615	59.66	55.02
	25	-0.4	1.310	0.630	84	29.4	29.4	0.7477	59.12	51.50
	30	-0.3	1.440	0.625	83	30.0	30.0	0.7445	58.93	51.04
3	-30	-0.7	-1.240	0.550	86	-29.6	29.6	0.6149	53.71	46.68
	-25	-0.6	-1.200	0.600	86	-25.7	25.8	0.7868	60.75	54.72
	-20	-0.4	-1.000	0.675	85	-19.3	19.3	0.7843	60.60	57.18
	-15	-0.5	-0.820	0.720	85	-15.4	15.4	0.8034	61.33	59.12
	-10	-0.4	-0.600	0.750	85	-10.9	10.9	0.8019	61.28	60.18
	-5	-0.4	-0.300	0.770	85	-4.0	4.0	0.8061	61.44	61.29
	0	-0.3	-0.030	0.760	85	1.9	1.9	0.7895	60.80	60.77
	5	-0.3	0.330	0.780	85	8.6	8.6	0.8061	61.44	60.74
	10	-0.3	0.600	0.780	85	12.3	12.3	0.8126	61.69	60.28
	15	-0.3	0.900	0.770	85	16.1	16.1	0.8131	61.70	59.29
	20	-0.1	1.140	0.730	84	21.1	21.1	0.7982	61.08	57.00
	25	-0.2	1.300	0.700	84	24.9	24.9	0.8076	61.44	55.71
	30	-0.2	1.450	0.630	84	30.0	30.0	0.7504	59.22	51.29

		Res	Vdir	Vax
Average	-30	29.82	58.24	50.52
	-25	25.75	60.53	54.52
	-20	19.59	60.34	56.85
	-15	14.90	60.85	58.80
	-10	10.80	61.07	59.99
	-5	4.79	61.16	60.93
	0	1.38	61.01	60.99
	5	6.42	61.29	60.82
	10	12.36	61.46	60.04
	15	16.30	61.45	58.98
	20	21.39	60.39	56.23
	25	26.59	60.44	54.03
	30	30.00	59.33	51.38

Table C1-137. Spherical SPH-5 Pre-test Computations - 90 fps

Probe: **Spherical SPH-5 / Pre-Test 30-60 Calibration**

Velocity Point: **90 fps** Cal Date: 08/05/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.61	Probe ID:	SPH-5
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.61	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.53%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**83.06**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.6	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.6		0
Resultant Angle Standard Deviation:	9.13		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-2.900	1.170	87	-30.0	30.0	1.5736	86.00	74.47
	-25	-0.3	-2.750	1.350	87	-25.7	25.7	1.6620	88.38	79.62
	-20	0.2	-2.450	1.480	87	-21.4	21.4	1.6633	88.41	82.31
	-15	-0.7	-2.000	1.580	87	-15.8	15.9	1.6273	87.45	84.12
	-10	-0.5	-1.350	1.660	86	-9.6	9.6	1.6208	87.20	85.98
	-5	-0.5	-0.650	1.700	86	-3.6	3.6	1.6125	86.98	86.81
	0	-0.3	-0.070	1.710	85	1.7	1.7	1.6185	87.06	87.02
	5	-0.3	0.750	1.750	85	7.3	7.3	1.6505	87.91	87.20
	10	-0.3	1.400	1.750	84	10.8	10.8	1.6545	87.94	86.38
	15	-0.3	1.850	1.700	84	14.3	14.3	1.6228	87.09	84.39
	20	0.0	2.400	1.630	83	19.1	19.1	1.6413	87.51	82.70
	25	0.4	2.850	1.550	82	24.6	24.6	1.6600	87.92	79.96
	30	0.3	3.100	1.420	82	29.4	29.4	1.6165	86.76	75.58
2	-30	-0.7	-2.950	1.350	86	-27.7	27.7	1.7319	90.14	79.82
	-25	-0.1	-2.850	1.330	87	-27.1	27.1	1.6866	89.03	79.25
	-20	-0.3	-2.450	1.500	88	-21.2	21.2	1.6769	88.86	82.85
	-15	-0.4	-2.100	1.570	88	-17.0	17.0	1.6425	87.94	84.10
	-10	-0.3	-1.400	1.660	89	-10.0	10.0	1.6249	87.55	86.22
	-5	-0.4	-1.100	1.700	89	-7.3	7.3	1.6365	87.86	87.14
	0	-0.4	-0.070	1.700	90	1.7	1.8	1.6090	87.20	87.16
	5	-0.3	0.800	1.740	91	7.6	7.6	1.6411	88.14	87.37
	10	-0.1	1.400	1.720	91	11.0	11.0	1.6269	87.76	86.16
	15	-0.1	2.050	1.720	91	15.6	15.6	1.6574	88.58	85.32
	20	0.0	2.500	1.630	92	19.8	19.8	1.6567	88.64	83.38
	25	0.0	2.800	1.550	92	24.1	24.1	1.6510	88.49	80.80
	30	-0.4	3.100	1.360	92	30.0	30.0	1.5595	86.00	74.48
3	-30	-0.7	-2.900	1.170	98	-30.0	30.0	1.2050	76.01	65.82
	-25	-0.4	-2.800	1.350	98	-26.2	26.2	1.6795	89.73	80.50
	-20	-0.2	-2.400	1.500	98	-20.8	20.8	1.6634	89.30	83.47
	-15	-0.8	-1.900	1.600	97	-14.7	14.7	1.6243	88.17	85.29
	-10	-0.7	-1.300	1.670	97	-9.1	9.1	1.6258	88.21	87.09
	-5	-0.7	-0.650	1.700	97	-3.6	3.6	1.6125	87.85	87.67
	0	-0.3	-0.070	1.740	97	1.7	1.8	1.6469	88.78	88.74
	5	-0.4	0.700	1.740	96	7.1	7.1	1.6411	88.54	87.87
	10	-0.4	1.450	1.750	96	11.1	11.2	1.6561	88.95	87.27
	15	-0.2	1.900	1.720	96	14.5	14.5	1.6427	88.59	85.76
	20	-0.2	2.400	1.650	96	18.9	18.9	1.6569	88.97	84.19
	25	-0.3	2.850	1.530	95	24.9	24.9	1.6452	88.57	80.31
	30	0.1	3.100	1.370	95	30.0	30.0	1.5709	86.55	74.95

		Res	Vdir	Vax
Average	-30	29.23	84.05	73.37
	-25	26.35	89.05	79.79
	-20	21.14	88.86	82.88
	-15	15.85	87.85	84.50
	-10	9.57	87.65	86.43
	-5	4.84	87.56	87.21
	0	1.75	87.68	87.64
	5	7.33	88.20	87.48
	10	10.98	88.22	86.60
	15	14.80	88.09	85.16
	20	19.25	88.37	83.43
	25	24.52	88.33	80.36
	30	29.81	86.44	75.00

Table C1-138. Spherical SPH-5 Post-test Computations - 90 fps

Probe: **Spherical SPH-5 / Post-Test 30-60 Calibration**

Velocity Point: **90 fps** Cal Date: 11/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.61	Probe ID:	SPH-5
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.61	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.53%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**86.31**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	17.3	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.3		0
Resultant Angle Standard Deviation:	8.91		

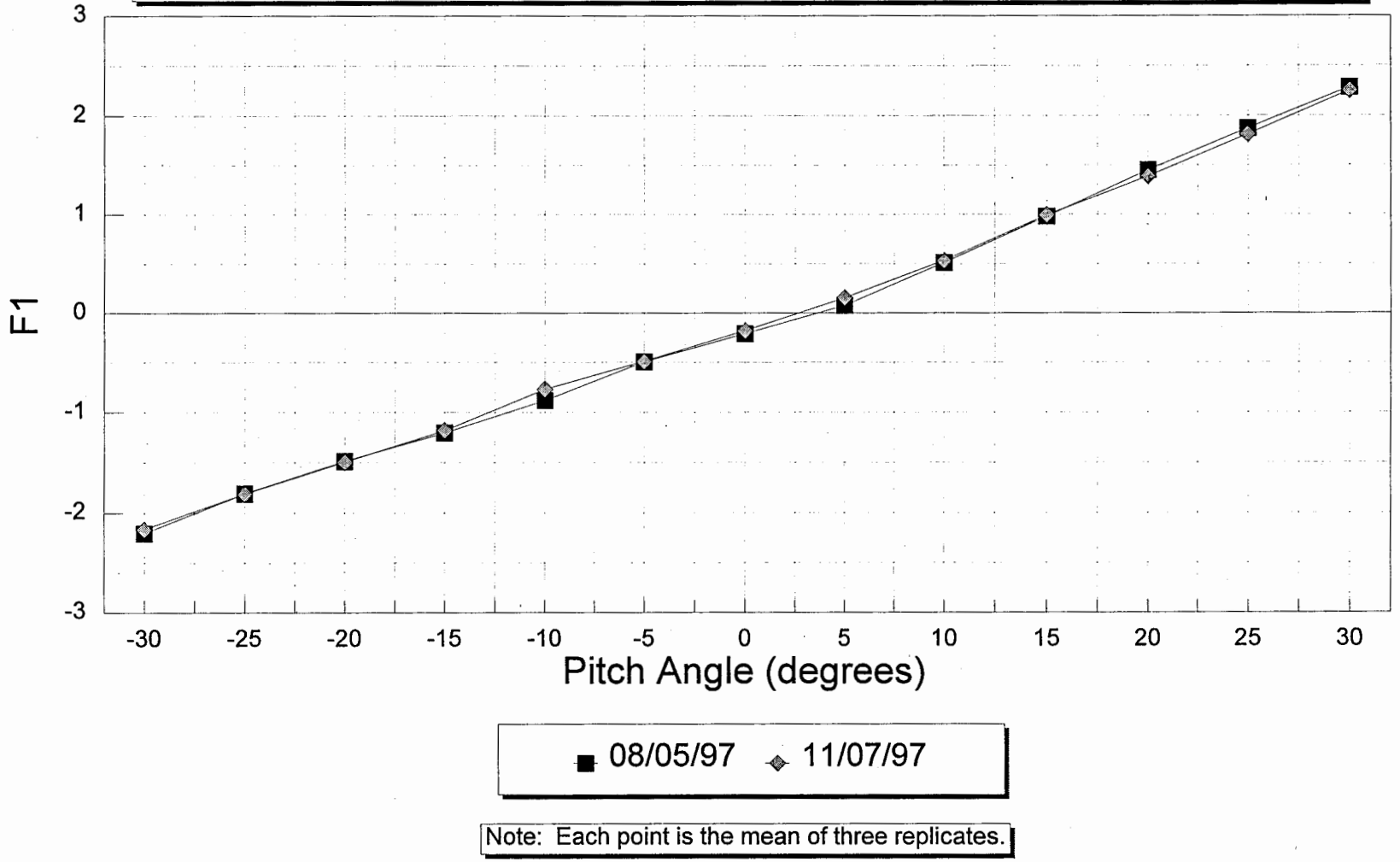
			Readings, in.H2O							
	Pitch	Yaw	----------	----------	Gas	<< ANGLES >>			Velocities, ft/sec	
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-2.900	1.170	87	-30.0	30.0	1.6834	88.95	77.03
	-25	-0.3	-2.750	1.350	87	-26.3	26.3	1.7931	91.80	82.29
	-20	0.2	-2.450	1.480	87	-21.4	21.4	1.7808	91.48	85.17
	-15	-0.7	-2.000	1.580	87	-16.9	16.9	1.7900	91.72	87.76
	-10	-0.5	-1.350	1.660	86	-11.0	11.0	1.7780	91.33	89.64
	-5	-0.5	-0.650	1.700	86	-3.8	3.9	1.7795	91.37	91.16
	0	-0.3	-0.070	1.710	85	1.9	1.9	1.7765	91.21	91.16
	5	-0.3	0.750	1.750	85	8.7	8.7	1.8087	92.03	90.96
	10	-0.3	1.400	1.750	84	12.5	12.5	1.8247	92.35	90.15
	15	-0.3	1.850	1.700	84	15.1	15.1	1.7858	91.36	88.23
	20	0.0	2.400	1.630	83	19.9	19.9	1.7544	90.47	85.07
	25	0.4	2.850	1.550	82	24.7	24.7	1.7824	91.11	82.78
	30	0.3	3.100	1.420	82	30.0	30.0	1.6914	88.75	76.86
2	-30	-0.7	-2.950	1.350	86	-28.6	28.6	1.8846	94.03	82.57
	-25	-0.1	-2.850	1.330	87	-27.9	27.9	1.8309	92.76	81.96
	-20	-0.3	-2.450	1.500	88	-21.1	21.1	1.7952	91.94	85.75
	-15	-0.4	-2.100	1.570	88	-17.7	17.7	1.7938	91.90	87.55
	-10	-0.3	-1.400	1.660	89	-11.5	11.5	1.7849	91.76	89.93
	-5	-0.4	-1.100	1.700	89	-8.5	8.5	1.7962	92.05	91.04
	0	-0.4	-0.070	1.700	90	1.9	1.9	1.7661	91.36	91.30
	5	-0.3	0.800	1.740	91	9.2	9.2	1.7993	92.29	91.10
	10	-0.1	1.400	1.720	91	12.7	12.7	1.7940	92.16	89.92
	15	-0.1	2.050	1.720	91	16.4	16.4	1.8188	92.79	89.04
	20	0.0	2.500	1.630	92	20.7	20.7	1.7730	91.70	85.78
	25	0.0	2.800	1.550	92	24.3	24.3	1.7722	91.68	83.58
	30	-0.4	3.100	1.360	92	30.0	30.0	1.6200	87.65	75.91
3	-30	-0.7	-2.900	1.170	98	-30.0	30.0	1.3255	79.72	69.03
	-25	-0.4	-2.800	1.350	98	-26.9	26.9	1.8160	93.31	83.23
	-20	-0.2	-2.400	1.500	98	-20.7	20.7	1.7807	92.40	86.42
	-15	-0.8	-1.900	1.600	97	-16.0	16.0	1.7958	92.70	89.11
	-10	-0.7	-1.300	1.670	97	-10.6	10.6	1.7807	92.31	90.74
	-5	-0.7	-0.650	1.700	97	-3.8	3.9	1.7795	92.28	92.07
	0	-0.3	-0.070	1.740	97	1.9	1.9	1.8076	93.01	92.96
	5	-0.4	0.700	1.740	96	8.3	8.3	1.7975	92.67	91.69
	10	-0.4	1.450	1.750	96	12.8	12.8	1.8260	93.40	91.08
	15	-0.2	1.900	1.720	96	15.3	15.3	1.8088	92.96	89.68
	20	-0.2	2.400	1.650	96	19.7	19.7	1.7740	92.06	86.68
	25	-0.3	2.850	1.530	95	25.0	25.0	1.7669	91.79	83.19
	30	0.1	3.100	1.370	95	30.0	30.0	1.6319	88.21	76.40

		Res	Vdir	Vax
Average	-30	29.53	87.56	76.21
	-25	27.04	92.62	82.49
	-20	21.09	91.94	85.78
	-15	16.87	92.11	88.14
	-10	11.03	91.80	90.10
	-5	5.40	91.90	91.43
	0	1.91	91.86	91.81
	5	8.75	92.33	91.25
	10	12.66	92.64	90.38
	15	15.56	92.37	88.98
	20	20.09	91.41	85.85
	25	24.65	91.52	83.18
	30	30.00	88.21	76.39

ATTACHMENT O.

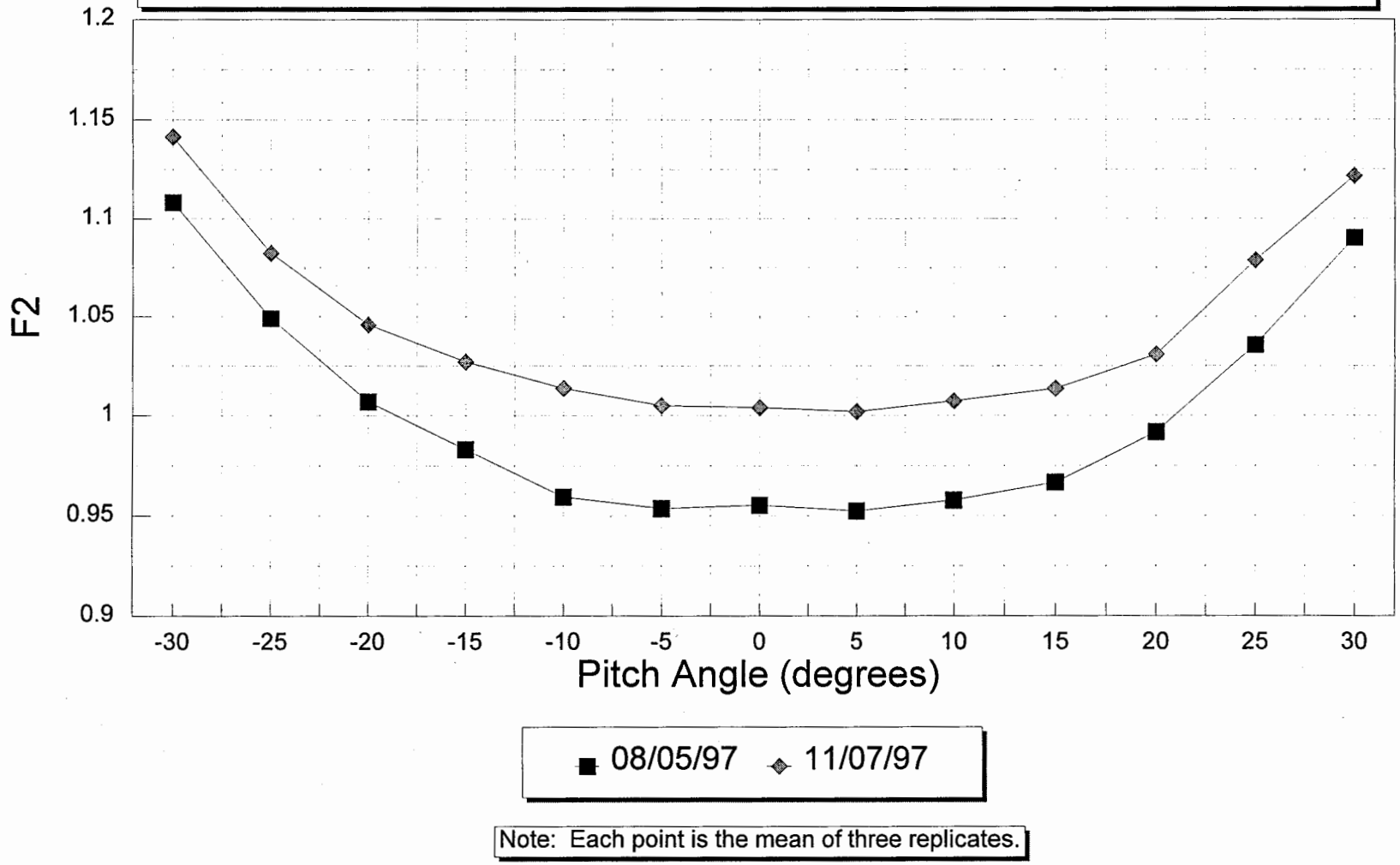
Spherical Probe SPH-6 Calibration Data

Figure C1-80. Spherical Probe 6 - Avg. (30-60 fps) F1 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration



Note: Each point is the mean of three replicates.

Figure C1-81. Spherical Probe 6 - Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration

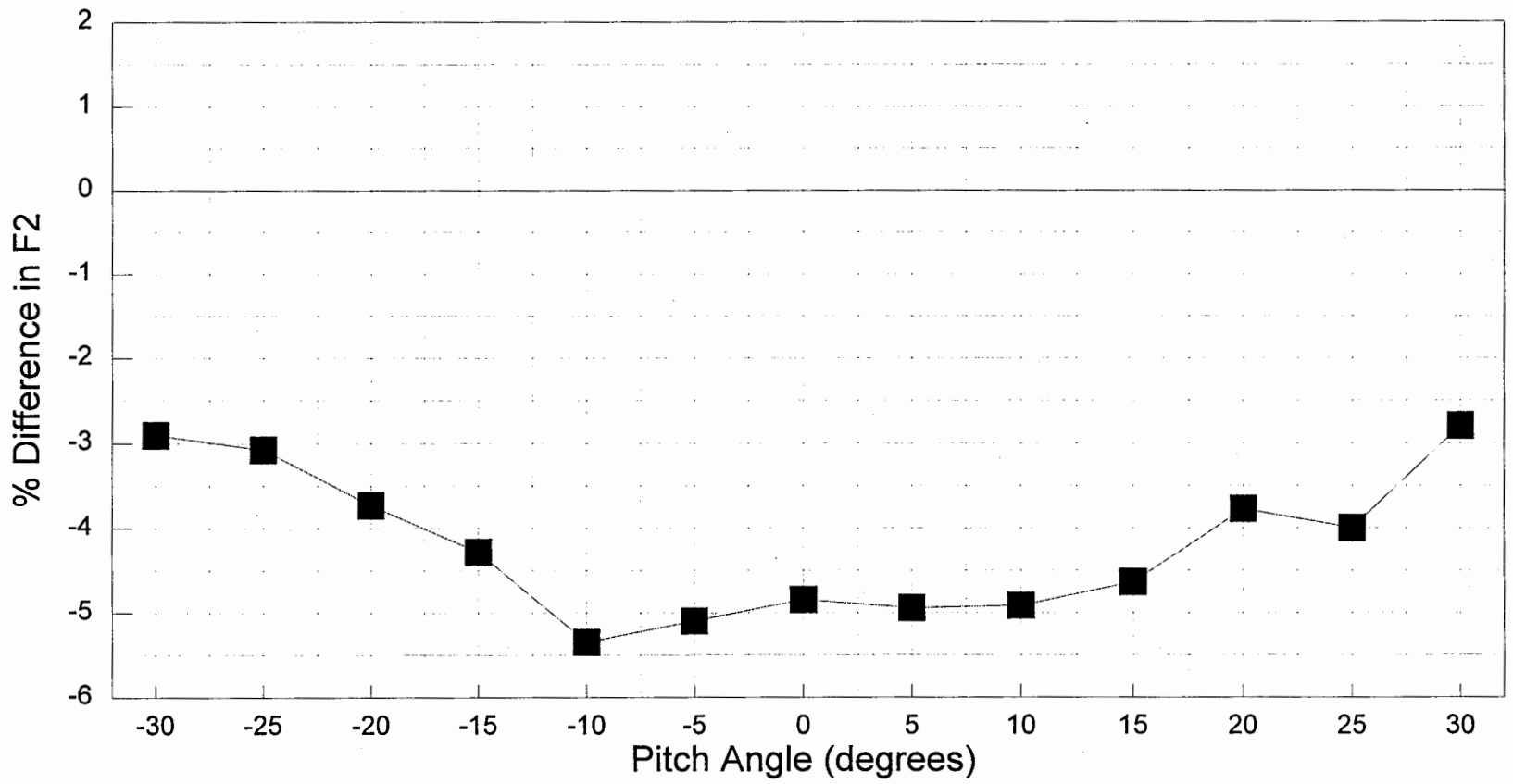


Note: Each point is the mean of three replicates.

SPHCMPR.WK4

Figure C1-82. Spherical Probe 6: Percent Difference in F2 (Avg. 30-60 fps)

NCSU Pre- (8/5/97) and Post-Test (11/7/97) Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-139. Spherical Probe SPH-6 Calibrations at NC State Wind Tunnel August and November 1997

Pitch Angle	30 fps / August / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.50	29.94	26.06	29.61	31.04	26.99	0.39	3.68	3.56
-25	25.00	31.49	28.54	24.96	32.49	29.45	-0.15	3.18	3.21
-20	20.35	31.34	29.38	20.22	32.51	30.51	-0.63	3.74	3.83
-15	16.30	31.71	30.42	16.55	33.11	31.73	1.52	4.42	4.29
-10	12.33	31.85	31.08	13.15	33.50	32.60	6.69	5.19	4.89
-5	5.48	31.43	31.26	6.25	33.17	32.93	14.09	5.52	5.34
0	2.99	31.33	31.28	2.53	32.97	32.94	-15.48	5.24	5.29
5	3.99	31.42	31.30	2.91	33.03	32.95	-27.04	5.14	5.25
10	8.44	31.38	31.00	7.27	32.96	32.63	-13.88	5.03	5.25
15	14.19	31.54	30.57	14.08	33.07	32.06	-0.72	4.85	4.89
20	19.30	31.46	29.69	19.95	32.85	30.88	3.38	4.43	4.00
25	24.13	31.48	28.73	24.85	32.98	29.93	2.96	4.78	4.18
30	29.52	31.40	27.32	29.67	32.38	28.13	0.51	3.12	2.96

Pitch Angle	60 fps / August / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.61	56.60	49.21	30.05	58.77	50.87	1.48	3.83	3.38
-25	25.04	58.78	53.25	24.98	60.61	54.94	-0.23	3.13	3.17
-20	19.63	59.09	55.65	19.54	61.37	57.84	-0.48	3.86	3.92
-15	13.96	58.40	56.67	14.49	61.24	59.29	3.80	4.86	4.62
-10	8.11	58.66	58.07	9.40	62.05	61.21	15.89	5.78	5.41
-5	3.92	58.97	58.82	4.23	62.11	61.93	7.67	5.33	5.29
0	3.08	58.81	58.72	2.05	61.89	61.84	-33.54	5.23	5.31
5	6.30	59.07	58.70	4.71	62.09	61.85	-25.22	5.11	5.38
10	11.79	59.00	57.76	11.57	61.97	60.71	-1.79	5.03	5.11
15	15.83	58.84	56.60	15.83	61.60	59.26	-0.05	4.69	4.70
20	20.79	58.97	55.13	21.53	61.73	57.42	3.57	4.68	4.16
25	25.91	58.88	52.96	26.53	61.49	55.01	2.42	4.43	3.87
30	30.01	58.58	50.73	30.01	60.26	52.19	0.00	2.88	2.88

Pitch Angle	90 fps / August / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.80	84.23	73.10	29.99	87.34	75.65	0.64	3.70	3.49
-25	25.36	88.28	79.77	25.33	91.04	82.28	-0.11	3.13	3.15
-20	20.03	87.79	82.47	19.92	91.11	85.66	-0.56	3.79	3.86
-15	14.60	87.65	84.81	15.03	91.76	88.62	2.89	4.70	4.49
-10	9.17	87.48	86.36	10.51	92.65	91.08	14.64	5.90	5.47
-5	4.37	88.08	87.79	4.76	92.82	92.45	8.85	5.38	5.31
0	0.78	88.38	88.37	0.38	92.91	92.91	-51.13	5.13	5.14
5	7.48	88.14	87.39	6.27	92.59	92.02	-16.13	5.04	5.30
10	11.68	87.77	85.95	11.47	92.18	90.34	-1.83	5.03	5.11
15	15.34	87.67	84.55	15.24	91.85	88.62	-0.63	4.77	4.82
20	19.58	86.94	81.91	20.24	90.80	85.19	3.39	4.44	4.00
25	24.65	86.94	79.02	25.34	91.05	82.28	2.81	4.72	4.13
30	29.27	86.08	75.09	29.66	88.97	77.32	1.32	3.36	2.96

Figure C1-83. Spherical Probe SPH-6 Pre- and Post-Test Calibrations

NC State Wind Tunnel -- August and November 1997

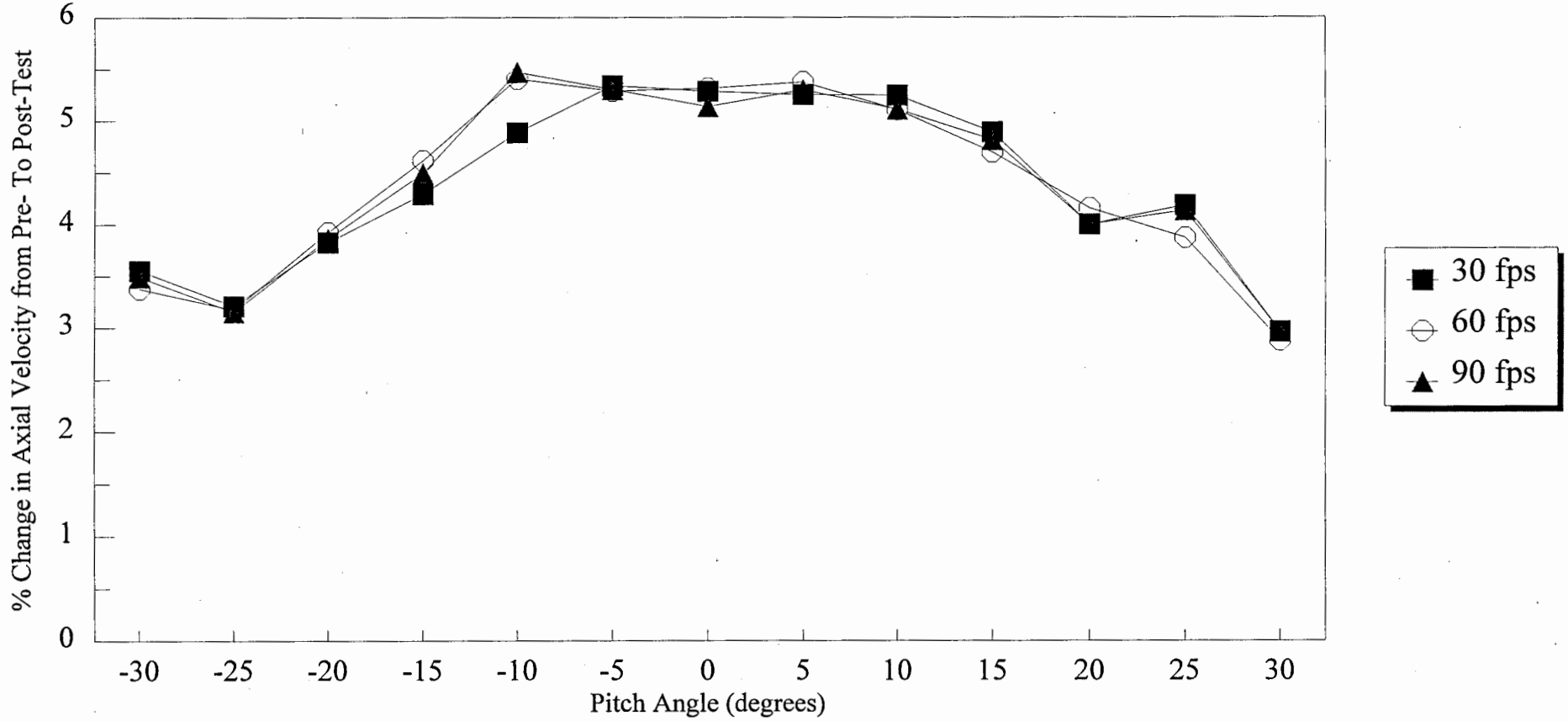


Table C1-140. Spherical SPH-6 Pre-test Computations - 30 fps

Probe: **Spherical SPH-6 / Pre-Test 30-60 Calibration**

Velocity Point: **30 fps** Cal Date: 08/05/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.64	Probe ID:	SPH-6
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.64	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.63%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**29.74**	Last Row:	61
Average Yaw Angle:	0.8		
Average Pitch Angle:	16.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.3		0
Resultant Angle Standard Deviation:	9.22		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.9	-0.360	0.174	88	-28.3	28.4	0.2062	31.14	27.40
	-25	2.0	-0.330	0.190	88	-23.9	24.0	0.2054	31.09	28.41
	-20	0.7	-0.300	0.205	88	-19.6	19.6	0.2070	31.20	29.40
	-15	0.7	-0.250	0.215	88	-14.3	14.4	0.2065	31.17	30.19
	-10	0.4	-0.180	0.224	88	-9.0	9.0	0.2057	31.11	30.72
	-5	0.4	-0.070	0.226	88	-1.8	1.8	0.2060	31.13	31.12
	0	0.3	-0.010	0.226	88	4.0	4.0	0.2052	31.07	30.99
	5	0.3	0.070	0.226	88	8.1	8.1	0.2064	31.16	30.85
	10	0.3	0.170	0.223	88	12.7	12.7	0.2066	31.17	30.41
	15	0.3	0.240	0.220	88	16.2	16.2	0.2081	31.28	30.05
	20	0.3	0.300	0.210	88	19.8	19.8	0.2061	31.14	29.30
	25	0.3	0.350	0.195	88	24.1	24.1	0.2060	31.13	28.42
	30	0.4	0.400	0.172	88	30.0	30.0	0.2045	31.01	26.86
2	-30	2.3	-0.390	0.166	96	-30.0	30.1	0.2039	31.19	26.99
	-25	2.4	-0.350	0.190	96	-25.4	25.5	0.2112	31.75	28.65
	-20	1.1	-0.310	0.205	95	-20.4	20.4	0.2092	31.57	29.59
	-15	1.1	-0.290	0.215	95	-17.5	17.6	0.2130	31.85	30.36
	-10	1.1	-0.270	0.228	95	-14.7	14.7	0.2197	32.35	31.29
	-5	0.4	-0.160	0.230	94	-7.6	7.6	0.2105	31.64	31.36
	0	0.4	-0.080	0.230	94	-2.4	2.5	0.2096	31.57	31.54
	5	0.4	-0.030	0.231	94	1.9	2.0	0.2103	31.63	31.61
	10	0.4	0.030	0.230	93	6.3	6.3	0.2092	31.51	31.32
	15	0.5	0.190	0.229	93	13.4	13.4	0.2127	31.77	30.91
	20	-0.7	0.300	0.213	93	19.5	19.6	0.2086	31.47	29.65
	25	-0.7	0.360	0.200	93	24.1	24.2	0.2115	31.68	28.91
	30	-0.6	0.400	0.185	92	28.5	28.5	0.2136	31.81	27.95
3	-30	1.6	-0.380	0.166	92	-30.0	30.0	0.1594	27.48	23.79
	-25	1.7	-0.350	0.190	92	-25.4	25.5	0.2112	31.63	28.56
	-20	1.7	-0.310	0.200	92	-21.0	21.0	0.2061	31.25	29.17
	-15	1.7	-0.290	0.221	92	-16.9	17.0	0.2175	32.10	30.71
	-10	0.8	-0.250	0.229	91	-13.2	13.3	0.2176	32.08	31.23
	-5	-0.1	-0.150	0.230	91	-7.0	7.0	0.2102	31.53	31.30
	0	-0.1	-0.080	0.228	91	-2.5	2.5	0.2078	31.35	31.32
	5	-0.3	-0.030	0.230	91	1.9	1.9	0.2094	31.47	31.45
	10	0.2	0.030	0.230	91	6.3	6.3	0.2092	31.46	31.27
	15	0.2	0.180	0.227	91	13.0	13.0	0.2106	31.56	30.75
	20	0.3	0.290	0.220	91	18.6	18.6	0.2134	31.77	30.11
	25	-0.7	0.360	0.200	91	24.1	24.2	0.2115	31.63	28.86
	30	-0.5	0.400	0.175	91	30.0	30.0	0.2080	31.37	27.16

		Res	Vdir	Vax
Average	-30	29.50	29.94	26.06
	-25	25.00	31.49	28.54
	-20	20.35	31.34	29.38
	-15	16.30	31.71	30.42
	-10	12.33	31.85	31.08
	-5	5.48	31.43	31.26
	0	2.99	31.33	31.28
	5	3.99	31.42	31.30
	10	8.44	31.38	31.00
	15	14.19	31.54	30.57
	20	19.30	31.46	29.69
	25	24.13	31.48	28.73
	30	29.52	31.40	27.32

Table C1-141. Spherical SPH-6 Post-test Computations - 30 fps

Probe: **Spherical SPH-6 / Post-Test 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 11/07/97

Number Of Points: 39

Barometric Pressure, in. Hg:	29.64	Probe ID:	SPH-6
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.64	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.63%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**31.06**	Last Row:	61
Average Yaw Angle:	0.8		
Average Pitch Angle:	16.3	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.3		0
Resultant Angle Standard Deviation:	9.49		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.9	-0.360	0.174	88	-28.7	28.7	0.2206	32.21	28.25
	-25	2.0	-0.330	0.190	88	-23.8	23.9	0.2190	32.10	29.35
	-20	0.7	-0.300	0.205	88	-19.5	19.5	0.2234	32.41	30.56
	-15	0.7	-0.250	0.215	88	-14.8	14.8	0.2265	32.64	31.56
	-10	0.4	-0.180	0.224	88	-10.4	10.4	0.2307	32.94	32.40
	-5	0.4	-0.070	0.226	88	-2.1	2.1	0.2280	32.75	32.72
	0	0.3	-0.010	0.226	88	2.0	2.1	0.2274	32.71	32.68
	5	0.3	0.070	0.226	88	7.1	7.1	0.2279	32.74	32.49
	10	0.3	0.170	0.223	88	12.5	12.5	0.2277	32.72	31.95
	15	0.3	0.240	0.220	88	16.2	16.2	0.2279	32.74	31.44
	20	0.3	0.300	0.210	88	20.5	20.5	0.2252	32.54	30.49
	25	0.3	0.350	0.195	88	24.8	24.8	0.2261	32.61	29.61
	30	0.4	0.400	0.172	88	30.0	30.0	0.2164	31.90	27.63
2	-30	2.3	-0.390	0.166	96	-30.0	30.1	0.2162	32.12	27.80
	-25	2.4	-0.350	0.190	96	-25.4	25.5	0.2247	32.75	29.55
	-20	1.1	-0.310	0.205	95	-20.2	20.3	0.2250	32.74	30.71
	-15	1.1	-0.290	0.215	95	-17.7	17.7	0.2312	33.19	31.62
	-10	1.1	-0.270	0.228	95	-15.0	15.1	0.2406	33.85	32.69
	-5	0.4	-0.160	0.230	94	-8.7	8.7	0.2353	33.45	33.06
	0	0.4	-0.080	0.230	94	-2.7	2.7	0.2321	33.22	33.18
	5	0.4	-0.030	0.231	94	0.8	0.9	0.2327	33.26	33.26
	10	0.4	0.030	0.230	93	4.6	4.7	0.2309	33.11	33.00
	15	0.5	0.190	0.229	93	13.2	13.2	0.2342	33.34	32.46
	20	-0.7	0.300	0.213	93	20.2	20.3	0.2274	32.85	30.82
	25	-0.7	0.360	0.200	93	24.9	24.9	0.2322	33.20	30.12
	30	-0.6	0.400	0.185	92	29.0	29.0	0.2292	32.96	28.82
3	-30	1.6	-0.380	0.166	92	-30.0	30.0	0.1749	28.79	24.92
	-25	1.7	-0.350	0.190	92	-25.4	25.5	0.2247	32.63	29.46
	-20	1.7	-0.310	0.200	92	-20.8	20.9	0.2214	32.39	30.25
	-15	1.7	-0.290	0.221	92	-17.1	17.2	0.2367	33.49	32.00
	-10	0.8	-0.250	0.229	91	-13.9	13.9	0.2402	33.71	32.71
	-5	-0.1	-0.150	0.230	91	-7.9	7.9	0.2346	33.31	32.99
	0	-0.1	-0.080	0.228	91	-2.8	2.8	0.2301	32.99	32.95
	5	-0.3	-0.030	0.230	91	0.8	0.8	0.2317	33.10	33.10
	10	0.2	0.030	0.230	91	4.6	4.7	0.2309	33.05	32.94
	15	0.2	0.180	0.227	91	12.8	12.8	0.2319	33.12	32.30
	20	0.3	0.290	0.220	91	19.1	19.1	0.2324	33.15	31.32
	25	-0.7	0.360	0.200	91	24.9	24.9	0.2322	33.14	30.06
	30	-0.5	0.400	0.175	91	30.0	30.0	0.2202	32.27	27.94

		Res		Vdir	Vax
Average	-30	29.61		31.04	26.99
	-25	24.96		32.49	29.45
	-20	20.22		32.51	30.51
	-15	16.55		33.11	31.73
	-10	13.15		33.50	32.60
	-5	6.25		33.17	32.93
	0	2.53		32.97	32.94
	5	2.91		33.03	32.95
	10	7.27		32.96	32.63
	15	14.08		33.07	32.06
	20	19.95		32.85	30.88
	25	24.85		32.98	29.93
	30	29.67		32.38	28.13

Table C1-142. Spherical SPH-6 Pre-test Computations - 60 fps

Probe: **Spherical SPH-6 / Pre-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 08/05/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.64	Probe ID:	SPH-6
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.64	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.64%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**55.56**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.28		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.9	-1.300	0.600	88	-29.6	29.6	0.7301	58.60	50.95
	-25	1.3	-1.200	0.670	88	-24.7	24.8	0.7343	58.77	53.36
	-20	1.4	-1.100	0.730	89	-20.3	20.4	0.7439	59.21	55.51
	-15	0.7	-0.890	0.750	89	-14.7	14.7	0.7228	58.36	56.45
	-10	0.0	-0.600	0.790	89	-8.4	8.4	0.7246	58.43	57.80
	-5	0.0	-0.440	0.800	89	-5.7	5.7	0.7289	58.61	58.32
	0	0.0	-0.290	0.800	89	-2.7	2.7	0.7289	58.61	58.54
	5	-0.1	-0.020	0.810	89	4.5	4.5	0.7352	58.86	58.68
	10	-0.1	0.550	0.800	89	11.9	11.9	0.7390	59.01	57.75
	15	-0.3	0.800	0.770	89	15.6	15.6	0.7240	58.41	56.26
	20	-0.2	1.100	0.750	90	20.2	20.2	0.7403	59.12	55.49
	25	-0.7	1.300	0.670	90	25.8	25.8	0.7316	58.77	52.89
	30	-0.7	1.400	0.610	90	30.0	30.0	0.7251	58.51	50.66
2	-30	1.6	-1.300	0.600	93	-29.6	29.6	0.7301	58.87	51.19
	-25	1.7	-1.200	0.660	93	-25.1	25.2	0.7285	58.81	53.22
	-20	0.6	-1.050	0.730	93	-19.1	19.1	0.7340	59.03	55.76
	-15	0.7	-0.830	0.750	93	-13.5	13.5	0.7144	58.23	56.62
	-10	-0.2	-0.600	0.790	93	-8.4	8.4	0.7246	58.65	58.01
	-5	0.1	-0.300	0.810	93	-2.8	2.8	0.7379	59.18	59.11
	0	0.0	-0.060	0.810	93	3.3	3.3	0.7363	59.12	59.02
	5	-0.3	0.200	0.810	93	7.4	7.4	0.7388	59.22	58.72
	10	-0.4	0.550	0.790	93	12.0	12.0	0.7300	58.87	57.58
	15	-0.4	0.850	0.780	93	16.1	16.2	0.7376	59.17	56.83
	20	-0.6	1.100	0.740	93	20.4	20.4	0.7336	59.01	55.30
	25	-0.6	1.300	0.680	93	25.5	25.5	0.7370	59.15	53.39
	30	-0.7	1.400	0.610	93	30.0	30.0	0.7251	58.67	50.80
3	-30	2.1	-1.300	0.600	92	-29.6	29.6	0.5783	52.34	45.50
	-25	1.6	-1.200	0.660	92	-25.1	25.2	0.7285	58.75	53.17
	-20	0.9	-1.060	0.730	92	-19.4	19.4	0.7357	59.04	55.69
	-15	0.9	-0.850	0.760	92	-13.7	13.7	0.7252	58.62	56.95
	-10	0.2	-0.550	0.800	92	-7.5	7.5	0.7321	58.90	58.39
	-5	0.1	-0.320	0.810	92	-3.2	3.2	0.7377	59.12	59.02
	0	-0.2	-0.060	0.800	92	3.3	3.3	0.7272	58.70	58.60
	5	-0.1	0.160	0.810	92	7.0	7.0	0.7380	59.13	58.70
	10	-0.4	0.520	0.800	92	11.5	11.5	0.7380	59.13	57.95
	15	-0.5	0.820	0.780	91	15.7	15.7	0.7344	58.94	56.72
	20	-0.5	1.150	0.720	91	21.7	21.7	0.7306	58.78	54.60
	25	-0.5	1.310	0.660	91	26.4	26.4	0.7290	58.72	52.60
	30	-0.5	1.420	0.610	91	30.0	30.0	0.7251	58.56	50.71

		Res		Vdir	Vax
Average	-30	29.61		56.60	49.21
	-25	25.04		58.78	53.25
	-20	19.63		59.09	55.65
	-15	13.96		58.40	56.67
	-10	8.11		58.66	58.07
	-5	3.92		58.97	58.82
	0	3.08		58.81	58.72
	5	6.30		59.07	58.70
	10	11.79		59.00	57.76
	15	15.83		58.84	56.60
	20	20.79		58.97	55.13
	25	25.91		58.88	52.96
	30	30.01		58.58	50.73

Table C1-143. Spherical SPH-6 Post-test Computations - 60 fps

Probe: **Spherical SPH-6 / Post-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 11/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.64	Probe ID:	SPH-6
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.64	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.64%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**58.03**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	16.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.56		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.9	-1.300	0.600	88	-30.0	30.1	0.7816	60.63	52.48
	-25	1.3	-1.200	0.670	88	-24.7	24.7	0.7814	60.62	55.08
	-20	1.4	-1.100	0.730	89	-20.2	20.2	0.8003	61.41	57.63
	-15	0.7	-0.890	0.750	89	-15.1	15.1	0.7917	61.08	58.97
	-10	0.0	-0.600	0.790	89	-9.8	9.8	0.8113	61.83	60.92
	-5	0.0	-0.440	0.800	89	-6.1	6.1	0.8110	61.82	61.47
	0	0.0	-0.290	0.800	89	-3.0	3.0	0.8073	61.68	61.59
	5	-0.1	-0.020	0.810	89	2.3	2.3	0.8148	61.97	61.91
	10	-0.1	0.550	0.800	89	11.7	11.7	0.8151	61.98	60.69
	15	-0.3	0.800	0.770	89	15.6	15.6	0.7940	61.17	58.93
	20	-0.2	1.100	0.750	90	20.9	20.9	0.8110	61.87	57.79
	25	-0.7	1.300	0.670	90	26.5	26.5	0.7982	61.39	54.95
	30	-0.7	1.400	0.610	90	30.0	30.0	0.7674	60.19	52.12
2	-30	1.6	-1.300	0.600	93	-30.0	30.0	0.7816	60.91	52.73
	-25	1.7	-1.200	0.660	93	-25.1	25.1	0.7746	60.64	54.89
	-20	0.6	-1.050	0.730	93	-19.1	19.1	0.7932	61.36	57.99
	-15	0.7	-0.830	0.750	93	-14.1	14.1	0.7875	61.14	59.29
	-10	-0.2	-0.600	0.790	93	-9.8	9.8	0.8113	62.06	61.15
	-5	0.1	-0.300	0.810	93	-3.1	3.1	0.8174	62.29	62.20
	0	0.0	-0.060	0.810	93	1.6	1.6	0.8154	62.21	62.19
	5	-0.3	0.200	0.810	93	6.2	6.2	0.8152	62.20	61.83
	10	-0.4	0.550	0.790	93	11.8	11.8	0.8051	61.82	60.52
	15	-0.4	0.850	0.780	93	16.2	16.2	0.8079	61.92	59.46
	20	-0.6	1.100	0.740	93	21.2	21.2	0.8037	61.76	57.59
	25	-0.6	1.300	0.680	93	26.1	26.1	0.8060	61.85	55.52
	30	-0.7	1.400	0.610	93	30.0	30.0	0.7674	60.35	52.26
3	-30	2.1	-1.300	0.600	92	-30.0	30.1	0.6333	54.78	47.41
	-25	1.6	-1.200	0.660	92	-25.1	25.1	0.7746	60.58	54.85
	-20	0.9	-1.060	0.730	92	-19.3	19.3	0.7944	61.35	57.90
	-15	0.9	-0.850	0.760	92	-14.2	14.3	0.7985	61.51	59.61
	-10	0.2	-0.550	0.800	92	-8.5	8.6	0.8180	62.25	61.56
	-5	0.1	-0.320	0.810	92	-3.5	3.5	0.8175	62.24	62.12
	0	-0.2	-0.060	0.800	92	1.6	1.6	0.8053	61.77	61.75
	5	-0.1	0.160	0.810	92	5.6	5.6	0.8140	62.10	61.81
	10	-0.4	0.520	0.800	92	11.3	11.3	0.8143	62.11	60.91
	15	-0.5	0.820	0.780	91	15.7	15.7	0.8052	61.71	59.40
	20	-0.5	1.150	0.720	91	22.5	22.5	0.8010	61.55	56.87
	25	-0.5	1.310	0.660	91	27.0	27.0	0.7926	61.23	54.56
	30	-0.5	1.420	0.610	91	30.0	30.0	0.7674	60.24	52.17

		Res	Vdir	Vax
Average	-30	30.05	58.77	50.87
	-25	24.98	60.61	54.94
	-20	19.54	61.37	57.84
	-15	14.49	61.24	59.29
	-10	9.40	62.05	61.21
	-5	4.23	62.11	61.93
	0	2.05	61.89	61.84
	5	4.71	62.09	61.85
	10	11.57	61.97	60.71
	15	15.83	61.60	59.26
	20	21.53	61.73	57.42
	25	26.53	61.49	55.01
	30	30.01	60.26	52.19

Table C1-144. Spherical SPH-6 Pre-test Computations - 90 fps

Probe: **Spherical SPH-6 / Pre-Test 30-60 Calibration**

Velocity Point: **90 fps** Cal Date: 08/05/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.64	Probe ID:	SPH-6
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.64	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.63%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**82.81**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.3	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.3		0
Resultant Angle Standard Deviation:	9.19		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.3	-2.850	1.330	99	-29.3	29.3	1.6081	87.84	76.57
	-25	1.5	-2.700	1.490	99	-25.1	25.1	1.6418	88.75	80.38
	-20	1.1	-2.300	1.600	99	-19.1	19.1	1.6086	87.85	82.99
	-15	1.1	-2.000	1.680	99	-14.8	14.8	1.6201	88.17	85.24
	-10	0.2	-1.300	1.770	98	-8.1	8.1	1.6222	88.14	87.26
	-5	0.1	-0.700	1.800	98	-3.1	3.1	1.6394	88.61	88.48
	0	0.1	-0.300	1.820	98	1.1	1.1	1.6591	89.14	89.12
	5	-0.2	0.300	1.800	97	6.7	6.7	1.6389	88.52	87.92
	10	-0.2	1.100	1.780	94	11.1	11.1	1.6399	88.31	86.64
	15	-0.3	1.800	1.750	93	15.5	15.5	1.6435	88.32	85.11
	20	-0.3	2.300	1.650	93	19.4	19.4	1.6133	87.51	82.54
	25	-0.7	2.800	1.500	92	24.9	24.9	1.6072	87.26	79.12
	30	-0.6	3.000	1.350	91	29.3	29.3	1.5819	86.50	75.45
2	-30	2.4	-2.900	1.320	94	-29.9	30.0	1.6192	87.75	75.97
	-25	1.8	-2.750	1.470	95	-25.8	25.9	1.6477	88.60	79.73
	-20	1.1	-2.450	1.600	95	-20.7	20.7	1.6411	88.42	82.70
	-15	0.9	-1.950	1.700	96	-14.1	14.1	1.6290	88.17	85.50
	-10	0.4	-1.550	1.750	97	-10.1	10.1	1.6124	87.80	86.44
	-5	-0.2	-1.100	1.800	97	-6.5	6.5	1.6433	88.64	88.07
	0	0.0	-0.400	1.800	98	-0.2	0.2	1.6428	88.70	88.70
	5	-0.3	0.450	1.800	98	7.5	7.5	1.6419	88.68	87.92
	10	-0.2	1.140	1.770	99	11.4	11.4	1.6324	88.50	86.75
	15	-0.6	1.780	1.730	99	15.5	15.5	1.6248	88.29	85.08
	20	-0.6	2.200	1.650	99	18.7	18.8	1.6028	87.69	83.04
	25	-0.9	2.700	1.530	100	23.7	23.7	1.6065	87.87	80.44
	30	-1.0	2.950	1.350	100	28.8	28.8	1.5678	86.81	76.04
3	-30	2.3	-2.900	1.320	84	-29.9	30.0	1.2729	77.09	66.75
	-25	2.0	-2.700	1.490	83	-25.1	25.1	1.6418	87.47	79.20
	-20	1.3	-2.400	1.600	83	-20.2	20.2	1.6275	87.09	81.72
	-15	0.7	-2.000	1.670	82	-14.9	14.9	1.6121	86.60	83.69
	-10	0.4	-1.450	1.750	82	-9.3	9.3	1.6086	86.51	85.36
	-5	0.0	-0.730	1.790	81	-3.5	3.5	1.6300	87.00	86.84
	0	0.0	-0.300	1.800	81	1.0	1.0	1.6409	87.29	87.28
	5	-0.3	0.600	1.800	79	8.3	8.3	1.6450	87.24	86.33
	10	-0.4	1.300	1.750	78	12.5	12.5	1.6201	86.49	84.45
	15	-0.5	1.700	1.730	78	15.0	15.0	1.6164	86.39	83.45
	20	-0.3	2.400	1.600	77	20.6	20.6	1.5906	85.63	80.16
	25	-0.9	2.800	1.480	76	25.2	25.3	1.5958	85.68	77.49
	30	-0.9	3.000	1.330	75	29.7	29.7	1.5711	84.94	73.79

		Res	Vdir	Vax
Average	-30	29.80	84.23	73.10
	-25	25.36	88.28	79.77
	-20	20.03	87.79	82.47
	-15	14.60	87.65	84.81
	-10	9.17	87.48	86.36
	-5	4.37	88.08	87.79
	0	0.78	88.38	88.37
	5	7.48	88.14	87.39
	10	11.68	87.77	85.95
	15	15.34	87.67	84.55
	20	19.58	86.94	81.91
	25	24.65	86.94	79.02
	30	29.27	86.08	75.09

Table C1-144. Spherical SPH-6 - Post-test Computations - 90 fps

Probe: **Spherical SPH-6 / Post-Test 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 11/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.64	Probe ID:	SPH-6
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.64	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.63%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**86.50**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.36		

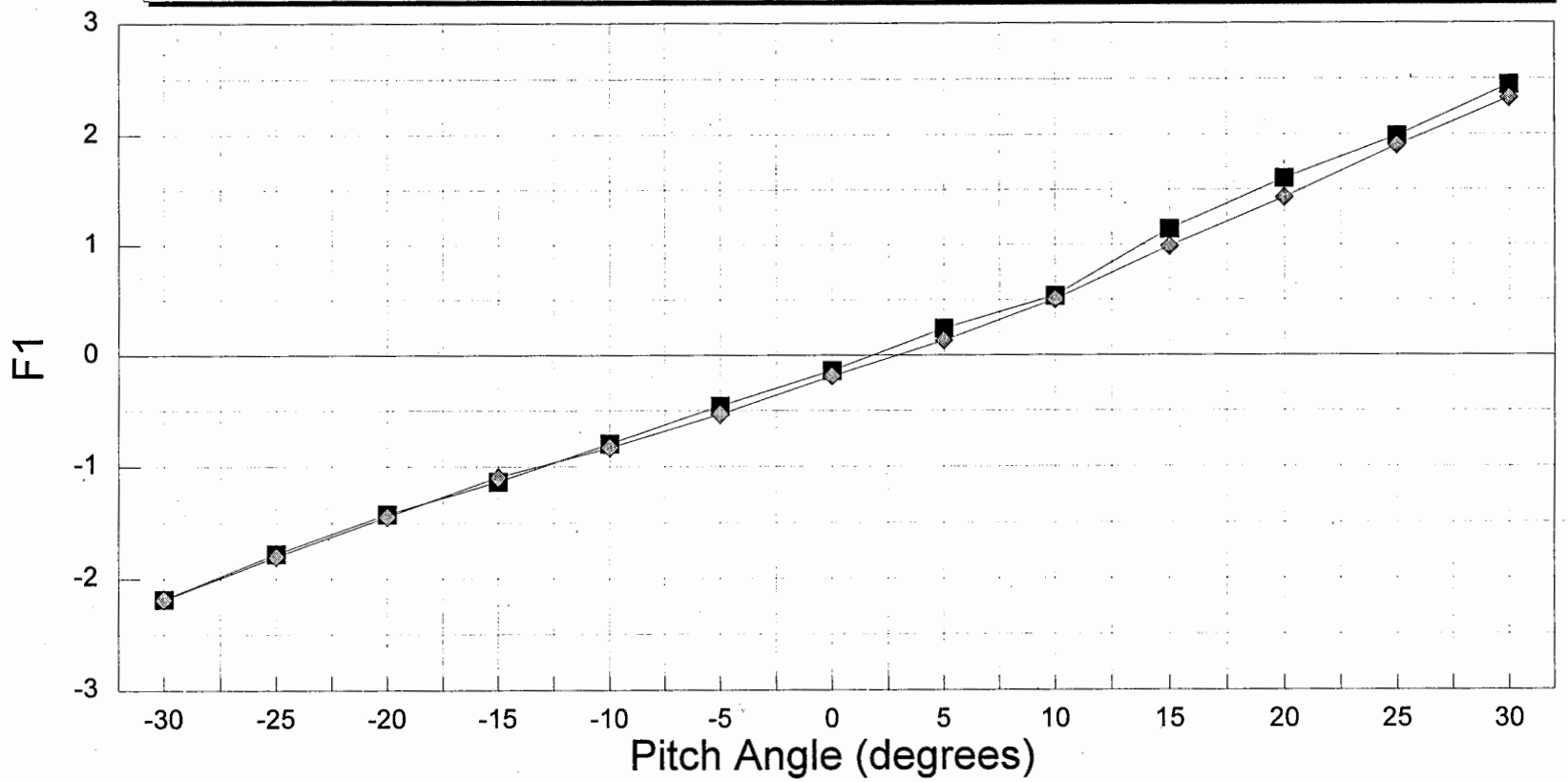
			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.3	-2.850	1.330	99	-29.7	29.8	1.7228	90.92	78.89
	-25	1.5	-2.700	1.490	99	-25.0	25.0	1.7454	91.51	82.92
	-20	1.1	-2.300	1.600	99	-19.1	19.1	1.7384	91.33	86.30
	-15	1.1	-2.000	1.680	99	-15.1	15.2	1.7741	92.26	89.04
	-10	0.2	-1.300	1.770	98	-9.4	9.4	1.8150	93.24	91.99
	-5	0.1	-0.700	1.800	98	-3.4	3.4	1.8166	93.28	93.11
	0	0.1	-0.300	1.820	98	0.2	0.3	1.8342	93.73	93.73
	5	-0.2	0.300	1.800	97	5.2	5.2	1.8073	92.95	92.57
	10	-0.2	1.100	1.780	94	10.9	10.9	1.8103	92.78	91.10
	15	-0.3	1.800	1.750	93	15.4	15.4	1.8029	92.51	89.18
	20	-0.3	2.300	1.650	93	20.1	20.1	1.7555	91.28	85.73
	25	-0.7	2.800	1.500	92	25.6	25.6	1.7633	91.40	82.41
	30	-0.6	3.000	1.350	91	29.7	29.7	1.6902	89.41	77.67
2	-30	2.4	-2.900	1.320	94	-30.0	30.1	1.7195	90.42	78.24
	-25	1.8	-2.750	1.470	95	-25.8	25.9	1.7542	91.41	82.24
	-20	1.1	-2.450	1.600	95	-20.5	20.6	1.7637	91.66	85.81
	-15	0.9	-1.950	1.700	96	-14.6	14.6	1.7894	92.41	89.42
	-10	0.4	-1.550	1.750	97	-11.4	11.4	1.8118	93.07	91.23
	-5	-0.2	-1.100	1.800	97	-7.2	7.2	1.8317	93.58	92.84
	0	0.0	-0.400	1.800	98	-0.7	0.7	1.8149	93.23	93.23
	5	-0.3	0.450	1.800	98	6.3	6.3	1.8116	93.15	92.59
	10	-0.2	1.140	1.770	99	11.2	11.2	1.8013	92.97	91.20
	15	-0.6	1.780	1.730	99	15.4	15.4	1.7824	92.48	89.14
	20	-0.6	2.200	1.650	99	19.3	19.3	1.7449	91.50	86.35
	25	-0.9	2.700	1.530	100	24.4	24.5	1.7633	92.06	83.80
	30	-1.0	2.950	1.350	100	29.3	29.3	1.6794	89.85	78.37
3	-30	2.3	-2.900	1.320	84	-30.0	30.1	1.3939	80.68	69.81
	-25	2.0	-2.700	1.490	83	-25.0	25.1	1.7454	90.19	81.70
	-20	1.3	-2.400	1.600	83	-20.1	20.1	1.7514	90.35	84.85
	-15	0.7	-2.000	1.670	82	-15.3	15.3	1.7650	90.62	87.41
	-10	0.4	-1.450	1.750	82	-10.7	10.7	1.8052	91.64	90.04
	-5	0.0	-0.730	1.790	81	-3.7	3.7	1.8067	91.60	91.40
	0	0.0	-0.300	1.800	81	0.2	0.2	1.8141	91.78	91.78
	5	-0.3	0.600	1.800	79	7.4	7.4	1.8160	91.66	90.90
	10	-0.4	1.300	1.750	78	12.3	12.3	1.7857	90.81	88.73
	15	-0.5	1.700	1.730	78	14.9	14.9	1.7766	90.58	87.54
	20	-0.3	2.400	1.600	77	21.3	21.3	1.7428	89.63	83.49
	25	-0.9	2.800	1.480	76	25.9	25.9	1.7478	89.67	80.65
	30	-0.9	3.000	1.330	75	30.0	30.0	1.6732	87.66	75.90

		Res	Vdir	Vax
Average	-30	29.99	87.34	75.65
	-25	25.33	91.04	82.28
	-20	19.92	91.11	85.66
	-15	15.03	91.76	88.62
	-10	10.51	92.65	91.08
	-5	4.76	92.82	92.45
	0	0.38	92.91	92.91
	5	6.27	92.59	92.02
	10	11.47	92.18	90.34
	15	15.24	91.85	88.62
	20	20.24	90.80	85.19
	25	25.34	91.05	82.28
	30	29.66	88.97	77.32

ATTACHMENT P.

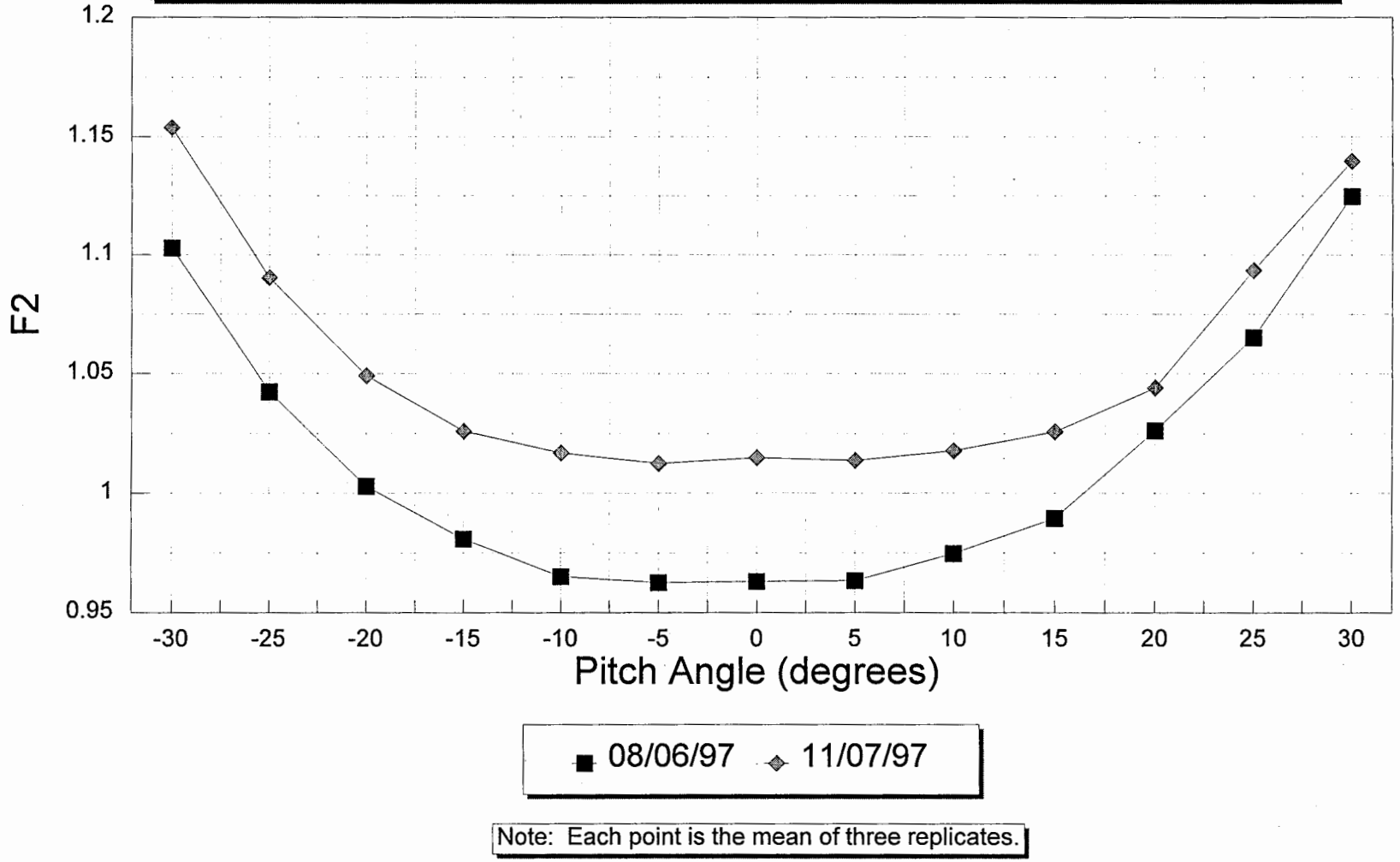
Spherical Probe SPH-7 Calibration Data

Figure C1-84. Spherical Probe 7 - Avg. (30-60 fps) F1 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration



Note: Each point is the mean of three replicates.

Figure C1-85. Spherical Probe 7 - Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration

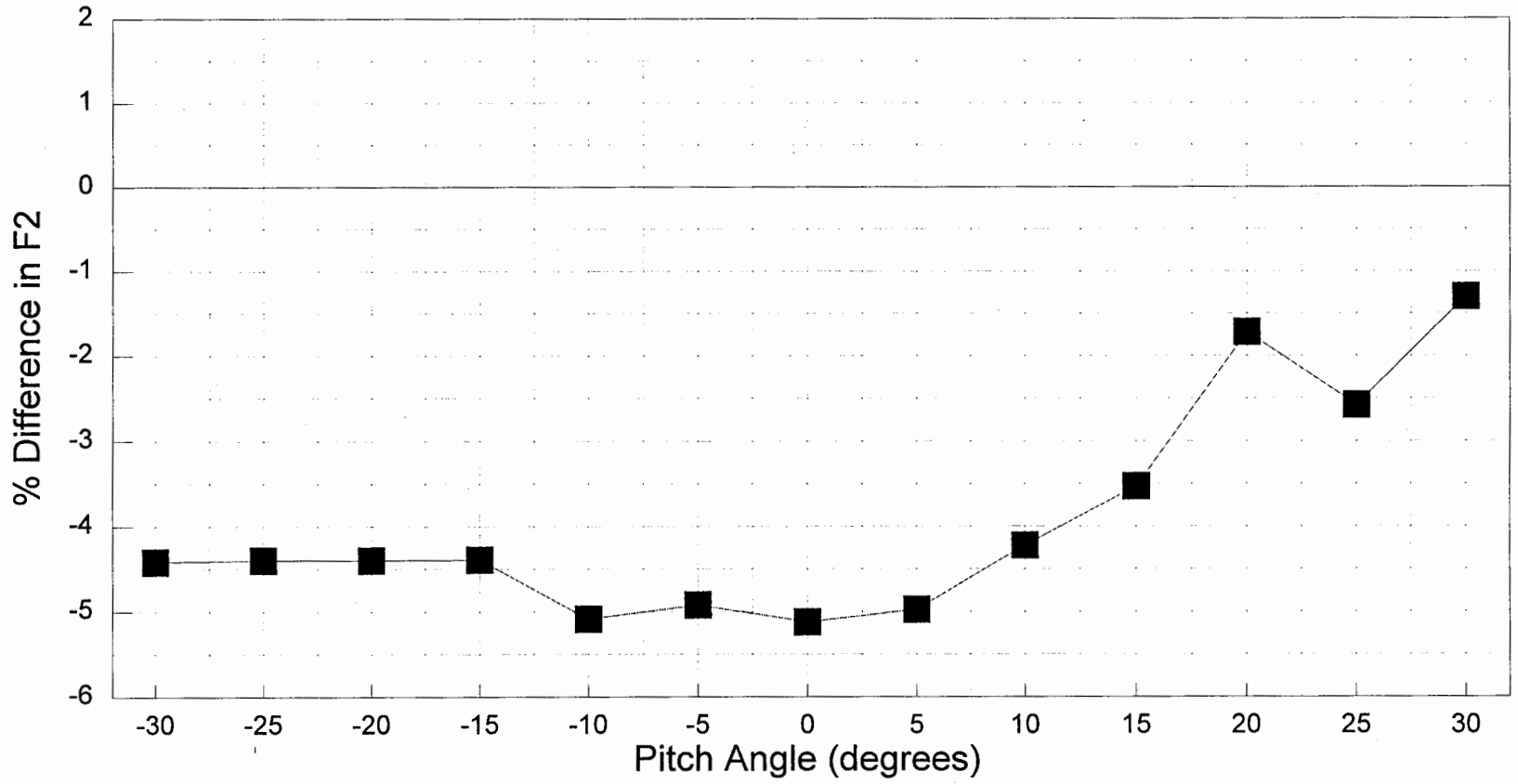


Note: Each point is the mean of three replicates.

SPHCMPR.WK4

Figure C1-86. Spherical Probe 7: Percent Difference in F2 (Avg. 30-60 fps)

NCSU Pre- (8/6/97) and Post-Test (11/7/97) Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-146. Spherical Probe SPH-7 Calibrations at NC State Wind Tunnel August and November 1997

Pitch Angle	30 fps / August / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.39	29.58	25.77	29.34	30.94	26.97	-0.17	4.61	4.66
-25	24.33	30.88	28.12	24.02	32.21	29.40	-1.28	4.29	4.54
-20	20.14	31.08	29.18	19.90	32.46	30.52	-1.20	4.42	4.58
-15	17.02	31.52	30.13	17.22	32.99	31.50	1.18	4.66	4.57
-10	11.78	31.18	30.51	11.66	32.76	32.06	-1.03	5.05	5.07
-5	5.72	30.89	30.70	4.80	32.51	32.35	-16.08	5.24	5.39
0	1.46	30.84	30.83	1.20	32.49	32.48	-17.45	5.36	5.37
5	3.05	31.01	30.91	3.95	32.62	32.48	29.65	5.18	5.08
10	6.42	30.94	30.68	7.68	32.46	32.11	19.62	4.91	4.66
15	14.58	30.99	29.99	16.12	32.26	30.98	10.50	4.08	3.31
20	19.55	30.99	29.21	21.40	32.06	29.85	9.45	3.43	2.20
25	24.77	30.94	28.09	25.92	31.99	28.77	4.65	3.42	2.44
30	29.45	31.02	27.02	30.02	31.62	27.38	1.93	1.93	1.35

Pitch Angle	60 fps / August / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.49	55.91	48.67	29.44	58.49	50.95	-0.18	4.62	4.68
-25	25.63	58.76	52.98	25.32	61.26	55.37	-1.19	4.25	4.51
-20	19.83	58.30	54.84	19.60	60.89	57.36	-1.15	4.45	4.60
-15	13.30	57.65	56.09	13.58	60.47	58.77	2.05	4.90	4.77
-10	8.23	58.35	57.74	7.38	61.39	60.87	-10.35	5.21	5.42
-5	4.21	58.61	58.45	3.18	61.69	61.59	-24.34	5.25	5.37
0	1.14	58.65	58.63	1.57	61.78	61.75	37.66	5.35	5.31
5	7.83	58.81	58.26	8.73	61.66	60.94	11.52	4.84	4.60
10	11.49	58.35	57.17	12.24	60.86	59.46	6.52	4.30	4.01
15	15.67	58.61	56.43	17.48	60.99	58.18	11.51	4.07	3.10
20	20.59	58.43	54.69	22.32	60.48	55.95	8.36	3.51	2.30
25	25.15	58.56	53.00	26.20	60.62	54.39	4.14	3.52	2.62
30	29.94	57.89	50.17	30.06	58.73	50.83	0.41	1.45	1.32

Pitch Angle	90 fps / August / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.08	84.08	72.76	30.08	88.01	76.16	0.00	4.67	4.67
-25	25.86	88.26	79.42	25.57	92.01	82.99	-1.11	4.25	4.51
-20	20.73	87.51	81.84	20.45	91.36	85.60	-1.32	4.40	4.59
-15	15.34	87.38	84.26	15.82	91.57	88.10	3.13	4.80	4.55
-10	9.02	87.82	86.73	8.28	92.43	91.46	-8.28	5.25	5.46
-5	4.26	88.14	87.86	3.27	92.77	92.58	-23.29	5.25	5.37
0	1.77	88.42	88.37	2.15	93.12	93.06	21.30	5.33	5.31
5	7.29	88.57	87.85	8.30	92.94	91.96	13.92	4.94	4.68
10	12.37	87.96	85.91	13.31	91.65	89.19	7.62	4.21	3.82
15	15.21	87.66	84.59	16.99	91.37	87.38	11.71	4.24	3.30
20	20.27	87.57	82.14	22.06	90.65	84.01	8.80	3.52	2.28
25	24.14	87.35	79.71	25.28	90.43	81.77	4.70	3.52	2.58
30	30.01	86.15	74.60	30.06	87.33	75.58	0.18	1.37	1.32

Figure C1-87. Spherical Probe SPH-7 Pre- and Post-Test Calibrations
NC State Wind Tunnel -- August and November 1997

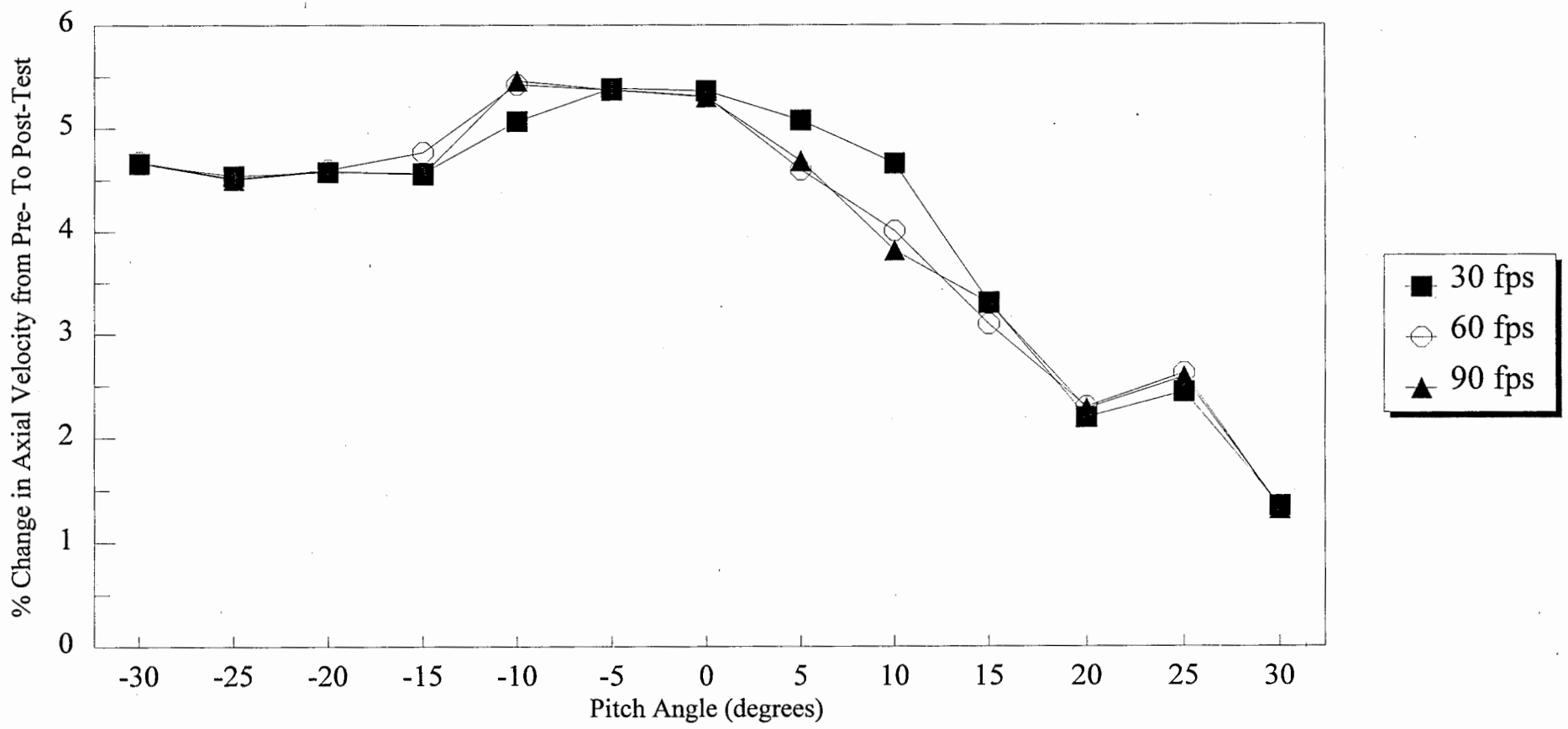


Table C1-47. Spherical SPH-7 Pre-test Computations - 30 fps

Probe: **Spherical SPH-7 / Pre-Test 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 08/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.82	Probe ID:	SPH-7
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.82	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.49%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	80 _F
Average Axial Velocity, ft/sec:	**29.32**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	16.0	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.0		0
Resultant Angle Standard Deviation:	9.66		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.8	-0.350	0.173	78	-28.0	28.0	0.2016	30.42	26.85
	-25	0.9	-0.300	0.193	78	-21.8	21.9	0.1999	30.29	28.11
	-20	1.1	-0.290	0.210	78	-19.2	19.3	0.2098	31.03	29.29
	-15	1.0	-0.240	0.220	78	-14.4	14.4	0.2108	31.11	30.13
	-10	1.0	-0.170	0.225	78	-9.4	9.5	0.2094	31.01	30.58
	-5	-0.3	-0.060	0.220	78	-2.1	2.1	0.2040	30.60	30.58
	0	-0.3	-0.015	0.219	77	0.9	1.0	0.2031	30.51	30.50
	5	-0.4	0.090	0.220	77	7.9	7.9	0.2069	30.79	30.50
	10	-0.3	0.170	0.215	77	12.1	12.1	0.2069	30.79	30.10
	15	-0.4	0.250	0.205	77	15.8	15.8	0.2032	30.51	29.35
	20	-0.4	0.310	0.192	77	20.1	20.2	0.2027	30.47	28.60
	25	-1.2	0.360	0.170	77	26.4	26.4	0.1992	30.21	27.05
	30	-1.2	0.400	0.158	77	30.0	30.0	0.1999	30.26	26.20
2	-30	2.4	-0.400	0.167	87	-30.0	30.1	0.2031	30.79	26.64
	-25	2.4	-0.350	0.190	86	-25.8	25.9	0.2105	31.31	28.16
	-20	0.3	-0.300	0.205	86	-20.5	20.5	0.2080	31.12	29.15
	-15	0.0	-0.290	0.217	85	-18.5	18.5	0.2154	31.64	30.01
	-10	-0.2	-0.220	0.220	85	-13.0	13.0	0.2090	31.17	30.37
	-5	-0.2	-0.160	0.223	85	-8.8	8.9	0.2075	31.06	30.69
	0	-0.1	-0.050	0.223	85	-1.4	1.4	0.2068	31.01	31.00
	5	-0.1	-0.020	0.224	84	0.6	0.6	0.2078	31.05	31.05
	10	-0.1	0.030	0.222	84	3.6	3.6	0.2060	30.92	30.86
	15	-0.1	0.220	0.216	84	14.0	14.0	0.2102	31.23	30.31
	20	-0.1	0.310	0.202	84	19.3	19.3	0.2105	31.26	29.51
	25	-0.2	0.360	0.193	84	23.4	23.4	0.2140	31.51	28.92
	30	-1.4	0.400	0.167	84	29.4	29.5	0.2088	31.13	27.10
3	-30	1.5	-0.380	0.170	85	-30.0	30.0	0.1629	27.52	23.83
	-25	1.6	-0.340	0.190	85	-25.2	25.2	0.2073	31.05	28.09
	-20	1.8	-0.300	0.205	85	-20.5	20.6	0.2080	31.10	29.11
	-15	0.4	-0.290	0.220	85	-18.2	18.2	0.2177	31.82	30.23
	-10	0.0	-0.220	0.223	85	-12.8	12.8	0.2116	31.37	30.58
	-5	-0.1	-0.120	0.223	85	-6.2	6.2	0.2069	31.02	30.84
	0	-0.2	-0.060	0.223	85	-2.0	2.1	0.2067	31.00	30.98
	5	0.0	-0.020	0.226	84	0.6	0.6	0.2096	31.19	31.19
	10	0.0	0.030	0.225	84	3.6	3.6	0.2088	31.13	31.07
	15	0.5	0.220	0.216	84	14.0	14.0	0.2102	31.23	30.31
	20	-0.2	0.310	0.202	84	19.3	19.3	0.2105	31.26	29.51
	25	-0.6	0.360	0.185	84	24.5	24.5	0.2083	31.09	28.30
	30	-0.5	0.410	0.175	84	28.9	28.9	0.2162	31.68	27.74

		Res	Vdir	Vax
Average	-30	29.39	29.58	25.77
	-25	24.33	30.88	28.12
	-20	20.14	31.08	29.18
	-15	17.02	31.52	30.13
	-10	11.78	31.18	30.51
	-5	5.72	30.89	30.70
	0	1.46	30.84	30.83
	5	3.05	31.01	30.91
	10	6.42	30.94	30.68
	15	14.58	30.99	29.99
	20	19.55	30.99	29.21
	25	24.77	30.94	28.09
	30	29.45	31.02	27.02

Table C1-148. Spherical SPH-7 Post-test Computations - 30 fps

Probe: **Spherical SPH-7 / Post-Test 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 11/07/97

Number Of Points: 39

Barometric Pressure, in. Hg:	29.82	Probe ID:	SPH-7
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.82	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.49%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	80 _F
Average Axial Velocity, ft/sec:	**30.53**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.4		0
Resultant Angle Standard Deviation:	9.76		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.8	-0.350	0.173	78	-27.9	27.9	0.2199	31.77	28.08
	-25	0.9	-0.300	0.193	78	-21.5	21.5	0.2176	31.60	29.40
	-20	1.1	-0.290	0.210	78	-19.1	19.1	0.2293	32.44	30.65
	-15	1.0	-0.240	0.220	78	-15.0	15.0	0.2315	32.60	31.49
	-10	1.0	-0.170	0.225	78	-8.7	8.8	0.2321	32.64	32.26
	-5	-0.3	-0.060	0.220	78	-1.2	1.3	0.2264	32.23	32.22
	0	-0.3	-0.015	0.219	77	1.9	1.9	0.2254	32.13	32.12
	5	-0.4	0.090	0.220	77	8.7	8.8	0.2274	32.28	31.90
	10	-0.3	0.170	0.215	77	13.0	13.0	0.2248	32.09	31.27
	15	-0.4	0.250	0.205	77	17.6	17.6	0.2198	31.73	30.24
	20	-0.4	0.310	0.192	77	22.0	22.0	0.2173	31.55	29.26
	25	-1.2	0.360	0.170	77	27.5	27.6	0.2122	31.18	27.64
	30	-1.2	0.400	0.158	77	30.0	30.0	0.2052	30.66	26.55
2	-30	2.4	-0.400	0.167	87	-30.0	30.1	0.2223	32.21	27.87
	-25	2.4	-0.350	0.190	86	-25.5	25.6	0.2288	32.64	29.43
	-20	0.3	-0.300	0.205	86	-20.2	20.3	0.2265	32.48	30.47
	-15	0.0	-0.290	0.217	85	-18.5	18.5	0.2356	33.10	31.39
	-10	-0.2	-0.220	0.220	85	-13.2	13.2	0.2301	32.71	31.84
	-5	-0.2	-0.160	0.223	85	-8.1	8.1	0.2298	32.69	32.36
	0	-0.1	-0.050	0.223	85	-0.5	0.5	0.2296	32.67	32.67
	5	-0.1	-0.020	0.224	84	1.5	1.5	0.2306	32.71	32.70
	10	-0.1	0.030	0.222	84	5.0	5.0	0.2282	32.54	32.42
	15	-0.1	0.220	0.216	84	15.4	15.4	0.2278	32.52	31.36
	20	-0.1	0.310	0.202	84	21.1	21.1	0.2250	32.31	30.14
	25	-0.2	0.360	0.193	84	24.6	24.6	0.2292	32.62	29.65
	30	-1.4	0.400	0.167	84	30.0	30.0	0.2169	31.73	27.47
3	-30	1.5	-0.380	0.170	85	-30.0	30.0	0.1789	28.84	24.97
	-25	1.6	-0.340	0.190	85	-24.8	24.9	0.2253	32.37	29.36
	-20	1.8	-0.300	0.205	85	-20.2	20.3	0.2265	32.45	30.43
	-15	0.4	-0.290	0.220	85	-18.2	18.2	0.2383	33.29	31.62
	-10	0.0	-0.220	0.223	85	-13.0	13.0	0.2330	32.92	32.08
	-5	-0.1	-0.120	0.223	85	-5.1	5.1	0.2286	32.60	32.48
	0	-0.2	-0.060	0.223	85	-1.2	1.2	0.2295	32.66	32.66
	5	0.0	-0.020	0.226	84	1.6	1.6	0.2326	32.86	32.85
	10	0.0	0.030	0.225	84	5.0	5.0	0.2312	32.76	32.63
	15	0.5	0.220	0.216	84	15.4	15.4	0.2278	32.52	31.36
	20	-0.2	0.310	0.202	84	21.1	21.1	0.2250	32.31	30.14
	25	-0.6	0.360	0.185	84	25.5	25.5	0.2232	32.19	29.04
	30	-0.5	0.410	0.175	84	30.0	30.0	0.2273	32.48	28.13

		Res	Vdir	Vax
Average	-30	29.34	30.94	26.97
	-25	24.02	32.21	29.40
	-20	19.90	32.46	30.52
	-15	17.22	32.99	31.50
	-10	11.66	32.76	32.06
	-5	4.80	32.51	32.35
	0	1.20	32.49	32.48
	5	3.95	32.62	32.48
	10	7.68	32.46	32.11
	15	16.12	32.26	30.98
	20	21.40	32.06	29.85
	25	25.92	31.99	28.77
	30	30.02	31.62	27.38

Table C1-149. Spherical SPH-7 Pre-test Computations - 60 fps

Probe: **Spherical SPH-7 / Pre-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 08/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.82	Probe ID:	SPH-7
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.82	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.59%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**55.16**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.3	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.3	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.35		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.9	-1.250	0.600	77	-28.8	28.8	0.7108	57.06	49.99
	-25	2.0	-1.200	0.670	77	-25.2	25.3	0.7313	57.88	52.35
	-20	0.9	-1.000	0.730	77	-19.0	19.1	0.7281	57.76	54.59
	-15	0.4	-0.800	0.750	78	-14.0	14.0	0.7171	57.37	55.66
	-10	0.0	-0.600	0.780	78	-9.6	9.6	0.7262	57.73	56.92
	-5	0.0	-0.400	0.800	78	-5.6	5.6	0.7418	58.35	58.07
	0	0.0	-0.150	0.800	79	-0.8	0.8	0.7418	58.41	58.40
	5	-0.3	0.300	0.780	79	7.4	7.4	0.7323	58.03	57.54
	10	-0.8	0.400	0.760	79	9.9	9.9	0.7216	57.60	56.75
	15	-0.9	0.860	0.750	79	15.0	15.0	0.7345	58.12	56.13
	20	-1.3	1.100	0.700	80	19.7	19.7	0.7336	58.13	54.73
	25	-1.4	1.300	0.650	80	25.1	25.2	0.7397	58.38	52.84
	30	-2.5	1.450	0.570	80	30.0	30.1	0.7211	57.64	49.87
2	-30	1.6	-1.330	0.620	86	-29.5	29.6	0.7467	58.98	51.29
	-25	1.6	-1.250	0.680	86	-25.8	25.8	0.7525	59.20	53.30
	-20	1.2	-1.050	0.730	86	-20.2	20.2	0.7363	58.57	54.96
	-15	0.0	-0.700	0.760	86	-11.9	11.9	0.7166	57.78	56.54
	-10	0.0	-0.500	0.790	86	-7.6	7.6	0.7340	58.47	57.96
	-5	-0.1	-0.300	0.800	85	-3.7	3.7	0.7415	58.72	58.59
	0	-0.1	-0.020	0.800	85	1.5	1.5	0.7421	58.74	58.72
	5	-0.6	0.350	0.800	85	8.3	8.4	0.7542	59.22	58.59
	10	-0.8	0.650	0.770	85	12.5	12.6	0.7429	58.77	57.37
	15	-0.9	0.900	0.750	85	15.6	15.6	0.7410	58.70	56.53
	20	-1.1	1.160	0.680	85	21.3	21.4	0.7309	58.30	54.29
	25	-1.1	1.300	0.650	85	25.1	25.2	0.7397	58.65	53.09
	30	-1.5	1.400	0.580	84	29.6	29.7	0.7283	58.14	50.51
3	-30	2.1	-1.330	0.600	86	-30.0	30.1	0.5737	51.69	44.74
	-25	1.3	-1.250	0.680	86	-25.8	25.8	0.7525	59.20	53.30
	-20	1.1	-1.050	0.730	86	-20.2	20.2	0.7363	58.57	54.96
	-15	0.4	-0.800	0.750	86	-14.0	14.0	0.7171	57.80	56.07
	-10	-0.2	-0.500	0.800	86	-7.5	7.5	0.7432	58.84	58.34
	-5	-0.3	-0.280	0.800	86	-3.3	3.3	0.7415	58.77	58.67
	0	-0.2	-0.040	0.800	86	1.2	1.2	0.7420	58.79	58.78
	5	-0.2	0.320	0.800	86	7.7	7.7	0.7520	59.18	58.65
	10	-0.7	0.600	0.770	85	12.0	12.0	0.7405	58.68	57.39
	15	-0.8	0.950	0.750	85	16.3	16.3	0.7491	59.02	56.63
	20	-1.0	1.160	0.700	85	20.7	20.7	0.7452	58.86	55.05
	25	-1.0	1.300	0.650	85	25.1	25.1	0.7397	58.65	53.09
	30	-1.8	1.400	0.570	85	30.0	30.0	0.7211	57.90	50.12

		Res	Vdir	Vax
Average	-30	29.49	55.91	48.67
	-25	25.63	58.76	52.98
	-20	19.83	58.30	54.84
	-15	13.30	57.65	56.09
	-10	8.23	58.35	57.74
	-5	4.21	58.61	58.45
	0	1.14	58.65	58.63
	5	7.83	58.81	58.26
	10	11.49	58.35	57.17
	15	15.67	58.61	56.43
	20	20.59	58.43	54.69
	25	25.15	58.56	53.00
	30	29.94	57.89	50.17

Table C1-150. Spherical SPH-7 Post-test Computations - 60 fps

Probe: **Spherical SPH-7 / Post-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 11/07/97

Number Of Points: 39

Barometric Pressure, in. Hg:	29.82	Probe ID:	SPH-7
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.82	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.59%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**57.42**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.7	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.7		0
Resultant Angle Standard Deviation:	9.51		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.9	-1.250	0.600	77	-28.7	28.7	0.7762	59.63	52.29
	-25	2.0	-1.200	0.670	77	-24.9	24.9	0.7948	60.34	54.72
	-20	0.9	-1.000	0.730	77	-18.9	18.9	0.7958	60.38	57.11
	-15	0.4	-0.800	0.750	78	-14.5	14.5	0.7880	60.14	58.22
	-10	0.0	-0.600	0.780	78	-8.9	8.9	0.8049	60.78	60.04
	-5	0.0	-0.400	0.800	78	-4.5	4.5	0.8204	61.37	61.18
	0	0.0	-0.150	0.800	79	0.0	0.0	0.8241	61.56	61.56
	5	-0.3	0.300	0.780	79	8.4	8.4	0.8059	60.88	60.22
	10	-0.8	0.400	0.760	79	10.3	10.3	0.7878	60.19	59.22
	15	-0.9	0.860	0.750	79	16.8	16.8	0.7994	60.63	58.03
	20	-1.3	1.100	0.700	80	21.5	21.5	0.7853	60.15	55.95
	25	-1.4	1.300	0.650	80	26.2	26.2	0.7928	60.43	54.22
	30	-2.5	1.450	0.570	80	30.0	30.1	0.7402	58.40	50.53
2	-30	1.6	-1.330	0.620	86	-29.5	29.5	0.8163	61.66	53.66
	-25	1.6	-1.250	0.680	86	-25.5	25.5	0.8178	61.72	55.69
	-20	1.2	-1.050	0.730	86	-19.9	19.9	0.8026	61.14	57.48
	-15	0.0	-0.700	0.760	86	-11.7	11.7	0.7906	60.69	59.42
	-10	0.0	-0.500	0.790	86	-6.7	6.7	0.8121	61.50	61.09
	-5	-0.1	-0.300	0.800	85	-2.7	2.7	0.8219	61.82	61.75
	0	-0.1	-0.020	0.800	85	2.5	2.5	0.8231	61.86	61.80
	5	-0.6	0.350	0.800	85	9.1	9.2	0.8275	62.03	61.24
	10	-0.8	0.650	0.770	85	13.5	13.6	0.8064	61.23	59.53
	15	-0.9	0.900	0.750	85	17.4	17.4	0.8028	61.10	58.29
	20	-1.1	1.160	0.680	85	22.9	23.0	0.7834	60.35	55.57
	25	-1.1	1.300	0.650	85	26.2	26.2	0.7928	60.71	54.48
	30	-1.5	1.400	0.580	84	30.0	30.0	0.7532	59.13	51.19
3	-30	2.1	-1.330	0.600	86	-30.0	30.1	0.6304	54.19	46.90
	-25	1.3	-1.250	0.680	86	-25.5	25.5	0.8178	61.72	55.70
	-20	1.1	-1.050	0.730	86	-19.9	19.9	0.8026	61.14	57.48
	-15	0.4	-0.800	0.750	86	-14.5	14.5	0.7880	60.59	58.66
	-10	-0.2	-0.500	0.800	86	-6.5	6.5	0.8222	61.89	61.48
	-5	-0.3	-0.280	0.800	86	-2.3	2.4	0.8222	61.89	61.83
	0	-0.2	-0.040	0.800	86	2.2	2.2	0.8232	61.93	61.88
	5	-0.2	0.320	0.800	86	8.6	8.6	0.8269	62.06	61.36
	10	-0.7	0.600	0.770	85	12.9	12.9	0.8047	61.17	59.63
	15	-0.8	0.950	0.750	85	18.2	18.2	0.8071	61.26	58.20
	20	-1.0	1.160	0.700	85	22.4	22.4	0.7988	60.94	56.33
	25	-1.0	1.300	0.650	85	26.2	26.2	0.7928	60.71	54.48
	30	-1.8	1.400	0.570	85	30.0	30.0	0.7402	58.67	50.78

		Res	Vdir	Vax
Average	-30	29.44	58.49	50.95
	-25	25.32	61.26	55.37
	-20	19.60	60.89	57.36
	-15	13.58	60.47	58.77
	-10	7.38	61.39	60.87
	-5	3.18	61.69	61.59
	0	1.57	61.78	61.75
	5	8.73	61.66	60.94
	10	12.24	60.86	59.46
	15	17.48	60.99	58.18
	20	22.32	60.48	55.95
	25	26.20	60.62	54.39
	30	30.06	58.73	50.83

Table C1-151. Spherical SPH-7 Pre-test Computations - 90 fps

Probe: **Spherical SPH-7 / Pre-Test 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 08/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.82	Probe ID:	SPH-7
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.82	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.66%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**82.77**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.6	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.6		0
Resultant Angle Standard Deviation:	9.22		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.3	-2.950	1.330	89	-30.0	30.1	1.6178	87.05	75.33
	-25	2.0	-2.700	1.500	89	-25.3	25.4	1.6416	87.69	79.23
	-20	0.9	-2.250	1.600	89	-19.7	19.7	1.6046	86.69	81.62
	-15	0.2	-2.000	1.660	88	-16.2	16.2	1.6149	86.89	83.43
	-10	0.0	-1.300	1.750	88	-9.2	9.2	1.6287	87.26	86.13
	-5	-0.2	-0.600	1.770	87	-3.1	3.1	1.6407	87.50	87.37
	0	-0.2	-0.070	1.770	87	1.3	1.3	1.6418	87.53	87.51
	5	-0.6	0.700	1.770	86	7.6	7.6	1.6631	88.02	87.24
	10	-0.7	1.400	1.700	85	12.4	12.4	1.6385	87.28	85.25
	15	-0.4	2.000	1.660	85	15.7	15.7	1.6414	87.36	84.12
	20	-1.4	2.550	1.530	84	20.8	20.9	1.6318	87.02	81.31
	25	-0.9	2.800	1.430	83	24.6	24.6	1.6135	86.46	78.59
	30	-2.1	3.100	1.250	82	30.0	30.1	1.5814	85.51	74.01
2	-30	2.2	-3.000	1.320	89	-30.0	30.1	1.6057	86.72	75.05
	-25	1.3	-2.800	1.480	89	-26.4	26.5	1.6630	88.26	79.01
	-20	1.0	-2.420	1.600	90	-21.2	21.3	1.6413	87.76	81.78
	-15	0.4	-1.950	1.680	90	-15.5	15.5	1.6234	87.28	84.11
	-10	-0.1	-1.350	1.760	91	-9.6	9.6	1.6386	87.76	86.54
	-5	-0.1	-1.000	1.770	91	-6.6	6.6	1.6429	87.88	87.30
	0	0.0	-0.550	1.800	92	-2.6	2.6	1.6686	88.65	88.55
	5	-0.5	0.600	1.780	93	6.6	6.6	1.6647	88.62	88.03
	10	-0.8	1.400	1.700	93	12.4	12.4	1.6385	87.92	85.87
	15	-0.8	1.900	1.660	93	15.0	15.0	1.6253	87.57	84.58
	20	-1.1	2.450	1.550	94	19.8	19.8	1.6266	87.68	82.51
	25	-1.3	2.750	1.480	94	23.3	23.3	1.6385	88.00	80.80
	30	-2.2	3.050	1.250	95	29.9	30.0	1.5788	86.46	74.88
3	-30	2.2	-2.950	1.330	98	-30.0	30.1	1.2939	78.48	67.92
	-25	1.5	-2.750	1.500	98	-25.7	25.7	1.6575	88.83	80.01
	-20	1.2	-2.400	1.590	98	-21.2	21.2	1.6299	88.09	82.11
	-15	0.0	-1.850	1.700	97	-14.3	14.3	1.6288	87.98	85.24
	-10	-0.1	-1.200	1.770	97	-8.3	8.3	1.6457	88.43	87.51
	-5	-0.1	-0.600	1.800	97	-3.0	3.0	1.6685	89.04	88.92
	0	-0.3	-0.060	1.800	97	1.4	1.4	1.6696	89.07	89.05
	5	-0.3	0.700	1.780	96	7.6	7.6	1.6722	89.06	88.28
	10	-0.9	1.400	1.720	96	12.3	12.3	1.6570	88.66	86.62
	15	-0.8	1.900	1.670	96	14.9	15.0	1.6345	88.05	85.07
	20	-1.3	2.500	1.550	95	20.1	20.2	1.6355	88.00	82.60
	25	-1.1	2.800	1.440	95	24.4	24.5	1.6206	87.60	79.74
	30	-1.7	3.050	1.250	95	29.9	30.0	1.5788	86.46	74.90

		Res		Vdir	Vax
Average	-30	30.08		84.08	72.76
	-25	25.86		88.26	79.42
	-20	20.73		87.51	81.84
	-15	15.34		87.38	84.26
	-10	9.02		87.82	86.73
	-5	4.26		88.14	87.86
	0	1.77		88.42	88.37
	5	7.29		88.57	87.85
	10	12.37		87.96	85.91
	15	15.21		87.66	84.59
	20	20.27		87.57	82.14
	25	24.14		87.35	79.71
	30	30.01		86.15	74.60

Table C1-152. Spherical SPH-7 Post-test Computations - 90 fps

Probe: **Spherical SPH-7 / Post-Test 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 11/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.82	Probe ID:	SPH-7
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.82	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.66%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**86.14**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	17.0	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.0		0
Resultant Angle Standard Deviation:	9.33		

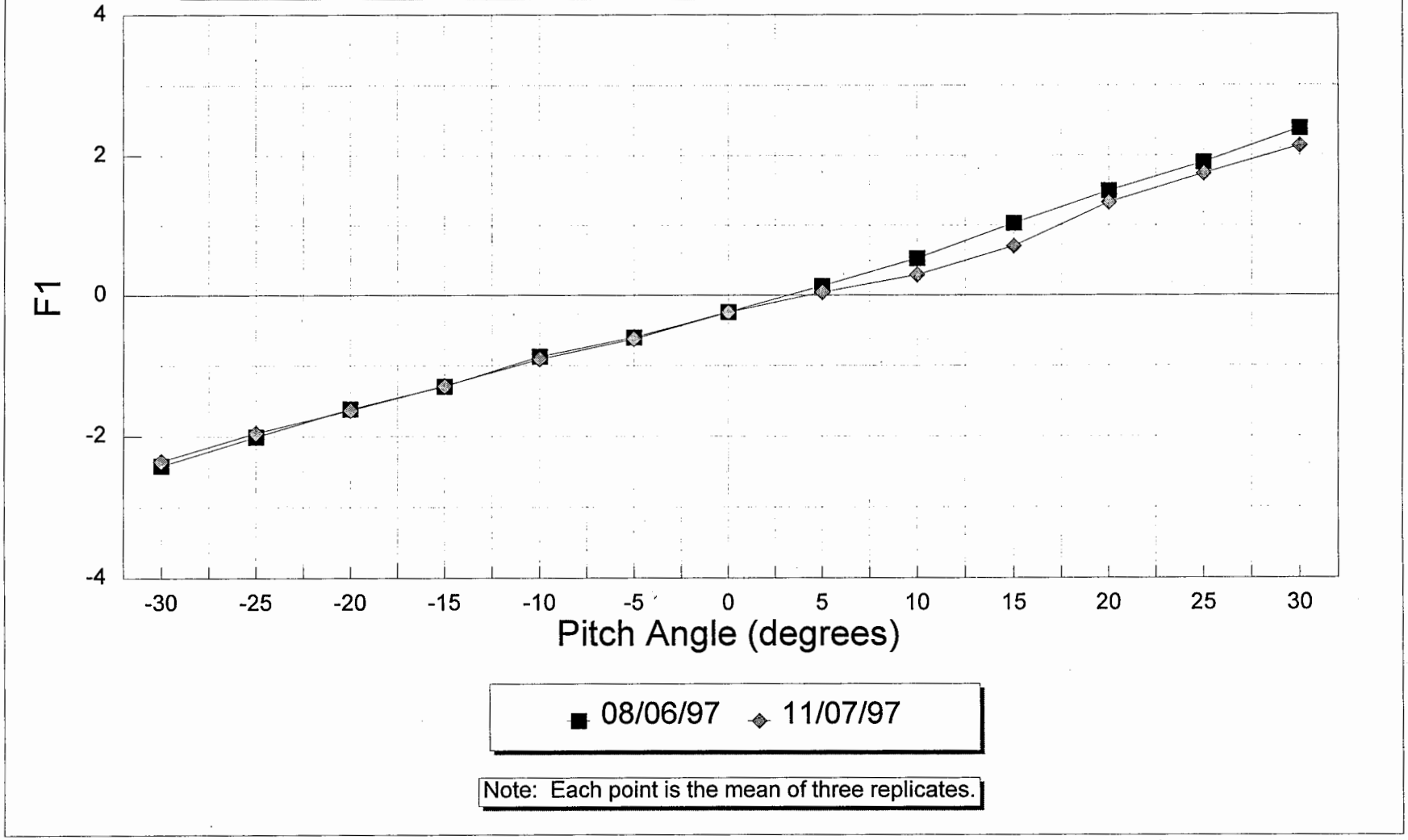
			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.3	-2.950	1.330	89	-30.0	30.1	1.7708	91.07	78.81
	-25	2.0	-2.700	1.500	89	-25.0	25.1	1.7828	91.38	82.78
	-20	0.9	-2.250	1.600	89	-19.4	19.5	1.7522	90.59	85.41
	-15	0.2	-2.000	1.660	88	-16.6	16.6	1.7725	91.03	87.24
	-10	0.0	-1.300	1.750	88	-8.5	8.5	1.8046	91.85	90.84
	-5	-0.2	-0.600	1.770	87	-2.2	2.2	1.8194	92.14	92.08
	0	-0.2	-0.070	1.770	87	2.3	2.3	1.8213	92.19	92.12
	5	-0.6	0.700	1.770	86	8.6	8.6	1.8292	92.31	91.27
	10	-0.7	1.400	1.700	85	13.3	13.3	1.7792	90.95	88.50
	15	-0.4	2.000	1.660	85	17.5	17.5	1.7775	90.91	86.72
	20	-1.4	2.550	1.530	84	22.5	22.6	1.7491	90.10	83.20
	25	-0.9	2.800	1.430	83	25.7	25.7	1.7296	89.51	80.66
	30	-2.1	3.100	1.250	82	30.0	30.1	1.6233	86.64	74.98
2	-30	2.2	-3.000	1.320	89	-30.0	30.1	1.7575	90.73	78.51
	-25	1.3	-2.800	1.480	89	-26.2	26.2	1.8093	92.06	82.59
	-20	1.0	-2.420	1.600	90	-20.9	21.0	1.7873	91.58	85.52
	-15	0.4	-1.950	1.680	90	-16.0	16.0	1.7839	91.49	87.96
	-10	-0.1	-1.350	1.760	91	-8.9	8.9	1.8162	92.40	91.28
	-5	-0.1	-1.000	1.770	91	-5.5	5.5	1.8159	92.39	91.97
	0	0.0	-0.550	1.800	92	-1.7	1.7	1.8511	93.37	93.33
	5	-0.5	0.600	1.780	93	7.8	7.8	1.8373	93.10	92.24
	10	-0.8	1.400	1.700	93	13.3	13.3	1.7792	91.62	89.15
	15	-0.8	1.900	1.660	93	16.8	16.8	1.7689	91.35	87.46
	20	-1.1	2.450	1.550	94	21.6	21.6	1.7421	90.74	84.35
	25	-1.3	2.750	1.480	94	24.6	24.6	1.7554	91.09	82.83
	30	-2.2	3.050	1.250	95	30.0	30.1	1.6233	87.67	75.87
3	-30	2.2	-2.950	1.330	98	-30.0	30.1	1.4202	82.22	71.16
	-25	1.5	-2.750	1.500	98	-25.4	25.5	1.8011	92.60	83.61
	-20	1.2	-2.400	1.590	98	-20.9	20.9	1.7749	91.92	85.86
	-15	0.0	-1.850	1.700	97	-14.9	14.9	1.7889	92.20	89.09
	-10	-0.1	-1.200	1.770	97	-7.4	7.4	1.8218	93.05	92.27
	-5	-0.1	-0.600	1.800	97	-2.1	2.1	1.8504	93.77	93.71
	0	-0.3	-0.060	1.800	97	2.4	2.4	1.8521	93.81	93.73
	5	-0.3	0.700	1.780	96	8.5	8.5	1.8395	93.41	92.38
	10	-0.9	1.400	1.720	96	13.2	13.2	1.7996	92.39	89.93
	15	-0.8	1.900	1.670	96	16.7	16.7	1.7786	91.85	87.97
	20	-1.3	2.500	1.550	95	21.9	22.0	1.7533	91.12	84.49
	25	-1.1	2.800	1.440	95	25.5	25.5	1.7370	90.69	81.82
	30	-1.7	3.050	1.250	95	30.0	30.0	1.6233	87.67	75.89

		Res	Vdir	Vax
Average	-30	30.08	88.01	76.16
	-25	25.57	92.01	82.99
	-20	20.45	91.36	85.60
	-15	15.82	91.57	88.10
	-10	8.28	92.43	91.46
	-5	3.27	92.77	92.58
	0	2.15	93.12	93.06
	5	8.30	92.94	91.96
	10	13.31	91.65	89.19
	15	16.99	91.37	87.38
	20	22.06	90.65	84.01
	25	25.28	90.43	81.77
	30	30.06	87.33	75.58

ATTACHMENT Q.

Spherical Probe SPH-8 Calibration Data

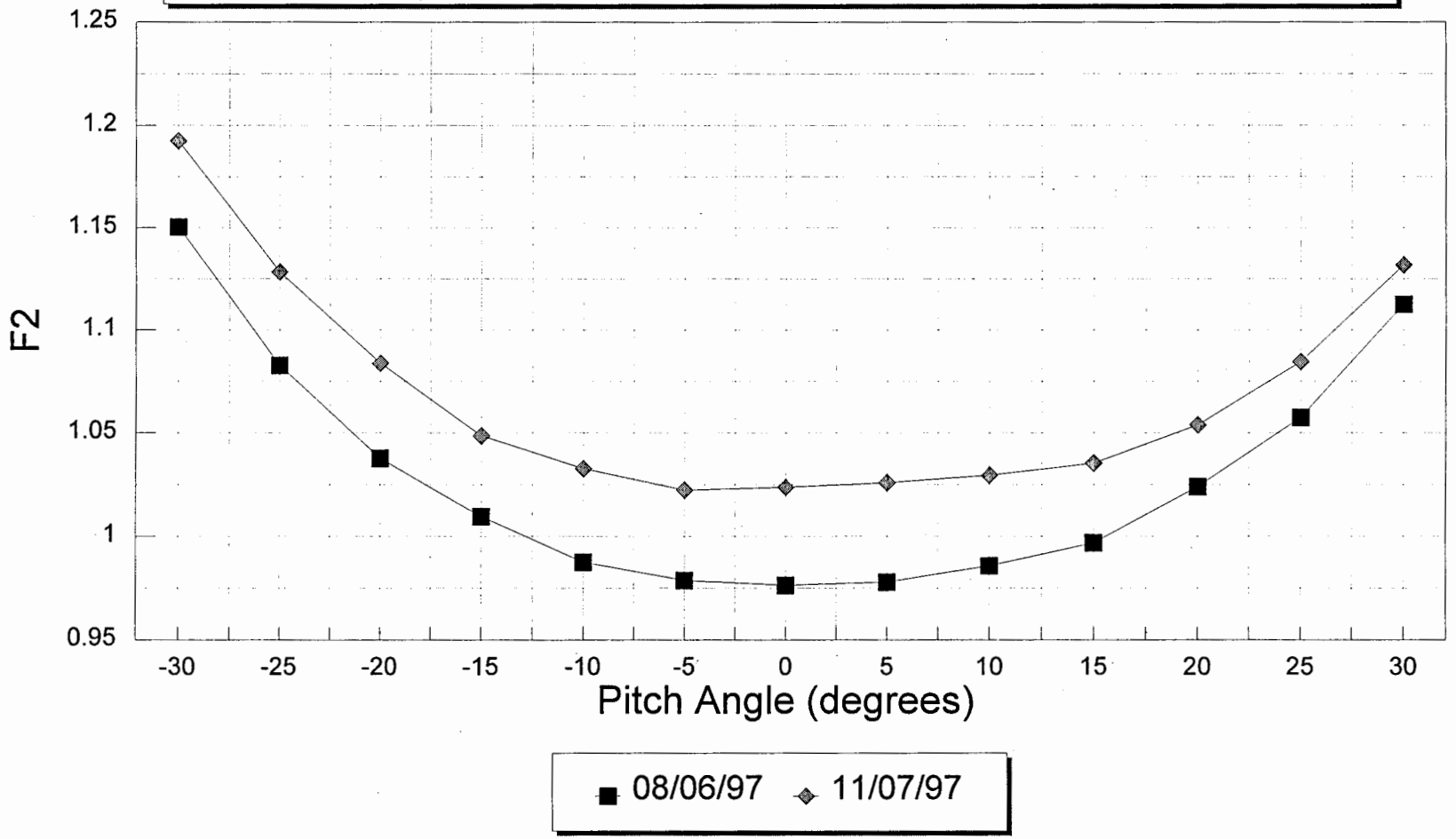
Figure C1-88. Spherical Probe 8 - Avg. (30-60 fps) F1 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration



Note: Each point is the mean of three replicates.

SPHCMPR.WK4

Figure C1-89. Spherical Probe 8 - Avg. (30-60 fps) F2 vs. Pitch Angle
Pre- and Post Test Wind Tunnel Calibration

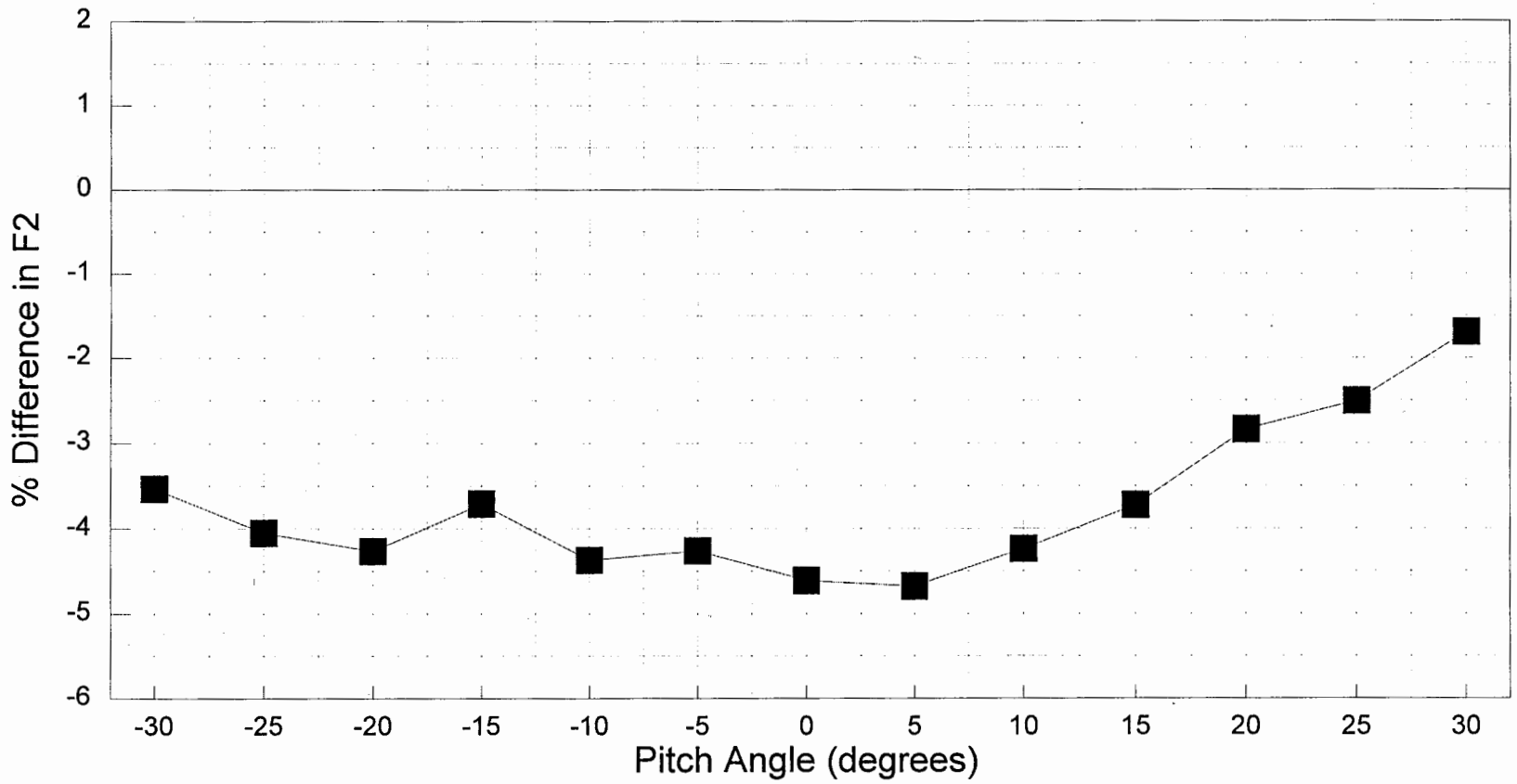


Note: Each point is the mean of three replicates.

SPHCMPR.WK4

Figure C1-90. Spherical Probe 8: Percent Difference in F2 (Avg. 30-60 fps)

NCSU Pre- (8/6/97) and Post-Test (11/7/97) Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C1-153. Spherical Probe SPH-8 Calibrations at NC State Wind Tunnel August and November 1997

Pitch Angle	30 fps / August / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.06	30.10	26.05	29.21	30.94	27.00	-2.83	2.77	3.65
-25	25.80	31.58	28.37	24.92	32.51	29.47	-3.40	2.96	3.89
-20	19.45	31.30	29.52	19.20	32.63	30.81	-1.27	4.22	4.38
-15	15.93	31.58	30.36	15.90	32.85	31.59	-0.21	4.02	4.03
-10	9.86	31.57	30.94	9.77	32.90	32.26	-0.86	4.23	4.25
-5	6.79	31.51	31.19	6.43	32.93	32.63	-5.22	4.52	4.62
0	2.08	31.41	31.39	2.17	32.91	32.88	4.55	4.75	4.74
5	3.92	31.43	31.33	5.29	32.97	32.78	34.90	4.90	4.62
10	7.46	31.34	31.03	9.65	32.87	32.33	29.28	4.88	4.20
15	14.56	31.39	30.38	17.26	32.86	31.38	18.55	4.69	3.30
20	19.85	31.31	29.45	21.77	32.57	30.25	9.67	4.04	2.72
25	24.75	31.40	28.51	26.80	32.72	29.21	8.26	4.22	2.44
30	29.59	31.29	27.21	30.04	31.97	27.67	1.52	2.17	1.71

Pitch Angle	60 fps / August / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.11	56.11	48.54	30.11	58.21	50.35	0.00	3.74	3.74
-25	30.10	62.62	54.18	26.51	62.42	55.86	-11.92	-0.32	3.10
-20	20.52	58.79	55.06	20.32	61.30	57.49	-0.98	4.27	4.41
-15	14.39	58.33	56.50	14.40	60.63	58.73	0.10	3.94	3.93
-10	9.12	58.57	57.83	8.53	61.16	60.48	-6.40	4.42	4.59
-5	4.04	58.65	58.48	3.76	61.31	61.15	-6.93	4.53	4.57
0	2.01	58.56	58.52	2.36	61.38	61.33	17.69	4.82	4.79
5	6.14	58.62	58.26	8.40	61.49	60.78	36.67	4.91	4.33
10	11.96	58.67	57.39	15.09	61.41	59.29	26.13	4.68	3.31
15	15.57	58.71	56.56	18.06	61.46	58.43	16.02	4.69	3.32
20	20.27	58.72	55.08	22.20	61.09	56.55	9.53	4.03	2.68
25	25.21	58.60	53.02	27.26	61.16	54.36	8.13	4.37	2.54
30	29.87	58.35	50.60	30.05	59.46	51.47	0.59	1.90	1.72

Pitch Angle	90 fps / August / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.10	82.96	71.77	30.10	86.07	74.46	0.00	3.75	3.75
-25	30.06	92.46	80.02	26.98	92.70	82.61	-10.24	0.26	3.23
-20	20.26	87.49	82.07	20.03	91.20	85.68	-1.14	4.25	4.40
-15	15.13	86.83	83.82	15.20	90.24	87.08	0.43	3.92	3.89
-10	10.32	87.27	85.86	9.83	91.10	89.76	-4.71	4.38	4.54
-5	4.00	87.21	86.98	3.72	91.15	90.94	-6.93	4.52	4.55
0	0.86	87.21	87.20	1.03	91.42	91.41	20.61	4.83	4.82
5	6.24	87.37	86.81	8.48	91.65	90.54	35.82	4.90	4.30
10	11.17	87.26	85.60	14.28	91.35	88.52	27.78	4.68	3.41
15	14.85	86.98	84.08	17.52	91.18	86.94	17.97	4.82	3.41
20	19.90	86.40	81.24	21.83	89.91	83.46	9.72	4.07	2.74
25	24.34	85.98	78.33	26.32	89.57	80.29	8.12	4.18	2.50
30	29.35	85.92	74.89	30.09	88.03	76.17	2.53	2.46	1.71

Figure C1-91. Spherical Probe SPH-8 Pre- and Post-Test Calibrations

NC State Wind Tunnel -- August and November 1997

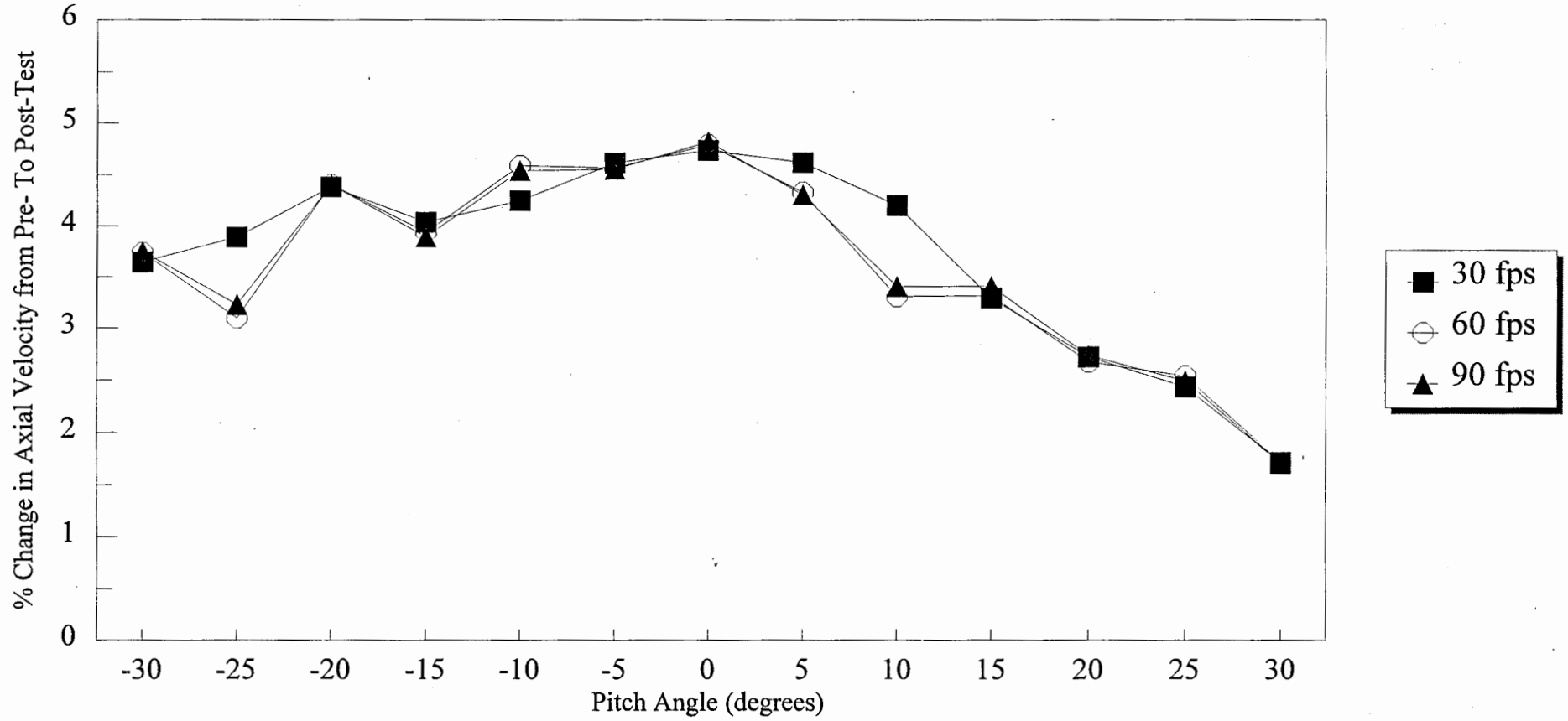


Table C1-154. Spherical SPH-8 Pre-test Computations - 30 fps

Probe: **Spherical SPH-8 / Pre-Test 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 08/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.83	Probe ID:	SPH-8
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.83	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.58%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**29.67**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.2		0
Resultant Angle Standard Deviation:	9.73		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.8	-0.350	0.163	88	-30.0	30.0	0.2157	31.75	27.49
	-25	0.8	-0.330	0.180	88	-22.8	22.8	0.2034	30.83	28.42
	-20	-0.3	-0.300	0.195	88	-18.8	18.8	0.2074	31.13	29.46
	-15	-0.3	-0.250	0.205	88	-14.2	14.2	0.2074	31.14	30.19
	-10	-0.3	-0.080	0.214	88	-1.9	1.9	0.2044	30.91	30.89
	-5	-0.3	-0.060	0.219	88	-0.5	0.6	0.2089	31.25	31.25
	0	-0.2	-0.020	0.220	88	2.1	2.1	0.2100	31.33	31.31
	5	-0.2	0.060	0.218	88	6.9	6.9	0.2098	31.31	31.08
	10	-1.3	0.150	0.210	89	11.9	11.9	0.2058	31.04	30.37
	15	-1.4	0.230	0.203	89	16.1	16.2	0.2042	30.92	29.70
	20	-1.7	0.300	0.195	89	20.6	20.7	0.2061	31.06	29.07
	25	-1.7	0.360	0.182	89	25.8	25.9	0.2070	31.13	28.02
	30	-1.7	0.400	0.165	89	30.0	30.0	0.2042	30.92	26.77
2	-30	2.1	-0.400	0.153	95	-30.0	30.1	0.2024	30.95	26.79
	-25	2.2	-0.350	0.170	95	-30.0	30.1	0.2249	32.63	28.24
	-20	1.2	-0.310	0.193	95	-19.9	19.9	0.2076	31.34	29.47
	-15	1.2	-0.290	0.208	94	-16.6	16.6	0.2159	31.94	30.60
	-10	-0.1	-0.260	0.213	94	-14.2	14.2	0.2156	31.91	30.94
	-5	0.3	-0.200	0.215	94	-10.7	10.7	0.2110	31.58	31.03
	0	0.3	-0.090	0.220	93	-2.4	2.4	0.2102	31.49	31.46
	5	0.4	-0.020	0.221	93	2.1	2.1	0.2110	31.55	31.52
	10	0.0	0.030	0.220	93	5.2	5.2	0.2106	31.51	31.38
	15	0.1	0.200	0.216	93	14.0	14.0	0.2136	31.74	30.81
	20	0.1	0.280	0.200	92	19.0	19.0	0.2076	31.26	29.55
	25	-1.1	0.350	0.191	92	24.2	24.2	0.2114	31.55	28.77
	30	-0.9	0.400	0.175	92	29.0	29.0	0.2123	31.62	27.66
3	-30	2.8	-0.380	0.160	92	-30.0	30.1	0.1619	27.61	23.88
	-25	2.8	-0.350	0.179	92	-24.4	24.5	0.2076	31.26	28.45
	-20	1.5	-0.310	0.196	92	-19.5	19.6	0.2099	31.44	29.62
	-15	1.5	-0.290	0.205	91	-16.9	17.0	0.2135	31.67	30.29
	-10	0.8	-0.250	0.215	91	-13.5	13.5	0.2163	31.88	31.00
	-5	0.7	-0.180	0.220	91	-9.0	9.1	0.2138	31.70	31.30
	0	0.2	-0.080	0.220	91	-1.7	1.8	0.2101	31.42	31.41
	5	0.3	-0.010	0.220	91	2.7	2.7	0.2101	31.42	31.39
	10	-0.2	0.030	0.220	91	5.2	5.2	0.2106	31.46	31.33
	15	-0.2	0.190	0.214	91	13.6	13.6	0.2113	31.51	30.63
	20	-0.4	0.300	0.203	91	19.9	19.9	0.2126	31.61	29.72
	25	-0.6	0.350	0.191	91	24.2	24.2	0.2114	31.52	28.75
	30	-1.9	0.400	0.170	90	29.7	29.7	0.2091	31.32	27.20

		Res	Vdir	Vax
Average	-30	30.06	30.10	26.05
	-25	25.80	31.58	28.37
	-20	19.45	31.30	29.52
	-15	15.93	31.58	30.36
	-10	9.86	31.57	30.94
	-5	6.79	31.51	31.19
	0	2.08	31.41	31.39
	5	3.92	31.43	31.33
	10	7.46	31.34	31.03
	15	14.56	31.39	30.38
	20	19.85	31.31	29.45
	25	24.75	31.40	28.51
	30	29.59	31.29	27.21

Table C1-155. Spherical SPH-8 Post-test Computations - 30 fps

Probe: **Spherical SPH-8 / Post-Test 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 11/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.83	Probe ID:	SPH-8
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.83	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.58%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**30.79**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.8	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.8		0
Resultant Angle Standard Deviation:	9.59		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.8	-0.350	0.163	88	-27.4	27.5	0.2194	32.02	28.41
	-25	0.8	-0.330	0.180	88	-23.1	23.2	0.2226	32.25	29.65
	-20	-0.3	-0.300	0.195	88	-18.6	18.6	0.2251	32.43	30.73
	-15	-0.3	-0.250	0.205	88	-14.1	14.1	0.2242	32.37	31.39
	-10	-0.3	-0.080	0.214	88	-1.7	1.8	0.2240	32.36	32.34
	-5	-0.3	-0.060	0.219	88	-0.4	0.5	0.2294	32.75	32.74
	0	-0.2	-0.020	0.220	88	2.7	2.7	0.2311	32.86	32.83
	5	-0.2	0.060	0.218	88	9.7	9.7	0.2309	32.85	32.38
	10	-1.3	0.150	0.210	89	15.1	15.2	0.2253	32.48	31.35
	15	-1.4	0.230	0.203	89	18.4	18.5	0.2230	32.31	30.64
	20	-1.7	0.300	0.195	89	22.5	22.6	0.2231	32.32	29.84
	25	-1.7	0.360	0.182	89	28.0	28.0	0.2255	32.49	28.68
	30	-1.7	0.400	0.165	89	30.0	30.0	0.2113	31.46	27.23
2	-30	2.1	-0.400	0.153	95	-30.0	30.1	0.2175	32.09	27.77
	-25	2.2	-0.350	0.170	95	-26.3	26.4	0.2232	32.50	29.11
	-20	1.2	-0.310	0.193	95	-19.6	19.6	0.2256	32.68	30.77
	-15	1.2	-0.290	0.208	94	-16.6	16.6	0.2336	33.22	31.84
	-10	-0.1	-0.260	0.213	94	-14.2	14.2	0.2330	33.18	32.17
	-5	0.3	-0.200	0.215	94	-10.3	10.3	0.2297	32.94	32.41
	0	0.3	-0.090	0.220	93	-2.2	2.2	0.2303	32.95	32.93
	5	0.4	-0.020	0.221	93	2.7	2.7	0.2321	33.09	33.05
	10	0.0	0.030	0.220	93	6.9	6.9	0.2321	33.09	32.85
	15	0.1	0.200	0.216	93	16.8	16.8	0.2345	33.26	31.84
	20	0.1	0.280	0.200	92	20.9	20.9	0.2244	32.51	30.37
	25	-1.1	0.350	0.191	92	26.2	26.2	0.2293	32.85	29.48
	30	-0.9	0.400	0.175	92	30.0	30.0	0.2241	32.48	28.13
3	-30	2.8	-0.380	0.160	92	-30.0	30.1	0.1750	28.70	24.83
	-25	2.8	-0.350	0.179	92	-25.0	25.2	0.2281	32.77	29.65
	-20	1.5	-0.310	0.196	92	-19.3	19.3	0.2281	32.77	30.92
	-15	1.5	-0.290	0.205	91	-16.9	16.9	0.2311	32.96	31.53
	-10	0.8	-0.250	0.215	91	-13.4	13.4	0.2341	33.17	32.26
	-5	0.7	-0.180	0.220	91	-8.5	8.5	0.2331	33.10	32.74
	0	0.2	-0.080	0.220	91	-1.6	1.6	0.2303	32.90	32.89
	5	0.3	-0.010	0.220	91	3.5	3.5	0.2312	32.96	32.90
	10	-0.2	0.030	0.220	91	6.9	6.9	0.2321	33.03	32.79
	15	-0.2	0.190	0.214	91	16.5	16.5	0.2319	33.01	31.65
	20	-0.4	0.300	0.203	91	21.8	21.8	0.2303	32.90	30.54
	25	-0.6	0.350	0.191	91	26.2	26.2	0.2293	32.82	29.46
	30	-1.9	0.400	0.170	90	30.0	30.1	0.2177	31.96	27.66

		Res	Vdir	Vax
Average	-30	29.21	30.94	27.00
	-25	24.92	32.51	29.47
	-20	19.20	32.63	30.81
	-15	15.90	32.85	31.59
	-10	9.77	32.90	32.26
	-5	6.43	32.93	32.63
	0	2.17	32.91	32.88
	5	5.29	32.97	32.78
	10	9.65	32.87	32.33
	15	17.26	32.86	31.38
	20	21.77	32.57	30.25
	25	26.80	32.72	29.21
	30	30.04	31.97	27.67

Table C1-156. Spherical SPH-8 Pre-test Computations - 60 fps

Probe: **Spherical SPH-8 / Pre-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 08/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.83	Probe ID:	SPH-8
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.83	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.66%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**55.38**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	16.8	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.9		0
Resultant Angle Standard Deviation:	9.79		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.8	-1.300	0.550	90	-30.0	30.1	0.7277	58.43	50.54
	-25	2.4	-1.300	0.630	90	-30.0	30.1	0.8336	62.53	54.11
	-20	1.3	-1.150	0.680	90	-21.0	21.0	0.7450	59.12	55.18
	-15	0.6	-0.900	0.710	90	-14.7	14.7	0.7221	58.20	56.28
	-10	0.6	-0.650	0.750	90	-9.9	9.9	0.7312	58.57	57.69
	-5	0.2	-0.500	0.770	90	-5.9	5.9	0.7400	58.92	58.60
	0	0.0	-0.290	0.770	90	-1.9	1.9	0.7355	58.74	58.70
	5	0.0	0.030	0.760	90	3.9	3.9	0.7264	58.37	58.24
	10	-0.8	0.470	0.750	90	11.0	11.0	0.7321	58.60	57.52
	15	-1.0	0.780	0.740	90	15.2	15.3	0.7372	58.81	56.73
	20	-1.2	1.000	0.700	90	19.3	19.4	0.7288	58.47	55.16
	25	-1.4	1.230	0.650	91	24.9	24.9	0.7260	58.41	52.96
	30	-2.1	1.400	0.600	91	29.5	29.5	0.7351	58.77	51.13
2	-30	2.8	-1.360	0.550	93	-30.0	30.1	0.7277	58.58	50.68
	-25	2.8	-1.300	0.630	93	-30.0	30.1	0.8336	62.70	54.24
	-20	1.5	-1.100	0.680	93	-20.1	20.1	0.7329	58.79	55.21
	-15	0.6	-0.900	0.710	93	-14.7	14.7	0.7221	58.36	56.44
	-10	0.3	-0.600	0.750	93	-8.7	8.7	0.7280	58.60	57.92
	-5	0.2	-0.300	0.760	93	-2.2	2.2	0.7261	58.52	58.48
	0	0.0	-0.060	0.760	93	2.2	2.2	0.7257	58.50	58.46
	5	0.0	0.220	0.760	93	7.1	7.1	0.7318	58.75	58.30
	10	-0.2	0.550	0.750	93	12.0	12.0	0.7356	58.90	57.60
	15	-0.7	0.800	0.730	93	15.7	15.7	0.7309	58.71	56.52
	20	-0.8	1.050	0.700	93	20.1	20.1	0.7352	58.88	55.28
	25	-0.9	1.260	0.650	93	25.4	25.4	0.7330	58.80	53.11
	30	-2.2	1.400	0.580	93	30.0	30.1	0.7179	58.19	50.36
3	-30	2.6	-1.380	0.550	92	-30.0	30.1	0.5593	51.32	44.39
	-25	2.5	-1.300	0.630	92	-30.0	30.1	0.8336	62.64	54.20
	-20	1.2	-1.100	0.670	92	-20.4	20.4	0.7261	58.46	54.80
	-15	0.4	-0.850	0.720	92	-13.7	13.7	0.7256	58.45	56.79
	-10	0.0	-0.600	0.750	92	-8.7	8.7	0.7280	58.54	57.87
	-5	0.0	-0.400	0.760	92	-4.0	4.0	0.7273	58.51	58.37
	0	0.0	-0.080	0.760	92	1.9	1.9	0.7255	58.44	58.41
	5	-0.2	0.240	0.760	92	7.4	7.4	0.7325	58.73	58.23
	10	-0.3	0.600	0.740	91	12.8	12.8	0.7282	58.50	57.04
	15	-0.7	0.800	0.730	91	15.7	15.7	0.7309	58.61	56.42
	20	-1.0	1.100	0.690	91	21.3	21.3	0.7357	58.80	54.78
	25	-1.1	1.250	0.650	91	25.2	25.3	0.7305	58.59	52.99
	30	-0.2	1.450	0.580	91	30.0	30.0	0.7179	58.08	50.30

		Res	Vdir	Vax
Average	-30	30.11	56.11	48.54
	-25	30.10	62.62	54.18
	-20	20.52	58.79	55.06
	-15	14.39	58.33	56.50
	-10	9.12	58.57	57.83
	-5	4.04	58.65	58.48
	0	2.01	58.56	58.52
	5	6.14	58.62	58.26
	10	11.96	58.67	57.39
	15	15.57	58.71	56.56
	20	20.27	58.72	55.08
	25	25.21	58.60	53.02
	30	29.87	58.35	50.60

Table C1-157. Spherical SPH-8 Post-test Computations - 60 fps

Probe: **Spherical SPH-8 / Post-Test 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 11/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.83	Probe ID:	SPH-8
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.83	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.66%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**57.41**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	17.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.5		0
Resultant Angle Standard Deviation:	9.45		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.8	-1.300	0.550	90	-30.0	30.1	0.7820	60.57	52.39
	-25	2.4	-1.300	0.630	90	-26.4	26.5	0.8282	62.33	55.78
	-20	1.3	-1.150	0.680	90	-20.9	20.9	0.8110	61.68	57.60
	-15	0.6	-0.900	0.710	90	-14.8	14.8	0.7796	60.47	58.47
	-10	0.6	-0.650	0.750	90	-9.3	9.3	0.7975	61.16	60.36
	-5	0.2	-0.500	0.770	90	-5.5	5.5	0.8063	61.50	61.21
	0	0.0	-0.290	0.770	90	-1.8	1.8	0.8061	61.49	61.46
	5	0.0	0.030	0.760	90	5.0	5.0	0.7999	61.25	61.02
	10	-0.8	0.470	0.750	90	14.1	14.1	0.8023	61.35	59.49
	15	-1.0	0.780	0.740	90	17.8	17.8	0.8094	61.62	58.65
	20	-1.2	1.000	0.700	90	21.2	21.3	0.7887	60.82	56.69
	25	-1.4	1.230	0.650	91	26.9	26.9	0.7906	60.95	54.33
	30	-2.1	1.400	0.600	91	30.0	30.1	0.7685	60.09	52.01
2	-30	2.8	-1.360	0.550	93	-30.0	30.1	0.7820	60.73	52.53
	-25	2.8	-1.300	0.630	93	-26.4	26.5	0.8282	62.50	55.92
	-20	1.5	-1.100	0.680	93	-19.8	19.8	0.7965	61.29	57.66
	-15	0.6	-0.900	0.710	93	-14.8	14.8	0.7796	60.64	58.63
	-10	0.3	-0.600	0.750	93	-8.1	8.1	0.7938	61.19	60.57
	-5	0.2	-0.300	0.760	93	-2.0	2.0	0.7955	61.25	61.21
	0	0.0	-0.060	0.760	93	2.9	2.9	0.7984	61.36	61.29
	5	0.0	0.220	0.760	93	9.9	9.9	0.8053	61.63	60.70
	10	-0.2	0.550	0.750	93	15.3	15.3	0.8055	61.64	59.46
	15	-0.7	0.800	0.730	93	18.2	18.2	0.8003	61.44	58.38
	20	-0.8	1.050	0.700	93	22.1	22.1	0.7966	61.29	56.79
	25	-0.9	1.260	0.650	93	27.5	27.5	0.7985	61.37	54.43
	30	-2.2	1.400	0.580	93	30.0	30.1	0.7429	59.19	51.22
3	-30	2.6	-1.380	0.550	92	-30.0	30.1	0.6039	53.32	46.13
	-25	2.5	-1.300	0.630	92	-26.4	26.5	0.8282	62.44	55.88
	-20	1.2	-1.100	0.670	92	-20.1	20.2	0.7888	60.94	57.20
	-15	0.4	-0.850	0.720	92	-13.6	13.6	0.7851	60.79	59.08
	-10	0.0	-0.600	0.750	92	-8.1	8.1	0.7938	61.13	60.51
	-5	0.0	-0.400	0.760	92	-3.8	3.8	0.7947	61.17	61.04
	0	0.0	-0.080	0.760	92	2.4	2.4	0.7981	61.30	61.24
	5	-0.2	0.240	0.760	92	10.3	10.3	0.8059	61.59	60.60
	10	-0.3	0.600	0.740	91	15.9	15.9	0.7983	61.25	58.91
	15	-0.7	0.800	0.730	91	18.2	18.2	0.8003	61.33	58.27
	20	-1.0	1.100	0.690	91	23.2	23.2	0.7955	61.14	56.18
	25	-1.1	1.250	0.650	91	27.3	27.3	0.7959	61.16	54.33
	30	-0.2	1.450	0.580	91	30.0	30.0	0.7429	59.08	51.17

		Res	Vdir	Vax
Average	-30	30.11	58.21	50.35
	-25	26.51	62.42	55.86
	-20	20.32	61.30	57.49
	-15	14.40	60.63	58.73
	-10	8.53	61.16	60.48
	-5	3.76	61.31	61.15
	0	2.36	61.38	61.33
	5	8.40	61.49	60.78
	10	15.09	61.41	59.29
	15	18.06	61.46	58.43
	20	22.20	61.09	56.55
	25	27.26	61.16	54.36
	30	30.05	59.46	51.47

Table C1-158. Spherical SPH-8 Pre-test Computations - 90 fps

Probe: **Spherical SPH-8 / Pre-Test 30-60 Calibration**

Velocity Point: **90 fps** Cal Date: 08/06/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.83	Probe ID:	SPH-8
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.83	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.71%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**82.21**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.6	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.7		0
Resultant Angle Standard Deviation:	9.75		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.2	-3.000	1.200	98	-30.0	30.1	1.5877	86.93	75.22
	-25	2.2	-2.900	1.360	98	-30.0	30.1	1.7994	92.54	80.08
	-20	0.9	-2.450	1.500	98	-20.3	20.3	1.6224	87.87	82.42
	-15	0.3	-2.050	1.560	98	-15.4	15.4	1.5968	87.17	84.06
	-10	0.1	-1.500	1.650	97	-10.5	10.5	1.6157	87.61	86.15
	-5	0.0	-0.700	1.690	97	-2.4	2.4	1.6150	87.59	87.51
	0	0.0	-0.300	1.700	96	0.9	0.9	1.6219	87.70	87.69
	5	0.0	0.600	1.690	96	7.9	7.9	1.6314	87.96	87.12
	10	-0.6	1.200	1.650	95	12.0	12.0	1.6178	87.51	85.59
	15	-0.9	1.700	1.620	95	15.2	15.2	1.6130	87.38	84.32
	20	-1.0	2.300	1.520	95	20.3	20.3	1.5998	87.02	81.61
	25	-1.7	2.650	1.430	94	24.4	24.5	1.5876	86.61	78.82
	30	-2.3	3.000	1.300	93	29.2	29.3	1.5844	86.44	75.40
2	-30	3.1	-3.050	1.190	95	-30.0	30.1	1.5745	86.33	74.65
	-25	1.7	-2.900	1.380	95	-30.0	30.0	1.8259	92.97	80.48
	-20	0.5	-2.500	1.500	96	-20.7	20.7	1.6345	88.04	82.36
	-15	0.1	-2.050	1.570	96	-15.2	15.2	1.6047	87.23	84.17
	-10	0.0	-1.500	1.660	96	-10.4	10.4	1.6246	87.77	86.33
	-5	0.0	-1.050	1.690	97	-5.4	5.4	1.6211	87.76	87.36
	0	-0.3	-0.500	1.690	97	-0.8	0.9	1.6127	87.53	87.52
	5	-0.3	0.030	1.690	98	3.6	3.6	1.6150	87.67	87.49
	10	-0.4	1.000	1.670	99	10.7	10.7	1.6281	88.10	86.56
	15	-0.5	1.650	1.630	99	14.8	14.8	1.6182	87.83	84.92
	20	-1.3	2.200	1.530	99	19.4	19.5	1.5948	87.19	82.21
	25	-1.2	2.600	1.430	100	24.0	24.0	1.5791	86.84	79.31
	30	-2.6	2.950	1.290	100	29.0	29.1	1.5656	86.47	75.56
3	-30	2.4	-3.000	1.200	86	-30.0	30.1	1.2283	75.63	65.44
	-25	2.1	-2.850	1.370	86	-30.0	30.1	1.8127	91.87	79.51
	-20	0.6	-2.400	1.500	85	-19.8	19.8	1.6115	86.55	81.43
	-15	0.2	-2.000	1.570	84	-14.8	14.8	1.5977	86.10	83.24
	-10	0.2	-1.450	1.650	84	-10.1	10.1	1.6105	86.44	85.10
	-5	-0.1	-0.900	1.680	83	-4.1	4.1	1.6079	86.29	86.07
	0	-0.1	-0.300	1.690	83	0.8	0.8	1.6123	86.41	86.40
	5	-0.3	0.500	1.680	82	7.2	7.2	1.6182	86.49	85.80
	10	-0.3	1.000	1.650	81	10.8	10.8	1.6092	86.17	84.64
	15	-0.9	1.580	1.610	80	14.5	14.5	1.5962	85.74	83.00
	20	-1.0	2.220	1.500	79	19.9	19.9	1.5711	84.98	79.90
	25	-1.1	2.600	1.400	78	24.5	24.5	1.5553	84.48	76.87
	30	-2.3	3.000	1.280	77	29.6	29.7	1.5714	84.83	73.72

		Res	Vdir	Vax
Average	-30	30.10	82.96	71.77
	-25	30.06	92.46	80.02
	-20	20.26	87.49	82.07
	-15	15.13	86.83	83.82
	-10	10.32	87.27	85.86
	-5	4.00	87.21	86.98
	0	0.86	87.21	87.20
	5	6.24	87.37	86.81
	10	11.17	87.26	85.60
	15	14.85	86.98	84.08
	20	19.90	86.40	81.24
	25	24.34	85.98	78.33
	30	29.35	85.92	74.89

Table C1-159. Spherical SPH-8 Post-test Computations - 90 fps

Probe: **Spherical SPH-8 / Post-Test 30-60 Calibration**

Velocity Point: **90 fps** Cal Date: 11/07/97

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.83	Probe ID:	SPH-8
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.83	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.71%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**85.22**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	17.3	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.3		0
Resultant Angle Standard Deviation:	9.47		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.2	-3.000	1.200	98	-30.0	30.1	1.7062	90.11	77.98
	-25	2.2	-2.900	1.360	98	-27.3	27.3	1.8229	93.14	82.73
	-20	0.9	-2.450	1.500	98	-20.0	20.0	1.7621	91.57	86.04
	-15	0.3	-2.050	1.560	98	-15.4	15.4	1.7251	90.61	87.34
	-10	0.1	-1.500	1.650	97	-10.0	10.0	1.7598	91.43	90.03
	-5	0.0	-0.700	1.690	97	-2.3	2.3	1.7687	91.66	91.59
	0	0.0	-0.300	1.700	96	1.2	1.2	1.7833	91.96	91.94
	5	0.0	0.600	1.690	96	10.8	10.8	1.7940	92.23	90.61
	10	-0.6	1.200	1.650	95	15.2	15.2	1.7714	91.57	88.36
	15	-0.9	1.700	1.620	95	17.8	17.8	1.7715	91.57	87.18
	20	-1.0	2.300	1.520	95	22.2	22.3	1.7330	90.57	83.82
	25	-1.7	2.650	1.430	94	26.4	26.5	1.7244	90.26	80.80
	30	-2.3	3.000	1.300	93	30.0	30.1	1.6650	88.62	76.68
2	-30	3.1	-3.050	1.190	95	-30.0	30.1	1.6920	89.49	77.39
	-25	1.7	-2.900	1.380	95	-26.9	26.9	1.8338	93.17	83.07
	-20	0.5	-2.500	1.500	96	-20.5	20.5	1.7775	91.81	85.98
	-15	0.1	-2.050	1.570	96	-15.3	15.3	1.7334	90.66	87.45
	-10	0.0	-1.500	1.660	96	-9.9	9.9	1.7697	91.61	90.23
	-5	0.0	-1.050	1.690	97	-5.0	5.0	1.7661	91.60	91.24
	0	-0.3	-0.500	1.690	97	-0.7	0.8	1.7702	91.70	91.69
	5	-0.3	0.030	1.690	98	4.6	4.6	1.7781	91.99	91.69
	10	-0.4	1.000	1.670	99	13.8	13.8	1.7850	92.25	89.60
	15	-0.5	1.650	1.630	99	17.5	17.5	1.7787	92.09	87.83
	20	-1.3	2.200	1.530	99	21.3	21.4	1.7261	90.71	84.48
	25	-1.2	2.600	1.430	100	26.0	26.0	1.7112	90.40	81.25
	30	-2.6	2.950	1.290	100	30.0	30.1	1.6522	88.83	76.85
3	-30	2.4	-3.000	1.200	86	-30.0	30.1	1.3270	78.61	68.02
	-25	2.1	-2.850	1.370	86	-26.6	26.7	1.8097	91.80	82.02
	-20	0.6	-2.400	1.500	85	-19.5	19.5	1.7513	90.22	85.03
	-15	0.2	-2.000	1.570	84	-14.9	14.9	1.7247	89.45	86.46
	-10	0.2	-1.450	1.650	84	-9.5	9.5	1.7560	90.26	89.02
	-5	-0.1	-0.900	1.680	83	-3.9	3.9	1.7566	90.19	89.99
	0	-0.1	-0.300	1.690	83	1.2	1.2	1.7727	90.61	90.59
	5	-0.3	0.500	1.680	82	10.1	10.1	1.7805	90.72	89.32
	10	-0.3	1.000	1.650	81	13.8	13.8	1.7640	90.22	87.60
	15	-0.9	1.580	1.610	80	17.2	17.3	1.7538	89.87	85.82
	20	-1.0	2.220	1.500	79	21.8	21.9	1.7023	88.46	82.10
	25	-1.1	2.600	1.400	78	26.5	26.5	1.6897	88.05	78.81
	30	-2.3	3.000	1.280	77	30.0	30.1	1.6394	86.65	74.98

		Res		Vdir	Vax
Average	-30	30.10		86.07	74.46
	-25	26.98		92.70	82.61
	-20	20.03		91.20	85.68
	-15	15.20		90.24	87.08
	-10	9.83		91.10	89.76
	-5	3.72		91.15	90.94
	0	1.03		91.42	91.41
	5	8.48		91.65	90.54
	10	14.28		91.35	88.52
	15	17.52		91.18	86.94
	20	21.83		89.91	83.46
	25	26.32		89.57	80.29
	30	30.09		88.03	76.17

Appendix C2.
National Institute of Standards and Technology Probe Calibrations

INTRODUCTION

Appendix C2 contains the test plan for the velocity probe calibrations conducted at the NIST wind tunnel, located at the National Institute of Standards and Technology, U.S. Department of Commerce in Gaithersburg, Maryland. The test plan begins on page C2-3. This appendix also includes all of the calibration data, which are presented beginning on page C2-25.

Flow Reference Method
Testing and Analysis

Test Plan:
Velocity Probe Calibrations at the NIST Wind Tunnel

Prepared for

U.S. Environmental Protection Agency
Acid Rain Division, 6204J
401 M Street, SW
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Contract No. 68-W6-0050
Work Assignment 0007AA-23

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December 8, 1997

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1.0 INTRODUCTION

1.1 BACKGROUND

Title IV of the Clean Air Act, as amended by the Clean Air Act Amendments of 1990 (the Act, 42 U.S.C. 7651), authorizes the U.S. Environmental Protection Agency (EPA) to establish an acid rain program to reduce the adverse effects of acidic deposition. On October 26, 1992, the Agency Administrator signed four core rules designed to implement the statutory mandate. Part 75 of the core rules requires affected electric utility units to install and operate continuous emission monitoring systems (CEMS) that provide EPA with continuous hourly measurements of sulfur dioxide, nitrogen oxides, carbon dioxide, and volumetric flow. A central element in the monitoring program is periodic performance testing of each type of CEMS against EPA's approved test methods specified in 40 CFR Part 60.

In the first three years of the Acid Rain Program, the electric utility industry has raised concerns that EPA's approved test method for determining volumetric flow (Method 2) overestimates the actual flow rate, resulting in overestimation of sulfur dioxide emissions and heat input. To address these concerns, EPA has been engaged in an interlaboratory field study of Method 2 and the comparison of the method to other methods of measuring flow. The field studies were conducted during the summer of 1997 at three electric utility sites and involved test crews from eight private companies. The purpose of the study is to assess the accuracy and the variability of flow reference methods, to compare reference method measurements to other measurements of flow, and to provide technical assessments of possible improvements to the flow reference methods.

1.2 PURPOSE OF WIND TUNNEL TESTS

A critical element in the test program is obtaining independent wind tunnel calibrations of each probe that was used in the field study. Under this interagency agreement, the 33 probes used in the field study will be calibrated in the wind tunnel operated by the National Institute of Standards and Technology (NIST), U.S. Department of Commerce, in Gaithersburg, Maryland. The calibrations will be performed in accordance with the procedures contained in EPA's Test Methods 1, 2, draft Method 2F, and in proposed revisions to these methods.

NIST will prepare a quality assurance (QA) project plan for the wind tunnel tests, provide and operate the wind tunnel, provide the instrumentation and hardware support for performing the probe calibrations and recording the resulting measurements, perform the probe calibrations, quality assure and analyze the resulting data, and produce final calibration reports for each tested probe. These reports will present the calculated calibration coefficients for the one- and two-dimensional probes, calibration curves for the three-dimensional probes, and associated error bands for each of the 33 pitot probes. Through a separate contract, EPA will provide the probes and any technical assistance requested by NIST. NIST will provide EPA with all pressure measurements and prepare an initial draft calculation of the calibration results for each probe. A log noting problems with the data and probes will be maintained by NIST personnel performing the calibrations. Quality assurance and quality control (QC) will be performed by NIST.

Following the performance of these tests at the NIST wind tunnel, the probes will be shipped either to Massachusetts Institute of Technology (MIT) or the Electric Power Research Institute's (EPRI) swirl wind tunnel for further testing.

1.3 DESCRIPTION OF NIST WIND TUNNEL FACILITY

All tests will be conducted in the NIST Dual Test Section Wind Tunnel shown in Figure 1. The wind tunnel is a closed-circuit facility lying in a horizontal plane. The tunnel is powered by a 370 kW (500 hp) AC-to-DC motor generator set which supplies DC power to a 300 kW (400 hp) drive motor. The maximum drive rpm is 600 and is controlled by a feedback loop producing shaft revolutions stable to within ±0.1%. The drive motor turns an 8-ft., two-stage axial flow fan with manually adjustable blade pitch. Downstream of the fan, the flow passes through a circular-to-square transition section and into a five-degree diffuser. The diffuser continues around through two sets of turning vanes, through a 12-ft. square cross-section containing a 3/8-in. by 3-in. phenolic resin honeycomb, and then into a wide-angle diffuser. The wide-angle diffuser contains six screens and discharges into a 20 ft., 2 in. by 25 ft. settling chamber containing nine screens. All screens are 20-mesh stainless steel made with 0.009-in. diameter wire, and are spaced 2 ft. apart in the flow direction. From the settling chamber, the flow passes through an entrance cone and into a 5 ft. by 7 ft. cross-section where folding hinges are attached to facilitate changing test sections. The honeycomb, screens, and a contraction ratio of 14.4-to-1 provide test section longitudinal free-stream turbulence levels of 0.07% over most of the speed range and a transverse velocity gradient within a 90% "working window" of less than 1% in both test sections.

The test section assembly consists of two ducts which ride "piggy back" on a cable hoisting arrangement. The upper test section is 39 ft., 7 in. long and has a system of parallel arms along the sides which allow the sidewalls to be adjusted to provide a zero pressure gradient for research purposes. This test section is variable in cross-section but nominally measures 7 ft. high and 5 ft. wide, with the width variable. The top speed in this configuration is approximately 147 ft/sec. The 7 ft. vertical dimension at the entrance to the lower test section is gradually reduced in the flow direction to 4 ft. forming a venturi-like duct so that the top speed is approximately 220 ft/sec. The effective working length is 10 ft. within the overall 40 ft. length. All sides of the lower test section are fixed. Both test sections are equipped with overhead lighting and windows in the sidewalls for observation and access.

The downstream end of the test section is vented to room air establishing this point in the closed-circuit system as being near atmospheric pressure and temperature conditions. From this point, the flow passes into a five-degree diffuser, around two 90-degree bends containing turning vanes and into the drive section which measures 12 ft., 5 in. wide by 14 ft. high at the location of a cooling coil used to stabilize the tunnel temperature. The cooling coil is situated between the drive motor and the fan, and a 6-in. drive shaft passes through the center of the coil. A rectangular to 8 ft. round transition completes the circuit connection to the drive fan inlet. The entire drive mechanism, along with the cooling coil, is mounted on a large concrete slab which is isolated from the building floor with springs to minimize the transmission of vibration. The main tunnel duct is attached to the drive section at each end by means of flexible boots.

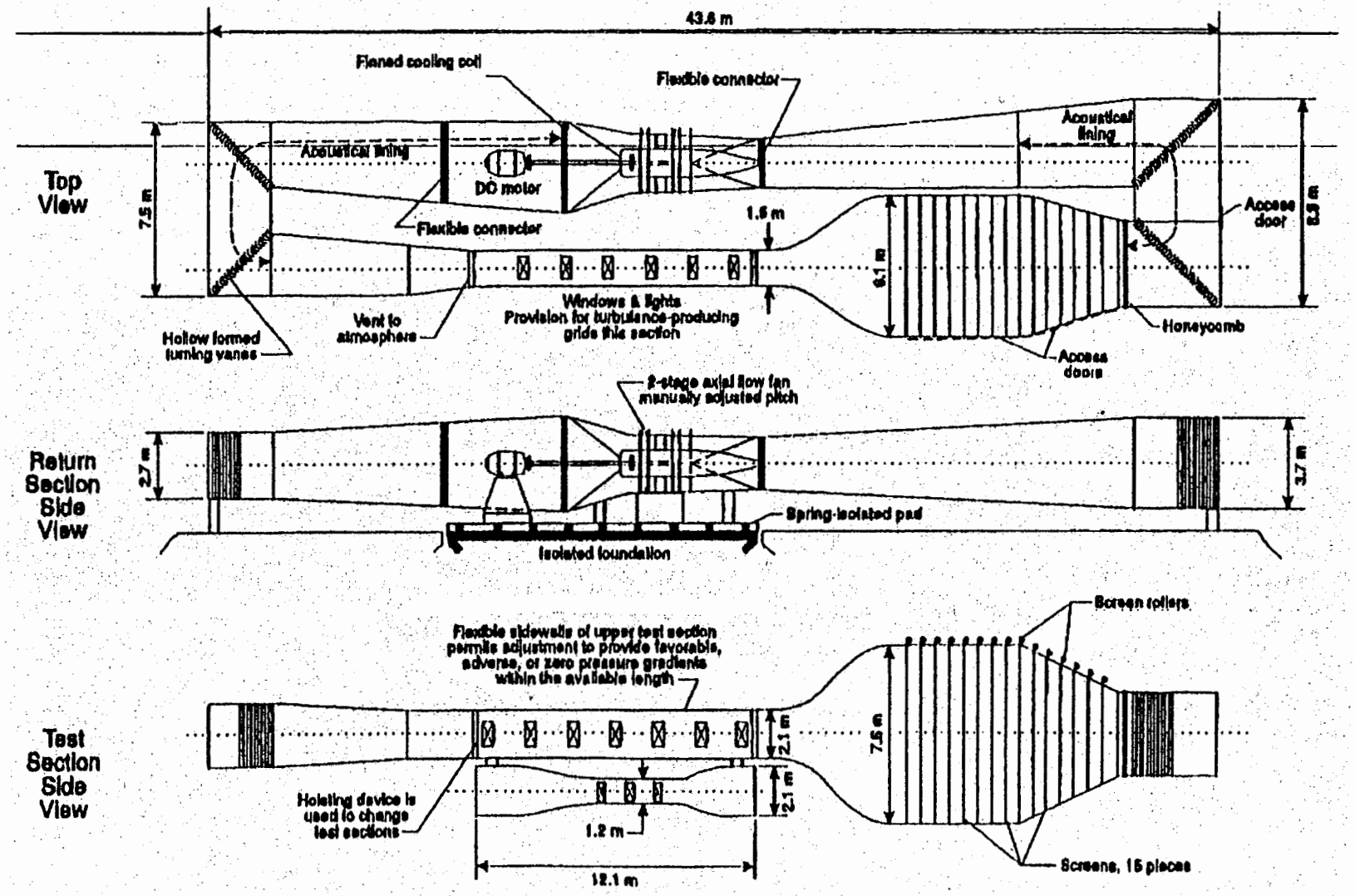


Figure 1. NIST Dual Test Section Wind Tunnel.

2.0 GOALS OF THE WIND TUNNEL TESTS

The wind tunnel tests are designed to provide independent calibrations of the probes used in the field study, and to evaluate the calibration data to determine whether the calibration procedures currently specified in Method 2 and draft Method 2F can be improved.

3.0 PROBE DESCRIPTIONS

Seven probe types will be calibrated at the NIST wind tunnel, namely, two one-dimensional probes (Prandtl and French), three two-dimensional probes (Type S, the Autoprobe with Type S head, and modified Kiel), and two three-dimensional probes (DAT and spherical). One-dimensional probes measure stack gas velocity pressure only and cannot be used to determine flow angles. Two-dimensional probes measure stack gas velocity pressure and can be used to determine yaw angle. Three-dimensional probes are used to measure stack gas velocity pressure and the yaw and pitch angles of the velocity vector, which are used to calculate axial velocity. Table 1 presents a list of the probes, the corresponding identification numbers, and the expected range of pressures for the wind tunnel velocity conditions.

3.1 ONE-DIMENSIONAL PROBES (PRANDTL AND FRENCH)

The Prandtl, or standard pitot, probe used in this project is a 0.25-in. outside diameter (O.D.) stainless steel tube with a 90° bend located approximately 3.5 in. from the hemispherical probe tip (Figure 2). Four, 0.035-in inside diameter (I.D.) static pressure ports are located one inch from the probe tip and positioned 90° apart around the tube. A Type K thermocouple is included in the probe head for gas temperature readings.

The French probe is a cylindrical probe with a solid stainless steel probe head, an impact port with a 15° chamfer on the probe head, and a wake port located at a 180° offset from the impact port (Figure 3). This probe head design does not meet current design specifications in EPA Method 2. Developed by Southern Company Services, the probe is not commercially marketed. The probe design does not include an installed thermocouple. Therefore, a Type K thermocouple is installed on the external sheath of the probe with the thermocouple tip positioned approximately 2 in. from the two pressure ports (in a position as to not interfere with the gas flow around the probe shaft near the pressure ports).

3.2 TWO-DIMENSIONAL PROBES (TYPE S, AUTOPROBE S, AND MODIFIED KIEL)

The Type S pitot probe has been used extensively during field test programs to measure flue gas volumetric flow. The pressure differential between the two face openings (i.e., the impact and static ports) is a function of gas velocity. The probe design and construction specifications of the two pressure tubes are prescribed in EPA Method 2. To enable the Type S probe to be used in determining yaw angles during this flow study, an additional design feature was added to those currently found in Method 2. The impact and static pitot tubes are enclosed in a round, metal sheath. The length of the pitot tubes extending from the sheath to the port openings is 4 in. The metal sheath allows a null position demarcation line to be inscribed along the full length of the probe. It also provides for installation of an angle measurement device for yaw angle determinations, and allows the probe to be rotated in controllable increments. These features are required when determining the yaw angle of the velocity vector.

Table 1. EPA Velocity Probes

Probe Type	Probe Supplier	Probe I.D.	Expected Range of Pressures
One- and Two-dimensional probes			
Prandtl	United Sensor Corp. Amherst, NH	PR-1 PR-2 PR-3 PR-4	ΔP: 0.20" to 1.80" H_2O
French	United Sensor Corp. Amherst, NH	FR-1 FR-2 FR-3 FR-4	ΔP: 0.35" to 3.60" H_2O
Type S	Environmental Supply Co. Durham, NC	S-10 S-11 S-12 S-13	ΔP: 0.30" to 2.70" H_2O
Modified Kiel	United Sensor Corp. Amherst, NH	MK-1 MK-2 MK-3 MK-4	ΔP: 0.3" to 3.5" H_2O
Autoprobe S (Baseline System and Manual Probe)	United Sciences Testing, Inc. Gibsonia, PA	026 (Baseline) 028 (Baseline) 033 (Baseline) 027 (Baseline) 036 (Manual)	ΔP: 0.2" to 2.8" H_2O
Three-dimensional probes			
DAT	Test Contractor-Supplied [each manufactured by United Sensor]	E-DAT K-DAT M-DAT T-DAT	P_1-P_2: 0 to 2" H_2O P_4-P_5: -1" to 1" H_2O
Spherical	United Sensor Corp. Amherst, NH	SPH-1 SPH-2 SPH-3 SPH-4 SPH-5 SPH-6 SPH-7 SPH-8	P_1-P_2: 0 to 2" H_2O P_4-P_5: -3" to 3" H_2O

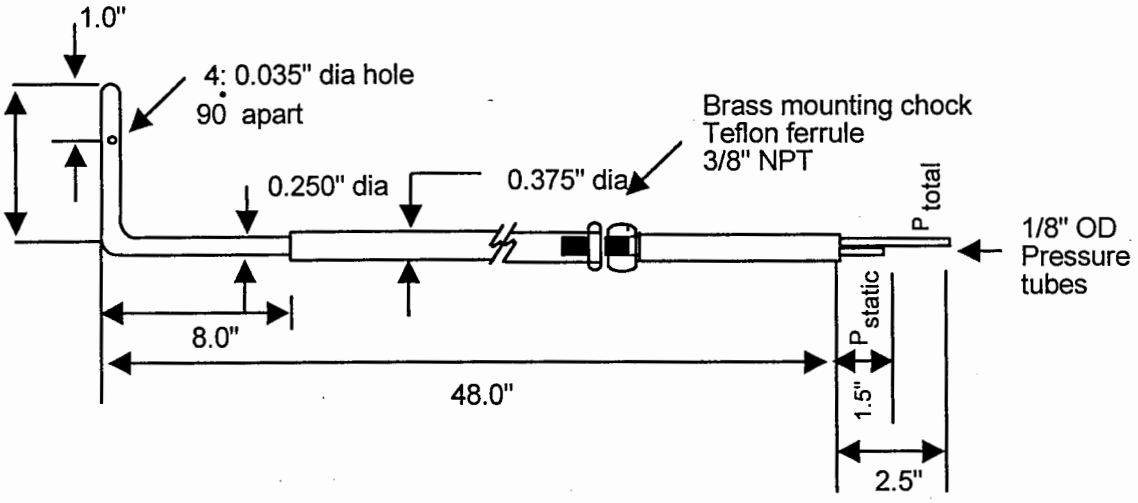


Figure 2. Construction details of the Prandtl probe.

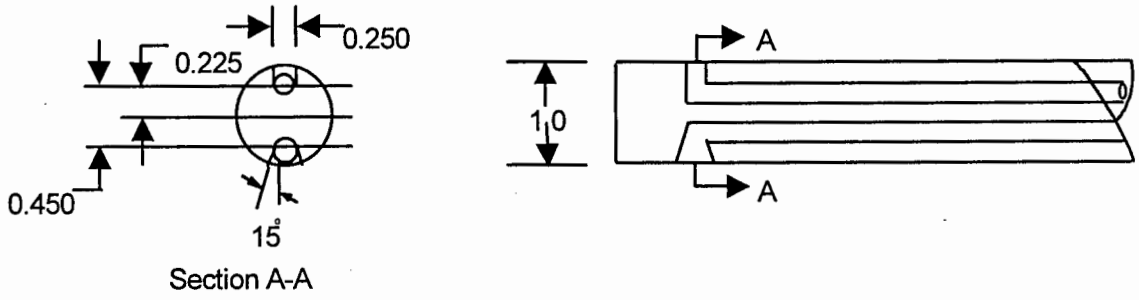


Figure 3. Construction details of French probe.

Clockwise rotation of the probe to find the yaw null yields a positive yaw angle, while counterclockwise rotation is negative. Figure 4 is an illustration showing the Type S probe used in this study. Each probe included a Type K thermocouple installed within a well with the tip positioned approximately 1.5 in. from the pressure ports.

The United Sciences Testing, Inc. (USTI) Autoprobe uses the Type S pitot probe tip to measure flue gas pressure.

The "modified" Kiel probe, shown in Figure 5, is a standard Kiel probe with a wake port and two Fechheimer ports added. The wake port is offset 180° and located 3.625 in. down the probe shaft from the Kiel's impact port. The Fechheimer ports are each offset 30° from the impact port and are located 2.375 in. down the probe shaft from the center of the impact port. The Fechheimer ports enable the probe to be rotated to find the yaw-null position, similar to the procedure used for the DAT and spherical probes. Clockwise rotation of the probe to find the yaw null yields a positive yaw angle, while counterclockwise rotation is negative. The pressure differential between the impact and wake (static) ports is a function of gas velocity. Each modified Kiel probe includes an installed thermocouple with the tip positioned directly behind the impact port.

3.3 THREE-DIMENSIONAL PROBES (DAT AND SPHERICAL)

Three-dimensional probes provide a measure of both yaw and pitch angles of gas flow using five ports on the sensing head of the probe. The ports are numbered 1 through 5, and the pressures measured at each are referred to as P_1, P_2, P_3, P_4, and P_5. The DAT and spherical probes are illustrated in Figures 6 and 7, respectively. Ports P_2 and P_3 are located symmetrically on either side of impact pressure port P_1. The ports used to determine the pitch, i.e., P_4 and P_5, are in opposite positions on the DAT and spherical probe heads, but are oriented to face the same direction of gas flow by the shape of each probe head.

The pressure differential between P_1 and P_2 is a function of gas velocity. The P_2 and P_3 pressure differential readings are used to yaw null the probe. Clockwise rotation of the probe to find the yaw null yields a positive yaw angle, while counterclockwise rotation is negative. The pressure differential between P_4 and P_5 is a function of pitch angle and gas stream velocity. The pitch angle is obtained from a calibration curve that plots the ratio $F_1 = (P_4 - P_5) / (P_1 - P_2)$ versus pitch angle. Flow toward the tester ($P_4 > P_5$) is considered positive pitch, and flow away from the tester ($P_5 > P_4$) is considered negative pitch. The probe's calibration curve also provides values of the velocity factor $F_2 = C_{ps} [(P_t - P_s) / (P_1 - P_2)]^{1/2}$ as a function of pitch angle. Equation 2F–2 in draft Method 2F is used to relate yaw and pitch angles, F_2, and (P_1-P_2) to axial velocity.

3.4 PRESSURE MEASUREMENT DEVICES

To assess the accuracy of pressure reading instrumentation, data will be obtained using three types of pressure devices: inclined manometers, electronic transducers, and magnehelic gauges. The requirements for the pressure measurement devices are shown in Table 2. All such devices must meet the calibration requirements of 40 CFR Part 60, Appendix A, Method 2, §2.2. Calibrations and, if available, traceability to a NIST standard should be documented.

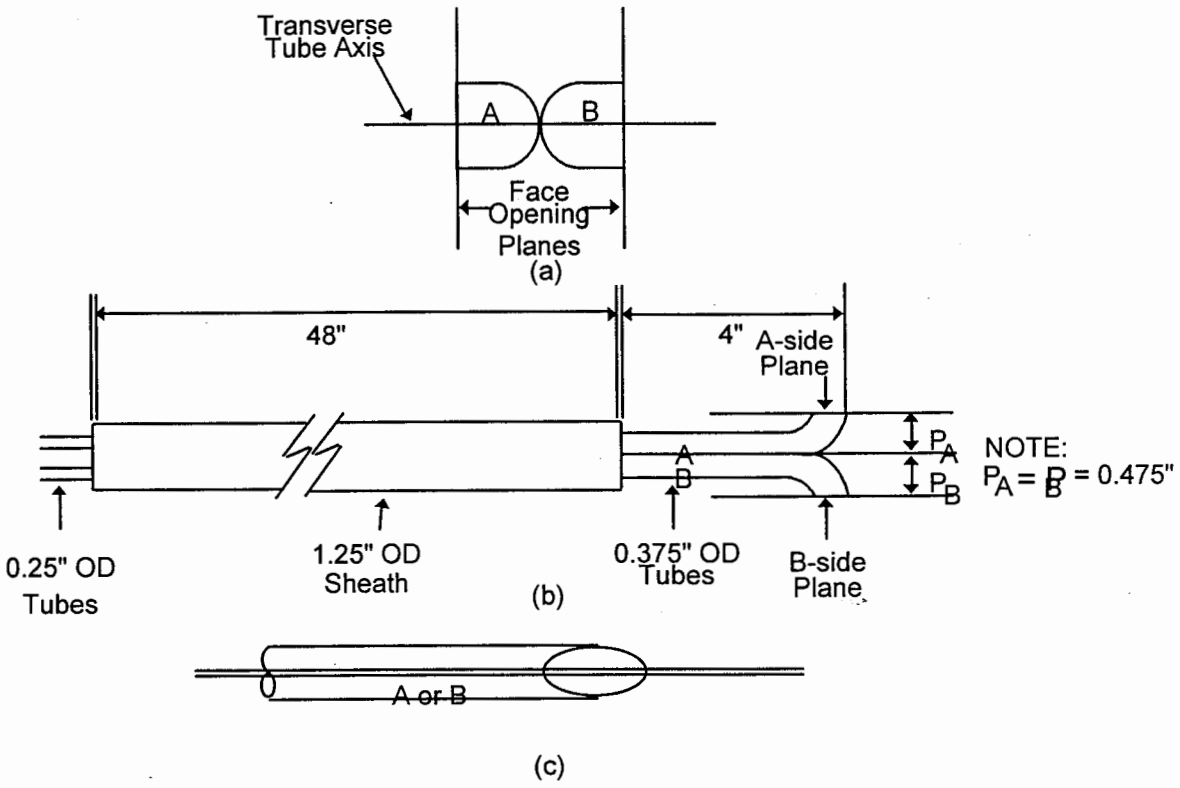


Figure 4. Schematic showing the design of the four Type S probes used in this study.

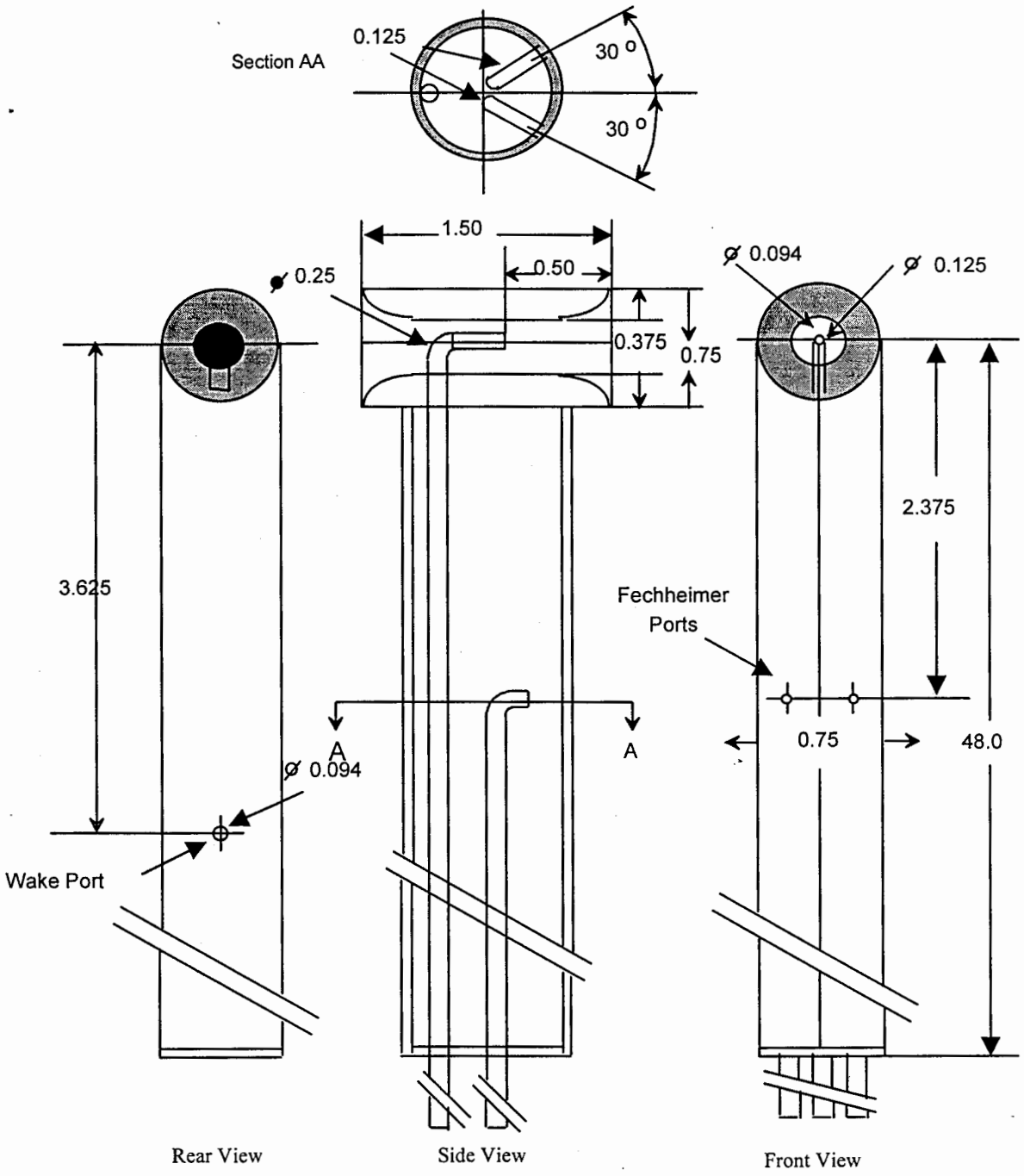


Figure 5. Schematic of modified Kiel probe.

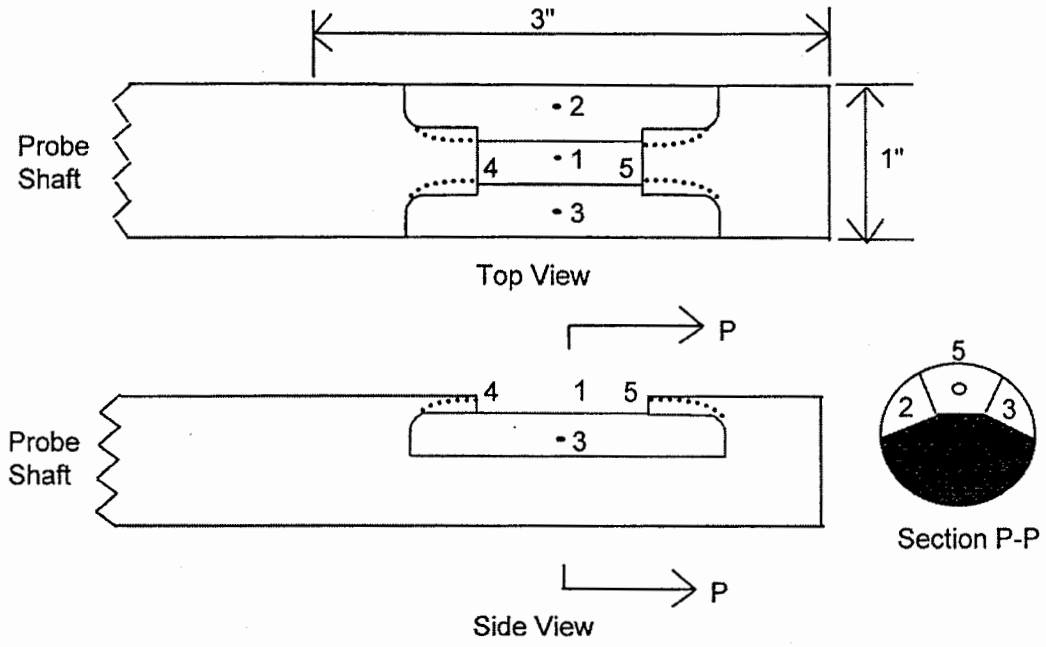


Figure 6. Top, side, and cross-sectional views of DAT probe.

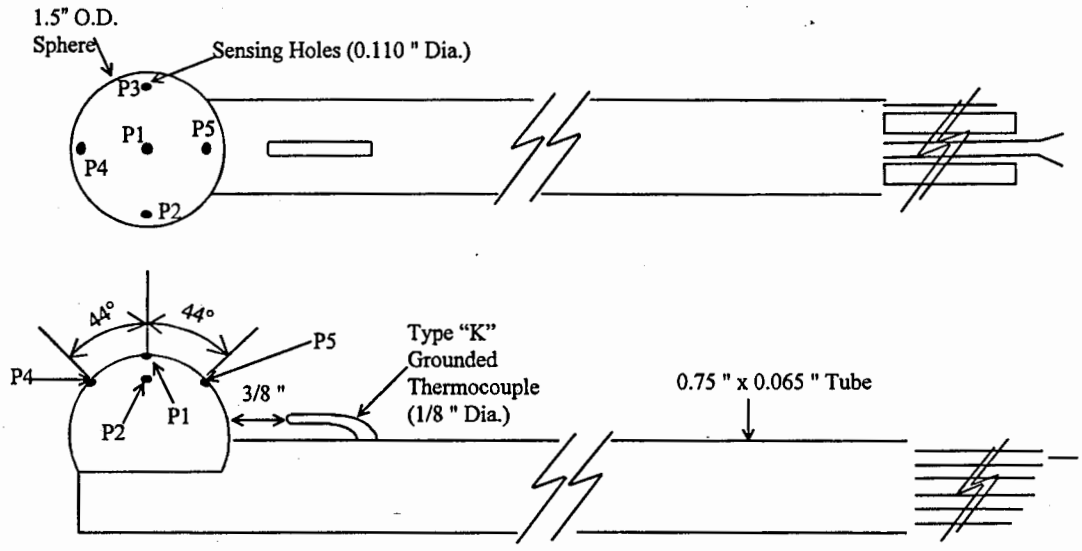


Figure 7. Front and side views of spherical probe.

Table 2. Requirements for Differential Pressure Measurement Devices

Device Type	Description/Specifications	Example	Notes
Inclined Manometer	Pressure range: -5 to 145 cm benzene Scale gradations: 0.1 cm benzene Inclined scale length: 60 in.	Meriam Instrument (Cleveland, Ohio) Model 40HEX35 Inclined Tube Manometer	For calibrating three-dimensional probes (i.e., DAT and spherical), a valving system will be required to enable selection of the appropriate pressure tubes (P_1-P_2 or P_4-P_5) for measurement. Alternatively, two separate manometers may be used during testing: one for measuring the velocity pressure (P_1 - P_2) and one for measuring the pitch angle pressure (P_4 - P_5). Because the P_4-P_5 pressure readings for the three-dimensional probes will be positive or negative, a valving system will be required to enable reversal of the pressure taps to obtain a positive deflection on the manometer.
Magnehelic Gauges	Pressure ranges: Magnehelic gauges connected in parallel with the ranges shown in the adjacent example are required. These ranges should cover the highest and lowest pressure readings expected from the tested probes. Accuracy: Capability of measuring pressure differentials to ±2 % of scale.	Dwyer Instruments, Inc. (Michigan City, Indiana) Range: 0-0.25, Div: 0.01 in H_2O : Model 2000-00 Range: 0-0.5, Div: 0.01 in H_2O: Model 2000-0 Range: 0-1, Div: 0.02 in H_2O: Model 2001 Range: 0-2, Div: 0.05 in H_2O: Model 2002 Range: 0-5, Div: 0.2 in H_2O: Model 2005 Range: ±0.5, Div: 0.02 in H_2O: Model 2301	The gauges will be configured to provide readings for all probes. The configuration would provide velocity pressure (P_1-P_2) and pitch pressure (P_4-P_5) readings for pressure ranges from 0-0.5 to 0-5 in. H_2O. Because the P_4-P_5 pressure readings for the three-dimensional probes will be positive or negative, a valving system will be required to enable reversal of the pressure taps to obtain a positive deflection on the one-directional gauges. The gauge used for yaw nulling the probes must have a bi-directional range because those readings can be either positive or negative.
Electronic Micromanometer	Range: 0.0001 to ±20 in. H_2O Accuracy: Capability of measuring pressure differentials within ±2% of reading ± one digit.	Shortridge Instruments, Inc. (Scottsdale, Arizona) AirData Multimeter Model ADM-880	For calibrating three-dimensional probes, a valving system will be required to enable selection of the appropriate pressure tubes (P_1-P_2 or P_4-P_5) for measurement. A signal processor (e.g., a datalogger, digital readout meter, or controller) shall be used to automatically record measurements.

General Notes

1. All pressure measurement devices must meet the calibration requirements of 40 CFR Part 60, App. A, Method 2, §2.2. If available, traceability to a NIST standard should be documented.
2. A magnehelic gauge with a bi-directional range of -0.5 to +0.5 in. of H_2O is the recommended type of pressure measurement device to be used in performing the yaw nulling procedure for the three- and two-dimensional probes (i.e., Type S and modified Kiel probes). A separate pressure measurement device must be used for yaw nulling. It may not be the same device as used for determining velocity pressure and pitch angle pressure.

NIST will provide the wind tunnel, the NIST standard pitot tube used in determining the wind speed in the tunnel, NIST standard devices for measuring temperature and pressure, three types of differential pressure measurement devices (inclined manometers, magnehelic gauges, and electronic pressure transducers) for use with the test probes, and connecting tubing, wires, clamps, and supports. The Cadmus Group, Inc., under contract to EPA, will provide the field test probes to be calibrated, probe block collars and angle measuring device to be used for yaw angle measurements.

NIST standard probe pressure measurements are made using an MKS 10 Torr pressure transducer and MKS Type 270 signal conditioner. The signals are recorded and converted to the desired units by a computer-based data acquisition system.

The inclined manometer has a scale length of 60 inches. The pressure range is -5 cm to 145 cm benzene (NIST fluid of choice), with scale graduations of 0.1 cm. The manometer fluid level is zeroed before each series of test velocities. A cathotometer (or telescope) is used by the operator to read the fluid column while setting to zero. During the calibrations, pressure readings are visually made from the manometer using a magnifying glass and then recorded on a data form. The readings are converted to an equivalent unit of measurement for direct comparison to the NIST probe pressure readings (in. H_2O).

The Shortridge Instruments, Inc. AirData Multilogger Model ADM-880 is an electronic micromanometer which provides pressure measurements over the range of 0.0001 to ±60 in H_2O. The pressure readings are recorded by a laptop computer.

The magnehelic gauge console is comprised of seven gauges used to read velocity, yaw, and pitch pressures. Three gauges (0-0.5 in., 0-2 in., and 0-5 in. H_2O scales) are used in parallel for the velocity pressure readings. One bi-directional gauge (-0.5 in. to +5 in. H_2O) is used to yaw null the probes. Another set of three gauges (0-0.25 in., 0-1 in., and 0-5 in. H_2O scales) is used in parallel for the pitch pressure readings from the three-dimensional probes. Pitch pressure readings will be either positive or negative, depending upon the pitch orientation of the probe in the wind tunnel. A ball valve is used to configure the pressure taps to provide a reading on the gauges. The valve positions are labeled to indicate whether the pressure reading is positive or negative. NIST will perform a multi-point calibration on these gauges, except for the one used for yaw nulling, as required by Method 2.

4.0 TEST PROCEDURES

The probe calibration procedures to be followed are based on the current specifications in EPA Methods 1, 2, and draft 2F. In addition, a test method revision currently under consideration will be implemented. A yaw nulling procedure (TM2-3) will be performed as a QA check to ensure that the yaw null found using a probe is within ±2° of true zero and to verify the yaw null position markings previously inscribed on each probe. These procedures are described in the following subsections; copies of applicable methods and procedures are in the appendices to this document.

As shown in Tables 3 and 4, five replicate measurements will be taken at each velocity setting for one- and two-dimensional probes and at each velocity and pitch angle setting for three-dimensional probes. Probes will remain in the wind tunnel during each transition between velocity points. Upon completion of the first set of calibrations at the three velocities, the wind tunnel will be shut down. The operator will misadjust the probe rotational position, then repeat the probe set-up procedures

(i.e., verify the alignment of the digital inclinometer to the probe head and measure the probe tip insertion depth in the tunnel). After the wind tunnel velocity is again set to 30 fps, perform the yaw-nulling procedure at the 30 fps velocity point, and then repeat the calibration routine at the three velocities.

Table 3. Design Matrix for One- and Two-Dimensional Probe Calibrations

Probe Type	Copies of Probe	Velocity Points (fps)	Rep. Meas. at Each Velocity	Repetitions
Type S	4	30 60 90	5	2
Modified Kiel	4			
French	4			
Prandtl	4			
Autoprobe	4			

Table 4. Design Matrix for Three-Dimensional Probe Calibrations

Probe Type	Copies of Probe	Velocity Points (fps)	Pitch Angle Settings	Replicate Measurements at Each Velocity and Pitch Setting	Repetitions
DAT	4	30 60 90	13 (from -30° to +30° in 5° increments)	5	2
Spherical	8				

Three separate measurements of pressure will be taken at each calibration point: one with an inclined manometer, another with a magnehelic gauge, and one with an electronic device.

Upon completion of the calibration on the first copy of each probe type, the results will be tabulated and transmitted (by fax or modem) to EPA for a quick review. EPA will then notify NIST personnel whether to continue with the calibrations on the remaining probe copies or possibly interrupt the calibration process to resolve a question or concern.

4.1 EQUIPMENT SET UP

The three types of pressure devices will be connected in parallel to provide concurrent pressure readings from the tested probe. Leak checks will be performed after all pressure line connections are made between the pressure devices and the probe. Both pressure lines of the one- and two-dimensional probes are checked. Pressure of approximately 3 in. H_2O is applied to the impact side of the probe and then sealed. The pressure reading must remain stable for at least 15 seconds to achieve an acceptable leak check. The procedure is repeated for the static side with a vacuum applied. The three-dimensional probes are leak-checked in a similar fashion by applying either a pressure or vacuum (whichever is applicable) of 3 in. H_2O to one of the five ports and sealed. Each pressure port is checked individually.

4.2 YAW NULLING CALIBRATION

For probes used to determine the yaw angle of flow (i.e., all probes except the Prandtl and French), a check will be performed to ensure that the yaw null found using a probe is within ±2° of true zero. This procedure was used during an earlier wind tunnel calibration routine to establish each individual probe's true yaw null position. A demarcation line was then placed along the length of the probe shaft to serve as a yaw null reference for subsequent use. This procedure will verify that the yaw angle measurement device, once attached to the probe and aligned with the demarcation line, correctly indicates the rotational position of the probe head to within ±2°.

Affix the digital inclinometer to the probe using the supplied probe collar. Align the reference mark on the collar with the probe's demarcation line (i.e., a previously established yaw null reference line). Insert the probe into the wind tunnel test section. At each wind tunnel gas velocity (30, 60, and 90 fps), perform the yaw null procedure specific to the probe type. The yaw angle reading from the digital inclinometer must be within ±2° of 0 for this result to be considered acceptable.

The five Autoprobes and four DAT probes do not have a yaw null demarcation line inscribed on the probe shafts. The following procedure is used to set up the digital inclinometer on these probe shafts. With the Autoprobe held in a horizontal position, place a small carpenters level on the side of the two pitot tubes and rotate the probe to provide an approximate 0° or 90° reference yaw angle position of the pitot tips. Maintain this rotational position while the digital inclinometer and probe collar are affixed to the probe shaft. A similar set up procedure is used for the DAT probes. With the probe held in a horizontal position, place a small carpenters level on the flat where the P_1 port is located. Then rotate the probe to provide an approximate 0° or 90° reference yaw angle position of the probe head. Maintain this rotational position while the digital inclinometer and probe collar are affixed to the probe shaft.

4.3 ONE- AND TWO-DIMENSIONAL PROBE CALIBRATION

All one- and two-dimensional probe calibrations are conducted with the probe tip positioned at the center of the wind tunnel test section and perpendicular to the flow (i.e., 0° pitch).

The Prandtl probe is placed into the gas stream with the probe tip facing upstream (i.e., the impact port aligned parallel and the stem perpendicular to the longitudinal axis of the wind tunnel test section). The French probe is operated with the impact and wake ports positioned parallel to the wind tunnel axis. Neither probe design can be used to determine yaw angles in the gas flow.

With the Type S and Autoprobe Type S probes, the yaw angle is determined by rotating the probe until a null differential pressure reading is obtained. (Each leg of the Type S probes is identified as either the impact leg or the static leg.) The probe head is then rotated 90° back to orient the impact opening into the direction of flow. In this position, the yaw angle is the rotational angle between the pitot impact port and the longitudinal axis of the stack, as indicated by the digital inclinometer. The differential pressure reading is recorded at this probe rotational position.

Using the two Fechheimer ports, the modified Kiel probe is yaw nulled in the same way as the DAT probe. The Fechheimer ports are located symmetrically on either side of the probe centerline. These ports correspond to ports P_2 and P_3 on the DAT probe. To yaw null, the probe is rotated to obtain a zero differential pressure between the two Fechheimer ports. The yaw angle is read from the

digital inclinometer. With the Fechheimer ports nulled, the Kiel cylinder impact port is aligned with the flow. The differential pressure between the impact and static ports (i.e., wake port) is recorded.

The one- and two-dimensional probe calibration procedure consists of the following steps:

1. Set the wind tunnel gas velocity, as determined by the standard pitot tube, to 30 fps (±2 fps). Record the pressure readings necessary to calculate the actual wind velocity from the tunnel's standard pitot.

2. Insert the tested probe with the probe tip positioned at the center of the wind tunnel test section. Set the pitch angle position of the probe to 0°.

3. Rotate the probe to determine the yaw null position using the procedures previously described for the respective probe type. At the yaw null position, record the actual alignment of the probe as indicated by the digital inclinometer.

4. Record the differential pressure reading provided by each of the three pressure device types. Make five replicate readings while at this probe position.

5. Increase the wind tunnel speed to 60 fps and repeat steps 3–4.

6. Repeat steps 3–4 at 90 fps.

7. Repeat steps 1–6 to obtain a series of duplicate calibrations for the probe.

Differential pressures for the one- and two-dimensional probes and the NIST standard pitot tube will be measured in addition to the yaw null angle. These measurements will be recorded on a data form similar to the one presented as Table 5. The averaged value resulting from the five replicate pressure readings will be used to calculate the probe's calibration coefficient, Cp, at each velocity using the following equation:

$$Cp = \sqrt{\frac{\Delta P_{std}}{\Delta P_t}}$$

where,

C_p = calibration coefficient;
ΔP_{std} = differential pressure for the standard pitot tube; and
ΔP_t = differential pressure for the tested probe.

4.4 THREE-DIMENSIONAL PROBE CALIBRATION

All three-dimensional probe calibrations are conducted with the probe tip positioned at the center of the wind tunnel test section. The DAT and spherical probes are yaw nulled by rotating the probe until a zero differential pressure between ports P_2 and P_3 is obtained. The yaw angle is determined using the digital inclinometer. Calibration curves specified in draft Method 2F will be derived at 30, 60, and 90 fps. The three-dimensional probe calibration procedure consists of the following steps:

Table 5. One- and Two-Dimensional Probe Calibration

Probe ID: _____ Date: _____

Side: _____ P_{bar}: _____

Nominal Velocity	Replicate Reading	Standard Pitot Probe ΔP_{std}	Yaw Angle	Tested Probe ΔP_t	Temperature (°F)	Calculated C_p
30	1					
	2					
	3					
	4					
	5					
	Average					
60	1					
	2					
	3					
	4					
	5					
	Average					
90	1					
	2					
	3					
	4					
	5					
	Average					

Note: No yaw angles will be obtained for the one-dimensional probes.

1. Set the wind tunnel gas velocity, as determined by the standard pitot tube, to 30 fps (±2 fps). Record the pressure readings necessary to calculate the actual wind velocity from the tunnel's standard pitot.

2. Set up the protractor platform to establish the pitch angles to within ±1°.

3. Insert the probe with the probe tip positioned at the center of the wind tunnel test section.

4. Position the probe at the -30° pitch position.

5. Rotate the probe to find the yaw null position (P_2-P_3 reading is zero) using the magnehelic gauge that is used solely for the yaw null readings. Read and record the actual alignment of the probe as indicated by the digital inclinometer (should be within ±2° of 0°).

6. Record the P_1-P_2 and P_4-P_5 pressure readings provided by all three pressure device types. Make five replicate pressure readings while at this yaw and pitch angle position. Ensure that the probe has remained in the same position during the readings.

7. Repeat steps 4–6 at pitch angles of -25°, -20°, -15°, -10°, -5°, 0°, 5°, 10°, 15°, 20°, 25°, and 30° at 30 fps.

8. Repeat steps 4–7 at velocities of 60 fps and 90 fps.

9. Repeat steps 1–8 to obtain a series of duplicate measurements for the probe.

10. Average the F_1 and the F_2 ratios obtained for each pitch angle in the three flow ranges, and plot a calibration curve with the average values versus the pitch angle. Draw a smooth line through the data points. For each measured F_1 data value at each velocity, determine the pitch angles and the corresponding F_2 values from the smoothed-out calibration curve. Determine the differences from the actual measured angles and F_2 values. For F_1, the difference at each comparison must be within ±2° for all angles. For F_2 values, the difference should not exceed ±3.0 percent from the F_2 ratio at the same pitch angle. If agreement is not within these specifications, resolve the problem and repeat the calibration.

Differential pressures for the three-dimensional probes and the standard pitot tube will be measured in addition to the yaw null and pitch angles. These measurements will be recorded on a data form similar to the one presented as Table 6. The averaged F_1 and F_2 values resulting from the two sets of five replicate pressure readings will be used to calculate the probe's calibration curves at each velocity.

5.0 CALIBRATION REPORTS

For each type of tested probe, NIST will prepare a report containing calibration coefficients and/or calibration curves (as appropriate) for each specific probe tested. The reports will include the items listed below and any additional information specified in EPA's Methods 1, 2, and draft 2F. The reports will be produced in NIST's Special Test Report format.

- For each one- and two-dimensional probe, separate calibration coefficients will be derived at 30, 60, and 90 fps.

- For three-dimensional probes, the following will be included: (1) a calibration curve of F_1 or $(P_4 - P_5)/(P_1 - P_2)$ readings against known pitch angles; (2) a calibration curve of the three-dimensional pitot coefficient F_2 or C_{ps} $[(P_t - P_s)/(P_1 - P_2)]^{½}$ against known pitch angles (where C_{ps} is the standard pitot tube coefficient); and (3) tables of the constituent values used to produce these calibration curves. The sample calibration curves are illustrated in Figure 2F-4 in draft Method 2F.

Two sets of calibration curves will be produced for each three-dimensional probe: one set derived by averaging measurements taken at 30 and 60 fps at each pitch angle; the other derived by averaging the measurements taken at 30, 60, and 90 fps at each pitch angle.

Table 6. Three-Dimensional Probe Calibration

Probe ID: _____ Date: _____

Repetition: _____ P_{bar}: _____

Nominal Velocity:

Pitch Angle (degrees)	Standard Pitot ΔP_{std} (in. H_2O)	Tested Probe			Temperature (°F)
		Yaw Angle (degrees)	Velocity Pressure P_1-P_2 (in. H_2O)	Pitch Pressure P_4-P_5 (in. H_2O)	
-30°					
-25°					
-20°					
-15°					
-10°					
-5°					
0°					
5°					
10°					
15°					
20°					
25°					
30°					

- For each probe, three separate sets of calibration results will be calculated using the pressure measurements obtained by each of the three pressure measurement devices (i.e., inclined manometer, magnehelic gauges, and electronic pressure devices).

- The calibration reports will include the pertinent documentation on the specifications of the wind tunnel, pressure measurement devices, and associated equipment used in the calibrations by NIST. As appropriate, the type of information shall include: model number, serial number, copies of certificates of traceability, calibration data or report, pressure rating, temperature rating, operating range, scale divisions, accuracy, repeatability, and linearity.

6.0 WIND TUNNEL TEST SCHEDULE

The probe calibrations will be conducted during the period of December 1, 1997 through January 31, 1998. EPA prefers that the calibrations be conducted in the order the probes are listed in Table 7.

Table 7. Testing and Reporting Deadlines

Probe Type	Probe Copies	Deadlines	
		Completion of Probe Testing	Submittal of Calibration Reports
Autoprobe	5	10 working days after commencement of calibrations	15 working days after completion of wind tunnel testing of this probe type
DAT	4	15 working days after commencement of DAT probe calibrations	15 working days after completion of wind tunnel testing of this probe type
Spherical French Modified Kiel Type S Prandtl	8 4 4 4 4	30 working days after commencement of work on this group of probes	15 working days after completion of wind tunnel testing of this probe type

Table C2-1. One- and Two-Dimensional Probe Calibration Summary at 60 fps

Probe Type	Probe Identification	NCSU Post-Test Cp	NIST Cp	Percent Difference *
Prandtl	PR-1	0.982	0.997	-1.5
	PR-2	0.970	0.989	-1.9
	PR-3	0.972	0.989	-1.7
	PR-4	0.970	0.989	-1.9
French	FR-1	0.705	0.709	-0.6
	FR-2	0.699	0.709	-1.4
	FR-3	0.711	0.710	0.1
	FR-4	0.699	0.709	-1.4
Type S	S-10	0.790	0.802	-1.5
	S-11	0.797	0.805	-1.0
	S-12	0.796	0.791	0.6
	S-13	0.797	0.809	-1.5
Autoprobe Type S	26	0.784	0.794	-1.3
	26	0.785	0.793	-1.0
	28	0.779	0.796	-2.1
	33	0.780	0.792	-1.5
	36	0.775	0.785	-1.3
Modified Kiel	MK-1	0.734	0.748	-1.9
	MK-2	0.747	0.749	-0.3
	MK-3	0.746	0.751	-0.7
	MK-4	0.744	0.747	-0.4

* % difference = [(NCSU Cp - NIST Cp) / NIST Cp] x 100

Table C2-2. DAT Probe Calibration Summary (avg. of 30 ft/sec and 60 ft/sec results)

Pitch Angle	Probe	NCSU Post-Test Calibration (9/17/97)		NIST Calibration		Percent Difference *
		F1	F2	F1	F2	F2
-30	E-DAT	-0.47729	1.04146	-0.6284	1.0828	-3.8
-25		-0.41179	1.02660	-0.4982	1.0728	-4.3
-20		-0.33238	1.01820	-0.3965	1.0681	-4.7
-15		-0.27050	1.00592	-0.3081	1.0522	-4.4
-10		-0.17458	0.99515	-0.2047	1.0253	-2.9
-5		-0.09484	0.99446	-0.1161	1.0035	-0.9
0		-0.04309	0.98117	-0.0482	0.9991	-1.8
5		0.02609	0.97781	0.0260	0.9923	-1.5
10		0.07471	0.97584	0.0846	0.9884	-1.3
15		0.18289	0.97622	0.1619	0.9915	-1.5
20		0.23620	0.96001	0.2365	0.9712	-1.2
25		0.31763	0.95254	0.3050	0.9543	-0.2
30		0.49202	0.96902	0.3946	0.9590	1.0
-30	K-DAT	-0.67962	1.09017	-0.7111	1.1122	-2.0
-25		-0.51028	1.07095	-0.5640	1.0959	-2.3
-20		-0.39533	1.04927	-0.4220	1.0668	-1.6
-15		-0.27409	1.03074	-0.3126	1.0454	-1.4
-10		-0.19434	1.02551	-0.2051	1.0102	1.5
-5		-0.14155	1.01992	-0.1182	1.0021	1.8
0		-0.07720	1.01573	-0.0385	1.0038	1.2
5		-0.03789	1.01276	0.0220	0.9917	2.1
10		0.04340	1.00771	0.0907	0.9941	1.4
15		0.10894	0.99405	0.1634	0.9911	0.3
20		0.20755	1.00064	0.2447	0.9965	0.4
25		0.27048	1.01247	0.3540	1.0150	-0.2
30		0.42102	1.03204	0.4847	1.0351	-0.3
-30	C-DAT	-0.52181	1.06801	-0.6400	1.1084	-3.6
-25		-0.40618	1.04594	-0.5008	1.0782	-3.0
-20		-0.32820	1.02184	-0.3932	1.0676	-4.3
-15		-0.22282	1.02023	-0.2912	1.0511	-2.9
-10		-0.16584	1.01749	-0.1970	1.0365	-1.8
-5		-0.09747	1.01995	-0.0986	1.0341	-1.4
0		-0.03737	1.01671	-0.0290	1.0294	-1.2
5		0.02572	1.01470	0.0291	1.0177	-0.3
10		0.08663	1.01136	0.1102	1.0277	-1.6
15		0.17102	1.00686	0.2016	1.0271	-2.0
20		0.25366	1.00621	0.2720	1.0163	-1.0
25		0.33780	1.01476	0.3709	1.0331	-1.8
30		0.43037	1.03342	0.4939	1.0606	-2.6
-30	T-DAT	-0.61006	1.08948	-0.7395	1.1229	-3.0
-25		-0.49503	1.07029	-0.5841	1.1002	-2.7
-20		-0.40612	1.05069	-0.4506	1.0807	-2.8
-15		-0.32021	1.01940	-0.3355	1.0559	-3.5
-10		-0.19589	1.00938	-0.2147	1.0196	-1.0
-5		-0.10389	1.00686	-0.1197	1.0110	-0.4
0		-0.03684	1.00477	-0.0478	0.9998	0.5
5		0.00205	1.00477	0.0347	0.9926	1.2
10		0.07111	1.00519	0.0916	0.9977	0.8
15		0.15823	1.00060	0.1772	1.0060	-0.5
20		0.24249	0.99736	0.2644	1.0030	-0.6
25		0.32914	0.98776	0.3578	1.0044	-1.7
30		0.45190	1.00371	0.4791	1.0289	-2.4

* % difference = [(F2,NCSU - F2,NIST)/F2,NIST] * 100

Table C2-3. Spherical Probe Calibration Summary (avg. of 30 ft/sec and 60 ft/sec results)

Pitch Angle	Probe	NCSU Post-Test Calibration (10/28/97)		NIST Calibration		Percent Difference *
		F1	F2	F1	F2	F2
-30	SPH-1	-2.12646	1.17587	-2.2370	1.2087	-2.7
-25		-1.95761	1.09101	-2.0694	1.1256	-3.1
-20		-1.65031	1.02602	-1.7947	1.0597	-3.2
-15		-1.38776	0.99855	-1.4816	1.0214	-2.2
-10		-1.00297	0.98009	-1.1667	0.9990	-1.9
-5		-0.69172	0.98173	-0.6811	0.9802	0.2
0		-0.34915	0.98672	-0.3117	0.9946	-0.8
5		0.01025	0.98857	0.0349	1.0031	-1.4
10		0.26544	0.99892	0.4277	1.0180	-1.9
15		0.87006	1.01677	0.8334	1.0330	-1.6
20		1.32029	1.04538	1.2392	1.0583	-1.2
25		1.74062	1.08355	1.6265	1.0810	0.2
30		2.13709	1.13068	2.1648	1.1605	-2.6
-30	SPH-2	-2.14775	1.17257	-2.1840	1.2061	-2.8
-25		-1.94227	1.07439	-2.0150	1.1157	-3.7
-20		-1.65462	1.02820	-1.7490	1.0585	-2.9
-15		-1.35578	1.00790	-1.4020	1.0243	-1.6
-10		-0.90879	0.99823	-1.0612	1.0096	-1.1
-5		-0.63303	0.99718	-0.6842	1.0050	-0.8
0		-0.26920	1.00100	-0.2952	1.0132	-1.2
5		0.05729	1.00640	0.0642	1.0158	-0.9
10		0.47572	1.01637	0.4859	1.0224	-0.6
15		0.98936	1.03248	0.9116	1.0456	-1.3
20		1.37530	1.05809	1.3427	1.0763	-1.7
25		1.84329	1.09745	1.7777	1.1139	-1.5
30		2.25874	1.14724	2.2379	1.1737	-2.3
-30	SPH-3	-2.23533	1.18953	-2.3510	1.2379	-3.9
-25		-2.01675	1.08661	-2.0610	1.1717	-7.3
-20		-1.74154	1.02635	-1.9406	1.0729	-4.3
-15		-1.49391	1.00552	-1.5993	1.0361	-3.0
-10		-1.10075	0.99151	-1.2163	1.0136	-2.2
-5		-0.74510	0.99066	-0.8341	1.0035	-1.3
0		-0.33037	0.99234	-0.4436	1.0035	-1.1
5		-0.03384	0.99864	-0.0366	1.0088	-1.0
10		0.25483	1.00292	0.3676	1.0145	-1.1
15		0.63445	1.01380	0.7807	1.0273	-1.3
20		1.24244	1.03652	1.1901	1.0504	-1.3
25		1.61737	1.06755	1.6322	1.0954	-2.5
30		2.09201	1.11341	2.0593	1.1370	-2.1
-30	SPH-4	-2.20009	1.16874	-2.1872	1.2213	-4.3
-25		-1.92268	1.07962	-2.0128	1.1398	-5.3
-20		-1.60999	1.02322	-1.7697	1.0669	-4.1
-15		-1.32574	0.99006	-1.4466	1.0233	-3.2
-10		-0.89706	0.97509	-1.0566	0.9990	-2.4
-5		-0.60567	0.97170	-0.6704	0.9881	-1.7
0		-0.25178	0.97607	-0.2476	0.9891	-1.3
5		0.06062	0.98572	0.0339	0.9976	-1.2
10		0.32925	0.99217	0.4440	1.0126	-2.0
15		0.82478	1.01502	0.8508	1.0312	-1.6
20		1.33843	1.03856	1.2300	1.0535	-1.4
25		1.77231	1.06775	1.6642	1.0907	-2.1
30		2.15674	1.12065	2.1221	1.1428	-1.9

Table C2-3. Spherical Probe Calibration Summary (avg. of 30 ft/sec and 60 ft/sec results)

Pitch Angle	Probe	NCSU Post-Test Calibration (10/28/97)		NIST Calibration		Percent Difference *
		F1	F2	F1	F2	F2
-30	SPH-5	-2.27879	1.19951	-2.4318	1.2584	-4.7
-25		-1.95097	1.13528	-2.1467	1.1784	-3.7
-20		-1.54001	1.08156	-1.7378	1.1198	-3.4
-15		-1.10060	1.05388	-1.2937	1.0765	-2.1
-10		-0.73793	1.02990	-0.9006	1.0479	-1.7
-5		-0.44354	1.02344	-0.5260	1.0285	-0.5
0		-0.18369	1.02205	-0.1248	1.0313	-0.9
5		0.19631	1.01459	0.2280	1.0256	-1.1
10		0.50876	1.01732	0.6454	1.0226	-0.5
15		1.08404	1.02480	1.0507	1.0307	-0.6
20		1.48072	1.03773	1.4486	1.0503	-1.2
25		1.86276	1.07463	1.8150	1.0833	-0.8
30		2.10885	1.09140	2.1894	1.1314	-3.5
-30	SPH-6	-2.16231	1.14134	-2.3019	1.1948	-4.5
-25		-1.81260	1.08237	-2.0821	1.1303	-4.2
-20		-1.49662	1.04584	-1.7429	1.0823	-3.4
-15		-1.18116	1.02707	-1.3610	1.0481	-2.0
-10		-0.76907	1.01371	-0.9807	1.0233	-0.9
-5		-0.48800	1.00490	-0.6276	1.0100	-0.5
0		-0.18109	1.00400	-0.2459	1.0078	-0.4
5		0.15412	1.00183	0.1280	1.0133	-1.1
10		0.53255	1.00731	0.5215	1.0130	-0.6
15		0.99557	1.01355	0.9296	1.0260	-1.2
20		1.38745	1.03072	1.3452	1.0468	-1.5
25		1.81183	1.07877	1.7774	1.0924	-1.2
30		2.25039	1.12163	2.2700	1.1524	-2.7
-30	SPH-7	-2.18520	1.15387	-1.9706	1.1800	-2.2
-25		-1.80142	1.09037	-1.6847	1.1218	-2.8
-20		-1.44563	1.04902	-1.3534	1.0747	-2.4
-15		-1.09269	1.02596	-1.0429	1.0426	-1.6
-10		-0.83170	1.01677	-0.7189	1.0209	-0.4
-5		-0.53457	1.01245	-0.4188	1.0209	-0.8
0		-0.18819	1.01494	-0.0677	1.0213	-0.6
5		0.13233	1.01375	0.2643	1.0225	-0.9
10		0.50150	1.01774	0.6339	1.0288	-1.1
15		0.98704	1.02570	1.0030	1.0434	-1.7
20		1.42972	1.04411	1.4063	1.0732	-2.7
25		1.89976	1.09336	1.8274	1.1174	-2.2
30		2.32735	1.13959	2.3323	1.1864	-3.9
-30	SPH-8	-2.35084	1.19240	-2.5527	1.2420	-4.0
-25		-1.95211	1.12833	-2.1881	1.1698	-3.5
-20		-1.63320	1.08383	-1.7840	1.1128	-2.6
-15		-1.28440	1.04855	-1.3273	1.0824	-3.1
-10		-0.90671	1.03263	-1.0752	1.0547	-2.1
-5		-0.62033	1.02223	-0.7004	1.0420	-1.9
0		-0.24374	1.02366	-0.3088	1.0438	-1.9
5		0.04126	1.02593	0.0940	1.0464	-2.0
10		0.29266	1.02939	0.4996	1.0511	-2.1
15		0.70049	1.03535	0.9088	1.0623	-2.5
20		1.32750	1.05388	1.3435	1.0838	-2.8
25		1.74116	1.08455	1.8000	1.1251	-3.6
30		2.13603	1.13172	2.2502	1.1840	-4.4

* % difference = [(F2,NCSU - F2,NIST)/F2,NIST] * 100

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ATTACHMENT A.

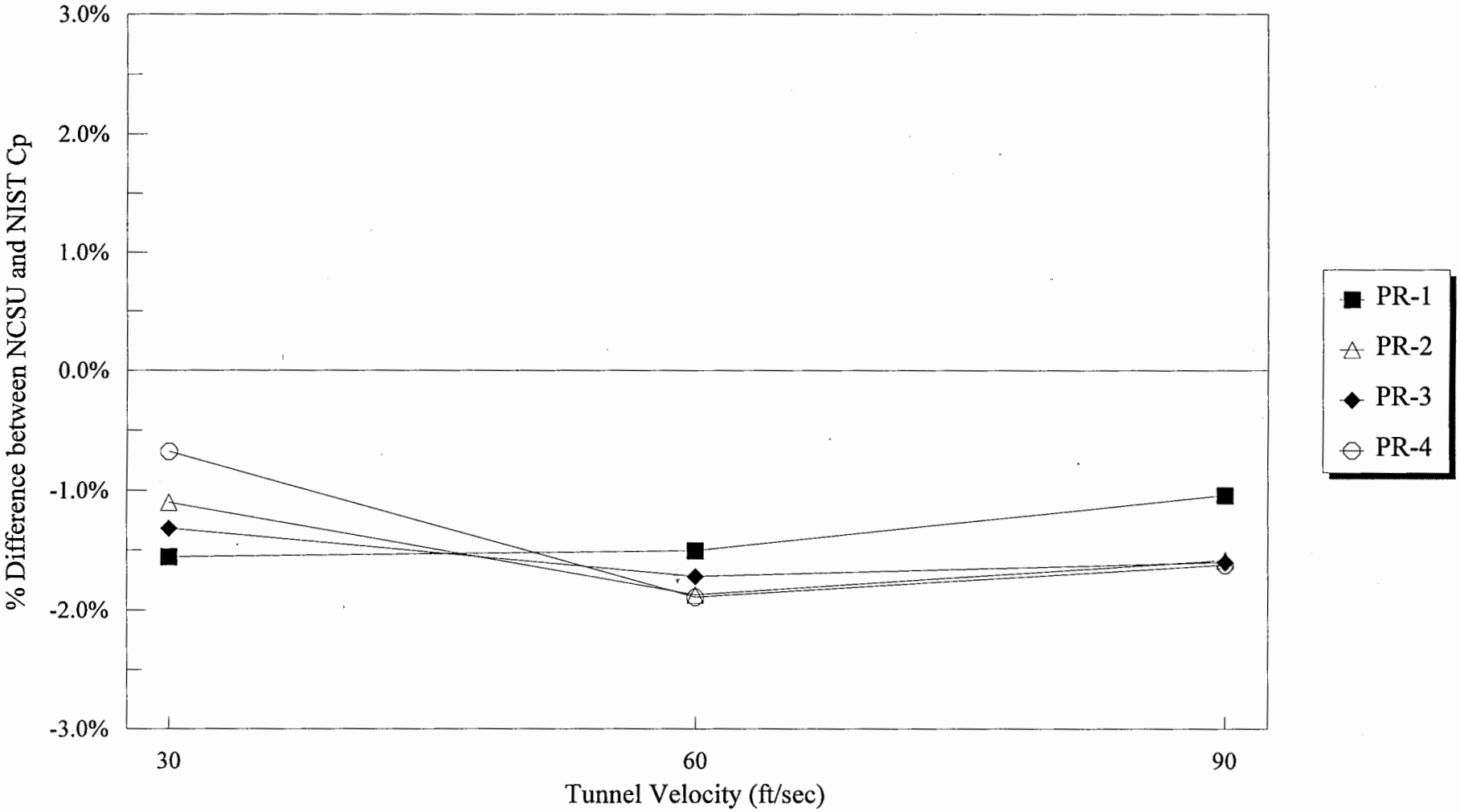
Prandtl Probe Calibration Data

Table C2-4. Prandtl Probe Calibration Results

		NCSU Post-Test	NIST Calibration (December 1997)			% Difference in Cp (NIST - NCSU Calibration) *		
Probe I.D.	Velocity Point	Magnehelic Gauge (Cp)	Electronic Manometer (Cp)	Inclined Manometer (Cp)	Magnehelic Gauge (Cp)	Electronic Manometer (%)	Inclined Manometer (%)	Magnehelic Gauge (%)
PR-1	30	0.987	1.0018	1.0026	1.0132	-1.5	-1.6	-2.6
	60	0.982	0.9978	0.9970	0.9990	-1.6	-1.5	-1.7
	90	0.987	0.9962	0.9974	1.0107	-0.9	-1.0	-2.3
	Avg.	0.985	0.9986	0.9990	1.0076	-1.3	-1.4	-2.2
PR-2	30	0.979	0.9923	0.9899	0.9931	-1.3	-1.1	-1.4
	60	0.970	0.9903	0.9885	0.9943	-2.0	-1.9	-2.4
	90	0.975	0.9903	0.9907	1.0062	-1.5	-1.6	-3.1
	Avg.	0.975	0.9910	0.9897	0.9979	-1.6	-1.5	-2.3
PR-3	30	0.981	0.9929	0.9941	0.9936	-1.2	-1.3	-1.3
	60	0.972	0.9897	0.9890	0.9889	-1.8	-1.7	-1.7
	90	0.975	0.9892	0.9909	1.0034	-1.4	-1.6	-2.8
	Avg.	0.976	0.9906	0.9913	0.9953	-1.5	-1.5	-1.9
PR-4	30	0.982	0.9901	0.9887	0.9927	-0.8	-0.7	-1.1
	60	0.970	0.9895	0.9887	0.9911	-2.0	-1.9	-2.1
	90	0.975	0.9892	0.9911	1.0032	-1.4	-1.6	-2.8
	Avg.	0.976	0.9896	0.9895	0.9957	-1.4	-1.4	-2.0

* % difference = [(NCSU Cp - NIST Cp) / NIST Cp] x 100

Figure C2-1. Prandtl Probe Calibration Coefficients
NCSU Post-Test and NIST Calibrations



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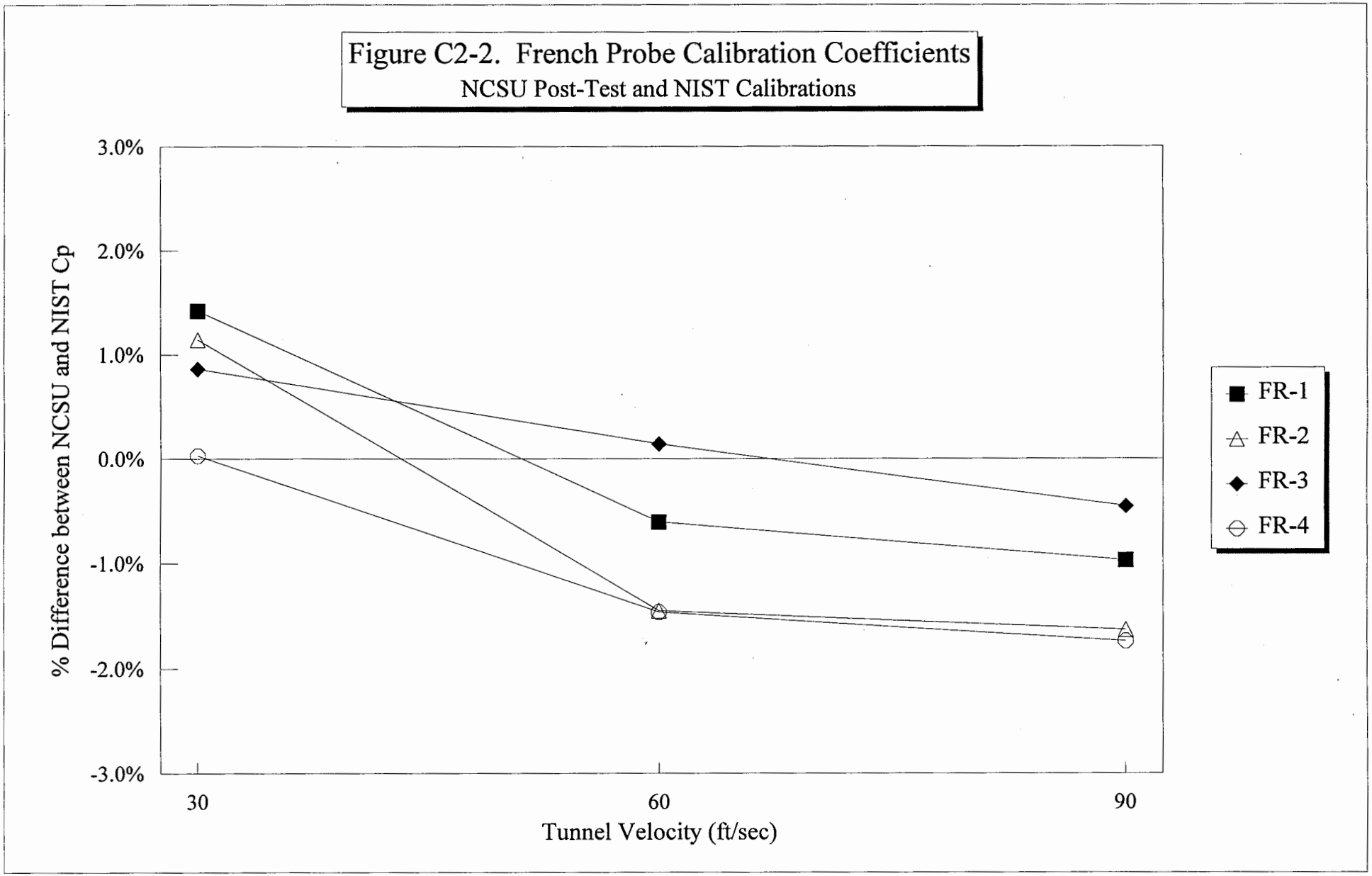
ATTACHMENT B.

French Probe Calibration Data

Table C2-5. French Probe Calibration Results

Probe I.D.	Velocity Point	NCSU Post-Test Magnehelic Gauge (Cp)	NIST Calibration (December 1997) Electronic Manometer (Cp)	Inclined Manometer (Cp)	Magnehelic Gauge (Cp)	% Difference in Cp (NIST - NCSU Calibration) * Electronic Manometer (%)	Inclined Manometer (%)	Magnehelic Gauge (%)
FR-1	30	0.722	0.7106	0.7119	0.7197	1.6	1.4	0.3
	60	0.705	0.7090	0.7093	0.7166	-0.6	-0.6	-1.6
	90	0.704	0.7097	0.7109	0.7117	-0.8	-1.0	-1.1
	Avg.	0.710	0.7098	0.7107	0.7160	0.1	-0.1	-0.8
FR-2	30	0.718	0.7100	0.7099	0.7181	1.1	1.1	-0.0
	60	0.699	0.7087	0.7093	0.7161	-1.4	-1.5	-2.4
	90	0.699	0.7096	0.7106	0.7111	-1.5	-1.6	-1.7
	Avg.	0.705	0.7094	0.7099	0.7151	-0.6	-0.6	-1.4
FR-3	30	0.715	0.7092	0.7089	0.7183	0.8	0.9	-0.5
	60	0.711	0.7107	0.7100	0.7166	0.0	0.1	-0.8
	90	0.719	0.7210	0.7223	0.7234	-0.3	-0.5	-0.6
	Avg.	0.715	0.7136	0.7137	0.7194	0.2	0.2	-0.6
FR-4	30	0.712	0.7103	0.7118	0.7182	0.2	0.0	-0.9
	60	0.699	0.7099	0.7094	0.7170	-1.5	-1.5	-2.5
	90	0.699	0.7111	0.7114	0.7134	-1.7	-1.7	-2.0
	Avg.	0.703	0.7104	0.7109	0.7162	-1.0	-1.1	-1.8

* % difference = [(NCSU Cp - NIST Cp) / NIST Cp] x 100


Figure C2-2. French Probe Calibration Coefficients
NCSU Post-Test and NIST Calibrations
3.0%
2.0%
1.0%
0.0%
-1.0%
-2.0%
-3.0%
% Difference between NCSU and NIST Cp
30
60
90
Tunnel Velocity (ft/sec)
FR-1
FR-2
FR-3
FR-4

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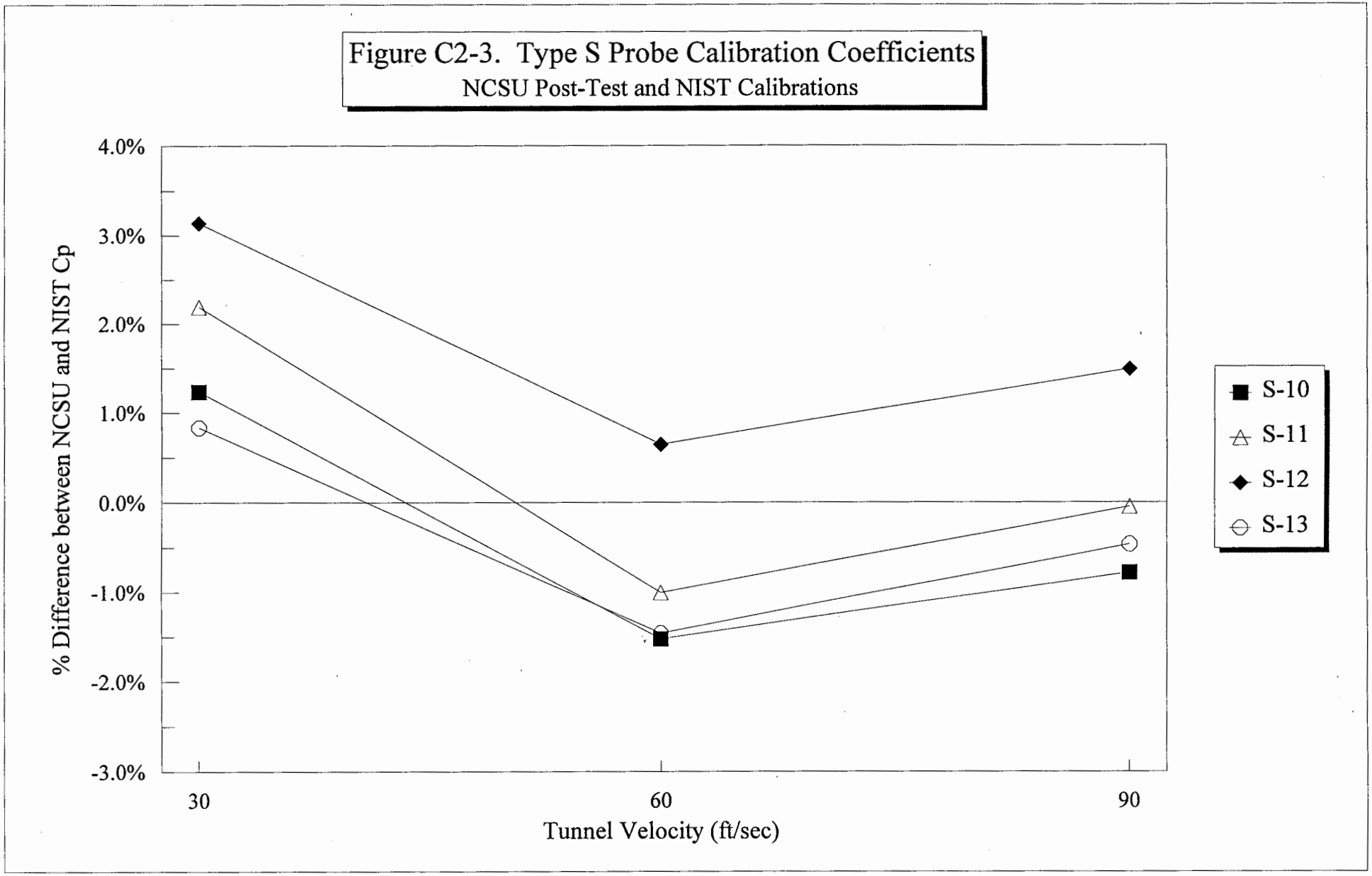
ATTACHMENT C.

Type S Probe Calibration Data

Table C2-6. Type S Probe Calibration Results

Probe I.D.	Velocity Point	NCSU Post-Test Magnehelic Gauge (Cp)	NIST Calibration (December 1997) Electronic Manometer (Cp)	Inclined Manometer (Cp)	Magnehelic Gauge (Cp)	% Difference in Cp (NIST - NCSU Calibration) * Electronic Manometer (%)	Inclined Manometer (%)	Magnehelic Gauge (%)
S-10	30	0.811	0.7974	0.8011	0.8023	1.7	1.2	1.1
	60	0.790	0.8015	0.8022	0.8054	-1.4	-1.5	-1.9
	90	0.798	0.8021	0.8043	0.8053	-0.5	-0.8	-0.9
	Avg.	0.800	0.8003	0.8025	0.8043	-0.1	-0.4	-0.6
S-11	30	0.825	0.8030	0.8073	0.8053	2.7	2.2	2.4
	60	0.797	0.8035	0.8051	0.8063	-0.8	-1.0	-1.2
	90	0.805	0.8023	0.8054	0.8061	0.3	-0.0	-0.1
	Avg.	0.809	0.8029	0.8059	0.8059	0.8	0.4	0.4
S-12	30	0.812	0.7826	0.7873	0.7879	3.8	3.1	3.1
	60	0.796	0.7893	0.7909	0.7940	0.8	0.6	0.3
	90	0.804	0.7891	0.7922	0.7923	1.9	1.5	1.5
	Avg.	0.804	0.7870	0.7901	0.7914	2.2	1.8	1.6
S-13	30	0.813	0.8047	0.8063	0.8079	1.0	0.8	0.6
	60	0.797	0.8079	0.8088	0.8097	-1.3	-1.5	-1.6
	90	0.807	0.8081	0.8108	0.8092	-0.1	-0.5	-0.3
	Avg.	0.806	0.8069	0.8086	0.8089	-0.2	-0.4	-0.4

* % difference = [(NCSU Cp - NIST Cp) / NIST Cp] x 100


Figure C2-3. Type S Probe Calibration Coefficients
NCSU Post-Test and NIST Calibrations
4.0%
3.0%
2.0%
1.0%
0.0%
-1.0%
-2.0%
-3.0%
% Difference between NCSU and NIST Cp
30
60
90
Tunnel Velocity (ft/sec)
S-10
S-11
S-12
S-13

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ATTACHMENT D.

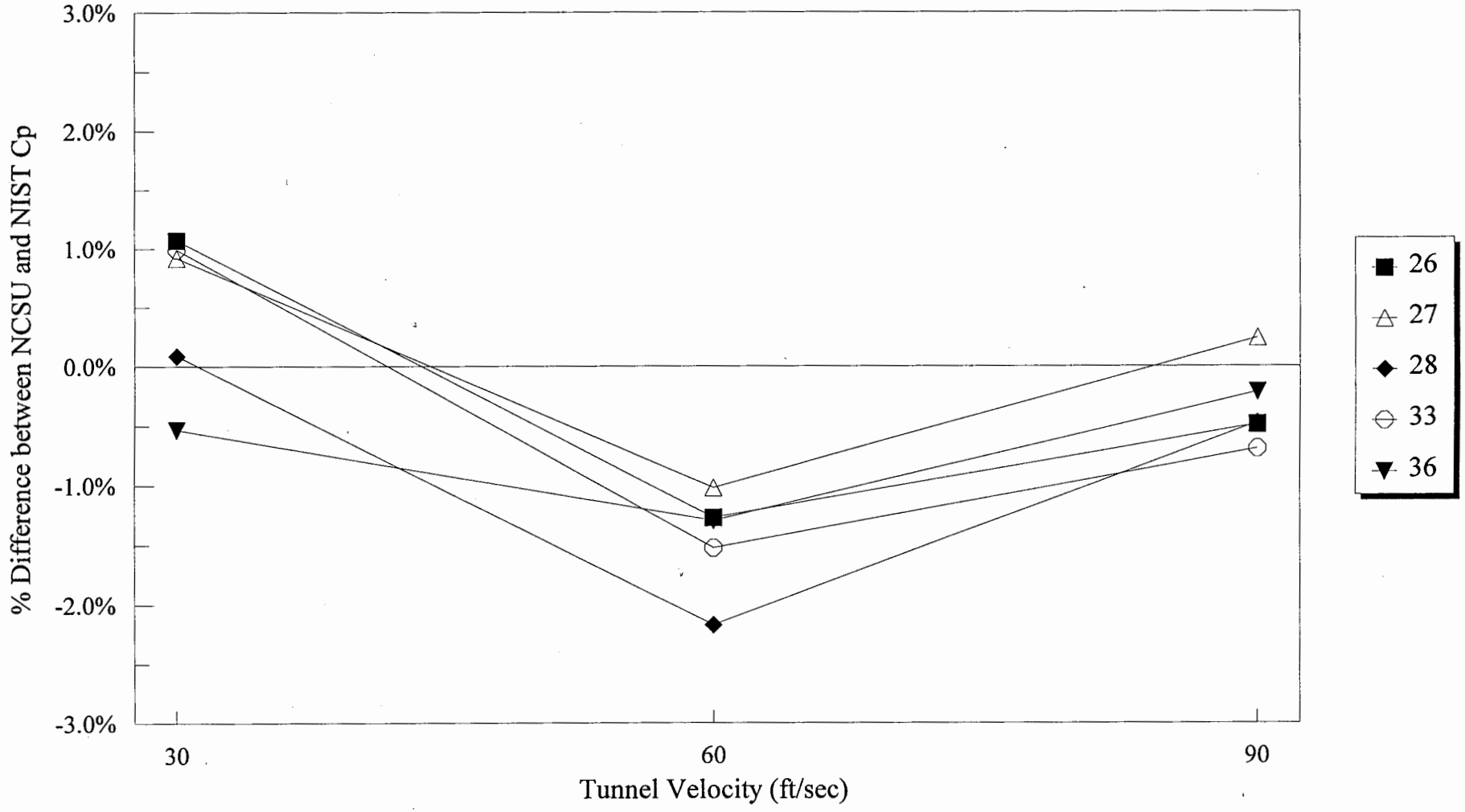
Autoprobe Type S Calibration Data

Table C2-7. USTI Autoprobe Type S Calibration Results

		NCSU Post-Test	NIST Calibration (December 1997)			% Difference in Cp (NIST - NCSU Calibration) *		
Probe I.D.	Velocity Point	Magnehelic Gauge (Cp)	Electronic Manometer (Cp)	Inclined Manometer (Cp)	Magnehelic Gauge (Cp)	Electronic Manometer (%)	Inclined Manometer (%)	Magnehelic Gauge (%)
26	30	0.802	0.793	0.794	0.792	1.2	1.1	1.2
	60	0.784	0.795	0.794	0.795	-1.3	-1.3	-1.3
	90	0.793	0.797	0.797	0.799	-0.5	-0.5	-0.8
	Avg.	0.793	0.795	0.795	0.795	-0.2	-0.2	-0.3
27	30	0.801	0.793	0.794	0.793	1.1	0.9	1.0
	60	0.785	0.793	0.793	0.793	-1.0	-1.0	-1.0
	90	0.795	0.793	0.793	0.792	0.3	0.2	0.4
	Avg.	0.794	0.793	0.793	0.793	0.1	0.0	0.1
28	30	0.794	0.792	0.793	0.797	0.2	0.1	-0.3
	60	0.779	0.797	0.796	0.795	-2.2	-2.2	-2.0
	90	0.792	0.796	0.796	0.796	-0.5	-0.5	-0.5
	Avg.	0.788	0.795	0.795	0.796	-0.8	-0.9	-1.0
33	30	0.796	0.787	0.788	0.788	1.1	1.0	1.0
	60	0.780	0.792	0.792	0.793	-1.6	-1.5	-1.6
	90	0.788	0.793	0.794	0.795	-0.7	-0.7	-0.8
	Avg.	0.788	0.791	0.791	0.792	-0.4	-0.4	-0.5
36	30	0.781	0.784	0.785	0.785	-0.4	-0.5	-0.5
	60	0.775	0.786	0.785	0.785	-1.4	-1.3	-1.3
	90	0.785	0.787	0.787	0.785	-0.2	-0.2	0.0
	Avg.	0.780	0.785	0.786	0.785	-0.6	-0.7	-0.6

* % difference = [(NCSU Cp - NIST Cp) / NIST Cp] x 100

Figure C2-4. USTI Autoprobe Type S Calibration Coefficients
NCSU Post-Test and NIST Calibrations



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ATTACHMENT E.

Modified Kiel Probe Calibration Data

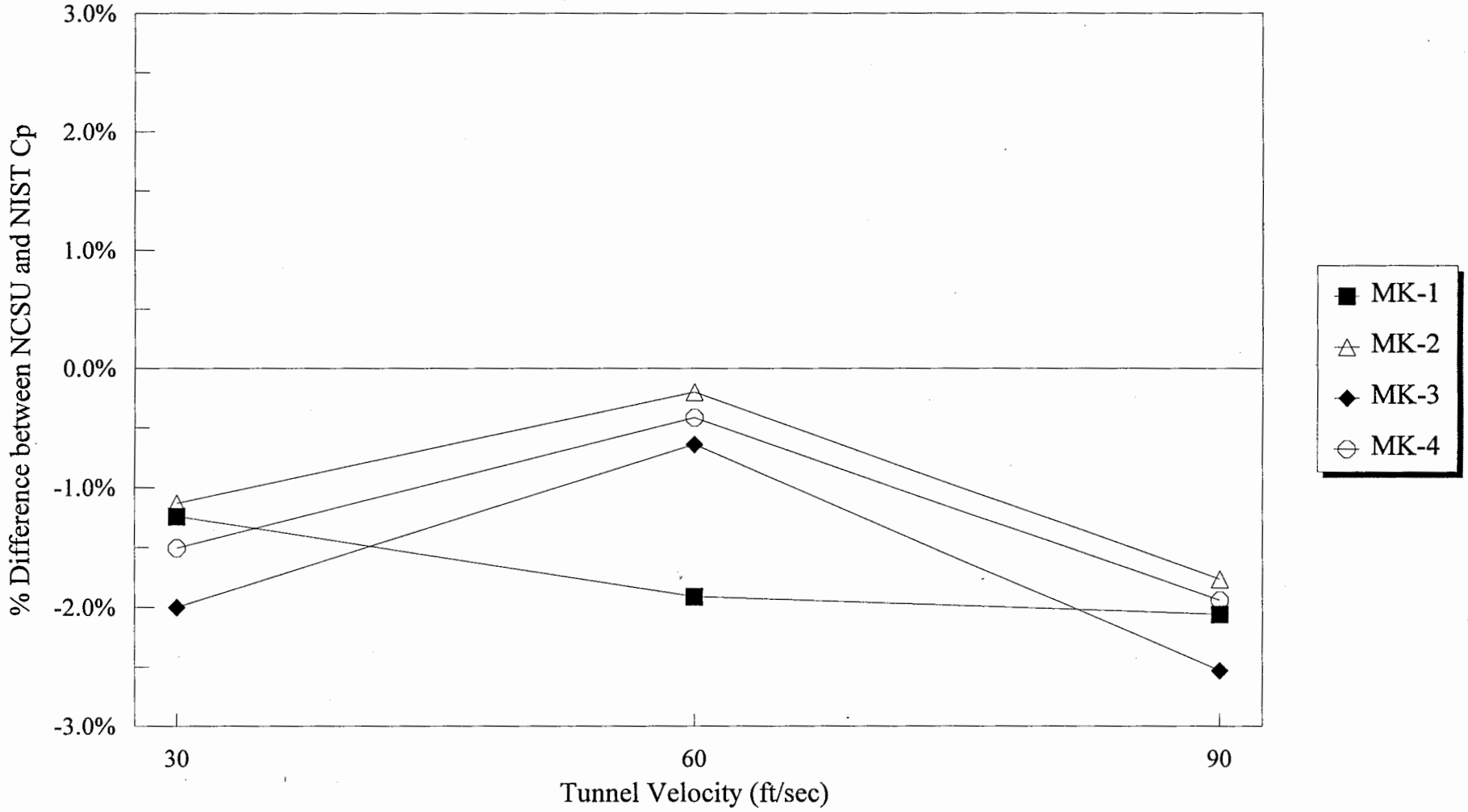
Table C2-8. Modified Kiel Probe Calibration Results

		NCSU Post-Test	NIST Calibration (December 1997)			% Difference in Cp (NIST - NCSU Calibration) *		
Probe I.D.	Velocity Point	Magnehelic Gauge (Cp)	Electronic Manometer (Cp)	Inclined Manometer (Cp)	Magnehelic Gauge (Cp)	Electronic Manometer (%)	Inclined Manometer (%)	Magnehelic Gauge (%)
MK-1	30	0.748	0.7534	0.7574	0.7583	-0.7	-1.2	-1.4
	60	0.734	0.7483	0.7483	0.7546	-1.9	-1.9	-2.7
	90	0.732	0.7465	0.7474	0.7479	-1.9	-2.1	-2.1
	Avg.	0.738	0.7494	0.7510	0.7536	-1.5	-1.7	-2.1
MK-2	30	0.750	0.7551	0.7586	0.7583	-0.7	-1.1	-1.1
	60	0.747	0.7484	0.7485	0.7548	-0.2	-0.2	-1.0
	90	0.733	0.7450	0.7462	0.7481	-1.6	-1.8	-2.0
	Avg.	0.743	0.7495	0.7511	0.7537	-0.8	-1.0	-1.4
MK-3	30	0.752	0.7643	0.7675	0.7632	-1.6	-2.0	-1.5
	60	0.746	0.7504	0.7508	0.7556	-0.6	-0.6	-1.3
	90	0.731	0.7477	0.7500	0.7490	-2.2	-2.5	-2.4
	Avg.	0.743	0.7541	0.7561	0.7559	-1.5	-1.7	-1.7
MK-4	30	0.752	0.7599	0.7635	0.7641	-1.0	-1.5	-1.6
	60	0.744	0.7460	0.7471	0.7512	-0.3	-0.4	-1.0
	90	0.732	0.7444	0.7465	0.7470	-1.7	-1.9	-2.0
	Avg.	0.743	0.7501	0.7524	0.7541	-1.0	-1.3	-1.5

* % difference = [(NCSU Cp - NIST Cp) / NIST Cp] x 100

Figure C2-5. Modified Kiel Probe Calibration Coefficients

NCSU Post-Test and NIST Calibrations



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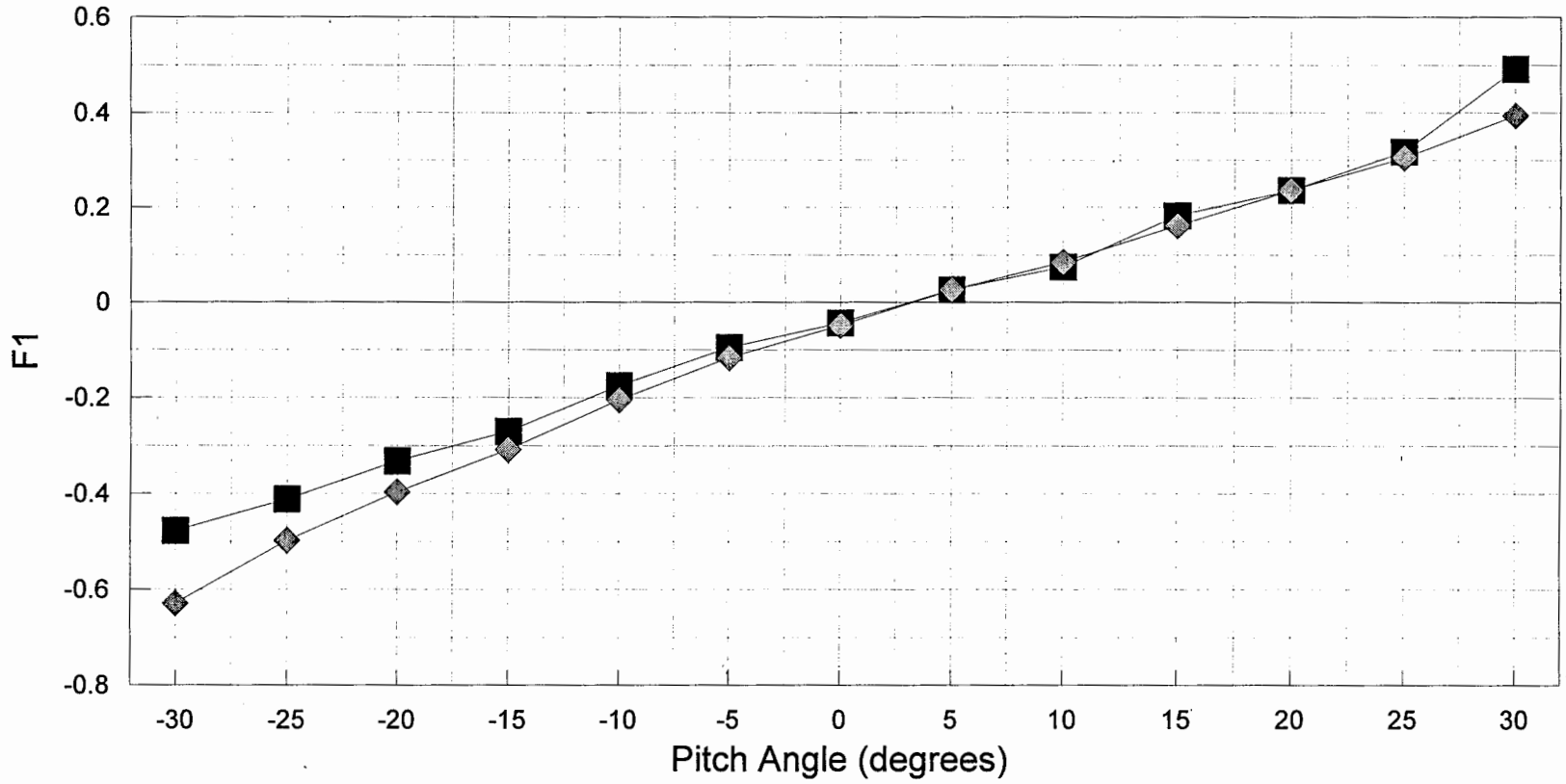
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ATTACHMENT F.

E-DAT Probe Calibration Data

Figure C2-6. E-DAT: Avg. (30-60 fps) F1 vs. Pitch Angle

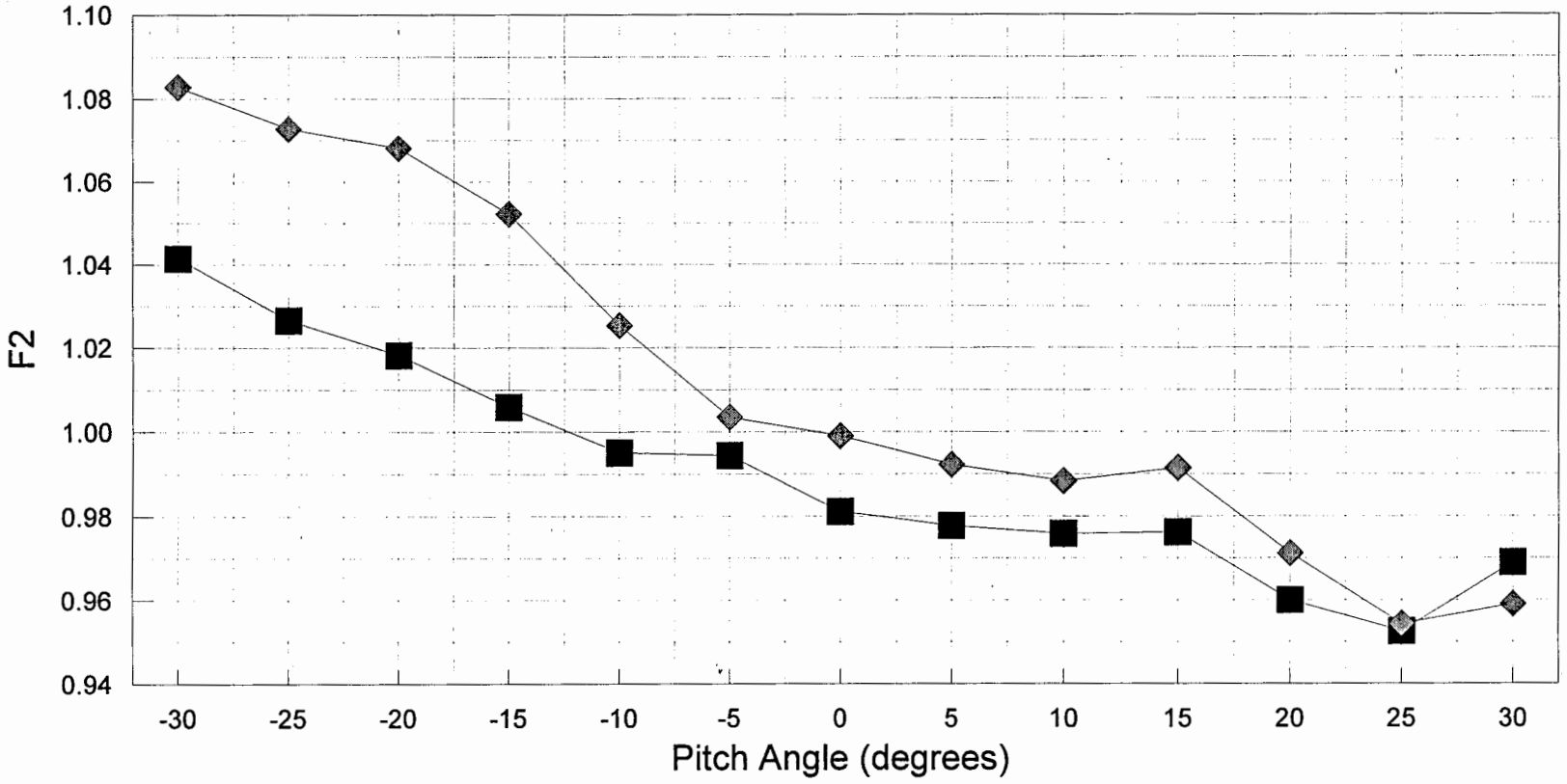
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Figure C2-7. E-DAT: Avg. (30-60 fps) F2 vs. Pitch Angle

NCSU Post-Test and NIST Wind Tunnel Calibrations

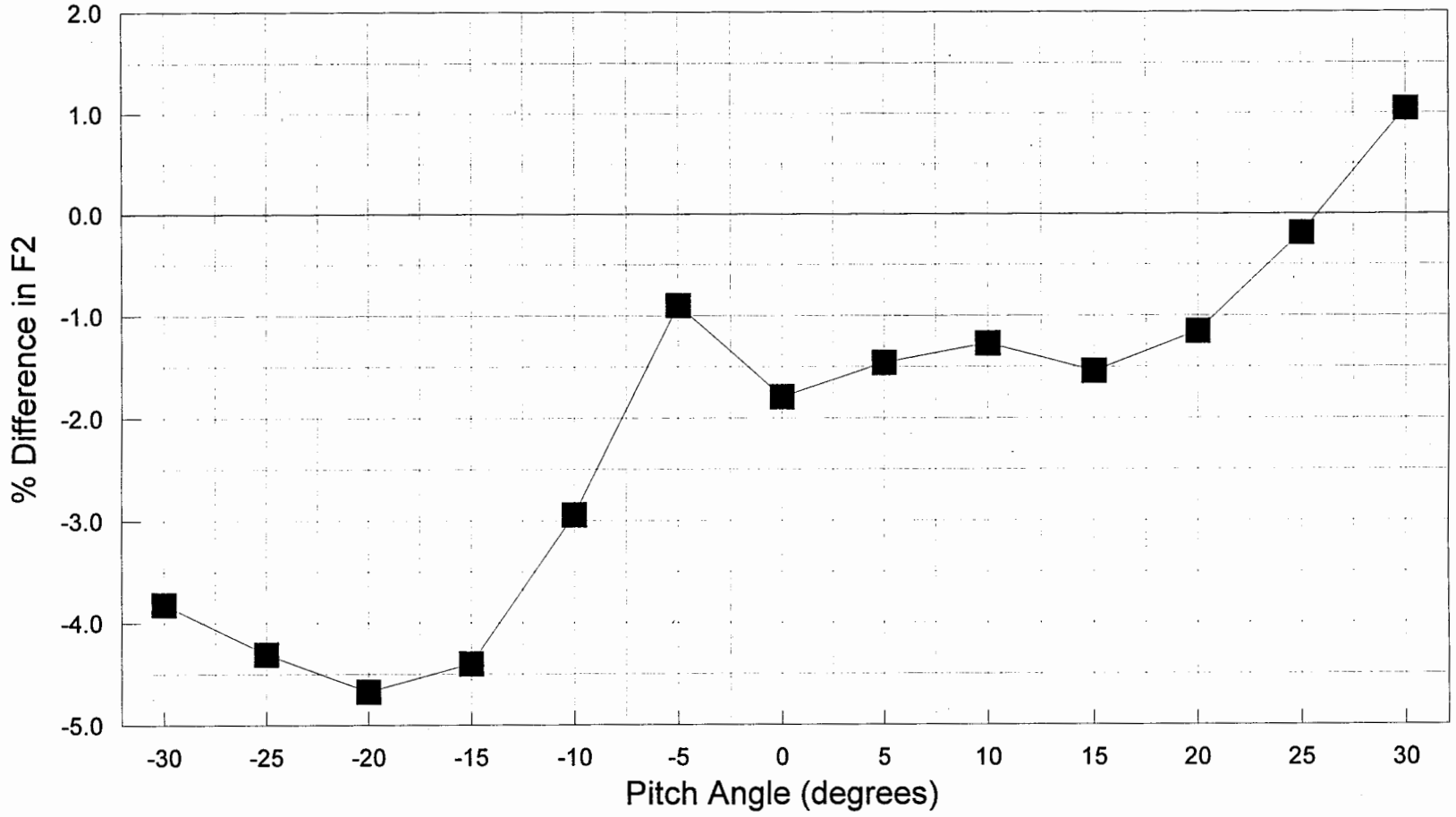


Note: Each point represents the mean of three replicates.

FC26-8.WK4

Figure C2-8. E-DAT: Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC26-8.WK4

Table C2-9. Entropy DAT Probe: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

	30 fps / NIST 30-60 Calibration			30 fps / Post-test 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	24.48	31.07	28.23	27.66	30.31	26.83	13.01	-2.44	-4.93
-25	21.47	32.04	29.76	25.40	30.86	27.82	18.33	-3.67	-6.51
-20	16.61	31.93	30.55	19.83	30.74	28.85	19.36	-3.74	-5.58
-15	13.00	32.03	31.21	15.09	30.95	29.87	16.04	-3.37	-4.27
-10	7.98	31.83	31.52	9.58	31.18	30.74	20.13	-2.05	-2.47
-5	4.94	31.73	31.59	6.53	31.35	31.12	32.19	-1.20	-1.48
0	1.21	31.52	31.50	1.97	31.09	31.05	63.59	-1.37	-1.44
5	4.66	31.44	31.29	4.96	30.97	30.80	6.29	-1.50	-1.55
10	9.31	31.50	31.07	9.62	31.08	30.62	3.35	-1.34	-1.42
15	14.67	31.38	30.34	13.83	30.99	30.08	-5.73	-1.26	-0.87
20	18.38	31.53	29.91	17.76	31.19	29.69	-3.36	-1.08	-0.75
25	25.10	31.30	28.33	24.25	31.19	28.43	-3.39	-0.35	0.35
30	30.09	30.92	26.75	27.97	31.02	27.39	-7.06	0.31	2.40

	60 fps / NIST 30-60 Calibration			60 fps / Post-test 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.16	61.51	54.24	30.02	59.46	51.49	6.62	-3.34	-5.08
-25	22.18	62.83	58.17	27.21	60.66	53.92	22.68	-3.46	-7.31
-20	18.79	62.79	59.45	22.69	60.34	55.67	20.75	-3.90	-6.35
-15	14.46	62.30	60.31	17.18	60.07	57.36	18.78	-3.57	-4.89
-10	8.18	60.69	60.00	9.72	59.45	58.52	18.88	-2.05	-2.47
-5	3.30	59.80	59.67	4.51	59.17	58.94	36.62	-1.07	-1.23
0	0.89	60.51	60.50	1.24	59.56	59.54	40.44	-1.57	-1.58
5	3.23	60.66	60.55	3.10	59.70	59.60	-4.17	-1.57	-1.56
10	7.58	60.53	59.96	7.81	59.69	59.10	3.11	-1.39	-1.44
15	15.09	60.47	58.38	14.08	59.65	57.85	-6.66	-1.35	-0.90
20	20.36	60.67	56.87	20.26	60.03	56.31	-0.46	-1.05	-0.99
25	25.65	60.75	54.76	24.75	60.62	55.05	-3.51	-0.21	0.53
30	30.08	60.93	52.72	27.59	61.02	54.08	-8.30	0.15	2.59

	90 fps / NIST 30-60 Calibration			90 fps / Post-test 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.10	91.44	80.66	30.01	88.31	76.46	6.82	-3.43	-5.20
-25	22.64	93.39	86.19	27.93	90.31	79.79	23.34	-3.30	-7.43
-20	16.32	93.07	89.31	19.85	89.65	84.32	21.62	-3.67	-5.59
-15	12.45	91.58	89.42	14.24	88.57	85.83	14.42	-3.29	-4.01
-10	8.43	90.03	89.05	10.09	88.02	86.66	19.62	-2.23	-2.69
-5	4.02	89.02	88.70	5.09	87.78	87.29	26.70	-1.39	-1.59
0	0.83	89.68	89.67	0.65	88.14	88.13	-21.68	-1.71	-1.71
5	3.57	90.85	90.65	3.50	89.44	89.24	-2.22	-1.56	-1.56
10	9.06	90.21	89.07	9.67	89.01	87.74	6.77	-1.33	-1.50
15	15.86	89.93	86.51	14.62	88.85	85.97	-7.79	-1.20	-0.62
20	21.70	88.71	82.42	21.45	88.01	81.91	-1.16	-0.79	-0.62
25	25.82	89.91	80.93	25.02	89.71	81.29	-3.11	-0.22	0.45
30	28.50	90.47	79.51	26.58	90.43	80.87	-6.73	-0.05	1.71

TABC29.WK4

Figure C2-9. E-DAT Probe: Percent Difference in NCSU Post-Test and NIST Wind Tunnel Calibrations
Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data

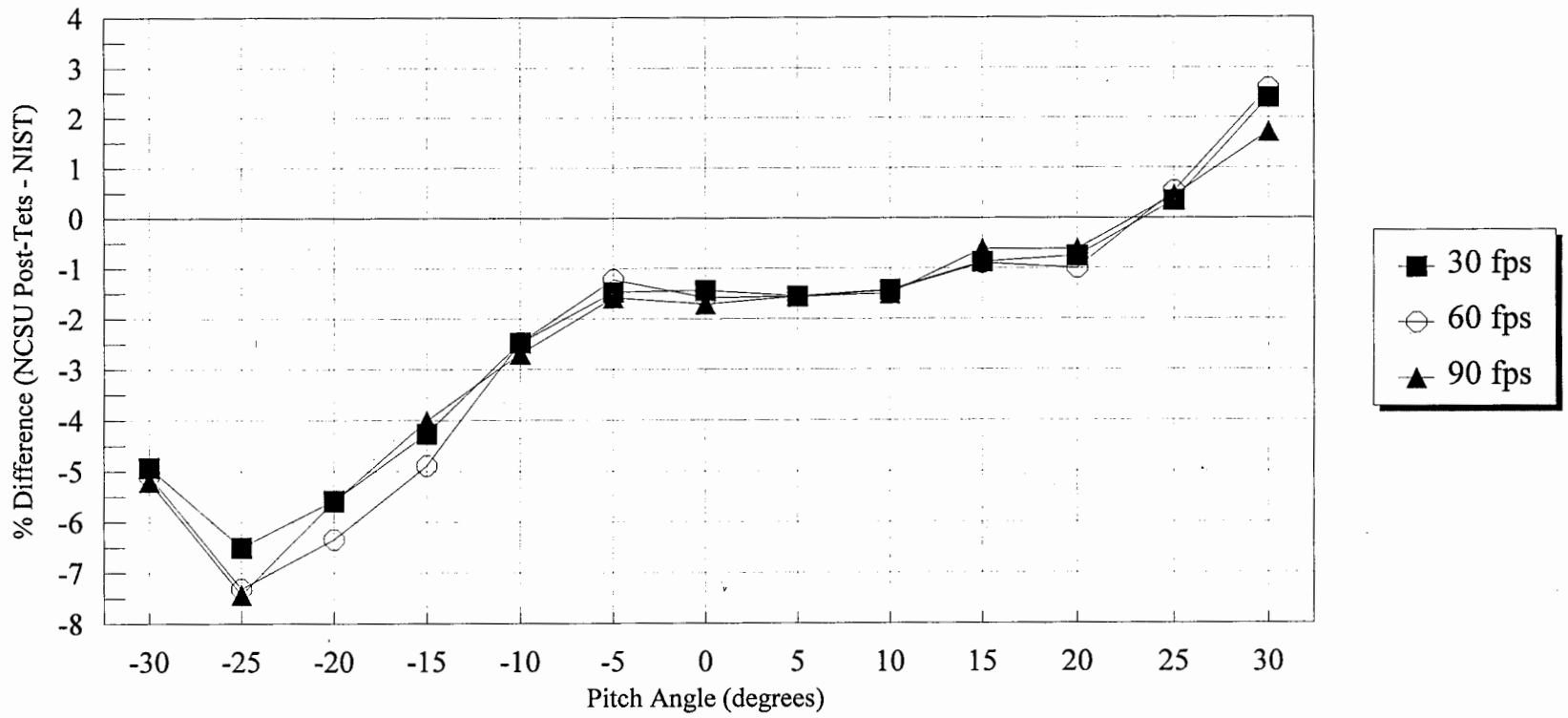


Table C2-10. E-DAT Computations: 30 fps

Probe: **E-DAT / with NIST 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 02/06/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.60	Probe ID:	E-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.60	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.53%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**30.16**	Last Row:	61
Average Yaw Angle:	0.4		
Average Pitch Angle:	14.7	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	14.8		0
Resultant Angle Standard Deviation:	9.00		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.5	-0.120	0.180	91	-30.0	30.0	0.1952	30.41	26.33
	-25	-0.6	-0.100	0.190	90	-26.1	26.1	0.2196	32.22	28.93
	-20	-0.6	-0.080	0.195	90	-20.7	20.7	0.2227	32.45	30.36
	-15	-0.5	-0.060	0.200	90	-14.6	14.6	0.2205	32.29	31.24
	-10	-0.6	-0.040	0.210	90	-9.2	9.2	0.2193	32.20	31.78
	-5	-0.6	-0.035	0.210	90	-7.9	7.9	0.2168	32.01	31.71
	0	-0.2	-0.020	0.210	90	-3.5	3.5	0.2109	31.57	31.52
	5	-0.3	-0.010	0.214	90	0.1	0.3	0.2136	31.77	31.77
	10	-0.5	0.010	0.215	89	6.8	6.8	0.2111	31.56	31.34
	15	-0.4	0.025	0.215	89	12.0	12.1	0.2106	31.52	30.83
	20	-0.4	0.040	0.218	89	16.4	16.5	0.2118	31.61	30.32
	25	-0.5	0.060	0.225	89	22.2	22.2	0.2090	31.40	29.07
	30	-2.7	0.090	0.224	89	30.0	30.1	0.2060	31.18	26.97
2	-30	-0.6	-0.080	0.185	91	-21.8	21.8	0.2117	31.66	29.41
	-25	-0.1	-0.075	0.190	91	-19.9	19.9	0.2166	32.03	30.12
	-20	-0.1	-0.060	0.191	91	-15.3	15.3	0.2119	31.68	30.55
	-15	-0.2	-0.050	0.200	91	-12.2	12.2	0.2151	31.92	31.20
	-10	-0.2	-0.030	0.207	91	-6.6	6.6	0.2114	31.64	31.43
	-5	-0.2	-0.020	0.210	91	-3.5	3.5	0.2109	31.60	31.55
	0	-0.1	-0.010	0.210	91	0.0	0.1	0.2096	31.51	31.51
	5	-0.3	0.010	0.211	91	6.8	6.8	0.2072	31.32	31.10
	10	-0.2	0.020	0.213	91	10.6	10.6	0.2082	31.40	30.87
	15	-0.2	0.035	0.210	91	15.3	15.3	0.2059	31.23	30.12
	20	-0.2	0.050	0.220	92	19.4	19.4	0.2086	31.46	29.68
	25	0.0	0.075	0.226	92	26.5	26.5	0.2064	31.29	28.01
	30	-2.5	0.095	0.215	92	30.0	30.1	0.1977	30.63	26.50
3	-30	-0.2	-0.080	0.186	90	-21.7	21.7	0.2051	31.14	28.94
	-25	-0.2	-0.070	0.190	90	-18.4	18.4	0.2147	31.86	30.23
	-20	-0.1	-0.055	0.194	90	-13.8	13.8	0.2122	31.67	30.76
	-15	-0.1	-0.050	0.200	90	-12.2	12.2	0.2151	31.89	31.17
	-10	-0.2	-0.035	0.205	90	-8.1	8.1	0.2120	31.66	31.34
	-5	0.0	-0.020	0.210	90	-3.5	3.5	0.2109	31.57	31.52
	0	0.0	-0.010	0.210	90	0.0	0.0	0.2096	31.48	31.48
	5	0.0	0.010	0.210	90	6.8	6.8	0.2062	31.22	31.00
	10	-0.1	0.020	0.215	90	10.5	10.5	0.2102	31.52	30.99
	15	-0.1	0.040	0.215	90	16.6	16.6	0.2086	31.40	30.09
	20	-0.1	0.050	0.221	91	19.3	19.3	0.2097	31.51	29.74
	25	-0.4	0.075	0.225	91	26.6	26.6	0.2055	31.20	27.90
	30	-2.3	0.090	0.220	91	30.0	30.1	0.2023	30.95	26.79

		Res	Vdir	Vax
Average	-30	24.48	31.07	28.23
	-25	21.47	32.04	29.76
	-20	16.61	31.93	30.55
	-15	13.00	32.03	31.21
	-10	7.98	31.83	31.52
	-5	4.94	31.73	31.59
	0	1.21	31.52	31.50
	5	4.66	31.44	31.29
	10	9.31	31.50	31.07
	15	14.67	31.38	30.34
	20	18.38	31.53	29.91
	25	25.10	31.30	28.33
	30	30.09	30.92	26.75

Table C2-11. E-DAT Computations: 60 fps

Probe: **E-DAT / with NIST 30-60 Calibration**
Velocity Point: **60 fps**

Cal Date: 02/06/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.60	Probe ID:	E-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.60	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**58.12**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	15.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.2		0
Resultant Angle Standard Deviation:	9.77		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.1	-0.400	0.720	92	-27.2	27.2	0.8355	62.96	55.99
	-25	-1.2	-0.300	0.730	92	-20.7	20.7	0.8339	62.90	58.82
	-20	-0.1	-0.265	0.730	92	-18.1	18.1	0.8235	62.51	59.41
	-15	-0.5	-0.195	0.750	92	-12.7	12.7	0.8108	62.02	60.51
	-10	-0.2	-0.080	0.750	92	-4.3	4.3	0.7543	59.82	59.65
	-5	0.0	-0.045	0.750	92	-0.9	0.9	0.7498	59.64	59.64
	0	-0.3	-0.020	0.790	92	1.5	1.6	0.7853	61.04	61.02
	5	-0.2	0.020	0.800	92	4.9	4.9	0.7879	61.14	60.91
	10	-0.1	0.075	0.800	92	10.6	10.6	0.7821	60.92	59.88
	15	-0.3	0.145	0.800	92	16.3	16.3	0.7782	60.76	58.32
	20	-0.4	0.210	0.830	93	21.2	21.2	0.7764	60.75	56.63
	25	-0.4	0.280	0.850	93	26.4	26.4	0.7762	60.74	54.42
	30	-3.9	0.330	0.850	93	29.6	29.9	0.7812	60.93	52.84
2	-30	-1.3	-0.400	0.720	93	-27.2	27.2	0.8355	63.02	56.03
	-25	-0.4	-0.320	0.730	93	-22.1	22.1	0.8358	63.03	58.41
	-20	-0.4	-0.280	0.740	93	-19.0	19.0	0.8391	63.15	59.72
	-15	-0.3	-0.230	0.740	93	-15.2	15.2	0.8200	62.43	60.26
	-10	-0.2	-0.160	0.745	93	-10.5	10.5	0.7872	61.17	60.15
	-5	-0.3	-0.090	0.750	93	-5.2	5.2	0.7567	59.97	59.72
	0	0.0	-0.040	0.770	93	-0.3	0.3	0.7690	60.46	60.46
	5	0.0	-0.010	0.780	93	2.4	2.4	0.7736	60.64	60.58
	10	-0.1	0.030	0.780	93	6.1	6.1	0.7668	60.37	60.03
	15	-0.1	0.120	0.780	93	14.5	14.5	0.7663	60.35	58.43
	20	-0.4	0.190	0.820	93	19.7	19.7	0.7755	60.71	57.17
	25	-0.1	0.280	0.850	93	26.4	26.4	0.7762	60.74	54.42
	30	-3.0	0.350	0.850	93	30.0	30.1	0.7817	60.96	52.72
3	-30	-1.0	-0.480	0.670	91	-30.0	30.0	0.7244	58.57	50.71
	-25	-0.4	-0.340	0.720	91	-23.7	23.7	0.8268	62.57	57.29
	-20	-0.5	-0.280	0.730	92	-19.3	19.3	0.8292	62.72	59.21
	-15	-0.4	-0.235	0.740	92	-15.5	15.5	0.8219	62.45	60.16
	-10	-0.2	-0.150	0.750	92	-9.7	9.7	0.7867	61.09	60.21
	-5	0.0	-0.075	0.750	92	-3.8	3.8	0.7537	59.80	59.67
	0	0.0	-0.045	0.760	92	-0.8	0.8	0.7597	60.04	60.03
	5	-0.2	-0.010	0.770	92	2.4	2.4	0.7637	60.19	60.14
	10	-0.3	0.030	0.780	92	6.1	6.1	0.7668	60.31	59.98
	15	-0.4	0.120	0.780	92	14.5	14.5	0.7663	60.30	58.38
	20	-0.2	0.196	0.820	92	20.2	20.2	0.7725	60.54	56.82
	25	-0.4	0.250	0.850	92	24.2	24.2	0.7785	60.77	55.43
	30	-4.0	0.340	0.850	92	30.0	30.2	0.7817	60.90	52.61

		Res	Vdir	Vax
Average	-30	28.16	61.51	54.24
	-25	22.18	62.83	58.17
	-20	18.79	62.79	59.45
	-15	14.46	62.30	60.31
	-10	8.18	60.69	60.00
	-5	3.30	59.80	59.67
	0	0.89	60.51	60.50
	5	3.23	60.66	60.55
	10	7.58	60.53	59.96
	15	15.09	60.47	58.38
	20	20.36	60.67	56.87
	25	25.65	60.75	54.76
	30	30.08	60.93	52.72

Table C2-12. E-DAT Computations: 90 fps

Probe: **E-DAT / with NIST 30-60 Calibration** Pre-test
Velocity Point: **90 fps** Cal Date: 02/06/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.60	Probe ID:	E_DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.60	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	5.13%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	92 _F
Average Axial Velocity, ft/sec:	**86.31**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	15.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.2		0
Resultant Angle Standard Deviation:	9.43		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.8	-0.890	1.550	88	-27.9	27.9	1.8034	92.16	81.43
	-25	-0.8	-0.720	1.600	89	-22.6	22.6	1.8338	93.02	85.85
	-20	-0.5	-0.550	1.620	90	-16.8	16.8	1.8129	92.57	88.63
	-15	-0.7	-0.420	1.630	91	-12.6	12.6	1.7602	91.30	89.11
	-10	-0.4	-0.300	1.630	91	-8.8	8.8	1.6967	89.64	88.57
	-5	-0.5	-0.225	1.640	92	-6.2	6.2	1.6688	88.98	88.46
	0	-0.6	-0.065	1.700	92	0.7	0.9	1.6938	89.65	89.63
	5	-0.5	-0.020	1.750	93	2.5	2.5	1.7351	90.81	90.72
	10	-0.5	0.125	1.750	93	8.9	8.9	1.7127	90.22	89.14
	15	0.2	0.310	1.730	93	16.2	16.2	1.6847	89.48	85.95
	20	0.0	0.450	1.770	94	21.3	21.3	1.6546	88.76	82.70
	25	-0.8	0.580	1.850	95	25.5	25.5	1.6864	89.69	80.96
	30	-3.9	0.690	1.860	95	28.7	28.9	1.7062	90.22	78.96
2	-30	-1.2	-0.900	1.550	98	-28.2	28.2	1.8051	93.04	82.01
	-25	-0.8	-0.700	1.600	98	-22.0	22.0	1.8318	93.73	86.89
	-20	-0.2	-0.520	1.640	98	-15.5	15.5	1.8213	93.46	90.06
	-15	-0.5	-0.380	1.630	97	-11.4	11.4	1.7386	91.23	89.44
	-10	-0.1	-0.270	1.640	97	-7.7	7.7	1.6912	89.98	89.16
	-5	-0.2	-0.080	1.650	97	-0.0	0.2	1.6471	88.80	88.80
	0	-0.2	-0.050	1.700	96	1.3	1.3	1.6911	89.90	89.87
	5	-0.2	0.060	1.750	96	5.7	5.7	1.7212	90.69	90.24
	10	-0.4	0.150	1.730	96	10.1	10.1	1.6904	89.88	88.47
	15	-0.3	0.300	1.730	95	15.8	15.8	1.6901	89.79	86.41
	20	-0.4	0.480	1.800	94	22.2	22.2	1.6720	89.23	82.61
	25	-0.8	0.600	1.870	94	25.9	25.9	1.7060	90.13	81.08
	30	-4.4	0.700	1.900	92	28.5	28.8	1.7424	90.92	79.64
3	-30	-0.9	-0.900	1.550	92	-28.2	28.2	1.6738	89.11	78.55
	-25	-0.6	-0.740	1.600	93	-23.2	23.3	1.8358	93.41	85.82
	-20	-0.3	-0.550	1.630	94	-16.7	16.7	1.8228	93.16	89.25
	-15	-0.5	-0.450	1.640	94	-13.4	13.4	1.7858	92.21	89.71
	-10	-0.3	-0.300	1.650	95	-8.7	8.7	1.7157	90.47	89.42
	-5	-0.4	-0.210	1.650	95	-5.6	5.6	1.6708	89.27	88.84
	0	-0.2	-0.075	1.680	96	0.2	0.3	1.6759	89.49	89.49
	5	-0.2	-0.020	1.750	96	2.5	2.5	1.7351	91.06	90.97
	10	-0.2	0.110	1.750	96	8.1	8.1	1.7147	90.52	89.61
	15	-0.2	0.300	1.750	97	15.6	15.6	1.7115	90.52	87.17
	20	-0.1	0.450	1.740	97	21.6	21.6	1.6229	88.14	81.95
	25	-0.5	0.600	1.850	97	26.1	26.1	1.6884	89.90	80.75
	30	-3.5	0.650	1.857	98	27.5	27.7	1.6995	90.28	79.92

		Res	Vdir	Vax
Average	-30	28.10	91.44	80.66
	-25	22.64	93.39	86.19
	-20	16.32	93.07	89.31
	-15	12.45	91.58	89.42
	-10	8.43	90.03	89.05
	-5	4.02	89.02	88.70
	0	0.83	89.68	89.67
	5	3.57	90.85	90.65
	10	9.06	90.21	89.07
	15	15.86	89.93	86.51
	20	21.70	88.71	82.42
	25	25.82	89.91	80.93
	30	28.50	90.47	79.51

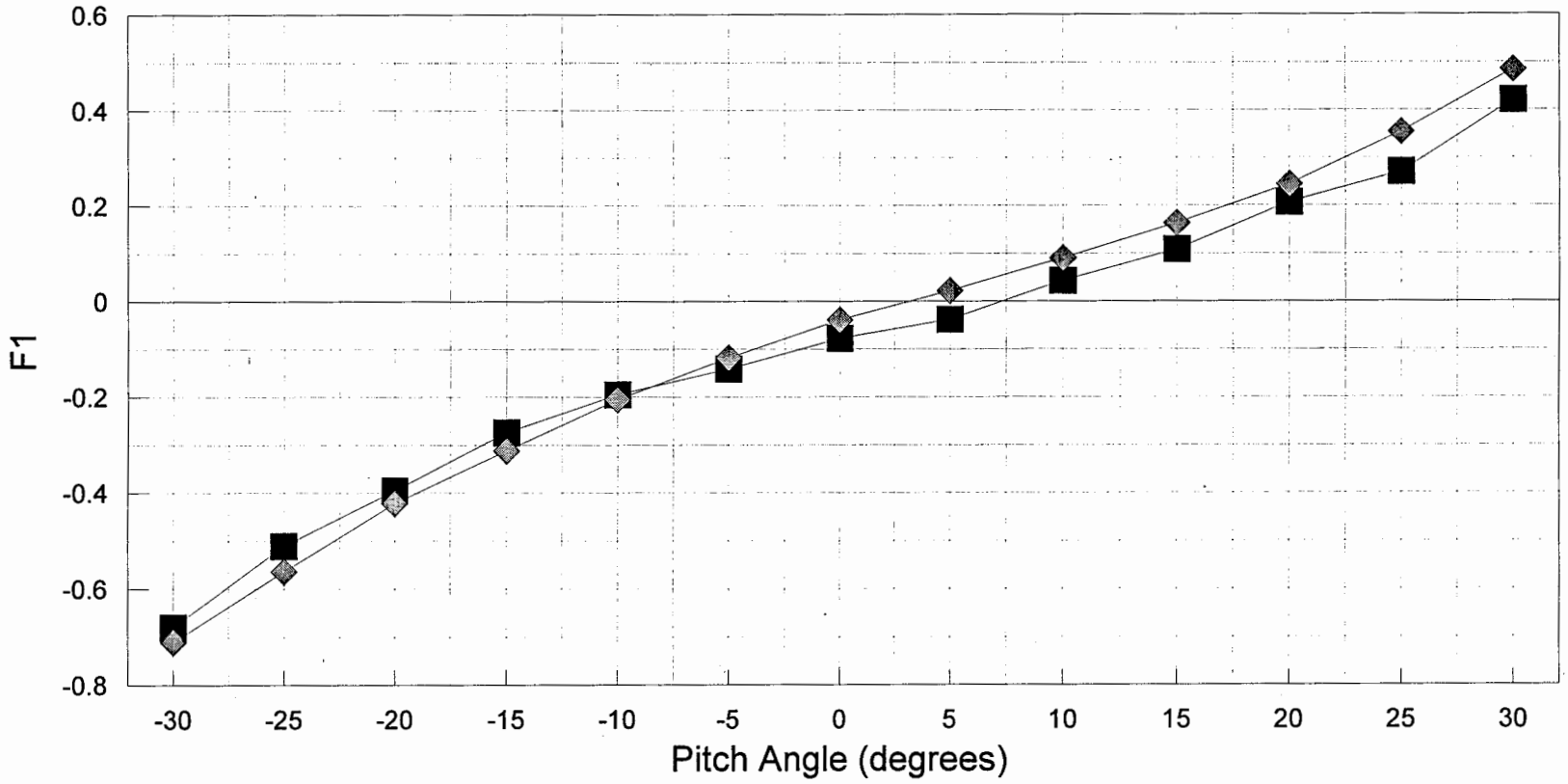
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ATTACHMENT G.

K-DAT Probe Calibration Data

Figure C2-10. K-DAT: Avg. (30-60 fps) F1 vs. Pitch Angle

NCSU Post-Test and NIST Wind Tunnel Calibrations

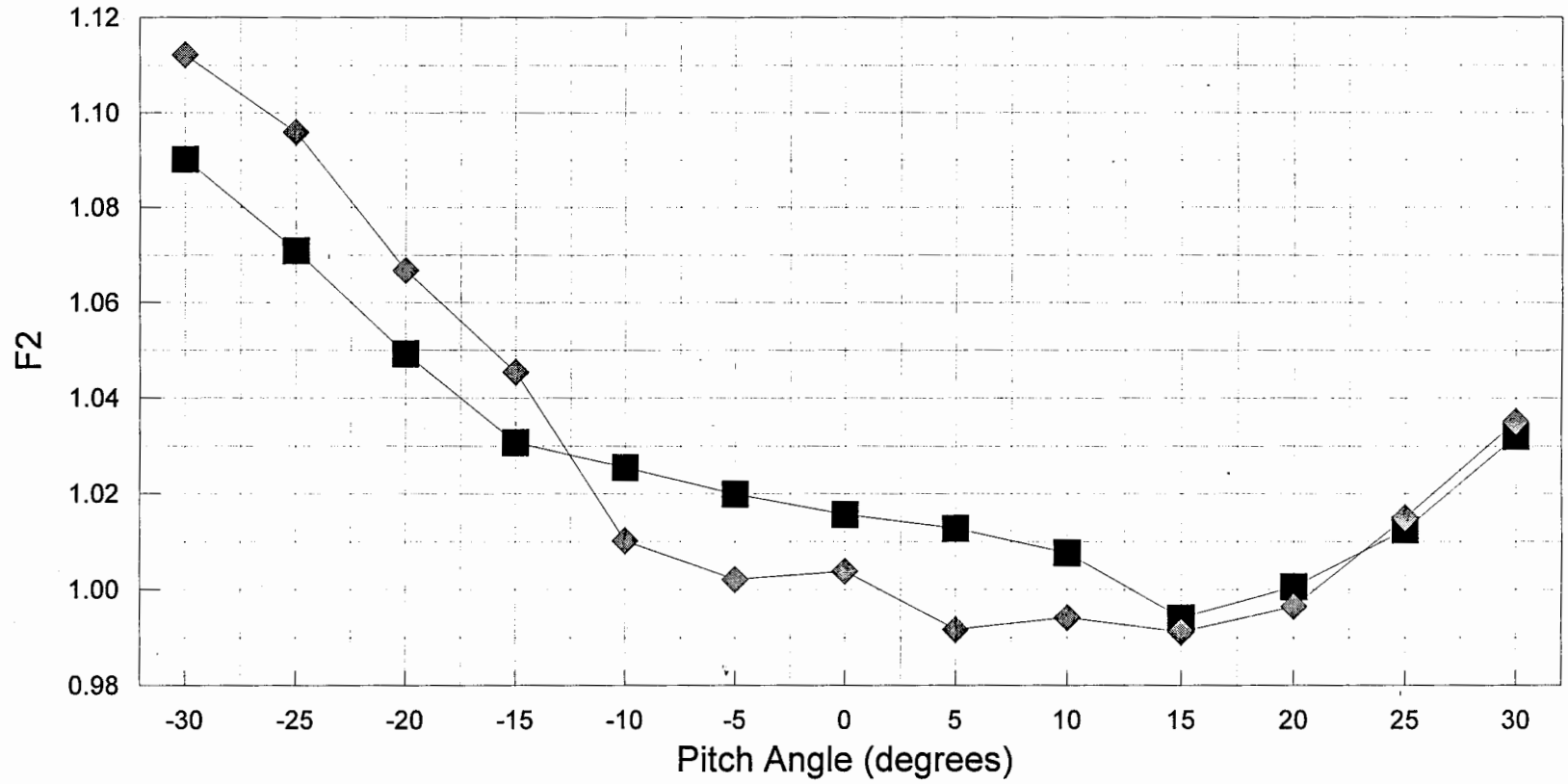


Note: Each point represents the mean of three replicates.

FC210-12.WK4

Figure C2-11. K-DAT: Avg. (30-60 fps) F2 vs. Pitch Angle

NCSU Post-Test and NIST Wind Tunnel Calibrations

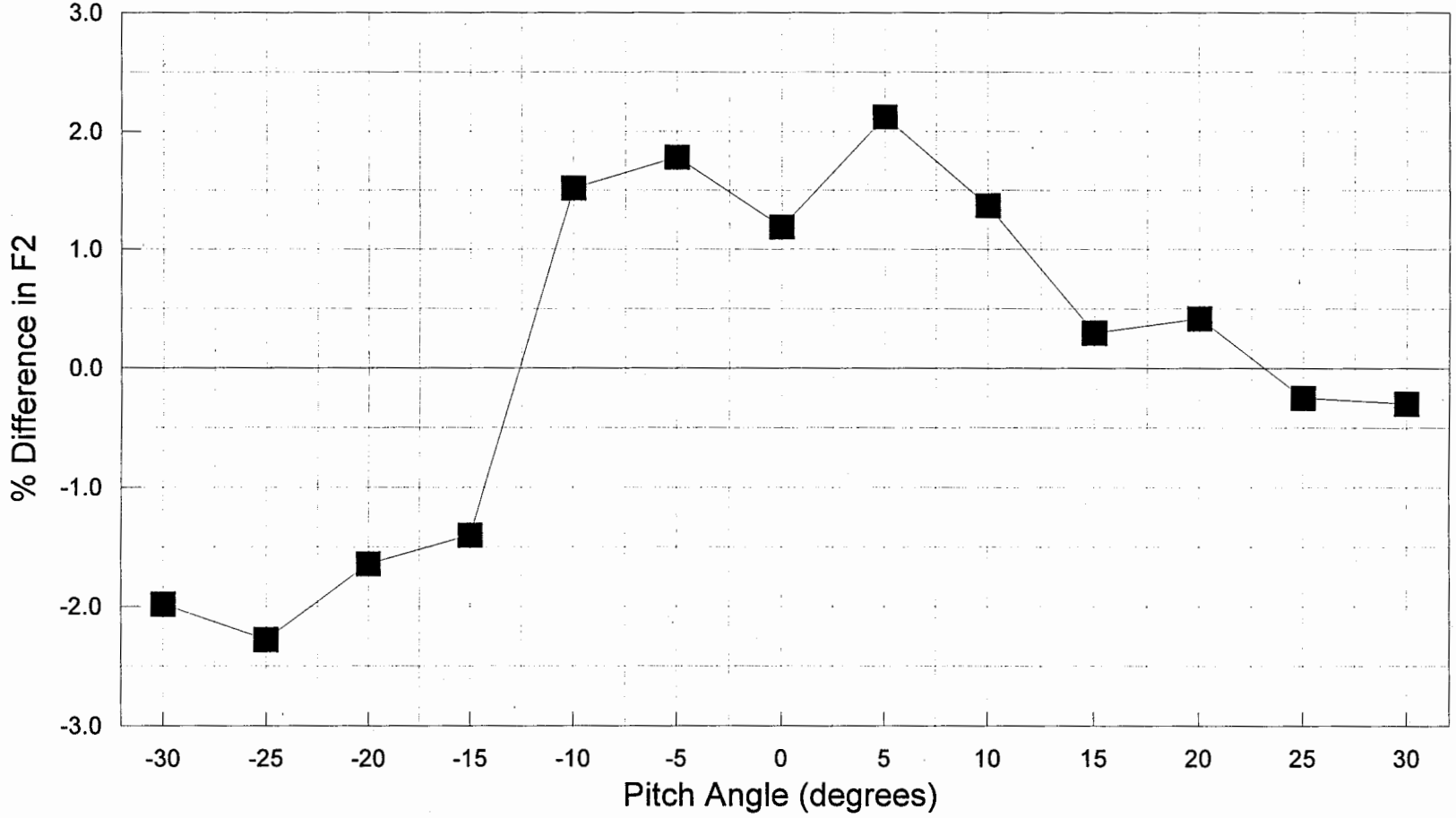


Note: Each point represents the mean of three replicates.

FC210-12.WK4

Figure C2-12. K-DAT: Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC210-12.WK4

Table C2-13. KEA DAT Probe: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

	30 fps / NIST 30-60 Calibration			30 fps / Post-test 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.56	30.93	27.17	29.11	30.45	26.61	1.93	-1.54	-2.05
-25	26.38	31.77	28.41	27.31	31.45	27.91	3.51	-0.98	-1.74
-20	20.75	31.71	29.61	22.31	31.32	28.94	7.50	-1.22	-2.29
-15	16.05	31.32	30.05	17.42	31.12	29.66	8.51	-0.61	-1.30
-10	11.47	30.78	30.14	12.48	30.94	30.17	8.83	0.51	0.08
-5	9.13	30.63	30.18	9.29	30.91	30.37	1.73	0.89	0.62
0	6.79	30.32	30.08	8.05	30.79	30.47	18.45	1.53	1.30
5	6.41	30.33	30.14	8.42	30.80	30.45	31.30	1.56	1.06
10	9.26	30.51	30.06	11.09	30.85	30.18	19.81	1.12	0.39
15	10.56	30.74	30.01	13.27	30.96	29.92	25.72	0.71	-0.29
20	17.95	30.58	29.05	20.93	30.86	28.78	16.57	0.90	-0.93
25	23.32	30.62	28.10	26.24	30.91	27.71	12.54	0.93	-1.40
30	27.76	30.76	27.21	29.50	30.88	26.88	6.25	0.39	-1.22

	60 fps / NIST 30-60 Calibration			60 fps / Post-test 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	26.99	58.03	51.73	28.31	57.53	50.66	4.91	-0.87	-2.07
-25	21.38	60.54	56.36	22.87	59.80	55.08	6.97	-1.23	-2.28
-20	15.75	60.17	57.80	17.07	59.86	57.12	8.39	-0.52	-1.18
-15	12.18	60.09	58.69	13.32	60.39	58.71	9.31	0.50	0.04
-10	10.34	59.87	58.85	11.07	60.44	59.23	7.01	0.95	0.66
-5	5.99	59.20	58.79	4.95	60.04	59.63	-17.38	1.41	1.44
0	3.18	58.84	58.74	5.51	59.65	59.36	72.93	1.37	1.06
5	4.97	58.75	58.47	7.91	59.52	58.85	59.22	1.30	0.65
10	8.62	59.00	58.05	12.24	59.29	57.70	42.07	0.49	-0.62
15	16.11	59.64	57.29	18.68	60.03	56.87	15.95	0.66	-0.74
20	20.26	60.65	56.88	23.49	61.28	56.18	15.95	1.05	-1.23
25	25.26	60.02	54.27	28.04	60.51	53.40	10.98	0.81	-1.61
30	29.33	60.70	52.91	30.02	60.68	52.54	2.35	-0.03	-0.71

	90 fps / NIST 30-60 Calibration			90 fps / Post-test 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	26.01	88.74	79.70	27.47	87.90	77.96	5.62	-0.95	-2.20
-25	21.42	91.43	85.07	22.88	90.26	83.11	6.78	-1.28	-2.31
-20	18.23	91.27	86.65	19.57	90.29	85.04	7.33	-1.08	-1.86
-15	12.74	90.42	88.11	13.94	90.71	87.95	9.45	0.32	-0.19
-10	7.61	89.12	88.18	7.13	90.19	89.19	-6.30	1.20	1.14
-5	4.59	88.64	88.27	3.10	89.89	89.61	-32.37	1.41	1.52
0	1.91	88.63	88.58	4.23	89.69	89.35	121.51	1.19	0.87
5	6.17	88.04	87.53	9.66	89.45	88.18	56.69	1.60	0.74
10	11.34	88.43	86.71	15.01	88.55	85.53	32.39	0.14	-1.35
15	17.12	89.82	85.81	19.70	90.49	85.16	15.06	0.75	-0.76
20	20.80	90.42	84.52	24.32	91.45	83.34	16.90	1.14	-1.41
25	24.97	90.27	81.83	27.75	91.01	80.54	11.16	0.83	-1.57
30	29.48	91.51	79.67	30.03	91.44	79.17	1.86	-0.08	-0.63

Figure C2-13. K-DAT Probe: Percent Difference in NCSU Post-Test and NIST Wind Tunnel Calibration

Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data

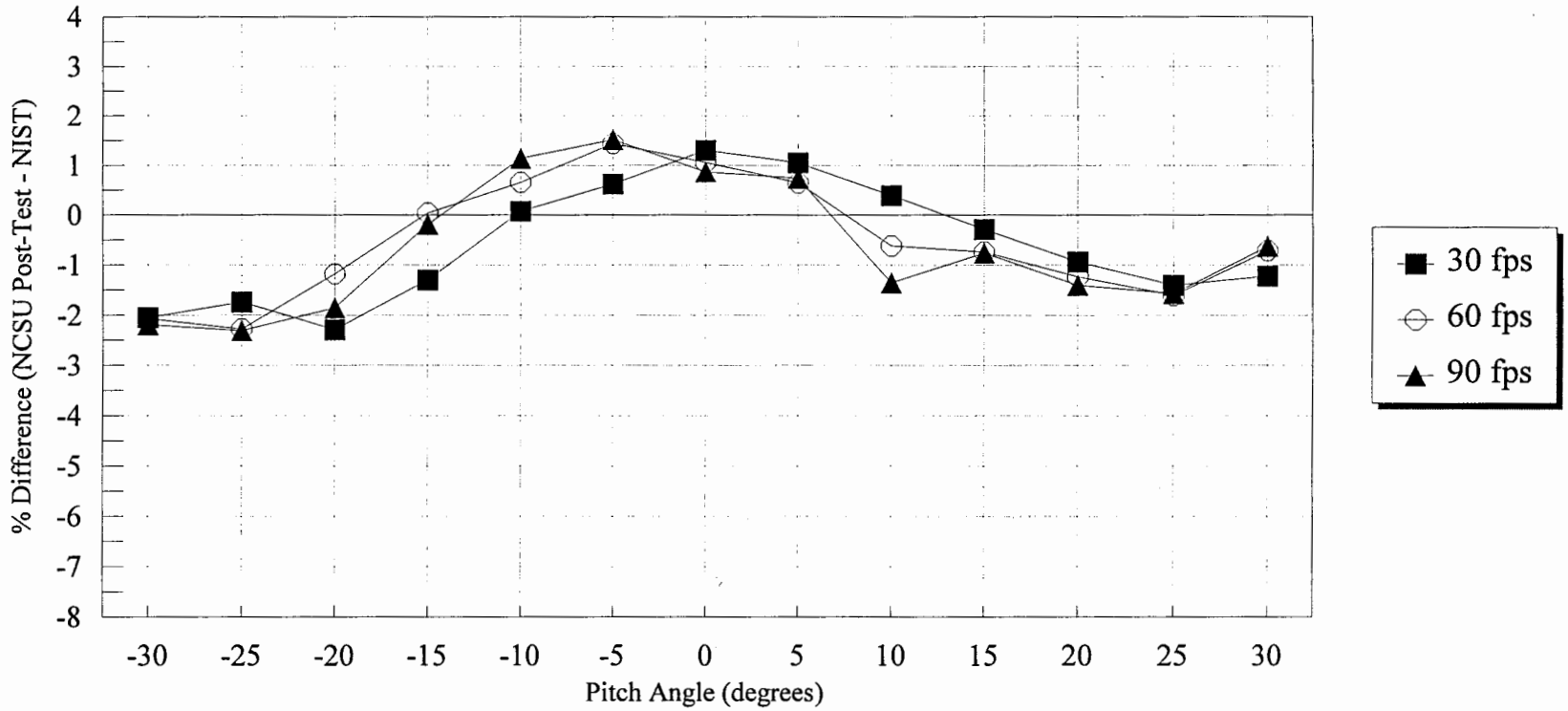


Table C2-14. K-DAT Computations: 30 fps

Probe: **K-DAT / with NIST 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 02/06/98

Number Of Points: 39

Barometric Pressure, in. Hg:	30.12	Probe ID:	K-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	30.12	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.84%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	84 _F
Average Axial Velocity, ft/sec:	**29.25**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	8.57		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.6	-0.120	0.170	82	-29.8	29.8	0.2101	31.01	26.90
	-25	0.8	-0.115	0.180	82	-27.5	27.6	0.2195	31.70	28.10
	-20	0.8	-0.085	0.184	82	-21.4	21.4	0.2127	31.20	29.05
	-15	0.8	-0.065	0.190	82	-16.3	16.4	0.2100	31.00	29.75
	-10	0.9	-0.055	0.190	82	-13.9	14.0	0.2047	30.61	29.71
	-5	0.9	-0.045	0.195	82	-11.2	11.2	0.2024	30.44	29.85
	0	0.9	-0.030	0.195	82	-7.1	7.1	0.1971	30.04	29.81
	5	0.8	0.005	0.198	82	5.2	5.3	0.1948	29.86	29.73
	10	1.7	0.010	0.200	82	7.0	7.2	0.1971	30.04	29.80
	15	0.9	0.030	0.205	82	13.8	13.9	0.2017	30.38	29.50
	20	1.7	0.050	0.205	82	20.0	20.0	0.2035	30.53	28.68
	25	0.9	0.070	0.200	82	24.8	24.8	0.2058	30.69	27.85
	30	0.8	0.080	0.190	82	27.6	27.6	0.1998	30.24	26.81
2	-30	0.5	-0.110	0.187	87	-25.8	25.8	0.2257	32.29	29.07
	-25	0.6	-0.090	0.193	87	-21.6	21.6	0.2234	32.13	29.88
	-20	0.6	-0.070	0.195	87	-17.1	17.1	0.2168	31.65	30.25
	-15	0.5	-0.050	0.197	87	-12.3	12.3	0.2075	30.96	30.25
	-10	0.6	-0.035	0.199	87	-8.3	8.3	0.2020	30.55	30.23
	-5	0.3	-0.020	0.200	87	-3.9	3.9	0.2010	30.47	30.40
	0	1.4	0.000	0.200	87	3.2	3.5	0.1984	30.28	30.22
	5	1.3	0.010	0.205	87	6.9	7.1	0.2020	30.55	30.32
	10	1.3	0.030	0.210	87	13.6	13.6	0.2066	30.90	30.03
	15	1.2	0.040	0.210	88	16.7	16.7	0.2070	30.96	29.65
	20	1.3	0.050	0.205	88	20.0	20.0	0.2035	30.69	28.84
	25	1.3	0.070	0.200	88	24.8	24.8	0.2058	30.86	28.00
	30	0.2	0.094	0.195	88	29.9	29.9	0.2088	31.09	26.95
3	-30	1.1	-0.160	0.170	88	-30.0	30.0	0.1879	29.49	25.53
	-25	1.4	-0.130	0.180	88	-30.0	30.0	0.2139	31.47	27.24
	-20	1.4	-0.100	0.190	88	-23.7	23.7	0.2250	32.27	29.55
	-15	1.4	-0.080	0.195	88	-19.5	19.5	0.2210	31.98	30.15
	-10	0.9	-0.050	0.200	88	-12.1	12.1	0.2101	31.19	30.49
	-5	0.9	-0.050	0.197	88	-12.3	12.3	0.2075	30.99	30.28
	0	0.8	-0.040	0.199	88	-9.8	9.8	0.2029	30.65	30.20
	5	0.8	-0.030	0.200	88	-6.8	6.9	0.2020	30.58	30.36
	10	0.9	-0.030	0.200	88	-6.8	6.9	0.2020	30.58	30.36
	15	0.9	-0.010	0.205	87	-0.6	1.1	0.2065	30.89	30.88
	20	0.8	0.030	0.205	87	13.8	13.8	0.2017	30.52	29.64
	25	1.0	0.050	0.200	87	20.2	20.3	0.1990	30.32	28.44
	30	0.7	0.075	0.200	87	25.8	25.8	0.2074	30.95	27.86

		Res	Vdir	Vax
Average	-30	28.56	30.93	27.17
	-25	26.38	31.77	28.41
	-20	20.75	31.71	29.61
	-15	16.05	31.32	30.05
	-10	11.47	30.78	30.14
	-5	9.13	30.63	30.18
	0	6.79	30.32	30.08
	5	6.41	30.33	30.14
	10	9.26	30.51	30.06
	15	10.56	30.74	30.01
	20	17.95	30.58	29.05
	25	23.32	30.62	28.10
	30	27.76	30.76	27.21

Table C2-15. K-DAT Computations: 60 fps

Probe: **K-DAT / with NIST 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 02/06/98

Number Of Points: 39

Barometric Pressure, in. Hg:	30.12	Probe ID:	K-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	30.12	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.95%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	84 _F
Average Axial Velocity, ft/sec:	**56.83**	Last Row:	61
Average Yaw Angle:	0.8		
Average Pitch Angle:	15.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.4		0
Resultant Angle Standard Deviation:	8.84		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.3	-0.400	0.650	84	-26.7	26.7	0.7888	60.20	53.76
	-25	0.5	-0.310	0.680	83	-21.2	21.2	0.7841	59.97	55.91
	-20	0.5	-0.240	0.720	83	-15.9	16.0	0.7930	60.31	57.99
	-15	0.6	-0.170	0.750	83	-11.0	11.0	0.7763	59.67	58.57
	-10	0.6	-0.135	0.750	83	-8.6	8.6	0.7618	59.11	58.45
	-5	1.0	-0.075	0.750	82	-3.9	4.0	0.7537	58.74	58.60
	0	0.4	-0.010	0.750	82	2.1	2.1	0.7482	58.52	58.48
	5	1.1	0.040	0.750	82	7.3	7.4	0.7392	58.17	57.69
	10	0.8	0.105	0.750	82	13.4	13.4	0.7381	58.13	56.55
	15	0.8	0.145	0.750	81	16.8	16.9	0.7397	58.14	55.64
	20	1.1	0.205	0.800	81	20.5	20.6	0.7976	60.37	56.53
	25	1.1	0.260	0.770	81	24.3	24.3	0.7890	60.04	54.73
	30	1.1	0.350	0.750	80	29.3	29.3	0.7993	60.38	52.64
2	-30	0.7	-0.380	0.650	88	-25.7	25.7	0.7839	60.24	54.27
	-25	0.6	-0.350	0.690	89	-23.0	23.0	0.8113	61.34	56.46
	-20	0.8	-0.300	0.730	89	-19.5	19.5	0.8275	61.94	58.39
	-15	0.7	-0.230	0.730	89	-15.1	15.1	0.7985	60.85	58.74
	-10	0.8	-0.210	0.750	89	-13.5	13.5	0.8032	61.03	59.34
	-5	0.8	-0.160	0.750	89	-10.4	10.4	0.7695	59.74	58.75
	0	0.8	-0.090	0.750	89	-5.1	5.2	0.7534	59.11	58.87
	5	0.8	-0.040	0.750	89	-0.9	1.2	0.7552	59.18	59.17
	10	0.7	-0.030	0.750	88	-0.1	0.7	0.7557	59.14	59.14
	15	0.8	0.130	0.800	89	14.9	15.0	0.7859	60.37	58.32
	20	0.9	0.180	0.800	89	18.8	18.8	0.7923	60.61	57.38
	25	0.9	0.280	0.750	89	25.7	25.8	0.7772	60.03	54.07
	30	1.3	0.350	0.750	89	29.3	29.3	0.7993	60.88	53.07
3	-30	0.9	-0.400	0.600	89	-28.5	28.5	0.6210	53.66	47.16
	-25	0.1	-0.290	0.690	89	-19.9	19.9	0.7848	60.32	56.71
	-20	0.6	-0.170	0.700	89	-11.8	11.8	0.7321	58.27	57.04
	-15	0.6	-0.160	0.750	89	-10.4	10.4	0.7695	59.74	58.75
	-10	0.4	-0.140	0.750	89	-8.9	8.9	0.7628	59.47	58.75
	-5	1.0	-0.070	0.750	89	-3.4	3.6	0.7540	59.13	59.01
	0	0.9	-0.010	0.750	89	2.1	2.3	0.7482	58.90	58.86
	5	0.8	0.030	0.760	89	6.3	6.3	0.7484	58.91	58.55
	10	0.9	0.090	0.780	89	11.7	11.7	0.7692	59.73	58.48
	15	0.9	0.150	0.800	88	16.5	16.5	0.7884	60.41	57.92
	20	1.1	0.220	0.800	88	21.4	21.4	0.8027	60.95	56.75
	25	1.1	0.280	0.750	88	25.7	25.8	0.7772	59.98	54.02
	30	1.1	0.350	0.750	88	29.3	29.3	0.7993	60.83	53.03

		Res	Vdir	Vax
Average	-30	26.99	58.03	51.73
	-25	21.38	60.54	56.36
	-20	15.75	60.17	57.80
	-15	12.18	60.09	58.69
	-10	10.34	59.87	58.85
	-5	5.99	59.20	58.79
	0	3.18	58.84	58.74
	5	4.97	58.75	58.47
	10	8.62	59.00	58.05
	15	16.11	59.64	57.29
	20	20.26	60.65	56.88
	25	25.26	60.02	54.27
	30	29.33	60.70	52.91

Table C2-16. K-DAT Computations: 90 fps

Probe: **K-DAT / with NIST 30-60 Calibration**
Velocity Point: **90 fps**
Cal Date: 02/06/98

Number Of Points: 39

Barometric Pressure, in. Hg:	30.12	Probe ID:	K-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	30.12	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.69%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**85.43**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	15.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.6		0
Resultant Angle Standard Deviation:	8.79		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.4	-0.900	1.450	94	-26.9	26.9	1.7616	90.79	80.95
	-25	0.6	-0.650	1.600	93	-19.3	19.3	1.8105	91.96	86.80
	-20	0.7	-0.600	1.600	93	-17.9	17.9	1.7898	91.43	87.02
	-15	0.6	-0.400	1.660	92	-11.7	11.7	1.7341	89.92	88.05
	-10	0.5	-0.270	1.670	92	-7.5	7.5	1.6906	88.78	88.02
	-5	0.7	-0.140	1.680	91	-2.8	2.9	1.6896	88.68	88.56
	0	0.7	-0.030	1.680	91	1.7	1.8	1.6790	88.40	88.35
	5	0.6	0.060	1.680	90	6.0	6.0	1.6538	87.65	87.17
	10	0.7	0.180	1.700	89	11.0	11.1	1.6779	88.21	86.57
	15	0.6	0.320	1.750	89	16.2	16.2	1.7235	89.40	85.85
	20	1.0	0.480	1.770	88	21.2	21.2	1.7736	90.61	84.45
	25	1.1	0.600	1.700	87	25.0	25.0	1.7508	89.94	81.53
	30	1.3	0.800	1.670	86	29.8	29.8	1.7863	90.76	78.75
2	-30	0.5	-0.900	1.450	87	-26.9	26.9	1.7616	90.22	80.43
	-25	0.4	-0.800	1.500	88	-23.9	23.9	1.7811	90.80	83.00
	-20	0.5	-0.680	1.570	89	-20.4	20.4	1.7945	91.22	85.50
	-15	0.6	-0.550	1.650	90	-15.9	16.0	1.8174	91.88	88.34
	-10	0.4	-0.400	1.650	91	-11.7	11.7	1.7253	89.61	87.73
	-5	0.7	-0.280	1.650	91	-8.0	8.0	1.6729	88.24	87.38
	0	0.5	-0.130	1.660	92	-2.5	2.5	1.6698	88.24	88.15
	5	0.5	0.070	1.680	94	6.4	6.5	1.6545	87.99	87.43
	10	0.6	0.180	1.700	94	11.0	11.1	1.6779	88.61	86.96
	15	0.7	0.320	1.750	95	16.2	16.2	1.7235	89.89	86.31
	20	0.7	0.450	1.750	95	20.6	20.6	1.7452	90.45	84.68
	25	0.8	0.600	1.700	95	25.0	25.0	1.7508	90.59	82.13
	30	1.2	0.780	1.690	96	29.1	29.1	1.7984	91.90	80.27
3	-30	0.2	-0.800	1.480	96	-24.2	24.2	1.5461	85.21	77.74
	-25	0.9	-0.700	1.550	96	-21.0	21.1	1.7843	91.54	85.43
	-20	0.7	-0.550	1.600	96	-16.4	16.4	1.7692	91.15	87.42
	-15	0.6	-0.360	1.660	95	-10.5	10.6	1.7072	89.46	87.94
	-10	0.4	-0.160	1.680	95	-3.6	3.6	1.6887	88.97	88.80
	-5	0.6	-0.140	1.680	95	-2.8	2.9	1.6896	89.00	88.88
	0	0.5	-0.040	1.700	94	1.2	1.3	1.7028	89.26	89.24
	5	0.8	0.060	1.700	94	6.0	6.0	1.6735	88.49	88.00
	10	0.9	0.200	1.700	93	11.9	11.9	1.6762	88.48	86.59
	15	1.0	0.400	1.760	92	18.9	19.0	1.7437	90.16	85.28
	20	1.0	0.450	1.750	92	20.6	20.6	1.7452	90.20	84.44
	25	0.9	0.600	1.700	91	25.0	25.0	1.7508	90.27	81.83
	30	1.4	0.800	1.700	91	29.5	29.5	1.8139	91.88	79.98

		Res	Vdir	Vax
Average	-30	26.01	88.74	79.70
	-25	21.42	91.43	85.07
	-20	18.23	91.27	86.65
	-15	12.74	90.42	88.11
	-10	7.61	89.12	88.18
	-5	4.59	88.64	88.27
	0	1.91	88.63	88.58
	5	6.17	88.04	87.53
	10	11.34	88.43	86.71
	15	17.12	89.82	85.81
	20	20.80	90.42	84.52
	25	24.97	90.27	81.83
	30	29.48	91.51	79.67

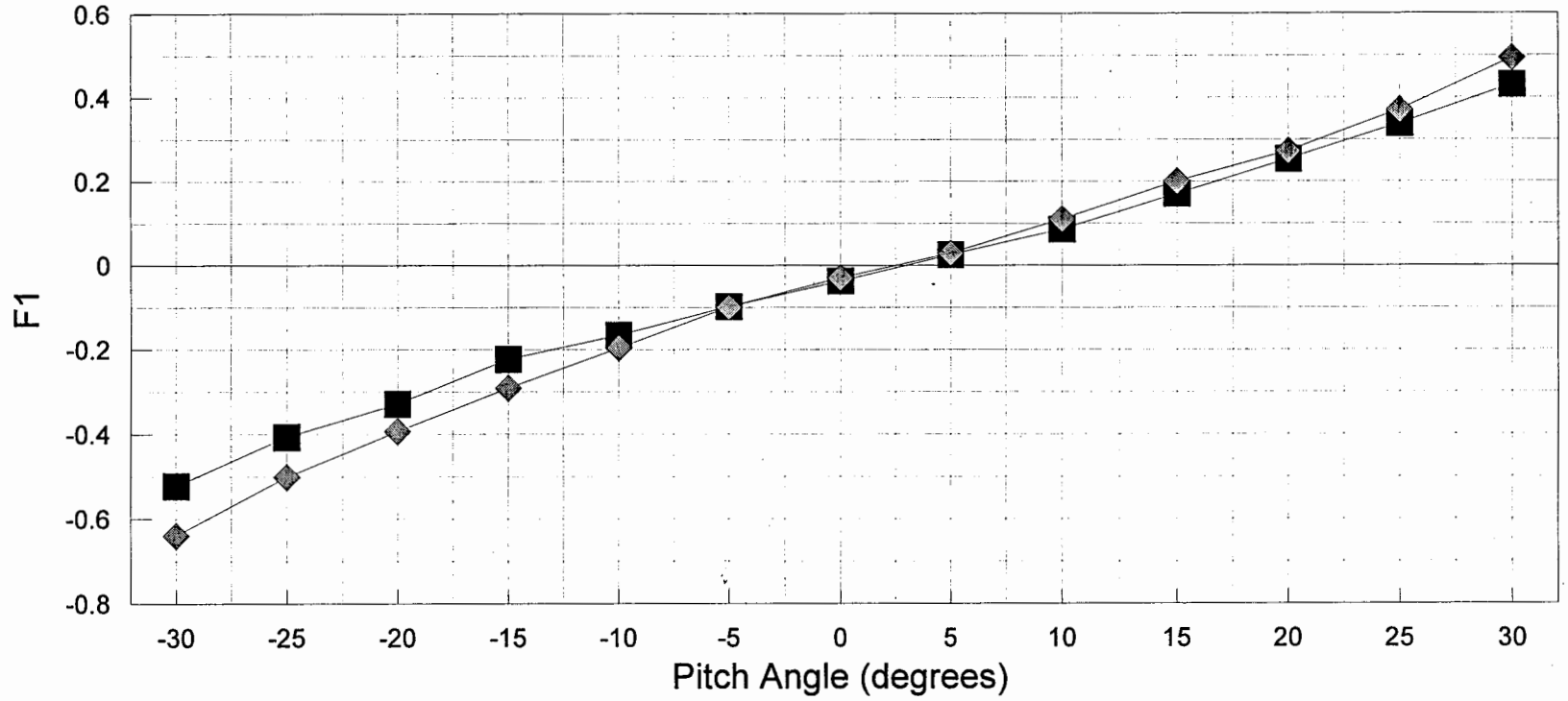
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ATTACHMENT H.

C-DAT Probe Calibration Data

Figure C2-14. C-DAT: Avg. (30-60 fps) F1 vs. Pitch Angle

NCSU Post-Test and NIST Wind Tunnel Calibrations

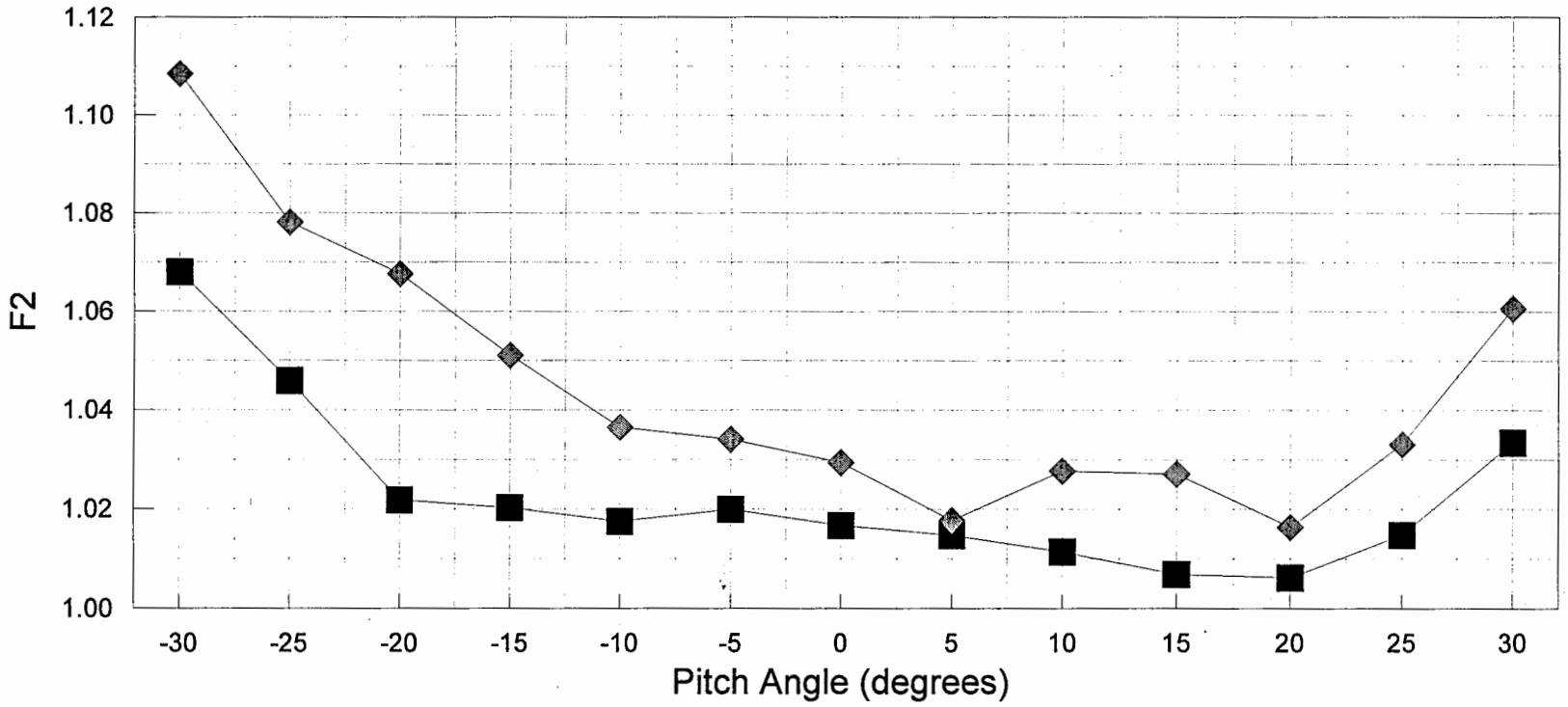


Note: Each point represents the mean of three replicates.

FC214-16.WK4

Figure C2-15. C-DAT: Avg. (30-60 fps) F2 vs. Pitch Angle

NCSU Post-Test and NIST Wind Tunnel Calibrations

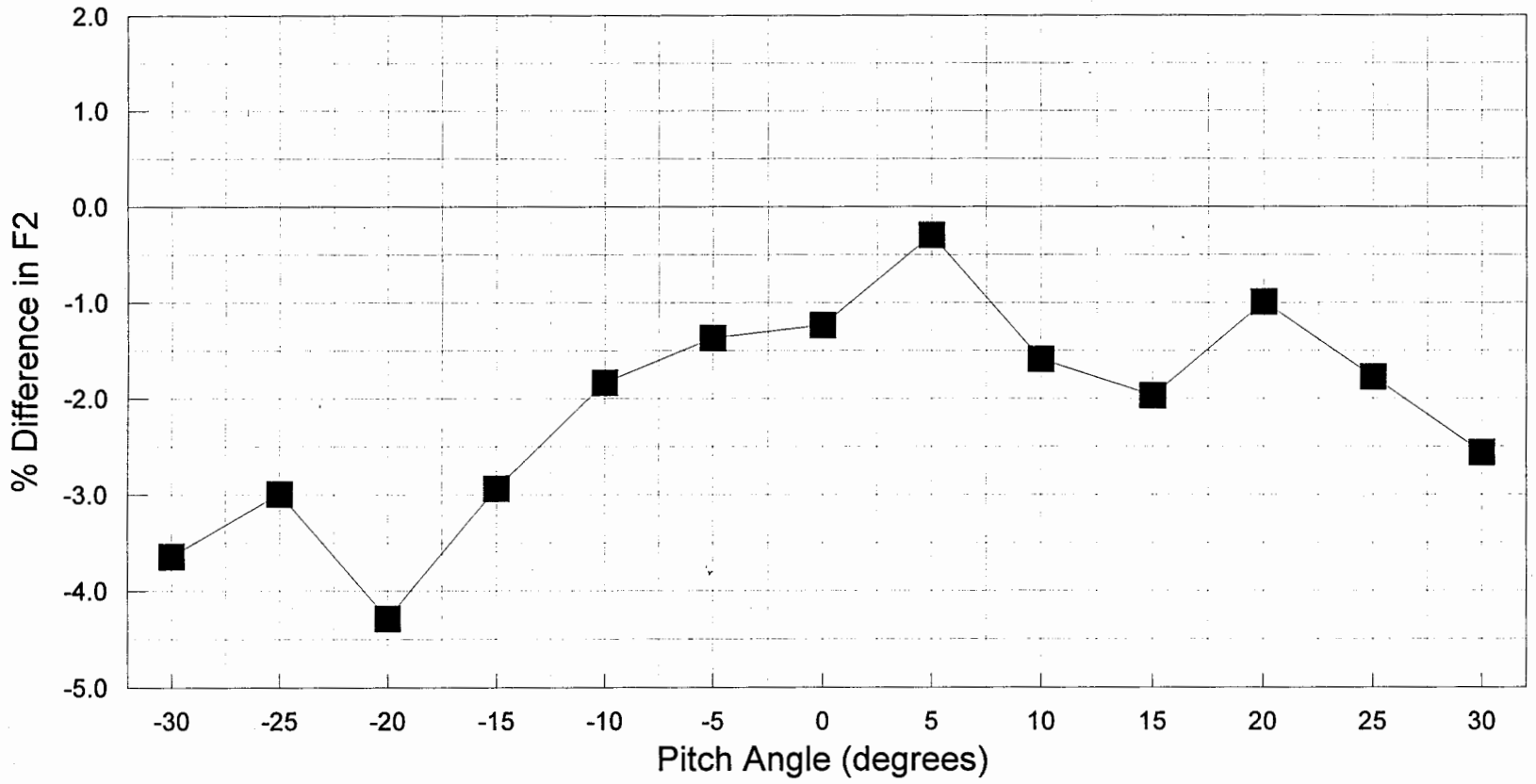


Note: Each point represents the mean of three replicates.

FC214-16.WK4

Figure C2-16. C-DAT: Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC214-16.WK4

Table C2-17. Cadmus DAT Probe 3D-3: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

	30 fps / NIST 30-60 Calibration			30 fps / Post-test 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	26.05	31.78	28.42	27.25	31.25	27.71	4.60	-1.66	-2.48
-25	22.11	33.32	30.80	25.98	32.64	29.25	17.50	-2.04	-5.03
-20	18.07	33.64	31.96	21.79	32.73	30.36	20.58	-2.72	-5.02
-15	13.44	33.64	32.70	16.85	32.81	31.39	25.37	-2.46	-4.01
-10	8.76	33.25	32.84	10.79	32.68	32.04	23.24	-1.72	-2.44
-5	6.13	33.02	32.77	7.13	32.50	32.14	16.29	-1.58	-1.91
0	3.75	32.92	32.84	3.91	32.53	32.45	4.01	-1.17	-1.18
5	3.81	32.86	32.72	3.99	32.42	32.24	4.67	-1.34	-1.46
10	6.36	32.79	32.53	7.19	32.45	32.13	13.14	-1.04	-1.25
15	10.70	33.30	32.68	12.28	32.78	31.99	14.75	-1.55	-2.11
20	16.50	33.21	31.81	18.00	32.69	31.07	9.07	-1.55	-2.34
25	24.36	32.82	29.89	26.12	32.43	29.12	7.23	-1.17	-2.59
30	28.89	33.24	29.11	30.03	32.58	28.21	3.94	-1.99	-3.08

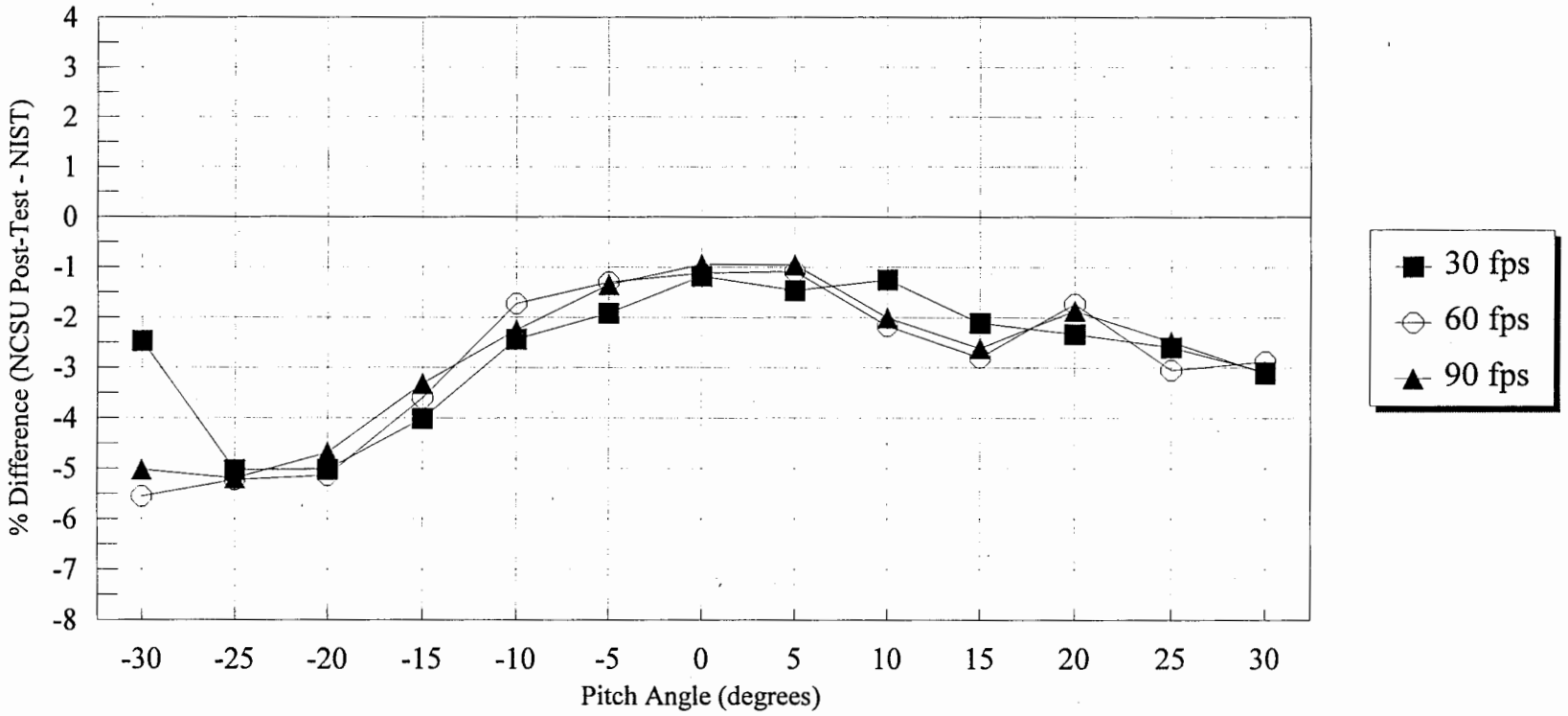
	60 fps / NIST 30-60 Calibration			60 fps / Post-test 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	25.77	60.19	54.20	29.79	58.99	51.19	15.59	-2.00	-5.56
-25	20.67	61.82	57.84	24.98	60.47	54.81	20.83	-2.18	-5.23
-20	17.89	62.34	59.31	21.41	60.45	56.26	19.65	-3.02	-5.14
-15	12.40	61.61	60.13	15.67	60.24	57.96	26.42	-2.22	-3.60
-10	6.25	61.08	60.67	7.05	60.18	59.62	12.91	-1.47	-1.73
-5	2.43	60.91	60.84	2.12	60.10	60.05	-12.67	-1.32	-1.30
0	1.41	60.80	60.78	1.65	60.13	60.10	16.89	-1.10	-1.11
5	5.71	60.36	60.02	6.56	59.81	59.36	14.92	-0.91	-1.09
10	10.73	60.57	59.48	12.21	59.57	58.19	13.77	-1.65	-2.17
15	15.41	60.83	58.65	17.19	59.67	57.00	11.57	-1.91	-2.80
20	19.56	61.66	58.10	20.74	61.05	57.09	6.05	-0.99	-1.73
25	25.55	61.92	55.83	27.66	61.16	54.13	8.26	-1.22	-3.05
30	29.34	61.68	53.77	30.01	60.31	52.22	2.28	-2.23	-2.87

	90 fps / NIST 30-60 Calibration			90 fps / Post-test 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	23.85	89.66	82.00	28.02	88.23	77.88	17.49	-1.60	-5.02
-25	20.50	92.15	86.30	24.69	90.06	81.82	20.42	-2.26	-5.19
-20	15.76	92.43	88.93	19.06	89.71	84.77	20.96	-2.95	-4.68
-15	11.51	91.77	89.91	14.83	89.94	86.92	28.86	-2.00	-3.32
-10	8.57	91.23	90.19	10.39	89.68	88.15	21.16	-1.70	-2.26
-5	2.64	91.79	91.63	2.59	90.56	90.40	-2.02	-1.34	-1.35
0	2.20	90.47	90.40	2.35	89.64	89.54	6.92	-0.92	-0.95
5	4.89	90.35	89.94	5.59	89.60	89.09	14.37	-0.83	-0.95
10	9.78	90.53	89.19	11.17	89.11	87.40	14.24	-1.57	-2.01
15	16.33	90.78	87.11	17.98	89.20	84.84	10.14	-1.74	-2.61
20	20.69	91.84	85.90	21.96	90.92	84.30	6.18	-1.00	-1.87
25	21.73	93.01	86.26	23.37	91.79	84.11	7.53	-1.31	-2.49
30	28.80	91.63	80.29	30.02	89.84	77.79	4.23	-1.95	-3.12

TABC217.WK4

Figure C2-17. C-DAT Probe: Percent Difference in NCSU Post-Test and NIST Wind Tunnel Calibration

Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data



TABC217.WK4

Table C2-18. C-DAT Computations: 30 fps

Probe: C-DAT / with NIST 30-60 Calibration
Velocity Point: 30 fps
Cal Date: 02/06/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	C-DAT
Static Pressure, inches H2O:	0	Pitot Cp:	1
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	1 Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	0.04
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	82.65 _F
Average Axial Velocity, ft/sec:	31.62	Last Row:	61
Average Yaw Angle:	0.38	First Row	23
Average Pitch Angle:	14.52	Volumetric Air Flow Rate,	
Average Resultant Angle:	14.53	SCFM Wet:	
Resultant Angle Standard Deviation:	9.04		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0	-0.070	0.197	79	-18.1	18.1	0.2220	31.91	30.33
	-25	0.1	-0.070	0.210	79	-17.1	17.1	0.2350	32.84	31.39
	-20	0.2	-0.065	0.215	79	-15.5	15.5	0.2384	33.07	31.86
	-15	0.2	-0.050	0.218	79	-11.7	11.7	0.2365	32.94	32.25
	-10	0	-0.025	0.215	79	-5.9	5.9	0.2301	32.49	32.32
	-5	-0.1	-0.010	0.215	79	-1.3	1.3	0.2284	32.37	32.36
	0	-0.1	0.000	0.215	78	2.5	2.5	0.2253	32.12	32.09
	5	-0.1	0.020	0.215	79	8.9	8.9	0.2261	32.21	31.82
	10	-0.1	0.026	0.216	79	10.6	10.6	0.2281	32.35	31.80
	15	0	0.045	0.226	79	14.9	14.9	0.2384	33.07	31.97
	20	0	0.060	0.222	79	19.9	19.9	0.2294	32.44	30.51
	25	-0.1	0.080	0.212	79	25.3	25.3	0.2269	32.26	29.18
	30	1.1	0.100	0.215	78	28.8	28.8	0.2390	33.08	28.97
2	-30	-0.1	-0.135	0.190	90	-30.0	30.0	0.2167	31.85	27.58
	-25	0.3	-0.105	0.205	90	-25.4	25.4	0.2394	33.48	30.24
	-20	0.4	-0.085	0.215	89	-20.1	20.1	0.2451	33.85	31.78
	-15	-0.1	-0.060	0.225	89	-13.7	13.7	0.2468	33.96	32.99
	-10	0.4	-0.050	0.225	89	-11.3	11.3	0.2436	33.74	33.08
	-5	0.6	-0.035	0.223	88	-8.0	8.0	0.2391	33.40	33.07
	0	-0.4	-0.020	0.221	88	-4.4	4.4	0.2361	33.18	33.08
	5	-0.1	-0.010	0.220	88	-1.2	1.2	0.2336	33.01	33.00
	10	0.5	0.010	0.222	88	6.0	6.0	0.2308	32.81	32.63
	15	0.3	0.020	0.230	88	8.6	8.6	0.2416	33.57	33.19
	20	-0.1	0.050	0.231	88	16.1	16.1	0.2426	33.64	32.33
	25	0	0.075	0.224	87	23.2	23.2	0.2363	33.17	30.49
	30	1.1	0.100	0.215	87	28.8	28.8	0.2390	33.35	29.21
3	-30	-0.8	-0.130	0.197	88	-30.0	30.0	0.2137	31.57	27.34
	-25	-0.1	-0.100	0.210	87	-23.9	23.9	0.2430	33.64	30.76
	-20	0.3	-0.080	0.220	87	-18.6	18.6	0.2485	34.02	32.25
	-15	0.8	-0.065	0.225	87	-14.9	14.9	0.2484	34.01	32.87
	-10	0.4	-0.040	0.225	87	-9.0	9.0	0.2415	33.53	33.12
	-5	0.4	-0.040	0.222	87	-9.1	9.2	0.2383	33.31	32.89
	0	0.5	-0.020	0.225	87	-4.3	4.3	0.2403	33.45	33.35
	5	0.7	-0.010	0.225	87	-1.1	1.3	0.2389	33.35	33.34
	10	-0.3	0.000	0.226	87	2.5	2.5	0.2368	33.20	33.17
	15	0.2	0.020	0.226	87	8.7	8.7	0.2375	33.25	32.87
	20	-1.2	0.040	0.229	87	13.5	13.6	0.2417	33.54	32.61
	25	-0.8	0.080	0.220	87	24.6	24.6	0.2342	33.02	30.02
	30	1.7	0.100	0.214	87	28.9	29.0	0.2381	33.29	29.13

		Res	Vdir	Vax
Average	-30	26.05	31.78	28.42
	-25	22.11	33.32	30.80
	-20	18.07	33.64	31.96
	-15	13.44	33.64	32.70
	-10	8.76	33.25	32.84
	-5	6.13	33.02	32.77
	0	3.75	32.92	32.84
	5	3.81	32.86	32.72
	10	6.36	32.79	32.53
	15	10.70	33.30	32.68
	20	16.50	33.21	31.81
	25	24.36	32.82	29.89
	30	28.89	33.24	29.11

Table C2-19. C-DAT Computations: 60 fps

Probe: **C-DAT / with NIST 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 02/06/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.89	Probe ID:	C-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.89%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	84 _F
Average Axial Velocity, ft/sec:	**58.43**	Last Row:	61
Average Yaw Angle:	0.5		
Average Pitch Angle:	14.8	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	14.9		0
Resultant Angle Standard Deviation:	9.10		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.350	0.670	80	-25.8	25.8	0.7857	60.10	54.12
	-25	-0.5	-0.300	0.710	80	-21.4	21.4	0.8136	61.15	56.95
	-20	-0.5	-0.280	0.730	81	-19.5	19.5	0.8296	61.81	58.25
	-15	-0.5	-0.225	0.750	81	-15.4	15.4	0.8309	61.85	59.62
	-10	-0.4	-0.140	0.750	81	-9.5	9.5	0.8054	60.90	60.06
	-5	-0.4	-0.060	0.750	82	-3.7	3.7	0.8001	60.75	60.63
	0	-0.8	-0.030	0.750	82	-0.8	1.1	0.7959	60.59	60.58
	5	0.0	0.000	0.750	82	2.5	2.5	0.7858	60.21	60.15
	10	-0.7	0.060	0.750	82	8.1	8.2	0.7864	60.23	59.62
	15	-0.7	0.150	0.750	82	14.9	14.9	0.7912	60.42	58.38
	20	-0.9	0.200	0.800	83	18.4	18.5	0.8318	62.00	58.81
	25	-0.4	0.260	0.770	83	23.3	23.3	0.8129	61.29	56.29
	30	-1.2	0.350	0.750	83	28.9	28.9	0.8341	62.09	54.35
2	-30	-0.4	-0.360	0.670	89	-26.3	26.3	0.7905	60.78	54.48
	-25	-0.6	-0.290	0.720	89	-20.4	20.5	0.8221	61.98	58.07
	-20	-0.4	-0.250	0.750	89	-17.1	17.1	0.8394	62.63	59.87
	-15	-0.6	-0.160	0.750	89	-10.9	10.9	0.8097	61.51	60.40
	-10	-0.3	-0.070	0.750	89	-4.6	4.6	0.8015	61.20	61.00
	-5	-0.2	-0.040	0.750	88	-1.7	1.8	0.7973	60.98	60.95
	0	-0.8	-0.010	0.760	88	1.4	1.6	0.8004	61.10	61.08
	5	0.0	0.050	0.750	88	7.3	7.3	0.7839	60.47	59.98
	10	-0.4	0.120	0.750	88	12.7	12.7	0.7916	60.76	59.27
	15	-0.5	0.160	0.770	88	15.4	15.4	0.8108	61.50	59.27
	20	-0.5	0.220	0.800	88	20.2	20.2	0.8271	62.11	58.31
	25	-0.8	0.300	0.760	88	26.0	26.0	0.8196	61.83	55.58
	30	-1.0	0.350	0.720	88	29.7	29.7	0.8073	61.36	53.30
3	-30	-0.3	-0.350	0.690	88	-25.2	25.2	0.7644	59.71	54.01
	-25	-0.5	-0.290	0.730	88	-20.2	20.2	0.8327	62.32	58.49
	-20	-0.3	-0.250	0.750	88	-17.1	17.1	0.8394	62.57	59.82
	-15	-0.1	-0.160	0.750	88	-10.9	10.9	0.8097	61.46	60.35
	-10	-0.2	-0.070	0.750	88	-4.6	4.6	0.8015	61.14	60.94
	-5	-0.6	-0.040	0.750	88	-1.7	1.8	0.7973	60.98	60.95
	0	-0.7	-0.010	0.750	88	1.3	1.5	0.7899	60.70	60.68
	5	-0.2	0.050	0.750	87	7.3	7.3	0.7839	60.41	59.92
	10	-0.9	0.100	0.750	87	11.3	11.3	0.7919	60.72	59.54
	15	-0.5	0.160	0.750	87	15.8	15.8	0.7884	60.59	58.29
	20	-0.9	0.210	0.770	87	20.0	20.1	0.7955	60.86	57.17
	25	-0.8	0.330	0.770	87	27.3	27.4	0.8426	62.63	55.63
	30	-0.5	0.350	0.730	86	29.4	29.4	0.8162	61.59	53.65

		Res	Vdir	Vax
Average	-30	25.77	60.19	54.20
	-25	20.67	61.82	57.84
	-20	17.89	62.34	59.31
	-15	12.40	61.61	60.13
	-10	6.25	61.08	60.67
	-5	2.43	60.91	60.84
	0	1.41	60.80	60.78
	5	5.71	60.36	60.02
	10	10.73	60.57	59.48
	15	15.41	60.83	58.65
	20	19.56	61.66	58.10
	25	25.55	61.92	55.83
	30	29.34	61.68	53.77

Table C2-20. C-DAT Computations: 90 fps

Probe: **C-DAT / with NIST 30-60 Calibration**
Velocity Point: **90 fps**
Cal Date: 02/06/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.89	Probe ID:	C-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.98%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	91 _F
Average Axial Velocity, ft/sec:	**87.54**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	14.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	14.4		0
Resultant Angle Standard Deviation:	8.45		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.2	-0.750	1.500	93	-25.0	25.0	1.7435	90.59	82.11
	-25	-0.8	-0.640	1.600	93	-20.3	20.3	1.8259	92.71	86.93
	-20	-0.1	-0.500	1.630	93	-15.8	15.8	1.8095	92.29	88.82
	-15	-1.1	-0.350	1.650	92	-10.8	10.9	1.7807	91.47	89.83
	-10	0.0	-0.250	1.650	92	-7.7	7.7	1.7689	91.16	90.34
	-5	-0.5	-0.070	1.750	91	-0.8	0.9	1.8571	93.32	93.31
	0	-0.1	0.000	1.650	91	2.5	2.5	1.7287	90.04	89.96
	5	-0.4	0.100	1.650	90	6.9	7.0	1.7220	89.79	89.12
	10	-1.1	0.210	1.650	90	10.9	11.0	1.7423	90.31	88.66
	15	-0.7	0.370	1.650	89	16.6	16.6	1.7289	89.88	86.13
	20	-1.1	0.470	1.700	88	20.2	20.3	1.7585	90.57	84.97
	25	-0.9	0.620	1.800	87	23.7	23.7	1.9046	94.17	86.24
	30	-1.1	0.750	1.640	85	28.5	28.5	1.8167	91.80	80.65
2	-30	-0.7	-0.700	1.510	90	-23.3	23.3	1.7435	90.34	82.99
	-25	-0.2	-0.670	1.550	91	-21.8	21.8	1.7794	91.35	84.81
	-20	-0.7	-0.550	1.620	92	-17.4	17.4	1.8166	92.39	88.17
	-15	-0.8	-0.410	1.640	93	-12.8	12.8	1.7900	91.79	89.50
	-10	-0.6	-0.330	1.630	93	-10.3	10.3	1.7540	90.86	89.40
	-5	-0.5	-0.180	1.640	93	-5.6	5.6	1.7547	90.88	90.45
	0	-0.5	-0.070	1.650	94	-1.0	1.1	1.7515	90.88	90.86
	5	-0.5	-0.020	1.650	94	1.5	1.5	1.7370	90.50	90.47
	10	-0.3	0.130	1.650	95	8.1	8.1	1.7296	90.39	89.50
	15	-0.6	0.350	1.650	95	15.7	15.8	1.7352	90.54	87.13
	20	-1.0	0.550	1.720	95	22.4	22.4	1.8051	92.34	85.35
	25	-1.2	0.400	1.700	96	17.4	17.4	1.7754	91.66	87.45
	30	-1.3	0.740	1.560	96	29.2	29.2	1.7405	90.76	79.20
3	-30	0.4	-0.700	1.510	99	-23.3	23.3	1.6296	88.05	80.89
	-25	-0.8	-0.600	1.580	99	-19.3	19.4	1.7936	92.38	87.16
	-20	-0.9	-0.450	1.640	99	-14.1	14.1	1.8030	92.62	89.81
	-15	-0.9	-0.350	1.650	99	-10.8	10.8	1.7807	92.05	90.40
	-10	-0.7	-0.250	1.650	98	-7.7	7.7	1.7689	91.66	90.83
	-5	-1.3	-0.060	1.650	98	-0.5	1.4	1.7501	91.17	91.14
	0	-0.1	0.010	1.650	98	3.0	3.0	1.7246	90.50	90.38
	5	-0.4	0.080	1.670	97	6.2	6.2	1.7376	90.76	90.24
	10	-0.4	0.190	1.650	97	10.3	10.3	1.7426	90.89	89.43
	15	-1.2	0.380	1.700	97	16.6	16.6	1.7817	91.91	88.08
	20	-0.8	0.460	1.750	96	19.4	19.4	1.8125	92.62	87.37
	25	-0.9	0.610	1.730	96	24.1	24.1	1.8354	93.20	85.08
	30	1.2	0.750	1.630	94	28.6	28.6	1.8078	92.33	81.02

		Res	Vdir	Vax
Average	-30	23.85	89.66	82.00
	-25	20.50	92.15	86.30
	-20	15.76	92.43	88.93
	-15	11.51	91.77	89.91
	-10	8.57	91.23	90.19
	-5	2.64	91.79	91.63
	0	2.20	90.47	90.40
	5	4.89	90.35	89.94
	10	9.78	90.53	89.19
	15	16.33	90.78	87.11
	20	20.69	91.84	85.90
	25	21.73	93.01	86.26
	30	28.80	91.63	80.29

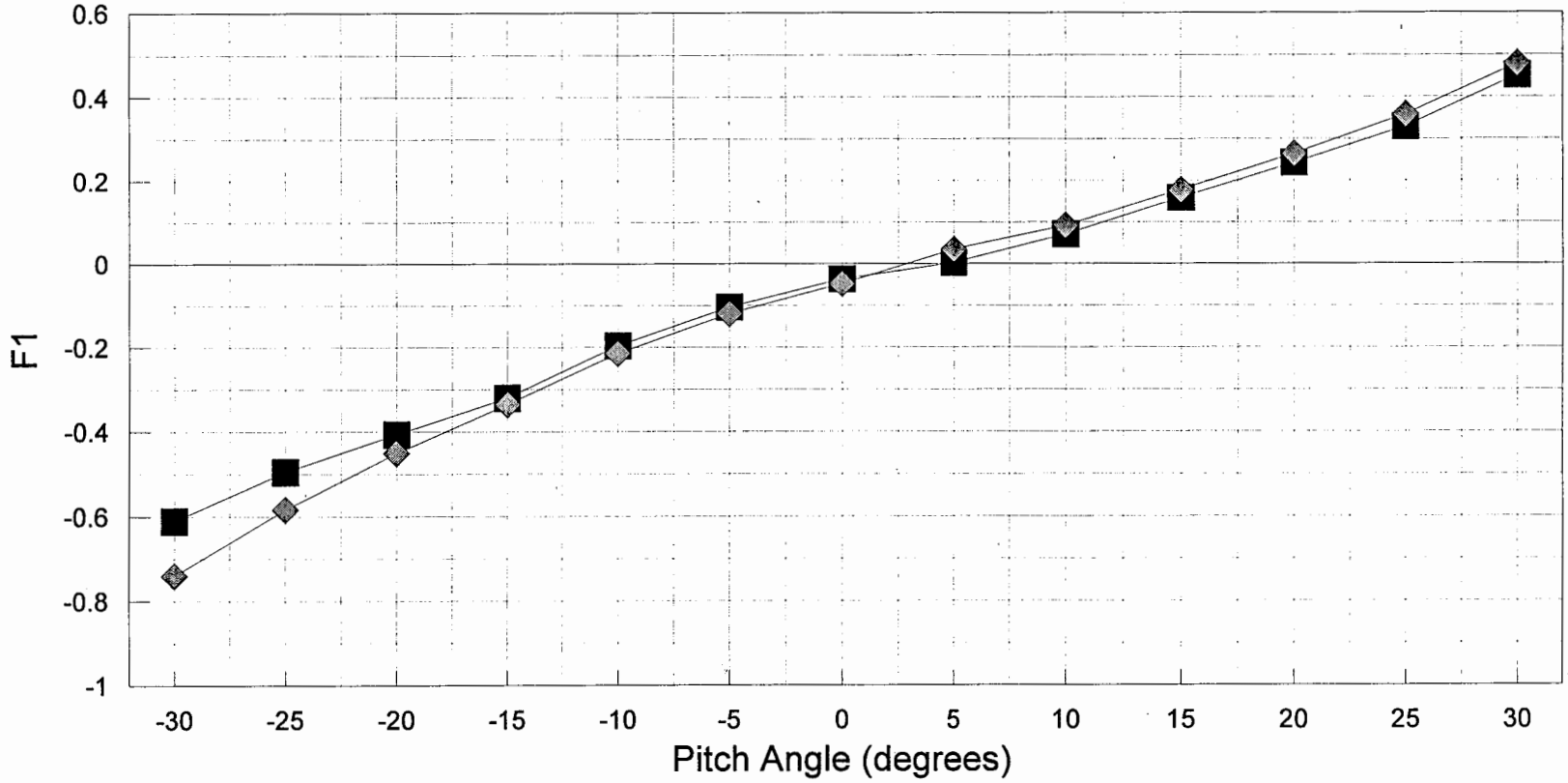
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ATTACHMENT I.

T-DAT Probe Calibration Data

Figure C2-18. T-DAT: Avg. (30-60 fps) F1 vs. Pitch Angle

NCSU Post-Test and NIST Wind Tunnel Calibrations

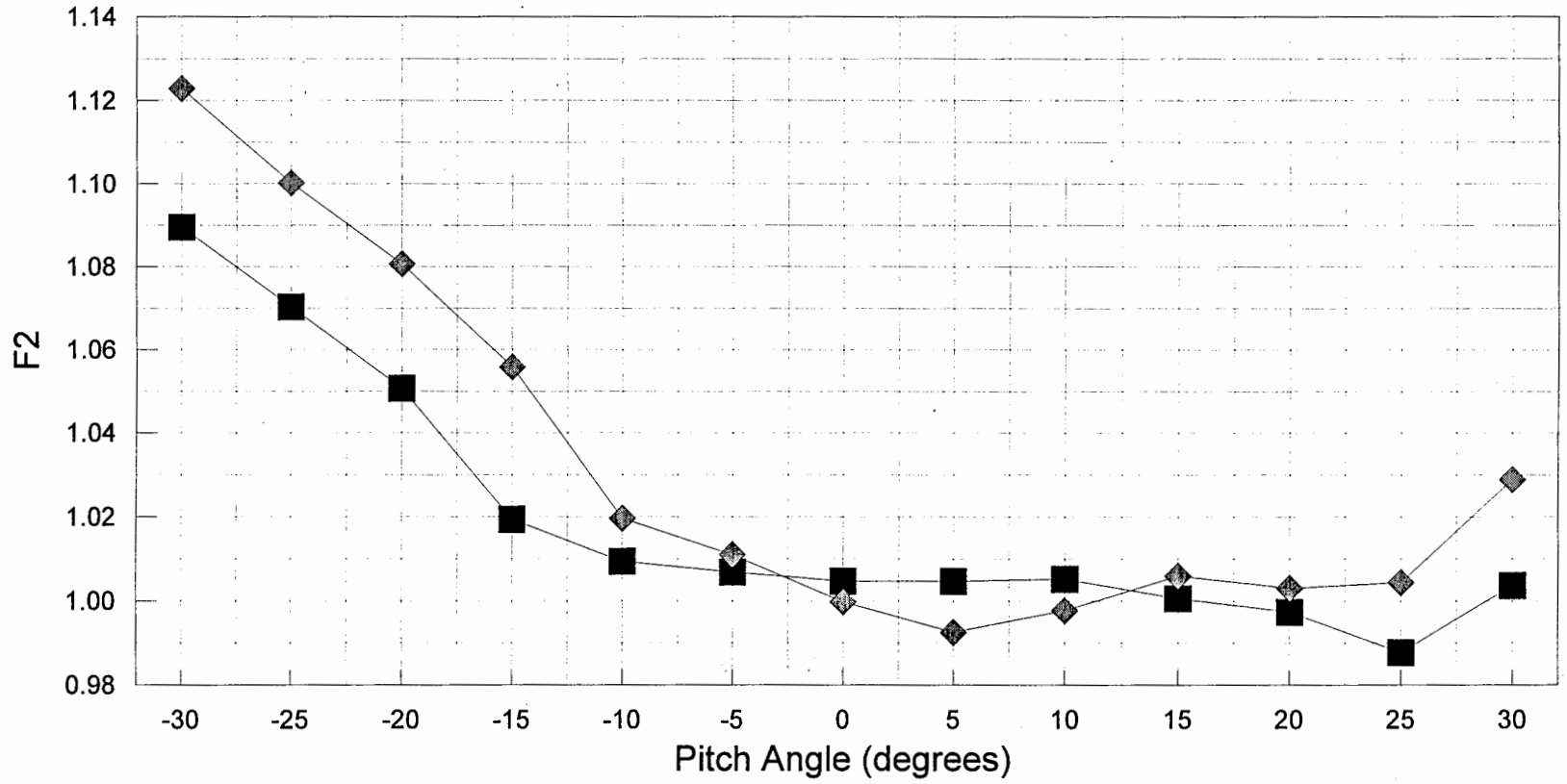


Note: Each point represents the mean of three replicates.

FC218-20.WK4

Figure C2-19. T-DAT: Avg. (30-60 fps) F2 vs. Pitch Angle

NCSU Post-Test and NIST Wind Tunnel Calibrations

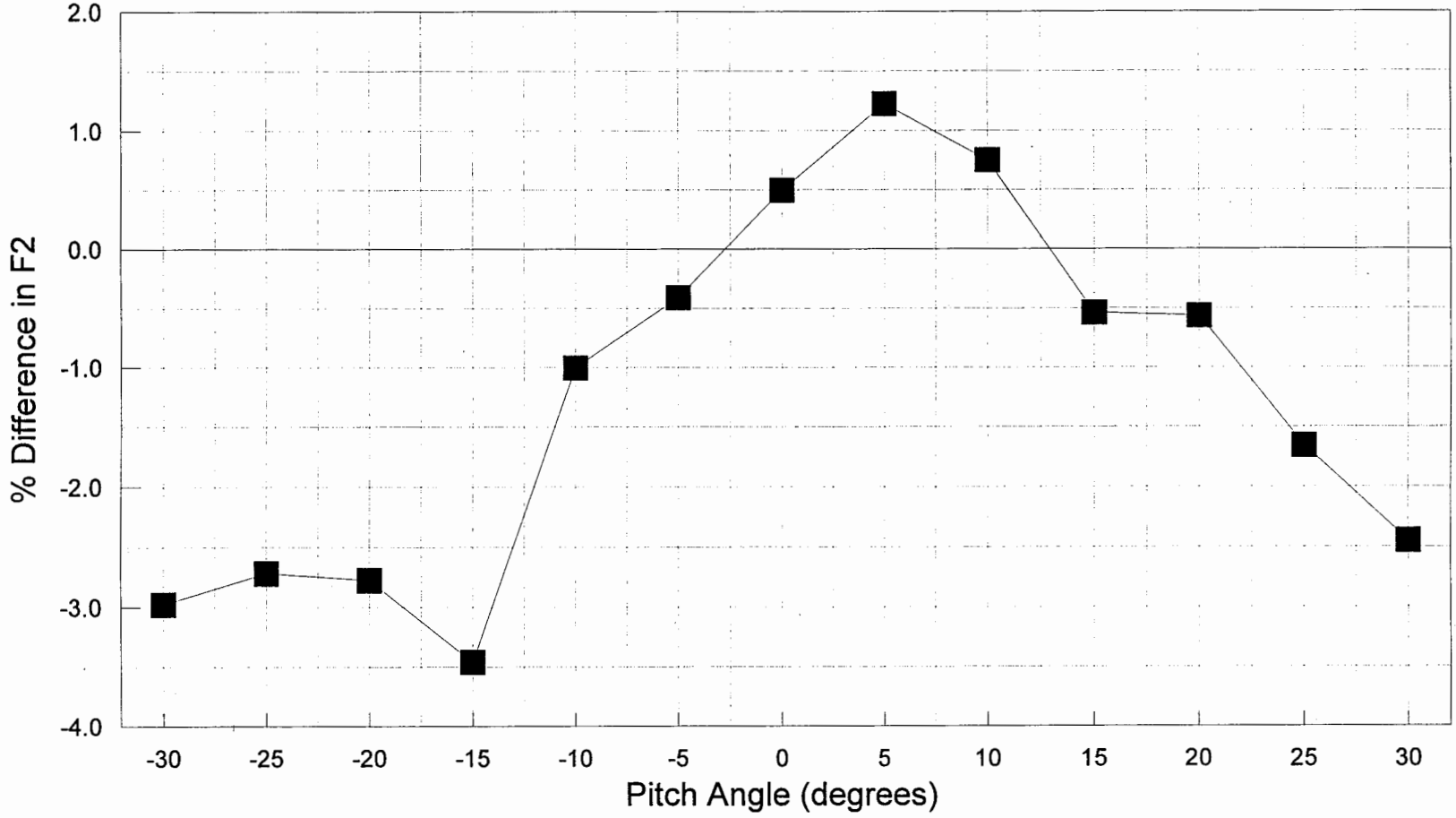


Note: Each point represents the mean of three replicates.

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Figure C2-20. T-DAT: Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C2-21. TSA DAT Probe: NIST vs. Post-test Calibrations at NC State Wind Tunne

Pitch Angle	30 fps / NIST 30-60 Calibration			30 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	27.99	30.79	27.16	29.23	30.46	26.58	4.40	-1.05	-2.13
-25	25.13	31.27	28.15	25.95	30.74	27.50	3.26	-1.68	-2.30
-20	22.31	31.67	29.21	25.40	31.12	27.97	13.87	-1.74	-4.26
-15	16.60	31.49	30.10	18.38	30.89	29.19	10.73	-1.91	-3.01
-10	11.57	31.22	30.52	12.31	30.56	29.81	6.34	-2.10	-2.34
-5	7.52	30.82	30.52	8.48	30.63	30.27	12.82	-0.61	-0.84
0	4.70	30.82	30.68	5.45	30.76	30.58	16.05	-0.21	-0.34
5	5.68	30.67	30.51	7.03	30.71	30.47	23.60	0.14	-0.14
10	7.99	30.79	30.41	9.01	30.69	30.24	12.73	-0.30	-0.57
15	9.00	30.60	30.10	10.41	30.64	30.01	15.65	0.12	-0.28
20	18.17	30.86	29.29	19.41	30.60	28.83	6.81	-0.83	-1.55
25	23.73	30.68	28.06	25.04	30.26	27.39	5.52	-1.37	-2.37
30	27.87	30.80	27.21	28.76	30.23	26.49	3.20	-1.86	-2.66

Pitch Angle	60 fps / NIST 30-60 Calibration			60 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	20.99	58.45	54.57	23.97	57.20	52.27	14.18	-2.14	-4.21
-25	18.86	59.63	56.38	21.06	58.39	54.41	11.65	-2.08	-3.50
-20	13.41	59.52	57.74	14.64	58.69	56.57	9.19	-1.41	-2.02
-15	10.65	60.58	59.48	11.50	59.66	58.41	7.98	-1.52	-1.79
-10	6.90	60.02	59.54	7.74	59.69	59.10	12.13	-0.56	-0.74
-5	3.54	59.58	59.35	4.38	59.58	59.28	23.73	-0.01	-0.12
0	3.30	59.12	59.02	4.95	59.50	59.27	50.16	0.64	0.43
5	5.47	59.14	58.77	6.89	59.61	59.04	25.81	0.79	0.46
10	8.80	59.26	58.26	9.50	59.34	58.16	7.91	0.13	-0.17
15	15.24	60.20	58.04	16.41	59.95	57.47	7.63	-0.41	-0.98
20	20.88	60.83	56.82	22.21	60.22	55.74	6.36	-1.00	-1.90
25	25.60	60.20	54.26	26.85	59.26	52.86	4.87	-1.55	-2.59
30	30.04	60.70	52.55	30.29	59.29	51.19	0.84	-2.33	-2.58

Pitch Angle	90 fps / NIST 30-60 Calibration			90 fps / Post-test 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	22.37	88.93	82.21	25.75	87.46	78.73	15.12	-1.65	-4.23
-25	20.77	91.06	85.14	23.66	89.49	81.97	13.90	-1.72	-3.73
-20	16.09	91.83	88.22	17.35	89.48	85.39	7.81	-2.55	-3.21
-15	10.38	91.04	89.35	11.11	89.49	87.63	7.05	-1.70	-1.92
-10	7.40	89.62	88.72	8.27	89.13	88.05	11.84	-0.55	-0.75
-5	6.04	89.48	88.92	7.28	89.36	88.59	20.56	-0.14	-0.37
0	2.65	88.83	88.72	3.97	89.23	88.98	49.84	0.45	0.29
5	3.34	88.20	88.01	4.60	89.01	88.64	37.91	0.91	0.72
10	8.80	88.29	87.19	10.47	88.96	87.43	18.99	0.75	0.28
15	15.25	90.35	87.10	16.41	89.98	86.24	7.60	-0.41	-0.98
20	20.69	91.25	85.36	22.01	90.37	83.78	6.37	-0.96	-1.85
25	*	*	*	*	*	*			
30	*	*	*	*	*	*			

* Probe could not be nulled within +/- 0.2 inches H2O at 90 fps during pre-test calibration.

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Figure C2-21. T-DAT Probe: Percent Difference in NCSU Post-Test and NIST Wind Tunnel Calibrations

Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data

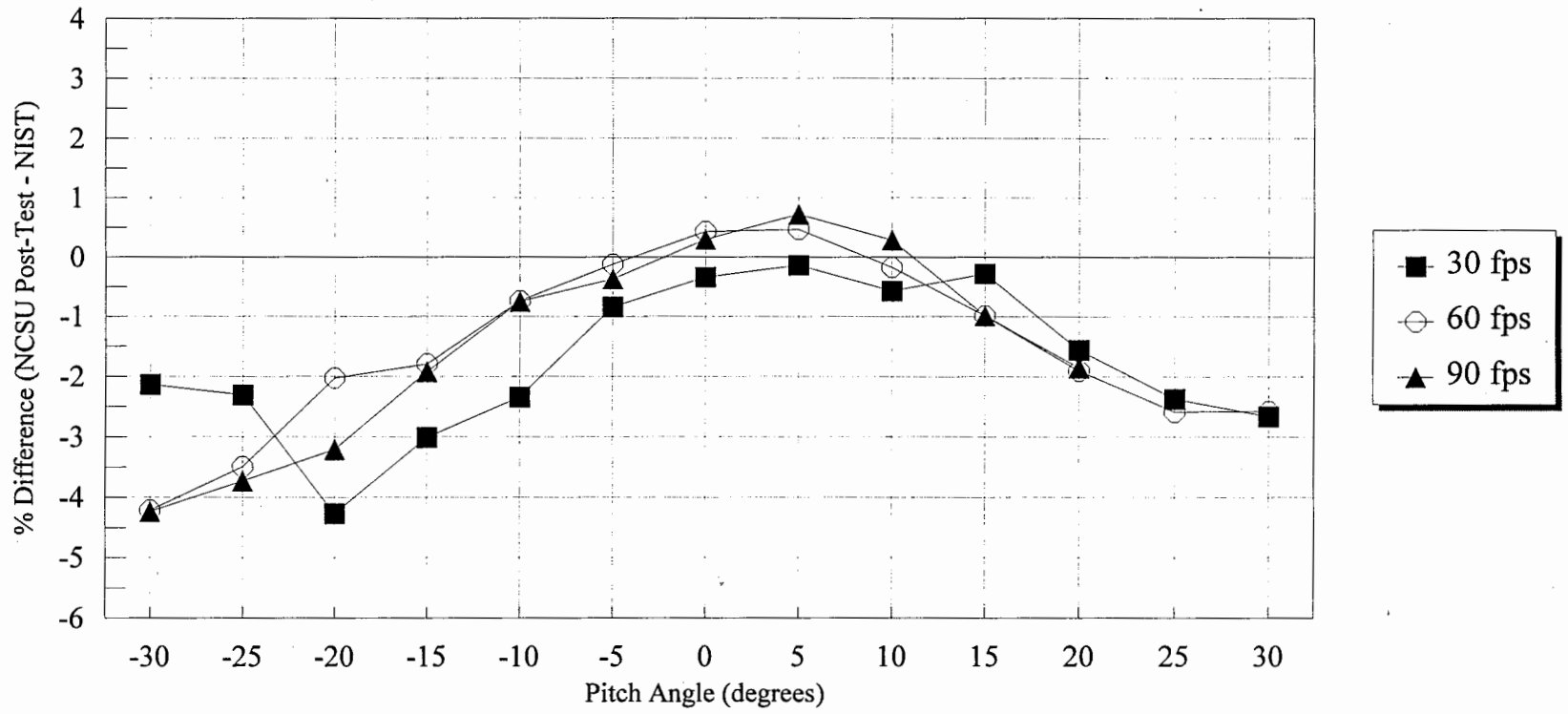


Table C2-22. T-DAT Computations: 30 fps

Probe: **T-DAT / with NIST 30-60 Calibration**
Velocity Point: **30 fps**
Cal Date: 02/06/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.71	Probe ID:	T-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	82 _F
Average Axial Velocity, ft/sec:	**29.38**	Last Row:	61
Average Yaw Angle:	1.3		
Average Pitch Angle:	15.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.0		0
Resultant Angle Standard Deviation:	9.24		

	Pitch	Yaw	Readings, in.H2O		Gas	<< ANGLES >>			Velocities, ft/sec	
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.8	-0.100	0.180	79	-23.9	23.9	0.2162	31.59	28.87
	-25	0.9	-0.070	0.190	79	-16.4	16.5	0.2147	31.48	30.19
	-20	0.8	-0.070	0.192	79	-16.3	16.3	0.2166	31.62	30.35
	-15	0.9	-0.050	0.195	79	-11.7	11.8	0.2078	30.97	30.32
	-10	0.8	-0.030	0.196	79	-6.8	6.8	0.2015	30.50	30.28
	-5	0.8	-0.020	0.197	79	-3.7	3.8	0.2002	30.40	30.33
	0	0.8	-0.010	0.200	79	-0.2	0.8	0.2001	30.39	30.38
	5	1.7	0.010	0.200	79	6.3	6.6	0.1976	30.20	30.00
	10	1.6	0.030	0.200	79	13.4	13.5	0.2014	30.48	29.64
	15	1.6	0.040	0.200	79	16.3	16.4	0.2021	30.54	29.30
	20	2.3	0.060	0.200	79	21.9	22.0	0.2014	30.49	28.27
	25	3.0	0.080	0.195	79	27.2	27.3	0.2009	30.45	27.06
	30	2.9	0.090	0.195	79	29.3	29.4	0.2050	30.76	26.80
2	-30	0.9	-0.170	0.170	88	-30.0	30.0	0.2018	30.77	26.65
	-25	0.4	-0.120	0.170	88	-28.9	28.9	0.2125	31.58	27.64
	-20	0.4	-0.100	0.173	88	-24.8	24.8	0.2091	31.32	28.44
	-15	0.6	-0.070	0.187	88	-16.7	16.7	0.2118	31.53	30.20
	-10	0.5	-0.060	0.197	88	-13.7	13.7	0.2158	31.83	30.92
	-5	0.5	-0.040	0.197	88	-9.4	9.4	0.2044	30.97	30.55
	0	0.1	-0.030	0.200	88	-6.6	6.6	0.2055	31.06	30.85
	5	1.0	-0.020	0.199	87	-3.7	3.8	0.2022	30.78	30.71
	10	1.1	-0.030	0.200	87	-6.6	6.7	0.2055	31.03	30.82
	15	2.1	0.010	0.200	87	6.3	6.7	0.1976	30.42	30.22
	20	2.1	0.040	0.205	87	16.0	16.2	0.2072	31.15	29.92
	25	2.3	0.060	0.200	87	21.9	22.0	0.2014	30.72	28.47
	30	3.1	0.090	0.195	87	29.3	29.4	0.2050	30.99	26.99
3	-30	1.3	-0.160	0.180	88	-30.0	30.0	0.1918	30.00	25.98
	-25	1.3	-0.150	0.170	87	-30.0	30.0	0.2018	30.74	26.62
	-20	0.2	-0.110	0.180	87	-25.9	25.9	0.2195	32.06	28.85
	-15	0.2	-0.090	0.185	87	-21.3	21.3	0.2182	31.97	29.78
	-10	0.2	-0.060	0.190	87	-14.2	14.2	0.2095	31.33	30.37
	-5	1.0	-0.040	0.199	87	-9.3	9.3	0.2064	31.09	30.68
	0	1.1	-0.030	0.200	87	-6.6	6.7	0.2055	31.03	30.82
	5	1.1	-0.030	0.200	87	-6.6	6.7	0.2055	31.03	30.82
	10	1.1	-0.020	0.200	87	-3.6	3.8	0.2032	30.85	30.78
	15	1.5	-0.020	0.200	87	-3.6	3.9	0.2032	30.85	30.78
	20	2.2	0.040	0.202	87	16.2	16.3	0.2041	30.92	29.67
	25	2.2	0.060	0.202	87	21.7	21.9	0.2034	30.87	28.65
	30	2.2	0.070	0.199	87	24.7	24.8	0.2007	30.66	27.84

		Res	Vdir	Vax
Average	-30	27.99	30.79	27.16
	-25	25.13	31.27	28.15
	-20	22.31	31.67	29.21
	-15	16.60	31.49	30.10
	-10	11.57	31.22	30.52
	-5	7.52	30.82	30.52
	0	4.70	30.82	30.68
	5	5.68	30.67	30.51
	10	7.99	30.79	30.41
	15	9.00	30.60	30.10
	20	18.17	30.86	29.29
	25	23.73	30.68	28.06
	30	27.87	30.80	27.21

Table C2-23. T-DAT Computations: 60 fps

Probe: **T-DAT / with NIST 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 02/06/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	T-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.86%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**57.29**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	14.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	14.1		0
Resultant Angle Standard Deviation:	8.88		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.1	-0.300	0.650	77	-20.4	20.4	0.7614	59.17	55.46
	-25	0.2	-0.300	0.670	77	-19.9	19.9	0.7816	59.95	56.38
	-20	0.2	-0.300	0.700	78	-19.0	19.0	0.8104	61.10	57.76
	-15	0.6	-0.230	0.730	78	-14.2	14.2	0.8046	60.88	59.03
	-10	0.5	-0.160	0.750	78	-9.9	9.9	0.7795	59.93	59.03
	-5	0.2	-0.140	0.750	78	-8.5	8.5	0.7758	59.78	59.12
	0	0.6	-0.070	0.750	79	-3.2	3.2	0.7604	59.24	59.15
	5	0.7	-0.040	0.750	79	-0.4	0.8	0.7510	58.87	58.87
	10	0.4	-0.030	0.750	79	0.5	0.6	0.7487	58.78	58.78
	15	0.9	0.100	0.750	79	12.4	12.5	0.7526	58.94	57.55
	20	1.6	0.200	0.770	80	19.7	19.8	0.7749	59.86	56.32
	25	0.6	0.250	0.800	80	22.6	22.6	0.8060	61.05	56.37
	30	1.9	0.350	0.740	80	29.7	29.8	0.7815	60.12	52.16
2	-30	0.2	-0.310	0.660	90	-20.7	20.7	0.7748	60.41	56.50
	-25	0.2	-0.300	0.630	90	-21.0	21.0	0.7409	59.07	55.16
	-20	0.5	-0.160	0.700	90	-10.6	10.6	0.7338	58.79	57.79
	-15	0.3	-0.140	0.750	90	-8.5	8.5	0.7758	60.45	59.78
	-10	0.3	-0.090	0.750	90	-5.0	5.0	0.7666	60.09	59.86
	-5	0.4	-0.050	0.750	90	-1.3	1.4	0.7541	59.60	59.58
	0	0.3	0.000	0.750	89	2.9	2.9	0.7435	59.12	59.04
	5	1.3	0.060	0.760	89	8.9	9.0	0.7548	59.57	58.84
	10	1.4	0.100	0.750	89	12.4	12.5	0.7526	59.48	58.07
	15	0.7	0.160	0.780	89	16.6	16.6	0.7879	60.86	58.32
	20	2.0	0.220	0.790	89	20.8	20.8	0.7951	61.14	57.14
	25	2.5	0.300	0.700	89	27.9	28.0	0.7265	58.44	51.59
	30	4.8	0.350	0.750	89	29.5	29.8	0.7901	60.95	52.87
3	-30	0.0	-0.300	0.600	89	-21.9	21.9	0.6613	55.76	51.75
	-25	0.1	-0.240	0.680	88	-15.8	15.8	0.7636	59.86	57.61
	-20	0.6	-0.160	0.700	88	-10.6	10.6	0.7338	58.68	57.68
	-15	0.5	-0.150	0.750	88	-9.2	9.2	0.7777	60.41	59.62
	-10	0.5	-0.100	0.750	88	-5.7	5.7	0.7685	60.05	59.75
	-5	0.6	-0.040	0.750	88	-0.4	0.7	0.7510	59.36	59.36
	0	0.6	0.010	0.750	88	3.7	3.8	0.7417	59.00	58.87
	5	0.2	0.040	0.750	88	6.6	6.6	0.7414	58.98	58.59
	10	1.2	0.110	0.750	88	13.2	13.3	0.7546	59.51	57.92
	15	1.2	0.160	0.780	88	16.6	16.6	0.7879	60.80	58.26
	20	2.0	0.240	0.800	88	21.9	22.0	0.8057	61.49	57.01
	25	2.2	0.300	0.780	88	26.1	26.2	0.7955	61.10	54.82
	30	5.6	0.400	0.750	88	30.0	30.5	0.7940	61.04	52.61

		Res	Vdir	Vax
Average	-30	20.99	58.45	54.57
	-25	18.86	59.63	56.38
	-20	13.41	59.52	57.74
	-15	10.65	60.58	59.48
	-10	6.90	60.02	59.54
	-5	3.54	59.58	59.35
	0	3.30	59.12	59.02
	5	5.47	59.14	58.77
	10	8.80	59.26	58.26
	15	15.24	60.20	58.04
	20	20.88	60.83	56.82
	25	25.60	60.20	54.26
	30	30.04	60.70	52.55

Table C2-24. T-DAT Computations: 90 fps

Probe: **T-DAT / with NIST 30-60 Calibration**
Velocity Point: **90 fps**
Cal Date: 02/06/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	T-DAT
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.54%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**87.17**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	10.3	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	12.2		0
Resultant Angle Standard Deviation:	7.27		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.800	1.450	83	-23.8	23.8	1.7402	89.95	82.31
	-25	0.2	-0.720	1.500	85	-21.1	21.1	1.7659	90.78	84.69
	-20	0.5	-0.600	1.560	86	-17.1	17.1	1.7746	91.09	87.04
	-15	0.8	-0.450	1.670	87	-12.3	12.3	1.7931	91.65	89.55
	-10	0.0	-0.350	1.660	88	-9.8	9.8	1.7245	89.96	88.65
	-5	0.3	-0.260	1.650	89	-7.0	7.0	1.6980	89.34	88.68
	0	0.4	-0.160	1.670	89	-3.3	3.4	1.6944	89.25	89.10
	5	0.8	-0.030	1.650	90	1.8	2.0	1.6408	87.91	87.86
	10	0.9	0.120	1.650	90	8.3	8.4	1.6369	87.80	86.86
	15	1.5	0.300	1.700	91	15.0	15.0	1.7202	90.09	87.01
	20	1.2	0.500	1.750	92	21.1	21.2	1.7616	91.25	85.09
	25									
	30									
2	-30	0.2	-0.750	1.470	97	-22.2	22.2	1.7447	91.22	84.44
	-25	0.2	-0.700	1.500	97	-20.6	20.6	1.7595	91.61	85.75
	-20	0.3	-0.520	1.560	96	-14.9	14.9	1.7372	90.94	87.88
	-15	1.0	-0.200	1.630	96	-5.2	5.3	1.6670	89.09	88.71
	-10	0.3	-0.140	1.630	96	-2.6	2.7	1.6488	88.60	88.50
	-5	0.2	0.000	1.690	95	2.9	2.9	1.6753	89.23	89.11
	0	0.6	0.020	1.650	95	3.6	3.7	1.6321	88.07	87.89
	5	0.6	0.070	1.630	94	5.7	5.8	1.6084	87.35	86.91
	10	1.1	0.200	1.670	93	11.6	11.7	1.6715	88.97	87.12
	15	1.2	0.400	1.730	92	18.1	18.1	1.7444	90.80	86.29
	20	1.7	0.500	1.750	91	21.1	21.2	1.7616	91.17	85.00
	25									
	30									
3	-30	0.4	-0.700	1.460	86	-21.1	21.1	1.5677	85.61	79.88
	-25	0.6	-0.700	1.500	87	-20.6	20.6	1.7595	90.78	84.97
	-20	0.2	-0.600	1.650	88	-16.2	16.2	1.8610	93.45	89.73
	-15	0.7	-0.500	1.660	89	-13.6	13.6	1.8153	92.38	89.79
	-10	0.1	-0.350	1.670	89	-9.7	9.7	1.7345	90.30	89.00
	-5	0.1	-0.300	1.660	90	-8.2	8.2	1.7153	89.88	88.96
	0	0.4	-0.100	1.680	91	-0.8	0.9	1.6855	89.18	89.17
	5	0.7	-0.020	1.700	92	2.2	2.3	1.6887	89.34	89.27
	10	1.2	0.080	1.660	93	6.2	6.3	1.6395	88.11	87.58
	15	1.3	0.230	1.710	93	12.5	12.6	1.7164	90.15	87.99
	20	2.2	0.450	1.750	93	19.6	19.7	1.7614	91.33	85.98
	25									
	30									

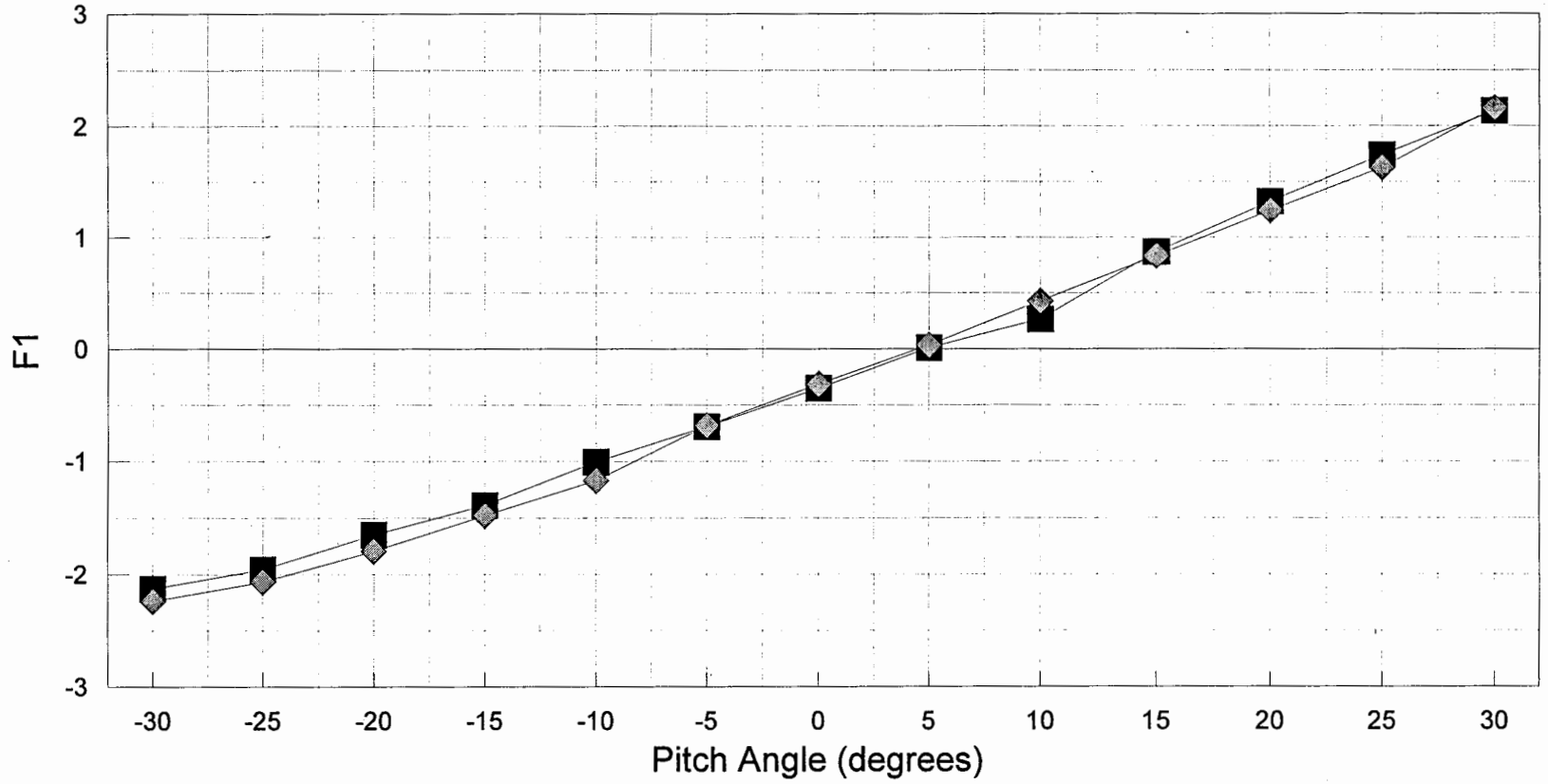
		Res	Vdir	Vax
Average	-30	22.37	88.93	82.21
	-25	20.77	91.06	85.14
* Probe could not be nulled within +/- 0.2 inches H2O.	-20	16.09	91.83	88.22
	-15	10.38	91.04	89.35
	-10	7.40	89.62	88.72
	-5	6.04	89.48	88.92
	0	2.65	88.83	88.72
	5	3.34	88.20	88.01
	10	8.80	88.29	87.19
	15	15.25	90.35	87.10
	20	20.69	91.25	85.36
	25			
	30			

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ATTACHMENT J.

Spherical Probe SPH-1 Calibration Data

Figure C2-22. Spherical Probe (SPH-1): Avg. (30-60 fps) F1 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations

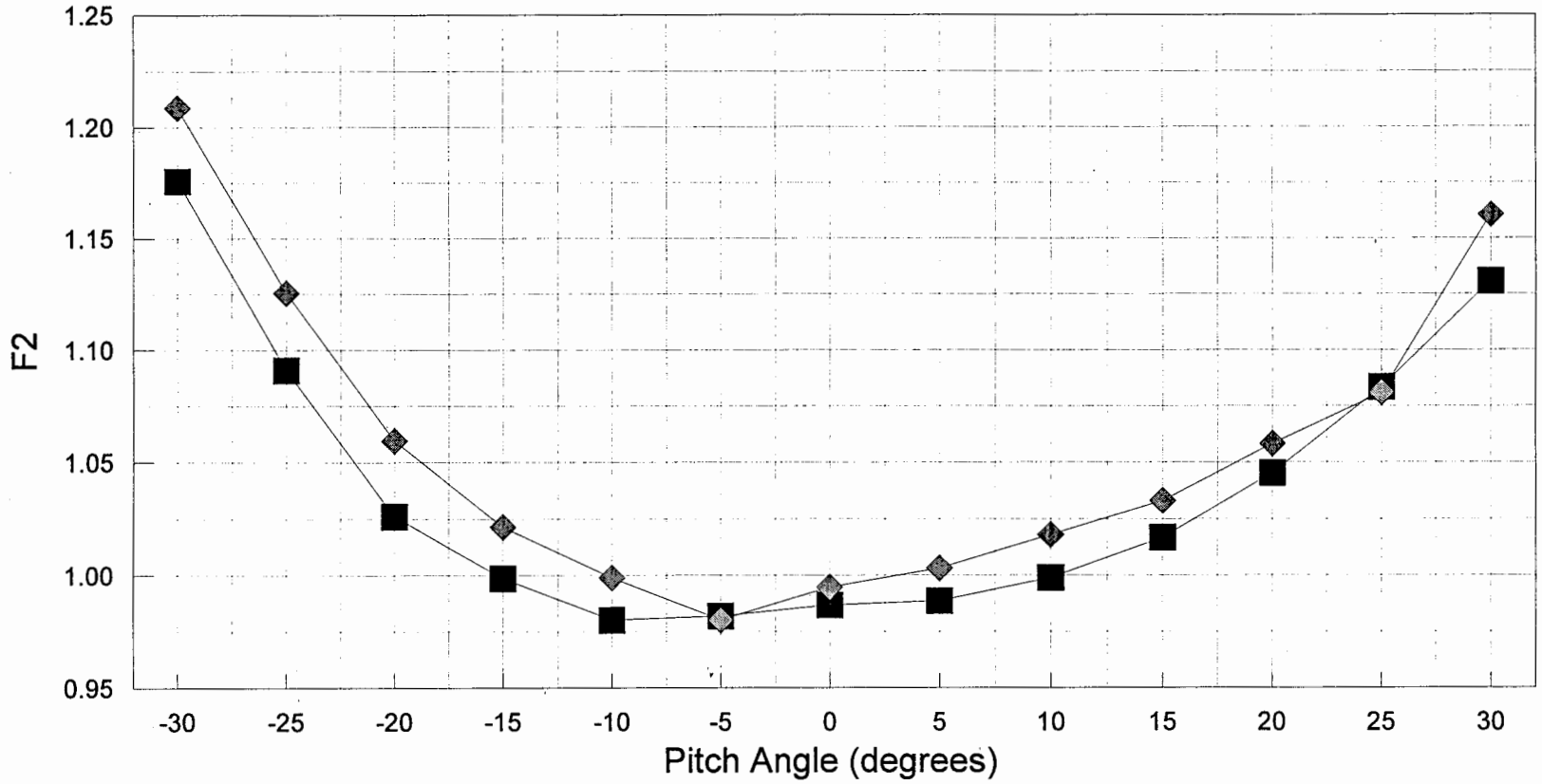


Note: Each point represents the mean of three replicates.

FC222-24.WK4

Figure C2-23. Spherical Probe (SPH-1): Avg. (30-60 fps) F2 vs. Pitch Angle

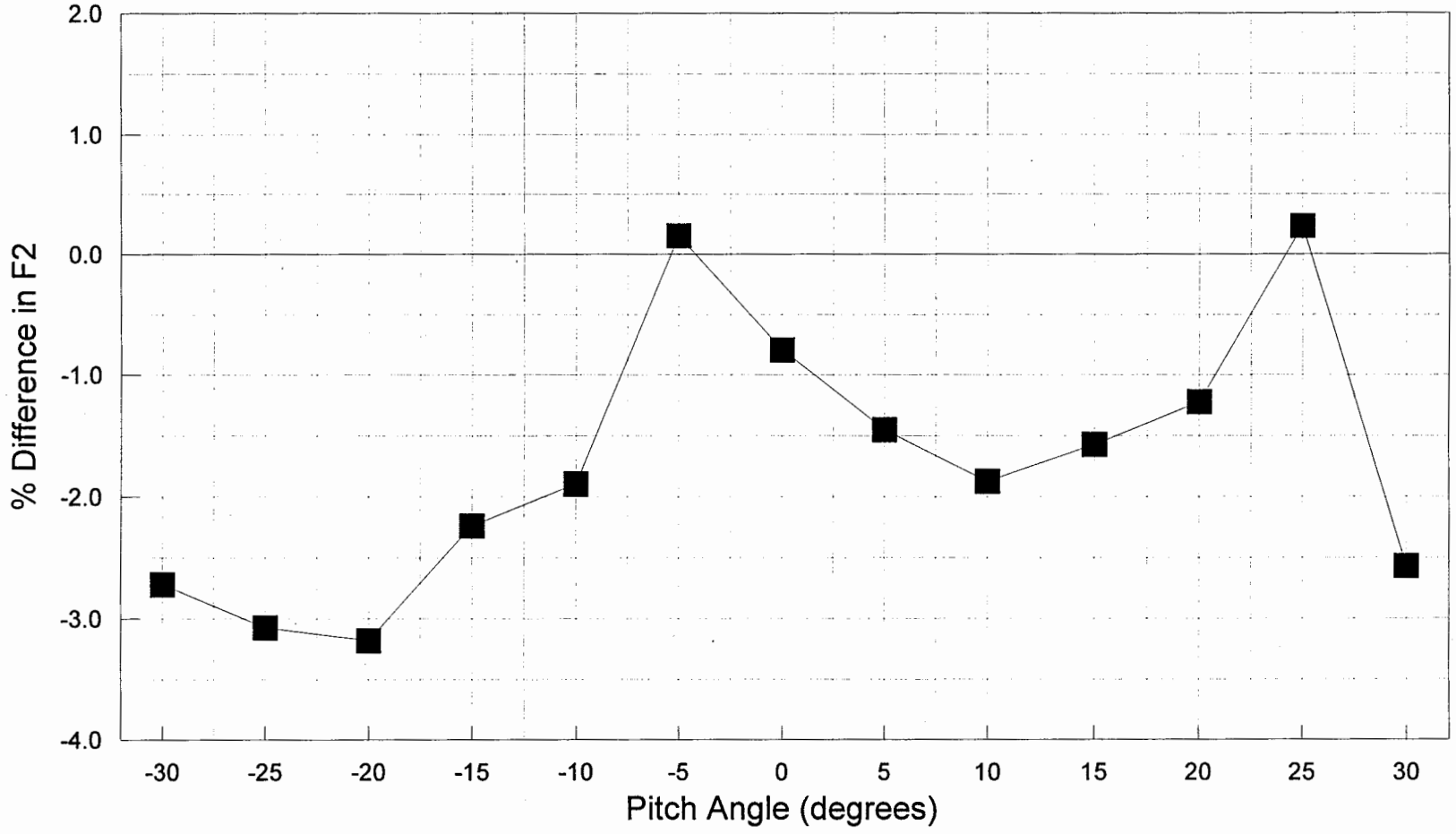
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Figure C2-24. Spherical Probe (SPH-1): Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC222-24.WK4

Table C2-25. Spherical Probe SPH-1: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

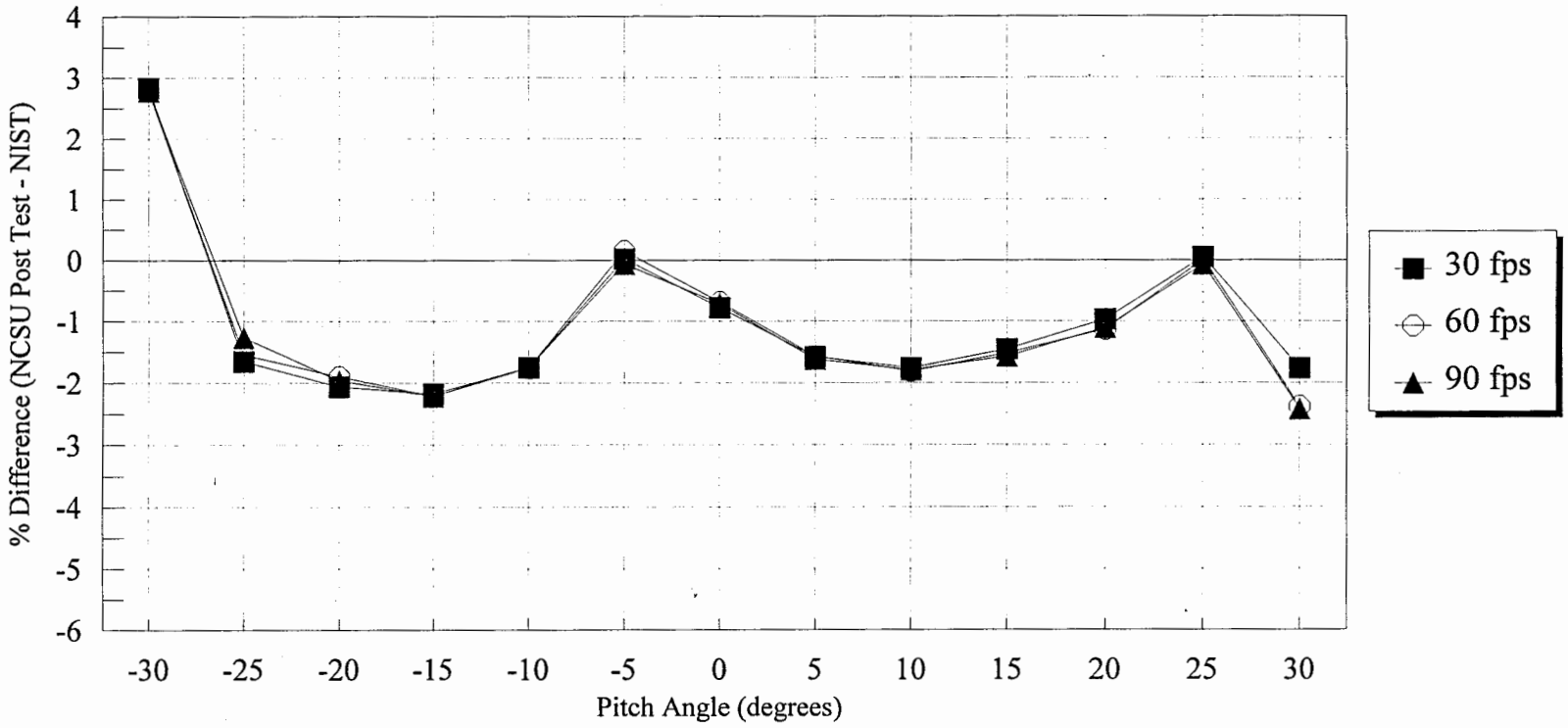
Pitch Angle	30 fps / NIST / 30-60 Calibration			30 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.04	29.87	25.86	30.04	30.72	26.60	0.00	2.84	2.84
-25	27.36	34.19	30.36	29.83	34.41	29.86	9.01	0.66	-1.65
-20	20.09	33.11	31.09	22.39	32.93	30.45	11.42	-0.53	-2.06
-15	14.41	32.46	31.44	16.06	32.01	30.76	11.49	-1.41	-2.18
-10	8.72	32.06	31.69	10.49	31.67	31.14	20.30	-1.24	-1.75
-5	4.14	31.80	31.72	3.92	31.80	31.72	-5.41	-0.00	0.02
0	2.03	32.13	32.10	1.97	31.88	31.85	-2.62	-0.77	-0.78
5	6.35	32.24	32.04	7.52	31.81	31.53	18.36	-1.32	-1.58
10	10.80	32.35	31.74	11.90	31.88	31.18	10.18	-1.44	-1.76
15	16.54	32.38	31.02	16.02	31.82	30.57	-3.16	-1.73	-1.45
20	20.79	32.30	30.20	19.80	31.79	29.90	-4.76	-1.60	-0.97
25	24.12	31.79	29.02	22.83	31.50	29.03	-5.34	-0.92	0.05
30	28.47	31.88	28.03	28.27	31.26	27.53	-0.70	-1.95	-1.76

Pitch Angle	60 fps / NIST / 30-60 Calibration			60 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.02	56.53	48.94	30.02	58.11	50.31	0.00	2.79	2.79
-25	27.24	65.02	57.81	30.02	65.74	56.92	10.22	1.10	-1.55
-20	20.45	62.86	58.90	22.75	62.66	57.78	11.26	-0.32	-1.90
-15	13.79	61.91	60.12	15.36	60.97	58.79	11.35	-1.52	-2.21
-10	8.90	61.50	60.75	10.73	60.75	59.69	20.49	-1.21	-1.76
-5	4.80	60.88	60.67	4.63	60.96	60.76	-3.59	0.13	0.15
0	0.89	61.29	61.28	0.89	60.87	60.86	-0.24	-0.69	-0.68
5	6.22	61.36	61.00	7.35	60.55	60.04	18.20	-1.32	-1.57
10	10.96	60.92	59.80	11.99	60.03	58.72	9.38	-1.45	-1.81
15	15.86	61.10	58.77	15.43	60.04	57.87	-2.67	-1.73	-1.52
20	20.06	60.91	57.21	19.15	59.87	56.56	-4.56	-1.70	-1.14
25	25.45	60.54	54.67	24.22	59.95	54.67	-4.84	-0.98	0.00
30	29.64	60.95	52.97	29.63	59.49	51.70	-0.04	-2.40	-2.39

Pitch Angle	90 fps / NIST / 30-60 Calibration			90 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.01	83.28	72.12	30.01	85.60	74.13	0.00	2.78	2.78
-25	26.64	96.32	86.09	29.90	98.06	85.00	12.23	1.80	-1.27
-20	20.00	93.36	87.72	22.32	92.97	86.00	11.60	-0.41	-1.96
-15	13.73	92.15	89.52	15.29	90.75	87.53	11.36	-1.52	-2.22
-10	8.77	91.55	90.48	10.56	90.43	88.89	20.43	-1.23	-1.75
-5	5.51	90.61	90.19	5.60	90.57	90.14	1.75	-0.05	-0.06
0	1.27	91.41	91.39	1.28	90.76	90.73	0.86	-0.71	-0.72
5	6.68	91.79	91.16	8.07	90.58	89.69	20.69	-1.31	-1.62
10	11.37	91.52	89.72	12.26	90.17	88.11	7.89	-1.48	-1.79
15	15.01	91.13	88.01	14.74	89.58	86.63	-1.76	-1.69	-1.57
20	19.97	91.91	86.37	19.06	90.38	85.41	-4.55	-1.67	-1.11
25	25.55	91.30	82.37	24.35	90.35	82.31	-4.71	-1.04	-0.07
30	29.66	92.39	80.28	29.84	90.31	78.34	0.60	-2.25	-2.43

TABC225.WK4

Figure C2-25. Spherical Probe SPH-1: Percent Differences in NCSU Post-Test and NIST Calibrations
Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data



TABC225.WK4

Table C2-26. SPH-1 Computations: 30 fps

Probe: **Spherical SPH-1 / NIST 30-60 Calibration**
Velocity Point: **30 fps**
Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.61%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**30.48**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.37		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.6	-0.390	0.160	84	-30.0	30.0	0.2016	30.55	26.45
	-25	1.6	-0.400	0.183	84	-28.5	28.5	0.2565	34.46	30.28
	-20	1.3	-0.380	0.220	84	-18.9	19.0	0.2433	33.56	31.74
	-15	1.3	-0.320	0.220	84	-14.6	14.6	0.2287	32.54	31.48
	-10	0.9	-0.240	0.224	84	-9.0	9.1	0.2219	32.06	31.65
	-5	0.9	-0.140	0.225	84	-4.2	4.3	0.2172	31.71	31.62
	0	0.9	-0.085	0.225	84	-0.9	1.3	0.2214	32.02	32.01
	5	0.9	0.020	0.220	84	5.7	5.8	0.2223	32.08	31.92
	10	0.8	0.070	0.217	84	8.7	8.7	0.2231	32.14	31.77
	15	0.5	0.180	0.210	84	15.3	15.3	0.2247	32.26	31.11
	20	0.5	0.250	0.200	84	20.1	20.1	0.2243	32.22	30.25
	25	0.5	0.290	0.190	84	23.7	23.7	0.2196	31.89	29.20
	30	0.4	0.340	0.170	84	28.5	28.5	0.2197	31.89	28.04
2	-30	1.5	-0.390	0.165	83	-30.0	30.0	0.2079	31.00	26.84
	-25	1.4	-0.400	0.190	83	-26.1	26.1	0.2486	33.90	30.44
	-20	0.8	-0.370	0.205	83	-20.2	20.2	0.2313	32.70	30.68
	-15	0.8	-0.310	0.219	83	-14.0	14.0	0.2264	32.35	31.39
	-10	0.8	-0.230	0.225	83	-8.5	8.5	0.2221	32.04	31.68
	-5	0.6	-0.125	0.225	83	-3.3	3.4	0.2184	31.77	31.71
	0	0.6	-0.020	0.223	83	3.2	3.3	0.2230	32.11	32.05
	5	0.6	0.050	0.220	83	7.4	7.5	0.2246	32.22	31.95
	10	0.6	0.170	0.215	83	14.5	14.5	0.2287	32.51	31.48
	15	0.5	0.240	0.205	83	19.2	19.2	0.2278	32.45	30.65
	20	0.6	0.280	0.200	84	22.1	22.1	0.2280	32.49	30.11
	25	0.4	0.300	0.185	84	24.9	24.9	0.2161	31.63	28.68
	30	0.2	0.340	0.170	84	28.5	28.5	0.2197	31.89	28.04
3	-30	1.5	-0.390	0.164	83	-30.0	30.0	0.1705	28.07	24.30
	-25	1.6	-0.400	0.186	83	-27.4	27.5	0.2531	34.20	30.35
	-20	1.4	-0.380	0.205	83	-21.1	21.1	0.2365	33.06	30.84
	-15	1.2	-0.320	0.220	83	-14.6	14.6	0.2287	32.51	31.46
	-10	1.1	-0.230	0.226	83	-8.5	8.5	0.2230	32.10	31.75
	-5	1.1	-0.150	0.229	83	-4.6	4.8	0.2205	31.92	31.81
	0	1.1	-0.090	0.229	83	-1.1	1.6	0.2251	32.25	32.24
	5	1.1	0.020	0.225	83	5.7	5.8	0.2273	32.41	32.25
	10	0.7	0.080	0.220	83	9.2	9.2	0.2269	32.38	31.97
	15	0.7	0.180	0.213	83	15.1	15.2	0.2276	32.43	31.31
	20	0.7	0.250	0.200	83	20.1	20.2	0.2243	32.20	30.22
	25	0.7	0.290	0.190	83	23.7	23.7	0.2196	31.86	29.17
	30	0.4	0.340	0.170	83	28.5	28.5	0.2197	31.86	28.01

		Res	Vdir	Vax
Average	-30	30.04	29.87	25.86
	-25	27.36	34.19	30.36
	-20	20.09	33.11	31.09
	-15	14.41	32.46	31.44
	-10	8.72	32.06	31.69
	-5	4.14	31.80	31.72
	0	2.03	32.13	32.10
	5	6.35	32.24	32.04
	10	10.80	32.35	31.74
	15	16.54	32.38	31.02
	20	20.79	32.30	30.20
	25	24.12	31.79	29.02
	30	28.47	31.88	28.03

Table C2-27. SPH-1 Computations: 60 fps

Probe: **Spherical SPH-1 / NIST 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.84%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**57.91**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.59		

	Pitch	Yaw	Readings, in.H2O		Gas	<< ANGLES >>			Velocities, ft/sec	
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-1.2	-1.400	0.590	85	-30.0	30.0	0.7434	58.72	50.85
	-25	-1.2	-1.440	0.670	85	-27.4	27.4	0.9108	65.00	57.70
	-20	-0.9	-1.350	0.750	85	-20.1	20.1	0.8443	62.58	58.76
	-15	-0.7	-1.100	0.800	85	-13.3	13.3	0.8224	61.76	60.10
	-10	-0.7	-0.860	0.830	85	-8.7	8.7	0.8200	61.68	60.97
	-5	-0.7	-0.540	0.840	85	-4.5	4.5	0.8095	61.28	61.09
	0	-0.6	-0.250	0.820	85	0.1	0.6	0.8114	61.35	61.35
	5	-0.2	0.090	0.800	85	6.0	6.0	0.8097	61.29	60.95
	10	0.5	0.400	0.770	85	11.1	11.1	0.8033	61.04	59.89
	15	-0.6	0.740	0.750	85	16.9	16.9	0.8153	61.50	58.84
	20	-0.4	0.910	0.720	84	20.3	20.3	0.8086	61.19	57.38
	25	0.0	1.150	0.670	84	25.8	25.8	0.8029	60.97	54.88
	30	-0.3	1.250	0.610	84	28.9	28.9	0.7982	60.79	53.21
2	-30	-1.3	-1.370	0.580	85	-30.0	30.0	0.7308	58.22	50.41
	-25	-1.1	-1.450	0.680	85	-26.9	26.9	0.9111	65.01	57.98
	-20	-1.1	-1.370	0.750	85	-20.6	20.6	0.8548	62.97	58.94
	-15	-0.9	-1.150	0.800	85	-14.3	14.3	0.8295	62.03	60.10
	-10	-0.9	-0.900	0.820	85	-9.3	9.3	0.8140	61.45	60.64
	-5	-0.7	-0.550	0.820	85	-4.9	4.9	0.7885	60.48	60.26
	0	-0.6	-0.330	0.820	85	-1.2	1.4	0.8054	61.12	61.11
	5	-0.5	0.050	0.810	86	5.3	5.4	0.8167	61.61	61.34
	10	0.7	0.350	0.770	86	10.3	10.4	0.7995	60.96	59.96
	15	0.7	0.600	0.750	86	14.6	14.6	0.7984	60.91	58.95
	20	0.5	0.850	0.710	86	19.5	19.5	0.7913	60.64	57.17
	25	0.2	1.100	0.670	86	25.1	25.1	0.7863	60.45	54.72
	30	-0.2	1.300	0.600	86	30.0	30.0	0.8081	61.28	53.07
3	-30	1.0	-1.400	0.580	86	-30.0	30.0	0.5962	52.64	45.58
	-25	1.1	-1.440	0.670	86	-27.4	27.4	0.9108	65.06	57.76
	-20	1.2	-1.370	0.750	86	-20.6	20.6	0.8548	63.03	58.99
	-15	-0.8	-1.120	0.800	86	-13.7	13.7	0.8252	61.93	60.16
	-10	-0.8	-0.850	0.820	86	-8.7	8.7	0.8102	61.36	60.66
	-5	-0.7	-0.560	0.830	86	-4.9	5.0	0.7979	60.89	60.66
	0	-0.7	-0.260	0.820	86	-0.1	0.7	0.8108	61.39	61.38
	5	-0.5	0.170	0.790	86	7.3	7.3	0.8058	61.20	60.70
	10	0.6	0.410	0.760	86	11.4	11.4	0.7940	60.75	59.55
	15	-0.6	0.680	0.740	86	16.1	16.1	0.7979	60.89	58.52
	20	-0.4	0.900	0.710	86	20.4	20.4	0.7977	60.89	57.08
	25	0.2	1.100	0.660	86	25.4	25.4	0.7800	60.21	54.40
	30	-0.2	1.300	0.590	86	30.0	30.0	0.7946	60.77	52.63

		Res	Vdir	Vax
Average	-30	30.02	56.53	48.94
	-25	27.24	65.02	57.81
	-20	20.45	62.86	58.90
	-15	13.79	61.91	60.12
	-10	8.90	61.50	60.75
	-5	4.80	60.88	60.67
	0	0.89	61.29	61.28
	5	6.22	61.36	61.00
	10	10.96	60.92	59.80
	15	15.86	61.10	58.77
	20	20.06	60.91	57.21
	25	25.45	60.54	54.67
	30	29.64	60.95	52.97

Table C2-28. SPH-1 Computations: 90 fps

Probe: **Spherical SPH-1 / NIST 30-60 Calibration**
Velocity Point: **90 fps**
Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.89	Probe ID:	SPH-1
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.89	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**86.57**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.5		0
Resultant Angle Standard Deviation:	9.37		

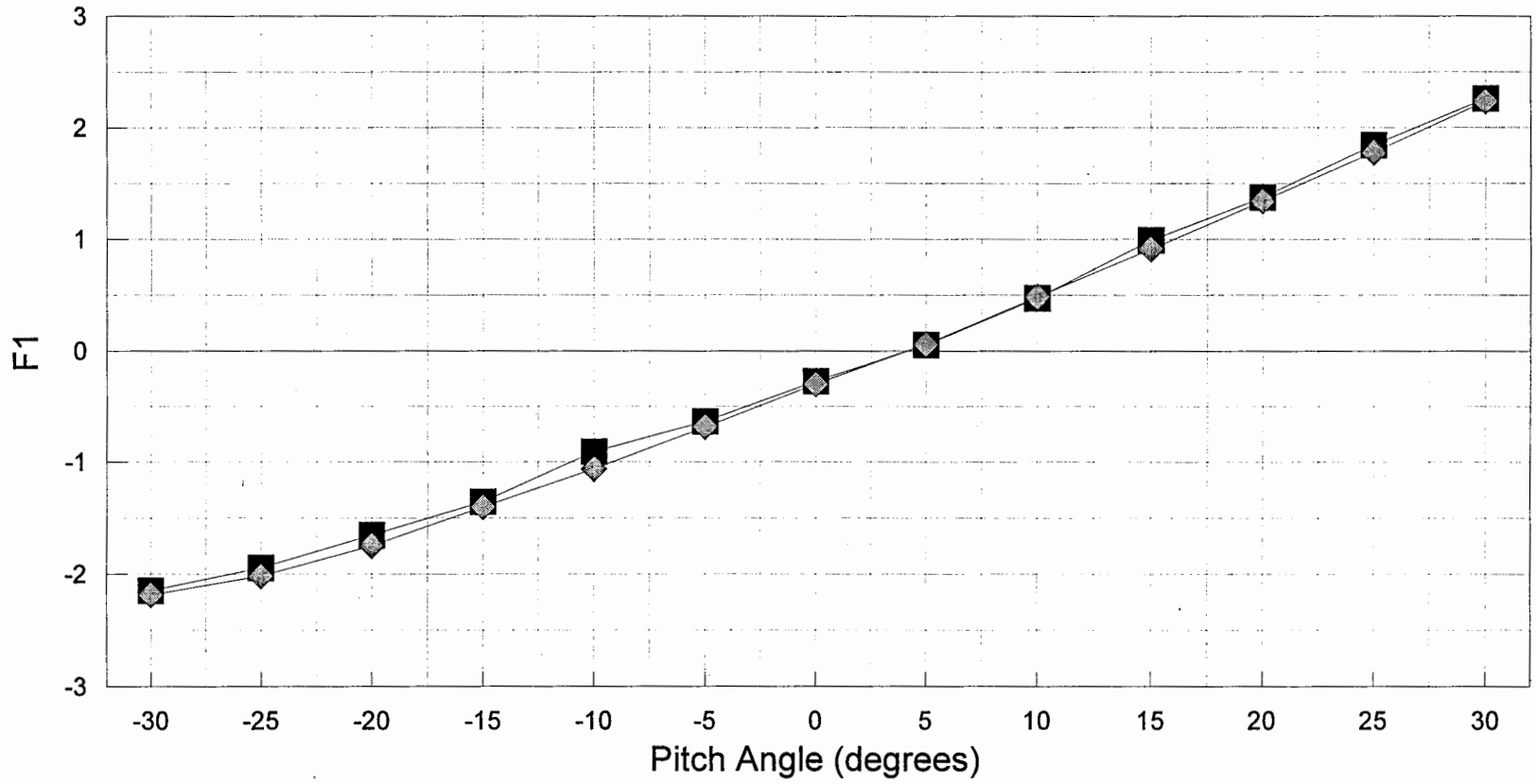
			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.6	-3.050	1.250	91	-30.0	30.0	1.5750	85.95	74.43
	-25	-1.3	-3.150	1.490	91	-26.3	26.4	1.9649	95.99	86.01
	-20	-0.9	-2.900	1.650	90	-19.4	19.4	1.8373	92.74	87.46
	-15	-0.8	-2.400	1.750	90	-13.3	13.3	1.7980	91.74	89.29
	-10	-0.7	-1.900	1.800	89	-8.9	8.9	1.7811	91.23	90.13
	-5	-0.5	-1.320	1.800	89	-5.5	5.6	1.7366	90.08	89.66
	0	-0.6	-0.600	1.800	89	-0.3	0.7	1.7776	91.14	91.13
	5	-0.5	0.290	1.770	89	6.6	6.7	1.7985	91.67	91.05
	10	0.4	1.000	1.710	88	11.9	11.9	1.7925	91.44	89.46
	15	0.2	1.500	1.650	88	15.9	15.9	1.7770	91.04	87.54
	20	-0.2	2.150	1.590	87	21.5	21.5	1.8033	91.63	85.28
	25	0.6	2.550	1.490	87	25.8	25.8	1.7830	91.11	82.03
	30	-0.9	2.900	1.370	86	29.6	29.6	1.8233	92.05	80.06
2	-30	-0.9	-3.000	1.250	91	-30.0	30.0	1.5750	85.95	74.42
	-25	-1.3	-3.150	1.480	91	-26.8	26.8	1.9762	96.27	85.94
	-20	-1.1	-3.000	1.640	92	-20.6	20.7	1.8714	93.77	87.74
	-15	-0.8	-2.500	1.750	92	-14.2	14.2	1.8124	92.28	89.47
	-10	-0.7	-1.850	1.800	92	-8.6	8.6	1.7772	91.38	90.35
	-5	-0.7	-1.330	1.820	93	-5.5	5.6	1.7556	90.90	90.48
	0	-0.6	-0.760	1.800	93	-1.5	1.6	1.7653	91.15	91.12
	5	-0.2	0.290	1.750	93	6.7	6.7	1.7784	91.49	90.87
	10	0.7	0.750	1.710	93	10.1	10.2	1.7735	91.37	89.93
	15	0.8	1.280	1.660	94	14.2	14.3	1.7635	91.19	88.38
	20	0.3	1.950	1.630	94	19.5	19.5	1.8165	92.55	87.25
	25	0.7	2.500	1.500	94	25.4	25.4	1.7728	91.43	82.60
	30	0.9	2.900	1.370	94	29.6	29.6	1.8233	92.72	80.65
3	-30	-0.9	-2.950	1.250	96	-30.0	30.0	1.2843	77.96	67.51
	-25	-1.0	-3.150	1.480	96	-26.8	26.8	1.9762	96.71	86.34
	-20	-1.0	-2.950	1.650	96	-19.9	19.9	1.8500	93.57	87.97
	-15	-0.8	-2.450	1.750	96	-13.7	13.7	1.8052	92.43	89.79
	-10	-0.8	-1.900	1.810	96	-8.8	8.8	1.7902	92.04	90.95
	-5	0.5	-1.300	1.810	96	-5.4	5.4	1.7442	90.85	90.45
	0	-0.5	-0.380	1.800	95	1.5	1.5	1.7895	91.94	91.91
	5	-0.4	0.300	1.770	95	6.7	6.7	1.7993	92.19	91.56
	10	0.7	1.000	1.700	95	12.0	12.0	1.7824	91.76	89.76
	15	0.8	1.350	1.650	95	14.8	14.8	1.7588	91.15	88.11
	20	0.5	1.850	1.600	95	19.0	19.0	1.7747	91.56	86.58
	25	0.7	2.500	1.490	95	25.5	25.5	1.7665	91.35	82.46
	30	0.9	2.900	1.350	94	29.8	29.9	1.8107	92.40	80.14
							Res		Vdir	Vax
					Average	-30	30.01		83.28	72.12
						-25	26.64		96.32	86.09
						-20	20.00		93.36	87.72
						-15	13.73		92.15	89.52
						-10	8.77		91.55	90.48
						-5	5.51		90.61	90.19
						0	1.27		91.41	91.39
						5	6.68		91.79	91.16
						10	11.37		91.52	89.72
						15	15.01		91.13	88.01
						20	19.97		91.91	86.37
						25	25.55		91.30	82.37
						30	29.66		92.39	80.28

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ATTACHMENT K.

Spherical Probe SPH-2 Calibration Data

Figure C2-26. Spherical Probe (SPH-2): Avg. (30-60 fps) F1 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations

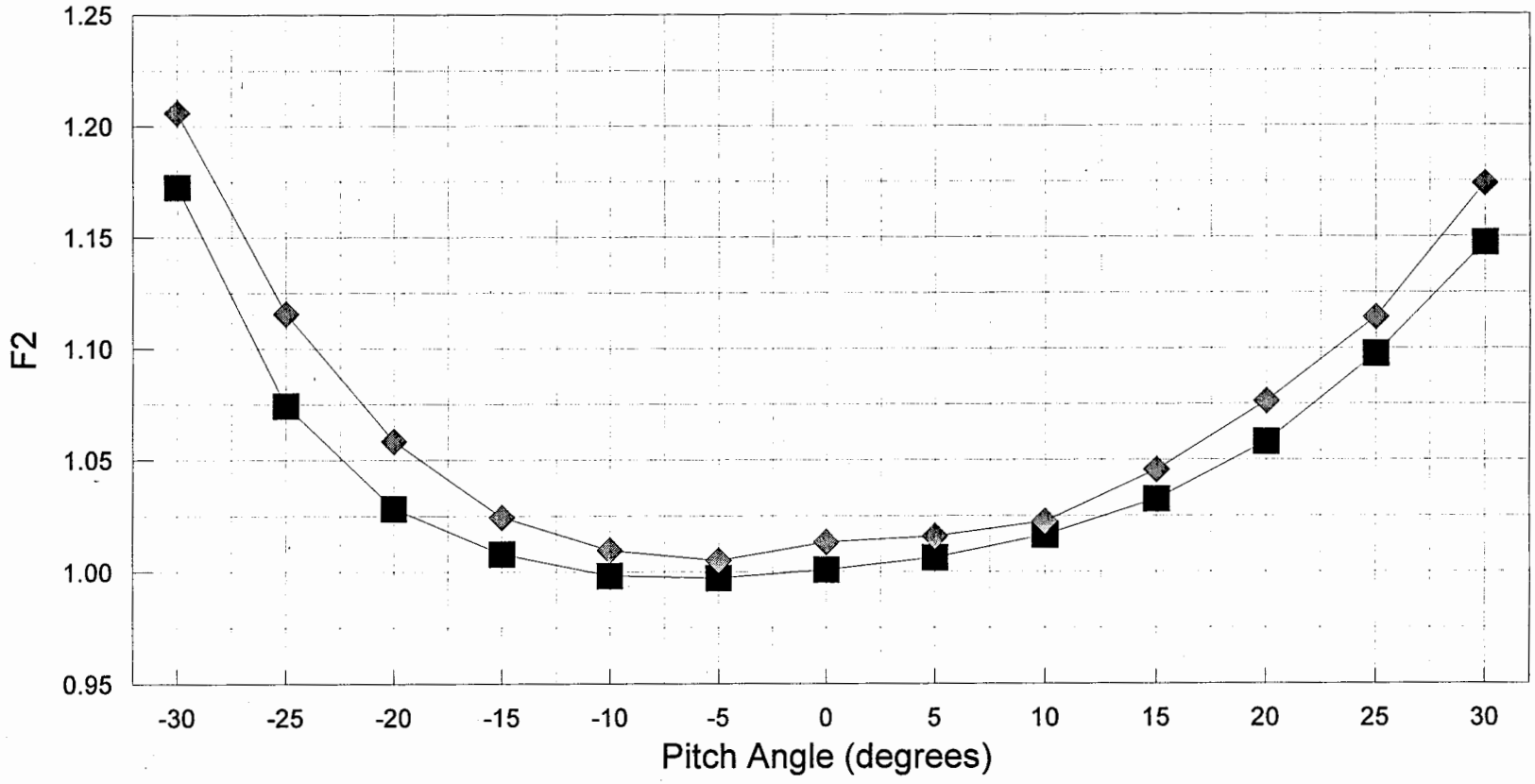


Note: Each point represents the mean of three replicates.

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Figure C2-27. Spherical Probe (SPH-2): Avg. (30-60 fps) F2 vs. Pitch Angle

NCSU Post-Test and NIST Wind Tunnel Calibrations

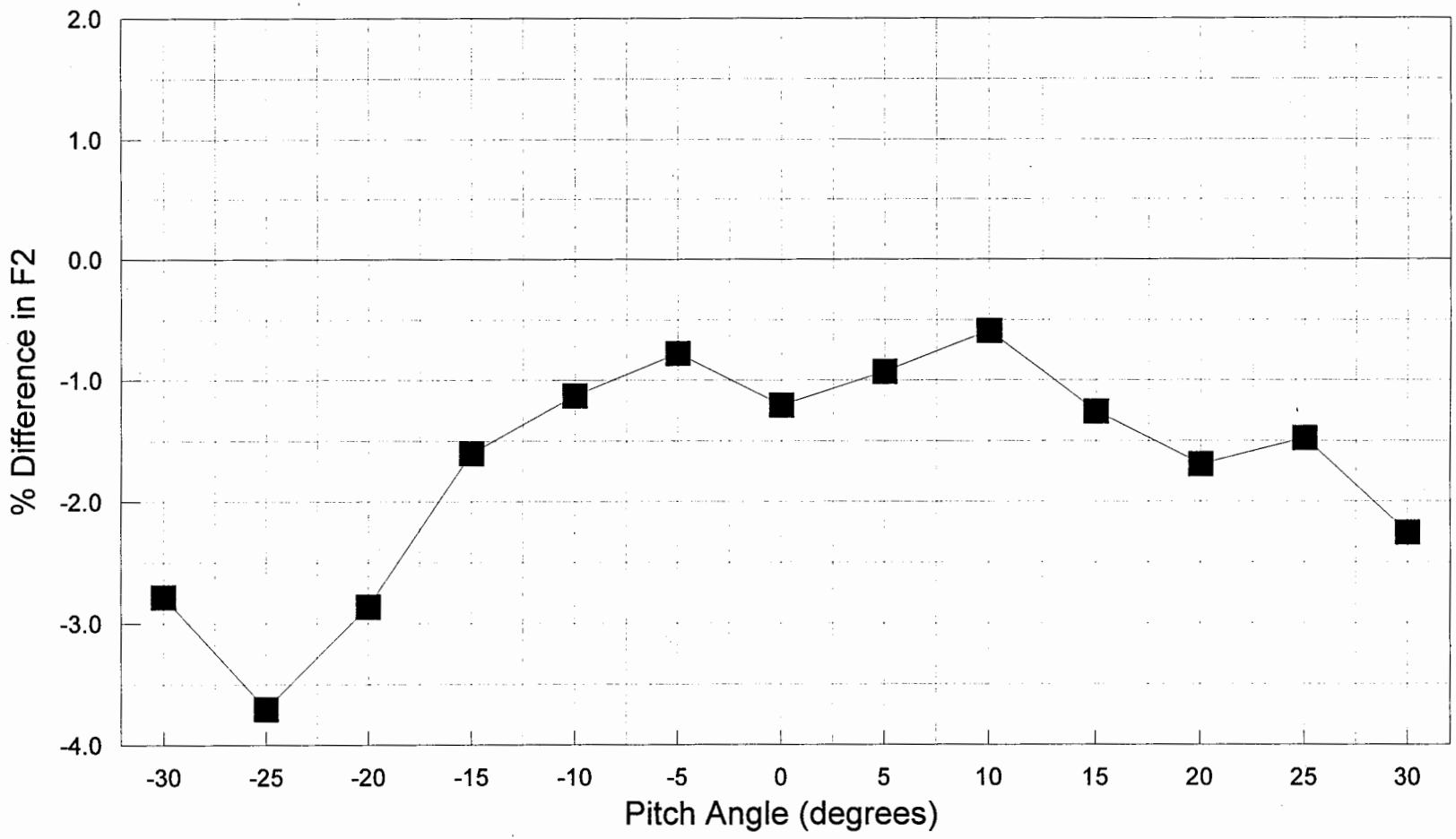


Note: Each point represents the mean of three replicates.

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Figure C2-28. Spherical Probe (SPH-2): Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC226-28.WK4

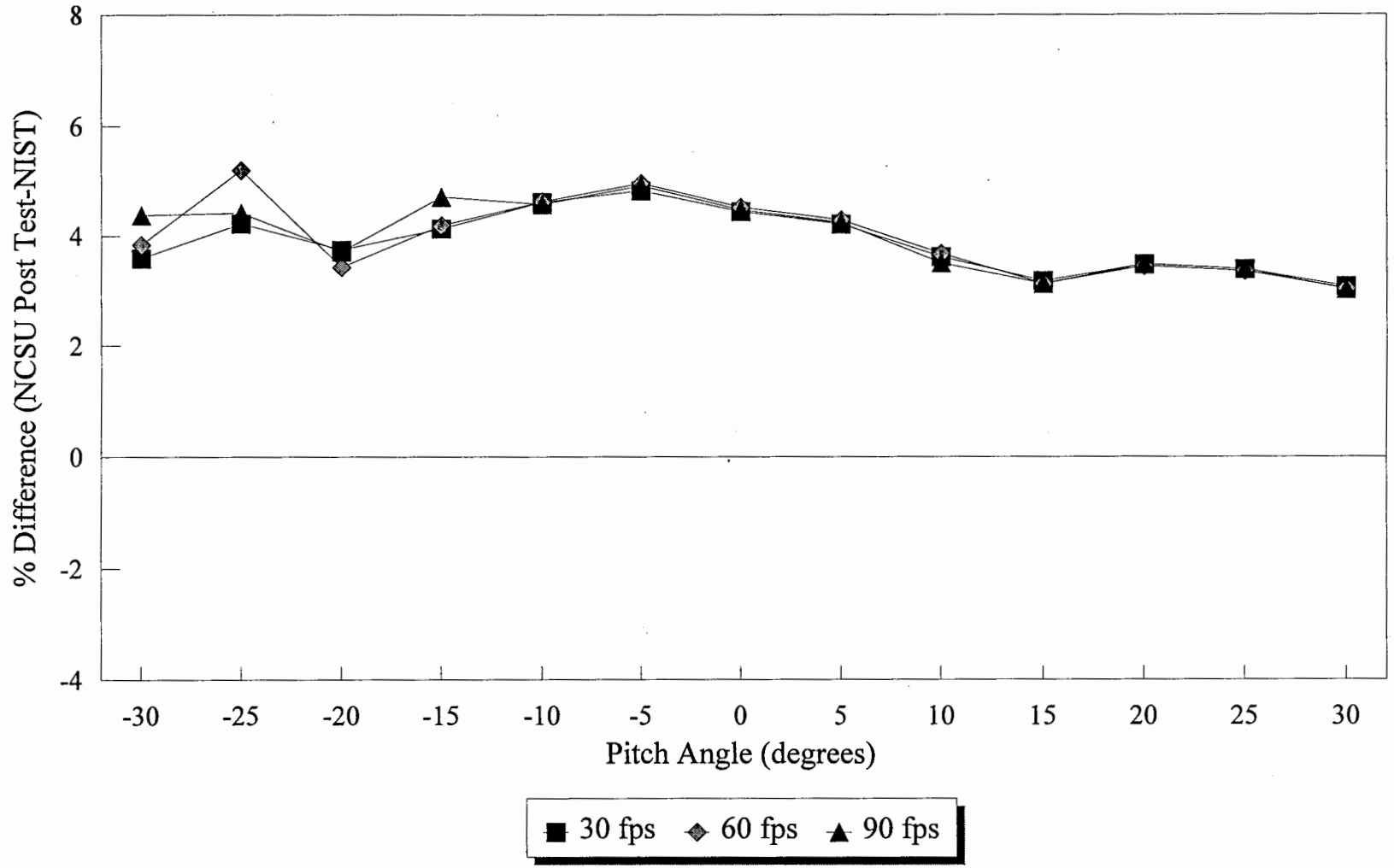
Table C2-29. Spherical Probe SPH-2: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

	30 fps / NIST / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.47	28.74	25.01	29.86	29.87	25.90	1.35	3.95	3.59
-25	24.43	30.35	27.58	25.82	31.99	28.75	5.69	5.42	4.22
-20	17.40	29.79	28.42	18.56	31.12	29.48	6.65	4.44	3.74
-15	13.95	29.95	29.06	14.81	31.31	30.26	6.21	4.53	4.13
-10	9.43	30.00	29.59	11.20	31.56	30.95	18.80	5.20	4.61
-5	4.29	29.91	29.80	5.15	31.40	31.24	20.10	4.98	4.82
0	1.87	29.83	29.81	1.83	31.15	31.13	-2.52	4.43	4.44
5	6.04	29.98	29.79	6.07	31.24	31.04	0.53	4.23	4.21
10	11.56	30.26	29.64	11.37	31.33	30.71	-1.68	3.53	3.62
15	16.06	30.40	29.21	15.27	31.24	30.14	-4.92	2.77	3.17
20	20.38	30.15	28.26	19.94	31.11	29.24	-2.15	3.19	3.48
25	25.25	30.47	27.56	24.58	31.33	28.49	-2.64	2.83	3.39
30	29.38	30.38	26.47	29.10	31.23	27.29	-0.92	2.80	3.07

	60 fps / NIST / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.42	54.80	47.71	30.07	57.25	49.54	2.20	4.48	3.84
-25	24.85	57.26	51.96	26.48	61.07	54.66	6.56	6.66	5.20
-20	18.31	57.47	54.56	19.61	59.90	56.43	7.08	4.24	3.43
-15	13.32	57.50	55.95	14.25	60.14	58.29	6.97	4.60	4.19
-10	8.67	57.51	56.85	10.56	60.50	59.48	21.81	5.21	4.63
-5	4.64	57.47	57.28	5.37	60.38	60.12	15.73	5.07	4.95
0	1.31	57.81	57.80	1.52	60.43	60.41	15.69	4.53	4.52
5	5.35	57.88	57.60	5.39	60.37	60.07	0.84	4.30	4.29
10	11.26	58.21	57.08	11.15	60.32	59.18	-0.97	3.64	3.68
15	15.93	58.31	56.07	15.08	59.89	57.83	-5.35	2.70	3.13
20	21.00	58.34	54.47	20.58	60.18	56.34	-1.99	3.16	3.45
25	25.64	58.42	52.66	24.94	60.02	54.43	-2.76	2.75	3.35
30	29.68	57.92	50.33	29.48	59.56	51.85	-0.68	2.83	3.04

	90 fps / NIST / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.85	81.36	70.57	30.10	85.14	73.65	0.84	4.65	4.37
-25	24.01	84.09	76.81	25.49	88.86	80.21	6.16	5.67	4.42
-20	19.61	86.51	81.49	21.15	90.62	84.51	7.90	4.75	3.71
-15	10.44	85.75	84.33	12.05	90.29	88.30	15.40	5.29	4.71
-10	8.08	86.36	85.51	10.03	90.81	89.42	24.23	5.15	4.58
-5	4.55	86.76	86.48	5.33	91.13	90.72	16.97	5.04	4.91
0	1.19	86.96	86.94	1.25	90.85	90.83	4.71	4.47	4.47
5	6.04	87.24	86.73	6.11	90.95	90.41	1.11	4.25	4.24
10	12.31	88.19	86.17	12.02	91.18	89.18	-2.37	3.39	3.50
15	15.75	87.73	84.44	14.91	90.11	87.08	-5.34	2.71	3.12
20	20.62	87.52	81.91	20.20	90.32	84.76	-2.07	3.19	3.48
25	25.64	87.38	78.78	24.95	89.83	81.45	-2.70	2.80	3.39
30	29.80	87.45	75.88	29.60	89.92	78.18	-0.68	2.82	3.03

Figure C2-29. Sperical Probe SPH-2: Percent Differences in NSCU Post Test and NIST Calibrations
Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data



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Table C2-30. SPH-2 Computations: 30 fps

Probe: **Spherical SPH-2 / NIST 30-60 Calibration** Pre-test
Velocity Point: **30 fps** Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	2.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	74 _F
Average Axial Velocity, ft/sec:	**28.48**	Last Row:	61
Average Yaw Angle:	1.2		
Average Pitch Angle:	16.0	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	16.1	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.18		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.8	-0.350	0.155	70	-30.0	30.0	0.1981	29.91	25.90
	-25	-0.8	-0.350	0.180	70	-23.7	23.7	0.1885	29.18	26.72
	-20	-0.9	-0.300	0.198	70	-16.6	16.7	0.1889	29.21	27.98
	-15	-0.9	-0.270	0.205	70	-13.8	13.8	0.1904	29.33	28.49
	-10	-0.9	-0.200	0.210	70	-8.6	8.6	0.1894	29.25	28.92
	-5	-0.9	-0.080	0.210	70	-1.1	1.4	0.1919	29.44	29.43
	0	-0.7	-0.040	0.205	70	1.4	1.6	0.1889	29.21	29.20
	5	-0.6	0.060	0.205	70	7.7	7.7	0.1937	29.58	29.31
	10	-0.7	0.145	0.200	70	12.8	12.8	0.1967	29.81	29.07
	15	-0.6	0.200	0.195	70	16.3	16.3	0.1980	29.90	28.70
	20	-0.6	0.270	0.185	70	21.3	21.4	0.1973	29.86	27.81
	25	-0.5	0.330	0.175	70	26.2	26.2	0.2016	30.18	27.08
	30	-0.8	0.360	0.160	70	30.0	30.0	0.1986	29.95	25.93
2	-30	-2.7	-0.340	0.155	80	-30.0	30.1	0.1981	30.20	26.12
	-25	-2.8	-0.400	0.190	79	-27.7	27.8	0.2243	32.10	28.40
	-20	-2.0	-0.350	0.205	79	-19.4	19.5	0.2012	30.40	28.66
	-15	-1.9	-0.300	0.214	79	-15.0	15.1	0.2006	30.36	29.31
	-10	-1.9	-0.250	0.224	79	-10.8	11.0	0.2036	30.58	30.02
	-5	-1.1	-0.170	0.220	79	-6.2	6.3	0.1980	30.16	29.98
	0	-1.0	-0.070	0.215	79	-0.4	1.1	0.1971	30.09	30.08
	5	-1.0	-0.020	0.215	79	2.8	3.0	0.1988	30.22	30.18
	10	-1.0	0.090	0.210	79	9.3	9.4	0.2002	30.33	29.92
	15	-1.0	0.185	0.205	78	14.9	14.9	0.2057	30.71	29.67
	20	-1.0	0.250	0.193	78	19.5	19.5	0.2009	30.35	28.61
	25	-1.0	0.310	0.184	78	23.9	24.0	0.2039	30.57	27.94
	30	-1.1	0.360	0.169	78	28.8	28.8	0.2052	30.67	26.86
3	-30	-1.3	-0.340	0.160	78	-28.3	28.3	0.1486	26.11	22.99
	-25	-1.4	-0.350	0.190	78	-21.8	21.8	0.1931	29.75	27.63
	-20	-1.5	-0.300	0.204	78	-16.0	16.1	0.1933	29.77	28.61
	-15	-1.5	-0.270	0.215	78	-12.9	12.9	0.1984	30.16	29.40
	-10	-1.5	-0.210	0.220	78	-8.6	8.7	0.1985	30.17	29.82
	-5	-1.4	-0.150	0.220	78	-5.0	5.2	0.1978	30.12	29.99
	0	-1.0	-0.020	0.215	78	2.8	3.0	0.1988	30.19	30.15
	5	-1.0	0.055	0.210	78	7.3	7.4	0.1980	30.13	29.88
	10	-1.0	0.145	0.209	78	12.4	12.5	0.2049	30.65	29.92
	15	-1.0	0.215	0.200	78	16.9	16.9	0.2040	30.58	29.26
	20	-1.0	0.260	0.190	78	20.3	20.3	0.1995	30.25	28.36
	25	-1.0	0.330	0.180	78	25.6	25.6	0.2050	30.66	27.65
	30	-1.1	0.360	0.166	78	29.2	29.3	0.2031	30.52	26.62

		Res	Vdir	Vax
Average	-30	29.47	28.74	25.01
	-25	24.43	30.35	27.58
	-20	17.40	29.79	28.42
	-15	13.95	29.95	29.06
	-10	9.43	30.00	29.59
	-5	4.29	29.91	29.80
	0	1.87	29.83	29.81
	5	6.04	29.98	29.79
	10	11.56	30.26	29.64
	15	16.06	30.40	29.21
	20	20.38	30.15	28.26
	25	25.25	30.47	27.56
	30	29.38	30.38	26.47

Table C2-31. SPH2 Computations: 60 fps

Probe: **Spherical SPH-2 / NIST 30-60 Calibration** Pre-test
Velocity Point: **60 fps** Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	2.99%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	76 _F
Average Axial Velocity, ft/sec:	**54.64**	Last Row:	61
Average Yaw Angle:	1.1		
Average Pitch Angle:	16.0	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.1		0
Resultant Angle Standard Deviation:	9.38		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw			Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-2.9	-1.280	0.580	72	-30.0	30.1	0.7413	57.98	50.14
	-25	-1.7	-1.350	0.670	72	-25.0	25.1	0.7162	56.99	51.63
	-20	-1.4	-1.200	0.740	72	-18.2	18.2	0.7172	57.03	54.17
	-15	-1.4	-1.000	0.770	72	-13.5	13.6	0.7139	56.89	55.31
	-10	-1.3	-0.770	0.800	73	-8.7	8.8	0.7217	57.26	56.59
	-5	-1.1	-0.500	0.800	73	-4.2	4.4	0.7215	57.25	57.08
	0	-1.1	-0.300	0.800	73	-1.0	1.5	0.7313	57.64	57.62
	5	-0.7	0.020	0.780	74	4.5	4.5	0.7244	57.42	57.24
	10	-1.0	0.430	0.760	74	10.9	11.0	0.7341	57.80	56.74
	15	-0.4	0.730	0.730	74	16.0	16.0	0.7393	58.01	55.75
	20	-0.5	1.000	0.700	74	21.0	21.0	0.7427	58.14	54.28
	25	-0.5	1.200	0.650	74	25.7	25.7	0.7424	58.13	52.36
	30	0.9	1.350	0.580	74	30.0	30.0	0.7198	57.24	49.56
2	-30	-2.6	-1.250	0.580	78	-29.1	29.3	0.7206	57.48	50.15
	-25	-1.9	-1.320	0.650	78	-25.5	25.5	0.7076	56.96	51.40
	-20	-1.5	-1.230	0.740	79	-18.7	18.8	0.7215	57.57	54.50
	-15	-1.5	-1.000	0.780	79	-13.2	13.3	0.7219	57.59	56.04
	-10	-1.2	-0.800	0.800	79	-9.2	9.3	0.7221	57.59	56.84
	-5	-1.2	-0.550	0.800	79	-5.0	5.2	0.7192	57.48	57.24
	0	-1.1	-0.300	0.800	79	-1.0	1.5	0.7313	57.96	57.94
	5	-1.0	-0.020	0.790	79	3.8	3.9	0.7324	58.00	57.87
	10	-1.1	0.420	0.770	79	10.7	10.8	0.7421	58.39	57.36
	15	-0.6	0.700	0.740	79	15.4	15.4	0.7457	58.53	56.42
	20	-0.6	1.000	0.710	79	20.8	20.8	0.7507	58.73	54.91
	25	-0.1	1.200	0.660	79	25.4	25.4	0.7492	58.67	52.98
	30	1.0	1.310	0.600	80	29.4	29.4	0.7364	58.22	50.71
3	-30	-2.6	-1.200	0.560	81	-28.8	28.9	0.5192	48.93	42.84
	-25	-1.7	-1.350	0.690	81	-23.9	24.0	0.7253	57.83	52.85
	-20	-1.4	-1.200	0.750	81	-17.9	17.9	0.7246	57.80	55.00
	-15	-1.5	-1.000	0.790	81	-13.0	13.1	0.7298	58.01	56.50
	-10	-1.2	-0.720	0.800	81	-7.9	8.0	0.7211	57.66	57.11
	-5	-1.0	-0.500	0.800	81	-4.2	4.4	0.7215	57.68	57.51
	0	-0.9	-0.220	0.790	81	0.2	0.9	0.7257	57.85	57.84
	5	-0.9	0.220	0.780	80	7.6	7.6	0.7363	58.21	57.70
	10	-0.9	0.500	0.760	80	12.0	12.1	0.7419	58.43	57.15
	15	-0.6	0.750	0.730	80	16.3	16.4	0.7412	58.41	56.04
	20	-0.5	1.000	0.690	80	21.2	21.2	0.7347	58.15	54.20
	25	-0.3	1.200	0.650	80	25.7	25.7	0.7424	58.45	52.65
	30	0.9	1.320	0.600	80	29.6	29.6	0.7389	58.32	50.71

		Res	Vdir	Vax
Average	-30	29.42	54.80	47.71
	-25	24.85	57.26	51.96
	-20	18.31	57.47	54.56
	-15	13.32	57.50	55.95
	-10	8.67	57.51	56.85
	-5	4.64	57.47	57.28
	0	1.31	57.81	57.80
	5	5.35	57.88	57.60
	10	11.26	58.21	57.08
	15	15.93	58.31	56.07
	20	21.00	58.34	54.47
	25	25.64	58.42	52.66
	30	29.68	57.92	50.33

Table C2-32. SPH-2 Computations: 90 fps

Probe: **Spherical SPH-2 / NIST 30-60 Calibration** Pre-test
Velocity Point: **90 fps** Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-2
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.81%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**82.00**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	15.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.0		0
Resultant Angle Standard Deviation:	9.46		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw			Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-2.8	-2.750	1.260	82	-30.0	30.1	1.6082	86.19	74.59
	-25	-1.8	-2.800	1.450	82	-23.4	23.5	1.5128	83.60	76.67
	-20	-1.3	-2.800	1.630	82	-19.6	19.6	1.6024	86.03	81.05
	-15	-1.2	-1.890	1.750	81	-10.3	10.3	1.5840	85.46	84.07
	-10	-1.1	-1.660	1.780	81	-8.3	8.4	1.6052	86.03	85.12
	-5	-1.0	-1.140	1.790	80	-4.4	4.5	1.6133	86.17	85.90
	0	-1.0	-0.440	1.780	80	0.7	1.2	1.6369	86.80	86.78
	5	-0.8	0.400	1.750	79	6.9	7.0	1.6460	86.96	86.31
	10	-0.8	1.100	1.710	79	11.8	11.9	1.6665	87.50	85.62
	15	-0.4	1.640	1.630	79	16.1	16.1	1.6518	87.11	83.69
	20	-0.3	2.200	1.560	78	20.8	20.8	1.6500	86.98	81.32
	25	0.1	2.700	1.430	77	26.2	26.2	1.6485	86.86	77.94
	30	0.6	3.000	1.330	76	30.0	30.0	1.6507	86.84	75.20
2	-30	-2.6	-2.700	1.250	83	-29.3	29.4	1.5605	84.98	74.04
	-25	-2.0	-2.850	1.430	83	-24.6	24.7	1.5191	83.85	76.20
	-20	-1.2	-2.800	1.640	84	-19.4	19.4	1.6097	86.39	81.47
	-15	-1.3	-1.900	1.740	85	-10.5	10.5	1.5771	85.59	84.15
	-10	-1.3	-1.600	1.780	85	-7.8	8.0	1.6045	86.33	85.50
	-5	-1.2	-1.300	1.800	85	-5.5	5.6	1.6189	86.72	86.30
	0	-1.0	-0.650	1.770	86	-0.9	1.4	1.6187	86.79	86.77
	5	-0.9	-0.010	1.750	86	4.0	4.1	1.6235	86.92	86.69
	10	-0.8	1.210	1.700	87	12.7	12.7	1.6697	88.23	86.08
	15	-0.4	1.510	1.650	87	15.0	15.0	1.6578	87.91	84.90
	20	-0.2	2.100	1.580	87	19.8	19.8	1.6495	87.69	82.49
	25	0.1	2.600	1.450	88	25.2	25.2	1.6368	87.43	79.13
	30	0.8	2.950	1.330	88	29.8	29.8	1.6440	87.63	76.04
3	-30	-2.3	-2.800	1.250	91	-30.0	30.1	1.1315	72.89	63.08
	-25	-1.8	-2.850	1.460	91	-23.8	23.9	1.5326	84.84	77.57
	-20	-1.3	-2.840	1.640	91	-19.8	19.8	1.6155	87.10	81.96
	-15	-1.4	-1.900	1.750	90	-10.4	10.5	1.5851	86.20	84.77
	-10	-1.0	-1.600	1.780	90	-7.8	7.9	1.6045	86.73	85.90
	-5	-1.1	-1.000	1.800	90	-3.3	3.5	1.6295	87.40	87.23
	0	-1.0	-0.500	1.770	90	0.2	1.0	1.6257	87.30	87.28
	5	-0.8	0.400	1.750	90	6.9	7.0	1.6460	87.84	87.19
	10	-0.8	1.180	1.720	90	12.4	12.4	1.6844	88.86	86.79
	15	-0.4	1.650	1.640	89	16.1	16.1	1.6619	88.18	84.72
	20	-0.2	2.250	1.550	89	21.3	21.3	1.6511	87.90	81.92
	25	-0.2	2.650	1.450	89	25.5	25.5	1.6494	87.85	79.26
	30	0.7	2.950	1.340	89	29.6	29.6	1.6508	87.89	76.41

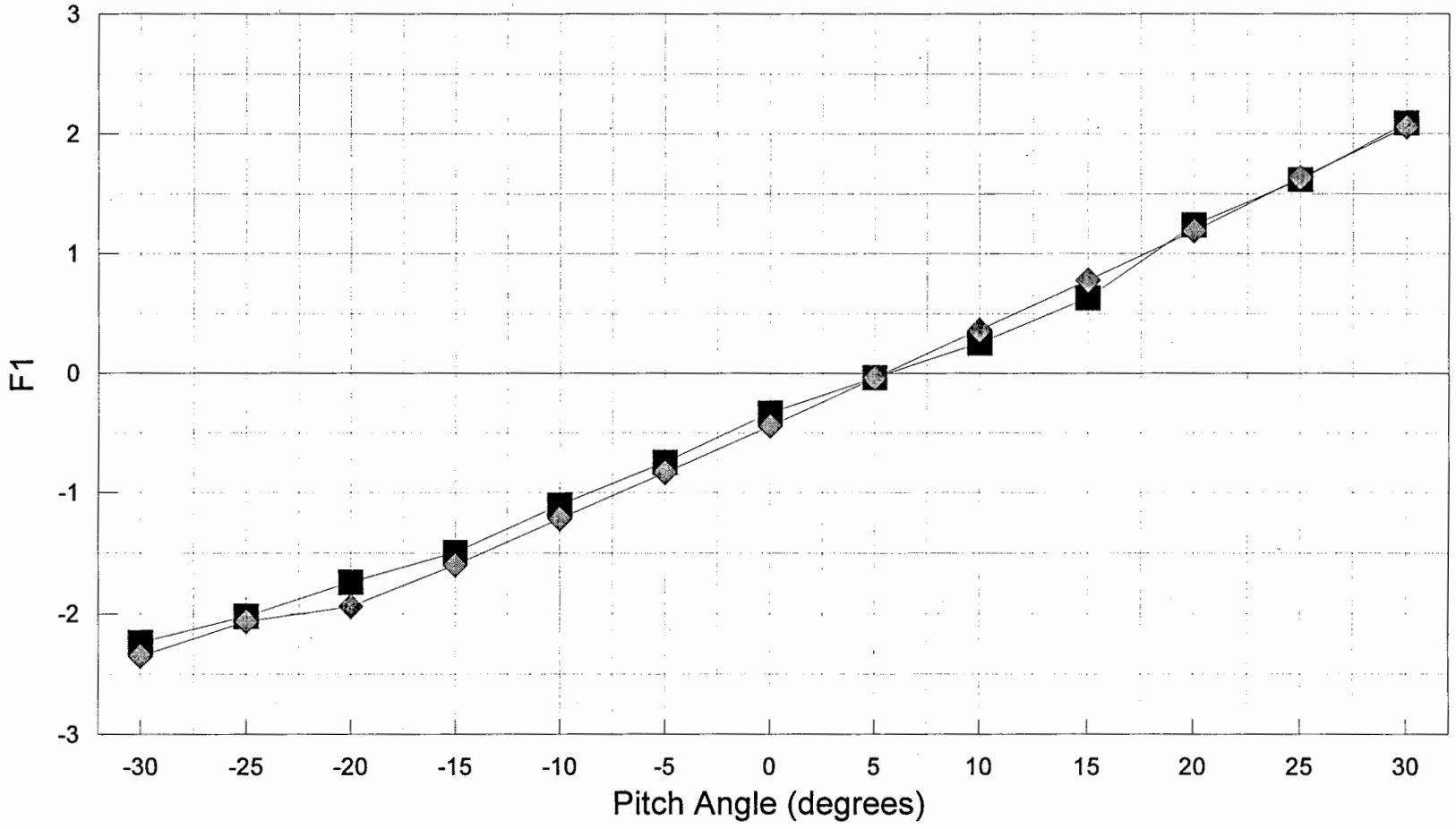
		Res	Vdir	Vax
Average	-30	29.85	81.36	70.57
	-25	24.01	84.09	76.81
	-20	19.61	86.51	81.49
	-15	10.44	85.75	84.33
	-10	8.08	86.36	85.51
	-5	4.55	86.76	86.48
	0	1.19	86.96	86.94
	5	6.04	87.24	86.73
	10	12.31	88.19	86.17
	15	15.75	87.73	84.44
	20	20.62	87.52	81.91
	25	25.64	87.38	78.78
	30	29.80	87.45	75.88

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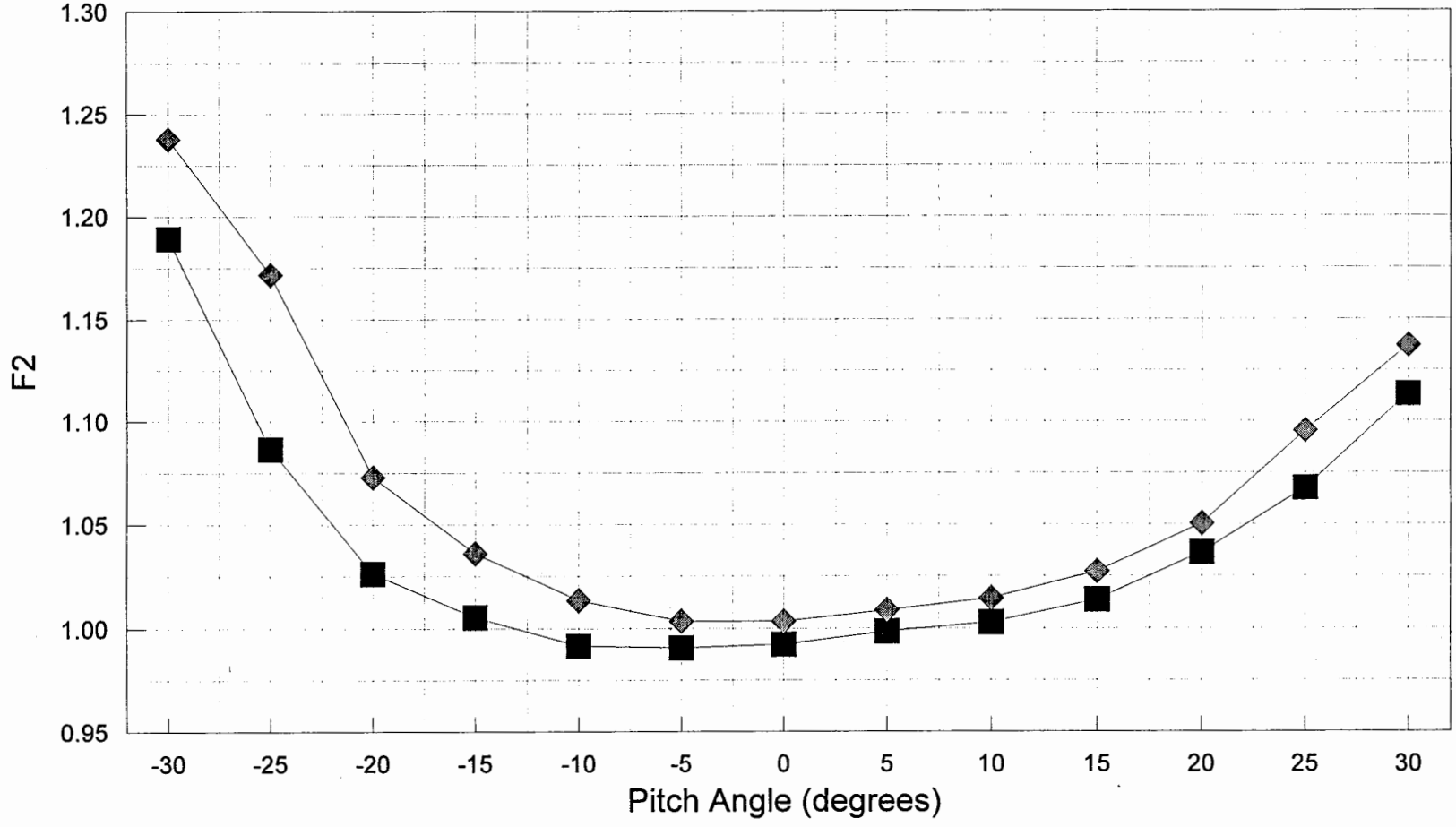
Spherical Probe SPH-3 Calibration Data

Figure C2-30. Spherical Probe (SPH-3): Avg. (30-60 fps) F1 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

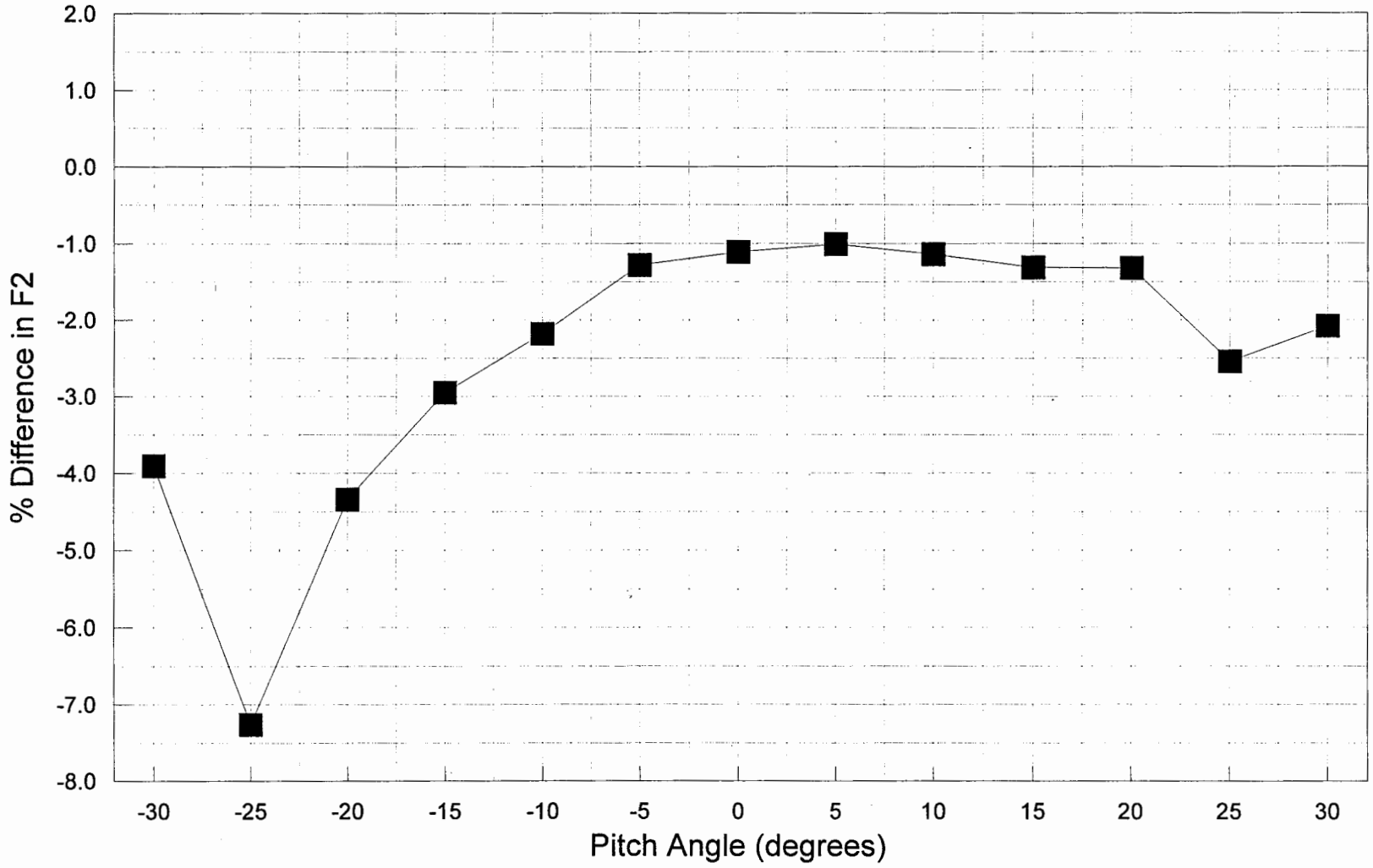
Figure C2-31. Spherical Probe (SPH-3): Avg. (30-60 fps) F2 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Figure C2-32. Spherical Probe (SPH-3): Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Table C2-33. Spherical Probe SPH-3: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

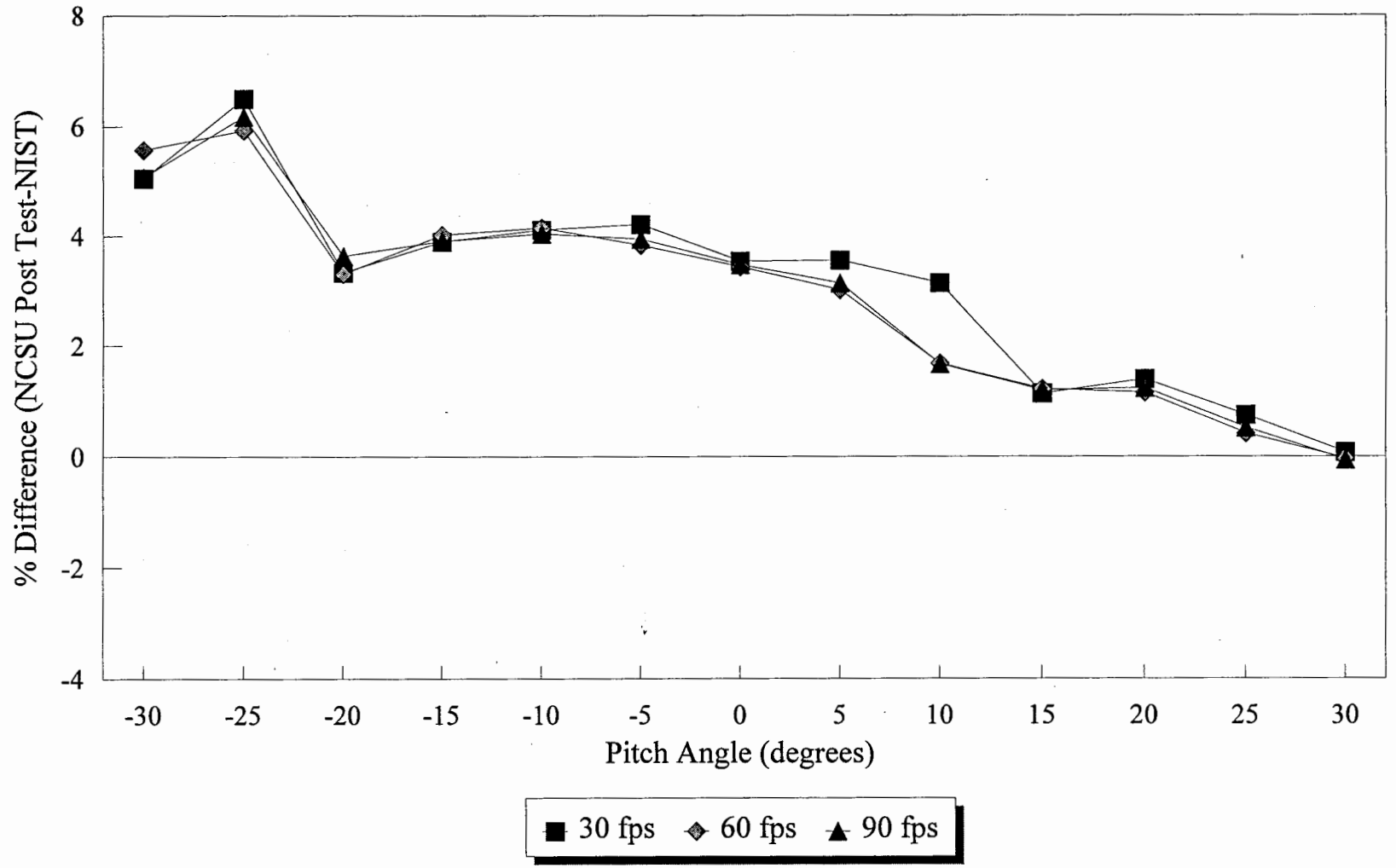
Pitch Angle	30 fps / NIST / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.70	28.24	24.53	30.00	29.76	25.77	1.03	5.38	5.06
-25	27.38	31.43	27.90	28.89	33.94	29.71	5.49	8.00	6.50
-20	17.45	29.90	28.53	20.46	31.46	29.48	17.21	5.21	3.33
-15	12.49	30.21	29.49	13.89	31.56	30.64	11.25	4.49	3.89
-10	10.60	30.42	29.90	12.05	31.83	31.13	13.71	4.64	4.11
-5	5.79	30.32	30.17	7.10	31.68	31.44	22.60	4.48	4.21
0	0.49	30.60	30.60	1.71	31.69	31.68	245.28	3.58	3.54
5	4.90	30.81	30.69	4.81	31.90	31.78	-1.77	3.54	3.55
10	6.59	30.86	30.65	7.18	31.87	31.61	8.89	3.27	3.14
15	15.16	31.30	30.20	16.31	31.83	30.55	7.57	1.71	1.14
20	19.51	31.09	29.30	19.24	31.47	29.71	-1.37	1.23	1.40
25	24.25	31.46	28.68	24.31	31.71	28.90	0.26	0.79	0.74
30	29.31	31.83	27.76	29.04	31.77	27.78	-0.94	-0.19	0.08

Pitch Angle	60 fps / NIST / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	25.63	51.24	46.20	26.85	54.67	48.77	4.75	6.68	5.57
-25	23.64	57.49	52.58	25.64	61.83	55.70	8.47	7.54	5.92
-20	16.30	57.47	55.16	18.91	60.24	56.98	16.06	4.82	3.31
-15	11.63	57.73	56.54	13.05	60.38	58.81	12.28	4.58	4.02
-10	6.46	57.89	57.52	7.82	60.47	59.91	21.04	4.46	4.15
-5	2.32	58.16	58.11	3.55	60.46	60.34	52.93	3.95	3.83
0	0.99	58.40	58.39	0.44	60.39	60.39	-55.70	3.42	3.44
5	7.04	58.51	58.07	7.80	60.38	59.82	10.86	3.19	3.01
10	11.92	58.93	57.66	13.58	60.31	58.63	13.87	2.35	1.68
15	17.35	59.18	56.49	17.79	60.05	57.17	2.51	1.46	1.22
20	21.74	59.48	55.25	21.35	60.01	55.88	-1.78	0.88	1.15
25	26.56	59.36	53.09	26.56	59.61	53.32	0.00	0.42	0.42
30	30.02	59.78	51.76	29.92	59.70	51.74	-0.33	-0.14	-0.04

Pitch Angle	90 fps / NIST / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.71	79.23	69.46	29.80	84.10	72.99	3.78	6.15	5.08
-25	25.23	85.46	77.29	26.61	91.80	82.06	5.44	7.42	6.17
-20	17.88	86.09	81.93	20.99	90.95	84.91	17.38	5.64	3.63
-15	12.41	86.64	84.61	13.82	90.54	87.91	11.33	4.50	3.90
-10	7.69	86.55	85.76	9.14	90.39	89.23	18.85	4.43	4.04
-5	3.06	87.45	87.32	4.25	91.02	90.77	38.72	4.08	3.95
0	1.25	87.70	87.67	0.90	90.74	90.72	-28.27	3.47	3.48
5	6.56	87.74	87.15	7.14	90.61	89.89	8.80	3.27	3.14
10	11.95	88.82	86.90	13.61	90.90	88.35	13.87	2.34	1.67
15	17.00	88.81	84.93	17.55	90.14	85.95	3.26	1.50	1.20
20	21.14	89.04	83.05	20.65	89.85	84.07	-2.34	0.91	1.24
25	25.90	89.25	80.28	25.97	89.76	80.70	0.26	0.58	0.52
30	30.01	88.90	76.97	30.01	88.84	76.93	-0.00	-0.06	-0.06

TABC233.WK4

Figure C2-33. Sperical Probe SPH-3: Percent Differences in NSCU Post Test and NIST Calibrations
Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data



TABC233.WK4

Table C2-34. SPH-3 Computations: 30 fps

Probe: **Spherical SPH-3 / NIST 30-60 Calibration**
Velocity Point: **30 fps**
Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.77%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**29.11**	Last Row:	61
Average Yaw Angle:	0.2		
Average Pitch Angle:	15.6	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.7		0
Resultant Angle Standard Deviation:	9.64		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-0.350	0.150	83	-29.7	29.7	0.1898	29.64	25.75
	-25	-0.3	-0.400	0.185	83	-26.7	26.7	0.2113	31.27	27.92
	-20	-0.4	-0.350	0.200	83	-17.2	17.2	0.1919	29.80	28.47
	-15	-0.5	-0.300	0.215	83	-12.3	12.3	0.1976	30.24	29.54
	-10	-0.4	-0.260	0.220	83	-9.5	9.6	0.1986	30.32	29.90
	-5	-0.3	-0.200	0.220	83	-6.0	6.0	0.1980	30.27	30.10
	0	-0.3	-0.100	0.220	83	-0.1	0.3	0.2018	30.56	30.56
	5	-0.4	-0.010	0.220	82	4.9	4.9	0.2045	30.74	30.63
	10	-0.3	0.020	0.218	82	6.6	6.6	0.2046	30.74	30.54
	15	-0.4	0.170	0.210	82	15.4	15.4	0.2115	31.26	30.14
	20	-0.3	0.230	0.200	82	19.5	19.5	0.2083	31.02	29.24
	25	-0.4	0.300	0.190	82	24.4	24.4	0.2119	31.29	28.49
	30	0.0	0.360	0.175	82	30.0	30.0	0.2171	31.67	27.43
2	-30	-0.1	-0.350	0.150	87	-29.7	29.7	0.1898	29.75	25.84
	-25	-0.1	-0.400	0.176	87	-28.7	28.7	0.2150	31.66	27.78
	-20	-0.4	-0.350	0.200	87	-17.2	17.2	0.1919	29.91	28.57
	-15	-0.4	-0.300	0.210	87	-12.8	12.8	0.1937	30.05	29.30
	-10	-0.4	-0.290	0.218	87	-11.5	11.5	0.1991	30.47	29.86
	-5	-0.4	-0.200	0.220	87	-6.0	6.0	0.1980	30.38	30.21
	0	-0.4	-0.100	0.220	86	-0.1	0.4	0.2018	30.65	30.65
	5	-0.3	-0.010	0.220	86	4.9	4.9	0.2045	30.85	30.74
	10	-0.4	0.030	0.219	86	7.1	7.2	0.2062	30.98	30.74
	15	0.2	0.150	0.210	86	14.2	14.2	0.2093	31.21	30.26
	20	0.0	0.220	0.200	86	18.9	18.9	0.2073	31.06	29.38
	25	0.0	0.300	0.195	86	23.9	23.9	0.2161	31.71	28.98
	30	0.0	0.350	0.180	86	28.7	28.7	0.2178	31.83	27.94
3	-30	-0.5	-0.350	0.150	86	-29.7	29.7	0.1379	25.33	22.00
	-25	-0.6	-0.400	0.185	86	-26.7	26.8	0.2113	31.35	28.00
	-20	-0.1	-0.360	0.200	86	-17.9	17.9	0.1934	30.00	28.54
	-15	-0.4	-0.300	0.215	86	-12.3	12.3	0.1976	30.33	29.63
	-10	-0.4	-0.280	0.220	85	-10.7	10.7	0.1998	30.47	29.93
	-5	-0.1	-0.190	0.220	85	-5.4	5.4	0.1978	30.31	30.18
	0	-0.1	-0.110	0.220	85	-0.7	0.7	0.2014	30.58	30.58
	5	0.0	-0.010	0.220	85	4.9	4.9	0.2045	30.82	30.71
	10	0.0	0.010	0.219	85	6.0	6.0	0.2049	30.85	30.68
	15	0.0	0.180	0.210	85	15.9	15.9	0.2125	31.42	30.21
	20	0.0	0.240	0.200	85	20.1	20.1	0.2094	31.19	29.29
	25	0.0	0.300	0.190	85	24.4	24.4	0.2119	31.37	28.57
	30	-0.1	0.360	0.180	85	29.3	29.3	0.2205	32.00	27.91

		Res	Vdir	Vax
Average	-30	29.70	28.24	24.53
	-25	27.38	31.43	27.90
	-20	17.45	29.90	28.53
	-15	12.49	30.21	29.49
	-10	10.60	30.42	29.90
	-5	5.79	30.32	30.17
	0	0.49	30.60	30.60
	5	4.90	30.81	30.69
	10	6.59	30.86	30.65
	15	15.16	31.30	30.20
	20	19.51	31.09	29.30
	25	24.25	31.46	28.68
	30	29.31	31.83	27.76

Table C2-35. SPH-3 Computations: 60 fps

Probe: **Spherical SPH-3 / NIST 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.86%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	83 _F
Average Axial Velocity, ft/sec:	**55.14**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	15.5	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	15.5	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.40		0

			Readings, in.H2O							
	Pitch	Yaw	----------	----------	Gas	<< ANGLES >>			Velocities, ft/sec	
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.0	-1.150	0.550	84	-25.5	25.5	0.5998	52.74	47.59
	-25	-0.2	-1.300	0.670	84	-20.0	20.0	0.6616	55.39	52.05
	-20	-0.1	-1.240	0.750	84	-15.8	15.8	0.7091	57.34	55.17
	-15	-0.1	-1.000	0.790	84	-10.6	10.6	0.7171	57.66	56.67
	-10	-0.1	-0.750	0.800	84	-6.4	6.4	0.7201	57.78	57.43
	-5	0.0	-0.500	0.800	84	-2.3	2.3	0.7273	58.07	58.02
	0	0.3	-0.290	0.790	84	0.9	1.0	0.7270	58.06	58.05
	5	0.4	0.090	0.780	83	6.9	6.9	0.7334	58.26	57.84
	10	0.3	0.400	0.760	83	11.9	11.9	0.7412	58.57	57.30
	15	0.5	0.700	0.740	83	17.0	17.0	0.7555	59.13	56.54
	20	0.5	1.000	0.700	83	22.7	22.7	0.7618	59.38	54.78
	25	0.5	1.150	0.650	83	26.6	26.6	0.7554	59.13	52.87
	30	1.2	1.320	0.600	83	30.0	30.0	0.7447	58.70	50.83
2	-30	-0.5	-1.140	0.540	87	-25.9	25.9	0.5968	52.75	47.46
	-25	-0.5	-1.420	0.670	87	-26.0	26.0	0.7445	58.91	52.95
	-20	-0.1	-1.250	0.750	87	-16.0	16.0	0.7106	57.56	55.33
	-15	-0.1	-1.100	0.780	87	-12.5	12.5	0.7181	57.86	56.48
	-10	-0.1	-0.720	0.800	87	-5.9	5.9	0.7198	57.93	57.62
	-5	0.0	-0.500	0.800	87	-2.3	2.3	0.7273	58.23	58.18
	0	0.0	-0.290	0.800	87	1.0	1.0	0.7363	58.59	58.58
	5	0.4	0.090	0.780	86	6.9	6.9	0.7334	58.42	58.00
	10	0.4	0.400	0.770	86	11.8	11.8	0.7503	59.09	57.83
	15	0.3	0.750	0.730	86	18.0	18.0	0.7512	59.12	56.23
	20	0.4	0.950	0.710	86	21.7	21.7	0.7611	59.51	55.30
	25	0.4	1.150	0.650	86	26.6	26.6	0.7554	59.29	53.01
	30	0.9	1.300	0.630	86	30.0	30.0	0.7819	60.32	52.23
3	-30	-0.5	-1.150	0.550	87	-25.5	25.5	0.4992	48.24	43.54
	-25	-0.5	-1.400	0.680	87	-24.9	24.9	0.7259	58.18	52.76
	-20	-0.1	-1.290	0.740	87	-17.1	17.1	0.7094	57.51	54.96
	-15	-0.1	-1.050	0.780	87	-11.7	11.7	0.7136	57.68	56.48
	-10	-0.2	-0.800	0.800	87	-7.2	7.2	0.7207	57.96	57.51
	-5	0.0	-0.500	0.800	86	-2.3	2.3	0.7273	58.18	58.13
	0	-0.1	-0.290	0.800	86	1.0	1.0	0.7363	58.54	58.53
	5	-0.1	0.120	0.790	86	7.3	7.3	0.7447	58.87	58.39
	10	0.1	0.410	0.770	86	12.0	12.0	0.7515	59.14	57.84
	15	-0.4	0.700	0.740	86	17.0	17.0	0.7555	59.29	56.69
	20	0.6	0.910	0.720	86	20.8	20.8	0.7622	59.56	55.66
	25	0.5	1.160	0.660	86	26.5	26.5	0.7650	59.66	53.41
	30	1.0	1.330	0.630	86	30.0	30.0	0.7819	60.32	52.23

		Res	Vdir	Vax
Average	-30	25.63	51.24	46.20
	-25	23.64	57.49	52.58
	-20	16.30	57.47	55.16
	-15	11.63	57.73	56.54
	-10	6.46	57.89	57.52
	-5	2.32	58.16	58.11
	0	0.99	58.40	58.39
	5	7.04	58.51	58.07
	10	11.92	58.93	57.66
	15	17.35	59.18	56.49
	20	21.74	59.48	55.25
	25	26.56	59.36	53.09
	30	30.02	59.78	51.76

Table C2-36. SPH-3 Computations: 90 fps

Probe: **Spherical SPH-3 / NIST 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.85	Probe ID:	SPH-3
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.85	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.54%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**82.56**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.1		0
Resultant Angle Standard Deviation:	9.53		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.5	-2.800	1.190	91	-30.0	30.0	1.5210	84.51	73.19
	-25	-0.2	-3.000	1.400	90	-26.4	26.4	1.5793	86.04	77.06
	-20	0.0	-3.000	1.620	90	-18.7	18.7	1.5788	86.03	81.49
	-15	0.0	-2.450	1.730	90	-12.6	12.6	1.5936	86.43	84.35
	-10	0.0	-1.900	1.760	89	-8.2	8.2	1.5871	86.17	85.29
	-5	0.0	-1.240	1.790	89	-3.2	3.2	1.6215	87.10	86.97
	0	0.0	-0.500	1.780	89	2.0	2.0	1.6426	87.67	87.62
	5	0.0	0.250	1.740	88	7.2	7.2	1.6393	87.50	86.80
	10	0.2	1.000	1.700	88	12.7	12.7	1.6700	88.32	86.17
	15	0.7	1.610	1.640	88	17.5	17.5	1.6801	88.58	84.50
	20	0.8	2.150	1.570	87	22.0	22.0	1.6918	88.81	82.32
	25	0.9	2.550	1.470	86	26.2	26.2	1.6946	88.80	79.67
	30	0.9	2.950	1.370	85	30.0	30.0	1.7003	88.87	76.95
2	-30	-0.7	-2.650	1.200	88	-27.5	27.5	1.4103	81.16	71.96
	-25	-0.2	-3.000	1.440	88	-25.4	25.4	1.5626	85.43	77.18
	-20	0.0	-2.900	1.640	89	-17.5	17.5	1.5782	85.93	81.97
	-15	-0.1	-2.450	1.730	90	-12.6	12.6	1.5936	86.43	84.35
	-10	-0.1	-1.650	1.770	90	-6.3	6.3	1.5931	86.42	85.90
	-5	-0.1	-1.240	1.800	91	-3.1	3.1	1.6309	87.52	87.38
	0	-0.1	-0.850	1.780	91	-0.4	0.4	1.6311	87.52	87.52
	5	0.0	-0.020	1.750	92	5.3	5.3	1.6305	87.58	87.21
	10	0.0	0.830	1.740	92	11.3	11.3	1.6871	89.09	87.36
	15	-0.6	1.550	1.650	92	16.9	16.9	1.6834	88.99	85.13
	20	-0.7	2.000	1.600	93	20.7	20.7	1.6897	89.24	83.49
	25	-0.9	2.500	1.500	93	25.4	25.4	1.7014	89.55	80.88
	30	-1.0	2.900	1.350	93	30.0	30.0	1.6755	88.86	76.95
3	-30	-0.3	-2.700	1.190	95	-28.6	28.6	1.0962	72.01	63.23
	-25	-0.3	-2.950	1.450	95	-23.9	23.9	1.5241	84.91	77.63
	-20	-0.1	-2.900	1.640	94	-17.5	17.5	1.5782	86.32	82.34
	-15	-0.1	-2.400	1.750	94	-12.0	12.0	1.6050	87.05	85.14
	-10	-0.2	-1.970	1.780	94	-8.6	8.6	1.6056	87.07	86.10
	-5	0.0	-1.200	1.800	93	-2.9	2.9	1.6329	87.73	87.62
	0	0.0	-0.600	1.780	93	1.3	1.3	1.6397	87.91	87.89
	5	0.1	0.240	1.750	93	7.1	7.1	1.6479	88.13	87.44
	10	0.1	0.900	1.730	92	11.8	11.8	1.6860	89.06	87.16
	15	0.6	1.500	1.650	92	16.6	16.6	1.6784	88.86	85.17
	20	0.8	2.000	1.600	91	20.7	20.7	1.6897	89.08	83.33
	25	0.9	2.550	1.480	91	26.1	26.1	1.7014	89.39	80.29
	30	-1.0	2.950	1.360	90	30.0	30.0	1.6879	88.95	77.02

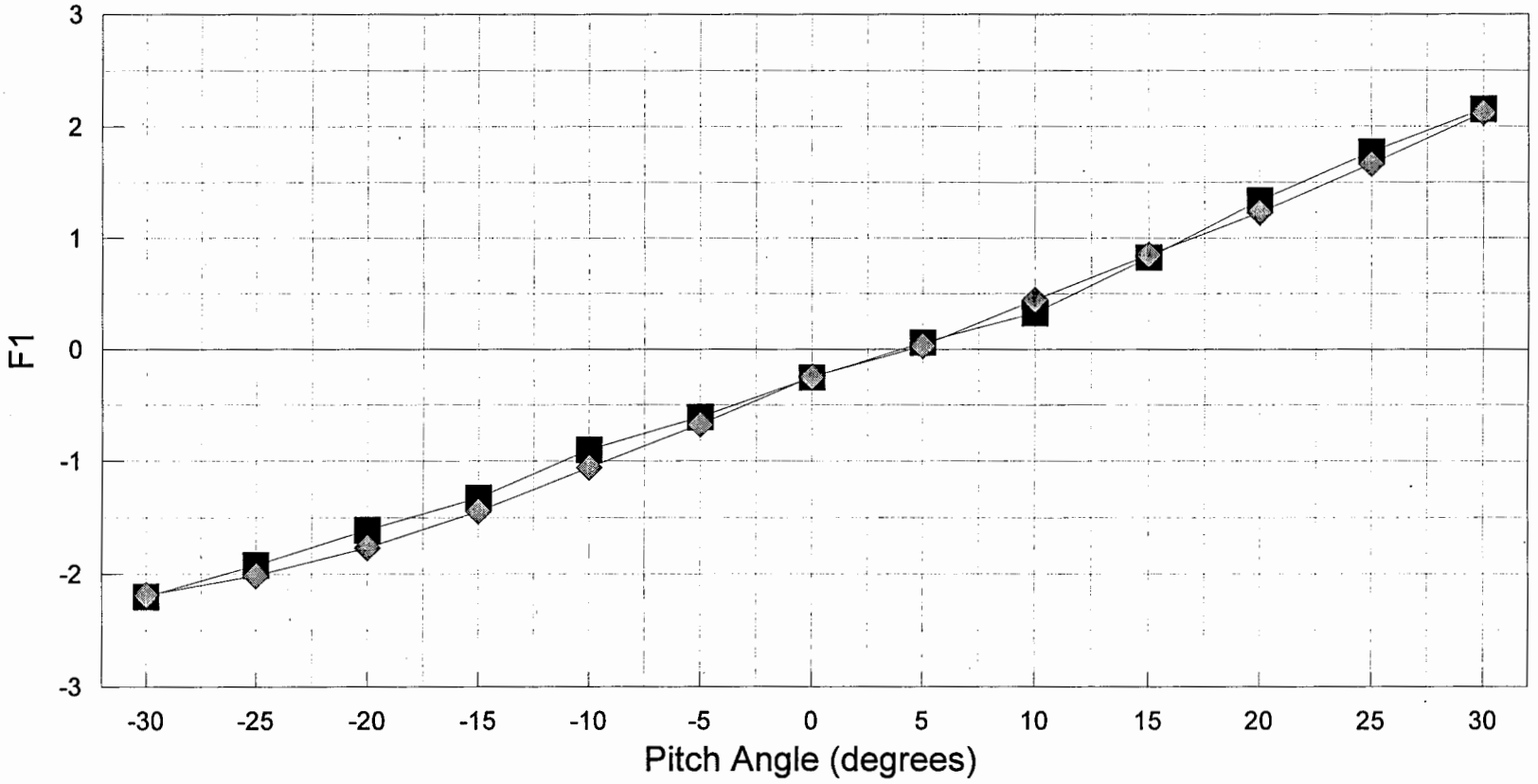
		Res	Vdir	Vax
Average	-30	28.71	79.23	69.46
	-25	25.23	85.46	77.29
	-20	17.88	86.09	81.93
	-15	12.41	86.64	84.61
	-10	7.69	86.55	85.76
	-5	3.06	87.45	87.32
	0	1.25	87.70	87.67
	5	6.56	87.74	87.15
	10	11.95	88.82	86.90
	15	17.00	88.81	84.93
	20	21.14	89.04	83.05
	25	25.90	89.25	80.28
	30	30.01	88.90	76.97

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ATTACHMENT M.

Spherical Probe SPH-4 Calibration Data

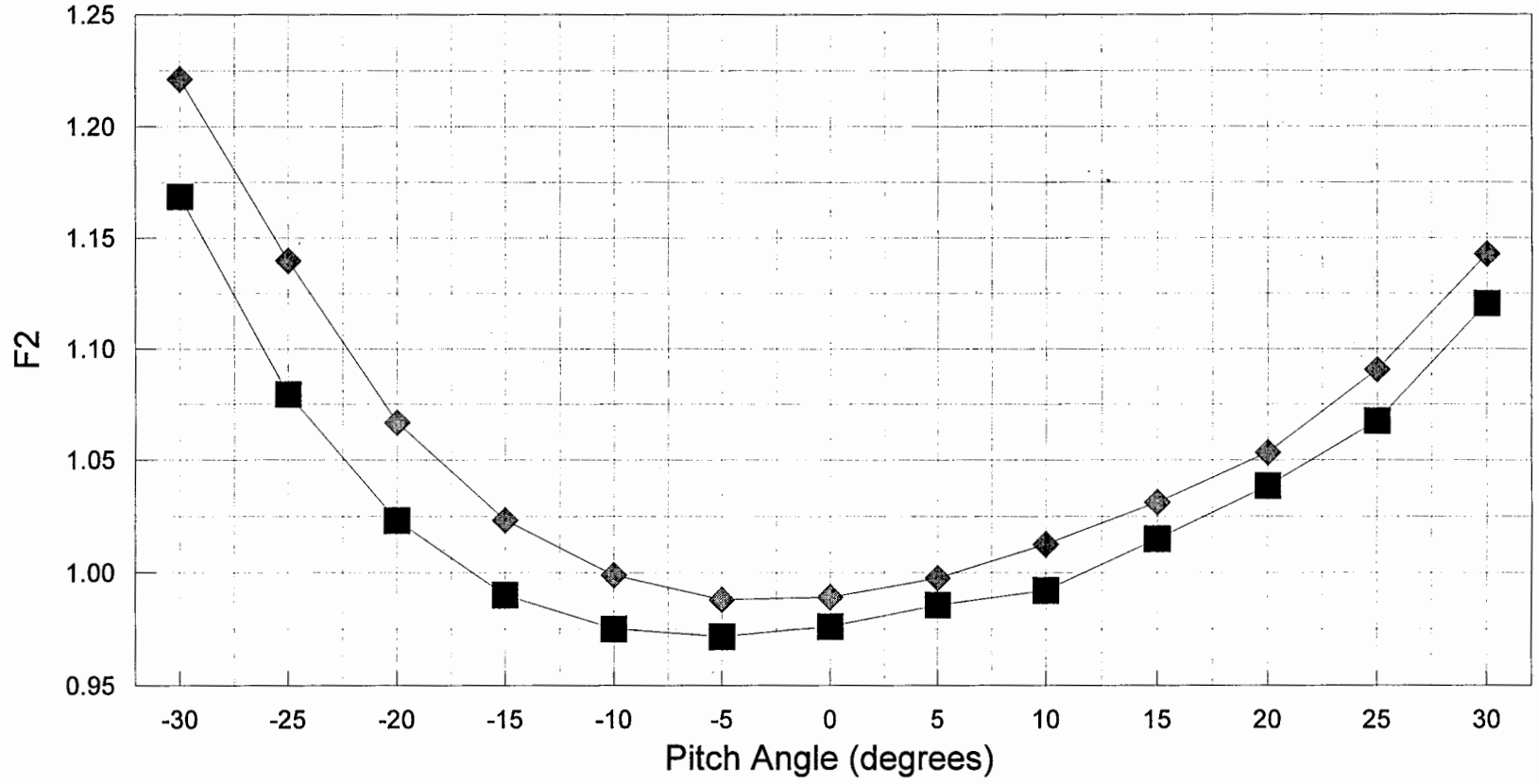
Figure C2-34. Spherical Probe (SPH-4): Avg. (30-60 fps) F1 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC234-36.WK4

Figure C2-35. Spherical Probe (SPH-4): Avg. (30-60 fps) F2 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations

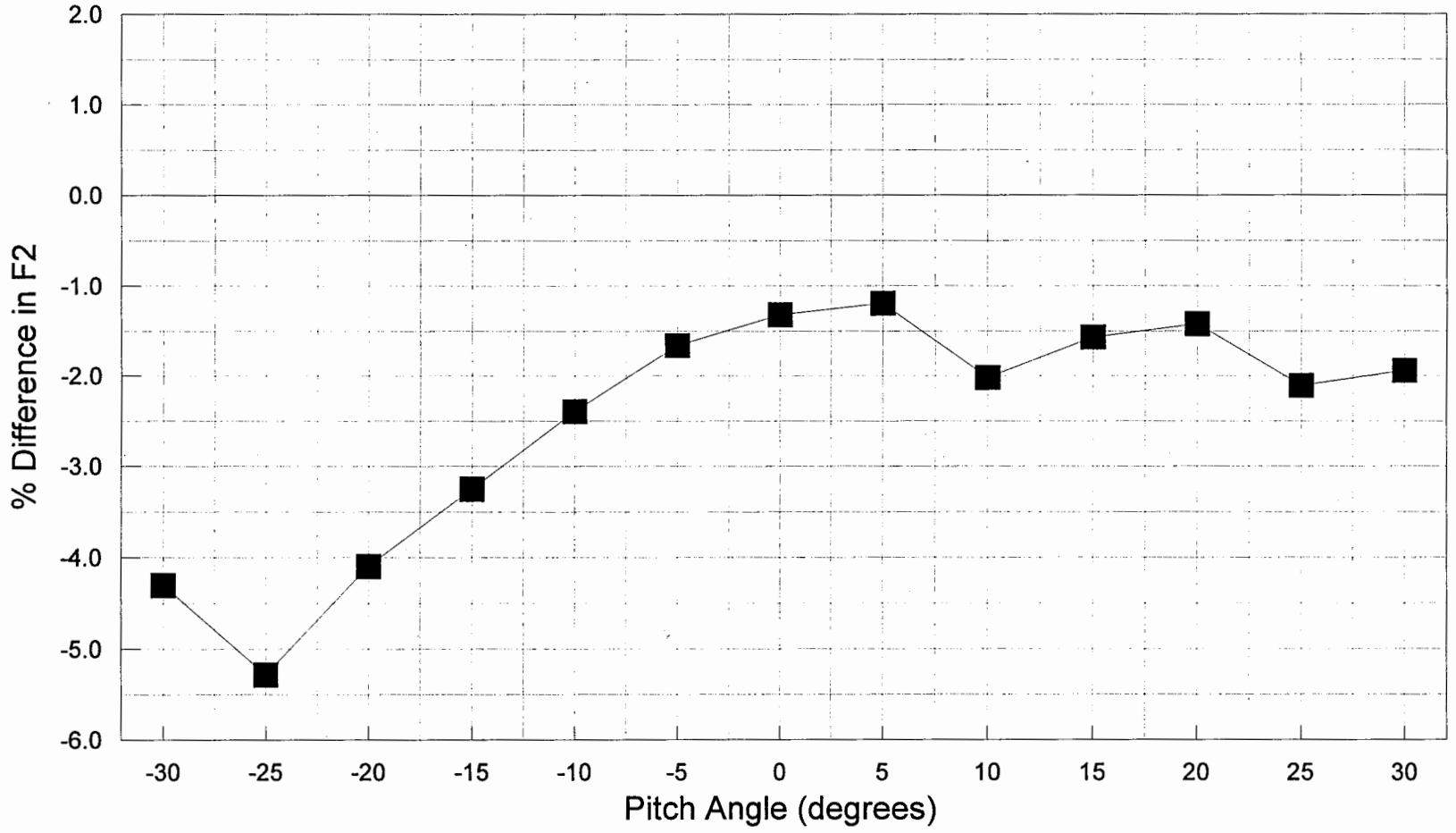


Note: Each point represents the mean of three replicates.

FC234-36.WK4

Figure C2-36. Spherical Probe (SPH-4): Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC234-36.WK4

Table C2-37. Spherical Probe SPH-4: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

Pitch Angle	30 fps / NIST / 30-60 Calibration			30 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	25.04	28.56	25.84	26.46	29.88	26.74	5.66	4.64	3.45
-25	21.36	29.89	27.82	23.61	31.74	29.06	10.52	6.16	4.47
-20	16.04	30.43	29.23	18.26	31.66	30.04	13.81	4.06	2.80
-15	12.27	31.01	30.29	13.94	31.93	30.98	13.61	2.98	2.28
-10	9.20	31.22	30.80	11.11	32.11	31.50	20.73	2.88	2.27
-5	3.46	31.45	31.38	4.13	32.17	32.06	19.43	2.29	2.19
0	1.42	31.36	31.35	1.34	31.97	31.96	-5.70	1.95	1.95
5	4.75	31.13	30.99	4.98	31.74	31.58	4.81	1.97	1.90
10	11.50	30.98	30.36	12.39	31.54	30.80	7.77	1.79	1.46
15	16.51	31.27	29.97	16.37	31.67	30.39	-0.83	1.31	1.38
20	22.59	31.76	29.32	21.35	31.89	29.70	-5.52	0.39	1.28
25	27.36	32.15	28.55	26.40	32.05	28.71	-3.50	-0.31	0.54
30	30.01	31.60	27.37	30.01	31.79	27.53	-0.00	0.59	0.59

Pitch Angle	60 fps / NIST / 30-60 Calibration			60 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.05	56.36	49.27	29.25	58.51	51.05	0.68	3.81	3.61
-25	22.55	57.30	52.91	24.55	60.74	55.25	8.86	6.01	4.41
-20	17.58	57.94	55.24	20.05	60.47	56.81	14.00	4.36	2.84
-15	12.91	57.86	56.39	14.62	59.62	57.68	13.23	3.05	2.30
-10	7.81	58.86	58.31	9.81	60.45	59.57	25.58	2.70	2.15
-5	4.04	58.90	58.76	4.77	60.26	60.05	18.04	2.30	2.20
0	0.91	59.01	59.00	0.98	60.16	60.15	7.45	1.95	1.94
5	7.01	58.68	58.23	7.55	59.83	59.30	7.71	1.97	1.83
10	12.22	58.43	57.10	12.98	59.43	57.91	6.25	1.71	1.41
15	16.70	59.36	56.85	16.51	60.13	57.64	-1.11	1.30	1.40
20	21.40	59.95	55.82	20.18	60.33	56.63	-5.70	0.64	1.46
25	25.89	60.23	54.19	24.70	60.02	54.52	-4.59	-0.36	0.62
30	30.00	60.01	51.97	29.94	60.33	52.28	-0.20	0.54	0.60

Pitch Angle	90 fps / NIST / 30-60 Calibration			90 fps / October / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.68	83.11	72.22	29.72	85.90	74.61	0.14	3.35	3.31
-25	25.13	87.61	79.29	26.58	93.11	83.26	5.75	6.27	5.00
-20	18.93	87.14	82.41	21.45	91.68	85.31	13.30	5.21	3.52
-15	13.12	87.30	85.02	14.70	89.81	86.87	12.03	2.87	2.17
-10	8.79	87.57	86.53	10.77	90.11	88.51	22.52	2.90	2.29
-5	4.84	88.03	87.71	5.85	90.18	89.70	20.81	2.44	2.27
0	0.82	88.61	88.60	0.92	90.35	90.34	11.80	1.96	1.96
5	6.84	87.71	87.08	7.29	89.45	88.72	6.57	1.98	1.88
10	11.71	88.41	86.57	12.57	89.98	87.82	7.29	1.77	1.44
15	16.61	89.02	85.30	16.44	90.18	86.48	-0.99	1.30	1.39
20	21.02	89.61	83.64	19.83	90.27	84.92	-5.65	0.74	1.53
25	25.60	89.41	80.63	24.39	89.17	81.21	-4.74	-0.28	0.71
30	29.80	89.34	77.53	29.46	89.59	78.00	-1.14	0.28	0.61

TABC237.WK4

Figure C2-37. Spherical Probe SPH-4: Percent Differences in NCSU Post-Test and NIST Calibrations

Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data

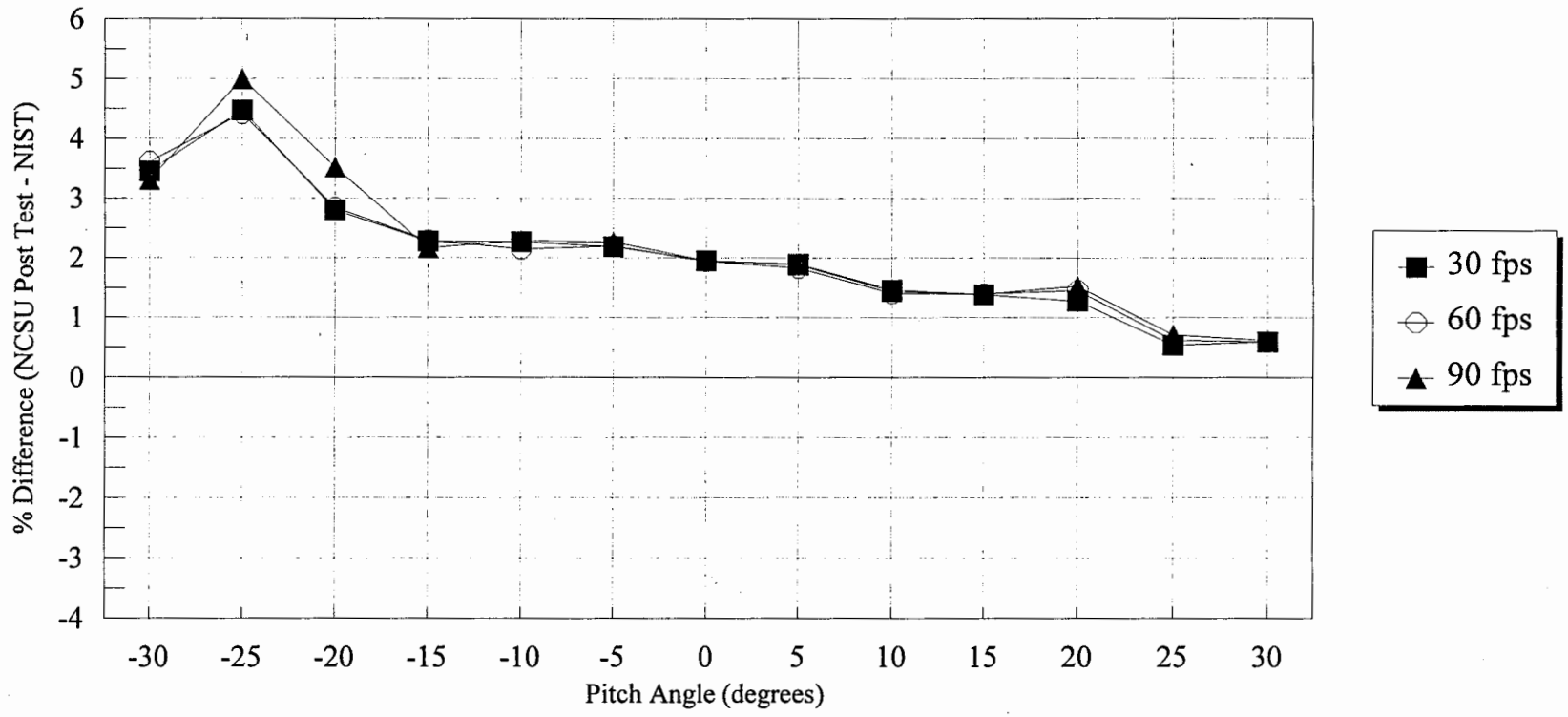


Table C2-38. SPH-4 Computations: 30 fps

Probe: **Spherical SPH-4 / NIST 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.76%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	82 _F
Average Axial Velocity, ft/sec:	**29.48**	Last Row:	61
Average Yaw Angle:	0.5		
Average Pitch Angle:	15.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.5		0
Resultant Angle Standard Deviation:	9.24		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.6	-0.330	0.175	82	-22.4	22.4	0.1796	28.87	26.70
	-25	-0.5	-0.340	0.195	82	-19.6	19.6	0.1918	29.83	28.11
	-20	-0.4	-0.300	0.210	82	-14.8	14.8	0.1966	30.20	29.20
	-15	-0.4	-0.260	0.225	82	-11.3	11.3	0.2052	30.86	30.26
	-10	-0.5	-0.220	0.230	82	-8.7	8.7	0.2075	31.03	30.67
	-5	-0.4	-0.140	0.234	82	-4.1	4.2	0.2111	31.30	31.22
	0	-0.5	-0.060	0.231	82	-0.1	0.5	0.2119	31.36	31.36
	5	-1.1	-0.040	0.225	82	1.2	1.7	0.2072	31.01	31.00
	10	-1.3	0.138	0.213	82	12.5	12.6	0.2089	31.14	30.39
	15	-0.9	0.186	0.205	82	15.7	15.8	0.2071	31.01	29.84
	20	-0.6	0.300	0.200	81	23.1	23.1	0.2190	31.85	29.29
	25	-0.6	0.360	0.189	81	27.6	27.6	0.2241	32.22	28.55
	30	-0.8	0.400	0.178	81	30.0	30.0	0.2209	31.99	27.70
2	-30	0.2	-0.350	0.166	92	-27.7	27.7	0.1965	30.48	26.97
	-25	0.1	-0.360	0.180	92	-24.7	24.7	0.1917	30.10	27.34
	-20	0.0	-0.350	0.210	91	-18.4	18.4	0.2040	31.03	29.44
	-15	0.6	-0.300	0.225	91	-13.5	13.6	0.2087	31.38	30.51
	-10	0.6	-0.270	0.235	90	-11.2	11.2	0.2142	31.76	31.16
	-5	0.6	-0.160	0.239	90	-5.0	5.0	0.2149	31.81	31.69
	0	-0.1	-0.035	0.230	90	1.7	1.7	0.2121	31.60	31.59
	5	1.4	0.000	0.229	90	4.4	4.6	0.2126	31.65	31.54
	10	0.7	0.100	0.215	90	10.3	10.3	0.2063	31.17	30.67
	15	1.0	0.200	0.214	89	16.1	16.1	0.2169	31.93	30.67
	20	-0.1	0.280	0.200	89	22.0	22.0	0.2153	31.81	29.51
	25	0.8	0.350	0.190	89	26.9	27.0	0.2223	32.33	28.82
	30	0.8	0.400	0.170	89	30.0	30.0	0.2110	31.49	27.27
3	-30	0.0	-0.330	0.164	81	-25.0	25.0	0.1496	26.32	23.86
	-25	-0.1	-0.340	0.194	81	-19.7	19.7	0.1911	29.75	28.00
	-20	-0.2	-0.300	0.208	81	-14.9	14.9	0.1949	30.05	29.03
	-15	-0.2	-0.270	0.223	81	-12.0	12.0	0.2045	30.78	30.11
	-10	-0.1	-0.200	0.228	81	-7.7	7.7	0.2055	30.85	30.58
	-5	0.0	-0.080	0.230	82	-1.2	1.2	0.2101	31.23	31.22
	0	0.1	-0.030	0.226	82	2.0	2.0	0.2086	31.11	31.09
	5	0.2	0.060	0.215	82	8.0	8.0	0.2034	30.73	30.43
	10	0.2	0.120	0.208	82	11.6	11.6	0.2023	30.64	30.01
	15	-0.3	0.210	0.200	82	17.6	17.6	0.2052	30.86	29.41
	20	-0.3	0.290	0.198	82	22.7	22.7	0.2155	31.62	29.17
	25	0.2	0.350	0.185	83	27.5	27.5	0.2188	31.90	28.30
	30	0.3	0.400	0.170	83	30.0	30.0	0.2110	31.32	27.12

		Res	Vdir	Vax
Average	-30	25.04	28.56	25.84
	-25	21.36	29.89	27.82
	-20	16.04	30.43	29.23
	-15	12.27	31.01	30.29
	-10	9.20	31.22	30.80
	-5	3.46	31.45	31.38
	0	1.42	31.36	31.35
	5	4.75	31.13	30.99
	10	11.50	30.98	30.36
	15	16.51	31.27	29.97
	20	22.59	31.76	29.32
	25	27.36	32.15	28.55
	30	30.01	31.60	27.37

Table C2-39. SPH-4 Computations: 60 fps

Probe: **Spherical SPH-4 / NIST 30-60 Calibration**
Velocity Point: **60 fps**
Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.61%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**55.70**	Last Row:	61
Average Yaw Angle:	0.4		
Average Pitch Angle:	16.0	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.0		0
Resultant Angle Standard Deviation:	9.26		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-1.330	0.630	83	-27.8	27.8	0.7477	58.96	52.15
	-25	0.1	-1.300	0.700	83	-21.8	21.8	0.7118	57.53	53.42
	-20	0.2	-1.200	0.750	83	-17.4	17.4	0.7210	57.90	55.26
	-15	-0.1	-1.050	0.760	84	-14.2	14.2	0.7082	57.44	55.69
	-10	0.1	-0.750	0.830	84	-8.0	8.0	0.7483	59.04	58.46
	-5	0.2	-0.460	0.830	84	-3.6	3.6	0.7505	59.13	59.01
	0	0.5	-0.170	0.810	84	0.7	0.8	0.7449	58.91	58.90
	5	1.0	0.090	0.800	84	6.0	6.0	0.7482	59.04	58.71
	10	1.1	0.450	0.750	85	11.9	12.0	0.7314	58.42	57.15
	15	1.1	0.680	0.750	85	15.7	15.8	0.7578	59.47	57.23
	20	-0.5	1.000	0.740	85	21.4	21.4	0.7900	60.72	56.53
	25	0.7	1.210	0.700	86	25.7	25.7	0.7989	61.12	55.06
	30	0.4	1.350	0.630	85	30.0	30.0	0.7819	60.41	52.31
2	-30	-0.2	-1.300	0.580	82	-30.0	30.0	0.7413	58.66	50.80
	-25	-0.2	-1.300	0.670	82	-23.5	23.5	0.7000	57.00	52.27
	-20	-0.3	-1.230	0.750	82	-18.0	18.0	0.7256	58.03	55.19
	-15	-0.3	-1.000	0.780	82	-12.9	12.9	0.7200	57.81	56.35
	-10	-0.3	-0.750	0.830	82	-8.0	8.0	0.7483	58.93	58.36
	-5	-0.3	-0.500	0.820	82	-4.3	4.3	0.7394	58.58	58.42
	0	-0.3	-0.300	0.820	83	-1.4	1.4	0.7484	58.99	58.97
	5	0.5	0.170	0.780	83	7.2	7.3	0.7349	58.46	57.99
	10	0.6	0.450	0.750	83	11.9	11.9	0.7314	58.32	57.06
	15	0.6	0.730	0.740	83	16.8	16.8	0.7541	59.21	56.69
	20	0.6	0.930	0.720	83	20.7	20.7	0.7608	59.48	55.63
	25	-0.2	1.150	0.670	83	25.6	25.6	0.7626	59.55	53.71
	30	0.1	1.350	0.620	83	30.0	30.0	0.7695	59.82	51.80
3	-30	-0.2	-1.320	0.610	84	-29.3	29.3	0.5684	51.46	44.86
	-25	-0.4	-1.300	0.690	83	-22.4	22.4	0.7079	57.37	53.06
	-20	-0.4	-1.200	0.750	83	-17.4	17.4	0.7210	57.90	55.26
	-15	-0.3	-0.950	0.800	83	-11.7	11.7	0.7318	58.33	57.13
	-10	-0.4	-0.700	0.820	83	-7.4	7.4	0.7388	58.61	58.13
	-5	-0.3	-0.500	0.830	83	-4.2	4.2	0.7487	59.00	58.84
	0	-0.4	-0.220	0.820	83	-0.2	0.5	0.7520	59.13	59.13
	5	0.4	0.200	0.780	83	7.7	7.7	0.7369	58.53	58.00
	10	-0.8	0.500	0.750	83	12.7	12.8	0.7372	58.55	57.10
	15	-0.8	0.770	0.740	83	17.5	17.5	0.7584	59.38	56.63
	20	-0.8	1.000	0.710	83	22.1	22.1	0.7654	59.66	55.29
	25	0.4	1.200	0.670	83	26.4	26.4	0.7753	60.04	53.78
	30	0.4	1.380	0.620	83	30.0	30.0	0.7695	59.82	51.80

		Res	Vdir	Vax
Average	-30	29.05	56.36	49.27
	-25	22.55	57.30	52.91
	-20	17.58	57.94	55.24
	-15	12.91	57.86	56.39
	-10	7.81	58.86	58.31
	-5	4.04	58.90	58.76
	0	0.91	59.01	59.00
	5	7.01	58.68	58.23
	10	12.22	58.43	57.10
	15	16.70	59.36	56.85
	20	21.40	59.95	55.82
	25	25.89	60.23	54.19
	30	30.00	60.01	51.97

Table C2-40. SPH-4 Computations: 90 fps

Probe: **Spherical SPH-4 / NIST 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.71	Probe ID:	SPH-4
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.71	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.23%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	86 _F
Average Axial Velocity, ft/sec:	**83.27**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.4	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.4		0
Resultant Angle Standard Deviation:	9.35		

			Readings, in.H2O							
	Pitch	Yaw			Gas	<< ANGLES >>			Velocities, ft/sec	
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.2	-2.900	1.280	95	-30.0	30.0	1.6360	88.18	76.36
	-25	0.0	-3.000	1.550	95	-23.4	23.4	1.6168	87.66	80.44
	-20	0.3	-2.850	1.650	95	-19.3	19.3	1.6186	87.71	82.75
	-15	0.5	-2.300	1.770	94	-13.1	13.1	1.6366	88.11	85.81
	-10	0.2	-1.800	1.810	94	-9.2	9.2	1.6337	88.03	86.90
	-5	0.2	-1.160	1.840	93	-4.5	4.5	1.6574	88.59	88.31
	0	0.1	-0.500	1.830	93	-0.3	0.3	1.6779	89.14	89.14
	5	1.2	0.300	1.750	92	6.7	6.8	1.6434	88.14	87.52
	10	1.0	1.000	1.700	92	11.8	11.8	1.6556	88.46	86.59
	15	0.8	1.630	1.670	91	16.7	16.7	1.6999	89.56	85.79
	20	0.5	2.070	1.600	90	20.7	20.7	1.6912	89.25	83.46
	25	0.8	2.550	1.500	90	25.4	25.4	1.7010	89.51	80.85
	30	0.9	2.930	1.400	89	29.7	29.7	1.7272	90.11	78.28
2	-30	0.1	-2.800	1.300	80	-29.0	29.0	1.6096	86.27	75.42
	-25	-0.3	-3.030	1.500	81	-25.2	25.2	1.6165	86.54	78.30
	-20	-0.2	-2.700	1.670	82	-17.6	17.6	1.6097	86.43	82.37
	-15	-0.3	-2.250	1.750	83	-12.9	12.9	1.6160	86.68	84.48
	-10	-0.3	-1.630	1.800	83	-8.0	8.1	1.6229	86.87	86.01
	-5	-0.2	-1.340	1.830	83	-5.8	5.8	1.6464	87.49	87.05
	0	-0.2	-0.580	1.820	84	-0.8	0.9	1.6650	88.07	88.06
	5	0.3	0.350	1.730	84	7.1	7.1	1.6282	87.09	86.43
	10	-0.8	0.880	1.730	85	10.8	10.8	1.6688	88.25	86.68
	15	0.5	1.500	1.650	86	15.8	15.8	1.6676	88.30	84.97
	20	-0.1	2.250	1.630	86	21.7	21.7	1.7488	90.42	84.00
	25	0.1	2.550	1.500	87	25.4	25.4	1.7010	89.26	80.64
	30	0.3	2.850	1.360	87	29.7	29.7	1.6788	88.68	77.02
3	-30	0.1	-2.950	1.300	85	-30.0	30.0	1.2020	74.90	64.86
	-25	0.0	-3.050	1.470	86	-26.8	26.8	1.6808	88.65	79.14
	-20	-0.3	-2.900	1.650	87	-19.8	19.8	1.6263	87.28	82.11
	-15	-0.2	-2.300	1.750	87	-13.3	13.3	1.6204	87.12	84.78
	-10	-0.2	-1.800	1.820	88	-9.1	9.1	1.6426	87.79	86.68
	-5	-0.2	-1.100	1.830	88	-4.2	4.2	1.6508	88.01	87.78
	0	-0.1	-0.650	1.830	89	-1.3	1.3	1.6711	88.63	88.61
	5	0.3	0.300	1.750	89	6.7	6.7	1.6434	87.90	87.30
	10	0.5	1.100	1.700	89	12.5	12.5	1.6672	88.53	86.43
	15	0.4	1.700	1.650	90	17.4	17.4	1.6892	89.19	85.13
	20	-0.1	2.050	1.600	90	20.6	20.6	1.6875	89.15	83.45
	25	0.3	2.600	1.480	90	26.0	26.0	1.6996	89.47	80.41
	30	0.5	3.000	1.360	91	30.0	30.0	1.6879	89.24	77.28

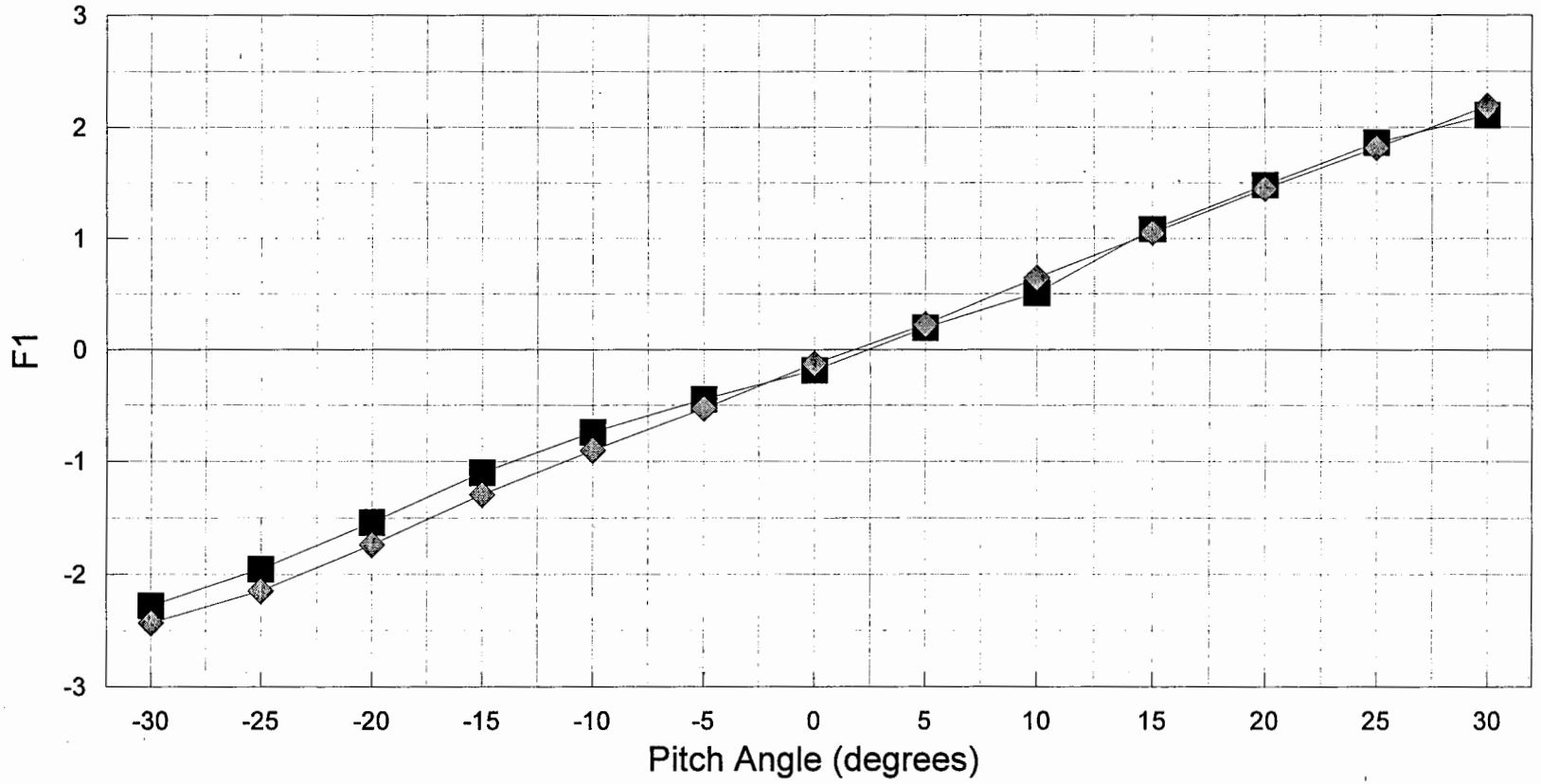
		Res	Vdir	Vax
Average	-30	29.68	83.11	72.22
	-25	25.13	87.61	79.29
	-20	18.93	87.14	82.41
	-15	13.12	87.30	85.02
	-10	8.79	87.57	86.53
	-5	4.84	88.03	87.71
	0	0.82	88.61	88.60
	5	6.84	87.71	87.08
	10	11.71	88.41	86.57
	15	16.61	89.02	85.30
	20	21.02	89.61	83.64
	25	25.60	89.41	80.63
	30	29.80	89.34	77.53

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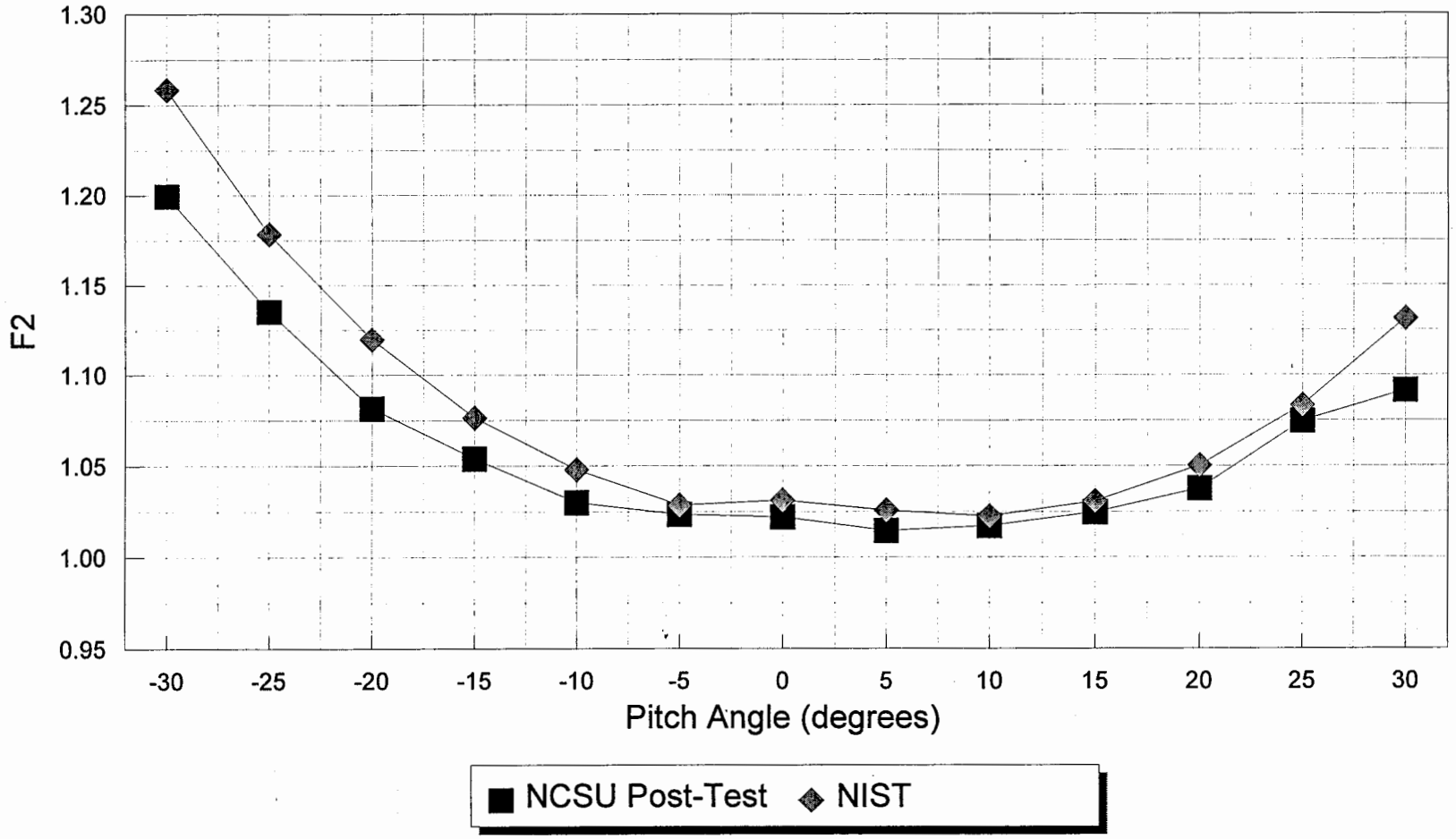
Spherical Probe SPH-5 Calibration Data

Figure C2-38. Spherical Probe (SPH-5): Avg. (30-60 fps) F1 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Figure C2-39. Spherical Probe (SPH-5): Avg. (30-60 fps) F2 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations

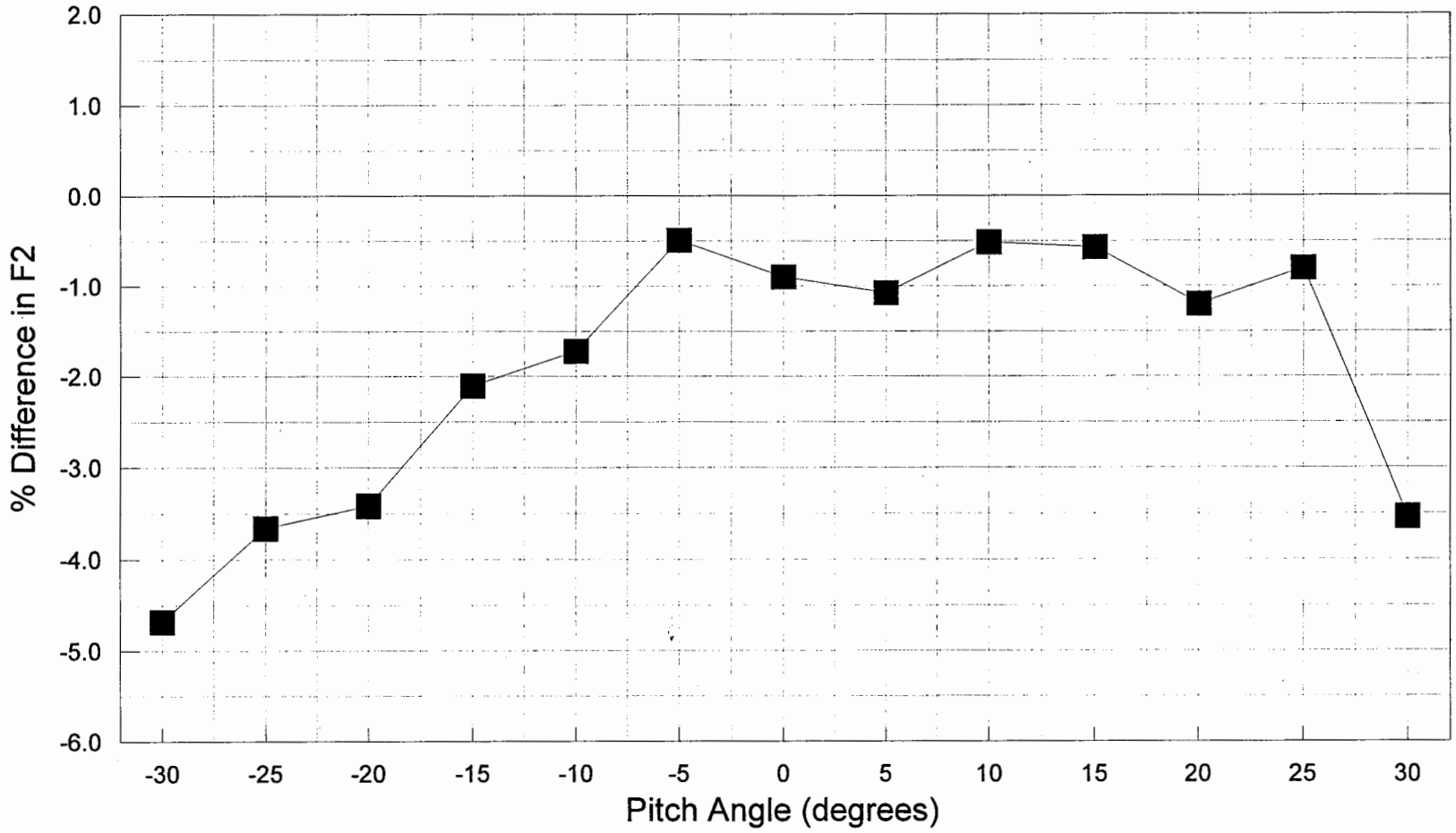


Note: Each point represents the mean of three replicates.

FC238-40.WK4

Figure C2-40. Spherical Probe (SPH-5): Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC238-40.WK4

Table C2-41. Spherical Probe SPH-5: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

Pitch Angle	30 fps / NIST / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.99	28.14	24.61	29.90	30.69	26.61	3.14	9.07	8.12
-25	22.82	28.91	26.61	25.44	32.44	29.25	11.46	12.20	9.89
-20	17.86	29.32	27.91	20.10	32.30	30.34	12.53	10.18	8.71
-15	15.30	30.00	28.92	17.58	33.01	31.45	14.88	10.03	8.75
-10	9.83	30.06	29.53	11.73	32.80	31.99	19.32	9.14	8.33
-5	4.99	30.46	30.31	6.16	32.87	32.62	23.52	7.93	7.62
0	2.39	30.60	30.57	2.70	32.68	32.65	12.79	6.81	6.78
5	2.73	30.74	30.65	3.50	32.57	32.43	28.43	5.94	5.81
10	10.55	31.37	30.83	11.57	32.59	31.93	9.67	3.90	3.55
15	15.66	31.91	30.72	15.35	32.58	31.42	-1.99	2.11	2.27
20	20.82	31.84	29.75	20.37	32.25	30.23	-2.17	1.29	1.60
25	24.69	31.94	29.02	24.12	32.20	29.38	-2.31	0.81	1.26
30	29.68	32.33	28.09	30.00	31.77	27.51	1.10	-1.73	-2.05

Pitch Angle	60 fps / NIST / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	27.11	52.57	46.79	29.82	58.24	50.52	10.00	10.80	7.99
-25	23.21	53.90	49.54	25.75	60.53	54.52	10.95	12.30	10.05
-20	17.37	54.81	52.31	19.59	60.34	56.85	12.79	10.09	8.67
-15	12.52	55.41	54.08	14.90	60.85	58.80	18.98	9.82	8.71
-10	8.61	56.11	55.48	10.80	61.07	59.99	25.49	8.84	8.13
-5	3.89	56.77	56.64	4.79	61.16	60.93	23.26	7.73	7.59
0	1.09	57.30	57.29	1.38	61.01	60.99	26.68	6.48	6.46
5	5.35	58.28	57.95	6.42	61.29	60.82	20.10	5.18	4.95
10	11.66	59.38	58.15	12.36	61.46	60.04	6.00	3.51	3.24
15	16.71	60.32	57.77	16.30	61.45	58.98	-2.48	1.88	2.10
20	21.88	59.75	55.44	21.39	60.39	56.23	-2.27	1.07	1.42
25	26.67	60.37	53.93	26.59	60.44	54.03	-0.32	0.12	0.18
30	29.98	60.55	52.45	30.00	59.33	51.38	0.07	-2.01	-2.03

Pitch Angle	90 fps / NIST / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.56	79.87	70.15	29.53	87.56	76.21	3.38	9.63	8.64
-25	24.24	81.95	74.72	27.04	92.62	82.49	11.54	13.03	10.40
-20	18.78	83.04	78.62	21.09	91.94	85.78	12.29	10.72	9.11
-15	14.61	83.70	80.99	16.87	92.11	88.14	15.45	10.04	8.83
-10	8.83	84.26	83.26	11.03	91.80	90.10	24.92	8.94	8.21
-5	4.39	85.27	84.99	5.40	91.90	91.43	23.14	7.78	7.58
0	1.24	86.48	86.46	1.91	91.86	91.81	54.38	6.21	6.18
5	7.43	88.20	87.46	8.75	92.33	91.25	17.76	4.68	4.34
10	12.09	89.64	87.66	12.66	92.64	90.38	4.73	3.34	3.11
15	15.98	90.56	87.06	15.56	92.37	88.98	-2.61	2.00	2.21
20	20.52	90.30	84.56	20.09	91.41	85.85	-2.13	1.23	1.52
25	25.28	90.82	82.12	24.65	91.52	83.18	-2.49	0.78	1.30
30	29.97	90.01	77.97	30.00	88.21	76.39	0.09	-2.01	-2.04

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Figure C2-41. Spherical Probe SPH-5: Percent Differences in NCSU Post-Test and NIST Calibrations

Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data

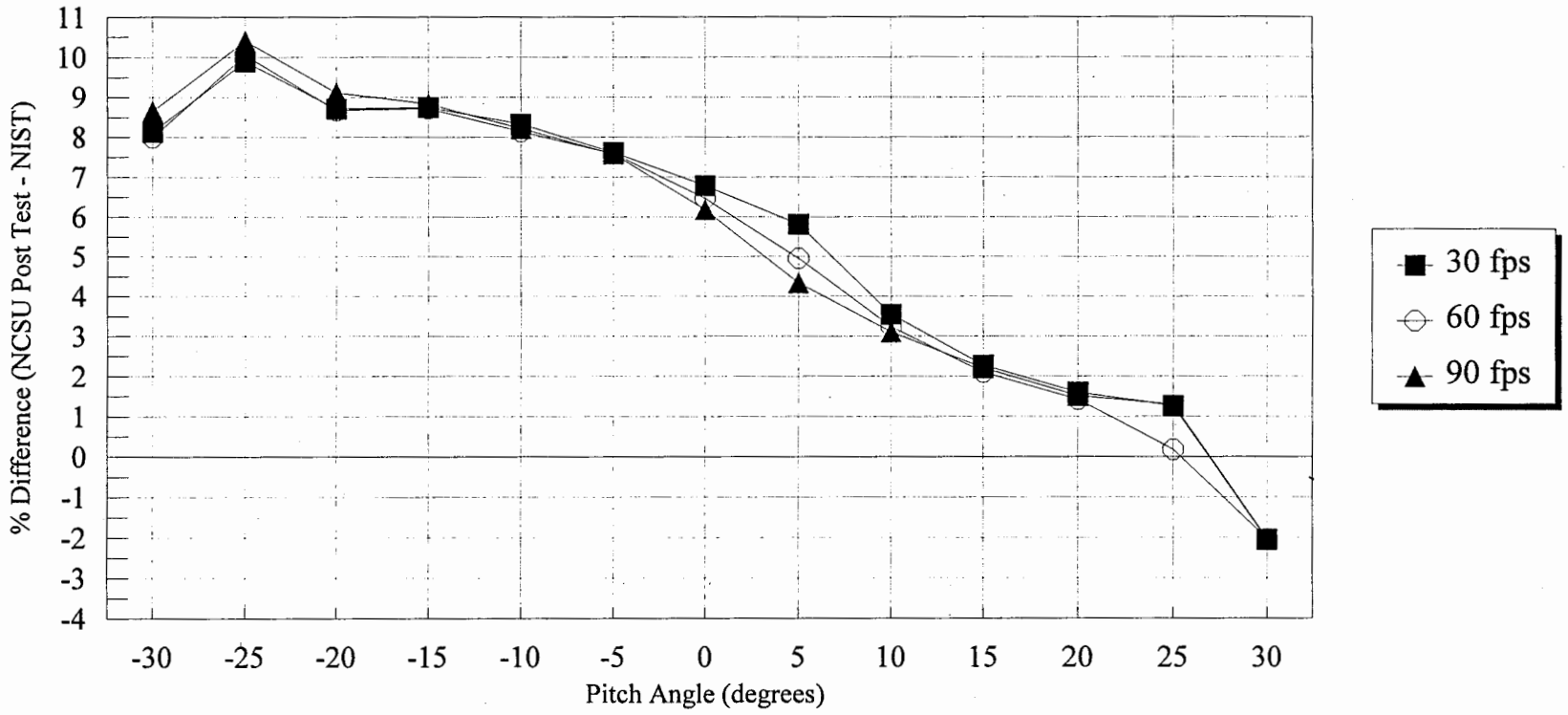


Table C2-42. SPH-5 Computations: 30 fps

Probe: **Spherical SPH-5 / NIST 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.61	Probe ID:	SPH-5
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.61	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.24%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	78 _F
Average Axial Velocity, ft/sec:	**29.04**	Last Row:	61
Average Yaw Angle:	0.2		
Average Pitch Angle:	15.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.9		0
Resultant Angle Standard Deviation:	9.35		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-0.350	0.155	73	-27.0	27.0	0.1784	28.58	25.47
	-25	-0.3	-0.300	0.175	73	-19.7	19.7	0.1724	28.09	26.44
	-20	-0.3	-0.290	0.190	73	-17.6	17.6	0.1831	28.96	27.60
	-15	-0.3	-0.230	0.202	73	-13.0	13.0	0.1867	29.24	28.48
	-10	-0.3	-0.090	0.210	73	-3.8	3.8	0.1898	29.48	29.41
	-5	0.1	-0.060	0.220	73	-1.8	1.8	0.2004	30.30	30.28
	0	0.1	0.010	0.219	73	2.4	2.4	0.2023	30.44	30.41
	5	0.1	0.100	0.218	73	7.8	7.8	0.2060	30.72	30.43
	10	0.1	0.175	0.217	73	12.0	12.0	0.2118	31.14	30.46
	15	0.1	0.250	0.214	72	16.5	16.5	0.2175	31.53	30.24
	20	0.1	0.333	0.200	72	23.0	23.0	0.2185	31.60	29.10
	25	0.1	0.336	0.192	72	24.1	24.1	0.2133	31.22	28.50
	30	-0.1	0.400	0.178	72	30.0	30.0	0.2209	31.78	27.52
2	-30	-0.4	-0.400	0.150	85	-30.0	30.0	0.1917	29.96	25.95
	-25	-0.3	-0.370	0.170	85	-25.5	25.5	0.1854	29.47	26.59
	-20	-0.2	-0.300	0.190	84	-18.2	18.2	0.1842	29.34	27.87
	-15	0.0	-0.290	0.205	84	-16.4	16.4	0.1950	30.19	28.97
	-10	-0.1	-0.250	0.212	84	-13.5	13.5	0.1966	30.32	29.47
	-5	0.0	-0.160	0.220	83	-7.7	7.7	0.1983	30.42	30.14
	0	-0.2	-0.070	0.221	83	-2.4	2.4	0.2009	30.61	30.59
	5	-0.2	-0.030	0.221	83	-0.1	0.2	0.2028	30.76	30.76
	10	0.4	0.150	0.222	83	10.4	10.4	0.2133	31.54	31.03
	15	0.1	0.250	0.219	83	16.1	16.1	0.2220	32.18	30.91
	20	0.0	0.300	0.210	82	19.7	19.7	0.2191	31.94	30.06
	25	0.0	0.350	0.200	82	24.1	24.1	0.2222	32.16	29.36
	30	0.1	0.400	0.189	82	29.0	29.0	0.2303	32.75	28.63
3	-30	-0.7	-0.380	0.155	84	-30.0	30.0	0.1432	25.87	22.41
	-25	-0.2	-0.350	0.175	84	-23.2	23.2	0.1820	29.16	26.80
	-20	-0.1	-0.300	0.195	84	-17.8	17.8	0.1882	29.66	28.25
	-15	-0.1	-0.300	0.210	84	-16.5	16.5	0.2001	30.58	29.32
	-10	-0.1	-0.230	0.215	84	-12.2	12.2	0.1974	30.37	29.69
	-5	-0.1	-0.125	0.224	83	-5.4	5.4	0.2015	30.66	30.52
	0	-0.1	-0.070	0.223	83	-2.4	2.4	0.2027	30.75	30.73
	5	-0.1	-0.030	0.221	83	-0.1	0.2	0.2028	30.76	30.76
	10	-0.1	0.130	0.222	83	9.3	9.3	0.2116	31.42	31.01
	15	-0.2	0.220	0.220	83	14.4	14.4	0.2197	32.01	31.01
	20	-0.1	0.300	0.210	83	19.7	19.7	0.2191	31.97	30.09
	25	-0.1	0.370	0.197	83	25.8	25.8	0.2255	32.43	29.19
	30	-0.3	0.400	0.182	83	30.0	30.0	0.2259	32.46	28.11

		Res	Vdir	Vax
Average	-30	28.99	28.14	24.61
	-25	22.82	28.91	26.61
	-20	17.86	29.32	27.91
	-15	15.30	30.00	28.92
	-10	9.83	30.06	29.53
	-5	4.99	30.46	30.31
	0	2.39	30.60	30.57
	5	2.73	30.74	30.65
	10	10.55	31.37	30.83
	15	15.66	31.91	30.72
	20	20.82	31.84	29.75
	25	24.69	31.94	29.02
	30	29.68	32.33	28.09

Table C2-43. SPH-5 Computations: 60 fps

Probe: **Spherical SPH-5 / NIST 30-60 Calibration**
Velocity Point: **60 fps**
Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.61	Probe ID:	SPH-5
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.61	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.46%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	80 _F
Average Axial Velocity, ft/sec:	**54.45**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	15.8	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.9		0
Resultant Angle Standard Deviation:	9.33		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-1.250	0.550	74	-27.2	27.2	0.6388	54.14	48.15
	-25	-0.3	-1.200	0.600	75	-23.2	23.2	0.6239	53.55	49.22
	-20	-0.3	-1.030	0.670	75	-17.7	17.7	0.6465	54.52	51.92
	-15	-0.6	-0.820	0.710	75	-13.2	13.2	0.6571	54.96	53.50
	-10	-0.4	-0.600	0.750	75	-8.7	8.7	0.6766	55.77	55.13
	-5	-0.4	-0.400	0.760	76	-5.0	5.0	0.6832	56.09	55.88
	0	-0.4	-0.160	0.770	76	-1.0	1.1	0.7038	56.93	56.92
	5	-0.3	-0.020	0.770	76	1.4	1.4	0.7095	57.16	57.14
	10	-0.3	0.580	0.775	77	11.3	11.3	0.7511	58.87	57.73
	15	-0.2	0.880	0.760	78	16.3	16.3	0.7717	59.73	57.31
	20	-0.1	1.100	0.730	78	20.8	20.8	0.7723	59.75	55.86
	25	-0.3	1.300	0.690	78	25.9	25.9	0.7910	60.47	54.38
	30	-0.2	1.420	0.650	78	29.9	29.9	0.8058	61.03	52.89
2	-30	-0.7	-1.250	0.550	85	-27.2	27.2	0.6388	54.69	48.64
	-25	-0.6	-1.200	0.600	85	-23.2	23.2	0.6239	54.05	49.67
	-20	-0.5	-1.000	0.670	85	-17.2	17.2	0.6432	54.88	52.41
	-15	-0.5	-0.720	0.720	85	-11.3	11.3	0.6566	55.45	54.38
	-10	-0.5	-0.590	0.750	85	-8.5	8.5	0.6765	56.28	55.66
	-5	-0.4	-0.300	0.770	84	-3.3	3.3	0.6972	57.09	56.99
	0	-0.3	-0.050	0.775	84	0.9	0.9	0.7131	57.73	57.72
	5	0.0	0.330	0.790	84	7.3	7.3	0.7444	58.99	58.51
	10	-0.3	0.640	0.780	84	12.2	12.2	0.7625	59.70	58.36
	15	0.0	0.950	0.770	84	17.3	17.3	0.7879	60.68	57.94
	20	0.0	1.150	0.680	84	23.3	23.3	0.7466	59.07	54.25
	25	-0.4	1.310	0.630	84	28.5	28.5	0.7604	59.62	52.38
	30	-0.3	1.440	0.625	83	30.0	30.0	0.7757	60.16	52.10
3	-30	-0.7	-1.240	0.550	86	-26.9	26.9	0.5090	48.87	43.58
	-25	-0.6	-1.200	0.600	86	-23.2	23.2	0.6239	54.10	49.72
	-20	-0.4	-1.000	0.675	85	-17.1	17.1	0.6471	55.05	52.61
	-15	-0.5	-0.820	0.720	85	-13.0	13.0	0.6653	55.82	54.38
	-10	-0.4	-0.600	0.750	85	-8.7	8.7	0.6766	56.29	55.64
	-5	-0.4	-0.300	0.770	85	-3.3	3.3	0.6972	57.14	57.04
	0	-0.3	-0.030	0.760	85	1.2	1.2	0.6999	57.25	57.24
	5	-0.3	0.330	0.780	85	7.3	7.3	0.7353	58.68	58.20
	10	-0.3	0.600	0.780	85	11.5	11.5	0.7578	59.57	58.37
	15	-0.3	0.900	0.770	85	16.5	16.5	0.7827	60.54	58.05
	20	-0.1	1.140	0.730	84	21.5	21.5	0.7810	60.42	56.20
	25	-0.2	1.300	0.700	84	25.6	25.6	0.7966	61.02	55.05
	30	-0.2	1.450	0.630	84	30.0	30.0	0.7819	60.45	52.35

		Res		Vdir	Vax
Average	-30	27.11		52.57	46.79
	-25	23.21		53.90	49.54
	-20	17.37		54.81	52.31
	-15	12.52		55.41	54.08
	-10	8.61		56.11	55.48
	-5	3.89		56.77	56.64
	0	1.09		57.30	57.29
	5	5.35		58.28	57.95
	10	11.66		59.38	58.15
	15	16.71		60.32	57.77
	20	21.88		59.75	55.44
	25	26.67		60.37	53.93
	30	29.98		60.55	52.45

Table C2-44. SPH-5 Computations: 90 fps

Probe: **Spherical SPH-5 / NIST 30-60 Calibration**
Velocity Point: **90 fps**
Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.61	Probe ID:	SPH-5
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.61	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.53%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	88 _F
Average Axial Velocity, ft/sec:	**82.00**	Last Row:	61
Average Yaw Angle:	0.3		
Average Pitch Angle:	16.3	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.3		0
Resultant Angle Standard Deviation:	9.05		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
	Pitch	Yaw	----------	----------	Gas					
Rep	Angle	Angle	P4-P5	P1-P2	Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	-0.4	-2.900	1.170	87	-30.0	30.0	1.4954	83.83	72.60
	-25	-0.3	-2.750	1.350	87	-23.7	23.7	1.4137	81.51	74.66
	-20	0.2	-2.450	1.480	87	-19.1	19.1	1.4478	82.49	77.96
	-15	-0.7	-2.000	1.580	87	-14.6	14.7	1.4775	83.33	80.62
	-10	-0.5	-1.350	1.660	86	-8.8	8.8	1.4978	83.82	82.83
	-5	-0.5	-0.650	1.700	86	-3.2	3.2	1.5399	84.99	84.86
	0	-0.3	-0.070	1.710	85	1.2	1.2	1.5747	85.87	85.85
	5	-0.3	0.750	1.750	85	7.4	7.4	1.6503	87.91	87.17
	10	-0.3	1.400	1.750	84	11.9	11.9	1.7065	89.31	87.39
	15	-0.3	1.850	1.700	84	15.5	15.5	1.7140	89.51	86.26
	20	0.0	2.400	1.630	83	20.3	20.3	1.7123	89.38	83.81
	25	0.4	2.850	1.550	82	25.3	25.3	1.7550	90.40	81.72
	30	0.3	3.100	1.420	82	29.9	29.9	1.7596	90.52	78.46
2	-30	-0.7	-2.950	1.350	86	-25.7	25.7	1.4813	83.36	75.12
	-25	-0.1	-2.850	1.330	87	-25.0	25.0	1.4208	81.72	74.09
	-20	-0.3	-2.450	1.500	88	-18.8	18.8	1.4637	83.02	78.57
	-15	-0.4	-2.100	1.570	88	-15.5	15.5	1.4797	83.47	80.43
	-10	-0.3	-1.400	1.660	89	-9.2	9.2	1.4984	84.07	82.98
	-5	-0.4	-1.100	1.700	89	-6.6	6.6	1.5306	84.97	84.40
	0	-0.4	-0.070	1.700	90	1.2	1.3	1.5655	86.01	85.99
	5	-0.3	0.800	1.740	91	7.8	7.8	1.6444	88.23	87.42
	10	-0.1	1.400	1.720	91	12.1	12.1	1.6800	89.18	87.21
	15	-0.1	2.050	1.720	91	16.8	16.8	1.7525	91.09	87.21
	20	0.0	2.500	1.630	92	21.2	21.2	1.7340	90.69	84.57
	25	0.0	2.800	1.550	92	24.9	24.9	1.7407	90.86	82.43
	30	-0.4	3.100	1.360	92	30.0	30.0	1.6879	89.47	77.48
3	-30	-0.7	-2.900	1.170	98	-30.0	30.0	1.0941	72.43	62.72
	-25	-0.4	-2.800	1.350	98	-24.1	24.1	1.4237	82.62	75.41
	-20	-0.2	-2.400	1.500	98	-18.4	18.4	1.4580	83.61	79.31
	-15	-0.8	-1.900	1.600	97	-13.6	13.7	1.4853	84.31	81.92
	-10	-0.7	-1.300	1.670	97	-8.4	8.4	1.5061	84.90	83.99
	-5	-0.7	-0.650	1.700	97	-3.2	3.3	1.5399	85.84	85.70
	0	-0.3	-0.070	1.740	97	1.2	1.2	1.6024	87.57	87.55
	5	-0.4	0.700	1.740	96	7.1	7.1	1.6379	88.46	87.78
	10	-0.4	1.450	1.750	96	12.3	12.3	1.7123	90.44	88.38
	15	-0.2	1.900	1.720	96	15.7	15.7	1.7371	91.09	87.71
	20	-0.2	2.400	1.650	96	20.1	20.1	1.7269	90.83	85.30
	25	-0.3	2.850	1.530	95	25.6	25.6	1.7438	91.19	82.21
	30	0.1	3.100	1.370	95	30.0	30.0	1.7003	90.04	77.98

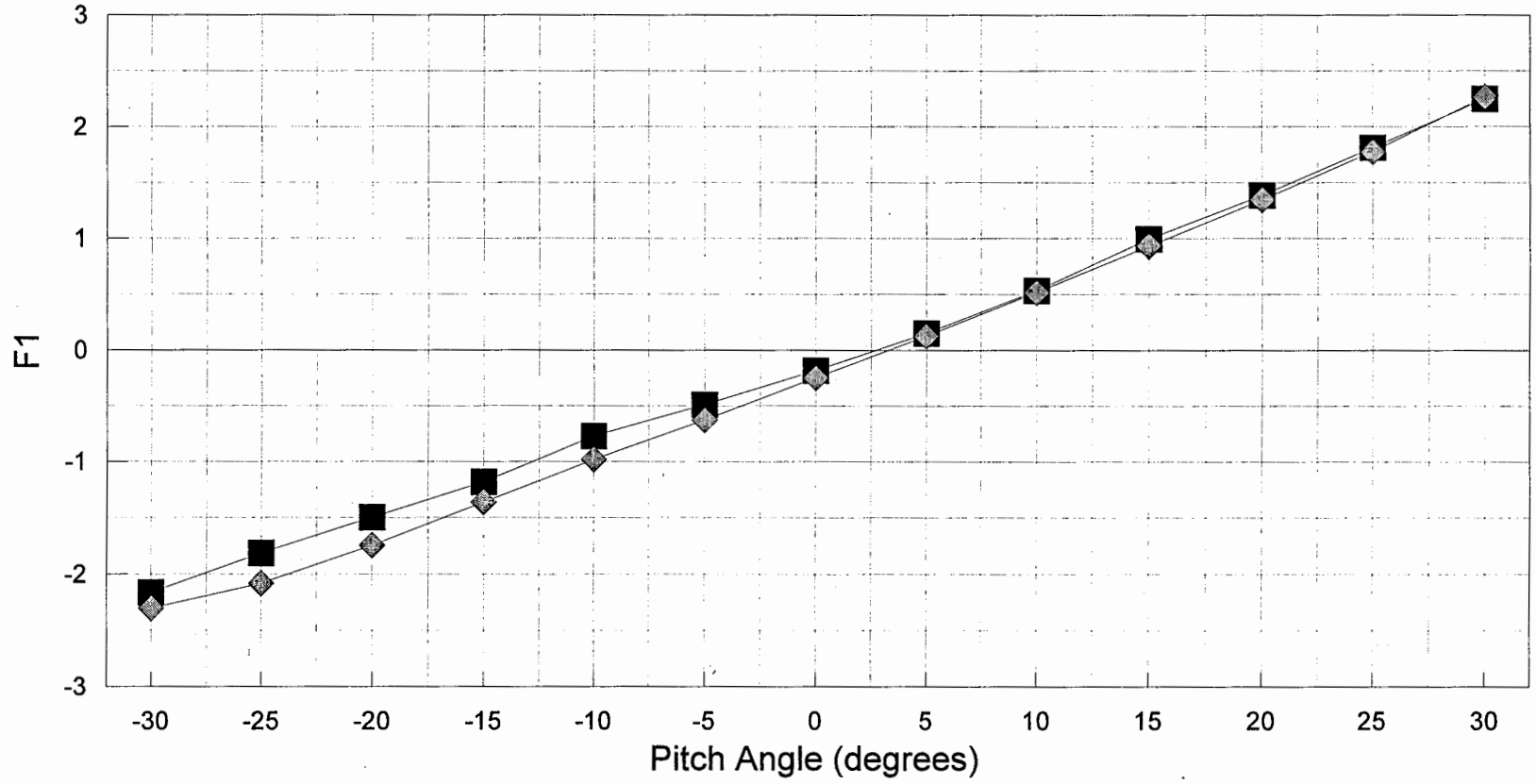
		Res	Vdir	Vax
Average	-30	28.56	79.87	70.15
	-25	24.24	81.95	74.72
	-20	18.78	83.04	78.62
	-15	14.61	83.70	80.99
	-10	8.83	84.26	83.26
	-5	4.39	85.27	84.99
	0	1.24	86.48	86.46
	5	7.43	88.20	87.46
	10	12.09	89.64	87.66
	15	15.98	90.56	87.06
	20	20.52	90.30	84.56
	25	25.28	90.82	82.12
	30	29.97	90.01	77.97

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ATTACHMENT O.

Spherical Probe SPH-6 Calibration Data

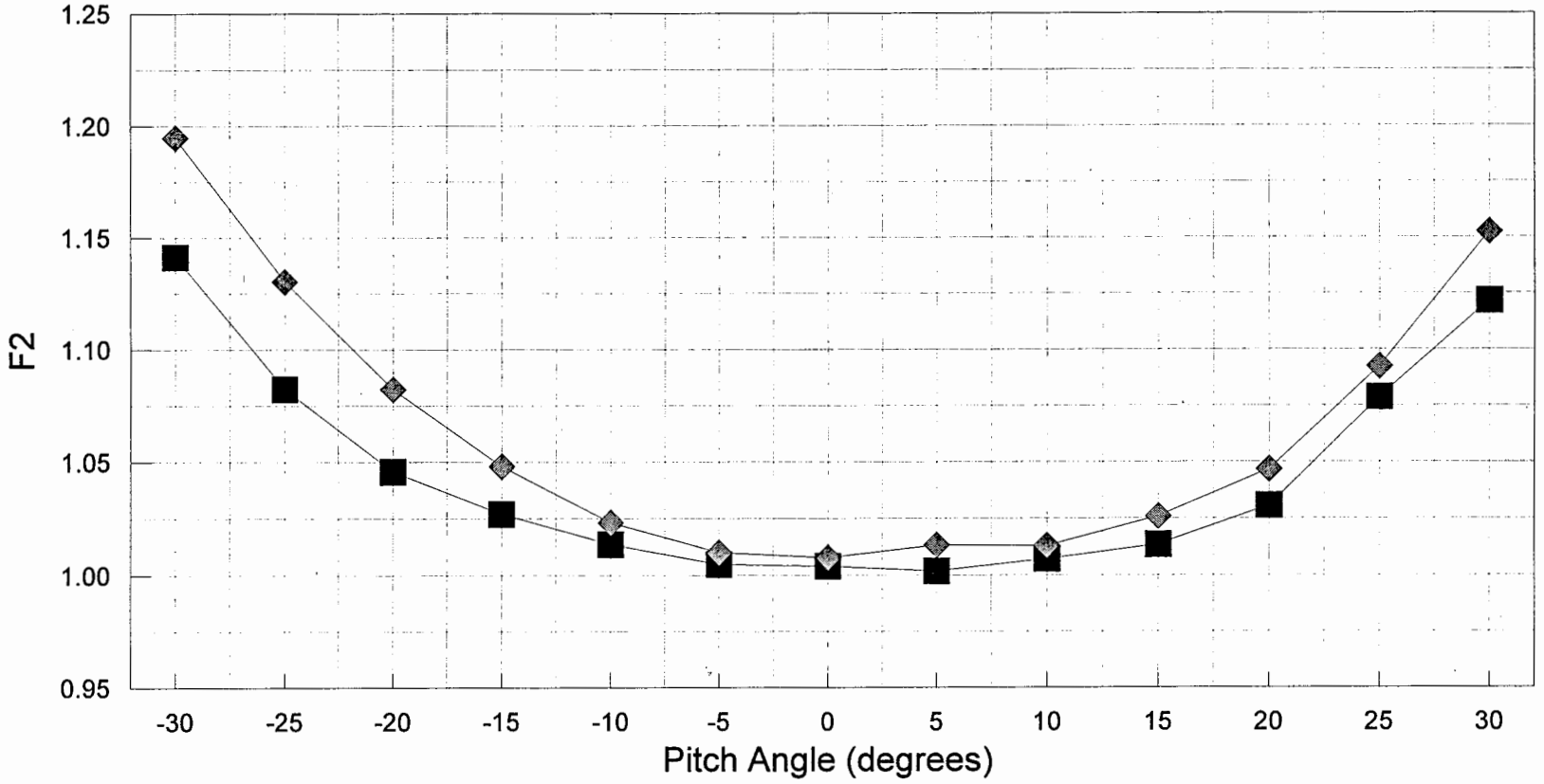
Figure C2-42. Spherical Probe (SPH-6): Avg. (30-60 fps) F1 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC242-44.WK4

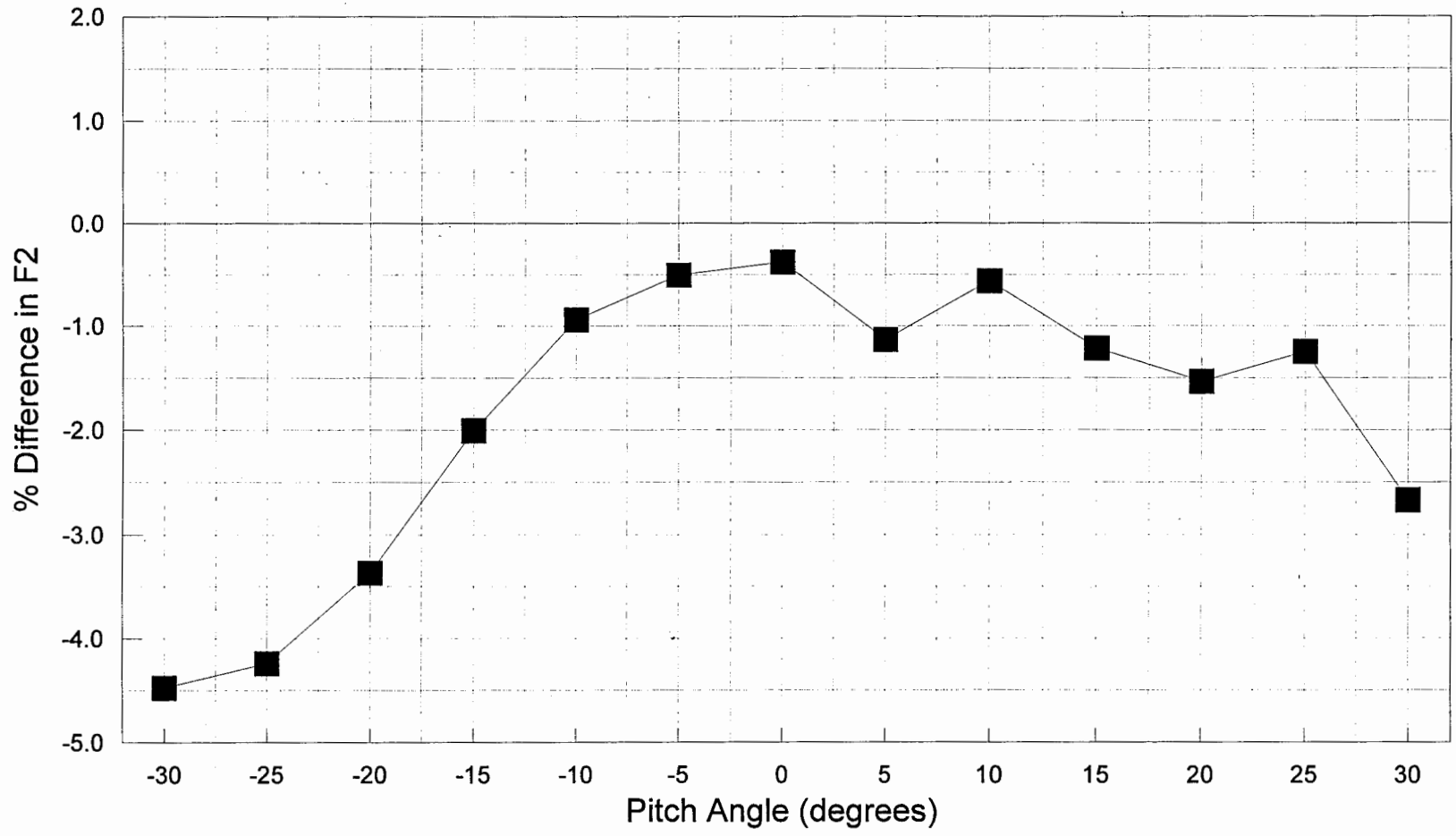
Figure C2-43. Spherical Probe (SPH-6): Avg. (30-60 fps) F2 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC242-44.WK4

Figure C2-44. Spherical Probe (SPH-6): Percent Difference in F2
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

FC242-44.WK4

Table C2-45. Spherical Probe SPH-6: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

	30 fps / NIST / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.23	29.42	25.89	29.61	31.04	26.99	4.89	5.52	4.23
-25	21.04	30.05	28.04	24.96	32.49	29.45	18.61	8.12	5.02
-20	16.97	30.35	29.03	20.22	32.51	30.51	19.14	7.12	5.10
-15	13.92	30.91	29.99	16.55	33.11	31.73	18.91	7.11	5.77
-10	10.57	31.30	30.74	13.15	33.50	32.60	24.40	7.03	6.04
-5	4.08	31.28	31.17	6.25	33.17	32.93	53.09	6.05	5.63
0	1.83	31.44	31.42	2.53	32.97	32.94	38.11	4.87	4.82
5	3.50	31.71	31.62	2.91	33.03	32.95	-16.71	4.17	4.21
10	7.68	31.94	31.58	7.27	32.96	32.63	-5.37	3.19	3.30
15	14.69	32.64	31.56	14.08	33.07	32.06	-4.10	1.31	1.59
20	20.46	32.66	30.60	19.95	32.85	30.88	-2.48	0.56	0.89
25	25.22	32.54	29.44	24.85	32.98	29.93	-1.47	1.35	1.66
30	29.64	32.13	27.92	29.67	32.38	28.13	0.10	0.77	0.75

	60 fps / NIST / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	26.98	55.12	49.12	30.05	58.77	50.87	11.37	6.63	3.57
-25	21.03	56.11	52.37	24.98	60.61	54.94	18.80	8.03	4.91
-20	16.40	57.32	54.99	19.54	61.37	57.84	19.11	7.06	5.18
-15	12.08	57.19	55.92	14.49	61.24	59.29	19.96	7.09	6.03
-10	6.53	58.14	57.76	9.40	62.05	61.21	44.02	6.73	5.98
-5	2.52	58.89	58.82	4.23	62.11	61.93	67.37	5.48	5.28
0	2.04	59.13	59.09	2.05	61.89	61.84	0.45	4.66	4.65
5	5.12	59.79	59.53	4.71	62.09	61.85	-7.94	3.84	3.90
10	11.92	60.63	59.33	11.57	61.97	60.71	-2.91	2.20	2.33
15	16.57	61.13	58.59	15.83	61.60	59.26	-4.50	0.78	1.16
20	21.99	61.27	56.81	21.53	61.73	57.42	-2.10	0.76	1.08
25	26.71	60.76	54.28	26.53	61.49	55.01	-0.68	1.19	1.35
30	30.01	59.86	51.83	30.01	60.26	52.19	0.00	0.68	0.68

	90 fps / NIST / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	27.30	82.06	72.93	29.99	87.34	75.65	9.87	6.43	3.73
-25	21.38	84.23	78.43	25.33	91.04	82.28	18.48	8.09	4.92
-20	16.72	85.08	81.48	19.92	91.11	85.66	19.12	7.09	5.12
-15	12.63	85.73	83.66	15.03	91.76	88.62	18.95	7.03	5.94
-10	7.68	86.63	85.85	10.51	92.65	91.08	36.91	6.94	6.10
-5	2.93	87.86	87.72	4.76	92.82	92.45	62.48	5.64	5.39
0	0.82	88.77	88.76	0.38	92.91	92.91	-53.44	4.67	4.68
5	6.56	89.40	88.81	6.27	92.59	92.02	-4.32	3.56	3.62
10	11.80	90.16	88.25	11.47	92.18	90.34	-2.82	2.25	2.37
15	16.02	91.11	87.58	15.24	91.85	88.62	-4.82	0.81	1.19
20	20.74	90.26	84.40	20.24	90.80	85.19	-2.41	0.60	0.93
25	25.65	89.89	81.03	25.34	91.05	82.28	-1.22	1.29	1.55
30	29.51	88.19	76.75	29.66	88.97	77.32	0.48	0.88	0.74

Figure C2-45. Spherical Probe SPH-6: Percent Differences in NCSU Post-Test and NIST Calibrations

Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data

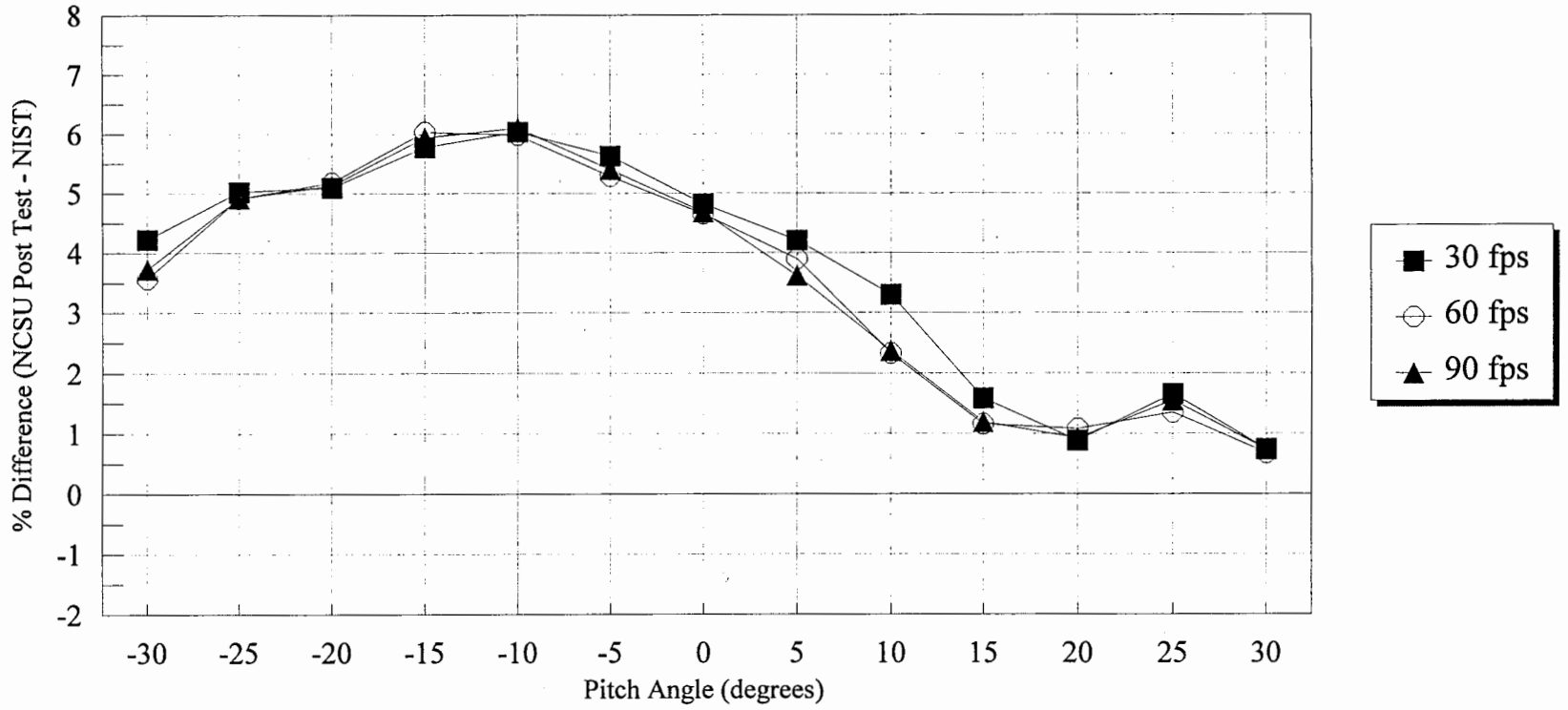


Table C2-46. SPH-6 Computations: 30 fps

Probe: **Spherical SPH-6 / NIST 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.64	Probe ID:	SPH-6
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.64	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.63%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**29.93**	Last Row:	61
Average Yaw Angle:	0.8		
Average Pitch Angle:	15.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.2		0
Resultant Angle Standard Deviation:	9.34		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.9	-0.360	0.174	88	-24.8	24.9	0.1855	29.54	26.80
	-25	2.0	-0.330	0.190	88	-19.9	20.0	0.1875	29.70	27.90
	-20	0.7	-0.300	0.205	88	-16.3	16.4	0.1949	30.28	29.06
	-15	0.7	-0.250	0.215	88	-12.4	12.4	0.1977	30.50	29.78
	-10	0.4	-0.180	0.224	88	-7.5	7.5	0.2019	30.81	30.55
	-5	0.4	-0.070	0.226	88	-0.8	0.9	0.2068	31.18	31.18
	0	0.3	-0.010	0.226	88	2.7	2.7	0.2089	31.35	31.31
	5	0.3	0.070	0.226	88	7.3	7.3	0.2130	31.65	31.40
	10	0.3	0.170	0.223	88	13.0	13.0	0.2197	32.14	31.33
	15	0.3	0.240	0.220	88	16.9	16.9	0.2245	32.49	31.08
	20	0.3	0.300	0.210	88	21.0	21.0	0.2227	32.37	30.22
	25	0.3	0.350	0.195	88	25.2	25.2	0.2202	32.18	29.12
	30	0.4	0.400	0.172	88	30.0	30.0	0.2135	31.69	27.44
2	-30	2.3	-0.390	0.166	96	-30.0	30.1	0.2122	31.82	27.53
	-25	2.4	-0.350	0.190	96	-21.5	21.6	0.1922	30.28	28.16
	-20	1.1	-0.310	0.205	95	-17.0	17.0	0.1963	30.58	29.24
	-15	1.1	-0.290	0.215	95	-14.8	14.9	0.2013	30.97	29.93
	-10	1.1	-0.270	0.228	95	-12.7	12.7	0.2101	31.64	30.86
	-5	0.4	-0.160	0.230	94	-6.0	6.0	0.2070	31.37	31.20
	0	0.4	-0.080	0.230	94	-1.3	1.4	0.2100	31.60	31.59
	5	0.4	-0.030	0.231	94	1.6	1.6	0.2129	31.82	31.81
	10	0.4	0.030	0.230	93	5.0	5.0	0.2139	31.87	31.74
	15	0.5	0.190	0.229	93	13.8	13.8	0.2274	32.85	31.90
	20	-0.7	0.300	0.213	93	20.7	20.7	0.2251	32.69	30.57
	25	-0.7	0.360	0.200	93	25.2	25.2	0.2260	32.76	29.63
	30	-0.6	0.400	0.185	92	28.9	28.9	0.2249	32.64	28.57
3	-30	1.6	-0.380	0.166	92	-29.7	29.7	0.1527	26.89	23.35
	-25	1.7	-0.350	0.190	92	-21.5	21.5	0.1922	30.17	28.07
	-20	1.7	-0.310	0.200	92	-17.5	17.6	0.1925	30.20	28.79
	-15	1.7	-0.290	0.221	92	-14.4	14.5	0.2062	31.26	30.27
	-10	0.8	-0.250	0.229	91	-11.5	11.5	0.2091	31.45	30.82
	-5	-0.1	-0.150	0.230	91	-5.3	5.3	0.2068	31.28	31.14
	0	-0.1	-0.080	0.228	91	-1.4	1.4	0.2081	31.37	31.36
	5	-0.3	-0.030	0.230	91	1.5	1.6	0.2120	31.66	31.65
	10	0.2	0.030	0.230	91	5.0	5.0	0.2139	31.81	31.69
	15	0.2	0.180	0.227	91	13.3	13.3	0.2244	32.58	31.70
	20	0.3	0.290	0.220	91	19.7	19.7	0.2294	32.94	31.01
	25	-0.7	0.360	0.200	91	25.2	25.2	0.2260	32.70	29.58
	30	-0.5	0.400	0.175	91	30.0	30.0	0.2172	32.05	27.75

		Res	Vdir	Vax
Average	-30	28.23	29.42	25.89
	-25	21.04	30.05	28.04
	-20	16.97	30.35	29.03
	-15	13.92	30.91	29.99
	-10	10.57	31.30	30.74
	-5	4.08	31.28	31.17
	0	1.83	31.44	31.42
	5	3.50	31.71	31.62
	10	7.68	31.94	31.58
	15	14.69	32.64	31.56
	20	20.46	32.66	30.60
	25	25.22	32.54	29.44
	30	29.64	32.13	27.92

Table C2-47. SPH-6 Computations: 60 fps

Probe: **Spherical SPH-6 / NIST 30-60 Calibration**
Velocity Point: **60 fps**
Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.64	Probe ID:	SPH-6
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.64	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.64%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**56.03**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	15.4	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	15.4	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.36		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.9	-1.300	0.600	88	-26.9	27.0	0.6897	56.96	50.75
	-25	1.3	-1.200	0.670	88	-20.7	20.7	0.6694	56.11	52.47
	-20	1.4	-1.100	0.730	89	-16.9	17.0	0.6983	57.37	54.87
	-15	0.7	-0.890	0.750	89	-12.7	12.7	0.6914	57.08	55.68
	-10	0.0	-0.600	0.790	89	-6.9	6.9	0.7115	57.90	57.49
	-5	0.0	-0.440	0.800	89	-4.0	4.0	0.7223	58.34	58.20
	0	0.0	-0.290	0.800	89	-1.5	1.5	0.7298	58.64	58.62
	5	-0.1	-0.020	0.810	89	3.0	3.0	0.7494	59.42	59.34
	10	-0.1	0.550	0.800	89	12.0	12.0	0.7811	60.67	59.33
	15	-0.3	0.800	0.770	89	16.3	16.3	0.7817	60.69	58.25
	20	-0.2	1.100	0.750	90	21.4	21.4	0.8008	61.48	57.24
	25	-0.7	1.300	0.670	90	26.7	26.7	0.7794	60.66	54.21
	30	-0.7	1.400	0.610	90	30.0	30.0	0.7571	59.78	51.77
2	-30	1.6	-1.300	0.600	93	-26.9	27.0	0.6897	57.22	50.99
	-25	1.7	-1.200	0.660	93	-21.1	21.2	0.6637	56.13	52.34
	-20	0.6	-1.050	0.730	93	-16.0	16.0	0.6918	57.30	55.08
	-15	0.7	-0.830	0.750	93	-11.7	11.7	0.6860	57.06	55.88
	-10	-0.2	-0.600	0.790	93	-6.9	6.9	0.7115	58.11	57.69
	-5	0.1	-0.300	0.810	93	-1.6	1.6	0.7386	59.21	59.18
	0	0.0	-0.060	0.810	93	2.3	2.3	0.7481	59.59	59.54
	5	-0.3	0.200	0.810	93	6.5	6.5	0.7599	60.06	59.67
	10	-0.4	0.550	0.790	93	12.1	12.1	0.7721	60.54	59.18
	15	-0.4	0.850	0.780	93	16.9	16.9	0.7957	61.46	58.79
	20	-0.6	1.100	0.740	93	21.6	21.6	0.7928	61.34	57.02
	25	-0.6	1.300	0.680	93	26.4	26.4	0.7865	61.10	54.74
	30	-0.7	1.400	0.610	93	30.0	30.0	0.7571	59.95	51.91
3	-30	2.1	-1.300	0.600	92	-26.9	27.0	0.5531	51.19	45.61
	-25	1.6	-1.200	0.660	92	-21.1	21.2	0.6637	56.08	52.29
	-20	0.9	-1.060	0.730	92	-16.2	16.2	0.6931	57.31	55.03
	-15	0.9	-0.850	0.760	92	-11.8	11.8	0.6959	57.42	56.20
	-10	0.2	-0.550	0.800	92	-5.8	5.9	0.7198	58.40	58.09
	-5	0.1	-0.320	0.810	92	-2.0	2.0	0.7376	59.12	59.08
	0	-0.2	-0.060	0.800	92	2.3	2.3	0.7388	59.16	59.12
	5	-0.1	0.160	0.810	92	5.9	5.9	0.7572	59.90	59.58
	10	-0.4	0.520	0.800	92	11.6	11.6	0.7776	60.70	59.46
	15	-0.5	0.820	0.780	91	16.5	16.5	0.7928	61.23	58.72
	20	-0.5	1.150	0.720	91	22.9	22.9	0.7860	60.97	56.16
	25	-0.5	1.310	0.660	91	27.1	27.1	0.7747	60.53	53.88
	30	-0.5	1.420	0.610	91	30.0	30.0	0.7571	59.84	51.82

		Res	Vdir	Vax
Average	-30	26.98	55.12	49.12
	-25	21.03	56.11	52.37
	-20	16.40	57.32	54.99
	-15	12.08	57.19	55.92
	-10	6.53	58.14	57.76
	-5	2.52	58.89	58.82
	0	2.04	59.13	59.09
	5	5.12	59.79	59.53
	10	11.92	60.63	59.33
	15	16.57	61.13	58.59
	20	21.99	61.27	56.81
	25	26.71	60.76	54.28
	30	30.01	59.86	51.83

Table C2-48. SPH-6 Computations: 90 fps

Probe: **Spherical SPH-6 / NIST 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.64	Probe ID:	SPH-6
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.64	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.63%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**83.51**	Last Row:	61
Average Yaw Angle:	0.7		
Average Pitch Angle:	15.3	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	15.4		0
Resultant Angle Standard Deviation:	9.08		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.3	-2.850	1.330	99	-26.4	26.5	1.4987	84.80	75.91
	-25	1.5	-2.700	1.490	99	-21.0	21.1	1.4962	84.73	79.06
	-20	1.1	-2.300	1.600	99	-16.0	16.0	1.5161	85.29	81.97
	-15	1.1	-2.000	1.680	99	-12.8	12.8	1.5493	86.22	84.07
	-10	0.2	-1.300	1.770	98	-6.5	6.5	1.5935	87.36	86.80
	-5	0.1	-0.700	1.800	98	-1.9	1.9	1.6396	88.62	88.57
	0	0.1	-0.300	1.820	98	1.1	1.1	1.6756	89.58	89.57
	5	-0.2	0.300	1.800	97	5.5	5.5	1.6788	89.59	89.18
	10	-0.2	1.100	1.780	94	11.2	11.2	1.7235	90.53	88.81
	15	-0.3	1.800	1.750	93	16.2	16.2	1.7747	91.78	88.14
	20	-0.3	2.300	1.650	93	20.6	20.6	1.7396	90.87	85.08
	25	-0.7	2.800	1.500	92	25.9	25.9	1.7190	90.25	81.17
	30	-0.6	3.000	1.350	91	29.5	29.5	1.6603	88.61	77.11
2	-30	2.4	-2.900	1.320	94	-27.6	27.7	1.5554	86.00	76.14
	-25	1.8	-2.750	1.470	95	-21.9	22.0	1.4968	84.44	78.32
	-20	1.1	-2.450	1.600	95	-17.2	17.3	1.5357	85.53	81.68
	-15	0.9	-1.950	1.700	96	-12.2	12.2	1.5611	86.31	84.36
	-10	0.4	-1.550	1.750	97	-8.7	8.7	1.5787	86.88	85.89
	-5	-0.2	-1.100	1.800	97	-4.8	4.8	1.6196	88.00	87.69
	0	0.0	-0.400	1.800	98	0.3	0.3	1.6538	89.00	89.00
	5	-0.3	0.450	1.800	98	6.6	6.6	1.6892	89.95	89.36
	10	-0.2	1.140	1.770	99	11.5	11.5	1.7192	90.82	89.00
	15	-0.6	1.780	1.730	99	16.2	16.2	1.7545	91.75	88.11
	20	-0.6	2.200	1.650	99	19.9	19.9	1.7228	90.92	85.51
	25	-0.9	2.700	1.530	100	24.9	24.9	1.7175	90.86	82.44
	30	-1.0	2.950	1.350	100	29.1	29.2	1.6485	89.01	77.74
3	-30	2.3	-2.900	1.320	84	-27.6	27.7	1.2173	75.39	66.75
	-25	2.0	-2.700	1.490	83	-21.0	21.1	1.4962	83.51	77.90
	-20	1.3	-2.400	1.600	83	-16.8	16.9	1.5292	84.42	80.79
	-15	0.7	-2.000	1.670	82	-12.9	12.9	1.5411	84.67	82.55
	-10	0.4	-1.450	1.750	82	-7.8	7.9	1.5775	85.67	84.86
	-5	0.0	-0.730	1.790	81	-2.1	2.1	1.6288	86.97	86.91
	0	0.0	-0.300	1.800	81	1.1	1.1	1.6570	87.72	87.70
	5	-0.3	0.600	1.800	79	7.6	7.6	1.6995	88.67	87.89
	10	-0.4	1.300	1.750	78	12.7	12.7	1.7198	89.12	86.93
	15	-0.5	1.700	1.730	78	15.6	15.6	1.7466	89.81	86.48
	20	-0.3	2.400	1.600	77	21.8	21.8	1.7181	88.99	82.63
	25	-0.9	2.800	1.480	76	26.2	26.2	1.7048	88.56	79.48
	30	-0.9	3.000	1.330	75	29.9	29.9	1.6462	86.94	75.40

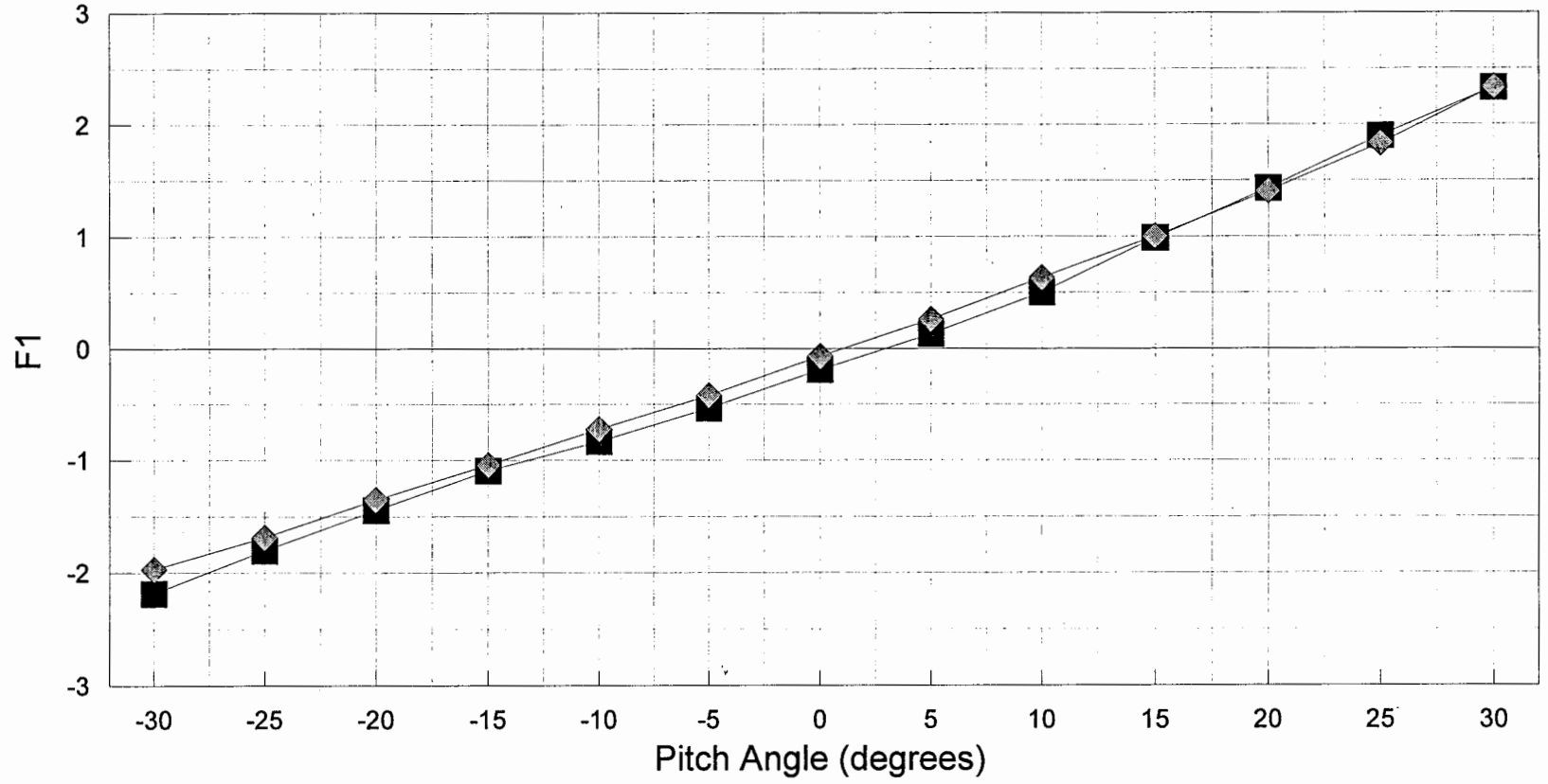
		Res	Vdir	Vax
Average	-30	27.30	82.06	72.93
	-25	21.38	84.23	78.43
	-20	16.72	85.08	81.48
	-15	12.63	85.73	83.66
	-10	7.68	86.63	85.85
	-5	2.93	87.86	87.72
	0	0.82	88.77	88.76
	5	6.56	89.40	88.81
	10	11.80	90.16	88.25
	15	16.02	91.11	87.58
	20	20.74	90.26	84.40
	25	25.65	89.89	81.03
	30	29.51	88.19	76.75

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ATTACHMENT P.

Spherical Probe SPH-7 Calibration Data

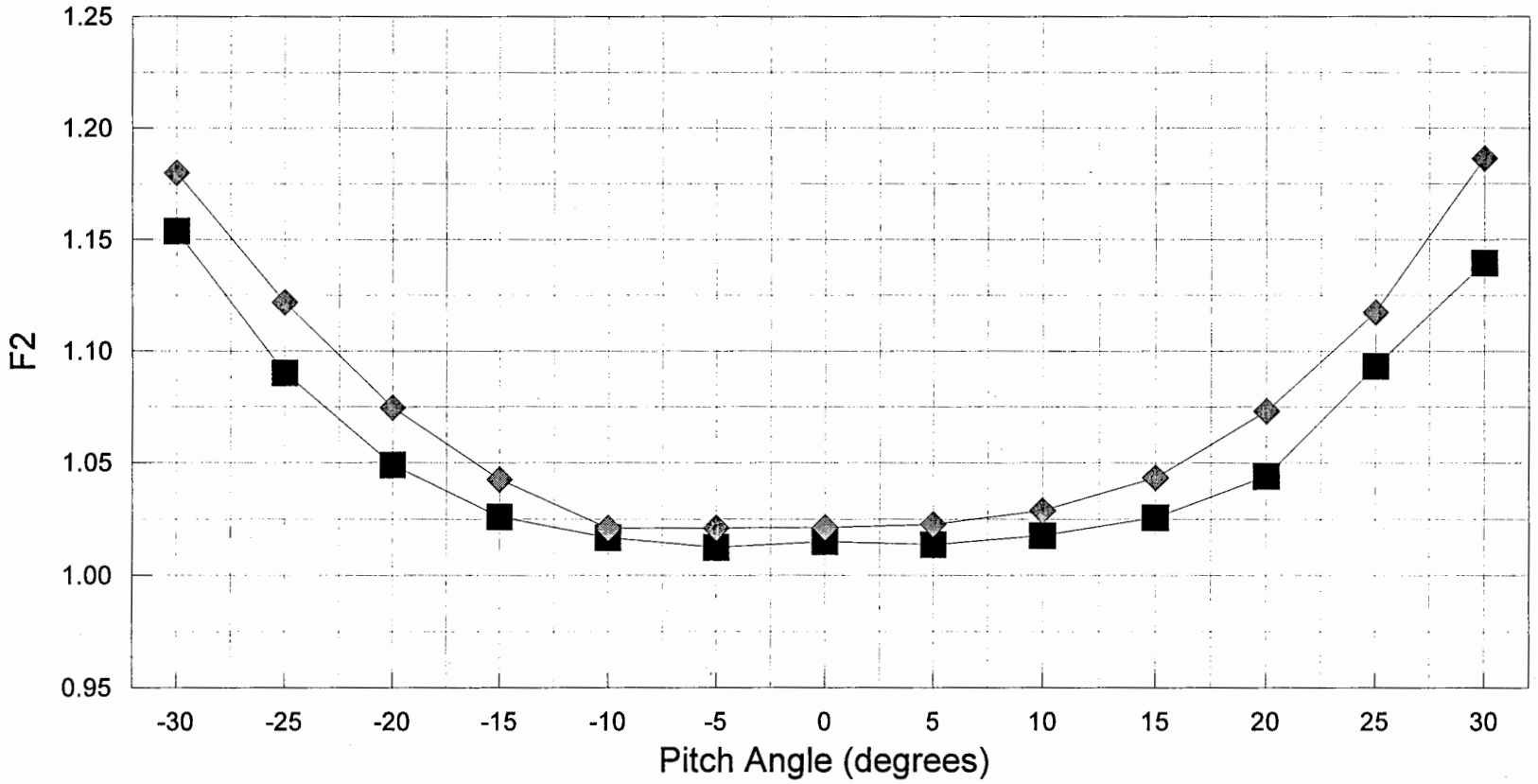
Figure C2-46. Spherical Probe (SPH-7): Avg. (30-60 fps) F1 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

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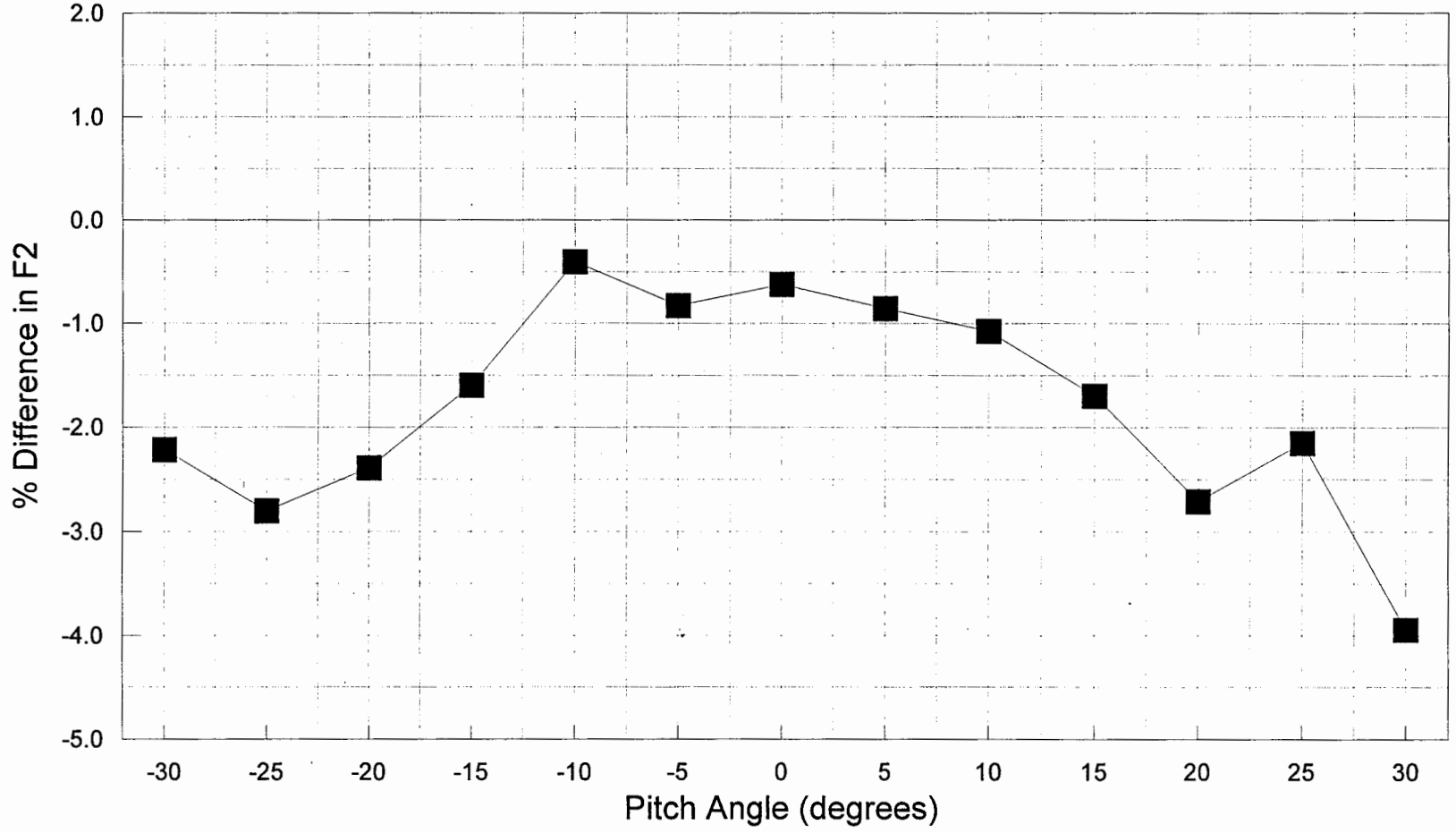
Figure C2-47. Spherical Probe (SPH-7): Avg. (30-60 fps) F2 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Figure C2-48. Spherical Probe (SPH-7): Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

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Table C2-49. Spherical Probe SPH-7: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

Pitch Angle	30 fps / NIST / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.04	30.25	26.19	29.34	30.94	26.97	-2.34	2.28	3.01
-25	25.92	31.50	28.30	24.02	32.21	29.40	-7.35	2.24	3.89
-20	21.28	31.06	28.94	19.90	32.46	30.52	-6.49	4.50	5.45
-15	18.32	31.37	29.76	17.22	32.99	31.50	-6.03	5.18	5.85
-10	13.03	30.86	30.05	11.66	32.76	32.06	-10.53	6.14	6.68
-5	6.63	30.47	30.23	4.80	32.51	32.35	-27.66	6.67	7.02
0	1.80	30.58	30.55	1.20	32.49	32.48	-33.31	6.26	6.31
5	2.53	30.89	30.82	3.95	32.62	32.48	56.25	5.58	5.41
10	6.07	31.00	30.74	7.68	32.46	32.11	26.48	4.74	4.46
15	16.03	31.52	30.29	16.12	32.26	30.98	0.56	2.33	2.29
20	21.84	31.41	29.15	21.40	32.06	29.85	-2.02	2.07	2.38
25	26.48	31.26	27.98	25.92	31.99	28.77	-2.14	2.34	2.84
30	30.02	30.91	26.77	30.02	31.62	27.38	0.00	2.29	2.29

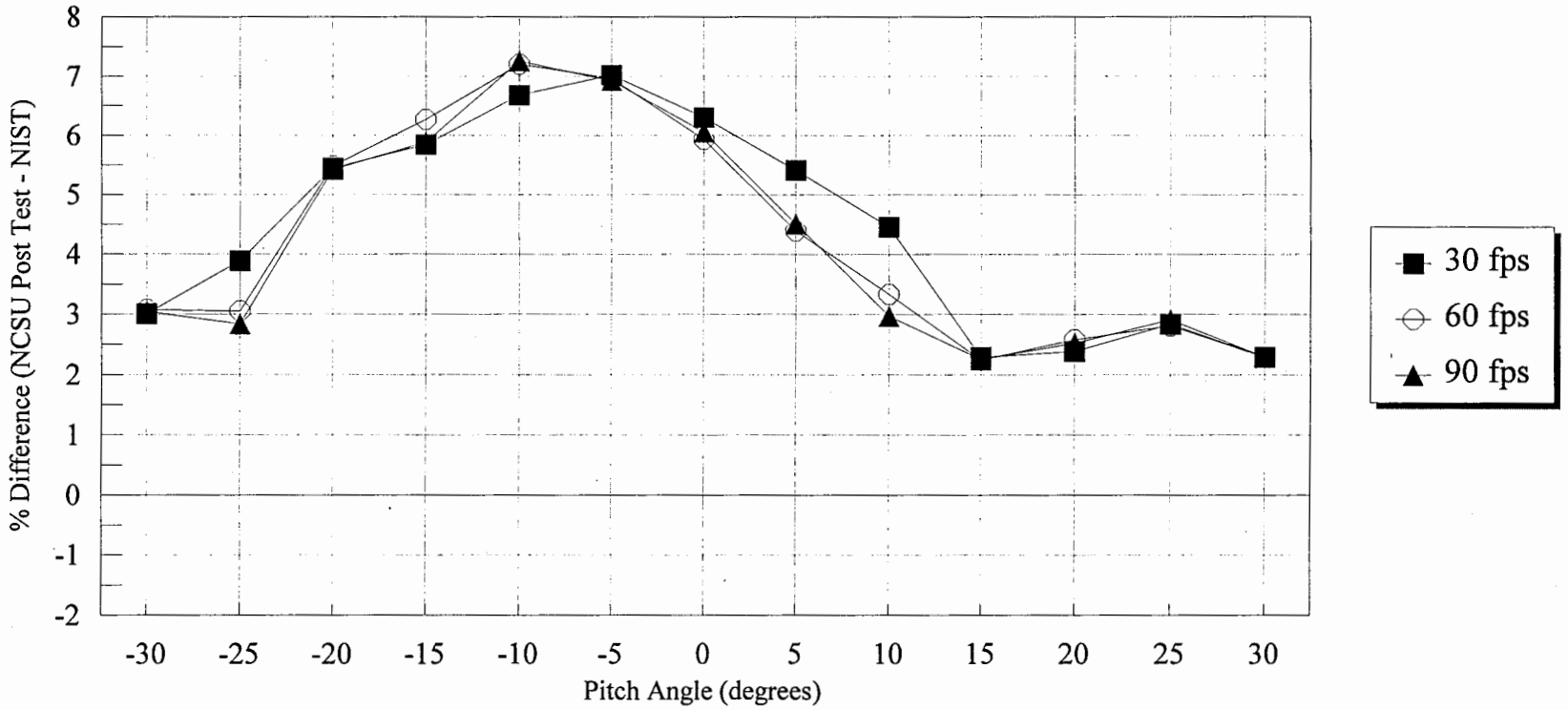
Pitch Angle	60 fps / NIST / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.05	57.11	49.43	29.44	58.49	50.95	-2.05	2.43	3.07
-25	27.46	60.56	53.73	25.32	61.26	55.37	-7.77	1.16	3.05
-20	20.96	58.24	54.38	19.60	60.89	57.36	-6.50	4.56	5.48
-15	14.63	57.16	55.30	13.58	60.47	58.77	-7.22	5.79	6.27
-10	9.26	57.54	56.78	7.38	61.39	60.87	-20.35	6.69	7.20
-5	4.92	57.80	57.58	3.18	61.69	61.59	-35.28	6.73	6.97
0	0.90	58.30	58.29	1.57	61.78	61.75	75.58	5.97	5.93
5	6.95	58.81	58.38	8.73	61.66	60.94	25.73	4.84	4.39
10	11.15	58.69	57.54	12.24	60.86	59.46	9.79	3.71	3.33
15	17.52	59.67	56.90	17.48	60.99	58.18	-0.24	2.22	2.24
20	22.86	59.19	54.54	22.32	60.48	55.95	-2.38	2.17	2.58
25	26.73	59.24	52.91	26.20	60.62	54.39	-2.01	2.33	2.81
30	30.06	57.41	49.69	30.06	58.73	50.83	0.00	2.29	2.29

Pitch Angle	90 fps / NIST / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	30.08	85.41	73.91	30.08	88.01	76.16	0.00	3.04	3.04
-25	27.79	91.24	80.70	25.57	92.01	82.99	-7.98	0.85	2.84
-20	21.87	87.50	81.19	20.45	91.36	85.60	-6.51	4.41	5.42
-15	16.75	86.89	83.20	15.82	91.57	88.10	-5.51	5.39	5.89
-10	10.14	86.64	85.28	8.28	92.43	91.46	-18.40	6.69	7.25
-5	5.03	86.96	86.59	3.27	92.77	92.58	-35.08	6.68	6.92
0	1.48	87.80	87.75	2.15	93.12	93.06	44.93	6.07	6.05
5	6.52	88.57	88.00	8.30	92.94	91.96	27.38	4.93	4.51
10	12.55	88.74	86.62	13.31	91.65	89.19	6.03	3.28	2.97
15	16.99	89.36	85.45	16.99	91.37	87.38	0.03	2.26	2.26
20	22.57	88.75	81.95	22.06	90.65	84.01	-2.27	2.14	2.52
25	25.94	88.36	79.46	25.28	90.43	81.77	-2.56	2.34	2.91
30	30.06	85.37	73.89	30.06	87.33	75.58	0.00	2.29	2.29

TABC249.WK4

Figure C2-49. Spherical Probe SPH-7: Percent Differences in NCSU Post-Test and NIST Calibrations

Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data



TABC249.WK4

Table C2-50: SPH-7 Computations: 30 fps

Probe: **Spherical SPH-7 / NIST 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.82	Probe ID:	SPH-7
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.82	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.49%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	80 _F
Average Axial Velocity, ft/sec:	**29.21**	Last Row:	61
Average Yaw Angle:	0.6		
Average Pitch Angle:	16.9	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.9		0
Resultant Angle Standard Deviation:	10.08		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.8	-0.350	0.173	78	-30.0	30.0	0.2211	31.86	27.59
	-25	0.9	-0.300	0.193	78	-23.0	23.1	0.2001	30.31	27.89
	-20	1.1	-0.290	0.210	78	-20.4	20.4	0.2088	30.96	29.01
	-15	1.0	-0.240	0.220	78	-15.8	15.8	0.2080	30.90	29.73
	-10	1.0	-0.170	0.225	78	-10.6	10.6	0.2041	30.61	30.08
	-5	-0.3	-0.060	0.220	78	-2.9	2.9	0.1995	30.26	30.22
	0	-0.3	-0.015	0.219	77	-0.0	0.3	0.2010	30.35	30.35
	5	-0.4	0.090	0.220	77	7.0	7.0	0.2069	30.79	30.56
	10	-0.3	0.170	0.215	77	12.1	12.1	0.2101	31.02	30.33
	15	-0.4	0.250	0.205	77	17.7	17.7	0.2104	31.05	29.58
	20	-0.4	0.310	0.192	77	22.5	22.5	0.2083	30.89	28.54
	25	-1.2	0.360	0.170	77	27.9	27.9	0.2026	30.47	26.92
	30	-1.2	0.400	0.158	77	30.0	30.0	0.1961	29.97	25.95
2	-30	2.4	-0.400	0.167	87	-30.0	30.1	0.2134	31.56	27.31
	-25	2.4	-0.350	0.190	86	-27.8	27.8	0.2250	32.37	28.62
	-20	0.3	-0.300	0.205	86	-21.7	21.7	0.2080	31.13	28.93
	-15	0.0	-0.290	0.217	85	-19.7	19.7	0.2137	31.52	29.67
	-10	-0.2	-0.220	0.220	85	-14.3	14.3	0.2053	30.89	29.93
	-5	-0.2	-0.160	0.223	85	-10.0	10.0	0.2014	30.60	30.14
	0	-0.1	-0.050	0.223	85	-2.2	2.2	0.2028	30.71	30.69
	5	-0.1	-0.020	0.224	84	-0.3	0.3	0.2054	30.87	30.87
	10	-0.1	0.030	0.222	84	3.1	3.1	0.2054	30.88	30.83
	15	-0.1	0.220	0.216	84	15.2	15.2	0.2173	31.76	30.65
	20	-0.1	0.310	0.202	84	21.5	21.5	0.2161	31.67	29.46
	25	-0.2	0.360	0.193	84	25.4	25.4	0.2188	31.87	28.79
	30	-1.4	0.400	0.167	84	30.0	30.0	0.2073	31.02	26.85
3	-30	1.5	-0.380	0.170	85	-30.0	30.0	0.1607	27.33	23.66
	-25	1.6	-0.340	0.190	85	-26.8	26.9	0.2177	31.81	28.38
	-20	1.8	-0.300	0.205	85	-21.7	21.7	0.2080	31.10	28.89
	-15	0.4	-0.290	0.220	85	-19.4	19.4	0.2160	31.69	29.89
	-10	0.0	-0.220	0.223	85	-14.1	14.1	0.2077	31.08	30.14
	-5	-0.1	-0.120	0.223	85	-7.0	7.0	0.2009	30.56	30.33
	0	-0.2	-0.060	0.223	85	-2.9	2.9	0.2023	30.67	30.63
	5	0.0	-0.020	0.226	84	-0.3	0.3	0.2072	31.01	31.01
	10	0.0	0.030	0.225	84	3.0	3.0	0.2082	31.08	31.04
	15	0.5	0.220	0.216	84	15.2	15.2	0.2173	31.76	30.65
	20	-0.2	0.310	0.202	84	21.5	21.5	0.2161	31.67	29.46
	25	-0.6	0.360	0.185	84	26.2	26.2	0.2132	31.45	28.23
	30	-0.5	0.410	0.175	84	30.0	30.0	0.2172	31.75	27.49

		Res		Vdir	Vax
Average	-30	30.04		30.25	26.19
	-25	25.92		31.50	28.30
	-20	21.28		31.06	28.94
	-15	18.32		31.37	29.76
	-10	13.03		30.86	30.05
	-5	6.63		30.47	30.23
	0	1.80		30.58	30.55
	5	2.53		30.89	30.82
	10	6.07		31.00	30.74
	15	16.03		31.52	30.29
	20	21.84		31.41	29.15
	25	26.48		31.26	27.98
	30	30.02		30.91	26.77

Table C2-51. SPH-7 Computations: 60 fps

Probe: **Spherical SPH-7 / NIST 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.82	Probe ID:	SPH-7
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.82	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	3.59%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	81 _F
Average Axial Velocity, ft/sec:	**55.03**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	17.2	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.2		0
Resultant Angle Standard Deviation:	9.77		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	1.9	-1.250	0.600	77	-30.0	30.1	0.7669	59.27	51.30
	-25	2.0	-1.200	0.670	77	-26.9	26.9	0.7684	59.33	52.90
	-20	0.9	-1.000	0.730	77	-20.2	20.3	0.7239	57.59	54.02
	-15	0.4	-0.800	0.750	78	-15.4	15.4	0.7060	56.93	54.89
	-10	0.0	-0.600	0.780	78	-10.8	10.8	0.7087	57.03	56.03
	-5	0.0	-0.400	0.800	78	-6.4	6.4	0.7201	57.49	57.14
	0	0.0	-0.150	0.800	79	-1.7	1.7	0.7292	57.91	57.88
	5	-0.3	0.300	0.780	79	6.6	6.6	0.7323	58.03	57.64
	10	-0.8	0.400	0.760	79	8.5	8.6	0.7214	57.60	56.95
	15	-0.9	0.860	0.750	79	16.8	16.8	0.7642	59.28	56.75
	20	-1.3	1.100	0.700	80	22.0	22.0	0.7536	58.92	54.63
	25	-1.4	1.300	0.650	80	26.7	26.7	0.7570	59.06	52.74
	30	-2.5	1.450	0.570	80	30.0	30.1	0.7074	57.09	49.39
2	-30	1.6	-1.330	0.620	86	-30.0	30.0	0.7924	60.76	52.60
	-25	1.6	-1.250	0.680	86	-27.7	27.7	0.8033	61.17	54.15
	-20	1.2	-1.050	0.730	86	-21.3	21.3	0.7362	58.56	54.55
	-15	0.0	-0.700	0.760	86	-13.1	13.1	0.7027	57.21	55.72
	-10	0.0	-0.500	0.790	86	-8.6	8.6	0.7126	57.61	56.97
	-5	-0.1	-0.300	0.800	85	-4.4	4.4	0.7211	57.90	57.73
	0	-0.1	-0.020	0.800	85	0.6	0.7	0.7357	58.49	58.48
	5	-0.6	0.350	0.800	85	7.3	7.4	0.7542	59.22	58.73
	10	-0.8	0.650	0.770	85	12.8	12.9	0.7577	59.36	57.86
	15	-0.9	0.900	0.750	85	17.4	17.5	0.7683	59.77	57.01
	20	-1.1	1.160	0.680	85	23.6	23.6	0.7493	59.03	54.10
	25	-1.1	1.300	0.650	85	26.7	26.7	0.7570	59.33	52.99
	30	-1.5	1.400	0.580	84	30.0	30.0	0.7198	57.80	50.04
3	-30	2.1	-1.330	0.600	86	-30.0	30.1	0.5648	51.29	44.39
	-25	1.3	-1.250	0.680	86	-27.7	27.7	0.8033	61.17	54.15
	-20	1.1	-1.050	0.730	86	-21.3	21.3	0.7362	58.56	54.56
	-15	0.4	-0.800	0.750	86	-15.4	15.4	0.7060	57.35	55.29
	-10	-0.2	-0.500	0.800	86	-8.4	8.4	0.7215	57.97	57.35
	-5	-0.3	-0.280	0.800	86	-4.0	4.0	0.7222	58.00	57.86
	0	-0.2	-0.040	0.800	86	0.3	0.3	0.7349	58.51	58.51
	5	-0.2	0.320	0.800	86	6.8	6.8	0.7520	59.18	58.76
	10	-0.7	0.600	0.770	85	12.0	12.0	0.7513	59.10	57.81
	15	-0.8	0.950	0.750	85	18.3	18.3	0.7734	59.97	56.94
	20	-1.0	1.160	0.700	85	23.0	23.0	0.7649	59.64	54.90
	25	-1.0	1.300	0.650	85	26.7	26.7	0.7570	59.33	52.99
	30	-1.8	1.400	0.570	85	30.0	30.0	0.7074	57.35	49.64

		Res	Vdir	Vax
Average	-30	30.05	57.11	49.43
	-25	27.46	60.56	53.73
	-20	20.96	58.24	54.38
	-15	14.63	57.16	55.30
	-10	9.26	57.54	56.78
	-5	4.92	57.80	57.58
	0	0.90	58.30	58.29
	5	6.95	58.81	58.38
	10	11.15	58.69	57.54
	15	17.52	59.67	56.90
	20	22.86	59.19	54.54
	25	26.73	59.24	52.91
	30	30.06	57.41	49.69

Table C2-52. SPH-7 Computations: 90 fps

Probe: **Spherical SPH-7 / NIST 30-60 Calibration**
Velocity Point: **90 fps**
Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.82	Probe ID:	SPH-7
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.82	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.66%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**82.61**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	17.5	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	17.5		0
Resultant Angle Standard Deviation:	9.56		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.3	-2.950	1.330	89	-30.0	30.1	1.6999	89.23	77.21
	-25	2.0	-2.700	1.500	89	-27.0	27.1	1.7300	90.02	80.15
	-20	0.9	-2.250	1.600	89	-20.8	20.8	1.6009	86.59	80.94
	-15	0.2	-2.000	1.660	88	-17.6	17.6	1.5996	86.48	82.43
	-10	0.0	-1.300	1.750	88	-10.4	10.4	1.5852	86.09	84.68
	-5	-0.2	-0.600	1.770	87	-3.9	3.9	1.5988	86.38	86.18
	0	-0.2	-0.070	1.770	87	0.4	0.5	1.6267	87.13	87.13
	5	-0.6	0.700	1.770	86	6.8	6.8	1.6632	88.02	87.40
	10	-0.7	1.400	1.700	85	12.6	12.6	1.6684	88.08	85.96
	15	-0.4	2.000	1.660	85	17.5	17.5	1.7013	88.94	84.82
	20	-1.4	2.550	1.530	84	23.1	23.1	1.6746	88.16	81.07
	25	-0.9	2.800	1.430	83	26.3	26.3	1.6516	87.47	78.41
	30	-2.1	3.100	1.250	82	30.0	30.1	1.5514	84.70	73.30
2	-30	2.2	-3.000	1.320	89	-30.0	30.1	1.6871	88.89	76.93
	-25	1.3	-2.800	1.480	89	-28.6	28.7	1.8064	91.98	80.72
	-20	1.0	-2.420	1.600	90	-22.4	22.4	1.6427	87.79	81.16
	-15	0.4	-1.950	1.680	90	-16.9	16.9	1.6069	86.83	83.08
	-10	-0.1	-1.350	1.760	91	-10.7	10.7	1.5987	86.69	85.17
	-5	-0.1	-1.000	1.770	91	-7.4	7.4	1.5949	86.59	85.86
	0	0.0	-0.550	1.800	92	-3.4	3.4	1.6292	87.59	87.44
	5	-0.5	0.600	1.780	93	6.0	6.0	1.6649	88.63	88.14
	10	-0.8	1.400	1.700	93	12.6	12.6	1.6684	88.72	86.58
	15	-0.8	1.900	1.660	93	16.8	16.8	1.6911	89.32	85.52
	20	-1.1	2.450	1.550	94	22.1	22.1	1.6713	88.88	82.35
	25	-1.3	2.750	1.480	94	25.3	25.3	1.6753	88.99	80.43
	30	-2.2	3.050	1.250	95	30.0	30.1	1.5514	85.71	74.17
3	-30	2.2	-2.950	1.330	98	-30.0	30.1	1.2816	78.11	67.60
	-25	1.5	-2.750	1.500	98	-27.6	27.6	1.7666	91.71	81.24
	-20	1.2	-2.400	1.590	98	-22.4	22.4	1.6312	88.12	81.48
	-15	0.0	-1.850	1.700	97	-15.7	15.7	1.6062	87.37	84.09
	-10	-0.1	-1.200	1.770	97	-9.3	9.3	1.5978	87.14	85.99
	-5	-0.1	-0.600	1.800	97	-3.8	3.8	1.6265	87.92	87.72
	0	-0.3	-0.060	1.800	97	0.5	0.6	1.6547	88.67	88.67
	5	-0.3	0.700	1.780	96	6.7	6.8	1.6723	89.06	88.45
	10	-0.9	1.400	1.720	96	12.4	12.5	1.6859	89.43	87.32
	15	-0.8	1.900	1.670	96	16.7	16.7	1.7001	89.80	86.02
	20	-1.3	2.500	1.550	95	22.5	22.5	1.6808	89.21	82.43
	25	-1.1	2.800	1.440	95	26.2	26.2	1.6587	88.62	79.53
	30	-1.7	3.050	1.250	95	30.0	30.0	1.5514	85.71	74.19

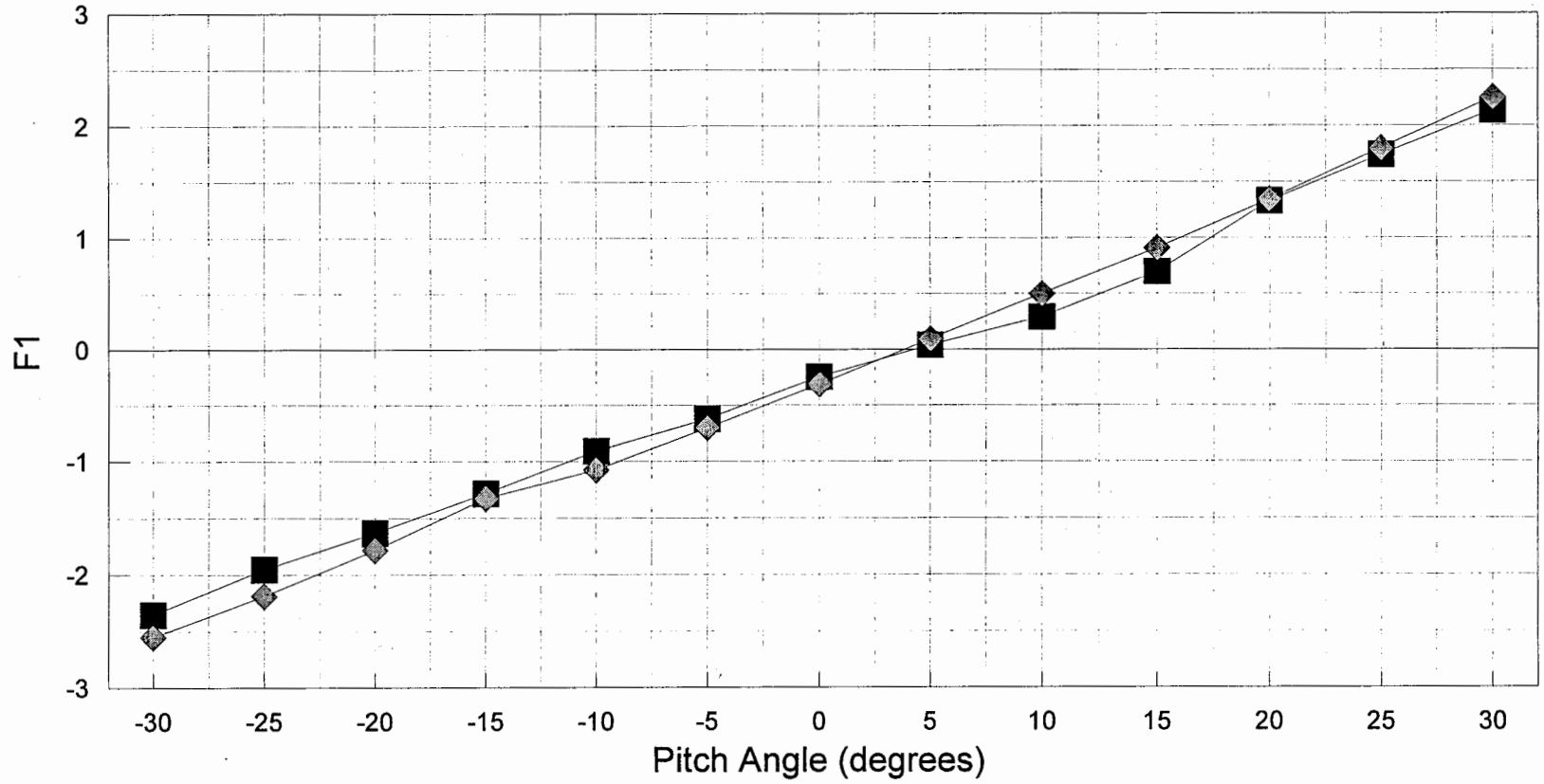
		Res	Vdir	Vax
Average	-30	30.08	85.41	73.91
	-25	27.79	91.24	80.70
	-20	21.87	87.50	81.19
	-15	16.75	86.89	83.20
	-10	10.14	86.64	85.28
	-5	5.03	86.96	86.59
	0	1.48	87.80	87.75
	5	6.52	88.57	88.00
	10	12.55	88.74	86.62
	15	16.99	89.36	85.45
	20	22.57	88.75	81.95
	25	25.94	88.36	79.46
	30	30.06	85.37	73.89

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ATTACHMENT Q.

Spherical Probe SPH-8 Calibration Data

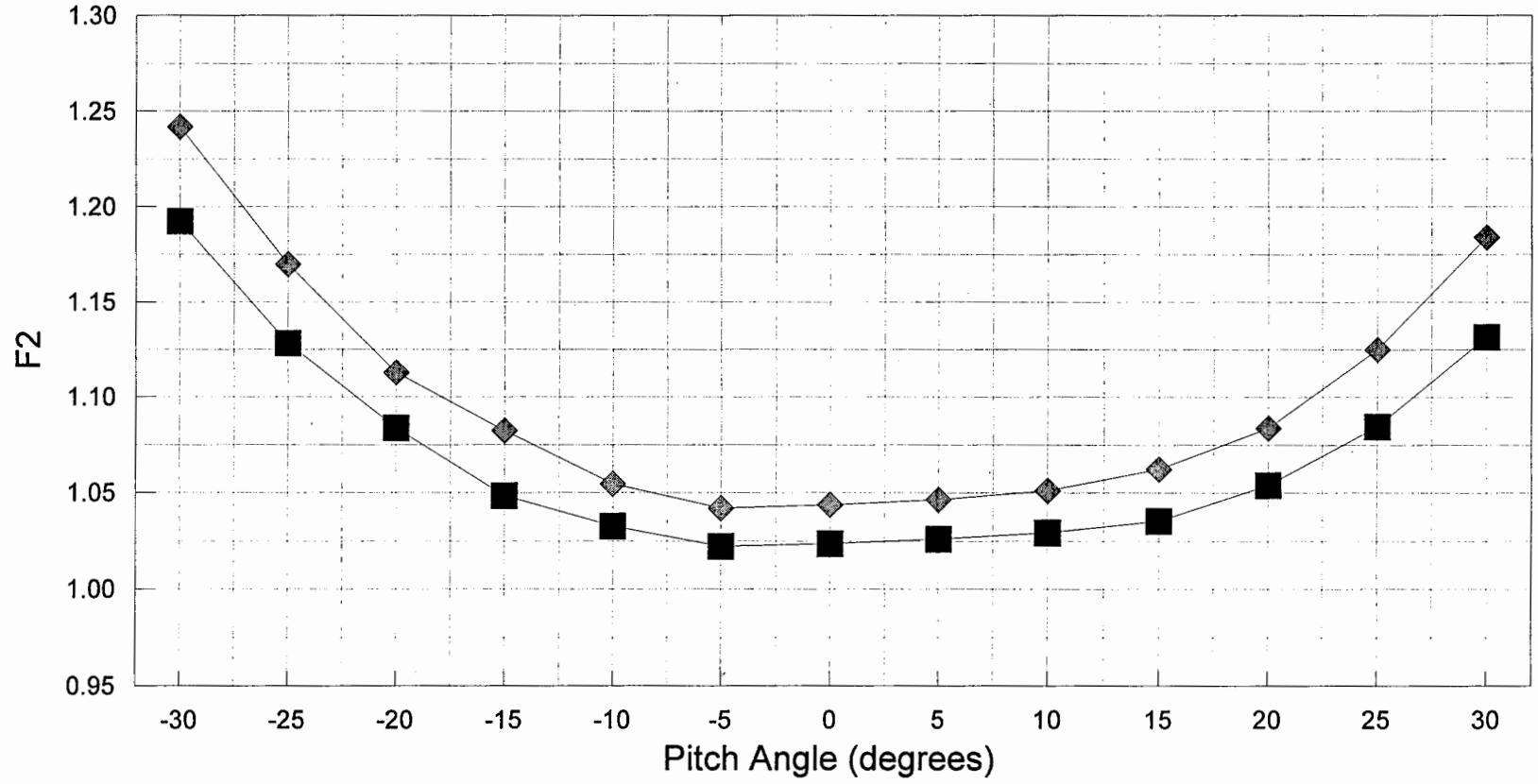
Figure C2-50. Spherical Probe (SPH-8): Avg. (30-60 fps) F1 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

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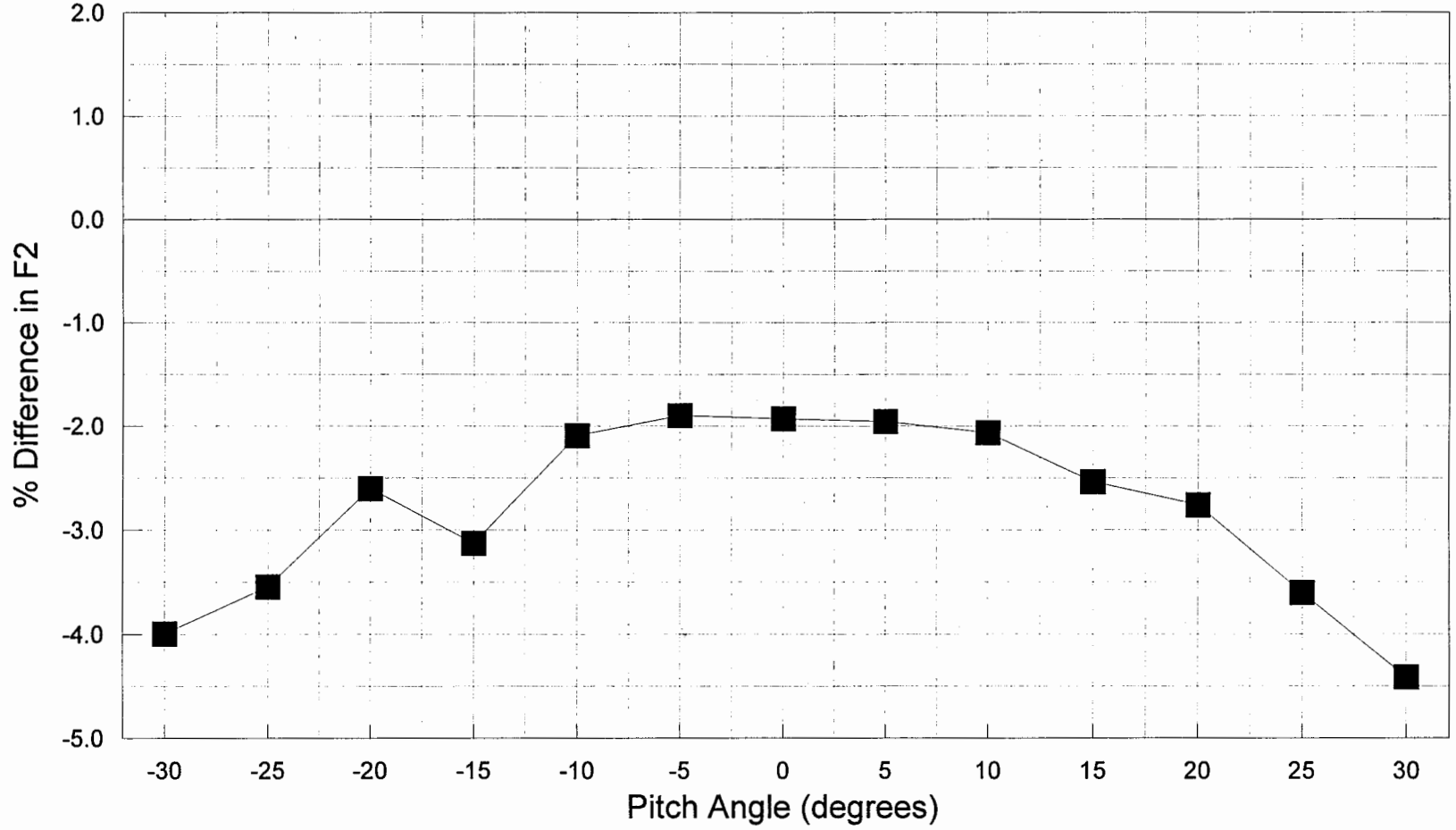
Figure C2-51. Spherical Probe (SPH-8): Avg. (30-60 fps) F2 vs. Pitch Angle
NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

Figure C2-52. Spherical Probe (SPH-8): Percent Difference in F2

NCSU Post-Test and NIST Wind Tunnel Calibrations



Note: Each point represents the mean of three replicates.

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Table C2-53. Spherical Probe SPH-8: NIST vs. Post-Test Calibrations at NC State Wind Tunnel

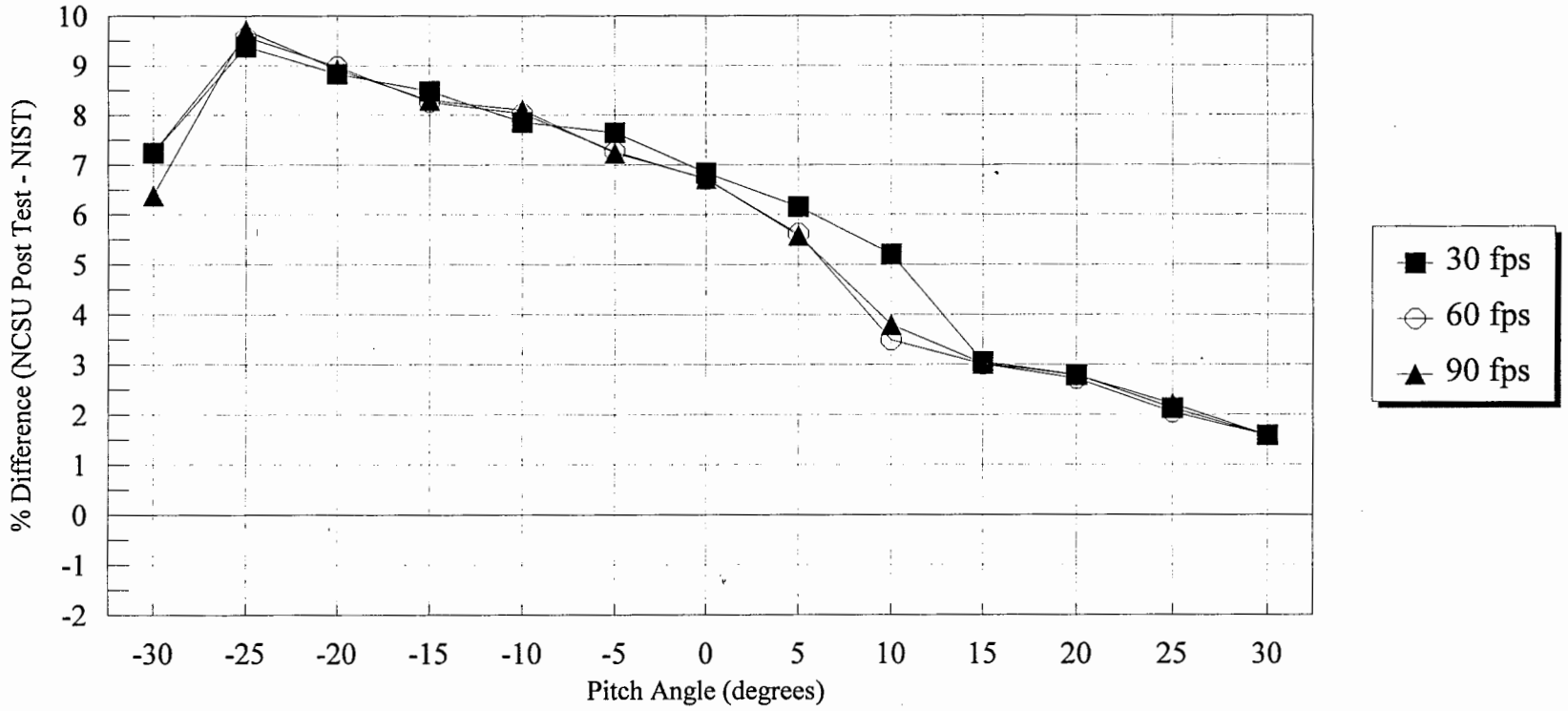
	30 fps / NIST / 30-60 Calibration			30 fps / November / 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	27.42	28.41	25.18	29.21	30.94	27.00	6.53	8.91	7.24
-25	22.14	29.10	26.94	24.92	32.51	29.47	12.57	11.73	9.38
-20	17.75	29.72	28.31	19.20	32.63	30.81	8.18	9.76	8.83
-15	14.89	30.14	29.12	15.90	32.85	31.59	6.77	9.00	8.48
-10	8.51	30.38	29.91	9.77	32.90	32.26	14.85	8.30	7.86
-5	5.07	30.48	30.31	6.43	32.93	32.63	26.92	8.03	7.65
0	1.59	30.79	30.78	2.17	32.91	32.88	36.87	6.86	6.84
5	4.42	30.99	30.88	5.29	32.97	32.78	19.66	6.39	6.16
10	7.91	31.08	30.73	9.65	32.87	32.33	21.96	5.75	5.20
15	15.86	31.66	30.45	17.26	32.86	31.38	8.87	3.80	3.06
20	21.43	31.61	29.43	21.77	32.57	30.25	1.58	3.04	2.80
25	25.93	31.80	28.60	26.80	32.72	29.21	3.36	2.90	2.13
30	30.04	31.47	27.24	30.04	31.97	27.67	0.00	1.59	1.59

	60 fps / NIST / 30-60 Calibration			60 fps / November / 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	28.69	53.51	46.95	30.11	58.21	50.35	4.96	8.78	7.25
-25	23.59	55.63	50.98	26.51	62.42	55.86	12.39	12.22	9.58
-20	18.58	55.65	52.75	20.32	61.30	57.49	9.33	10.15	8.98
-15	13.25	55.73	54.24	14.40	60.63	58.73	8.69	8.80	8.27
-10	6.64	56.37	55.99	8.53	61.16	60.48	28.59	8.50	8.02
-5	2.75	57.09	57.01	3.76	61.31	61.15	36.77	7.38	7.27
0	2.08	57.52	57.47	2.36	61.38	61.33	13.44	6.72	6.71
5	6.49	57.94	57.54	8.40	61.49	60.78	29.39	6.13	5.62
10	12.75	58.75	57.29	15.09	61.41	59.29	18.35	4.54	3.49
15	17.01	59.32	56.73	18.06	61.46	58.43	6.17	3.60	3.00
20	21.82	59.31	55.06	22.20	61.09	56.55	1.74	3.00	2.72
25	26.33	59.44	53.27	27.26	61.16	54.36	3.52	2.89	2.05
30	30.05	58.53	50.66	30.05	59.46	51.47	0.00	1.59	1.59

	90 fps / NIST / 30-60 Calibration			90 fps / November / 30-60 Calibration			% Change		
Pitch Angle	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle (degrees)	Directional Velocity (fps)	Axial Velocity (fps)	Resultant Angle	Directional Velocity	Axial Velocity
-30	29.62	80.53	69.99	30.10	86.07	74.46	1.62	6.88	6.39
-25	24.05	82.45	75.30	26.98	92.70	82.61	12.21	12.43	9.71
-20	18.36	82.88	78.66	20.03	91.20	85.68	9.07	10.04	8.93
-15	14.42	83.03	80.41	15.20	90.24	87.08	5.41	8.69	8.30
-10	7.63	83.78	83.04	9.83	91.10	89.76	28.91	8.74	8.10
-5	2.74	84.92	84.80	3.72	91.15	90.94	35.50	7.34	7.24
0	1.21	85.67	85.65	1.03	91.42	91.41	-14.25	6.71	6.72
5	6.60	86.37	85.76	8.48	91.65	90.54	28.43	6.11	5.58
10	11.77	87.12	85.28	14.28	91.35	88.52	21.26	4.85	3.80
15	16.23	87.90	84.39	17.52	91.18	86.94	7.93	3.73	3.02
20	21.49	87.27	81.20	21.83	89.91	83.46	1.60	3.03	2.79
25	25.51	87.04	78.55	26.32	89.57	80.29	3.18	2.92	2.21
30	30.09	86.66	74.98	30.09	88.03	76.17	0.00	1.59	1.59

Figure C2-53. Spherical Probe SPH-8: Percent Differences in NCSU Post-Test and NIST Calibrations

Based on Computed Axial Velocities Using 30-60 fps Averaged Calibration Data



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Table C2-54. SPH-8 Computations: 30 fps

Probe: **Spherical SPH-8 / NIST 30-60 Calibration**
Velocity Point: **30 fps** Cal Date: 03/04/98

Number Of Points:	39		
Barometric Pressure, in. Hg:	29.83	Probe ID:	SPH-8
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.83	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.58%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**29.07**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	15.6	**Volumetric Air Flow Rate,**	
Average Resultant Angle:	15.6	**SCFM Wet:**	
Resultant Angle Standard Deviation:	9.51		0

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	0.8	-0.350	0.163	88	-24.5	24.5	0.1729	28.43	25.87
	-25	0.8	-0.330	0.180	88	-20.6	20.6	0.1795	28.97	27.11
	-20	-0.3	-0.300	0.195	88	-17.3	17.3	0.1873	29.59	28.25
	-15	-0.3	-0.250	0.205	88	-12.9	12.9	0.1892	29.74	28.99
	-10	-0.3	-0.080	0.214	88	-0.8	0.9	0.1958	30.25	30.25
	-5	-0.3	-0.060	0.219	88	0.4	0.5	0.2013	30.67	30.67
	0	-0.2	-0.020	0.220	88	2.7	2.7	0.2034	30.83	30.80
	5	-0.2	0.060	0.218	88	7.2	7.2	0.2054	30.98	30.74
	10	-1.3	0.150	0.210	89	12.6	12.7	0.2062	31.07	30.31
	15	-1.4	0.230	0.203	89	17.6	17.6	0.2082	31.22	29.75
	20	-1.7	0.300	0.195	89	22.1	22.2	0.2105	31.39	29.07
	25	-1.7	0.360	0.182	89	27.0	27.0	0.2131	31.59	28.14
	30	-1.7	0.400	0.165	89	30.0	30.0	0.2048	30.97	26.80
2	-30	2.1	-0.400	0.153	95	-30.0	30.1	0.1956	30.42	26.33
	-25	2.2	-0.350	0.170	95	-23.4	23.5	0.1773	28.97	26.57
	-20	1.2	-0.310	0.193	95	-18.1	18.1	0.1868	29.74	28.27
	-15	1.2	-0.290	0.208	94	-15.7	15.8	0.1965	30.47	29.32
	-10	-0.1	-0.260	0.213	94	-12.9	12.9	0.1966	30.48	29.71
	-5	0.3	-0.200	0.215	94	-8.1	8.1	0.1938	30.26	29.96
	0	0.3	-0.090	0.220	93	-1.3	1.3	0.2009	30.78	30.77
	5	0.4	-0.020	0.221	93	2.7	2.7	0.2043	31.04	31.01
	10	0.0	0.030	0.220	93	5.5	5.5	0.2052	31.11	30.97
	15	0.1	0.200	0.216	93	15.2	15.2	0.2173	32.01	30.89
	20	0.1	0.280	0.200	92	20.6	20.6	0.2110	31.52	29.50
	25	-1.1	0.350	0.191	92	25.4	25.4	0.2165	31.92	28.84
	30	-0.9	0.400	0.175	92	30.0	30.0	0.2172	31.98	27.69
3	-30	2.8	-0.380	0.160	92	-27.6	27.7	0.1477	26.37	23.35
	-25	2.8	-0.350	0.179	92	-22.1	22.3	0.1830	29.35	27.16
	-20	1.5	-0.310	0.196	92	-17.8	17.8	0.1892	29.85	28.41
	-15	1.5	-0.290	0.205	91	-16.0	16.0	0.1942	30.21	29.03
	-10	0.8	-0.250	0.215	91	-11.7	11.8	0.1968	30.41	29.77
	-5	0.7	-0.180	0.220	91	-6.6	6.6	0.1981	30.51	30.31
	0	0.2	-0.080	0.220	91	-0.7	0.7	0.2014	30.76	30.76
	5	0.3	-0.010	0.220	91	3.3	3.3	0.2037	30.94	30.89
	10	-0.2	0.030	0.220	91	5.5	5.5	0.2052	31.06	30.91
	15	-0.2	0.190	0.214	91	14.7	14.7	0.2144	31.74	30.70
	20	-0.4	0.300	0.203	91	21.5	21.5	0.2170	31.93	29.71
	25	-0.6	0.350	0.191	91	25.4	25.4	0.2165	31.89	28.82
	30	-1.9	0.400	0.170	90	30.0	30.1	0.2110	31.46	27.23

		Res		Vdir	Vax
Average	-30	27.42		28.41	25.18
	-25	22.14		29.10	26.94
	-20	17.75		29.72	28.31
	-15	14.89		30.14	29.12
	-10	8.51		30.38	29.91
	-5	5.07		30.48	30.31
	0	1.59		30.79	30.78
	5	4.42		30.99	30.88
	10	7.91		31.08	30.73
	15	15.86		31.66	30.45
	20	21.43		31.61	29.43
	25	25.93		31.80	28.60
	30	30.04		31.47	27.24

Table C2-55. SPH-8 Computations: 60 fps

Probe: **Spherical SPH-8 / NIST 30-60 Calibration**
Velocity Point: **60 fps** Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.83	Probe ID:	SPH-8
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.83	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.66%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	89 _F
Average Axial Velocity, ft/sec:	**54.30**	Last Row:	61
Average Yaw Angle:	1.0		
Average Pitch Angle:	16.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.2		0
Resultant Angle Standard Deviation:	9.48		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.8	-1.300	0.550	90	-27.4	27.5	0.6433	54.93	48.71
	-25	2.4	-1.300	0.630	90	-23.5	23.6	0.6577	55.54	50.91
	-20	1.3	-1.150	0.680	90	-19.0	19.0	0.6646	55.83	52.78
	-15	0.6	-0.900	0.710	90	-13.8	13.8	0.6599	55.64	54.02
	-10	0.6	-0.650	0.750	90	-7.2	7.2	0.6757	56.30	55.85
	-5	0.2	-0.500	0.770	90	-4.3	4.4	0.6941	57.06	56.90
	0	0.0	-0.290	0.770	90	-0.9	0.9	0.7043	57.48	57.47
	5	0.0	0.030	0.760	90	4.3	4.3	0.7056	57.53	57.37
	10	-0.8	0.470	0.750	90	11.6	11.6	0.7288	58.47	57.28
	15	-1.0	0.780	0.740	90	16.7	16.7	0.7534	59.45	56.94
	20	-1.2	1.000	0.700	90	20.9	21.0	0.7421	59.00	55.09
	25	-1.4	1.230	0.650	91	26.0	26.1	0.7467	59.24	53.21
	30	-2.1	1.400	0.600	91	30.0	30.1	0.7447	59.16	51.20
2	-30	2.8	-1.360	0.550	93	-28.9	29.0	0.6777	56.54	49.44
	-25	2.8	-1.300	0.630	93	-23.5	23.6	0.6577	55.69	51.03
	-20	1.5	-1.100	0.680	93	-18.2	18.2	0.6591	55.76	52.95
	-15	0.6	-0.900	0.710	93	-13.8	13.8	0.6599	55.79	54.17
	-10	0.3	-0.600	0.750	93	-6.3	6.3	0.6751	56.43	56.08
	-5	0.2	-0.300	0.760	93	-1.1	1.1	0.6945	57.23	57.22
	0	0.0	-0.060	0.760	93	2.9	2.9	0.7029	57.58	57.51
	5	0.0	0.220	0.760	93	7.4	7.4	0.7167	58.14	57.66
	10	-0.2	0.550	0.750	93	12.9	12.9	0.7381	59.00	57.52
	15	-0.7	0.800	0.730	93	17.2	17.2	0.7461	59.32	56.68
	20	-0.8	1.050	0.700	93	21.7	21.7	0.7508	59.51	55.28
	25	-0.9	1.260	0.650	93	26.5	26.6	0.7544	59.65	53.36
	30	-2.2	1.400	0.580	93	30.0	30.1	0.7198	58.27	50.42
3	-30	2.6	-1.380	0.550	92	-29.4	29.5	0.5112	49.06	42.69
	-25	2.5	-1.300	0.630	92	-23.5	23.6	0.6577	55.64	51.00
	-20	1.2	-1.100	0.670	92	-18.4	18.5	0.6512	55.37	52.51
	-15	0.4	-0.850	0.720	92	-12.1	12.1	0.6607	55.77	54.53
	-10	0.0	-0.600	0.750	92	-6.3	6.3	0.6751	56.38	56.03
	-5	0.0	-0.400	0.760	92	-2.8	2.8	0.6897	56.98	56.91
	0	0.0	-0.080	0.760	92	2.5	2.5	0.7023	57.50	57.44
	5	-0.2	0.240	0.760	92	7.7	7.7	0.7181	58.14	57.61
	10	-0.3	0.600	0.740	91	13.8	13.8	0.7349	58.76	57.07
	15	-0.7	0.800	0.730	91	17.2	17.2	0.7461	59.21	56.57
	20	-1.0	1.100	0.690	91	22.7	22.8	0.7514	59.42	54.79
	25	-1.1	1.250	0.650	91	26.4	26.4	0.7518	59.44	53.25
	30	-0.2	1.450	0.580	91	30.0	30.0	0.7198	58.16	50.37

		Res		Vdir	Vax
Average	-30	28.69		53.51	46.95
	-25	23.59		55.63	50.98
	-20	18.58		55.65	52.75
	-15	13.25		55.73	54.24
	-10	6.64		56.37	55.99
	-5	2.75		57.09	57.01
	0	2.08		57.52	57.47
	5	6.49		57.94	57.54
	10	12.75		58.75	57.29
	15	17.01		59.32	56.73
	20	21.82		59.31	55.06
	25	26.33		59.44	53.27
	30	30.05		58.53	50.66

Table C2-56. SPH-8 Computations: 90 fps

Probe: **Spherical SPH-8 / NIST 30-60 Calibration**
Velocity Point: **90 fps** Cal Date: 03/04/98

Number Of Points: 39

Barometric Pressure, in. Hg:	29.83	Probe ID:	SPH-8
Static Pressure, inches H2O:	0.00	Pitot Cp:	1.00
Absolute Pressure, in. Hg:	29.83	CO2, %d:	0.00
Molecular Wt. Dry, lb/lb-mole:	28.84	O2, %d:	20.9
Molecular Wt. Wet, lb/lb-mole:	28.73	Water, %:	1
Fuel Factor, Fo:	NA	% Satur.:	4.71%
Volumetric Air Flow Rate, SCFM Dry:	0	Avg Temp:	90 _F
Average Axial Velocity, ft/sec:	**80.62**	Last Row:	61
Average Yaw Angle:	0.9		
Average Pitch Angle:	16.1	**Volumetric Air Flow Rate, SCFM Wet:**	
Average Resultant Angle:	16.1		0
Resultant Angle Standard Deviation:	9.55		

			Readings, in.H2O			<< ANGLES >>			Velocities, ft/sec	
Rep	Pitch Angle	Yaw Angle	P4-P5	P1-P2	Gas Temp, F	Pitch	Resultant	Pt-Ps	Flow Dir	Axial
1	-30	2.2	-3.000	1.200	98	-29.3	29.4	1.4975	84.42	73.58
	-25	2.2	-2.900	1.360	98	-24.3	24.4	1.4386	82.74	75.35
	-20	0.9	-2.450	1.500	98	-18.4	18.4	1.4566	83.26	79.01
	-15	0.3	-2.050	1.560	98	-14.7	14.7	1.4598	83.35	80.61
	-10	0.1	-1.500	1.650	97	-7.8	7.8	1.4873	84.05	83.28
	-5	0.0	-0.700	1.690	97	-1.3	1.3	1.5428	85.61	85.59
	0	0.0	-0.300	1.700	96	1.6	1.6	1.5674	86.21	86.17
	5	0.0	0.600	1.690	96	8.2	8.2	1.6012	87.14	86.24
	10	-0.6	1.200	1.650	95	12.8	12.8	1.6226	87.64	85.46
	15	-0.9	1.700	1.620	95	16.6	16.6	1.6485	88.34	84.64
	20	-1.0	2.300	1.520	95	21.9	21.9	1.6338	87.94	81.61
	25	-1.7	2.650	1.430	94	25.6	25.6	1.6282	87.71	79.07
	30	-2.3	3.000	1.300	93	30.0	30.1	1.6134	87.23	75.48
2	-30	3.1	-3.050	1.190	95	-30.0	30.1	1.5210	84.85	73.37
	-25	1.7	-2.900	1.380	95	-23.9	24.0	1.4511	82.88	75.72
	-20	0.5	-2.500	1.500	96	-18.7	18.7	1.4620	83.26	78.86
	-15	0.1	-2.050	1.570	96	-14.6	14.6	1.4673	83.41	80.73
	-10	0.0	-1.500	1.660	96	-7.7	7.7	1.4962	84.23	83.47
	-5	0.0	-1.050	1.690	97	-4.0	4.0	1.5258	85.14	84.93
	0	-0.3	-0.500	1.690	97	0.2	0.3	1.5521	85.87	85.87
	5	-0.3	0.030	1.690	98	4.1	4.1	1.5679	86.38	86.16
	10	-0.4	1.000	1.670	99	11.2	11.2	1.6175	87.81	86.14
	15	-0.5	1.650	1.630	99	16.2	16.2	1.6530	88.77	85.25
	20	-1.3	2.200	1.530	99	21.0	21.1	1.6245	88.00	82.12
	25	-1.2	2.600	1.430	100	25.2	25.2	1.6153	87.83	79.46
	30	-2.6	2.950	1.290	100	30.0	30.1	1.6010	87.44	75.65
3	-30	2.4	-3.000	1.200	86	-29.3	29.4	1.1229	72.31	63.02
	-25	2.1	-2.850	1.370	86	-23.7	23.8	1.4348	81.74	74.81
	-20	0.6	-2.400	1.500	85	-18.0	18.0	1.4511	82.13	78.11
	-15	0.2	-2.000	1.570	84	-13.9	13.9	1.4605	82.32	79.89
	-10	0.2	-1.450	1.650	84	-7.4	7.4	1.4867	83.05	82.36
	-5	-0.1	-0.900	1.680	83	-2.9	2.9	1.5237	84.00	83.90
	0	-0.1	-0.300	1.690	83	1.6	1.6	1.5581	84.94	84.91
	5	-0.3	0.500	1.680	82	7.5	7.5	1.5853	85.60	84.87
	10	-0.3	1.000	1.650	81	11.3	11.3	1.5995	85.91	84.24
	15	-0.9	1.580	1.610	80	15.8	15.9	1.6281	86.59	83.29
	20	-1.0	2.220	1.500	79	21.5	21.5	1.6037	85.86	79.88
	25	-1.1	2.600	1.400	78	25.6	25.7	1.5955	85.56	77.13
	30	-2.3	3.000	1.280	77	30.0	30.1	1.5886	85.30	73.81

		Res	Vdir	Vax
Average	-30	29.62	80.53	69.99
	-25	24.05	82.45	75.30
	-20	18.36	82.88	78.66
	-15	14.42	83.03	80.41
	-10	7.63	83.78	83.04
	-5	2.74	84.92	84.80
	0	1.21	85.67	85.65
	5	6.60	86.37	85.76
	10	11.77	87.12	85.28
	15	16.23	87.90	84.39
	20	21.49	87.27	81.20
	25	25.51	87.04	78.55
	30	30.09	86.66	74.98

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Appendix C3.
Supporting Data for First-Order Error Analysis of Engineering Methods

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First-order error analysis provides the total uncertainty in a single measurement of volumetric flow generated by a specific engineering method. The analysis consists of several steps. First, an equation providing an approximation (to first order) of the error in a single calculation of volumetric flow is derived. The first-order equation propagates the error in each term of the engineering method equation into an error in the calculation in volumetric flow. Assuming independence among the input parameters for each of the engineering method calculations, the overall (resulting) uncertainty in the calculated flow rate can be determined from the uncertainties in the primary measurement parameters (such as temperature and pressure) using the following approach:

$$U(R) = \{[\theta_1 U(x_1)]^2 + [\theta_2 U(x_2)]^2 + ... + [\theta_n U(x_n)]^2\}^{0.5}$$

where:

$U(R)$ = Resulting coefficient of variation in calculated volumetric or mass flow rate of flue gas;
θ_i = Sensitivity coefficient for the i-th parameter, i = 1 to n;
$U(x_i)$ = Measurement uncertainty in the i-th parameter as represented by the sampling variance of the parameter, i = 1 to n;
x_i = the i-th parameter, i = 1 to n; and
n = the total number of parameters.

Sensitivity coefficients for the stoichiometry-based engineering methods were determined by differentiation, while sensitivity testing of the engineering equation was used to determine the sensitivity coefficients for the BTCE method. This analysis was performed using the HEATRT computer code developed by the Energy Research Center at Lehigh University.

Table C3-1 presents the test data used in the engineering methods at each test site. Average values for each of the parameters were calculated from the raw data.

Table C3-2 presents a statistical representation—the coefficient of variation (CV)—of the uncertainty in each of these parameters at each test site. The CV, expressed as a percent, is calculated by CV = standard deviation divided by the mean times 100.

Figures C3-1 through C3-3 present the volumetric flow values calculated according to the engineering methods for DeCordova (Figure C3-1), Lake Hubbard high-load runs (Figure C3-2), and Homer City (Figure C3-3). The error bars on each value represent the coefficient of variation.

Table C3-1. Average of Test Measurements Used as Input to Engineering Methods for Post-Test First-Order Error Analysis

Measured Values—Full Load Tests			
Test Site Inputs[a]	**DeCordova**	**Lake Hubbard**	**Homer City[b]**
Load (MWe)	784.90	508.80	650.10
Fuel Flow (scfm), (lb/h)	121,941	80,963	481,080

Table C3-1. Average of Test Measurements Used as Input to Engineering Methods for Post-Test First-Order Error Analysis

Measured Values—Full Load Tests			
Test Site Inputs[a]	**DeCordova**	**Lake Hubbard**	**Homer City[b]**
HHV (Btu/scf), (Btu/lb)	1,027	1,030	12,387
$O_{2,econ}$ (%)	1.47	2.02	2.66
$CO_{2,stack}$ (%)	8.27	7.73	12.51
$O_{2,stack}$ (%)	2.57	3.57	5.17
H_2O_{stack} (%)	17.24	16.61	6.96
Fuel C (lb/lb AR)	72.47	72.17	69.04
Fuel H (lb/lb AR)	23.68	23.44	4.49
Fuel S (lb/lb AR)	0.00	0.00	1.62
Fuel O (lb/lb AR)	0.77	1.20	4.23
Fuel N (lb/lb AR)	3.10	3.23	1.11
Fuel Moisture (lb/lb AR)	–	–	8.09
Fuel Ash (lb/lb AR)	–	–	11.42

[a] AR = as received.
[b] Run 31 was excluded.

Table C3-2. Uncertainty in Test Measurements Used as Input to Engineering Methods for Post-Test First-Order Error Analysis

CV(%) Full Load Tests			
	DeCordova	**Lake Hubbard**	**Homer City[a]**
Test Site Inputs	**Individual Measurements**		
Load	0.05	0.11	0.57
Fuel Flow	0.18	0.44	1.96
HHV	0.12	0.27	1.93
$O_{2,econ}$	3.23	6.64	4.52
$CO_{2,stack}$	1.60	1.15	0.95
$O_{2,stack}$	5.23	3.98	2.11
H_2O_{stack}	2.31	2.34	6.74
Fuel C	0.08	0.30	1.93
Fuel H	0.10	0.62	2.18
Fuel S	–	–	11.76
Fuel O	5.05	15.28	11.16
Fuel N	2.77	7.37	5.06
Fuel Moisture	–	–	7.33
Fuel Ash	–	–	10.15

[a] Run 31 was excluded.

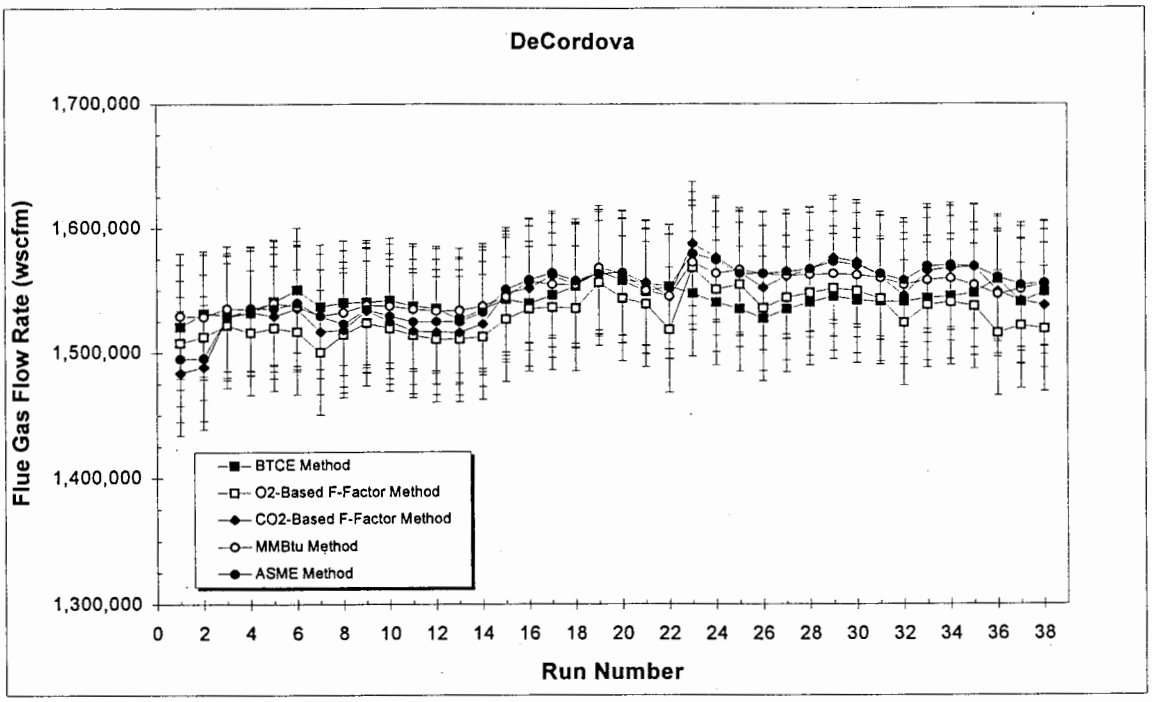


Figure C3-1. Volumetric flow values obtained using engineering methods at DeCordova.

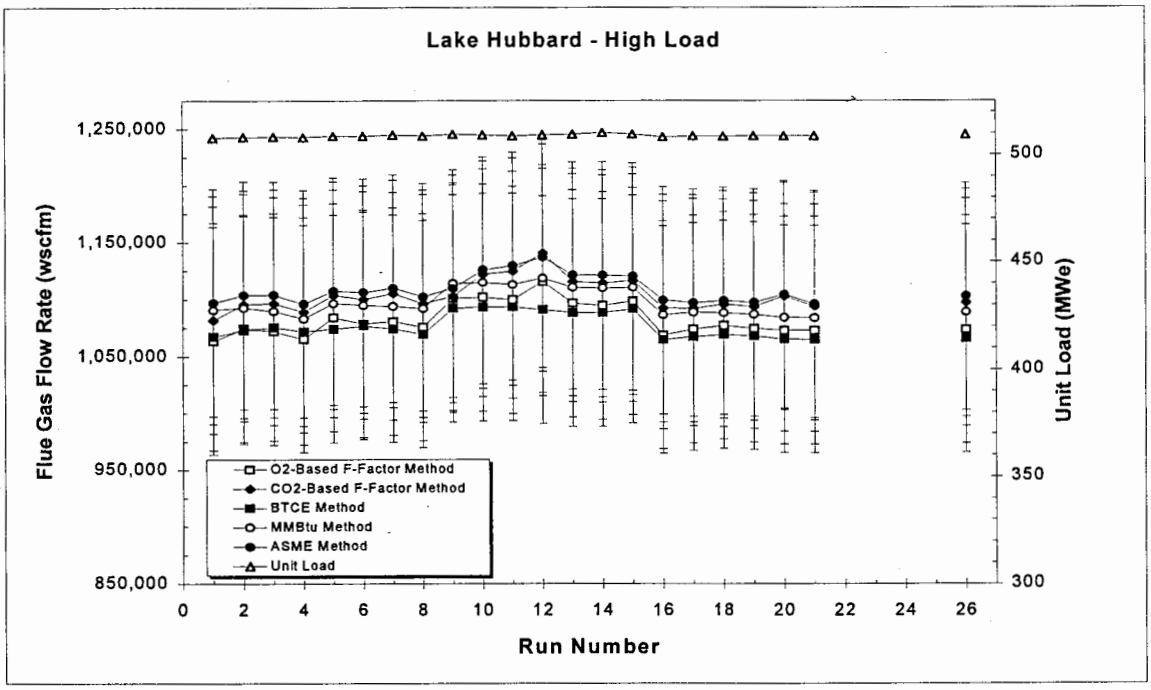


Figure C3-2. Volumetric flow values obtained using engineering methods at Lake Hubbard during high load.

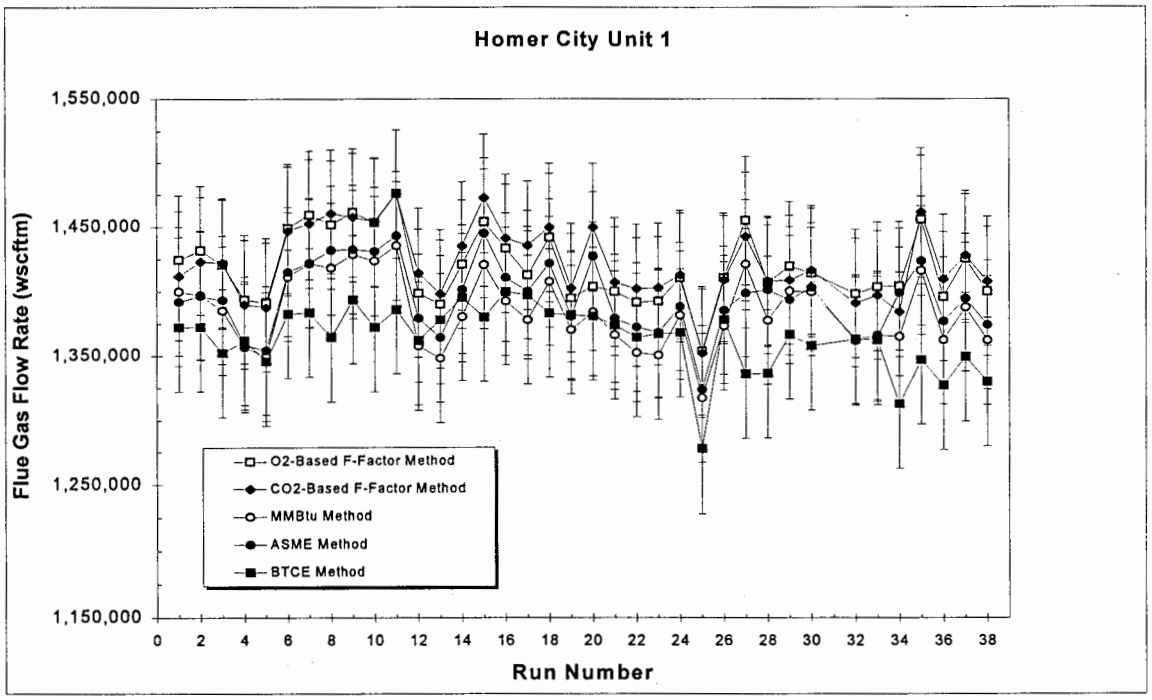


Figure C3-3. Volumetric flow values obtained using engineering methods at Homer City.

Appendix D.
Rank Order Tables

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Table D-1. DeCordova Rank Order of Volumetric Flow Across All Methods for Matrix A (Runs 1-8)

Method	Run								Rank	
	1	2	3	4	5	6	7	8	Median	Range
DAT	13	10	11	1	1	12	10	13	10.5	12
Type S Straight-up	11	13	13	13					13	2
Type S Yaw-nulled	10	14	14	11					12.5	4
Modified Kiel	14	12	12	14					13	3
Spherical	12	11	10	12					11.5	1
Prandtl					14	14	14	14	14	0
French					13	13	13	6	13	7
Manual Autoprobe 16 Pt. Straight-up					12	11	8	12	11.5	4
Manual Autoprobe 16 Pt. Yaw-nulled					11	10	12	11	11	2
Baseline Autoprobes 16 Pt. Straight-up	8	9	9	10	9	9	9	10	9	2
Baseline Autoprobes 16 Pt. Yaw-nulled	9	8	8	9	10	8	11	9	9	3
Baseline Autoprobes 48 Pt. Straight-up	7	7	7	8	7	7	6	8	7	2
Baseline Autoprobes 48 Pt. Yaw-nulled	6	6	6	7	8	6	7	7	6.5	2
O_2 F-Factor	3	3	1	2	2	1	1	1	1.5	2
CO_2 F-Factor	1	1	2	4	3	2	2	2	2	3
MMBtu	5	4	5	5	5	3	4	4	4.5	2
ASME PTC 4.1	2	2	3	6	4	4	3	3	3	4
BTCE	4	5	4	3	6	5	5	5	5	3

Table D-2. DeCordova Rank Order Summary of Volumetric Flow for Matrix A Runs (1-8)

Method	Rank Median	Rank Range		
		Maximum	Minimum	Difference
Prandtl	14.0	14	14	0
Modified Kiel	13.0	14	12	2
Type S Straight-up	13.0	13	11	2
French	13.0	13	6	7
Type S Yaw-nulled	12.5	14	10	4
Spherical	11.5	12	10	2
Manual Autoprobe 16 Pt. Straight-up	11.5	12	8	4
Manual Autoprobe 16 Pt. Yaw-nulled	11.0	12	10	2
DAT	10.5	13	1	12
Baseline Autoprobes 16 Pt. Straight-up	9.0	10	8	2
Baseline Autoprobes 16 Pt. Yaw-nulled	9.0	11	8	3
Baseline Autoprobes 48 Pt. Straight-up	7.0	8	6	2
Baseline Autoprobes 48 Pt. Yaw-nulled	6.5	8	6	2
BTCE	5.0	6	3	3
MMBtu	4.5	5	3	2
ASME PTC 4.1	3.0	6	2	4
CO_2 F-Factor	2.0	4	1	3
O_2 F-Factor	1.5	3	1	2

Table D-3. Lake Hubbard Rank Order of Volumetric Flow Across All Methods for Matrix A (High-Load Runs 1-8)

Method	Run								Rank	
	1	2	3	4	5	6	7	8	Median	Range
DAT	1	9	7	12	4	1	8	5	6	11
Type S Straight-up	13	13	14	13					13.5	1
Type S Yaw-nulled	12	12	13	2					12	11
Modified Kiel	14	14	12	14					14	2
Spherical	2	1	1	1					1	1
Prandtl					14	14	12	12	13	2
French					2	11	1	1	1.5	10
Manual Autoprobe 16 Pt. Straight-up					13	9	10	14	11.5	5
Manual Autoprobe 16 Pt. Yaw-nulled					8	7	5	7	7	3
Baseline Autoprobes 16 Pt. Straight-up	11	10	10	11	10	12	14	11	11	4
Baseline Autoprobes 16 Pt. Yaw-nulled	7	5	8	7	6	5	9	6	6.5	4
Baseline Autoprobes 48 Pt. Straight-up	8	6	5	9	7	6	7	9	7	4
Baseline Autoprobes 48 Pt. Yaw-nulled	5	4	4	5	3	4	3	4	4	2
O_2 F-Factor	3	3	2	3	5	3	4	3	3	3
CO_2 F-Factor	6	8	9	8	11	10	11	10	9.5	5
MMBtu	9	7	6	6	9	8	6	8	7.5	3
ASME PTC 4.1	10	11	11	10	12	13	13	13	11.5	3
BTCE	4	2	3	4	1	2	2	2	2	3

Table D-4. Lake Hubbard Rank Order of Volumetric Flow for Matrix A (High Load Runs 1-8)

Method	Rank Median	Rank Range		
		Maximum	Minimum	Difference
Modified Kiel	14.0	14	12	2
Type S Straight-up	13.5	14	13	1
Prandtl	13.0	14	12	2
Type S Yaw-nulled	12.0	13	2	11
ASME PTC 4.1	11.5	13	10	3
Manual Autoprobe 16 Pt. Straight-up	11.5	14	9	5
Baseline Autoprobes 16 Pt. Straight-up	11.0	14	10	4
CO_2 F-Factor	9.5	11	6	5
MMBtu	7.5	9	6	3
Baseline Autoprobes 48 Pt. Straight-up	7.0	9	5	4
Manual Autoprobe 16 Pt. Yaw-nulled	7.0	8	5	3
Baseline Autoprobes 16 Pt. Yaw-nulled	6.5	9	5	4
DAT	6.0	12	1	11
Baseline Autoprobes 48 Pt. Yaw-nulled	4.0	5	3	2
O_2 F-Factor	3.0	5	2	3
BTCE	2.0	4	1	3
French	1.5	11	1	10
Spherical	1.0	2	1	1

Table D-5. Homer City Rank Order of Volumetric Flow Across All Methods for Matrix A (High-Load Runs 1-8)

Method	Run								Rank	
	1	2	3	4	5	6	7	8	Median	Range
DAT	11	2	7	3	4	8	7	2	5.5	9
Type S Straight-up	14	14	14	14					14	0
Type S Yaw-nulled	6	8	13	13					10.5	7
Modified Kiel					11	3	8	8	8	8
Spherical A[a]	2	5	5	5					5	3
Spherical B[a]	1	7	6	4					5	6
French					3	1	1	7	2	6
Manual Autoprobe 16 Pt. Straight-up					14	13	13	13	13	1
Manual Autoprobe 16 Pt. Yaw-nulled					10	6	6	6	6	4
Baseline Autoprobes 12 Pt. Straight-up	13	13	11	12	12	14	14	14	13	3
Baseline Autoprobes 12 Pt. Yaw-nulled	5	4	2	10	6	5	4	3	4.5	8
Baseline Autoprobes 16 Pt. Straight-up	12	12	12	11	13	12	12	12	12	2
Baseline Autoprobes 16 Pt. Yaw-nulled	4	3	4	6	5	4	3	4	4	3
O_2 F-Factor	10	11	8	9	9	11	11	9	9.5	3
CO_2 F-Factor	8	9	9	8	8	10	10	10	8.5	2
MMBtu	7	6	3	1	2	7	5	5	5	6
ASME PTC 4.1	9	10	10	7	7	9	9	11	9	4
BTCE	3	1	1	2	1	2	2	1	1.5	2

[a] Spherical A = spherical probe copies SPH-1, SPH-2, SPH-3, and SPH-4;
Spherical B = spherical probe copies SPH-5, SPH-6, SPH-7, and SPH-8.

Table D-6. Homer City Rank Order Summary of Volumetric Flow Matrix A (High-Load Runs 1-8)[a]

Method[b]	Rank Median	Rank Range		
		Minimum	Maximum	Difference
Type S Straight-up	14.0	14	14	0
Manual Autoprobe 16 Pt. Straight-up	13.0	13	14	1
Baseline Autoprobes 12 Pt. Straight-up[c]	13.0	11	14	3
Baseline Autoprobes 16 Pt. Straight-up	12.0	11	13	2
Type S Yaw-nulled	10.5	6	13	7
O_2 F-Factor	9.5	8	11	3
ASME PTC 4.1	9.0	7	11	4
CO_2 F-Factor	8.5	8	10	2
Modified Kiel	8.0	3	11	8
Manual Autoprobe 16 Pt. Yaw-nulled	6.0	6	10	4
DAT	5.5	2	11	9
Spherical B	5.0	1	7	6
Spherical A	5.0	2	5	3
MMBtu	5.0	1	7	6
Baseline Autoprobes 12 Pt. Yaw-nulled	4.5	2	10	8
Baseline Autoprobes 16 Pt. Yaw-nulled	4.0	3	6	3
French	2.0	1	7	6
BTCE	1.5	1	3	2

[a] At Homer City, 20-point traverses (results not shown in table) instead of 48-point traverses were performed by the baseline Autoprobes for comparison with results for 12- and 16-point traverses.

[b] Prandtl probes were not tested at Homer City because the 0.035-in. I.D. static pressure ports could become clogged with particulate matter at this site.

[c] Twelve-point traverses were performed by the Baseline Autoprobes at Homer City for comparison with results for 16- and 20-point traverses.

Appendix E.
Analysis of Variance

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ANALYSIS OF VARIANCE

The analysis of variance (ANOVA) models, the classes of probes defined in the Matrix A ANOVA, and a description of the multiple comparison method used to test whether the mean volumetric flow values significantly differ from each other are presented in this appendix.

ANOVA Models

Two distinct ANOVA models were used to analyze the Matrix A and Matrix B data. The models are defined in the next two subsections.

Matrix A Runs

The ANOVA model used to analyze the Matrix A data is as follows:

$$F_{ijk} = \mu + P_i + T_j + \varepsilon_{ijk}$$

where

F_{ijk} = volumetric flow (wscfm), i = 1...9, j=1...5, k=1...4;
μ = overall mean;
P_i = probe type effect, i = 1 to 9;
T_j = test team effect, j = 1 to 5; and
ϵ_{ijk} = random error, k=1 to 4.

Matrix B Runs

The ANOVA model used to analyze the Matrix B data is as follows:

$$F_{ijk} = \mu + C_i + T_j + (PT)_{ij} + \varepsilon_{ijk}$$

where

F_{ijk} = volumetric flow (wscfm), i = 1...9, j=1...5, k=1...4;
μ = overall mean;
C_i = probe copy effect, i = 1 to 4;
T_j = test team effect, j = 1 to 4;
$(PT)_{ij}$ = probe copy and test team interaction effect; and
ϵ_{ijk} = random error, k=1 to 4.

Probe Classes

For the Matrix A ANOVA, methods for determining volumetric flow were grouped into classes. The first variation of the approach (Variant 1) created separate classes for the one-dimensional, two-dimensional, and three-dimensional probes, and for the French probe and engineering methods. A second set of classes (Variant 2) that analyzed only the in-stack methods and separated the Autoprobes from their manual counterparts was also created. The classes occurring in each variant and the runs used in the analyses are presented for Variant 1 in Table E-1 and for Variant 2 in Table E-2.

Table E-1. Class Definitions for Variant 1

Class	Method	Runs of Available Data Used			
		DeCordova	Lake Hubbard High Load	Lake Hubbard Low Load	Homer City
1D	Type S Straight up	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24 ,25	1, 2, 3, 4
	Baseline Autoprobes 16 Pt. Straight up	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24 ,25	1, 2, 3, 4
	Manual Autoprobe 16 Pt. Straight up	5, 6, 7, 8	5, 6, 7, 8	NA	5, 6, 7, 8
	Prandtl	5, 6, 7, 8	5, 6, 7, 8	NA	NA
F	French	5, 6, 7, 8	5, 6, 7, 8	NA	5, 6, 7, 8
2D	Type S Yaw nulled	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24, 25	1, 2, 3, 4
	Baseline Autoprobes 16 Pt. Yaw nulled	1, 2, 3 ,4	1, 2, 3 ,4	22, 23, 24, 25	1, 2, 3 ,4
	Manual Autoprobe 16 Pt. Yaw nulled	5, 6, 7, 8	5, 6, 7, 8	NA	5, 6, 7, 8
	Modified Kiel	1, 2, 3, 4	1, X[a], 3, 4	22, 23, 24, 25	5, 6, 7, 8
3D	DAT	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24, 25	1, 2, 3, 4
	Spherical	1, 2, Y[b], 4	1, 2, 3, 4	22, 23, 24, 25	1, 2, 3, 4
E	O_2 F-Factor	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24 ,25	1, 2, 3, 4
	CO_2 F-Factor	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24 ,25	1, 2, 3, 4
	MMBtu	1, 2, 3 ,4	1, 2, 3 ,4	22, 23, 24 ,25	1, 2, 3 ,4
	ASME PTC 4.1	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24 ,25	1, 2, 3, 4
	BTCE	1, 2, 3 ,4	1, 2, 3 ,4	22, 23, 24 ,25	1, 2, 3 ,4

[a] The flow value for Run 2 measured by the modified Kiel (MK-4) at Lake Hubbard was not valid due to a bent probe. The average of the values for Runs 1, 3, and 4 by the modified Kiel probes was therefore used in the analysis.

[b] The flow value for Run 3 measured by the spherical probe at DeCordova was not available due to a damaged probe. The average of the values for the spherical probe data from Runs 34, 35, 37, and 38 was used therefore used in the analysis.

Table E-2. Class Definitions for Variant 2

Class	Method	Runs of Available Data Used			
		DeCordova	Lake Hubbard High Load	Lake Hubbard Low Load	Class
$1D_m$	Type S Straight up	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24 ,25	1, 2, 3, 4
	Prandtl	5, 6, 7, 8	5, 6, 7, 8	N/A	N/A
F	French	5, 6, 7, 8	5, 6, 7, 8	N/A	5, 6, 7, 8
$2D_m$	Type S Yaw nulled	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24 ,25	1, 2, 3, 4
	Modified Kiel	1, 2, 3, 4	1, X[a], 3, 4	22, 23, 24 ,25	5, 6, 7, 8
$IV3D_m$	DAT	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24 ,25	1, 2, 3, 4
	Spherical	1, 2, Y[b], 4	1, 2, 3, 4	22, 23, 24, 25	1, 2, 3, 4
$1D_a$	Baseline Autoprobes 16 Pt. Straight up	1, 2, 3, 4	1, 2, 3, 4	22, 23, 24 ,25	1, 2, 3, 4
	Manual Autoprobe 16 Pt. Straight up	5, 6, 7, 8	5, 6, 7, 8	N/A	5, 6, 7, 8
$2D_a$	Baseline Autoprobes 16 Pt. Yaw nulled	1, 2, 3 ,4	1, 2, 3 ,4	22, 23, 24 ,25	1, 2, 3 ,4
	Manual Autoprobe 16 Pt. Yaw nulled	5, 6, 7, 8	5, 6, 7, 8	N/A	5, 6, 7, 8

[a] The flow value for Run 2 measured by the modified Kiel (MK-4) at Lake Hubbard was not valid due to a bent probe. The average of the values for Runs 1, 3, and 4 by the modified Kiel probes was therefore used in the analysis.

[b] The flow value for Run 3 measured by the spherical probe at DeCordova was not available due to a damaged probe. The average of the values for the spherical probe data from Runs 34, 35, 37, and 38 was used therefore used in the analysis.

Multiple Means Comparison Tests

Introduction

When comparing more than two means, an ANOVA reveals whether the means significantly differ from each other, but not which means differ from the others. Multiple comparison methods (which are also referred to as *means separation tests*) provide information about differences among means. Many multiple comparison methods are available, including Fisher's least significant difference method, Duncan's multiple range test, Tukey's studentized range test, Dunnett's comparison of all treatments to a control, and others. The following narrative briefly describes the Duncan's multiple range test, which was used in this study, followed by a brief discussion of the advantages and disadvantages of this test and other multiple comparison methods.

Duncan's multiple range test

Suppose that, following an ANOVA where the null hypothesis is rejected (i.e., the means are significantly different), we wish to test H_o: $\mu_i = \mu_j$ for all i≠j, and i, j = 1...a. For a test in which the sample sizes are equal, Duncan's multiple range test arranges the a treatment means in ascending order, and the standard error of each mean is determined as

$$S_{\bar{y}_{i.}} = \sqrt{\frac{MS_E}{n}}$$

where

$S_{\bar{y}_{i.}}$ = standard error of each treatment average;
MS_E = mean squared error obtained from the ANOVA; and
n = the sample size.

For unequal sample sizes, n in the above equation is replaced by the harmonic mean n_h of $\{n_i\}$,

where

$$n_h = \frac{a}{\sum_{i=1}^{a}\left(\frac{1}{n}\right)}$$

Note that if $n_1 = n_2 = ... = n_a$, then $n_h = n$.

The test statistic in Duncan's multiple range test is the difference between means as denoted in the following:

$$t.s. = y_{i.} - y_{j.}$$

where

$t.s.$ = test statistic;

$\bar{y}_{i.}$ = average response at treatment level i, i = 1...a; and

$\bar{y}_{j.}$ = average response at treatment level j, j≠i, i = 1...a.

The critical value is calculated by the following steps:

- From Duncan's table of significant ranges (which can be found in most statistics books), obtain the values $r_\alpha(p,f)$ for p = 2,3,...a, where α is the significance level and f is the number of degrees of freedom for error.

- Convert these ranges into a set of a-1 least significant ranges (e.g., R_p) for p = 2,3,...a by calculating

$$R_p = r_\alpha(p,f)\ S_{\bar{y}_{i.}}$$

The Duncan's multiple range test can now be performed using the test statistics and the critical values obtained above. The observed differences between means are tested, beginning with the largest versus the smallest, which would be compared with the least significant range R_a (taking p = a). Next, the difference of the largest and the second smallest is computed and compared with the least significant range R_{a-1} (taking p = a-1). This process is continued until the differences of all possible $a(a$-1)/2 pairs of means have been considered. If an observed difference (test statistic) is greater than the corresponding least significant range (critical value), then the pair of means in question is significantly different. To prevent contradictions, no differences between a pair of means are considered significant if the two means involved fall between two other means that do not differ significantly.

Discussion

The problem inherent in multiple comparisons is the overall error rate. Suppose there are ten means and each pair of means is tested at the α = 0.05 level. There are 10(10-1)/2 = 45 pairs of means to compare, each with a 0.05 probability of a type I error (a false rejection of the null hypothesis, i.e., when the two mean flow values are not significantly different but one concludes that they are). The chance of making at least one type I error is much higher than 0.05. Calculating the exact probability is difficult, but a conservative approximation can be derived by assuming the comparisons are independent, giving an upper bound to the probability of making at least one type I error (the experiment-wise error rate) of

$$1-(1-0.05)^{45} = 0.90.$$

The actual probability is somewhat less than 0.90, but as the number of means increases, the chance of making at least one type I error approaches 1.

Whether to control the individual type I error rate for each comparison (also referred to as the comparison-wise error rate) or the overall type I error rate for all the comparisons (also referred to as the experiment-wise error rate) is the prerogative of the investigator. A smaller type I error rate, however, will generally result in a test of lower power (i.e., a decreased ability to detect differences in means when real differences exist). The importance between the two should be weighed and considered when choosing which multiple comparison procedure to use.

Duncan's multiple range test controls the comparison-wise error rate. Therefore, if the significance level of each individual comparison is α, then tests on means have a significance level that is greater than or equal to α. Consequently, Duncan's procedure is quite powerful; that is, it is very effective at detecting differences between means when real differences exist. The overall error rate, however, tends to be high when the number of means tested increases.

Each multiple comparison method has its own advantages and disadvantages. Fisher's least-squares difference method is a repeated t-test—easy to compute and explain. It controls the comparison-wise error rate, and thus has a high power at the cost of a high overall type I error rate. Fisher's test has been suggested as being very effective for detecting true differences in means if it is applied only when the ANOVA is significant at the 0.05 level. Tukey's studentized range test controls experiment-wise error rate, which results in a low overall type I error rate. Consequently, this more conservative test has less power than, for example, Duncan's multiple range test.

Appendix F.
Confidence Interval Plots

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The central tendency analysis using the grand mean, presented in Section 3.1, indicates how close a specific probe type's run average is to the grand mean for all methods. The grand mean approach, however, does not provide a sense of the run-to-run variability of each tested method or the run-by-run deviation of a probe's measurements from the average of all measurements on specific runs. This latter issue, i.e., the deviation of each probe type's measurements from the run average, is illustrated in the confidence interval graphs presented in Figures F-1 through F-4.

For each site, the graphs plot the Matrix A volumetric flow values by run for each method. Superimposed on these line plots are three shaded areas representing 90%, 95%, and 99% confidence intervals around the mean for each run. The methods whose line plots tend to fall within the various shaded confidence intervals have produced values closest to the grand mean.

Visual inspection of the graphs provides a sense of a method's proximity to the true volumetric flow value on each run and the run-to-run swings in each method's volumetric flow values.

These graphs corroborate the observations made in the grand mean analyses presented in Section 3.1.

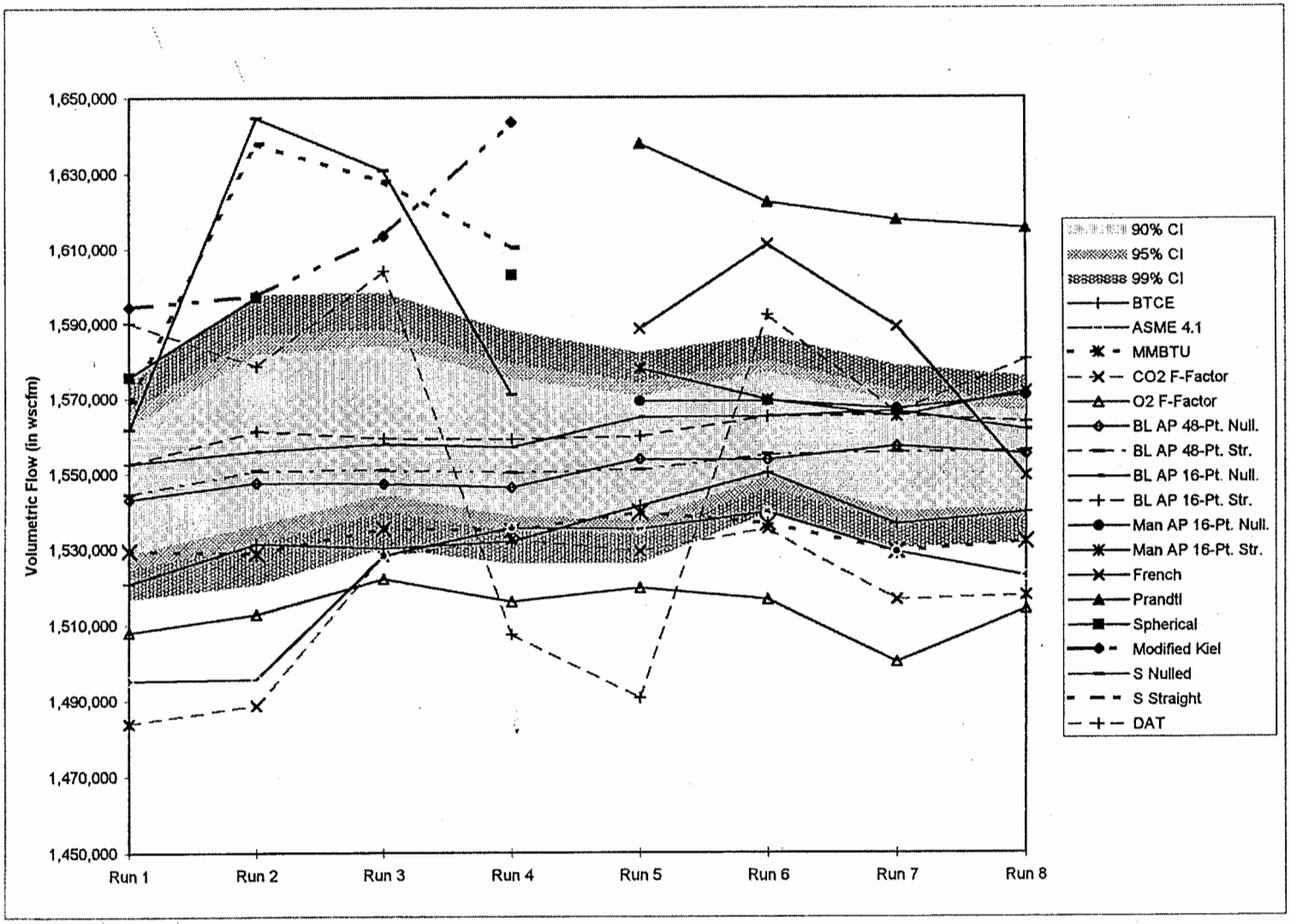


Figure F-1. Method measurements of volumetric flow and 90-99% confidence intervals about the run mean (DeCordova field test, Matrix A).

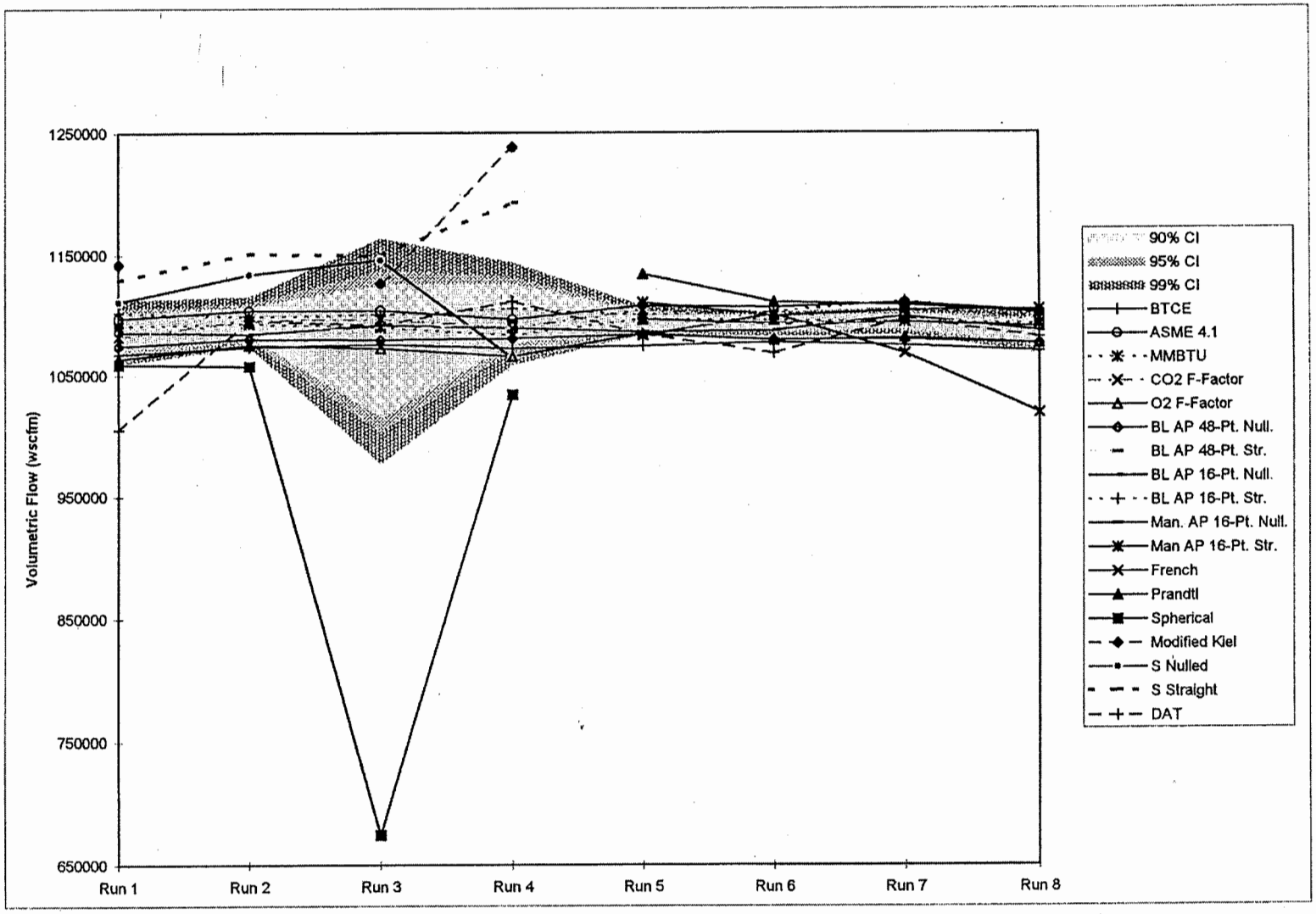


Figure F-2. Method measurements of volumetric flow and 90-99% confidence intervals about the run mean (Lake Hubbard field test, Matrix A—high load).

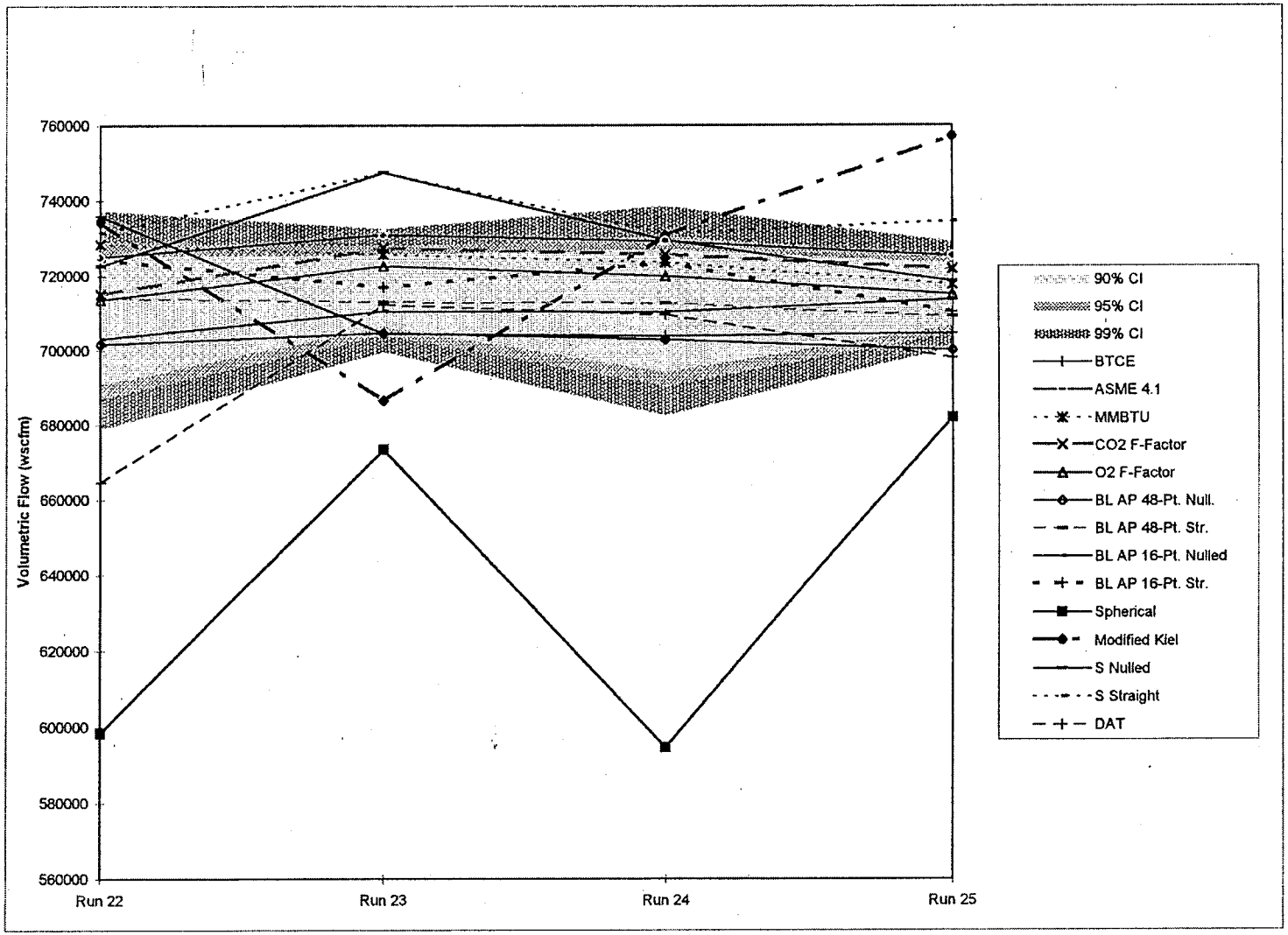


Figure F-3. Method measurements of volumetric flow and 90-99% confidence intervals about the run mean (Lake Hubbard field test, Matrix A—low load).

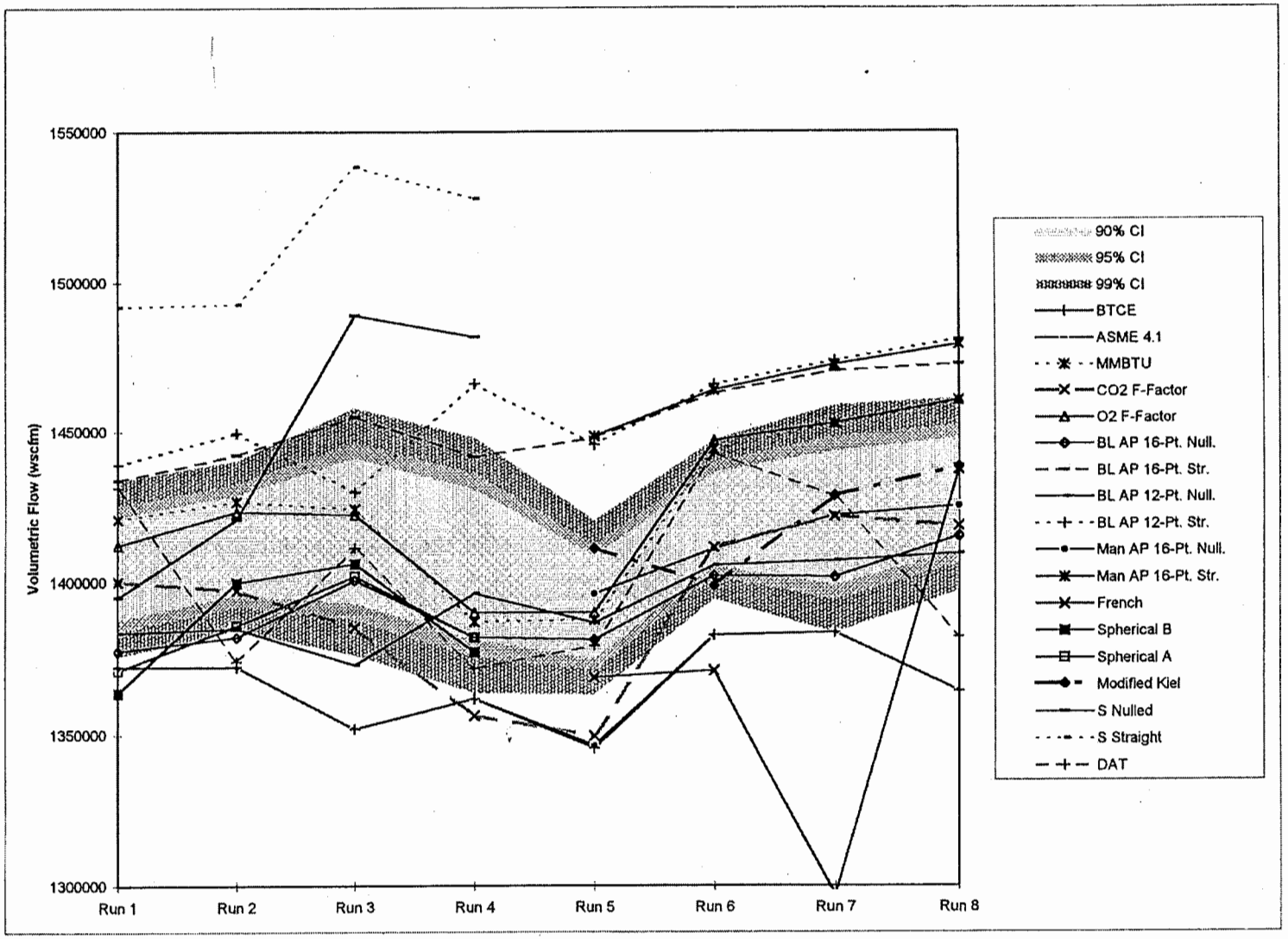


Figure F-4. Method measurements of volumetric flow and 90-99% confidence intervals about the run mean (Homer City field test—Matrix A).

Appendix G.
Dispersion Analysis

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This appendix presents a graphical display of Matrix B data (Matrix A data for the manual and baseline Autoprobes), showing run-by-run variability in the measurements by different copies of the same type of probe across all three sites (Figures G-1 through G-9). The graphs provide a visual representation of each probe type's measurement variability. Each page consists of three graphs, one for each site. The scale and length of the y-axis on the graphs are the same, facilitating site-to-site comparisons.

Along with the graphs appearing in this appendix, a "dispersion metric" was derived as an indicator of the extent of dispersion in probe copy measurements. For a particular set of runs at a given site, the absolute value of the difference between the volumetric flow values obtained by every pair of probes in a given run is calculated. These calculated differences are summed for the four runs. This total is then divided by the sum of the minimum volumetric flow values obtained for each of the four runs. The resulting dispersion metric is expressed as a percent of the minimum flow values obtained during the set of runs.

The derivation of the dispersion metric, *DM*, can be expressed algebraically as follows:

$$DM = \left(\frac{\sum_{k=1}^{4} \sum_{i=1}^{3} \sum_{j=i+1}^{4} \left(\left| V_j^k - V_i^k \right| \right)}{\sum_{k=1}^{4} V_{\min}^k} \right) \times 100\%$$

where:

k = index of runs in a given test series, $k = 1, 2, 3, 4$.

i = index of test probe copies in a given run, $i = 1, 2, 3$.

j = index of test probe copies in a given run, $j = 2, 3, 4$.

V_i^k = volumetric flow value obtained on run k by probe copy i.

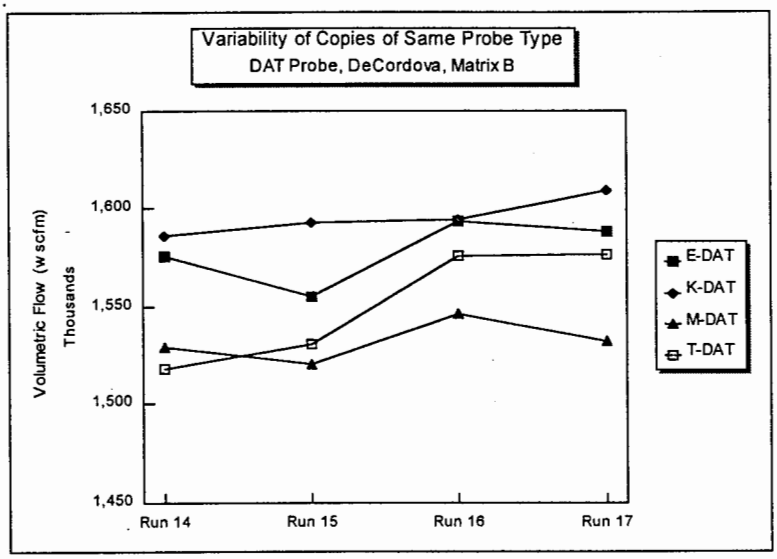
V_j^k = volumetric flow value obtained on run k by probe copy j.

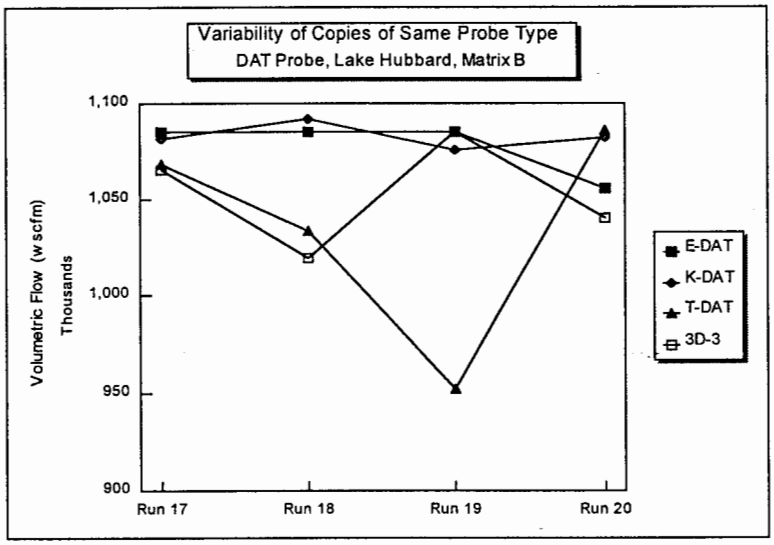
$V_{\min}^k$ = minimum volumetric flow value obtained by any copy of tested probe on run k.

On runs where fewer than four copies of a probe were tested, the average of the tested probes is weighted to make it comparable to a four-probe test run. In effect, the dispersion metric is a single number that captures the spread of the measurements appearing in each "snapshot" graph in this appendix. The higher the metric, the greater the spread. The dispersion metrics obtained for each probe at each site are presented in Table G-1.

Table G-1. Dispersion Metric Summary

Method	DeCordova	Lake Hubbard	Homer City
DAT	14.70%	22.46%	12.25%
Type S Straight-up	11.22%	12.70%	4.49%
Type S Yaw-nulled	7.93%	15.10%	6.88%
Modified Kiel	8.07%	—	17.36%
Spherical A	NA	22.59%	15.69%
Spherical B	—	—	18.27%
Prandtl	7.22%	—	—
French	9.38%	—	19.11%
Autoprobe Straight-up	4.31%	5.14%	1.19%
Autoprobe Yaw-nulled	3.64%	5.44%	4.31%





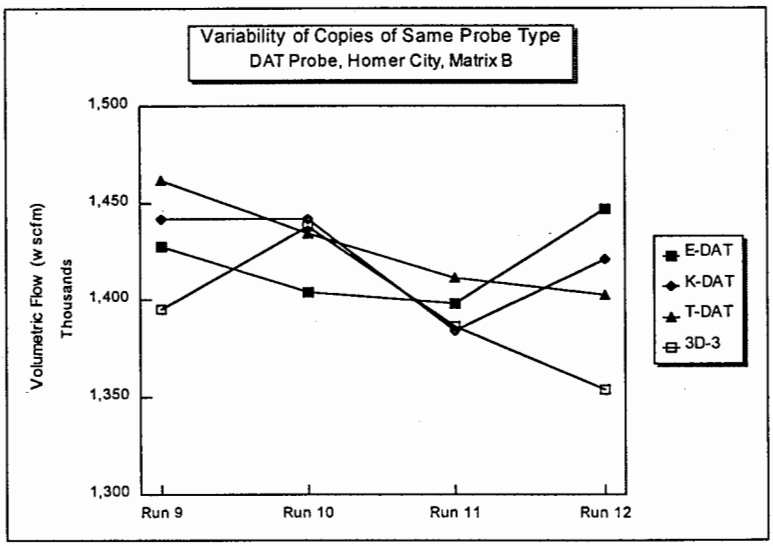
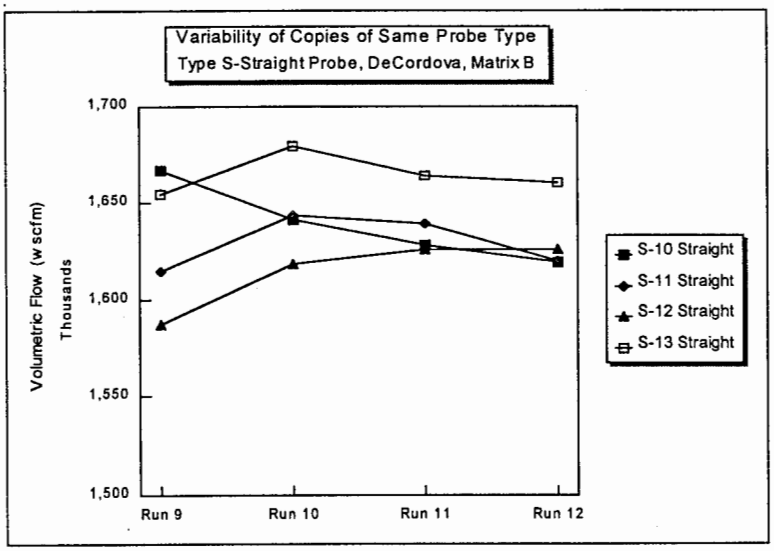
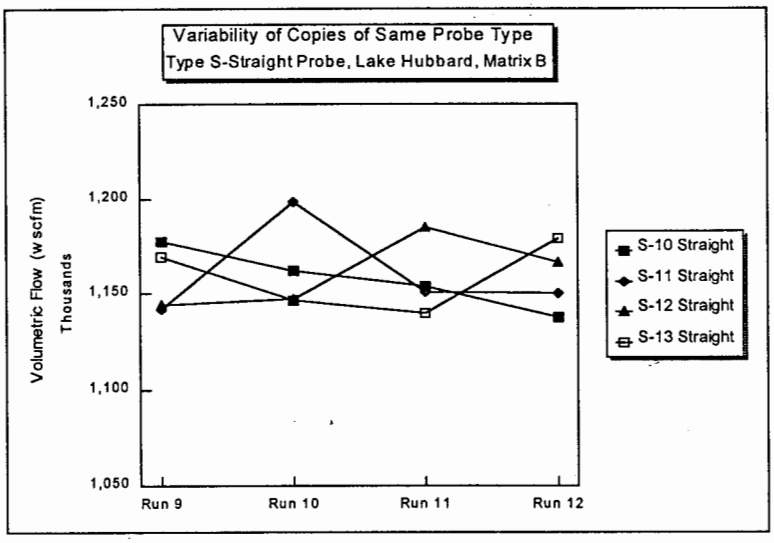


Figure G-1. Results of dispersion analysis for DAT probes.





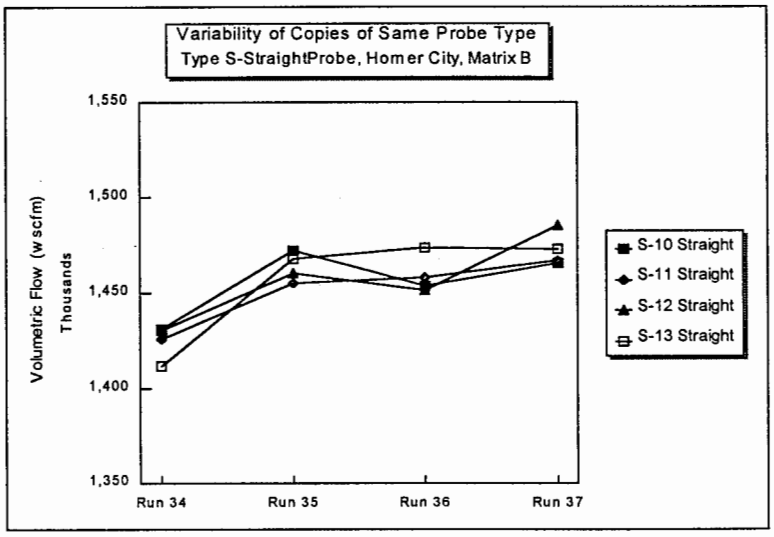
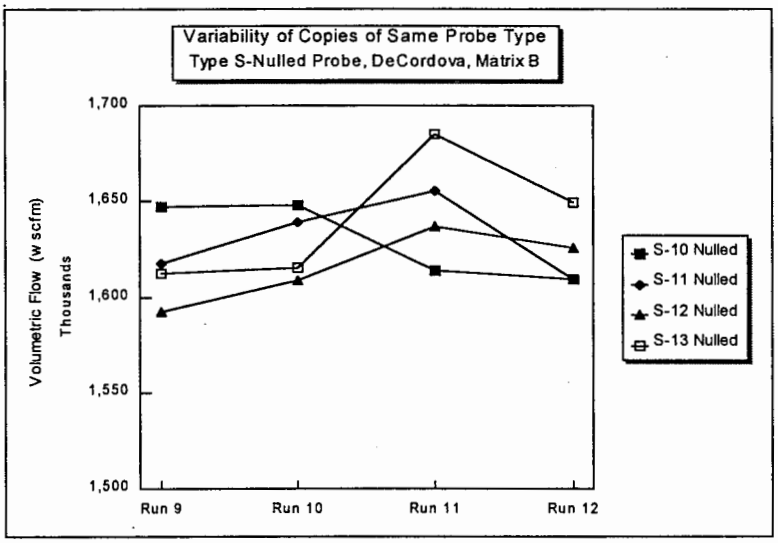
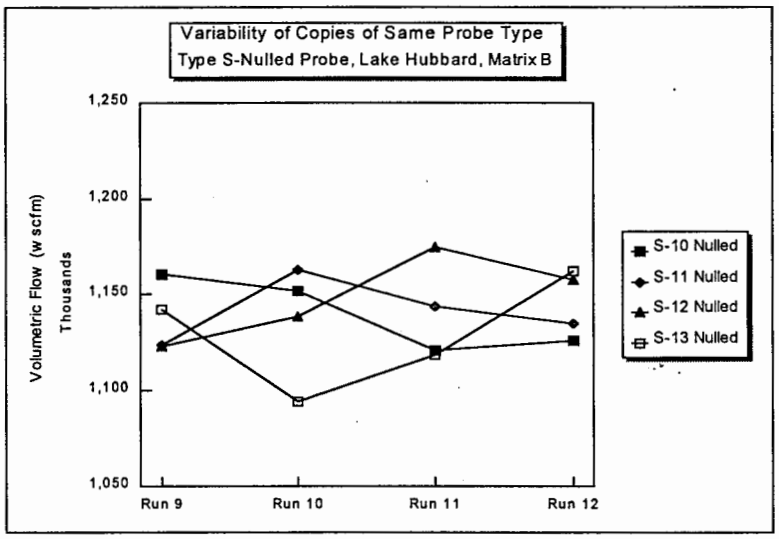


Figure G-2. Results of dispersion analysis for Type S probes straight-up.





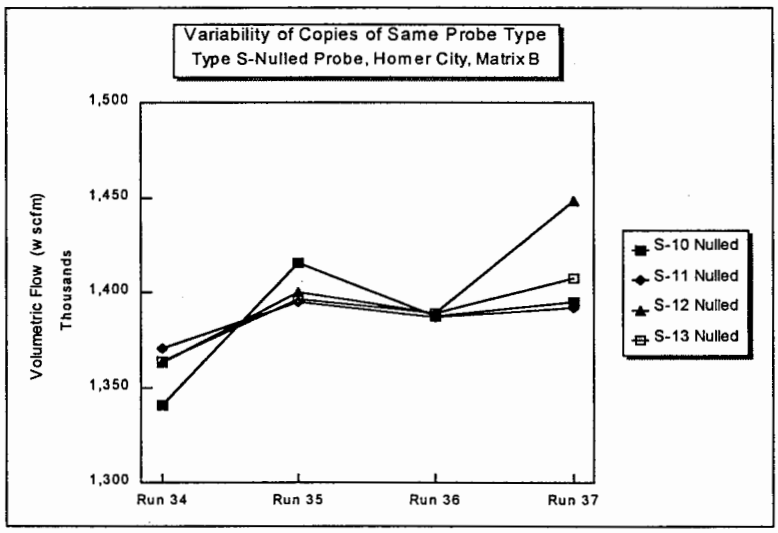
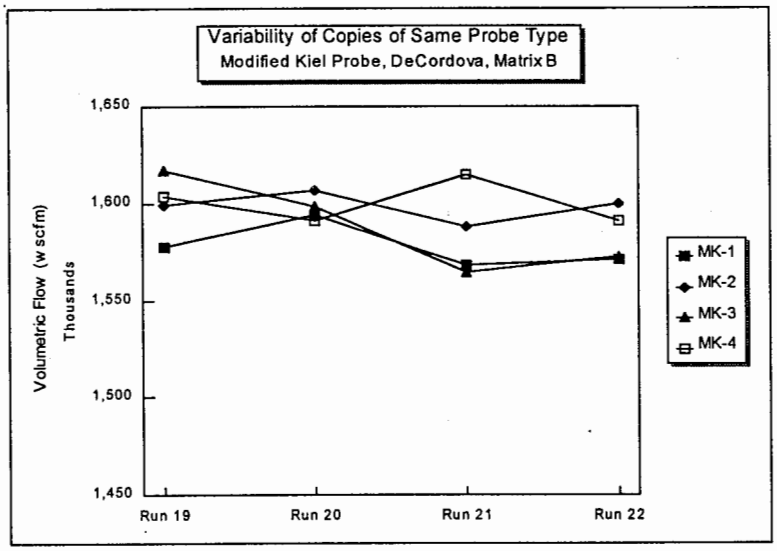
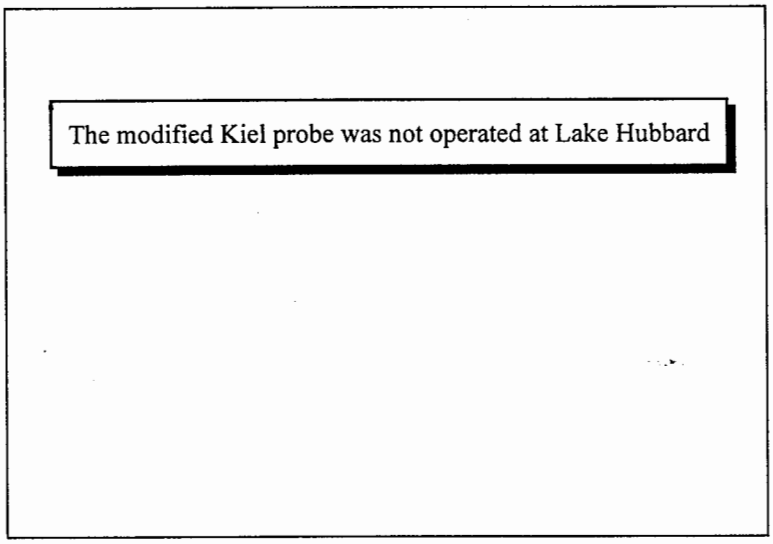


Figure G-3. Results of dispersion analysis for Type S probes yaw-nulled.





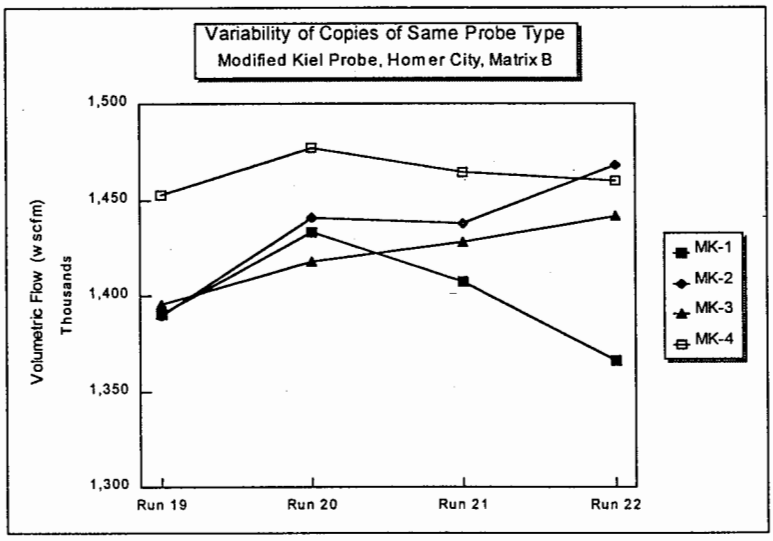
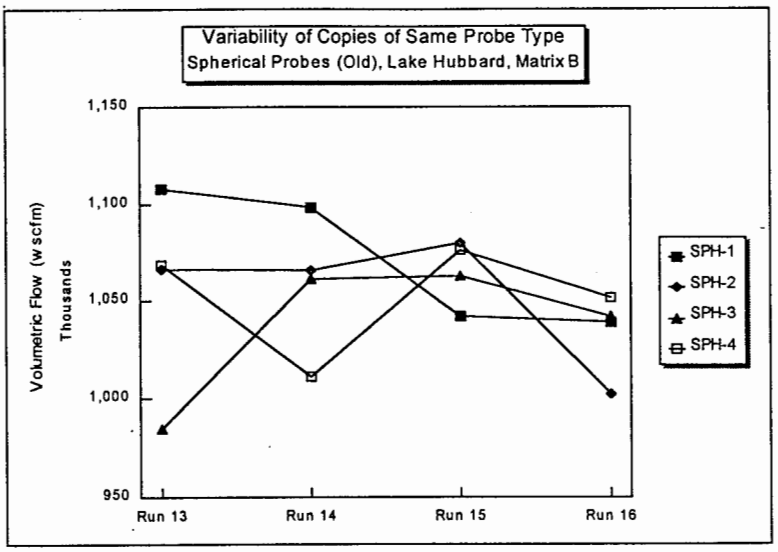
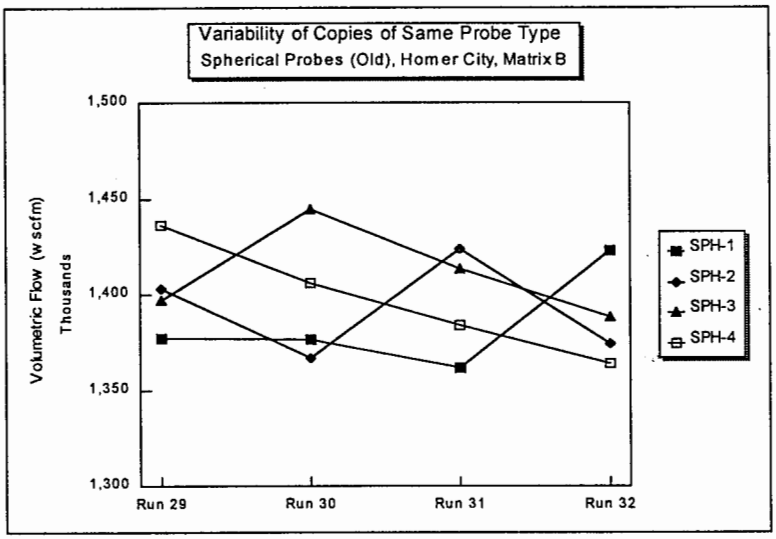


Figure G-4. Results of dispersion analysis for modified Kiel probes.





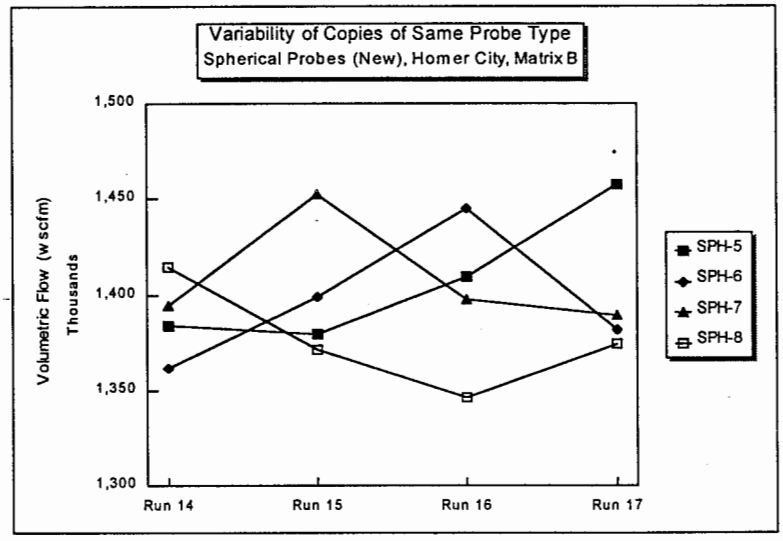
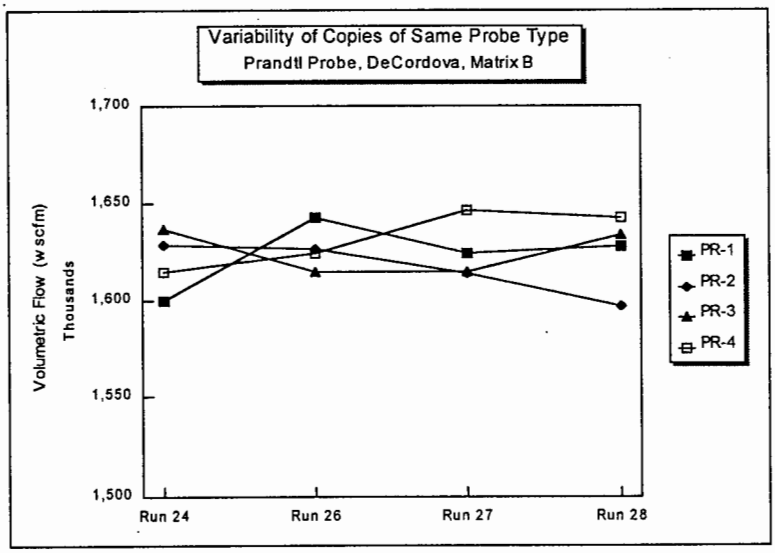


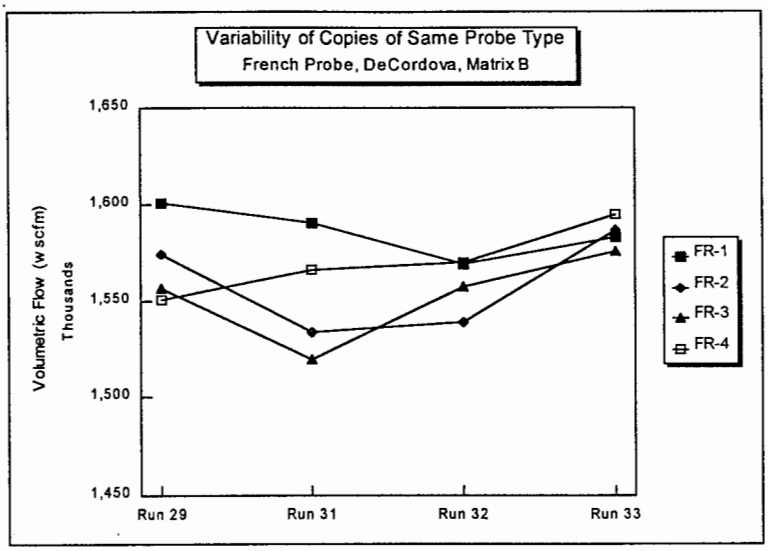
Figure G-5. Results of dispersion analysis for spherical probes.

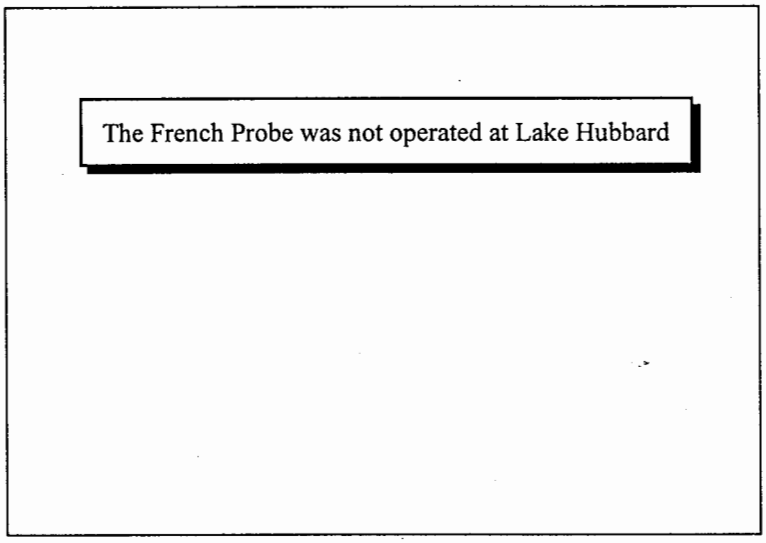


The Prandtl probe was not operated at Lake Hubbard

The Prandtl probe was not operated at Homer City

Figure G-6. Results of dispersion analysis for the Prandtl probe.





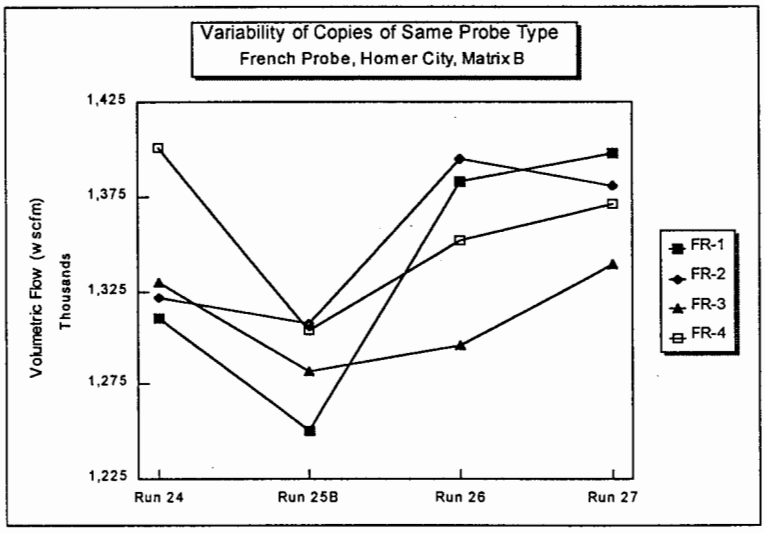
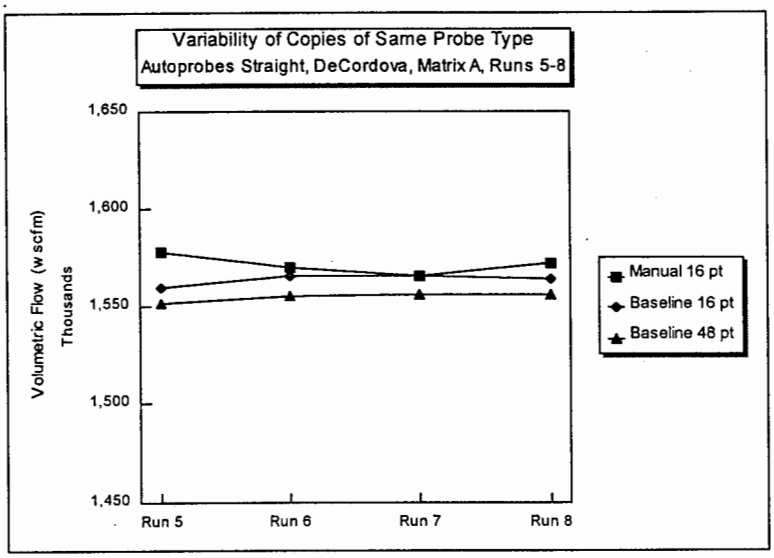
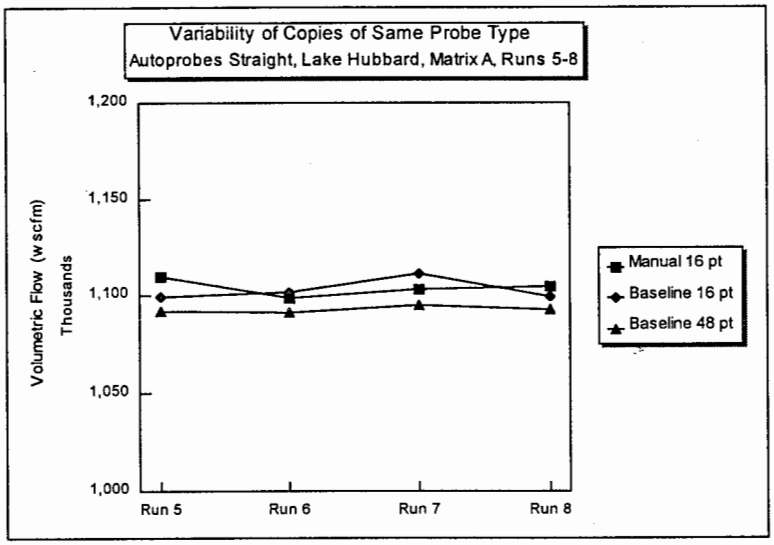


Figure G-7. Results of dispersion analysis for French probes.





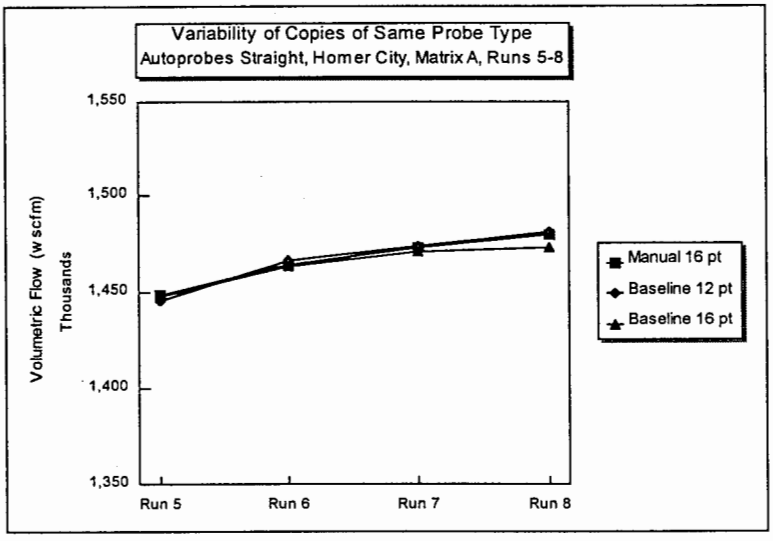
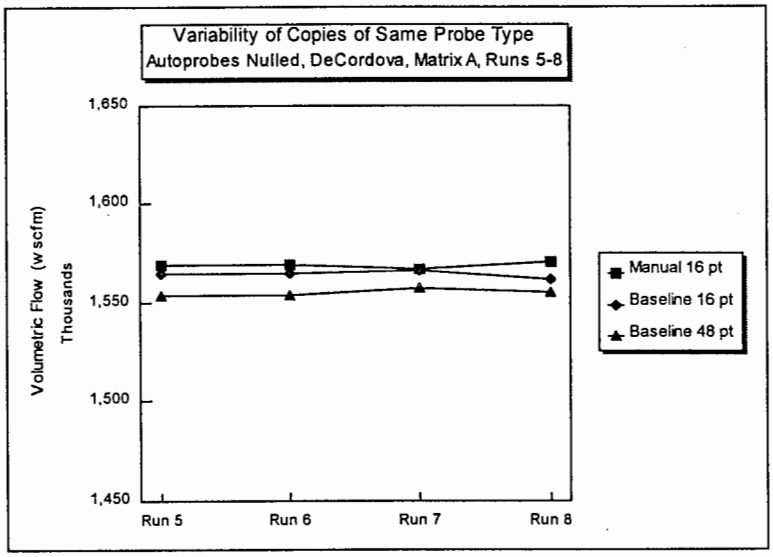
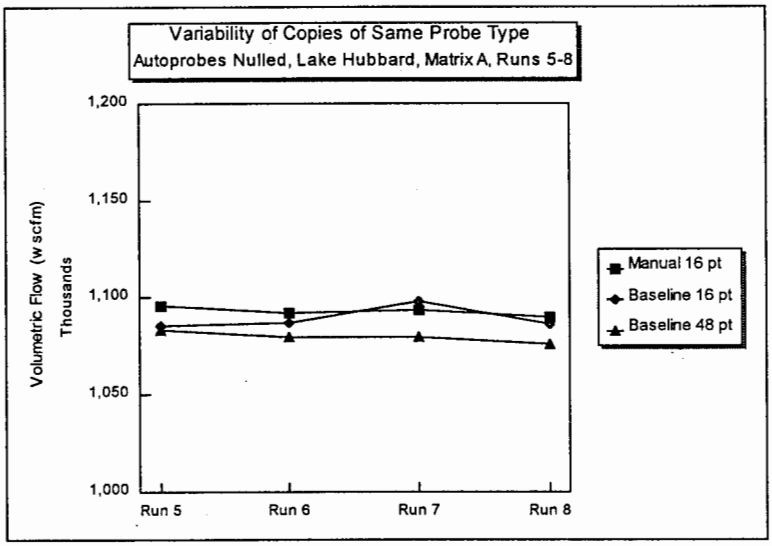


Figure G-8. Results of dispersion analysis for Autoprobes straight-up.





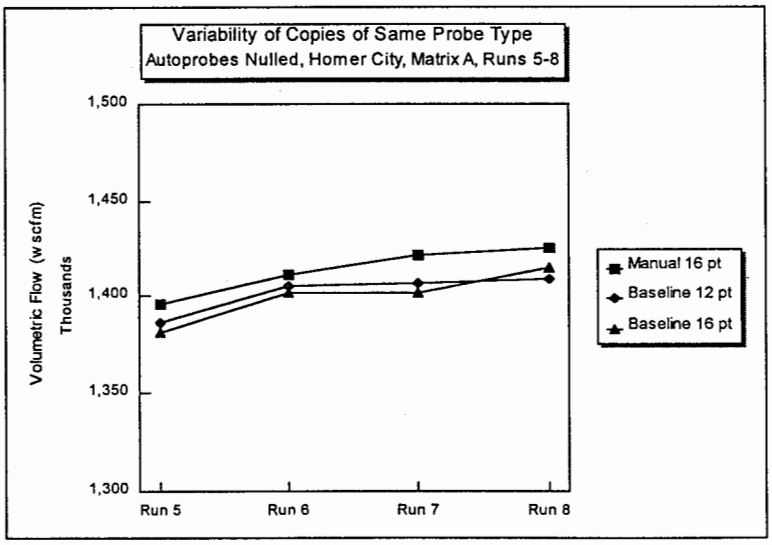


Figure G-9. Results of dispersion analysis for Autoprobes yaw-nulled.

Appendix H.
Initial Parameters and Results for Uncertainty Analysis

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Estimation of flue gas flow based on the MMBtu method

This method of calculating flue gas flow is based on the concept that the weight of air required for combustion of a unit weight of fuel is proportional to heat input. Consequently, the weights of air, dry gas, moisture, and wet gas are expressed in units of pounds per million Btu (MMBtu) fired. The calculation procedure involves several steps, as follows (parameters for which no units are given are dimensionless):

(a) Fuel in Combustion Products Factor:

$$F = 10^4(100 - \%\text{Unburned Combustibles Weight Loss})/HHV \quad \text{(lb fuel/MMBtu).} \qquad \textbf{(Eq. H-1)}$$

The quantity "%Unburned Combustibles Weight Loss" is expressed as a percent of the solid unburned fuel, by weight, in the as-fired (AF) fuel. The heating value of the fuel is expressed in Btu per pound of AF fuel.

(b) Theoretical Dry Combustion Air:

$$A_{dry} = 10^4[11.52C + 34.57(H - O/8) + 4.32S] /HHV \quad \text{(lb dry air/MMBtu).} \qquad \textbf{(Eq. H-2)}$$

The quantities C, H, O, and S are percents of carbon, hydrogen, oxygen, and sulfur in AF fuel on a weight basis.

(c) Theoretical Wet Combustion Air:

$$A_{wet} = (1 + m)\, A_{dry} \quad \text{(lb wet air/MMBtu).} \qquad \textbf{(Eq. H-3)}$$

The quantity m is the humidity ratio of inlet (ambient) air, expressed in pounds of air moisture per pound of dry air.

(d) Unburned Combustibles Loss Factor:

$$C = 1 - \%\text{Unburned Combustibles Weight Loss}/100. \qquad \textbf{(Eq. H-4)}$$

(e) Products of Combustion:

$$P = F + C(1 + E)A_{wet} \quad \text{(lb wet flue gas/MMBtu).} \qquad \textbf{(Eq. H-5)}$$

The quantity E is the excess air coefficient, determined from:

$$E = \{[B + \beta(3.76 + \omega)]A - x_{UC,s} - x_{US,s}\}/\{\beta[1 - (4.76 + \omega)A]\}. \qquad \textbf{(Eq. H-6)}$$

where:

B is the fuel composition coefficient, determined from:

$$B = 1 + C_2/2 + C_3 + C_5/2 + C_6 + C_7. \qquad \textbf{(Eq. H-7)}$$

β is the theoretical air coefficient, determined from:

$$\beta = 1 + C_2/4 + C_3 - C_4/2 \qquad \textbf{(Eq. H-8)}$$

and ω is moles of air moisture per mole of dry air.

A is a combustion coefficient, determined from:

$$A = [2O_2 - CO - 2(UC_g + US_g)(1 - O_2)]/(2 - CO). \quad \textbf{(Eq. H-9)}$$

Other parameters are defined below:

$x_{UC,s}$, $x_{US,s}$ = Moles of solid unburned carbon and sulfur per mole of fuel carbon, respectively;

UC_g, US_g = Moles of gaseous unburned carbon and sulfur in flue gas;

C_2 = mole H/mole C;

C_3 = mole S/mole C;

C_4 = mole O/mole C;

C_5 = mole N/mole C;

C_6 = mole H_2O/mole C; and

C_7 = mole CO_2/mole C (applicable only for gaseous fuel).

Note: C_2, C_3, C_4, C_5, C_6, and C_7 are calculated from gaseous fuel composition data and coal ultimate analysis.

(f) Flue Gas Mass Flow Rate:

$$M_{fg} = PQ_{fuel} \quad \text{(lb/h)}. \quad \textbf{(Eq. H-10)}$$

(g) Volumetric Flue Gas Flow Rate:

$$V_{fg} = M_{fg}/\rho_{fg} \quad \text{(wcft/h)}. \quad \textbf{(Eq. H-11)}$$

where the quantity ρ_{fg} represents the density of wet flue gas.

Estimation of Flue Gas Flow Using a Type S Probe

$$V_s = 85.49 C_p \sqrt{\frac{\Delta P \left(T_s + 460\right)}{\left(P_s\right)\left(M_s\right)}} \quad \textbf{(Eq. H-12)}$$

where:

V_s = stack gas total velocity (fps);

85.49 = pitot tube constant (fps) $\left[\frac{(\text{lb/lb-mole})(\text{in. Hg})}{(^\circ\text{R})(\text{in. H}_2\text{O})}\right]$;

C_P = pitot tube coefficient;
ΔP = pressure differential (in. H_2O);
T_s = stack temperature (°F);
P_s = absolute stack gas pressure (in. Hg);
M_s = molecular weight of stack gas, wet basis (lb/lb-mole); and
θ_y = yaw angle (°).

In accordance with Method 2, volumetric flow results were first calculated in units of dry standard cubic feet per minute. This flow value is then converted to wet volumetric flow by using Equation H-14.

$$Q_{sd} = 60(1-B_{ws})\ (V_{avg})\ (A)\left[\frac{(T_{std})\ (P_s)}{(T_s + 460)\ (P_{std})}\right] \qquad \textbf{(Eq. H-13)}$$

$$Q_{sw} = \frac{Q_{sd}}{(1-B_{ws})} \qquad \textbf{(Eq. H-14)}$$

where:

Q_{sd} = dry volumetric flow rate corrected to standard conditions (dscf/min);
Q_{sw} = wet volumetric flow rate corrected to standard conditions (wscf/min);
60 = conversion factor (sec/min);
B_{ws} = water vapor in gas stream (%H_2O/100);
V_{avg} = average of the velocity measurements, V_s, over all points in the traverse (fps);
A = stack cross-sectional area (ft^2);
T_{std} = standard absolute temperature (528°R);
P_s = absolute stack gas pressure (in. Hg);
T_s = absolute stack gas temperature (°F); and
P_{std} = standard absolute pressure (29.92 in. Hg).

Table H-1. Sampling Distribution for the Monte Carlo Analysis of the MMBtu Method

Input Parameter	Resulting Parameter	DeCordova				Homer City			
		Mean	Std. Dev.	CV (%)	Source of Estimating Uncertainties	Mean	Std. Dev.	CV (%)	Source of Estimating Uncertainties
Relative humidity (lb/lb dry air)	E - excess air coefficient	0.011	0.0002	2	Run by run data	0.008	0.0017	22.41	Run by run data
O_2 - stack (%) (wet)		2.57	0.09	3.60	40 CFR Part 60, App. A, Method 3A	5.17	0.19	3.63	40 CFR Part 60, App. A, Method 3A
CO_2 - stack (%) (wet)		8.27	0.27	3.27	40 CFR Part 60, App. A, Method 3A	12.52	0.41	3.30	40 CFR Part 60, App. A, Method 3A
CO - stack (ppm) (wet)		188.74	3.85	2.04	40 CFR Part 60, App. A, Method 10	240	7.39	3.08	40 CFR Part 60, App. A, Method 10
V_m - Gas Meter Volume (cf)	H_2O - stack (%)	34.25	0.34	1	40 CFR Part 60, App. A, Method 4	34.75	0.35	1	40 CFR Part 60, App. A, Method 4
Y - Meter Box Factor		0.973	0.024	2.5		0.983	0.025	2.5	
P_{bar} - Barometric Pressure (in. Hg)		29.1	0.05	0.17		28.8	0.05	0.17	
T_m - Average Temperature (°F)		72	2.7	3.75		85	2.7	3.18	
V - Impinger (ml)		134	0.5	0.37		45	0.5	1.11	
W - Silica Gel (gm)		7.7	0.25	3.25		7.2	0.25	3.47	
Fuel C (%)	E - excess air coefficient					69.26	0.951	1.37	Official and QA as-received coal composition data
Fuel H (%)						4.503	0.065	1.43	Official and QA as-received coal composition data
Fuel O (%)						4.219	0.477	11.30	Official and QA as-received coal composition data
Fuel S (%)						1.623	0.081	4.99	Official and QA as-received coal composition data
Fuel N (%)						1.118	0.067	5.99	Official and QA as-received coal composition data
Fuel Moisture (%)						8.08	0.55	6.87	Official and QA as-received coal composition data

Table H-1. Sampling Distribution for the Monte Carlo Analysis of the MMBtu Method

Input Parameter	Resulting Parameter	DeCordova				Homer City			
		Mean	Std. Dev.	CV (%)	Source of Estimating Uncertainties	Mean	Std. Dev.	CV (%)	Source of Estimating Uncertainties
V_m - Gas Meter Volume (cf)	H_2O - stack (%)	34.25	0.34	1	40 CFR Part 60, App. A, Method 4	34.75	0.35	1	40 CFR Part 60, App. A, Method 4
Y - Meter Box Factor		0.973	0.024	2.5		0.983	0.025	2.5	
P_{bar} - Barometric Pressure (in. Hg)		29.1	0.05	0.17		28.8	0.05	0.17	
T_m - Average Temperature (°F)		72	2.7	3.75		85	2.7	3.18	
V - Impinger (ml)		134	0.5	0.37		45	0.5	1.11	
W - Silica Gel (gm)		7.7	0.25	3.25		7.2	0.25	3.47	
Fuel C (%)	E - excess air coefficient					69.26	0.951	1.37	Official and QA as-received coal composition data
Fuel H (%)						4.503	0.065	1.43	Official and QA as-received coal composition data
Fuel O (%)						4.219	0.477	11.30	Official and QA as-received coal composition data
Fuel S (%)						1.623	0.081	4.99	Official and QA as-received coal composition data
Fuel N (%)						1.118	0.067	5.99	Official and QA as-received coal composition data
Fuel Moisture (%)						8.08	0.55	6.87	Official and QA as-received coal composition data

Table H-2. Span and Calibration Gas Values for O_2, CO_2, and CO Monitors at DeCordova and Homer City

Monitors	DeCordova		Homer City	
	Span	Calibration Gas	Span	Calibration Gas
O_2 (%)	25	12.67	25	12.55
CO_2 (%)	20	11.15	20	11.07
CO (ppm)	500	454.8	500	296.3

Table H-3. Error Components in Stack Gas Monitors

Monitors	DeCordova				Homer City			
	Linearity	Drift	Cal Gas	Results	Linearity	Drift	Cal Gas	Results
O_2 (%)	0.25	0.375	0.063	3.60	0.5	0.375	0.063	3.63
CO_2 (%)	0.20	0.30	0.056	3.27	0.20	0.30	0.055	3.30
CO (ppm)	5	7.5	2.274	2.04	5	7.5	1.482	3.08

Table H-4. Sampling Distribution for Monte Carlo Analysis of Type S Probe, Straight Up

Input Parameter	DeCordova				Homer City			
	Mean	Std. Dev.	CV (%)	Source of Estimating Uncertainties	Mean	Std. Dev.	CV (%)	Source of Estimating Uncertainties
Stack Area (in^2)	60235.8	301.2	0.5	Expert opinion	65144.1	325.7	0.5	Expert opinion
P_{bar} - Barometric Pressure (in. Hg)	28.9	0.05	0.17	40 CFR Part 60, App A, Meth. 4	28.58	0.05	0.17	40 CFR Part 60, App A, Meth. 4
P_g - Static Pressure (in. H_2O)	-1.3025	0.05	-3.84	40 CFR Part 60, App A, Meth. 4	-2.32	0.05	-2.16	40 CFR Part 60, App A, Meth. 4
C_p - Calibration Coefficient	0.788	0.005	0.64	40 CFR Part 60, App A, Meth. 2	0.794	0.005	0.63	40 CFR Part 60, App A, Meth. 2
Δp (in. H_2O)	2.146	0.04	2	Magnehelic spec.	1.55	0.03	2	Magnehelic spec.
Gas temperature (°F)	303.5	1	0.33	40 CFR Part 60, App A, Meth. 4	283.6	1	0.35	40 CFR Part 60, App A, Meth. 4
O_2 - stack (%) (dry)	2.94	0.11	3.60	40 CFR Part 60, App A, Meth. 3A	5.50	0.20	3.63	40 CFR Part 60, App A, Meth. 3A
CO_2 - stack (%) (dry)	10.14	0.33	3.27	40 CFR Part 60, App A, Meth. 3A	13.57	0.45	3.30	40 CFR Part 60, App A, Meth. 3A
H_2O - stack (%)	17.34	0.35	2	Monte Carlo[a]	6.69	0.17	2.6	Monte Carlo[a]

[a] Uncertainty obtained using the input parameters and associated uncertainties presented in Table H-1.

Appendix I1.
Wall Effects Adjustment Factors Used in Round 2 Central Tendency Analysis

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Table I1-1 shows the wall effects adjustment factors that were used in the Round 2 Central tendency analysis presented in Section 4.1.

Table I1-1. Wall Effects Adjustment Factors Used in the Round 2 Central Tendency Analysis

Method	DeCordova	Lake Hubbard	Homer City
Type S Yaw-nulled	-1.93%	-1.93%[b]	-1.93%[b]
DAT	-1.57%	-1.56%	-1.57%[c]
Spherical	-1.32%[d]	-1.32%[b]	-1.32%[b]
Baseline Autoprobes 16-Pt. Yaw-nulled	-1.33%[e]	-1.58%	-1.45%[c]
Type S Straight-up[a]	-1.83%	-1.83%[b]	-1.83%[b]
Prandtl[a]	-1.59%	-1.59%[b]	-1.59%[b]

[a] Not included in the grand mean calculations.

[b] The Type S yaw-nulled, spherical, Type S straight-up, and Prandtl probe factors for Lake Hubbard and Homer City are based on tests conducted at DeCordova. Wall effects testing with these probe types was not carried out at Lake Hubbard. Wall effects testing with the Prandtl probe was not carried out at Homer City. Although wall effects testing with the Type S and spherical probes was carried out at Homer City, the results have been excluded from analysis in this report because measurements could not be obtained beginning at 1 in. from the stack wall for every port. See Appendix J for a detailed description of problems with wall effects testing at Homer City.

[c] The 16-point baseline Autoprobes yaw-nulled and DAT probe factors for Homer City are the averages of the DeCordova and Lake Hubbard results for those probe types (each site weighted equally). The results of the wall effects tests using the Autoprobes and DAT probe at Homer City have been excluded from analysis in this report because measurements could not be obtained beginning at 1 in. from the stack wall for every port. See Appendix J for a detailed description of problems with wall effects testing at Homer City.

[d] Due to problems with two of the spherical probes used at DeCordova, two DAT probes were substituted for spherical probes during Matrix C testing. The spherical probe wall effects factor for DeCordova is based on the wall effects data collected by the two remaining spherical probes, which were operated in Ports B and D during the test. See Table J-1 in Appendix J for more details.

[e] The 16-point baseline Autoprobes yaw-nulled factor for DeCordova is the average of the factors obtained during the four daytime wall effects tests in which this method was used.

Appendix I2.
Comparison of Manual and Electronic Pressure Measuring Devices

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According to some of the peer reviewers, manual pressure devices provide consistently higher pressure readings than electronic transducers. To examine this assertion, Cadmus analyzed several data sets from this project and other test programs sponsored by the U.S. Environmental Protection Agency (EPA) and the Electric Power Research Institute (EPRI). The data sets consist of pressure readings taken with manometers, magnehelic gauges, and various types of electronic transducers. Data from the following tests were used: an EPA-sponsored swirl tunnel test conducted by Fossil Energy Research Corp. (FERCo); an EPRI-sponsored field test at the Coal Creek and Columbia power plants conducted by FERCO; an EPA-sponsored field test conducted by Radian; and a National Institute of Standards and Technology (NIST) wind tunnel test during which the probes used in the study were calibrated. This appendix describes the devices used, the types of data collected, and the analyses performed in reaching the conclusions on manual and electronic pressure devices presented in Section 4.4. This appendix also includes a more detailed discussion of the findings than that presented in Section 4.4. Comparisons are presented in tabular format and as box-and-whisker plots.

EQUIPMENT AND SITE DESCRIPTIONS

NIST Wind Tunnel Test (NIST Data Set)

During December 1997 through April 1998, 33 probes used in this field study were calibrated in the wind tunnel operated by NIST in Gaithersburg, Maryland. The pressure measurements were obtained using three types of pressure devices: inclined manometers, electronic transducers, and magnehelic gauges. Measurements were made at three different velocities for each type of probe. The characteristics of the pressure measurement devices used at NIST are summarized in Table I2-1.

Table I2-1. Differential Pressure Devices Used During NIST Wind Tunnel Tests

Pressure Measurement	Instrument	Range (in. H_2O)	Divisions (in. H_2O)	Accuracy (±% FS)
P_1 - P_2	Merriam Inclined Manometer	0 to 4	0.01	0.25
P_1 - P_2	Dwyer Magnehelic Gauge	0 to 0.5	0.01	3
P_1 - P_2	Dwyer Magnehelic Gauge	0 to 2	0.05	2
P_1 - P_2	Dwyer Magnehelic Gauge	0 to 5	0.2	2
P_1 - P_2	Shortridge Electronic Manometer	0 to 5	0.01	0.5
P_2 - P_3	Dwyer Magnehelic Gauge	-0.5 to 0.5	0.02	2
P_4 - P_5	Meriam Inclined Manometer	0 to 4	0.01	0.25
P_4 - P_5	Dwyer Magnehelic Gauge	± (0 to 0.25)	0.01	3
P_4 - P_5	Dwyer Magnehelic Gauge	± (0 to 1)	0.02	2
P_4 - P_5	Dwyer Magnehelic Gauge	± (0 to 5)	0.2	2
P_4 - P_5	MKS Pressure Transducer	0 to 5	0.01	0.5

Swirl Wind Tunnel Test (FERCo Swirl Wind Tunnel Data Set)

During July 1998, the Fossil Energy Research Corp., under contract to EPA, conducted a series of tests at a special wind tunnel that FERCo had developed for the Electric Power Research Institute to study swirling flow. For the EPA-sponsored work, pressure measurements were taken at three points in the wind tunnel for each of three velocities. The test points and velocities were chosen to simulate the flow turbulence extremes encountered in field test sites. Each measurement was taken independently by three separate testers. All measurements were made with a Type S probe (EPA Probe S-11) operated in the straight-up mode. Three pressure measurement devices were used at each point: an inclined manometer, an electronic transducer, and a magnehelic gauge. Pressures from the inclined manometer and magnehelic gauge were manually read and recorded. An electronic data-logger was used with the electronic transducer, automatically collecting and storing a value every 0.1 second. Table I2-2 summarizes the specifications and calibration data for the devices used in the FERCo wind tunnel tests.

Table I2-2. Specification and Calibration Data in FERCo Swirl Wind Tunnel Test

Instrument	Serial Number	Range (in. H_2O)	Divisions (in. H_2O)	Accuracy (± %)	Cal Factor K
Meriam Inclined Manometer, 30-in. Scale	12802-K2	0 to 4	0.01	0.25 FS	-
Dwyer Electronic Transducer	60714420	0 to 5	0.01	0.5 FS	1.007
Dwyer Magnehelic	R40D	0 to 5	0.1	2 FS	0.990

EPA Field Test (Radian Data Set)

In September 1995, Radian Corporation, under contract to EPA, conducted a series of tests at a coal-fired boiler. During these tests, three types of pressure measurement devices were evaluated: oil (or inclined) manometers, magnehelic gauges, and electronic transducers. The types of probes used during the test included a 1/4" Type S, a 3/8" Type S, a 3D, and a modified Type S. Table I2-3 summarizes the specifications and requirements for the pressure measurement devices used in this field test.

EPRI Field Tests (Coal Creek and Columbia Data Sets)

In September 1996, FERCo, under contract to EPRI, conducted field tests at two electric utilities, Columbia and Coal Creek. The Columbia site is located in Portage, Wisconsin, and the Coal Creek site is located in Underwood, North Dakota. Electronic transducers and magnehelic gauges were used in parallel with each test probe to provide comparative differential pressure data. Inclined manometers were not used during these tests.

Table I2-4 presents the specifications for the pressure measurement devices. Differential pressure readings using the magnehelic gauges were manually recorded, and the pressures from the electronic transducers were electronically recorded every second. Both types of pressure devices were used to simultaneously measure velocity pressure (P_1-P_2) for all test probes and the yaw null (P_2-P_3) and pitch (P_4-P_5) pressure readings for three-dimensional probes.

Table I2-3. Differential Pressure Devices Used During the Radian Field Test

Pressure Measurement	Instrument	Range (in. H_2O)	Divisions (in. H_2O)	Accuracy (±% FS)
$P_1 - P_2$	Dwyer Inclined Manometer	0 to 2	0.01	0.25
$P_1 - P_2$	Dwyer Inclined-Vertical Manometer	0 to 1, 1 to 5	0.01, 0.1	0.25
$P_1 - P_2$	Dwyer Magnehelic Gauge	0 to 2	0.05	2
$P_1 - P_2$	Dwyer Magnehelic Gauge	0 to 5	0.10	2
$P_1 - P_2$	Setra Systems Pressure Transducer	0 to 5	0.01	0.5
$P_2 - P_3$	Dwyer Magnehelic Gauge	-1.0 to 1.0	0.5	2
$P_4 - P_5$	Dwyer Inclined Manometer	0 to 2	0.01	0.25
$P_4 - P_5$	Dwyer Inclined-Vertical Manometer	0 to 1, 1 to 5	0.01, 0.1	0.25
$P_4 - P_5$	Dwyer Magnehelic Gauge	-1 to 1	0.05	2
$P_4 - P_5$	Setra Systems Pressure Transducer	0 to 5	0.01	0.5

Table I2-4. Differential Pressure Devices Used During the Field Tests at Columbia and Coal Creek

Pressure Measurement	Instrument	Serial Number	Range (in. H_2O)	Divisions (in. H_2O)	Accuracy[a] (± %)
P_1-P_2	Dwyer Magnehelic	R24D	0 to 5	0.1	2 FS
P_1-P_2	Dwyer Electronic Transducer	60714420	0 to 5	0.01	0.5 FS
P_2-P_3	Dwyer Magnehelic	CR63	-0.5 to 0.5	0.01	2 FS
P_2-P_3	Dwyer Electronic Transducer	50328123	-0.25 to 0.25	0.01	0.25 FS
P_4-P_5	Dwyer Magnehelic	CR56	-0.5 to 0.5	0.02	2 FS
P_4-P_5	Dwyer Magnehelic	R40D	0 to 5	0.1	2 FS
P_4-P_5	Dwyer Electronic Transducer	60714435	0 to 5	0.01	0.5 FS

[a] FS = Full scale

COMPARISON OF PRESSURE MEASUREMENTS

Averaging Procedures for the Electronic Transducers

Pressure readings from electronic transducers in the data sets were provided in three forms: (1) averaged ΔP values in the NIST and Radian data sets, (2) raw 1-second ΔP values in the Coal Creek and Columbia field test data sets, and (3) raw 0.1-second ΔP values in the FERCo swirl wind tunnel data set. Two approaches were used to calculate the average ΔP values from the 1-second or 0.1-second ΔP values obtained by the electronic transducer:

1. Approach 1 (Straight averages)—The averages of each 1-second (or 0.1-second) ΔP value was calculated for the same period observed for the manual device measurements.

2. Approach 2 (Squares of the square root averages)—The square roots of each 1-second or 0.1-second ΔP value were first calculated; next the average of these square root values over the observation period was calculated; and finally, this value was squared.

To evaluate the differences in these two approaches, the average ΔP values from the electronic transducer calculated using each approach were summarized in Table I2-5 for the FERCo swirl wind tunnel data and Table I2-6 for the Coal Creek and Columbia field test data. The percent differences in the average ΔP values for these two approaches were also calculated and summarized in the tables. Turbulence calculations were included in the tables as a means of examining whether the difference in these two approaches is related to the turbulence of the flow as measured by the electronic transducer. Turbulence was calculated as (maximum - minimum) / mean * 100, using the 1-second ΔP values for Columbia and Coal Creek field test data and the 0.1-second ΔP values for swirl wind tunnel data. Turbulence was calculated for the period when the manual device measurements were observed.

Examination of Tables I2-5 and I2-6 results in the following observations:

- The average percent difference in the ΔP values from the electronic transducer between Approach 1 and Approach 2 is very small. It ranges from 0.04% to 0.38% for the swirl wind tunnel test. For the Coal Creek field test and the Columbia field test, the average percent differences between the two approaches are 0.44% and 0.14%, respectively.

- For the swirl wind tunnel test, turbulence at the inlet is the highest among all three test points, followed by Test Point 1b. Test Point 5a demonstrates the least turbulence. This observation is true for all velocity conditions conducted. A similar pattern is observed for the average percent differences in the ΔP values between Approach 1 and Approach 2 for the electronic transducers. In addition, the larger the percent difference between the two averaging approaches, the more turbulence is observed.

For subsequent analyses, the second approach was used for calculating the average ΔP values for the electronic transducer. This approach is equivalent to averaging velocities (velocity is proportional to the square root of ΔP) and should therefore provide a more representative average velocity value. The results of comparing the manual devices and the electronic transducer are summarized in the following sections.

NIST Wind Tunnel Test (NIST Data Set)

In the wind tunnel test performed at NIST, pressure readings were taken at three different velocities: 30, 60, and 90 fps. Seven different probe types were used during the tests. Data obtained from the DAT, Type S, modified Kiel, Prandtl, French, spherical, and Autoprobes were used for this analysis. The percent differences between the manual devices (inclined manometer and magnehelic gauge) and the electronic transducer were calculated for each probe type at each velocity. Table I2-7

Table I2-5. Comparison of the Average ΔP Values from the Electronic Transducer Calculated in Two Ways and Turbulence—FERCo Swirl Wind Tunnel Test

Electronic Transducer in Parallel With	Velocity Condition	Test Point Location	Avg. ΔP Values from the Electronic Transducer			Turbulence[d]
			Approach 1[a]	Approach 2[b]	%Diff.[c]	
Inclined Manometer	1	1b	1.776	1.773	0.17	40.00
		5a	1.529	1.528	0.06	28.07
		inlet	1.537	1.531	0.38	76.84
	2	1b	1.430	1.428	0.13	41.56
		5a	1.234	1.234	0.06	24.40
		inlet	1.216	1.212	0.36	61.14
	3	1b	1.154	1.152	0.12	34.98
		5a	0.980	0.980	0.05	21.32
		inlet	1.000	0.997	0.25	52.40
Magnehelic Gauge	1	1b	1.794	1.791	0.17	40.23
		5a	1.539	1.538	0.05	23.01
		inlet	1.518	1.513	0.37	69.38
	2	1b	1.445	1.443	0.14	36.31
		5a	1.221	1.221	0.05	22.86
		inlet	1.244	1.240	0.35	63.46
	3	1b	1.149	1.148	0.12	35.60
		5a	0.965	0.965	0.04	19.62
		inlet	0.995	0.991	0.38	56.49

a Straight averages of the 0.1-second ΔP values.
b Squares of the average of the square root of each 0.1-second ΔP values.
c Percent difference = (Approach 1 - Approach 2) / Approach 2 * 100
d Turbulence (%) = (maximum - minimum) / mean * 100.

Table I2-6. Comparison of the Average ΔP Values from the Electronic Transducer Calculated in Two Ways and Turbulence—Coal Creek and Columbia Field Tests

Site	Avg. ΔP Values from the Electronic Transducer			Turbulence (%)[d]
	Approach 1[a]	Approach 2[b]	%Diff.[c]	
Coal Creek	1.745	1.738	0.44	49.21
Columbia	2.234	2.231	0.14	20.04

[a] Straight averages of the 0.1-second ΔP values.
[b] Squares of the average of the square root of each 0.1-second ΔP values.
[c] Percent difference = (Approach 1 - Approach 2) / Approach 2 * 100
[d] Turbulence (%) = (maximum - minimum) / mean * 100.

summarizes the means and standard deviations of these percent differences. The mean ΔP values calculated from the electronic transducer readings are also listed to provide the magnitude of the pressure. A statistical test called the t-test was used to determine if the differences between the pressure readings taken by the manual and electronic devices are statistically significant. The t-test yields a "p-value" for each pressure difference. The smaller the p-value, the higher the probability that two values are statistically distinguishable. Typically, when choosing the type I error rate[1] of α=0.05, a p-value smaller than 0.05 is interpreted to mean that values are statistically different. For these analyses, a type I error rate of $\alpha = 0.05$ was chosen. P-values for each comparison are listed in Table I2-7.

In addition, data were examined visually using box-and-whisker plots[2] of ΔP values. Figures I2-1 through I2-3 depict ΔP values obtained by the electronic transducer and manual devices using different probe types at different velocity conditions. Summary statistics (average, median, minimum, maximum, standard deviation, and interquartile range) on ΔP values are also provided in Table I2-8.

Examination of Tables I2-7 and I2-8, as well as Figures I2-1 through I2-3, lead to the following observations:

- The average percent difference in ΔP values between the inclined manometer and the electronic transducer ranges from -1.68% to 0.42% for a velocity of 30 fps, from -1.14% to -0.06% for a velocity of 60 fps, and from -1.25% to -0.26% for a velocity of 90 fps.

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1 In this application, a type I error rate is the probability of concluding that two instruments produce different pressure readings, when, in fact, the readings are the same.

2 The box-and-whisker plot is a useful tool for displaying the distribution of a data set. The plots show the median (middle horizontal line), the 25th and the 75th percentiles (lower and upper horizontal lines of the boxes), and the minimum and maximum values. Potential outliers are indicated by asterisks (*) or other plotting symbols and the criterion for identifying the potential outliers is any value beyond the distance of 1.5 times the interquartile range (75th percentile value minus the 25th percentile value) from the box.

Table I2-7. Percent Difference from Electronic Device in Pressure—NIST Data Set

Manual Devices	Probe	Velocity = 30 fps				Velocity = 60 fps				Velocity = 90 fps			
		Mean ΔP from Electronic Device (in. H_2O)	Percent Difference[a] in ΔP (in. H_2O)			Mean ΔP from Electronic Device (in. H_2O)	Percent Difference[a] in ΔP (in. H_2O)			Mean ΔP from Electronic Device (in. H_2O)	Percent Difference[a] in ΔP (in. H_2O)		
			Mean (%)	s.d. (%)	p_value[b]		Mean (%)	s.d. (%)	p_value[b]		Mean (%)	s.d. (%)	p_value[b]
Manometer	DAT	0.213	0.42	1.05	0.0000	0.716	-0.34	1.10	0.0000	1.684	-0.38	1.53	0.0000
	Type S	0.360	-0.90	0.55	0.0000	1.236	-0.47	0.22	0.0000	2.882	-0.69	0.15	0.0000
	Modified Kiel	0.370	-0.94	0.28	0.0000	1.419	-0.23	0.25	0.0000	3.340	-0.44	0.19	0.0000
	Prandtl	0.210	0.09	0.99	0.5569	0.790	-0.06	0.36	0.2770	1.847	-0.26	0.14	0.0000
	French	0.414	-0.16	0.43	0.0221	1.549	-0.07	0.23	0.0522	3.586	-0.27	0.19	0.0000
	Spherical A	0.187	-1.68	1.94	0.0000	0.698	-0.88	1.02	0.0000	1.580	-0.47	2.97	0.0000
	Spherical B	0.193	-1.62	1.44	0.0000	0.678	-0.67	0.94	0.0000	1.543	-0.59	0.81	0.0000
	Autoprobe	0.333	-1.49	0.26	0.0000	1.246	-1.14	0.11	0.0000	2.900	-1.25	0.10	0.0000
Magnehelic	DAT	0.213	-1.00	1.72	0.0000	0.716	0.77	1.58	0.0000	1.684	-1.53	0.78	0.0000
	Type S	0.360	-0.96	1.51	0.0003	1.236	-0.97	0.42	0.0000	2.882	-0.70	0.44	0.0000
	Modified Kiel	0.370	-0.73	1.09	0.0001	1.419	-1.65	0.35	0.0000	3.340	-0.55	0.26	0.0000
	Prandtl	0.210	-0.76	1.75	0.0100	0.790	-0.44	0.47	0.0000	1.847	-2.89	0.23	0.0000
	French	0.414	-2.36	1.14	0.0000	1.549	-2.13	0.38	0.0000	3.586	-0.57	0.25	0.0000
	Spherical A	0.187	0.38	1.82	0.0000	0.698	0.72	2.68	0.0000	1.580	-1.22	1.06	0.0000
	Spherical B	0.193	-0.23	1.81	0.0001	0.678	1.05	2.66	0.0000	1.543	-1.23	1.10	0.0000
	Autoprobe	0.333	-1.54	1.15	0.0000	1.246	1.52	0.46	0.0000	2.900	1.29	0.43	0.0000

[a] Percent difference = (manual - electronic) / electronic * 100.

[b] p-value for paired t-test; any value less than 0.05 indicates a statistically significant test result.

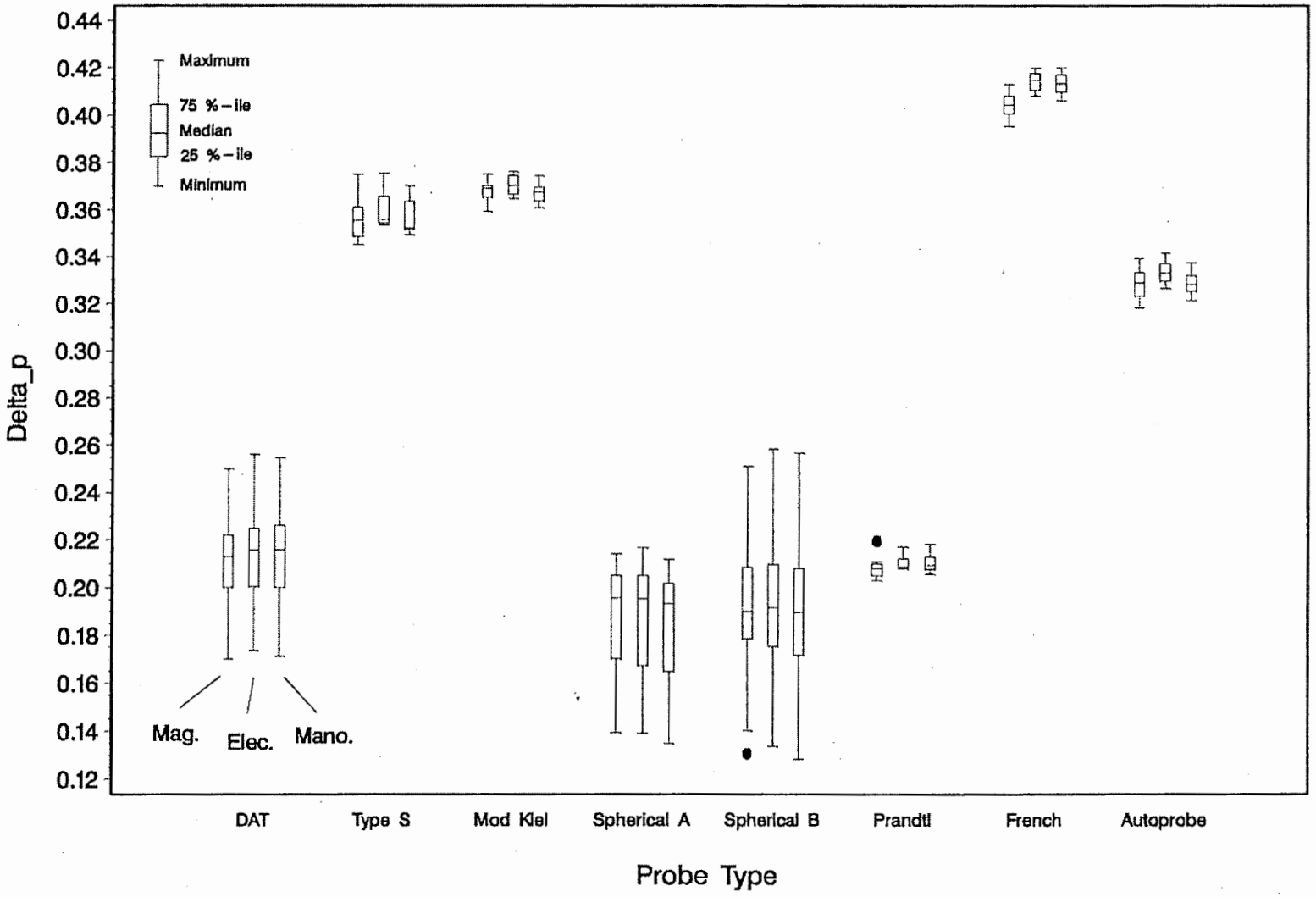


Figure I2-1. Comparison of ΔP across probe type at 30 fps using NIST data.

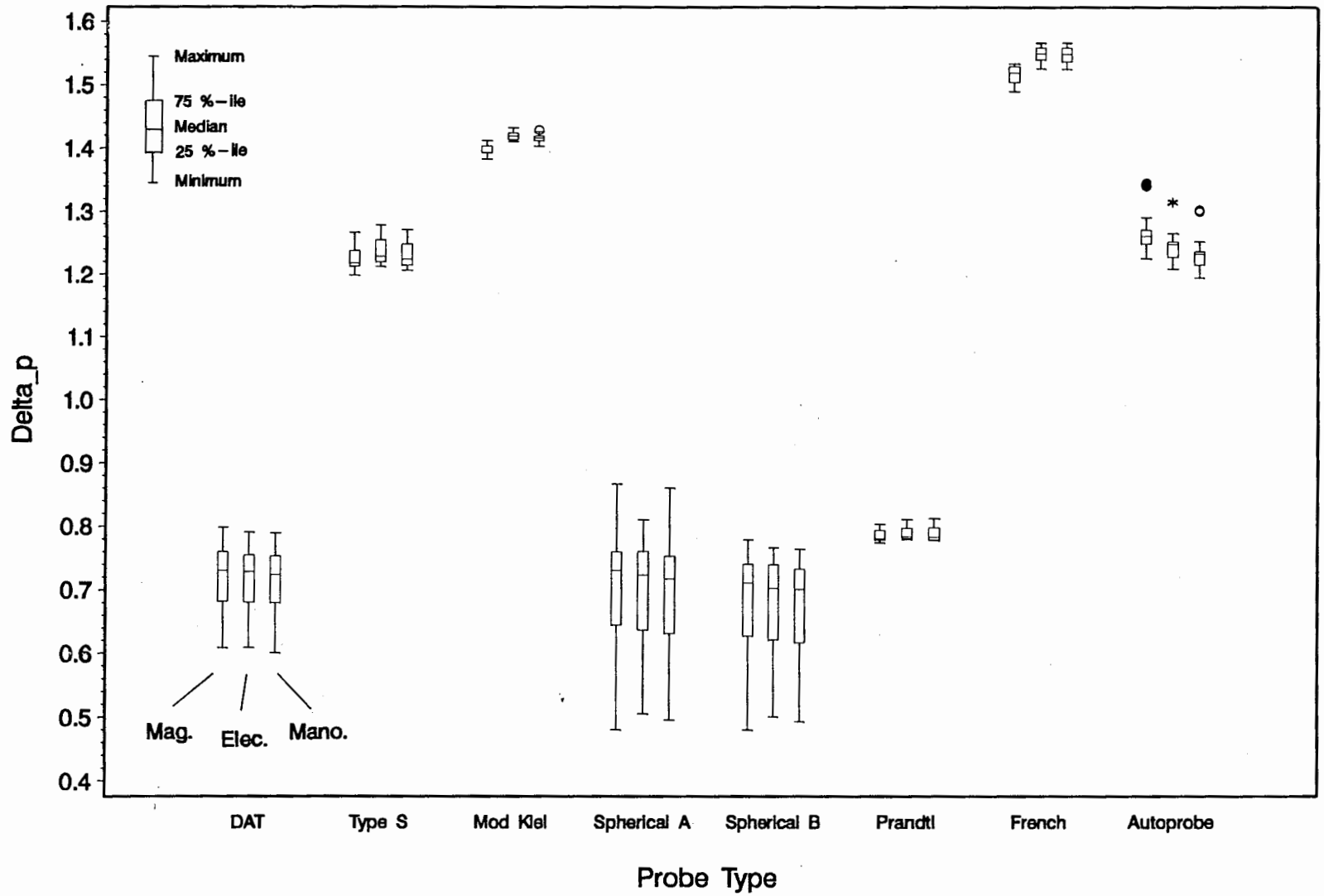


Figure I2-2. Comparison of ΔP across probe type at 60 fps using NIST data.

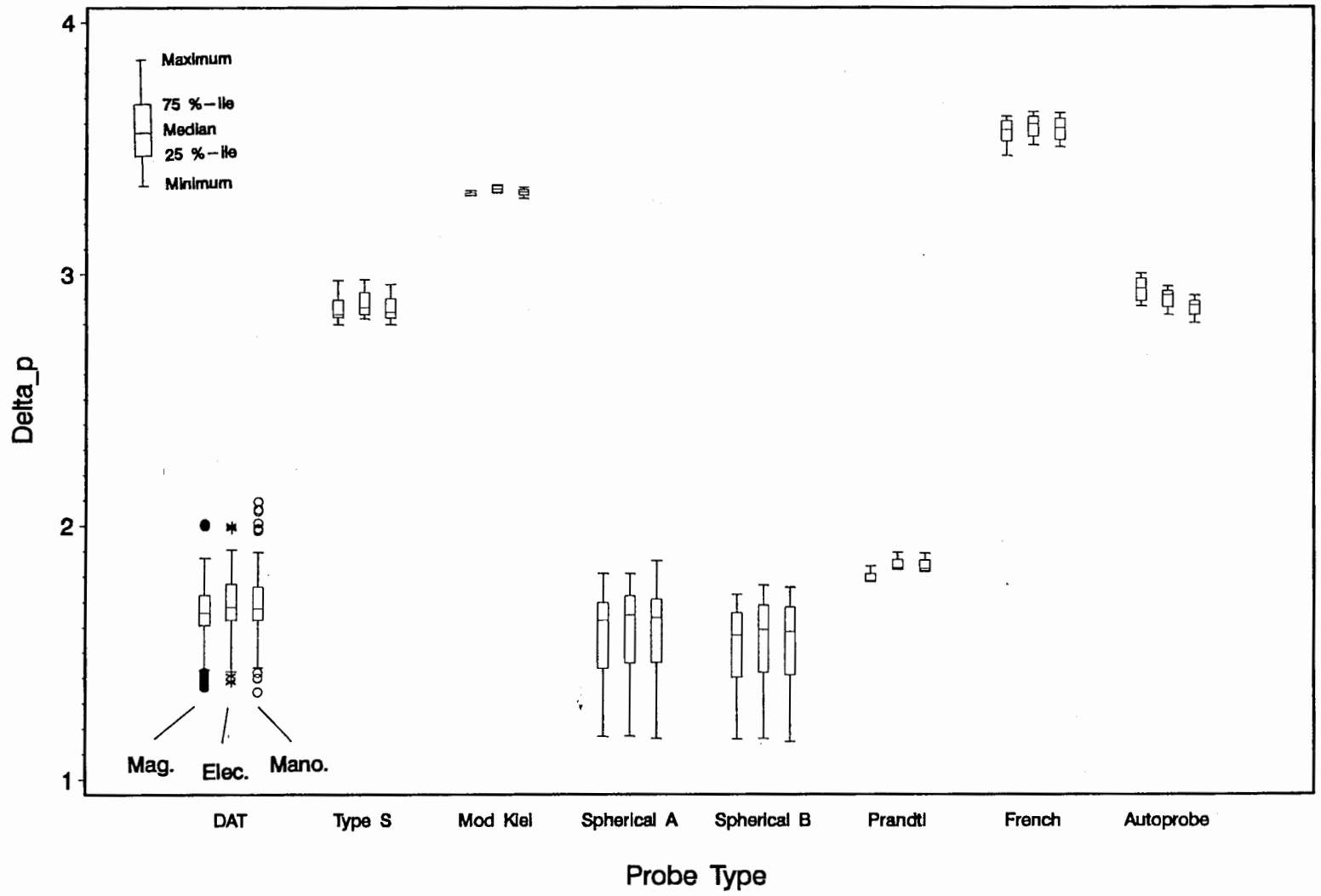


Figure I2-3. Comparison of ΔP across probe type at 90 fps using NIST data.

Table I2-8a. Summary Statistics[a] on ΔP—NIST Data at Velocity 30 fps[b]

Probe	Average ΔP (in. H_2O)			Med. ΔP (in. H_2O)			Min. ΔP (in. H_2O)			Max. ΔP (in. H_2O)			S.D. ΔP (in. H_2O)			IQR ΔP (in. H_2O)		
	Mag.	Elec.	Mano	Mag.	Elec.	Mano	Mag.	Elec.	Mano	Mag.	Elec.	Mano	Mag.	Elec.	Mano	Mag.	Elec.	Mano.
DAT	0.211	0.213	0.214	0.213	0.216	0.216	0.170	0.174	0.171	0.250	0.256	0.255	0.019	0.020	0.019	0.022	0.024	0.026
Type S	0.357	0.360	0.357	0.356	0.356	0.352	0.345	0.353	0.349	0.375	0.375	0.370	0.009	0.008	0.008	0.013	0.011	0.012
Mod. Kiel	0.368	0.370	0.367	0.369	0.370	0.367	0.359	0.365	0.361	0.375	0.376	0.374	0.004	0.004	0.004	0.005	0.008	0.006
Prandtl	0.209	0.210	0.210	0.208	0.209	0.209	0.203	0.208	0.206	0.220	0.217	0.218	0.005	0.003	0.004	0.005	0.004	0.005
French	0.404	0.414	0.413	0.404	0.415	0.413	0.395	0.408	0.406	0.413	0.420	0.420	0.005	0.004	0.004	0.008	0.007	0.007
Spherical A	0.187	0.187	0.183	0.196	0.195	0.193	0.139	0.139	0.135	0.214	0.217	0.212	0.021	0.022	0.022	0.035	0.038	0.037
Spherical B	0.192	0.193	0.190	0.190	0.191	0.190	0.130	0.134	0.128	0.251	0.258	0.257	0.028	0.029	0.030	0.030	0.034	0.037
Autoprobes	0.328	0.333	0.328	0.329	0.333	0.328	0.318	0.326	0.321	0.339	0.341	0.337	0.006	0.005	0.005	0.010	0.007	0.007

[a] Med. = median, Min. = minimum, Max. = maximum, S.D. = standard deviation, IQR = interquartile range = 75th - 25th percentile.

[b] Mag. = magnehelic gauge, Elec. = electronic transducer, Mano. = manometer.

Table I2-8b. Summary Statistics[a] on ΔP—NIST Data at Velocity 60 fps[b]

Probe	Avg. ΔP (in. H_2O)			Med. ΔP (in. H_2O)			Min. ΔP (in. H_2O)			Max. ΔP (in. H_2O)			S.D. ΔP (in. H_2O)			IQR ΔP (in. H_2O)		
	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.
DAT	0.722	0.716	0.714	0.730	0.728	0.723	0.609	0.609	0.601	0.799	0.790	0.789	0.050	0.049	0.050	0.078	0.073	0.073
Type S	1.224	1.236	1.231	1.217	1.228	1.223	1.198	1.212	1.205	1.266	1.278	1.270	0.021	0.024	0.023	0.024	0.035	0.033
Mod Kiel	1.395	1.419	1.415	1.393	1.419	1.416	1.383	1.410	1.402	1.412	1.432	1.429	0.008	0.006	0.006	0.010	0.010	0.007
Prandtl	0.786	0.790	0.789	0.782	0.784	0.783	0.774	0.780	0.778	0.803	0.812	0.813	0.010	0.012	0.013	0.015	0.016	0.018
French	1.516	1.549	1.548	1.519	1.550	1.549	1.490	1.526	1.525	1.534	1.566	1.566	0.014	0.012	0.013	0.024	0.019	0.021
Spherical A	0.703	0.698	0.692	0.730	0.723	0.717	0.480	0.505	0.496	0.867	0.810	0.860	0.081	0.081	0.082	0.114	0.123	0.120
Spherical B	0.685	0.678	0.674	0.711	0.703	0.701	0.480	0.501	0.493	0.779	0.767	0.764	0.068	0.071	0.071	0.112	0.117	0.116
Autoprobes	1.265	1.246	1.232	1.260	1.247	1.232	1.225	1.208	1.194	1.345	1.315	1.302	0.030	0.029	0.028	0.021	0.024	0.021

[a] Med. = median, Min. = minimum, Max. = maximum, S.D. = standard deviation, IQR = interquartile range = 75th - 25th percentile.

[b] Mag. = magnehelic gauge, Elec. = electronic transducer, Mano. = manometer.

Table I2-8c. Summary Statistics[a] on ΔP—NIST Data at Velocity 90 fps[b]

Probe	Avg. ΔP (in. H_2O)			Med. ΔP (in. H_2O)			Min. ΔP (in. H_2O)			Max. ΔP (in. H_2O)			S.D. ΔP (in. H_2O)			IQR ΔP (in. H_2O)		
	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.
DAT	1.658	1.684	1.678	1.657	1.680	1.675	1.365	1.386	1.345	2.008	2.001	2.095	0.112	0.116	0.120	0.117	0.142	0.130
Type S	2.862	2.882	2.863	2.837	2.866	2.846	2.798	2.822	2.798	2.973	2.978	2.958	0.055	0.058	0.056	0.068	0.085	0.074
Mod Kiel	3.322	3.340	3.326	3.324	3.340	3.328	3.314	3.323	3.302	3.334	3.357	3.347	0.008	0.012	0.013	0.010	0.025	0.020
Prandtl	1.794	1.847	1.843	1.782	1.834	1.830	1.777	1.826	1.818	1.841	1.894	1.891	0.022	0.026	0.028	0.032	0.036	0.040
French	3.566	3.586	3.576	3.573	3.594	3.579	3.470	3.513	3.505	3.626	3.644	3.639	0.044	0.042	0.046	0.078	0.078	0.082
Spherical A	1.559	1.580	1.571	1.626	1.647	1.637	1.169	1.170	1.161	1.811	1.810	1.860	0.172	0.181	0.178	0.258	0.263	0.248
Spherical B	1.523	1.543	1.534	1.568	1.590	1.581	1.159	1.159	1.148	1.729	1.764	1.758	0.154	0.162	0.162	0.253	0.262	0.265
Autoprobes	2.938	2.864	2.864	2.940	2.913	2.874	2.870	2.835	2.802	3.000	2.995	2.912	0.045	0.038	0.036	0.090	0.064	0.054

[a] Med. = median, Min. = minimum, Max. = maximum, S.D. = standard deviation, IQR = interquartile range = 75th - 25th percentile.

[b] Mag. = magnehelic gauge, Elec. = electronic transducer, Mano. = manometer.

- Except for the DAT and Prandtl probes at 30 fps where the inclined manometer provides larger values than the electronic transducer on average, the inclined manometer reads lower than the electronic transducer on average for every probe at all velocities.

- A statistically significant difference between the inclined manometer and the electronic transducer was observed for every probe at every velocity condition except for the Prandtl at 30 and 60 fps, and the French at 60 fps. However, the differences were often too small to have practical consequences. (For example, the mean difference in ΔP for the modified Kiel at 60 fps is -0.23%, which is statistically significantly different from zero (p-value=0.0000), but the difference is so small that it is of no practical consequence.)

- The average percent difference in ΔP values between the magnehelic gauge and the electronic transducer ranges from -2.36% to 0.38% for a velocity of 30 fps, from -2.13% to 1.52% for a velocity of 60 fps, and from -2.89% to 1.29% for a velocity of 90 fps. These ranges are larger than those between the inclined manometer and the electronic transducer.

- The magnehelic gauge generally produces smaller pressure readings than the electronic transducer at 30 and 90 fps, except for Spherical A at 30 fps and the Autoprobe at 90 fps. At 60 fps, half of the probes showed lower readings from the magnehelic than from the electronic transducer.

- A statistically significant difference between the magnehelic gauge and the electronic transducer was observed for every probe at every velocity condition. Again, the differences were often too small to have practical consequences.

Swirl Wind Tunnel Tests (FERCo Swirl Tunnel Data Set)

In the swirl wind tunnel tests performed at FERCo, the ΔP values were measured at three different velocity conditions (1, 2, and 3), at three test points (1b, 5a, and inlet), on three runs (1, 2, and 3), by three testers. A Type S probe (EPA Probe S-11) was used for all measurements. To determine how the pressure measurements from manual devices differ from those from the electronic transducers, percent differences between the manual devices (inclined manometer and magnehelic gauge) and the electronic transducer were calculated for each set of paired measurements.

Table I2-9 summarizes the means and standard deviations of these percent differences at each velocity condition and each test point. In addition, the mean ΔP values from the electronic transducer are also presented to provide a sense of the magnitude of the pressure measurements. To compare the pressure readings from the manual and electronic devices, a paired t-test was performed in the same manner as the one described for the NIST data analysis. The p-value of the t-test is also included in Table I2-9.

In addition, ΔP data were examined visually using box-and-whisker plots. Figures I2-4 through I2-6 depict ΔP values obtained by electronic transducer and manual devices using different probe types at different velocity conditions. Summary statistics (average, median, minimum, maximum, standard deviation, and interquartile range) on ΔP values are also provided in Table I2-10.

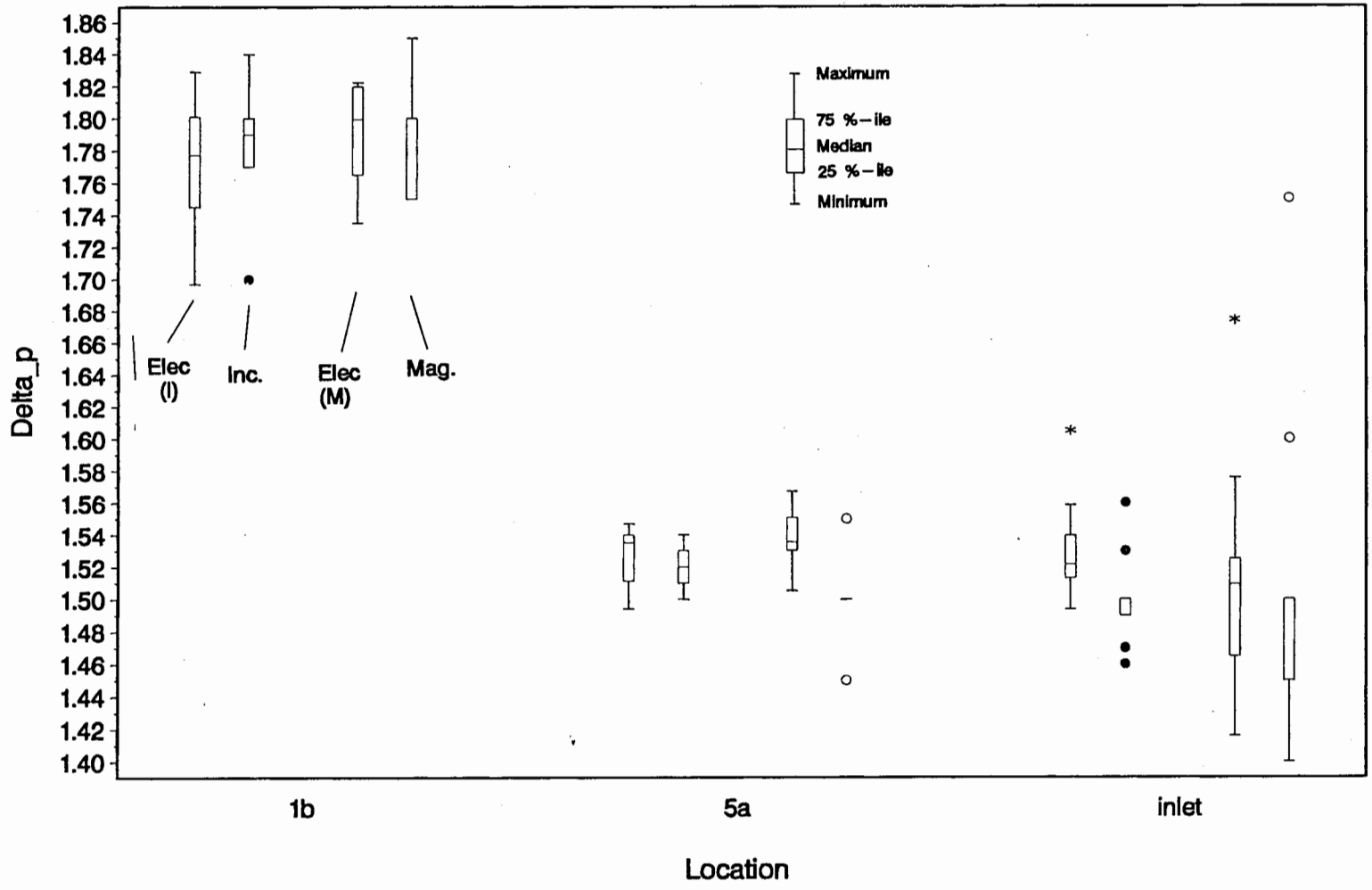
Table I2-9. Percent Difference[a] Between Manual and Electronic Transducers in Pressure—FERCo Swirl Wind Tunnel Data

Velocity	Test Point Location	Devices	Mean ΔP from Electronic Transducer[b] (in. H_2O)	Percent Difference[a] in ΔP (in. H_2O)		
				Mean (%)	S.D.(%)	p-value[c]
1	1b	Inclined	1.773	0.71	1.48	0.1996
		Magnehelic	1.791	-0.09	1.50	0.8434
	5a	Inclined	1.528	-0.43	1.14	0.2771
		Magnehelic	1.538	-2.46	1.64	0.0020
	inlet	Inclined	1.531	-1.96	0.89	0.0002
		Magnehelic	1.513	-0.15	3.08	0.9237
2	1b	Inclined	1.428	0.02	0.93	0.9753
		Magnehelic	1.443	1.27	1.91	0.0783
	5a	Inclined	1.234	-0.65	0.85	0.0517
		Magnehelic	1.221	-0.78	1.89	0.2459
	inlet	Inclined	1.212	1.18	2.62	0.1962
		Magnehelic	1.240	-0.05	2.48	0.9308
3	1b	Inclined	1.152	1.52	2.09	0.0568
		Magnehelic	1.148	2.12	3.31	0.0924
	5a	Inclined	0.980	-0.56	1.33	0.2432
		Magnehelic	0.965	-0.96	1.86	0.1616
	inlet	Inclined	0.997	-0.76	2.73	0.4347
		Magnehelic	0.991	-1.28	2.93	0.2018

[a] Percent Difference = (Manual - Electronic) / Electronic * 100.

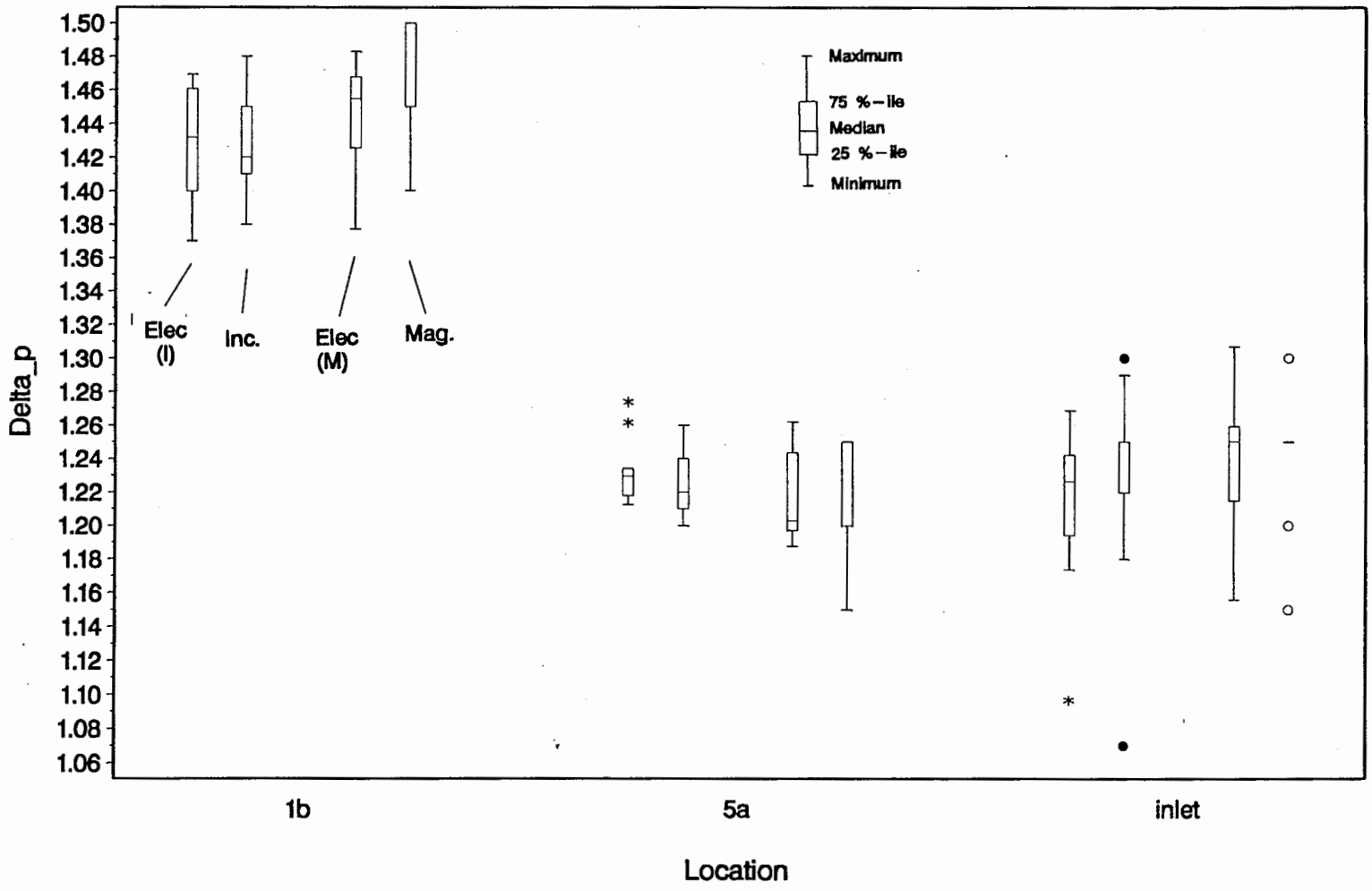
[b] ΔP values from electronic transducer were calculated as the squares of the averages of the 0.1-second sqrt(ΔP) values over the same period as the manual device measurements were observed.

[c] p-value for paired t-test; any value less than 0.05 indicates a statistically significant test result.



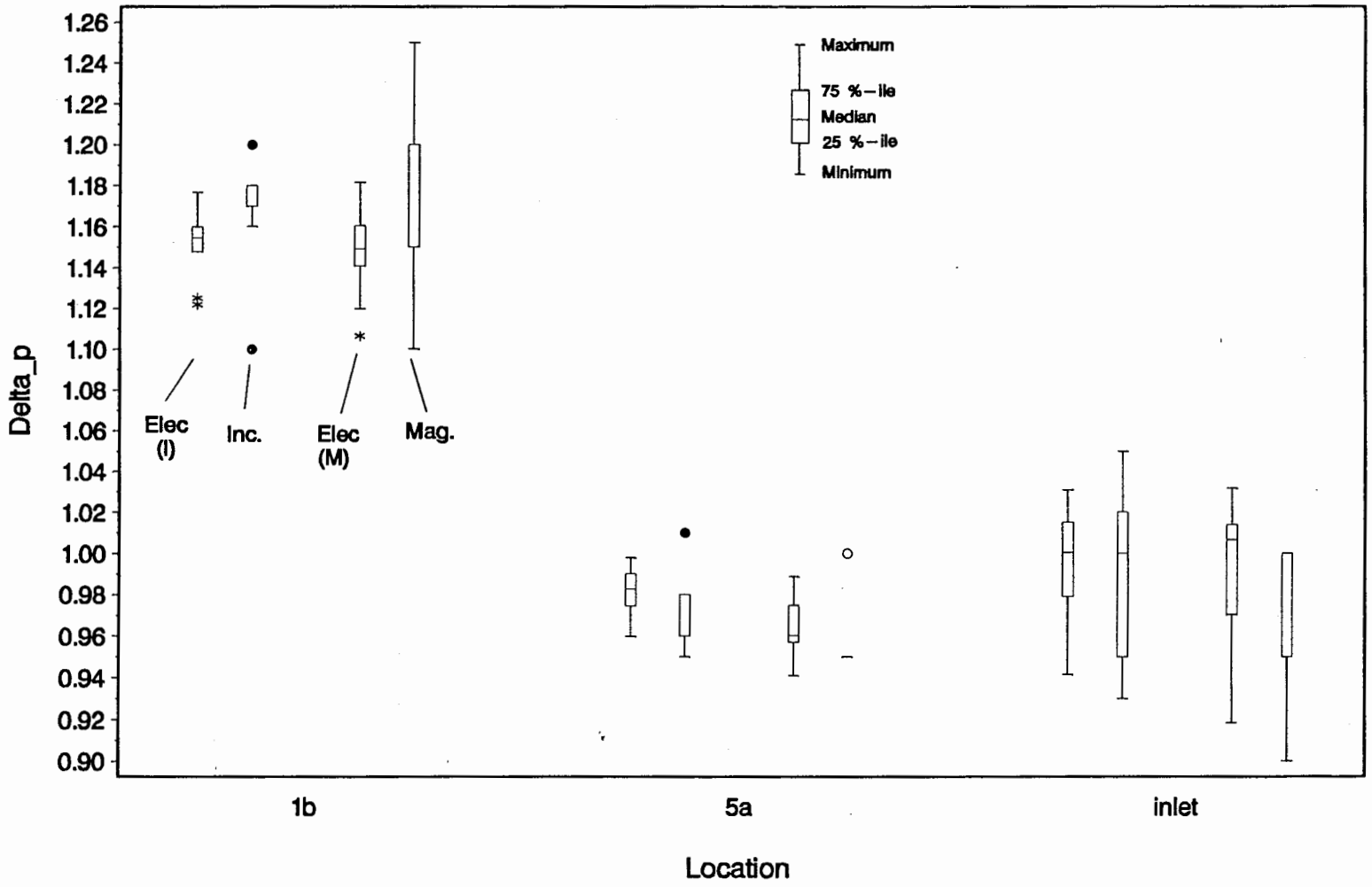
Squares of the averages of the 0.1-second sqrt(delta_p) values for the electronic device were used.

Figure I2-4. Comparison of ΔP across probe type at velocity condition 1 using FERCo swirl tunnel data.



Squares of the averages of the 0.1-second sqrt(delta_p) values for the electronic device were used.

Figure I2-5. Comparison of ΔP across probe type at velocity condition 2 using FERCo swirl tunnel data.



Squares of the averages of the 0.1-second sqrt(delta_p) values for the electronic device were used.

Figure I2-6. Comparison of ΔP across probe type at velocity condition 3 using FERCo swirl tunnel data.

Table I2-10. Summary Statistics[a] on ΔP—FERCo Swirl Wind Tunnel Data (Squares of the Averages of the Square Root of ΔP from Electronic Transducer)[b,c]

Velocity	Test Point Location	Manual Devices	Avg. ΔP (in. H_2O)		Med. ΔP (in. H_2O)		Min. ΔP (in. H_2O)		Max. ΔP (in. H_2O)		S.D. ΔP (in. H_2O)		IQR ΔP (in. H_2O)	
			Elec.	Man.	Elec.	Man.	Elec.	Man.	Elec.	Man.	Elec.	Man.	Elec.	Man.
1	1b	Incline	1.773	1.786	1.777	1.790	1.697	1.700	1.829	1.840	0.040	0.041	0.056	0.030
		Magnehelic	1.791	1.789	1.800	1.800	1.735	1.750	1.823	1.850	0.034	0.033	0.055	0.050
	5a	Incline	1.528	1.521	1.535	1.520	1.494	1.500	1.547	1.540	0.018	0.014	0.029	0.020
		Magnehelic	1.538	1.500	1.536	1.500	1.505	1.450	1.567	1.550	0.018	0.025	0.020	0.000
	inlet	Incline	1.531	1.501	1.521	1.500	1.494	1.460	1.605	1.560	0.033	0.030	0.026	0.010
		Magnehelic	1.513	1.511	1.509	1.500	1.416	1.400	1.674	1.750	0.078	0.105	0.060	0.050
2	1b	Incline	1.428	1.428	1.432	1.420	1.370	1.380	1.469	1.480	0.034	0.033	0.061	0.040
		Magnehelic	1.443	1.461	1.455	1.450	1.377	1.400	1.483	1.500	0.036	0.033	0.042	0.050
	5a	Incline	1.234	1.226	1.230	1.220	1.213	1.200	1.274	1.260	0.021	0.024	0.016	0.030
		Magnehelic	1.221	1.211	1.203	1.200	1.188	1.150	1.262	1.250	0.030	0.033	0.046	0.050
	inlet	Incline	1.212	1.227	1.227	1.250	1.097	1.070	1.269	1.300	0.052	0.069	0.048	0.030
		Magnehelic	1.240	1.239	1.250	1.250	1.156	1.150	1.307	1.300	0.042	0.042	0.044	0.000
3	1b	Incline	1.152	1.170	1.155	1.180	1.122	1.100	1.177	1.200	0.019	0.028	0.012	0.010
		Magnehelic	1.148	1.172	1.149	1.150	1.106	1.100	1.182	1.250	0.024	0.044	0.020	0.050
	5a	Incline	0.980	0.974	0.983	0.980	0.960	0.950	0.998	1.010	0.013	0.017	0.015	0.020
		Magnehelic	0.965	0.956	0.960	0.950	0.941	0.950	0.989	1.000	0.014	0.017	0.018	0.000
	inlet	Incline	0.997	0.990	1.001	1.000	0.942	0.930	1.031	1.050	0.028	0.042	0.036	0.070
		Magnehelic	0.991	0.978	1.007	1.000	0.918	0.900	1.032	1.000	0.038	0.036	0.044	0.050

Examination of Tables I2-9 and I2-10, as well as Figures I2-4 through I2-6 provide the following observations:

- At all three velocities, pressure measurements at Test Point 1b are generally higher than those obtained at Test Point 5a and the inlet.

- At Test Point 5a and the inlet, the pressure measurements obtained by the inclined manometer and the magnehelic gauge are sometimes identical across the three runs and the three testers.

- Across all three velocities, the manual devices tend to produce smaller pressure readings on average most of the time than the electronic transducer except at Test Point 1b.

- The average percent difference in ΔP values between the electronic transducer and the manual devices ranges from -2.46% to 2.12% across all velocity conditions and test points.

- Pressure measurements obtained at velocity conditions 2 and 3 at all test points do not statistically significantly differ between the electronic transducer and the manual devices.

- At velocity condition 1, pressure measurements with the magnehelic gauge are significantly smaller than those obtained by the electronic transducer at Test Point 5a; at the inlet, the inclined manometer tends to produce smaller measurements than the electronic transducer; and at Test Point 1b, the pressure measurements do not differ between the electronic transducer and the manual devices.

EPA Field Tests (Radian Data Set)

For the EPA field tests conducted by Radian, pressure measurements obtained by 1/4" Type S probe, 3/8" Type S probe, 3D probe, and modified Type S probe were included in this analysis. The tests were conducted at one velocity. To determine how the pressure measurements from the manual devices differ from those from the electronic transducer, the percent differences between the manual devices (inclined manometer and magnehelic gauge) and the electronic transducer were calculated for each set of paired measurements. Table I2-11summarizes the mean and standard deviation of these percent differences for each probe type. In addition, the mean ΔP values from the electronic transducer were also calculated to provide information on the magnitude of the pressure measurements. To compare the pressure readings from the manual and electronic devices, a paired t-test was performed as described for the NIST data analysis. The p-value for the t-test is also included in Table I2-11.

In addition, ΔP data were examined visually using box-and-whisker plots. Figure I2-7 depicts ΔP values obtained by the electronic transducer and manual devices using different probe types. Summary statistics (average, median, minimum, maximum, standard deviation, and interquartile range) on ΔP values are also provided in Table I2-12.

Table I2-11. Percent Difference from Electronic Device in Pressure—Radian Field Data, Matrix B

Manual Devices	Probe	Mean ΔP from Electronic Device (in. H_2O)	Percent Difference in ΔP (in. H_2O)		p-value[a]
			Mean (%)	S.D. (%)	
Manometer	1/4" Type S	0.734	0.87	4.84	0.3873
	3/8" Type S	0.736	1.06	2.76	0.0598
	3D	0.428	-5.64	7.55	0.0001
	Mod S	0.623	-2.06	4.03	0.0040
Magnehelic	1/4" Type S	0.734	3.66	4.74	0.0001
	3/8" Type S	0.736	2.27	3.48	0.0004
	3D	0.428	-2.30	4.40	0.0034
	Mod S	0.623	0.60	3.77	0.3915

[a] p-value for paired t-test; any value less than 0.05 indicates a statistically significant test result.

Examination of Tables I2-11 and I2-12, as well as Figure I2-7, results in the following observations:

- The average percent difference in ΔP values between the inclined manometer and the electronic transducer ranges from -5.64% for the 3D probe to 1.06% for the 3/8" Type S probe, and the average percent difference in ΔP values between the magnehelic gauge and the electronic transducer ranges from -2.30% for the 3D probe to 3.66% for the 1/4" Type S probe.

- The manual devices produce higher pressure readings on average than the electronic transducer for the 1/4" Type S probe and 3/8" Type S probe, and smaller pressure measurements for the 3D probe.

- The inclined manometer produces significantly smaller pressure readings on average than the electronic transducer with the 3D and modified S probes; no significant differences were observed for the Type S probes. The magnehelic gauge provides significantly larger readings than the electronic transducer on average for the 1/4" Type S and 3/8" Type S probes. A significant difference was also observed for the 3D probe. No significant differences were observed for the modified S probe between the magnehelic gauge and the electronic transducer.

EPRI Field Tests (Coal Creek and Columbia Data Sets)

In the EPRI-sponsored field tests at Coal Creek and Columbia conducted by FERCo, several probe types were used to collect the data. Only data obtained by Type S probes were included in this analysis. Pressure measurements were made only with electronic transducers and magnehelic gauges.

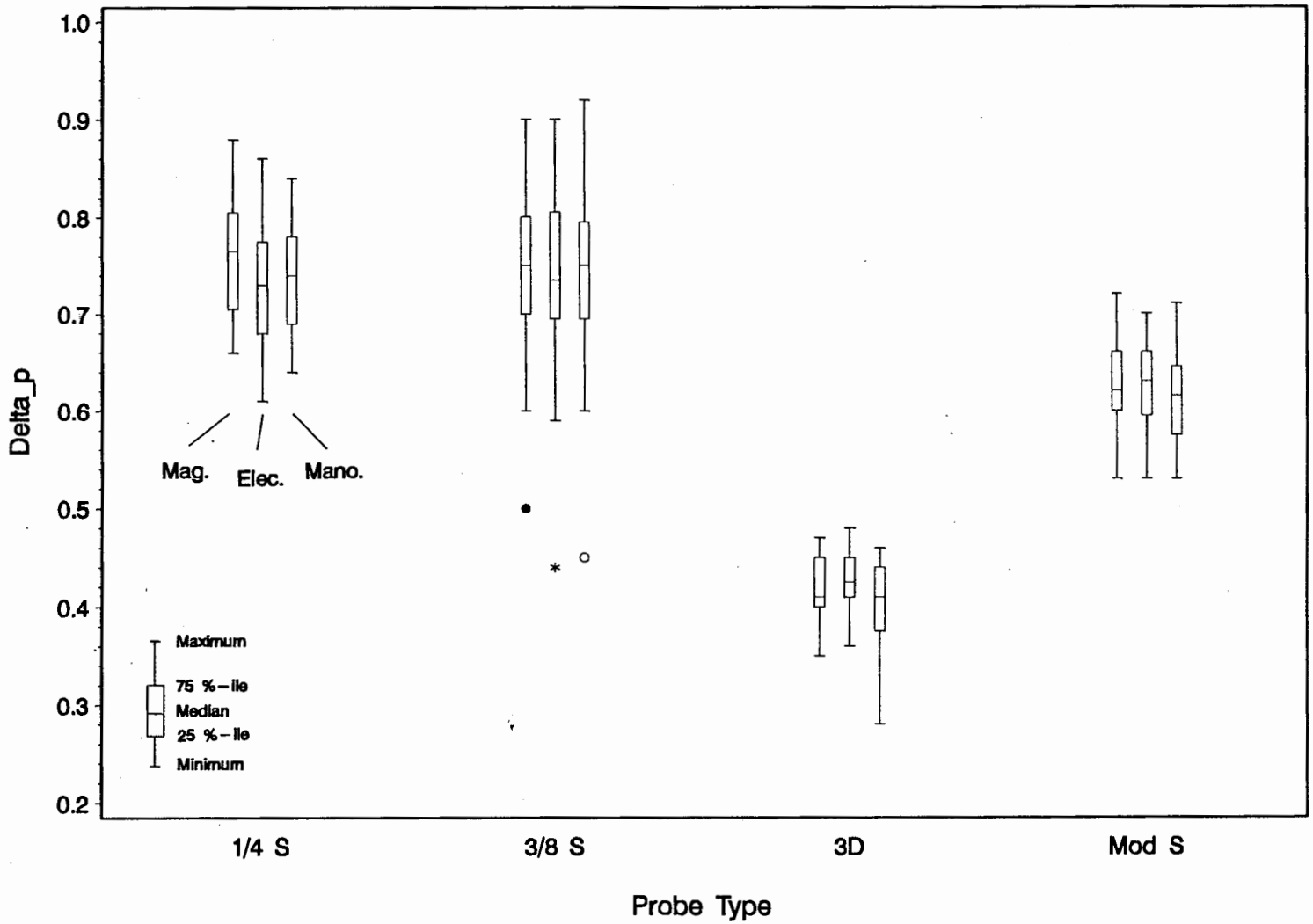


Figure I2-7. Comparison of ΔP across probe type using Radian data.

Table I2-12. Summary Statistics[a] on ΔP—Radian Field Data, Matrix B[b]

Probe	Avg. ΔP (in. H_2O)			Med. ΔP (in. H_2O)			Min. ΔP (in. H_2O)			Max. ΔP (in.H_2O)			S.D. ΔP (in. H_2O)			IQR ΔP (in. H_2O)		
	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.	Mag.	Elec.	Mano.
1/4" Type S	0.760	0.734	0.739	0.765	0.730	0.740	0.66	0.61	0.64	0.88	0.86	0.84	0.057	0.062	0.054	0.100	0.095	0.090
3/8" Type S	0.751	0.736	0.743	0.750	0.735	0.750	0.50	0.44	0.45	0.90	0.90	0.92	0.083	0.090	0.084	0.100	0.110	0.100
3D	0.418	0.428	0.404	0.410	0.425	0.410	0.35	0.36	0.28	0.47	0.48	0.46	0.029	0.030	0.041	0.050	0.040	0.065
Mod S	0.626	0.623	0.610	0.620	0.630	0.615	0.53	0.53	0.53	0.72	0.70	0.71	0.045	0.044	0.047	0.060	0.065	0.070

[a] Med. = median, Min. = minimum, Max. = maximum, S.D. = standard deviation, IQR = interquartile range = 75th - 25th percentile.

[b] Mag. = magnehelic gauge, Elec. = electronic transducer, Mano. = manometer.

I2-13 summarizes the mean and standard deviation of these percent differences for each field test. In addition, the mean ΔP values from the electronic transducer was also calculated to provide information on the magnitude of the pressure measurements. To compare the pressure readings from the manual and electronic devices, a paired t-test was performed in the same manner as described for the NIST data analysis. The p-values for the t-test are also included in Table I2-13.

Table I2-13. Percent Difference[a] Between Manual and Electronic Transducers in Pressure (in. H_2O)—Coal Creek and Columbia Field Tests

Site	Mean ΔP from Electronic Transducer[b] (in. H_2O)	Percent Difference in ΔP (in. H_2O)		p-value[c]
		Mean (%)	S.D. (%)	
Coal Creek	1.738	3.26	4.84	0.0173
Columbia	2.231	0.58	1.98	0.2414

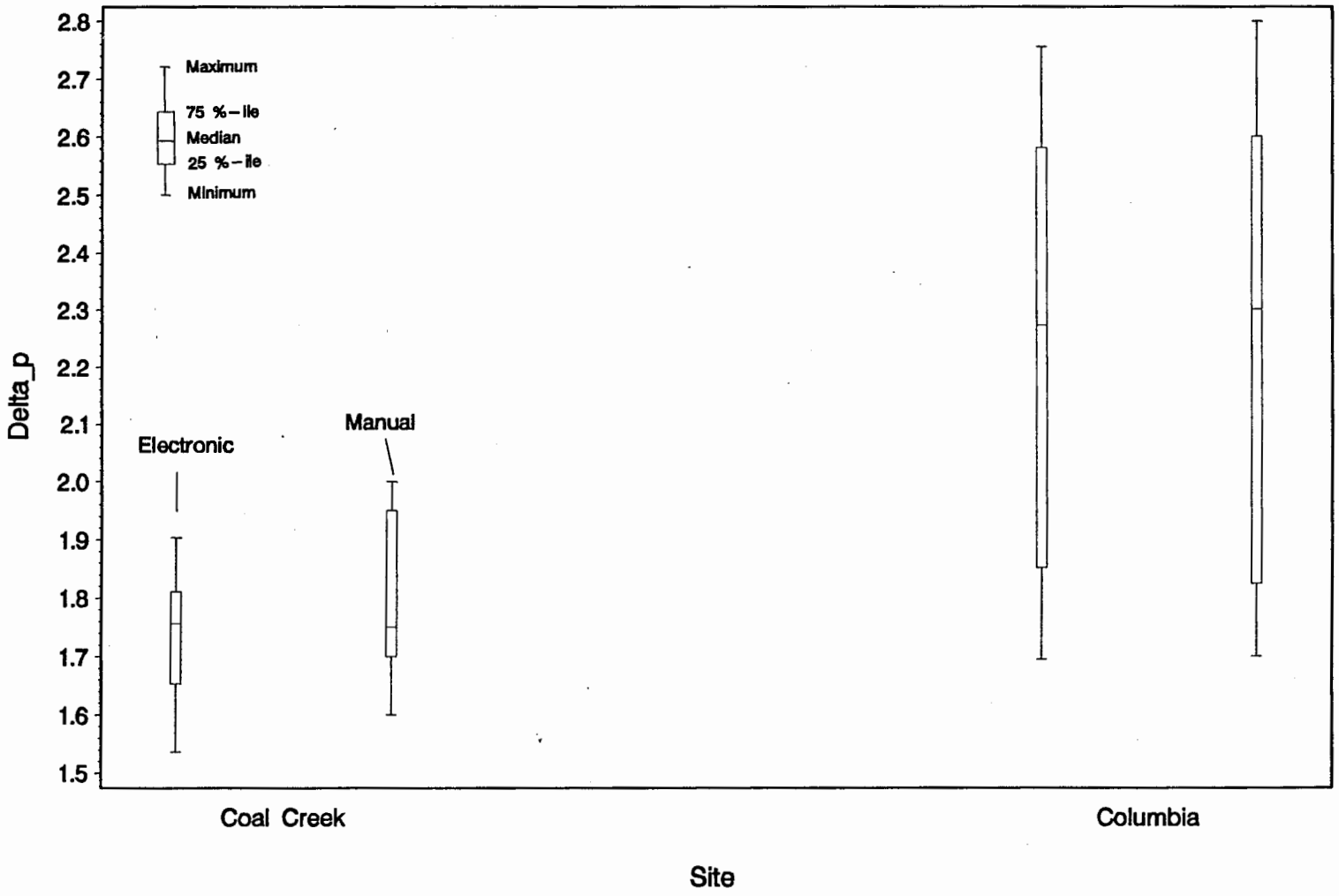
[a] Percent Difference = (Manual - Electronic) / Electronic * 100.
[b] ΔP values from electronic transducers were calculated as the squares of the average of each 1-second sqrt(ΔP) values over the same period as the manual device measurements were observed.
[c] p-value for paired t-test; any value less than 0.05 indicates a statistically significant test result.

In addition, ΔP data were examined visually using box-and-whisker plots. Figure I2-8 depicts ΔP values obtained by the electronic transducer and the magnehelic gauge for each field test. Summary statistics (average, median, minimum, maximum, standard deviation, and interquartile range) on ΔP values are also provided in Table I2-14.

Examination of Tables I2-13 and I2-14, as well as Figure I2-8, results in the following observations:

- At Coal Creek, ΔP values from the electronic transducer are generally lower than those from the manual device; at Columbia, although the electronic transducer values are also lower than the manual device readings, the differences are small.

- At Coal Creek, the pressure values from the electronic transducer differ significantly from those from the manual device. At Columbia, statistically significant differences in the two types of pressure devices could not be demonstrated.



Squares of the averages of the one-second sqrt(delta_p) values for the electronic transducer were used

Figure I2-8. Comparison of ΔP across probe type using FERCo field data at Coal Creek and Columbia.

Table I2-14. Summary Statistics[a] on ΔP—FERCo (Coal Creek and Columbia) Data, Square Root Averages[b]

Site	Avg. ΔP (in. H_2O)		Med. ΔP (in. H_2O)		Min. ΔP (in. H_2O)		Max. ΔP (in. H_2O)		S.D. ΔP (in.H_2O)		IQR ΔP (in.H_2O)	
	Elec.	Man.	Elec.	Man.	Elec.	Man.	Elec.	Man.	Elec.	Man.	Elec.	Man.
Coal Creek	1.738	1.794	1.757	1.750	1.536	1.600	1.904	2.000	0.116	0.141	0.157	0.250
Columbia	2.231	2.244	2.272	2.300	1.695	1.700	2.756	2.800	0.381	0.384	0.728	0.775

[a] Elec. = electronic transducer, Man. = manual pressure device.

[b] Med. = median, Min. = minimum, Max. = maximum, S.D. = standard deviation, IQR = interquartile range = 75th - 25th percentile.

ΔP values from electronic transducers were calculated as the squares of the averages of the 1-second sqrt(ΔP) values over the same period as the manual device measurements were observed.

Appendix J.
Wall Effects Data

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Exhibit J-1. Criterion for Excluding Baseline Autoprobes Wall Effects Data Due to Change in Load (Velocity) Between Original and Wall-Effects Runs.

Wall effects data collected under nonsteady-state load conditions were excluded from analysis in the wall effects study according to the following procedure.

Velocity values for traverse points at the same distance from the stack wall in the baseline run and the wall effects run were compared for each port. (If there was no traverse point in the wall-effects run at the same distance as or within 0.25 in. of a point in the baseline run, the point velocity values in the wall effects run at the next larger and smaller 1-in. distances were averaged for comparison to the value in the baseline traverse.) The percent difference in point velocity between the baseline run and the wall effects run was calculated for each port and averaged across all four ports. If the average percent difference across all four ports in any given run exceeded ±8%, all data for that run were excluded from analysis. The ±8% criterion was developed through examination of baseline and wall-effects runs conducted at DeCordova, Lake Hubbard, and Homer City, and is slightly greater than the maximum percent difference (6.2%) observed for any single port for all baseline and wall-effects runs conducted under steady load conditions at these sites.

Exhibit J-2. Example Calculation of Near-Wall Replacement Velocity

Wall Effects Run 21 - DAT Probe								
PORT C, Test Team 3								
		Stack Area:	57255.5	sq. in.				
1		Radius:	135	in.		pi =3.14159		
2	(A)		(B)	(C)	(D)	(E)	(F)	(G)
	Distance		Axial vel.	Decay vel.	Intermediate		Area of	Vol. flow
	from wall		V-d		calculations		segment	in segment
	(inches)		ft/sec	avg of d, d-1	pi(r-d+1)^2	pi(r-d)^2	(col D - E)	(col C X F)
	d=	1	52.42	26.21	57255.48	56410.39	845.09	22150.30
	d=	2	63.85	58.14	56410.39	55571.59	838.80	48765.46
	d=	3	72.42	68.14	55571.59	54739.06	832.52	56726.89
	d=	4	72.02	72.22	54739.06	53912.83	826.24	59672.17
	d=	5	72.61	72.31	53912.83	53092.87	819.96	59294.99
	d=	6	75.16	73.89	53092.87	52279.20	813.67	60119.46
	d=	7	80.61	77.89	52279.20	51471.81	807.39	62884.81
	d=	8	81.75	81.18	51471.81	50670.71	801.11	65034.92
	d=	9	80.67	81.21	50670.71	49875.88	794.82	64549.62
	d=	10	81.90	81.28	49875.88	49087.34	788.54	64096.23
	d=	11	82.19	82.04	49087.34	48305.09	782.26	64176.93
	d=	12	82.89	82.54	48305.09	47529.12	775.97	64046.36
	d=	13	83.29	83.09	47529.12	46759.43	769.69	63952.31
	d=	14	84.84	84.06	46759.43	45996.02	763.41	64174.02
	d=	15	85.13	84.99	45996.02	45238.90	757.12	64344.14
	d=	16	84.48	84.81	45238.90	44488.06	750.84	63676.14
	d=	17	85.41	84.94	44488.06	43743.50	744.56	63245.78
3	Total near-wall volumetric flow (total of column G)							1010910.51
	Volumetric flow in remainder of the Method 1 near-wall equal area segment							
	a) Axial velocity at drem (17.54 in)						85.22	
	b) Total area in remainder of near-wall equal area segment						801.85	
	(This is pi*(r-dlast)^2 - 0.75pi*r^2)							
4	Multiply a) by b)							68334.05
	Wall-effect adjusted velocity in the Method 1 near-wall equal area segment							
5a	a) Add the values on lines 3 and 4.							1079244.6
5b	b) Divide line 5a by 0.25pi*r^2. This is the substitute velocity value, V.							75.40

Exhibit J-3. DeCordova.

Seventeen wall effects tests were conducted at DeCordova under steady load conditions during the daytime. The results of these tests are reported in the series 7 tables in Appendix A of the DeCordova site data report. Seven of the tests were performed using manual probes. Four copies of each of five types of manual probes (Type S straight-up and yaw-nulled, DAT, modified Kiel, Prandtl, and French) were used to determine wall effects in the first six manual probe tests. Because two spherical probes had been damaged during earlier non-wall effects tests, the remaining two operational spherical probes and two DAT probes were used in the seventh test (designated by footnote "a" in Table J-1 in this appendix). Due to the offset positions of the impact and wake pressure ports, it was not possible to obtain accurate measurements at distances closer than 4 in. from the stack wall using the modified Kiel probes.

The baseline Autoprobes were operated in the straight-up and yaw-nulled modes during tests involving the Type S, DAT, modified Kiel, and spherical/DAT probes and in only the straight-up mode during tests involving the one-dimensional Prandtl and French probes. This produced ten additional wall effects results, counting both straight-up and yaw-nulled Autoprobe results as separate tests.

Fourteen additional wall effects tests were conducted at DeCordova at night under nonsteady-state load conditions, seven each using the baseline Autoprobes operated in the straight-up and yaw-nulled modes. The data for these tests are reported in the tables in Appendix O of the DeCordova site data report. Sixteen traverse points were sampled in the original traverses for all the day-time and over-night tests.

Exhibit J-4. Lake Hubbard.

At Lake Hubbard, three wall effects tests were conducted under steady load conditions during the day: one using DAT probes and one each using the baseline Autoprobes operated in the straight-up and yaw-nulled modes. The results of these tests are reported in the series 7 tables in Appendix A of the Lake Hubbard site data report.

Eighteen additional wall effects tests were conducted at Lake Hubbard at night under nonsteady-state load conditions, nine each using the baseline Autoprobes operated in the straight-up and yaw-nulled modes. Sixteen traverse points were sampled in the original traverses for all the day-time and over-night tests. The data for these tests are reported in the tables in Appendix O of the Lake Hubbard site data report.

Exhibit J-5. Homer City.

Day-time tests. Twenty-nine wall effects tests were conducted at Homer City under steady load conditions during the daytime. The results of these tests are reported in the series 7 tables in Appendix A of the Homer City site data report. Seven wall effects tests were conducted with manual probes. Type S (straight-up and yaw-nulled), DAT, modified Kiel, and French probes were used in five of these tests. Two different groups of four spherical probes were used in the other two tests. Due to the offset positions of the impact and wake pressure ports, it was not possible to obtain accurate measurements at distances closer than 4 in. from the stack wall using the modified Kiel probes. Due to a slight extension of the sampling port nipple into the gas stream, it was not possible to obtain accurate measurements at distances closer than 2 in. from the stack wall in Port A for the French probes, in Ports A, C, and D, for the Type S probes, and in any port for the DAT and spherical probes.

The baseline Autoprobes were operated concurrently during all tests involving the manual probes at Homer City. Sixteen-point original traverses were conducted by the baseline Autoprobes for all the manual probe tests. In addition, separate 12-point original traverses were conducted by the baseline Autoprobes for the DAT probe test and for one of the two spherical probe tests; separate 20-point original traverses were performed by the baseline Autoprobes for all other manual probe tests. The Autoprobes were operated in only the straight-up mode for the test involving the French probe, and in the straight-up and yaw-nulled modes for all other manual probe tests. In all, this produced an additional 22 wall effects test results.

Due to space limitations at the sampling site which kept them from withdrawing fully, the baseline Autoprobes were unable to obtain measurements for sampling points closer than 5 in. from the stack wall. In accordance with the procedure described in the "Method 2 Draft Revisions: Wall Effects Velocity Procedure," the velocity measurements made at the 5-in. sampling point were used for all sampling points closer to the stack wall in calculating the percent difference values reported in Table J-1 in this appendix.

Over-night tests. Fourteen wall effects tests were conducted at Homer City on the night of August 20 and the morning of August 21 under nonsteady-state load conditions, seven each using the baseline Autoprobes operated in the straight-up and yaw-nulled modes. Sixteen traverse points were sampled in the original traverses for all the over-night tests at Homer City.

On the night of August 22 and the morning of August 23, and again on the night of August 23 and the morning of August 24, an additional 56 wall effects tests (28 straight-up and 28 yaw-nulled) were conducted using the baseline Autoprobes and one of the Autoprobes that had been used in Matrix A testing. In these tests, the baseline Autoprobes performed 16-point Method 1 traverses while the single additional Autoprobe took near-wall measurements in one of the manual sampling ports. Because of its shorter shaft, the Autoprobe that had been used in Matrix A testing was able to take near-wall measurements within 1 in. of the stack wall. The single Autoprobe took 26 sets of near-wall measurements in Port D on the night of August 22-23 and 30 sets in Port C on the night of August 23-24.

The data for these over-night tests are reported in the tables in Appendix O of the Homer City site data report.

Exhibit J-6. Conesville Unit 1 and 2 Stack.

Twelve wall effects tests were conducted at the Conesville Unit 1 and 2 shared stack during the day under steady load conditions. The tests included three 16-point traverses using the baseline Autoprobes operated in the straight-up and yaw-nulled modes and three 12-point traverses using the baseline Autoprobes operated in each mode. Results of the tests are reported in the series J-2 tables in this appendix.

Exhibit J-7. Conesville Unit 3.

Twelve wall effects tests were conducted at Conesville Unit 3 during the day under steady load conditions. The data for these tests are reported in the series J-3 tables in this appendix. The tests included three 16-point traverses using the baseline Autoprobes operated in the straight-up and yaw-nulled modes and three 12-point traverses using the baseline Autoprobes operated in each mode. Due to space limitations at the sampling site which kept them from withdrawing fully, the baseline Autoprobes were unable to obtain measurements for sampling points closer than 4 in. from the stack wall. In accordance with the procedure described in the "Method 2 Draft Revisions: Wall Effects Velocity Procedure," the velocity measurements made at the 4-in. sampling point were used for all sampling points closer to the stack wall in calculating the percent difference values reported in series J-3 tables and in Table J-1 in this appendix.

Exhibit J-8. Conesville Unit 5.

Twelve wall effects tests were conducted at Conesville Unit 5 during the day under steady load conditions. These included separate 12- and 16-point traverses, using the baseline Autoprobes operated in the straight-up and yaw-nulled modes. Ten additional wall effects tests were conducted using the baseline Autoprobes operated in the straight-up and yaw-nulled modes at night under nonsteady-state load conditions. Results of the tests are reported in the series J-4 tables in this appendix.

Due to an obstruction in the gas flow for Port D, only three of the four ports could be sampled at Conesville Unit 5. Thus, each Method 1 traverse was only 75% complete. Three 75%-complete 16-point original traverses (i.e., four points for each of three ports) and three 75%-complete 12-point original traverses (i.e., three points for each of three ports) were performed by the baseline Autoprobes for the Conesville Unit 5 day-time tests. Five 75%-complete 16-point original traverses were performed for the over-night tests at Conesville Unit 5. While the data from these tests may be technically suitable for the purpose of calculating the percent difference in volumetric flow due to velocity drop-off close to the stack wall, the data were excluded from analysis because of concern about the adequacy of a 75%-complete traverse to characterize the average cross-stack velocity.

Exhibit J-9. Picway.

Twelve wall effects tests were conducted at Picway during the day under steady load conditions using the baseline Autoprobes operated in the straight-up and yaw-nulled modes. Separate 16- and 12-point original traverses were performed by the baseline Autoprobes for these tests. Results of the tests are reported in the series J-5 tables in this appendix.

Exhibit J-10. Mitchell.

Sixteen wall effects tests were conducted at Mitchell during the day under steady load conditions using the baseline Autoprobes operated in the straight-up and yaw-nulled modes. These included separate 16- and 12-point original traverses. Results of the tests are reported in the series J-6 tables in this appendix. The results for six of the 12-point (three straight-up and three yaw-nulled) tests did not meet the velocity stability criteria described in Exhibit J-1 in this appendix and were not included in the results reported in Table J-1 in this appendix.

Exhibit J-11. Titus.

Twelve wall effects tests were conducted at Titus during the day under nonsteady-state load conditions using the baseline Autoprobes operated in the straight-up and yaw-nulled modes. These included separate 16- and 12-point original traverses. The results for two 16-point (one straight-up and one yaw-nulled) tests did not meet the velocity stability criteria described in Exhibit J-1 in this appendix and were not included in the results reported in Table J-1 in this appendix.

Twenty additional wall effects tests were conducted at night under nonsteady-state load conditions, ten each using the baseline Autoprobes operated in the straight-up and yaw-nulled modes. Sixteen traverse points were sampled in the original traverses for the over-night tests at Titus. Results of the tests are reported in the series J-7 tables in this appendix.

Table J-1. Summary of Percent Decrease in Average Velocity Between Original and Wall Effects-Adjusted Runs (for all stable velocity data)

Site	Stack Mat'l	Statistics	Manual Type S		Baseline Autoprobes								DAT	Spherical	Modified Kiel	Prandtl	French
					Day-Time						Over-Night						
					20 Point		16 Point		12 Point		16 Point						
			Straight-Up	Yaw-Nulled	Straight-Up	Yaw-Nulled	Straight-Up	Yaw-Nulled	Straight-Up	Yaw-Nulled	Straight-Up	Yaw-Nulled					
DeCordova	Steel	No. Runs	1	1			6	4			7	7	1	1[a]	1	1	1
		Average	-1.83%	-1.93%			-1.32%	-1.33%			-1.66%	-1.61%	-1.57%	-1.06%	1.46%	-1.59%	-1.13%
		Std. Dev.					0.06%	0.10%			0.70%	0.74%					
Lake Hubbard	Steel	No. Runs					1	1			9	9	1				
		Average					-1.82%	-1.58%			-1.37%	-1.24%	-1.56%				
		Std. Dev.									0.98%	1.02%					
Homer City	Steel	No. Runs	1	1	4	3	6	5	2	2	7	7	1	2	1		1
		Average	-2.09%	-2.08%	-0.83%	-0.71%	-0.93%	-0.61%	-1.65%	-1.21%	-0.59%	-0.27%	-0.81%	-1.21%	-0.68%		-0.20%
		Std. Dev.			0.15%	0.14%	0.32%	0.19%	0.59%	0.74%	0.54%	0.42%		0.47%			
Conesville Unit 1/2	Brick and mortar	No. Runs					3	3	3	3							
		Average					-1.94%	-1.92%	-4.23%	-4.28%							
		Std. Dev.					0.24%	0.17%	0.12%	0.25%							
Conesville Unit 3	Brick and mortar	No. Runs					3	3	3	3							
		Average					-1.50%	-1.63%	-6.03%	-6.19%							
		Std. Dev.					0.29%	0.18%	0.32%	0.48%							
Conesville Unit 5	Brick and mortar	No. Runs					3	3	3	3	5	5					
		Average					-1.59%	-1.67%	-2.61%	-2.61%	-1.56%	-1.63%					
		Std. Dev.					0.89%	1.09%	0.90%	0.63%	0.52%	0.89%					
Picway	Brick and mortar	No. Runs					3	3	3	3							
		Average					-1.92%	-1.95%	-2.37%	-2.53%							
		Std. Dev.					0.18%	0.23%	0.39%	0.40%							
Mitchell	Brick and mortar	No. Runs					4	4	1	1							
		Average					-1.75%	-1.69%	-2.01%	-2.03%							
		Std. Dev.					1.83%	1.66%									
Titus	Brick and mortar	No. Runs					2	2	3	3	10	10					
		Average					-2.71%	-2.90%	-2.84%	-3.19%	-1.77%	-2.04%					
		Std. Dev.					0.40%	0.33%	0.57%	0.76%	0.83%	1.04%					

a This value was derived from wall effects data that were collected using 2 DAT probes and 2 spherical probes. For the purposes of the round 2 analysis of Matrix A and B data presented in Section 4, a wall effects factor was calculated using only the spherical probe data, which were collected in Ports B and D. The % difference between the average baseline and adjusted velocities calculated using only data from Ports B and D is -1.32% (reported in Table 4-1). For the purposes of the round 2 analysis, this factor was assumed to be representative of the entire stack area.

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 1-2

UNITED SCIENCES AUTOPROBE TEST, 5/6/98

TABLE J-2. WALL EFFECTS VS. ORIGINAL (ORIG), OVERALL SUMMARY

Run No.	Traverse Type	Avg. Velocity, ft/sec			
		Base	Adjusted	Difference	% Difference
1,3	16 pt. straight-up	54.44	53.24	-1.20	-2.20%
	16 pt. yaw-nulled	54.40	53.25	-1.15	-2.11%
2,3	12 pt. straight-up	54.63	52.39	-2.24	-4.10%
	12 pt. yaw-nulled	54.90	52.70	-2.20	-4.01%
5,6	16 pt. straight-up	54.08	53.14	-0.94	-1.74%
	16 pt. yaw-nulled	54.22	53.26	-0.96	-1.77%
5,7	12 pt. straight-up	55.02	52.63	-2.39	-4.34%
	12 pt. yaw-nulled	55.18	52.70	-2.48	-4.49%
8,9	16 pt. straight-up	54.70	53.67	-1.03	-1.88%
	16 pt. yaw-nulled	55.07	54.04	-1.03	-1.87%
8,10	12 pt. straight-up	55.05	52.71	-2.34	-4.25%
	12 pt. yaw-nulled	55.36	52.95	-2.41	-4.35%

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 1-2

UNITED SCIENCES AUTOPROBE TEST, 5/6/98

TABLE J-2A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS *
16 PT. TRAVERSES

Port	Port A				Port B				Port C				Port D				
Point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average
Run 1 (orig) - straight-up	58.8	59.0	55.7	47.7	57.9	58.5	57.9	50.8	58.8	53.3	51.3	46.6	57.0	57.1	54.7	45.9	54.44
Run 3 (wall) - straight-up	58.8	59.0	55.7	**41.7**	57.9	58.5	57.9	**47.4**	58.8	53.3	51.3	**42.6**	57.0	57.1	54.7	**40.2**	53.24
Difference				-6.0				-3.4				-4.0				-5.7	-1.20
% Difference				-12.6%				-6.7%				-8.6%				-12.4%	-2.20%
Run 1 (orig) - yaw-nulled	58.3	58.4	56.8	47.8	58.1	58.0	57.5	51.2	58.5	53.5	51.5	46.4	57.2	56.8	55.5	44.9	54.40
Run 3 (wall) - yaw-nulled	58.3	58.4	56.8	**41.7**	58.1	58.0	57.5	**47.5**	58.5	53.5	51.5	**42.8**	57.2	56.8	55.5	**39.9**	53.25
Difference				-6.1				-3.7				-3.6				-5.0	-1.15
% Difference				-12.8%				-7.2%				-7.8%				-11.1%	-2.11%
Run 6 (orig) - straight-up	58.7	57.7	56.4	47.0	58.8	57.8	56.9	50.3	59.3	53.5	51.0	45.5	56.8	56.8	54.6	44.2	54.08
Run 5 (wall) - straight-up	58.7	57.7	56.4	**41.7**	58.8	57.8	56.9	**47.5**	59.3	53.5	51.0	**42.5**	56.8	56.8	54.6	**40.2**	53.14
Difference				-5.3				-2.8				-3.0				-4.0	-0.94
% Difference				-11.3%				-5.6%				-6.6%				-9.0%	-1.74%
Run 6 (orig) - yaw-nulled	58.2	58.1	56.2	46.8	59.0	57.8	57.7	50.8	59.7	54.0	50.8	46.0	57.7	57.1	53.9	43.7	54.22
Run 5 (wall) - yaw-nulled	58.2	58.1	56.2	**41.8**	59.0	57.8	57.7	**47.5**	59.7	54.0	50.8	**42.7**	57.7	57.1	53.9	**40.0**	53.26
Difference				-5.0				-3.3				-3.3				-3.7	-0.96
% Difference				-10.7%				-6.5%				-7.2%				-8.5%	-1.77%
Run 9 (orig) - straight-up	59.4	58.2	57.1	47.0	59.3	58.5	58.0	49.8	60.0	54.8	50.9	46.8	57.6	57.5	55.0	45.3	54.70
Run 8 (wall) - straight-up	59.4	58.2	57.1	**41.3**	59.3	58.5	58.0	**47.9**	60.0	54.8	50.9	**42.9**	57.6	57.5	55.0	**40.3**	53.67
Difference				-5.7				-1.9				-3.9				-5.0	-1.03
% Difference				-12.1%				-3.8%				-8.3%				-11.0%	-1.88%
Run 9 (orig) - yaw-nulled	59.3	58.6	57.7	47.4	59.8	58.8	58.1	50.9	60.4	55.1	51.4	46.0	58.7	58.0	56.0	44.9	55.07
Run 8 (wall) - yaw-nulled	59.3	58.6	57.7	**41.9**	59.8	58.8	58.1	**47.8**	60.4	55.1	51.4	**42.9**	58.7	58.0	56.0	**40.1**	54.04
Difference				-5.5				-3.1				-3.1				-4.8	-1.03
% Difference				-11.6%				-6.1%				-6.7%				-10.7%	-1.87%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first three points at each port were taken from the corresponding baseline. The fourth point at each port, in a bold cell, was calculated using data obtained during wall effects runs (14 near-wall data points).

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 1-2

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TABLE J-2B. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS*
12 PT. TRAVERSES

Port	Port A			Port B			Port C			Port D			
Point	1	2	3	4	5	6	7	8	9	10	11	12	Average
Run 2 (orig) - straight-up	59.3	57.9	49.6	58.6	57.6	52.3	59.1	51.2	48.2	57.6	55.1	49.0	54.63
Run 3 (wall) - straight-up	59.3	57.9	**42.4**	58.6	57.6	**46.9**	59.1	51.2	**42.1**	57.6	55.1	**40.9**	52.39
Difference			-7.2			-5.4			-6.1			-8.1	-2.24
% Difference			-14.5%			-10.3%			-12.7%			-16.5%	-4.10%
Run 2 (orig) - yaw-nulled	59.2	58.0	50.5	58.8	58.9	52.6	58.8	51.6	47.2	58.2	56.2	48.8	54.90
Run 3 (wall) - yaw-nulled	59.2	58.0	**42.4**	58.8	58.9	**47.1**	58.8	51.6	**42.5**	58.2	56.2	**40.7**	52.70
Difference			-8.1			-5.5			-4.7			-8.1	-2.20
% Difference			-16.0%			-10.5%			-10.0%			-16.6%	-4.01%
Run 7 (orig) - straight-up	58.5	59.0	50.4	58.7	58.4	52.8	59.5	51.9	48.2	57.4	56.1	49.3	55.02
Run 5 (wall) - straight-up	58.5	59.0	**42.3**	58.7	58.4	**46.9**	59.5	51.9	**42.1**	57.4	56.1	**40.8**	52.63
Difference			-8.1			-5.9			-6.1			-8.5	-2.39
% Difference			-16.1%			-11.2%			-12.7%			-17.2%	-4.34%
Run 7 (orig) - yaw-nulled	58.4	57.5	51.1	58.9	59.0	54.6	59.7	52.4	47.6	57.4	56.7	48.8	55.18
Run 5 (wall) - yaw-nulled	58.4	57.5	**42.4**	58.9	59.0	**47.0**	59.7	52.4	**42.3**	57.4	56.7	**40.7**	52.70
Difference			-8.7			-7.6			-5.3			-8.1	-2.48
% Difference			-17.0%			-13.9%			-11.1%			-16.6%	-4.49%
Run 10 (orig) - straight-up	59.2	58.1	50.2	58.9	58.5	53.5	59.3	52.3	48.0	57.8	55.5	49.3	55.05
Run 8 (wall) - straight-up	59.2	58.1	**42.2**	58.9	58.5	**47.3**	59.3	52.3	**42.4**	57.8	55.5	**41.0**	52.71
Difference			-8.0			-6.2			-5.6			-8.3	-2.34
% Difference			-15.9%			-11.6%			-11.7%			-16.8%	-4.25%
Run 10 (orig) - yaw-nulled	59.3	57.3	50.3	59.7	58.8	54.0	59.5	52.6	48.7	58.1	56.8	49.2	55.36
Run 8 (wall) - yaw-nulled	59.3	57.3	**42.6**	59.7	58.8	**47.4**	59.5	52.6	**42.4**	58.1	56.8	**40.9**	52.95
Difference			-7.7			-6.6			-6.3			-8.3	-2.41
% Difference			-15.3%			-12.2%			-12.9%			-16.9%	-4.35%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first two points at each port were taken from the corresponding baseline. The third point at each port, in a bold cell, was calculated using data obtained during wall effects runs (18 near-wall data points).

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 1-2

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TABLE J-2C. POINT VELOCITY (FPS) VALUES FOR WALL EFFECTS RUNS

Run	Traverse		Adjusted Avg. Velocity		Point Distance (in) from Wall															
No.	Type	Port	16 Pt. Traverse	12 Pt. Traverse	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
3	straight-up	A	41.7	42.4	15.2	24.2	34.2	42.0	45.1	47.1	48.0	49.3	50.3	50.6	52.8	53.3	53.7	54.1	54.3	55.7	56.1	56.3
		B	47.4	46.9	38.5	41.7	44.5	46.7	48.2	49.8	51.1	51.9	52.5	53.1	53.5	54.8	54.3	55.4	55.6	56.2	56.8	57.2
		C	42.6	42.1	31.1	35.7	39.1	42.0	44.1	45.1	46.1	48.0	47.7	48.9	49.1	49.2	50.2	51.2	50.5	50.8	51.7	50.5
		D	40.2	40.9	22.5	26.8	30.3	34.3	39.6	42.9	46.9	47.0	49.0	50.1	51.7	51.5	52.3	53.1	52.3	53.8	54.4	53.7
	yaw-nulled	A	41.7	42.4	16.5	24.1	34.1	41.8	44.7	46.6	47.7	49.2	50.8	51.2	52.3	52.4	53.7	54.2	55.3	56.1	55.8	55.6
		B	47.5	47.1	37.2	42.3	44.6	47.0	48.7	49.5	51.4	51.7	52.9	53.0	54.3	55.0	54.9	55.8	56.6	56.8	56.8	57.7
		C	42.8	42.5	31.3	35.4	39.9	42.1	44.0	45.6	46.0	47.1	47.9	49.5	50.2	50.7	50.4	50.5	51.7	52.1	51.0	51.5
		D	39.9	40.7	23.1	25.9	28.8	34.9	39.9	43.3	46.9	48.0	47.7	49.4	50.7	50.3	52.0	52.2	53.1	53.9	53.8	54.4
5	straight-up	A	41.7	42.3	15.3	24.3	34.7	42.0	44.7	46.4	48.7	49.0	50.3	50.7	52.2	52.6	53.5	54.3	54.6	54.5	55.6	55.7
		B	47.5	46.9	37.0	41.5	44.8	46.5	48.6	49.4	51.9	52.5	53.0	53.8	54.1	54.3	54.3	56.3	55.6	55.4	56.5	56.7
		C	42.5	42.1	30.9	36.2	39.5	42.4	43.5	44.7	45.6	47.2	48.0	48.5	49.2	49.6	49.9	50.4	50.2	50.1	50.3	51.2
		D	40.2	40.8	23.5	25.6	30.5	35.1	40.1	42.9	45.7	47.3	48.5	50.5	51.1	51.5	52.4	52.4	51.7	52.5	53.3	54.2
	yaw-nulled	A	41.8	42.4	17.0	23.9	34.0	42.0	45.2	47.3	47.5	48.9	50.8	51.9	52.0	52.9	53.3	53.8	53.9	54.6	54.9	55.7
		B	47.5	47.0	37.1	42.3	44.7	46.0	48.7	49.9	51.3	52.4	52.3	53.1	54.5	55.4	55.3	55.4	56.5	56.1	56.5	57.4
		C	42.7	42.3	31.3	36.1	40.0	41.9	43.1	44.3	46.1	46.6	48.1	48.5	50.0	50.0	50.8	51.4	50.5	50.3	51.5	51.6
		D	40.0	40.7	23.8	25.4	28.8	34.3	40.1	42.7	46.4	47.0	48.0	50.3	50.7	51.7	51.8	52.8	52.8	52.8	54.0	54.2
8	straight-up	A	41.3	42.2	12.6	22.8	34.6	42.0	44.8	46.1	48.2	48.9	50.4	51.0	51.9	52.7	54.3	54.6	54.5	55.2	55.7	56.3
		B	47.9	47.3	37.8	42.3	44.9	47.1	48.7	50.2	51.1	52.6	53.2	54.1	54.5	54.9	55.0	56.9	56.5	56.1	57.1	57.2
		C	42.9	42.4	30.7	36.2	39.9	43.0	43.6	45.2	46.6	47.6	48.3	49.4	49.8	50.2	50.3	50.9	50.4	51.4	51.6	51.1
		D	40.3	41.0	22.3	24.9	30.5	36.2	39.7	44.0	46.4	46.9	49.4	50.0	50.8	52.2	52.5	52.7	52.7	54.1	53.5	54.0
	yaw-nulled	A	41.9	42.6	15.0	24.0	34.9	42.8	45.5	46.6	47.6	48.8	50.5	51.9	52.6	53.8	54.0	54.3	56.1	55.8	56.4	55.9
		B	47.8	47.4	37.7	42.1	44.8	47.4	48.7	50.7	51.2	51.4	53.2	54.3	53.9	54.8	55.9	56.7	57.4	56.8	57.0	57.6
		C	42.9	42.4	31.5	34.3	39.7	41.7	44.3	46.2	46.6	47.3	48.6	49.0	50.3	50.2	50.8	51.0	50.4	51.3	51.3	51.4
		D	40.1	40.9	22.6	26.7	28.6	34.3	38.9	43.6	45.9	47.5	48.9	50.6	50.2	52.7	53.1	53.1	52.9	53.9	54.8	54.3

Note: ▒▒ Data in these cells were required for calculations of adjusted average velocity values for the 12 pt. traverses, but not for the 16 pt. traverses.

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 3

UNITED SCIENCES AUTOPROBE TEST, 3/25/98

TABLE J-3. WALL EFFECTS VS. ORIGINAL (ORIG), OVERALL SUMMARY

Run No.	Traverse Type	Avg. Velocity, ft/sec			
		Base	Adjusted	Difference	% Difference
2,4	16 pt. straight-up	19.03	18.81	-0.22	-1.16%
	16 pt. yaw-nulled	19.06	18.79	-0.27	-1.42%
3,4	12 pt. straight-up	19.68	18.45	-1.23	-6.25%
	12 pt. yaw-nulled	19.58	18.41	-1.17	-5.98%
5,7	16 pt. straight-up	19.30	18.98	-0.32	-1.66%
	16 pt. yaw-nulled	19.43	19.09	-0.34	-1.75%
6,7	12 pt. straight-up	19.43	18.23	-1.20	-6.18%
	12 pt. yaw-nulled	19.44	18.13	-1.31	-6.74%
8,10	16 pt. straight-up	19.65	19.32	-0.33	-1.68%
	16 pt. yaw-nulled	19.80	19.46	-0.34	-1.72%
9,10	12 pt. straight-up	19.56	18.45	-1.11	-5.67%
	12 pt. yaw-nulled	19.68	18.53	-1.15	-5.84%

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 3

UNITED SCIENCES AUTOPROBE TEST, 3/25/98

TABLE J3-A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS *
16 PT. TRAVERSES

Port	Port A				Port B				Port C				Port D				
Point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average
Run 2 (orig) - straight-up	22.0	20.0	18.3	14.5	21.4	20.2	19.4	11.7	21.9	21.2	20.0	16.2	21.1	21.3	19.2	16.0	19.03
Run 4 (wall) - straight-up	22.0	20.0	18.3	**12.0**	21.4	20.2	19.4	**11.9**	21.9	21.2	20.0	**16.1**	21.1	21.3	19.2	**15.0**	18.81
Difference				-2.5				0.2				-0.1				-1.0	-0.22
% Difference				-17.2%				1.7%				-0.6%				-6.3%	-1.16%
Run 2 (orig) - yaw-nulled	22.3	19.9	17.9	14.7	20.8	20.5	19.3	11.6	22.1	21.6	20.0	17.4	21.1	21.2	19.3	15.3	19.06
Run 4 (wall) - yaw-nulled	22.3	19.9	17.9	**11.6**	20.8	20.5	19.3	**11.8**	22.1	21.6	20.0	**16.2**	21.1	21.2	19.3	**15.0**	18.79
Difference				-3.1				0.2				-1.2				-0.3	-0.27
% Difference				-21.1%				1.7%				-6.9%				-2.0%	-1.42%
Run 5 (orig) - straight-up	22.4	20.1	17.9	14.9	21.5	20.4	19.8	12.9	22.4	21.6	19.8	16.7	21.6	20.8	19.7	16.3	19.30
Run 7 (wall) - straight-up	22.4	20.1	17.9	**12.2**	21.5	20.4	19.8	**11.8**	22.4	21.6	19.8	**16.5**	21.6	20.8	19.7	**15.1**	18.98
Difference				-2.7				-1.1				-0.2				-1.2	-0.32
% Difference				-18.1%				-8.5%				-1.2%				-7.4%	-1.66%
Run 5 (orig) - yaw-nulled	22.1	20.8	19.1	15.6	21.2	20.6	20.1	11.9	22.4	21.4	20.5	16.7	21.5	21.2	19.8	15.9	19.43
Run 7 (wall) - yaw-nulled	22.1	20.8	19.1	**11.9**	21.2	20.6	20.1	**11.9**	22.4	21.4	20.5	**16.3**	21.5	21.2	19.8	**14.7**	19.09
Difference				-3.7				0.0				-0.4				-1.2	-0.34
% Difference				-23.7%				0.0%				-2.4%				-7.5%	-1.75%
Run 8 (orig) - straight-up	22.0	21.2	19.5	14.3	20.7	21.8	19.6	13.1	21.6	22.0	20.9	17.1	21.4	22.1	20.6	16.5	19.65
Run 10 (wall) - straight-up	22.0	21.2	19.5	**12.0**	20.7	21.8	19.6	**12.1**	21.6	22.0	20.9	**16.4**	21.4	22.1	20.6	**15.2**	19.32
Difference				-2.3				-1.0				-0.7				-1.3	-0.33
% Difference				-16.1%				-7.6%				-4.1%				-7.9%	-1.68%
Run 8 (orig) - yaw-nulled	22.4	21.0	19.4	14.2	21.7	21.9	20.2	13.7	22.3	22.7	21.1	17.1	20.7	22.4	20.7	15.3	19.80
Run 10 (wall) - yaw-nulled	22.4	21.0	19.4	**11.6**	21.7	21.9	20.2	**11.9**	22.3	22.7	21.1	**16.6**	20.7	22.4	20.7	**14.7**	19.46
Difference				-2.6				-1.8				-0.5				-0.6	-0.34
% Difference				-18.3%				-13.1%				-2.9%				-3.9%	-1.72%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first three points at each port were taken from the corresponding baseline. The fourth point at each port, in a bold cell, was calculated using data obtained during wall effects runs (15 near-wall data points).

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 3

UNITED SCIENCES AUTOPROBE TEST, 3/25/98

TABLE J-3B. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS*
12 PT. TRAVERSES

Port	Port A			Port B			Port C			Port D			
Point	1	2	3	4	5	6	7	8	9	10	11	12	Average
Run 3 (orig) - straight-up	22.3	19.5	16.4	21.8	20.9	13.3	22.1	21.4	18.9	22.1	21.2	16.2	19.68
Run 4 (wall) - straight-up	22.3	19.5	**11.1**	21.8	20.9	**11.1**	22.1	21.4	**14.4**	22.1	21.2	**13.5**	18.45
Difference			-5.3			-2.2			-4.5			-2.7	-1.23
% Difference			-32.3%			-16.5%			-23.8%			-16.7%	-6.25%
Run 3 (orig) - yaw-nulled	22.9	19.6	15.7	21.4	21.1	12.6	22.6	20.9	18.1	22.2	20.5	17.3	19.58
Run 4 (wall) - yaw-nulled	22.9	19.6	**10.9**	21.4	21.1	**10.8**	22.6	20.9	**14.5**	22.2	20.5	**13.5**	18.41
Difference			-4.8			-1.8			-3.6			-3.8	-1.17
% Difference			-30.6%			-14.3%			-19.9%			-22.0%	-5.98%
Run 6 (orig) - straight-up	22.2	19.3	16.4	21.9	20.3	13.7	21.9	20.9	18.2	21.3	20.5	16.6	19.43
Run 7 (wall) - straight-up	22.2	19.3	**11.2**	21.9	20.3	**11.0**	21.9	20.9	**14.7**	21.3	20.5	**13.5**	18.23
Difference			-5.2			-2.7			-3.5			-3.1	-1.20
% Difference			-31.7%			-19.7%			-19.2%			-18.7%	-6.18%
Run 6 (orig) - yaw-nulled	21.9	19.3	16.6	20.9	20.6	13.9	21.6	20.7	18.2	21.8	21.0	16.8	19.44
Run 7 (wall) - yaw-nulled	21.9	19.3	**11.0**	20.9	20.6	**11.1**	21.6	20.7	**14.5**	21.8	21.0	**13.2**	18.13
Difference			-5.6			-2.8			-3.7			-3.6	-1.31
% Difference			-33.7%			-20.1%			-20.3%			-21.4%	-6.74%
Run 9 (orig) - straight-up	22.6	19.5	15.5	21.1	20.9	13.5	22.5	21.5	18.5	21.8	20.7	16.6	19.56
Run 10 (wall) - straight-up	22.6	19.5	**11.2**	21.1	20.9	**11.3**	22.5	21.5	**14.7**	21.8	20.7	**13.6**	18.45
Difference			-4.3			-2.2			-3.8			-3.0	-1.11
% Difference			-27.7%			-16.3%			-20.5%			-18.1%	-5.67%
Run 9 (orig) - yaw-nulled	22.7	19.1	15.9	22.1	20.6	13.6	22.5	22.3	17.5	21.7	21.4	16.8	19.68
Run 10 (wall) - yaw-nulled	22.7	19.1	**10.9**	22.1	20.6	**11.0**	22.5	22.3	**14.8**	21.7	21.4	**13.3**	18.53
Difference			-5.0			-2.6			-2.7			-3.5	-1.15
% Difference			-31.4%			-19.1%			-15.4%			-20.8%	-5.84%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first two points at each port were taken from the corresponding baseline. The third point at each port, in a bold cell, was calculated using data obtained during wall effects runs (21 near-wall data points).

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 3

UNITED SCIENCES AUTOPROBE TEST, 3/25/98

TABLE J-3C. POINT VELOCITY (FPS) VALUES FOR WALL EFFECTS RUNS

Run	Traverse		Adjusted Avg. Velocity		Point Distance (in) from Wall																				
No.	Type	Port	16 Pt. Traverse	12 Pt. Traverse	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
4	straight-up	A	12.0	11.1	4.3	4.3	4.3	4.3	10.5	13.3	14.2	14.5	15.3	15.8	16.5	16.8	16.4	17.9	16.9	18.5	17.9	18.8	18.6	18.4	18.4
		B	11.9	11.1	8.4	8.4	8.4	8.4	9.8	11.2	12.7	12.5	13.4	14.7	14.7	14.7	15.2	15.0	17.0	16.4	17.1	19.3	18.7	19.8	19.1
		C	16.1	14.4	14.7	14.7	14.7	14.7	15.8	16.0	16.5	16.6	17.7	17.5	18.7	18.7	18.6	19.6	19.2	19.9	18.9	18.2	19.5	18.6	20.5
		D	15.0	13.5	13.2	13.2	13.2	13.2	13.5	14.3	15.9	15.5	17.1	16.7	17.4	16.9	17.9	17.4	18.3	19.3	18.3	18.9	18.5	18.2	20.0
	yaw-nulled	A	11.6	10.9	5.2	5.2	5.2	5.2	10.1	13.1	13.9	15.3	15.0	16.0	17.1	16.6	16.7	16.5	18.2	17.4	18.1	18.4	18.9	18.8	18.8
		B	11.8	10.8	9.2	9.2	9.2	9.2	10.5	10.6	11.4	13.0	13.3	13.7	15.0	16.3	15.7	15.5	15.9	17.4	17.6	18.5	18.6	18.8	19.1
		C	16.2	14.5	14.0	14.0	14.0	14.0	15.8	16.9	17.3	17.6	17.2	17.9	17.9	18.3	18.8	19.5	19.2	20.5	19.7	19.7	19.9	19.3	19.5
		D	15.0	13.5	13.5	13.5	13.5	13.5	13.8	15.1	14.8	15.9	16.0	17.0	17.9	17.8	17.3	17.6	17.8	18.0	19.4	19.4	18.4	19.4	19.7
7	straight-up	A	12.2	11.2	4.6	4.6	4.6	4.6	10.8	13.1	14.6	14.9	15.4	16.3	15.9	16.4	17.4	16.3	18.1	18.0	17.4	18.1	19.1	18.2	19.0
		B	11.8	11.0	8.8	8.8	8.8	8.8	10.3	11.0	12.5	12.2	13.2	13.9	14.4	15.0	15.6	17.4	17.1	16.9	18.1	18.1	19.4	18.8	20.5
		C	16.5	14.7	15.4	15.4	15.4	15.4	15.4	17.0	16.8	16.1	17.1	17.9	17.5	17.7	19.2	18.6	19.3	18.6	19.1	19.0	20.1	19.9	20.0
		D	15.1	13.5	12.8	12.8	12.8	12.8	13.6	14.3	14.7	15.6	16.5	17.1	16.9	17.1	17.1	18.7	18.2	18.5	14.4	18.8	18.2	19.1	19.4
	yaw-nulled	A	11.9	11.0	5.8	5.8	5.8	5.8	10.1	13.9	14.2	14.3	16.1	16.4	16.2	16.6	16.9	17.2	17.7	18.0	17.3	18.0	18.8	17.6	18.1
		B	11.9	11.1	8.5	8.5	8.5	8.5	10.3	10.0	12.7	11.8	14.1	15.3	13.7	14.3	15.5	15.7	18.0	18.2	17.4	18.6	18.8	19.0	19.5
		C	16.3	14.5	15.1	15.1	15.1	15.1	15.7	16.5	17.5	17.0	17.6	18.9	17.7	19.3	19.3	19.2	18.7	19.2	19.5	19.4	20.1	20.3	20.2
		D	14.7	13.2	12.4	12.4	12.4	12.4	14.4	14.7	15.7	15.9	17.6	17.4	17.2	17.8	17.7	18.8	19.2	18.9	18.5	18.4	19.7	19.2	19.3
10	straight-up	A	12.0	11.2	3.7	3.7	3.7	3.7	10.4	13.4	14.2	15.0	15.8	15.5	16.3	16.3	17.4	17.1	18.4	17.9	18.4	18.9	18.9	19.0	19.0
		B	12.1	11.3	9.1	9.1	9.1	9.1	10.3	11.7	11.7	12.7	12.7	13.4	14.1	13.6	15.7	15.1	18.2	16.8	18.1	18.9	19.3	20.7	20.5
		C	16.4	14.7	15.0	15.0	15.0	15.0	15.6	16.3	17.4	17.3	18.5	18.1	18.9	19.5	19.1	19.0	19.8	19.2	19.4	20.3	19.7	19.8	20.3
		D	15.2	13.6	12.7	12.7	12.7	12.7	13.4	14.2	14.8	14.9	16.6	16.2	17.4	18.2	18.1	18.2	18.1	18.9	19.3	19.8	19.1	19.2	19.9
	yaw-nulled	A	11.6	10.9	4.9	4.9	4.9	4.9	10.0	12.8	14.1	15.0	15.2	16.6	16.8	17.2	17.6	17.3	18.6	18.2	17.5	18.0	18.6	18.8	19.8
		B	11.9	11.0	9.3	9.3	9.3	9.3	9.9	12.2	12.0	11.9	13.7	13.5	14.2	14.8	16.3	16.5	17.4	18.9	18.4	19.0	20.0	18.9	20.8
		C	16.6	14.8	15.1	15.1	15.1	15.1	16.5	16.4	16.2	17.3	18.0	17.6	18.4	19.0	19.3	19.4	18.5	19.2	19.6	20.9	20.9	20.4	21.4
		D	14.7	13.3	13.2	13.2	13.2	13.2	14.2	14.5	15.9	16.5	16.9	17.5	17.0	17.5	17.5	18.4	18.7	19.2	18.9	18.5	19.3	19.9	19.9

Note: Data in these cells were required for calculations of adjusted average velocity values for the 12 pt. traverses, but not for the 16 pt. traverses.

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 5

UNITED SCIENCES AUTOPROBE TEST, 1/15/98

TABLE J-4. WALL EFFECTS VS. ORIGINAL (ORIG), OVERALL SUMMARY

Run No.	Traverse Type	Avg. Velocity, ft/sec			
		Base	Adjusted	Difference	% Difference
2,4	16 pt. straight-up	45.14	44.81	-0.33	-0.73%
	16 pt. yaw-nulled	45.25	44.59	-0.66	-1.46%
3,4	12 pt. straight-up	45.51	44.41	-1.10	-2.42%
	12 pt. yaw-nulled	45.50	44.31	-1.19	-2.62%
5,8	16 pt. straight-up	46.83	45.66	-1.17	-2.50%
	16 pt. yaw-nulled	46.71	45.38	-1.33	-2.85%
6,8	12 pt. straight-up	47.08	45.39	-1.69	-3.59%
	12 pt. yaw-nulled	46.44	44.94	-1.50	-3.23%
9,11	16 pt. straight-up	44.73	44.04	-0.69	-1.54%
	16 pt. yaw-nulled	44.16	43.85	-0.31	-0.70%
10,11	12 pt. straight-up	44.62	43.81	-0.81	-1.82%
	12 pt. yaw-nulled	44.52	43.64	-0.88	-1.98%
N1	16 pt. straight-up	46.87	46.18	-0.69	-1.47%
	16 pt. yaw-nulled	46.51	45.96	-0.55	-1.18%
N2	16 pt. straight-up	47.14	46.35	-0.79	-1.68%
	16 pt. yaw-nulled	47.17	46.41	-0.76	-1.61%
N3	16 pt. straight-up	47.25	46.27	-0.98	-2.07%
	16 pt. yaw-nulled	47.22	45.88	-1.34	-2.84%
N4	16 pt. straight-up	41.69	40.92	-0.77	-1.85%
	16 pt. yaw-nulled	41.84	40.98	-0.86	-2.06%
N5	16 pt. straight-up	35.38	35.13	-0.25	-0.71%
	16 pt. yaw-nulled	35.12	34.95	-0.17	-0.48%

WALL EFFECTS FIELD TEST SUMMARY
AEP - CONESVILLE STATION, UNIT 5

UNITED SCIENCES AUTOPROBE TEST, 1/15/98

TABLE J-4A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS *
16 PT. TRAVERSES

Port	Port A				Port B				Port C				Port D				
Point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average
Run 2 (orig) - straight-up	48.7	48.1	47.7	38.9	47.3	46.8	46.3	39.7	47.4	46.3	44.4	40.1					45.14
Run 4 (wall) - straight-up	48.7	48.1	47.7	39.0	47.3	46.8	46.3	37.8	47.4	46.3	44.4	38.0					44.81
Difference				0.1				-1.9				-2.1					-0.33
% Difference				0.4%				-4.9%				-5.3%					-0.73%
Run 2 (orig) - yaw-nulled	48.6	47.9	47.5	42.7	47.1	47.0	45.4	39.7	47.0	46.2	44.6	39.3					45.25
Run 4 (wall) - yaw-nulled	48.6	47.9	47.5	38.5	47.1	47.0	45.4	37.5	47.0	46.2	44.6	37.7					44.59
Difference				-4.2				-2.2				-1.6					-0.66
% Difference				-9.8%				-5.4%				-4.2%					-1.46%
Run 5 (orig) - straight-up	49.6	48.9	47.4	43.2	48.8	48.4	47.5	42.0	48.8	48.5	47.1	41.7					46.83
Run 8 (wall) - straight-up	49.6	48.9	47.4	38.2	48.8	48.4	47.5	37.1	48.8	48.5	47.1	37.6					45.66
Difference				-5.0				-4.9				-4.1					-1.17
% Difference				-11.5%				-11.8%				-9.8%					-2.50%
Run 5 (orig) - yaw-nulled	50.0	48.8	48.8	42.8	48.6	48.3	45.2	42.3	48.9	47.8	45.7	43.3					46.71
Run 8 (wall) - yaw-nulled	50.0	48.8	48.8	38.0	48.6	48.3	45.2	36.9	48.9	47.8	45.7	37.5					45.38
Difference				-4.8				-5.4				-5.8					-1.33
% Difference				-11.1%				-12.7%				-13.4%					-2.85%
Run 9 (orig) - straight-up	48.2	48.1	46.2	41.0	46.7	45.5	43.4	40.3	46.1	45.9	44.7	40.7					44.73
Run 11 (wall) - straight-up	48.2	48.1	46.2	38.0	46.7	45.5	43.4	37.1	46.1	45.9	44.7	38.5					44.04
Difference				-3.0				-3.2				-2.2					-0.69
% Difference				-7.2%				-7.9%				-5.4%					-1.54%
Run 9 (orig) - yaw-nulled	47.0	47.1	47.0	39.8	45.8	44.8	44.4	37.6	46.3	46.4	44.4	39.3					44.16
Run 11 (wall) - yaw-nulled	47.0	47.1	47.0	38.2	45.8	44.8	44.4	37.1	46.3	46.4	44.4	37.7					43.85
Difference				-1.6				-0.5				-1.6					-0.31
% Difference				-4.1%				-1.4%				-4.0%					-0.70%
Run N1 (orig) - straight-up	49.3	50.0	47.7	42.3	48.9	48.2	47.8	41.3	49.2	48.0	47.3	42.4					46.87
Run N1 (wall) - straight-up	49.3	50.0	47.7	39.9	48.9	48.2	47.8	38.9	49.2	48.0	47.3	38.9					46.18
Difference				-2.5				-2.4				-3.5					-0.69
% Difference				-5.8%				-5.7%				-8.1%					-1.47%
Run N1 (orig) - yaw-nulled	49.2	49.6	47.3	42.6	48.7	47.7	47.4	39.4	48.9	47.9	47.7	41.8					46.51
Run N1 (wall) - yaw-nulled	49.2	49.6	47.3	38.9	48.7	47.7	47.4	38.8	48.9	47.9	47.7	39.4					45.96
Difference				-3.7				-0.5				-2.4					-0.55
% Difference				-8.7%				-1.4%				-5.8%					-1.18%

WALL EFFECTS FIELD TEST SUMMARY
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TABLE J-4A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS *
16 PT. TRAVERSES

Port	Port A				Port B				Port C				Port D				
Point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average
Run N2 (orig) - straight-up	50.0	49.0	47.9	43.4	49.7	49.4	46.4	40.6	49.2	49.3	47.8	43.0					47.14
Run N2 (wall) - straight-up	50.0	49.0	47.9	**39.7**	49.7	49.4	46.4	**38.9**	49.2	49.3	47.8	**39.0**					46.35
Difference				-3.7				-1.7				-4.0					-0.79
% Difference				-8.5%				-4.3%				-9.2%					-1.68%
Run N2 (orig) - yaw-nulled	50.4	49.8	47.5	42.4	50.4	48.2	47.1	41.0	49.8	48.5	47.7	43.3					47.17
Run N2 (wall) - yaw-nulled	50.4	49.8	47.5	**40.0**	50.4	48.2	47.1	**38.3**	49.8	48.5	47.7	**39.3**					46.41
Difference				-2.4				-2.7				-4.0					-0.76
% Difference				-5.7%				-6.6%				-9.2%					-1.61%
Run N3 (orig) - straight-up	50.7	49.4	48.2	42.9	49.3	48.6	47.5	41.4	48.1	48.9	48.1	43.8					47.25
Run N3 (wall) - straight-up	50.7	49.4	48.2	**39.4**	49.3	48.6	47.5	**38.4**	48.1	48.9	48.1	**38.6**					46.27
Difference				-3.5				-3.0				-5.2					-0.98
% Difference				-8.2%				-7.2%				-11.9%					-2.07%
Run N3 (orig) - yaw-nulled	50.0	49.7	47.4	44.6	48.5	48.2	48.1	42.9	49.1	48.1	46.9	43.1					47.22
Run N3 (wall) - yaw-nulled	50.0	49.7	47.4	**38.8**	48.5	48.2	48.1	**37.4**	49.1	48.1	46.9	**38.2**					45.88
Difference				-5.8				-5.5				-4.9					-1.34
% Difference				-12.9%				-12.7%				-11.4%					-2.84%
Run N4 (orig) - straight-up	47.9	45.1	41.7	35.4	47.2	43.6	39.8	35.4	46.3	43.0	39.5	35.5					41.69
Run N4 (wall) - straight-up	47.9	45.1	41.7	**32.6**	47.2	43.6	39.8	**32.1**	46.3	43.0	39.5	**32.4**					40.92
Difference				-2.8				-3.2				-3.2					-0.77
% Difference				-7.9%				-9.1%				-8.9%					-1.85%
Run N4 (orig) - yaw-nulled	48.2	45.1	41.7	35.9	47.1	43.5	40.1	34.8	46.2	43.0	40.3	36.1					41.84
Run N4 (wall) - yaw-nulled	48.2	45.1	41.7	**32.5**	47.1	43.5	40.1	**31.9**	46.2	43.0	40.3	**31.9**					40.98
Difference				-3.3				-2.8				-4.1					-0.86
% Difference				-9.3%				-8.2%				-11.5%					-2.06%
Run N5 (orig) - straight-up	39.8	38.9	36.9	28.5	39.7	38.8	35.4	26.1	39.9	38.0	35.6	26.9					35.38
Run N5 (wall) - straight-up	39.8	38.9	36.9	**26.2**	39.7	38.8	35.4	**25.7**	39.9	38.0	35.6	**26.5**					35.13
Difference				-2.3				-0.4				-0.4					-0.25
% Difference				-8.0%				-1.4%				-1.4%					-0.71%
Run N5 (orig) - yaw-nulled	40.3	37.4	35.9	27.1	39.1	37.0	37.4	26.7	40.2	37.7	35.6	27.0					35.12
Run N5 (wall) - yaw-nulled	40.3	37.4	35.9	**26.4**	39.1	37.0	37.4	**26.0**	40.2	37.7	35.6	**26.4**					34.95
Difference				-0.7				-0.7				-0.6					-0.17
% Difference				-2.7%				-2.7%				-2.2%					-0.48%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first three points at each port were taken from the corresponding baseline. The fourth point at each port, in a bold cell, was calculated using data obtained during wall effects runs (18 near-wall data points).

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TABLE J-4B. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS*
12 PT. TRAVERSES

Port	Port A			Port B			Port C			Port D			
Point	1	2	3	4	5	6	7	8	9	10	11	12	Average
Run 3 (orig) - straight-up	48.0	48.0	43.3	47.0	45.8	42.0	47.2	45.6	42.7				45.51
Run 4 (wall) - straight-up	48.0	48.0	**40.4**	47.0	45.8	**38.8**	47.2	45.6	**38.9**				44.41
Difference			-2.9			-3.2			-3.8				-1.10
% Difference			-6.8%			-7.6%			-8.9%				-2.42%
Run 3 (orig) - yaw-nulled	48.6	48.2	43.3	46.9	46.7	42.4	46.4	45.0	42.0				45.50
Run 4 (wall) - yaw-nulled	48.6	48.2	**39.6**	46.9	46.7	**38.7**	46.4	45.0	**38.7**				44.31
Difference			-3.7			-3.7			-3.3				-1.19
% Difference			-8.6%			-8.7%			-7.8%				-2.62%
Run 6 (orig) - straight-up	49.4	49.6	44.8	48.2	47.6	43.1	48.0	48.6	44.4				47.08
Run 8 (wall) - straight-up	49.4	49.6	**39.7**	48.2	47.6	**38.5**	48.0	48.6	**39.0**				45.39
Difference			-5.1			-4.6			-5.4				-1.69
% Difference			-11.5%			-10.7%			-12.2%				-3.59%
Run 6 (orig) - yaw-nulled	49.3	47.6	44.8	47.8	47.4	42.3	48.2	47.3	43.3				46.44
Run 8 (wall) - yaw-nulled	49.3	47.6	**39.4**	47.8	47.4	**38.4**	48.2	47.3	**39.1**				44.94
Difference			-5.4			-3.9			-4.2				-1.50
% Difference			-12.0%			-9.3%			-9.8%				-3.23%
Run 10 (orig) - straight-up	47.4	47.1	41.8	46.2	45.0	40.4	46.3	45.4	42.0				44.62
Run 11 (wall) - straight-up	47.4	47.1	**38.8**	46.2	45.0	**38.1**	46.3	45.4	**39.9**				43.81
Difference			-3.0			-2.3			-2.1				-0.81
% Difference			-7.1%			-5.6%			-5.0%				-1.82%
Run 10 (orig) - yaw-nulled	47.8	47.0	42.1	45.7	45.8	40.2	46.5	43.9	41.7				44.52
Run 11 (wall) - yaw-nulled	47.8	47.0	**39.1**	45.7	45.8	**38.2**	46.5	43.9	**38.7**				43.64
Difference			-3.0			-2.0			-3.0				-0.88
% Difference			-7.1%			-5.0%			-7.1%				-1.98%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first two points at each port were taken from the corresponding baseline. The third point at each port, in a bold cell, was calculated using data obtained during wall effects runs (18 near-wall data points).

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TABLE J-4C. POINT VELOCITY (FPS) VALUES FOR WALL EFFECTS RUNS

Run	Traverse		Adjusted Avg. Velocity		Point Distance (in) from Wall																
No.	Type	Port	16 Pt. Traverse	12 Pt. Traverse	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
4	straight-up	A	39.0	40.4	24.5	28.5	31.2	34.7	35.3	35.5	37.8	40.6	38.6	40.0	38.7	39.9	43.3	41.5	41.5	42.4	43.6	44.3
		B	37.8	38.8	24.2	29.8	29.2	33.9	36.2	34.6	38.4	39.4	37.9	39.6	38.6	38.2	39.5	40.3	42.1	41.7	42.3	41.9
		C	38.0	38.9	25.4	28.5	30.0	33.4	36.5	37.0	38.2	39.9	38.4	40.0	38.8	39.2	41.2	41.6	41.2	41.5	42.2	41.7
		D																				
	yaw-nulled	A	38.5	39.6	23.4	27.8	31.9	33.8	36.6	36.8	40.4	39.8	40.2	40.3	39.3	40.7	40.3	41.2	41.5	42.0	42.7	42.7
		B	37.5	38.7	23.8	30.5	31.1	31.9	34.3	34.9	37.5	38.5	36.6	37.9	37.9	38.0	39.2	39.3	40.7	41.4	42.6	42.3
		C	37.7	38.7	23.4	27.6	30.8	32.5	35.4	36.4	39.1	39.5	37.9	37.3	38.6	39.9	38.8	40.4	40.5	42.5	42.9	41.9
		D																				
8	straight-up	A	38.2	39.7	23.5	28.0	29.1	32.7	34.7	35.1	36.6	37.7	37.8	38.5	38.2	38.7	40.7	40.0	42.8	42.5	43.4	43.9
		B	37.1	38.5	22.4	26.5	29.7	30.1	33.6	33.7	36.2	35.9	35.3	37.7	37.0	38.4	39.1	38.2	40.2	42.4	41.9	42.8
		C	37.6	39.0	22.5	26.8	30.4	31.9	32.7	34.4	34.7	37.5	36.9	38.7	40.4	38.2	39.4	39.0	42.4	42.1	43.5	43.1
		D																				
	yaw-nulled	A	38.0	39.4	22.1	27.9	30.3	32.3	33.5	34.6	36.4	37.0	37.0	39.1	39.6	39.1	39.3	41.7	41.1	43.3	43.3	43.6
		B	36.9	38.4	22.8	26.3	28.9	30.8	33.1	33.1	35.3	34.9	35.5	34.8	38.8	38.1	37.1	39.7	40.6	43.6	42.9	42.7
		C	37.5	39.1	21.9	27.0	28.1	31.2	31.6	34.2	34.2	36.0	36.0	37.8	38.8	38.5	39.7	39.7	41.6	42.9	43.4	43.7
		D																				
11	straight-up	A	38.0	38.8	24.5	29.8	33.7	33.7	36.1	36.7	39.6	40.2	39.5	39.4	39.2	39.6	40.4	40.9	42.1	42.0	43.1	41.2
		B	37.1	38.1	23.5	28.4	31.8	32.3	34.1	35.1	38.0	37.9	39.7	39.6	37.1	38.5	38.7	40.0	40.2	40.5	40.4	41.1
		C	38.5	39.9	23.8	29.3	31.4	34.4	35.4	36.5	37.1	39.6	38.5	38.9	37.9	38.9	39.3	39.7	41.1	41.0	41.0	44.1
		D																				
	yaw-nulled	A	38.2	39.1	23.3	29.4	31.1	35.7	37.1	34.3	39.3	41.4	39.1	39.7	38.9	40.9	40.7	40.6	41.6	40.6	41.4	42.0
		B	37.1	38.2	24.1	28.5	29.8	30.4	33.5	35.1	38.3	38.9	37.4	40.2	36.5	38.2	38.7	40.0	40.7	39.2	40.7	41.5
		C	37.7	38.7	23.1	28.0	31.4	33.1	35.1	35.5	37.5	40.6	40.0	39.8	39.2	39.2	40.0	40.5	42.7	39.3	41.9	41.7
		D																				
N1	straight-up	A	39.9		25.6	29.3	33.2	35.3	36.6	36.5	39.0	40.2	40.6	41.5	40.4	41.4	42.2	42.2	43.8	41.7	46.1	44.9
		B	38.9		25.1	28.7	30.3	34.9	34.9	35.9	37.8	39.1	40.0	41.6	39.9	40.1	41.7	41.5	41.2	42.3	44.2	43.9
		C	38.9		23.7	29.5	30.5	34.5	35.3	36.5	37.4	39.5	39.5	40.5	41.3	41.4	42.2	42.0	42.5	43.1	43.6	43.4
		D																				
	yaw-nulled	A	38.9		25.6	30.6	30.2	34.1	36.1	36.7	37.0	40.1	41.1	38.9	40.5	39.9	40.7	42.4	43.1	43.6	45.9	43.1
		B	38.8		24.3	29.2	30.7	34.2	34.5	35.6	37.6	38.3	38.1	40.2	40.1	41.4	41.3	40.7	40.1	43.3	44.7	44.1
		C	39.4		24.8	28.6	31.5	34.2	35.0	33.6	38.6	40.4	40.1	41.9	40.4	39.8	41.6	42.7	43.1	43.3	45.9	44.5
		D																				
N2	straight-up	A	39.7		26.3	29.4	31.6	34.5	36.6	36.2	37.9	40.4	40.5	41.1	42.1	40.9	42.8	43.3	42.7	44.3	44.4	44.3
		B	38.9		24.5	29.2	30.2	33.6	36.1	36.4	36.3	38.6	39.4	40.3	41.6	41.7	42.8	41.5	42.6	42.4	44.7	43.5
		C	39.0		24.5	28.7	30.6	33.6	36.1	35.9	37.8	38.7	39.3	39.6	42.2	42.2	43.0	42.3	43.5	42.2	44.2	43.5
		D																				
	yaw-nulled	A	40.0		24.6	28.7	32.2	34.2	36.4	39.1	38.0	38.3	39.5	39.2	42.6	42.6	42.7	42.9	43.4	44.9	44.1	45.3
		B	38.3		23.8	28.2	30.1	31.4	36.1	36.4	36.6	37.1	37.9	39.4	40.5	41.6	41.0	42.3	41.9	44.3	42.7	42.9
		C	39.3		23.7	28.7	30.7	32.6	34.1	35.4	37.7	39.0	39.3	41.1	41.7	42.1	43.9	44.5	41.8	43.2	44.0	44.5
		D																				
N3	straight-up	A	39.4		24.1	27.7	31.1	32.4	34.2	35.5	36.9	37.2	38.6	39.7	42.6	41.1	40.9	43.5	43.6	43.6	44.2	45.4
		B	38.4		23.3	28.3	29.8	31.7	33.2	33.0	35.2	36.2	37.2	39.5	40.7	42.4	41.7	42.2	42.3	43.1	43.0	44.2
		C	38.6		23.3	26.9	29.5	30.9	32.2	33.6	35.0	37.3	37.3	40.7	40.9	41.9	43.2	42.7	43.2	42.7	44.2	44.3
		D																				
	yaw-nulled	A	38.8		22.8	27.4	30.5	31.5	34.6	35.6	36.1	36.3	38.0	40.6	41.0	42.9	42.7	41.1	43.2	41.6	43.9	44.5
		B	37.4		23.5	26.8	30.1	30.6	32.9	32.6	34.2	34.9	37.9	37.8	41.1	39.4	40.9	42.4	41.7	43.6	42.7	42.3
		C	38.2		22.1	27.7	29.5	31.2	32.8	34.1	34.7	36.0	38.6	40.5	42.6	42.0	43.1	44.4	42.6	43.2	43.3	42.9
		D																				

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TABLE J-4C. POINT VELOCITY (FPS) VALUES FOR WALL EFFECTS RUNS

Run	Traverse		Adjusted Avg. Velocity		Point Distance (in) from Wall																
No.	Type	Port	16 Pt. Traverse	12 Pt. Traverse	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
N4	straight-up	A	32.6		19.7	23.6	25.9	28.3	27.8	28.9	31.7	33.4	31.6	33.1	31.6	33.5	35.4	34.5	36.6	37.1	36.7	37.3
		B	32.1		19.9	22.7	25.4	26.6	28.9	30.0	30.7	30.8	31.2	32.3	32.2	33.1	33.4	35.3	34.6	36.5	36.7	37.0
		C	32.4		19.1	22.4	25.7	27.0	28.7	29.5	31.3	32.5	32.0	32.2	32.6	33.1	34.2	35.4	36.5	37.2	36.9	37.1
		D																				
	yaw-nulled	A	32.5		19.3	22.9	26.0	28.0	28.8	29.0	31.8	33.1	31.9	32.4	33.1	33.9	35.3	36.1	35.8	36.2	36.5	37.1
		B	31.9		20.0	23.0	26.0	28.5	26.8	28.8	29.9	30.9	29.9	31.5	31.2	33.1	34.8	35.3	35.6	36.1	36.1	36.7
		C	31.9		20.2	23.3	25.6	27.1	27.8	30.0	30.9	31.6	31.4	32.1	32.0	33.5	35.0	36.5	37.0	36.4	36.8	35.7
		D																				
N5	straight-up	A	26.2		13.5	17.3	18.5	21.2	23.0	23.2	24.9	25.7	24.9	25.0	28.9	27.4	29.5	27.1	29.2	29.6	31.1	30.7
		B	25.7		14.9	17.0	19.1	20.3	21.7	23.3	23.7	25.4	24.9	25.5	27.4	26.9	27.0	26.4	27.2	28.7	29.1	30.4
		C	26.5		15.9	17.4	20.0	21.7	22.6	24.4	23.6	25.3	25.7	24.9	25.9	27.2	28.9	26.9	28.6	31.0	31.3	31.4
		D																				
	yaw-nulled	A	26.4		14.5	16.7	19.4	20.4	22.1	23.4	24.6	25.5	25.8	24.9	28.3	26.8	27.5	27.7	27.9	30.4	30.7	31.5
		B	26.0		13.9	16.8	19.1	20.0	21.6	22.2	24.1	23.9	25.1	26.2	27.1	26.4	26.8	25.1	28.0	29.9	30.0	31.4
		C	26.4		14.4	16.8	18.4	20.2	22.2	23.1	24.8	25.6	25.4	26.0	26.4	27.6	27.8	27.4	27.6	28.2	31.3	32.0
		D																				

WALL EFFECTS FIELD TEST SUMMARY
AEP - PICWAY STATION

UNITED SCIENCES AUTOPROBE TEST, 1/13/98

TABLE J-5. WALL EFFECTS VS. ORIGINAL (ORIG), OVERALL SUMMARY

Run No.	Traverse Type	Avg. Velocity, ft/sec			
		Base	Adjusted	Difference	% Difference
3,5	16 pt. straight-up	37.98	37.22	-0.76	-2.00%
	16 pt. yaw-nulled	37.98	37.14	-0.84	-2.21%
4,5	12 pt. straight-up	37.98	37.09	-0.89	-2.34%
	12 pt. yaw-nulled	37.70	36.78	-0.92	-2.44%
6,8	16 pt. straight-up	37.96	37.18	-0.78	-2.05%
	16 pt. yaw-nulled	37.74	37.03	-0.71	-1.88%
7,8	12 pt. straight-up	38.09	37.03	-1.06	-2.78%
	12 pt. yaw-nulled	38.48	37.34	-1.14	-2.96%
9,11	16 pt. straight-up	37.86	37.21	-0.65	-1.72%
	16 pt. yaw-nulled	37.56	36.90	-0.66	-1.76%
10,11	12 pt. straight-up	38.04	37.28	-0.76	-2.00%
	12 pt. yaw-nulled	38.05	37.22	-0.83	-2.18%

WALL EFFECTS FIELD TEST SUMMARY
AEP - PICWAY STATION

UNITED SCIENCES AUTOPROBE TEST, 1/13/98

TABLE J-5A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS*
16 PT. TRAVERSES

Port	Port A				Port B				Port C				Port D				
Point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average
Run 3 (orig) - straight-up	37.7	37.8	37.2	30.0	37.9	38.4	39.1	35.2	40.9	43.2	42.6	38.3	36.9	38.2	40.0	34.3	37.98
Run 5 (wall) - straight-up	37.7	37.8	37.2	**28.1**	37.9	38.4	39.1	**32.6**	40.9	43.2	42.6	**34.7**	36.9	38.2	40.0	**30.2**	37.22
Difference				-1.9				-2.6				-3.6				-4.1	-0.76
% Difference				-6.3%				-7.4%				-9.4%				-12.0%	-2.00%
Run 3 (orig) - yaw-nulled	37.2	36.8	36.3	30.7	38.5	39.4	37.6	34.5	41.9	42.7	44.0	38.1	36.1	38.8	39.8	35.3	37.98
Run 5 (wall) - yaw-nulled	37.2	36.8	36.3	**27.4**	38.5	39.4	37.6	**32.5**	41.9	42.7	44.0	**34.9**	36.1	38.8	39.8	**30.4**	37.14
Difference				-3.3				-2.0				-3.2				-4.9	-0.84
% Difference				-10.7%				-5.8%				-8.4%				-13.9%	-2.21%
Run 6 (orig) - straight-up	37.3	36.7	36.3	29.4	38.1	39.9	37.5	34.9	41.3	42.6	43.0	37.9	37.0	38.9	40.6	36.0	37.96
Run 8 (wall) - straight-up	37.3	36.7	36.3	**27.1**	38.1	39.9	37.5	**33.1**	41.3	42.6	43.0	**34.5**	37.0	38.9	40.6	**31.0**	37.18
Difference				-2.3				-1.8				-3.4				-5.0	-0.78
% Difference				-7.8%				-5.2%				-9.0%				-13.9%	-2.05%
Run 6 (orig) - yaw-nulled	37.5	35.8	37.4	29.3	37.9	39.3	38.8	35.6	41.5	42.8	42.1	36.9	36.3	38.4	39.4	34.9	37.74
Run 8 (wall) - yaw-nulled	37.5	35.8	37.4	**27.6**	37.9	39.3	38.8	**32.8**	41.5	42.8	42.1	**34.5**	36.3	38.4	39.4	**30.4**	37.03
Difference				-1.7				-2.8				-2.4				-4.5	-0.71
% Difference				-5.8%				-7.9%				-6.5%				-12.9%	-1.88%
Run 9 (orig) - straight-up	36.2	37.5	36.2	29.8	39.9	38.9	39.1	35.5	40.7	42.0	43.2	37.5	36.8	37.7	40.1	34.6	37.86
Run 11 (wall) - straight-up	36.2	37.5	36.2	**28.0**	39.9	38.9	39.1	**33.0**	40.7	42.0	43.2	**34.7**	36.8	37.7	40.1	**31.3**	37.21
Difference				-1.8				-2.5				-2.8				-3.3	-0.65
% Difference				-6.0%				-7.0%				-7.5%				-9.5%	-1.72%
Run 9 (orig) - yaw-nulled	36.9	36.8	38.1	29.7	38.2	39.7	38.0	34.3	39.1	42.1	41.9	37.3	36.9	38.0	38.7	35.2	37.56
Run 11 (wall) - yaw-nulled	36.9	36.8	38.1	**27.5**	38.2	39.7	38.0	**33.2**	39.1	42.1	41.9	**34.7**	36.9	38.0	38.7	**30.6**	36.90
Difference				-2.2				-1.1				-2.6				-4.6	-0.66
% Difference				-7.4%				-3.2%				-7.0%				-13.1%	-1.76%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first three points at each port were taken from the corresponding baseline. The fourth point at each port, in a bold cell, was calculated using data obtained during wall effects runs (11 near-wall data points).

WALL EFFECTS FIELD TEST SUMMARY
AEP - PICWAY STATION

UNITED SCIENCES AUTOPROBE TEST, 1/13/98

TABLE J-5B. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS
12 PT. TRAVERSES

Port	Port A			Port B			Port C			Port D			
Point	1	2	3	4	5	6	7	8	9	10	11	12	Average
Run 4 (orig) - straight-up	36.3	37.3	32.8	37.7	38.1	35.6	41.8	43.6	39.2	37.0	40.2	36.2	37.98
Run 5 (wall) - straight-up	36.3	37.3	**29.8**	37.7	38.1	**34.1**	41.8	43.6	**36.8**	37.0	40.2	**32.4**	37.09
Difference			-3.0			-1.5			-2.4			-3.8	-0.89
% Difference			-9.1%			-4.2%			-6.1%			-10.5%	-2.34%
Run 4 (orig) - yaw-nulled	37.1	36.8	30.4	39.2	39.8	35.9	39.3	42.3	40.4	36.1	38.6	36.5	37.70
Run 5 (wall) - yaw-nulled	37.1	36.8	**29.2**	39.2	39.8	**33.9**	39.3	42.3	**36.7**	36.1	38.6	**32.3**	36.78
Difference			-1.2			-2.0			-3.7			-4.2	-0.92
% Difference			-3.9%			-5.6%			-9.2%			-11.5%	-2.44%
Run 7 (orig) - straight-up	37.4	35.8	32.2	39.0	38.3	36.4	40.6	43.6	39.5	37.4	39.6	37.3	38.09
Run 8 (wall) - straight-up	37.4	35.8	**29.2**	39.0	38.3	**34.2**	40.6	43.6	**36.4**	37.4	39.6	**32.8**	37.03
Difference			-3.0			-2.2			-3.1			-4.5	-1.06
% Difference			-9.3%			-6.0%			-7.8%			-12.1%	-2.78%
Run 7 (orig) - yaw-nulled	37.6	37.3	34.0	38.6	41.0	35.9	42.1	42.6	39.6	37.5	38.9	36.6	38.48
Run 8 (wall) - yaw-nulled	37.6	37.3	**29.6**	38.6	41.0	**34.1**	42.1	42.6	**36.4**	37.5	38.9	**32.4**	37.34
Difference			-4.4			-1.8			-3.2			-4.2	-1.14
% Difference			-12.9%			-5.0%			-8.1%			-11.5%	-2.96%
Run 10 (orig) - straight-up	36.5	37.8	32.1	38.3	39.6	36.7	42.2	43.1	39.2	37.7	37.8	35.5	38.04
Run 11 (wall) - straight-up	36.5	37.8	**29.9**	38.3	39.6	**34.5**	42.2	43.1	**36.7**	37.7	37.8	**33.3**	37.28
Difference			-2.2			-2.2			-2.5			-2.2	-0.76
% Difference			-6.9%			-6.0%			-6.4%			-6.2%	-2.00%
Run 10 (orig) - yaw-nulled	37.4	37.5	32.3	37.6	38.9	34.5	41.8	43.4	38.5	38.6	38.4	37.7	38.05
Run 11 (wall) - yaw-nulled	37.4	37.5	**29.6**	37.6	38.9	**34.3**	41.8	43.4	**36.5**	38.6	38.4	**32.6**	37.22
Difference			-2.7			-0.2			-2.0			-5.1	-0.83
% Difference			-8.4%			-0.6%			-5.2%			-13.5%	-2.18%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first two points at each port were taken from the corresponding baseline. The third point at each port, in a bold cell, was calculated using data obtained during wall effects runs (16 near-wall data points).

WALL EFFECTS FIELD TEST SUMMARY
AEP - PICWAY STATION

UNITED SCIENCES AUTOPROBE TEST, 1/13/98

TABLE J-5C. POINT VELOCITY (FPS) VALUES FOR WALL EFFECTS RUNS

Run	Traverse		Adjusted Avg. Velocity		Point Distance (in) from Wall																
No.	Type	Port	16 Pt. Traverse	12 Pt. Traverse	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
5	straight-up	A	28.1	29.8	18.7	22.6	25.6	27.1	29.9	32.9	31.7	32.9	34.1	32.5	35.4	33.2	34.8	36.8	36.2	36.8	37.0	34.8
		B	32.6	34.1	27.0	31.1	33.5	33.0	35.9	34.9	33.9	37.5	35.7	37.7	36.5	38.2	37.7	38.6	38.5	38.9	36.6	38.9
		C	34.7	36.8	26.1	30.7	31.7	35.3	36.5	37.1	40.1	39.9	41.0	41.9	41.5	42.5	43.3	42.6	42.3	43.1	42.8	42.6
		D	30.2	32.4	6.4	27.5	30.1	32.9	34.3	34.5	36.9	35.4	36.7	38.1	37.7	38.9	38.1	39.5	39.0	38.7	38.5	38.6
	yaw-nulled	A	27.4	29.2	17.2	22.4	25.0	27.0	29.3	30.3	30.8	31.7	32.1	33.7	36.4	33.6	36.2	34.5	34.2	36.0	36.0	35.9
		B	32.5	33.9	27.4	29.1	31.9	33.2	35.6	34.7	35.1	36.6	38.9	37.4	36.0	38.4	37.4	37.4	37.7	38.5	37.3	39.6
		C	34.9	36.7	26.2	30.7	33.2	34.5	37.4	35.7	40.1	40.3	41.5	41.1	42.0	41.7	42.9	42.6	43.4	42.0	43.1	43.6
		D	30.4	32.3	5.4	27.1	31.3	33.7	34.2	35.0	36.3	37.0	38.4	37.4	37.2	36.5	38.9	37.2	38.0	39.1	38.5	39.2
8	straight-up	A	27.1	29.2	17.4	21.5	24.1	26.8	28.6	28.4	32.0	31.7	33.7	34.1	35.1	34.7	34.7	36.5	35.6	36.1	36.2	36.5
		B	33.1	34.2	28.9	32.0	32.2	33.9	34.3	35.7	35.1	36.8	38.5	36.1	37.9	38.3	38.0	37.6	37.2	37.7	39.0	37.9
		C	34.5	36.4	24.2	30.1	33.0	35.2	36.4	37.5	38.9	39.3	40.0	40.9	42.3	40.9	43.4	42.6	42.3	42.3	43.0	43.1
		D	31.0	32.8	7.5	28.1	31.1	33.2	34.6	37.3	36.7	37.3	36.3	36.6	39.3	38.0	37.8	39.3	38.4	39.5	39.2	38.6
	yaw-nulled	A	27.6	29.6	17.4	21.6	24.4	26.2	30.5	30.9	31.8	31.7	34.7	33.5	35.3	35.6	36.1	34.9	35.7	36.4	36.4	36.4
		B	32.8	34.1	27.0	31.1	32.6	34.3	34.7	34.1	36.8	37.2	36.3	36.8	37.6	37.1	37.4	39.3	36.8	38.2	38.2	37.7
		C	34.5	36.4	24.9	31.2	33.1	35.2	35.5	37.5	39.6	39.6	40.3	41.7	40.4	41.6	42.1	41.9	42.2	42.4	42.6	43.2
		D	30.4	32.4	6.4	27.2	30.6	32.5	32.2	34.7	37.1	37.3	38.5	36.3	38.7	38.6	38.4	38.0	37.3	40.7	38.6	39.0
11	straight-up	A	28.0	29.9	17.7	23.6	25.4	27.5	29.9	30.1	31.3	33.8	34.3	35.2	34.9	34.8	36.5	34.8	36.9	35.9	37.1	36.7
		B	33.0	34.5	29.0	30.8	33.6	34.6	33.7	35.3	34.7	36.4	36.5	38.0	38.3	38.6	38.4	39.7	38.2	38.8	38.8	38.9
		C	34.7	36.7	24.7	30.0	33.1	35.9	37.0	38.3	40.2	39.4	39.7	40.1	41.6	41.8	42.1	43.8	43.4	43.5	42.1	44.1
		D	31.3	33.3	8.2	28.8	32.3	32.8	35.5	34.7	36.8	37.4	38.5	39.9	38.5	38.8	38.0	39.1	39.4	40.1	40.2	38.8
	yaw-nulled	A	27.5	29.6	16.1	23.1	25.7	28.1	29.5	29.3	32.3	32.5	32.6	33.3	35.1	34.7	35.3	36.9	36.6	36.6	36.7	36.0
		B	33.2	34.3	28.1	31.0	32.6	33.8	34.7	36.3	36.8	37.8	38.0	36.7	37.2	37.2	37.1	38.3	38.7	37.6	38.1	39.6
		C	34.7	36.5	24.4	30.8	34.2	35.3	36.2	36.9	39.1	39.5	40.0	41.2	42.4	40.3	42.4	42.5	44.1	42.0	42.5	41.9
		D	30.6	32.6	7.4	27.9	31.0	32.9	34.4	34.8	36.1	37.0	35.9	38.8	38.5	38.6	38.5	37.2	38.4	39.2	38.5	39.5

Notes: Data in these cells were required for calculations of adjusted average velocity values for the 12 pt. traverses, but not for the 16 pt. traverses.

Data in these cells were not required for any calculations.

WALL EFFECTS FIELD TEST SUMMARY
ALLEGHENY POWER MITCHELL STATION

UNITED SCIENCES AUTOPROBE TEST, 12/17/97

TABLE J-6. WALL EFFECTS VS. ORIGINAL (ORIG), OVERALL SUMMARY

Run No.	Traverse Type	Avg. Velocity, ft/sec			
		Base	Adjusted	Difference	% Difference
1	16 pt. straight-up	20.33	20.08	-0.25	-1.23%
	16 pt. yaw-nulled	20.47	20.11	-0.36	-1.76%
1	12 pt. straight-up	***29.53***	***24.78***	***-4.75***	***-16.09%***
	12 pt. yaw-nulled	***28.90***	***24.41***	***-4.49***	***-15.54%***
2	16 pt. straight-up	33.60	33.60	0.00	0.00%
	16 pt. yaw-nulled	33.14	33.19	0.05	0.15%
2	12 pt. straight-up	***29.33***	***29.90***	***0.57***	***1.94%***
	12 pt. yaw-nulled	***29.14***	***29.63***	***0.49***	***1.68%***
3	16 pt. straight-up	30.72	29.39	-1.33	-4.33%
	16 pt. yaw-nulled	30.46	29.28	-1.18	-3.87%
3	12 pt. straight-up	***36.71***	***34.74***	***-1.97***	***-5.37%***
	12 pt. yaw-nulled	***36.61***	***34.63***	***-1.98***	***-5.41%***
4	16 pt. straight-up	36.62	36.10	-0.52	-1.42%
	16 pt. yaw-nulled	36.46	35.99	-0.47	-1.29%
4	12 pt. straight-up	36.77	36.03	-0.74	-2.01%
	12 pt. yaw-nulled	36.93	36.18	-0.75	-2.03%

Note: Data in bold and italic font did not meet the load stability criterion and were excluded from analysis in the wall effects study.

WALL EFFECTS FIELD TEST SUMMARY
ALLEGHENY POWER MITCHELL STATION

UNITED SCIENCES AUTOPROBE TEST, 12/17/97

TABLE J-6A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS *
16 PT. TRAVERSES

Port	Port A				Port B				Port C				Port D				
Point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average
Run 1 (orig) - straight-up	20.6	20.4	20.1	18.7	21.3	21.8	20.9	18.5	21.4	21.5	21.6	19.6	20.2	20.4	20.1	18.2	20.33
Run 1 (wall) - straight-up	20.6	20.4	20.1	**17.0**	21.3	21.8	20.9	**17.9**	21.4	21.5	21.6	**18.7**	20.2	20.4	20.1	**17.4**	20.08
Difference				-1.7				-0.6				-0.9				-0.8	-0.25
% Difference				-9.1%				-3.2%				-4.6%				-4.4%	-1.23%
Run 1 (orig) - yaw-nulled	21.1	20.6	19.1	19.0	21.7	21.0	21.5	19.6	21.4	21.5	21.6	19.6	20.7	21.0	19.9	18.2	20.47
Run 1 (wall) - yaw-nulled	21.1	20.6	19.1	**17.3**	21.7	21.0	21.5	**17.6**	21.4	21.5	21.6	**18.5**	20.7	21.0	19.9	**17.2**	20.11
Difference				-1.7				-2.0				-1.1				-1.0	-0.36
% Difference				-8.9%				-10.2%				-5.6%				-5.5%	-1.76%
Run 2 (orig) - straight-up	35.5	35.2	33.7	26.9	35.6	36.9	34.9	29.6	36.1	36.6	36.4	28.4	35.2	34.8	34.9	26.9	33.60
Run 2 (wall) - straight-up	35.5	35.2	33.7	**27.2**	35.6	36.9	34.9	**28.3**	36.1	36.6	36.4	**29.1**	35.2	34.8	34.9	**27.2**	33.60
Difference				0.3				-1.3				0.7				0.3	0.00
% Difference				1.1%				-4.4%				2.5%				1.1%	0.00%
Run 2 (orig) - yaw-nulled	34.9	34.4	33.9	26.5	36.1	35.8	34.9	28.7	35.4	36.8	35.3	28.5	34.2	34.1	33.5	27.3	33.14
Run 2 (wall) - yaw-nulled	34.9	34.4	33.9	**27.1**	36.1	35.8	34.9	**28.2**	35.4	36.8	35.3	**29.1**	34.2	34.1	33.5	**27.3**	33.19
Difference				0.6				-0.5				0.6				0.0	0.05
% Difference				2.3%				-1.7%				2.1%				0.0%	0.15%
Run 3 (orig) - straight-up	30.2	28.3	27.6	33.3	29.6	30.2	30.0	35.1	31.2	30.0	29.6	36.0	29.6	28.8	28.0	34.0	30.72
Run 3 (wall) - straight-up	30.2	28.3	27.6	**28.5**	29.6	30.2	30.0	**29.3**	31.2	30.0	29.6	**30.8**	29.6	28.8	28.0	**28.5**	29.39
Difference				-4.8				-5.8				-5.2				-5.5	-1.33
% Difference				-14.4%				-16.5%				-14.4%				-16.2%	-4.33%
Run 3 (orig) - yaw-nulled	28.5	29.4	27.8	33.6	29.8	29.9	29.4	33.7	30.0	30.3	29.6	34.7	29.2	28.8	28.7	33.9	30.46
Run 3 (wall) - yaw-nulled	28.5	29.4	27.8	**28.6**	29.8	29.9	29.4	**29.6**	30.0	30.3	29.6	**30.4**	29.2	28.8	28.7	**28.4**	29.28
Difference				-5.0				-4.1				-4.3				-5.5	-1.18
% Difference				-14.9%				-12.2%				-12.4%				-16.2%	-3.87%
Run 4 (orig) - straight-up	38.0	36.9	35.4	32.9	38.3	38.6	37.9	33.3	38.3	39.2	39.7	35.8	36.1	35.9	35.7	33.9	36.62
Run 4 (wall) - straight-up	38.0	36.9	35.4	**31.0**	38.3	38.6	37.9	**32.4**	38.3	39.2	39.7	**33.2**	36.1	35.9	35.7	**31.0**	36.10
Difference				-1.9				-0.9				-2.6				-2.9	-0.52
% Difference				-5.8%				-2.7%				-7.3%				-8.6%	-1.42%
Run 4 (orig) - yaw-nulled	37.3	36.7	36.3	31.8	37.9	37.8	37.0	34.6	38.0	38.2	37.9	35.9	37.1	37.6	35.8	33.5	36.46
Run 4 (wall) - yaw-nulled	37.3	36.7	36.3	**31.3**	37.9	37.8	37.0	**32.6**	38.0	38.2	37.9	**33.2**	37.1	37.6	35.8	**31.1**	35.99
Difference				-0.5				-2.0				-2.7				-2.4	-0.47
% Difference				-1.6%				-5.8%				-7.5%				-7.2%	-1.29%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first three points at each port were taken from the corresponding baseline. The fourth point at each port, in a bold cell, was calculated using data obtained during a wall effects run (17 near-wall data points).

WALL EFFECTS FIELD TEST SUMMARY
ALLEGHENY POWER MITCHELL STATION

UNITED SCIENCES AUTOPROBE TEST, 12/17/97

TABLE J-6B. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS*
12 PT. TRAVERSES

Port	Port A			Port B			Port C			Port D			
Point	1	2	3	4	5	6	7	8	9	10	11	12	Average
Run 1 (orig) - straight-up	25.2	28.3	31.5	26.5	30.2	33.2	27.2	31.9	33.9	25.6	28.9	31.9	29.53
Run 1 (wall) - straight-up	25.2	28.3	**17.7**	26.5	30.2	**18.6**	27.2	31.9	**19.3**	25.6	28.9	**18.0**	24.78
Difference			-13.8			-14.6			-14.6			-13.9	-4.75
% Difference			-43.8%			-44.0%			-43.1%			-43.6%	-16.09%
Run 1 (orig) - yaw-nulled	25.6	27.8	30.2	25.6	29.9	33.1	26.4	30.5	32.8	24.9	28.7	31.3	28.90
Run 1 (wall) - yaw-nulled	25.6	27.8	**17.9**	25.6	29.9	**18.5**	26.4	30.5	**19.2**	24.9	28.7	**17.9**	24.41
Difference			-12.3			-14.6			-13.6			-13.4	-4.49
% Difference			-40.7%			-44.1%			-41.5%			-42.8%	-15.54%
Run 2 (orig) - straight-up	29.7	29.5	26.5	30.5	30.4	27.8	30.3	31.4	28.6	28.9	30.1	28.3	29.33
Run 2 (wall) - straight-up	29.7	29.5	**28.7**	30.5	30.4	**29.8**	30.3	31.4	**30.7**	28.9	30.1	**28.8**	29.90
Difference			2.2			2.0			2.1			0.5	0.57
% Difference			8.3%			7.2%			7.3%			1.8%	1.94%
Run 2 (orig) - yaw-nulled	29.5	28.9	26.6	30.9	29.2	28.1	30.6	30.9	29.5	28.3	29.2	28.0	29.14
Run 2 (wall) - yaw-nulled	29.5	28.9	**28.6**	30.9	29.2	**29.9**	30.6	30.9	**30.6**	28.3	29.2	**28.9**	29.63
Difference			2.0			1.8			1.1			0.9	0.49
% Difference			7.5%			6.4%			3.7%			3.2%	1.68%
Run 3 (orig) - straight-up	36.6	36.5	33.1	38.0	37.8	36.8	39.1	38.5	36.2	36.6	36.9	34.4	36.71
Run 3 (wall) - straight-up	36.6	36.5	**28.2**	38.0	37.8	**29.6**	39.1	38.5	**30.5**	36.6	36.9	**28.6**	34.74
Difference			-4.9			-7.2			-5.7			-5.8	-1.97
% Difference			-14.8%			-19.6%			-15.7%			-16.9%	-5.37%
Run 3 (orig) - yaw-nulled	37.0	36.6	34.2	37.6	38.2	35.5	37.9	37.3	36.9	36.7	37.1	34.3	36.61
Run 3 (wall) - yaw-nulled	37.0	36.6	**28.6**	37.6	38.2	**29.7**	37.9	37.3	**30.5**	36.7	37.1	**28.4**	34.63
Difference			-5.6			-5.8			-6.4			-5.9	-1.98
% Difference			-16.4%			-16.3%			-17.3%			-17.2%	-5.41%
Run 4 (orig) - straight-up	37.4	36.4	32.9	39.6	37.5	37.0	37.6	38.6	36.3	37.0	36.7	34.2	36.77
Run 4 (wall) - straight-up	37.4	36.4	**31.9**	39.6	37.5	**33.3**	37.6	38.6	**34.3**	37.0	36.7	**32.1**	36.03
Difference			-1.0			-3.7			-2.0			-2.1	-0.74
% Difference			-3.0%			-10.0%			-5.5%			-6.1%	-2.01%
Run 4 (orig) - yaw-nulled	37.9	36.5	33.6	37.6	37.4	35.5	39.5	38.7	37.1	36.6	37.4	35.4	36.93
Run 4 (wall) - yaw-nulled	37.9	36.5	**32.3**	37.6	37.4	**33.8**	39.5	38.7	**34.2**	36.6	37.4	**32.2**	36.18
Difference			-1.3			-1.7			-2.9			-3.2	-0.75
% Difference			-3.9%			-4.8%			-7.8%			-9.0%	-2.03%

* NOTE: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first two points at each port were taken from the corresponding baseline. The third point at each port, in a bold cell, was calculated using data obtained during a wall effects run (18 near-wall data points).

WALL EFFECTS FIELD TEST SUMMARY
ALLEGHENY POWER MITCHELL STATION

UNITED SCIENCES AUTOPROBE TEST, 12/17/97

TABLE J-6C. POINT VELOCITY (FPS) VALUES FOR WALL EFFECTS RUNS

Run	Traverse		Adjusted Avg. Velocity		Point Distance (in) from Wall																
No.	Type	Port	16 Pt. Traverse	12 Pt. Traverse	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	straight-up	A	17.0	17.7	13.7	14.6	15.5	16.2	17.2	16.9	17.4	17.8	19.1	18.4	17.7	18.6	18.5	18.9	18.8	19.6	19.5	19.9
		B	17.9	18.6	13.6	15.2	15.8	16.9	19.0	19.2	19.0	19.3	19.3	19.7	19.6	19.4	19.6	19.5	20.6	19.6	19.7	20.6
		C	18.7	19.3	15.2	15.8	16.8	18.3	18.6	19.1	19.2	20.1	19.6	20.2	21.1	20.2	20.8	20.4	20.8	21.3	21.4	21.0
		D	17.4	18.0	13.2	15.0	15.3	16.3	16.9	17.5	18.2	17.9	18.7	19.4	19.2	19.0	19.2	19.5	19.6	20.2	20.4	20.0
	yaw-nulled	A	17.3	17.9	14.1	15.2	16.0	16.2	16.4	17.8	17.5	17.6	18.0	19.4	18.8	19.1	19.9	18.7	19.1	19.6	19.8	19.7
		B	17.6	18.5	13.2	14.5	15.1	16.6	17.2	17.3	18.2	18.0	19.7	19.3	19.8	19.2	20.6	19.9	20.7	20.0	20.1	21.2
		C	18.5	19.2	15.4	16.0	17.1	18.0	18.9	18.6	19.3	19.3	19.4	20.1	20.5	20.5	20.0	20.4	20.7	21.1	20.5	21.2
		D	17.2	17.9	12.3	14.5	15.7	16.3	17.5	18.1	17.8	18.3	18.4	19.4	18.5	19.7	18.6	19.1	19.5	19.7	19.7	19.9
2	straight-up	A	27.2	28.7	19.1	20.6	22.1	24.2	25.5	25.1	25.6	24.3	30.5	31.5	32.5	32.7	33.4	32.5	33.4	33.1	33.5	33.1
		B	28.3	29.8	18.9	20.5	22.5	25.7	26.1	27.0	26.4	26.0	32.8	33.7	33.0	32.9	34.5	34.4	34.0	33.7	35.1	34.6
		C	29.1	30.7	20.2	22.2	24.2	27.2	26.6	26.3	27.1	26.5	33.1	33.6	34.6	34.9	34.5	34.4	35.8	35.9	35.5	35.6
		D	27.2	28.8	17.6	20.5	22.1	25.0	25.4	24.7	24.8	24.1	32.1	31.9	32.9	32.3	32.7	33.4	33.6	33.5	33.2	33.4
	yaw-nulled	A	27.1	28.6	19.2	21.1	21.8	24.5	24.4	24.3	24.8	25.0	31.6	32.4	32.1	31.8	33.5	32.3	32.7	33.3	32.9	33.0
		B	28.2	29.9	18.6	21.5	22.9	25.5	26.3	26.6	26.2	25.2	33.0	32.2	33.0	33.1	34.3	34.2	34.6	34.7	34.6	34.9
		C	29.1	30.6	20.8	22.4	24.8	25.6	27.8	26.7	27.3	26.3	32.6	33.7	34.8	34.5	34.6	35.0	34.8	35.1	35.5	35.1
		D	27.3	28.9	17.6	20.6	21.7	24.2	25.8	24.4	24.8	24.8	31.9	32.5	32.5	32.0	32.8	34.0	33.0	34.0	33.7	33.9
3	straight-up	A	28.5	28.2	25.3	26.6	29.7	29.5	30.4	32.3	32.1	31.8	32.2	30.6	30.6	28.8	27.6	27.7	27.9	26.8	28.6	27.7
		B	29.3	29.6	22.8	27.4	29.7	30.6	31.9	32.4	34.1	34.6	33.7	33.5	31.2	29.2	28.5	29.0	28.2	29.2	28.8	30.1
		C	30.8	30.5	25.9	29.1	31.5	31.8	33.7	34.0	34.5	34.8	36.5	34.3	32.8	31.7	29.5	30.6	29.6	30.3	29.7	29.7
		D	28.5	28.6	22.5	27.2	28.8	29.8	29.7	31.9	32.7	32.3	32.4	31.5	30.4	28.7	28.2	28.6	28.6	28.0	28.2	28.9
	yaw-nulled	A	28.6	28.6	24.3	27.4	30.5	30.1	31.3	31.3	32.9	32.9	33.5	30.8	29.9	27.9	27.8	28.4	27.9	27.4	27.3	28.5
		B	29.6	29.7	23.4	27.4	29.8	30.8	30.6	33.2	34.1	34.5	34.1	34.0	31.9	28.6	28.4	28.5	28.7	31.0	30.8	30.1
		C	30.4	30.5	24.9	29.0	31.1	31.6	33.2	33.9	35.1	33.9	33.9	34.6	31.4	30.7	28.6	30.5	30.6	29.9	29.7	30.8
		D	28.4	28.4	22.6	27.1	28.0	30.2	32.0	32.1	31.7	31.1	32.4	31.6	30.7	28.9	27.3	28.6	28.2	28.2	27.8	28.4
4	straight-up	A	31.0	31.9	25.5	27.1	27.5	30.4	31.2	30.9	33.6	31.8	31.5	34.7	33.2	34.8	33.4	33.4	33.8	36.0	35.7	34.8
		B	32.4	33.3	24.2	26.5	28.6	31.4	32.2	33.3	34.3	35.0	35.4	34.9	35.6	35.8	36.2	36.3	35.7	36.5	37.6	36.1
		C	33.2	34.3	25.1	28.4	31.4	31.9	32.1	34.7	34.1	34.5	34.8	35.8	37.4	37.1	37.0	35.8	37.2	38.3	37.7	37.7
		D	31.0	32.1	23.2	25.6	27.0	29.1	30.3	32.3	33.0	33.0	33.0	34.8	33.8	34.7	35.1	35.0	34.1	35.4	35.4	35.6
	yaw-nulled	A	31.3	32.3	25.1	27.4	29.6	30.2	31.2	31.9	32.2	31.9	33.0	33.3	33.7	33.2	35.3	34.3	35.5	35.4	35.7	35.4
		B	32.6	33.8	23.5	28.3	29.9	32.7	32.1	32.8	33.3	34.8	33.6	34.5	36.2	37.0	37.1	37.1	38.0	38.0	35.9	36.9
		C	33.2	34.2	26.9	28.9	31.4	31.8	32.8	33.1	34.3	35.0	34.5	35.9	37.2	37.6	36.5	37.1	36.0	37.5	37.5	37.0
		D	31.1	32.2	22.5	25.5	28.4	29.9	31.8	32.2	32.4	33.0	34.2	33.8	34.2	35.0	35.1	34.5	34.9	34.7	34.9	35.3

Note: Data in these cells were required for calculations of adjusted average velocity values for the 12 pt. traverses, but not for the 16 pt. traverses.

WALL EFFECTS FIELD TEST SUMMARY
GPU - TITUS STATION

UNITED SCIENCES AUTOPROBE TEST, 2/4-5/98

TABLE J-7. WALL EFFECTS VS. ORIGINAL (ORIG), OVERALL SUMMARY

Run No.	Traverse Type	Avg. Velocity, ft/sec			
		Base	Adjusted	Difference	% Difference
2,4	16 pt. straight-up	33.46	32.46	-1.00	-2.99%
	16 pt. yaw-nulled	33.19	32.15	-1.04	-3.13%
3,4	12 pt. straight-up	32.46	31.75	-0.71	-2.19%
	12 pt. yaw-nulled	32.35	31.60	-0.75	-2.32%
5,7	16 pt. straight-up	***31.66***	***30.90***	***-0.76***	***-2.40%***
	16 pt. yaw-nulled	***31.22***	***30.61***	***-0.61***	***-1.95%***
6,7	12 pt. straight-up	31.68	30.65	-1.03	-3.25%
	12 pt. yaw-nulled	31.52	30.36	-1.16	-3.68%
8,10	16 pt. straight-up	32.46	31.67	-0.79	-2.43%
	16 pt. yaw-nulled	32.39	31.53	-0.86	-2.66%
9,10	12 pt. straight-up	30.63	29.69	-0.94	-3.07%
	12 pt. yaw-nulled	30.48	29.39	-1.09	-3.58%
N1	16 pt. straight-up	30.71	30.20	-0.51	-1.66%
	16 pt. yaw-nulled	30.51	29.90	-0.61	-2.00%
N2	16 pt. straight-up	28.84	28.61	-0.23	-0.80%
	16 pt. yaw-nulled	28.53	28.27	-0.26	-0.91%
N3	16 pt. straight-up	30.83	30.24	-0.59	-1.91%
	16 pt. yaw-nulled	30.49	29.86	-0.63	-2.07%
N4	16 pt. straight-up	19.96	19.71	-0.25	-1.25%
	16 pt. yaw-nulled	19.91	19.56	-0.35	-1.76%
N5	16 pt. straight-up	18.83	18.51	-0.32	-1.70%
	16 pt. yaw-nulled	18.73	18.48	-0.25	-1.33%
N6	16 pt. straight-up	18.24	17.96	-0.28	-1.54%
	16 pt. yaw-nulled	18.11	17.75	-0.36	-1.99%
N7	16 pt. straight-up	18.25	17.93	-0.32	-1.75%
	16 pt. yaw-nulled	18.09	17.81	-0.28	-1.55%
N8	16 pt. straight-up	18.10	17.84	-0.26	-1.44%
	16 pt. yaw-nulled	17.96	17.61	-0.35	-1.95%
N9	16 pt. straight-up	21.83	20.97	-0.86	-3.94%
	16 pt. yaw-nulled	21.89	20.84	-1.05	-4.80%
N10	16 pt. straight-up	32.89	32.34	-0.55	-1.67%
	16 pt. yaw-nulled	32.66	31.99	-0.67	-2.05%

Note: Data in bold and italic font did not meet the load stability criterion and were excluded from analysis in the wall effects study.

WALL EFFECTS FIELD TEST SUMMARY
GPU - TITUS STATION

UNITED SCIENCES AUTOPROBE TEST, 2/4-5/98

TABLE J-7A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS*
16 PT. TRAVERSES

Test Date	Port / Point	Port A 1	2	3	4	Port B 5	6	7	8	Port C 9	10	11	12	Port D 13	14	15	16	Average
Day-time 02/05/98	Run 2 (orig) - straight-up	34.7	36.0	35.9	27.0	36.3	34.9	33.8	25.8	37.5	37.2	36.8	27.7	35.4	34.7	33.7	27.9	33.46
	Run 4 (wall) - straight-up	34.7	36.0	35.9	23.4	36.3	34.9	33.8	22.4	37.5	37.2	36.8	22.8	35.4	34.7	33.7	24.0	32.46
	Difference				-3.6				-3.4				-4.9				-3.9	-1.00
	% Difference				-13.4%				-13.3%				-17.8%				-13.9%	-2.99%
	Run 2 (orig) - yaw-nulled	33.9	35.0	35.0	27.0	36.2	35.2	32.8	26.1	37.4	37.3	36.1	27.7	35.0	35.5	33.6	27.3	33.19
	Run 4 (wall) - yaw-nulled	33.9	35.0	35.0	23.3	36.2	35.2	32.8	21.7	37.4	37.3	36.1	22.4	35.0	35.5	33.6	24.0	32.15
	Difference				-3.7				-4.4				-5.3				-3.3	-1.04
	% Difference				-13.6%				-17.0%				-19.2%				-12.2%	-3.13%
Day-time 02/05/98	Run 5 (orig) - straight-up	***32.7***	***33.9***	***33.4***	***25.3***	***34.1***	***33.6***	***31.6***	***24.9***	***35.5***	***35.3***	***34.2***	***27.0***	***33.6***	***33.1***	***32.2***	***26.2***	***31.66***
	Run 7 (wall) - straight-up	***32.7***	***33.9***	***33.4***	***23.2***	***34.1***	***33.6***	***31.6***	***22.0***	***35.5***	***35.3***	***34.2***	***22.1***	***33.6***	***33.1***	***32.2***	***23.9***	***30.90***
	Difference				***-2.1***				***-2.9***				***-4.9***				***-2.3***	***-0.76***
	% Difference				***-8.3%***				***-11.8%***				***-18.1%***				***-8.6%***	***-2.40%***
	Run 5 (orig) - yaw-nulled	***32.1***	***32.8***	***32.5***	***24.7***	***34.8***	***33.3***	***31.6***	***24.5***	***35.2***	***35.3***	***34.7***	***26.0***	***32.6***	***33.0***	***31.1***	***25.3***	***31.22***
	Run 7 (wall) - yaw-nulled	***32.1***	***32.8***	***32.5***	***23.3***	***34.8***	***33.3***	***31.6***	***21.5***	***35.2***	***35.3***	***34.7***	***22.2***	***32.6***	***33.0***	***31.1***	***23.8***	***30.61***
	Difference				***-1.4***				***-3.0***				***-3.8***				***-1.5***	***-0.61***
	% Difference				***-5.9%***				***-12.2%***				***-14.4%***				***-6.0%***	***-1.95%***
Day-time 02/05/98	Run 8 (orig) - straight-up	34.8	36.3	33.3	23.4	36.7	35.4	32.1	23.9	38.0	38.3	34.3	25.1	35.2	35.6	32.4	24.6	32.46
	Run 10 (wall) - straight-up	34.8	36.3	33.3	21.4	36.7	35.4	32.1	20.3	38.0	38.3	34.3	20.6	35.2	35.6	32.4	22.1	31.67
	Difference				-2.0				-3.6				-4.5				-2.5	-0.79
	% Difference				-8.4%				-15.0%				-18.0%				-10.3%	-2.43%
	Run 8 (orig) - yaw-nulled	34.8	35.7	32.9	24.5	36.7	35.7	31.9	23.7	38.7	37.5	34.1	25.2	35.4	35.4	31.8	24.3	32.39
	Run 10 (wall) - yaw-nulled	34.8	35.7	32.9	21.4	36.7	35.7	31.9	20.1	38.7	37.5	34.1	20.6	35.4	35.4	31.8	21.7	31.53
	Difference				-3.1				-3.6				-4.6				-2.6	-0.86
	% Difference				-12.5%				-15.0%				-18.4%				-10.7%	-2.66%
Over-night 02/04-05/98	Run N1 (orig) - straight-up	32.3	34.0	31.0	24.3	34.2	33.3	30.0	24.4	35.2	35.0	32.0	26.0	32.6	32.4	29.5	25.2	30.71
	Run N1 (wall) - straight-up	32.3	34.0	31.0	22.9	34.2	33.3	30.0	22.7	35.2	35.0	32.0	22.4	32.6	32.4	29.5	23.7	30.20
	Difference				-1.4				-1.7				-3.6				-1.5	-0.51
	% Difference				-5.6%				-6.8%				-14.0%				-5.8%	-1.66%
	Run N1 (orig) - yaw-nulled	32.3	33.2	30.4	24.9	33.6	32.3	29.6	24.8	34.6	34.8	31.6	26.0	32.5	32.8	29.6	25.2	30.51
	Run N1 (wall) - yaw-nulled	32.3	33.2	30.4	23.0	33.6	32.3	29.6	22.0	34.6	34.8	31.6	22.5	32.5	32.8	29.6	23.6	29.90
	Difference				-1.9				-2.8				-3.5				-1.6	-0.61
	% Difference				-7.8%				-11.4%				-13.5%				-6.3%	-2.00%

WALL EFFECTS FIELD TEST SUMMARY
GPU - TITUS STATION

UNITED SCIENCES AUTOPROBE TEST, 2/4-5/98

TABLE J-7A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS*
16 PT. TRAVERSES

Test Date	Port / Point	Port A 1	2	3	4	Port B 5	6	7	8	Port C 9	10	11	12	Port D 13	14	15	16	Average
Over-night 02/04-05/98	Run N2 (orig) - straight-up	28.5	31.1	31.8	22.4	29.7	30.9	31.2	22.9	31.2	32.5	32.1	23.5	28.9	30.6	30.3	23.9	28.84
	Run N2 (wall) - straight-up	28.5	31.1	31.8	22.5	29.7	30.9	31.2	22.1	31.2	32.5	32.1	21.4	28.9	30.6	30.3	23.0	28.61
	Difference				0.1				-0.8				-2.1				-0.9	-0.23
	% Difference				0.5%				-3.6%				-9.0%				-3.8%	-0.80%
	Run N2 (orig) - yaw-nulled	28.8	30.8	30.8	22.8	29.7	30.5	29.5	22.4	30.8	32.2	32.4	23.8	28.4	29.8	30.4	23.4	28.53
	Run N2 (wall) - yaw-nulled	28.8	30.8	30.8	22.2	29.7	30.5	29.5	21.4	30.8	32.2	32.4	21.7	28.4	29.8	30.4	22.9	28.27
	Difference				-0.6				-1.0				-2.1				-0.5	-0.26
	% Difference				-2.5%				-4.4%				-8.8%				-2.2%	-0.91%
Over-night 02/04-05/98	Run N3 (orig) - straight-up	33.7	34.4	32.2	21.5	36.1	33.7	30.9	22.1	37.5	35.8	33.1	21.9	35.1	32.8	30.5	22.0	30.83
	Run N3 (wall) - straight-up	33.7	34.4	32.2	19.5	36.1	33.7	30.9	19.2	37.5	35.8	33.1	19.3	35.1	32.8	30.5	20.0	30.24
	Difference				-2.0				-2.9				-2.6				-2.0	-0.59
	% Difference				-9.3%				-12.9%				-11.9%				-9.2%	-1.91%
	Run N3 (orig) - yaw-nulled	34.1	34.0	31.9	21.5	35.6	32.8	30.0	21.2	36.9	36.2	32.6	22.8	33.8	32.9	29.8	21.7	30.49
	Run N3 (wall) - yaw-nulled	34.1	34.0	31.9	19.4	35.6	32.8	30.0	18.9	36.9	36.2	32.6	19.4	33.8	32.9	29.8	19.4	29.86
	Difference				-2.1				-2.3				-3.4				-2.3	-0.63
	% Difference				-9.6%				-10.7%				-15.1%				-10.4%	-2.07%
Over-night 02/04-05/98	Run N4 (orig) - straight-up	20.2	21.4	19.4	16.0	22.1	21.7	20.3	17.7	22.0	22.8	21.4	18.0	21.0	20.2	17.9	17.3	19.96
	Run N4 (wall) - straight-up	20.2	21.4	19.4	15.9	22.1	21.7	20.3	16.5	22.0	22.8	21.4	16.1	21.0	20.2	17.9	16.5	19.71
	Difference				-0.1				-1.2				-1.9				-0.8	-0.25
	% Difference				-0.4%				-6.9%				-10.6%				-4.6%	-1.25%
	Run N4 (orig) - yaw-nulled	20.0	20.9	19.0	16.6	22.2	21.7	19.9	18.1	21.7	22.6	21.0	18.2	20.1	20.6	18.5	17.5	19.91
	Run N4 (wall) - yaw-nulled	20.0	20.9	19.0	15.9	22.2	21.7	19.9	16.2	21.7	22.6	21.0	16.1	20.1	20.6	18.5	16.5	19.56
	Difference				-0.7				-1.9				-2.1				-1.0	-0.35
	% Difference				-4.0%				-10.5%				-11.4%				-5.6%	-1.76%
Over-night 02/04-05/98	Run N5 (orig) - straight-up	20.5	19.6	18.0	13.2	22.2	20.8	19.9	15.6	23.2	21.2	20.6	15.3	20.8	19.4	17.4	13.6	18.83
	Run N5 (wall) - straight-up	20.5	19.6	18.0	12.4	22.2	20.8	19.9	13.9	23.2	21.2	20.6	13.4	20.8	19.4	17.4	12.9	18.51
	Difference				-0.8				-1.7				-1.9				-0.7	-0.32
	% Difference				-5.7%				-10.8%				-12.5%				-5.5%	-1.70%
	Run N5 (orig) - yaw-nulled	20.7	19.4	18.5	12.9	22.4	20.6	19.6	15.3	22.8	21.3	20.3	15.0	21.5	19.3	17.3	12.7	18.73
	Run N5 (wall) - yaw-nulled	20.7	19.4	18.5	12.1	22.4	20.6	19.6	13.8	22.8	21.3	20.3	13.5	21.5	19.3	17.3	12.7	18.48
	Difference				-0.8				-1.5				-1.5				-0.0	-0.25
	% Difference				-6.4%				-10.0%				-9.9%				-0.3%	-1.33%

WALL EFFECTS FIELD TEST SUMMARY
GPU - TITUS STATION

UNITED SCIENCES AUTOPROBE TEST, 2/4-5/98

TABLE J-7A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS*
16 PT. TRAVERSES

Test	Port	Port A				Port B				Port C				Port D				
Date	Point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average
Over-night	Run N6 (orig) - straight-up	17.8	18.9	18.1	13.2	19.8	20.9	20.4	14.8	20.6	21.0	21.0	15.3	19.1	19.0	17.4	14.6	18.24
02/04-05/98	Run N6 (wall) - straight-up	17.8	18.9	18.1	12.4	19.8	20.9	20.4	14.1	20.6	21.0	21.0	13.7	19.1	19.0	17.4	13.1	17.96
	Difference				-0.8				-0.7				-1.6				-1.5	-0.28
	% Difference				-6.0%				-4.5%				-10.4%				-10.1%	-1.54%
	Run N6 (orig) - yaw-nulled	18.3	18.5	17.6	13.3	20.2	20.2	19.3	15.2	20.0	21.1	20.9	15.6	18.9	18.6	17.8	14.2	18.11
	Run N6 (wall) - yaw-nulled	18.3	18.5	17.6	12.2	20.2	20.2	19.3	13.8	20.0	21.1	20.9	13.6	18.9	18.6	17.8	12.9	17.75
	Difference				-1.1				-1.4				-2.0				-1.3	-0.36
	% Difference				-8.5%				-9.0%				-12.5%				-9.3%	-1.99%
Over-night	Run N7 (orig) - straight-up	18.0	19.2	17.9	13.1	20.1	21.1	20.5	15.8	20.7	21.2	20.5	15.4	19.1	18.2	17.1	14.1	18.25
02/04-05/98	Run N7 (wall) - straight-up	18.0	19.2	17.9	12.3	20.1	21.1	20.5	14.1	20.7	21.2	20.5	13.5	19.1	18.2	17.1	13.3	17.93
	Difference				-0.8				-1.7				-1.9				-0.8	-0.32
	% Difference				-6.0%				-10.6%				-12.4%				-5.6%	-1.75%
	Run N7 (orig) - yaw-nulled	18.3	18.6	18.1	13.3	20.4	20.0	19.5	15.0	20.9	21.1	20.9	15.7	18.7	18.9	16.9	13.1	18.09
	Run N7 (wall) - yaw-nulled	18.3	18.6	18.1	12.4	20.4	20.0	19.5	14.0	20.9	21.1	20.9	13.6	18.7	18.9	16.9	12.6	17.81
	Difference				-0.9				-1.0				-2.1				-0.5	-0.28
	% Difference				-6.7%				-6.7%				-13.3%				-3.9%	-1.55%
Over-night	Run N8 (orig) - straight-up	17.5	18.7	17.9	13.0	19.8	20.5	20.5	15.2	20.7	21.1	20.7	15.4	18.8	18.5	17.8	13.5	18.10
02/04-05/98	Run N8 (wall) - straight-up	17.5	18.7	17.9	12.4	19.8	20.5	20.5	14.1	20.7	21.1	20.7	13.6	18.8	18.5	17.8	12.8	17.84
	Difference				-0.6				-1.1				-1.8				-0.7	-0.26
	% Difference				-4.7%				-7.3%				-11.8%				-5.0%	-1.44%
	Run N8 (orig) - yaw-nulled	18.0	18.5	17.4	13.2	20.7	20.0	19.7	15.2	20.3	20.8	20.1	15.8	18.4	18.0	17.4	13.9	17.96
	Run N8 (wall) - yaw-nulled	18.0	18.5	17.4	12.1	20.7	20.0	19.7	14.0	20.3	20.8	20.1	13.5	18.4	18.0	17.4	12.9	17.61
	Difference				-1.1				-1.2				-2.3				-1.0	-0.35
	% Difference				-8.1%				-7.9%				-14.4%				-7.5%	-1.95%
Over-night	Run N9 (orig) - straight-up	18.7	20.4	19.3	25.3	21.0	22.2	21.2	25.5	21.4	22.8	21.6	26.6	19.4	19.4	18.8	25.7	21.83
02/04-05/98	Run N9 (wall) - straight-up	18.7	20.4	19.3	22.2	21.0	22.2	21.2	22.6	21.4	22.8	21.6	21.9	19.4	19.4	18.8	22.6	20.97
	Difference				-3.1				-2.9				-4.7				-3.1	-0.86
	% Difference				-12.1%				-11.4%				-17.6%				-12.1%	-3.94%
	Run N9 (orig) - yaw-nulled	19.4	19.7	19.2	25.6	21.2	21.9	20.6	25.3	21.4	22.2	21.6	26.3	19.2	20.3	19.4	26.9	21.89
	Run N9 (wall) - yaw-nulled	19.4	19.7	19.2	21.9	21.2	21.9	20.6	21.4	21.4	22.2	21.6	21.6	19.2	20.3	19.4	22.4	20.84
	Difference				-3.7				-3.9				-4.7				-4.5	-1.05
	% Difference				-14.4%				-15.3%				-18.0%				-16.6%	-4.80%

WALL EFFECTS FIELD TEST SUMMARY
GPU - TITUS STATION

UNITED SCIENCES AUTOPROBE TEST, 2/4-5/98

TABLE J-7A. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS*
16 PT. TRAVERSES

Test	Port	Port A				Port B				Port C				Port D				
Date	Point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average
Over-night	Run N10 (orig) - straight-up	32.7	34.3	36.4	28.1	34.2	33.6	35.4	27.0	35.4	35.2	37.1	27.3	33.4	33.4	35.2	27.6	32.89
02/04-05/98	Run N10 (wall) - straight-up	32.7	34.3	36.4	**25.7**	34.2	33.6	35.4	**24.6**	35.4	35.2	37.1	**24.8**	33.4	33.4	35.2	**26.0**	32.34
	Difference				-2.4				-2.4				-2.5				-1.6	-0.55
	% Difference				-8.4%				-8.9%				-9.2%				-5.8%	-1.67%
	Run N10 (orig) - yaw-nulled	32.0	33.5	36.4	27.4	34.6	33.3	34.7	27.1	35.5	35.6	37.0	28.1	32.8	32.5	33.7	28.4	32.66
	Run N10 (wall) - yaw-nulled	32.0	33.5	36.4	**25.4**	34.6	33.3	34.7	**24.0**	35.5	35.6	37.0	**24.8**	32.8	32.5	33.7	**26.1**	31.99
	Difference				-2.0				-3.1				-3.3				-2.3	-0.67
	% Difference				-7.3%				-11.4%				-11.8%				-8.2%	-2.05%

* Notes: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first three points at each port were taken from the corresponding baseline. The fourth point at each port, in a bold cell, was calculated using data obtained during wall effects runs (11 near-wall data points).

Data in bold and italic font did not meet the load stability criterion and were excluded from analysis in the wall effects study.

WALL EFFECTS FIELD TEST SUMMARY
GPU - TITUS STATION

UNITED SCIENCES AUTOPROBE TEST, 2/4-5/98

TABLE J-7B. VELOCITY (FPS) BY EQUAL AREA SECTOR FOR ORIGINAL (ORIG) AND WALL EFFECTS-ADJUSTED (WALL) RUNS
12 PT. TRAVERSES

Port	Port A			Port B			Port C			Port D			
Point	1	2	3	4	5	6	7	8	9	10	11	12	Average
Run 3 (orig) - straight-up	34.7	34.4	27.6	36.0	33.5	26.8	37.1	35.5	28.3	35.4	33.1	27.1	32.46
Run 4 (wall) - straight-up	34.7	34.4	**25.5**	36.0	33.5	**24.6**	37.1	35.5	**25.3**	35.4	33.1	**25.8**	31.75
Difference			-2.1			-2.2			-3.0			-1.3	-0.71
% Difference			-7.5%			-8.0%			-10.6%			-4.9%	-2.19%
Run 3 (orig) - yaw-nulled	34.2	34.2	27.4	35.8	33.6	26.8	37.6	35.8	28.4	34.9	33.2	26.3	32.35
Run 4 (wall) - yaw-nulled	34.2	34.2	**25.5**	35.8	33.6	**23.9**	37.6	35.8	**25.0**	34.9	33.2	**25.6**	31.60
Difference			-1.9			-2.9			-3.4			-0.7	-0.75
% Difference			-7.1%			-10.9%			-12.0%			-2.8%	-2.32%
Run 6 (orig) - straight-up	32.9	34.0	27.4	34.2	33.0	26.6	35.2	34.8	28.0	33.4	33.0	27.7	31.68
Run 7 (wall) - straight-up	32.9	34.0	**24.8**	34.2	33.0	**23.6**	35.2	34.8	**24.0**	33.4	33.0	**24.9**	30.65
Difference			-2.6			-3.0			-4.0			-2.8	-1.03
% Difference			-9.5%			-11.3%			-14.1%			-10.1%	-3.25%
Run 6 (orig) - yaw-nulled	32.4	33.1	27.6	34.0	32.0	26.8	35.8	34.7	28.8	33.0	32.5	27.5	31.52
Run 7 (wall) - yaw-nulled	32.4	33.1	**24.7**	34.0	32.0	**23.1**	35.8	34.7	**24.2**	33.0	32.5	**24.8**	30.36
Difference			-2.9			-3.7			-4.6			-2.7	-1.16
% Difference			-10.6%			-13.7%			-15.9%			-9.7%	-3.68%
Run 9 (orig) - straight-up	31.2	32.7	26.7	32.4	32.5	25.8	34.7	34.5	26.7	31.9	32.4	26.0	30.63
Run 10 (wall) - straight-up	31.2	32.7	**23.9**	32.4	32.5	**22.7**	34.7	34.5	**23.3**	31.9	32.4	**24.0**	29.69
Difference			-2.8			-3.1			-3.4			-2.0	-0.94
% Difference			-10.6%			-11.9%			-12.6%			-7.7%	-3.07%
Run 9 (orig) - yaw-nulled	31.2	32.5	27.2	32.7	31.5	25.5	33.9	34.5	26.9	32.1	31.2	26.6	30.48
Run 10 (wall) - yaw-nulled	31.2	32.5	**23.8**	32.7	31.5	**22.4**	33.9	34.5	**23.3**	32.1	31.2	**23.6**	29.39
Difference			-3.4			-3.1			-3.6			-3.0	-1.09
% Difference			-12.7%			-12.2%			-13.2%			-11.3%	-3.58%

* Note: In order to calculate the average velocity for a wall effects-adjusted run, the values for the first two points at each port were taken from the corresponding baseline. The third point at each port, in a bold cell, was calculated using data obtained during wall effects runs (15 near-wall data points).

WALL EFFECTS FIELD TEST SUMMARY
GPU - TITUS STATION

UNITED SCIENCES AUTOPROBE TEST, 2/4-5/98

TABLE J-7C. POINT VELOCITY (FPS) VALUES FOR WALL EFFECTS RUNS

Test Date	Run No.	Traverse Type	Port	Adjusted Avg. Velocity		Point Distance (in) from Wall														
				16 Pt. Traverse	12 Pt. Traverse	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Day-time 02/05/98	4	straight-up	A	23.4	25.5	18.4	18.4	18.4	21.8	24.2	26.2	26.8	28.5	29.2	30.0	31.5	31.4	31.8	32.6	33.0
			B	22.4	24.6	15.3	15.3	15.3	22.2	24.3	25.7	27.8	27.1	29.1	29.5	30.7	31.0	31.9	31.3	32.3
			C	22.8	25.3	13.7	13.7	13.7	22.5	25.2	26.8	28.7	29.6	30.2	31.0	32.5	32.6	32.6	33.8	33.9
			D	24.0	25.8	20.6	20.6	20.6	23.6	25.6	26.1	27.4	28.4	28.3	29.1	29.6	30.6	30.4	32.0	32.1
		yaw-nulled	A	23.3	25.5	18.1	18.1	18.1	22.6	24.5	25.3	27.3	28.6	29.4	29.5	31.2	31.5	31.8	32.1	32.8
			B	21.7	23.9	14.6	14.6	14.6	22.2	23.9	25.1	25.3	27.6	27.6	28.6	30.0	30.5	30.5	31.1	31.0
			C	22.4	25.0	13.2	13.2	13.2	22.1	25.1	26.5	27.6	29.5	29.9	31.0	32.1	32.1	33.2	33.8	33.6
			D	24.0	25.6	20.3	20.3	20.3	23.6	24.6	26.7	27.5	28.9	28.0	28.9	30.2	29.9	30.4	30.9	30.8
Day-time 02/05/98	7	straight-up	A	23.2	24.8	19.7	19.7	19.7	21.3	23.8	26.5	27.9	26.2	28.1	29.9	28.7	29.1	28.9	28.9	30.4
			B	22.0	23.6	16.0	16.0	16.0	21.9	24.3	26.1	26.8	26.6	26.7	29.3	28.1	27.8	27.8	28.3	29.2
			C	22.1	24.0	14.2	14.2	14.2	21.5	24.2	27.3	28.4	27.5	28.7	30.5	29.7	29.4	29.6	29.6	30.1
			D	23.9	24.9	22.9	22.9	22.9	22.5	25.3	25.9	27.3	25.6	26.6	28.2	28.1	27.6	27.2	26.8	28.7
		yaw-nulled	A	23.3	24.7	20.1	20.1	20.1	21.0	24.6	26.5	27.3	25.7	27.5	30.0	29.0	28.5	28.3	28.1	29.7
			B	21.5	23.1	15.8	15.8	15.8	20.7	23.8	25.8	26.6	25.6	26.8	28.5	27.3	26.6	27.5	28.3	28.9
			C	22.2	24.2	14.3	14.3	14.3	21.3	25.5	27.5	28.8	27.7	28.1	30.6	29.4	29.4	29.6	29.5	31.3
			D	23.8	24.8	22.0	22.0	22.0	22.5	25.8	26.7	27.1	26.8	26.5	28.5	27.1	26.9	28.5	27.6	28.1
Day-time 02/05/98	10	straight-up	A	21.4	23.9	16.2	16.2	16.2	20.1	21.6	23.0	24.1	25.7	28.6	28.4	30.9	31.2	30.6	32.1	32.4
			B	20.3	22.7	13.8	13.8	13.8	19.9	21.7	23.2	24.1	25.3	26.1	27.0	29.4	30.3	29.5	31.3	30.6
			C	20.6	23.3	11.5	11.5	11.5	20.0	22.7	24.3	25.3	27.4	28.1	28.3	31.4	31.6	31.2	33.7	32.6
			D	22.1	24.0	19.0	19.0	19.0	20.4	22.5	23.6	23.9	26.4	26.6	26.8	29.8	30.4	29.3	32.1	29.9
		yaw-nulled	A	21.4	23.8	16.4	16.4	16.4	19.8	21.4	23.1	24.1	26.6	27.4	28.1	31.2	30.9	30.1	32.3	31.5
			B	20.1	22.4	13.2	13.2	13.2	19.9	21.5	23.2	24.2	25.2	26.4	26.9	29.4	28.8	28.6	30.6	30.2
			C	20.6	23.3	11.4	11.4	11.4	20.2	22.0	24.2	25.0	27.2	28.3	29.1	32.0	31.8	30.8	33.0	32.9
			D	21.7	23.6	18.1	18.1	18.1	20.8	22.8	23.1	24.2	24.5	27.0	26.9	29.4	29.8	28.9	30.3	29.8
Over-night 02/04-05/98	N1	straight-up	A	22.9		17.4	17.4	17.4	20.9	23.9	25.8	27.3	28.1	29.9	29.8	30.8	32.1	31.8	31.9	32.1
			B	22.7		16.6	16.6	16.6	23.0	24.1	26.0	27.4	28.1	29.0	29.2	29.6	30.6	30.8	30.7	30.9
			C	22.4		14.1	14.1	14.1	22.0	24.4	26.4	27.3	29.0	29.8	30.4	31.2	31.7	32.2	32.4	32.4
			D	23.7		19.7	19.7	19.7	23.1	25.5	25.6	27.3	28.2	29.5	29.2	29.4	29.9	30.1	30.7	30.4
		yaw-nulled	A	23.0		17.4	17.4	17.4	21.8	24.3	25.3	26.9	29.0	29.3	29.9	30.3	31.1	30.8	31.6	32.0
			B	22.0		16.1	16.1	16.1	21.4	23.7	25.6	26.6	27.0	27.4	28.0	29.2	29.3	29.5	30.1	30.1
			C	22.5		13.6	13.6	13.6	21.9	25.4	26.6	28.3	28.9	29.7	31.0	32.1	31.8	32.2	32.6	32.8
			D	23.6		20.0	20.0	20.0	22.6	24.6	26.3	27.2	27.9	28.5	28.6	29.4	29.2	29.9	30.6	30.2
Over-night 02/04-05/98	N2	straight-up	A	22.5		19.2	19.2	19.2	23.0	23.1	23.8	25.2	26.3	27.5	27.3	28.5	28.5	28.6	29.5	28.6
			B	22.1		17.9	17.9	17.9	23.4	23.3	24.0	25.0	26.0	27.0	26.9	28.0	28.1	27.8	28.1	28.3
			C	21.4		14.3	14.3	14.3	22.6	24.1	24.4	25.4	26.3	27.9	28.3	28.9	28.9	29.5	29.9	29.1
			D	23.0		21.4	21.4	21.4	23.2	23.9	24.5	24.8	25.7	26.0	26.8	28.0	27.6	27.3	27.8	28.3
		yaw-nulled	A	22.2		19.0	19.0	19.0	22.8	23.1	23.7	25.0	25.8	27.1	27.5	27.4	28.3	28.5	29.5	29.2
			B	21.4		17.6	17.6	17.6	22.9	23.4	23.2	24.7	25.0	25.1	26.8	26.2	27.2	27.3	27.7	27.3
			C	21.7		14.6	14.6	14.6	22.9	24.4	24.8	25.8	26.7	28.2	28.5	29.4	29.8	29.5	29.3	29.8
			D	22.9		21.6	21.6	21.6	24.6	23.4	23.7	24.5	25.9	26.9	27.0	25.5	27.3	27.0	27.8	27.1

WALL EFFECTS FIELD TEST SUMMARY
GPU - TITUS STATION

UNITED SCIENCES AUTOPROBE TEST, 2/4-5/98

TABLE J-7C. POINT VELOCITY (FPS) VALUES FOR WALL EFFECTS RUNS

Test Date	Run No.	Traverse Type	Port	Adjusted Avg. Velocity		Point Distance (in) from Wall														
				16 Pt. Traverse	12 Pt. Traverse	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Over-night 02/04-05/98	N3	straight-up	A	19.5		12.2	12.2	12.2	13.2	19.2	23.9	25.8	26.2	27.1	29.1	29.5	30.7	29.2	29.1	29.0
			B	19.2		11.7	11.7	11.7	15.1	18.9	24.9	24.9	25.9	26.0	27.9	28.5	29.8	28.9	28.1	28.8
			C	19.3		10.0	10.0	10.0	14.4	19.5	25.4	26.3	26.8	27.4	28.8	29.8	31.3	29.6	29.6	30.4
			D	20.0		13.7	13.7	13.7	15.8	19.8	24.7	25.5	25.6	26.1	27.8	28.6	29.0	27.7	26.6	28.6
		yaw-nulled	A	19.4		12.4	12.4	12.4	14.3	18.9	24.3	24.5	26.0	26.6	28.5	29.2	30.1	28.8	28.5	28.2
			B	18.9		11.3	11.3	11.3	15.7	19.1	24.1	24.4	25.7	25.8	26.7	27.8	28.7	27.3	27.6	27.2
			C	19.4		10.1	10.1	10.1	14.6	19.8	24.3	25.9	27.2	27.8	29.2	30.3	31.2	30.1	29.3	29.9
			D	19.4		13.4	13.4	13.4	15.1	19.0	24.3	25.5	25.5	25.3	26.7	27.0	28.9	26.6	27.9	26.9
Over-night 02/04-05/98	N4	straight-up	A	15.9		11.9	11.9	11.9	15.1	16.6	17.6	17.7	19.7	20.7	21.4	22.4	22.9	22.6	23.3	22.1
			B	16.5		12.1	12.1	12.1	15.9	17.8	18.6	19.7	19.6	21.3	21.6	22.3	22.9	23.0	24.3	22.9
			C	16.1		10.1	10.1	10.1	15.8	17.7	18.6	19.6	20.6	21.6	22.8	22.7	24.3	23.8	24.6	23.3
			D	16.5		13.3	13.3	13.3	15.1	17.6	17.8	18.6	20.4	20.2	20.5	22.4	21.4	22.1	22.6	21.0
		yaw-nulled	A	15.9		11.8	11.8	11.8	14.9	16.7	17.4	19.1	19.6	20.0	21.0	22.5	22.5	22.4	23.4	21.2
			B	16.2		11.9	11.9	11.9	15.6	17.0	18.3	18.9	19.8	20.6	21.5	22.4	22.7	23.1	23.1	21.8
			C	16.1		10.0	10.0	10.0	15.5	17.5	19.0	19.8	20.7	21.4	22.7	23.4	23.7	24.0	24.6	22.8
			D	16.5		13.7	13.7	13.7	16.0	17.2	18.0	18.6	19.7	20.1	21.2	21.3	22.2	21.5	22.1	21.7
Over-night 02/04-05/98	N5	straight-up	A	12.4		9.7	9.7	9.7	11.4	13.0	13.4	14.4	15.2	16.0	16.1	17.0	17.0	17.4	17.0	17.9
			B	13.9		9.8	9.8	9.8	13.2	15.0	15.8	17.0	17.7	18.5	18.0	18.5	18.5	19.4	19.1	19.7
			C	13.4		8.1	8.1	8.1	13.3	14.4	15.8	17.0	17.3	17.9	18.5	19.0	18.6	18.8	19.7	20.1
			D	12.9		10.6	10.6	10.6	12.2	13.5	14.1	15.3	15.0	16.5	16.1	15.7	17.4	16.8	16.1	17.9
		yaw-nulled	A	12.1		8.8	8.8	8.8	11.4	12.3	14.0	14.6	14.8	15.5	16.4	16.4	16.1	17.3	17.3	17.5
			B	13.8		9.8	9.8	9.8	14.0	15.1	15.7	16.6	17.0	17.2	17.8	18.5	17.5	18.9	18.8	18.9
			C	13.5		8.6	8.6	8.6	13.2	15.0	16.1	16.7	17.3	18.1	18.2	18.5	19.0	19.6	19.2	20.0
			D	12.7		10.7	10.7	10.7	11.9	13.0	14.2	13.9	15.5	15.5	16.5	15.7	17.0	16.8	16.4	17.5
Over-night 02/04-05/98	N6	straight-up	A	12.4		9.7	9.7	9.7	11.4	12.6	14.1	14.9	15.2	15.9	15.8	16.2	16.8	17.5	17.6	18.0
			B	14.1		10.2	10.2	10.2	13.9	14.6	15.9	17.0	17.4	18.4	18.9	19.2	18.8	19.8	19.6	20.0
			C	13.7		8.2	8.2	8.2	13.5	14.9	16.0	17.1	18.0	18.9	19.2	19.3	19.3	19.9	19.9	20.0
			D	13.1		11.0	11.0	11.0	13.3	13.0	14.2	15.0	16.2	14.7	17.0	17.1	17.6	17.6	16.8	17.1
		yaw-nulled	A	12.2		9.3	9.3	9.3	11.5	12.3	14.0	14.3	14.6	15.6	16.0	16.4	16.5	16.6	16.9	17.0
			B	13.8		10.0	10.0	10.0	13.4	15.7	15.8	16.2	16.9	17.8	18.1	18.2	18.5	18.5	19.5	18.5
			C	13.6		8.2	8.2	8.2	13.1	15.5	16.0	17.5	17.1	18.3	19.0	19.6	19.4	19.6	20.1	20.6
			D	12.9		10.7	10.7	10.7	13.4	13.0	13.6	14.5	16.4	15.4	16.0	16.0	17.1	16.9	17.3	18.5
Over-night 02/04-05/98	N7	straight-up	A	12.3		9.1	9.1	9.1	11.8	13.0	14.2	14.3	15.1	15.7	16.3	16.6	17.4	17.1	17.9	18.1
			B	14.1		9.9	9.9	9.9	14.0	15.6	16.6	16.9	17.1	18.3	18.4	19.0	19.5	19.5	19.6	19.6
			C	13.5		8.0	8.0	8.0	13.3	15.4	16.4	16.8	17.3	18.2	19.2	18.6	20.0	20.1	19.7	19.5
			D	13.3		11.5	11.5	11.5	13.4	14.5	13.6	14.5	15.1	16.1	15.9	17.3	17.0	17.3	18.0	17.6
		yaw-nulled	A	12.4		9.3	9.3	9.3	11.6	13.0	14.1	14.5	15.3	16.0	16.0	16.9	16.9	16.8	17.4	17.5
			B	14.0		9.8	9.8	9.8	14.2	15.3	16.3	16.5	17.3	17.6	18.2	19.1	19.3	18.5	19.1	19.4
			C	13.6		8.2	8.2	8.2	13.2	14.9	15.9	17.8	18.3	17.9	18.4	19.1	19.6	19.4	19.9	20.0
			D	12.6		10.6	10.6	10.6	12.4	13.3	13.6	14.0	14.2	16.1	16.1	15.7	16.7	17.5	17.3	17.3

WALL EFFECTS FIELD TEST SUMMARY
GPU - TITUS STATION

UNITED SCIENCES AUTOPROBE TEST, 2/4-5/98

TABLE J-7C. POINT VELOCITY (FPS) VALUES FOR WALL EFFECTS RUNS

Test Date	Run No.	Traverse Type	Port	Adjusted Avg. Velocity		Point Distance (in) from Wall														
				16 Pt. Traverse	12 Pt. Traverse	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Over-night 02/04-05/98	N8	straight-up	A	12.4		9.3	9.3	9.3	12.0	12.9	14.0	14.9	15.3	16.1	15.6	16.2	17.0	16.9	17.6	17.9
			B	14.1		10.1	10.1	10.1	14.4	14.3	16.1	16.7	17.6	18.4	18.2	19.0	19.3	19.4	20.5	19.7
			C	13.6		8.0	8.0	8.0	13.8	15.0	16.0	17.1	18.0	18.4	18.4	19.1	19.2	19.7	19.9	20.1
			D	12.8		10.6	10.6	10.6	12.8	13.6	13.3	14.6	15.4	15.7	15.7	16.6	16.3	17.7	17.4	17.1
		yaw-nulled	A	12.1		9.1	9.1	9.1	11.3	12.3	13.8	14.7	15.2	15.8	15.7	16.0	16.8	16.6	17.3	17.1
			B	14.0		10.2	10.2	10.2	14.0	15.2	15.6	16.5	17.6	17.8	18.2	18.5	18.4	18.9	18.7	19.3
			C	13.5		8.0	8.0	8.0	13.5	14.8	16.2	16.5	17.9	18.2	19.1	19.2	19.4	19.8	19.7	20.1
			D	12.9		10.9	10.9	10.9	12.9	13.2	13.8	14.3	15.4	14.9	15.6	16.9	16.5	17.0	16.8	16.7
Over-night 02/04-05/98	N9	straight-up	A	22.2		18.5	18.5	18.5	22.2	24.7	27.7	26.0	26.6	25.4	25.5	25.2	22.9	22.6	21.2	19.9
			B	22.6		17.5	17.5	17.5	22.6	25.3	27.6	26.8	28.0	26.4	26.2	27.5	23.0	24.0	22.4	21.6
			C	21.9		13.9	13.9	13.9	22.9	25.5	29.1	27.9	28.3	26.9	26.6	27.3	24.4	24.7	23.3	22.0
			D	22.6		19.6	19.6	19.6	23.4	25.7	28.1	25.1	26.0	26.0	23.8	24.7	21.9	21.6	20.1	19.5
		yaw-nulled	A	21.9		17.9	17.9	17.9	21.8	25.0	27.6	26.5	26.6	25.9	24.9	23.1	22.2	22.2	20.8	19.7
			B	21.4		16.7	16.7	16.7	22.3	24.5	26.8	25.8	25.9	25.6	25.5	23.6	22.7	22.5	21.6	21.4
			C	21.6		13.8	13.8	13.8	22.7	25.8	29.3	27.4	27.8	26.0	26.8	25.4	23.9	24.9	23.1	21.9
			D	22.4		20.1	20.1	20.1	23.3	25.2	28.3	25.5	25.1	24.6	24.4	23.6	22.1	22.6	19.9	19.3
Over-night 02/04-05/98	N10	straight-up	A	25.7		20.3	20.3	20.3	24.0	26.3	28.6	30.2	31.6	32.4	33.3	33.9	35.3	35.1	35.2	35.7
			B	24.6		17.9	17.9	17.9	24.5	26.3	28.0	28.9	30.9	31.6	32.8	32.0	32.9	32.9	33.8	33.5
			C	24.8		15.5	15.5	15.5	24.5	27.0	29.1	30.7	32.4	33.0	34.1	34.4	35.1	34.9	35.4	36.4
			D	26.0		22.1	22.1	22.1	25.3	27.4	28.7	29.4	30.7	31.9	32.1	31.7	32.7	33.0	33.4	34.7
		yaw-nulled	A	25.4		19.6	19.6	19.6	23.7	26.3	28.3	30.5	31.3	32.1	32.8	33.6	34.1	35.0	35.2	35.2
			B	24.0		17.6	17.6	17.6	23.8	25.8	27.9	28.7	29.7	30.0	30.9	31.4	32.2	32.3	32.2	33.2
			C	24.8		15.2	15.2	15.2	24.3	27.2	29.4	31.2	31.7	33.4	34.0	34.9	34.3	34.8	35.0	35.9
			D	26.1		22.3	22.3	22.3	25.4	27.2	28.3	30.1	30.6	31.8	31.9	31.9	32.1	33.1	33.0	33.6

Note: Data in these cells were required for calculations of adjusted average velocity values for the 12 pt. traverses, but not for the 16 pt. traverses.

Table J-8. Summary of Percent Decrease in Average Velocity Between Original and Wall Effects-Adjusted Runs (day-time and over-night runs separated)

Site	Stack Mat'l	Statistics	Baseline Autoprobes								DAT	Prandtl	French	Aggregate Results	
			Manual Type S		Day-Time Steady Load				Over-Night						
					16 Point		12 Point		16 Point						
			Straight-Up	Yaw-Nulled	Straight-Up	Yaw-Nulled	Straight-Up	Yaw-Nulled	Straight-Up	Yaw-Nulled				16 Point	12 Point
TU DeCordova	Steel	No. Runs	1	1	6	4			7	7	1	1	1	9	
		Average	-1.83%	-1.93%	-1.32%	-1.33%			-1.66%	-1.61%	-1.57%	-1.59%	-1.13%	-1.55%	
		Std. Dev.			0.06%	0.10%			0.70%	0.74%				0.25%	
TU Lake Hubbard	Steel	No. Runs			1	1			9	9	1			5	
		Average			-1.82%	-1.58%			-1.37%	-1.23%	-1.56%			-1.51%	
		Std. Dev.							0.98%	1.02%				0.22%	
AEP Conesville Unit 1/2	Brick and mortar	No. Runs			3	3	3	3						2	2
		Average			-1.94%	-1.92%	-4.23%	-4.28%						-1.93%	-4.26%
		Std. Dev.			0.24%	0.17%	0.12%	0.25						0.01%	0.04%
AEP Picway	Brick and mortar	No. Runs			3	3	3	3						2	2
		Average			-1.92%	-1.95%	-2.37%	-2.53%						-1.94%	-2.45%
		Std. Dev.			0.18%	0.23%	0.39%	0.40%						0.02%	0.11%
Allegheny Mitchell	Brick and mortar	No. Runs			4	4	1	1						2	2
		Average			-1.75%	-1.69%	-2.01%	-2.03%						-1.72%	-2.02%
		Std. Dev.			1.83%	1.66%								0.04%	0.01%
Averages, Based on Equal Weighting of Each Site ~~Test~~	Steel	No. Sites	1	1	2	2			2	2	2	1	1	2	
		Average	-1.83%	-1.93%	-1.57%	-1.46%			-1.52%	-1.43%	-1.57%	-1.59%	-1.13%	-1.53%	
		Std. Dev.			0.35%	0.18%			0.21%	0.26%	0.01%			0.03%	
	Brick and mortar	No. Sites			3	3	3	3						3	3
		Average			-1.87%	-1.85%	-2.87%	-2.95%						-1.86%	-2.91%
		Std. Dev.			0.10%	0.14%	1.19%	1.18%						0.12%	1.19%

Table J-9. Comparison of Percent Differences Between Original and Wall Effects-adjusted Average Velocities, Using All Wall Effects Traverse Points and Using Only Two Wall Effects Traverse Points per Port. Results for Tests Conducted at Sites with Steel Stacks (16-point Method 1 Baseline Traverses).

Site	Test No.	Day or Night	Type of Probe	% Difference Using All Data Points	% Difference Using Two Data Points
DeCordova	203	n	16-point Autoprobes straight-up	-2.82%	-1.14%
DeCordova	203	n	16-point Autoprobes yaw-nulled	-2.82%	-0.99%
Lake Hubbard	2 (n3)	n	16-point Autoprobes straight-up	-2.36%	-0.99%
DeCordova	201	n	16-point Autoprobes yaw-nulled	-2.25%	-0.96%
DeCordova	201	n	16-point Autoprobes straight-up	-2.21%	-0.89%
Lake Hubbard	3 (n1)	n	16-point Autoprobes yaw-nulled	-2.18%	-1.00%
Lake Hubbard	2 (n1)	n	16-point Autoprobes yaw-nulled	-2.14%	-1.13%
Lake Hubbard	2 (n3)	n	16-point Autoprobes yaw-nulled	-2.14%	-0.86%
Lake Hubbard	2(n1)	n	16-point Autoprobes straight-up	-2.04%	-0.82%
Lake Hubbard	3 (n1)	n	16-point Autoprobes straight-up	-1.99%	-0.68%
DeCordova	13	d	Type S yaw-nulled	-1.93%	-0.82%
DeCordova	13	d	Type S straight-up	-1.83%	-0.76%
Lake Hubbard	21	d	16-point Autoprobes straight-up	-1.82%	-0.94%
DeCordova	202	n	16-point Autoprobes straight-up	-1.76%	0.20%
Lake Hubbard	5 (n1)	n	16-point Autoprobes straight-up	-1.70%	-0.90%
DeCordova	205	n	16-point Autoprobes yaw-nulled	-1.61%	-1.03%
DeCordova	202	n	16-point Autoprobes yaw-nulled	-1.59%	0.13%
DeCordova	25	d	Prandtl	-1.59%	-0.99%
DeCordova	18	d	DAT	-1.57%	-0.82%
Lake Hubbard	21	d	16-point Autoprobes yaw-nulled	-1.57%	-0.38%
Lake Hubbard	21	d	DAT	-1.56%	-0.52%
Lake Hubbard	1 (n2)	n	16-point Autoprobes straight-up	-1.50%	-0.81%
Lake Hubbard	3 (n3)	n	16-point Autoprobes straight-up	-1.49%	-1.71%
DeCordova	205	n	16-point Autoprobes straight-up	-1.45%	-0.72%
DeCordova	23	d	16-point Autoprobes yaw-nulled	-1.43%	-0.86%
DeCordova	18	d	16-point Autoprobes straight-up	-1.41%	-0.75%
DeCordova	206	n	16-point Autoprobes straight-up	-1.41%	-0.78%
DeCordova	18	d	16-point Autoprobes yaw-nulled	-1.37%	-0.92%
DeCordova	23	d	16-point Autoprobes straight-up	-1.36%	-0.65%
DeCordova	30	d	16-point Autoprobes straight-up	-1.34%	-0.75%
DeCordova	207	n	16-point Autoprobes yaw-nulled	-1.33%	-0.75%
DeCordova	13	d	16-point Autoprobes yaw-nulled	-1.33%	-0.67%
Lake Hubbard	1 (n2)	n	16-point Autoprobes yaw-nulled	-1.33%	-0.62%
DeCordova	25	d	16-point Autoprobes straight-up	-1.32%	-1.09%
Lake Hubbard	5 (n1)	n	16-point Autoprobes yaw-nulled	-1.30%	-0.19%
Lake Hubbard	1 (n3)	n	16-point Autoprobes straight-up	-1.29%	-1.03%
Lake Hubbard	3 (n3)	n	16-point Autoprobes yaw-nulled	-1.28%	-1.60%
DeCordova	13	d	16-point Autoprobes straight-up	-1.26%	-0.55%
DeCordova	36	d	16-point Autoprobes straight-up	-1.25%	-0.50%
DeCordova	207	n	16-point Autoprobes straight-up	-1.25%	-0.68%
DeCordova	36	d	16-point Autoprobes yaw-nulled	-1.19%	-0.49%
DeCordova	30	d	French	-1.13%	-0.57%
DeCordova	206	n	16-point Autoprobes yaw-nulled	-1.04%	-0.43%
Lake Hubbard	4 (n1)	n	16-point Autoprobes yaw-nulled	-0.97%	-0.21%
Lake Hubbard	1 (n3)	n	16-point Autoprobes yaw-nulled	-0.91%	-0.85%
Lake Hubbard	4 (n1)	n	16-point Autoprobes straight-up	-0.88%	-0.08%
DeCordova	204	n	16-point Autoprobes straight-up	-0.68%	-0.74%
DeCordova	204	n	16-point Autoprobes yaw-nulled	-0.61%	-0.47%
Lake Hubbard	1 (n1)	n	16-point Autoprobes straight-up	0.96%	0.03%
Lake Hubbard	1 (n1)	n	16-point Autoprobes yaw-nulled	1.13%	0.20%

Table J-10. Comparison of Percent Differences Between Original and Wall Effects-adjusted Average Velocities, Using All Wall Effects Traverse Points and Using Only Two Wall Effects Traverse Points per Port. Results for Tests Conducted at Sites with Brick and Mortar Stacks (16-point Method 1 Baseline Traverses).

Site	Test No.	Day or Night	Type of Probe	% Difference Using All Data Points	% Difference Using Two Data Points
Mitchell	3	d	16-point Autoprobes straight-up	-4.33%	-1.79%
Mitchell	3	d	16-point Autoprobes yaw-nulled	-3.87%	-1.51%
Picway	5	d	16-point Autoprobes yaw-nulled	-2.21%	-1.79%
Conesville Unit 1/2	3	d	16-point Autoprobes straight-up	-2.20%	-1.01%
Conesville Unit 1/2	3	d	16-point Autoprobes yaw-nulled	-2.11%	-0.94%
Picway	8	d	16-point Autoprobes straight-up	-2.05%	-1.29%
Picway	5	d	16-point Autoprobes straight-up	-2.00%	-1.16%
Picway	8	d	16-point Autoprobes yaw-nulled	-1.88%	-1.22%
Conesville Unit 1/2	8	d	16-point Autoprobes straight-up	-1.88%	-0.77%
Conesville Unit 1/2	8	d	16-point Autoprobes yaw-nulled	-1.87%	-0.89%
Conesville Unit 1/2	5	d	16-point Autoprobes yaw-nulled	-1.77%	-0.68%
Mitchell	1	d	16-point Autoprobes yaw-nulled	-1.76%	-1.12%
Picway	11	d	16-point Autoprobes yaw-nulled	-1.76%	-1.09%
Conesville Unit 1/2	5	d	16-point Autoprobes straight-up	-1.74%	-0.57%
Picway	11	d	16-point Autoprobes straight-up	-1.72%	-1.22%
Mitchell	4	d	16-point Autoprobes straight-up	-1.42%	-1.09%
Mitchell	4	d	16-point Autoprobes yaw-nulled	-1.29%	-0.96%
Mitchell	1	d	16-point Autoprobes straight-up	-1.23%	-0.39%
Mitchell	2	d	16-point Autoprobes straight-up	0.00%	2.08%
Mitchell	2	d	16-point Autoprobes yaw-nulled	0.15%	2.41%

ATTACHMENT A.

Conesville Station Unit 1/2
Wall Effects Calculation Forms

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Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.2	7.60	33575.47	32929.06	646.41	4912.74
d= 2	24.2	19.70	32929.06	32288.93	640.13	12610.56
d= 3	34.2	29.20	32288.93	31655.08	633.85	18508.33
d= 4	42.0	38.10	31655.08	31027.52	627.56	23910.18
d= 5	45.1	43.55	31027.52	30406.24	621.28	27056.77
d= 6	47.1	46.10	30406.24	29791.24	615.00	28351.38
d= 7	48.0	47.55	29791.24	29182.52	608.71	28944.36
d= 8	49.3	48.65	29182.52	28580.09	602.43	29308.27
d= 9	50.3	49.80	28580.09	27983.95	596.15	29688.16
d= 10	50.6	50.45	27983.95	27394.08	589.86	29758.67
d= 11	52.8	51.70	27394.08	26810.50	583.58	30171.16
d= 12	53.3	53.05	26810.50	26233.20	577.30	30625.67
d= 13	53.7	53.50	26233.20	25662.19	571.02	30549.31
d= 14	54.1	53.90	25662.19	25097.45	564.73	30439.05
d= 15	54.3	54.20	25097.45	24539.01	558.45	30267.92
d= 16	55.7	55.00	24539.01	23986.84	552.17	30369.10
d= 17	56.1	55.90	23986.84	23440.96	545.88	30514.82
drem 18.0	56.3					

line 3) Total near-wall volumetric flow (total of column G) **415471.60**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 56.30
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **59520.32**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **474991.923**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.44**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	38.5	19.25	33575.47	32929.06	646.41	12443.45
d= 2	41.7	40.10	32929.06	32288.93	640.13	25669.21
d= 3	44.5	43.10	32288.93	31655.08	633.85	27318.80
d= 4	46.7	45.60	31655.08	31027.52	627.56	28616.90
d= 5	48.2	47.45	31027.52	30406.24	621.28	29479.76
d= 6	49.8	49.00	30406.24	29791.24	615.00	30134.87
d= 7	51.1	50.45	29791.24	29182.52	608.71	30709.63
d= 8	51.9	51.50	29182.52	28580.09	602.43	31025.19
d= 9	52.5	52.20	28580.09	27983.95	596.15	31118.91
d= 10	53.1	52.80	27983.95	27394.08	589.86	31144.85
d= 11	53.5	53.30	27394.08	26810.50	583.58	31104.89
d= 12	54.8	54.15	26810.50	26233.20	577.30	31260.70
d= 13	54.3	54.55	26233.20	25662.19	571.02	31148.87
d= 14	55.4	54.85	25662.19	25097.45	564.73	30975.54
d= 15	55.6	55.50	25097.45	24539.01	558.45	30993.90
d= 16	56.2	55.90	24539.01	23986.84	552.17	30866.05
d= 17	56.8	56.50	23986.84	23440.96	545.88	30842.35
drem 18.0	57.2					

line 3) Total near-wall volumetric flow (total of column G) **464011.54**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 57.20
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **60471.80**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **524483.342**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **46.86**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	31.1	15.55	33575.47	32929.06	646.41	10051.73
d= 2	35.7	33.40	32929.06	32288.93	640.13	21380.34
d= 3	39.1	37.40	32288.93	31655.08	633.85	23705.87
d= 4	42.0	40.55	31655.08	31027.52	627.56	25447.71
d= 5	44.1	43.05	31027.52	30406.24	621.28	26746.13
d= 6	45.1	44.60	30406.24	29791.24	615.00	27428.88
d= 7	46.1	45.60	29791.24	29182.52	608.71	27757.36
d= 8	48.0	47.05	29182.52	28580.09	602.43	28344.38
d= 9	47.7	47.85	28580.09	27983.95	596.15	28525.67
d= 10	48.9	48.30	27983.95	27394.08	589.86	28490.46
d= 11	49.1	49.00	27394.08	26810.50	583.58	28595.49
d= 12	49.2	49.15	26810.50	26233.20	577.30	28374.21
d= 13	50.2	49.70	26233.20	25662.19	571.02	28379.45
d= 14	51.2	50.70	25662.19	25097.45	564.73	28631.91
d= 15	50.5	50.85	25097.45	24539.01	558.45	28397.12
d= 16	50.8	50.65	24539.01	23986.84	552.17	27967.18
d= 17	51.7	51.25	23986.84	23440.96	545.88	27976.47
drem 18.0	50.5					

line 3) Total near-wall volumetric flow (total of column G) **418223.88**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 50.50
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **53388.56**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **471612.439**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.14**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159

line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.5	11.25	33575.47	32929.06	646.41	7272.15
d= 2	26.8	24.65	32929.06	32288.93	640.13	15779.21
d= 3	30.3	28.55	32288.93	31655.08	633.85	18096.33
d= 4	34.3	32.30	31655.08	31027.52	627.56	20270.31
d= 5	39.6	36.95	31027.52	30406.24	621.28	22956.31
d= 6	42.9	41.25	30406.24	29791.24	615.00	25368.64
d= 7	46.9	44.90	29791.24	29182.52	608.71	27331.26
d= 8	47.0	46.95	29182.52	28580.09	602.43	28284.13
d= 9	49.0	48.00	28580.09	27983.95	596.15	28615.09
d= 10	50.1	49.55	27983.95	27394.08	589.86	29227.79
d= 11	51.7	50.90	27394.08	26810.50	583.58	29704.29
d= 12	51.5	51.60	26810.50	26233.20	577.30	29788.59
d= 13	52.3	51.90	26233.20	25662.19	571.02	29635.68
d= 14	53.1	52.70	25662.19	25097.45	564.73	29761.37
d= 15	52.3	52.70	25097.45	24539.01	558.45	29430.25
d= 16	53.8	53.05	24539.01	23986.84	552.17	29292.38
d= 17	54.4	54.10	23986.84	23440.96	545.88	29532.23
drem 18.0	53.7					

line 3) Total near-wall volumetric flow (total of column G) **400813.78**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 53.70
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **56771.60**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **457585.384**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **40.89**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 1/2

Wall Effects Run 3
PORT A, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.5	8.25	33575.47	32929.06	646.41	5332.91
d= 2	24.1	20.30	32929.06	32288.93	640.13	12994.64
d= 3	34.1	29.10	32288.93	31655.08	633.85	18444.94
d= 4	41.8	37.95	31655.08	31027.52	627.56	23816.04
d= 5	44.7	43.25	31027.52	30406.24	621.28	26870.38
d= 6	46.6	45.65	30406.24	29791.24	615.00	28074.63
d= 7	47.7	47.15	29791.24	29182.52	608.71	28700.87
d= 8	49.2	48.45	29182.52	28580.09	602.43	29187.78
d= 9	50.8	50.00	28580.09	27983.95	596.15	29807.39
d= 10	51.2	51.00	27983.95	27394.08	589.86	30083.09
d= 11	52.3	51.75	27394.08	26810.50	583.58	30200.34
d= 12	52.4	52.35	26810.50	26233.20	577.30	30221.56
d= 13	53.7	53.05	26233.20	25662.19	571.02	30292.35
d= 14	54.2	53.95	25662.19	25097.45	564.73	30467.28
d= 15	55.3	54.75	25097.45	24539.01	558.45	30575.07
d= 16	56.1	55.70	24539.01	23986.84	552.17	30755.62
d= 17	55.8	55.95	23986.84	23440.96	545.88	30542.12
drem 18.0	55.6					

line 3) Total near-wall volumetric flow (total of column G) **415824.90**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 55.60
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **58780.28**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **474605.174**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.41**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 1/2

Wall Effects Run 3
PORT B, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.2	18.60	33575.47	32929.06	646.41	12023.29
d= 2	42.3	39.75	32929.06	32288.93	640.13	25445.17
d= 3	44.6	43.45	32288.93	31655.08	633.85	27540.65
d= 4	47.0	45.80	31655.08	31027.52	627.56	28742.42
d= 5	48.7	47.85	31027.52	30406.24	621.28	29728.27
d= 6	49.5	49.10	30406.24	29791.24	615.00	30196.37
d= 7	51.4	50.45	29791.24	29182.52	608.71	30709.63
d= 8	51.7	51.55	29182.52	28580.09	602.43	31055.32
d= 9	52.9	52.30	28580.09	27983.95	596.15	31178.53
d= 10	53.0	52.95	27983.95	27394.08	589.86	31233.33
d= 11	54.3	53.65	27394.08	26810.50	583.58	31309.14
d= 12	55.0	54.65	26810.50	26233.20	577.30	31549.35
d= 13	54.9	54.95	26233.20	25662.19	571.02	31377.28
d= 14	55.8	55.35	25662.19	25097.45	564.73	31257.91
d= 15	56.6	56.20	25097.45	24539.01	558.45	31384.82
d= 16	56.8	56.70	24539.01	23986.84	552.17	31307.78
d= 17	56.8	56.80	23986.84	23440.96	545.88	31006.12
drem 18.0	57.7					

line 3) Total near-wall volumetric flow (total of column G) **466039.24**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 57.70
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **61000.40**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **527039.635**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **47.09**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 1/2

Wall Effects Run 3
PORT C, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	31.3	15.65	33575.47	32929.06	646.41	10116.37
d= 2	35.4	33.35	32929.06	32288.93	640.13	21348.34
d= 3	39.9	37.65	32288.93	31655.08	633.85	23864.33
d= 4	42.1	41.00	31655.08	31027.52	627.56	25730.11
d= 5	44.0	43.05	31027.52	30406.24	621.28	26746.13
d= 6	45.6	44.80	30406.24	29791.24	615.00	27551.88
d= 7	46.0	45.80	29791.24	29182.52	608.71	27879.11
d= 8	47.1	46.55	29182.52	28580.09	602.43	28043.16
d= 9	47.9	47.50	28580.09	27983.95	596.15	28317.02
d= 10	49.5	48.70	27983.95	27394.08	589.86	28726.41
d= 11	50.2	49.85	27394.08	26810.50	583.58	29091.53
d= 12	50.7	50.45	26810.50	26233.20	577.30	29124.70
d= 13	50.4	50.55	26233.20	25662.19	571.02	28864.81
d= 14	50.5	50.45	25662.19	25097.45	564.73	28490.72
d= 15	51.7	51.10	25097.45	24539.01	558.45	28536.73
d= 16	52.1	51.90	24539.01	23986.84	552.17	28657.39
d= 17	51.0	51.55	23986.84	23440.96	545.88	28140.23
drem 18.0	51.5					

line 3) Total near-wall volumetric flow (total of column G) **421088.73**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 51.50
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **54445.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **475534.49**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.49**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 1/2

Wall Effects Run 3
PORT D, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.1	11.55	33575.47	32929.06	646.41	7466.07
d= 2	25.9	24.50	32929.06	32288.93	640.13	15683.19
d= 3	28.8	27.35	32288.93	31655.08	633.85	17335.71
d= 4	34.9	31.85	31655.08	31027.52	627.56	19987.90
d= 5	39.9	37.40	31027.52	30406.24	621.28	23235.89
d= 6	43.3	41.60	30406.24	29791.24	615.00	25583.89
d= 7	46.9	45.10	29791.24	29182.52	608.71	27453.01
d= 8	48.0	47.45	29182.52	28580.09	602.43	28585.35
d= 9	47.7	47.85	28580.09	27983.95	596.15	28525.67
d= 10	49.4	48.55	27983.95	27394.08	589.86	28637.93
d= 11	50.7	50.05	27394.08	26810.50	583.58	29208.25
d= 12	50.3	50.50	26810.50	26233.20	577.30	29153.56
d= 13	52.0	51.15	26233.20	25662.19	571.02	29207.42
d= 14	52.2	52.10	25662.19	25097.45	564.73	29422.53
d= 15	53.1	52.65	25097.45	24539.01	558.45	29402.32
d= 16	53.9	53.50	24539.01	23986.84	552.17	29540.85
d= 17	53.8	53.85	23986.84	23440.96	545.88	29395.76
drem 18.0	54.4					

line 3) Total near-wall volumetric flow (total of column G) **398429.54**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.40
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **57511.64**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **455941.185**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **40.74**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.3	7.65	33575.47	32929.06	646.41	4945.06
d= 2	24.3	19.80	32929.06	32288.93	640.13	12674.57
d= 3	34.7	29.50	32288.93	31655.08	633.85	18698.48
d= 4	42.0	38.35	31655.08	31027.52	627.56	24067.07
d= 5	44.7	43.35	31027.52	30406.24	621.28	26932.51
d= 6	46.4	45.55	30406.24	29791.24	615.00	28013.13
d= 7	48.7	47.55	29791.24	29182.52	608.71	28944.36
d= 8	49.0	48.85	29182.52	28580.09	602.43	29428.75
d= 9	50.3	49.65	28580.09	27983.95	596.15	29598.74
d= 10	50.7	50.50	27983.95	27394.08	589.86	29788.16
d= 11	52.2	51.45	27394.08	26810.50	583.58	30025.26
d= 12	52.6	52.40	26810.50	26233.20	577.30	30250.43
d= 13	53.5	53.05	26233.20	25662.19	571.02	30292.35
d= 14	54.3	53.90	25662.19	25097.45	564.73	30439.05
d= 15	54.6	54.45	25097.45	24539.01	558.45	30407.53
d= 16	54.5	54.55	24539.01	23986.84	552.17	30120.63
d= 17	55.6	55.05	23986.84	23440.96	545.88	30050.82
drem 18.0	55.7					

line 3) Total near-wall volumetric flow (total of column G) **414626.08**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 55.70
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **58886.00**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **473512.077**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.31**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.0	18.50	33575.47	32929.06	646.41	11958.64
d= 2	41.5	39.25	32929.06	32288.93	640.13	25125.10
d= 3	44.8	43.15	32288.93	31655.08	633.85	27350.49
d= 4	46.5	45.65	31655.08	31027.52	627.56	28648.28
d= 5	48.6	47.55	31027.52	30406.24	621.28	29541.89
d= 6	49.4	49.00	30406.24	29791.24	615.00	30134.87
d= 7	51.9	50.65	29791.24	29182.52	608.71	30831.37
d= 8	52.5	52.20	29182.52	28580.09	602.43	31446.90
d= 9	53.0	52.75	28580.09	27983.95	596.15	31446.80
d= 10	53.8	53.40	27983.95	27394.08	589.86	31498.77
d= 11	54.1	53.95	27394.08	26810.50	583.58	31484.22
d= 12	54.3	54.20	26810.50	26233.20	577.30	31289.56
d= 13	54.3	54.30	26233.20	25662.19	571.02	31006.12
d= 14	56.3	55.30	25662.19	25097.45	564.73	31229.67
d= 15	55.6	55.95	25097.45	24539.01	558.45	31245.20
d= 16	55.4	55.50	24539.01	23986.84	552.17	30645.19
d= 17	56.5	55.95	23986.84	23440.96	545.88	30542.12
drem 18.0	56.7					

line 3) Total near-wall volumetric flow (total of column G) **464883.07**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 56.70
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **59943.20**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **524826.269**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **46.89**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	30.9	15.45	33575.47	32929.06	646.41	9987.08
d= 2	36.2	33.55	32929.06	32288.93	640.13	21476.36
d= 3	39.5	37.85	32288.93	31655.08	633.85	23991.10
d= 4	42.4	40.95	31655.08	31027.52	627.56	25698.73
d= 5	43.5	42.95	31027.52	30406.24	621.28	26684.00
d= 6	44.7	44.10	30406.24	29791.24	615.00	27121.38
d= 7	45.6	45.15	29791.24	29182.52	608.71	27483.44
d= 8	47.2	46.40	29182.52	28580.09	602.43	27952.80
d= 9	48.0	47.60	28580.09	27983.95	596.15	28376.63
d= 10	48.5	48.25	27983.95	27394.08	589.86	28460.97
d= 11	49.2	48.85	27394.08	26810.50	583.58	28507.95
d= 12	49.6	49.40	26810.50	26233.20	577.30	28518.53
d= 13	49.9	49.75	26233.20	25662.19	571.02	28408.00
d= 14	50.4	50.15	25662.19	25097.45	564.73	28321.30
d= 15	50.2	50.30	25097.45	24539.01	558.45	28089.97
d= 16	50.1	50.15	24539.01	23986.84	552.17	27691.10
d= 17	50.3	50.20	23986.84	23440.96	545.88	27403.29
drem 18.0	51.2					

line 3) Total near-wall volumetric flow (total of column G) **416769.36**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 51.20
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **54128.60**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **470897.961**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.08**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.5	11.75	33575.47	32929.06	646.41	7595.36
d= 2	25.6	24.55	32929.06	32288.93	640.13	15715.19
d= 3	30.5	28.05	32288.93	31655.08	633.85	17779.40
d= 4	35.1	32.80	31655.08	31027.52	627.56	20584.09
d= 5	40.1	37.60	31027.52	30406.24	621.28	23360.15
d= 6	42.9	41.50	30406.24	29791.24	615.00	25522.39
d= 7	45.7	44.30	29791.24	29182.52	608.71	26966.04
d= 8	47.3	46.50	29182.52	28580.09	602.43	28013.04
d= 9	48.5	47.90	28580.09	27983.95	596.15	28555.48
d= 10	50.5	49.50	27983.95	27394.08	589.86	29198.30
d= 11	51.1	50.80	27394.08	26810.50	583.58	29645.94
d= 12	51.5	51.30	26810.50	26233.20	577.30	29615.40
d= 13	52.4	51.95	26233.20	25662.19	571.02	29664.23
d= 14	52.4	52.40	25662.19	25097.45	564.73	29591.95
d= 15	51.7	52.05	25097.45	24539.01	558.45	29067.25
d= 16	52.5	52.10	24539.01	23986.84	552.17	28767.82
d= 17	53.3	52.90	23986.84	23440.96	545.88	28877.18
drem 18.0	54.2					

line 3) Total near-wall volumetric flow (total of column G) **399642.02**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.20
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **57300.20**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **456942.222**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **40.83**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT A, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.0	8.50	33575.47	32929.06	646.41	5494.51
d= 2	23.9	20.45	32929.06	32288.93	640.13	13090.66
d= 3	34.0	28.95	32288.93	31655.08	633.85	18349.87
d= 4	42.0	38.00	31655.08	31027.52	627.56	23847.42
d= 5	45.2	43.60	31027.52	30406.24	621.28	27087.83
d= 6	47.3	46.25	30406.24	29791.24	615.00	28443.63
d= 7	47.5	47.40	29791.24	29182.52	608.71	28853.05
d= 8	48.9	48.20	29182.52	28580.09	602.43	29037.17
d= 9	50.8	49.85	28580.09	27983.95	596.15	29717.97
d= 10	51.9	51.35	27983.95	27394.08	589.86	30289.55
d= 11	52.0	51.95	27394.08	26810.50	583.58	30317.05
d= 12	52.9	52.45	26810.50	26233.20	577.30	30279.29
d= 13	53.3	53.10	26233.20	25662.19	571.02	30320.90
d= 14	53.8	53.55	25662.19	25097.45	564.73	30241.39
d= 15	53.9	53.85	25097.45	24539.01	558.45	30072.46
d= 16	54.6	54.25	24539.01	23986.84	552.17	29954.98
d= 17	54.9	54.75	23986.84	23440.96	545.88	29887.06
drem 18.0	55.7					

line 3) Total near-wall volumetric flow (total of column G) **415397.73**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 55.70
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **58886.00**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **474283.726**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.38**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT B, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.1	18.55	33575.47	32929.06	646.41	11990.97
d= 2	42.3	39.70	32929.06	32288.93	640.13	25413.16
d= 3	44.7	43.50	32288.93	31655.08	633.85	27572.34
d= 4	46.0	45.35	31655.08	31027.52	627.56	28460.01
d= 5	48.7	47.35	31027.52	30406.24	621.28	29417.63
d= 6	49.9	49.30	30406.24	29791.24	615.00	30319.37
d= 7	51.3	50.60	29791.24	29182.52	608.71	30800.94
d= 8	52.4	51.85	29182.52	28580.09	602.43	31236.04
d= 9	52.3	52.35	28580.09	27983.95	596.15	31208.34
d= 10	53.1	52.70	27983.95	27394.08	589.86	31085.86
d= 11	54.5	53.80	27394.08	26810.50	583.58	31396.68
d= 12	55.4	54.95	26810.50	26233.20	577.30	31722.54
d= 13	55.3	55.35	26233.20	25662.19	571.02	31605.68
d= 14	55.4	55.35	25662.19	25097.45	564.73	31257.91
d= 15	56.5	55.95	25097.45	24539.01	558.45	31245.20
d= 16	56.1	56.30	24539.01	23986.84	552.17	31086.92
d= 17	56.5	56.30	23986.84	23440.96	545.88	30733.18
drem 18.0	57.4					

line 3) Total near-wall volumetric flow (total of column G) **465819.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 57.40
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **60683.24**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **526502.828**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **47.04**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT C, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	31.3	15.65	33575.47	32929.06	646.41	10116.37
d= 2	36.1	33.70	32929.06	32288.93	640.13	21572.38
d= 3	40.0	38.05	32288.93	31655.08	633.85	24117.87
d= 4	41.9	40.95	31655.08	31027.52	627.56	25698.73
d= 5	43.1	42.50	31027.52	30406.24	621.28	26404.42
d= 6	44.3	43.70	30406.24	29791.24	615.00	26875.38
d= 7	46.1	45.20	29791.24	29182.52	608.71	27513.88
d= 8	46.6	46.35	29182.52	28580.09	602.43	27922.67
d= 9	48.1	47.35	28580.09	27983.95	596.15	28227.60
d= 10	48.5	48.30	27983.95	27394.08	589.86	28490.46
d= 11	50.0	49.25	27394.08	26810.50	583.58	28741.38
d= 12	50.0	50.00	26810.50	26233.20	577.30	28864.91
d= 13	50.8	50.40	26233.20	25662.19	571.02	28779.16
d= 14	51.4	51.10	25662.19	25097.45	564.73	28857.80
d= 15	50.5	50.95	25097.45	24539.01	558.45	28452.96
d= 16	50.3	50.40	24539.01	23986.84	552.17	27829.14
d= 17	51.5	50.90	23986.84	23440.96	545.88	27785.41
drem 18.0	51.6					

line 3) Total near-wall volumetric flow (total of column G) **418465.12**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 51.60
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **54551.48**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **473016.607**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.26**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT D, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.8	11.90	33575.47	32929.06	646.41	7692.32
d= 2	25.4	24.60	32929.06	32288.93	640.13	15747.20
d= 3	28.8	27.10	32288.93	31655.08	633.85	17177.25
d= 4	34.3	31.55	31655.08	31027.52	627.56	19799.63
d= 5	40.1	37.20	31027.52	30406.24	621.28	23111.63
d= 6	42.7	41.40	30406.24	29791.24	615.00	25460.89
d= 7	46.4	44.55	29791.24	29182.52	608.71	27118.21
d= 8	47.0	46.70	29182.52	28580.09	602.43	28133.53
d= 9	48.0	47.50	28580.09	27983.95	596.15	28317.02
d= 10	50.3	49.15	27983.95	27394.08	589.86	28991.84
d= 11	50.7	50.50	27394.08	26810.50	583.58	29470.86
d= 12	51.7	51.20	26810.50	26233.20	577.30	29557.67
d= 13	51.8	51.75	26233.20	25662.19	571.02	29550.03
d= 14	52.8	52.30	25662.19	25097.45	564.73	29535.48
d= 15	52.8	52.80	25097.45	24539.01	558.45	29486.09
d= 16	52.8	52.80	24539.01	23986.84	552.17	29154.34
d= 17	54.0	53.40	23986.84	23440.96	545.88	29150.12
drem 18.0	54.2					

line 3) Total near-wall volumetric flow (total of column G) **398303.99**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.20
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **57300.20**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **455604.194**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **40.71**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.6	6.30	33575.47	32929.06	646.41	4072.40
d= 2	22.8	17.70	32929.06	32288.93	640.13	11330.30
d= 3	34.6	28.70	32288.93	31655.08	633.85	18191.40
d= 4	42.0	38.30	31655.08	31027.52	627.56	24035.69
d= 5	44.8	43.40	31027.52	30406.24	621.28	26963.57
d= 6	46.1	45.45	30406.24	29791.24	615.00	27951.63
d= 7	48.2	47.15	29791.24	29182.52	608.71	28700.87
d= 8	48.9	48.55	29182.52	28580.09	602.43	29248.02
d= 9	50.4	49.65	28580.09	27983.95	596.15	29598.74
d= 10	51.0	50.70	27983.95	27394.08	589.86	29906.13
d= 11	51.9	51.45	27394.08	26810.50	583.58	30025.26
d= 12	52.7	52.30	26810.50	26233.20	577.30	30192.70
d= 13	54.3	53.50	26233.20	25662.19	571.02	30549.31
d= 14	54.6	54.45	25662.19	25097.45	564.73	30749.65
d= 15	54.5	54.55	25097.45	24539.01	558.45	30463.38
d= 16	55.2	54.85	24539.01	23986.84	552.17	30286.28
d= 17	55.7	55.45	23986.84	23440.96	545.88	30269.18
drem 18.0	56.3					

line 3) Total near-wall volumetric flow (total of column G) **412265.34**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 56.30
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **59520.32**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **471785.656**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.15**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.8	18.90	33575.47	32929.06	646.41	12217.21
d= 2	42.3	40.05	32929.06	32288.93	640.13	25637.21
d= 3	44.9	43.60	32288.93	31655.08	633.85	27635.72
d= 4	47.1	46.00	31655.08	31027.52	627.56	28867.93
d= 5	48.7	47.90	31027.52	30406.24	621.28	29759.34
d= 6	50.2	49.45	30406.24	29791.24	615.00	30411.62
d= 7	51.1	50.65	29791.24	29182.52	608.71	30831.37
d= 8	52.6	51.85	29182.52	28580.09	602.43	31236.04
d= 9	53.2	52.90	28580.09	27983.95	596.15	31536.22
d= 10	54.1	53.65	27983.95	27394.08	589.86	31646.24
d= 11	54.5	54.30	27394.08	26810.50	583.58	31688.47
d= 12	54.9	54.70	26810.50	26233.20	577.30	31578.21
d= 13	55.0	54.95	26233.20	25662.19	571.02	31377.28
d= 14	56.9	55.95	25662.19	25097.45	564.73	31596.75
d= 15	56.5	56.70	25097.45	24539.01	558.45	31664.04
d= 16	56.1	56.30	24539.01	23986.84	552.17	31086.92
d= 17	57.1	56.60	23986.84	23440.96	545.88	30896.94
drem 18.0	57.2					

line 3) Total near-wall volumetric flow (total of column G) **468770.56**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 57.20
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **60471.80**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **529242.358**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **47.29**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	30.7	15.35	33575.47	32929.06	646.41	9922.44
d= 2	36.2	33.45	32929.06	32288.93	640.13	21412.35
d= 3	39.9	38.05	32288.93	31655.08	633.85	24117.87
d= 4	43.0	41.45	31655.08	31027.52	627.56	26012.51
d= 5	43.6	43.30	31027.52	30406.24	621.28	26901.45
d= 6	45.2	44.40	30406.24	29791.24	615.00	27305.88
d= 7	46.6	45.90	29791.24	29182.52	608.71	27939.98
d= 8	47.6	47.10	29182.52	28580.09	602.43	28374.50
d= 9	48.3	47.95	28580.09	27983.95	596.15	28585.29
d= 10	49.4	48.85	27983.95	27394.08	589.86	28814.89
d= 11	49.8	49.60	27394.08	26810.50	583.58	28945.64
d= 12	50.2	50.00	26810.50	26233.20	577.30	28864.91
d= 13	50.3	50.25	26233.20	25662.19	571.02	28693.51
d= 14	50.9	50.60	25662.19	25097.45	564.73	28575.43
d= 15	50.4	50.65	25097.45	24539.01	558.45	28285.43
d= 16	51.4	50.90	24539.01	23986.84	552.17	28105.22
d= 17	51.6	51.50	23986.84	23440.96	545.88	28112.94
drem 18.0	51.1					

line 3) Total near-wall volumetric flow (total of column G) **420857.29**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 51.10
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **54022.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **474880.176**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.3	11.15	33575.47	32929.06	646.41	7207.51
d= 2	24.9	23.60	32929.06	32288.93	640.13	15107.07
d= 3	30.5	27.70	32288.93	31655.08	633.85	17557.56
d= 4	36.2	33.35	31655.08	31027.52	627.56	20929.25
d= 5	39.7	37.95	31027.52	30406.24	621.28	23577.59
d= 6	44.0	41.85	30406.24	29791.24	615.00	25737.64
d= 7	46.4	45.20	29791.24	29182.52	608.71	27513.88
d= 8	46.9	46.65	29182.52	28580.09	602.43	28103.40
d= 9	49.4	48.15	28580.09	27983.95	596.15	28704.52
d= 10	50.0	49.70	27983.95	27394.08	589.86	29316.27
d= 11	50.8	50.40	27394.08	26810.50	583.58	29412.50
d= 12	52.2	51.50	26810.50	26233.20	577.30	29730.86
d= 13	52.5	52.35	26233.20	25662.19	571.02	29892.64
d= 14	52.7	52.60	25662.19	25097.45	564.73	29704.90
d= 15	52.7	52.70	25097.45	24539.01	558.45	29430.25
d= 16	54.1	53.40	24539.01	23986.84	552.17	29485.64
d= 17	53.5	53.80	23986.84	23440.96	545.88	29368.47
drem 18.0	54.0					

line 3) Total near-wall volumetric flow (total of column G) **401411.46**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.00
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **57088.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **458500.225**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **40.97**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT A, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.0	7.50	33575.47	32929.06	646.41	4848.10
d= 2	24.0	19.50	32929.06	32288.93	640.13	12482.54
d= 3	34.9	29.45	32288.93	31655.08	633.85	18666.79
d= 4	42.8	38.85	31655.08	31027.52	627.56	24380.85
d= 5	45.5	44.15	31027.52	30406.24	621.28	27429.53
d= 6	46.6	46.05	30406.24	29791.24	615.00	28320.63
d= 7	47.6	47.10	29791.24	29182.52	608.71	28670.44
d= 8	48.8	48.20	29182.52	28580.09	602.43	29037.17
d= 9	50.5	49.65	28580.09	27983.95	596.15	29598.74
d= 10	51.9	51.20	27983.95	27394.08	589.86	30201.07
d= 11	52.6	52.25	27394.08	26810.50	583.58	30492.13
d= 12	53.8	53.20	26810.50	26233.20	577.30	30712.27
d= 13	54.0	53.90	26233.20	25662.19	571.02	30777.71
d= 14	54.3	54.15	25662.19	25097.45	564.73	30580.23
d= 15	56.1	55.20	25097.45	24539.01	558.45	30826.37
d= 16	55.8	55.95	24539.01	23986.84	552.17	30893.66
d= 17	56.4	56.10	23986.84	23440.96	545.88	30624.00
drem 18.0	55.9					

line 3) Total near-wall volumetric flow (total of column G) **417918.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 55.90
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **59097.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **477015.65**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.62**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT B, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.7	18.85	33575.47	32929.06	646.41	12184.89
d= 2	42.1	39.90	32929.06	32288.93	640.13	25541.19
d= 3	44.8	43.45	32288.93	31655.08	633.85	27540.65
d= 4	47.4	46.10	31655.08	31027.52	627.56	28930.69
d= 5	48.7	48.05	31027.52	30406.24	621.28	29852.53
d= 6	50.7	49.70	30406.24	29791.24	615.00	30565.37
d= 7	51.2	50.95	29791.24	29182.52	608.71	31013.99
d= 8	51.4	51.30	29182.52	28580.09	602.43	30904.71
d= 9	53.2	52.30	28580.09	27983.95	596.15	31178.53
d= 10	54.3	53.75	27983.95	27394.08	589.86	31705.22
d= 11	53.9	54.10	27394.08	26810.50	583.58	31571.75
d= 12	54.8	54.35	26810.50	26233.20	577.30	31376.16
d= 13	55.9	55.35	26233.20	25662.19	571.02	31605.68
d= 14	56.7	56.30	25662.19	25097.45	564.73	31794.40
d= 15	57.4	57.05	25097.45	24539.01	558.45	31859.50
d= 16	56.8	57.10	24539.01	23986.84	552.17	31528.65
d= 17	57.0	56.90	23986.84	23440.96	545.88	31060.70
drem 18.0	57.6					

line 3) Total near-wall volumetric flow (total of column G) **469153.90**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 57.60
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **60894.68**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **530048.574**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **47.36**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT C, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	31.5	15.75	33575.47	32929.06	646.41	10181.01
d= 2	34.3	32.90	32929.06	32288.93	640.13	21060.28
d= 3	39.7	37.00	32288.93	31655.08	633.85	23452.33
d= 4	41.7	40.70	31655.08	31027.52	627.56	25541.84
d= 5	44.3	43.00	31027.52	30406.24	621.28	26715.06
d= 6	46.2	45.25	30406.24	29791.24	615.00	27828.63
d= 7	46.6	46.40	29791.24	29182.52	608.71	28244.34
d= 8	47.3	46.95	29182.52	28580.09	602.43	28284.13
d= 9	48.6	47.95	28580.09	27983.95	596.15	28585.29
d= 10	49.0	48.80	27983.95	27394.08	589.86	28785.39
d= 11	50.3	49.65	27394.08	26810.50	583.58	28974.82
d= 12	50.2	50.25	26810.50	26233.20	577.30	29009.24
d= 13	50.8	50.50	26233.20	25662.19	571.02	28836.26
d= 14	51.0	50.90	25662.19	25097.45	564.73	28744.85
d= 15	50.4	50.70	25097.45	24539.01	558.45	28313.35
d= 16	51.3	50.85	24539.01	23986.84	552.17	28077.62
d= 17	51.3	51.30	23986.84	23440.96	545.88	28003.76
drem 18.0	51.4					

line 3) Total near-wall volumetric flow (total of column G) **420634.43**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 51.40
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **54340.04**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **474974.471**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **42.44**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT D, USI 12pt AUTOPROBE, yaw-nulled

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.6	11.30	33575.47	32929.06	646.41	7304.47
d= 2	26.7	24.65	32929.06	32288.93	640.13	15779.21
d= 3	28.6	27.65	32288.93	31655.08	633.85	17525.87
d= 4	34.3	31.45	31655.08	31027.52	627.56	19736.88
d= 5	38.9	36.60	31027.52	30406.24	621.28	22738.87
d= 6	43.6	41.25	30406.24	29791.24	615.00	25368.64
d= 7	45.9	44.75	29791.24	29182.52	608.71	27239.96
d= 8	47.5	46.70	29182.52	28580.09	602.43	28133.53
d= 9	48.9	48.20	28580.09	27983.95	596.15	28734.32
d= 10	50.6	49.75	27983.95	27394.08	589.86	29345.76
d= 11	50.2	50.40	27394.08	26810.50	583.58	29412.50
d= 12	52.7	51.45	26810.50	26233.20	577.30	29701.99
d= 13	53.1	52.90	26233.20	25662.19	571.02	30206.70
d= 14	53.1	53.10	25662.19	25097.45	564.73	29987.26
d= 15	52.9	53.00	25097.45	24539.01	558.45	29597.78
d= 16	53.9	53.40	24539.01	23986.84	552.17	29485.64
d= 17	54.8	54.35	23986.84	23440.96	545.88	29668.70
drem 18.0	54.3					

line 3) Total near-wall volumetric flow (total of column G) **400299.37**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.30
b) Total area in remainder segment 1057.20
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **57405.92**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **457705.288**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **40.90**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159

line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.2	7.60	33575.47	32929.06	646.41	4912.74
d= 2	24.2	19.70	32929.06	32288.93	640.13	12610.56
d= 3	34.2	29.20	32288.93	31655.08	633.85	18508.33
d= 4	42.0	38.10	31655.08	31027.52	627.56	23910.18
d= 5	45.1	43.55	31027.52	30406.24	621.28	27056.77
d= 6	47.1	46.10	30406.24	29791.24	615.00	28351.38
d= 7	48.0	47.55	29791.24	29182.52	608.71	28944.36
d= 8	49.3	48.65	29182.52	28580.09	602.43	29308.27
d= 9	50.3	49.80	28580.09	27983.95	596.15	29688.16
d= 10	50.6	50.45	27983.95	27394.08	589.86	29758.67
d= 11	52.8	51.70	27394.08	26810.50	583.58	30171.16
d= 12	53.3	53.05	26810.50	26233.20	577.30	30625.67
d= 13	53.7	53.50	26233.20	25662.19	571.02	30549.31
drem 13.4	54.1					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **324395.53**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.10
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **25999.58**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **350395.116**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **41.74**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	38.5	19.25	33575.47	32929.06	646.41	12443.45
d= 2	41.7	40.10	32929.06	32288.93	640.13	25669.21
d= 3	44.5	43.10	32288.93	31655.08	633.85	27318.80
d= 4	46.7	45.60	31655.08	31027.52	627.56	28616.90
d= 5	48.2	47.45	31027.52	30406.24	621.28	29479.76
d= 6	49.8	49.00	30406.24	29791.24	615.00	30134.87
d= 7	51.1	50.45	29791.24	29182.52	608.71	30709.63
d= 8	51.9	51.50	29182.52	28580.09	602.43	31025.19
d= 9	52.5	52.20	28580.09	27983.95	596.15	31118.91
d= 10	53.1	52.80	27983.95	27394.08	589.86	31144.85
d= 11	53.5	53.30	27394.08	26810.50	583.58	31104.89
d= 12	54.8	54.15	26810.50	26233.20	577.30	31260.70
d= 13	54.3	54.55	26233.20	25662.19	571.02	31148.87
drem 13.4	55.4					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **371176.05**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 55.40
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **26624.34**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **397800.386**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **47.39**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159

line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	31.1	15.55	33575.47	32929.06	646.41	10051.73
d= 2	35.7	33.40	32929.06	32288.93	640.13	21380.34
d= 3	39.1	37.40	32288.93	31655.08	633.85	23705.87
d= 4	42.0	40.55	31655.08	31027.52	627.56	25447.71
d= 5	44.1	43.05	31027.52	30406.24	621.28	26746.13
d= 6	45.1	44.60	30406.24	29791.24	615.00	27428.88
d= 7	46.1	45.60	29791.24	29182.52	608.71	27757.36
d= 8	48.0	47.05	29182.52	28580.09	602.43	28344.38
d= 9	47.7	47.85	28580.09	27983.95	596.15	28525.67
d= 10	48.9	48.30	27983.95	27394.08	589.86	28490.46
d= 11	49.1	49.00	27394.08	26810.50	583.58	28595.49
d= 12	49.2	49.15	26810.50	26233.20	577.30	28374.21
d= 13	50.2	49.70	26233.20	25662.19	571.02	28379.45
drem 13.4	51.2					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **333227.67**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 51.20
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24605.89**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **357833.559**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **42.63**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.5	11.25	33575.47	32929.06	646.41	7272.15
d= 2	26.8	24.65	32929.06	32288.93	640.13	15779.21
d= 3	30.3	28.55	32288.93	31655.08	633.85	18096.33
d= 4	34.3	32.30	31655.08	31027.52	627.56	20270.31
d= 5	39.6	36.95	31027.52	30406.24	621.28	22956.31
d= 6	42.9	41.25	30406.24	29791.24	615.00	25368.64
d= 7	46.9	44.90	29791.24	29182.52	608.71	27331.26
d= 8	47.0	46.95	29182.52	28580.09	602.43	28284.13
d= 9	49.0	48.00	28580.09	27983.95	596.15	28615.09
d= 10	50.1	49.55	27983.95	27394.08	589.86	29227.79
d= 11	51.7	50.90	27394.08	26810.50	583.58	29704.29
d= 12	51.5	51.60	26810.50	26233.20	577.30	29788.59
d= 13	52.3	51.90	26233.20	25662.19	571.02	29635.68
drem 13.4	53.1					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **312329.79**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 53.10
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **25519.00**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **337848.785**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **40.25**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.5	8.25	33575.47	32929.06	646.41	5332.91
d= 2	24.1	20.30	32929.06	32288.93	640.13	12994.64
d= 3	34.1	29.10	32288.93	31655.08	633.85	18444.94
d= 4	41.8	37.95	31655.08	31027.52	627.56	23816.04
d= 5	44.7	43.25	31027.52	30406.24	621.28	26870.38
d= 6	46.6	45.65	30406.24	29791.24	615.00	28074.63
d= 7	47.7	47.15	29791.24	29182.52	608.71	28700.87
d= 8	49.2	48.45	29182.52	28580.09	602.43	29187.78
d= 9	50.8	50.00	28580.09	27983.95	596.15	29807.39
d= 10	51.2	51.00	27983.95	27394.08	589.86	30083.09
d= 11	52.3	51.75	27394.08	26810.50	583.58	30200.34
d= 12	52.4	52.35	26810.50	26233.20	577.30	30221.56
d= 13	53.7	53.05	26233.20	25662.19	571.02	30292.35
drem 13.4	54.2					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **324026.93**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.20
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **26047.64**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **350074.566**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **41.71**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.2	18.60	33575.47	32929.06	646.41	12023.29
d= 2	42.3	39.75	32929.06	32288.93	640.13	25445.17
d= 3	44.6	43.45	32288.93	31655.08	633.85	27540.65
d= 4	47.0	45.80	31655.08	31027.52	627.56	28742.42
d= 5	48.7	47.85	31027.52	30406.24	621.28	29728.27
d= 6	49.5	49.10	30406.24	29791.24	615.00	30196.37
d= 7	51.4	50.45	29791.24	29182.52	608.71	30709.63
d= 8	51.7	51.55	29182.52	28580.09	602.43	31055.32
d= 9	52.9	52.30	28580.09	27983.95	596.15	31178.53
d= 10	53.0	52.95	27983.95	27394.08	589.86	31233.33
d= 11	54.3	53.65	27394.08	26810.50	583.58	31309.14
d= 12	55.0	54.65	26810.50	26233.20	577.30	31549.35
d= 13	54.9	54.95	26233.20	25662.19	571.02	31377.28
drem 13.4	55.8					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **372088.73**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 55.80
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **26816.57**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **398905.301**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **47.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	31.3	15.65	33575.47	32929.06	646.41	10116.37
d= 2	35.4	33.35	32929.06	32288.93	640.13	21348.34
d= 3	39.9	37.65	32288.93	31655.08	633.85	23864.33
d= 4	42.1	41.00	31655.08	31027.52	627.56	25730.11
d= 5	44.0	43.05	31027.52	30406.24	621.28	26746.13
d= 6	45.6	44.80	30406.24	29791.24	615.00	27551.88
d= 7	46.0	45.80	29791.24	29182.52	608.71	27879.11
d= 8	47.1	46.55	29182.52	28580.09	602.43	28043.16
d= 9	47.9	47.50	28580.09	27983.95	596.15	28317.02
d= 10	49.5	48.70	27983.95	27394.08	589.86	28726.41
d= 11	50.2	49.85	27394.08	26810.50	583.58	29091.53
d= 12	50.7	50.45	26810.50	26233.20	577.30	29124.70
d= 13	50.4	50.55	26233.20	25662.19	571.02	28864.81
drem 13.4	50.5					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **335403.89**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 50.50
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24269.48**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **359673.366**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **42.85**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 3
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.1	11.55	33575.47	32929.06	646.41	7466.07
d= 2	25.9	24.50	32929.06	32288.93	640.13	15683.19
d= 3	28.8	27.35	32288.93	31655.08	633.85	17335.71
d= 4	34.9	31.85	31655.08	31027.52	627.56	19987.90
d= 5	39.9	37.40	31027.52	30406.24	621.28	23235.89
d= 6	43.3	41.60	30406.24	29791.24	615.00	25583.89
d= 7	46.9	45.10	29791.24	29182.52	608.71	27453.01
d= 8	48.0	47.45	29182.52	28580.09	602.43	28585.35
d= 9	47.7	47.85	28580.09	27983.95	596.15	28525.67
d= 10	49.4	48.55	27983.95	27394.08	589.86	28637.93
d= 11	50.7	50.05	27394.08	26810.50	583.58	29208.25
d= 12	50.3	50.50	26810.50	26233.20	577.30	29153.56
d= 13	52.0	51.15	26233.20	25662.19	571.02	29207.42
drem 13.4	52.2					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **310063.84**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 52.20
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **25086.47**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **335150.308**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **39.93**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.3	7.65	33575.47	32929.06	646.41	4945.06
d= 2	24.3	19.80	32929.06	32288.93	640.13	12674.57
d= 3	34.7	29.50	32288.93	31655.08	633.85	18698.48
d= 4	42.0	38.35	31655.08	31027.52	627.56	24067.07
d= 5	44.7	43.35	31027.52	30406.24	621.28	26932.51
d= 6	46.4	45.55	30406.24	29791.24	615.00	28013.13
d= 7	48.7	47.55	29791.24	29182.52	608.71	28944.36
d= 8	49.0	48.85	29182.52	28580.09	602.43	29428.75
d= 9	50.3	49.65	28580.09	27983.95	596.15	29598.74
d= 10	50.7	50.50	27983.95	27394.08	589.86	29788.16
d= 11	52.2	51.45	27394.08	26810.50	583.58	30025.26
d= 12	52.6	52.40	26810.50	26233.20	577.30	30250.43
d= 13	53.5	53.05	26233.20	25662.19	571.02	30292.35
drem 13.4	54.3					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **323658.87**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.30
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **26095.70**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **349754.568**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **41.67**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.0	18.50	33575.47	32929.06	646.41	11958.64
d= 2	41.5	39.25	32929.06	32288.93	640.13	25125.10
d= 3	44.8	43.15	32288.93	31655.08	633.85	27350.49
d= 4	46.5	45.65	31655.08	31027.52	627.56	28648.28
d= 5	48.6	47.55	31027.52	30406.24	621.28	29541.89
d= 6	49.4	49.00	30406.24	29791.24	615.00	30134.87
d= 7	51.9	50.65	29791.24	29182.52	608.71	30831.37
d= 8	52.5	52.20	29182.52	28580.09	602.43	31446.90
d= 9	53.0	52.75	28580.09	27983.95	596.15	31446.80
d= 10	53.8	53.40	27983.95	27394.08	589.86	31498.77
d= 11	54.1	53.95	27394.08	26810.50	583.58	31484.22
d= 12	54.3	54.20	26810.50	26233.20	577.30	31289.56
d= 13	54.3	54.30	26233.20	25662.19	571.02	31006.12
drem 13.4	56.3					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **371763.01**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 56.30
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **27056.87**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **398819.873**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **47.51**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	30.9	15.45	33575.47	32929.06	646.41	9987.08
d= 2	36.2	33.55	32929.06	32288.93	640.13	21476.36
d= 3	39.5	37.85	32288.93	31655.08	633.85	23991.10
d= 4	42.4	40.95	31655.08	31027.52	627.56	25698.73
d= 5	43.5	42.95	31027.52	30406.24	621.28	26684.00
d= 6	44.7	44.10	30406.24	29791.24	615.00	27121.38
d= 7	45.6	45.15	29791.24	29182.52	608.71	27483.44
d= 8	47.2	46.40	29182.52	28580.09	602.43	27952.80
d= 9	48.0	47.60	28580.09	27983.95	596.15	28376.63
d= 10	48.5	48.25	27983.95	27394.08	589.86	28460.97
d= 11	49.2	48.85	27394.08	26810.50	583.58	28507.95
d= 12	49.6	49.40	26810.50	26233.20	577.30	28518.53
d= 13	49.9	49.75	26233.20	25662.19	571.02	28408.00
drem 13.4	50.4					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **332666.99**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 50.40
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24221.42**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **356888.407**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **42.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.5	11.75	33575.47	32929.06	646.41	7595.36
d= 2	25.6	24.55	32929.06	32288.93	640.13	15715.19
d= 3	30.5	28.05	32288.93	31655.08	633.85	17779.40
d= 4	35.1	32.80	31655.08	31027.52	627.56	20584.09
d= 5	40.1	37.60	31027.52	30406.24	621.28	23360.15
d= 6	42.9	41.50	30406.24	29791.24	615.00	25522.39
d= 7	45.7	44.30	29791.24	29182.52	608.71	26966.04
d= 8	47.3	46.50	29182.52	28580.09	602.43	28013.04
d= 9	48.5	47.90	28580.09	27983.95	596.15	28555.48
d= 10	50.5	49.50	27983.95	27394.08	589.86	29198.30
d= 11	51.1	50.80	27394.08	26810.50	583.58	29645.94
d= 12	51.5	51.30	26810.50	26233.20	577.30	29615.40
d= 13	52.4	51.95	26233.20	25662.19	571.02	29664.23
drem 13.4	52.4					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **312214.99**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 52.40
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **25182.59**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **337397.583**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **40.20**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.0	8.50	33575.47	32929.06	646.41	5494.51
d= 2	23.9	20.45	32929.06	32288.93	640.13	13090.66
d= 3	34.0	28.95	32288.93	31655.08	633.85	18349.87
d= 4	42.0	38.00	31655.08	31027.52	627.56	23847.42
d= 5	45.2	43.60	31027.52	30406.24	621.28	27087.83
d= 6	47.3	46.25	30406.24	29791.24	615.00	28443.63
d= 7	47.5	47.40	29791.24	29182.52	608.71	28853.05
d= 8	48.9	48.20	29182.52	28580.09	602.43	29037.17
d= 9	50.8	49.85	28580.09	27983.95	596.15	29717.97
d= 10	51.9	51.35	27983.95	27394.08	589.86	30289.55
d= 11	52.0	51.95	27394.08	26810.50	583.58	30317.05
d= 12	52.9	52.45	26810.50	26233.20	577.30	30279.29
d= 13	53.3	53.10	26233.20	25662.19	571.02	30320.90
drem 13.4	53.8					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **325128.89**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 53.80
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **25855.41**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **350984.301**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **41.81**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.1	18.55	33575.47	32929.06	646.41	11990.97
d= 2	42.3	39.70	32929.06	32288.93	640.13	25413.16
d= 3	44.7	43.50	32288.93	31655.08	633.85	27572.34
d= 4	46.0	45.35	31655.08	31027.52	627.56	28460.01
d= 5	48.7	47.35	31027.52	30406.24	621.28	29417.63
d= 6	49.9	49.30	30406.24	29791.24	615.00	30319.37
d= 7	51.3	50.60	29791.24	29182.52	608.71	30800.94
d= 8	52.4	51.85	29182.52	28580.09	602.43	31236.04
d= 9	52.3	52.35	28580.09	27983.95	596.15	31208.34
d= 10	53.1	52.70	27983.95	27394.08	589.86	31085.86
d= 11	54.5	53.80	27394.08	26810.50	583.58	31396.68
d= 12	55.4	54.95	26810.50	26233.20	577.30	31722.54
d= 13	55.3	55.35	26233.20	25662.19	571.02	31605.68
drem 13.4	55.4					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **372229.56**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 55.40
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **26624.34**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **398853.899**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **47.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	31.3	15.65	33575.47	32929.06	646.41	10116.37
d= 2	36.1	33.70	32929.06	32288.93	640.13	21572.38
d= 3	40.0	38.05	32288.93	31655.08	633.85	24117.87
d= 4	41.9	40.95	31655.08	31027.52	627.56	25698.73
d= 5	43.1	42.50	31027.52	30406.24	621.28	26404.42
d= 6	44.3	43.70	30406.24	29791.24	615.00	26875.38
d= 7	46.1	45.20	29791.24	29182.52	608.71	27513.88
d= 8	46.6	46.35	29182.52	28580.09	602.43	27922.67
d= 9	48.1	47.35	28580.09	27983.95	596.15	28227.60
d= 10	48.5	48.30	27983.95	27394.08	589.86	28490.46
d= 11	50.0	49.25	27394.08	26810.50	583.58	28741.38
d= 12	50.0	50.00	26810.50	26233.20	577.30	28864.91
d= 13	50.8	50.40	26233.20	25662.19	571.02	28779.16
drem 13.4	51.4					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **333325.22**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 51.40
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24702.01**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **358027.229**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **42.65**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 5
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.8	11.90	33575.47	32929.06	646.41	7692.32
d= 2	25.4	24.60	32929.06	32288.93	640.13	15747.20
d= 3	28.8	27.10	32288.93	31655.08	633.85	17177.25
d= 4	34.3	31.55	31655.08	31027.52	627.56	19799.63
d= 5	40.1	37.20	31027.52	30406.24	621.28	23111.63
d= 6	42.7	41.40	30406.24	29791.24	615.00	25460.89
d= 7	46.4	44.55	29791.24	29182.52	608.71	27118.21
d= 8	47.0	46.70	29182.52	28580.09	602.43	28133.53
d= 9	48.0	47.50	28580.09	27983.95	596.15	28317.02
d= 10	50.3	49.15	27983.95	27394.08	589.86	28991.84
d= 11	50.7	50.50	27394.08	26810.50	583.58	29470.86
d= 12	51.7	51.20	26810.50	26233.20	577.30	29557.67
d= 13	51.8	51.75	26233.20	25662.19	571.02	29550.03
drem 13.4	52.8					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **310128.09**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 52.80
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **25374.82**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **335502.91**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **39.97**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.6	6.30	33575.47	32929.06	646.41	4072.40
d= 2	22.8	17.70	32929.06	32288.93	640.13	11330.30
d= 3	34.6	28.70	32288.93	31655.08	633.85	18191.40
d= 4	42.0	38.30	31655.08	31027.52	627.56	24035.69
d= 5	44.8	43.40	31027.52	30406.24	621.28	26963.57
d= 6	46.1	45.45	30406.24	29791.24	615.00	27951.63
d= 7	48.2	47.15	29791.24	29182.52	608.71	28700.87
d= 8	48.9	48.55	29182.52	28580.09	602.43	29248.02
d= 9	50.4	49.65	28580.09	27983.95	596.15	29598.74
d= 10	51.0	50.70	27983.95	27394.08	589.86	29906.13
d= 11	51.9	51.45	27394.08	26810.50	583.58	30025.26
d= 12	52.7	52.30	26810.50	26233.20	577.30	30192.70
d= 13	54.3	53.50	26233.20	25662.19	571.02	30549.31
drem 13.4	54.6					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **320766.03**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.60
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **26239.87**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **347005.906**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **41.34**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.8	18.90	33575.47	32929.06	646.41	12217.21
d= 2	42.3	40.05	32929.06	32288.93	640.13	25637.21
d= 3	44.9	43.60	32288.93	31655.08	633.85	27635.72
d= 4	47.1	46.00	31655.08	31027.52	627.56	28867.93
d= 5	48.7	47.90	31027.52	30406.24	621.28	29759.34
d= 6	50.2	49.45	30406.24	29791.24	615.00	30411.62
d= 7	51.1	50.65	29791.24	29182.52	608.71	30831.37
d= 8	52.6	51.85	29182.52	28580.09	602.43	31236.04
d= 9	53.2	52.90	28580.09	27983.95	596.15	31536.22
d= 10	54.1	53.65	27983.95	27394.08	589.86	31646.24
d= 11	54.5	54.30	27394.08	26810.50	583.58	31688.47
d= 12	54.9	54.70	26810.50	26233.20	577.30	31578.21
d= 13	55.0	54.95	26233.20	25662.19	571.02	31377.28
drem 13.4	56.9					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **374422.85**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 56.90
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **27345.22**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **401768.068**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **47.86**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	30.7	15.35	33575.47	32929.06	646.41	9922.44
d= 2	36.2	33.45	32929.06	32288.93	640.13	21412.35
d= 3	39.9	38.05	32288.93	31655.08	633.85	24117.87
d= 4	43.0	41.45	31655.08	31027.52	627.56	26012.51
d= 5	43.6	43.30	31027.52	30406.24	621.28	26901.45
d= 6	45.2	44.40	30406.24	29791.24	615.00	27305.88
d= 7	46.6	45.90	29791.24	29182.52	608.71	27939.98
d= 8	47.6	47.10	29182.52	28580.09	602.43	28374.50
d= 9	48.3	47.95	28580.09	27983.95	596.15	28585.29
d= 10	49.4	48.85	27983.95	27394.08	589.86	28814.89
d= 11	49.8	49.60	27394.08	26810.50	583.58	28945.64
d= 12	50.2	50.00	26810.50	26233.20	577.30	28864.91
d= 13	50.3	50.25	26233.20	25662.19	571.02	28693.51
drem 13.4	50.9					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **335891.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 50.90
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **24461.71**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **360352.923**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **42.93**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.3	11.15	33575.47	32929.06	646.41	7207.51
d= 2	24.9	23.60	32929.06	32288.93	640.13	15107.07
d= 3	30.5	27.70	32288.93	31655.08	633.85	17557.56
d= 4	36.2	33.35	31655.08	31027.52	627.56	20929.25
d= 5	39.7	37.95	31027.52	30406.24	621.28	23577.59
d= 6	44.0	41.85	30406.24	29791.24	615.00	25737.64
d= 7	46.4	45.20	29791.24	29182.52	608.71	27513.88
d= 8	46.9	46.65	29182.52	28580.09	602.43	28103.40
d= 9	49.4	48.15	28580.09	27983.95	596.15	28704.52
d= 10	50.0	49.70	27983.95	27394.08	589.86	29316.27
d= 11	50.8	50.40	27394.08	26810.50	583.58	29412.50
d= 12	52.2	51.50	26810.50	26233.20	577.30	29730.86
d= 13	52.5	52.35	26233.20	25662.19	571.02	29892.64
drem 13.4	52.7					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **312790.68**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 52.70
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **25326.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **338117.448**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **40.28**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.0	7.50	33575.47	32929.06	646.41	4848.10
d= 2	24.0	19.50	32929.06	32288.93	640.13	12482.54
d= 3	34.9	29.45	32288.93	31655.08	633.85	18666.79
d= 4	42.8	38.85	31655.08	31027.52	627.56	24380.85
d= 5	45.5	44.15	31027.52	30406.24	621.28	27429.53
d= 6	46.6	46.05	30406.24	29791.24	615.00	28320.63
d= 7	47.6	47.10	29791.24	29182.52	608.71	28670.44
d= 8	48.8	48.20	29182.52	28580.09	602.43	29037.17
d= 9	50.5	49.65	28580.09	27983.95	596.15	29598.74
d= 10	51.9	51.20	27983.95	27394.08	589.86	30201.07
d= 11	52.6	52.25	27394.08	26810.50	583.58	30492.13
d= 12	53.8	53.20	26810.50	26233.20	577.30	30712.27
d= 13	54.0	53.90	26233.20	25662.19	571.02	30777.71
drem 13.4	54.3					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **325617.95**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 54.30
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **26095.70**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **351713.65**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **41.90**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	37.7	18.85	33575.47	32929.06	646.41	12184.89
d= 2	42.1	39.90	32929.06	32288.93	640.13	25541.19
d= 3	44.8	43.45	32288.93	31655.08	633.85	27540.65
d= 4	47.4	46.10	31655.08	31027.52	627.56	28930.69
d= 5	48.7	48.05	31027.52	30406.24	621.28	29852.53
d= 6	50.7	49.70	30406.24	29791.24	615.00	30565.37
d= 7	51.2	50.95	29791.24	29182.52	608.71	31013.99
d= 8	51.4	51.30	29182.52	28580.09	602.43	30904.71
d= 9	53.2	52.30	28580.09	27983.95	596.15	31178.53
d= 10	54.3	53.75	27983.95	27394.08	589.86	31705.22
d= 11	53.9	54.10	27394.08	26810.50	583.58	31571.75
d= 12	54.8	54.35	26810.50	26233.20	577.30	31376.16
d= 13	55.9	55.35	26233.20	25662.19	571.02	31605.68
drem 13.4	56.7					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **373971.34**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 56.70
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **27249.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **401220.442**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **47.80**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	31.5	15.75	33575.47	32929.06	646.41	10181.01
d= 2	34.3	32.90	32929.06	32288.93	640.13	21060.28
d= 3	39.7	37.00	32288.93	31655.08	633.85	23452.33
d= 4	41.7	40.70	31655.08	31027.52	627.56	25541.84
d= 5	44.3	43.00	31027.52	30406.24	621.28	26715.06
d= 6	46.2	45.25	30406.24	29791.24	615.00	27828.63
d= 7	46.6	46.40	29791.24	29182.52	608.71	28244.34
d= 8	47.3	46.95	29182.52	28580.09	602.43	28284.13
d= 9	48.6	47.95	28580.09	27983.95	596.15	28585.29
d= 10	49.0	48.80	27983.95	27394.08	589.86	28785.39
d= 11	50.3	49.65	27394.08	26810.50	583.58	28974.82
d= 12	50.2	50.25	26810.50	26233.20	577.30	29009.24
d= 13	50.8	50.50	26233.20	25662.19	571.02	28836.26
drem 13.4	51.0					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **335498.61**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 51.00
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24509.77**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **360008.383**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **42.89**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Units 1 and 2

Wall Effects Run 8
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 33,575.5 sq. in. pi = 3.14159
line 1) radius: 103.38 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.6	11.30	33575.47	32929.06	646.41	7304.47
d= 2	26.7	24.65	32929.06	32288.93	640.13	15779.21
d= 3	28.6	27.65	32288.93	31655.08	633.85	17525.87
d= 4	34.3	31.45	31655.08	31027.52	627.56	19736.88
d= 5	38.9	36.60	31027.52	30406.24	621.28	22738.87
d= 6	43.6	41.25	30406.24	29791.24	615.00	25368.64
d= 7	45.9	44.75	29791.24	29182.52	608.71	27239.96
d= 8	47.5	46.70	29182.52	28580.09	602.43	28133.53
d= 9	48.9	48.20	28580.09	27983.95	596.15	28734.32
d= 10	50.6	49.75	27983.95	27394.08	589.86	29345.76
d= 11	50.2	50.40	27394.08	26810.50	583.58	29412.50
d= 12	52.7	51.45	26810.50	26233.20	577.30	29701.99
d= 13	53.1	52.90	26233.20	25662.19	571.02	30206.70
drem 13.4	53.1					

(use d=14 for drem)

line 3) Total near-wall volumetric flow (total of column G) **311228.69**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 53.10
b) Total area in remainder segment 480.58
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **25519.00**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **336747.684**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **40.12**

ATTACHMENT B.

Conesville Station Unit 3
Wall Effects Calculation Forms

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Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	5.2	2.60	40828.14	40115.00	713.14	1854.17
d= 2	5.2	5.20	40115.00	39408.14	706.86	3675.66
d= 3	5.2	5.20	39408.14	38707.57	700.57	3642.99
d= 4	5.2	5.20	38707.57	38013.27	694.29	3610.32
d= 5	10.1	7.65	38013.27	37325.27	688.01	5263.27
d= 6	13.1	11.60	37325.27	36643.54	681.73	7908.01
d= 7	13.9	13.50	36643.54	35968.10	675.44	9118.47
d= 8	15.3	14.60	35968.10	35298.94	669.16	9769.72
d= 9	15.0	15.15	35298.94	34636.06	662.88	10042.57
d= 10	16.0	15.50	34636.06	33979.47	656.59	10177.19
d= 11	17.1	16.55	33979.47	33329.16	650.31	10762.62
d= 12	16.6	16.85	33329.16	32685.13	644.03	10851.84
d= 13	16.7	16.65	32685.13	32047.39	637.74	10618.42
d= 14	16.5	16.60	32047.39	31415.93	631.46	10482.23
d= 15	18.2	17.35	31415.93	30790.76	625.18	10846.82
d= 16	17.4	17.80	30790.76	30171.86	618.89	11016.31
d= 17	18.1	17.75	30171.86	29559.25	612.61	10873.83
d= 18	18.4	18.25	29559.25	28952.92	606.33	11065.47
d= 19	18.9	18.65	28952.92	28352.88	600.04	11190.82
d= 20	18.8	18.85	28352.88	27759.12	593.76	11192.39
drem= 20.5	18.8					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **140514.44**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.80
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10156.19**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **150670.631**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **11.07**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.2	4.60	40828.14	40115.00	713.14	3280.45
d= 2	9.2	9.20	40115.00	39408.14	706.86	6503.09
d= 3	9.2	9.20	39408.14	38707.57	700.57	6445.29
d= 4	9.2	9.20	38707.57	38013.27	694.29	6387.48
d= 5	10.5	9.85	38013.27	37325.27	688.01	6776.88
d= 6	10.6	10.55	37325.27	36643.54	681.73	7192.20
d= 7	11.4	11.00	36643.54	35968.10	675.44	7429.86
d= 8	13.0	12.20	35968.10	35298.94	669.16	8163.74
d= 9	13.3	13.15	35298.94	34636.06	662.88	8716.82
d= 10	13.7	13.50	34636.06	33979.47	656.59	8864.00
d= 11	15.0	14.35	33979.47	33329.16	650.31	9331.94
d= 12	16.3	15.65	33329.16	32685.13	644.03	10079.01
d= 13	15.7	16.00	32685.13	32047.39	637.74	10203.89
d= 14	15.5	15.60	32047.39	31415.93	631.46	9850.77
d= 15	15.9	15.70	31415.93	30790.76	625.18	9815.27
d= 16	17.4	16.65	30790.76	30171.86	618.89	10304.58
d= 17	17.6	17.50	30171.86	29559.25	612.61	10720.68
d= 18	18.5	18.05	29559.25	28952.92	606.33	10944.21
d= 19	18.6	18.55	28952.92	28352.88	600.04	11130.82
d= 20	18.8	18.70	28352.88	27759.12	593.76	11103.33
drem= 20.5	19.1					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **140065.97**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.10
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10318.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **150384.235**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **11.05**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.0	7.00	40828.14	40115.00	713.14	4991.99
d= 2	14.0	14.00	40115.00	39408.14	706.86	9896.01
d= 3	14.0	14.00	39408.14	38707.57	700.57	9808.05
d= 4	14.0	14.00	38707.57	38013.27	694.29	9720.08
d= 5	15.8	14.90	38013.27	37325.27	688.01	10251.33
d= 6	16.9	16.35	37325.27	36643.54	681.73	11146.21
d= 7	17.3	17.10	36643.54	35968.10	675.44	11550.06
d= 8	17.6	17.45	35968.10	35298.94	669.16	11676.82
d= 9	17.2	17.40	35298.94	34636.06	662.88	11534.04
d= 10	17.9	17.55	34636.06	33979.47	656.59	11523.20
d= 11	17.9	17.90	33979.47	33329.16	650.31	11640.54
d= 12	18.3	18.10	33329.16	32685.13	644.03	11656.88
d= 13	18.8	18.55	32685.13	32047.39	637.74	11830.13
d= 14	19.5	19.15	32047.39	31415.93	631.46	12092.46
d= 15	19.2	19.35	31415.93	30790.76	625.18	12097.17
d= 16	20.5	19.85	30790.76	30171.86	618.89	12285.04
d= 17	19.7	20.10	30171.86	29559.25	612.61	12313.47
d= 18	19.7	19.70	29559.25	28952.92	606.33	11944.65
d= 19	19.9	19.80	28952.92	28352.88	600.04	11880.87
d= 20	19.3	19.60	28352.88	27759.12	593.76	11637.71
drem= 20.5	19.5					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **186013.48**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.50
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10534.35**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **196547.828**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **14.44**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.5	6.75	40828.14	40115.00	713.14	4813.70
d= 2	13.5	13.50	40115.00	39408.14	706.86	9542.58
d= 3	13.5	13.50	39408.14	38707.57	700.57	9457.76
d= 4	13.5	13.50	38707.57	38013.27	694.29	9372.94
d= 5	13.8	13.65	38013.27	37325.27	688.01	9391.32
d= 6	15.1	14.45	37325.27	36643.54	681.73	9850.93
d= 7	14.8	14.95	36643.54	35968.10	675.44	10097.86
d= 8	15.9	15.35	35968.10	35298.94	669.16	10271.59
d= 9	16.0	15.95	35298.94	34636.06	662.88	10572.87
d= 10	17.0	16.50	34636.06	33979.47	656.59	10833.78
d= 11	17.9	17.45	33979.47	33329.16	650.31	11347.90
d= 12	17.8	17.85	33329.16	32685.13	644.03	11495.87
d= 13	17.3	17.55	32685.13	32047.39	637.74	11192.39
d= 14	17.6	17.45	32047.39	31415.93	631.46	11018.98
d= 15	17.8	17.70	31415.93	30790.76	625.18	11065.63
d= 16	18.0	17.90	30790.76	30171.86	618.89	11078.19
d= 17	19.4	18.70	30171.86	29559.25	612.61	11455.81
d= 18	19.4	19.40	29559.25	28952.92	606.33	11762.75
d= 19	18.4	18.90	28952.92	28352.88	600.04	11340.83
d= 20	19.4	18.90	28352.88	27759.12	593.76	11222.08
drem 20.5	19.7					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **172860.10**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.70
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10642.40**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **183502.5**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **13.48**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT A, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	4.3	2.15	40828.14	40115.00	713.14	1533.25
d= 2	4.3	4.30	40115.00	39408.14	706.86	3039.49
d= 3	4.3	4.30	39408.14	38707.57	700.57	3012.47
d= 4	4.3	4.30	38707.57	38013.27	694.29	2985.45
d= 5	10.5	7.40	38013.27	37325.27	688.01	5091.26
d= 6	13.3	11.90	37325.27	36643.54	681.73	8112.53
d= 7	14.2	13.75	36643.54	35968.10	675.44	9287.33
d= 8	14.5	14.35	35968.10	35298.94	669.16	9602.43
d= 9	15.3	14.90	35298.94	34636.06	662.88	9876.85
d= 10	15.8	15.55	34636.06	33979.47	656.59	10210.02
d= 11	16.5	16.15	33979.47	33329.16	650.31	10502.50
d= 12	16.8	16.65	33329.16	32685.13	644.03	10723.04
d= 13	16.4	16.60	32685.13	32047.39	637.74	10586.54
d= 14	17.9	17.15	32047.39	31415.93	631.46	10829.54
d= 15	16.9	17.40	31415.93	30790.76	625.18	10878.08
d= 16	18.5	17.70	30790.76	30171.86	618.89	10954.42
d= 17	17.9	18.20	30171.86	29559.25	612.61	11149.51
d= 18	18.8	18.35	29559.25	28952.92	606.33	11126.10
d= 19	18.6	18.70	28952.92	28352.88	600.04	11220.82
d= 20	18.4	18.50	28352.88	27759.12	593.76	10984.58
drem= 20.5	18.4					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **138374.70**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.40
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **9940.11**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **148314.804**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **10.90**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT B, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.4	4.20	40828.14	40115.00	713.14	2995.19
d= 2	8.4	8.40	40115.00	39408.14	706.86	5937.61
d= 3	8.4	8.40	39408.14	38707.57	700.57	5884.83
d= 4	8.4	8.40	38707.57	38013.27	694.29	5832.05
d= 5	9.8	9.10	38013.27	37325.27	688.01	6260.88
d= 6	11.2	10.50	37325.27	36643.54	681.73	7158.12
d= 7	12.7	11.95	36643.54	35968.10	675.44	8071.53
d= 8	12.5	12.60	35968.10	35298.94	669.16	8431.40
d= 9	13.4	12.95	35298.94	34636.06	662.88	8584.24
d= 10	14.7	14.05	34636.06	33979.47	656.59	9225.13
d= 11	14.7	14.70	33979.47	33329.16	650.31	9559.55
d= 12	14.7	14.70	33329.16	32685.13	644.03	9467.19
d= 13	15.2	14.95	32685.13	32047.39	637.74	9534.26
d= 14	15.0	15.10	32047.39	31415.93	631.46	9535.04
d= 15	17.0	16.00	31415.93	30790.76	625.18	10002.83
d= 16	16.4	16.70	30790.76	30171.86	618.89	10335.52
d= 17	17.1	16.75	30171.86	29559.25	612.61	10261.22
d= 18	19.3	18.20	29559.25	28952.92	606.33	11035.15
d= 19	18.7	19.00	28952.92	28352.88	600.04	11400.84
d= 20	19.8	19.25	28352.88	27759.12	593.76	11429.90
drem= 20.5	19.1					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **137076.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.10
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10318.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **147394.854**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **10.83**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT C, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.7	7.35	40828.14	40115.00	713.14	5241.59
d= 2	14.7	14.70	40115.00	39408.14	706.86	10390.81
d= 3	14.7	14.70	39408.14	38707.57	700.57	10298.45
d= 4	14.7	14.70	38707.57	38013.27	694.29	10206.09
d= 5	15.8	15.25	38013.27	37325.27	688.01	10492.13
d= 6	16.0	15.90	37325.27	36643.54	681.73	10839.43
d= 7	16.5	16.25	36643.54	35968.10	675.44	10975.94
d= 8	16.6	16.55	35968.10	35298.94	669.16	11074.58
d= 9	17.7	17.15	35298.94	34636.06	662.88	11368.32
d= 10	17.5	17.60	34636.06	33979.47	656.59	11556.03
d= 11	18.7	18.10	33979.47	33329.16	650.31	11770.60
d= 12	18.7	18.70	33329.16	32685.13	644.03	12043.29
d= 13	18.6	18.65	32685.13	32047.39	637.74	11893.91
d= 14	19.6	19.10	32047.39	31415.93	631.46	12060.88
d= 15	19.2	19.40	31415.93	30790.76	625.18	12128.43
d= 16	19.9	19.55	30790.76	30171.86	618.89	12099.37
d= 17	18.9	19.40	30171.86	29559.25	612.61	11884.64
d= 18	18.2	18.55	29559.25	28952.92	606.33	11247.37
d= 19	19.5	18.85	28952.92	28352.88	600.04	11310.83
d= 20	18.6	19.05	28352.88	27759.12	593.76	11311.14
drem= 20.5	20.5					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **186324.49**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.50
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **11074.57**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **197399.069**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **14.50**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT D, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159

line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	40828.14	40115.00	713.14	4706.73
d= 2	13.2	13.20	40115.00	39408.14	706.86	9330.53
d= 3	13.2	13.20	39408.14	38707.57	700.57	9247.59
d= 4	13.2	13.20	38707.57	38013.27	694.29	9164.65
d= 5	13.5	13.35	38013.27	37325.27	688.01	9184.91
d= 6	14.3	13.90	37325.27	36643.54	681.73	9475.98
d= 7	15.9	15.10	36643.54	35968.10	675.44	10199.18
d= 8	15.5	15.70	35968.10	35298.94	669.16	10505.80
d= 9	17.1	16.30	35298.94	34636.06	662.88	10804.88
d= 10	16.7	16.90	34636.06	33979.47	656.59	11096.42
d= 11	17.4	17.05	33979.47	33329.16	650.31	11087.78
d= 12	16.9	17.15	33329.16	32685.13	644.03	11045.05
d= 13	17.9	17.40	32685.13	32047.39	637.74	11096.73
d= 14	17.4	17.65	32047.39	31415.93	631.46	11145.27
d= 15	18.3	17.85	31415.93	30790.76	625.18	11159.40
d= 16	19.3	18.80	30790.76	30171.86	618.89	11635.20
d= 17	18.3	18.80	30171.86	29559.25	612.61	11517.07
d= 18	18.9	18.60	29559.25	28952.92	606.33	11277.69
d= 19	18.5	18.70	28952.92	28352.88	600.04	11220.82
d= 20	18.2	18.35	28352.88	27759.12	593.76	10895.51
drem= 20.5	20.0					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **172403.16**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.00
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10804.46**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **183207.623**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **13.46**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	5.8	2.90	40828.14	40115.00	713.14	2068.11
d= 2	5.8	5.80	40115.00	39408.14	706.86	4099.78
d= 3	5.8	5.80	39408.14	38707.57	700.57	4063.33
d= 4	5.8	5.80	38707.57	38013.27	694.29	4026.89
d= 5	10.1	7.95	38013.27	37325.27	688.01	5469.67
d= 6	13.9	12.00	37325.27	36643.54	681.73	8180.70
d= 7	14.2	14.05	36643.54	35968.10	675.44	9489.96
d= 8	14.3	14.25	35968.10	35298.94	669.16	9535.52
d= 9	16.1	15.20	35298.94	34636.06	662.88	10075.71
d= 10	16.4	16.25	34636.06	33979.47	656.59	10669.63
d= 11	16.2	16.30	33979.47	33329.16	650.31	10600.04
d= 12	16.6	16.40	33329.16	32685.13	644.03	10562.03
d= 13	16.9	16.75	32685.13	32047.39	637.74	10682.20
d= 14	17.2	17.05	32047.39	31415.93	631.46	10766.39
d= 15	17.7	17.45	31415.93	30790.76	625.18	10909.33
d= 16	18.0	17.85	30790.76	30171.86	618.89	11047.25
d= 17	17.3	17.65	30171.86	29559.25	612.61	10812.57
d= 18	18.0	17.65	29559.25	28952.92	606.33	10701.67
d= 19	18.8	18.40	28952.92	28352.88	600.04	11040.81
d= 20	17.6	18.20	28352.88	27759.12	593.76	10806.45
drem= 20.5	18.1					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **143059.13**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.10
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **9778.04**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **152837.164**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **11.23**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.5	4.25	40828.14	40115.00	713.14	3030.85
d= 2	8.5	8.50	40115.00	39408.14	706.86	6008.29
d= 3	8.5	8.50	39408.14	38707.57	700.57	5954.89
d= 4	8.5	8.50	38707.57	38013.27	694.29	5901.48
d= 5	10.3	9.40	38013.27	37325.27	688.01	6467.28
d= 6	10.0	10.15	37325.27	36643.54	681.73	6919.51
d= 7	12.7	11.35	36643.54	35968.10	675.44	7666.27
d= 8	11.8	12.25	35968.10	35298.94	669.16	8197.20
d= 9	14.1	12.95	35298.94	34636.06	662.88	8584.24
d= 10	15.3	14.70	34636.06	33979.47	656.59	9651.91
d= 11	13.7	14.50	33979.47	33329.16	650.31	9429.49
d= 12	14.3	14.00	33329.16	32685.13	644.03	9016.37
d= 13	15.5	14.90	32685.13	32047.39	637.74	9502.37
d= 14	15.7	15.60	32047.39	31415.93	631.46	9850.77
d= 15	18.0	16.85	31415.93	30790.76	625.18	10534.23
d= 16	18.2	18.10	30790.76	30171.86	618.89	11201.97
d= 17	17.4	17.80	30171.86	29559.25	612.61	10904.46
d= 18	18.6	18.00	29559.25	28952.92	606.33	10913.89
d= 19	18.8	18.70	28952.92	28352.88	600.04	11220.82
d= 20	19.0	18.90	28352.88	27759.12	593.76	11222.08
drem= 20.5	19.5					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **138821.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.50
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10534.35**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **149355.94**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **10.97**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.1	7.55	40828.14	40115.00	713.14	5384.22
d= 2	15.1	15.10	40115.00	39408.14	706.86	10673.56
d= 3	15.1	15.10	39408.14	38707.57	700.57	10578.68
d= 4	15.1	15.10	38707.57	38013.27	694.29	10483.80
d= 5	15.7	15.40	38013.27	37325.27	688.01	10595.33
d= 6	16.5	16.10	37325.27	36643.54	681.73	10975.78
d= 7	17.5	17.00	36643.54	35968.10	675.44	11482.52
d= 8	17.0	17.25	35968.10	35298.94	669.16	11542.99
d= 9	17.6	17.30	35298.94	34636.06	662.88	11467.75
d= 10	18.9	18.25	34636.06	33979.47	656.59	11982.82
d= 11	17.7	18.30	33979.47	33329.16	650.31	11900.66
d= 12	19.3	18.50	33329.16	32685.13	644.03	11914.49
d= 13	19.3	19.30	32685.13	32047.39	637.74	12308.44
d= 14	19.2	19.25	32047.39	31415.93	631.46	12155.60
d= 15	18.7	18.95	31415.93	30790.76	625.18	11847.10
d= 16	19.2	18.95	30790.76	30171.86	618.89	11728.03
d= 17	19.5	19.35	30171.86	29559.25	612.61	11854.01
d= 18	19.4	19.45	29559.25	28952.92	606.33	11793.06
d= 19	20.1	19.75	28952.92	28352.88	600.04	11850.87
d= 20	20.3	20.20	28352.88	27759.12	593.76	11993.97
drem= 20.5	20.2					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **188875.78**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.20
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10912.51**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **199788.288**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **14.68**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.4	6.20	40828.14	40115.00	713.14	4421.48
d= 2	12.4	12.40	40115.00	39408.14	706.86	8765.04
d= 3	12.4	12.40	39408.14	38707.57	700.57	8687.13
d= 4	12.4	12.40	38707.57	38013.27	694.29	8609.22
d= 5	14.4	13.40	38013.27	37325.27	688.01	9219.31
d= 6	14.7	14.55	37325.27	36643.54	681.73	9919.10
d= 7	15.7	15.20	36643.54	35968.10	675.44	10266.72
d= 8	15.9	15.80	35968.10	35298.94	669.16	10572.71
d= 9	17.6	16.75	35298.94	34636.06	662.88	11103.17
d= 10	17.4	17.50	34636.06	33979.47	656.59	11490.37
d= 11	17.2	17.30	33979.47	33329.16	650.31	11250.35
d= 12	17.8	17.50	33329.16	32685.13	644.03	11270.46
d= 13	17.7	17.75	32685.13	32047.39	637.74	11319.94
d= 14	18.8	18.25	32047.39	31415.93	631.46	11524.14
d= 15	19.2	19.00	31415.93	30790.76	625.18	11878.36
d= 16	18.9	19.05	30790.76	30171.86	618.89	11789.92
d= 17	18.5	18.70	30171.86	29559.25	612.61	11455.81
d= 18	18.4	18.45	29559.25	28952.92	606.33	11186.74
d= 19	19.7	19.05	28952.92	28352.88	600.04	11430.84
d= 20	19.2	19.45	28352.88	27759.12	593.76	11548.65
drem= 20.5	19.3					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **173543.24**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.30
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10426.31**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **183969.55**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **13.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT A, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	4.6	2.30	40828.14	40115.00	713.14	1640.22
d= 2	4.6	4.60	40115.00	39408.14	706.86	3251.55
d= 3	4.6	4.60	39408.14	38707.57	700.57	3222.64
d= 4	4.6	4.60	38707.57	38013.27	694.29	3193.74
d= 5	10.8	7.70	38013.27	37325.27	688.01	5297.67
d= 6	13.1	11.95	37325.27	36643.54	681.73	8146.62
d= 7	14.6	13.85	36643.54	35968.10	675.44	9354.87
d= 8	14.9	14.75	35968.10	35298.94	669.16	9870.10
d= 9	15.4	15.15	35298.94	34636.06	662.88	10042.57
d= 10	16.3	15.85	34636.06	33979.47	656.59	10406.99
d= 11	15.9	16.10	33979.47	33329.16	650.31	10469.98
d= 12	16.4	16.15	33329.16	32685.13	644.03	10401.02
d= 13	17.4	16.90	32685.13	32047.39	637.74	10777.86
d= 14	16.3	16.85	32047.39	31415.93	631.46	10640.10
d= 15	18.1	17.20	31415.93	30790.76	625.18	10753.04
d= 16	18.0	18.05	30790.76	30171.86	618.89	11171.03
d= 17	17.4	17.70	30171.86	29559.25	612.61	10843.20
d= 18	18.1	17.75	29559.25	28952.92	606.33	10762.31
d= 19	19.1	18.60	28952.92	28352.88	600.04	11160.82
d= 20	18.2	18.65	28352.88	27759.12	593.76	11073.64
drem= 20.5	19.0					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **139483.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.00
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10264.24**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **149747.448**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **11.00**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT B, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.8	4.40	40828.14	40115.00	713.14	3137.82
d= 2	8.8	8.80	40115.00	39408.14	706.86	6220.35
d= 3	8.8	8.80	39408.14	38707.57	700.57	6165.06
d= 4	8.8	8.80	38707.57	38013.27	694.29	6109.77
d= 5	10.3	9.55	38013.27	37325.27	688.01	6570.48
d= 6	11.0	10.65	37325.27	36643.54	681.73	7260.37
d= 7	12.5	11.75	36643.54	35968.10	675.44	7936.45
d= 8	12.2	12.35	35968.10	35298.94	669.16	8264.11
d= 9	13.2	12.70	35298.94	34636.06	662.88	8418.52
d= 10	13.9	13.55	34636.06	33979.47	656.59	8896.83
d= 11	14.4	14.15	33979.47	33329.16	650.31	9201.88
d= 12	15.0	14.70	33329.16	32685.13	644.03	9467.19
d= 13	15.6	15.30	32685.13	32047.39	637.74	9757.47
d= 14	17.4	16.50	32047.39	31415.93	631.46	10419.09
d= 15	17.1	17.25	31415.93	30790.76	625.18	10784.30
d= 16	16.9	17.00	30790.76	30171.86	618.89	10521.19
d= 17	18.1	17.50	30171.86	29559.25	612.61	10720.68
d= 18	18.1	18.10	29559.25	28952.92	606.33	10974.52
d= 19	19.4	18.75	28952.92	28352.88	600.04	11250.83
d= 20	18.8	19.10	28352.88	27759.12	593.76	11340.83
drem= 20.5	20.5					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **139851.56**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.50
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **11074.57**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **150926.134**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **11.09**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT C, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159

line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.4	7.70	40828.14	40115.00	713.14	5491.19
d= 2	15.4	15.40	40115.00	39408.14	706.86	10885.61
d= 3	15.4	15.40	39408.14	38707.57	700.57	10788.85
d= 4	15.4	15.40	38707.57	38013.27	694.29	10692.09
d= 5	15.4	15.40	38013.27	37325.27	688.01	10595.33
d= 6	17.0	16.20	37325.27	36643.54	681.73	11043.95
d= 7	16.8	16.90	36643.54	35968.10	675.44	11414.97
d= 8	16.1	16.45	35968.10	35298.94	669.16	11007.67
d= 9	17.1	16.60	35298.94	34636.06	662.88	11003.74
d= 10	17.9	17.50	34636.06	33979.47	656.59	11490.37
d= 11	17.5	17.70	33979.47	33329.16	650.31	11510.48
d= 12	17.7	17.60	33329.16	32685.13	644.03	11334.86
d= 13	19.2	18.45	32685.13	32047.39	637.74	11766.36
d= 14	18.6	18.90	32047.39	31415.93	631.46	11934.59
d= 15	19.3	18.95	31415.93	30790.76	625.18	11847.10
d= 16	18.6	18.95	30790.76	30171.86	618.89	11728.03
d= 17	19.1	18.85	30171.86	29559.25	612.61	11547.71
d= 18	19.0	19.05	29559.25	28952.92	606.33	11550.53
d= 19	20.1	19.55	28952.92	28352.88	600.04	11730.86
d= 20	19.9	20.00	28352.88	27759.12	593.76	11875.22
drem= 20.5	20.0					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **186082.91**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.00
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10804.46**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **196887.369**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **14.47**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT D, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.8	6.40	40828.14	40115.00	713.14	4564.10
d= 2	12.8	12.80	40115.00	39408.14	706.86	9047.78
d= 3	12.8	12.80	39408.14	38707.57	700.57	8967.36
d= 4	12.8	12.80	38707.57	38013.27	694.29	8886.93
d= 5	13.6	13.20	38013.27	37325.27	688.01	9081.71
d= 6	14.3	13.95	37325.27	36643.54	681.73	9510.07
d= 7	14.7	14.50	36643.54	35968.10	675.44	9793.91
d= 8	15.6	15.15	35968.10	35298.94	669.16	10137.76
d= 9	16.5	16.05	35298.94	34636.06	662.88	10639.16
d= 10	17.1	16.80	34636.06	33979.47	656.59	11030.76
d= 11	16.9	17.00	33979.47	33329.16	650.31	11055.26
d= 12	17.1	17.00	33329.16	32685.13	644.03	10948.45
d= 13	17.1	17.10	32685.13	32047.39	637.74	10905.41
d= 14	18.7	17.90	32047.39	31415.93	631.46	11303.13
d= 15	18.2	18.45	31415.93	30790.76	625.18	11534.51
d= 16	18.5	18.35	30790.76	30171.86	618.89	11356.70
d= 17	14.4	16.45	30171.86	29559.25	612.61	10077.44
d= 18	18.8	16.60	29559.25	28952.92	606.33	10065.03
d= 19	18.2	18.50	28952.92	28352.88	600.04	11100.81
d= 20	19.1	18.65	28352.88	27759.12	593.76	11073.64
drem= 20.5	19.4					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **168840.44**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.40
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10480.33**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **179320.767**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **13.18**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	4.9	2.45	40828.14	40115.00	713.14	1747.20
d= 2	4.9	4.90	40115.00	39408.14	706.86	3463.60
d= 3	4.9	4.90	39408.14	38707.57	700.57	3432.82
d= 4	4.9	4.90	38707.57	38013.27	694.29	3402.03
d= 5	10.0	7.45	38013.27	37325.27	688.01	5125.66
d= 6	12.8	11.40	37325.27	36643.54	681.73	7771.67
d= 7	14.1	13.45	36643.54	35968.10	675.44	9084.70
d= 8	15.0	14.55	35968.10	35298.94	669.16	9736.26
d= 9	15.2	15.10	35298.94	34636.06	662.88	10009.42
d= 10	16.6	15.90	34636.06	33979.47	656.59	10439.82
d= 11	16.8	16.70	33979.47	33329.16	650.31	10860.17
d= 12	17.2	17.00	33329.16	32685.13	644.03	10948.45
d= 13	17.6	17.40	32685.13	32047.39	637.74	11096.73
d= 14	17.3	17.45	32047.39	31415.93	631.46	11018.98
d= 15	18.6	17.95	31415.93	30790.76	625.18	11221.92
d= 16	18.2	18.40	30790.76	30171.86	618.89	11387.64
d= 17	17.5	17.85	30171.86	29559.25	612.61	10935.10
d= 18	18.0	17.75	29559.25	28952.92	606.33	10762.31
d= 19	18.6	18.30	28952.92	28352.88	600.04	10980.81
d= 20	18.8	18.70	28352.88	27759.12	593.76	11103.33
drem= 20.5	19.8					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **141682.17**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.80
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10696.42**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **152378.584**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **11.20**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.3	4.65	40828.14	40115.00	713.14	3316.11
d= 2	9.3	9.30	40115.00	39408.14	706.86	6573.78
d= 3	9.3	9.30	39408.14	38707.57	700.57	6515.35
d= 4	9.3	9.30	38707.57	38013.27	694.29	6456.91
d= 5	9.9	9.60	38013.27	37325.27	688.01	6604.88
d= 6	12.2	11.05	37325.27	36643.54	681.73	7533.07
d= 7	12.0	12.10	36643.54	35968.10	675.44	8172.85
d= 8	11.9	11.95	35968.10	35298.94	669.16	7996.45
d= 9	13.7	12.80	35298.94	34636.06	662.88	8484.81
d= 10	13.5	13.60	34636.06	33979.47	656.59	8929.66
d= 11	14.2	13.85	33979.47	33329.16	650.31	9006.79
d= 12	14.8	14.50	33329.16	32685.13	644.03	9338.38
d= 13	16.3	15.56	32685.13	32047.39	637.74	9920.09
d= 14	16.5	16.41	32047.39	31415.93	631.46	10359.10
d= 15	17.4	16.95	31415.93	30790.76	625.18	10596.75
d= 16	18.9	18.15	30790.76	30171.86	618.89	11232.92
d= 17	18.4	18.65	30171.86	29559.25	612.61	11425.18
d= 18	19.0	18.70	29559.25	28952.92	606.33	11338.32
d= 19	20.0	19.50	28952.92	28352.88	600.04	11700.86
d= 20	18.9	19.45	28352.88	27759.12	593.76	11548.65
drem= 20.5	20.8					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **142463.07**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.80
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **11236.64**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **153699.712**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **11.29**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.1	7.55	40828.14	40115.00	713.14	5384.22
d= 2	15.1	15.10	40115.00	39408.14	706.86	10673.56
d= 3	15.1	15.10	39408.14	38707.57	700.57	10578.68
d= 4	15.1	15.10	38707.57	38013.27	694.29	10483.80
d= 5	16.5	15.80	38013.27	37325.27	688.01	10870.53
d= 6	16.4	16.45	37325.27	36643.54	681.73	11214.38
d= 7	16.2	16.30	36643.54	35968.10	675.44	11009.71
d= 8	17.3	16.75	35968.10	35298.94	669.16	11208.41
d= 9	18.0	17.65	35298.94	34636.06	662.88	11699.76
d= 10	17.6	17.80	34636.06	33979.47	656.59	11687.35
d= 11	18.4	18.00	33979.47	33329.16	650.31	11705.57
d= 12	19.0	18.70	33329.16	32685.13	644.03	12043.29
d= 13	19.3	19.15	32685.13	32047.39	637.74	12212.78
d= 14	19.4	19.35	32047.39	31415.93	631.46	12218.75
d= 15	18.5	18.95	31415.93	30790.76	625.18	11847.10
d= 16	19.2	18.85	30790.76	30171.86	618.89	11666.14
d= 17	19.6	19.40	30171.86	29559.25	612.61	11884.64
d= 18	20.9	20.25	29559.25	28952.92	606.33	12278.13
d= 19	20.9	20.90	28952.92	28352.88	600.04	12540.92
d= 20	20.4	20.65	28352.88	27759.12	593.76	12261.16
drem= 20.5	21.4					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **188388.68**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 21.40
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **11560.77**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **199949.452**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **14.69**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	40828.14	40115.00	713.14	4706.73
d= 2	13.2	13.20	40115.00	39408.14	706.86	9330.53
d= 3	13.2	13.20	39408.14	38707.57	700.57	9247.59
d= 4	13.2	13.20	38707.57	38013.27	694.29	9164.65
d= 5	14.2	13.70	38013.27	37325.27	688.01	9425.72
d= 6	14.5	14.35	37325.27	36643.54	681.73	9782.76
d= 7	15.9	15.20	36643.54	35968.10	675.44	10266.72
d= 8	16.5	16.20	35968.10	35298.94	669.16	10840.38
d= 9	16.9	16.70	35298.94	34636.06	662.88	11070.03
d= 10	17.5	17.20	34636.06	33979.47	656.59	11293.39
d= 11	17.0	17.25	33979.47	33329.16	650.31	11217.84
d= 12	17.5	17.25	33329.16	32685.13	644.03	11109.45
d= 13	17.5	17.50	32685.13	32047.39	637.74	11160.50
d= 14	18.4	17.95	32047.39	31415.93	631.46	11334.71
d= 15	18.7	18.55	31415.93	30790.76	625.18	11597.03
d= 16	19.2	18.95	30790.76	30171.86	618.89	11728.03
d= 17	18.9	19.05	30171.86	29559.25	612.61	11670.23
d= 18	18.5	18.70	29559.25	28952.92	606.33	11338.32
d= 19	19.3	18.90	28952.92	28352.88	600.04	11340.83
d= 20	19.9	19.60	28352.88	27759.12	593.76	11637.71
drem= 20.5	19.9					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **174946.28**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.90
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10750.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **185696.719**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **13.64**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT A, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	3.7	1.85	40828.14	40115.00	713.14	1319.31
d= 2	3.7	3.70	40115.00	39408.14	706.86	2615.37
d= 3	3.7	3.70	39408.14	38707.57	700.57	2592.13
d= 4	3.7	3.70	38707.57	38013.27	694.29	2568.88
d= 5	10.4	7.05	38013.27	37325.27	688.01	4850.46
d= 6	13.4	11.90	37325.27	36643.54	681.73	8112.53
d= 7	14.2	13.80	36643.54	35968.10	675.44	9321.10
d= 8	15.0	14.60	35968.10	35298.94	669.16	9769.72
d= 9	15.8	15.40	35298.94	34636.06	662.88	10208.29
d= 10	15.5	15.65	34636.06	33979.47	656.59	10275.67
d= 11	16.3	15.91	33979.47	33329.16	650.31	10343.17
d= 12	16.3	16.31	33329.16	32685.13	644.03	10500.85
d= 13	17.4	16.85	32685.13	32047.39	637.74	10745.97
d= 14	17.1	17.25	32047.39	31415.93	631.46	10892.68
d= 15	18.4	17.75	31415.93	30790.76	625.18	11096.89
d= 16	17.9	18.15	30790.76	30171.86	618.89	11232.92
d= 17	18.4	18.15	30171.86	29559.25	612.61	11118.88
d= 18	18.9	18.65	29559.25	28952.92	606.33	11308.00
d= 19	18.9	18.90	28952.92	28352.88	600.04	11340.83
d= 20	19.0	18.95	28352.88	27759.12	593.76	11251.77
drem= 20.5	19.0					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **137564.83**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.00
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10264.24**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **147829.067**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **10.86**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT B, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.1	4.55	40828.14	40115.00	713.14	3244.79
d= 2	9.1	9.10	40115.00	39408.14	706.86	6432.41
d= 3	9.1	9.10	39408.14	38707.57	700.57	6375.23
d= 4	9.1	9.10	38707.57	38013.27	694.29	6318.05
d= 5	10.3	9.70	38013.27	37325.27	688.01	6673.68
d= 6	11.7	11.00	37325.27	36643.54	681.73	7498.98
d= 7	11.7	11.70	36643.54	35968.10	675.44	7902.67
d= 8	12.7	12.20	35968.10	35298.94	669.16	8163.74
d= 9	12.7	12.70	35298.94	34636.06	662.88	8418.52
d= 10	13.4	13.05	34636.06	33979.47	656.59	8568.53
d= 11	14.1	13.75	33979.47	33329.16	650.31	8941.75
d= 12	13.6	13.85	33329.16	32685.13	644.03	8919.76
d= 13	15.7	14.65	32685.13	32047.39	637.74	9342.94
d= 14	15.1	15.40	32047.39	31415.93	631.46	9724.48
d= 15	18.2	16.65	31415.93	30790.76	625.18	10409.19
d= 16	16.8	17.50	30790.76	30171.86	618.89	10830.64
d= 17	18.1	17.45	30171.86	29559.25	612.61	10690.05
d= 18	18.9	18.50	29559.25	28952.92	606.33	11217.05
d= 19	19.3	19.10	28952.92	28352.88	600.04	11460.84
d= 20	20.7	20.00	28352.88	27759.12	593.76	11875.22
drem= 20.5	20.5					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **138455.44**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.50
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **11074.57**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **149530.011**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **10.99**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT C, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.0	7.50	40828.14	40115.00	713.14	5348.56
d= 2	15.0	15.00	40115.00	39408.14	706.86	10602.87
d= 3	15.0	15.00	39408.14	38707.57	700.57	10508.62
d= 4	15.0	15.00	38707.57	38013.27	694.29	10414.38
d= 5	15.6	15.30	38013.27	37325.27	688.01	10526.53
d= 6	16.3	15.95	37325.27	36643.54	681.73	10873.52
d= 7	17.4	16.85	36643.54	35968.10	675.44	11381.20
d= 8	17.3	17.35	35968.10	35298.94	669.16	11609.91
d= 9	18.5	17.90	35298.94	34636.06	662.88	11865.48
d= 10	18.1	18.30	34636.06	33979.47	656.59	12015.65
d= 11	18.9	18.50	33979.47	33329.16	650.31	12030.72
d= 12	19.5	19.20	33329.16	32685.13	644.03	12365.30
d= 13	19.1	19.30	32685.13	32047.39	637.74	12308.44
d= 14	19.0	19.05	32047.39	31415.93	631.46	12029.31
d= 15	19.8	19.40	31415.93	30790.76	625.18	12128.43
d= 16	19.2	19.50	30790.76	30171.86	618.89	12068.42
d= 17	19.4	19.30	30171.86	29559.25	612.61	11823.38
d= 18	20.3	19.85	29559.25	28952.92	606.33	12035.59
d= 19	19.7	20.00	28952.92	28352.88	600.04	12000.88
d= 20	19.8	19.75	28352.88	27759.12	593.76	11726.78
drem= 20.5	20.3					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **189900.73**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.30
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10966.53**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **200867.255**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **14.76**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT D, USI 12pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.7	6.35	40828.14	40115.00	713.14	4528.45
d= 2	12.7	12.70	40115.00	39408.14	706.86	8977.10
d= 3	12.7	12.70	39408.14	38707.57	700.57	8897.30
d= 4	12.7	12.70	38707.57	38013.27	694.29	8817.50
d= 5	13.4	13.05	38013.27	37325.27	688.01	8978.51
d= 6	14.2	13.80	37325.27	36643.54	681.73	9407.81
d= 7	14.8	14.50	36643.54	35968.10	675.44	9793.91
d= 8	14.9	14.85	35968.10	35298.94	669.16	9937.01
d= 9	16.6	15.75	35298.94	34636.06	662.88	10440.29
d= 10	16.2	16.40	34636.06	33979.47	656.59	10768.12
d= 11	17.4	16.80	33979.47	33329.16	650.31	10925.20
d= 12	18.2	17.80	33329.16	32685.13	644.03	11463.67
d= 13	18.1	18.15	32685.13	32047.39	637.74	11575.04
d= 14	18.2	18.15	32047.39	31415.93	631.46	11461.00
d= 15	18.1	18.15	31415.93	30790.76	625.18	11346.96
d= 16	18.9	18.50	30790.76	30171.86	618.89	11449.53
d= 17	19.3	19.10	30171.86	29559.25	612.61	11700.86
d= 18	19.8	19.55	29559.25	28952.92	606.33	11853.70
d= 19	19.1	19.45	28952.92	28352.88	600.04	11670.86
d= 20	19.2	19.15	28352.88	27759.12	593.76	11370.52
drem= 20.5	19.9					

(use d=21 for drem)

line 3) Total near-wall volumetric flow (total of column G) **170468.25**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.90
b) Total area in remainder segment 540.22
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10750.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **181218.694**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **13.32**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159

line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	5.2	2.60	40828.14	40115.00	713.14	1854.17
d= 2	5.2	5.20	40115.00	39408.14	706.86	3675.66
d= 3	5.2	5.20	39408.14	38707.57	700.57	3642.99
d= 4	5.2	5.20	38707.57	38013.27	694.29	3610.32
d= 5	10.1	7.65	38013.27	37325.27	688.01	5263.27
d= 6	13.1	11.60	37325.27	36643.54	681.73	7908.01
d= 7	13.9	13.50	36643.54	35968.10	675.44	9118.47
d= 8	15.3	14.60	35968.10	35298.94	669.16	9769.72
d= 9	15.0	15.15	35298.94	34636.06	662.88	10042.57
d= 10	16.0	15.50	34636.06	33979.47	656.59	10177.19
d= 11	17.1	16.55	33979.47	33329.16	650.31	10762.62
d= 12	16.6	16.85	33329.16	32685.13	644.03	10851.84
d= 13	16.7	16.65	32685.13	32047.39	637.74	10618.42
d= 14	16.5	16.60	32047.39	31415.93	631.46	10482.23
drem 14.6	18.2					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **107777.48**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.20
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14465.85**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **122243.33**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **11.98**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.2	4.60	40828.14	40115.00	713.14	3280.45
d= 2	9.2	9.20	40115.00	39408.14	706.86	6503.09
d= 3	9.2	9.20	39408.14	38707.57	700.57	6445.29
d= 4	9.2	9.20	38707.57	38013.27	694.29	6387.48
d= 5	10.5	9.85	38013.27	37325.27	688.01	6776.88
d= 6	10.6	10.55	37325.27	36643.54	681.73	7192.20
d= 7	11.4	11.00	36643.54	35968.10	675.44	7429.86
d= 8	13.0	12.20	35968.10	35298.94	669.16	8163.74
d= 9	13.3	13.15	35298.94	34636.06	662.88	8716.82
d= 10	13.7	13.50	34636.06	33979.47	656.59	8864.00
d= 11	15.0	14.35	33979.47	33329.16	650.31	9331.94
d= 12	16.3	15.65	33329.16	32685.13	644.03	10079.01
d= 13	15.7	16.00	32685.13	32047.39	637.74	10203.89
d= 14	15.5	15.60	32047.39	31415.93	631.46	9850.77
drem 14.6	15.9					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **109225.44**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 15.90
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **12637.75**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **121863.187**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **11.94**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.0	7.00	40828.14	40115.00	713.14	4991.99
d= 2	14.0	14.00	40115.00	39408.14	706.86	9896.01
d= 3	14.0	14.00	39408.14	38707.57	700.57	9808.05
d= 4	14.0	14.00	38707.57	38013.27	694.29	9720.08
d= 5	15.8	14.90	38013.27	37325.27	688.01	10251.33
d= 6	16.9	16.35	37325.27	36643.54	681.73	11146.21
d= 7	17.3	17.10	36643.54	35968.10	675.44	11550.06
d= 8	17.6	17.45	35968.10	35298.94	669.16	11676.82
d= 9	17.2	17.40	35298.94	34636.06	662.88	11534.04
d= 10	17.9	17.55	34636.06	33979.47	656.59	11523.20
d= 11	17.9	17.90	33979.47	33329.16	650.31	11640.54
d= 12	18.3	18.10	33329.16	32685.13	644.03	11656.88
d= 13	18.8	18.55	32685.13	32047.39	637.74	11830.13
d= 14	19.5	19.15	32047.39	31415.93	631.46	12092.46
drem 14.6	19.2					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **149317.80**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.20
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15260.68**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **164578.478**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.12**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.5	6.75	40828.14	40115.00	713.14	4813.70
d= 2	13.5	13.50	40115.00	39408.14	706.86	9542.58
d= 3	13.5	13.50	39408.14	38707.57	700.57	9457.76
d= 4	13.5	13.50	38707.57	38013.27	694.29	9372.94
d= 5	13.8	13.65	38013.27	37325.27	688.01	9391.32
d= 6	15.1	14.45	37325.27	36643.54	681.73	9850.93
d= 7	14.8	14.95	36643.54	35968.10	675.44	10097.86
d= 8	15.9	15.35	35968.10	35298.94	669.16	10271.59
d= 9	16.0	15.95	35298.94	34636.06	662.88	10572.87
d= 10	17.0	16.50	34636.06	33979.47	656.59	10833.78
d= 11	17.9	17.45	33979.47	33329.16	650.31	11347.90
d= 12	17.8	17.85	33329.16	32685.13	644.03	11495.87
d= 13	17.3	17.55	32685.13	32047.39	637.74	11192.39
d= 14	17.6	17.45	32047.39	31415.93	631.46	11018.98
drem 14.6	17.8					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **139260.47**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 17.80
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14147.92**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **153408.387**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **15.03**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159

line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	4.3	2.15	40828.14	40115.00	713.14	1533.25
d= 2	4.3	4.30	40115.00	39408.14	706.86	3039.49
d= 3	4.3	4.30	39408.14	38707.57	700.57	3012.47
d= 4	4.3	4.30	38707.57	38013.27	694.29	2985.45
d= 5	10.5	7.40	38013.27	37325.27	688.01	5091.26
d= 6	13.3	11.90	37325.27	36643.54	681.73	8112.53
d= 7	14.2	13.75	36643.54	35968.10	675.44	9287.33
d= 8	14.5	14.35	35968.10	35298.94	669.16	9602.43
d= 9	15.3	14.90	35298.94	34636.06	662.88	9876.85
d= 10	15.8	15.55	34636.06	33979.47	656.59	10210.02
d= 11	16.5	16.15	33979.47	33329.16	650.31	10502.50
d= 12	16.8	16.65	33329.16	32685.13	644.03	10723.04
d= 13	16.4	16.60	32685.13	32047.39	637.74	10586.54
d= 14	17.9	17.15	32047.39	31415.93	631.46	10829.54
drem 14.6	16.9					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105392.70**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 16.90
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **13432.57**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **118825.273**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **11.64**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT B, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.4	4.20	40828.14	40115.00	713.14	2995.19
d= 2	8.4	8.40	40115.00	39408.14	706.86	5937.61
d= 3	8.4	8.40	39408.14	38707.57	700.57	5884.83
d= 4	8.4	8.40	38707.57	38013.27	694.29	5832.05
d= 5	9.8	9.10	38013.27	37325.27	688.01	6260.88
d= 6	11.2	10.50	37325.27	36643.54	681.73	7158.12
d= 7	12.7	11.95	36643.54	35968.10	675.44	8071.53
d= 8	12.5	12.60	35968.10	35298.94	669.16	8431.40
d= 9	13.4	12.95	35298.94	34636.06	662.88	8584.24
d= 10	14.7	14.05	34636.06	33979.47	656.59	9225.13
d= 11	14.7	14.70	33979.47	33329.16	650.31	9559.55
d= 12	14.7	14.70	33329.16	32685.13	644.03	9467.19
d= 13	15.2	14.95	32685.13	32047.39	637.74	9534.26
d= 14	15.0	15.10	32047.39	31415.93	631.46	9535.04
drem 14.6	17.0					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **106477.02**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 17.00
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **13512.06**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **119989.076**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **11.76**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT C, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.7	7.35	40828.14	40115.00	713.14	5241.59
d= 2	14.7	14.70	40115.00	39408.14	706.86	10390.81
d= 3	14.7	14.70	39408.14	38707.57	700.57	10298.45
d= 4	14.7	14.70	38707.57	38013.27	694.29	10206.09
d= 5	15.8	15.25	38013.27	37325.27	688.01	10492.13
d= 6	16.0	15.90	37325.27	36643.54	681.73	10839.43
d= 7	16.5	16.25	36643.54	35968.10	675.44	10975.94
d= 8	16.6	16.55	35968.10	35298.94	669.16	11074.58
d= 9	17.7	17.15	35298.94	34636.06	662.88	11368.32
d= 10	17.5	17.60	34636.06	33979.47	656.59	11556.03
d= 11	18.7	18.10	33979.47	33329.16	650.31	11770.60
d= 12	18.7	18.70	33329.16	32685.13	644.03	12043.29
d= 13	18.6	18.65	32685.13	32047.39	637.74	11893.91
d= 14	19.6	19.10	32047.39	31415.93	631.46	12060.88
drem 14.6	19.2					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **150212.06**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.20
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15260.68**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **165472.732**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.21**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 4
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	40828.14	40115.00	713.14	4706.73
d= 2	13.2	13.20	40115.00	39408.14	706.86	9330.53
d= 3	13.2	13.20	39408.14	38707.57	700.57	9247.59
d= 4	13.2	13.20	38707.57	38013.27	694.29	9164.65
d= 5	13.5	13.35	38013.27	37325.27	688.01	9184.91
d= 6	14.3	13.90	37325.27	36643.54	681.73	9475.98
d= 7	15.9	15.10	36643.54	35968.10	675.44	10199.18
d= 8	15.5	15.70	35968.10	35298.94	669.16	10505.80
d= 9	17.1	16.30	35298.94	34636.06	662.88	10804.88
d= 10	16.7	16.90	34636.06	33979.47	656.59	11096.42
d= 11	17.4	17.05	33979.47	33329.16	650.31	11087.78
d= 12	16.9	17.15	33329.16	32685.13	644.03	11045.05
d= 13	17.9	17.40	32685.13	32047.39	637.74	11096.73
d= 14	17.4	17.65	32047.39	31415.93	631.46	11145.27
drem 14.6	18.3					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **138091.48**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.30
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14545.33**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **152636.814**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **14.95**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	5.8	2.90	40828.14	40115.00	713.14	2068.11
d= 2	5.8	5.80	40115.00	39408.14	706.86	4099.78
d= 3	5.8	5.80	39408.14	38707.57	700.57	4063.33
d= 4	5.8	5.80	38707.57	38013.27	694.29	4026.89
d= 5	10.1	7.95	38013.27	37325.27	688.01	5469.67
d= 6	13.9	12.00	37325.27	36643.54	681.73	8180.70
d= 7	14.2	14.05	36643.54	35968.10	675.44	9489.96
d= 8	14.3	14.25	35968.10	35298.94	669.16	9535.52
d= 9	16.1	15.20	35298.94	34636.06	662.88	10075.71
d= 10	16.4	16.25	34636.06	33979.47	656.59	10669.63
d= 11	16.2	16.30	33979.47	33329.16	650.31	10600.04
d= 12	16.6	16.40	33329.16	32685.13	644.03	10562.03
d= 13	16.9	16.75	32685.13	32047.39	637.74	10682.20
d= 14	17.2	17.05	32047.39	31415.93	631.46	10766.39
drem 14.6	17.7					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **110289.97**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 17.70
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14068.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **124358.404**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.18**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159

line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.5	4.25	40828.14	40115.00	713.14	3030.85
d= 2	8.5	8.50	40115.00	39408.14	706.86	6008.29
d= 3	8.5	8.50	39408.14	38707.57	700.57	5954.89
d= 4	8.5	8.50	38707.57	38013.27	694.29	5901.48
d= 5	10.3	9.40	38013.27	37325.27	688.01	6467.28
d= 6	10.0	10.15	37325.27	36643.54	681.73	6919.51
d= 7	12.7	11.35	36643.54	35968.10	675.44	7666.27
d= 8	11.8	12.25	35968.10	35298.94	669.16	8197.20
d= 9	14.1	12.95	35298.94	34636.06	662.88	8584.24
d= 10	15.3	14.70	34636.06	33979.47	656.59	9651.91
d= 11	13.7	14.50	33979.47	33329.16	650.31	9429.49
d= 12	14.3	14.00	33329.16	32685.13	644.03	9016.37
d= 13	15.5	14.90	32685.13	32047.39	637.74	9502.37
d= 14	15.7	15.60	32047.39	31415.93	631.46	9850.77
drem 14.6	18.0					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **106180.92**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.00
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14306.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **120487.808**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **11.80**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.1	7.55	40828.14	40115.00	713.14	5384.22
d= 2	15.1	15.10	40115.00	39408.14	706.86	10673.56
d= 3	15.1	15.10	39408.14	38707.57	700.57	10578.68
d= 4	15.1	15.10	38707.57	38013.27	694.29	10483.80
d= 5	15.7	15.40	38013.27	37325.27	688.01	10595.33
d= 6	16.5	16.10	37325.27	36643.54	681.73	10975.78
d= 7	17.5	17.00	36643.54	35968.10	675.44	11482.52
d= 8	17.0	17.25	35968.10	35298.94	669.16	11542.99
d= 9	17.6	17.30	35298.94	34636.06	662.88	11467.75
d= 10	18.9	18.25	34636.06	33979.47	656.59	11982.82
d= 11	17.7	18.30	33979.47	33329.16	650.31	11900.66
d= 12	19.3	18.50	33329.16	32685.13	644.03	11914.49
d= 13	19.3	19.30	32685.13	32047.39	637.74	12308.44
d= 14	19.2	19.25	32047.39	31415.93	631.46	12155.60
drem 14.6	18.7					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **153446.64**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.70
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14863.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **168309.901**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.49**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.4	6.20	40828.14	40115.00	713.14	4421.48
d= 2	12.4	12.40	40115.00	39408.14	706.86	8765.04
d= 3	12.4	12.40	39408.14	38707.57	700.57	8687.13
d= 4	12.4	12.40	38707.57	38013.27	694.29	8609.22
d= 5	14.4	13.40	38013.27	37325.27	688.01	9219.31
d= 6	14.7	14.55	37325.27	36643.54	681.73	9919.10
d= 7	15.7	15.20	36643.54	35968.10	675.44	10266.72
d= 8	15.9	15.80	35968.10	35298.94	669.16	10572.71
d= 9	17.6	16.75	35298.94	34636.06	662.88	11103.17
d= 10	17.4	17.50	34636.06	33979.47	656.59	11490.37
d= 11	17.2	17.30	33979.47	33329.16	650.31	11250.35
d= 12	17.8	17.50	33329.16	32685.13	644.03	11270.46
d= 13	17.7	17.75	32685.13	32047.39	637.74	11319.94
d= 14	18.8	18.25	32047.39	31415.93	631.46	11524.14
drem 14.6	19.2					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **138419.15**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.20
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15260.68**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **153679.826**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **15.06**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	4.6	2.30	40828.14	40115.00	713.14	1640.22
d= 2	4.6	4.60	40115.00	39408.14	706.86	3251.55
d= 3	4.6	4.60	39408.14	38707.57	700.57	3222.64
d= 4	4.6	4.60	38707.57	38013.27	694.29	3193.74
d= 5	10.8	7.70	38013.27	37325.27	688.01	5297.67
d= 6	13.1	11.95	37325.27	36643.54	681.73	8146.62
d= 7	14.6	13.85	36643.54	35968.10	675.44	9354.87
d= 8	14.9	14.75	35968.10	35298.94	669.16	9870.10
d= 9	15.4	15.15	35298.94	34636.06	662.88	10042.57
d= 10	16.3	15.85	34636.06	33979.47	656.59	10406.99
d= 11	15.9	16.10	33979.47	33329.16	650.31	10469.98
d= 12	16.4	16.15	33329.16	32685.13	644.03	10401.02
d= 13	17.4	16.90	32685.13	32047.39	637.74	10777.86
d= 14	16.3	16.85	32047.39	31415.93	631.46	10640.10
drem 14.6	18.1					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **106715.94**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.10
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14386.37**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **121102.304**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **11.86**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT B, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159

line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.8	4.40	40828.14	40115.00	713.14	3137.82
d= 2	8.8	8.80	40115.00	39408.14	706.86	6220.35
d= 3	8.8	8.80	39408.14	38707.57	700.57	6165.06
d= 4	8.8	8.80	38707.57	38013.27	694.29	6109.77
d= 5	10.3	9.55	38013.27	37325.27	688.01	6570.48
d= 6	11.0	10.65	37325.27	36643.54	681.73	7260.37
d= 7	12.5	11.75	36643.54	35968.10	675.44	7936.45
d= 8	12.2	12.35	35968.10	35298.94	669.16	8264.11
d= 9	13.2	12.70	35298.94	34636.06	662.88	8418.52
d= 10	13.9	13.55	34636.06	33979.47	656.59	8896.83
d= 11	14.4	14.15	33979.47	33329.16	650.31	9201.88
d= 12	15.0	14.70	33329.16	32685.13	644.03	9467.19
d= 13	15.6	15.30	32685.13	32047.39	637.74	9757.47
d= 14	17.4	16.50	32047.39	31415.93	631.46	10419.09
drem 14.6	17.1					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **107825.39**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 17.10
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **13591.54**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **121416.929**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **11.90**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT C, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.4	7.70	40828.14	40115.00	713.14	5491.19
d= 2	15.4	15.40	40115.00	39408.14	706.86	10885.61
d= 3	15.4	15.40	39408.14	38707.57	700.57	10788.85
d= 4	15.4	15.40	38707.57	38013.27	694.29	10692.09
d= 5	15.4	15.40	38013.27	37325.27	688.01	10595.33
d= 6	17.0	16.20	37325.27	36643.54	681.73	11043.95
d= 7	16.8	16.90	36643.54	35968.10	675.44	11414.97
d= 8	16.1	16.45	35968.10	35298.94	669.16	11007.67
d= 9	17.1	16.60	35298.94	34636.06	662.88	11003.74
d= 10	17.9	17.50	34636.06	33979.47	656.59	11490.37
d= 11	17.5	17.70	33979.47	33329.16	650.31	11510.48
d= 12	17.7	17.60	33329.16	32685.13	644.03	11334.86
d= 13	19.2	18.45	32685.13	32047.39	637.74	11766.36
d= 14	18.6	18.90	32047.39	31415.93	631.46	11934.59
drem 14.6	19.3					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **150960.07**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.30
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15340.16**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **166300.228**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.29**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 7
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.8	6.40	40828.14	40115.00	713.14	4564.10
d= 2	12.8	12.80	40115.00	39408.14	706.86	9047.78
d= 3	12.8	12.80	39408.14	38707.57	700.57	8967.36
d= 4	12.8	12.80	38707.57	38013.27	694.29	8886.93
d= 5	13.6	13.20	38013.27	37325.27	688.01	9081.71
d= 6	14.3	13.95	37325.27	36643.54	681.73	9510.07
d= 7	14.7	14.50	36643.54	35968.10	675.44	9793.91
d= 8	15.6	15.15	35968.10	35298.94	669.16	10137.76
d= 9	16.5	16.05	35298.94	34636.06	662.88	10639.16
d= 10	17.1	16.80	34636.06	33979.47	656.59	11030.76
d= 11	16.9	17.00	33979.47	33329.16	650.31	11055.26
d= 12	17.1	17.00	33329.16	32685.13	644.03	10948.45
d= 13	17.1	17.10	32685.13	32047.39	637.74	10905.41
d= 14	18.7	17.90	32047.39	31415.93	631.46	11303.13
drem 14.6	18.2					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **135871.79**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.20
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14465.85**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **150337.64**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **14.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	4.9	2.45	40828.14	40115.00	713.14	1747.20
d= 2	4.9	4.90	40115.00	39408.14	706.86	3463.60
d= 3	4.9	4.90	39408.14	38707.57	700.57	3432.82
d= 4	4.9	4.90	38707.57	38013.27	694.29	3402.03
d= 5	10.0	7.45	38013.27	37325.27	688.01	5125.66
d= 6	12.8	11.40	37325.27	36643.54	681.73	7771.67
d= 7	14.1	13.45	36643.54	35968.10	675.44	9084.70
d= 8	15.0	14.55	35968.10	35298.94	669.16	9736.26
d= 9	15.2	15.10	35298.94	34636.06	662.88	10009.42
d= 10	16.6	15.90	34636.06	33979.47	656.59	10439.82
d= 11	16.8	16.70	33979.47	33329.16	650.31	10860.17
d= 12	17.2	17.00	33329.16	32685.13	644.03	10948.45
d= 13	17.6	17.40	32685.13	32047.39	637.74	11096.73
d= 14	17.3	17.45	32047.39	31415.93	631.46	11018.98
drem 14.6	18.6					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **108137.51**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.60
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **14783.78**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **122921.287**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.04**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.3	4.65	40828.14	40115.00	713.14	3316.11
d= 2	9.3	9.30	40115.00	39408.14	706.86	6573.78
d= 3	9.3	9.30	39408.14	38707.57	700.57	6515.35
d= 4	9.3	9.30	38707.57	38013.27	694.29	6456.91
d= 5	9.9	9.60	38013.27	37325.27	688.01	6604.88
d= 6	12.2	11.05	37325.27	36643.54	681.73	7533.07
d= 7	12.0	12.10	36643.54	35968.10	675.44	8172.85
d= 8	11.9	11.95	35968.10	35298.94	669.16	7996.45
d= 9	13.7	12.80	35298.94	34636.06	662.88	8484.81
d= 10	13.5	13.60	34636.06	33979.47	656.59	8929.66
d= 11	14.2	13.85	33979.47	33329.16	650.31	9006.79
d= 12	14.8	14.50	33329.16	32685.13	644.03	9338.38
d= 13	16.3	15.56	32685.13	32047.39	637.74	9920.09
d= 14	16.5	16.41	32047.39	31415.93	631.46	10359.10
drem 14.6	17.4					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **109208.22**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 17.40
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **13829.99**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **123038.212**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.05**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.1	7.55	40828.14	40115.00	713.14	5384.22
d= 2	15.1	15.10	40115.00	39408.14	706.86	10673.56
d= 3	15.1	15.10	39408.14	38707.57	700.57	10578.68
d= 4	15.1	15.10	38707.57	38013.27	694.29	10483.80
d= 5	16.5	15.80	38013.27	37325.27	688.01	10870.53
d= 6	16.4	16.45	37325.27	36643.54	681.73	11214.38
d= 7	16.2	16.30	36643.54	35968.10	675.44	11009.71
d= 8	17.3	16.75	35968.10	35298.94	669.16	11208.41
d= 9	18.0	17.65	35298.94	34636.06	662.88	11699.76
d= 10	17.6	17.80	34636.06	33979.47	656.59	11687.35
d= 11	18.4	18.00	33979.47	33329.16	650.31	11705.57
d= 12	19.0	18.70	33329.16	32685.13	644.03	12043.29
d= 13	19.3	19.15	32685.13	32047.39	637.74	12212.78
d= 14	19.4	19.35	32047.39	31415.93	631.46	12218.75
drem 14.6	18.5					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **152990.79**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.50
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14704.30**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **167695.091**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	40828.14	40115.00	713.14	4706.73
d= 2	13.2	13.20	40115.00	39408.14	706.86	9330.53
d= 3	13.2	13.20	39408.14	38707.57	700.57	9247.59
d= 4	13.2	13.20	38707.57	38013.27	694.29	9164.65
d= 5	14.2	13.70	38013.27	37325.27	688.01	9425.72
d= 6	14.5	14.35	37325.27	36643.54	681.73	9782.76
d= 7	15.9	15.20	36643.54	35968.10	675.44	10266.72
d= 8	16.5	16.20	35968.10	35298.94	669.16	10840.38
d= 9	16.9	16.70	35298.94	34636.06	662.88	11070.03
d= 10	17.5	17.20	34636.06	33979.47	656.59	11293.39
d= 11	17.0	17.25	33979.47	33329.16	650.31	11217.84
d= 12	17.5	17.25	33329.16	32685.13	644.03	11109.45
d= 13	17.5	17.50	32685.13	32047.39	637.74	11160.50
d= 14	18.4	17.95	32047.39	31415.93	631.46	11334.71
drem 14.6	18.7					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **139950.99**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.70
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14863.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **154814.253**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **15.17**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	3.7	1.85	40828.14	40115.00	713.14	1319.31
d= 2	3.7	3.70	40115.00	39408.14	706.86	2615.37
d= 3	3.7	3.70	39408.14	38707.57	700.57	2592.13
d= 4	3.7	3.70	38707.57	38013.27	694.29	2568.88
d= 5	10.4	7.05	38013.27	37325.27	688.01	4850.46
d= 6	13.4	11.90	37325.27	36643.54	681.73	8112.53
d= 7	14.2	13.80	36643.54	35968.10	675.44	9321.10
d= 8	15.0	14.60	35968.10	35298.94	669.16	9769.72
d= 9	15.8	15.40	35298.94	34636.06	662.88	10208.29
d= 10	15.5	15.65	34636.06	33979.47	656.59	10275.67
d= 11	16.3	15.91	33979.47	33329.16	650.31	10343.17
d= 12	16.3	16.31	33329.16	32685.13	644.03	10500.85
d= 13	17.4	16.85	32685.13	32047.39	637.74	10745.97
d= 14	17.1	17.25	32047.39	31415.93	631.46	10892.68
drem 14.6	18.4					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **104116.14**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.40
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **14624.81**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **118740.959**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **11.63**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT B, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159
line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.1	4.55	40828.14	40115.00	713.14	3244.79
d= 2	9.1	9.10	40115.00	39408.14	706.86	6432.41
d= 3	9.1	9.10	39408.14	38707.57	700.57	6375.23
d= 4	9.1	9.10	38707.57	38013.27	694.29	6318.05
d= 5	10.3	9.70	38013.27	37325.27	688.01	6673.68
d= 6	11.7	11.00	37325.27	36643.54	681.73	7498.98
d= 7	11.7	11.70	36643.54	35968.10	675.44	7902.67
d= 8	12.7	12.20	35968.10	35298.94	669.16	8163.74
d= 9	12.7	12.70	35298.94	34636.06	662.88	8418.52
d= 10	13.4	13.05	34636.06	33979.47	656.59	8568.53
d= 11	14.1	13.75	33979.47	33329.16	650.31	8941.75
d= 12	13.6	13.85	33329.16	32685.13	644.03	8919.76
d= 13	15.7	14.65	32685.13	32047.39	637.74	9342.94
d= 14	15.1	15.40	32047.39	31415.93	631.46	9724.48
drem 14.6	18.2					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **106525.56**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.20
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14465.85**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **120991.405**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **11.85**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT C, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159

line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.0	7.50	40828.14	40115.00	713.14	5348.56
d= 2	15.0	15.00	40115.00	39408.14	706.86	10602.87
d= 3	15.0	15.00	39408.14	38707.57	700.57	10508.62
d= 4	15.0	15.00	38707.57	38013.27	694.29	10414.38
d= 5	15.6	15.30	38013.27	37325.27	688.01	10526.53
d= 6	16.3	15.95	37325.27	36643.54	681.73	10873.52
d= 7	17.4	16.85	36643.54	35968.10	675.44	11381.20
d= 8	17.3	17.35	35968.10	35298.94	669.16	11609.91
d= 9	18.5	17.90	35298.94	34636.06	662.88	11865.48
d= 10	18.1	18.30	34636.06	33979.47	656.59	12015.65
d= 11	18.9	18.50	33979.47	33329.16	650.31	12030.72
d= 12	19.5	19.20	33329.16	32685.13	644.03	12365.30
d= 13	19.1	19.30	32685.13	32047.39	637.74	12308.44
d= 14	19.0	19.05	32047.39	31415.93	631.46	12029.31
drem 14.6	19.8					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **153880.49**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.80
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15737.57**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **169618.065**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.62**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville, Unit 3

Wall Effects Run 10
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 40,828.1 sq. in. pi = 3.14159

line 1) radius: 114 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.7	6.35	40828.14	40115.00	713.14	4528.45
d= 2	12.7	12.70	40115.00	39408.14	706.86	8977.10
d= 3	12.7	12.70	39408.14	38707.57	700.57	8897.30
d= 4	12.7	12.70	38707.57	38013.27	694.29	8817.50
d= 5	13.4	13.05	38013.27	37325.27	688.01	8978.51
d= 6	14.2	13.80	37325.27	36643.54	681.73	9407.81
d= 7	14.8	14.50	36643.54	35968.10	675.44	9793.91
d= 8	14.9	14.85	35968.10	35298.94	669.16	9937.01
d= 9	16.6	15.75	35298.94	34636.06	662.88	10440.29
d= 10	16.2	16.40	34636.06	33979.47	656.59	10768.12
d= 11	17.4	16.80	33979.47	33329.16	650.31	10925.20
d= 12	18.2	17.80	33329.16	32685.13	644.03	11463.67
d= 13	18.1	18.15	32685.13	32047.39	637.74	11575.04
d= 14	18.2	18.15	32047.39	31415.93	631.46	11461.00
drem 14.6	18.1					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **135970.91**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 18.10
b) Total area in remainder segment 794.83
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14386.37**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **150357.274**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **14.73**

ATTACHMENT C.

Conesville Station Unit 5
Wall Effects Calculation Forms

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Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.5	12.25	130740.50	129461.87	1278.63	15663.19
d= 2	28.5	26.50	129461.87	128189.53	1272.34	33717.13
d= 3	31.2	29.85	128189.53	126923.47	1266.06	37791.93
d= 4	34.7	32.95	126923.47	125663.69	1259.78	41509.69
d= 5	35.3	35.00	125663.69	124410.19	1253.49	43872.32
d= 6	35.5	35.40	124410.19	123162.98	1247.21	44151.29
d= 7	37.8	36.65	123162.98	121922.05	1240.93	45480.03
d= 8	40.6	39.20	121922.05	120687.41	1234.65	48398.10
d= 9	38.6	39.60	120687.41	119459.05	1228.36	48643.14
d= 10	40.0	39.30	119459.05	118236.97	1222.08	48027.70
d= 11	38.7	39.35	118236.97	117021.17	1215.80	47841.56
d= 12	39.9	39.30	117021.17	115811.66	1209.51	47533.84
d= 13	43.3	41.60	115811.66	114608.43	1203.23	50054.34
d= 14	41.5	42.40	114608.43	113411.48	1196.95	50750.52
d= 15	41.5	41.50	113411.48	112220.82	1190.66	49412.52
d= 16	42.4	41.95	112220.82	111036.44	1184.38	49684.74
d= 17	43.6	43.00	111036.44	109858.34	1178.10	50658.16
drem 27.5	44.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **753190.19**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.30
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **1005502.55**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1758692.75**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **40.36**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.2	12.10	130740.50	129461.87	1278.63	15471.39
d= 2	29.8	27.00	129461.87	128189.53	1272.34	34353.30
d= 3	29.2	29.50	128189.53	126923.47	1266.06	37348.81
d= 4	33.9	31.55	126923.47	125663.69	1259.78	39746.00
d= 5	36.2	35.05	125663.69	124410.19	1253.49	43934.99
d= 6	34.6	35.40	124410.19	123162.98	1247.21	44151.29
d= 7	38.4	36.50	123162.98	121922.05	1240.93	45293.89
d= 8	39.4	38.90	121922.05	120687.41	1234.65	48027.70
d= 9	37.9	38.65	120687.41	119459.05	1228.36	47476.20
d= 10	39.6	38.75	119459.05	118236.97	1222.08	47355.56
d= 11	38.6	39.10	118236.97	117021.17	1215.80	47537.61
d= 12	38.2	38.40	117021.17	115811.66	1209.51	46445.28
d= 13	39.5	38.85	115811.66	114608.43	1203.23	46745.46
d= 14	40.3	39.90	114608.43	113411.48	1196.95	47758.15
d= 15	42.1	41.20	113411.48	112220.82	1190.66	49055.32
d= 16	41.7	41.90	112220.82	111036.44	1184.38	49625.52
d= 17	42.3	42.00	111036.44	109858.34	1178.10	49480.06
drem 27.5	41.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **739806.54**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.90
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **951028.38**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1690834.92**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.80**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.4	12.70	130740.50	129461.87	1278.63	16238.57
d= 2	28.5	26.95	129461.87	128189.53	1272.34	34289.68
d= 3	30.0	29.25	128189.53	126923.47	1266.06	37032.29
d= 4	33.4	31.70	126923.47	125663.69	1259.78	39934.96
d= 5	36.5	34.95	125663.69	124410.19	1253.49	43809.65
d= 6	37.0	36.75	124410.19	123162.98	1247.21	45835.03
d= 7	38.2	37.60	123162.98	121922.05	1240.93	46658.91
d= 8	39.9	39.05	121922.05	120687.41	1234.65	48212.90
d= 9	38.4	39.15	120687.41	119459.05	1228.36	48090.38
d= 10	40.0	39.20	119459.05	118236.97	1222.08	47905.49
d= 11	38.8	39.40	118236.97	117021.17	1215.80	47902.35
d= 12	39.2	39.00	117021.17	115811.66	1209.51	47170.99
d= 13	41.2	40.20	115811.66	114608.43	1203.23	48369.82
d= 14	41.6	41.40	114608.43	113411.48	1196.95	49553.57
d= 15	41.2	41.40	113411.48	112220.82	1190.66	49293.45
d= 16	41.5	41.35	112220.82	111036.44	1184.38	48974.11
d= 17	42.2	41.85	111036.44	109858.34	1178.10	49303.35
drem 27.5	41.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **748575.51**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.70
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **946488.86**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1695064.37**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.90**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT A, USI 12pt AUTOPROBE, yaw nulled

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.4	11.70	130740.50	129461.87	1278.63	14959.94
d= 2	27.8	25.60	129461.87	128189.53	1272.34	32572.02
d= 3	31.9	29.85	128189.53	126923.47	1266.06	37791.93
d= 4	33.8	32.85	126923.47	125663.69	1259.78	41383.71
d= 5	36.6	35.20	125663.69	124410.19	1253.49	44123.02
d= 6	36.8	36.70	124410.19	123162.98	1247.21	45772.67
d= 7	40.4	38.60	123162.98	121922.05	1240.93	47899.84
d= 8	39.8	40.10	121922.05	120687.41	1234.65	49509.28
d= 9	40.2	40.00	120687.41	119459.05	1228.36	49134.49
d= 10	40.3	40.25	119459.05	118236.97	1222.08	49188.68
d= 11	39.3	39.80	118236.97	117021.17	1215.80	48388.67
d= 12	40.7	40.00	117021.17	115811.66	1209.51	48380.50
d= 13	40.3	40.50	115811.66	114608.43	1203.23	48730.79
d= 14	41.2	40.75	114608.43	113411.48	1196.95	48775.56
d= 15	41.5	41.35	113411.48	112220.82	1190.66	49233.92
d= 16	42.0	41.75	112220.82	111036.44	1184.38	49447.86
d= 17	42.7	42.35	111036.44	109858.34	1178.10	49892.39
drem 27.5	42.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **755185.26**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.70
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **969186.43**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1724371.7**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **39.57**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT B, USI 12pt AUTOPROBE, yaw nulled

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.8	11.90	130740.50	129461.87	1278.63	15215.67
d= 2	30.5	27.15	129461.87	128189.53	1272.34	34544.15
d= 3	31.1	30.80	128189.53	126923.47	1266.06	38994.69
d= 4	31.9	31.50	126923.47	125663.69	1259.78	39683.01
d= 5	34.3	33.10	125663.69	124410.19	1253.49	41490.68
d= 6	34.9	34.60	124410.19	123162.98	1247.21	43153.52
d= 7	37.5	36.20	123162.98	121922.05	1240.93	44921.61
d= 8	38.5	38.00	121922.05	120687.41	1234.65	46916.52
d= 9	36.6	37.55	120687.41	119459.05	1228.36	46125.00
d= 10	37.9	37.25	119459.05	118236.97	1222.08	45522.44
d= 11	37.9	37.90	118236.97	117021.17	1215.80	46078.66
d= 12	38.0	37.95	117021.17	115811.66	1209.51	45901.00
d= 13	39.2	38.60	115811.66	114608.43	1203.23	46444.66
d= 14	39.3	39.25	114608.43	113411.48	1196.95	46980.14
d= 15	40.7	40.00	113411.48	112220.82	1190.66	47626.52
d= 16	41.4	41.05	112220.82	111036.44	1184.38	48618.79
d= 17	42.6	42.00	111036.44	109858.34	1178.10	49480.06
drem 27.5	42.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **727697.12**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.30
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **960107.41**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1687804.53**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT C, USI 12pt AUTOPROBE, yaw nulled

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.4	11.70	130740.50	129461.87	1278.63	14959.94
d= 2	27.6	25.50	129461.87	128189.53	1272.34	32444.78
d= 3	30.8	29.20	128189.53	126923.47	1266.06	36968.99
d= 4	32.5	31.65	126923.47	125663.69	1259.78	39871.97
d= 5	35.4	33.95	125663.69	124410.19	1253.49	42556.15
d= 6	36.4	35.90	124410.19	123162.98	1247.21	44774.90
d= 7	39.1	37.75	123162.98	121922.05	1240.93	46845.05
d= 8	39.5	39.30	121922.05	120687.41	1234.65	48521.56
d= 9	37.9	38.70	120687.41	119459.05	1228.36	47537.61
d= 10	37.3	37.60	119459.05	118236.97	1222.08	45950.17
d= 11	38.6	37.95	118236.97	117021.17	1215.80	46139.45
d= 12	39.9	39.25	117021.17	115811.66	1209.51	47473.37
d= 13	38.8	39.35	115811.66	114608.43	1203.23	47347.08
d= 14	40.4	39.60	114608.43	113411.48	1196.95	47399.07
d= 15	40.5	40.45	113411.48	112220.82	1190.66	48162.32
d= 16	42.5	41.50	112220.82	111036.44	1184.38	49151.76
d= 17	42.9	42.70	111036.44	109858.34	1178.10	50304.73
drem 27.5	41.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **736408.91**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.90
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **951028.38**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1687437.29**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.72**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.5	11.75	130740.50	129461.87	1278.63	15023.87
d= 2	28.0	25.75	129461.87	128189.53	1272.34	32762.87
d= 3	29.1	28.55	128189.53	126923.47	1266.06	36146.05
d= 4	32.7	30.90	126923.47	125663.69	1259.78	38927.14
d= 5	34.7	33.70	125663.69	124410.19	1253.49	42242.78
d= 6	35.1	34.90	124410.19	123162.98	1247.21	43527.69
d= 7	36.6	35.85	123162.98	121922.05	1240.93	44487.29
d= 8	37.7	37.15	121922.05	120687.41	1234.65	45867.07
d= 9	37.8	37.75	120687.41	119459.05	1228.36	46370.67
d= 10	38.5	38.15	119459.05	118236.97	1222.08	46622.31
d= 11	38.2	38.35	118236.97	117021.17	1215.80	46625.77
d= 12	38.7	38.45	117021.17	115811.66	1209.51	46505.76
d= 13	40.7	39.70	115811.66	114608.43	1203.23	47768.21
d= 14	40.0	40.35	114608.43	113411.48	1196.95	48296.78
d= 15	42.8	41.40	113411.48	112220.82	1190.66	49293.45
d= 16	42.5	42.65	112220.82	111036.44	1184.38	50513.80
d= 17	43.4	42.95	111036.44	109858.34	1178.10	50599.25
drem 27.5	43.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **731580.76**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.90
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **996423.52**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1728004.28**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **39.65**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.4	11.20	130740.50	129461.87	1278.63	14320.63
d= 2	26.5	24.45	129461.87	128189.53	1272.34	31108.82
d= 3	29.7	28.10	128189.53	126923.47	1266.06	35576.32
d= 4	30.1	29.90	126923.47	125663.69	1259.78	37667.36
d= 5	33.6	31.85	125663.69	124410.19	1253.49	39923.81
d= 6	33.7	33.65	124410.19	123162.98	1247.21	41968.67
d= 7	36.2	34.95	123162.98	121922.05	1240.93	43370.45
d= 8	35.9	36.05	121922.05	120687.41	1234.65	44508.96
d= 9	35.3	35.60	120687.41	119459.05	1228.36	43729.69
d= 10	37.7	36.50	119459.05	118236.97	1222.08	44605.88
d= 11	37.0	37.35	118236.97	117021.17	1215.80	45409.97
d= 12	38.4	37.70	117021.17	115811.66	1209.51	45598.62
d= 13	39.1	38.75	115811.66	114608.43	1203.23	46625.14
d= 14	38.2	38.65	114608.43	113411.48	1196.95	46261.97
d= 15	40.2	39.20	113411.48	112220.82	1190.66	46673.99
d= 16	42.4	41.30	112220.82	111036.44	1184.38	48914.89
d= 17	41.9	42.15	111036.44	109858.34	1178.10	49656.78
drem 27.5	42.8					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **705921.97**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.80
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **971456.19**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1677378.16**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.49**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.5	11.25	130740.50	129461.87	1278.63	14384.56
d= 2	26.8	24.65	129461.87	128189.53	1272.34	31363.29
d= 3	30.4	28.60	128189.53	126923.47	1266.06	36209.35
d= 4	31.9	31.15	126923.47	125663.69	1259.78	39242.09
d= 5	32.7	32.30	125663.69	124410.19	1253.49	40487.88
d= 6	34.4	33.55	124410.19	123162.98	1247.21	41843.95
d= 7	34.7	34.55	123162.98	121922.05	1240.93	42874.08
d= 8	37.5	36.10	121922.05	120687.41	1234.65	44570.70
d= 9	36.9	37.20	120687.41	119459.05	1228.36	45695.07
d= 10	38.7	37.80	119459.05	118236.97	1222.08	46194.58
d= 11	40.4	39.55	118236.97	117021.17	1215.80	48084.72
d= 12	38.2	39.30	117021.17	115811.66	1209.51	47533.84
d= 13	39.4	38.80	115811.66	114608.43	1203.23	46685.30
d= 14	39.0	39.20	114608.43	113411.48	1196.95	46920.29
d= 15	42.4	40.70	113411.48	112220.82	1190.66	48459.99
d= 16	42.1	42.25	112220.82	111036.44	1184.38	50040.05
d= 17	43.5	42.80	111036.44	109858.34	1178.10	50422.54
drem 27.5	43.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **721012.29**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.10
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **978265.46**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1699277.75**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.99**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT A, USI 12pt AUTOPROBE, yaw nulled

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.1	11.05	130740.50	129461.87	1278.63	14128.83
d= 2	27.9	25.00	129461.87	128189.53	1272.34	31808.61
d= 3	30.3	29.10	128189.53	126923.47	1266.06	36842.38
d= 4	32.3	31.30	126923.47	125663.69	1259.78	39431.05
d= 5	33.5	32.90	125663.69	124410.19	1253.49	41239.98
d= 6	34.6	34.05	124410.19	123162.98	1247.21	42467.56
d= 7	36.4	35.50	123162.98	121922.05	1240.93	44052.96
d= 8	37.0	36.70	121922.05	120687.41	1234.65	45311.48
d= 9	37.0	37.00	120687.41	119459.05	1228.36	45449.40
d= 10	39.1	38.05	119459.05	118236.97	1222.08	46500.10
d= 11	39.6	39.35	118236.97	117021.17	1215.80	47841.56
d= 12	39.1	39.35	117021.17	115811.66	1209.51	47594.32
d= 13	39.3	39.20	115811.66	114608.43	1203.23	47166.59
d= 14	41.7	40.50	114608.43	113411.48	1196.95	48476.32
d= 15	41.1	41.40	113411.48	112220.82	1190.66	49293.45
d= 16	43.3	42.20	112220.82	111036.44	1184.38	49980.83
d= 17	43.3	43.30	111036.44	109858.34	1178.10	51011.59
drem 27.5	43.6					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **728597.03**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.60
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **989614.25**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1718211.28**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **39.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT B, USI 12pt AUTOPROBE, yaw nulled

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.8	11.40	130740.50	129461.87	1278.63	14576.35
d= 2	26.3	24.55	129461.87	128189.53	1272.34	31236.05
d= 3	28.9	27.60	128189.53	126923.47	1266.06	34943.29
d= 4	30.8	29.85	126923.47	125663.69	1259.78	37604.37
d= 5	33.1	31.95	125663.69	124410.19	1253.49	40049.16
d= 6	33.1	33.10	124410.19	123162.98	1247.21	41282.71
d= 7	35.3	34.20	123162.98	121922.05	1240.93	42439.75
d= 8	34.9	35.10	121922.05	120687.41	1234.65	43336.05
d= 9	35.5	35.20	120687.41	119459.05	1228.36	43238.35
d= 10	34.8	35.15	119459.05	118236.97	1222.08	42956.08
d= 11	38.8	36.80	118236.97	117021.17	1215.80	44741.28
d= 12	38.1	38.45	117021.17	115811.66	1209.51	46505.76
d= 13	37.1	37.60	115811.66	114608.43	1203.23	45241.43
d= 14	39.7	38.40	114608.43	113411.48	1196.95	45962.74
d= 15	40.6	40.15	113411.48	112220.82	1190.66	47805.12
d= 16	43.6	42.10	112220.82	111036.44	1184.38	49862.39
d= 17	42.9	43.25	111036.44	109858.34	1178.10	50952.68
drem 27.5	42.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **702733.57**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.70
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **969186.43**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1671920**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.36**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT C, USI 12pt AUTOPROBE, yaw nulled

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	21.9	10.95	130740.50	129461.87	1278.63	14000.97
d= 2	27.0	24.45	129461.87	128189.53	1272.34	31108.82
d= 3	28.1	27.55	128189.53	126923.47	1266.06	34879.99
d= 4	31.2	29.65	126923.47	125663.69	1259.78	37352.42
d= 5	31.6	31.40	125663.69	124410.19	1253.49	39359.74
d= 6	34.2	32.90	124410.19	123162.98	1247.21	41033.26
d= 7	34.2	34.20	123162.98	121922.05	1240.93	42439.75
d= 8	36.0	35.10	121922.05	120687.41	1234.65	43336.05
d= 9	36.0	36.00	120687.41	119459.05	1228.36	44221.04
d= 10	37.8	36.90	119459.05	118236.97	1222.08	45094.71
d= 11	38.8	38.30	118236.97	117021.17	1215.80	46564.98
d= 12	38.5	38.65	117021.17	115811.66	1209.51	46747.66
d= 13	39.7	39.10	115811.66	114608.43	1203.23	47046.27
d= 14	39.7	39.70	114608.43	113411.48	1196.95	47518.77
d= 15	41.6	40.65	113411.48	112220.82	1190.66	48400.45
d= 16	42.9	42.25	112220.82	111036.44	1184.38	50040.05
d= 17	43.4	43.15	111036.44	109858.34	1178.10	50834.87
drem 27.5	43.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **709979.81**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.70
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **991884.01**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1701863.82**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **39.05**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.5	12.25	130740.50	129461.87	1278.63	15663.19
d= 2	29.8	27.15	129461.87	128189.53	1272.34	34544.15
d= 3	33.7	31.75	128189.53	126923.47	1266.06	40197.44
d= 4	33.7	33.70	126923.47	125663.69	1259.78	42454.52
d= 5	36.1	34.90	125663.69	124410.19	1253.49	43746.97
d= 6	36.7	36.40	124410.19	123162.98	1247.21	45398.50
d= 7	39.6	38.15	123162.98	121922.05	1240.93	47341.42
d= 8	40.2	39.90	121922.05	120687.41	1234.65	49262.35
d= 9	39.5	39.85	120687.41	119459.05	1228.36	48950.23
d= 10	39.4	39.45	119459.05	118236.97	1222.08	48211.01
d= 11	39.2	39.30	118236.97	117021.17	1215.80	47780.77
d= 12	39.6	39.40	117021.17	115811.66	1209.51	47654.80
d= 13	40.4	40.00	115811.66	114608.43	1203.23	48129.18
d= 14	40.9	40.65	114608.43	113411.48	1196.95	48655.86
d= 15	42.1	41.50	113411.48	112220.82	1190.66	49412.52
d= 16	42.0	42.05	112220.82	111036.44	1184.38	49803.17
d= 17	43.1	42.55	111036.44	109858.34	1178.10	50128.01
drem 27.5	41.2					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **757334.11**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.20
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **935140.07**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1692474.18**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.84**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.5	11.75	130740.50	129461.87	1278.63	15023.87
d= 2	28.4	25.95	129461.87	128189.53	1272.34	33017.34
d= 3	31.8	30.10	128189.53	126923.47	1266.06	38108.44
d= 4	32.3	32.05	126923.47	125663.69	1259.78	40375.89
d= 5	34.1	33.20	125663.69	124410.19	1253.49	41616.03
d= 6	35.1	34.60	124410.19	123162.98	1247.21	43153.52
d= 7	38.0	36.55	123162.98	121922.05	1240.93	45355.94
d= 8	37.9	37.95	121922.05	120687.41	1234.65	46854.79
d= 9	39.7	38.80	120687.41	119459.05	1228.36	47660.45
d= 10	39.6	39.65	119459.05	118236.97	1222.08	48455.43
d= 11	37.1	38.35	118236.97	117021.17	1215.80	46625.77
d= 12	38.5	37.80	117021.17	115811.66	1209.51	45719.58
d= 13	38.7	38.60	115811.66	114608.43	1203.23	46444.66
d= 14	40.0	39.35	114608.43	113411.48	1196.95	47099.83
d= 15	40.2	40.10	113411.48	112220.82	1190.66	47745.59
d= 16	40.5	40.35	112220.82	111036.44	1184.38	47789.73
d= 17	40.4	40.45	111036.44	109858.34	1178.10	47654.01
drem 27.5	41.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **728700.86**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.10
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **932870.32**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1661571.18**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.13**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.8	11.90	130740.50	129461.87	1278.63	15215.67
d= 2	29.3	26.55	129461.87	128189.53	1272.34	33780.74
d= 3	31.4	30.35	128189.53	126923.47	1266.06	38424.96
d= 4	34.4	32.90	126923.47	125663.69	1259.78	41446.70
d= 5	35.4	34.90	125663.69	124410.19	1253.49	43746.97
d= 6	36.5	35.95	124410.19	123162.98	1247.21	44837.26
d= 7	37.1	36.80	123162.98	121922.05	1240.93	45666.17
d= 8	39.6	38.35	121922.05	120687.41	1234.65	47348.65
d= 9	38.5	39.05	120687.41	119459.05	1228.36	47967.54
d= 10	38.9	38.70	119459.05	118236.97	1222.08	47294.46
d= 11	37.9	38.40	118236.97	117021.17	1215.80	46686.56
d= 12	38.9	38.40	117021.17	115811.66	1209.51	46445.28
d= 13	39.3	39.10	115811.66	114608.43	1203.23	47046.27
d= 14	39.7	39.50	114608.43	113411.48	1196.95	47279.38
d= 15	41.1	40.40	113411.48	112220.82	1190.66	48102.79
d= 16	41.0	41.05	112220.82	111036.44	1184.38	48618.79
d= 17	41.0	41.00	111036.44	109858.34	1178.10	48301.96
drem 27.5	44.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **738210.14**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.10
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **1000963.04**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1739173.18**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **39.91**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT A, USI 12pt AUTOPROBE, yaw nulled

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.3	11.65	130740.50	129461.87	1278.63	14896.01
d= 2	29.4	26.35	129461.87	128189.53	1272.34	33526.27
d= 3	31.1	30.25	128189.53	126923.47	1266.06	38298.35
d= 4	35.7	33.40	126923.47	125663.69	1259.78	42076.59
d= 5	37.1	36.40	125663.69	124410.19	1253.49	45627.21
d= 6	34.3	35.70	124410.19	123162.98	1247.21	44525.46
d= 7	39.3	36.80	123162.98	121922.05	1240.93	45666.17
d= 8	41.4	40.35	121922.05	120687.41	1234.65	49817.94
d= 9	39.1	40.25	120687.41	119459.05	1228.36	49441.58
d= 10	39.7	39.40	119459.05	118236.97	1222.08	48149.91
d= 11	38.9	39.30	118236.97	117021.17	1215.80	47780.77
d= 12	40.9	39.90	117021.17	115811.66	1209.51	48259.55
d= 13	40.7	40.80	115811.66	114608.43	1203.23	49091.76
d= 14	40.6	40.65	114608.43	113411.48	1196.95	48655.86
d= 15	41.6	41.10	113411.48	112220.82	1190.66	48936.25
d= 16	40.6	41.10	112220.82	111036.44	1184.38	48678.01
d= 17	41.4	41.00	111036.44	109858.34	1178.10	48301.96
drem 27.5	42.0					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **751729.67**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.00
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **953298.13**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1705027.8**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **39.12**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT B, USI 12pt AUTOPROBE, yaw nulled

Stack Area: 130,740.5 sq. in. pi = 3.14159
line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.1	12.05	130740.50	129461.87	1278.63	15407.46
d= 2	28.5	26.30	129461.87	128189.53	1272.34	33462.66
d= 3	29.8	29.15	128189.53	126923.47	1266.06	36905.68
d= 4	30.4	30.10	126923.47	125663.69	1259.78	37919.32
d= 5	33.5	31.95	125663.69	124410.19	1253.49	40049.16
d= 6	35.1	34.30	124410.19	123162.98	1247.21	42779.36
d= 7	38.3	36.70	123162.98	121922.05	1240.93	45542.08
d= 8	38.9	38.60	121922.05	120687.41	1234.65	47657.31
d= 9	37.4	38.15	120687.41	119459.05	1228.36	46862.02
d= 10	40.2	38.80	119459.05	118236.97	1222.08	47416.66
d= 11	36.5	38.35	118236.97	117021.17	1215.80	46625.77
d= 12	38.2	37.35	117021.17	115811.66	1209.51	45175.30
d= 13	38.7	38.45	115811.66	114608.43	1203.23	46264.17
d= 14	40.0	39.35	114608.43	113411.48	1196.95	47099.83
d= 15	40.7	40.35	113411.48	112220.82	1190.66	48043.25
d= 16	39.2	39.95	112220.82	111036.44	1184.38	47315.98
d= 17	40.7	39.95	111036.44	109858.34	1178.10	47064.96
drem 27.5	41.5					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **721590.97**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.50
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **941949.35**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1663540.31**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.17**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT C, USI 12pt AUTOPROBE, yaw nulled

Stack Area: 130,740.5 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.1	11.55	130740.50	129461.87	1278.63	14768.15
d= 2	28.0	25.55	129461.87	128189.53	1272.34	32508.40
d= 3	31.4	29.70	128189.53	126923.47	1266.06	37602.02
d= 4	33.1	32.25	126923.47	125663.69	1259.78	40627.84
d= 5	35.1	34.10	125663.69	124410.19	1253.49	42744.17
d= 6	35.5	35.30	124410.19	123162.98	1247.21	44026.57
d= 7	37.5	36.50	123162.98	121922.05	1240.93	45293.89
d= 8	40.6	39.05	121922.05	120687.41	1234.65	48212.90
d= 9	40.0	40.30	120687.41	119459.05	1228.36	49502.99
d= 10	39.8	39.90	119459.05	118236.97	1222.08	48760.95
d= 11	39.2	39.50	118236.97	117021.17	1215.80	48023.93
d= 12	39.2	39.20	117021.17	115811.66	1209.51	47412.89
d= 13	40.0	39.60	115811.66	114608.43	1203.23	47647.88
d= 14	40.5	40.25	114608.43	113411.48	1196.95	48177.09
d= 15	42.7	41.60	113411.48	112220.82	1190.66	49531.58
d= 16	39.3	41.00	112220.82	111036.44	1184.38	48559.57
d= 17	41.9	40.60	111036.44	109858.34	1178.10	47830.73
drem 27.5	41.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **741231.57**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.70
b) Total area in remainder segment 22697.57
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **946488.86**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1687720.43**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **38.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.5	12.25	130741.00	129462.37	1278.63	15663.22
d= 2	28.5	26.50	129462.37	128190.02	1272.35	33717.19
d= 3	31.2	29.85	128190.02	126923.96	1266.06	37792.00
d= 4	34.7	32.95	126923.96	125664.18	1259.78	41509.77
d= 5	35.3	35.00	125664.18	124410.68	1253.50	43872.41
d= 6	35.5	35.40	124410.68	123163.47	1247.21	44151.38
d= 7	37.8	36.65	123163.47	121922.54	1240.93	45480.12
d= 8	40.6	39.20	121922.54	120687.89	1234.65	48398.19
d= 9	38.6	39.60	120687.89	119459.52	1228.36	48643.24
d= 10	40.0	39.30	119459.52	118237.44	1222.08	48027.80
d= 11	38.7	39.35	118237.44	117021.64	1215.80	47841.66
d= 12	39.9	39.30	117021.64	115812.13	1209.52	47533.94
d= 13	43.3	41.60	115812.13	114608.90	1203.23	50054.45
d= 14	41.5	42.40	114608.90	113411.95	1196.95	50750.62
d= 15	41.5	41.50	113411.95	112221.28	1190.67	49412.62
d= 16	42.4	41.95	112221.28	111036.90	1184.38	49684.84
d= 17	43.6	43.00	111036.90	109858.80	1178.10	50658.26
drem 22.6	44.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **753191.70**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.30
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **522875.21**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1276066.91**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **39.04**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.2	12.10	130741.00	129462.37	1278.63	15471.42
d= 2	29.8	27.00	129462.37	128190.02	1272.35	34353.36
d= 3	29.2	29.50	128190.02	126923.96	1266.06	37348.88
d= 4	33.9	31.55	126923.96	125664.18	1259.78	39746.07
d= 5	36.2	35.05	125664.18	124410.68	1253.50	43935.08
d= 6	34.6	35.40	124410.68	123163.47	1247.21	44151.38
d= 7	38.4	36.50	123163.47	121922.54	1240.93	45293.98
d= 8	39.4	38.90	121922.54	120687.89	1234.65	48027.80
d= 9	37.9	38.65	120687.89	119459.52	1228.36	47476.29
d= 10	39.6	38.75	119459.52	118237.44	1222.08	47355.65
d= 11	38.6	39.10	118237.44	117021.64	1215.80	47537.71
d= 12	38.2	38.40	117021.64	115812.13	1209.52	46445.38
d= 13	39.5	38.85	115812.13	114608.90	1203.23	46745.56
d= 14	40.3	39.90	114608.90	113411.95	1196.95	47758.25
d= 15	42.1	41.20	113411.95	112221.28	1190.67	49055.42
d= 16	41.7	41.90	112221.28	111036.90	1184.38	49625.62
d= 17	42.3	42.00	111036.90	109858.80	1178.10	49480.16
drem 22.6	41.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **739808.03**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.90
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **494547.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1234355.91**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.76**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.4	12.70	130741.00	129462.37	1278.63	16238.60
d= 2	28.5	26.95	129462.37	128190.02	1272.35	34289.75
d= 3	30.0	29.25	128190.02	126923.96	1266.06	37032.36
d= 4	33.4	31.70	126923.96	125664.18	1259.78	39935.04
d= 5	36.5	34.95	125664.18	124410.68	1253.50	43809.73
d= 6	37.0	36.75	124410.68	123163.47	1247.21	45835.12
d= 7	38.2	37.60	123163.47	121922.54	1240.93	46659.00
d= 8	39.9	39.05	121922.54	120687.89	1234.65	48213.00
d= 9	38.4	39.15	120687.89	119459.52	1228.36	48090.47
d= 10	40.0	39.20	119459.52	118237.44	1222.08	47905.59
d= 11	38.8	39.40	118237.44	117021.64	1215.80	47902.45
d= 12	39.2	39.00	117021.64	115812.13	1209.52	47171.09
d= 13	41.2	40.20	115812.13	114608.90	1203.23	48369.92
d= 14	41.6	41.40	114608.90	113411.95	1196.95	49553.68
d= 15	41.2	41.40	113411.95	112221.28	1190.67	49293.55
d= 16	41.5	41.35	112221.28	111036.90	1184.38	48974.21
d= 17	42.2	41.85	111036.90	109858.80	1178.10	49303.45
drem 22.6	41.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **748577.01**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.70
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **492187.27**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1240764.28**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.96**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT A, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 204 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	23.4	11.70	130741.00	129462.37	1278.63	14959.97
d= 2	27.8	25.60	129462.37	128190.02	1272.35	32572.08
d= 3	31.9	29.85	128190.02	126923.96	1266.06	37792.00
d= 4	33.8	32.85	126923.96	125664.18	1259.78	41383.79
d= 5	36.6	35.20	125664.18	124410.68	1253.50	44123.11
d= 6	36.8	36.70	124410.68	123163.47	1247.21	45772.76
d= 7	40.4	38.60	123163.47	121922.54	1240.93	47899.93
d= 8	39.8	40.10	121922.54	120687.89	1234.65	49509.38
d= 9	40.2	40.00	120687.89	119459.52	1228.36	49134.58
d= 10	40.3	40.25	119459.52	118237.44	1222.08	49188.78
d= 11	39.3	39.80	118237.44	117021.64	1215.80	48388.77
d= 12	40.7	40.00	117021.64	115812.13	1209.52	48380.60
d= 13	40.3	40.50	115812.13	114608.90	1203.23	48730.89
d= 14	41.2	40.75	114608.90	113411.95	1196.95	48775.66
d= 15	41.5	41.35	113411.95	112221.28	1190.67	49234.02
d= 16	42.0	41.75	112221.28	111036.90	1184.38	49447.96
d= 17	42.7	42.35	111036.90	109858.80	1178.10	49892.50
drem 22.6	42.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **755186.77**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.70
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **503990.32**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1259177.1**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT B, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.8	11.90	130741.00	129462.37	1278.63	15215.70
d= 2	30.5	27.15	129462.37	128190.02	1272.35	34544.22
d= 3	31.1	30.80	128190.02	126923.96	1266.06	38994.76
d= 4	31.9	31.50	126923.96	125664.18	1259.78	39683.09
d= 5	34.3	33.10	125664.18	124410.68	1253.50	41490.76
d= 6	34.9	34.60	124410.68	123163.47	1247.21	43153.61
d= 7	37.5	36.20	123163.47	121922.54	1240.93	44921.70
d= 8	38.5	38.00	121922.54	120687.89	1234.65	46916.62
d= 9	36.6	37.55	120687.89	119459.52	1228.36	46125.09
d= 10	37.9	37.25	119459.52	118237.44	1222.08	45522.53
d= 11	37.9	37.90	118237.44	117021.64	1215.80	46078.75
d= 12	38.0	37.95	117021.64	115812.13	1209.52	45901.10
d= 13	39.2	38.60	115812.13	114608.90	1203.23	46444.75
d= 14	39.3	39.25	114608.90	113411.95	1196.95	46980.24
d= 15	40.7	40.00	113411.95	112221.28	1190.67	47626.62
d= 16	41.4	41.05	112221.28	111036.90	1184.38	48618.89
d= 17	42.6	42.00	111036.90	109858.80	1178.10	49480.16
drem 22.6	42.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **727698.58**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.30
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **499269.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1226967.68**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.54**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 4
PORT C, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.4	11.70	130741.00	129462.37	1278.63	14959.97
d= 2	27.6	25.50	129462.37	128190.02	1272.35	32444.84
d= 3	30.8	29.20	128190.02	126923.96	1266.06	36969.06
d= 4	32.5	31.65	126923.96	125664.18	1259.78	39872.05
d= 5	35.4	33.95	125664.18	124410.68	1253.50	42556.23
d= 6	36.4	35.90	124410.68	123163.47	1247.21	44774.99
d= 7	39.1	37.75	123163.47	121922.54	1240.93	46845.14
d= 8	39.5	39.30	121922.54	120687.89	1234.65	48521.66
d= 9	37.9	38.70	120687.89	119459.52	1228.36	47537.71
d= 10	37.3	37.60	119459.52	118237.44	1222.08	45950.26
d= 11	38.6	37.95	118237.44	117021.64	1215.80	46139.54
d= 12	39.9	39.25	117021.64	115812.13	1209.52	47473.47
d= 13	38.8	39.35	115812.13	114608.90	1203.23	47347.17
d= 14	40.4	39.60	114608.90	113411.95	1196.95	47399.17
d= 15	40.5	40.45	113411.95	112221.28	1190.67	48162.42
d= 16	42.5	41.50	112221.28	111036.90	1184.38	49151.87
d= 17	42.9	42.70	111036.90	109858.80	1178.10	50304.83
drem 22.6	41.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **736410.39**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.90
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **494547.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1230958.27**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.66**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.5	11.75	130741.00	129462.37	1278.63	15023.90
d= 2	28.0	25.75	129462.37	128190.02	1272.35	32762.93
d= 3	29.1	28.55	128190.02	126923.96	1266.06	36146.12
d= 4	32.7	30.90	126923.96	125664.18	1259.78	38927.22
d= 5	34.7	33.70	125664.18	124410.68	1253.50	42242.86
d= 6	35.1	34.90	124410.68	123163.47	1247.21	43527.77
d= 7	36.6	35.85	123163.47	121922.54	1240.93	44487.37
d= 8	37.7	37.15	121922.54	120687.89	1234.65	45867.16
d= 9	37.8	37.75	120687.89	119459.52	1228.36	46370.76
d= 10	38.5	38.15	119459.52	118237.44	1222.08	46622.41
d= 11	38.2	38.35	118237.44	117021.64	1215.80	46625.86
d= 12	38.7	38.45	117021.64	115812.13	1209.52	46505.85
d= 13	40.7	39.70	115812.13	114608.90	1203.23	47768.31
d= 14	40.0	40.35	114608.90	113411.95	1196.95	48296.88
d= 15	42.8	41.40	113411.95	112221.28	1190.67	49293.55
d= 16	42.5	42.65	112221.28	111036.90	1184.38	50513.91
d= 17	43.4	42.95	111036.90	109858.80	1178.10	50599.36
drem 22.6	43.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **731582.22**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.90
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **518153.99**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1249736.21**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.24**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.4	11.20	130741.00	129462.37	1278.63	14320.66
d= 2	26.5	24.45	129462.37	128190.02	1272.35	31108.88
d= 3	29.7	28.10	128190.02	126923.96	1266.06	35576.39
d= 4	30.1	29.90	126923.96	125664.18	1259.78	37667.44
d= 5	33.6	31.85	125664.18	124410.68	1253.50	39923.89
d= 6	33.7	33.65	124410.68	123163.47	1247.21	41968.76
d= 7	36.2	34.95	123163.47	121922.54	1240.93	43370.54
d= 8	35.9	36.05	121922.54	120687.89	1234.65	44509.05
d= 9	35.3	35.60	120687.89	119459.52	1228.36	43729.78
d= 10	37.7	36.50	119459.52	118237.44	1222.08	44605.97
d= 11	37.0	37.35	118237.44	117021.64	1215.80	45410.06
d= 12	38.4	37.70	117021.64	115812.13	1209.52	45598.72
d= 13	39.1	38.75	115812.13	114608.90	1203.23	46625.23
d= 14	38.2	38.65	114608.90	113411.95	1196.95	46262.07
d= 15	40.2	39.20	113411.95	112221.28	1190.67	46674.09
d= 16	42.4	41.30	112221.28	111036.90	1184.38	48914.99
d= 17	41.9	42.15	111036.90	109858.80	1178.10	49656.88
drem 22.6	42.8					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **705923.38**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.80
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **505170.63**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1211094.01**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.05**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.5	11.25	130741.00	129462.37	1278.63	14384.59
d= 2	26.8	24.65	129462.37	128190.02	1272.35	31363.35
d= 3	30.4	28.60	128190.02	126923.96	1266.06	36209.42
d= 4	31.9	31.15	126923.96	125664.18	1259.78	39242.16
d= 5	32.7	32.30	125664.18	124410.68	1253.50	40487.96
d= 6	34.4	33.55	124410.68	123163.47	1247.21	41844.03
d= 7	34.7	34.55	123163.47	121922.54	1240.93	42874.16
d= 8	37.5	36.10	121922.54	120687.89	1234.65	44570.78
d= 9	36.9	37.20	120687.89	119459.52	1228.36	45695.16
d= 10	38.7	37.80	119459.52	118237.44	1222.08	46194.68
d= 11	40.4	39.55	118237.44	117021.64	1215.80	48084.82
d= 12	38.2	39.30	117021.64	115812.13	1209.52	47533.94
d= 13	39.4	38.80	115812.13	114608.90	1203.23	46685.40
d= 14	39.0	39.20	114608.90	113411.95	1196.95	46920.39
d= 15	42.4	40.70	113411.95	112221.28	1190.67	48460.09
d= 16	42.1	42.25	112221.28	111036.90	1184.38	50040.15
d= 17	43.5	42.80	111036.90	109858.80	1178.10	50422.64
drem 22.6	43.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **721013.73**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.10
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **508711.54**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1229725.28**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.62**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT A, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.1	11.05	130741.00	129462.37	1278.63	14128.86
d= 2	27.9	25.00	129462.37	128190.02	1272.35	31808.67
d= 3	30.3	29.10	128190.02	126923.96	1266.06	36842.45
d= 4	32.3	31.30	126923.96	125664.18	1259.78	39431.13
d= 5	33.5	32.90	125664.18	124410.68	1253.50	41240.06
d= 6	34.6	34.05	124410.68	123163.47	1247.21	42467.64
d= 7	36.4	35.50	123163.47	121922.54	1240.93	44053.05
d= 8	37.0	36.70	121922.54	120687.89	1234.65	45311.57
d= 9	37.0	37.00	120687.89	119459.52	1228.36	45449.49
d= 10	39.1	38.05	119459.52	118237.44	1222.08	46500.20
d= 11	39.6	39.35	118237.44	117021.64	1215.80	47841.66
d= 12	39.1	39.35	117021.64	115812.13	1209.52	47594.42
d= 13	39.3	39.20	115812.13	114608.90	1203.23	47166.69
d= 14	41.7	40.50	114608.90	113411.95	1196.95	48476.42
d= 15	41.1	41.40	113411.95	112221.28	1190.67	49293.55
d= 16	43.3	42.20	112221.28	111036.90	1184.38	49980.93
d= 17	43.3	43.30	111036.90	109858.80	1178.10	51011.69
drem 22.6	43.6					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **728598.49**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.60
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **514613.07**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1243211.56**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.04**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT B, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.8	11.40	130741.00	129462.37	1278.63	14576.38
d= 2	26.3	24.55	129462.37	128190.02	1272.35	31236.12
d= 3	28.9	27.60	128190.02	126923.96	1266.06	34943.36
d= 4	30.8	29.85	126923.96	125664.18	1259.78	37604.45
d= 5	33.1	31.95	125664.18	124410.68	1253.50	40049.24
d= 6	33.1	33.10	124410.68	123163.47	1247.21	41282.79
d= 7	35.3	34.20	123163.47	121922.54	1240.93	42439.84
d= 8	34.9	35.10	121922.54	120687.89	1234.65	43336.14
d= 9	35.5	35.20	120687.89	119459.52	1228.36	43238.43
d= 10	34.8	35.15	119459.52	118237.44	1222.08	42956.16
d= 11	38.8	36.80	118237.44	117021.64	1215.80	44741.37
d= 12	38.1	38.45	117021.64	115812.13	1209.52	46505.85
d= 13	37.1	37.60	115812.13	114608.90	1203.23	45241.52
d= 14	39.7	38.40	114608.90	113411.95	1196.95	45962.83
d= 15	40.6	40.15	113411.95	112221.28	1190.67	47805.22
d= 16	43.6	42.10	112221.28	111036.90	1184.38	49862.50
d= 17	42.9	43.25	111036.90	109858.80	1178.10	50952.79
drem 22.6	42.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **702734.98**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.70
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **503990.32**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1206725.3**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **36.92**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 8
PORT C, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	21.9	10.95	130741.00	129462.37	1278.63	14001.00
d= 2	27.0	24.45	129462.37	128190.02	1272.35	31108.88
d= 3	28.1	27.55	128190.02	126923.96	1266.06	34880.05
d= 4	31.2	29.65	126923.96	125664.18	1259.78	37352.49
d= 5	31.6	31.40	125664.18	124410.68	1253.50	39359.82
d= 6	34.2	32.90	124410.68	123163.47	1247.21	41033.34
d= 7	34.2	34.20	123163.47	121922.54	1240.93	42439.84
d= 8	36.0	35.10	121922.54	120687.89	1234.65	43336.14
d= 9	36.0	36.00	120687.89	119459.52	1228.36	44221.13
d= 10	37.8	36.90	119459.52	118237.44	1222.08	45094.80
d= 11	38.8	38.30	118237.44	117021.64	1215.80	46565.07
d= 12	38.5	38.65	117021.64	115812.13	1209.52	46747.76
d= 13	39.7	39.10	115812.13	114608.90	1203.23	47046.37
d= 14	39.7	39.70	114608.90	113411.95	1196.95	47518.86
d= 15	41.6	40.65	113411.95	112221.28	1190.67	48400.55
d= 16	42.9	42.25	112221.28	111036.90	1184.38	50040.15
d= 17	43.4	43.15	111036.90	109858.80	1178.10	50834.98
drem 22.6	43.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **709981.23**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.70
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **515793.37**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1225774.6**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.50**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.5	12.25	130741.00	129462.37	1278.63	15663.22
d= 2	29.8	27.15	129462.37	128190.02	1272.35	34544.22
d= 3	33.7	31.75	128190.02	126923.96	1266.06	40197.52
d= 4	33.7	33.70	126923.96	125664.18	1259.78	42454.60
d= 5	36.1	34.90	125664.18	124410.68	1253.50	43747.06
d= 6	36.7	36.40	124410.68	123163.47	1247.21	45398.59
d= 7	39.6	38.15	123163.47	121922.54	1240.93	47341.52
d= 8	40.2	39.90	121922.54	120687.89	1234.65	49262.45
d= 9	39.5	39.85	120687.89	119459.52	1228.36	48950.33
d= 10	39.4	39.45	119459.52	118237.44	1222.08	48211.11
d= 11	39.2	39.30	118237.44	117021.64	1215.80	47780.87
d= 12	39.6	39.40	117021.64	115812.13	1209.52	47654.89
d= 13	40.4	40.00	115812.13	114608.90	1203.23	48129.27
d= 14	40.9	40.65	114608.90	113411.95	1196.95	48655.96
d= 15	42.1	41.50	113411.95	112221.28	1190.67	49412.62
d= 16	42.0	42.05	112221.28	111036.90	1184.38	49803.28
d= 17	43.1	42.55	111036.90	109858.80	1178.10	50128.12
drem 22.6	41.2					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **757335.63**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.20
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **486285.74**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1243621.37**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.05**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.5	11.75	130741.00	129462.37	1278.63	15023.90
d= 2	28.4	25.95	129462.37	128190.02	1272.35	33017.40
d= 3	31.8	30.10	128190.02	126923.96	1266.06	38108.52
d= 4	32.3	32.05	126923.96	125664.18	1259.78	40375.96
d= 5	34.1	33.20	125664.18	124410.68	1253.50	41616.11
d= 6	35.1	34.60	124410.68	123163.47	1247.21	43153.61
d= 7	38.0	36.55	123163.47	121922.54	1240.93	45356.03
d= 8	37.9	37.95	121922.54	120687.89	1234.65	46854.88
d= 9	39.7	38.80	120687.89	119459.52	1228.36	47660.55
d= 10	39.6	39.65	119459.52	118237.44	1222.08	48455.53
d= 11	37.1	38.35	118237.44	117021.64	1215.80	46625.86
d= 12	38.5	37.80	117021.64	115812.13	1209.52	45719.67
d= 13	38.7	38.60	115812.13	114608.90	1203.23	46444.75
d= 14	40.0	39.35	114608.90	113411.95	1196.95	47099.93
d= 15	40.2	40.10	113411.95	112221.28	1190.67	47745.69
d= 16	40.5	40.35	112221.28	111036.90	1184.38	47789.83
d= 17	40.4	40.45	111036.90	109858.80	1178.10	47654.11
drem 22.6	41.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **728702.32**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.10
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **485105.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1213807.76**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.14**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.8	11.90	130741.00	129462.37	1278.63	15215.70
d= 2	29.3	26.55	129462.37	128190.02	1272.35	33780.81
d= 3	31.4	30.35	128190.02	126923.96	1266.06	38425.03
d= 4	34.4	32.90	126923.96	125664.18	1259.78	41446.78
d= 5	35.4	34.90	125664.18	124410.68	1253.50	43747.06
d= 6	36.5	35.95	124410.68	123163.47	1247.21	44837.35
d= 7	37.1	36.80	123163.47	121922.54	1240.93	45666.26
d= 8	39.6	38.35	121922.54	120687.89	1234.65	47348.74
d= 9	38.5	39.05	120687.89	119459.52	1228.36	47967.64
d= 10	38.9	38.70	119459.52	118237.44	1222.08	47294.55
d= 11	37.9	38.40	118237.44	117021.64	1215.80	46686.65
d= 12	38.9	38.40	117021.64	115812.13	1209.52	46445.38
d= 13	39.3	39.10	115812.13	114608.90	1203.23	47046.37
d= 14	39.7	39.50	114608.90	113411.95	1196.95	47279.47
d= 15	41.1	40.40	113411.95	112221.28	1190.67	48102.89
d= 16	41.0	41.05	112221.28	111036.90	1184.38	48618.89
d= 17	41.0	41.00	111036.90	109858.80	1178.10	48302.06
drem 22.6	44.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **738211.62**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.10
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **520514.60**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1258726.22**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.51**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT A, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.3	11.65	130741.00	129462.37	1278.63	14896.04
d= 2	29.4	26.35	129462.37	128190.02	1272.35	33526.34
d= 3	31.1	30.25	128190.02	126923.96	1266.06	38298.43
d= 4	35.7	33.40	126923.96	125664.18	1259.78	42076.67
d= 5	37.1	36.40	125664.18	124410.68	1253.50	45627.30
d= 6	34.3	35.70	124410.68	123163.47	1247.21	44525.54
d= 7	39.3	36.80	123163.47	121922.54	1240.93	45666.26
d= 8	41.4	40.35	121922.54	120687.89	1234.65	49818.04
d= 9	39.1	40.25	120687.89	119459.52	1228.36	49441.67
d= 10	39.7	39.40	119459.52	118237.44	1222.08	48150.01
d= 11	38.9	39.30	118237.44	117021.64	1215.80	47780.87
d= 12	40.9	39.90	117021.64	115812.13	1209.52	48259.65
d= 13	40.7	40.80	115812.13	114608.90	1203.23	49091.86
d= 14	40.6	40.65	114608.90	113411.95	1196.95	48655.96
d= 15	41.6	41.10	113411.95	112221.28	1190.67	48936.35
d= 16	40.6	41.10	112221.28	111036.90	1184.38	48678.11
d= 17	41.4	41.00	111036.90	109858.80	1178.10	48302.06
drem 22.6	42.0					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **751731.17**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.00
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **495728.19**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1247459.36**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.17**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT B, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.1	12.05	130741.00	129462.37	1278.63	15407.49
d= 2	28.5	26.30	129462.37	128190.02	1272.35	33462.72
d= 3	29.8	29.15	128190.02	126923.96	1266.06	36905.76
d= 4	30.4	30.10	126923.96	125664.18	1259.78	37919.39
d= 5	33.5	31.95	125664.18	124410.68	1253.50	40049.24
d= 6	35.1	34.30	124410.68	123163.47	1247.21	42779.44
d= 7	38.3	36.70	123163.47	121922.54	1240.93	45542.17
d= 8	38.9	38.60	121922.54	120687.89	1234.65	47657.40
d= 9	37.4	38.15	120687.89	119459.52	1228.36	46862.11
d= 10	40.2	38.80	119459.52	118237.44	1222.08	47416.76
d= 11	36.5	38.35	118237.44	117021.64	1215.80	46625.86
d= 12	38.2	37.35	117021.64	115812.13	1209.52	45175.39
d= 13	38.7	38.45	115812.13	114608.90	1203.23	46264.27
d= 14	40.0	39.35	114608.90	113411.95	1196.95	47099.93
d= 15	40.7	40.35	113411.95	112221.28	1190.67	48043.35
d= 16	39.2	39.95	112221.28	111036.90	1184.38	47316.07
d= 17	40.7	39.95	111036.90	109858.80	1178.10	47065.06
drem 22.6	41.5					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **721592.42**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.50
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **489826.66**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1211419.08**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.06**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Run 11
PORT C, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.1	11.55	130741.00	129462.37	1278.63	14768.18
d= 2	28.0	25.55	129462.37	128190.02	1272.35	32508.46
d= 3	31.4	29.70	128190.02	126923.96	1266.06	37602.09
d= 4	33.1	32.25	126923.96	125664.18	1259.78	40627.92
d= 5	35.1	34.10	125664.18	124410.68	1253.50	42744.26
d= 6	35.5	35.30	124410.68	123163.47	1247.21	44026.66
d= 7	37.5	36.50	123163.47	121922.54	1240.93	45293.98
d= 8	40.6	39.05	121922.54	120687.89	1234.65	48213.00
d= 9	40.0	40.30	120687.89	119459.52	1228.36	49503.09
d= 10	39.8	39.90	119459.52	118237.44	1222.08	48761.05
d= 11	39.2	39.50	118237.44	117021.64	1215.80	48024.03
d= 12	39.2	39.20	117021.64	115812.13	1209.52	47412.99
d= 13	40.0	39.60	115812.13	114608.90	1203.23	47647.98
d= 14	40.5	40.25	114608.90	113411.95	1196.95	48177.18
d= 15	42.7	41.60	113411.95	112221.28	1190.67	49531.69
d= 16	39.3	41.00	112221.28	111036.90	1184.38	48559.68
d= 17	41.9	40.60	111036.90	109858.80	1178.10	47830.83
drem 22.6	41.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **741233.05**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 41.70
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **492187.27**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1233420.32**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.74**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 1
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.6	12.80	130741.00	129462.37	1278.63	16366.46
d= 2	29.3	27.45	129462.37	128190.02	1272.35	34925.92
d= 3	33.2	31.25	128190.02	126923.96	1266.06	39564.49
d= 4	35.3	34.25	126923.96	125664.18	1259.78	43147.48
d= 5	36.6	35.95	125664.18	124410.68	1253.50	45063.23
d= 6	36.5	36.55	124410.68	123163.47	1247.21	45585.68
d= 7	39.0	37.75	123163.47	121922.54	1240.93	46845.14
d= 8	40.2	39.60	121922.54	120687.89	1234.65	48892.05
d= 9	40.6	40.40	120687.89	119459.52	1228.36	49625.93
d= 10	41.5	41.05	119459.52	118237.44	1222.08	50166.44
d= 11	40.4	40.95	118237.44	117021.64	1215.80	49786.94
d= 12	41.4	40.90	117021.64	115812.13	1209.52	49469.17
d= 13	42.2	41.80	115812.13	114608.90	1203.23	50295.09
d= 14	42.2	42.20	114608.90	113411.95	1196.95	50511.23
d= 15	43.8	43.00	113411.95	112221.28	1190.67	51198.62
d= 16	41.7	42.75	112221.28	111036.90	1184.38	50632.34
d= 17	46.1	43.90	111036.90	109858.80	1178.10	51718.55
drem 22.6	44.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **773794.77**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.90
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **529957.04**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1303751.81**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **39.89**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 1
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.1	12.55	130741.00	129462.37	1278.63	16046.81
d= 2	28.7	26.90	129462.37	128190.02	1272.35	34226.13
d= 3	30.3	29.50	128190.02	126923.96	1266.06	37348.88
d= 4	34.9	32.60	126923.96	125664.18	1259.78	41068.84
d= 5	34.9	34.90	125664.18	124410.68	1253.50	43747.06
d= 6	35.9	35.40	124410.68	123163.47	1247.21	44151.38
d= 7	37.8	36.85	123163.47	121922.54	1240.93	45728.31
d= 8	39.1	38.45	121922.54	120687.89	1234.65	47472.21
d= 9	40.0	39.55	120687.89	119459.52	1228.36	48581.82
d= 10	41.6	40.80	119459.52	118237.44	1222.08	49860.92
d= 11	39.9	40.75	118237.44	117021.64	1215.80	49543.78
d= 12	40.1	40.00	117021.64	115812.13	1209.52	48380.60
d= 13	41.7	40.90	115812.13	114608.90	1203.23	49212.18
d= 14	41.5	41.60	114608.90	113411.95	1196.95	49793.07
d= 15	41.2	41.35	113411.95	112221.28	1190.67	49234.02
d= 16	42.3	41.75	112221.28	111036.90	1184.38	49447.96
d= 17	44.2	43.25	111036.90	109858.80	1178.10	50952.79
drem 22.6	43.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **754796.74**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.90
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **518153.99**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1272950.73**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.95**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 1
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.7	11.85	130741.00	129462.37	1278.63	15151.77
d= 2	29.5	26.60	129462.37	128190.02	1272.35	33844.43
d= 3	30.5	30.00	128190.02	126923.96	1266.06	37981.91
d= 4	34.5	32.50	126923.96	125664.18	1259.78	40942.87
d= 5	35.3	34.90	125664.18	124410.68	1253.50	43747.06
d= 6	36.5	35.90	124410.68	123163.47	1247.21	44774.99
d= 7	37.4	36.95	123163.47	121922.54	1240.93	45852.40
d= 8	39.5	38.45	121922.54	120687.89	1234.65	47472.21
d= 9	39.5	39.50	120687.89	119459.52	1228.36	48520.40
d= 10	40.5	40.00	119459.52	118237.44	1222.08	48883.26
d= 11	41.3	40.90	118237.44	117021.64	1215.80	49726.15
d= 12	41.4	41.35	117021.64	115812.13	1209.52	50013.45
d= 13	42.2	41.80	115812.13	114608.90	1203.23	50295.09
d= 14	42.0	42.10	114608.90	113411.95	1196.95	50391.54
d= 15	42.5	42.25	113411.95	112221.28	1190.67	50305.62
d= 16	43.1	42.80	112221.28	111036.90	1184.38	50691.56
d= 17	43.6	43.35	111036.90	109858.80	1178.10	51070.60
drem 22.6	43.4					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **759665.28**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.40
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **512252.46**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1271917.74**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.91**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 1
PORT A, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.6	12.80	130741.00	129462.37	1278.63	16366.46
d= 2	30.6	28.10	129462.37	128190.02	1272.35	35752.95
d= 3	30.2	30.40	128190.02	126923.96	1266.06	38488.34
d= 4	34.1	32.15	126923.96	125664.18	1259.78	40501.94
d= 5	36.1	35.10	125664.18	124410.68	1253.50	43997.76
d= 6	36.7	36.40	124410.68	123163.47	1247.21	45398.59
d= 7	37.0	36.85	123163.47	121922.54	1240.93	45728.31
d= 8	40.1	38.55	121922.54	120687.89	1234.65	47595.67
d= 9	41.1	40.60	120687.89	119459.52	1228.36	49871.60
d= 10	38.9	40.00	119459.52	118237.44	1222.08	48883.26
d= 11	40.5	39.70	118237.44	117021.64	1215.80	48267.19
d= 12	39.9	40.20	117021.64	115812.13	1209.52	48622.50
d= 13	40.7	40.30	115812.13	114608.90	1203.23	48490.24
d= 14	42.4	41.55	114608.90	113411.95	1196.95	49733.22
d= 15	43.1	42.75	113411.95	112221.28	1190.67	50900.95
d= 16	43.6	43.35	112221.28	111036.90	1184.38	51342.97
d= 17	45.9	44.75	111036.90	109858.80	1178.10	52719.94
drem 22.6	43.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **762661.89**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.10
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **508711.54**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1271373.43**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.90**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 1
PORT B, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.3	12.15	130741.00	129462.37	1278.63	15535.35
d= 2	29.2	26.75	129462.37	128190.02	1272.35	34035.28
d= 3	30.7	29.95	128190.02	126923.96	1266.06	37918.61
d= 4	34.2	32.45	126923.96	125664.18	1259.78	40879.88
d= 5	34.5	34.35	125664.18	124410.68	1253.50	43057.63
d= 6	35.6	35.05	124410.68	123163.47	1247.21	43714.86
d= 7	37.6	36.60	123163.47	121922.54	1240.93	45418.07
d= 8	38.3	37.95	121922.54	120687.89	1234.65	46854.88
d= 9	38.1	38.20	120687.89	119459.52	1228.36	46923.53
d= 10	40.2	39.15	119459.52	118237.44	1222.08	47844.49
d= 11	40.1	40.15	118237.44	117021.64	1215.80	48814.30
d= 12	41.4	40.75	117021.64	115812.13	1209.52	49287.74
d= 13	41.3	41.35	115812.13	114608.90	1203.23	49753.64
d= 14	40.7	41.00	114608.90	113411.95	1196.95	49074.90
d= 15	40.1	40.40	113411.95	112221.28	1190.67	48102.89
d= 16	43.3	41.70	112221.28	111036.90	1184.38	49388.74
d= 17	44.7	44.00	111036.90	109858.80	1178.10	51836.36
drem 22.6	44.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **748441.14**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.10
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **520514.60**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1268955.73**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.82**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 1
PORT C, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.8	12.40	130741.00	129462.37	1278.63	15855.01
d= 2	28.6	26.70	129462.37	128190.02	1272.35	33971.66
d= 3	31.5	30.05	128190.02	126923.96	1266.06	38045.21
d= 4	34.2	32.85	126923.96	125664.18	1259.78	41383.79
d= 5	35.0	34.60	125664.18	124410.68	1253.50	43371.01
d= 6	33.6	34.30	124410.68	123163.47	1247.21	42779.44
d= 7	38.6	36.10	123163.47	121922.54	1240.93	44797.61
d= 8	40.4	39.50	121922.54	120687.89	1234.65	48768.59
d= 9	40.1	40.25	120687.89	119459.52	1228.36	49441.67
d= 10	41.9	41.00	119459.52	118237.44	1222.08	50105.34
d= 11	40.4	41.15	118237.44	117021.64	1215.80	50030.10
d= 12	39.8	40.10	117021.64	115812.13	1209.52	48501.55
d= 13	41.6	40.70	115812.13	114608.90	1203.23	48971.54
d= 14	42.7	42.15	114608.90	113411.95	1196.95	50451.39
d= 15	43.1	42.90	113411.95	112221.28	1190.67	51079.55
d= 16	43.3	43.20	112221.28	111036.90	1184.38	51165.32
d= 17	45.9	44.60	111036.90	109858.80	1178.10	52543.22
drem 22.6	44.5					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **761262.00**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.50
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **525235.82**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1286497.81**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **39.36**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 2
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	26.3	13.15	130741.00	129462.37	1278.63	16813.98
d= 2	29.4	27.85	129462.37	128190.02	1272.35	35434.86
d= 3	31.6	30.50	128190.02	126923.96	1266.06	38614.94
d= 4	34.5	33.05	126923.96	125664.18	1259.78	41635.75
d= 5	36.6	35.55	125664.18	124410.68	1253.50	44561.83
d= 6	36.2	36.40	124410.68	123163.47	1247.21	45398.59
d= 7	37.9	37.05	123163.47	121922.54	1240.93	45976.49
d= 8	40.4	39.15	121922.54	120687.89	1234.65	48336.46
d= 9	40.5	40.45	120687.89	119459.52	1228.36	49687.35
d= 10	41.1	40.80	119459.52	118237.44	1222.08	49860.92
d= 11	42.1	41.60	118237.44	117021.64	1215.80	50577.21
d= 12	40.9	41.50	117021.64	115812.13	1209.52	50194.87
d= 13	42.8	41.85	115812.13	114608.90	1203.23	50355.25
d= 14	43.3	43.05	114608.90	113411.95	1196.95	51528.64
d= 15	42.7	43.00	113411.95	112221.28	1190.67	51198.62
d= 16	44.3	43.50	112221.28	111036.90	1184.38	51520.63
d= 17	44.4	44.35	111036.90	109858.80	1178.10	52248.70
drem 22.6	44.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **773945.09**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.30
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **522875.21**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1296820.3**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **39.68**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 2
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.5	12.25	130741.00	129462.37	1278.63	15663.22
d= 2	29.2	26.85	129462.37	128190.02	1272.35	34162.51
d= 3	30.2	29.70	128190.02	126923.96	1266.06	37602.09
d= 4	33.6	31.90	126923.96	125664.18	1259.78	40187.00
d= 5	36.1	34.85	125664.18	124410.68	1253.50	43684.38
d= 6	36.4	36.25	124410.68	123163.47	1247.21	45211.51
d= 7	36.3	36.35	123163.47	121922.54	1240.93	45107.84
d= 8	38.6	37.45	121922.54	120687.89	1234.65	46237.56
d= 9	39.4	39.00	120687.89	119459.52	1228.36	47906.22
d= 10	40.3	39.85	119459.52	118237.44	1222.08	48699.94
d= 11	41.6	40.95	118237.44	117021.64	1215.80	49786.94
d= 12	41.7	41.65	117021.64	115812.13	1209.52	50376.30
d= 13	42.8	42.25	115812.13	114608.90	1203.23	50836.55
d= 14	41.5	42.15	114608.90	113411.95	1196.95	50451.39
d= 15	42.6	42.05	113411.95	112221.28	1190.67	50067.48
d= 16	42.4	42.50	112221.28	111036.90	1184.38	50336.25
d= 17	44.7	43.55	111036.90	109858.80	1178.10	51306.22
drem 22.6	43.5					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **757623.40**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.50
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **513432.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1271056.16**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.89**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 2
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.5	12.25	130741.00	129462.37	1278.63	15663.22
d= 2	28.7	26.60	129462.37	128190.02	1272.35	33844.43
d= 3	30.6	29.65	128190.02	126923.96	1266.06	37538.79
d= 4	33.6	32.10	126923.96	125664.18	1259.78	40438.95
d= 5	36.1	34.85	125664.18	124410.68	1253.50	43684.38
d= 6	35.9	36.00	124410.68	123163.47	1247.21	44899.71
d= 7	37.8	36.85	123163.47	121922.54	1240.93	45728.31
d= 8	38.7	38.25	121922.54	120687.89	1234.65	47225.28
d= 9	39.3	39.00	120687.89	119459.52	1228.36	47906.22
d= 10	39.6	39.45	119459.52	118237.44	1222.08	48211.11
d= 11	42.2	40.90	118237.44	117021.64	1215.80	49726.15
d= 12	42.2	42.20	117021.64	115812.13	1209.52	51041.53
d= 13	43.0	42.60	115812.13	114608.90	1203.23	51257.68
d= 14	42.3	42.65	114608.90	113411.95	1196.95	51049.86
d= 15	43.5	42.90	113411.95	112221.28	1190.67	51079.55
d= 16	42.2	42.85	112221.28	111036.90	1184.38	50750.78
d= 17	44.2	43.20	111036.90	109858.80	1178.10	50893.88
drem 22.6	43.5					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **760939.82**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 43.50
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **513432.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1274372.59**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.99**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 2
PORT A, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.6	12.30	130741.00	129462.37	1278.63	15727.15
d= 2	28.7	26.65	129462.37	128190.02	1272.35	33908.04
d= 3	32.2	30.45	128190.02	126923.96	1266.06	38551.64
d= 4	34.2	33.20	126923.96	125664.18	1259.78	41824.71
d= 5	36.4	35.30	125664.18	124410.68	1253.50	44248.45
d= 6	39.1	37.75	124410.68	123163.47	1247.21	47082.33
d= 7	38.0	38.55	123163.47	121922.54	1240.93	47837.89
d= 8	38.3	38.15	121922.54	120687.89	1234.65	47101.81
d= 9	39.5	38.90	120687.89	119459.52	1228.36	47783.38
d= 10	39.2	39.35	119459.52	118237.44	1222.08	48088.90
d= 11	42.6	40.90	118237.44	117021.64	1215.80	49726.15
d= 12	42.6	42.60	117021.64	115812.13	1209.52	51525.34
d= 13	42.7	42.65	115812.13	114608.90	1203.23	51317.84
d= 14	42.9	42.80	114608.90	113411.95	1196.95	51229.40
d= 15	43.4	43.15	113411.95	112221.28	1190.67	51377.22
d= 16	44.9	44.15	112221.28	111036.90	1184.38	52290.48
d= 17	44.1	44.50	111036.90	109858.80	1178.10	52425.41
drem 22.6	45.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **772046.16**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 45.30
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **534678.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1306724.41**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **39.98**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 2
PORT B, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.8	11.90	130741.00	129462.37	1278.63	15215.70
d= 2	28.2	26.00	129462.37	128190.02	1272.35	33081.02
d= 3	30.1	29.15	128190.02	126923.96	1266.06	36905.76
d= 4	31.4	30.75	126923.96	125664.18	1259.78	38738.25
d= 5	36.1	33.75	125664.18	124410.68	1253.50	42305.53
d= 6	36.4	36.25	124410.68	123163.47	1247.21	45211.51
d= 7	36.6	36.50	123163.47	121922.54	1240.93	45293.98
d= 8	37.1	36.85	121922.54	120687.89	1234.65	45496.77
d= 9	37.9	37.50	120687.89	119459.52	1228.36	46063.67
d= 10	39.4	38.65	119459.52	118237.44	1222.08	47233.45
d= 11	40.5	39.95	118237.44	117021.64	1215.80	48571.14
d= 12	41.6	41.05	117021.64	115812.13	1209.52	49650.59
d= 13	41.0	41.30	115812.13	114608.90	1203.23	49693.48
d= 14	42.3	41.65	114608.90	113411.95	1196.95	49852.91
d= 15	41.9	42.10	113411.95	112221.28	1190.67	50127.02
d= 16	44.3	43.10	112221.28	111036.90	1184.38	51046.88
d= 17	42.7	43.50	111036.90	109858.80	1178.10	51247.31
drem 22.6	42.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **745734.96**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.90
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **506350.93**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1252085.9**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.31**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 2
PORT C, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.7	11.85	130741.00	129462.37	1278.63	15151.77
d= 2	28.7	26.20	129462.37	128190.02	1272.35	33335.49
d= 3	30.7	29.70	128190.02	126923.96	1266.06	37602.09
d= 4	32.6	31.65	126923.96	125664.18	1259.78	39872.05
d= 5	34.1	33.35	125664.18	124410.68	1253.50	41804.14
d= 6	35.4	34.75	124410.68	123163.47	1247.21	43340.69
d= 7	37.7	36.55	123163.47	121922.54	1240.93	45356.03
d= 8	39.0	38.35	121922.54	120687.89	1234.65	47348.74
d= 9	39.3	39.15	120687.89	119459.52	1228.36	48090.47
d= 10	41.1	40.20	119459.52	118237.44	1222.08	49127.67
d= 11	41.7	41.40	118237.44	117021.64	1215.80	50334.05
d= 12	42.1	41.90	117021.64	115812.13	1209.52	50678.68
d= 13	43.9	43.00	115812.13	114608.90	1203.23	51738.97
d= 14	44.5	44.20	114608.90	113411.95	1196.95	52905.13
d= 15	41.8	43.15	113411.95	112221.28	1190.67	51377.22
d= 16	43.2	42.50	112221.28	111036.90	1184.38	50336.25
d= 17	44.0	43.60	111036.90	109858.80	1178.10	51365.12
drem 22.6	44.5					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **759764.55**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.50
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **525235.82**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1285000.37**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **39.31**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 3
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.1	12.05	130741.00	129462.37	1278.63	15407.49
d= 2	27.7	25.90	129462.37	128190.02	1272.35	32953.78
d= 3	31.1	29.40	128190.02	126923.96	1266.06	37222.27
d= 4	32.4	31.75	126923.96	125664.18	1259.78	39998.03
d= 5	34.2	33.30	125664.18	124410.68	1253.50	41741.46
d= 6	35.5	34.85	124410.68	123163.47	1247.21	43465.41
d= 7	36.9	36.20	123163.47	121922.54	1240.93	44921.70
d= 8	37.2	37.05	121922.54	120687.89	1234.65	45743.70
d= 9	38.6	37.90	120687.89	119459.52	1228.36	46555.02
d= 10	39.7	39.15	119459.52	118237.44	1222.08	47844.49
d= 11	42.6	41.15	118237.44	117021.64	1215.80	50030.10
d= 12	41.1	41.85	117021.64	115812.13	1209.52	50618.20
d= 13	40.9	41.00	115812.13	114608.90	1203.23	49332.51
d= 14	43.5	42.20	114608.90	113411.95	1196.95	50511.23
d= 15	43.6	43.55	113411.95	112221.28	1190.67	51853.48
d= 16	43.6	43.60	112221.28	111036.90	1184.38	51639.07
d= 17	44.2	43.90	111036.90	109858.80	1178.10	51718.55
drem 22.6	45.4					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **751556.50**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 45.40
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **535858.56**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1287415.06**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **39.39**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 3
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	23.3	11.65	130741.00	129462.37	1278.63	14896.04
d= 2	28.3	25.80	129462.37	128190.02	1272.35	32826.55
d= 3	29.8	29.05	128190.02	126923.96	1266.06	36779.15
d= 4	31.7	30.75	126923.96	125664.18	1259.78	38738.25
d= 5	33.2	32.45	125664.18	124410.68	1253.50	40675.99
d= 6	33.0	33.10	124410.68	123163.47	1247.21	41282.79
d= 7	35.2	34.10	123163.47	121922.54	1240.93	42315.75
d= 8	36.2	35.70	121922.54	120687.89	1234.65	44076.93
d= 9	37.2	36.70	120687.89	119459.52	1228.36	45080.98
d= 10	39.5	38.35	119459.52	118237.44	1222.08	46866.82
d= 11	40.7	40.10	118237.44	117021.64	1215.80	48753.51
d= 12	42.4	41.55	117021.64	115812.13	1209.52	50255.35
d= 13	41.7	42.05	115812.13	114608.90	1203.23	50595.90
d= 14	42.2	41.95	114608.90	113411.95	1196.95	50212.00
d= 15	42.3	42.25	113411.95	112221.28	1190.67	50305.62
d= 16	43.1	42.70	112221.28	111036.90	1184.38	50573.13
d= 17	43.0	43.05	111036.90	109858.80	1178.10	50717.17
drem 22.6	44.2					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **734951.90**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.20
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **521694.90**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1256646.8**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.45**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 3
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	23.3	11.65	130741.00	129462.37	1278.63	14896.04
d= 2	26.9	25.10	129462.37	128190.02	1272.35	31935.91
d= 3	29.5	28.20	128190.02	126923.96	1266.06	35703.00
d= 4	30.9	30.20	126923.96	125664.18	1259.78	38045.37
d= 5	32.2	31.55	125664.18	124410.68	1253.50	39547.84
d= 6	33.6	32.90	124410.68	123163.47	1247.21	41033.34
d= 7	35.0	34.30	123163.47	121922.54	1240.93	42563.93
d= 8	37.3	36.15	121922.54	120687.89	1234.65	44632.52
d= 9	37.3	37.30	120687.89	119459.52	1228.36	45818.00
d= 10	40.7	39.00	119459.52	118237.44	1222.08	47661.17
d= 11	40.9	40.80	118237.44	117021.64	1215.80	49604.57
d= 12	41.9	41.40	117021.64	115812.13	1209.52	50073.92
d= 13	43.2	42.55	115812.13	114608.90	1203.23	51197.52
d= 14	42.7	42.95	114608.90	113411.95	1196.95	51408.95
d= 15	43.2	42.95	113411.95	112221.28	1190.67	51139.08
d= 16	42.7	42.95	112221.28	111036.90	1184.38	50869.22
d= 17	44.2	43.45	111036.90	109858.80	1178.10	51188.41
drem 22.6	44.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **737318.78**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.30
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **522875.21**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1260193.99**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.56**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 3
PORT A, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.8	11.40	130741.00	129462.37	1278.63	14576.38
d= 2	27.4	25.10	129462.37	128190.02	1272.35	31935.91
d= 3	30.5	28.95	128190.02	126923.96	1266.06	36652.54
d= 4	31.5	31.00	126923.96	125664.18	1259.78	39053.20
d= 5	34.6	33.05	125664.18	124410.68	1253.50	41428.09
d= 6	35.6	35.10	124410.68	123163.47	1247.21	43777.22
d= 7	36.1	35.85	123163.47	121922.54	1240.93	44487.37
d= 8	36.3	36.20	121922.54	120687.89	1234.65	44694.25
d= 9	38.0	37.15	120687.89	119459.52	1228.36	45633.74
d= 10	40.6	39.30	119459.52	118237.44	1222.08	48027.80
d= 11	41.0	40.80	118237.44	117021.64	1215.80	49604.57
d= 12	42.9	41.95	117021.64	115812.13	1209.52	50739.16
d= 13	42.7	42.80	115812.13	114608.90	1203.23	51498.32
d= 14	41.1	41.90	114608.90	113411.95	1196.95	50152.15
d= 15	43.2	42.15	113411.95	112221.28	1190.67	50186.55
d= 16	41.6	42.40	112221.28	111036.90	1184.38	50217.81
d= 17	43.9	42.75	111036.90	109858.80	1178.10	50363.74
drem 22.6	44.5					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **743028.79**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 44.50
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **525235.82**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1268264.61**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.80**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 3
PORT B, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.5	11.75	130741.00	129462.37	1278.63	15023.90
d= 2	26.8	25.15	129462.37	128190.02	1272.35	31999.52
d= 3	30.1	28.45	128190.02	126923.96	1266.06	36019.51
d= 4	30.6	30.35	126923.96	125664.18	1259.78	38234.34
d= 5	32.9	31.75	125664.18	124410.68	1253.50	39798.54
d= 6	32.6	32.75	124410.68	123163.47	1247.21	40846.26
d= 7	34.2	33.40	123163.47	121922.54	1240.93	41447.09
d= 8	34.9	34.55	121922.54	120687.89	1234.65	42657.08
d= 9	37.9	36.40	120687.89	119459.52	1228.36	44712.47
d= 10	37.8	37.85	119459.52	118237.44	1222.08	46255.78
d= 11	41.1	39.45	118237.44	117021.64	1215.80	47963.24
d= 12	39.4	40.25	117021.64	115812.13	1209.52	48682.98
d= 13	40.9	40.15	115812.13	114608.90	1203.23	48309.76
d= 14	42.4	41.65	114608.90	113411.95	1196.95	49852.91
d= 15	41.7	42.05	113411.95	112221.28	1190.67	50067.48
d= 16	43.6	42.65	112221.28	111036.90	1184.38	50513.91
d= 17	42.7	43.15	111036.90	109858.80	1178.10	50834.98
drem 22.6	42.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **723219.76**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.30
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **499269.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1222488.87**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **37.40**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 3
PORT C, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.1	11.05	130741.00	129462.37	1278.63	14128.86
d= 2	27.7	24.90	129462.37	128190.02	1272.35	31681.44
d= 3	29.5	28.60	128190.02	126923.96	1266.06	36209.42
d= 4	31.2	30.35	126923.96	125664.18	1259.78	38234.34
d= 5	32.8	32.00	125664.18	124410.68	1253.50	40111.91
d= 6	34.1	33.45	124410.68	123163.47	1247.21	41719.31
d= 7	34.7	34.40	123163.47	121922.54	1240.93	42688.02
d= 8	36.0	35.35	121922.54	120687.89	1234.65	43644.80
d= 9	38.6	37.30	120687.89	119459.52	1228.36	45818.00
d= 10	40.5	39.55	119459.52	118237.44	1222.08	48333.32
d= 11	42.6	41.55	118237.44	117021.64	1215.80	50516.42
d= 12	42.0	42.30	117021.64	115812.13	1209.52	51162.49
d= 13	43.1	42.55	115812.13	114608.90	1203.23	51197.52
d= 14	44.4	43.75	114608.90	113411.95	1196.95	52366.50
d= 15	42.6	43.50	113411.95	112221.28	1190.67	51793.95
d= 16	43.2	42.90	112221.28	111036.90	1184.38	50810.00
d= 17	43.3	43.25	111036.90	109858.80	1178.10	50952.79
drem 22.6	42.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **741369.09**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 42.90
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **506350.93**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **1247720.02**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **38.17**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 4
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.7	9.85	130741.00	129462.37	1278.63	12594.51
d= 2	23.6	21.65	129462.37	128190.02	1272.35	27546.31
d= 3	25.9	24.75	128190.02	126923.96	1266.06	31335.08
d= 4	28.3	27.10	126923.96	125664.18	1259.78	34140.05
d= 5	27.8	28.05	125664.18	124410.68	1253.50	35160.60
d= 6	28.9	28.35	124410.68	123163.47	1247.21	35358.52
d= 7	31.7	30.30	123163.47	121922.54	1240.93	37600.21
d= 8	33.4	32.55	121922.54	120687.89	1234.65	40187.78
d= 9	31.6	32.50	120687.89	119459.52	1228.36	39921.85
d= 10	33.1	32.35	119459.52	118237.44	1222.08	39534.33
d= 11	31.6	32.35	118237.44	117021.64	1215.80	39331.07
d= 12	33.5	32.55	117021.64	115812.13	1209.52	39369.71
d= 13	35.4	34.45	115812.13	114608.90	1203.23	41451.34
d= 14	34.5	34.95	114608.90	113411.95	1196.95	41833.36
d= 15	36.6	35.55	113411.95	112221.28	1190.67	42328.16
d= 16	37.1	36.85	112221.28	111036.90	1184.38	43644.49
d= 17	36.7	36.90	111036.90	109858.80	1178.10	43471.86
drem 22.6	37.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **624809.22**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.30
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **440253.84**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1065063.07**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **32.59**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 4
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.9	9.95	130741.00	129462.37	1278.63	12722.37
d= 2	22.7	21.30	129462.37	128190.02	1272.35	27100.99
d= 3	25.4	24.05	128190.02	126923.96	1266.06	30448.83
d= 4	26.6	26.00	126923.96	125664.18	1259.78	32754.29
d= 5	28.9	27.75	125664.18	124410.68	1253.50	34784.55
d= 6	30.0	29.45	124410.68	123163.47	1247.21	36730.46
d= 7	30.7	30.35	123163.47	121922.54	1240.93	37662.25
d= 8	30.8	30.75	121922.54	120687.89	1234.65	37965.42
d= 9	31.2	31.00	120687.89	119459.52	1228.36	38079.30
d= 10	32.3	31.75	119459.52	118237.44	1222.08	38801.08
d= 11	32.2	32.25	118237.44	117021.64	1215.80	39209.49
d= 12	33.1	32.65	117021.64	115812.13	1209.52	39490.67
d= 13	33.4	33.25	115812.13	114608.90	1203.23	40007.46
d= 14	35.3	34.35	114608.90	113411.95	1196.95	41115.19
d= 15	34.6	34.95	113411.95	112221.28	1190.67	41613.76
d= 16	36.5	35.55	112221.28	111036.90	1184.38	42104.79
d= 17	36.7	36.60	111036.90	109858.80	1178.10	43118.43
drem 22.6	37.0					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **613709.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.00
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **436712.93**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1050422.26**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **32.14**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 4
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.1	9.55	130741.00	129462.37	1278.63	12210.92
d= 2	22.4	20.75	129462.37	128190.02	1272.35	26401.20
d= 3	25.7	24.05	128190.02	126923.96	1266.06	30448.83
d= 4	27.0	26.35	126923.96	125664.18	1259.78	33195.22
d= 5	28.7	27.85	125664.18	124410.68	1253.50	34909.90
d= 6	29.5	29.10	124410.68	123163.47	1247.21	36293.93
d= 7	31.3	30.40	123163.47	121922.54	1240.93	37724.30
d= 8	32.5	31.90	121922.54	120687.89	1234.65	39385.26
d= 9	32.0	32.25	120687.89	119459.52	1228.36	39614.76
d= 10	32.2	32.10	119459.52	118237.44	1222.08	39228.81
d= 11	32.6	32.40	118237.44	117021.64	1215.80	39391.86
d= 12	33.1	32.85	117021.64	115812.13	1209.52	39732.57
d= 13	34.2	33.65	115812.13	114608.90	1203.23	40488.75
d= 14	35.4	34.80	114608.90	113411.95	1196.95	41653.81
d= 15	36.5	35.95	113411.95	112221.28	1190.67	42804.42
d= 16	37.2	36.85	112221.28	111036.90	1184.38	43644.49
d= 17	36.9	37.05	111036.90	109858.80	1178.10	43648.57
drem 22.6	37.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **620777.61**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.10
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **437893.23**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1058670.84**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **32.39**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 4
PORT A, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.3	9.65	130741.00	129462.37	1278.63	12338.78
d= 2	22.9	21.10	129462.37	128190.02	1272.35	26846.52
d= 3	26.0	24.45	128190.02	126923.96	1266.06	30955.26
d= 4	28.0	27.00	126923.96	125664.18	1259.78	34014.07
d= 5	28.8	28.40	125664.18	124410.68	1253.50	35599.32
d= 6	29.0	28.90	124410.68	123163.47	1247.21	36044.49
d= 7	31.8	30.40	123163.47	121922.54	1240.93	37724.30
d= 8	33.1	32.45	121922.54	120687.89	1234.65	40064.32
d= 9	31.9	32.50	120687.89	119459.52	1228.36	39921.85
d= 10	32.4	32.15	119459.52	118237.44	1222.08	39289.92
d= 11	33.1	32.75	118237.44	117021.64	1215.80	39817.39
d= 12	33.9	33.50	117021.64	115812.13	1209.52	40518.75
d= 13	35.3	34.60	115812.13	114608.90	1203.23	41631.82
d= 14	36.1	35.70	114608.90	113411.95	1196.95	42731.07
d= 15	35.8	35.95	113411.95	112221.28	1190.67	42804.42
d= 16	36.2	36.00	112221.28	111036.90	1184.38	42637.76
d= 17	36.5	36.35	111036.90	109858.80	1178.10	42823.90
drem 22.6	37.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **625763.96**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.10
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **437893.23**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1063657.19**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **32.54**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 4
PORT B, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.0	10.00	130741.00	129462.37	1278.63	12786.30
d= 2	23.0	21.50	129462.37	128190.02	1272.35	27355.46
d= 3	26.0	24.50	128190.02	126923.96	1266.06	31018.56
d= 4	28.5	27.25	126923.96	125664.18	1259.78	34329.02
d= 5	26.8	27.65	125664.18	124410.68	1253.50	34659.20
d= 6	28.8	27.80	124410.68	123163.47	1247.21	34672.55
d= 7	29.9	29.35	123163.47	121922.54	1240.93	36421.32
d= 8	30.9	30.40	121922.54	120687.89	1234.65	37533.29
d= 9	29.9	30.40	120687.89	119459.52	1228.36	37342.28
d= 10	31.5	30.70	119459.52	118237.44	1222.08	37517.90
d= 11	31.2	31.35	118237.44	117021.64	1215.80	38115.27
d= 12	33.1	32.15	117021.64	115812.13	1209.52	38885.91
d= 13	34.8	33.95	115812.13	114608.90	1203.23	40849.72
d= 14	35.3	35.05	114608.90	113411.95	1196.95	41953.05
d= 15	35.6	35.45	113411.95	112221.28	1190.67	42209.09
d= 16	36.1	35.85	112221.28	111036.90	1184.38	42460.11
d= 17	36.1	36.10	111036.90	109858.80	1178.10	42529.38
drem 22.6	36.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **610638.42**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 36.70
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **433172.01**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1043810.43**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **31.94**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 4
PORT C, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.2	10.10	130741.00	129462.37	1278.63	12914.16
d= 2	23.3	21.75	129462.37	128190.02	1272.35	27673.54
d= 3	25.6	24.45	128190.02	126923.96	1266.06	30955.26
d= 4	27.1	26.35	126923.96	125664.18	1259.78	33195.22
d= 5	27.8	27.45	125664.18	124410.68	1253.50	34408.50
d= 6	30.0	28.90	124410.68	123163.47	1247.21	36044.49
d= 7	30.9	30.45	123163.47	121922.54	1240.93	37786.35
d= 8	31.6	31.25	121922.54	120687.89	1234.65	38582.74
d= 9	31.4	31.50	120687.89	119459.52	1228.36	38693.48
d= 10	32.1	31.75	119459.52	118237.44	1222.08	38801.08
d= 11	32.0	32.05	118237.44	117021.64	1215.80	38966.33
d= 12	33.5	32.75	117021.64	115812.13	1209.52	39611.62
d= 13	35.0	34.25	115812.13	114608.90	1203.23	41210.69
d= 14	36.5	35.75	114608.90	113411.95	1196.95	42790.92
d= 15	37.0	36.75	113411.95	112221.28	1190.67	43756.96
d= 16	36.4	36.70	112221.28	111036.90	1184.38	43466.83
d= 17	36.8	36.60	111036.90	109858.80	1178.10	43118.43
drem 22.6	35.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **621976.60**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.70
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **421368.96**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **1043345.56**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **31.92**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 5
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.5	6.75	130741.00	129462.37	1278.63	8630.75
d= 2	17.3	15.40	129462.37	128190.02	1272.35	19594.14
d= 3	18.5	17.90	128190.02	126923.96	1266.06	22662.54
d= 4	21.2	19.85	126923.96	125664.18	1259.78	25006.64
d= 5	23.0	22.10	125664.18	124410.68	1253.50	27702.29
d= 6	23.2	23.10	124410.68	123163.47	1247.21	28810.65
d= 7	24.9	24.05	123163.47	121922.54	1240.93	29844.39
d= 8	25.7	25.30	121922.54	120687.89	1234.65	31236.59
d= 9	24.9	25.30	120687.89	119459.52	1228.36	31077.62
d= 10	25.0	24.95	119459.52	118237.44	1222.08	30490.93
d= 11	28.9	26.95	118237.44	117021.64	1215.80	32765.76
d= 12	27.4	28.15	117021.64	115812.13	1209.52	34047.85
d= 13	29.5	28.45	115812.13	114608.90	1203.23	34231.95
d= 14	27.1	28.30	114608.90	113411.95	1196.95	33873.65
d= 15	29.2	28.15	113411.95	112221.28	1190.67	33517.23
d= 16	29.6	29.40	112221.28	111036.90	1184.38	34820.84
d= 17	31.1	30.35	111036.90	109858.80	1178.10	35755.31
drem 22.6	30.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **494069.13**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 30.70
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **362353.70**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **856422.832**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **26.20**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 5
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 204 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d 14.9	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	14.9	7.45	130741.00	129462.37	1278.63	9525.79
d= 2	17.0	15.95	129462.37	128190.02	1272.35	20293.93
d= 3	19.1	18.05	128190.02	126923.96	1266.06	22852.45
d= 4	20.3	19.70	126923.96	125664.18	1259.78	24817.68
d= 5	21.7	21.00	125664.18	124410.68	1253.50	26323.44
d= 6	23.3	22.50	124410.68	123163.47	1247.21	28062.32
d= 7	23.7	23.50	123163.47	121922.54	1240.93	29161.88
d= 8	25.4	24.55	121922.54	120687.89	1234.65	30310.60
d= 9	24.9	25.15	120687.89	119459.52	1228.36	30893.37
d= 10	25.5	25.20	119459.52	118237.44	1222.08	30796.45
d= 11	27.4	26.45	118237.44	117021.64	1215.80	32157.86
d= 12	26.9	27.15	117021.64	115812.13	1209.52	32838.33
d= 13	27.0	26.95	115812.13	114608.90	1203.23	32427.10
d= 14	26.4	26.70	114608.90	113411.95	1196.95	31958.53
d= 15	27.2	26.80	113411.95	112221.28	1190.67	31909.84
d= 16	28.7	27.95	112221.28	111036.90	1184.38	33103.49
d= 17	29.1	28.90	111036.90	109858.80	1178.10	34047.07
drem 22.6	30.4					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **481480.12**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 30.40
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **358812.78**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **840292.907**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **25.71**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 5
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.9	7.95	130741.00	129462.37	1278.63	10165.11
d= 2	17.4	16.65	129462.37	128190.02	1272.35	21184.57
d= 3	20.0	18.70	128190.02	126923.96	1266.06	23675.39
d= 4	21.7	20.85	126923.96	125664.18	1259.78	26266.42
d= 5	22.6	22.15	125664.18	124410.68	1253.50	27764.97
d= 6	24.4	23.50	124410.68	123163.47	1247.21	29309.53
d= 7	23.6	24.00	123163.47	121922.54	1240.93	29782.34
d= 8	25.3	24.45	121922.54	120687.89	1234.65	30187.14
d= 9	25.7	25.50	120687.89	119459.52	1228.36	31323.30
d= 10	24.9	25.30	119459.52	118237.44	1222.08	30918.66
d= 11	25.9	25.40	118237.44	117021.64	1215.80	30881.27
d= 12	27.2	26.55	117021.64	115812.13	1209.52	32112.62
d= 13	28.9	28.05	115812.13	114608.90	1203.23	33750.65
d= 14	26.9	27.90	114608.90	113411.95	1196.95	33394.87
d= 15	28.6	27.75	113411.95	112221.28	1190.67	33040.97
d= 16	31.0	29.80	112221.28	111036.90	1184.38	35294.59
d= 17	31.3	31.15	111036.90	109858.80	1178.10	36697.79
drem 22.6	31.4					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **495750.20**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 31.40
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **370615.83**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **866366.037**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **26.51**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 5
PORT A, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.5	7.25	130741.00	129462.37	1278.63	9270.07
d= 2	16.7	15.60	129462.37	128190.02	1272.35	19848.61
d= 3	19.4	18.05	128190.02	126923.96	1266.06	22852.45
d= 4	20.4	19.90	126923.96	125664.18	1259.78	25069.63
d= 5	22.1	21.25	125664.18	124410.68	1253.50	26636.82
d= 6	23.4	22.75	124410.68	123163.47	1247.21	28374.12
d= 7	24.6	24.00	123163.47	121922.54	1240.93	29782.34
d= 8	25.5	25.05	121922.54	120687.89	1234.65	30927.93
d= 9	25.8	25.65	120687.89	119459.52	1228.36	31507.55
d= 10	24.9	25.35	119459.52	118237.44	1222.08	30979.76
d= 11	28.3	26.60	118237.44	117021.64	1215.80	32340.23
d= 12	26.8	27.55	117021.64	115812.13	1209.52	33322.14
d= 13	27.5	27.15	115812.13	114608.90	1203.23	32667.75
d= 14	27.7	27.60	114608.90	113411.95	1196.95	33035.78
d= 15	27.9	27.80	113411.95	112221.28	1190.67	33100.50
d= 16	30.4	29.15	112221.28	111036.90	1184.38	34524.74
d= 17	30.7	30.55	111036.90	109858.80	1178.10	35990.93
drem 22.6	31.5					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **490231.36**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 31.50
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **371796.14**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **862027.498**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **26.37**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 5
PORT B, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159

line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.9	6.95	130741.00	129462.37	1278.63	8886.48
d= 2	16.8	15.35	129462.37	128190.02	1272.35	19530.52
d= 3	19.1	17.95	128190.02	126923.96	1266.06	22725.84
d= 4	20.0	19.55	126923.96	125664.18	1259.78	24628.71
d= 5	21.6	20.80	125664.18	124410.68	1253.50	26072.74
d= 6	22.2	21.90	124410.68	123163.47	1247.21	27313.99
d= 7	24.1	23.15	123163.47	121922.54	1240.93	28727.55
d= 8	23.9	24.00	121922.54	120687.89	1234.65	29631.55
d= 9	25.1	24.50	120687.89	119459.52	1228.36	30094.93
d= 10	26.2	25.65	119459.52	118237.44	1222.08	31346.39
d= 11	27.1	26.65	118237.44	117021.64	1215.80	32401.02
d= 12	26.4	26.75	117021.64	115812.13	1209.52	32354.53
d= 13	26.8	26.60	115812.13	114608.90	1203.23	32005.97
d= 14	25.1	25.95	114608.90	113411.95	1196.95	31060.82
d= 15	28.0	26.55	113411.95	112221.28	1190.67	31612.17
d= 16	29.9	28.95	112221.28	111036.90	1184.38	34287.87
d= 17	30.0	29.95	111036.90	109858.80	1178.10	35284.07
drem 22.6	31.4					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **477965.15**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 31.40
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **370615.83**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **848580.983**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **25.96**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Conesville Unit 5

Wall Effects Overnight Run 5
PORT C, USI 16pt AUTOPROBE, YAW NULLED

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 204 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.4	7.20	130741.00	129462.37	1278.63	9206.14
d= 2	16.8	15.60	129462.37	128190.02	1272.35	19848.61
d= 3	18.4	17.60	128190.02	126923.96	1266.06	22282.72
d= 4	20.2	19.30	126923.96	125664.18	1259.78	24313.76
d= 5	22.2	21.20	125664.18	124410.68	1253.50	26574.14
d= 6	23.1	22.65	124410.68	123163.47	1247.21	28249.40
d= 7	24.8	23.95	123163.47	121922.54	1240.93	29720.30
d= 8	25.6	25.20	121922.54	120687.89	1234.65	31113.12
d= 9	25.4	25.50	120687.89	119459.52	1228.36	31323.30
d= 10	26.0	25.70	119459.52	118237.44	1222.08	31407.49
d= 11	26.4	26.20	118237.44	117021.64	1215.80	31853.91
d= 12	27.6	27.00	117021.64	115812.13	1209.52	32656.91
d= 13	27.8	27.70	115812.13	114608.90	1203.23	33329.52
d= 14	27.4	27.60	114608.90	113411.95	1196.95	33035.78
d= 15	27.6	27.50	113411.95	112221.28	1190.67	32743.30
d= 16	28.2	27.90	112221.28	111036.90	1184.38	33044.27
d= 17	31.3	29.75	111036.90	109858.80	1178.10	35048.45
drem 22.6	32.0					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **485751.13**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 32.00
b) Total area in remainder segment 11803.05
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **377697.67**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **863448.792**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **26.42**

ATTACHMENT D.

Picway Station
Wall Effects Calculation Forms

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Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 5
PORT A, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.7	9.35	23811.52	23267.65	543.87	5085.21
d= 2	22.6	20.65	23267.65	22730.06	537.59	11101.21
d= 3	25.6	24.10	22730.06	22198.75	531.31	12804.47
d= 4	27.1	26.35	22198.75	21673.73	525.02	13834.35
d= 5	29.9	28.50	21673.73	21154.99	518.74	14784.08
d= 6	32.9	31.40	21154.99	20642.53	512.46	16091.13
d= 7	31.7	32.30	20642.53	20136.36	506.17	16349.39
d= 8	32.9	32.30	20136.36	19636.47	499.89	16146.45
d= 9	34.1	33.50	19636.47	19142.86	493.61	16535.83
d= 10	32.5	33.30	19142.86	18655.54	487.32	16227.88
d= 11	35.4	33.95	18655.54	18174.50	481.04	16331.32
d= 12	33.2	34.30	18174.50	17699.74	474.76	16284.17
d= 13	34.8	34.00	17699.74	17231.27	468.47	15928.12
d= 14	36.8	35.00	17231.27	16769.08	462.19	16176.68
d= 15	36.2	36.50	16769.08	16313.17	455.91	16640.63
drem 15.5	36.8					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **220320.92**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 36.80
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16145.79**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **236466.706**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.79**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 5
PORT B, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	27.0	13.50	23811.52	23267.65	543.87	7342.28
d= 2	31.1	29.05	23267.65	22730.06	537.59	15616.96
d= 3	33.5	32.30	22730.06	22198.75	531.31	17161.18
d= 4	33.0	33.25	22198.75	21673.73	525.02	17457.00
d= 5	35.9	34.45	21673.73	21154.99	518.74	17870.58
d= 6	34.9	35.40	21154.99	20642.53	512.46	18140.95
d= 7	33.9	34.40	20642.53	20136.36	506.17	17412.36
d= 8	37.5	35.70	20136.36	19636.47	499.89	17846.07
d= 9	35.7	36.60	19636.47	19142.86	493.61	18066.01
d= 10	37.7	36.70	19142.86	18655.54	487.32	17884.78
d= 11	36.5	37.10	18655.54	18174.50	481.04	17846.60
d= 12	38.2	37.35	18174.50	17699.74	474.76	17732.18
d= 13	37.7	37.95	17699.74	17231.27	468.47	17778.59
d= 14	38.6	38.15	17231.27	16769.08	462.19	17632.58
d= 15	38.5	38.10	16769.08	16313.17	455.91	17370.08
drem 15.5	38.9					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **253158.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 38.90
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17067.15**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **270225.362**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **34.05**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 5
PORT C, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	26.1	13.05	23811.52	23267.65	543.87	7097.53
d= 2	30.7	28.40	23267.65	22730.06	537.59	15267.53
d= 3	31.7	31.20	22730.06	22198.75	531.31	16576.74
d= 4	35.3	33.50	22198.75	21673.73	525.02	17588.26
d= 5	36.5	35.90	21673.73	21154.99	518.74	18622.75
d= 6	37.1	36.80	21154.99	20642.53	512.46	18858.39
d= 7	40.1	38.60	20642.53	20136.36	506.17	19538.28
d= 8	39.9	40.00	20136.36	19636.47	499.89	19995.60
d= 9	41.0	40.45	19636.47	19142.86	493.61	19966.40
d= 10	41.9	41.45	19142.86	18655.54	487.32	20199.56
d= 11	41.5	41.70	18655.54	18174.50	481.04	20059.39
d= 12	42.5	42.00	18174.50	17699.74	474.76	19939.81
d= 13	43.3	42.90	17699.74	17231.27	468.47	20097.54
d= 14	42.6	42.95	17231.27	16769.08	462.19	19851.10
d= 15	42.3	42.80	16769.08	16313.17	455.91	19512.85
drem 15.5	43.1					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **273171.73**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 43.10
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **18909.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **292081.607**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **36.80**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 5
PORT D, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	6.4	3.20	23811.52	23267.65	543.87	1740.39
d= 2	27.5	16.95	23267.65	22730.06	537.59	9112.13
d= 3	30.1	28.80	22730.06	22198.75	531.31	15301.61
d= 4	32.9	31.50	22198.75	21673.73	525.02	16538.22
d= 5	34.3	33.60	21673.73	21154.99	518.74	17429.65
d= 6	34.5	34.40	21154.99	20642.53	512.46	17628.50
d= 7	36.9	35.70	20642.53	20136.36	506.17	18070.38
d= 8	35.4	36.15	20136.36	19636.47	499.89	18071.02
d= 9	36.7	36.05	19636.47	19142.86	493.61	17794.53
d= 10	38.1	37.40	19142.86	18655.54	487.32	18225.90
d= 11	37.7	37.90	18655.54	18174.50	481.04	18231.43
d= 12	38.9	38.30	18174.50	17699.74	474.76	18183.20
d= 13	38.1	38.50	17699.74	17231.27	468.47	18036.25
d= 14	39.5	38.80	17231.27	16769.08	462.19	17933.01
d= 15	39.0	38.55	16769.08	16313.17	455.91	17575.24
drem 15.5	38.7					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **239871.47**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 38.70
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16979.40**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **256850.869**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **32.36**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 5
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159

line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.2	8.60	23811.52	23267.65	543.87	4677.30
d= 2	22.4	19.80	23267.65	22730.06	537.59	10644.26
d= 3	25.0	23.70	22730.06	22198.75	531.31	12591.95
d= 4	27.0	26.00	22198.75	21673.73	525.02	13650.59
d= 5	29.3	28.15	21673.73	21154.99	518.74	14602.52
d= 6	30.3	29.80	21154.99	20642.53	512.46	15271.20
d= 7	30.8	30.55	20642.53	20136.36	506.17	15463.59
d= 8	31.7	31.25	20136.36	19636.47	499.89	15621.56
d= 9	32.1	31.90	19636.47	19142.86	493.61	15746.06
d= 10	33.7	32.90	19142.86	18655.54	487.32	16032.95
d= 11	36.4	35.05	18655.54	18174.50	481.04	16860.47
d= 12	33.6	35.00	18174.50	17699.74	474.76	16616.50
d= 13	36.2	34.90	17699.74	17231.27	468.47	16349.75
d= 14	34.5	35.35	17231.27	16769.08	462.19	16338.45
d= 15	34.2	34.35	16769.08	16313.17	455.91	15660.43
drem 15.5	36.0					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **216127.57**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 36.00
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15794.79**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **231922.365**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.22**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 5
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	27.4	13.70	23811.52	23267.65	543.87	7451.05
d= 2	29.1	28.25	23267.65	22730.06	537.59	15186.89
d= 3	31.9	30.50	22730.06	22198.75	531.31	16204.83
d= 4	33.2	32.55	22198.75	21673.73	525.02	17089.49
d= 5	35.6	34.40	21673.73	21154.99	518.74	17844.64
d= 6	34.7	35.15	21154.99	20642.53	512.46	18012.84
d= 7	35.1	34.90	20642.53	20136.36	506.17	17665.44
d= 8	36.6	35.85	20136.36	19636.47	499.89	17921.06
d= 9	38.9	37.75	19636.47	19142.86	493.61	18633.66
d= 10	37.4	38.15	19142.86	18655.54	487.32	18591.40
d= 11	36.0	36.70	18655.54	18174.50	481.04	17654.18
d= 12	38.4	37.20	18174.50	17699.74	474.76	17660.97
d= 13	37.4	37.90	17699.74	17231.27	468.47	17755.17
d= 14	37.4	37.40	17231.27	16769.08	462.19	17285.94
d= 15	37.7	37.55	16769.08	16313.17	455.91	17119.33
drem 15.5	38.5					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **252076.89**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 38.50
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16891.65**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **268968.541**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **33.89**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 5
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	26.2	13.10	23811.52	23267.65	543.87	7124.73
d= 2	30.7	28.45	23267.65	22730.06	537.59	15294.41
d= 3	33.2	31.95	22730.06	22198.75	531.31	16975.22
d= 4	34.5	33.85	22198.75	21673.73	525.02	17772.02
d= 5	37.4	35.95	21673.73	21154.99	518.74	18648.69
d= 6	35.7	36.55	21154.99	20642.53	512.46	18730.28
d= 7	40.1	37.90	20642.53	20136.36	506.17	19183.96
d= 8	40.3	40.20	20136.36	19636.47	499.89	20095.58
d= 9	41.5	40.90	19636.47	19142.86	493.61	20188.52
d= 10	41.1	41.30	19142.86	18655.54	487.32	20126.47
d= 11	42.0	41.55	18655.54	18174.50	481.04	19987.23
d= 12	41.7	41.85	18174.50	17699.74	474.76	19868.59
d= 13	42.9	42.30	17699.74	17231.27	468.47	19816.45
d= 14	42.6	42.75	17231.27	16769.08	462.19	19758.66
d= 15	43.4	43.00	16769.08	16313.17	455.91	19604.03
drem 15.5	42.0					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **273174.83**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 42.00
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18427.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **291602.092**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **36.74**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 5
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159

line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	5.4	2.70	23811.52	23267.65	543.87	1468.46
d= 2	27.1	16.25	23267.65	22730.06	537.59	8735.82
d= 3	31.3	29.20	22730.06	22198.75	531.31	15514.13
d= 4	33.7	32.50	22198.75	21673.73	525.02	17063.24
d= 5	34.2	33.95	21673.73	21154.99	518.74	17611.21
d= 6	35.0	34.60	21154.99	20642.53	512.46	17730.99
d= 7	36.3	35.65	20642.53	20136.36	506.17	18045.07
d= 8	37.0	36.65	20136.36	19636.47	499.89	18320.97
d= 9	38.4	37.70	19636.47	19142.86	493.61	18608.98
d= 10	37.4	37.90	19142.86	18655.54	487.32	18469.57
d= 11	37.2	37.30	18655.54	18174.50	481.04	17942.81
d= 12	36.5	36.85	18174.50	17699.74	474.76	17494.81
d= 13	38.9	37.70	17699.74	17231.27	468.47	17661.47
d= 14	37.2	38.05	17231.27	16769.08	462.19	17586.36
d= 15	38.0	37.60	16769.08	16313.17	455.91	17142.13
drem 15.5	39.1					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **239396.01**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 39.10
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17154.90**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **256550.906**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **32.32**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 8
PORT A, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.4	8.70	23811.52	23267.65	543.87	4731.69
d= 2	21.5	19.45	23267.65	22730.06	537.59	10456.11
d= 3	24.1	22.80	22730.06	22198.75	531.31	12113.77
d= 4	26.8	25.45	22198.75	21673.73	525.02	13361.83
d= 5	28.6	27.70	21673.73	21154.99	518.74	14369.08
d= 6	28.4	28.50	21154.99	20642.53	512.46	14605.01
d= 7	32.0	30.20	20642.53	20136.36	506.17	15286.43
d= 8	31.7	31.85	20136.36	19636.47	499.89	15921.50
d= 9	33.7	32.70	19636.47	19142.86	493.61	16140.94
d= 10	34.1	33.90	19142.86	18655.54	487.32	16520.27
d= 11	35.1	34.60	18655.54	18174.50	481.04	16644.00
d= 12	34.7	34.90	18174.50	17699.74	474.76	16569.03
d= 13	34.7	34.70	17699.74	17231.27	468.47	16256.05
d= 14	36.5	35.60	17231.27	16769.08	462.19	16454.00
d= 15	35.6	36.05	16769.08	16313.17	455.91	16435.47
drem 15.5	36.1					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **215865.17**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 36.10
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15838.67**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **231703.841**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.19**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 8
PORT B, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159

line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	28.9	14.45	23811.52	23267.65	543.87	7858.95
d= 2	32.0	30.45	23267.65	22730.06	537.59	16369.59
d= 3	32.2	32.10	22730.06	22198.75	531.31	17054.92
d= 4	33.9	33.05	22198.75	21673.73	525.02	17352.00
d= 5	34.3	34.10	21673.73	21154.99	518.74	17689.02
d= 6	35.7	35.00	21154.99	20642.53	512.46	17935.97
d= 7	35.1	35.40	20642.53	20136.36	506.17	17918.53
d= 8	36.8	35.95	20136.36	19636.47	499.89	17971.04
d= 9	38.5	37.65	19636.47	19142.86	493.61	18584.30
d= 10	36.1	37.30	19142.86	18655.54	487.32	18177.17
d= 11	37.9	37.00	18655.54	18174.50	481.04	17798.50
d= 12	38.3	38.10	18174.50	17699.74	474.76	18088.25
d= 13	38.0	38.15	17699.74	17231.27	468.47	17872.29
d= 14	37.6	37.80	17231.27	16769.08	462.19	17470.82
d= 15	37.2	37.40	16769.08	16313.17	455.91	17050.95
drem 15.5	37.7					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **255192.29**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 37.70
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16540.66**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **271732.948**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **34.24**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 8
PORT C, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.2	12.10	23811.52	23267.65	543.87	6580.85
d= 2	30.1	27.15	23267.65	22730.06	537.59	14595.54
d= 3	33.0	31.55	22730.06	22198.75	531.31	16762.70
d= 4	35.2	34.10	22198.75	21673.73	525.02	17903.27
d= 5	36.4	35.80	21673.73	21154.99	518.74	18570.87
d= 6	37.5	36.95	21154.99	20642.53	512.46	18935.26
d= 7	38.9	38.20	20642.53	20136.36	506.17	19335.81
d= 8	39.3	39.10	20136.36	19636.47	499.89	19545.70
d= 9	40.0	39.65	19636.47	19142.86	493.61	19571.51
d= 10	40.9	40.45	19142.86	18655.54	487.32	19712.24
d= 11	42.3	41.60	18655.54	18174.50	481.04	20011.28
d= 12	40.9	41.60	18174.50	17699.74	474.76	19749.90
d= 13	43.4	42.15	17699.74	17231.27	468.47	19746.18
d= 14	42.6	43.00	17231.27	16769.08	462.19	19874.21
d= 15	42.3	42.45	16769.08	16313.17	455.91	19353.28
drem 15.5	42.3					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **270248.63**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 42.30
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18558.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **288807.512**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **36.39**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 8
PORT D, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159

line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	7.5	3.75	23811.52	23267.65	543.87	2039.52
d= 2	28.1	17.80	23267.65	22730.06	537.59	9569.09
d= 3	31.1	29.60	22730.06	22198.75	531.31	15726.65
d= 4	33.2	32.15	22198.75	21673.73	525.02	16879.48
d= 5	34.6	33.90	21673.73	21154.99	518.74	17585.27
d= 6	37.3	35.95	21154.99	20642.53	512.46	18422.81
d= 7	36.7	37.00	20642.53	20136.36	506.17	18728.41
d= 8	37.3	37.00	20136.36	19636.47	499.89	18495.93
d= 9	36.3	36.80	19636.47	19142.86	493.61	18164.73
d= 10	36.6	36.45	19142.86	18655.54	487.32	17762.95
d= 11	39.3	37.95	18655.54	18174.50	481.04	18255.48
d= 12	38.0	38.65	18174.50	17699.74	474.76	18349.37
d= 13	37.8	37.90	17699.74	17231.27	468.47	17755.17
d= 14	39.3	38.55	17231.27	16769.08	462.19	17817.46
d= 15	38.4	38.85	16769.08	16313.17	455.91	17712.02
drem 15.5	39.5					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **243264.32**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 39.50
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17330.40**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **260594.72**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **32.83**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 8
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.4	8.70	23811.52	23267.65	543.87	4731.69
d= 2	21.6	19.50	23267.65	22730.06	537.59	10482.99
d= 3	24.4	23.00	22730.06	22198.75	531.31	12220.04
d= 4	26.2	25.30	22198.75	21673.73	525.02	13283.07
d= 5	30.5	28.35	21673.73	21154.99	518.74	14706.27
d= 6	30.9	30.70	21154.99	20642.53	512.46	15732.41
d= 7	31.8	31.35	20642.53	20136.36	506.17	15868.53
d= 8	31.7	31.75	20136.36	19636.47	499.89	15871.51
d= 9	34.7	33.20	19636.47	19142.86	493.61	16387.75
d= 10	33.5	34.10	19142.86	18655.54	487.32	16617.74
d= 11	35.3	34.40	18655.54	18174.50	481.04	16547.79
d= 12	35.6	35.45	18174.50	17699.74	474.76	16830.14
d= 13	36.1	35.85	17699.74	17231.27	468.47	16794.80
d= 14	34.9	35.50	17231.27	16769.08	462.19	16407.78
d= 15	35.7	35.30	16769.08	16313.17	455.91	16093.54
drem 15.5	36.4					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **218576.03**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 36.40
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15970.29**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **234546.319**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.55**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 8
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	27.0	13.50	23811.52	23267.65	543.87	7342.28
d= 2	31.1	29.05	23267.65	22730.06	537.59	15616.96
d= 3	32.6	31.85	22730.06	22198.75	531.31	16922.09
d= 4	34.3	33.45	22198.75	21673.73	525.02	17562.01
d= 5	34.7	34.50	21673.73	21154.99	518.74	17896.51
d= 6	34.1	34.40	21154.99	20642.53	512.46	17628.50
d= 7	36.8	35.45	20642.53	20136.36	506.17	17943.84
d= 8	37.2	37.00	20136.36	19636.47	499.89	18495.93
d= 9	36.3	36.75	19636.47	19142.86	493.61	18140.05
d= 10	36.8	36.55	19142.86	18655.54	487.32	17811.68
d= 11	37.6	37.20	18655.54	18174.50	481.04	17894.70
d= 12	37.1	37.35	18174.50	17699.74	474.76	17732.18
d= 13	37.4	37.25	17699.74	17231.27	468.47	17450.66
d= 14	39.3	38.35	17231.27	16769.08	462.19	17725.02
d= 15	36.8	38.05	16769.08	16313.17	455.91	17347.29
drem 15.5	38.2					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **253509.70**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 38.20
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16760.03**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **270269.734**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **34.05**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 8
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.9	12.45	23811.52	23267.65	543.87	6771.21
d= 2	31.2	28.05	23267.65	22730.06	537.59	15079.37
d= 3	33.1	32.15	22730.06	22198.75	531.31	17081.48
d= 4	35.2	34.15	22198.75	21673.73	525.02	17929.53
d= 5	35.5	35.35	21673.73	21154.99	518.74	18337.44
d= 6	37.5	36.50	21154.99	20642.53	512.46	18704.66
d= 7	39.6	38.55	20642.53	20136.36	506.17	19512.98
d= 8	39.6	39.60	20136.36	19636.47	499.89	19795.64
d= 9	40.3	39.95	19636.47	19142.86	493.61	19719.59
d= 10	41.7	41.00	19142.86	18655.54	487.32	19980.27
d= 11	40.4	41.05	18655.54	18174.50	481.04	19746.71
d= 12	41.6	41.00	18174.50	17699.74	474.76	19465.05
d= 13	42.1	41.85	17699.74	17231.27	468.47	19605.64
d= 14	41.9	42.00	17231.27	16769.08	462.19	19412.02
d= 15	42.2	42.05	16769.08	16313.17	455.91	19170.92
drem 15.5	42.4					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **270312.51**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 42.40
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **18602.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **288915.261**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **36.40**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.1	9.55	54739.11	53912.87	826.24	7890.58
d= 2	20.6	19.85	53912.87	53092.92	819.96	16276.11
d= 3	22.1	21.35	53092.92	52279.24	813.67	17371.90
d= 4	24.2	23.15	52279.24	51471.86	807.39	18691.05
d= 5	25.5	24.85	51471.86	50670.75	801.11	19907.48
d= 6	25.1	25.30	50670.75	49875.93	794.82	20109.01
d= 7	25.6	25.35	49875.93	49087.39	788.54	19989.47
d= 8	24.3	24.95	49087.39	48305.13	782.26	19517.29
d= 9	30.5	27.40	48305.13	47529.16	775.97	21261.66
d= 10	31.5	31.00	47529.16	46759.47	769.69	23860.39
d= 11	32.5	32.00	46759.47	45996.06	763.41	24429.01
d= 12	32.7	32.60	45996.06	45238.94	757.12	24682.23
d= 13	33.4	33.05	45238.94	44488.10	750.84	24815.27
d= 14	32.5	32.95	44488.10	43743.54	744.56	24533.16
d= 15	33.4	32.95	43743.54	43005.27	738.27	24326.13
d= 16	33.1	33.25	43005.27	42273.28	731.99	24338.69
d= 17	33.5	33.30	42273.28	41547.57	725.71	24166.06
drem 20.5	33.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **356165.52**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 33.10
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **167308.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **523474.275**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **28.69**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.9	9.45	54739.11	53912.87	826.24	7807.95
d= 2	20.5	19.70	53912.87	53092.92	819.96	16153.12
d= 3	22.5	21.50	53092.92	52279.24	813.67	17493.95
d= 4	25.7	24.10	52279.24	51471.86	807.39	19458.07
d= 5	26.1	25.90	51471.86	50670.75	801.11	20748.64
d= 6	27.0	26.55	50670.75	49875.93	794.82	21102.54
d= 7	26.4	26.70	49875.93	49087.39	788.54	21054.00
d= 8	26.0	26.20	49087.39	48305.13	782.26	20495.11
d= 9	32.8	29.40	48305.13	47529.16	775.97	22813.61
d= 10	33.7	33.25	47529.16	46759.47	769.69	25592.19
d= 11	33.0	33.35	46759.47	45996.06	763.41	25459.61
d= 12	32.9	32.95	45996.06	45238.94	757.12	24947.22
d= 13	34.5	33.70	45238.94	44488.10	750.84	25303.32
d= 14	34.4	34.45	44488.10	43743.54	744.56	25649.99
d= 15	34.0	34.20	43743.54	43005.27	738.27	25248.97
d= 16	33.7	33.85	43005.27	42273.28	731.99	24777.89
d= 17	35.1	34.40	42273.28	41547.57	725.71	24964.34
drem 20.5	34.6					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **369070.55**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 34.60
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **174890.72**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **543961.272**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.81**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.2	10.10	54739.11	53912.87	826.24	8345.01
d= 2	22.2	21.20	53912.87	53092.92	819.96	17383.05
d= 3	24.2	23.20	53092.92	52279.24	813.67	18877.19
d= 4	27.2	25.70	52279.24	51471.86	807.39	20749.90
d= 5	26.6	26.90	51471.86	50670.75	801.11	21549.75
d= 6	26.3	26.45	50670.75	49875.93	794.82	21023.06
d= 7	27.1	26.70	49875.93	49087.39	788.54	21054.00
d= 8	26.5	26.80	49087.39	48305.13	782.26	20964.47
d= 9	33.1	29.80	48305.13	47529.16	775.97	23124.00
d= 10	33.6	33.35	47529.16	46759.47	769.69	25669.16
d= 11	34.6	34.10	46759.47	45996.06	763.41	26032.17
d= 12	34.9	34.75	45996.06	45238.94	757.12	26310.04
d= 13	34.5	34.70	45238.94	44488.10	750.84	26054.16
d= 14	34.4	34.45	44488.10	43743.54	744.56	25649.99
d= 15	35.8	35.10	43743.54	43005.27	738.27	25913.42
d= 16	35.9	35.85	43005.27	42273.28	731.99	26241.87
d= 17	35.5	35.70	42273.28	41547.57	725.71	25907.76
drem 20.5	35.6					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **380849.00**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.60
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **179945.37**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **560794.371**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **30.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.6	8.80	54739.11	53912.87	826.24	7270.90
d= 2	20.5	19.05	53912.87	53092.92	819.96	15620.15
d= 3	22.1	21.30	53092.92	52279.24	813.67	17331.22
d= 4	25.0	23.55	52279.24	51471.86	807.39	19014.01
d= 5	25.4	25.20	51471.86	50670.75	801.11	20187.87
d= 6	24.7	25.05	50670.75	49875.93	794.82	19910.31
d= 7	24.8	24.75	49875.93	49087.39	788.54	19516.35
d= 8	24.1	24.45	49087.39	48305.13	782.26	19126.17
d= 9	32.1	28.10	48305.13	47529.16	775.97	21804.84
d= 10	31.9	32.00	47529.16	46759.47	769.69	24630.08
d= 11	32.9	32.40	46759.47	45996.06	763.41	24734.38
d= 12	32.3	32.60	45996.06	45238.94	757.12	24682.23
d= 13	32.7	32.50	45238.94	44488.10	750.84	24402.31
d= 14	33.4	33.05	44488.10	43743.54	744.56	24607.61
d= 15	33.6	33.50	43743.54	43005.27	738.27	24732.18
d= 16	33.5	33.55	43005.27	42273.28	731.99	24558.29
d= 17	33.2	33.35	42273.28	41547.57	725.71	24202.35
drem 20.5	33.4					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **356331.24**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 33.40
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **168825.15**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **525156.387**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **28.78**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.2	9.60	54739.11	53912.87	826.24	7931.89
d= 2	21.1	20.15	53912.87	53092.92	819.96	16522.10
d= 3	21.8	21.45	53092.92	52279.24	813.67	17453.27
d= 4	24.5	23.15	52279.24	51471.86	807.39	18691.05
d= 5	24.4	24.45	51471.86	50670.75	801.11	19587.04
d= 6	24.3	24.35	50670.75	49875.93	794.82	19353.93
d= 7	24.8	24.55	49875.93	49087.39	788.54	19358.64
d= 8	25.0	24.90	49087.39	48305.13	782.26	19478.18
d= 9	31.6	28.30	48305.13	47529.16	775.97	21960.04
d= 10	32.4	32.00	47529.16	46759.47	769.69	24630.08
d= 11	32.1	32.25	46759.47	45996.06	763.41	24619.87
d= 12	31.8	31.95	45996.06	45238.94	757.12	24190.10
d= 13	33.5	32.65	45238.94	44488.10	750.84	24514.94
d= 14	32.3	32.90	44488.10	43743.54	744.56	24495.93
d= 15	32.7	32.50	43743.54	43005.27	738.27	23993.90
d= 16	33.3	33.00	43005.27	42273.28	731.99	24155.70
d= 17	32.9	33.10	42273.28	41547.57	725.71	24020.92
drem 20.5	33.0					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **354957.58**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 33.00
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **166803.29**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **521760.868**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **28.60**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.6	9.30	54739.11	53912.87	826.24	7684.02
d= 2	21.5	20.05	53912.87	53092.92	819.96	16440.10
d= 3	22.9	22.20	53092.92	52279.24	813.67	18063.52
d= 4	25.5	24.20	52279.24	51471.86	807.39	19538.81
d= 5	26.3	25.90	51471.86	50670.75	801.11	20748.64
d= 6	26.6	26.45	50670.75	49875.93	794.82	21023.06
d= 7	26.2	26.40	49875.93	49087.39	788.54	20817.44
d= 8	25.2	25.70	49087.39	48305.13	782.26	20103.99
d= 9	33.0	29.10	48305.13	47529.16	775.97	22580.82
d= 10	32.2	32.60	47529.16	46759.47	769.69	25091.89
d= 11	33.0	32.60	46759.47	45996.06	763.41	24887.06
d= 12	33.1	33.05	45996.06	45238.94	757.12	25022.93
d= 13	34.3	33.70	45238.94	44488.10	750.84	25303.32
d= 14	34.2	34.25	44488.10	43743.54	744.56	25501.08
d= 15	34.6	34.40	43743.54	43005.27	738.27	25396.63
d= 16	34.7	34.65	43005.27	42273.28	731.99	25363.48
d= 17	34.6	34.65	42273.28	41547.57	725.71	25145.77
drem 27.5	34.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **368712.56**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 34.90
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **176407.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **545119.681**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.88**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 8
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	6.4	3.20	23811.52	23267.65	543.87	1740.39
d= 2	27.2	16.80	23267.65	22730.06	537.59	9031.50
d= 3	30.6	28.90	22730.06	22198.75	531.31	15354.74
d= 4	32.5	31.55	22198.75	21673.73	525.02	16564.47
d= 5	32.2	32.35	21673.73	21154.99	518.74	16781.22
d= 6	34.7	33.45	21154.99	20642.53	512.46	17141.66
d= 7	37.1	35.90	20642.53	20136.36	506.17	18171.62
d= 8	37.3	37.20	20136.36	19636.47	499.89	18595.91
d= 9	38.5	37.90	19636.47	19142.86	493.61	18707.70
d= 10	36.3	37.40	19142.86	18655.54	487.32	18225.90
d= 11	38.7	37.50	18655.54	18174.50	481.04	18039.02
d= 12	38.6	38.65	18174.50	17699.74	474.76	18349.37
d= 13	38.4	38.50	17699.74	17231.27	468.47	18036.25
d= 14	38.0	38.20	17231.27	16769.08	462.19	17655.69
d= 15	37.3	37.65	16769.08	16313.17	455.91	17164.93
drem 15.5	40.7					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **239560.36**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 40.70
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17856.89**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **257417.252**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **32.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 11
PORT A, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.7	8.85	23811.52	23267.65	543.87	4813.27
d= 2	23.6	20.65	23267.65	22730.06	537.59	11101.21
d= 3	25.4	24.50	22730.06	22198.75	531.31	13016.99
d= 4	27.5	26.45	22198.75	21673.73	525.02	13886.85
d= 5	29.9	28.70	21673.73	21154.99	518.74	14887.82
d= 6	30.1	30.00	21154.99	20642.53	512.46	15373.69
d= 7	31.3	30.70	20642.53	20136.36	506.17	15539.52
d= 8	33.8	32.55	20136.36	19636.47	499.89	16271.42
d= 9	34.3	34.05	19636.47	19142.86	493.61	16807.31
d= 10	35.2	34.75	19142.86	18655.54	487.32	16934.50
d= 11	34.9	35.05	18655.54	18174.50	481.04	16860.47
d= 12	34.8	34.85	18174.50	17699.74	474.76	16545.29
d= 13	36.5	35.65	17699.74	17231.27	468.47	16701.10
d= 14	34.8	35.65	17231.27	16769.08	462.19	16477.11
d= 15	36.9	35.85	16769.08	16313.17	455.91	16344.29
drem 15.5	35.9					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **221560.84**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 35.90
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15750.92**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **237311.76**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.90**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 11
PORT B, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	29.0	14.50	23811.52	23267.65	543.87	7886.15
d= 2	30.8	29.90	23267.65	22730.06	537.59	16073.91
d= 3	33.6	32.20	22730.06	22198.75	531.31	17108.05
d= 4	34.6	34.10	22198.75	21673.73	525.02	17903.27
d= 5	33.7	34.15	21673.73	21154.99	518.74	17714.95
d= 6	35.3	34.50	21154.99	20642.53	512.46	17679.74
d= 7	34.7	35.00	20642.53	20136.36	506.17	17716.06
d= 8	36.4	35.55	20136.36	19636.47	499.89	17771.09
d= 9	36.5	36.45	19636.47	19142.86	493.61	17991.97
d= 10	38.0	37.25	19142.86	18655.54	487.32	18152.80
d= 11	38.3	38.15	18655.54	18174.50	481.04	18351.69
d= 12	38.6	38.45	18174.50	17699.74	474.76	18254.42
d= 13	38.4	38.50	17699.74	17231.27	468.47	18036.25
d= 14	39.7	39.05	17231.27	16769.08	462.19	18048.55
d= 15	38.2	38.95	16769.08	16313.17	455.91	17757.61
drem 15.5	38.8					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **256446.53**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 38.80
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17023.28**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **273469.803**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **34.45**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 11
PORT C, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.7	12.35	23811.52	23267.65	543.87	6716.82
d= 2	30.0	27.35	23267.65	22730.06	537.59	14703.06
d= 3	33.1	31.55	22730.06	22198.75	531.31	16762.70
d= 4	35.9	34.50	22198.75	21673.73	525.02	18113.28
d= 5	37.0	36.45	21673.73	21154.99	518.74	18908.06
d= 6	38.3	37.65	21154.99	20642.53	512.46	19293.98
d= 7	40.2	39.25	20642.53	20136.36	506.17	19867.30
d= 8	39.4	39.80	20136.36	19636.47	499.89	19895.62
d= 9	39.7	39.55	19636.47	19142.86	493.61	19522.15
d= 10	40.1	39.90	19142.86	18655.54	487.32	19444.21
d= 11	41.6	40.85	18655.54	18174.50	481.04	19650.50
d= 12	41.8	41.70	18174.50	17699.74	474.76	19797.38
d= 13	42.1	41.95	17699.74	17231.27	468.47	19652.49
d= 14	43.8	42.95	17231.27	16769.08	462.19	19851.10
d= 15	43.4	43.60	16769.08	16313.17	455.91	19877.58
drem 15.5	43.5					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **272056.23**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 43.50
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **19085.37**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **291141.601**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **36.68**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 11
PORT D, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.2	4.10	23811.52	23267.65	543.87	2229.88
d= 2	28.8	18.50	23267.65	22730.06	537.59	9945.40
d= 3	32.3	30.55	22730.06	22198.75	531.31	16231.39
d= 4	32.8	32.55	22198.75	21673.73	525.02	17089.49
d= 5	35.5	34.15	21673.73	21154.99	518.74	17714.95
d= 6	34.7	35.10	21154.99	20642.53	512.46	17987.22
d= 7	36.8	35.75	20642.53	20136.36	506.17	18095.69
d= 8	37.4	37.10	20136.36	19636.47	499.89	18545.92
d= 9	38.5	37.95	19636.47	19142.86	493.61	18732.38
d= 10	39.9	39.20	19142.86	18655.54	487.32	19103.09
d= 11	38.5	39.20	18655.54	18174.50	481.04	18856.79
d= 12	38.8	38.65	18174.50	17699.74	474.76	18349.37
d= 13	38.0	38.40	17699.74	17231.27	468.47	17989.40
d= 14	39.1	38.55	17231.27	16769.08	462.19	17817.46
d= 15	39.4	39.25	16769.08	16313.17	455.91	17894.38
drem 15.5	40.1					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **246582.80**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 40.10
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17593.64**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **264176.442**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **33.28**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 11
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.1	8.05	23811.52	23267.65	543.87	4378.17
d= 2	23.1	19.60	23267.65	22730.06	537.59	10536.75
d= 3	25.7	24.40	22730.06	22198.75	531.31	12963.86
d= 4	28.1	26.90	22198.75	21673.73	525.02	14123.11
d= 5	29.5	28.80	21673.73	21154.99	518.74	14939.70
d= 6	29.3	29.40	21154.99	20642.53	512.46	15066.22
d= 7	32.3	30.80	20642.53	20136.36	506.17	15590.13
d= 8	32.5	32.40	20136.36	19636.47	499.89	16196.44
d= 9	32.6	32.55	19636.47	19142.86	493.61	16066.90
d= 10	33.3	32.95	19142.86	18655.54	487.32	16057.31
d= 11	35.1	34.20	18655.54	18174.50	481.04	16451.58
d= 12	34.7	34.90	18174.50	17699.74	474.76	16569.03
d= 13	35.3	35.00	17699.74	17231.27	468.47	16396.59
d= 14	36.9	36.10	17231.27	16769.08	462.19	16685.09
d= 15	36.6	36.75	16769.08	16313.17	455.91	16754.61
drem 15.5	36.6					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **218775.49**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 36.60
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16058.04**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **234833.533**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.59**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 11
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	28.1	14.05	23811.52	23267.65	543.87	7641.41
d= 2	31.0	29.55	23267.65	22730.06	537.59	15885.76
d= 3	32.6	31.80	22730.06	22198.75	531.31	16895.53
d= 4	33.8	33.20	22198.75	21673.73	525.02	17430.75
d= 5	34.7	34.25	21673.73	21154.99	518.74	17766.83
d= 6	36.3	35.50	21154.99	20642.53	512.46	18192.20
d= 7	36.8	36.55	20642.53	20136.36	506.17	18500.63
d= 8	37.8	37.30	20136.36	19636.47	499.89	18645.90
d= 9	38.0	37.90	19636.47	19142.86	493.61	18707.70
d= 10	36.7	37.35	19142.86	18655.54	487.32	18201.54
d= 11	37.2	36.95	18655.54	18174.50	481.04	17774.44
d= 12	37.2	37.20	18174.50	17699.74	474.76	17660.97
d= 13	37.1	37.15	17699.74	17231.27	468.47	17403.81
d= 14	38.3	37.70	17231.27	16769.08	462.19	17424.60
d= 15	38.7	38.50	16769.08	16313.17	455.91	17552.45
drem 15.5	37.6					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **255684.50**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 37.60
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16496.78**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **272181.286**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **34.29**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 11
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159

line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.4	12.20	23811.52	23267.65	543.87	6635.24
d= 2	30.8	27.60	23267.65	22730.06	537.59	14837.46
d= 3	34.2	32.50	22730.06	22198.75	531.31	17267.44
d= 4	35.3	34.75	22198.75	21673.73	525.02	18244.54
d= 5	36.2	35.75	21673.73	21154.99	518.74	18544.94
d= 6	36.9	36.55	21154.99	20642.53	512.46	18730.28
d= 7	39.1	38.00	20642.53	20136.36	506.17	19234.58
d= 8	39.5	39.30	20136.36	19636.47	499.89	19645.68
d= 9	40.0	39.75	19636.47	19142.86	493.61	19620.87
d= 10	41.2	40.60	19142.86	18655.54	487.32	19785.34
d= 11	42.4	41.80	18655.54	18174.50	481.04	20107.49
d= 12	40.3	41.35	18174.50	17699.74	474.76	19631.21
d= 13	42.4	41.35	17699.74	17231.27	468.47	19371.40
d= 14	42.5	42.45	17231.27	16769.08	462.19	19620.00
d= 15	44.1	43.30	16769.08	16313.17	455.91	19740.80
drem 15.5	42.0					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **271017.28**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 42.00
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18427.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **289444.535**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **36.47**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at AEP Picway

Wall Effects Run 11
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	7.4	3.70	23811.52	23267.65	543.87	2012.33
d= 2	27.9	17.65	23267.65	22730.06	537.59	9488.45
d= 3	31.0	29.45	22730.06	22198.75	531.31	15646.96
d= 4	32.9	31.95	22198.75	21673.73	525.02	16774.48
d= 5	34.4	33.65	21673.73	21154.99	518.74	17455.58
d= 6	34.8	34.60	21154.99	20642.53	512.46	17730.99
d= 7	36.1	35.45	20642.53	20136.36	506.17	17943.84
d= 8	37.0	36.55	20136.36	19636.47	499.89	18270.98
d= 9	35.9	36.45	19636.47	19142.86	493.61	17991.97
d= 10	38.8	37.35	19142.86	18655.54	487.32	18201.54
d= 11	38.5	38.65	18655.54	18174.50	481.04	18592.21
d= 12	38.6	38.55	18174.50	17699.74	474.76	18301.89
d= 13	38.5	38.55	17699.74	17231.27	468.47	18059.68
d= 14	37.2	37.85	17231.27	16769.08	462.19	17493.93
d= 15	38.4	37.80	16769.08	16313.17	455.91	17233.31
drem 15.5	39.2					

(use d=16 for drem)

line 3) Total near-wall volumetric flow (total of column G) **241198.12**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 39.20
b) Total area in remainder segment 438.74
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **17198.77**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **258396.898**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **32.56**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 5
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.7	9.35	23811.52	23267.65	543.87	5085.21
d= 2	22.6	20.65	23267.65	22730.06	537.59	11101.21
d= 3	25.6	24.10	22730.06	22198.75	531.31	12804.47
d= 4	27.1	26.35	22198.75	21673.73	525.02	13834.35
d= 5	29.9	28.50	21673.73	21154.99	518.74	14784.08
d= 6	32.9	31.40	21154.99	20642.53	512.46	16091.13
d= 7	31.7	32.30	20642.53	20136.36	506.17	16349.39
d= 8	32.9	32.30	20136.36	19636.47	499.89	16146.45
d= 9	34.1	33.50	19636.47	19142.86	493.61	16535.83
d= 10	32.5	33.30	19142.86	18655.54	487.32	16227.88
drem 10.8	35.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **138959.99**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 35.40
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **28210.28**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **167170.273**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **28.08**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 5
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	27.0	13.50	23811.52	23267.65	543.87	7342.28
d= 2	31.1	29.05	23267.65	22730.06	537.59	15616.96
d= 3	33.5	32.30	22730.06	22198.75	531.31	17161.18
d= 4	33.0	33.25	22198.75	21673.73	525.02	17457.00
d= 5	35.9	34.45	21673.73	21154.99	518.74	17870.58
d= 6	34.9	35.40	21154.99	20642.53	512.46	18140.95
d= 7	33.9	34.40	20642.53	20136.36	506.17	17412.36
d= 8	37.5	35.70	20136.36	19636.47	499.89	17846.07
d= 9	35.7	36.60	19636.47	19142.86	493.61	18066.01
d= 10	37.7	36.70	19142.86	18655.54	487.32	17884.78
drem 10.8	36.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **164798.17**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 36.50
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **29086.87**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **193885.043**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **32.57**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 5
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	26.1	13.05	23811.52	23267.65	543.87	7097.53
d= 2	30.7	28.40	23267.65	22730.06	537.59	15267.53
d= 3	31.7	31.20	22730.06	22198.75	531.31	16576.74
d= 4	35.3	33.50	22198.75	21673.73	525.02	17588.26
d= 5	36.5	35.90	21673.73	21154.99	518.74	18622.75
d= 6	37.1	36.80	21154.99	20642.53	512.46	18858.39
d= 7	40.1	38.60	20642.53	20136.36	506.17	19538.28
d= 8	39.9	40.00	20136.36	19636.47	499.89	19995.60
d= 9	41.0	40.45	19636.47	19142.86	493.61	19966.40
d= 10	41.9	41.45	19142.86	18655.54	487.32	20199.56
drem 10.8	41.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **173711.05**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 41.50
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **33071.38**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **206782.429**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **34.74**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 5
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	6.4	3.20	23811.52	23267.65	543.87	1740.39
d= 2	27.5	16.95	23267.65	22730.06	537.59	9112.13
d= 3	30.1	28.80	22730.06	22198.75	531.31	15301.61
d= 4	32.9	31.50	22198.75	21673.73	525.02	16538.22
d= 5	34.3	33.60	21673.73	21154.99	518.74	17429.65
d= 6	34.5	34.40	21154.99	20642.53	512.46	17628.50
d= 7	36.9	35.70	20642.53	20136.36	506.17	18070.38
d= 8	35.4	36.15	20136.36	19636.47	499.89	18071.02
d= 9	36.7	36.05	19636.47	19142.86	493.61	17794.53
d= 10	38.1	37.40	19142.86	18655.54	487.32	18225.90
drem 10.8	37.7					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **149912.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.70
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **30043.16**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **179955.485**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **30.23**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 5
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.2	8.60	23811.52	23267.65	543.87	4677.30
d= 2	22.4	19.80	23267.65	22730.06	537.59	10644.26
d= 3	25.0	23.70	22730.06	22198.75	531.31	12591.95
d= 4	27.0	26.00	22198.75	21673.73	525.02	13650.59
d= 5	29.3	28.15	21673.73	21154.99	518.74	14602.52
d= 6	30.3	29.80	21154.99	20642.53	512.46	15271.20
d= 7	30.8	30.55	20642.53	20136.36	506.17	15463.59
d= 8	31.7	31.25	20136.36	19636.47	499.89	15621.56
d= 9	32.1	31.90	19636.47	19142.86	493.61	15746.06
d= 10	33.7	32.90	19142.86	18655.54	487.32	16032.95
drem 10.8	36.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **134301.98**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 36.40
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **29007.18**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **163309.162**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **27.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 5
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	27.4	13.70	23811.52	23267.65	543.87	7451.05
d= 2	29.1	28.25	23267.65	22730.06	537.59	15186.89
d= 3	31.9	30.50	22730.06	22198.75	531.31	16204.83
d= 4	33.2	32.55	22198.75	21673.73	525.02	17089.49
d= 5	35.6	34.40	21673.73	21154.99	518.74	17844.64
d= 6	34.7	35.15	21154.99	20642.53	512.46	18012.84
d= 7	35.1	34.90	20642.53	20136.36	506.17	17665.44
d= 8	36.6	35.85	20136.36	19636.47	499.89	17921.06
d= 9	38.9	37.75	19636.47	19142.86	493.61	18633.66
d= 10	37.4	38.15	19142.86	18655.54	487.32	18591.40
drem 10.8	36.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **164601.29**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 36.00
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **28688.42**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **193289.716**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **32.47**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 5
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	26.2	13.10	23811.52	23267.65	543.87	7124.73
d= 2	30.7	28.45	23267.65	22730.06	537.59	15294.41
d= 3	33.2	31.95	22730.06	22198.75	531.31	16975.22
d= 4	34.5	33.85	22198.75	21673.73	525.02	17772.02
d= 5	37.4	35.95	21673.73	21154.99	518.74	18648.69
d= 6	35.7	36.55	21154.99	20642.53	512.46	18730.28
d= 7	40.1	37.90	20642.53	20136.36	506.17	19183.96
d= 8	40.3	40.20	20136.36	19636.47	499.89	20095.58
d= 9	41.5	40.90	19636.47	19142.86	493.61	20188.52
d= 10	41.1	41.30	19142.86	18655.54	487.32	20126.47
drem 10.8	42.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **174139.87**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 42.00
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **33469.83**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **207609.694**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **34.88**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 5
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	5.4	2.70	23811.52	23267.65	543.87	1468.46
d= 2	27.1	16.25	23267.65	22730.06	537.59	8735.82
d= 3	31.3	29.20	22730.06	22198.75	531.31	15514.13
d= 4	33.7	32.50	22198.75	21673.73	525.02	17063.24
d= 5	34.2	33.95	21673.73	21154.99	518.74	17611.21
d= 6	35.0	34.60	21154.99	20642.53	512.46	17730.99
d= 7	36.3	35.65	20642.53	20136.36	506.17	18045.07
d= 8	37.0	36.65	20136.36	19636.47	499.89	18320.97
d= 9	38.4	37.70	19636.47	19142.86	493.61	18608.98
d= 10	37.4	37.90	19142.86	18655.54	487.32	18469.57
drem 10.8	37.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **151568.43**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.20
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **29644.71**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **181213.131**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **30.44**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 8
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.4	8.70	23811.52	23267.65	543.87	4731.69
d= 2	21.5	19.45	23267.65	22730.06	537.59	10456.11
d= 3	24.1	22.80	22730.06	22198.75	531.31	12113.77
d= 4	26.8	25.45	22198.75	21673.73	525.02	13361.83
d= 5	28.6	27.70	21673.73	21154.99	518.74	14369.08
d= 6	28.4	28.50	21154.99	20642.53	512.46	14605.01
d= 7	32.0	30.20	20642.53	20136.36	506.17	15286.43
d= 8	31.7	31.85	20136.36	19636.47	499.89	15921.50
d= 9	33.7	32.70	19636.47	19142.86	493.61	16140.94
d= 10	34.1	33.90	19142.86	18655.54	487.32	16520.27
drem 10.8	35.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **133506.63**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 35.10
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **27971.21**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **161477.841**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **27.13**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 8
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	28.9	14.45	23811.52	23267.65	543.87	7858.95
d= 2	32.0	30.45	23267.65	22730.06	537.59	16369.59
d= 3	32.2	32.10	22730.06	22198.75	531.31	17054.92
d= 4	33.9	33.05	22198.75	21673.73	525.02	17352.00
d= 5	34.3	34.10	21673.73	21154.99	518.74	17689.02
d= 6	35.7	35.00	21154.99	20642.53	512.46	17935.97
d= 7	35.1	35.40	20642.53	20136.36	506.17	17918.53
d= 8	36.8	35.95	20136.36	19636.47	499.89	17971.04
d= 9	38.5	37.65	19636.47	19142.86	493.61	18584.30
d= 10	36.1	37.30	19142.86	18655.54	487.32	18177.17
drem 10.8	37.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **166911.49**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 37.90
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **30202.54**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **197114.027**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **33.11**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 8
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.2	12.10	23811.52	23267.65	543.87	6580.85
d= 2	30.1	27.15	23267.65	22730.06	537.59	14595.54
d= 3	33.0	31.55	22730.06	22198.75	531.31	16762.70
d= 4	35.2	34.10	22198.75	21673.73	525.02	17903.27
d= 5	36.4	35.80	21673.73	21154.99	518.74	18570.87
d= 6	37.5	36.95	21154.99	20642.53	512.46	18935.26
d= 7	38.9	38.20	20642.53	20136.36	506.17	19335.81
d= 8	39.3	39.10	20136.36	19636.47	499.89	19545.70
d= 9	40.0	39.65	19636.47	19142.86	493.61	19571.51
d= 10	40.9	40.45	19142.86	18655.54	487.32	19712.24
drem 10.8	42.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **171513.77**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 42.30
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **33708.90**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **205222.671**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **34.47**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 8
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159

line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	7.5	3.75	23811.52	23267.65	543.87	2039.52
d= 2	28.1	17.80	23267.65	22730.06	537.59	9569.09
d= 3	31.1	29.60	22730.06	22198.75	531.31	15726.65
d= 4	33.2	32.15	22198.75	21673.73	525.02	16879.48
d= 5	34.6	33.90	21673.73	21154.99	518.74	17585.27
d= 6	37.3	35.95	21154.99	20642.53	512.46	18422.81
d= 7	36.7	37.00	20642.53	20136.36	506.17	18728.41
d= 8	37.3	37.00	20136.36	19636.47	499.89	18495.93
d= 9	36.3	36.80	19636.47	19142.86	493.61	18164.73
d= 10	36.6	36.45	19142.86	18655.54	487.32	17762.95
drem 10.8	39.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **153374.83**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 39.30
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **31318.20**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **184693.025**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **31.03**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 8
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.4	8.70	23811.52	23267.65	543.87	4731.69
d= 2	21.6	19.50	23267.65	22730.06	537.59	10482.99
d= 3	24.4	23.00	22730.06	22198.75	531.31	12220.04
d= 4	26.2	25.30	22198.75	21673.73	525.02	13283.07
d= 5	30.5	28.35	21673.73	21154.99	518.74	14706.27
d= 6	30.9	30.70	21154.99	20642.53	512.46	15732.41
d= 7	31.8	31.35	20642.53	20136.36	506.17	15868.53
d= 8	31.7	31.75	20136.36	19636.47	499.89	15871.51
d= 9	34.7	33.20	19636.47	19142.86	493.61	16387.75
d= 10	33.5	34.10	19142.86	18655.54	487.32	16617.74
drem 10.8	35.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **135901.98**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 35.30
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **28130.59**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **164032.571**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **27.56**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 8
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	27.0	13.50	23811.52	23267.65	543.87	7342.28
d= 2	31.1	29.05	23267.65	22730.06	537.59	15616.96
d= 3	32.6	31.85	22730.06	22198.75	531.31	16922.09
d= 4	34.3	33.45	22198.75	21673.73	525.02	17562.01
d= 5	34.7	34.50	21673.73	21154.99	518.74	17896.51
d= 6	34.1	34.40	21154.99	20642.53	512.46	17628.50
d= 7	36.8	35.45	20642.53	20136.36	506.17	17943.84
d= 8	37.2	37.00	20136.36	19636.47	499.89	18495.93
d= 9	36.3	36.75	19636.47	19142.86	493.61	18140.05
d= 10	36.8	36.55	19142.86	18655.54	487.32	17811.68
drem 10.8	37.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **165359.85**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 37.60
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **29963.47**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **195323.313**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **32.81**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 8
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.9	12.45	23811.52	23267.65	543.87	6771.21
d= 2	31.2	28.05	23267.65	22730.06	537.59	15079.37
d= 3	33.1	32.15	22730.06	22198.75	531.31	17081.48
d= 4	35.2	34.15	22198.75	21673.73	525.02	17929.53
d= 5	35.5	35.35	21673.73	21154.99	518.74	18337.44
d= 6	37.5	36.50	21154.99	20642.53	512.46	18704.66
d= 7	39.6	38.55	20642.53	20136.36	506.17	19512.98
d= 8	39.6	39.60	20136.36	19636.47	499.89	19795.64
d= 9	40.3	39.95	19636.47	19142.86	493.61	19719.59
d= 10	41.7	41.00	19142.86	18655.54	487.32	19980.27
drem 10.8	40.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **172912.17**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 40.40
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **32194.79**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **205106.957**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **34.46**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 8
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	6.4	3.20	23811.52	23267.65	543.87	1740.39
d= 2	27.2	16.80	23267.65	22730.06	537.59	9031.50
d= 3	30.6	28.90	22730.06	22198.75	531.31	15354.74
d= 4	32.5	31.55	22198.75	21673.73	525.02	16564.47
d= 5	32.2	32.35	21673.73	21154.99	518.74	16781.22
d= 6	34.7	33.45	21154.99	20642.53	512.46	17141.66
d= 7	37.1	35.90	20642.53	20136.36	506.17	18171.62
d= 8	37.3	37.20	20136.36	19636.47	499.89	18595.91
d= 9	38.5	37.90	19636.47	19142.86	493.61	18707.70
d= 10	36.3	37.40	19142.86	18655.54	487.32	18225.90
drem 10.8	38.7					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **150315.11**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 38.70
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **30840.06**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **181155.163**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **30.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 11
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.7	8.85	23811.52	23267.65	543.87	4813.27
d= 2	23.6	20.65	23267.65	22730.06	537.59	11101.21
d= 3	25.4	24.50	22730.06	22198.75	531.31	13016.99
d= 4	27.5	26.45	22198.75	21673.73	525.02	13886.85
d= 5	29.9	28.70	21673.73	21154.99	518.74	14887.82
d= 6	30.1	30.00	21154.99	20642.53	512.46	15373.69
d= 7	31.3	30.70	20642.53	20136.36	506.17	15539.52
d= 8	33.8	32.55	20136.36	19636.47	499.89	16271.42
d= 9	34.3	34.05	19636.47	19142.86	493.61	16807.31
d= 10	35.2	34.75	19142.86	18655.54	487.32	16934.50
drem 10.8	34.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **138632.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 34.90
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **27811.83**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **166444.419**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **27.96**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 11
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	29.0	14.50	23811.52	23267.65	543.87	7886.15
d= 2	30.8	29.90	23267.65	22730.06	537.59	16073.91
d= 3	33.6	32.20	22730.06	22198.75	531.31	17108.05
d= 4	34.6	34.10	22198.75	21673.73	525.02	17903.27
d= 5	33.7	34.15	21673.73	21154.99	518.74	17714.95
d= 6	35.3	34.50	21154.99	20642.53	512.46	17679.74
d= 7	34.7	35.00	20642.53	20136.36	506.17	17716.06
d= 8	36.4	35.55	20136.36	19636.47	499.89	17771.09
d= 9	36.5	36.45	19636.47	19142.86	493.61	17991.97
d= 10	38.0	37.25	19142.86	18655.54	487.32	18152.80
drem 10.8	38.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **165998.00**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 38.30
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **30521.30**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **196519.301**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **33.01**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 11
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.7	12.35	23811.52	23267.65	543.87	6716.82
d= 2	30.0	27.35	23267.65	22730.06	537.59	14703.06
d= 3	33.1	31.55	22730.06	22198.75	531.31	16762.70
d= 4	35.9	34.50	22198.75	21673.73	525.02	18113.28
d= 5	37.0	36.45	21673.73	21154.99	518.74	18908.06
d= 6	38.3	37.65	21154.99	20642.53	512.46	19293.98
d= 7	40.2	39.25	20642.53	20136.36	506.17	19867.30
d= 8	39.4	39.80	20136.36	19636.47	499.89	19895.62
d= 9	39.7	39.55	19636.47	19142.86	493.61	19522.15
d= 10	40.1	39.90	19142.86	18655.54	487.32	19444.21
drem 10.8	41.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **173227.18**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 41.60
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **33151.07**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **206378.251**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **34.67**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 11
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.2	4.10	23811.52	23267.65	543.87	2229.88
d= 2	28.8	18.50	23267.65	22730.06	537.59	9945.40
d= 3	32.3	30.55	22730.06	22198.75	531.31	16231.39
d= 4	32.8	32.55	22198.75	21673.73	525.02	17089.49
d= 5	35.5	34.15	21673.73	21154.99	518.74	17714.95
d= 6	34.7	35.10	21154.99	20642.53	512.46	17987.22
d= 7	36.8	35.75	20642.53	20136.36	506.17	18095.69
d= 8	37.4	37.10	20136.36	19636.47	499.89	18545.92
d= 9	38.5	37.95	19636.47	19142.86	493.61	18732.38
d= 10	39.9	39.20	19142.86	18655.54	487.32	19103.09
drem 10.8	38.5					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **155675.40**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 38.50
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **30680.68**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **186356.079**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **31.31**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 11
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.1	8.05	23811.52	23267.65	543.87	4378.17
d= 2	23.1	19.60	23267.65	22730.06	537.59	10536.75
d= 3	25.7	24.40	22730.06	22198.75	531.31	12963.86
d= 4	28.1	26.90	22198.75	21673.73	525.02	14123.11
d= 5	29.5	28.80	21673.73	21154.99	518.74	14939.70
d= 6	29.3	29.40	21154.99	20642.53	512.46	15066.22
d= 7	32.3	30.80	20642.53	20136.36	506.17	15590.13
d= 8	32.5	32.40	20136.36	19636.47	499.89	16196.44
d= 9	32.6	32.55	19636.47	19142.86	493.61	16066.90
d= 10	33.3	32.95	19142.86	18655.54	487.32	16057.31
drem 10.8	35.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **135918.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 35.10
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **27971.21**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **163889.803**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **27.53**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 11
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	28.1	14.05	23811.52	23267.65	543.87	7641.41
d= 2	31.0	29.55	23267.65	22730.06	537.59	15885.76
d= 3	32.6	31.80	22730.06	22198.75	531.31	16895.53
d= 4	33.8	33.20	22198.75	21673.73	525.02	17430.75
d= 5	34.7	34.25	21673.73	21154.99	518.74	17766.83
d= 6	36.3	35.50	21154.99	20642.53	512.46	18192.20
d= 7	36.8	36.55	20642.53	20136.36	506.17	18500.63
d= 8	37.8	37.30	20136.36	19636.47	499.89	18645.90
d= 9	38.0	37.90	19636.47	19142.86	493.61	18707.70
d= 10	36.7	37.35	19142.86	18655.54	487.32	18201.54
drem 10.8	37.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **167868.23**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 37.20
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **29644.71**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **197512.937**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **33.18**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 11
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.4	12.20	23811.52	23267.65	543.87	6635.24
d= 2	30.8	27.60	23267.65	22730.06	537.59	14837.46
d= 3	34.2	32.50	22730.06	22198.75	531.31	17267.44
d= 4	35.3	34.75	22198.75	21673.73	525.02	18244.54
d= 5	36.2	35.75	21673.73	21154.99	518.74	18544.94
d= 6	36.9	36.55	21154.99	20642.53	512.46	18730.28
d= 7	39.1	38.00	20642.53	20136.36	506.17	19234.58
d= 8	39.5	39.30	20136.36	19636.47	499.89	19645.68
d= 9	40.0	39.75	19636.47	19142.86	493.61	19620.87
d= 10	41.2	40.60	19142.86	18655.54	487.32	19785.34
drem 10.8	42.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **172546.36**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 42.40
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **33788.59**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **206334.951**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **34.66**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at AEP Picway

Wall Effects Run 11
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 23,811.5 sq. in. pi = 3.14159
line 1) radius: 87.06 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	7.4	3.70	23811.52	23267.65	543.87	2012.33
d= 2	27.9	17.65	23267.65	22730.06	537.59	9488.45
d= 3	31.0	29.45	22730.06	22198.75	531.31	15646.96
d= 4	32.9	31.95	22198.75	21673.73	525.02	16774.48
d= 5	34.4	33.65	21673.73	21154.99	518.74	17455.58
d= 6	34.8	34.60	21154.99	20642.53	512.46	17730.99
d= 7	36.1	35.45	20642.53	20136.36	506.17	17943.84
d= 8	37.0	36.55	20136.36	19636.47	499.89	18270.98
d= 9	35.9	36.45	19636.47	19142.86	493.61	17991.97
d= 10	38.8	37.35	19142.86	18655.54	487.32	18201.54
drem 10.8	38.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **151517.10**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 38.50
b) Total area in remainder segment 796.90
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **30680.68**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **182197.781**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **30.61**

ATTACHMENT E.

Mitchell Station
Wall Effects Calculation Forms

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Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.7	6.85	54739.11	53912.87	826.24	5659.73
d= 2	14.6	14.15	53912.87	53092.92	819.96	11602.37
d= 3	15.5	15.05	53092.92	52279.24	813.67	12245.77
d= 4	16.2	15.85	52279.24	51471.86	807.39	12797.12
d= 5	17.2	16.70	51471.86	50670.75	801.11	13378.47
d= 6	16.9	17.05	50670.75	49875.93	794.82	13551.73
d= 7	17.4	17.15	49875.93	49087.39	788.54	13523.45
d= 8	17.8	17.60	49087.39	48305.13	782.26	13767.71
d= 9	19.1	18.45	48305.13	47529.16	775.97	14316.70
d= 10	18.4	18.75	47529.16	46759.47	769.69	14431.69
d= 11	17.7	18.05	46759.47	45996.06	763.41	13779.49
d= 12	18.6	18.15	45996.06	45238.94	757.12	13741.79
d= 13	18.5	18.55	45238.94	44488.10	750.84	13928.09
d= 14	18.9	18.70	44488.10	43743.54	744.56	13923.22
d= 15	18.8	18.85	43743.54	43005.27	738.27	13916.46
d= 16	19.6	19.20	43005.27	42273.28	731.99	14054.22
d= 17	19.5	19.55	42273.28	41547.57	725.71	14187.58
drem 20.5	19.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **222805.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.90
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **100587.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **323393.03**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **17.72**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.6	6.80	54739.11	53912.87	826.24	5618.42
d= 2	15.2	14.40	53912.87	53092.92	819.96	11807.36
d= 3	15.8	15.50	53092.92	52279.24	813.67	12611.92
d= 4	16.9	16.35	52279.24	51471.86	807.39	13200.81
d= 5	19.0	17.95	51471.86	50670.75	801.11	14379.85
d= 6	19.2	19.10	50670.75	49875.93	794.82	15181.11
d= 7	19.0	19.10	49875.93	49087.39	788.54	15061.10
d= 8	19.3	19.15	49087.39	48305.13	782.26	14980.21
d= 9	19.3	19.30	48305.13	47529.16	775.97	14976.28
d= 10	19.7	19.50	47529.16	46759.47	769.69	15008.95
d= 11	19.6	19.65	46759.47	45996.06	763.41	15000.94
d= 12	19.4	19.50	45996.06	45238.94	757.12	14763.91
d= 13	19.6	19.50	45238.94	44488.10	750.84	14641.39
d= 14	19.5	19.55	44488.10	43743.54	744.56	14556.09
d= 15	20.6	20.05	43743.54	43005.27	738.27	14802.39
d= 16	19.6	20.10	43005.27	42273.28	731.99	14713.02
d= 17	19.7	19.65	42273.28	41547.57	725.71	14260.16
drem 20.5	20.6					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **235563.91**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.60
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **104125.69**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **339689.598**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **18.62**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.2	7.60	54739.11	53912.87	826.24	6279.41
d= 2	15.8	15.50	53912.87	53092.92	819.96	12709.31
d= 3	16.8	16.30	53092.92	52279.24	813.67	13262.86
d= 4	18.3	17.55	52279.24	51471.86	807.39	14169.68
d= 5	18.6	18.45	51471.86	50670.75	801.11	14780.40
d= 6	19.1	18.85	50670.75	49875.93	794.82	14982.41
d= 7	19.2	19.15	49875.93	49087.39	788.54	15100.53
d= 8	20.1	19.65	49087.39	48305.13	782.26	15371.34
d= 9	19.6	19.85	48305.13	47529.16	775.97	15403.07
d= 10	20.2	19.90	47529.16	46759.47	769.69	15316.83
d= 11	21.1	20.65	46759.47	45996.06	763.41	15764.35
d= 12	20.2	20.65	45996.06	45238.94	757.12	15634.60
d= 13	20.8	20.50	45238.94	44488.10	750.84	15392.23
d= 14	20.4	20.60	44488.10	43743.54	744.56	15337.88
d= 15	20.8	20.60	43743.54	43005.27	738.27	15208.44
d= 16	21.3	21.05	43005.27	42273.28	731.99	15408.41
d= 17	21.4	21.35	42273.28	41547.57	725.71	15493.86
drem 20.5	21.0					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **245615.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 21.00
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **106147.55**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **351763.135**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **19.28**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	54739.11	53912.87	826.24	5453.17
d= 2	15.0	14.10	53912.87	53092.92	819.96	11561.37
d= 3	15.3	15.15	53092.92	52279.24	813.67	12327.13
d= 4	16.3	15.80	52279.24	51471.86	807.39	12756.75
d= 5	16.9	16.60	51471.86	50670.75	801.11	13298.36
d= 6	17.5	17.20	50670.75	49875.93	794.82	13670.95
d= 7	18.2	17.85	49875.93	49087.39	788.54	14075.43
d= 8	17.9	18.05	49087.39	48305.13	782.26	14119.73
d= 9	18.7	18.30	48305.13	47529.16	775.97	14200.31
d= 10	19.4	19.05	47529.16	46759.47	769.69	14662.59
d= 11	19.2	19.30	46759.47	45996.06	763.41	14733.75
d= 12	19.0	19.10	45996.06	45238.94	757.12	14461.06
d= 13	19.2	19.10	45238.94	44488.10	750.84	14341.05
d= 14	19.5	19.35	44488.10	43743.54	744.56	14407.18
d= 15	19.6	19.55	43743.54	43005.27	738.27	14433.26
d= 16	20.2	19.90	43005.27	42273.28	731.99	14566.62
d= 17	20.4	20.30	42273.28	41547.57	725.71	14731.87
drem 20.5	20.0					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **227800.56**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.00
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **101092.90**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **328893.468**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **18.03**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.1	7.05	54739.11	53912.87	826.24	5824.98
d= 2	15.2	14.65	53912.87	53092.92	819.96	12012.35
d= 3	16.0	15.60	53092.92	52279.24	813.67	12693.29
d= 4	16.2	16.10	52279.24	51471.86	807.39	12998.96
d= 5	16.4	16.30	51471.86	50670.75	801.11	13058.02
d= 6	17.8	17.10	50670.75	49875.93	794.82	13591.47
d= 7	17.5	17.65	49875.93	49087.39	788.54	13917.72
d= 8	17.6	17.55	49087.39	48305.13	782.26	13728.60
d= 9	18.0	17.80	48305.13	47529.16	775.97	13812.32
d= 10	19.4	18.70	47529.16	46759.47	769.69	14393.20
d= 11	18.8	19.10	46759.47	45996.06	763.41	14581.07
d= 12	19.1	18.95	45996.06	45238.94	757.12	14347.49
d= 13	19.9	19.50	45238.94	44488.10	750.84	14641.39
d= 14	18.7	19.30	44488.10	43743.54	744.56	14369.95
d= 15	19.1	18.90	43743.54	43005.27	738.27	13953.38
d= 16	19.6	19.35	43005.27	42273.28	731.99	14164.02
d= 17	19.8	19.70	42273.28	41547.57	725.71	14296.44
drem 20.5	19.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **226384.65**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.70
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **99576.51**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **325961.159**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **17.86**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	54739.11	53912.87	826.24	5453.17
d= 2	14.5	13.85	53912.87	53092.92	819.96	11356.38
d= 3	15.1	14.80	53092.92	52279.24	813.67	12042.35
d= 4	16.6	15.85	52279.24	51471.86	807.39	12797.12
d= 5	17.2	16.90	51471.86	50670.75	801.11	13538.69
d= 6	17.3	17.25	50670.75	49875.93	794.82	13710.69
d= 7	18.2	17.75	49875.93	49087.39	788.54	13996.58
d= 8	18.0	18.10	49087.39	48305.13	782.26	14158.84
d= 9	19.7	18.85	48305.13	47529.16	775.97	14627.09
d= 10	19.3	19.50	47529.16	46759.47	769.69	15008.95
d= 11	19.8	19.55	46759.47	45996.06	763.41	14924.60
d= 12	19.2	19.50	45996.06	45238.94	757.12	14763.91
d= 13	20.6	19.90	45238.94	44488.10	750.84	14941.72
d= 14	19.9	20.25	44488.10	43743.54	744.56	15077.28
d= 15	20.7	20.30	43743.54	43005.27	738.27	14986.96
d= 16	20.0	20.35	43005.27	42273.28	731.99	14896.01
d= 17	20.1	20.05	42273.28	41547.57	725.71	14550.44
drem 20.5	21.2					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **230830.79**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 21.20
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **107158.48**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **337989.264**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **18.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.4	7.70	54739.11	53912.87	826.24	6362.04
d= 2	16.0	15.70	53912.87	53092.92	819.96	12873.30
d= 3	17.1	16.55	53092.92	52279.24	813.67	13466.27
d= 4	18.0	17.55	52279.24	51471.86	807.39	14169.68
d= 5	18.9	18.45	51471.86	50670.75	801.11	14780.40
d= 6	18.6	18.75	50670.75	49875.93	794.82	14902.92
d= 7	19.3	18.95	49875.93	49087.39	788.54	14942.82
d= 8	19.3	19.30	49087.39	48305.13	782.26	15097.55
d= 9	19.4	19.35	48305.13	47529.16	775.97	15015.08
d= 10	20.1	19.75	47529.16	46759.47	769.69	15201.38
d= 11	20.5	20.30	46759.47	45996.06	763.41	15497.16
d= 12	20.5	20.50	45996.06	45238.94	757.12	15521.03
d= 13	20.0	20.25	45238.94	44488.10	750.84	15204.52
d= 14	20.4	20.20	44488.10	43743.54	744.56	15040.05
d= 15	20.7	20.55	43743.54	43005.27	738.27	15171.53
d= 16	21.1	20.90	43005.27	42273.28	731.99	15298.61
d= 17	20.5	20.80	42273.28	41547.57	725.71	15094.72
drem 20.5	21.2					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **243639.05**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 21.20
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **107158.48**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **350797.532**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **19.23**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.3	6.15	54739.11	53912.87	826.24	5081.37
d= 2	14.5	13.40	53912.87	53092.92	819.96	10987.40
d= 3	15.7	15.10	53092.92	52279.24	813.67	12286.45
d= 4	16.3	16.00	52279.24	51471.86	807.39	12918.22
d= 5	17.5	16.90	51471.86	50670.75	801.11	13538.69
d= 6	18.1	17.80	50670.75	49875.93	794.82	14147.84
d= 7	17.8	17.95	49875.93	49087.39	788.54	14154.28
d= 8	18.3	18.05	49087.39	48305.13	782.26	14119.73
d= 9	18.4	18.35	48305.13	47529.16	775.97	14239.11
d= 10	19.4	18.90	47529.16	46759.47	769.69	14547.14
d= 11	18.5	18.95	46759.47	45996.06	763.41	14466.56
d= 12	19.7	19.10	45996.06	45238.94	757.12	14461.06
d= 13	18.6	19.15	45238.94	44488.10	750.84	14378.59
d= 14	19.1	18.85	44488.10	43743.54	744.56	14034.90
d= 15	19.5	19.30	43743.54	43005.27	738.27	14248.69
d= 16	19.7	19.60	43005.27	42273.28	731.99	14347.02
d= 17	19.7	19.70	42273.28	41547.57	725.71	14296.44
drem 20.5	19.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **226253.49**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.90
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **100587.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **326840.927**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **17.91**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.8	10.40	54739.11	53912.87	826.24	8592.88
d= 2	22.4	21.60	53912.87	53092.92	819.96	17711.04
d= 3	24.8	23.60	53092.92	52279.24	813.67	19202.66
d= 4	25.6	25.20	52279.24	51471.86	807.39	20346.20
d= 5	27.8	26.70	51471.86	50670.75	801.11	21389.52
d= 6	26.7	27.25	50670.75	49875.93	794.82	21658.92
d= 7	27.3	27.00	49875.93	49087.39	788.54	21290.56
d= 8	26.3	26.80	49087.39	48305.13	782.26	20964.47
d= 9	32.6	29.45	48305.13	47529.16	775.97	22852.41
d= 10	33.7	33.15	47529.16	46759.47	769.69	25515.22
d= 11	34.8	34.25	46759.47	45996.06	763.41	26146.68
d= 12	34.5	34.65	45996.06	45238.94	757.12	26234.33
d= 13	34.6	34.55	45238.94	44488.10	750.84	25941.53
d= 14	35.0	34.80	44488.10	43743.54	744.56	25910.59
d= 15	34.8	34.90	43743.54	43005.27	738.27	25765.76
d= 16	35.1	34.95	43005.27	42273.28	731.99	25583.08
d= 17	35.5	35.30	42273.28	41547.57	725.71	25617.48
drem 27.5	35.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **380723.34**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.10
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **177418.05**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **558141.385**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **30.59**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.6	8.80	54739.11	53912.87	826.24	7270.90
d= 2	20.6	19.10	53912.87	53092.92	819.96	15661.15
d= 3	21.7	21.15	53092.92	52279.24	813.67	17209.17
d= 4	24.2	22.95	52279.24	51471.86	807.39	18529.58
d= 5	25.8	25.00	51471.86	50670.75	801.11	20027.64
d= 6	24.4	25.10	50670.75	49875.93	794.82	19950.05
d= 7	24.8	24.60	49875.93	49087.39	788.54	19398.07
d= 8	24.8	24.80	49087.39	48305.13	782.26	19399.96
d= 9	31.9	28.35	48305.13	47529.16	775.97	21998.84
d= 10	32.5	32.20	47529.16	46759.47	769.69	24784.01
d= 11	32.5	32.50	46759.47	45996.06	763.41	24810.72
d= 12	32.0	32.25	45996.06	45238.94	757.12	24417.23
d= 13	32.8	32.40	45238.94	44488.10	750.84	24327.23
d= 14	34.0	33.40	44488.10	43743.54	744.56	24868.21
d= 15	33.0	33.50	43743.54	43005.27	738.27	24732.18
d= 16	34.0	33.50	43005.27	42273.28	731.99	24521.69
d= 17	33.7	33.85	42273.28	41547.57	725.71	24565.20
drem 27.5	33.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **356471.82**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 33.90
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **171352.47**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **527824.296**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **28.93**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.3	12.65	54739.11	53912.87	826.24	10451.92
d= 2	26.6	25.95	53912.87	53092.92	819.96	21277.84
d= 3	29.7	28.15	53092.92	52279.24	813.67	22904.87
d= 4	29.5	29.60	52279.24	51471.86	807.39	23898.71
d= 5	30.4	29.95	51471.86	50670.75	801.11	23993.12
d= 6	32.3	31.35	50670.75	49875.93	794.82	24917.69
d= 7	32.1	32.20	49875.93	49087.39	788.54	25390.97
d= 8	31.8	31.95	49087.39	48305.13	782.26	24993.09
d= 9	32.2	32.00	48305.13	47529.16	775.97	24831.14
d= 10	30.6	31.40	47529.16	46759.47	769.69	24168.26
d= 11	30.6	30.60	46759.47	45996.06	763.41	23360.25
d= 12	28.8	29.70	45996.06	45238.94	757.12	22486.57
d= 13	27.6	28.20	45238.94	44488.10	750.84	21173.70
d= 14	27.7	27.65	44488.10	43743.54	744.56	20587.01
d= 15	27.9	27.80	43743.54	43005.27	738.27	20524.02
d= 16	26.8	27.35	43005.27	42273.28	731.99	20019.95
d= 17	28.6	27.70	42273.28	41547.57	725.71	20102.10
drem 20.5	27.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **375081.20**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 27.70
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **140013.67**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **515094.868**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **28.23**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	22.8	11.40	54739.11	53912.87	826.24	9419.12
d= 2	27.4	25.10	53912.87	53092.92	819.96	20580.88
d= 3	29.7	28.55	53092.92	52279.24	813.67	23230.34
d= 4	30.6	30.15	52279.24	51471.86	807.39	24342.78
d= 5	31.9	31.25	51471.86	50670.75	801.11	25034.56
d= 6	32.4	32.15	50670.75	49875.93	794.82	25553.55
d= 7	34.1	33.25	49875.93	49087.39	788.54	26218.94
d= 8	34.6	34.35	49087.39	48305.13	782.26	26870.50
d= 9	33.7	34.15	48305.13	47529.16	775.97	26499.48
d= 10	33.5	33.60	47529.16	46759.47	769.69	25861.58
d= 11	31.2	32.35	46759.47	45996.06	763.41	24696.21
d= 12	29.2	30.20	45996.06	45238.94	757.12	22865.13
d= 13	28.5	28.85	45238.94	44488.10	750.84	21661.74
d= 14	29.0	28.75	44488.10	43743.54	744.56	21406.02
d= 15	28.2	28.60	43743.54	43005.27	738.27	21114.64
d= 16	29.2	28.70	43005.27	42273.28	731.99	21008.14
d= 17	28.8	29.00	42273.28	41547.57	725.71	21045.52
drem 27.5	30.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **387409.11**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 30.10
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **152144.82**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **539553.936**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.57**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.9	12.95	54739.11	53912.87	826.24	10699.79
d= 2	29.1	27.50	53912.87	53092.92	819.96	22548.77
d= 3	31.5	30.30	53092.92	52279.24	813.67	24654.27
d= 4	31.8	31.65	52279.24	51471.86	807.39	25553.86
d= 5	33.7	32.75	51471.86	50670.75	801.11	26236.21
d= 6	34.0	33.85	50670.75	49875.93	794.82	26904.75
d= 7	34.5	34.25	49875.93	49087.39	788.54	27007.48
d= 8	34.8	34.65	49087.39	48305.13	782.26	27105.18
d= 9	36.5	35.65	48305.13	47529.16	775.97	27663.44
d= 10	34.3	35.40	47529.16	46759.47	769.69	27247.02
d= 11	32.8	33.55	46759.47	45996.06	763.41	25612.30
d= 12	31.7	32.25	45996.06	45238.94	757.12	24417.23
d= 13	29.5	30.60	45238.94	44488.10	750.84	22975.71
d= 14	30.6	30.05	44488.10	43743.54	744.56	22373.94
d= 15	29.6	30.10	43743.54	43005.27	738.27	22222.05
d= 16	30.3	29.95	43005.27	42273.28	731.99	21923.12
d= 17	29.7	30.00	42273.28	41547.57	725.71	21771.23
drem 27.5	29.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **406916.36**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.70
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **150122.96**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **557039.318**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **30.53**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.5	11.25	54739.11	53912.87	826.24	9295.18
d= 2	27.2	24.85	53912.87	53092.92	819.96	20375.89
d= 3	28.8	28.00	53092.92	52279.24	813.67	22782.82
d= 4	29.8	29.30	52279.24	51471.86	807.39	23656.50
d= 5	29.7	29.75	51471.86	50670.75	801.11	23832.90
d= 6	31.9	30.80	50670.75	49875.93	794.82	24480.54
d= 7	32.7	32.30	49875.93	49087.39	788.54	25469.82
d= 8	32.3	32.50	49087.39	48305.13	782.26	25423.33
d= 9	32.4	32.35	48305.13	47529.16	775.97	25102.73
d= 10	31.5	31.95	47529.16	46759.47	769.69	24591.59
d= 11	30.4	30.95	46759.47	45996.06	763.41	23627.44
d= 12	28.7	29.55	45996.06	45238.94	757.12	22373.00
d= 13	28.2	28.45	45238.94	44488.10	750.84	21361.41
d= 14	28.6	28.40	44488.10	43743.54	744.56	21145.42
d= 15	28.6	28.60	43743.54	43005.27	738.27	21114.64
d= 16	28.0	28.30	43005.27	42273.28	731.99	20715.34
d= 17	28.2	28.10	42273.28	41547.57	725.71	20392.38
drem 27.5	28.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **375740.93**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.90
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **146079.25**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **521820.177**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **28.60**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.3	12.15	54739.11	53912.87	826.24	10038.80
d= 2	27.4	25.85	53912.87	53092.92	819.96	21195.85
d= 3	30.5	28.95	53092.92	52279.24	813.67	23555.81
d= 4	30.1	30.30	52279.24	51471.86	807.39	24463.89
d= 5	31.3	30.70	51471.86	50670.75	801.11	24593.95
d= 6	31.3	31.30	50670.75	49875.93	794.82	24877.95
d= 7	32.9	32.10	49875.93	49087.39	788.54	25312.12
d= 8	32.9	32.90	49087.39	48305.13	782.26	25736.23
d= 9	33.5	33.20	48305.13	47529.16	775.97	25762.31
d= 10	30.8	32.15	47529.16	46759.47	769.69	24745.53
d= 11	29.9	30.35	46759.47	45996.06	763.41	23169.39
d= 12	27.9	28.90	45996.06	45238.94	757.12	21880.87
d= 13	27.8	27.85	45238.94	44488.10	750.84	20910.90
d= 14	28.4	28.10	44488.10	43743.54	744.56	20922.06
d= 15	27.9	28.15	43743.54	43005.27	738.27	20782.41
d= 16	27.4	27.65	43005.27	42273.28	731.99	20239.55
d= 17	27.3	27.35	42273.28	41547.57	725.71	19848.10
drem 20.5	28.5					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **378035.71**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.50
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **144057.39**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **522093.094**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **28.61**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.4	11.70	54739.11	53912.87	826.24	9666.99
d= 2	27.4	25.40	53912.87	53092.92	819.96	20826.87
d= 3	29.8	28.60	53092.92	52279.24	813.67	23271.02
d= 4	30.8	30.30	52279.24	51471.86	807.39	24463.89
d= 5	30.6	30.70	51471.86	50670.75	801.11	24593.95
d= 6	33.2	31.90	50670.75	49875.93	794.82	25354.84
d= 7	34.1	33.65	49875.93	49087.39	788.54	26534.35
d= 8	34.5	34.30	49087.39	48305.13	782.26	26831.39
d= 9	34.1	34.30	48305.13	47529.16	775.97	26615.88
d= 10	34.0	34.05	47529.16	46759.47	769.69	26207.94
d= 11	31.9	32.95	46759.47	45996.06	763.41	25154.25
d= 12	28.6	30.25	45996.06	45238.94	757.12	22902.99
d= 13	28.4	28.50	45238.94	44488.10	750.84	21398.95
d= 14	28.5	28.45	44488.10	43743.54	744.56	21182.65
d= 15	28.7	28.60	43743.54	43005.27	738.27	21114.64
d= 16	31.0	29.85	43005.27	42273.28	731.99	21849.93
d= 17	30.8	30.90	42273.28	41547.57	725.71	22424.37
drem 27.5	30.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **390394.88**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 30.10
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **152144.82**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **542539.704**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **29.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159

line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.9	12.45	54739.11	53912.87	826.24	10286.67
d= 2	29.0	26.95	53912.87	53092.92	819.96	22097.80
d= 3	31.1	30.05	53092.92	52279.24	813.67	24450.85
d= 4	31.6	31.35	52279.24	51471.86	807.39	25311.64
d= 5	33.2	32.40	51471.86	50670.75	801.11	25955.83
d= 6	33.9	33.55	50670.75	49875.93	794.82	26666.30
d= 7	35.1	34.50	49875.93	49087.39	788.54	27204.61
d= 8	33.9	34.50	49087.39	48305.13	782.26	26987.84
d= 9	33.9	33.90	48305.13	47529.16	775.97	26305.49
d= 10	34.6	34.25	47529.16	46759.47	769.69	26361.88
d= 11	31.4	33.00	46759.47	45996.06	763.41	25192.42
d= 12	30.7	31.05	45996.06	45238.94	757.12	23508.69
d= 13	28.6	29.65	45238.94	44488.10	750.84	22262.42
d= 14	30.5	29.55	44488.10	43743.54	744.56	22001.66
d= 15	30.6	30.55	43743.54	43005.27	738.27	22554.27
d= 16	29.9	30.25	43005.27	42273.28	731.99	22142.72
d= 17	29.7	29.80	42273.28	41547.57	725.71	21626.09
drem 27.5	30.8					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **400917.17**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 30.80
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **155683.07**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **556600.245**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **30.51**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159

line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.6	11.30	54739.11	53912.87	826.24	9336.50
d= 2	27.1	24.85	53912.87	53092.92	819.96	20375.89
d= 3	28.0	27.55	53092.92	52279.24	813.67	22416.67
d= 4	30.2	29.10	52279.24	51471.86	807.39	23495.02
d= 5	32.0	31.10	51471.86	50670.75	801.11	24914.39
d= 6	32.1	32.05	50670.75	49875.93	794.82	25474.06
d= 7	31.7	31.90	49875.93	49087.39	788.54	25154.41
d= 8	31.1	31.40	49087.39	48305.13	782.26	24562.85
d= 9	32.4	31.75	48305.13	47529.16	775.97	24637.15
d= 10	31.6	32.00	47529.16	46759.47	769.69	24630.08
d= 11	30.7	31.15	46759.47	45996.06	763.41	23780.12
d= 12	28.9	29.80	45996.06	45238.94	757.12	22562.28
d= 13	27.3	28.10	45238.94	44488.10	750.84	21098.61
d= 14	28.6	27.95	44488.10	43743.54	744.56	20810.37
d= 15	28.2	28.40	43743.54	43005.27	738.27	20966.98
d= 16	28.2	28.20	43005.27	42273.28	731.99	20642.14
d= 17	27.8	28.00	42273.28	41547.57	725.71	20319.81
drem 27.5	28.4					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **375177.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.40
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **143551.92**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **518729.253**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **28.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT A, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.5	12.75	54739.11	53912.87	826.24	10534.54
d= 2	27.1	26.30	53912.87	53092.92	819.96	21564.83
d= 3	27.5	27.30	53092.92	52279.24	813.67	22213.25
d= 4	30.4	28.95	52279.24	51471.86	807.39	23373.91
d= 5	31.2	30.80	51471.86	50670.75	801.11	24674.06
d= 6	30.9	31.05	50670.75	49875.93	794.82	24679.24
d= 7	33.6	32.25	49875.93	49087.39	788.54	25430.40
d= 8	31.8	32.70	49087.39	48305.13	782.26	25579.78
d= 9	31.5	31.65	48305.13	47529.16	775.97	24559.55
d= 10	34.7	33.10	47529.16	46759.47	769.69	25476.74
d= 11	33.2	33.95	46759.47	45996.06	763.41	25917.66
d= 12	34.8	34.00	45996.06	45238.94	757.12	25742.20
d= 13	33.4	34.10	45238.94	44488.10	750.84	25603.66
d= 14	33.4	33.40	44488.10	43743.54	744.56	24868.21
d= 15	33.8	33.60	43743.54	43005.27	738.27	24806.01
d= 16	36.0	34.90	43005.27	42273.28	731.99	25546.48
d= 17	35.7	35.85	42273.28	41547.57	725.71	26016.62
drem 20.5	34.8					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **406587.12**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 34.80
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **175901.65**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **582488.771**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **31.92**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT B, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.2	12.10	54739.11	53912.87	826.24	9997.49
d= 2	26.5	25.35	53912.87	53092.92	819.96	20785.87
d= 3	28.6	27.55	53092.92	52279.24	813.67	22416.67
d= 4	31.4	30.00	52279.24	51471.86	807.39	24221.67
d= 5	32.2	31.80	51471.86	50670.75	801.11	25475.16
d= 6	33.3	32.75	50670.75	49875.93	794.82	26030.44
d= 7	34.3	33.80	49875.93	49087.39	788.54	26652.63
d= 8	35.0	34.65	49087.39	48305.13	782.26	27105.18
d= 9	35.4	35.20	48305.13	47529.16	775.97	27314.25
d= 10	34.9	35.15	47529.16	46759.47	769.69	27054.60
d= 11	35.6	35.25	46759.47	45996.06	763.41	26910.09
d= 12	35.8	35.70	45996.06	45238.94	757.12	27029.31
d= 13	36.2	36.00	45238.94	44488.10	750.84	27030.25
d= 14	36.3	36.25	44488.10	43743.54	744.56	26990.20
d= 15	35.7	36.00	43743.54	43005.27	738.27	26577.86
d= 16	36.5	36.10	43005.27	42273.28	731.99	26424.87
d= 17	37.6	37.05	42273.28	41547.57	725.71	26887.47
drem 27.5	36.1					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **424904.01**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 36.10
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **182472.69**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **607376.701**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **33.29**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT C, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.1	12.55	54739.11	53912.87	826.24	10369.29
d= 2	28.4	26.75	53912.87	53092.92	819.96	21933.81
d= 3	31.4	29.90	53092.92	52279.24	813.67	24328.80
d= 4	31.9	31.65	52279.24	51471.86	807.39	25553.86
d= 5	32.1	32.00	51471.86	50670.75	801.11	25635.39
d= 6	34.7	33.40	50670.75	49875.93	794.82	26547.08
d= 7	34.1	34.40	49875.93	49087.39	788.54	27125.76
d= 8	34.5	34.30	49087.39	48305.13	782.26	26831.39
d= 9	34.8	34.65	48305.13	47529.16	775.97	26887.47
d= 10	35.8	35.30	47529.16	46759.47	769.69	27170.05
d= 11	37.4	36.60	46759.47	45996.06	763.41	27940.69
d= 12	37.1	37.25	45996.06	45238.94	757.12	28202.85
d= 13	37.0	37.05	45238.94	44488.10	750.84	27818.64
d= 14	35.8	36.40	44488.10	43743.54	744.56	27101.88
d= 15	37.2	36.50	43743.54	43005.27	738.27	26947.00
d= 16	38.3	37.75	43005.27	42273.28	731.99	27632.65
d= 17	37.7	38.00	42273.28	41547.57	725.71	27576.89
drem 27.5	37.7					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **435603.48**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.70
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **190560.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **626163.608**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **34.32**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT D, USI 12pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.2	11.60	54739.11	53912.87	826.24	9584.37
d= 2	25.6	24.40	53912.87	53092.92	819.96	20006.91
d= 3	27.0	26.30	53092.92	52279.24	813.67	21399.58
d= 4	29.1	28.05	52279.24	51471.86	807.39	22647.26
d= 5	30.3	29.70	51471.86	50670.75	801.11	23792.84
d= 6	32.3	31.30	50670.75	49875.93	794.82	24877.95
d= 7	33.0	32.65	49875.93	49087.39	788.54	25745.81
d= 8	33.0	33.00	49087.39	48305.13	782.26	25814.46
d= 9	33.0	33.00	48305.13	47529.16	775.97	25607.11
d= 10	34.8	33.90	47529.16	46759.47	769.69	26092.49
d= 11	33.8	34.30	46759.47	45996.06	763.41	26184.85
d= 12	34.7	34.25	45996.06	45238.94	757.12	25931.48
d= 13	35.1	34.90	45238.94	44488.10	750.84	26204.33
d= 14	35.0	35.05	44488.10	43743.54	744.56	26096.73
d= 15	34.1	34.55	43743.54	43005.27	738.27	25507.37
d= 16	35.4	34.75	43005.27	42273.28	731.99	25436.68
d= 17	35.4	35.40	42273.28	41547.57	725.71	25690.05
drem 27.5	35.6					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **406620.26**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.60
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **179945.37**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **586565.631**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **32.15**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.1	12.55	54739.11	53912.87	826.24	10369.29
d= 2	27.4	26.25	53912.87	53092.92	819.96	21523.83
d= 3	29.6	28.50	53092.92	52279.24	813.67	23189.66
d= 4	30.2	29.90	52279.24	51471.86	807.39	24140.93
d= 5	31.2	30.70	51471.86	50670.75	801.11	24593.95
d= 6	31.9	31.55	50670.75	49875.93	794.82	25076.65
d= 7	32.2	32.05	49875.93	49087.39	788.54	25272.69
d= 8	31.9	32.05	49087.39	48305.13	782.26	25071.31
d= 9	33.0	32.45	48305.13	47529.16	775.97	25180.33
d= 10	33.3	33.15	47529.16	46759.47	769.69	25515.22
d= 11	33.7	33.50	46759.47	45996.06	763.41	25574.13
d= 12	33.2	33.45	45996.06	45238.94	757.12	25325.78
d= 13	35.3	34.25	45238.94	44488.10	750.84	25716.28
d= 14	34.3	34.80	44488.10	43743.54	744.56	25910.59
d= 15	35.5	34.90	43743.54	43005.27	738.27	25765.76
d= 16	35.4	35.45	43005.27	42273.28	731.99	25949.07
d= 17	35.7	35.55	42273.28	41547.57	725.71	25798.91
drem 20.5	35.4					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **409974.38**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.40
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **178934.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **588908.822**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **32.28**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159

line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.5	11.75	54739.11	53912.87	826.24	9708.30
d= 2	28.3	25.90	53912.87	53092.92	819.96	21236.84
d= 3	29.9	29.10	53092.92	52279.24	813.67	23677.86
d= 4	32.7	31.30	52279.24	51471.86	807.39	25271.27
d= 5	32.1	32.40	51471.86	50670.75	801.11	25955.83
d= 6	32.8	32.45	50670.75	49875.93	794.82	25791.99
d= 7	33.3	33.05	49875.93	49087.39	788.54	26061.23
d= 8	34.8	34.05	49087.39	48305.13	782.26	26635.83
d= 9	33.6	34.20	48305.13	47529.16	775.97	26538.28
d= 10	34.5	34.05	47529.16	46759.47	769.69	26207.94
d= 11	36.2	35.35	46759.47	45996.06	763.41	26986.43
d= 12	37.0	36.60	45996.06	45238.94	757.12	27710.72
d= 13	37.1	37.05	45238.94	44488.10	750.84	27818.64
d= 14	37.1	37.10	44488.10	43743.54	744.56	27623.07
d= 15	38.0	37.55	43743.54	43005.27	738.27	27722.19
d= 16	38.0	38.00	43005.27	42273.28	731.99	27815.65
d= 17	35.9	36.95	42273.28	41547.57	725.71	26814.90
drem 27.5	36.9					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **429576.97**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 36.90
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **186516.41**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **616093.378**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **33.77**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	26.9	13.45	54739.11	53912.87	826.24	11112.91
d= 2	28.9	27.90	53912.87	53092.92	819.96	22876.75
d= 3	31.4	30.15	53092.92	52279.24	813.67	24532.22
d= 4	31.8	31.60	52279.24	51471.86	807.39	25513.49
d= 5	32.8	32.30	51471.86	50670.75	801.11	25875.72
d= 6	33.1	32.95	50670.75	49875.93	794.82	26189.41
d= 7	34.3	33.70	49875.93	49087.39	788.54	26573.78
d= 8	35.0	34.65	49087.39	48305.13	782.26	27105.18
d= 9	34.5	34.75	48305.13	47529.16	775.97	26965.06
d= 10	35.9	35.20	47529.16	46759.47	769.69	27093.08
d= 11	37.2	36.55	46759.47	45996.06	763.41	27902.52
d= 12	37.6	37.40	45996.06	45238.94	757.12	28316.42
d= 13	36.5	37.05	45238.94	44488.10	750.84	27818.64
d= 14	37.1	36.80	44488.10	43743.54	744.56	27399.70
d= 15	36.0	36.55	43743.54	43005.27	738.27	26983.91
d= 16	37.5	36.75	43005.27	42273.28	731.99	26900.66
d= 17	37.5	37.50	42273.28	41547.57	725.71	27214.04
drem 27.5	37.0					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **436373.49**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.00
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **187021.87**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **623395.361**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **34.17**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.5	11.25	54739.11	53912.87	826.24	9295.18
d= 2	25.5	24.00	53912.87	53092.92	819.96	19678.93
d= 3	28.4	26.95	53092.92	52279.24	813.67	21928.46
d= 4	29.9	29.15	52279.24	51471.86	807.39	23535.39
d= 5	31.8	30.85	51471.86	50670.75	801.11	24714.11
d= 6	32.2	32.00	50670.75	49875.93	794.82	25434.32
d= 7	32.4	32.30	49875.93	49087.39	788.54	25469.82
d= 8	33.0	32.70	49087.39	48305.13	782.26	25579.78
d= 9	34.2	33.60	48305.13	47529.16	775.97	26072.70
d= 10	33.8	34.00	47529.16	46759.47	769.69	26169.46
d= 11	34.2	34.00	46759.47	45996.06	763.41	25955.83
d= 12	35.0	34.60	45996.06	45238.94	757.12	26196.47
d= 13	35.1	35.05	45238.94	44488.10	750.84	26316.95
d= 14	34.5	34.80	44488.10	43743.54	744.56	25910.59
d= 15	34.9	34.70	43743.54	43005.27	738.27	25618.11
d= 16	34.7	34.80	43005.27	42273.28	731.99	25473.28
d= 17	34.9	34.80	42273.28	41547.57	725.71	25254.63
drem 27.5	35.3					

(use d=18 for drem)

line 3) Total near-wall volumetric flow (total of column G) **408604.02**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.30
b) Total area in remainder segment 5054.65
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **178428.98**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **587032.995**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **32.17**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132.0001 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.7	6.85	54739.11	53912.87	826.24	5659.73
d= 2	14.6	14.15	53912.87	53092.92	819.96	11602.37
d= 3	15.5	15.05	53092.92	52279.24	813.67	12245.77
d= 4	16.2	15.85	52279.24	51471.86	807.39	12797.12
d= 5	17.2	16.70	51471.86	50670.75	801.11	13378.47
d= 6	16.9	17.05	50670.75	49875.93	794.82	13551.73
d= 7	17.4	17.15	49875.93	49087.39	788.54	13523.45
d= 8	17.8	17.60	49087.39	48305.13	782.26	13767.71
d= 9	19.1	18.45	48305.13	47529.16	775.97	14316.70
d= 10	18.4	18.75	47529.16	46759.47	769.69	14431.69
d= 11	17.7	18.05	46759.47	45996.06	763.41	13779.49
d= 12	18.6	18.15	45996.06	45238.94	757.12	13741.79
d= 13	18.5	18.55	45238.94	44488.10	750.84	13928.09
d= 14	18.9	18.70	44488.10	43743.54	744.56	13923.22
d= 15	18.8	18.85	43743.54	43005.27	738.27	13916.46
d= 16	19.6	19.20	43005.27	42273.28	731.99	14054.22
drem= 16.8	19.5					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **208618.01**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.50
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **23769.39**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **232387.391**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.98**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132.0001 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.6	6.80	54739.11	53912.87	826.24	5618.42
d= 2	15.2	14.40	53912.87	53092.92	819.96	11807.36
d= 3	15.8	15.50	53092.92	52279.24	813.67	12611.92
d= 4	16.9	16.35	52279.24	51471.86	807.39	13200.81
d= 5	19.0	17.95	51471.86	50670.75	801.11	14379.85
d= 6	19.2	19.10	50670.75	49875.93	794.82	15181.11
d= 7	19.0	19.10	49875.93	49087.39	788.54	15061.10
d= 8	19.3	19.15	49087.39	48305.13	782.26	14980.21
d= 9	19.3	19.30	48305.13	47529.16	775.97	14976.28
d= 10	19.7	19.50	47529.16	46759.47	769.69	15008.95
d= 11	19.6	19.65	46759.47	45996.06	763.41	15000.94
d= 12	19.4	19.50	45996.06	45238.94	757.12	14763.91
d= 13	19.6	19.50	45238.94	44488.10	750.84	14641.39
d= 14	19.5	19.55	44488.10	43743.54	744.56	14556.09
d= 15	20.6	20.05	43743.54	43005.27	738.27	14802.39
d= 16	19.6	20.10	43005.27	42273.28	731.99	14713.02
drem= 16.8	19.7					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **221303.75**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.70
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24013.17**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **245316.925**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **17.93**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 132.0001 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.2	7.60	54739.11	53912.87	826.24	6279.41
d= 2	15.8	15.50	53912.87	53092.92	819.96	12709.31
d= 3	16.8	16.30	53092.92	52279.24	813.67	13262.86
d= 4	18.3	17.55	52279.24	51471.86	807.39	14169.68
d= 5	18.6	18.45	51471.86	50670.75	801.11	14780.40
d= 6	19.1	18.85	50670.75	49875.93	794.82	14982.41
d= 7	19.2	19.15	49875.93	49087.39	788.54	15100.53
d= 8	20.1	19.65	49087.39	48305.13	782.26	15371.34
d= 9	19.6	19.85	48305.13	47529.16	775.97	15403.07
d= 10	20.2	19.90	47529.16	46759.47	769.69	15316.83
d= 11	21.1	20.65	46759.47	45996.06	763.41	15764.35
d= 12	20.2	20.65	45996.06	45238.94	757.12	15634.60
d= 13	20.8	20.50	45238.94	44488.10	750.84	15392.23
d= 14	20.4	20.60	44488.10	43743.54	744.56	15337.88
d= 15	20.8	20.60	43743.54	43005.27	738.27	15208.44
d= 16	21.3	21.05	43005.27	42273.28	731.99	15408.41
drem= 16.8	21.4					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **230121.73**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 21.40
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **26085.38**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **256207.104**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **18.72**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 130,741.0 sq. in. pi = 3.14159
line 1) radius: 132.0001 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	13.2	6.60	54739.11	53912.87	826.24	5453.17
d= 2	15.0	14.10	53912.87	53092.92	819.96	11561.37
d= 3	15.3	15.15	53092.92	52279.24	813.67	12327.13
d= 4	16.3	15.80	52279.24	51471.86	807.39	12756.75
d= 5	16.9	16.60	51471.86	50670.75	801.11	13298.36
d= 6	17.5	17.20	50670.75	49875.93	794.82	13670.95
d= 7	18.2	17.85	49875.93	49087.39	788.54	14075.43
d= 8	17.9	18.05	49087.39	48305.13	782.26	14119.73
d= 9	18.7	18.30	48305.13	47529.16	775.97	14200.31
d= 10	19.4	19.05	47529.16	46759.47	769.69	14662.59
d= 11	19.2	19.30	46759.47	45996.06	763.41	14733.75
d= 12	19.0	19.10	45996.06	45238.94	757.12	14461.06
d= 13	19.2	19.10	45238.94	44488.10	750.84	14341.05
d= 14	19.5	19.35	44488.10	43743.54	744.56	14407.18
d= 15	19.6	19.55	43743.54	43005.27	738.27	14433.26
d= 16	20.2	19.90	43005.27	42273.28	731.99	14566.62
drem= 16.8	20.4					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **213068.70**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.40
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **24866.43**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **237935.132**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **17.39**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT A, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159

line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.1	7.05	54739.11	53912.87	826.24	5824.98
d= 2	15.2	14.65	53912.87	53092.92	819.96	12012.35
d= 3	16.0	15.60	53092.92	52279.24	813.67	12693.29
d= 4	16.2	16.10	52279.24	51471.86	807.39	12998.96
d= 5	16.4	16.30	51471.86	50670.75	801.11	13058.02
d= 6	17.8	17.10	50670.75	49875.93	794.82	13591.47
d= 7	17.5	17.65	49875.93	49087.39	788.54	13917.72
d= 8	17.6	17.55	49087.39	48305.13	782.26	13728.60
d= 9	18.0	17.80	48305.13	47529.16	775.97	13812.32
d= 10	19.4	18.70	47529.16	46759.47	769.69	14393.20
d= 11	18.8	19.10	46759.47	45996.06	763.41	14581.07
d= 12	19.1	18.95	45996.06	45238.94	757.12	14347.49
d= 13	19.9	19.50	45238.94	44488.10	750.84	14641.39
d= 14	18.7	19.30	44488.10	43743.54	744.56	14369.95
d= 15	19.1	18.90	43743.54	43005.27	738.27	13953.38
d= 16	19.6	19.35	43005.27	42273.28	731.99	14164.02
drem 16.8	19.8					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **212088.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.80
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24135.07**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **236223.276**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **17.26**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT B, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	54739.11	53912.87	826.24	5453.17
d= 2	14.5	13.85	53912.87	53092.92	819.96	11356.38
d= 3	15.1	14.80	53092.92	52279.24	813.67	12042.35
d= 4	16.6	15.85	52279.24	51471.86	807.39	12797.12
d= 5	17.2	16.90	51471.86	50670.75	801.11	13538.69
d= 6	17.3	17.25	50670.75	49875.93	794.82	13710.69
d= 7	18.2	17.75	49875.93	49087.39	788.54	13996.58
d= 8	18.0	18.10	49087.39	48305.13	782.26	14158.84
d= 9	19.7	18.85	48305.13	47529.16	775.97	14627.09
d= 10	19.3	19.50	47529.16	46759.47	769.69	15008.95
d= 11	19.8	19.55	46759.47	45996.06	763.41	14924.60
d= 12	19.2	19.50	45996.06	45238.94	757.12	14763.91
d= 13	20.6	19.90	45238.94	44488.10	750.84	14941.72
d= 14	19.9	20.25	44488.10	43743.54	744.56	15077.28
d= 15	20.7	20.30	43743.54	43005.27	738.27	14986.96
d= 16	20.0	20.35	43005.27	42273.28	731.99	14896.01
drem 16.8	20.1					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **216280.35**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.10
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24500.75**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **240781.098**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **17.59**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT C, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.4	7.70	54739.11	53912.87	826.24	6362.04
d= 2	16.0	15.70	53912.87	53092.92	819.96	12873.30
d= 3	17.1	16.55	53092.92	52279.24	813.67	13466.27
d= 4	18.0	17.55	52279.24	51471.86	807.39	14169.68
d= 5	18.9	18.45	51471.86	50670.75	801.11	14780.40
d= 6	18.6	18.75	50670.75	49875.93	794.82	14902.92
d= 7	19.3	18.95	49875.93	49087.39	788.54	14942.82
d= 8	19.3	19.30	49087.39	48305.13	782.26	15097.55
d= 9	19.4	19.35	48305.13	47529.16	775.97	15015.08
d= 10	20.1	19.75	47529.16	46759.47	769.69	15201.38
d= 11	20.5	20.30	46759.47	45996.06	763.41	15497.16
d= 12	20.5	20.50	45996.06	45238.94	757.12	15521.03
d= 13	20.0	20.25	45238.94	44488.10	750.84	15204.52
d= 14	20.4	20.20	44488.10	43743.54	744.56	15040.05
d= 15	20.7	20.55	43743.54	43005.27	738.27	15171.53
d= 16	21.1	20.90	43005.27	42273.28	731.99	15298.61
drem 16.8	20.5					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **228544.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 20.50
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24988.33**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **253532.662**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **18.53**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 1
PORT D, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.3	6.15	54739.11	53912.87	826.24	5081.37
d= 2	14.5	13.40	53912.87	53092.92	819.96	10987.40
d= 3	15.7	15.10	53092.92	52279.24	813.67	12286.45
d= 4	16.3	16.00	52279.24	51471.86	807.39	12918.22
d= 5	17.5	16.90	51471.86	50670.75	801.11	13538.69
d= 6	18.1	17.80	50670.75	49875.93	794.82	14147.84
d= 7	17.8	17.95	49875.93	49087.39	788.54	14154.28
d= 8	18.3	18.05	49087.39	48305.13	782.26	14119.73
d= 9	18.4	18.35	48305.13	47529.16	775.97	14239.11
d= 10	19.4	18.90	47529.16	46759.47	769.69	14547.14
d= 11	18.5	18.95	46759.47	45996.06	763.41	14466.56
d= 12	19.7	19.10	45996.06	45238.94	757.12	14461.06
d= 13	18.6	19.15	45238.94	44488.10	750.84	14378.59
d= 14	19.1	18.85	44488.10	43743.54	744.56	14034.90
d= 15	19.5	19.30	43743.54	43005.27	738.27	14248.69
d= 16	19.7	19.60	43005.27	42273.28	731.99	14347.02
drem 16.8	19.7					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **211957.05**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 19.70
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **24013.17**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **235970.22**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **17.24**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159

line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.1	9.55	54739.11	53912.87	826.24	7890.58
d= 2	20.6	19.85	53912.87	53092.92	819.96	16276.11
d= 3	22.1	21.35	53092.92	52279.24	813.67	17371.90
d= 4	24.2	23.15	52279.24	51471.86	807.39	18691.05
d= 5	25.5	24.85	51471.86	50670.75	801.11	19907.48
d= 6	25.1	25.30	50670.75	49875.93	794.82	20109.01
d= 7	25.6	25.35	49875.93	49087.39	788.54	19989.47
d= 8	24.3	24.95	49087.39	48305.13	782.26	19517.29
d= 9	30.5	27.40	48305.13	47529.16	775.97	21261.66
d= 10	31.5	31.00	47529.16	46759.47	769.69	23860.39
d= 11	32.5	32.00	46759.47	45996.06	763.41	24429.01
d= 12	32.7	32.60	45996.06	45238.94	757.12	24682.23
d= 13	33.4	33.05	45238.94	44488.10	750.84	24815.27
d= 14	32.5	32.95	44488.10	43743.54	744.56	24533.16
d= 15	33.4	32.95	43743.54	43005.27	738.27	24326.13
d= 16	33.1	33.25	43005.27	42273.28	731.99	24338.69
drem 16.8	33.5					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **331999.45**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 33.50
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **40834.58**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **372834.038**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **27.24**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.9	9.45	54739.11	53912.87	826.24	7807.95
d= 2	20.5	19.70	53912.87	53092.92	819.96	16153.12
d= 3	22.5	21.50	53092.92	52279.24	813.67	17493.95
d= 4	25.7	24.10	52279.24	51471.86	807.39	19458.07
d= 5	26.1	25.90	51471.86	50670.75	801.11	20748.64
d= 6	27.0	26.55	50670.75	49875.93	794.82	21102.54
d= 7	26.4	26.70	49875.93	49087.39	788.54	21054.00
d= 8	26.0	26.20	49087.39	48305.13	782.26	20495.11
d= 9	32.8	29.40	48305.13	47529.16	775.97	22813.61
d= 10	33.7	33.25	47529.16	46759.47	769.69	25592.19
d= 11	33.0	33.35	46759.47	45996.06	763.41	25459.61
d= 12	32.9	32.95	45996.06	45238.94	757.12	24947.22
d= 13	34.5	33.70	45238.94	44488.10	750.84	25303.32
d= 14	34.4	34.45	44488.10	43743.54	744.56	25649.99
d= 15	34.0	34.20	43743.54	43005.27	738.27	25248.97
d= 16	33.7	33.85	43005.27	42273.28	731.99	24777.89
drem 16.8	35.1					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **344106.20**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.10
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **42784.89**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **386891.097**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **28.27**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.2	10.10	54739.11	53912.87	826.24	8345.01
d= 2	22.2	21.20	53912.87	53092.92	819.96	17383.05
d= 3	24.2	23.20	53092.92	52279.24	813.67	18877.19
d= 4	27.2	25.70	52279.24	51471.86	807.39	20749.90
d= 5	26.6	26.90	51471.86	50670.75	801.11	21549.75
d= 6	26.3	26.45	50670.75	49875.93	794.82	21023.06
d= 7	27.1	26.70	49875.93	49087.39	788.54	21054.00
d= 8	26.5	26.80	49087.39	48305.13	782.26	20964.47
d= 9	33.1	29.80	48305.13	47529.16	775.97	23124.00
d= 10	33.6	33.35	47529.16	46759.47	769.69	25669.16
d= 11	34.6	34.10	46759.47	45996.06	763.41	26032.17
d= 12	34.9	34.75	45996.06	45238.94	757.12	26310.04
d= 13	34.5	34.70	45238.94	44488.10	750.84	26054.16
d= 14	34.4	34.45	44488.10	43743.54	744.56	25649.99
d= 15	35.8	35.10	43743.54	43005.27	738.27	25913.42
d= 16	35.9	35.85	43005.27	42273.28	731.99	26241.87
drem 16.8	35.5					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **354941.24**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.50
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **43272.47**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **398213.709**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **29.10**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159

line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.6	8.80	54739.11	53912.87	826.24	7270.90
d= 2	20.5	19.05	53912.87	53092.92	819.96	15620.15
d= 3	22.1	21.30	53092.92	52279.24	813.67	17331.22
d= 4	25.0	23.55	52279.24	51471.86	807.39	19014.01
d= 5	25.4	25.20	51471.86	50670.75	801.11	20187.87
d= 6	24.7	25.05	50670.75	49875.93	794.82	19910.31
d= 7	24.8	24.75	49875.93	49087.39	788.54	19516.35
d= 8	24.1	24.45	49087.39	48305.13	782.26	19126.17
d= 9	32.1	28.10	48305.13	47529.16	775.97	21804.84
d= 10	31.9	32.00	47529.16	46759.47	769.69	24630.08
d= 11	32.9	32.40	46759.47	45996.06	763.41	24734.38
d= 12	32.3	32.60	45996.06	45238.94	757.12	24682.23
d= 13	32.7	32.50	45238.94	44488.10	750.84	24402.31
d= 14	33.4	33.05	44488.10	43743.54	744.56	24607.61
d= 15	33.6	33.50	43743.54	43005.27	738.27	24732.18
d= 16	33.5	33.55	43005.27	42273.28	731.99	24558.29
drem 16.8	33.2					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **332128.89**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 33.20
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **40468.90**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **372597.789**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **27.23**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT A, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.2	9.60	54739.11	53912.87	826.24	7931.89
d= 2	21.1	20.15	53912.87	53092.92	819.96	16522.10
d= 3	21.8	21.45	53092.92	52279.24	813.67	17453.27
d= 4	24.5	23.15	52279.24	51471.86	807.39	18691.05
d= 5	24.4	24.45	51471.86	50670.75	801.11	19587.04
d= 6	24.3	24.35	50670.75	49875.93	794.82	19353.93
d= 7	24.8	24.55	49875.93	49087.39	788.54	19358.64
d= 8	25.0	24.90	49087.39	48305.13	782.26	19478.18
d= 9	31.6	28.30	48305.13	47529.16	775.97	21960.04
d= 10	32.4	32.00	47529.16	46759.47	769.69	24630.08
d= 11	32.1	32.25	46759.47	45996.06	763.41	24619.87
d= 12	31.8	31.95	45996.06	45238.94	757.12	24190.10
d= 13	33.5	32.65	45238.94	44488.10	750.84	24514.94
d= 14	32.3	32.90	44488.10	43743.54	744.56	24495.93
d= 15	32.7	32.50	43743.54	43005.27	738.27	23993.90
d= 16	33.3	33.00	43005.27	42273.28	731.99	24155.70
drem 16.8	32.9					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **330936.65**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 32.90
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **40103.22**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **371039.872**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **27.11**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT B, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.6	9.30	54739.11	53912.87	826.24	7684.02
d= 2	21.5	20.05	53912.87	53092.92	819.96	16440.10
d= 3	22.9	22.20	53092.92	52279.24	813.67	18063.52
d= 4	25.5	24.20	52279.24	51471.86	807.39	19538.81
d= 5	26.3	25.90	51471.86	50670.75	801.11	20748.64
d= 6	26.6	26.45	50670.75	49875.93	794.82	21023.06
d= 7	26.2	26.40	49875.93	49087.39	788.54	20817.44
d= 8	25.2	25.70	49087.39	48305.13	782.26	20103.99
d= 9	33.0	29.10	48305.13	47529.16	775.97	22580.82
d= 10	32.2	32.60	47529.16	46759.47	769.69	25091.89
d= 11	33.0	32.60	46759.47	45996.06	763.41	24887.06
d= 12	33.1	33.05	45996.06	45238.94	757.12	25022.93
d= 13	34.3	33.70	45238.94	44488.10	750.84	25303.32
d= 14	34.2	34.25	44488.10	43743.54	744.56	25501.08
d= 15	34.6	34.40	43743.54	43005.27	738.27	25396.63
d= 16	34.7	34.65	43005.27	42273.28	731.99	25363.48
drem 16.8	34.6					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **343566.79**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 34.60
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **42175.42**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **385742.215**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **28.19**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT C, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.8	10.40	54739.11	53912.87	826.24	8592.88
d= 2	22.4	21.60	53912.87	53092.92	819.96	17711.04
d= 3	24.8	23.60	53092.92	52279.24	813.67	19202.66
d= 4	25.6	25.20	52279.24	51471.86	807.39	20346.20
d= 5	27.8	26.70	51471.86	50670.75	801.11	21389.52
d= 6	26.7	27.25	50670.75	49875.93	794.82	21658.92
d= 7	27.3	27.00	49875.93	49087.39	788.54	21290.56
d= 8	26.3	26.80	49087.39	48305.13	782.26	20964.47
d= 9	32.6	29.45	48305.13	47529.16	775.97	22852.41
d= 10	33.7	33.15	47529.16	46759.47	769.69	25515.22
d= 11	34.8	34.25	46759.47	45996.06	763.41	26146.68
d= 12	34.5	34.65	45996.06	45238.94	757.12	26234.33
d= 13	34.6	34.55	45238.94	44488.10	750.84	25941.53
d= 14	35.0	34.80	44488.10	43743.54	744.56	25910.59
d= 15	34.8	34.90	43743.54	43005.27	738.27	25765.76
d= 16	35.1	34.95	43005.27	42273.28	731.99	25583.08
drem 16.8	35.5					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **355105.86**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.50
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **43272.47**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **398378.328**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **29.11**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 2
PORT D, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.6	8.80	54739.11	53912.87	826.24	7270.90
d= 2	20.6	19.10	53912.87	53092.92	819.96	15661.15
d= 3	21.7	21.15	53092.92	52279.24	813.67	17209.17
d= 4	24.2	22.95	52279.24	51471.86	807.39	18529.58
d= 5	25.8	25.00	51471.86	50670.75	801.11	20027.64
d= 6	24.4	25.10	50670.75	49875.93	794.82	19950.05
d= 7	24.8	24.60	49875.93	49087.39	788.54	19398.07
d= 8	24.8	24.80	49087.39	48305.13	782.26	19399.96
d= 9	31.9	28.35	48305.13	47529.16	775.97	21998.84
d= 10	32.5	32.20	47529.16	46759.47	769.69	24784.01
d= 11	32.5	32.50	46759.47	45996.06	763.41	24810.72
d= 12	32.0	32.25	45996.06	45238.94	757.12	24417.23
d= 13	32.8	32.40	45238.94	44488.10	750.84	24327.23
d= 14	34.0	33.40	44488.10	43743.54	744.56	24868.21
d= 15	33.0	33.50	43743.54	43005.27	738.27	24732.18
d= 16	34.0	33.50	43005.27	42273.28	731.99	24521.69
drem 16.8	33.7					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **331906.62**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 33.70
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **41078.37**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **372984.993**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **27.26**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.3	12.65	54739.11	53912.87	826.24	10451.92
d= 2	26.6	25.95	53912.87	53092.92	819.96	21277.84
d= 3	29.7	28.15	53092.92	52279.24	813.67	22904.87
d= 4	29.5	29.60	52279.24	51471.86	807.39	23898.71
d= 5	30.4	29.95	51471.86	50670.75	801.11	23993.12
d= 6	32.3	31.35	50670.75	49875.93	794.82	24917.69
d= 7	32.1	32.20	49875.93	49087.39	788.54	25390.97
d= 8	31.8	31.95	49087.39	48305.13	782.26	24993.09
d= 9	32.2	32.00	48305.13	47529.16	775.97	24831.14
d= 10	30.6	31.40	47529.16	46759.47	769.69	24168.26
d= 11	30.6	30.60	46759.47	45996.06	763.41	23360.25
d= 12	28.8	29.70	45996.06	45238.94	757.12	22486.57
d= 13	27.6	28.20	45238.94	44488.10	750.84	21173.70
d= 14	27.7	27.65	44488.10	43743.54	744.56	20587.01
d= 15	27.9	27.80	43743.54	43005.27	738.27	20524.02
d= 16	26.8	27.35	43005.27	42273.28	731.99	20019.95
drem 16.8	28.6					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **354979.09**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.60
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **34861.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **389840.859**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **28.49**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.8	11.40	54739.11	53912.87	826.24	9419.12
d= 2	27.4	25.10	53912.87	53092.92	819.96	20580.88
d= 3	29.7	28.55	53092.92	52279.24	813.67	23230.34
d= 4	30.6	30.15	52279.24	51471.86	807.39	24342.78
d= 5	31.9	31.25	51471.86	50670.75	801.11	25034.56
d= 6	32.4	32.15	50670.75	49875.93	794.82	25553.55
d= 7	34.1	33.25	49875.93	49087.39	788.54	26218.94
d= 8	34.6	34.35	49087.39	48305.13	782.26	26870.50
d= 9	33.7	34.15	48305.13	47529.16	775.97	26499.48
d= 10	33.5	33.60	47529.16	46759.47	769.69	25861.58
d= 11	31.2	32.35	46759.47	45996.06	763.41	24696.21
d= 12	29.2	30.20	45996.06	45238.94	757.12	22865.13
d= 13	28.5	28.85	45238.94	44488.10	750.84	21661.74
d= 14	29.0	28.75	44488.10	43743.54	744.56	21406.02
d= 15	28.2	28.60	43743.54	43005.27	738.27	21114.64
d= 16	29.2	28.70	43005.27	42273.28	731.99	21008.14
drem 16.8	28.8					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **366363.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.80
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **35105.55**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **401469.146**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **29.34**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.9	12.95	54739.11	53912.87	826.24	10699.79
d= 2	29.1	27.50	53912.87	53092.92	819.96	22548.77
d= 3	31.5	30.30	53092.92	52279.24	813.67	24654.27
d= 4	31.8	31.65	52279.24	51471.86	807.39	25553.86
d= 5	33.7	32.75	51471.86	50670.75	801.11	26236.21
d= 6	34.0	33.85	50670.75	49875.93	794.82	26904.75
d= 7	34.5	34.25	49875.93	49087.39	788.54	27007.48
d= 8	34.8	34.65	49087.39	48305.13	782.26	27105.18
d= 9	36.5	35.65	48305.13	47529.16	775.97	27663.44
d= 10	34.3	35.40	47529.16	46759.47	769.69	27247.02
d= 11	32.8	33.55	46759.47	45996.06	763.41	25612.30
d= 12	31.7	32.25	45996.06	45238.94	757.12	24417.23
d= 13	29.5	30.60	45238.94	44488.10	750.84	22975.71
d= 14	30.6	30.05	44488.10	43743.54	744.56	22373.94
d= 15	29.6	30.10	43743.54	43005.27	738.27	22222.05
d= 16	30.3	29.95	43005.27	42273.28	731.99	21923.12
drem 16.8	29.7					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **385145.13**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.70
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **36202.60**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **421347.728**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **30.79**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.5	11.25	54739.11	53912.87	826.24	9295.18
d= 2	27.2	24.85	53912.87	53092.92	819.96	20375.89
d= 3	28.8	28.00	53092.92	52279.24	813.67	22782.82
d= 4	29.8	29.30	52279.24	51471.86	807.39	23656.50
d= 5	29.7	29.75	51471.86	50670.75	801.11	23832.90
d= 6	31.9	30.80	50670.75	49875.93	794.82	24480.54
d= 7	32.7	32.30	49875.93	49087.39	788.54	25469.82
d= 8	32.3	32.50	49087.39	48305.13	782.26	25423.33
d= 9	32.4	32.35	48305.13	47529.16	775.97	25102.73
d= 10	31.5	31.95	47529.16	46759.47	769.69	24591.59
d= 11	30.4	30.95	46759.47	45996.06	763.41	23627.44
d= 12	28.7	29.55	45996.06	45238.94	757.12	22373.00
d= 13	28.2	28.45	45238.94	44488.10	750.84	21361.41
d= 14	28.6	28.40	44488.10	43743.54	744.56	21145.42
d= 15	28.6	28.60	43743.54	43005.27	738.27	21114.64
d= 16	28.0	28.30	43005.27	42273.28	731.99	20715.34
drem 16.8	28.2					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **355348.55**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.20
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **34374.19**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **389722.733**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **28.48**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT A, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.3	12.15	54739.11	53912.87	826.24	10038.80
d= 2	27.4	25.85	53912.87	53092.92	819.96	21195.85
d= 3	30.5	28.95	53092.92	52279.24	813.67	23555.81
d= 4	30.1	30.30	52279.24	51471.86	807.39	24463.89
d= 5	31.3	30.70	51471.86	50670.75	801.11	24593.95
d= 6	31.3	31.30	50670.75	49875.93	794.82	24877.95
d= 7	32.9	32.10	49875.93	49087.39	788.54	25312.12
d= 8	32.9	32.90	49087.39	48305.13	782.26	25736.23
d= 9	33.5	33.20	48305.13	47529.16	775.97	25762.31
d= 10	30.8	32.15	47529.16	46759.47	769.69	24745.53
d= 11	29.9	30.35	46759.47	45996.06	763.41	23169.39
d= 12	27.9	28.90	45996.06	45238.94	757.12	21880.87
d= 13	27.8	27.85	45238.94	44488.10	750.84	20910.90
d= 14	28.4	28.10	44488.10	43743.54	744.56	20922.06
d= 15	27.9	28.15	43743.54	43005.27	738.27	20782.41
d= 16	27.4	27.65	43005.27	42273.28	731.99	20239.55
drem 16.8	27.3					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **358187.60**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 27.30
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **33277.14**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **391464.74**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **28.61**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT B, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.4	11.70	54739.11	53912.87	826.24	9666.99
d= 2	27.4	25.40	53912.87	53092.92	819.96	20826.87
d= 3	29.8	28.60	53092.92	52279.24	813.67	23271.02
d= 4	30.8	30.30	52279.24	51471.86	807.39	24463.89
d= 5	30.6	30.70	51471.86	50670.75	801.11	24593.95
d= 6	33.2	31.90	50670.75	49875.93	794.82	25354.84
d= 7	34.1	33.65	49875.93	49087.39	788.54	26534.35
d= 8	34.5	34.30	49087.39	48305.13	782.26	26831.39
d= 9	34.1	34.30	48305.13	47529.16	775.97	26615.88
d= 10	34.0	34.05	47529.16	46759.47	769.69	26207.94
d= 11	31.9	32.95	46759.47	45996.06	763.41	25154.25
d= 12	28.6	30.25	45996.06	45238.94	757.12	22902.99
d= 13	28.4	28.50	45238.94	44488.10	750.84	21398.95
d= 14	28.5	28.45	44488.10	43743.54	744.56	21182.65
d= 15	28.7	28.60	43743.54	43005.27	738.27	21114.64
d= 16	31.0	29.85	43005.27	42273.28	731.99	21849.93
drem 16.8	30.8					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **367970.52**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 30.80
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **37543.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **405513.956**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **29.63**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT C, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.9	12.45	54739.11	53912.87	826.24	10286.67
d= 2	29.0	26.95	53912.87	53092.92	819.96	22097.80
d= 3	31.1	30.05	53092.92	52279.24	813.67	24450.85
d= 4	31.6	31.35	52279.24	51471.86	807.39	25311.64
d= 5	33.2	32.40	51471.86	50670.75	801.11	25955.83
d= 6	33.9	33.55	50670.75	49875.93	794.82	26666.30
d= 7	35.1	34.50	49875.93	49087.39	788.54	27204.61
d= 8	33.9	34.50	49087.39	48305.13	782.26	26987.84
d= 9	33.9	33.90	48305.13	47529.16	775.97	26305.49
d= 10	34.6	34.25	47529.16	46759.47	769.69	26361.88
d= 11	31.4	33.00	46759.47	45996.06	763.41	25192.42
d= 12	30.7	31.05	45996.06	45238.94	757.12	23508.69
d= 13	28.6	29.65	45238.94	44488.10	750.84	22262.42
d= 14	30.5	29.55	44488.10	43743.54	744.56	22001.66
d= 15	30.6	30.55	43743.54	43005.27	738.27	22554.27
d= 16	29.9	30.25	43005.27	42273.28	731.99	22142.72
drem 16.8	29.7					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **379291.08**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.70
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **36202.60**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **415493.686**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **30.36**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 3
PORT D, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.6	11.30	54739.11	53912.87	826.24	9336.50
d= 2	27.1	24.85	53912.87	53092.92	819.96	20375.89
d= 3	28.0	27.55	53092.92	52279.24	813.67	22416.67
d= 4	30.2	29.10	52279.24	51471.86	807.39	23495.02
d= 5	32.0	31.10	51471.86	50670.75	801.11	24914.39
d= 6	32.1	32.05	50670.75	49875.93	794.82	25474.06
d= 7	31.7	31.90	49875.93	49087.39	788.54	25154.41
d= 8	31.1	31.40	49087.39	48305.13	782.26	24562.85
d= 9	32.4	31.75	48305.13	47529.16	775.97	24637.15
d= 10	31.6	32.00	47529.16	46759.47	769.69	24630.08
d= 11	30.7	31.15	46759.47	45996.06	763.41	23780.12
d= 12	28.9	29.80	45996.06	45238.94	757.12	22562.28
d= 13	27.3	28.10	45238.94	44488.10	750.84	21098.61
d= 14	28.6	27.95	44488.10	43743.54	744.56	20810.37
d= 15	28.2	28.40	43743.54	43005.27	738.27	20966.98
d= 16	28.2	28.20	43005.27	42273.28	731.99	20642.14
drem 16.8	27.8					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **354857.51**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 27.80
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **33886.61**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **388744.125**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **28.41**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT A, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.5	12.75	54739.11	53912.87	826.24	10534.54
d= 2	27.1	26.30	53912.87	53092.92	819.96	21564.83
d= 3	27.5	27.30	53092.92	52279.24	813.67	22213.25
d= 4	30.4	28.95	52279.24	51471.86	807.39	23373.91
d= 5	31.2	30.80	51471.86	50670.75	801.11	24674.06
d= 6	30.9	31.05	50670.75	49875.93	794.82	24679.24
d= 7	33.6	32.25	49875.93	49087.39	788.54	25430.40
d= 8	31.8	32.70	49087.39	48305.13	782.26	25579.78
d= 9	31.5	31.65	48305.13	47529.16	775.97	24559.55
d= 10	34.7	33.10	47529.16	46759.47	769.69	25476.74
d= 11	33.2	33.95	46759.47	45996.06	763.41	25917.66
d= 12	34.8	34.00	45996.06	45238.94	757.12	25742.20
d= 13	33.4	34.10	45238.94	44488.10	750.84	25603.66
d= 14	33.4	33.40	44488.10	43743.54	744.56	24868.21
d= 15	33.8	33.60	43743.54	43005.27	738.27	24806.01
d= 16	36.0	34.90	43005.27	42273.28	731.99	25546.48
drem 16.8	35.7					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **380570.50**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.70
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **43516.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **424086.757**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **30.99**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT B, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	24.2	12.10	54739.11	53912.87	826.24	9997.49
d= 2	26.5	25.35	53912.87	53092.92	819.96	20785.87
d= 3	28.6	27.55	53092.92	52279.24	813.67	22416.67
d= 4	31.4	30.00	52279.24	51471.86	807.39	24221.67
d= 5	32.2	31.80	51471.86	50670.75	801.11	25475.16
d= 6	33.3	32.75	50670.75	49875.93	794.82	26030.44
d= 7	34.3	33.80	49875.93	49087.39	788.54	26652.63
d= 8	35.0	34.65	49087.39	48305.13	782.26	27105.18
d= 9	35.4	35.20	48305.13	47529.16	775.97	27314.25
d= 10	34.9	35.15	47529.16	46759.47	769.69	27054.60
d= 11	35.6	35.25	46759.47	45996.06	763.41	26910.09
d= 12	35.8	35.70	45996.06	45238.94	757.12	27029.31
d= 13	36.2	36.00	45238.94	44488.10	750.84	27030.25
d= 14	36.3	36.25	44488.10	43743.54	744.56	26990.20
d= 15	35.7	36.00	43743.54	43005.27	738.27	26577.86
d= 16	36.5	36.10	43005.27	42273.28	731.99	26424.87
drem 16.8	37.6					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **398016.54**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.60
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **45832.25**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **443848.791**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **32.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT C, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159

line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.1	12.55	54739.11	53912.87	826.24	10369.29
d= 2	28.4	26.75	53912.87	53092.92	819.96	21933.81
d= 3	31.4	29.90	53092.92	52279.24	813.67	24328.80
d= 4	31.9	31.65	52279.24	51471.86	807.39	25553.86
d= 5	32.1	32.00	51471.86	50670.75	801.11	25635.39
d= 6	34.7	33.40	50670.75	49875.93	794.82	26547.08
d= 7	34.1	34.40	49875.93	49087.39	788.54	27125.76
d= 8	34.5	34.30	49087.39	48305.13	782.26	26831.39
d= 9	34.8	34.65	48305.13	47529.16	775.97	26887.47
d= 10	35.8	35.30	47529.16	46759.47	769.69	27170.05
d= 11	37.4	36.60	46759.47	45996.06	763.41	27940.69
d= 12	37.1	37.25	45996.06	45238.94	757.12	28202.85
d= 13	37.0	37.05	45238.94	44488.10	750.84	27818.64
d= 14	35.8	36.40	44488.10	43743.54	744.56	27101.88
d= 15	37.2	36.50	43743.54	43005.27	738.27	26947.00
d= 16	38.3	37.75	43005.27	42273.28	731.99	27632.65
drem 16.8	37.7					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **408026.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.70
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **45954.14**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **453980.738**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **33.17**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT D, USI 16pt AUTOPROBE, STANDARD

Stack Area: 54,739.1 sq. in. pi = 3.14159

line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.2	11.60	54739.11	53912.87	826.24	9584.37
d= 2	25.6	24.40	53912.87	53092.92	819.96	20006.91
d= 3	27.0	26.30	53092.92	52279.24	813.67	21399.58
d= 4	29.1	28.05	52279.24	51471.86	807.39	22647.26
d= 5	30.3	29.70	51471.86	50670.75	801.11	23792.84
d= 6	32.3	31.30	50670.75	49875.93	794.82	24877.95
d= 7	33.0	32.65	49875.93	49087.39	788.54	25745.81
d= 8	33.0	33.00	49087.39	48305.13	782.26	25814.46
d= 9	33.0	33.00	48305.13	47529.16	775.97	25607.11
d= 10	34.8	33.90	47529.16	46759.47	769.69	26092.49
d= 11	33.8	34.30	46759.47	45996.06	763.41	26184.85
d= 12	34.7	34.25	45996.06	45238.94	757.12	25931.48
d= 13	35.1	34.90	45238.94	44488.10	750.84	26204.33
d= 14	35.0	35.05	44488.10	43743.54	744.56	26096.73
d= 15	34.1	34.55	43743.54	43005.27	738.27	25507.37
d= 16	35.4	34.75	43005.27	42273.28	731.99	25436.68
drem 16.8	35.4					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **380930.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.40
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **43150.58**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **424080.786**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **30.99**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT A, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	25.1	12.55	54739.11	53912.87	826.24	10369.29
d= 2	27.4	26.25	53912.87	53092.92	819.96	21523.83
d= 3	29.6	28.50	53092.92	52279.24	813.67	23189.66
d= 4	30.2	29.90	52279.24	51471.86	807.39	24140.93
d= 5	31.2	30.70	51471.86	50670.75	801.11	24593.95
d= 6	31.9	31.55	50670.75	49875.93	794.82	25076.65
d= 7	32.2	32.05	49875.93	49087.39	788.54	25272.69
d= 8	31.9	32.05	49087.39	48305.13	782.26	25071.31
d= 9	33.0	32.45	48305.13	47529.16	775.97	25180.33
d= 10	33.3	33.15	47529.16	46759.47	769.69	25515.22
d= 11	33.7	33.50	46759.47	45996.06	763.41	25574.13
d= 12	33.2	33.45	45996.06	45238.94	757.12	25325.78
d= 13	35.3	34.25	45238.94	44488.10	750.84	25716.28
d= 14	34.3	34.80	44488.10	43743.54	744.56	25910.59
d= 15	35.5	34.90	43743.54	43005.27	738.27	25765.76
d= 16	35.4	35.45	43005.27	42273.28	731.99	25949.07
drem 16.8	35.7					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **384175.47**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.70
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **43516.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **427691.733**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **31.25**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT B, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159

line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	23.5	11.75	54739.11	53912.87	826.24	9708.30
d= 2	28.3	25.90	53912.87	53092.92	819.96	21236.84
d= 3	29.9	29.10	53092.92	52279.24	813.67	23677.86
d= 4	32.7	31.30	52279.24	51471.86	807.39	25271.27
d= 5	32.1	32.40	51471.86	50670.75	801.11	25955.83
d= 6	32.8	32.45	50670.75	49875.93	794.82	25791.99
d= 7	33.3	33.05	49875.93	49087.39	788.54	26061.23
d= 8	34.8	34.05	49087.39	48305.13	782.26	26635.83
d= 9	33.6	34.20	48305.13	47529.16	775.97	26538.28
d= 10	34.5	34.05	47529.16	46759.47	769.69	26207.94
d= 11	36.2	35.35	46759.47	45996.06	763.41	26986.43
d= 12	37.0	36.60	45996.06	45238.94	757.12	27710.72
d= 13	37.1	37.05	45238.94	44488.10	750.84	27818.64
d= 14	37.1	37.10	44488.10	43743.54	744.56	27623.07
d= 15	38.0	37.55	43743.54	43005.27	738.27	27722.19
d= 16	38.0	38.00	43005.27	42273.28	731.99	27815.65
drem 16.8	35.9					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **402762.07**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 35.90
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **43760.05**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **446522.119**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **32.63**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT C, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	26.9	13.45	54739.11	53912.87	826.24	11112.91
d= 2	28.9	27.90	53912.87	53092.92	819.96	22876.75
d= 3	31.4	30.15	53092.92	52279.24	813.67	24532.22
d= 4	31.8	31.60	52279.24	51471.86	807.39	25513.49
d= 5	32.8	32.30	51471.86	50670.75	801.11	25875.72
d= 6	33.1	32.95	50670.75	49875.93	794.82	26189.41
d= 7	34.3	33.70	49875.93	49087.39	788.54	26573.78
d= 8	35.0	34.65	49087.39	48305.13	782.26	27105.18
d= 9	34.5	34.75	48305.13	47529.16	775.97	26965.06
d= 10	35.9	35.20	47529.16	46759.47	769.69	27093.08
d= 11	37.2	36.55	46759.47	45996.06	763.41	27902.52
d= 12	37.6	37.40	45996.06	45238.94	757.12	28316.42
d= 13	36.5	37.05	45238.94	44488.10	750.84	27818.64
d= 14	37.1	36.80	44488.10	43743.54	744.56	27399.70
d= 15	36.0	36.55	43743.54	43005.27	738.27	26983.91
d= 16	37.5	36.75	43005.27	42273.28	731.99	26900.66
drem 16.8	37.5					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **409159.45**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 37.50
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **45710.36**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **454869.807**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **33.24**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at Allegheny, Mitchell Station

Wall Effects Run 4
PORT D, USI 16pt AUTOPROBE, yaw nulled

Stack Area: 54,739.1 sq. in. pi = 3.14159
line 1) radius: 132 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.5	11.25	54739.11	53912.87	826.24	9295.18
d= 2	25.5	24.00	53912.87	53092.92	819.96	19678.93
d= 3	28.4	26.95	53092.92	52279.24	813.67	21928.46
d= 4	29.9	29.15	52279.24	51471.86	807.39	23535.39
d= 5	31.8	30.85	51471.86	50670.75	801.11	24714.11
d= 6	32.2	32.00	50670.75	49875.93	794.82	25434.32
d= 7	32.4	32.30	49875.93	49087.39	788.54	25469.82
d= 8	33.0	32.70	49087.39	48305.13	782.26	25579.78
d= 9	34.2	33.60	48305.13	47529.16	775.97	26072.70
d= 10	33.8	34.00	47529.16	46759.47	769.69	26169.46
d= 11	34.2	34.00	46759.47	45996.06	763.41	25955.83
d= 12	35.0	34.60	45996.06	45238.94	757.12	26196.47
d= 13	35.1	35.05	45238.94	44488.10	750.84	26316.95
d= 14	34.5	34.80	44488.10	43743.54	744.56	25910.59
d= 15	34.9	34.70	43743.54	43005.27	738.27	25618.11
d= 16	34.7	34.80	43005.27	42273.28	731.99	25473.28
drem 16.8	34.9					

(use d=17 for drem)

line 3) Total near-wall volumetric flow (total of column G) **383349.39**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 34.90
b) Total area in remainder segment 1218.94
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **42541.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **425890.497**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **31.12**

ATTACHMENT F.

Titus Station
Wall Effects Calculation Forms

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Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 3
PORT A, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.4	9.20	21904.07	21382.56	521.51	4797.85
d= 2	18.4	18.40	21382.56	20867.34	515.22	9480.09
d= 3	18.4	18.40	20867.34	20358.40	508.94	9364.48
d= 4	21.8	20.10	20358.40	19855.75	502.66	10103.38
d= 5	24.2	23.00	19855.75	19359.37	496.37	11416.57
d= 6	26.2	25.20	19359.37	18869.29	490.09	12350.25
d= 7	26.8	26.50	18869.29	18385.48	483.81	12820.87
d= 8	28.5	27.65	18385.48	17907.96	477.52	13203.51
d= 9	29.2	28.85	17907.96	17436.72	471.24	13595.27
d= 10	30.0	29.60	17436.72	16971.76	464.96	13762.72
d= 11	31.5	30.75	16971.76	16513.09	458.67	14104.21
d= 12	31.4	31.45	16513.09	16060.70	452.39	14227.68
d= 13	31.8	31.60	16060.70	15614.59	446.11	14096.99
d= 14	32.6	32.20	15614.59	15174.76	439.82	14162.33
drem 14.7	33.0					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **167486.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 33.00
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18875.27**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **186361.477**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **25.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 3
PORT B, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.3	7.65	21904.07	21382.56	521.51	3989.52
d= 2	15.3	15.30	21382.56	20867.34	515.22	7882.90
d= 3	15.3	15.30	20867.34	20358.40	508.94	7786.77
d= 4	22.2	18.75	20358.40	19855.75	502.66	9424.80
d= 5	24.3	23.25	19855.75	19359.37	496.37	11540.66
d= 6	25.7	25.00	19359.37	18869.29	490.09	12252.24
d= 7	27.8	26.75	18869.29	18385.48	483.81	12941.82
d= 8	27.1	27.45	18385.48	17907.96	477.52	13108.01
d= 9	29.1	28.10	17907.96	17436.72	471.24	13241.84
d= 10	29.5	29.30	17436.72	16971.76	464.96	13623.23
d= 11	30.7	30.10	16971.76	16513.09	458.67	13806.07
d= 12	31.0	30.85	16513.09	16060.70	452.39	13956.24
d= 13	31.9	31.45	16060.70	15614.59	446.11	14030.07
d= 14	31.3	31.60	15614.59	15174.76	439.82	13898.44
drem 14.7	32.3					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **161482.61**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 32.30
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18474.89**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **179957.497**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **24.65**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 3
PORT C, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.7	6.85	21904.07	21382.56	521.51	3572.31
d= 2	13.7	13.70	21382.56	20867.34	515.22	7058.54
d= 3	13.7	13.70	20867.34	20358.40	508.94	6972.46
d= 4	22.5	18.10	20358.40	19855.75	502.66	9098.07
d= 5	25.2	23.85	19855.75	19359.37	496.37	11838.49
d= 6	26.8	26.00	19359.37	18869.29	490.09	12742.33
d= 7	28.7	27.75	18869.29	18385.48	483.81	13425.62
d= 8	29.6	29.15	18385.48	17907.96	477.52	13919.80
d= 9	30.2	29.90	17907.96	17436.72	471.24	14090.07
d= 10	31.0	30.60	17436.72	16971.76	464.96	14227.68
d= 11	32.5	31.75	16971.76	16513.09	458.67	14562.89
d= 12	32.6	32.55	16513.09	16060.70	452.39	14725.31
d= 13	32.6	32.60	16060.70	15614.59	446.11	14543.09
d= 14	33.8	33.20	15614.59	15174.76	439.82	14602.16
drem 14.7	33.9					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **165378.82**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 33.90
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **19390.05**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **184768.874**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **25.31**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 3
PORT D, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.6	10.30	21904.07	21382.56	521.51	5371.51
d= 2	20.6	20.60	21382.56	20867.34	515.22	10613.58
d= 3	20.6	20.60	20867.34	20358.40	508.94	10484.14
d= 4	23.6	22.10	20358.40	19855.75	502.66	11108.69
d= 5	25.6	24.60	19855.75	19359.37	496.37	12210.77
d= 6	26.1	25.85	19359.37	18869.29	490.09	12668.81
d= 7	27.4	26.75	18869.29	18385.48	483.81	12941.82
d= 8	28.4	27.90	18385.48	17907.96	477.52	13322.89
d= 9	28.3	28.35	17907.96	17436.72	471.24	13359.65
d= 10	29.1	28.70	17436.72	16971.76	464.96	13344.26
d= 11	29.6	29.35	16971.76	16513.09	458.67	13462.07
d= 12	30.6	30.10	16513.09	16060.70	452.39	13616.95
d= 13	30.4	30.50	16060.70	15614.59	446.11	13606.27
d= 14	32.0	31.20	15614.59	15174.76	439.82	13722.51
drem 14.7	32.1					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **169833.92**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 32.10
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18360.49**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **188194.413**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **25.78**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 3
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	18.1	9.05	21904.07	21382.56	521.51	4719.62
d= 2	18.1	18.10	21382.56	20867.34	515.22	9325.52
d= 3	18.1	18.10	20867.34	20358.40	508.94	9211.80
d= 4	22.6	20.35	20358.40	19855.75	502.66	10229.05
d= 5	24.5	23.55	19855.75	19359.37	496.37	11689.58
d= 6	25.3	24.90	19359.37	18869.29	490.09	12203.23
d= 7	27.3	26.30	18869.29	18385.48	483.81	12724.11
d= 8	28.6	27.95	18385.48	17907.96	477.52	13346.77
d= 9	29.4	29.00	17907.96	17436.72	471.24	13665.96
d= 10	29.5	29.45	17436.72	16971.76	464.96	13692.98
d= 11	31.2	30.35	16971.76	16513.09	458.67	13920.74
d= 12	31.5	31.35	16513.09	16060.70	452.39	14182.44
d= 13	31.8	31.65	16060.70	15614.59	446.11	14119.29
d= 14	32.1	31.95	15614.59	15174.76	439.82	14052.38
drem 14.7	32.8					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **167083.45**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 32.80
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18760.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **185844.328**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **25.45**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 3
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.6	7.30	21904.07	21382.56	521.51	3806.99
d= 2	14.6	14.60	21382.56	20867.34	515.22	7522.24
d= 3	14.6	14.60	20867.34	20358.40	508.94	7430.51
d= 4	22.2	18.40	20358.40	19855.75	502.66	9248.87
d= 5	23.9	23.05	19855.75	19359.37	496.37	11441.39
d= 6	25.1	24.50	19359.37	18869.29	490.09	12007.19
d= 7	25.3	25.20	18869.29	18385.48	483.81	12191.92
d= 8	27.6	26.45	18385.48	17907.96	477.52	12630.49
d= 9	27.6	27.60	17907.96	17436.72	471.24	13006.22
d= 10	28.6	28.10	17436.72	16971.76	464.96	13065.28
d= 11	30.0	29.30	16971.76	16513.09	458.67	13439.14
d= 12	30.5	30.25	16513.09	16060.70	452.39	13684.81
d= 13	30.5	30.50	16060.70	15614.59	446.11	13606.27
d= 14	31.1	30.80	15614.59	15174.76	439.82	13546.58
drem 14.7	31.0					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **156627.90**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 31.00
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17731.31**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **174359.212**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **23.88**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 3
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	21904.07	21382.56	521.51	3441.94
d= 2	13.2	13.20	21382.56	20867.34	515.22	6800.93
d= 3	13.2	13.20	20867.34	20358.40	508.94	6717.99
d= 4	22.1	17.65	20358.40	19855.75	502.66	8871.88
d= 5	25.1	23.60	19855.75	19359.37	496.37	11714.39
d= 6	26.5	25.80	19359.37	18869.29	490.09	12644.31
d= 7	27.6	27.05	18869.29	18385.48	483.81	13086.96
d= 8	29.5	28.55	18385.48	17907.96	477.52	13633.28
d= 9	29.9	29.70	17907.96	17436.72	471.24	13995.83
d= 10	31.0	30.45	17436.72	16971.76	464.96	14157.93
d= 11	32.1	31.55	16971.76	16513.09	458.67	14471.15
d= 12	32.1	32.10	16513.09	16060.70	452.39	14521.73
d= 13	33.2	32.65	16060.70	15614.59	446.11	14565.40
d= 14	33.8	33.50	15614.59	15174.76	439.82	14734.10
drem 14.7	33.6					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **163357.83**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 33.60
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **19218.46**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **182576.29**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **25.01**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 3
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.3	10.15	21904.07	21382.56	521.51	5293.28
d= 2	20.3	20.30	21382.56	20867.34	515.22	10459.01
d= 3	20.3	20.30	20867.34	20358.40	508.94	10331.46
d= 4	23.6	21.95	20358.40	19855.75	502.66	11033.30
d= 5	24.6	24.10	19855.75	19359.37	496.37	11962.58
d= 6	26.7	25.65	19359.37	18869.29	490.09	12570.79
d= 7	27.5	27.10	18869.29	18385.48	483.81	13111.15
d= 8	28.9	28.20	18385.48	17907.96	477.52	13466.15
d= 9	28.0	28.45	17907.96	17436.72	471.24	13406.78
d= 10	28.9	28.45	17436.72	16971.76	464.96	13228.02
d= 11	30.2	29.55	16971.76	16513.09	458.67	13553.80
d= 12	29.9	30.05	16513.09	16060.70	452.39	13594.33
d= 13	30.4	30.15	16060.70	15614.59	446.11	13450.13
d= 14	30.9	30.65	15614.59	15174.76	439.82	13480.61
drem 14.7	30.8					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **168941.39**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 30.80
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17616.92**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **186558.313**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **25.55**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 6
PORT A, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.7	9.85	21904.07	21382.56	521.51	5136.83
d= 2	19.7	19.70	21382.56	20867.34	515.22	10149.88
d= 3	19.7	19.70	20867.34	20358.40	508.94	10026.10
d= 4	21.3	20.50	20358.40	19855.75	502.66	10304.44
d= 5	23.8	22.55	19855.75	19359.37	496.37	11193.20
d= 6	26.5	25.15	19359.37	18869.29	490.09	12325.75
d= 7	27.9	27.20	18869.29	18385.48	483.81	13159.53
d= 8	26.2	27.05	18385.48	17907.96	477.52	12917.00
d= 9	28.1	27.15	17907.96	17436.72	471.24	12794.16
d= 10	29.9	29.00	17436.72	16971.76	464.96	13483.75
d= 11	28.7	29.30	16971.76	16513.09	458.67	13439.14
d= 12	29.1	28.90	16513.09	16060.70	452.39	13074.08
d= 13	28.9	29.00	16060.70	15614.59	446.11	12937.11
d= 14	28.9	28.90	15614.59	15174.76	439.82	12710.91
drem 14.7	30.4					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **163651.88**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 30.40
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17388.13**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **181040.011**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **24.80**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 6
PORT B, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.0	8.00	21904.07	21382.56	521.51	4172.04
d= 2	16.0	16.00	21382.56	20867.34	515.22	8243.55
d= 3	16.0	16.00	20867.34	20358.40	508.94	8143.02
d= 4	21.9	18.95	20358.40	19855.75	502.66	9525.33
d= 5	24.3	23.10	19855.75	19359.37	496.37	11466.21
d= 6	26.1	25.20	19359.37	18869.29	490.09	12350.25
d= 7	26.8	26.45	18869.29	18385.48	483.81	12796.68
d= 8	26.6	26.70	18385.48	17907.96	477.52	12749.87
d= 9	26.7	26.65	17907.96	17436.72	471.24	12558.54
d= 10	29.3	28.00	17436.72	16971.76	464.96	13018.79
d= 11	28.1	28.70	16971.76	16513.09	458.67	13163.93
d= 12	27.8	27.95	16513.09	16060.70	452.39	12644.31
d= 13	27.8	27.80	16060.70	15614.59	446.11	12401.78
d= 14	28.3	28.05	15614.59	15174.76	439.82	12337.06
drem 14.7	29.2					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **155571.38**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 29.20
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16701.75**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **172273.13**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **23.59**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 6
PORT C, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.2	7.10	21904.07	21382.56	521.51	3702.69
d= 2	14.2	14.20	21382.56	20867.34	515.22	7316.16
d= 3	14.2	14.20	20867.34	20358.40	508.94	7226.93
d= 4	21.5	17.85	20358.40	19855.75	502.66	8972.41
d= 5	24.2	22.85	19855.75	19359.37	496.37	11342.11
d= 6	27.3	25.75	19359.37	18869.29	490.09	12619.80
d= 7	28.4	27.85	18869.29	18385.48	483.81	13474.01
d= 8	27.5	27.95	18385.48	17907.96	477.52	13346.77
d= 9	28.7	28.10	17907.96	17436.72	471.24	13241.84
d= 10	30.5	29.60	17436.72	16971.76	464.96	13762.72
d= 11	29.7	30.10	16971.76	16513.09	458.67	13806.07
d= 12	29.4	29.55	16513.09	16060.70	452.39	13368.14
d= 13	29.6	29.50	16060.70	15614.59	446.11	13160.16
d= 14	29.6	29.60	15614.59	15174.76	439.82	13018.79
drem 14.7	30.1					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **158358.60**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 30.10
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17216.53**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **175575.139**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **24.05**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 6
PORT D, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.9	11.45	21904.07	21382.56	521.51	5971.24
d= 2	22.9	22.90	21382.56	20867.34	515.22	11798.59
d= 3	22.9	22.90	20867.34	20358.40	508.94	11654.70
d= 4	22.5	22.70	20358.40	19855.75	502.66	11410.29
d= 5	25.3	23.90	19855.75	19359.37	496.37	11863.31
d= 6	25.9	25.60	19359.37	18869.29	490.09	12546.29
d= 7	27.3	26.60	18869.29	18385.48	483.81	12869.25
d= 8	25.6	26.45	18385.48	17907.96	477.52	12630.49
d= 9	26.6	26.10	17907.96	17436.72	471.24	12299.36
d= 10	28.2	27.40	17436.72	16971.76	464.96	12739.81
d= 11	28.1	28.15	16971.76	16513.09	458.67	12911.66
d= 12	27.6	27.85	16513.09	16060.70	452.39	12599.07
d= 13	27.2	27.40	16060.70	15614.59	446.11	12223.34
d= 14	26.8	27.00	15614.59	15174.76	439.82	11875.25
drem 14.7	28.7					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **165392.64**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 28.70
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16415.77**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **181808.407**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **24.90**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 6
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.1	10.05	21904.07	21382.56	521.51	5241.13
d= 2	20.1	20.10	21382.56	20867.34	515.22	10355.97
d= 3	20.1	20.10	20867.34	20358.40	508.94	10229.67
d= 4	21.0	20.55	20358.40	19855.75	502.66	10329.58
d= 5	24.6	22.80	19855.75	19359.37	496.37	11317.30
d= 6	26.5	25.55	19359.37	18869.29	490.09	12521.79
d= 7	27.3	26.90	18869.29	18385.48	483.81	13014.39
d= 8	25.7	26.50	18385.48	17907.96	477.52	12654.36
d= 9	27.5	26.60	17907.96	17436.72	471.24	12534.98
d= 10	30.0	28.75	17436.72	16971.76	464.96	13367.51
d= 11	29.0	29.50	16971.76	16513.09	458.67	13530.87
d= 12	28.5	28.75	16513.09	16060.70	452.39	13006.22
d= 13	28.3	28.40	16060.70	15614.59	446.11	12669.44
d= 14	28.1	28.20	15614.59	15174.76	439.82	12403.04
drem 14.7	29.7					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **163176.24**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 29.70
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16987.74**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **180163.988**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **24.68**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 6
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	15.8	7.90	21904.07	21382.56	521.51	4119.89
d= 2	15.8	15.80	21382.56	20867.34	515.22	8140.51
d= 3	15.8	15.80	20867.34	20358.40	508.94	8041.24
d= 4	20.7	18.25	20358.40	19855.75	502.66	9173.47
d= 5	23.8	22.25	19855.75	19359.37	496.37	11044.29
d= 6	25.8	24.80	19359.37	18869.29	490.09	12154.22
d= 7	26.6	26.20	18869.29	18385.48	483.81	12675.72
d= 8	25.6	26.10	18385.48	17907.96	477.52	12463.35
d= 9	26.8	26.20	17907.96	17436.72	471.24	12346.49
d= 10	28.5	27.65	17436.72	16971.76	464.96	12856.05
d= 11	27.3	27.90	16971.76	16513.09	458.67	12796.99
d= 12	26.6	26.95	16513.09	16060.70	452.39	12191.92
d= 13	27.5	27.05	16060.70	15614.59	446.11	12067.20
d= 14	28.3	27.90	15614.59	15174.76	439.82	12271.09
drem 14.7	28.9					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **152342.44**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 28.90
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16530.16**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **168872.601**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **23.13**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 6
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.3	7.15	21904.07	21382.56	521.51	3728.76
d= 2	14.3	14.30	21382.56	20867.34	515.22	7367.68
d= 3	14.3	14.30	20867.34	20358.40	508.94	7277.83
d= 4	21.3	17.80	20358.40	19855.75	502.66	8947.27
d= 5	25.5	23.40	19855.75	19359.37	496.37	11615.12
d= 6	27.5	26.50	19359.37	18869.29	490.09	12987.37
d= 7	28.8	28.15	18869.29	18385.48	483.81	13619.15
d= 8	27.7	28.25	18385.48	17907.96	477.52	13490.03
d= 9	28.1	27.90	17907.96	17436.72	471.24	13147.59
d= 10	30.6	29.35	17436.72	16971.76	464.96	13646.48
d= 11	29.4	30.00	16971.76	16513.09	458.67	13760.21
d= 12	29.4	29.40	16513.09	16060.70	452.39	13300.28
d= 13	29.6	29.50	16060.70	15614.59	446.11	13160.16
d= 14	29.5	29.55	15614.59	15174.76	439.82	12996.80
drem 14.7	31.3					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **159044.73**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 31.30
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17902.91**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **176947.637**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **24.24**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 6
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.0	11.00	21904.07	21382.56	521.51	5736.56
d= 2	22.0	22.00	21382.56	20867.34	515.22	11334.89
d= 3	22.0	22.00	20867.34	20358.40	508.94	11196.66
d= 4	22.5	22.25	20358.40	19855.75	502.66	11184.09
d= 5	25.8	24.15	19855.75	19359.37	496.37	11987.40
d= 6	26.7	26.25	19359.37	18869.29	490.09	12864.85
d= 7	27.1	26.90	18869.29	18385.48	483.81	13014.39
d= 8	26.8	26.95	18385.48	17907.96	477.52	12869.25
d= 9	26.5	26.65	17907.96	17436.72	471.24	12558.54
d= 10	28.5	27.50	17436.72	16971.76	464.96	12786.31
d= 11	27.1	27.80	16971.76	16513.09	458.67	12751.13
d= 12	26.9	27.00	16513.09	16060.70	452.39	12214.54
d= 13	28.5	27.70	16060.70	15614.59	446.11	12357.17
d= 14	27.6	28.05	15614.59	15174.76	439.82	12337.06
drem 14.7	28.1					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **165192.84**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 28.10
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16072.58**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **181265.415**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **24.83**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 9
PORT A, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.2	8.10	21904.07	21382.56	521.51	4224.19
d= 2	16.2	16.20	21382.56	20867.34	515.22	8346.60
d= 3	16.2	16.20	20867.34	20358.40	508.94	8244.81
d= 4	20.1	18.15	20358.40	19855.75	502.66	9123.20
d= 5	21.6	20.85	19855.75	19359.37	496.37	10349.37
d= 6	23.0	22.30	19359.37	18869.29	490.09	10929.00
d= 7	24.1	23.55	18869.29	18385.48	483.81	11393.64
d= 8	25.7	24.90	18385.48	17907.96	477.52	11890.33
d= 9	28.6	27.15	17907.96	17436.72	471.24	12794.16
d= 10	28.4	28.50	17436.72	16971.76	464.96	13251.27
d= 11	30.9	29.65	16971.76	16513.09	458.67	13599.67
d= 12	31.2	31.05	16513.09	16060.70	452.39	14046.72
d= 13	30.6	30.90	16060.70	15614.59	446.11	13784.71
d= 14	32.1	31.35	15614.59	15174.76	439.82	13788.48
drem 14.7	32.4					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **155766.16**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 32.40
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18532.08**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **174298.24**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **23.87**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 9
PORT B, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.8	6.90	21904.07	21382.56	521.51	3598.39
d= 2	13.8	13.80	21382.56	20867.34	515.22	7110.07
d= 3	13.8	13.80	20867.34	20358.40	508.94	7023.36
d= 4	19.9	16.85	20358.40	19855.75	502.66	8469.75
d= 5	21.7	20.80	19855.75	19359.37	496.37	10324.55
d= 6	23.2	22.45	19359.37	18869.29	490.09	11002.51
d= 7	24.1	23.65	18869.29	18385.48	483.81	11442.02
d= 8	25.3	24.70	18385.48	17907.96	477.52	11794.82
d= 9	26.1	25.70	17907.96	17436.72	471.24	12110.87
d= 10	27.0	26.55	17436.72	16971.76	464.96	12344.60
d= 11	29.4	28.20	16971.76	16513.09	458.67	12934.59
d= 12	30.3	29.85	16513.09	16060.70	452.39	13503.85
d= 13	29.5	29.90	16060.70	15614.59	446.11	13338.61
d= 14	31.3	30.40	15614.59	15174.76	439.82	13370.65
drem 14.7	30.6					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **148368.63**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 30.60
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17502.52**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **165871.156**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **22.72**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 9
PORT C, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	11.5	5.75	21904.07	21382.56	521.51	2998.66
d= 2	11.5	11.50	21382.56	20867.34	515.22	5925.06
d= 3	11.5	11.50	20867.34	20358.40	508.94	5852.80
d= 4	20.0	15.75	20358.40	19855.75	502.66	7916.83
d= 5	22.7	21.35	19855.75	19359.37	496.37	10597.56
d= 6	24.3	23.50	19359.37	18869.29	490.09	11517.10
d= 7	25.3	24.80	18869.29	18385.48	483.81	11998.40
d= 8	27.4	26.35	18385.48	17907.96	477.52	12582.73
d= 9	28.1	27.75	17907.96	17436.72	471.24	13076.91
d= 10	28.3	28.20	17436.72	16971.76	464.96	13111.78
d= 11	31.4	29.85	16971.76	16513.09	458.67	13691.41
d= 12	31.6	31.50	16513.09	16060.70	452.39	14250.30
d= 13	31.2	31.40	16060.70	15614.59	446.11	14007.77
d= 14	33.7	32.45	15614.59	15174.76	439.82	14272.29
drem 14.7	32.6					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **151799.57**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 32.60
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18646.48**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **170446.054**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **23.34**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 9
PORT D, USI 12pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.0	9.50	21904.07	21382.56	521.51	4954.30
d= 2	19.0	19.00	21382.56	20867.34	515.22	9789.22
d= 3	19.0	19.00	20867.34	20358.40	508.94	9669.84
d= 4	20.4	19.70	20358.40	19855.75	502.66	9902.32
d= 5	22.5	21.45	19855.75	19359.37	496.37	10647.19
d= 6	23.6	23.05	19359.37	18869.29	490.09	11296.56
d= 7	23.9	23.75	18869.29	18385.48	483.81	11490.40
d= 8	26.4	25.15	18385.48	17907.96	477.52	12009.71
d= 9	26.6	26.50	17907.96	17436.72	471.24	12487.86
d= 10	26.8	26.70	17436.72	16971.76	464.96	12414.35
d= 11	29.8	28.30	16971.76	16513.09	458.67	12980.46
d= 12	30.4	30.10	16513.09	16060.70	452.39	13616.95
d= 13	29.3	29.85	16060.70	15614.59	446.11	13316.30
d= 14	32.1	30.70	15614.59	15174.76	439.82	13502.60
drem 14.7	29.9					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **158078.06**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 29.90
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17102.14**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **175180.197**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **23.99**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 9
PORT A, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.4	8.20	21904.07	21382.56	521.51	4276.34
d= 2	16.4	16.40	21382.56	20867.34	515.22	8449.64
d= 3	16.4	16.40	20867.34	20358.40	508.94	8346.60
d= 4	19.8	18.10	20358.40	19855.75	502.66	9098.07
d= 5	21.4	20.60	19855.75	19359.37	496.37	10225.28
d= 6	23.1	22.25	19359.37	18869.29	490.09	10904.49
d= 7	24.1	23.60	18869.29	18385.48	483.81	11417.83
d= 8	26.6	25.35	18385.48	17907.96	477.52	12105.21
d= 9	27.4	27.00	17907.96	17436.72	471.24	12723.48
d= 10	28.1	27.75	17436.72	16971.76	464.96	12902.55
d= 11	31.2	29.65	16971.76	16513.09	458.67	13599.67
d= 12	30.9	31.05	16513.09	16060.70	452.39	14046.72
d= 13	30.1	30.50	16060.70	15614.59	446.11	13606.27
d= 14	32.3	31.20	15614.59	15174.76	439.82	13722.51
drem 14.7	31.5					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **155424.66**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 31.50
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18017.30**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **173441.968**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **23.75**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 9
PORT B, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	13.2	6.60	21904.07	21382.56	521.51	3441.94
d= 2	13.2	13.20	21382.56	20867.34	515.22	6800.93
d= 3	13.2	13.20	20867.34	20358.40	508.94	6717.99
d= 4	19.9	16.55	20358.40	19855.75	502.66	8318.95
d= 5	21.5	20.70	19855.75	19359.37	496.37	10274.91
d= 6	23.2	22.35	19359.37	18869.29	490.09	10953.50
d= 7	24.2	23.70	18869.29	18385.48	483.81	11466.21
d= 8	25.2	24.70	18385.48	17907.96	477.52	11794.82
d= 9	26.4	25.80	17907.96	17436.72	471.24	12157.99
d= 10	26.9	26.65	17436.72	16971.76	464.96	12391.10
d= 11	29.4	28.15	16971.76	16513.09	458.67	12911.66
d= 12	28.8	29.10	16513.09	16060.70	452.39	13164.56
d= 13	28.6	28.70	16060.70	15614.59	446.11	12803.28
d= 14	30.6	29.60	15614.59	15174.76	439.82	13018.79
drem 14.7	30.2					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **146216.64**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 30.20
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17273.73**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **163490.369**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **22.39**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 9
PORT C, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	11.4	5.70	21904.07	21382.56	521.51	2972.58
d= 2	11.4	11.40	21382.56	20867.34	515.22	5873.53
d= 3	11.4	11.40	20867.34	20358.40	508.94	5801.90
d= 4	20.2	15.80	20358.40	19855.75	502.66	7941.96
d= 5	22.0	21.10	19855.75	19359.37	496.37	10473.46
d= 6	24.2	23.10	19359.37	18869.29	490.09	11321.07
d= 7	25.0	24.60	18869.29	18385.48	483.81	11901.63
d= 8	27.2	26.10	18385.48	17907.96	477.52	12463.35
d= 9	28.3	27.75	17907.96	17436.72	471.24	13076.91
d= 10	29.1	28.70	17436.72	16971.76	464.96	13344.26
d= 11	32.0	30.55	16971.76	16513.09	458.67	14012.48
d= 12	31.8	31.90	16513.09	16060.70	452.39	14431.25
d= 13	30.8	31.30	16060.70	15614.59	446.11	13963.16
d= 14	33.0	31.90	15614.59	15174.76	439.82	14030.39
drem 14.7	32.9					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **151607.94**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 32.90
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18818.07**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **170426.01**
line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **23.34**

Form for calculating Replacement Near-Wall Velocity in Augmented 12-point Traverse at GPU Titus

Wall Effects Run 9
PORT D, USI 12pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5002 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	18.1	9.05	21904.07	21382.56	521.51	4719.62
d= 2	18.1	18.10	21382.56	20867.34	515.22	9325.52
d= 3	18.1	18.10	20867.34	20358.40	508.94	9211.80
d= 4	20.8	19.45	20358.40	19855.75	502.66	9776.66
d= 5	22.8	21.80	19855.75	19359.37	496.37	10820.92
d= 6	23.1	22.95	19359.37	18869.29	490.09	11247.55
d= 7	24.2	23.65	18869.29	18385.48	483.81	11442.02
d= 8	24.5	24.35	18385.48	17907.96	477.52	11627.69
d= 9	27.0	25.75	17907.96	17436.72	471.24	12134.43
d= 10	26.9	26.95	17436.72	16971.76	464.96	12530.58
d= 11	29.4	28.15	16971.76	16513.09	458.67	12911.66
d= 12	29.8	29.60	16513.09	16060.70	452.39	13390.76
d= 13	28.9	29.35	16060.70	15614.59	446.11	13093.25
d= 14	30.3	29.60	15614.59	15174.76	439.82	13018.79
drem 14.7	29.8					

(use d=15 for drem)

line 3) Total near-wall volumetric flow (total of column G) **155251.25**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (d=16 29.80
b) Total area in remainder segment 571.98
Subtract 2/3 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17044.94**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **172296.188**

line 5b) b) Divide line a) by 1/3*pi*r^2
This is the substitute velocity value, V. **23.60**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 1
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.4	8.70	21904.10	21382.59	521.51	4537.10
d= 2	17.4	17.40	21382.59	20867.37	515.22	8964.87
d= 3	17.4	17.40	20867.37	20358.43	508.94	8855.54
d= 4	20.9	19.15	20358.43	19855.78	502.66	9625.87
d= 5	23.9	22.40	19855.78	19359.40	496.37	11118.76
d= 6	25.8	24.85	19359.40	18869.31	490.09	12178.73
d= 7	27.3	26.55	18869.31	18385.51	483.81	12845.07
d= 8	28.1	27.70	18385.51	17907.98	477.52	13227.40
d= 9	29.9	29.00	17907.98	17436.74	471.24	13665.97
d= 10	29.8	29.85	17436.74	16971.79	464.96	13878.97
drem 10.6	30.8					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **108898.27**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 30.80
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16746.29**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **125644.569**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.94**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 1
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.6	8.30	21904.10	21382.59	521.51	4328.50
d= 2	16.6	16.60	21382.59	20867.37	515.22	8552.69
d= 3	16.6	16.60	20867.37	20358.43	508.94	8448.39
d= 4	23.0	19.80	20358.43	19855.78	502.66	9952.59
d= 5	24.1	23.55	19855.78	19359.40	496.37	11689.58
d= 6	26.0	25.05	19359.40	18869.31	490.09	12276.75
d= 7	27.4	26.70	18869.31	18385.51	483.81	12917.64
d= 8	28.1	27.75	18385.51	17907.98	477.52	13251.28
d= 9	29.0	28.55	17907.98	17436.74	471.24	13453.91
d= 10	29.2	29.10	17436.74	16971.79	464.96	13530.25
drem 10.6	29.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **108401.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16093.84**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **124495.429**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 1
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.1	7.05	21904.10	21382.59	521.51	3676.62
d= 2	14.1	14.10	21382.59	20867.37	515.22	7264.64
d= 3	14.1	14.10	20867.37	20358.43	508.94	7176.05
d= 4	22.0	18.05	20358.43	19855.78	502.66	9072.94
d= 5	24.4	23.20	19855.78	19359.40	496.37	11515.85
d= 6	26.4	25.40	19359.40	18869.31	490.09	12448.28
d= 7	27.3	26.85	18869.31	18385.51	483.81	12990.21
d= 8	29.0	28.15	18385.51	17907.98	477.52	13442.29
d= 9	29.8	29.40	17907.98	17436.74	471.24	13854.46
d= 10	30.4	30.10	17436.74	16971.79	464.96	13995.21
drem 10.6	31.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105436.55**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 31.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16963.78**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **122400.323**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.35**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 1
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.7	9.85	21904.10	21382.59	521.51	5136.83
d= 2	19.7	19.70	21382.59	20867.37	515.22	10149.88
d= 3	19.7	19.70	20867.37	20358.43	508.94	10026.11
d= 4	23.1	21.40	20358.43	19855.78	502.66	10756.84
d= 5	25.5	24.30	19855.78	19359.40	496.37	12061.86
d= 6	25.6	25.55	19359.40	18869.31	490.09	12521.80
d= 7	27.3	26.45	18869.31	18385.51	483.81	12796.69
d= 8	28.2	27.75	18385.51	17907.98	477.52	13251.28
d= 9	29.5	28.85	17907.98	17436.74	471.24	13595.28
d= 10	29.2	29.35	17436.74	16971.79	464.96	13646.49
drem 10.6	29.4					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **113943.06**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **129928.157**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 1
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.4	8.70	21904.10	21382.59	521.51	4537.10
d= 2	17.4	17.40	21382.59	20867.37	515.22	8964.87
d= 3	17.4	17.40	20867.37	20358.43	508.94	8855.54
d= 4	21.8	19.60	20358.43	19855.78	502.66	9852.06
d= 5	24.3	23.05	19855.78	19359.40	496.37	11441.40
d= 6	25.3	24.80	19359.40	18869.31	490.09	12154.23
d= 7	26.9	26.10	18869.31	18385.51	483.81	12627.35
d= 8	29.0	27.95	18385.51	17907.98	477.52	13346.78
d= 9	29.3	29.15	17907.98	17436.74	471.24	13736.65
d= 10	29.9	29.60	17436.74	16971.79	464.96	13762.73
drem 10.8	30.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **109278.72**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 30.30
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16474.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **125753.161**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.96**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 1
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	16.1	8.05	21904.10	21382.59	521.51	4198.12
d= 2	16.1	16.10	21382.59	20867.37	515.22	8295.08
d= 3	16.1	16.10	20867.37	20358.43	508.94	8193.92
d= 4	21.4	18.75	20358.43	19855.78	502.66	9424.80
d= 5	23.7	22.55	19855.78	19359.40	496.37	11193.21
d= 6	25.6	24.65	19359.40	18869.31	490.09	12080.71
d= 7	26.6	26.10	18869.31	18385.51	483.81	12627.35
d= 8	27.0	26.80	18385.51	17907.98	477.52	12797.63
d= 9	27.4	27.20	17907.98	17436.74	471.24	12817.74
d= 10	28.0	27.70	17436.74	16971.79	464.96	12879.31
drem 10.8	29.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **104507.89**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15876.36**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **120384.243**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.98**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 1
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.6	6.80	21904.10	21382.59	521.51	3546.24
d= 2	13.6	13.60	21382.59	20867.37	515.22	7007.03
d= 3	13.6	13.60	20867.37	20358.43	508.94	6921.58
d= 4	21.9	17.75	20358.43	19855.78	502.66	8922.15
d= 5	25.4	23.65	19855.78	19359.40	496.37	11739.22
d= 6	26.6	26.00	19359.40	18869.31	490.09	12742.34
d= 7	28.3	27.45	18869.31	18385.51	483.81	13280.49
d= 8	28.9	28.60	18385.51	17907.98	477.52	13657.17
d= 9	29.7	29.30	17907.98	17436.74	471.24	13807.34
d= 10	31.0	30.35	17436.74	16971.79	464.96	14111.45
drem 10.8	32.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105735.00**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 32.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17453.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **123188.115**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.50**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 1
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.0	10.00	21904.10	21382.59	521.51	5215.06
d= 2	20.0	20.00	21382.59	20867.37	515.22	10304.45
d= 3	20.0	20.00	20867.37	20358.43	508.94	10178.79
d= 4	22.6	21.30	20358.43	19855.78	502.66	10706.58
d= 5	24.6	23.60	19855.78	19359.40	496.37	11714.40
d= 6	26.3	25.45	19359.40	18869.31	490.09	12472.79
d= 7	27.2	26.75	18869.31	18385.51	483.81	12941.83
d= 8	27.9	27.55	18385.51	17907.98	477.52	13155.77
d= 9	28.5	28.20	17907.98	17436.74	471.24	13288.98
d= 10	28.6	28.55	17436.74	16971.79	464.96	13274.53
drem 10.8	29.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **113253.16**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **129238.261**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.60**

GPU Titus, Wall Effects Run 1
Autoprobe, 16pt, yaw-nulled

Contractor	Test Port	Substitute Traverse point	Substitute Axial velocity	pasted values to be copied to weadj file
USI - AP	A	4	23.0	23.0
USI - AP	B	8	22.0	22.0
USI - AP	C	12	22.5	22.5
USI - AP	D	16	23.6	23.6

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 2
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.2	9.60	21904.10	21382.59	521.51	5006.45
d= 2	19.2	19.20	21382.59	20867.37	515.22	9892.27
d= 3	19.2	19.20	20867.37	20358.43	508.94	9771.64
d= 4	23.0	21.10	20358.43	19855.78	502.66	10606.05
d= 5	23.1	23.05	19855.78	19359.40	496.37	11441.40
d= 6	23.8	23.45	19359.40	18869.31	490.09	11492.61
d= 7	25.2	24.50	18869.31	18385.51	483.81	11853.26
d= 8	26.3	25.75	18385.51	17907.98	477.52	12296.23
d= 9	27.5	26.90	17907.98	17436.74	471.24	12676.36
d= 10	27.3	27.40	17436.74	16971.79	464.96	12739.82
drem 10.6	28.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **107776.09**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 28.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15495.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **123271.853**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.51**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 2
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.9	8.95	21904.10	21382.59	521.51	4667.48
d= 2	17.9	17.90	21382.59	20867.37	515.22	9222.48
d= 3	17.9	17.90	20867.37	20358.43	508.94	9110.01
d= 4	23.4	20.65	20358.43	19855.78	502.66	10379.85
d= 5	23.3	23.35	19855.78	19359.40	496.37	11590.31
d= 6	24.0	23.65	19359.40	18869.31	490.09	11590.62
d= 7	25.0	24.50	18869.31	18385.51	483.81	11853.26
d= 8	26.0	25.50	18385.51	17907.98	477.52	12176.85
d= 9	27.0	26.50	17907.98	17436.74	471.24	12487.87
d= 10	26.9	26.95	17436.74	16971.79	464.96	12530.59
drem 10.6	28.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105609.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 28.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15223.90**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **120833.235**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.07**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 2
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.3	7.15	21904.10	21382.59	521.51	3728.77
d= 2	14.3	14.30	21382.59	20867.37	515.22	7367.68
d= 3	14.3	14.30	20867.37	20358.43	508.94	7277.83
d= 4	22.6	18.45	20358.43	19855.78	502.66	9274.01
d= 5	24.1	23.35	19855.78	19359.40	496.37	11590.31
d= 6	24.4	24.25	19359.40	18869.31	490.09	11884.68
d= 7	25.4	24.90	18869.31	18385.51	483.81	12046.79
d= 8	26.3	25.85	18385.51	17907.98	477.52	12343.98
d= 9	27.9	27.10	17907.98	17436.74	471.24	12770.61
d= 10	28.3	28.10	17436.74	16971.79	464.96	13065.29
drem 10.6	28.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **101349.95**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 28.90
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15713.24**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **117063.193**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.38**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 2
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	21.4	10.70	21904.10	21382.59	521.51	5580.11
d= 2	21.4	21.40	21382.59	20867.37	515.22	11025.76
d= 3	21.4	21.40	20867.37	20358.43	508.94	10891.30
d= 4	23.2	22.30	20358.43	19855.78	502.66	11209.23
d= 5	23.9	23.55	19855.78	19359.40	496.37	11689.58
d= 6	24.5	24.20	19359.40	18869.31	490.09	11860.17
d= 7	24.8	24.65	18869.31	18385.51	483.81	11925.83
d= 8	25.7	25.25	18385.51	17907.98	477.52	12057.47
d= 9	26.0	25.85	17907.98	17436.74	471.24	12181.56
d= 10	26.8	26.40	17436.74	16971.79	464.96	12274.87
drem 10.6	28.0					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **110695.90**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15223.90**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **125919.801**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.99**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 2
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.0	9.50	21904.10	21382.59	521.51	4954.30
d= 2	19.0	19.00	21382.59	20867.37	515.22	9789.23
d= 3	19.0	19.00	20867.37	20358.43	508.94	9669.85
d= 4	22.8	20.90	20358.43	19855.78	502.66	10505.51
d= 5	23.1	22.95	19855.78	19359.40	496.37	11391.76
d= 6	23.7	23.40	19359.40	18869.31	490.09	11468.10
d= 7	25.0	24.35	18869.31	18385.51	483.81	11780.69
d= 8	25.8	25.40	18385.51	17907.98	477.52	12129.10
d= 9	27.1	26.45	17907.98	17436.74	471.24	12464.31
d= 10	27.5	27.30	17436.74	16971.79	464.96	12693.33
drem 10.8	27.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **106846.18**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 27.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14897.68**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **121743.857**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.23**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 2
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	17.6	8.80	21904.10	21382.59	521.51	4589.25
d= 2	17.6	17.60	21382.59	20867.37	515.22	9067.92
d= 3	17.6	17.60	20867.37	20358.43	508.94	8957.33
d= 4	22.9	20.25	20358.43	19855.78	502.66	10178.79
d= 5	23.4	23.15	19855.78	19359.40	496.37	11491.04
d= 6	23.2	23.30	19359.40	18869.31	490.09	11419.09
d= 7	24.7	23.95	18869.31	18385.51	483.81	11587.17
d= 8	25.0	24.85	18385.51	17907.98	477.52	11866.46
d= 9	25.1	25.05	17907.98	17436.74	471.24	11804.57
d= 10	26.8	25.95	17436.74	16971.79	464.96	12065.64
drem 10.8	26.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **103027.25**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 26.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **14245.22**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **117272.473**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.42**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 2
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	14.6	7.30	21904.10	21382.59	521.51	3806.99
d= 2	14.6	14.60	21382.59	20867.37	515.22	7522.25
d= 3	14.6	14.60	20867.37	20358.43	508.94	7430.51
d= 4	22.9	18.75	20358.43	19855.78	502.66	9424.80
d= 5	24.4	23.65	19855.78	19359.40	496.37	11739.22
d= 6	24.8	24.60	19359.40	18869.31	490.09	12056.21
d= 7	25.8	25.30	18869.31	18385.51	483.81	12240.31
d= 8	26.7	26.25	18385.51	17907.98	477.52	12534.99
d= 9	28.2	27.45	17907.98	17436.74	471.24	12935.55
d= 10	28.5	28.35	17436.74	16971.79	464.96	13181.53
drem 10.8	29.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **102872.37**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **118857.468**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.71**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 2
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	21.6	10.80	21904.10	21382.59	521.51	5632.26
d= 2	21.6	21.60	21382.59	20867.37	515.22	11128.81
d= 3	21.6	21.60	20867.37	20358.43	508.94	10993.09
d= 4	24.6	23.10	20358.43	19855.78	502.66	11611.36
d= 5	23.4	24.00	19855.78	19359.40	496.37	11912.95
d= 6	23.7	23.55	19359.40	18869.31	490.09	11541.62
d= 7	24.5	24.10	18869.31	18385.51	483.81	11659.74
d= 8	25.9	25.20	18385.51	17907.98	477.52	12033.59
d= 9	26.9	26.40	17907.98	17436.74	471.24	12440.74
d= 10	27.0	26.95	17436.74	16971.79	464.96	12530.59
drem 10.8	25.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **111484.75**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 25.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **13864.63**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **125349.38**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.89**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 3
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.4	9.20	21904.10	21382.59	521.51	4797.85
d= 2	18.4	18.40	21382.59	20867.37	515.22	9480.09
d= 3	18.4	18.40	20867.37	20358.43	508.94	9364.48
d= 4	21.8	20.10	20358.43	19855.78	502.66	10103.39
d= 5	24.2	23.00	19855.78	19359.40	496.37	11416.58
d= 6	26.2	25.20	19359.40	18869.31	490.09	12350.26
d= 7	26.8	26.50	18869.31	18385.51	483.81	12820.88
d= 8	28.5	27.65	18385.51	17907.98	477.52	13203.52
d= 9	29.2	28.85	17907.98	17436.74	471.24	13595.28
d= 10	30.0	29.60	17436.74	16971.79	464.96	13762.73
drem 10.6	31.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **110895.08**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 31.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17126.89**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **128021.968**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.38**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 3
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.3	7.65	21904.10	21382.59	521.51	3989.52
d= 2	15.3	15.30	21382.59	20867.37	515.22	7882.90
d= 3	15.3	15.30	20867.37	20358.43	508.94	7786.77
d= 4	22.2	18.75	20358.43	19855.78	502.66	9424.80
d= 5	24.3	23.25	19855.78	19359.40	496.37	11540.67
d= 6	25.7	25.00	19359.40	18869.31	490.09	12252.25
d= 7	27.8	26.75	18869.31	18385.51	483.81	12941.83
d= 8	27.1	27.45	18385.51	17907.98	477.52	13108.02
d= 9	29.1	28.10	17907.98	17436.74	471.24	13241.85
d= 10	29.5	29.30	17436.74	16971.79	464.96	13623.24
drem 10.6	30.7					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105791.86**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 30.70
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16691.92**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **122483.783**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.37**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 3
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.7	6.85	21904.10	21382.59	521.51	3572.31
d= 2	13.7	13.70	21382.59	20867.37	515.22	7058.55
d= 3	13.7	13.70	20867.37	20358.43	508.94	6972.47
d= 4	22.5	18.10	20358.43	19855.78	502.66	9098.08
d= 5	25.2	23.85	19855.78	19359.40	496.37	11838.50
d= 6	26.8	26.00	19359.40	18869.31	490.09	12742.34
d= 7	28.7	27.75	18869.31	18385.51	483.81	13425.63
d= 8	29.6	29.15	18385.51	17907.98	477.52	13919.81
d= 9	30.2	29.90	17907.98	17436.74	471.24	14090.08
d= 10	31.0	30.60	17436.74	16971.79	464.96	14227.69
drem 10.6	32.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **106945.46**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 32.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17670.60**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **124616.059**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.76**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 3
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.6	10.30	21904.10	21382.59	521.51	5371.51
d= 2	20.6	20.60	21382.59	20867.37	515.22	10613.58
d= 3	20.6	20.60	20867.37	20358.43	508.94	10484.15
d= 4	23.6	22.10	20358.43	19855.78	502.66	11108.70
d= 5	25.6	24.60	19855.78	19359.40	496.37	12210.78
d= 6	26.1	25.85	19359.40	18869.31	490.09	12668.82
d= 7	27.4	26.75	18869.31	18385.51	483.81	12941.83
d= 8	28.4	27.90	18385.51	17907.98	477.52	13322.90
d= 9	28.3	28.35	17907.98	17436.74	471.24	13359.66
d= 10	29.1	28.70	17436.74	16971.79	464.96	13344.27
drem 10.6	29.6					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **115426.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16093.84**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **131520.048**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **24.02**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 3
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	18.1	9.05	21904.10	21382.59	521.51	4719.63
d= 2	18.1	18.10	21382.59	20867.37	515.22	9325.53
d= 3	18.1	18.10	20867.37	20358.43	508.94	9211.80
d= 4	22.6	20.35	20358.43	19855.78	502.66	10229.05
d= 5	24.5	23.55	19855.78	19359.40	496.37	11689.58
d= 6	25.3	24.90	19359.40	18869.31	490.09	12203.24
d= 7	27.3	26.30	18869.31	18385.51	483.81	12724.11
d= 8	28.6	27.95	18385.51	17907.98	477.52	13346.78
d= 9	29.4	29.00	17907.98	17436.74	471.24	13665.97
d= 10	29.5	29.45	17436.74	16971.79	464.96	13692.99
drem 10.8	31.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **110808.68**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 31.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16963.78**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **127772.461**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.33**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 3
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	14.6	7.30	21904.10	21382.59	521.51	3806.99
d= 2	14.6	14.60	21382.59	20867.37	515.22	7522.25
d= 3	14.6	14.60	20867.37	20358.43	508.94	7430.51
d= 4	22.2	18.40	20358.43	19855.78	502.66	9248.87
d= 5	23.9	23.05	19855.78	19359.40	496.37	11441.40
d= 6	25.1	24.50	19359.40	18869.31	490.09	12007.20
d= 7	25.3	25.20	18869.31	18385.51	483.81	12191.93
d= 8	27.6	26.45	18385.51	17907.98	477.52	12630.50
d= 9	27.6	27.60	17907.98	17436.74	471.24	13006.23
d= 10	28.6	28.10	17436.74	16971.79	464.96	13065.29
drem 10.8	30.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **102351.18**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 30.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16311.33**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **118662.503**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.67**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 3
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	21904.10	21382.59	521.51	3441.94
d= 2	13.2	13.20	21382.59	20867.37	515.22	6800.94
d= 3	13.2	13.20	20867.37	20358.43	508.94	6718.00
d= 4	22.1	17.65	20358.43	19855.78	502.66	8871.88
d= 5	25.1	23.60	19855.78	19359.40	496.37	11714.40
d= 6	26.5	25.80	19359.40	18869.31	490.09	12644.32
d= 7	27.6	27.05	18869.31	18385.51	483.81	13086.97
d= 8	29.5	28.55	18385.51	17907.98	477.52	13633.29
d= 9	29.9	29.70	17907.98	17436.74	471.24	13995.84
d= 10	31.0	30.45	17436.74	16971.79	464.96	14157.94
drem 10.8	32.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105065.52**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 32.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **17453.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **122518.64**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.37**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 3
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	20.3	10.15	21904.10	21382.59	521.51	5293.28
d= 2	20.3	20.30	21382.59	20867.37	515.22	10459.02
d= 3	20.3	20.30	20867.37	20358.43	508.94	10331.47
d= 4	23.6	21.95	20358.43	19855.78	502.66	11033.30
d= 5	24.6	24.10	19855.78	19359.40	496.37	11962.59
d= 6	26.7	25.65	19359.40	18869.31	490.09	12570.80
d= 7	27.5	27.10	18869.31	18385.51	483.81	13111.16
d= 8	28.9	28.20	18385.51	17907.98	477.52	13466.16
d= 9	28.0	28.45	17907.98	17436.74	471.24	13406.79
d= 10	28.9	28.45	17436.74	16971.79	464.96	13228.03
drem 10.8	30.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **114862.60**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 30.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16420.07**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **131282.672**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.97**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 6
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.7	9.85	21904.10	21382.59	521.51	5136.83
d= 2	19.7	19.70	21382.59	20867.37	515.22	10149.88
d= 3	19.7	19.70	20867.37	20358.43	508.94	10026.11
d= 4	21.3	20.50	20358.43	19855.78	502.66	10304.45
d= 5	23.8	22.55	19855.78	19359.40	496.37	11193.21
d= 6	26.5	25.15	19359.40	18869.31	490.09	12325.76
d= 7	27.9	27.20	18869.31	18385.51	483.81	13159.54
d= 8	26.2	27.05	18385.51	17907.98	477.52	12917.01
d= 9	28.1	27.15	17907.98	17436.74	471.24	12794.17
d= 10	29.9	29.00	17436.74	16971.79	464.96	13483.76
drem 10.6	28.7					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **111490.72**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 28.70
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15604.50**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **127095.225**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.21**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 6
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.0	8.00	21904.10	21382.59	521.51	4172.05
d= 2	16.0	16.00	21382.59	20867.37	515.22	8243.56
d= 3	16.0	16.00	20867.37	20358.43	508.94	8143.03
d= 4	21.9	18.95	20358.43	19855.78	502.66	9525.33
d= 5	24.3	23.10	19855.78	19359.40	496.37	11466.22
d= 6	26.1	25.20	19359.40	18869.31	490.09	12350.26
d= 7	26.8	26.45	18869.31	18385.51	483.81	12796.69
d= 8	26.6	26.70	18385.51	17907.98	477.52	12749.88
d= 9	26.7	26.65	17907.98	17436.74	471.24	12558.55
d= 10	29.3	28.00	17436.74	16971.79	464.96	13018.80
drem 10.6	28.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105024.37**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 28.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15278.27**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **120302.641**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.97**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 6
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.2	7.10	21904.10	21382.59	521.51	3702.69
d= 2	14.2	14.20	21382.59	20867.37	515.22	7316.16
d= 3	14.2	14.20	20867.37	20358.43	508.94	7226.94
d= 4	21.5	17.85	20358.43	19855.78	502.66	8972.41
d= 5	24.2	22.85	19855.78	19359.40	496.37	11342.12
d= 6	27.3	25.75	19359.40	18869.31	490.09	12619.81
d= 7	28.4	27.85	18869.31	18385.51	483.81	13474.02
d= 8	27.5	27.95	18385.51	17907.98	477.52	13346.78
d= 9	28.7	28.10	17907.98	17436.74	471.24	13241.85
d= 10	30.5	29.60	17436.74	16971.79	464.96	13762.73
drem 10.6	29.7					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105005.52**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.70
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16148.21**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **121153.729**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.12**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 6
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.9	11.45	21904.10	21382.59	521.51	5971.24
d= 2	22.9	22.90	21382.59	20867.37	515.22	11798.60
d= 3	22.9	22.90	20867.37	20358.43	508.94	11654.71
d= 4	22.5	22.70	20358.43	19855.78	502.66	11410.30
d= 5	25.3	23.90	19855.78	19359.40	496.37	11863.31
d= 6	25.9	25.60	19359.40	18869.31	490.09	12546.30
d= 7	27.3	26.60	18869.31	18385.51	483.81	12869.26
d= 8	25.6	26.45	18385.51	17907.98	477.52	12630.50
d= 9	26.6	26.10	17907.98	17436.74	471.24	12299.37
d= 10	28.2	27.40	17436.74	16971.79	464.96	12739.82
drem 10.6	28.1					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **115783.41**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15278.27**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **131061.681**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.93**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 6
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.1	10.05	21904.10	21382.59	521.51	5241.13
d= 2	20.1	20.10	21382.59	20867.37	515.22	10355.97
d= 3	20.1	20.10	20867.37	20358.43	508.94	10229.68
d= 4	21.0	20.55	20358.43	19855.78	502.66	10329.58
d= 5	24.6	22.80	19855.78	19359.40	496.37	11317.30
d= 6	26.5	25.55	19359.40	18869.31	490.09	12521.80
d= 7	27.3	26.90	18869.31	18385.51	483.81	13014.40
d= 8	25.7	26.50	18385.51	17907.98	477.52	12654.37
d= 9	27.5	26.60	17907.98	17436.74	471.24	12534.99
d= 10	30.0	28.75	17436.74	16971.79	464.96	13367.52
drem 10.8	29.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **111566.75**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15767.61**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **127334.365**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.25**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 6
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.8	7.90	21904.10	21382.59	521.51	4119.90
d= 2	15.8	15.80	21382.59	20867.37	515.22	8140.52
d= 3	15.8	15.80	20867.37	20358.43	508.94	8041.24
d= 4	20.7	18.25	20358.43	19855.78	502.66	9173.48
d= 5	23.8	22.25	19855.78	19359.40	496.37	11044.30
d= 6	25.8	24.80	19359.40	18869.31	490.09	12154.23
d= 7	26.6	26.20	18869.31	18385.51	483.81	12675.73
d= 8	25.6	26.10	18385.51	17907.98	477.52	12463.36
d= 9	26.8	26.20	17907.98	17436.74	471.24	12346.50
d= 10	28.5	27.65	17436.74	16971.79	464.96	12856.06
drem 10.8	27.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **103015.31**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 27.30
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **14843.31**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **117858.618**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 6
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.3	7.15	21904.10	21382.59	521.51	3728.77
d= 2	14.3	14.30	21382.59	20867.37	515.22	7367.68
d= 3	14.3	14.30	20867.37	20358.43	508.94	7277.83
d= 4	21.3	17.80	20358.43	19855.78	502.66	8947.28
d= 5	25.5	23.40	19855.78	19359.40	496.37	11615.13
d= 6	27.5	26.50	19359.40	18869.31	490.09	12987.38
d= 7	28.8	28.15	18869.31	18385.51	483.81	13619.16
d= 8	27.7	28.25	18385.51	17907.98	477.52	13490.04
d= 9	28.1	27.90	17907.98	17436.74	471.24	13147.60
d= 10	30.6	29.35	17436.74	16971.79	464.96	13646.49
drem 10.8	29.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105827.36**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **121812.459**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.24**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 6
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.0	11.00	21904.10	21382.59	521.51	5736.56
d= 2	22.0	22.00	21382.59	20867.37	515.22	11334.90
d= 3	22.0	22.00	20867.37	20358.43	508.94	11196.67
d= 4	22.5	22.25	20358.43	19855.78	502.66	11184.10
d= 5	25.8	24.15	19855.78	19359.40	496.37	11987.41
d= 6	26.7	26.25	19359.40	18869.31	490.09	12864.86
d= 7	27.1	26.90	18869.31	18385.51	483.81	13014.40
d= 8	26.8	26.95	18385.51	17907.98	477.52	12869.26
d= 9	26.5	26.65	17907.98	17436.74	471.24	12558.55
d= 10	28.5	27.50	17436.74	16971.79	464.96	12786.32
drem 10.8	27.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **115533.02**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 27.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **14734.56**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **130267.585**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.79**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 9
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.2	8.10	21904.10	21382.59	521.51	4224.20
d= 2	16.2	16.20	21382.59	20867.37	515.22	8346.61
d= 3	16.2	16.20	20867.37	20358.43	508.94	8244.82
d= 4	20.1	18.15	20358.43	19855.78	502.66	9123.21
d= 5	21.6	20.85	19855.78	19359.40	496.37	10349.38
d= 6	23.0	22.30	19359.40	18869.31	490.09	10929.00
d= 7	24.1	23.55	18869.31	18385.51	483.81	11393.65
d= 8	25.7	24.90	18385.51	17907.98	477.52	11890.33
d= 9	28.6	27.15	17907.98	17436.74	471.24	12794.17
d= 10	28.4	28.50	17436.74	16971.79	464.96	13251.28
drem 10.6	30.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **100546.64**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 30.90
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16800.66**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **117347.306**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 9
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.8	6.90	21904.10	21382.59	521.51	3598.39
d= 2	13.8	13.80	21382.59	20867.37	515.22	7110.07
d= 3	13.8	13.80	20867.37	20358.43	508.94	7023.36
d= 4	19.9	16.85	20358.43	19855.78	502.66	8469.76
d= 5	21.7	20.80	19855.78	19359.40	496.37	10324.56
d= 6	23.2	22.45	19359.40	18869.31	490.09	11002.52
d= 7	24.1	23.65	18869.31	18385.51	483.81	11442.03
d= 8	25.3	24.70	18385.51	17907.98	477.52	11794.83
d= 9	26.1	25.70	17907.98	17436.74	471.24	12110.88
d= 10	27.0	26.55	17436.74	16971.79	464.96	12344.61
drem 10.6	29.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **95221.00**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **111206.098**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **20.31**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 9
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	11.5	5.75	21904.10	21382.59	521.51	2998.66
d= 2	11.5	11.50	21382.59	20867.37	515.22	5925.06
d= 3	11.5	11.50	20867.37	20358.43	508.94	5852.80
d= 4	20.0	15.75	20358.43	19855.78	502.66	7916.83
d= 5	22.7	21.35	19855.78	19359.40	496.37	10597.56
d= 6	24.3	23.50	19359.40	18869.31	490.09	11517.11
d= 7	25.3	24.80	18869.31	18385.51	483.81	11998.40
d= 8	27.4	26.35	18385.51	17907.98	477.52	12582.74
d= 9	28.1	27.75	17907.98	17436.74	471.24	13076.92
d= 10	28.3	28.20	17436.74	16971.79	464.96	13111.79
drem 10.6	31.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **95577.89**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 31.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17072.52**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **112650.406**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **20.57**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 9
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.0	9.50	21904.10	21382.59	521.51	4954.30
d= 2	19.0	19.00	21382.59	20867.37	515.22	9789.23
d= 3	19.0	19.00	20867.37	20358.43	508.94	9669.85
d= 4	20.4	19.70	20358.43	19855.78	502.66	9902.33
d= 5	22.5	21.45	19855.78	19359.40	496.37	10647.20
d= 6	23.6	23.05	19359.40	18869.31	490.09	11296.57
d= 7	23.9	23.75	18869.31	18385.51	483.81	11490.41
d= 8	26.4	25.15	18385.51	17907.98	477.52	12009.72
d= 9	26.6	26.50	17907.98	17436.74	471.24	12487.87
d= 10	26.8	26.70	17436.74	16971.79	464.96	12414.35
drem 10.6	29.8					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **104661.82**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.80
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16202.58**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **120864.407**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.07**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 9
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.4	8.20	21904.10	21382.59	521.51	4276.35
d= 2	16.4	16.40	21382.59	20867.37	515.22	8449.65
d= 3	16.4	16.40	20867.37	20358.43	508.94	8346.61
d= 4	19.8	18.10	20358.43	19855.78	502.66	9098.08
d= 5	21.4	20.60	19855.78	19359.40	496.37	10225.28
d= 6	23.1	22.25	19359.40	18869.31	490.09	10904.50
d= 7	24.1	23.60	18869.31	18385.51	483.81	11417.84
d= 8	26.6	25.35	18385.51	17907.98	477.52	12105.22
d= 9	27.4	27.00	17907.98	17436.74	471.24	12723.49
d= 10	28.1	27.75	17436.74	16971.79	464.96	12902.56
drem 10.8	31.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **100449.57**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 31.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16963.78**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **117413.344**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.44**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 9
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.2	6.60	21904.10	21382.59	521.51	3441.94
d= 2	13.2	13.20	21382.59	20867.37	515.22	6800.94
d= 3	13.2	13.20	20867.37	20358.43	508.94	6718.00
d= 4	19.9	16.55	20358.43	19855.78	502.66	8318.96
d= 5	21.5	20.70	19855.78	19359.40	496.37	10274.92
d= 6	23.2	22.35	19359.40	18869.31	490.09	10953.51
d= 7	24.2	23.70	18869.31	18385.51	483.81	11466.22
d= 8	25.2	24.70	18385.51	17907.98	477.52	11794.83
d= 9	26.4	25.80	17907.98	17436.74	471.24	12158.00
d= 10	26.9	26.65	17436.74	16971.79	464.96	12391.11
drem 10.8	29.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **94318.42**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **110303.516**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **20.14**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 9
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	11.4	5.70	21904.10	21382.59	521.51	2972.58
d= 2	11.4	11.40	21382.59	20867.37	515.22	5873.54
d= 3	11.4	11.40	20867.37	20358.43	508.94	5801.91
d= 4	20.2	15.80	20358.43	19855.78	502.66	7941.97
d= 5	22.0	21.10	19855.78	19359.40	496.37	10473.47
d= 6	24.2	23.10	19359.40	18869.31	490.09	11321.07
d= 7	25.0	24.60	18869.31	18385.51	483.81	11901.64
d= 8	27.2	26.10	18385.51	17907.98	477.52	12463.36
d= 9	28.3	27.75	17907.98	17436.74	471.24	13076.92
d= 10	29.1	28.70	17436.74	16971.79	464.96	13344.27
drem 10.8	32.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **95170.73**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 32.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17398.75**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **112569.481**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **20.56**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Run 9
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.1	9.05	21904.10	21382.59	521.51	4719.63
d= 2	18.1	18.10	21382.59	20867.37	515.22	9325.53
d= 3	18.1	18.10	20867.37	20358.43	508.94	9211.80
d= 4	20.8	19.45	20358.43	19855.78	502.66	9776.66
d= 5	22.8	21.80	19855.78	19359.40	496.37	10820.93
d= 6	23.1	22.95	19359.40	18869.31	490.09	11247.56
d= 7	24.2	23.65	18869.31	18385.51	483.81	11442.03
d= 8	24.5	24.35	18385.51	17907.98	477.52	11627.70
d= 9	27.0	25.75	17907.98	17436.74	471.24	12134.44
d= 10	26.9	26.95	17436.74	16971.79	464.96	12530.59
drem 10.8	29.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **102836.87**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **118821.967**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.70**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 1
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.4	8.70	21904.10	21382.59	521.51	4537.10
d= 2	17.4	17.40	21382.59	20867.37	515.22	8964.87
d= 3	17.4	17.40	20867.37	20358.43	508.94	8855.54
d= 4	20.9	19.15	20358.43	19855.78	502.66	9625.87
d= 5	23.9	22.40	19855.78	19359.40	496.37	11118.76
d= 6	25.8	24.85	19359.40	18869.31	490.09	12178.73
d= 7	27.3	26.55	18869.31	18385.51	483.81	12845.07
d= 8	28.1	27.70	18385.51	17907.98	477.52	13227.40
d= 9	29.9	29.00	17907.98	17436.74	471.24	13665.97
d= 10	29.8	29.85	17436.74	16971.79	464.96	13878.97
drem 10.6	30.8					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **108898.27**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 30.80
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16746.29**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **125644.569**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.94**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 1
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.6	8.30	21904.10	21382.59	521.51	4328.50
d= 2	16.6	16.60	21382.59	20867.37	515.22	8552.69
d= 3	16.6	16.60	20867.37	20358.43	508.94	8448.39
d= 4	23.0	19.80	20358.43	19855.78	502.66	9952.59
d= 5	24.1	23.55	19855.78	19359.40	496.37	11689.58
d= 6	26.0	25.05	19359.40	18869.31	490.09	12276.75
d= 7	27.4	26.70	18869.31	18385.51	483.81	12917.64
d= 8	28.1	27.75	18385.51	17907.98	477.52	13251.28
d= 9	29.0	28.55	17907.98	17436.74	471.24	13453.91
d= 10	29.2	29.10	17436.74	16971.79	464.96	13530.25
drem 10.6	29.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **108401.59**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16093.84**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **124495.429**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 1
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	14.1	7.05	21904.10	21382.59	521.51	3676.62
d= 2	14.1	14.10	21382.59	20867.37	515.22	7264.64
d= 3	14.1	14.10	20867.37	20358.43	508.94	7176.05
d= 4	22.0	18.05	20358.43	19855.78	502.66	9072.94
d= 5	24.4	23.20	19855.78	19359.40	496.37	11515.85
d= 6	26.4	25.40	19359.40	18869.31	490.09	12448.28
d= 7	27.3	26.85	18869.31	18385.51	483.81	12990.21
d= 8	29.0	28.15	18385.51	17907.98	477.52	13442.29
d= 9	29.8	29.40	17907.98	17436.74	471.24	13854.46
d= 10	30.4	30.10	17436.74	16971.79	464.96	13995.21
drem 10.6	31.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105436.55**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 31.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16963.78**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **122400.323**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.35**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 1
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.7	9.85	21904.10	21382.59	521.51	5136.83
d= 2	19.7	19.70	21382.59	20867.37	515.22	10149.88
d= 3	19.7	19.70	20867.37	20358.43	508.94	10026.11
d= 4	23.1	21.40	20358.43	19855.78	502.66	10756.84
d= 5	25.5	24.30	19855.78	19359.40	496.37	12061.86
d= 6	25.6	25.55	19359.40	18869.31	490.09	12521.80
d= 7	27.3	26.45	18869.31	18385.51	483.81	12796.69
d= 8	28.2	27.75	18385.51	17907.98	477.52	13251.28
d= 9	29.5	28.85	17907.98	17436.74	471.24	13595.28
d= 10	29.2	29.35	17436.74	16971.79	464.96	13646.49
drem 10.6	29.4					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **113943.06**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **129928.157**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 1
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.4	8.70	21904.10	21382.59	521.51	4537.10
d= 2	17.4	17.40	21382.59	20867.37	515.22	8964.87
d= 3	17.4	17.40	20867.37	20358.43	508.94	8855.54
d= 4	21.8	19.60	20358.43	19855.78	502.66	9852.06
d= 5	24.3	23.05	19855.78	19359.40	496.37	11441.40
d= 6	25.3	24.80	19359.40	18869.31	490.09	12154.23
d= 7	26.9	26.10	18869.31	18385.51	483.81	12627.35
d= 8	29.0	27.95	18385.51	17907.98	477.52	13346.78
d= 9	29.3	29.15	17907.98	17436.74	471.24	13736.65
d= 10	29.9	29.60	17436.74	16971.79	464.96	13762.73
drem 10.8	30.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **109278.72**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 30.30
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16474.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **125753.161**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.96**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 1
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	16.1	8.05	21904.10	21382.59	521.51	4198.12
d= 2	16.1	16.10	21382.59	20867.37	515.22	8295.08
d= 3	16.1	16.10	20867.37	20358.43	508.94	8193.92
d= 4	21.4	18.75	20358.43	19855.78	502.66	9424.80
d= 5	23.7	22.55	19855.78	19359.40	496.37	11193.21
d= 6	25.6	24.65	19359.40	18869.31	490.09	12080.71
d= 7	26.6	26.10	18869.31	18385.51	483.81	12627.35
d= 8	27.0	26.80	18385.51	17907.98	477.52	12797.63
d= 9	27.4	27.20	17907.98	17436.74	471.24	12817.74
d= 10	28.0	27.70	17436.74	16971.79	464.96	12879.31
drem 10.8	29.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **104507.89**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15876.36**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **120384.243**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.98**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 1
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.6	6.80	21904.10	21382.59	521.51	3546.24
d= 2	13.6	13.60	21382.59	20867.37	515.22	7007.03
d= 3	13.6	13.60	20867.37	20358.43	508.94	6921.58
d= 4	21.9	17.75	20358.43	19855.78	502.66	8922.15
d= 5	25.4	23.65	19855.78	19359.40	496.37	11739.22
d= 6	26.6	26.00	19359.40	18869.31	490.09	12742.34
d= 7	28.3	27.45	18869.31	18385.51	483.81	13280.49
d= 8	28.9	28.60	18385.51	17907.98	477.52	13657.17
d= 9	29.7	29.30	17907.98	17436.74	471.24	13807.34
d= 10	31.0	30.35	17436.74	16971.79	464.96	14111.45
drem 10.8	32.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105735.00**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 32.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **17453.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **123188.115**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.50**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 1
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	20.0	10.00	21904.10	21382.59	521.51	5215.06
d= 2	20.0	20.00	21382.59	20867.37	515.22	10304.45
d= 3	20.0	20.00	20867.37	20358.43	508.94	10178.79
d= 4	22.6	21.30	20358.43	19855.78	502.66	10706.58
d= 5	24.6	23.60	19855.78	19359.40	496.37	11714.40
d= 6	26.3	25.45	19359.40	18869.31	490.09	12472.79
d= 7	27.2	26.75	18869.31	18385.51	483.81	12941.83
d= 8	27.9	27.55	18385.51	17907.98	477.52	13155.77
d= 9	28.5	28.20	17907.98	17436.74	471.24	13288.98
d= 10	28.6	28.55	17436.74	16971.79	464.96	13274.53
drem 10.8	29.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **113253.16**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **129238.261**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **23.60**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 2
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.2	9.60	21904.10	21382.59	521.51	5006.45
d= 2	19.2	19.20	21382.59	20867.37	515.22	9892.27
d= 3	19.2	19.20	20867.37	20358.43	508.94	9771.64
d= 4	23.0	21.10	20358.43	19855.78	502.66	10606.05
d= 5	23.1	23.05	19855.78	19359.40	496.37	11441.40
d= 6	23.8	23.45	19359.40	18869.31	490.09	11492.61
d= 7	25.2	24.50	18869.31	18385.51	483.81	11853.26
d= 8	26.3	25.75	18385.51	17907.98	477.52	12296.23
d= 9	27.5	26.90	17907.98	17436.74	471.24	12676.36
d= 10	27.3	27.40	17436.74	16971.79	464.96	12739.82
drem 10.6	28.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **107776.09**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 28.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15495.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **123271.853**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.51**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 2
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.9	8.95	21904.10	21382.59	521.51	4667.48
d= 2	17.9	17.90	21382.59	20867.37	515.22	9222.48
d= 3	17.9	17.90	20867.37	20358.43	508.94	9110.01
d= 4	23.4	20.65	20358.43	19855.78	502.66	10379.85
d= 5	23.3	23.35	19855.78	19359.40	496.37	11590.31
d= 6	24.0	23.65	19359.40	18869.31	490.09	11590.62
d= 7	25.0	24.50	18869.31	18385.51	483.81	11853.26
d= 8	26.0	25.50	18385.51	17907.98	477.52	12176.85
d= 9	27.0	26.50	17907.98	17436.74	471.24	12487.87
d= 10	26.9	26.95	17436.74	16971.79	464.96	12530.59
drem 10.6	28.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105609.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 28.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15223.90**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **120833.235**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.07**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 2
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	14.3	7.15	21904.10	21382.59	521.51	3728.77
d= 2	14.3	14.30	21382.59	20867.37	515.22	7367.68
d= 3	14.3	14.30	20867.37	20358.43	508.94	7277.83
d= 4	22.6	18.45	20358.43	19855.78	502.66	9274.01
d= 5	24.1	23.35	19855.78	19359.40	496.37	11590.31
d= 6	24.4	24.25	19359.40	18869.31	490.09	11884.68
d= 7	25.4	24.90	18869.31	18385.51	483.81	12046.79
d= 8	26.3	25.85	18385.51	17907.98	477.52	12343.98
d= 9	27.9	27.10	17907.98	17436.74	471.24	12770.61
d= 10	28.3	28.10	17436.74	16971.79	464.96	13065.29
drem 10.6	28.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **101349.95**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 28.90
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15713.24**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **117063.193**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.38**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 2
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	21.4	10.70	21904.10	21382.59	521.51	5580.11
d= 2	21.4	21.40	21382.59	20867.37	515.22	11025.76
d= 3	21.4	21.40	20867.37	20358.43	508.94	10891.30
d= 4	23.2	22.30	20358.43	19855.78	502.66	11209.23
d= 5	23.9	23.55	19855.78	19359.40	496.37	11689.58
d= 6	24.5	24.20	19359.40	18869.31	490.09	11860.17
d= 7	24.8	24.65	18869.31	18385.51	483.81	11925.83
d= 8	25.7	25.25	18385.51	17907.98	477.52	12057.47
d= 9	26.0	25.85	17907.98	17436.74	471.24	12181.56
d= 10	26.8	26.40	17436.74	16971.79	464.96	12274.87
drem 10.6	28.0					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **110695.90**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15223.90**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **125919.801**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.99**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 2
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.0	9.50	21904.10	21382.59	521.51	4954.30
d= 2	19.0	19.00	21382.59	20867.37	515.22	9789.23
d= 3	19.0	19.00	20867.37	20358.43	508.94	9669.85
d= 4	22.8	20.90	20358.43	19855.78	502.66	10505.51
d= 5	23.1	22.95	19855.78	19359.40	496.37	11391.76
d= 6	23.7	23.40	19359.40	18869.31	490.09	11468.10
d= 7	25.0	24.35	18869.31	18385.51	483.81	11780.69
d= 8	25.8	25.40	18385.51	17907.98	477.52	12129.10
d= 9	27.1	26.45	17907.98	17436.74	471.24	12464.31
d= 10	27.5	27.30	17436.74	16971.79	464.96	12693.33
drem 10.8	27.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **106846.18**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 27.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14897.68**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **121743.857**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.23**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 2
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.6	8.80	21904.10	21382.59	521.51	4589.25
d= 2	17.6	17.60	21382.59	20867.37	515.22	9067.92
d= 3	17.6	17.60	20867.37	20358.43	508.94	8957.33
d= 4	22.9	20.25	20358.43	19855.78	502.66	10178.79
d= 5	23.4	23.15	19855.78	19359.40	496.37	11491.04
d= 6	23.2	23.30	19359.40	18869.31	490.09	11419.09
d= 7	24.7	23.95	18869.31	18385.51	483.81	11587.17
d= 8	25.0	24.85	18385.51	17907.98	477.52	11866.46
d= 9	25.1	25.05	17907.98	17436.74	471.24	11804.57
d= 10	26.8	25.95	17436.74	16971.79	464.96	12065.64
drem 10.8	26.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **103027.25**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 26.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **14245.22**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **117272.473**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.42**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 2
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	14.6	7.30	21904.10	21382.59	521.51	3806.99
d= 2	14.6	14.60	21382.59	20867.37	515.22	7522.25
d= 3	14.6	14.60	20867.37	20358.43	508.94	7430.51
d= 4	22.9	18.75	20358.43	19855.78	502.66	9424.80
d= 5	24.4	23.65	19855.78	19359.40	496.37	11739.22
d= 6	24.8	24.60	19359.40	18869.31	490.09	12056.21
d= 7	25.8	25.30	18869.31	18385.51	483.81	12240.31
d= 8	26.7	26.25	18385.51	17907.98	477.52	12534.99
d= 9	28.2	27.45	17907.98	17436.74	471.24	12935.55
d= 10	28.5	28.35	17436.74	16971.79	464.96	13181.53
drem 10.8	29.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **102872.37**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15985.10**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **118857.468**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.71**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 2
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	21.6	10.80	21904.10	21382.59	521.51	5632.26
d= 2	21.6	21.60	21382.59	20867.37	515.22	11128.81
d= 3	21.6	21.60	20867.37	20358.43	508.94	10993.09
d= 4	24.6	23.10	20358.43	19855.78	502.66	11611.36
d= 5	23.4	24.00	19855.78	19359.40	496.37	11912.95
d= 6	23.7	23.55	19359.40	18869.31	490.09	11541.62
d= 7	24.5	24.10	18869.31	18385.51	483.81	11659.74
d= 8	25.9	25.20	18385.51	17907.98	477.52	12033.59
d= 9	26.9	26.40	17907.98	17436.74	471.24	12440.74
d= 10	27.0	26.95	17436.74	16971.79	464.96	12530.59
drem 10.8	25.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **111484.75**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 25.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **13864.63**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **125349.38**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.89**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 3
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.2	6.10	21904.10	21382.59	521.51	3181.18
d= 2	12.2	12.20	21382.59	20867.37	515.22	6285.72
d= 3	12.2	12.20	20867.37	20358.43	508.94	6209.06
d= 4	13.2	12.70	20358.43	19855.78	502.66	6383.73
d= 5	19.2	16.20	19855.78	19359.40	496.37	8041.24
d= 6	23.9	21.55	19359.40	18869.31	490.09	10561.44
d= 7	25.8	24.85	18869.31	18385.51	483.81	12022.60
d= 8	26.2	26.00	18385.51	17907.98	477.52	12415.61
d= 9	27.1	26.65	17907.98	17436.74	471.24	12558.55
d= 10	29.1	28.10	17436.74	16971.79	464.96	13065.29
drem 10.6	29.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **90724.43**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16039.47**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **106763.896**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **19.50**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 3
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	11.7	5.85	21904.10	21382.59	521.51	3050.81
d= 2	11.7	11.70	21382.59	20867.37	515.22	6028.10
d= 3	11.7	11.70	20867.37	20358.43	508.94	5954.59
d= 4	15.1	13.40	20358.43	19855.78	502.66	6735.59
d= 5	18.9	17.00	19855.78	19359.40	496.37	8438.34
d= 6	24.9	21.90	19359.40	18869.31	490.09	10732.97
d= 7	24.9	24.90	18869.31	18385.51	483.81	12046.79
d= 8	25.9	25.40	18385.51	17907.98	477.52	12129.10
d= 9	26.0	25.95	17907.98	17436.74	471.24	12228.69
d= 10	27.9	26.95	17436.74	16971.79	464.96	12530.59
drem 10.6	28.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **89875.56**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 28.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15495.76**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **105371.324**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **19.24**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 3
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.0	5.00	21904.10	21382.59	521.51	2607.53
d= 2	10.0	10.00	21382.59	20867.37	515.22	5152.23
d= 3	10.0	10.00	20867.37	20358.43	508.94	5089.39
d= 4	14.4	12.20	20358.43	19855.78	502.66	6132.41
d= 5	19.5	16.95	19855.78	19359.40	496.37	8413.52
d= 6	25.4	22.45	19359.40	18869.31	490.09	11002.52
d= 7	26.3	25.85	18869.31	18385.51	483.81	12506.40
d= 8	26.8	26.55	18385.51	17907.98	477.52	12678.25
d= 9	27.4	27.10	17907.98	17436.74	471.24	12770.61
d= 10	28.8	28.10	17436.74	16971.79	464.96	13065.29
drem 10.6	29.8					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **89418.15**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.80
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **16202.58**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **105620.732**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **19.29**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 3
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.7	6.85	21904.10	21382.59	521.51	3572.31
d= 2	13.7	13.70	21382.59	20867.37	515.22	7058.55
d= 3	13.7	13.70	20867.37	20358.43	508.94	6972.47
d= 4	15.8	14.75	20358.43	19855.78	502.66	7414.18
d= 5	19.8	17.80	19855.78	19359.40	496.37	8835.44
d= 6	24.7	22.25	19359.40	18869.31	490.09	10904.50
d= 7	25.5	25.10	18869.31	18385.51	483.81	12143.55
d= 8	25.6	25.55	18385.51	17907.98	477.52	12200.72
d= 9	26.1	25.85	17907.98	17436.74	471.24	12181.56
d= 10	27.8	26.95	17436.74	16971.79	464.96	12530.59
drem 10.6	28.6					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **93813.88**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 28.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **15550.13**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **109364.006**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **19.97**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 3
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.4	6.20	21904.10	21382.59	521.51	3233.34
d= 2	12.4	12.40	21382.59	20867.37	515.22	6388.76
d= 3	12.4	12.40	20867.37	20358.43	508.94	6310.85
d= 4	14.3	13.35	20358.43	19855.78	502.66	6710.46
d= 5	18.9	16.60	19855.78	19359.40	496.37	8239.79
d= 6	24.3	21.60	19359.40	18869.31	490.09	10585.94
d= 7	24.5	24.40	18869.31	18385.51	483.81	11804.88
d= 8	26.0	25.25	18385.51	17907.98	477.52	12057.47
d= 9	26.6	26.30	17907.98	17436.74	471.24	12393.62
d= 10	28.5	27.55	17436.74	16971.79	464.96	12809.57
drem 10.8	29.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **90534.67**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 29.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15876.36**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **106411.029**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **19.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 3
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	11.3	5.65	21904.10	21382.59	521.51	2946.51
d= 2	11.3	11.30	21382.59	20867.37	515.22	5822.01
d= 3	11.3	11.30	20867.37	20358.43	508.94	5751.01
d= 4	15.7	13.50	20358.43	19855.78	502.66	6785.86
d= 5	19.1	17.40	19855.78	19359.40	496.37	8636.89
d= 6	24.1	21.60	19359.40	18869.31	490.09	10585.94
d= 7	24.4	24.25	18869.31	18385.51	483.81	11732.31
d= 8	25.7	25.05	18385.51	17907.98	477.52	11961.96
d= 9	25.8	25.75	17907.98	17436.74	471.24	12134.44
d= 10	26.7	26.25	17436.74	16971.79	464.96	12205.12
drem 10.8	27.8					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **88562.06**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 27.80
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **15115.16**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **103677.223**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **18.93**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 3
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.1	5.05	21904.10	21382.59	521.51	2633.60
d= 2	10.1	10.10	21382.59	20867.37	515.22	5203.75
d= 3	10.1	10.10	20867.37	20358.43	508.94	5140.29
d= 4	14.6	12.35	20358.43	19855.78	502.66	6207.80
d= 5	19.8	17.20	19855.78	19359.40	496.37	8537.62
d= 6	24.3	22.05	19359.40	18869.31	490.09	10806.48
d= 7	25.9	25.10	18869.31	18385.51	483.81	12143.55
d= 8	27.2	26.55	18385.51	17907.98	477.52	12678.25
d= 9	27.8	27.50	17907.98	17436.74	471.24	12959.11
d= 10	29.2	28.50	17436.74	16971.79	464.96	13251.28
drem 10.8	30.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **89561.72**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 30.30
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **16474.44**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **106036.158**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **19.36**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 3
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.4	6.70	21904.10	21382.59	521.51	3494.09
d= 2	13.4	13.40	21382.59	20867.37	515.22	6903.98
d= 3	13.4	13.40	20867.37	20358.43	508.94	6819.79
d= 4	15.1	14.25	20358.43	19855.78	502.66	7162.85
d= 5	19.0	17.05	19855.78	19359.40	496.37	8463.16
d= 6	24.3	21.65	19359.40	18869.31	490.09	10610.44
d= 7	25.5	24.90	18869.31	18385.51	483.81	12046.79
d= 8	25.5	25.50	18385.51	17907.98	477.52	12176.85
d= 9	25.3	25.40	17907.98	17436.74	471.24	11969.50
d= 10	26.7	26.00	17436.74	16971.79	464.96	12088.88
drem 10.8	27.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **91736.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 27.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14680.19**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **106416.528**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **19.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 4
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	11.9	5.95	21904.10	21382.59	521.51	3102.96
d= 2	11.9	11.90	21382.59	20867.37	515.22	6131.15
d= 3	11.9	11.90	20867.37	20358.43	508.94	6056.38
d= 4	15.1	13.50	20358.43	19855.78	502.66	6785.86
d= 5	16.6	15.85	19855.78	19359.40	496.37	7867.51
d= 6	17.6	17.10	19359.40	18869.31	490.09	8380.54
d= 7	17.7	17.65	18869.31	18385.51	483.81	8539.19
d= 8	19.7	18.70	18385.51	17907.98	477.52	8929.69
d= 9	20.7	20.20	17907.98	17436.74	471.24	9519.05
d= 10	21.4	21.05	17436.74	16971.79	464.96	9787.35
drem 10.6	22.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **75099.67**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 22.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **12179.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **87278.7923**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **15.94**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 4
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	12.1	6.05	21904.10	21382.59	521.51	3155.11
d= 2	12.1	12.10	21382.59	20867.37	515.22	6234.19
d= 3	12.1	12.10	20867.37	20358.43	508.94	6158.17
d= 4	15.9	14.00	20358.43	19855.78	502.66	7037.19
d= 5	17.8	16.85	19855.78	19359.40	496.37	8363.89
d= 6	18.6	18.20	19359.40	18869.31	490.09	8919.63
d= 7	19.7	19.15	18869.31	18385.51	483.81	9264.90
d= 8	19.6	19.65	18385.51	17907.98	477.52	9383.34
d= 9	21.3	20.45	17907.98	17436.74	471.24	9636.86
d= 10	21.6	21.45	17436.74	16971.79	464.96	9973.33
drem 10.6	22.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **78126.60**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 22.30
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **12124.75**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **90251.3543**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.48**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 4
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.1	5.05	21904.10	21382.59	521.51	2633.60
d= 2	10.1	10.10	21382.59	20867.37	515.22	5203.75
d= 3	10.1	10.10	20867.37	20358.43	508.94	5140.29
d= 4	15.8	12.95	20358.43	19855.78	502.66	6509.40
d= 5	17.7	16.75	19855.78	19359.40	496.37	8314.25
d= 6	18.6	18.15	19359.40	18869.31	490.09	8895.13
d= 7	19.6	19.10	18869.31	18385.51	483.81	9240.71
d= 8	20.6	20.10	18385.51	17907.98	477.52	9598.22
d= 9	21.6	21.10	17907.98	17436.74	471.24	9943.17
d= 10	22.8	22.20	17436.74	16971.79	464.96	10322.05
drem 10.6	22.7					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **75800.56**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 22.70
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **12342.24**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **88142.7975**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.10**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 4
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.3	6.65	21904.10	21382.59	521.51	3468.01
d= 2	13.3	13.30	21382.59	20867.37	515.22	6852.46
d= 3	13.3	13.30	20867.37	20358.43	508.94	6768.89
d= 4	15.1	14.20	20358.43	19855.78	502.66	7137.72
d= 5	17.6	16.35	19855.78	19359.40	496.37	8115.70
d= 6	17.8	17.70	19359.40	18869.31	490.09	8674.59
d= 7	18.6	18.20	18869.31	18385.51	483.81	8805.28
d= 8	20.4	19.50	18385.51	17907.98	477.52	9311.71
d= 9	20.2	20.30	17907.98	17436.74	471.24	9566.18
d= 10	20.5	20.35	17436.74	16971.79	464.96	9461.88
drem 10.6	22.4					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **78162.42**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 22.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **12179.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **90341.5392**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.50**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 4
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	11.8	5.90	21904.10	21382.59	521.51	3076.88
d= 2	11.8	11.80	21382.59	20867.37	515.22	6079.63
d= 3	11.8	11.80	20867.37	20358.43	508.94	6005.48
d= 4	14.9	13.35	20358.43	19855.78	502.66	6710.46
d= 5	16.7	15.80	19855.78	19359.40	496.37	7842.69
d= 6	17.4	17.05	19359.40	18869.31	490.09	8356.03
d= 7	19.1	18.25	18869.31	18385.51	483.81	8829.47
d= 8	19.6	19.35	18385.51	17907.98	477.52	9240.08
d= 9	20.0	19.80	17907.98	17436.74	471.24	9330.56
d= 10	21.0	20.50	17436.74	16971.79	464.96	9531.62
drem 10.8	22.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **75002.91**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 22.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **12233.49**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **87236.4021**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **15.93**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 4
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	11.9	5.95	21904.10	21382.59	521.51	3102.96
d= 2	11.9	11.90	21382.59	20867.37	515.22	6131.15
d= 3	11.9	11.90	20867.37	20358.43	508.94	6056.38
d= 4	15.6	13.75	20358.43	19855.78	502.66	6911.52
d= 5	17.0	16.30	19855.78	19359.40	496.37	8090.88
d= 6	18.3	17.65	19359.40	18869.31	490.09	8650.09
d= 7	18.9	18.60	18869.31	18385.51	483.81	8998.80
d= 8	19.8	19.35	18385.51	17907.98	477.52	9240.08
d= 9	20.6	20.20	17907.98	17436.74	471.24	9519.05
d= 10	21.5	21.05	17436.74	16971.79	464.96	9787.35
drem 10.8	22.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **76488.26**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 22.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **12179.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **88667.3802**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.19**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 4
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	10.0	5.00	21904.10	21382.59	521.51	2607.53
d= 2	10.0	10.00	21382.59	20867.37	515.22	5152.23
d= 3	10.0	10.00	20867.37	20358.43	508.94	5089.39
d= 4	15.5	12.75	20358.43	19855.78	502.66	6408.87
d= 5	17.5	16.50	19855.78	19359.40	496.37	8190.15
d= 6	19.0	18.25	19359.40	18869.31	490.09	8944.14
d= 7	19.8	19.40	18869.31	18385.51	483.81	9385.85
d= 8	20.7	20.25	18385.51	17907.98	477.52	9669.85
d= 9	21.4	21.05	17907.98	17436.74	471.24	9919.61
d= 10	22.7	22.05	17436.74	16971.79	464.96	10252.30
drem 10.8	23.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **75619.92**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 23.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **12722.83**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **88342.753**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.13**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 4
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.7	6.85	21904.10	21382.59	521.51	3572.31
d= 2	13.7	13.70	21382.59	20867.37	515.22	7058.55
d= 3	13.7	13.70	20867.37	20358.43	508.94	6972.47
d= 4	16.0	14.85	20358.43	19855.78	502.66	7464.44
d= 5	17.2	16.60	19855.78	19359.40	496.37	8239.79
d= 6	18.0	17.60	19359.40	18869.31	490.09	8625.58
d= 7	18.6	18.30	18869.31	18385.51	483.81	8853.66
d= 8	19.7	19.15	18385.51	17907.98	477.52	9144.57
d= 9	20.1	19.90	17907.98	17436.74	471.24	9377.68
d= 10	21.2	20.65	17436.74	16971.79	464.96	9601.36
drem 10.8	21.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **78910.43**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 21.30
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **11581.04**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **90491.4724**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **16.53**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 5
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.7	4.85	21904.10	21382.59	521.51	2529.30
d= 2	9.7	9.70	21382.59	20867.37	515.22	4997.66
d= 3	9.7	9.70	20867.37	20358.43	508.94	4936.71
d= 4	11.4	10.55	20358.43	19855.78	502.66	5303.02
d= 5	13.0	12.20	19855.78	19359.40	496.37	6055.75
d= 6	13.4	13.20	19359.40	18869.31	490.09	6469.19
d= 7	14.4	13.90	18869.31	18385.51	483.81	6724.91
d= 8	15.2	14.80	18385.51	17907.98	477.52	7067.35
d= 9	16.0	15.60	17907.98	17436.74	471.24	7351.35
d= 10	16.1	16.05	17436.74	16971.79	464.96	7462.56
drem 10.6	17.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **58897.80**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 17.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **9243.08**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **68140.8864**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.44**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 5
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.8	4.90	21904.10	21382.59	521.51	2555.38
d= 2	9.8	9.80	21382.59	20867.37	515.22	5049.18
d= 3	9.8	9.80	20867.37	20358.43	508.94	4987.61
d= 4	13.2	11.50	20358.43	19855.78	502.66	5780.55
d= 5	15.0	14.10	19855.78	19359.40	496.37	6998.86
d= 6	15.8	15.40	19359.40	18869.31	490.09	7547.38
d= 7	17.0	16.40	18869.31	18385.51	483.81	7934.43
d= 8	17.7	17.35	18385.51	17907.98	477.52	8285.03
d= 9	18.5	18.10	17907.98	17436.74	471.24	8529.45
d= 10	18.0	18.25	17436.74	16971.79	464.96	8485.47
drem 10.6	18.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **66153.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 18.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10058.65**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **76211.9817**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.92**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 5
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.1	4.05	21904.10	21382.59	521.51	2112.10
d= 2	8.1	8.10	21382.59	20867.37	515.22	4173.30
d= 3	8.1	8.10	20867.37	20358.43	508.94	4122.41
d= 4	13.3	10.70	20358.43	19855.78	502.66	5378.42
d= 5	14.4	13.85	19855.78	19359.40	496.37	6874.77
d= 6	15.8	15.10	19359.40	18869.31	490.09	7400.36
d= 7	17.0	16.40	18869.31	18385.51	483.81	7934.43
d= 8	17.3	17.15	18385.51	17907.98	477.52	8189.53
d= 9	17.9	17.60	17907.98	17436.74	471.24	8293.83
d= 10	18.5	18.20	17436.74	16971.79	464.96	8462.22
drem 10.6	19.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **62941.36**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10330.51**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **73271.8641**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.38**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 5
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.6	5.30	21904.10	21382.59	521.51	2763.98
d= 2	10.6	10.60	21382.59	20867.37	515.22	5461.36
d= 3	10.6	10.60	20867.37	20358.43	508.94	5394.76
d= 4	12.2	11.40	20358.43	19855.78	502.66	5730.28
d= 5	13.5	12.85	19855.78	19359.40	496.37	6378.39
d= 6	14.1	13.80	19359.40	18869.31	490.09	6763.24
d= 7	15.3	14.70	18869.31	18385.51	483.81	7111.96
d= 8	15.0	15.15	18385.51	17907.98	477.52	7234.48
d= 9	16.5	15.75	17907.98	17436.74	471.24	7422.03
d= 10	16.1	16.30	17436.74	16971.79	464.96	7578.80
drem 10.6	15.7					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **61839.28**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 15.70
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **8536.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **70375.5436**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.85**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 5
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.8	4.40	21904.10	21382.59	521.51	2294.63
d= 2	8.8	8.80	21382.59	20867.37	515.22	4533.96
d= 3	8.8	8.80	20867.37	20358.43	508.94	4478.67
d= 4	11.4	10.10	20358.43	19855.78	502.66	5076.83
d= 5	12.3	11.85	19855.78	19359.40	496.37	5882.02
d= 6	14.0	13.15	19359.40	18869.31	490.09	6444.68
d= 7	14.6	14.30	18869.31	18385.51	483.81	6918.44
d= 8	14.8	14.70	18385.51	17907.98	477.52	7019.59
d= 9	15.5	15.15	17907.98	17436.74	471.24	7139.29
d= 10	16.4	15.95	17436.74	16971.79	464.96	7416.07
drem 10.8	16.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **57204.16**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 16.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **8916.86**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **66121.0228**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.07**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 5
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.8	4.90	21904.10	21382.59	521.51	2555.38
d= 2	9.8	9.80	21382.59	20867.37	515.22	5049.18
d= 3	9.8	9.80	20867.37	20358.43	508.94	4987.61
d= 4	14.0	11.90	20358.43	19855.78	502.66	5981.61
d= 5	15.1	14.55	19855.78	19359.40	496.37	7222.23
d= 6	15.7	15.40	19359.40	18869.31	490.09	7547.38
d= 7	16.6	16.15	18869.31	18385.51	483.81	7813.48
d= 8	17.0	16.80	18385.51	17907.98	477.52	8022.39
d= 9	17.2	17.10	17907.98	17436.74	471.24	8058.21
d= 10	17.8	17.50	17436.74	16971.79	464.96	8136.75
drem 10.8	18.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **65374.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 18.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10058.65**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **75432.8643**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.78**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 5
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.6	4.30	21904.10	21382.59	521.51	2242.47
d= 2	8.6	8.60	21382.59	20867.37	515.22	4430.91
d= 3	8.6	8.60	20867.37	20358.43	508.94	4376.88
d= 4	13.2	10.90	20358.43	19855.78	502.66	5478.95
d= 5	15.0	14.10	19855.78	19359.40	496.37	6998.86
d= 6	16.1	15.55	19359.40	18869.31	490.09	7620.90
d= 7	16.7	16.40	18869.31	18385.51	483.81	7934.43
d= 8	17.3	17.00	18385.51	17907.98	477.52	8117.90
d= 9	18.1	17.70	17907.98	17436.74	471.24	8340.95
d= 10	18.2	18.15	17436.74	16971.79	464.96	8438.97
drem 10.8	18.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **63981.23**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 18.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10058.65**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **74039.8787**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 5
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159

line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.7	5.35	21904.10	21382.59	521.51	2790.06
d= 2	10.7	10.70	21382.59	20867.37	515.22	5512.88
d= 3	10.7	10.70	20867.37	20358.43	508.94	5445.65
d= 4	11.9	11.30	20358.43	19855.78	502.66	5680.01
d= 5	13.0	12.45	19855.78	19359.40	496.37	6179.84
d= 6	14.2	13.60	19359.40	18869.31	490.09	6665.22
d= 7	13.9	14.05	18869.31	18385.51	483.81	6797.48
d= 8	15.5	14.70	18385.51	17907.98	477.52	7019.59
d= 9	15.5	15.50	17907.98	17436.74	471.24	7304.22
d= 10	16.5	16.00	17436.74	16971.79	464.96	7439.31
drem 10.8	15.7					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **60834.28**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 15.70
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **8536.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **69370.5452**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.67**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 6
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.7	4.85	21904.10	21382.59	521.51	2529.30
d= 2	9.7	9.70	21382.59	20867.37	515.22	4997.66
d= 3	9.7	9.70	20867.37	20358.43	508.94	4936.71
d= 4	11.4	10.55	20358.43	19855.78	502.66	5303.02
d= 5	12.6	12.00	19855.78	19359.40	496.37	5956.48
d= 6	14.1	13.35	19359.40	18869.31	490.09	6542.70
d= 7	14.9	14.50	18869.31	18385.51	483.81	7015.20
d= 8	15.2	15.05	18385.51	17907.98	477.52	7186.73
d= 9	15.9	15.55	17907.98	17436.74	471.24	7327.79
d= 10	15.8	15.85	17436.74	16971.79	464.96	7369.57
drem 10.6	16.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **59165.15**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 16.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **8808.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **67973.268**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.41**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 6
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.2	5.10	21904.10	21382.59	521.51	2659.68
d= 2	10.2	10.20	21382.59	20867.37	515.22	5255.27
d= 3	10.2	10.20	20867.37	20358.43	508.94	5191.18
d= 4	13.9	12.05	20358.43	19855.78	502.66	6057.01
d= 5	14.6	14.25	19855.78	19359.40	496.37	7073.32
d= 6	15.9	15.25	19359.40	18869.31	490.09	7473.87
d= 7	17.0	16.45	18869.31	18385.51	483.81	7958.62
d= 8	17.4	17.20	18385.51	17907.98	477.52	8213.40
d= 9	18.4	17.90	17907.98	17436.74	471.24	8435.20
d= 10	18.9	18.65	17436.74	16971.79	464.96	8671.45
drem 10.6	19.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **66989.00**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10439.25**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **77428.2452**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **14.14**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 6
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.2	4.10	21904.10	21382.59	521.51	2138.17
d= 2	8.2	8.20	21382.59	20867.37	515.22	4224.82
d= 3	8.2	8.20	20867.37	20358.43	508.94	4173.30
d= 4	13.5	10.85	20358.43	19855.78	502.66	5453.82
d= 5	14.9	14.20	19855.78	19359.40	496.37	7048.50
d= 6	16.0	15.45	19359.40	18869.31	490.09	7571.89
d= 7	17.1	16.55	18869.31	18385.51	483.81	8007.00
d= 8	18.0	17.55	18385.51	17907.98	477.52	8380.54
d= 9	18.9	18.45	17907.98	17436.74	471.24	8694.38
d= 10	19.2	19.05	17436.74	16971.79	464.96	8857.43
drem 10.6	19.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **64549.86**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.30
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10493.62**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **75043.4775**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.70**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 6
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	11.0	5.50	21904.10	21382.59	521.51	2868.28
d= 2	11.0	11.00	21382.59	20867.37	515.22	5667.45
d= 3	11.0	11.00	20867.37	20358.43	508.94	5598.33
d= 4	13.3	12.15	20358.43	19855.78	502.66	6107.27
d= 5	13.0	13.15	19855.78	19359.40	496.37	6527.31
d= 6	14.2	13.60	19359.40	18869.31	490.09	6665.22
d= 7	15.0	14.60	18869.31	18385.51	483.81	7063.58
d= 8	16.2	15.60	18385.51	17907.98	477.52	7449.37
d= 9	14.7	15.45	17907.98	17436.74	471.24	7280.66
d= 10	17.0	15.85	17436.74	16971.79	464.96	7369.57
drem 10.6	17.1					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **62597.04**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 17.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **9297.46**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **71894.4929**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.13**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 6
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.3	4.65	21904.10	21382.59	521.51	2425.00
d= 2	9.3	9.30	21382.59	20867.37	515.22	4791.57
d= 3	9.3	9.30	20867.37	20358.43	508.94	4733.14
d= 4	11.5	10.40	20358.43	19855.78	502.66	5227.62
d= 5	12.3	11.90	19855.78	19359.40	496.37	5906.84
d= 6	14.0	13.15	19359.40	18869.31	490.09	6444.68
d= 7	14.3	14.15	18869.31	18385.51	483.81	6845.86
d= 8	14.6	14.45	18385.51	17907.98	477.52	6900.21
d= 9	15.6	15.10	17907.98	17436.74	471.24	7115.73
d= 10	16.0	15.80	17436.74	16971.79	464.96	7346.32
drem 10.8	16.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **57736.98**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 16.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **8916.86**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **66653.8382**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.17**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 6
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	10.0	5.00	21904.10	21382.59	521.51	2607.53
d= 2	10.0	10.00	21382.59	20867.37	515.22	5152.23
d= 3	10.0	10.00	20867.37	20358.43	508.94	5089.39
d= 4	13.4	11.70	20358.43	19855.78	502.66	5881.08
d= 5	15.7	14.55	19855.78	19359.40	496.37	7222.23
d= 6	15.8	15.75	19359.40	18869.31	490.09	7718.91
d= 7	16.2	16.00	18869.31	18385.51	483.81	7740.91
d= 8	16.9	16.55	18385.51	17907.98	477.52	7903.01
d= 9	17.8	17.35	17907.98	17436.74	471.24	8176.02
d= 10	18.1	17.95	17436.74	16971.79	464.96	8345.98
drem 10.8	18.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **65837.29**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 18.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **9895.54**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **75732.8231**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.83**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 6
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	8.2	4.10	21904.10	21382.59	521.51	2138.17
d= 2	8.2	8.20	21382.59	20867.37	515.22	4224.82
d= 3	8.2	8.20	20867.37	20358.43	508.94	4173.30
d= 4	13.1	10.65	20358.43	19855.78	502.66	5353.29
d= 5	15.5	14.30	19855.78	19359.40	496.37	7098.13
d= 6	16.0	15.75	19359.40	18869.31	490.09	7718.91
d= 7	17.5	16.75	18869.31	18385.51	483.81	8103.76
d= 8	17.1	17.30	18385.51	17907.98	477.52	8261.16
d= 9	18.3	17.70	17907.98	17436.74	471.24	8340.95
d= 10	19.0	18.65	17436.74	16971.79	464.96	8671.45
drem 10.8	19.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **64083.96**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10656.73**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **74740.6911**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.65**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 6
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.7	5.35	21904.10	21382.59	521.51	2790.06
d= 2	10.7	10.70	21382.59	20867.37	515.22	5512.88
d= 3	10.7	10.70	20867.37	20358.43	508.94	5445.65
d= 4	13.4	12.05	20358.43	19855.78	502.66	6057.01
d= 5	13.0	13.20	19855.78	19359.40	496.37	6552.12
d= 6	13.6	13.30	19359.40	18869.31	490.09	6518.19
d= 7	14.5	14.05	18869.31	18385.51	483.81	6797.48
d= 8	16.4	15.45	18385.51	17907.98	477.52	7377.74
d= 9	15.4	15.90	17907.98	17436.74	471.24	7492.72
d= 10	16.0	15.70	17436.74	16971.79	464.96	7299.83
drem 10.8	16.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **61843.68**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 16.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **8699.37**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **70543.055**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.88**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 7
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.1	4.55	21904.10	21382.59	521.51	2372.85
d= 2	9.1	9.10	21382.59	20867.37	515.22	4688.53
d= 3	9.1	9.10	20867.37	20358.43	508.94	4631.35
d= 4	11.8	10.45	20358.43	19855.78	502.66	5252.76
d= 5	13.0	12.40	19855.78	19359.40	496.37	6155.03
d= 6	14.2	13.60	19359.40	18869.31	490.09	6665.22
d= 7	14.3	14.25	18869.31	18385.51	483.81	6894.24
d= 8	15.1	14.70	18385.51	17907.98	477.52	7019.59
d= 9	15.7	15.40	17907.98	17436.74	471.24	7257.10
d= 10	16.3	16.00	17436.74	16971.79	464.96	7439.31
drem 10.6	16.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **58375.98**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 16.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **9025.60**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **67401.5822**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.31**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 7
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.9	4.95	21904.10	21382.59	521.51	2581.45
d= 2	9.9	9.90	21382.59	20867.37	515.22	5100.70
d= 3	9.9	9.90	20867.37	20358.43	508.94	5038.50
d= 4	14.0	11.95	20358.43	19855.78	502.66	6006.74
d= 5	15.6	14.80	19855.78	19359.40	496.37	7346.32
d= 6	16.6	16.10	19359.40	18869.31	490.09	7890.45
d= 7	16.9	16.75	18869.31	18385.51	483.81	8103.76
d= 8	17.1	17.00	18385.51	17907.98	477.52	8117.90
d= 9	18.3	17.70	17907.98	17436.74	471.24	8340.95
d= 10	18.4	18.35	17436.74	16971.79	464.96	8531.96
drem 10.6	19.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **67058.74**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10330.51**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **77389.2465**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **14.13**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 7
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159

line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.0	4.00	21904.10	21382.59	521.51	2086.02
d= 2	8.0	8.00	21382.59	20867.37	515.22	4121.78
d= 3	8.0	8.00	20867.37	20358.43	508.94	4071.51
d= 4	13.3	10.65	20358.43	19855.78	502.66	5353.29
d= 5	15.4	14.35	19855.78	19359.40	496.37	7122.95
d= 6	16.4	15.90	19359.40	18869.31	490.09	7792.43
d= 7	16.8	16.60	18869.31	18385.51	483.81	8031.19
d= 8	17.3	17.05	18385.51	17907.98	477.52	8141.78
d= 9	18.2	17.75	17907.98	17436.74	471.24	8364.52
d= 10	19.2	18.70	17436.74	16971.79	464.96	8694.70
drem 10.6	18.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **63780.17**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 18.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10113.02**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **73893.1875**

line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.49**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 7
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	11.5	5.75	21904.10	21382.59	521.51	2998.66
d= 2	11.5	11.50	21382.59	20867.37	515.22	5925.06
d= 3	11.5	11.50	20867.37	20358.43	508.94	5852.80
d= 4	13.4	12.45	20358.43	19855.78	502.66	6258.07
d= 5	14.5	13.95	19855.78	19359.40	496.37	6924.40
d= 6	13.6	14.05	19359.40	18869.31	490.09	6885.76
d= 7	14.5	14.05	18869.31	18385.51	483.81	6797.48
d= 8	15.1	14.80	18385.51	17907.98	477.52	7067.35
d= 9	16.1	15.60	17907.98	17436.74	471.24	7351.35
d= 10	15.9	16.00	17436.74	16971.79	464.96	7439.31
drem 10.6	17.3					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **63500.25**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 17.30
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **9406.20**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **72906.4453**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.31**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 7
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.3	4.65	21904.10	21382.59	521.51	2425.00
d= 2	9.3	9.30	21382.59	20867.37	515.22	4791.57
d= 3	9.3	9.30	20867.37	20358.43	508.94	4733.14
d= 4	11.6	10.45	20358.43	19855.78	502.66	5252.76
d= 5	13.0	12.30	19855.78	19359.40	496.37	6105.39
d= 6	14.1	13.55	19359.40	18869.31	490.09	6640.72
d= 7	14.5	14.30	18869.31	18385.51	483.81	6918.44
d= 8	15.3	14.90	18385.51	17907.98	477.52	7115.10
d= 9	16.0	15.65	17907.98	17436.74	471.24	7374.91
d= 10	16.0	16.00	17436.74	16971.79	464.96	7439.31
drem 10.8	16.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **58796.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 16.90
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **9188.71**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **67985.0417**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.42**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 7
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.8	4.90	21904.10	21382.59	521.51	2555.38
d= 2	9.8	9.80	21382.59	20867.37	515.22	5049.18
d= 3	9.8	9.80	20867.37	20358.43	508.94	4987.61
d= 4	14.2	12.00	20358.43	19855.78	502.66	6031.87
d= 5	15.3	14.75	19855.78	19359.40	496.37	7321.50
d= 6	16.3	15.80	19359.40	18869.31	490.09	7743.42
d= 7	16.5	16.40	18869.31	18385.51	483.81	7934.43
d= 8	17.3	16.90	18385.51	17907.98	477.52	8070.15
d= 9	17.6	17.45	17907.98	17436.74	471.24	8223.14
d= 10	18.2	17.90	17436.74	16971.79	464.96	8322.73
drem 10.8	19.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **66239.41**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10384.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **76624.2879**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.99**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 7
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	8.2	4.10	21904.10	21382.59	521.51	2138.17
d= 2	8.2	8.20	21382.59	20867.37	515.22	4224.82
d= 3	8.2	8.20	20867.37	20358.43	508.94	4173.30
d= 4	13.2	10.70	20358.43	19855.78	502.66	5378.42
d= 5	14.9	14.05	19855.78	19359.40	496.37	6974.04
d= 6	15.9	15.40	19359.40	18869.31	490.09	7547.38
d= 7	17.8	16.85	18869.31	18385.51	483.81	8152.14
d= 8	18.3	18.05	18385.51	17907.98	477.52	8619.30
d= 9	17.9	18.10	17907.98	17436.74	471.24	8529.45
d= 10	18.4	18.15	17436.74	16971.79	464.96	8438.97
drem 10.8	19.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **64176.01**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10384.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **74560.8846**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.62**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 7
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.6	5.30	21904.10	21382.59	521.51	2763.98
d= 2	10.6	10.60	21382.59	20867.37	515.22	5461.36
d= 3	10.6	10.60	20867.37	20358.43	508.94	5394.76
d= 4	12.4	11.50	20358.43	19855.78	502.66	5780.55
d= 5	13.3	12.85	19855.78	19359.40	496.37	6378.39
d= 6	13.6	13.45	19359.40	18869.31	490.09	6591.71
d= 7	14.0	13.80	18869.31	18385.51	483.81	6676.53
d= 8	14.2	14.10	18385.51	17907.98	477.52	6733.08
d= 9	16.1	15.15	17907.98	17436.74	471.24	7139.29
d= 10	16.1	16.10	17436.74	16971.79	464.96	7485.81
drem 10.8	15.7					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **60405.46**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 15.70
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **8536.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **68941.7166**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.59**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 8
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.3	4.65	21904.10	21382.59	521.51	2425.00
d= 2	9.3	9.30	21382.59	20867.37	515.22	4791.57
d= 3	9.3	9.30	20867.37	20358.43	508.94	4733.14
d= 4	12.0	10.65	20358.43	19855.78	502.66	5353.29
d= 5	12.9	12.45	19855.78	19359.40	496.37	6179.84
d= 6	14.0	13.45	19359.40	18869.31	490.09	6591.71
d= 7	14.9	14.45	18869.31	18385.51	483.81	6991.01
d= 8	15.3	15.10	18385.51	17907.98	477.52	7210.60
d= 9	16.1	15.70	17907.98	17436.74	471.24	7398.47
d= 10	15.6	15.85	17436.74	16971.79	464.96	7369.57
drem 10.6	16.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **59044.20**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 16.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **8808.12**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **67852.3165**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.39**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 8
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.1	5.05	21904.10	21382.59	521.51	2633.60
d= 2	10.1	10.10	21382.59	20867.37	515.22	5203.75
d= 3	10.1	10.10	20867.37	20358.43	508.94	5140.29
d= 4	14.4	12.25	20358.43	19855.78	502.66	6157.54
d= 5	14.3	14.35	19855.78	19359.40	496.37	7122.95
d= 6	16.1	15.20	19359.40	18869.31	490.09	7449.37
d= 7	16.7	16.40	18869.31	18385.51	483.81	7934.43
d= 8	17.6	17.15	18385.51	17907.98	477.52	8189.53
d= 9	18.4	18.00	17907.98	17436.74	471.24	8482.33
d= 10	18.2	18.30	17436.74	16971.79	464.96	8508.72
drem 10.6	19.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **66822.49**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10330.51**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **77152.9981**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **14.09**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 8
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.0	4.00	21904.10	21382.59	521.51	2086.02
d= 2	8.0	8.00	21382.59	20867.37	515.22	4121.78
d= 3	8.0	8.00	20867.37	20358.43	508.94	4071.51
d= 4	13.8	10.90	20358.43	19855.78	502.66	5478.95
d= 5	15.0	14.40	19855.78	19359.40	496.37	7147.77
d= 6	16.0	15.50	19359.40	18869.31	490.09	7596.39
d= 7	17.1	16.55	18869.31	18385.51	483.81	8007.00
d= 8	18.0	17.55	18385.51	17907.98	477.52	8380.54
d= 9	18.4	18.20	17907.98	17436.74	471.24	8576.57
d= 10	18.4	18.40	17436.74	16971.79	464.96	8555.21
drem 10.6	19.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **64021.75**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **10384.88**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **74406.632**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.59**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 8
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.6	5.30	21904.10	21382.59	521.51	2763.98
d= 2	10.6	10.60	21382.59	20867.37	515.22	5461.36
d= 3	10.6	10.60	20867.37	20358.43	508.94	5394.76
d= 4	12.8	11.70	20358.43	19855.78	502.66	5881.08
d= 5	13.6	13.20	19855.78	19359.40	496.37	6552.12
d= 6	13.3	13.45	19359.40	18869.31	490.09	6591.71
d= 7	14.6	13.95	18869.31	18385.51	483.81	6749.10
d= 8	15.4	15.00	18385.51	17907.98	477.52	7162.85
d= 9	15.7	15.55	17907.98	17436.74	471.24	7327.79
d= 10	15.7	15.70	17436.74	16971.79	464.96	7299.83
drem 10.6	16.6					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **61184.57**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 16.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **9025.60**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **70210.1735**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.82**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 8
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	9.1	4.55	21904.10	21382.59	521.51	2372.85
d= 2	9.1	9.10	21382.59	20867.37	515.22	4688.53
d= 3	9.1	9.10	20867.37	20358.43	508.94	4631.35
d= 4	11.3	10.20	20358.43	19855.78	502.66	5127.09
d= 5	12.3	11.80	19855.78	19359.40	496.37	5857.20
d= 6	13.8	13.05	19359.40	18869.31	490.09	6395.67
d= 7	14.7	14.25	18869.31	18385.51	483.81	6894.24
d= 8	15.2	14.95	18385.51	17907.98	477.52	7138.98
d= 9	15.8	15.50	17907.98	17436.74	471.24	7304.22
d= 10	15.7	15.75	17436.74	16971.79	464.96	7323.07
drem 10.8	16.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **57733.21**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 16.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **8699.37**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **66432.5841**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.13**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 8
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	10.2	5.10	21904.10	21382.59	521.51	2659.68
d= 2	10.2	10.20	21382.59	20867.37	515.22	5255.27
d= 3	10.2	10.20	20867.37	20358.43	508.94	5191.18
d= 4	14.0	12.10	20358.43	19855.78	502.66	6082.14
d= 5	15.2	14.60	19855.78	19359.40	496.37	7247.05
d= 6	15.6	15.40	19359.40	18869.31	490.09	7547.38
d= 7	16.5	16.05	18869.31	18385.51	483.81	7765.10
d= 8	17.6	17.05	18385.51	17907.98	477.52	8141.78
d= 9	17.8	17.70	17907.98	17436.74	471.24	8340.95
d= 10	18.2	18.00	17436.74	16971.79	464.96	8369.23
drem 10.8	18.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **66599.75**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 18.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10058.65**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **76658.403**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **14.00**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 8
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	8.0	4.00	21904.10	21382.59	521.51	2086.02
d= 2	8.0	8.00	21382.59	20867.37	515.22	4121.78
d= 3	8.0	8.00	20867.37	20358.43	508.94	4071.51
d= 4	13.5	10.75	20358.43	19855.78	502.66	5403.55
d= 5	14.8	14.15	19855.78	19359.40	496.37	7023.68
d= 6	16.2	15.50	19359.40	18869.31	490.09	7596.39
d= 7	16.5	16.35	18869.31	18385.51	483.81	7910.24
d= 8	17.9	17.20	18385.51	17907.98	477.52	8213.40
d= 9	18.2	18.05	17907.98	17436.74	471.24	8505.89
d= 10	19.1	18.65	17436.74	16971.79	464.96	8671.45
drem 10.8	19.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **63603.92**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 19.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **10439.25**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **74043.1701**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **13.52**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 8
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	10.9	5.45	21904.10	21382.59	521.51	2842.21
d= 2	10.9	10.90	21382.59	20867.37	515.22	5615.93
d= 3	10.9	10.90	20867.37	20358.43	508.94	5547.44
d= 4	12.9	11.90	20358.43	19855.78	502.66	5981.61
d= 5	13.2	13.05	19855.78	19359.40	496.37	6477.67
d= 6	13.8	13.50	19359.40	18869.31	490.09	6616.21
d= 7	14.3	14.05	18869.31	18385.51	483.81	6797.48
d= 8	15.4	14.85	18385.51	17907.98	477.52	7091.22
d= 9	14.9	15.15	17907.98	17436.74	471.24	7139.29
d= 10	15.6	15.25	17436.74	16971.79	464.96	7090.60
drem 10.8	16.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **61199.65**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 16.90
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **9188.71**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **70388.3663**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **12.85**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 9
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	18.5	9.25	21904.10	21382.59	521.51	4823.93
d= 2	18.5	18.50	21382.59	20867.37	515.22	9531.62
d= 3	18.5	18.50	20867.37	20358.43	508.94	9415.38
d= 4	22.2	20.35	20358.43	19855.78	502.66	10229.05
d= 5	24.7	23.45	19855.78	19359.40	496.37	11639.95
d= 6	27.7	26.20	19359.40	18869.31	490.09	12840.35
d= 7	26.0	26.85	18869.31	18385.51	483.81	12990.21
d= 8	26.6	26.30	18385.51	17907.98	477.52	12558.87
d= 9	25.4	26.00	17907.98	17436.74	471.24	12252.25
d= 10	25.5	25.45	17436.74	16971.79	464.96	11833.16
drem 10.6	25.2					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **108114.76**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 25.20
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **13701.51**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **121816.272**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.25**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 9
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.5	8.75	21904.10	21382.59	521.51	4563.18
d= 2	17.5	17.50	21382.59	20867.37	515.22	9016.39
d= 3	17.5	17.50	20867.37	20358.43	508.94	8906.44
d= 4	22.6	20.05	20358.43	19855.78	502.66	10078.26
d= 5	25.3	23.95	19855.78	19359.40	496.37	11888.13
d= 6	27.6	26.45	19359.40	18869.31	490.09	12962.88
d= 7	26.8	27.20	18869.31	18385.51	483.81	13159.54
d= 8	28.0	27.40	18385.51	17907.98	477.52	13084.14
d= 9	26.4	27.20	17907.98	17436.74	471.24	12817.74
d= 10	26.2	26.30	17436.74	16971.79	464.96	12228.37
drem 10.6	27.5					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **108705.07**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 27.50
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **14952.05**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **123657.114**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.58**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 9
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.9	6.95	21904.10	21382.59	521.51	3624.46
d= 2	13.9	13.90	21382.59	20867.37	515.22	7161.59
d= 3	13.9	13.90	20867.37	20358.43	508.94	7074.26
d= 4	22.9	18.40	20358.43	19855.78	502.66	9248.87
d= 5	25.5	24.20	19855.78	19359.40	496.37	12012.23
d= 6	29.1	27.30	19359.40	18869.31	490.09	13379.45
d= 7	27.9	28.50	18869.31	18385.51	483.81	13788.49
d= 8	28.3	28.10	18385.51	17907.98	477.52	13418.41
d= 9	26.9	27.60	17907.98	17436.74	471.24	13006.23
d= 10	26.6	26.75	17436.74	16971.79	464.96	12437.60
drem 10.6	27.3					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **105151.60**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 27.30
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **14843.31**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **119994.907**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.91**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 9
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	19.6	9.80	21904.10	21382.59	521.51	5110.76
d= 2	19.6	19.60	21382.59	20867.37	515.22	10098.36
d= 3	19.6	19.60	20867.37	20358.43	508.94	9975.21
d= 4	23.4	21.50	20358.43	19855.78	502.66	10807.11
d= 5	25.7	24.55	19855.78	19359.40	496.37	12185.96
d= 6	28.1	26.90	19359.40	18869.31	490.09	13183.42
d= 7	25.1	26.60	18869.31	18385.51	483.81	12869.26
d= 8	26.0	25.55	18385.51	17907.98	477.52	12200.72
d= 9	26.0	26.00	17907.98	17436.74	471.24	12252.25
d= 10	23.8	24.90	17436.74	16971.79	464.96	11577.43
drem 10.6	24.7					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **110260.47**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 24.70
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **13429.66**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **123690.13**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.59**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 9
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	17.9	8.95	21904.10	21382.59	521.51	4667.48
d= 2	17.9	17.90	21382.59	20867.37	515.22	9222.48
d= 3	17.9	17.90	20867.37	20358.43	508.94	9110.01
d= 4	21.8	19.85	20358.43	19855.78	502.66	9977.73
d= 5	25.0	23.40	19855.78	19359.40	496.37	11615.13
d= 6	27.6	26.30	19359.40	18869.31	490.09	12889.36
d= 7	26.5	27.05	18869.31	18385.51	483.81	13086.97
d= 8	26.6	26.55	18385.51	17907.98	477.52	12678.25
d= 9	25.9	26.25	17907.98	17436.74	471.24	12370.06
d= 10	24.9	25.40	17436.74	16971.79	464.96	11809.91
drem 10.8	23.1					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **107427.38**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 23.10
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **12559.72**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **119987.097**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.91**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 9
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	16.7	8.35	21904.10	21382.59	521.51	4354.57
d= 2	16.7	16.70	21382.59	20867.37	515.22	8604.22
d= 3	16.7	16.70	20867.37	20358.43	508.94	8499.29
d= 4	22.3	19.50	20358.43	19855.78	502.66	9801.80
d= 5	24.5	23.40	19855.78	19359.40	496.37	11615.13
d= 6	26.8	25.65	19359.40	18869.31	490.09	12570.80
d= 7	25.8	26.30	18869.31	18385.51	483.81	12724.11
d= 8	25.9	25.85	18385.51	17907.98	477.52	12343.98
d= 9	25.6	25.75	17907.98	17436.74	471.24	12134.44
d= 10	25.5	25.55	17436.74	16971.79	464.96	11879.65
drem 10.8	23.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **104527.99**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 23.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **12831.58**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **117359.568**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.43**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 9
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	13.8	6.90	21904.10	21382.59	521.51	3598.39
d= 2	13.8	13.80	21382.59	20867.37	515.22	7110.07
d= 3	13.8	13.80	20867.37	20358.43	508.94	7023.36
d= 4	22.7	18.25	20358.43	19855.78	502.66	9173.48
d= 5	25.8	24.25	19855.78	19359.40	496.37	12037.05
d= 6	29.3	27.55	19359.40	18869.31	490.09	13501.97
d= 7	27.4	28.35	18869.31	18385.51	483.81	13715.92
d= 8	27.8	27.60	18385.51	17907.98	477.52	13179.65
d= 9	26.0	26.90	17907.98	17436.74	471.24	12676.36
d= 10	26.8	26.40	17436.74	16971.79	464.96	12274.87
drem 10.8	25.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **104291.12**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 25.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **13810.26**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **118101.372**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **21.57**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 9
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	20.1	10.05	21904.10	21382.59	521.51	5241.13
d= 2	20.1	20.10	21382.59	20867.37	515.22	10355.97
d= 3	20.1	20.10	20867.37	20358.43	508.94	10229.68
d= 4	23.3	21.70	20358.43	19855.78	502.66	10907.64
d= 5	25.2	24.25	19855.78	19359.40	496.37	12037.05
d= 6	28.3	26.75	19359.40	18869.31	490.09	13109.90
d= 7	25.5	26.90	18869.31	18385.51	483.81	13014.40
d= 8	25.1	25.30	18385.51	17907.98	477.52	12081.34
d= 9	24.6	24.85	17907.98	17436.74	471.24	11710.32
d= 10	24.4	24.50	17436.74	16971.79	464.96	11391.45
drem 10.8	23.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **110078.89**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 23.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **12831.58**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **122910.463**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **22.45**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 10
PORT A, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	20.3	10.15	21904.10	21382.59	521.51	5293.28
d= 2	20.3	20.30	21382.59	20867.37	515.22	10459.02
d= 3	20.3	20.30	20867.37	20358.43	508.94	10331.47
d= 4	24.0	22.15	20358.43	19855.78	502.66	11133.83
d= 5	26.3	25.15	19855.78	19359.40	496.37	12483.78
d= 6	28.6	27.45	19359.40	18869.31	490.09	13452.97
d= 7	30.2	29.40	18869.31	18385.51	483.81	14223.92
d= 8	31.6	30.90	18385.51	17907.98	477.52	14755.48
d= 9	32.4	32.00	17907.98	17436.74	471.24	15079.69
d= 10	33.3	32.85	17436.74	16971.79	464.96	15273.84
drem 10.6	33.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **122487.27**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 33.90
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E

line 4) Multiply a) by b) **18431.80**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment

line 5a) a) Add the values on lines 3 and 4. **140919.069**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **25.73**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects NIght Run 10
PORT B, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	17.9	8.95	21904.10	21382.59	521.51	4667.48
d= 2	17.9	17.90	21382.59	20867.37	515.22	9222.48
d= 3	17.9	17.90	20867.37	20358.43	508.94	9110.01
d= 4	24.5	21.20	20358.43	19855.78	502.66	10656.31
d= 5	26.3	25.40	19855.78	19359.40	496.37	12607.87
d= 6	28.0	27.15	19359.40	18869.31	490.09	13305.94
d= 7	28.9	28.45	18869.31	18385.51	483.81	13764.30
d= 8	30.9	29.90	18385.51	17907.98	477.52	14277.95
d= 9	31.6	31.25	17907.98	17436.74	471.24	14726.26
d= 10	32.8	32.20	17436.74	16971.79	464.96	14971.62
drem 10.6	32.0					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **117310.23**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 32.00
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **17398.75**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **134708.974**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **24.60**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 10
PORT C, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.5	7.75	21904.10	21382.59	521.51	4041.67
d= 2	15.5	15.50	21382.59	20867.37	515.22	7985.95
d= 3	15.5	15.50	20867.37	20358.43	508.94	7888.56
d= 4	24.5	20.00	20358.43	19855.78	502.66	10053.12
d= 5	27.0	25.75	19855.78	19359.40	496.37	12781.60
d= 6	29.1	28.05	19359.40	18869.31	490.09	13747.02
d= 7	30.7	29.90	18869.31	18385.51	483.81	14465.82
d= 8	32.4	31.55	18385.51	17907.98	477.52	15065.87
d= 9	33.0	32.70	17907.98	17436.74	471.24	15409.56
d= 10	34.1	33.55	17436.74	16971.79	464.96	15599.31
drem 10.6	34.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **117038.48**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 34.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **18703.65**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **135742.132**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **24.79**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 10
PORT D, USI 16pt AUTOPROBE, STRAIGHT-UP

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.1	11.05	21904.10	21382.59	521.51	5762.64
d= 2	22.1	22.10	21382.59	20867.37	515.22	11386.42
d= 3	22.1	22.10	20867.37	20358.43	508.94	11247.56
d= 4	25.3	23.70	20358.43	19855.78	502.66	11912.95
d= 5	27.4	26.35	19855.78	19359.40	496.37	13079.43
d= 6	28.7	28.05	19359.40	18869.31	490.09	13747.02
d= 7	29.4	29.05	18869.31	18385.51	483.81	14054.58
d= 8	30.7	30.05	18385.51	17907.98	477.52	14349.58
d= 9	31.9	31.30	17907.98	17436.74	471.24	14749.82
d= 10	32.1	32.00	17436.74	16971.79	464.96	14878.63
drem 10.6	31.7					

(use d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **125168.63**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 31.70
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **17235.63**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **142404.262**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **26.01**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 10
PORT A, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	19.6	9.80	21904.10	21382.59	521.51	5110.76
d= 2	19.6	19.60	21382.59	20867.37	515.22	10098.36
d= 3	19.6	19.60	20867.37	20358.43	508.94	9975.21
d= 4	23.7	21.65	20358.43	19855.78	502.66	10882.51
d= 5	26.3	25.00	19855.78	19359.40	496.37	12409.33
d= 6	28.3	27.30	19359.40	18869.31	490.09	13379.45
d= 7	30.5	29.40	18869.31	18385.51	483.81	14223.92
d= 8	31.3	30.90	18385.51	17907.98	477.52	14755.48
d= 9	32.1	31.70	17907.98	17436.74	471.24	14938.32
d= 10	32.8	32.45	17436.74	16971.79	464.96	15087.86
drem 10.8	33.6					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **120861.18**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 33.60
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **18268.68**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **139129.863**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **25.41**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 10
PORT B, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance from wall (inches)	Axial vel. V-d ft/sec	Decay vel. avg of d, d-1	Intermediate calculations pi(r-d+1)^2	pi(r-d)^2	Area of segment (col D - E)	Vol. flow in segment (col C X F)
d= 1	17.6	8.80	21904.10	21382.59	521.51	4589.25
d= 2	17.6	17.60	21382.59	20867.37	515.22	9067.92
d= 3	17.6	17.60	20867.37	20358.43	508.94	8957.33
d= 4	23.8	20.70	20358.43	19855.78	502.66	10404.98
d= 5	25.8	24.80	19855.78	19359.40	496.37	12310.05
d= 6	27.9	26.85	19359.40	18869.31	490.09	13158.91
d= 7	28.7	28.30	18869.31	18385.51	483.81	13691.73
d= 8	29.7	29.20	18385.51	17907.98	477.52	13943.69
d= 9	30.0	29.85	17907.98	17436.74	471.24	14066.52
d= 10	30.9	30.45	17436.74	16971.79	464.96	14157.94
drem 10.8	31.4					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **114348.33**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 31.40
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **17072.52**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **131420.846**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **24.00**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 10
PORT C, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	15.2	7.60	21904.10	21382.59	521.51	3963.44
d= 2	15.2	15.20	21382.59	20867.37	515.22	7831.38
d= 3	15.2	15.20	20867.37	20358.43	508.94	7735.88
d= 4	24.3	19.75	20358.43	19855.78	502.66	9927.46
d= 5	27.2	25.75	19855.78	19359.40	496.37	12781.60
d= 6	29.4	28.30	19359.40	18869.31	490.09	13869.54
d= 7	31.2	30.30	18869.31	18385.51	483.81	14659.34
d= 8	31.7	31.45	18385.51	17907.98	477.52	15018.11
d= 9	33.4	32.55	17907.98	17436.74	471.24	15338.87
d= 10	34.0	33.70	17436.74	16971.79	464.96	15669.05
drem 10.8	34.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **116794.69**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem (use d=11) 34.90
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **18975.51**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **135770.2**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **24.79**

Form for calculating Replacement Near-Wall Velocity in Augmented 16-point Traverse at GPU Titus

Wall Effects Night Run 10
PORT D, USI 16pt AUTOPROBE, YAW-NULLED

Stack Area: 21,904.1 sq. in. pi = 3.14159
line 1) radius: 83.5003 in

line 2)

(A) Distance from wall (inches)	(B) Axial vel. V-d ft/sec	(C) Decay vel. avg of d, d-1	(D) Intermediate calculations pi(r-d+1)^2	(E) Intermediate calculations pi(r-d)^2	(F) Area of segment (col D - E)	(G) Vol. flow in segment (col C X F)
d= 1	22.3	11.15	21904.10	21382.59	521.51	5814.79
d= 2	22.3	22.30	21382.59	20867.37	515.22	11489.46
d= 3	22.3	22.30	20867.37	20358.43	508.94	11349.35
d= 4	25.4	23.85	20358.43	19855.78	502.66	11988.35
d= 5	27.2	26.30	19855.78	19359.40	496.37	13054.61
d= 6	28.3	27.75	19359.40	18869.31	490.09	13599.99
d= 7	30.1	29.20	18869.31	18385.51	483.81	14127.15
d= 8	30.6	30.35	18385.51	17907.98	477.52	14492.84
d= 9	31.8	31.20	17907.98	17436.74	471.24	14702.70
d= 10	31.9	31.85	17436.74	16971.79	464.96	14808.88
drem 10.8	31.9					

(use vel. at d=11 for drem)

line 3) Total near-wall volumetric flow (total of column G) **125428.12**

Volumetric flow in remainder of the Method 1 near-wall equal area segment

a) Axial velocity at drem 31.90
b) Total area in remainder segment 543.71
Subtract 3/4 pi r^2 from last entry in item 2, col E
line 4) Multiply a) by b) **17344.38**

Wall-effect adjusted velocity in the Method 1 near-wall equal area segment
line 5a) a) Add the values on lines 3 and 4. **142772.5**
line 5b) b) Divide line a) by 1/4*pi*r^2
This is the substitute velocity value, V. **26.07**

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