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POLLUTION PREVENTION OPPORTUNITY ASSESSMENT
UNITED STATES COAST GUARD
AVIATION TRAINING CENTER
MOBILE, ALABAMA

by
TRC Environmental Corporation
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DISCLAIMER

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FOREWORD

Today's rapidly developing and changing technologies and industrial products and practices frequently carry with them the increased generation of materials that, if improperly dealt with, can threaten both public health and the environment. The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. These laws direct the EPA to perform research to define our environmental problems, measure the impacts and search for solutions.

The Risk Reduction Engineering Laboratory is responsible for planning, implementing, and managing research, development, and demonstration programs to provide an authoritative, defensible engineering basis in support of the policies, programs, and regulations of the EPA with respect to drinking water, waste water, pesticides, toxic substances, solid and hazardous wastes, pollution prevention, and Superfund-related activities. This publication is one of the products of that research and provides a vital communication link between the researcher and the user community.

The Pollution Prevention Research Branch of the Risk Reduction Engineering Laboratory has instituted the Waste Reduction Evaluations At Federal Sites (WREAFS) Program to identify, evaluate, and demonstrate pollution prevention opportunities in industrial, military, and other Federal facilities. EPA believes the WREAFS Program will show pollution prevention to be a cost-effective tool in reducing the generation and disposal of hazardous and non-hazardous wastes. This report summarizes a pollution prevention opportunity assessment of the U.S. Coast Guard (USCG) Aviation Training Center in Mobile, Alabama, which maintains the readiness and airworthiness of Dauphin HH65 and Jayhawk HH-60 helicopters and Falcon HU-25 jets used in training and search and rescue missions.

E. Timothy Oppelt, Director
Risk Reduction Engineering Laboratory

ABSTRACT

This report summarizes work conducted at the U.S. Coast Guard (USCG) Aviation Training Center (ATC) in Mobile, Alabama under the U.S. Environmental Protection Agency's (EPA's) Waste Reduction Evaluations at Federal Sites (WREAFS) Program. This project was funded by EPA and conducted in cooperation with U.S. Coast Guard officials.

The purposes of the WREAFS Program are to identify new technologies and techniques for reducing wastes from processes operations and other activities at Federal sites, and to enhance the implementation of pollution prevention/waste minimization through technology transfer. New techniques and technologies for reducing waste generation are identified through waste minimization opportunity assessments and may be further evaluated through joint research, development, and demonstration projects.

A pollution prevention opportunity assessment was performed during the fall of 1993 which identified areas for waste reduction at the ATC. The study followed procedures in the EPA Facility Pollution Prevention Guide. Although the ATC has made substantial progress to date, opportunities were identified for further action. This report identifies potential procedural initiatives as well as technology options to achieve further pollution prevention progress.

Several waste generating processes were initially screened including flight simulators, aircraft maintenance, aircraft fuel management, and aircraft cleaning. Opportunities to reduce wastes in each area were identified and evaluated.

This report was submitted in fulfillment of Contract No. 68-D2-0181 by TRC Environmental Corporation, under the sponsorship of the U.S. Environmental Protection Agency. This report covers a period from October 15, 1993 to September 30, 1994; work was completeded as of September 30, 1994.

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SECTION 1
INTRODUCTION

PURPOSE

The purpose of this project was to conduct a Pollution Prevention Opportunity Assessment (PPOA) of the United States Coast Guard (USCG) Aviation Training Center (ATC) in Mobile, Alabama. The assessment was conducted for the EPA's Risk Reduction Engineering Laboratory (RREL) and the USCG's Research and Development Center under the purview of the Waste Reduction Evaluations at Federal Sites (WREAFS) Program of the Pollution Prevention Research Branch in RREL. The study was conducted using the procedures outlined in the EPA manual, Facility Pollution Prevention Guide (EPA/600/R-92/088), which provides a methodology for assessing operations to identify, evaluate and implement pollution prevention opportunities.

Pollution prevention in environmental management requires the development of a comprehensive program which continually seeks opportunities to implement cost-effective strategies to reduce waste generation. PPOAs provide detailed assessments of waste streams, options for reducing waste generation or preventing pollution, and analyses of alternatives identified. Figure 1 identifies the key elements of a pollution prevention program showing the interrelationship of the PPOA to the program. The elements of the pollution prevention program are discussed in detail in the Facility Pollution Prevention Guide.

The approach for conducting a PPOA at the ATC is described in this section. Section 2 describes activities that generate wastes for each of several process areas identified. Possible alternative practices to minimizing these wastes are discussed in Section 3. Recommendations on potential follow-up activities are also included in Section 3. The PPOA worksheets are included in the Appendix.

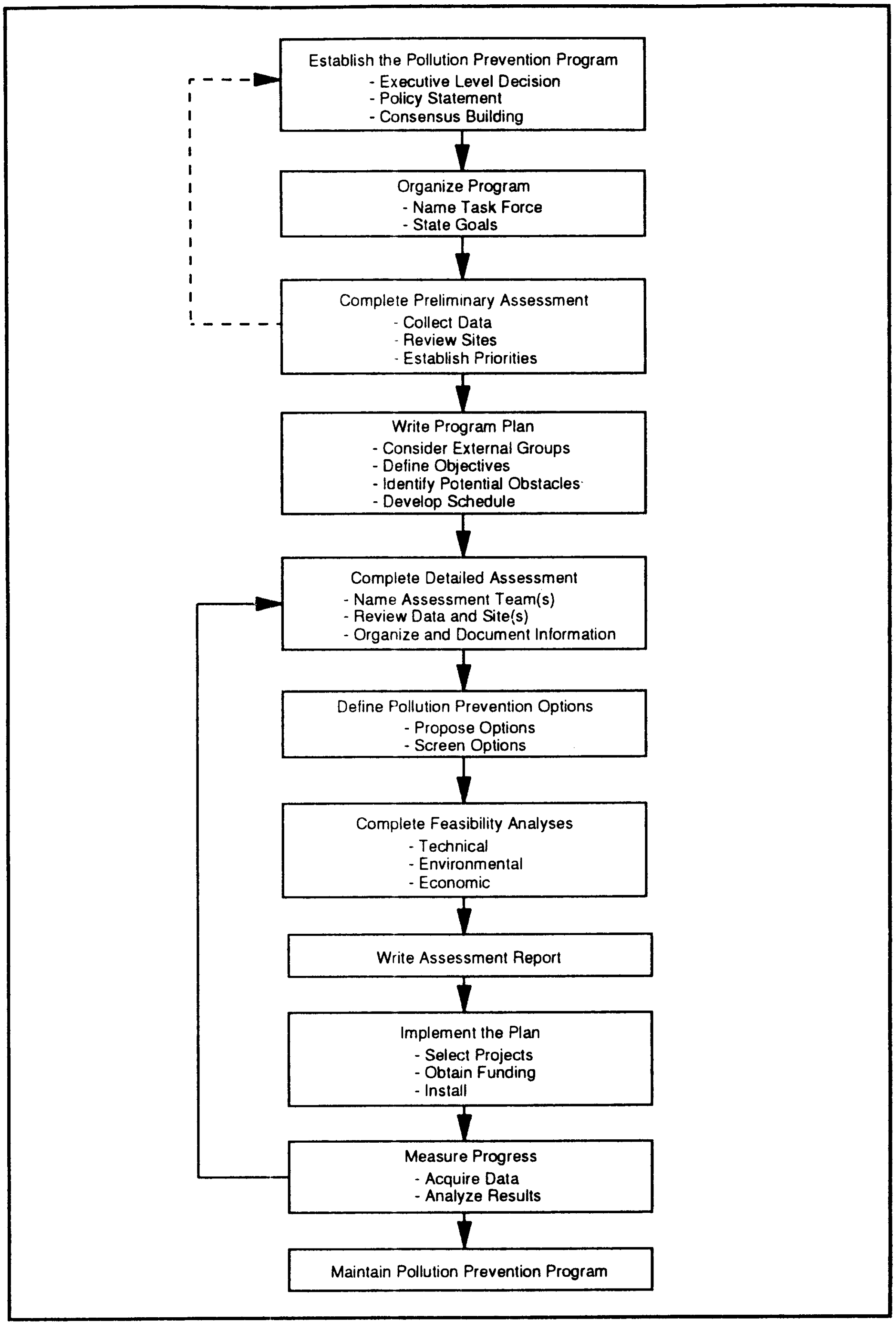


Figure 1. Pollution prevention program overview.

APPROACH

The USCG Aviation Training Center is located at Bates Field, adjacent to the Mobile, Alabama Municipal Airport. The ATC was commissioned in 1966 to provide centralized comprehensive training to USCG personnel in the operation of fixed-wing and rotary-wing aircraft. The facility also has fixed-wing search and rescue responsibilities. Five hundred personnel operate the facility on a 24-hour basis. Three types of aircraft are maintained in operation: the Dauphin Helicopter (HH-65), the Jayhawk Helicopter (HH-60) and the Falcon Jet (HU-25). Duties performed include cleaning, maintenance and repair of structural, mechanical, and electrical aircraft components, and rescue and survival gear. The aircraft are also fueled onsite. Approximately 20 aircraft are operated at this facility.

The ATC has ongoing activities to reduce waste generation at the facility. Each activity or process area has a lead "Point Manager" who, under the direction of the Environmental Safety Manager, works with the operating personnel to identify and implement approaches to reduce waste generation. In preparation for this PPOA, a pre-assessment was conducted by USCG Environmental Safety personnel from the ATC in Mobile with the assistance of staff from the USCG's Research and Development (R & D) Center in Groton, Connecticut and the Civil Engineering and Aeronautical Engineering Divisions of USCG Headquarters in Washington, DC. The pre-assessment identified the following four activity areas as candidates for further review in the PPOA:

1. Flight simulators
2. Aircraft maintenance
3. Aircraft fueling
4. Aircraft washing

The pre-assessment report served to identify priority waste streams for further consideration during the detailed PPOA. The pre-assessment report included information on the volume of waste generation in each process and the current cost of handling off-site disposal of the wastes.

The PPOA process includes developing a work plan for the PPOA; identifying the assessment team; conducting the site visit for data collection and observation of waste generating activities; identifying and analyzing waste reduction alternatives; and developing the PPOA assessment report.

The PPOA assessment team included USCG representatives from the ATC, the R & D Center and the Aeronautical Engineering Division of USCG Headquarters, in addition to an EPA representative from RREL and EPA contractor personnel. A protocol for the site visit was prepared and discussed by the assessment team in advance of the site visit. The site visit opened and closed with briefings of the Commanding Officer and staff who showed strong interest in the goals of the PPOA. During the site visit, operating personnel were interviewed to gain their perspectives on alternative practices which could lead to reduced waste generation. The operating personnel provided important input into the characterization of potential alternatives. They expressed an understanding of the importance of minimizing waste while meeting performance needs. The site visit concluded with a "brainstorming" session which allowed the assessment team to interact and exchange ideas on the waste reduction alternatives and identify areas for follow-up activities. Following the site visit, selected waste reduction options were investigated further as described in Section 3.

SECTION 2
SITE ACTIVITY DESCRIPTIONS

FLIGHT SIMULATORS

The Mobile, Alabama ATC houses three flight simulators in the Flight Training Systems Building which are used for training USCG aviators. The flight simulators each function as sophisticated trainers for instrument, cockpit, operational, and emergency flight procedures. The simulators are dynamic replicas of the HH-60, HU-25A, and the HH-65A aircraft.

Each simulator is equipped with a "six degrees of freedom motion" system and an independent single purpose digital computer. The HU-25A and the HH-65A are also equipped with SP-1 night/dusk visual systems. The ATC has a maintenance and engineering support services contract with Simtech for these simulators. The contractor is responsible for all maintenance activities including safety and environmental protection. The simulators must be available during training periods from 0700-2300, Monday through Friday. The ATC also uses a contractor to recycle or dispose of the waste from the simulator activities.

The simulators utilize hydraulic equipment, the fluid for which is pumped from a fluid reservoir. The degree of leakage resulting from pipe and pump joints failures is primarily a function of the age of the simulators and associated piping and pumping systems. Hydraulic fluid spill cleanup accounts for the major portion of the waste generated from the simulators.

The simulators are subject to operational readiness (daily) and housekeeping (weekly) maintenance and to major maintenance at predetermined periods. In these maintenance activities, several materials are used, which are listed in Table 1.

The operation and maintenance of the simulators produces very little waste except as a result of cleanup of hydraulic fluid spills as described above. Normal maintenance produces very little

TABLE 1. FLIGHT SIMULATOR MATERIALS USAGE LIST

Description	Specification
Adhesive, Rubber Cement	MMM-A-121
Anti Seize	Loctite 767
Avionic Cleaner, Texwipe HCFC Cleaner	TX132
Avionic Cleaner, Texwipe HCFC Cleaner	TX124
Chlorinated Cleaner	AP-20 Remover
Chlorinated Cleaner	Spray Kleen
Chlorinated Cleaner	Spraytec Flux-A-Way
Chlorinated Cleaner, Safety Kleen #609	Cleaner 601
Circuit Cooler, Spraytec	SPC 34N610
Grease, Lubrimatic	11380
Hydraulic Fluid	Brayco Micronic 745
Solid Lube	Yellow 77

hazardous waste, mostly in the form of aerosol cans with residue products (less than 60 lbs per year). Most of the solvent residues are HCFCs. The hydraulic fluid reservoir pump filters are changed semi-annually, and the spent filters are discarded. Leaked/spilled hydraulic fluid is absorbed on absorbents or collected in drip pans placed under the leaking joints. Hydraulic fluid collected in the pans and the absorbents and the spent filters are regularly transferred to two 55 gallon drums which are stored in a satellite collection area located at the back of the simulator building. One drum receives liquid waste and the other receives solid waste. Any saturated rags from cleaning operations are also stored in the solid waste drum. The ATC waste contractor removes the 55 gallon drums when full for offsite disposal or recycling. The waste contractor pays ATC $0.03 per gallon of hydraulic fluid and charges $0.50 per gallon for any water mixed with the fluid. The contractor charges $0.46 per pound for disposal of the spill-cleanup absorbents, cleaning rags, discarded filters, etc. In 1992-1993, approximately 790 pounds of such material were disposed of at a cost of $359.50. This included about 220 gallons of hydraulic fluid collected during the same period.

AIRCRAFT MAINTENANCE SHOPS

The ATC operates three different aircraft or airframes in training activities, the Dauphin and Jayhawk Helicopters and the Falcon Jet. The Falcon Jet is also utilized for search and rescue missions. Each type of aircraft has its own maintenance and repair shop, which operate continuously, with assigned staff to maintain the aircraft's readiness and airworthiness. Engine repair shop facilities are shared. The evening shift (4 p.m. to midnight) is utilized for scheduled maintenance, with some maintenance needs carrying over into the mid-shift (midnight to 8 a.m.). The day shift (8 a.m. to 4 p.m.) prepares and services aircraft in support of the day's scheduled training activities.

The ATC has the capability to address the majority of repair needs for each airframe design. Each aircraft's needs are tracked by the specific airframe shop which conducts the majority of the routine maintenance activities. Routine maintenance is scheduled and tracked for each individual aircraft by an Aviation Computerized Maintenance System (ACMS). The ACMS provides a systematic mechanism to insure each aircraft is receiving required maintenance on schedule and to identify trends in maintenance and repair needs across similar aircraft. The ACMS's role is currently being expanded to provide information on specific chemicals approved for use on each airframe. The ACMS's Authorized Chemical Use List (ACUL) has been completed for the Dauphin helicopter and Falcon Jet and is under development for the Jayhawk Helicopter.

The airframe shops are responsible for interior and exterior cleaning; lubrication of moving parts; and disassembly, repair and reassembly or replacement of aircraft parts and engines. The airframe shop personnel also refuel the aircraft and conduct daily analyses of the fuel for water and sediment content. Written Technical Information Maintenance Instructions (TIMIs) are used to identify the specific requirements for each task. Specialty aircraft repair needs that cannot be addressed by the general airframe shops are referred to the specialty maintenance shops such as the Avionics, Metal, Paint, Composite, and Engine shops described in other sections of this report.

Many chemical materials are used by the airframe shops. The majority of these materials are stored in individual shop lockers for use by shop personnel. Table 2 identifies the materials used by the air frame shops and the engine shop and ATC's estimated annual usage rates for each. Many of the same or similar materials are used for the same function and application in each of the shops. For several functions, such as cleaning, corrosion control, and lubrication, several different products

TABLE 2. AIR FRAME AND ENGINE SHOPS MATERIAL USAGE RATES

Description	Specification Number	Unit Size and Annual Usage			
		Dauphin Hel. Shop (HH65)	Falcon Jet Shop (HU25)	Jayhawk Hel. Shop (HH60)	Engine Shop
Adhesive	MMM-A-121			1 quart	
Adhesive	MIL-A-121		4 16-oz. cans		
Adhesive	MMM-A-1617A		12 10-oz. tubes		
Adhesive	MIL-A-5540B		12 10-oz. tubes		
Adhesive	Versilock		3 10-oz. tubes		
Adhesive	MIL-A-46106A		12 16-oz. cans		
Adhesive, Dexter				2 16-oz. cans	
Adhesive, Scotchweld	EC-1751B			1 2-oz. kit	
Adhesive Sealant			12 16-oz. cans		
Adhesive Sealant	RTV 3145		12 10-oz. tubes		
Adhesive, Sealant Silicone	MIL-A-46146			8 10-oz. tubes	
Adhesive, Sealant Silicone RTV	MIL-46106B			8 10-oz. tubes	
Adhesive, Sealant Silicone	MIL-A46146B			8 10-oz. tubes	
Adhesive, Structural Hysol	EA-9309			2 quarts	
Adhesive, Super Glue	MIL-A-46050				3 10-oz. tubes
Adhesive, 3M	1751		12 16-oz. cans		
Anti Fog Compound	O-A-549	8 pints			
Anti Fog Compound	O-A-549A		2 pints	2 pints	
Anti-Seize	MIL-A-907B				4 16-oz. cans
Anti-Seize	MIL-A-907E		12 16-oz. cans	2 pints	
Anti-Seize	MIL-A-13881C			2 pints	

(continued)

TABLE 2. (continued)

Description	Specification Number	Unit Size and Annual Usage			
		Dauphin Hel. Shop (HH65)	Falcon Jet Shop (HU25)	Jayhawk Hel. Shop (HH60)	Engine Shop
Anti-Seize	P/N C-300		6 16-oz. cans		
Anti-Seize	Hi Temp C5A		12 16-oz. cans		
Anti-Seize (LED-Plate)				1 pint	
Anti-Seize, Mastinox	6856KD150-2	24 10-oz. tubes	12 10-oz. tubes	2 10-oz. tubes	
Cleaner, Aerosol	Block Buster	48 16-oz. cans	288 16-oz. cans	72 16-oz. cans	
Cleaner, Aerosol Contact	EMC 13	48 16-oz. cans	288 16-oz. cans	60 16-oz. cans	12 16-oz. cans
Cleaner, Aerosol Surface	Super CSC	100 16-oz. cans	24 16-oz. cans	144 16-oz. cans	12 16-oz. cans
Cleaner, Chlorinated	Stainless Steel CP		60 16-oz. cans		
Cleaner, Chlorinated Aerosol	Master Mechanic 81-309	36 16-oz. cans	72 16-oz. cans	12 16-oz. cans	
Cleaner, Easy Off Oven					1 16-oz. can
Cleaner, General Purpose	PD 1747	8 gals			
Cleaner, Glass	A-A-40		12 16-oz. cans		
Cleaner Lube	MIL-L-43460D	12 pints			
Cleaner, Lubricant	MIL-L-63460D		1 qt.		
Cleaner, Solvent Aerosol	PB-230		288 16-oz. cans		
Cleaning Comp., Aircraft Surface				2 pints	
Cleaning Compound, Avionics	MIL-C-81964A/AS			120 pints	
Cleaning Compound, Solvent	MIL-C-81302			48 pints	
Cleaning Compound, Windshield				2 pints	
Corrosion Preventive Compound	MIL-81309 II			36 pints	
Corrosion Preventive Compound	MIL-81309 III		72 pints	36 pints	

(continued)

TABLE 2. (continued)

Description	Specification Number	Unit Size and Annual Usage			
		Dauphin Hel. Shop (HH65)	Falcon Jet Shop (HU25)	Jayhawk Hel. Shop (HH60)	Engine Shop
Corrosion Preventive Compound	MIL-C-81309C		12 pints		12 pints
Corrosion Preventive Compound	MIL-C-81309D	48 pints	144 pints		
Corrosion Preventive Compound	MIL-85054		12 pints	24 pints	
Corrosion Preventive Compound	AMLGUARD MIL-C-16173D			2 pints	
Corrosion Preventive Compound	MIL-C-6529C		288 pints		
Corrosion Preventive Compound	ACF-50	48 pints			
Corrosion Preventive Compound	MIL-C-16173D				4 pints
Corrosion Preventive Compound	Rustlick 606				12 gals
Corrosion Preventive Compound	MIL-C-16173			2 pints	
Corrosion Preventive Compound			12 pints	2 pints	
Corrosion Preventive Compound			72 pints		
Damping Fluid, Silicone				1 pint	
Desiccant			6 16-oz. cans		
Detergent, General	P-D1747C		24 pints	144 pints	
Developer, Zyglo					2 pints
Dye Penetrant	MIL-I-25135				2 16-oz. cans
Dye Penetrant	ZL17C				2 16-oz. cans
Floor Finish	28745		12 gals		
Floor Finish, O-Brite-O				1 gal	
Floor Wax			24 gals.		
Freon 12				unknown	

(continued)

TABLE 2. (continued)

Description	Specification Number	Unit Size and Annual Usage			
		Dauphin Hel. Shop (HH65)	Falcon Jet Shop (HU25)	Jayhawk Hel. Shop (HH60)	Engine Shop
Grease, ACFT			4 16-oz. cans		
Grease, Aircraft (WTR)	MIL-G-81322	8 quarts		1 gal	
Grease, Aircraft	MIL-G-81827	8 quarts		2 quarts	
Grease, Aircraft (GOB)	MIL-G-25537			2 quarts	
Grease, Aircraft	MIL-G-4343			2 quarts	
Grease, Aircraft, Gear & Actuator	MIL-G-23827			1 quart	
Grease, Aircraft, Plug Valve	MIL-G-6032			1 quart	
Grease, Bearing	Sunstrand	20 10-oz. tubes			
Grease, Hi Temp	MIL-G-81322				12 pounds
Grease, Lube			4 16-oz. cans		
Grease, Lube	VV-P-236B		12 16-oz. cans		
Grease, Lube	W-6424-5		12 16-oz. cans		
Grease, Lube	MIL-G-27617		12 16-oz. cans		
Grease, Lube	YG-UAR-0500		12 16-oz. cans		
Grease, Lube	MIL-G-23827B		12 16-oz. cans		
Grease, Lube	MIL-G-3534C		12 16-oz. cans		
Grease, Lube	MIL-G-46886A		6 16-oz. cans		
Grease, Lubriplate	630AA	4 gals		12 quarts	36 pounds
Grease, Molybdenum Disulfide			4 quarts		
Grease, Molybdenum Disulfide	MIL-G-21164D	4 quarts			
Grease, Molybdenum Disulfide	MIL-G-21164		4 quarts	12 quarts	1 quart

(continued)

TABLE 2. (continued)

Description	Specification Number	Unit Size and Annual Usage			
		Dauphin Hel. Shop (HH65)	Falcon Jet Shop (HU25)	Jayhawk Hel. Shop (HH60)	Engine Shop
Hydraulic Fluid	MIL-H-83282	384 quarts		288 quarts	
Hydraulic Fluid	MIL-H-5606		2,304 quarts		
Insecticide	MIL-I-51484		36 16-oz. cans		
Lacquer				12 16-oz. cans	
Lacquer, Orange Aerosol		12 16-oz. cans			
Leak Detection Compound, Leak Tec	MIL-L-25567D	48 pints		12 pints	
Liquid Protectant & Beautifier			2 gals.		
Lubricant, Cleaner	MIL-L-43460D	12 quarts	1 quart		
Lubricant, Solid	K-LAST		24 16-oz. cans		
Lubricant, Solid Film Perma Silk	MIL-L-23398	24 pints	12 pints	12 pints	2 pints
Lubricant, Solid Film	MIL-L-46010B			12 pints	
Lubricating Oil	MIL-L-60326		12 quarts		
Lubricating Oil, CLP	MIL-L-6460D			2 pints	
Lubricating Oil, Gas Turbine	MIL-L-23699D				576 quarts
Lubricating Oil, Gear	MIL-L-6086		4 pints	2 pints	
Lubricating Oil, Gearbox	MIL-L-23699C	384 quarts			
Lubricating Oil, General Purpose	MIL-L-7870	12 quarts	8 quarts	6 quarts	24 quarts
Lubricating Oil, General Purpose	MIL-L-7808	4 quarts			4 quarts
Lubricating Oil, General Purpose	VVL-800C	8 quarts		12 pints	
Lubricating Oil, Mobil Jet 254		384 quarts	2,304 quarts		24 quarts
Mold Release, Freekote 33	FK 3300	8 16-oz. cans	12 16-oz. cans		

(continued)

TABLE 2. (continued)

Description	Specification Number	Unit Size and Annual Usage			
		Dauphin Hel. Shop (HH65)	Falcon Jet Shop (HU25)	Jayhawk Hel. Shop (HH60)	Engine Shop
Oil, Refrigerator	Witco Oil	2 gals			
Paint Primer	Locquic		12 16-oz. cans		
Penetrating Oil	VVP-216-C	8 quarts		12 quarts	
Penetrating Oil	Seeze Eze		6 quarts		
Penetrating Oil, Aerosol	Brute Force	48 16-oz. cans	288 16-oz. cans	12 16-oz. cans	
Petroleum Jelly	VV-P-236			2 quarts	
Polish, Plastic	P-P-560		3 pints.	1 pint	
Polyfoam	PB-230	144 16-oz. cans		144 16-oz. cans	
Pro Seal	P-P-560			12 2-oz. kits	
Putty, Zinc Chromate	MIL-P-8116			2 10-oz. tubes	
Rain Repellant, Windshield	MIL-W-6882			2 pints	
Sealant	Loctite RC 680	4 pints		8 gals	
Sealant	MIL-S-8784	96 2-oz. kits			
Sealant	RTV-102		12 10-oz. tubes		
Sealant	Hylomar PL32		3 16-oz. cans		
Sealant	MIL-S-8516		12 16-oz. cans		
Sealant	MIL-S-8802	112 2-oz. kits		48 2-oz. kits	
Sealant	MIL-S-22473		2 10-oz. tubes	4 10-oz. tubes	
Sealant, Thread	MIL-A-13881			2 16-oz. cans	
Sealant, Thread	Locktite 242	4 pints			
Skin Protective Compound			4 10-oz. tubes		

(continued)

TABLE 2. (continued)

Description	Specification Number	Unit Size and Annual Usage			
		Dauphin Hel. Shop (HH65)	Falcon Jet Shop (HU25)	Jayhawk Hel. Shop (HH60)	Engine Shop
Skin Protective Compound	PPP-C-186			1 16-oz. can	
Solvent, Acetone	O-A-51		16 pints	48 pints	1 pint
Solvent, Alcohol, Denatured				2 gals	1 gal
Solvent, Isopropyl Alcohol		2 gals			
Solvent, Methanol	O-M-232		2 gals.		
Solvent, Methyl Ethyl Ketone				12 gals	
Solvent, Naphtha				12 pints	
Solvent, Penatone	724	16 quarts		12 quarts	
Talc	ZZ-T-416		2 16-oz. cans		

are used for the same function. The selection of different products for similar applications has evolved over time based on the experience of the individuals performing the tasks. The materials are centrally purchased for the ATC, stored at the Aviation Materials Office's supply building and then dispersed to each shop upon request.

Waste streams resulting from the operation of the airframe shops include aircraft fuel, used lubricants and hydraulic fluids, waste solvents, expired materials, containers, and used rags and absorbents. Table 3 identifies the estimated volumes of these waste streams. Waste aircraft fuel results from the daily analysis of fuel from each aircraft (one to two gallons per day per aircraft) to check for moisture and sediment, as well as fuel drained from aircraft fuel cells, fuel pumps and engines prior to repair work in order to complete repairs. Fuel spills may also result from these activities. Fuel wastes are collected and stored in an aboveground 1,500 gallon storage vessel or "bowser" used to collect waste oil and fuel. The materials stored in the bowser are collected for off-site disposal by a waste management contractor. Fuels will be discussed further in the section on Aircraft Fueling.

TABLE 3. AIRCRAFT MAINTENANCE SHOPS WASTE STREAMS

Waste Stream	**Estimated Annual Quantity**
Waste Fuel[a]	12,000 gallons
Used Lubricating Oil[b]	937 gallons
Used Hydraulic Fluid[b]	744 gallons
Coldcleaner Spent Solvent[c]	180 gallons
Mixed Spent Solvents	24 gallons
Materials with Expired Shelf-life	24 gallons
Material Containers	600 pounds

[a] Includes all fuel losses
[b] Based on 1992 usage
[c] Includes metal shop Usage

Also collected in the bowser are spent lubricating oils and hydraulic fluids from the servicing of aircraft engines, gearboxes and hydraulic systems. The used oils are drained during maintenance activities and then transferred to the bowser. Virgin oils are generally received in quart cans. After the oil is dispensed, the empty quart cans are crushed and allowed to drain for 24 hours before being transferred to the municipal waste stream. The drained oil is transferred to the bowser. Engine and gearbox oil replacement is typically prescribed by the engine manufacturer based on hours of engine operation, and the Falcon Jet and Dauphin Helicopter are maintained this way. The approach followed with the Jayhawk Helicopter, however, is based on the condition of the oil, which is analyzed on a regularly scheduled basis. Each year an estimated 1,680 gallons of waste lubricating oil and hydraulic fluids are generated from servicing the aircraft. Over 6,700 quart containers must also be disposed of each year.

Waste organic solvents are generated from cleaning activities. Organic solvents have been used in parts washers for immersing and manually cleaning parts. The ATC has recently reduced the number of organic-solvent-based parts washers to a single unit located in the metal shop which can be used in aircraft maintenance activities. The parts washing unit is serviced by Safety-Kleen on a bi-weekly basis when the spent solvent is collected for recycling and fresh solvent added, approximately 30 gallons per month. To compensate for the lost cold cleaning capability, a water-based parts washing unit is being evaluated. The unit has the potential to reduce the volume of waste organic solvents from parts cleaning activities. In addition, a variety of organic solvents is used for wipe and spot cleaning, typically with rags. The waste organic solvents are collected and stored in 55 gallon drums for pickup by the waste management contractor.

Waste materials are also collected from containers with spent shelf-life. Containers are drained and liquids transferred to the appropriate waste stream. Containers are then crushed for disposal. In addition, rags and absorbents in cleaning activities and spill containment are collected in drums for off-site disposal by the waste management contractor.

Aircraft Survival Shop

The aircraft survival shop inspects and repairs all of the life support equipment maintained on the aircraft used in rescue activities. This includes parachutes, rafts, life preservers, lines, signal devices and inflation devices. All equipment is subject to regular inspections. Any defects identified are corrected and the equipment is then placed back in service. The materials used in the aircraft survival shop and their estimated consumption rates are shown in Table 4. The rubber adhesive used in raft repair has a six-month shelf-life which is monitored closely. Toluene is used to clean surfaces prior to application of the glue. Dispensed glue which is not used is allowed to set before disposal with municipal waste. Empty containers are disposed of with those from the other shops.

TABLE 4. AIRCRAFT SURVIVAL SHOP MATERIALS USAGE LIST

Description	Specification	Annual Usage by Unit Size
Adhesive, Rubber	8040-00-290-4301	40 quarts
Cleaner, CPC	8030-00-546-8637	64 pints
Floor Wax	7930-01-184-3905	12 gallons
Grease, General Purpose	9150-00-273-8663	48 pints
Grease	9150-00-754-2595	16 quarts
Insecticide	6840-01-067-6674	48 pints
Oil, 30W Motor	9150-00-231-6689	72 quarts
Solvent, Toluene	6810-00-281-2002	12 gallons

Paint, Composites, and Metal Shops

The ATC has two shops which serve to build, repair and coat aircraft components. The paint and composites shop manages the supply, distribution and application of paints for coating aircraft components. It also has the capability to construct and repair components made from composite materials which are used in aircraft construction, particularly the interior and exterior skins. The metal shop has the capability to fabricate and repair metal components of the aircraft. The metal shop also conducts non-destructive testing of aircraft wheels to identify potential for metal fatigue and wheel failure. Material consumption rates for these shops are shown in Table 5.

The paint and composite shop utilizes high-pressure compressed air spray paint guns for application of surface coats. Aerosol cans are also used for some paint application requirements. Painting can be conducted in a spray paint booth with a drying oven or in the hanger. The spray booth is ventilated through a water curtain to collect overspray. Aircraft components are painted in the spray booth, while small sections of the aircraft surface are painted in the hanger. Quart- and pint-sized spray guns are typically used. Painting in the booth is typically one or two hours per day. Painting in the hanger is limited to weekends when maintenance personnel are routinely off duty and the hanger is unoccupied. A paint mixing room is used to mix paints, setup application guns, store

TABLE 5. PAINT/COMPOSITE/METAL SHOPS MATERIALS USAGE LIST

Description	Specification	Annual Usage by Unit Size
Adhesive	1751 A/B	10 2-oz. kits
Adhesive	Epocast 169A	24 quarts
Adhesive	Cho Bond 360-20	4 2-oz. kits
Adhesive	8040-00-165-8614	12 quarts
Adhesive, Epoxy	RP 1257-3	12 quarts
Adhesive, Epoxy	Atacs 5103	12 2-oz. kits
Alodine	MIL-C-81706	2 16-oz. cans
Dye Penetrant	ZL-17	12 2-oz. kits
Fluid, Layout	Dykem	6 16-oz. cans
Edge Dressing	8030-00-936-9940	4 16-oz. cans
Grease	MIL-G-3545C	10 gallons
Grease	MIL-G-81322	2 quarts
Grease, Lubriplate	630AA	2 gallons
Lacquer, Gray (Deck)	Deck Paint	30 gallons
Machine Oil	Rando HD 32	12 quarts
Mold Release	Freekote 33	24 16-oz. cans
Paint, Aerosol	Various Colors	85 16-oz. cans
Paint, Poly (Various Colors)	MIL-C-83286	36 2-oz. kits
Paint Remover	8010-00-181-7568	4 gallons
Lubricant Solid Film, Perma Silk	MIL-G-23398D	2 quarts
Grease, Petrolatum	VV-P-236B	4 quarts
Plastic Face Coat	RP 1118	12 quarts
Primer, Epoxy	MIL-P-23377E	8 2-oz. kits
Resin	9309.3	12 quarts
Sealant	MIL-S-8802	2 2-oz. kits
Solvent, Acetone	O-A-51	100 gallons
Solvent, MEK Peroxide		4 gallons
Solvent, Methyl Ethyl Ketone		60 gallons
Solvent, Naptha, Aliphatic	TT-N-95	2 gallons
Walkway Compound	Non-skid	6 gallons

and dispense coating materials and clean application equipment. Preparation of surfaces for painting may require paint removal using chemical-based paint strippers or blasting media. Also located in the paint mixing room is a Safety-Kleen paint-gun cleaning unit which is serviced by Safety-Kleen once a month. The cleaning unit includes storage of used and virgin solvent and has the capability to spray either solvent during gun cleaning. Spent solvent is used to remove the majority of the paint, followed by virgin solvent, which is sparingly used to rinse the gun.

Centralized distribution of painting materials was initiated in 1991 using the paint locker in the paint mixing room. The locker also serves as the ATC's centralized point for dispensing bulk solvents such as MEK and acetone. This approach has resulted in a significant reduction in solvent use from three to five drums per month to one to two drums per year. Efforts are made to match the volume of paint formulated with the job at hand and to clean the paint guns immediately after application, facilitating cleaning.

The paint and composite shop also repairs aircraft components made from composite materials by constructing similar compositions. Composites are use for helicopter skins and interior components of the Falcon Jet. The composites are typically a structural material, such as a honeycomb matrix, wrapped with a synthetic fiber coated with resin skin. In the layout of composite repairs, the skin material used consists of a woven mat of synthetic fibers (*e.g.*, fiberglass or carbon) which is impregnated with a partially-cured resin formulation. The "pre-preg" material is kept from curing by storing it at reduced temperatures. Both the structural material and pre-preg materials are cut to size, set in place and allowed to cure at room temperature. The repair area is usually sealed and connected to a vacuum pump to volatilize and remove any unreacted resin. Molds are used for constructing entire components such as an aircraft interior headliner.

The metal shop operates metalworking equipment to repair and fabricate metal aircraft components. Parts under repair may require paint removal using chemical-based paint strippers, or cleaning using the organic solvent parts washer described in the aircraft maintenance shops. The metal shop also conducts non-destructive testing of aircraft wheels using dye penetrants. Dye penetrant, containing a fluorescent dye in a solvent with good penetrating properties, is applied to the metal surface of the wheel and allowed to soak into any potential cracks. After wiping residual penetrant from the surface, a fluorescent light is used to identify cracks.

Waste streams associated with the paint and composite shop include the masking material and rags from painting, paint slops from the watercurtain in the paint booth, spent solvent from the paint gun cleaner, contaminated paint thinning solvents, paint blasting media, and empty containers. The estimated volumes of these waste streams are identified in Table 6. The spent solvent from the operation of the Safety-Kleen paint gun cleaner is replaced twice a month and recycled offsite. A 55 gallon drum is kept in the paint mixing room for collecting the waste paint thinning solvents for removal by the waste management contractor. A separate container is used to collect paint rags and masking materials. Wastes from the metal shop include the spent solvent from the parts washer shared with the maintenance shops and contaminated rags.

TABLE 6. PAINT/COMPOSITES/METAL SHOPS WASTE STREAMS

Waste Stream	Estimated Annual Quantity
Rags and Masking Materials	600 pounds
Paint Shops	452 pounds
Paint Gun Cleaning Solvent	360 pounds
Spent Paint Thinning Solvents	36 gallons
Mixed Spent Solvents	24 gallons
Paint Blasting Media	1,042 pounds
Paint Containers	120 pounds

Battery Shop

The battery shop is located in the hangar with the other aircraft maintenance shops. This shop is responsible for discharging, recharging, and disposal of the following four types of aircraft batteries.

- Nickel-Cadmium (NiCd) dry battery cells
- NiCd wet battery cells
- Mercury batteries
- Lithium batteries

The battery shop uses a small supply of new NiCd, mercury, and lithium batteries for replacement of discharged batteries which are not rechargeable and are discarded. No lead or acid batteries are handled at the battery shop.

The waste generated from the battery shop includes discarded batteries and potassium hydroxide from wet NiCd battery maintenance. Table 7 lists the wastes generated annually from the battery shop.

TABLE 7. BATTERY SHOP WASTES

Waste	Quantity (lbs)	Cost ($)
Lithium Batteries	10	60.00
Mercury Batteries	9	27.00
NiCd Batteries	30	36.00
Potassium Hydroxide	240	280.00

In addition to the above aircraft batteries, there are waste auto batteries from support vehicles, the auto hobby shop, and satellite service areas on the base. The auto batteries are discarded when discharged and replaced with new batteries.

The automotive batteries are collected from the base as a separate waste stream. Auto batteries from the satellite services are exchanged for new batteries at a reduced cost depending on the battery life. The auto batteries from the other areas are consigned to the Defense Reutilization and Marketing Office (DRMO) for recycling. If DRMO locates a buyer/recycler, ATC will be compensated for the batteries. To date, no sales have occurred. It is estimated that about 20 batteries per year are wasted from these areas.

Avionics Shop

The avionics shop also supports the aircraft maintenance activities. Avionics equipment from the aircraft is cleaned and/or soldered in this shop. Table 8 lists the materials and quantities used.

The waste generated from the avionics shop is limited to empty cans, bottles, or containers with product residue.

TABLE 8. AVIONICS REPAIR SHOP MATERIALS USAGE LIST

Description	Specification	Annual Usage by Unit Size
Aerosol, Block Buster	Block Buster	24 16-oz. cans
Aerosol, Selig EMC 13	EMC 13	48 16-oz. cans
Aerosol, Selig Super CSC	Super CSC	16 16-oz. cans
Avionics Cleaner	MIL-C-81964A	96 16-oz. cans
Expo Cleaner	White Board Care	4 gals
General Purpose Cleaner	P.D. 1747	48 pints
Grease, Instrument	MIL-G-23827B	4 quarts
Isopropyl Alcohol	Isopropanol	4 gallons
Leak Tec	MIL-I-25567D	8 pints
RTV Sealant	MIL-A-461068	16 10-oz. tubes
Sealant	MIL-S-8660C	8 10-oz. tubes
Solder Flux	Laco Brite	4 gallons

AIRCRAFT FUELING

Aircraft fuel used at the ATC is JP-4, which is stored in three 34,000 gallon vaulted tanks at the fuel farm. JP-4 is received from tanker trucks and loaded into the fuel farm holding tanks. The aircraft refuelers are then filled at the JP-4 loading station. As a result, the fueling process has three potential spilling opportunities. About two million gallons per year of fuel are transferred into each aircraft. This totals to six million gallons of fuel per year handled in the fueling process. Fuel transfer is not equipped with spill containment. Spills normally occur at the fuel farm from overfilling/valve malfunction, primarily due to unsupervised or unattended fuel transfer activities or mechanical failures. Soil contamination at the fuel farm was observed during the site visit and possible groundwater contamination cannot be ruled out due to sandy soils in this area.

The fuel farm is equipped with a 2,500 gallon vaulted stripping tank for collecting the fuel/water mixture stripped from the holding tanks. Fuel from aircraft defueling is recycled back into the holding tank for reuse. The defueling is performed as an aircraft maintenance activity in order to drain fuel from lines clearing, fuel cell, and pump repair activity.

As part of the daily preflight inspection, fuel samples of one quart per fuel tank are taken for "Clear and Bright" analysis. Approximately two gallons of fuel samples per aircraft are taken.

The following waste streams are generated from the aircraft fueling operations:

(1) Discarded fuel samples from the aircraft, tanks, and trucks. These are dumped in the waste bowser located west of the hangar. The bowser is manually filled by transfer through a large funnel. Frequently, the funnel is left unattended, and was observed collecting rain, adding moisture to the bowser contents. The bowser also receives waste oils from aircraft maintenance activities. The bowser contents are emptied by a local contractor for recycling periodically or when full.

(2) Fuel/water mixture stripped from the holding tanks at the fuel farm is collected in the 2,500 gallon tank. The tank is emptied by a local contractor when full for recycling.

(3) JP-4 fuel spills occur at fueling transfer locations as described above, at defueling, at sampling, and at other places where the JP-4 is handled. Absorbent materials are used to clean spills and saturated waste is disposed of through DRMO Keesler.

It has been estimated that about 12,000 gallons of fuel/water mixture are generated from the first two waste streams. The base receives $0.03 per gallon for recyclable fuel and pays $0.50 per gallon for the water.

Approximately 2,767 pounds of saturated waste is generated per year, which is disposed of at a cost of $1.00 per pound.

AIRCRAFT WASHING

Aircraft must be washed after the last flight of the day as part of the corrosion prevention program. The aircraft washing is performed to clean the aircraft surface from any soil, grime, salt, etc. accumulated on the aircraft. There are two wash racks located east and west of the hangar. Different kinds of soaps are used to wash the aircraft. The soap, available in liquid form, is intended to be measured and mixed with the appropriate quantity of water. During the site visit, however, ATC personnel were observed preparing the soap and water mixture without measuring either component. The soap and water mixture is manually applied to the aircraft with brush scrubbers: the aircraft is then hose-sprayed with water to remove the soap. ATC uses about 3,300 gallons of aircraft soap per year. The following soaps are used in the aircraft cleaning:

Soap	Spec	Use
Aircraft Soap Type 1	MIL-C-85570 TY1	A/C Cleaner of General Use
Aircraft Soap Type 4	MIL-C-85570 TY4	Rubbing Compound
Aircraft Soap Type 5	MIL-C-85570 TY5	Spot Cleaner for H25/H60
Aircraft Soap Type 2	MIL-C-85570 TY2	A/C Soap for H65A

Aircraft cleaning produces a waste stream of rinsate which contains the soap and dirt, oil and grease which were cleaned from the aircraft surfaces. The wash rack located west of the hangar drains into an oil/water separator and then into the sanitary sewer. The State of Alabama does not require a State Industrial Permit for this discharge because of its relatively small volume and the characteristics of the soap water rinsate. The new wash rack located east of the hangar drained into a settling and skimming tank and into the stormwater sewer during the site visit. The discharge has now been directed to the sanitary sewer. Sludge is periodically removed from the settling tank and no appreciable skimmed material has been observed as a result of its operation. This discharge has received a permit from the State of Alabama which requires monthly testing for several parameters (BTEX, total suspended solids, oil/grease, pH, phosphates, and naphthalene) to demonstrate conformance with the permit conditions. Several chemical constituents have been identified in the MSDSs for the aircraft soaps which could also be present in the rinsate including naphtha, 2-butoxyethanol, hexylene glycol, dipropylene glycol monomethyl ether and morpholine. The presence and potential concentrations of these compounds in the rinsate have not been determined.

SECTION 3
OPPORTUNITY ASSESSMENT

During the site visit to the ATC, the Assessment Team observed evidence of a concerted effort to reduce wastes at the facility. Additional opportunities to further progress in waste reduction were also identified. This section will discuss the ongoing successes identified and the feasibility of the additional options considered for reducing wastes for each shop. Recommendations will also be made regarding implementation of these options.

Several ongoing practices at the ATC facility support a pollution prevention ethic and reduced waste generation. The policy for hazardous material procurement centralizes purchasing authority for hazardous materials. Only authorized materials for aircraft are purchased, with exceptions requiring approval of the Hazardous Material Control Officer. The ATC is working to reduce the inventory of on-site materials to a three to six month supply. These practices will limit the purchase of unnecessary hazardous materials, and reduce the loss rate due to expired shelf-life. The "Point Managers" in each shop serve to increase the awareness of the procurement policies and identify hazardous material use issues at the operating level. All personnel have been advised by memorandum of the importance of eliminating duplicate purchases of materials authorized for the same function and application. The development of the Authorized Chemical Use Lists in the Aviation Computerized Maintenance System will further limit the purchase and use of unauthorized materials.

At the ATC, increasing awareness of the concept of pollution prevention will be critical in making further improvements in waste reduction. At the ATC, high quality performance and efficient task completion may be viewed as incompatible with limiting the use of necessary materials. Improving the understanding of the benefits of waste reduction at the task level will reduce the potential for this conflict and lead to the incorporation of waste reducing practices as an integral part of each job. At the ATC, the operating personnel appear to be highly motivated and well trained in carrying out their duties. Their duties need to reflect the responsibility for reducing waste generation in their job function.

At the ATC, several alternatives were identified which could serve to facilitate communicating how a pollution prevention ethic can relate to specific job requirements.

- Management Policy - Written policy by the ATC management establishing the importance of pollution prevention in operation of the facility.
- Training Material - Tailored specifically to USCG aviation activities.
- Staff Briefings - Information exchange on the progress made at the ATC in waste reduction on a continuing basis.
- Recognition Programs - Encourage the identification of new ideas and, on a periodic basis, acknowledge significant achievements of individuals or units in waste reduction.
- Operating Procedures - Incorporate waste reduction practices with user-friendly language into task instructions such as the Aviation Computerized Maintenance System (ACMS) work cards and the Technical Information Maintenance Instructions (TIMIs).
- Measures of Progress - Develop measures to record and track progress in reducing the quantity and toxicity of waste streams and costs of waste management.

The ATC will need to gain the support and "buy-in" of the operating staff in the development and implementation of waste reduction activities. All material will need to be prepared in terminology which the appropriate staff can understand. Information provided on Material Safety Data Sheets (MSDSs), for example, cannot always be easily interpreted by the operating personnel.

Because of the diversity of waste streams, further progress in waste reduction at the ATC will require many small steps over time resulting from a concerted effort toward identifying, developing and implementing pollution prevention alternatives and tracking progress made. Specific options recommended for consideration in each process area are identified in Table 9 and discussed below. A summation of potential demonstration projects identified as a result of this PPOA is presented at the end of this section.

FLIGHT SIMULATORS

Flight Simulator Contract Incentives

The flight simulators are subject to maintenance at regular intervals. This effort is mainly directed at keeping the simulators available for training purposes as dictated by the Simtech contract. Therefore, very little attention is given to maintenance of the pipes or pumps where hydraulic fluid is leaked or spilled. This area could benefit from a waste minimization effort.

TABLE 9. SUMMARY OF RECOMMENDED POLLUTION PREVENTION OPTIONS

Waste Stream	Pollution Prevention Option
Flight Simulators	
Hydraulic Fluid	Contract incentives for waste minimization
	Recovery of liquid hydraulic fluid using pans and wringer for absorbents
	Investigate reuse of recovered hydraulic fluid
Aircraft Maintenance	
Maintenance Materials	Centralize control of material distribution
	Assess lifecycle benefits of alternative cleaning agents
	Replace solvent-vehicle aerosol dispensing cans with rechargeable compressed air or manual pump dispensers
Engine/Gearbox Oil	Investigate conditioned-based oil maintenance scheduling
Survival Raft Wipe Cleaner	Replace toluene with less toxic wipe cleaner
Paint Application and Cleaning Solvents	Increase use of high volume-low pressure (HVLP) paint spray guns
	Match size of HVLP gun with job coating requirements
	Replace aerosol can application with HVLP spray guns whenever possible
Used Batteries	Recycle/exchange program for lead-acid (automotive) batteries
	Negotiate battery reclamation agreements with suppliers of aircraft batteries

(continued)

TABLE 9. (continued)

Waste Stream	Pollution Prevention Option
<u>Aircraft Fueling</u>	
Fuel Spills	Use wringer on absorbents for spill containment and recovery
	Construct containment barriers in fuel farm transfer area
	Improve instructions and training for fuel transfer activities
	Eliminate rainwater entry into bowser for waste fuel storage
Recovered Fuel	Segregate waste fuel from waste oils, solvents, etc.
	Investigate reuse of recovered fuel
	Adhere to fuel sample size requirements
Fuel Samples	Investigate alternatives to "clear and bright" analysis
<u>Aircraft Washing</u>	
Rinsate	Investigate potential use of more "environmentally friendly" soaps
	Standardize soap mixing and cleaning procedures
	Assess effectiveness of oil water separator

ATC should consider modifying the Simtech contract to provide incentives for prevention of leaks and spills. The contract should also require implementation of a maintenance program directed specifically at eliminating or preventing hydraulic fluid leaks/spills.

Although this approach would require additional labor hours for the leak prevention/ maintenance program, time will be saved which would otherwise be used in spill response and waste management activities. Furthermore, there will be benefits realized in the form of less consumption of hydraulic fluid, much reduced waste disposal cost and reduce potential for environmental deterioration.

Flight Simulator Hydraulic Fluid Recovery

The simulator operations produce a significant waste stream from hydraulic fluid leakage and spill cleanup. Hydraulic fluid from leaky piping joints is collected in pans placed under the joints. Approximately 50-60 percent of the hydraulic fluid leaked/spilled is directly collected as liquid; absorbents are used for the remainder. Previously, the leaked fluid was captured by absorbents, which were then disposed of at cost as hazardous waste. With the recovery of liquid hydraulic fluid, ATC has been able to sell the spent material at $0.03 per gallon to an off-site fuel recycling contractor. Overall, this has reduced the cleanup absorbent waste load by about 50 to 60 percent, thereby halving absorbent purchase and disposal cost. This effort also produces some revenue from the sale of fluid. It is strongly recommended that this effort continue.

The absorbents are disposed of as hazardous waste. This hydraulic fluid can be recovered by using a wringer to recover the fluid from the absorbents. Figure 2 shows a typical wringer. ATC already uses a spill cleanup cart with a wringer for fuel spills. The same can be used for recovering the hydraulic fluid. An estimated 90 percent of the absorbed hydraulic fluid can be recovered through wringing out the used absorbents.

The use of a wringer will reduce simulator spill cleanup solid waste by approximately half, thereby reducing the corresponding waste disposal cost. The recovered waste hydraulic fluid volume will increase, resulting in additional revenue from sales of the waste hydraulic fluid at $0.03 per gallon. In addition, the absorbent material can be reused with an average 75 percent absorption capacity.

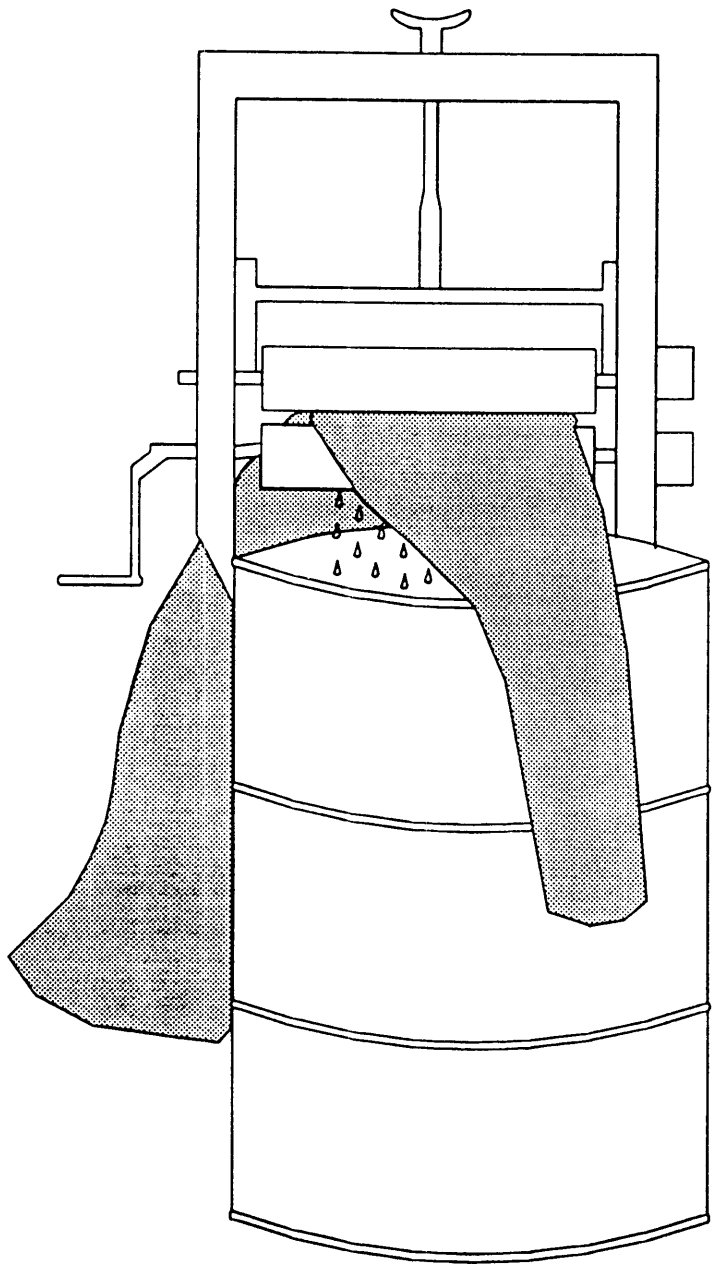


Figure 2. Typical absorbent wringer.

This will limit future absorbent material purchases and further reduce waste disposal costs. The labor hours required in the wringing process should be minimal and will likely be compensated by the savings realized in waste management labor hours. Overall, this option not only offers savings in purchase of raw materials and waste disposal costs, but also offers additional revenue from waste fluid sale and environmental benefits from less waste disposal.

As an extension of this option, the recovered hydraulic fluid should be investigated for possible on-site reuse potential, either for the original purpose or any other purposes such as fuel for an on-site boiler. The increased volume may justify steps to make reuse viable.

AIRCRAFT MAINTENANCE

Centralized Material Control

Each airframe shop and the engine shop have their own material lockers. The use of these lockers is monitored by the respective Point Manager. As indicated in Section 2, many of the materials used in each shop are the same or similar. This option would combine the four material lockers and establish a centralized control point for management of maintenance materials.

Table 2 identified the commonality between materials used and stored in each of the lockers. Most of these materials are in pint or quart cans or aerosol cans. Material usage rates vary significantly, from less than one to over 100 cans per year. By combining the material lockers with centralized control, several benefits will be realized. The similarities between maintenance activities and materials used point toward more effective use of resources if control of materials for maintenance activities is centralized. A centralized management responsibility can more effectively work with procurement to match purchasing rates with use rates. Policies can be more easily implemented which will result in elimination of duplicate materials and better inventory control, thereby reducing shelf-life losses. Material management responsibilities would include tracking material shelf-life extension dates based on re-inspection information sought from the appropriate supply organization. This option should result in reduction of material usage and loss rates at little or no cost in personnel resources. The increased efficiency in material management would more than offset any perceived expansion in responsibilities currently split between Point Managers.

Alternative Cleaning Solvents

Numerous cleaning materials are used in maintenance activities. Most of these products use organic solvents which either evaporate or are collected as hazardous wastes. This includes use of pure solvents, aerosol formulations and liquid cleaners. In an effort to reduce the cleaning solvent waste stream, the ATC has recently terminated the use of several organic solvent-based parts washing units. One unit remains in operation in the maintenance area and a new unit has been added which uses a water-based formulation.

In many industrial settings, alternatives to the use of organic solvents have been found resulting in reduced waste generation. Emphasis has been placed on replacing chlorinated-fluorocarbons (CFCs), chlorinated hydrocarbons, and volatile organic compounds in general. Alternative approaches range from process changes, to eliminating the need for cleaning altogether, to use of aqueous and semi-aqueous based approaches. A recent EPA report, Eliminating CFC-113 and Methyl Chloroform in Aircraft Maintenance Procedures (EPA-430-B-93-006) identified alternative cleaning approaches for the full range of aircraft cleaning requirements. Table 10 lists the alternatives identified for aircraft cleaning in the EPA report. Many of these alternatives would be directly applicable to the ATC cleaning needs.

MIL-SPECs have been established for cleaning materials which authorize the use of alternatives to organic solvents. For example, MIL-C-87936A applies to cleaning aircraft surfaces with water-dilutable compounds, authorizing alkaline based cleaners (Type I) and non-halogenated organic solvents-based cleaners (up to 45 percent organic solvent by volume, Type II). Cleaning of aerospace equipment including aircraft, engines, and ground vehicles is addressed by MIL-C-87937A which authorizes terpene-based cleaners (Type I) and alkaline-based cleaners (Type II).

The ATC has taken positive steps toward reducing waste generation from aircraft maintenance cleaning activities. Further progress will require careful consideration of the available options and the specific needs of each application, which is beyond the scope of this report. A detailed assessment of cleaning alternatives should be conducted. The assessment should characterize the specific cleaning applications and needs in aircraft maintenance at the ATC, the cleaning alternatives available (inventory analysis), and the life cycle implications of each alternative (impact analysis). Consideration should be given to the waste streams generated, the environmental media impacted

TABLE 10. SUMMARY CHART OF AIRCRAFT MAINTENANCE CLEANING APPLICATIONS AND FEASIBLE ALTERNATIVE CLEANING METHODS

Cleaning Application	Current Cleaning Method	Alternative Cleaning Method[1]
Aircraft Exterior	Aerosol Spray or Hand-Wipe	Aqueous Cleaning - Alkaline (Light Soil Removal) Semi-Aqueous Cleaning - Alkaline & Aliphatic Naphtha (Moderately Heavy Soil Removal) Semi-Aqueous Cleaning - Alkaline & Aliphatic Naphtha (Heavy Soil Removal) Semi-Aqueous Cleaning - Terpene
Landing Gear	In-Shop Overhaul: Vapor Degreasing or Aerosol Spray	Aqueous Cleaning - Alkaline Semi-Aqueous Cleaning - Mineral Spirits
	On-the-Aircraft Maintenance: Aerosol Spray	Aqueous Cleaning - Alkaline
Engine or Engine Modules	Vapor Degreasing	Aqueous Cleaning - Hot Tank
	Vapor Degreasing	Aqueous Cleaning - Alkaline, Hot Tank
	Vapor Degreasing or Hand-Wipe	Aqueous Cleaning - One Step Heavy-Duty Alkaline
	Vapor Degreasing or Hand-Wipe	Aqueous Cleaning - Alkaline
	Vapor Degreasing	Blasting - High Pressure Steam/Water
	Immersion	Aqueous Cleaning - Alkaline, Hot Tank
	Immersion	Aqueous Cleaning - Four Step Heavy-Duty Alkaline
Engine or Engine Modules: Assembled and Semi-Assembled Parts	Aerosol Spray or Hand-Wipe	Aqueous Cleaning - Alkaline
Flight Control Surfaces	Aerosol Spray or Hand-Wipe	Aqueous Cleaning - Alkaline Organic Solvent Cleaning - Acetone
Electrical Equipment	Aerosol Spray	Aqueous Cleaning - Alkaline, Ultrasonic Organic Solvent Cleaning - Isopropyl Alcohol
Hydraulic Lines	Hand-Wipe or Vapor Degreasing	Aqueous Cleaning - Water-Base Soap Solution
Aircraft Seat Covers and Curtains/ Draperies	Dry Cleaning	Wet Cleaning Technologies

(continued)

TABLE 10. (continued)

Cleaning Application	Current Cleaning Method	Alternative Cleaning Method[1]
Prior to Coating: Polyurethane Chromate Conversion Other	Hand-Wipe	Semi-Aqueous Cleaning - Alkaline and Aliphatic Naphtha
Prior to Adhesive Bonding	Spray or Hand-Wipe	Organic Solvent Cleaning - Isopropyl Alcohol
	Hand-Wipe	Semi-Aqueous Cleaning - Terpene
Fluorescent Penetrant Inspection	Aerosol Spray or Hand-Wipe	Organic Solvent Cleaning - Isopropyl Alcohol, or Acetone
Prior to Reassembly	Hand-Wipe or Immersion	Organic Solvent Cleaning - Isopropyl Alcohol or Acetone
Prior to Welding	Hand-Wipe or Immersion	Organic Solvent Cleaning - Isopropyl Alcohol or Acetone
Prior to Painting	Aerosol Spray or Hand-Wipe	Organic Solvent Cleaning - Acetone

Derived from EPA Publication: Eliminating CFC and Methyl Chloroform in Aircraft Maintenance Procedures (EPA-430-B-93-006).

[1]Organic solvents such as aliphatic naphtha, terpenes, acetone, and isopropyl alcohol may be regulated as volatile organic compounds (VOC).

(air, water and land or solid waste), the costs (purchase, operating, and waste management costs) and other concerns such as health and safety. Opportunities to reduce environmental releases, energy consumption, and material use should be evaluated (improvement analysis). The principles for conducting a life cycle analysis are described in EPA report Life-Cycle Assessment: Inventory Guidelines and Principles (EPA/600/R-92/245).

Alternative Aerosol Dispensing Systems

The ATC purchases several products in aerosol cans which are used in relatively large quantities. For example, over a thousand cans per year of spray cleaners are used in aircraft maintenance. Aerosol products typically contain 10 to 25 percent of the material to be applied and 75 to 90 percent propellant or dispersing agent.

Agents are typically organic compounds, gases or fast evaporating liquids. The application of an aerosol product results in the release of the agent to the atmosphere. Relative to non-aerosol material packaging, many more containers are needed to deliver the same volume of applied material. This option recommends considering alternative dispensing systems to the aerosol cans.

Although aerosol cans offer a unique, controllable delivery system, the same performance requirements can frequently be met using refillable aerosol dispensers which are charged with compressed air. Manual pump sprays can also meet the needs in certain applications. Both approaches allow for the purchase of the material to be applied in bulk form, eliminating the need for agents in the purchased material and significantly reducing the volume of containers which must be managed. Reduced use of aerosol cans will also result in reduced release of volatile organic compounds to the atmosphere, reduced occupational exposure to these compounds and reduced shelf-life losses. The ATC airframe maintenance shops are currently using compressed air charged dispensers, "Sure-Shots", to a limited degree. Increased emphasis should be placed on the use of these dispensers. Each function/application currently supplied by aerosol can dispensing systems should be evaluated to determine the potential for use of alternative dispensing systems. First preference should be given to non-aerosol dispensing techniques. Manual and/or compressed air charged dispensers should then be evaluated to determine the effectiveness of these delivery systems for the specific application.

Condition-Based Oil Replacement

Currently, preventative maintenance of the airframe engines in the Dauphin Helicopter and the Falcon Jet require replacing the engine oil every 150 hours of operation and gearbox oil every 450 hours of operation. For the Jayhawk Helicopter, however, replacement is based on the condition of the oil. This option would establish a similar practice of replacing the engine and gearbox oil in the Jayhawk Helicopter and Falcon Jet on the basis of oil condition.

The benefits of this option would be a function of the extended life of the oil. Savings would result from reduced maintenance personnel time associated with fewer oil changes and reduced purchases of fresh oil. A 10 percent increase in the life of the oil, for example, would reduce oil consumption by an estimated 200 to 300 gallons per year at the ATC. Costs to implement this approach would be associated with the periodic analyses required to track the oil condition. Currently, oil analyses are conducted on a regular basis for each aircraft to identify metal content as an indicator of engine wear. Additional analyses would likely be necessary to insure the desired properties of the oil are maintained. For example, MIL-SPEC requirements for new oil include analyses of viscosity, corrosion and oxidation stability, sediment, acidity and other parameters, in addition to metal content. The condition analyses would require testing a sufficient set of parameters to track any excessive changes in performance characteristics.

Contacts were made with personnel of the U.S. Air Force and Navy and two commercial airlines, USAIR and Northwest Airlines, to determine whether they had preventative maintenance procedures in place for oil changes based on oil condition. All of the operations contacted indicated oil changes were based on engine operating hours, and no procedures for tracking oil condition were found.

In order to investigate this option further, the current practices with the Jayhawk Helicopter should be examined. Information should be collected on the frequency and variability of oil replacement and the cost associated with the analyses to track the oil condition. The applicability of these specific analyses to the Falcon Jet and Dauphin Helicopter should then be assessed.

Aircraft Survival Shop

Alternative Wipe Cleaner--

The aircraft survival shop currently uses an estimated 12 gallons per year of toluene to clean rubber surfaces prior to the application of glues. This option recommends replacing toluene with an alternative wiping compound.

Toluene is a very effective aromatic solvent, but is potentially more toxic than other solvents which may be effective in this application. Acetone, for example, may provide the same cleaning potential on rubber as toluene, and has reduced exposure concerns. For example, the occupational exposure limit for toluene set by the American Conference of Industrial Hygienists (ACGIH) is 50 ppm for an 8-hour time weighted average (TWA); the 8-hour TWA exposure limit for acetone is 750 ppm. EPA's voluntary pollution prevention initiative, the 33/50 Program, has also targeted toluene for reductions in use.

The aircraft survival shop should conduct a study of the effectiveness of alternative solvents, such as acetone, in providing the degree of cleaning and surface preparation necessary for raft repair work. Isopropyl alcohol (400 ppm 8-hour TWA) and terpene-based cleaners have also been identified as effective in cleaning substrates prior to adhesive use (see Table 10). Any of these alternatives, if effective, would result in reduced use of toxic materials.

Paint/Composites and Metal Shops

Paint Application Alternatives--

The paint and composites shop currently uses a number of approaches to applying paints. Aerosol cans are used for a variety of coating activities for smaller surface areas. Conventional compressed air spray guns with different size reservoirs, such as pint and quart size, are used for coating applications within the on-site paint spray booth. High volume-low pressure (HVLP) paint spray guns are used for coatings applied to aircraft in the hangar. This option recommends greater use of HVLP spray guns and centralized control of paint application.

The aerospace industry is relying increasingly on HVLP application guns to increase transfer efficiencies and reduce solvent emissions to the atmosphere. The lower pressure results in less random paint particles and better control of the spray pattern. HVLP has been found to be effective in most aerospace applications. An EPA Section 114 Clean Air Act survey of HVLP users found increased transfer efficiency estimates from 25 to 80 percent. Increased transfer efficiencies result in savings in coating usage and solvent emissions. The use of HVLP in the hangar has been driven largely by the need to reduce paint drift. However, using this approach in all coating applications including those in the paint booth would reduce air emissions, volume of paint slops, and overall paint usage in proportion to the improved transfer efficiencies.

The use of HVLP guns is also recommended to replace a portion of the aerosol can paint usage. To affect this change, all paint application should be controlled by the paint and composite shop. The shop should determine which applications can reasonably be addressed with HVLP guns. Aerosol cans offer the convenience of immediate availability and portability. However, the paint and composite shop staff are able to prepare paint application volumes using appropriate sized paint gun reservoirs to match application sizes of aerosol cans. Coating needs that cannot be reached by compressed air units will continue to require the use of aerosol cans. Decreased aerosol can use will result in a decrease in shelf-life losses, particularly from partially used cans, and decreased container disposal. The increased use of HVLP in favor of aerosol cans will result in an increased frequency of use of the paint gun cleaning unit. In addition, the purchase of additional HVLP spray paint guns may be necessary to address any increase in frequency and size of application.

Battery Shop

Automotive Battery Exchange--

ATC discards approximately 20 auto batteries per year at an expense of $0.70 per pound through DRMO. Satellite Services exchanges old automotive batteries for new ones at a reduced cost. Therefore, Satellite Services not only saves in waste disposal cost, but also in rebates on new batteries for the exchange of old ones. ATC should start a similar battery exchange program independent of or in concert with Satellite Services. Consequently, ATC will also be able to save on battery disposal cost and receive rebates on the purchase of new batteries in exchange for the old ones.

Aircraft Battery Reclamation--

Aircraft batteries from the battery shop disposed of as waste are NiCd, Lithium and Mercury batteries. Many battery manufacturers offer reclamation programs, where they accept waste batteries from buyers. Some manufacturers may even pay a nominal fee for them. ATC has indicated that since it does not directly buy these batteries from manufacturers but works through suppliers, it can not directly negotiate with the manufacturers. In order for this option to be effective, ATC must work with its suppliers to establish a process that allows waste batteries to be shipped back to the manufacturers for reclamation.

Different manufacturers have their own requirements with respect to their reclamation programs. ATC, therefore, would have to tailor its battery collection, segregation and shipping accordingly. At present ATC spends approximately $403.00 per year on battery waste disposal. It is anticipated that the only expense incurred by ATC with respect to manufacturer battery reclamation would be shipping the waste batteries. This may be offset by nominal fees paid by the manufacturers. In addition, some manufacturers offer rebates on new battery purchases. The opportunity exists for the ATC through one mechanism or another to eliminate this waste stream from waste disposal and save in disposal costs. Since these batteries are already collected and disposed of separately, there should not be a significant labor hour increase by switching to manufacturer reclamation programs. Overall, there appears to be a potential for a net savings from adoption of this option. The most significant benefit, however, is in the prevention of waste battery disposal.

AIRCRAFT FUELING

Fuel Spill Recovery

ATC has acquired a Wringer to recover JP-4 fuel from the fuel spill cleanup absorbents. The wringer is on a 55 gallon drum in the spill cleanup cart and is brought to the spill site during cleanup operation. The fuel spill absorbents are squeezed by the wringer, and the fuel drops are collected in the 55 gallon drum on which the wringer is attached. The wringer absorbents are collected in an accompanying 55 gallon drum. The wringer can reclaim up to 90 percent of the fuel from the absorbents. The absorbents can be reused with about 75 percent of their original absorption capacity.

The absorbents are discarded when their absorption capacity falls below about 50 percent which usually occurs after about two to three times of use. The discarded absorbents are about 50 percent to 60 percent lighter than the unsqueezed absorbents, depending on how often they have been reused. The cost of disposing of the spill cleanup waste is thus reduced by at least half. The fuel recovered from spill cleanup is dumped into the waste bowser and sold at $0.03 per gallon minus $0.50 per gallon of water that is mixed with the fuel. Overall, this procedure has allowed ATC to reduce the waste management cost of the fuel spill cleanup.

It is not clear, however, that this practice is currently used at all of the fuel spills at ATC. It is recommended that this practice continue and be formalized as a required spill response technique.

Eliminate Rainwater Entry to Bowser

The waste bowser receives waste oil and fuel from maintenance activities. During waste transfer to the bowser, the inlet and funnel remain unattended for a considerable period of time. During rainfall, rain can enter the bowser under these conditions, increasing the water content of the bowser waste. The bowser waste is sold at $0.03 per gallon minus $0.50 per gallon of water mixed with the waste. Therefore, the value of the waste oil can be increased if the water content of the bowser can be eliminated/reduced.

This option recommends that the bowser opening be covered when waste transfer activity is not being performed, especially during rainfall. This can be accomplished by merely placing a cover over the funnel and inlet opening. Alternatively, a funnel with a hinged cover at the top could be used to allow closure when not in use. Waste transfer personnel should also be required to keep the bowser closed when not in use. Adopting these measures should eliminate rainwater entry into the bowser.

The ATC should develop written instructions for the waste transfer operations. These instructions should include procedures for limiting water contamination of the bowser. All waste transfer personnel should be trained and familiarized with the procedures before being authorized to handle waste transfer. Increased supervision and reporting requirements should also be included in the instructions to ensure adherence to the required procedures.

Bowser Waste Segregation

The Bowser receives waste JP-4 fuel, waste oils, and other petroleum-based products. By combining these wastes, recovery alternatives are limited. The wastes can not be recovered for usage on-site for original or even lower-quality purposes. Therefore, in order to consider such possibilities, the waste streams must be segregated. This option recommends that two bowsers be used, one for fuel, one for other petroleum-based wastes. This will limit degradation of the quality of one stream by the other. This option can be further extended to segregate the different types of oils such as hydraulic fluid, engine oil, turbine oil, etc. Separately collected waste steams can be potentially reused for original purposes after cleaning or for lower-quality purposes. For example, segregated JP-4 could be refiltered at the tank farm for reuse in aircraft or mixed with diesel fuel for use by ground support vehicles. Similarly, waste oils can continue to be sold for off-site recycling. Further guidance on reuse of fuels and oil is found in Technical Manual T.O. 428-1-23, Management of Recoverable and Waste Liquid Petroleum Products, issued by the Air Force.

With this option, as a minimum, it is expected the waste fuel can be used on-site in diesel fuel resulting in savings in the form of less diesel consumption. A unit saving rate higher than the $0.03/ gallon received from selling waste fuel for off-site recycling would be realized.

Fuel Transfer Spill Prevention

The Assessment Team was informed that most spills from fuel transfer activities occurred due to unsupervised or unattended fuel transfer, especially at the fuel farm. Additionally, failure of shut-off valves resulted in overfill spills. This option, therefore, recommends that overfill protection systems in all fuel transfer facilities and equipment be installed correctly, examined carefully, and tested periodically to ensure reliability.

At the ATC, most transfer facilities and equipment are equipped with mechanical automatic valves. As stated above, malfunctions of these valves have contributed to overfill spills. To avoid this, regular testing and maintenance of these valves is necessary. As an alternative, electronic automatic valve systems with self-checking routines are available; these should reduce the risk of an overfill caused by a malfunctioning mechanical valve. The effect of vibration and erosion from humid or marine environments on contact switches should also be considered. Regular testing and maintenance of overfill protection systems should reduce the risk of such problems.

In summary, the following procedures are recommended to avoid or minimize fuel spills during fuel transfer activities:

1. Follow National Fire Protection Association (NFPA) and American Petroleum Institute (API) recommendations when selecting, installing, and testing overfill protection systems.

2. Have written operating instructions available for specific locations describing orderly, simple shutdown and emergency procedures.

3. Each fuel transfer activity should be planned, monitored, and completed in accordance with the written instructions.

4. All fuel transfer activities must be performed by an adequate number of operators, and at no time should the fuel transfer be performed unattended or unsupervised.

5. All personnel involved should be adequately trained and be familiar with all aspects of fuel transfer activities and emergency procedures before assignment to fuel transfer activities.

6. A testing, inspection, and maintenance program should be incorporated for fuel transfer facilities and equipment, including overfill protection systems. This program should include an account of manufacturer recommendations. Industry organizations, government regulations, and ATC policies may necessitate additional tests and maintenance procedures. This program should include written instructions, a regular schedule, and recording procedures.

In adopting this option, fuel spills occurring during transfer activities should be minimized, resulting in a reduction in spill cleanup and disposal cost and in fuel consumption/purchase. It is anticipated that a slight increase in labor hours will be necessary for the rigorous implementation of the maintenance program; this increase will be more than balanced by the savings in labor hours used in spill cleanup operations. An additional benefit derived from this will be the prevention of soil and groundwater contamination from fuel spills, especially at the fuel farm.

Spill Containment

The fuel farm has no containment available during the fuel transfer operations. From past spills, soils in this area appear stained, and depending on the spill size and frequency, possible groundwater contamination cannot be ruled out. Therefore, containing and cleaning fuel spills at the fuel farm is of paramount importance. Also, temporary containment measures are needed at spills on paved areas to avoid the spread of contamination and enable maximum cleanup.

This option recommends that fuel transfer stations at the fuel farm be encompassed by permanent containment. This will allow containment of any spills within these structures for cleanup or recovery, and contamination of soils or groundwater will be prevented.

Apart from the fuel farm, where a permanent containment structure is recommended, this option recommends temporary containments be utilized at all fuel transfer activities on paved areas. Before performing the actual transfer, spaghetti absorbents should be placed around the transfer area and absorbent pads placed under the transfer equipment.

Once the spilled fuel is contained, it should be recovered by using the wringer/squeezer, which is available at the ATC on the spill cleanup cart. Recovered fuel should be reused or recycled as described under the Bowser Waste Segregation option. Similarly, the absorbent material should be reused as described under the Simulator Hydraulic Fluid Recovery option.

This option does not incur any additional cost except the permanent containment structure at the fuel farm. ATC already uses a wringer to recover spilled fuel; therefore, there should be no measurable increase in the labor hours. Savings will be realized due to fuel recovery and absorbent reuse. An additional benefit from this option will be increased prevention of soil and water contamination and potentially reduced environmental cleanup cost.

In implementing this option, the ATC should prepare written instructions for performing spill containment and cleanup/recovery operations. All concerned personnel should be trained and familiarized with the relevant procedures for continuous success of this option.

Reduce Fuel Sample Size

The sample size for fuel analysis is specified in the TIMI (T-203-92 September 3, 1993) for Aircraft Fuel Surveillance. In actual practice, however, this is not being followed. The sample size in practice is typically larger than necessary.

This option explored ways to reduce the size of the fuel samples. Alternative methods were considered as described in the next option for fuel surveillance, but no proven technique was identified. Therefore, the only way to minimize waste from fuel samples is to strictly adhere to the required sample size and prevent taking larger than required samples. The above mentioned TIMI requires the taking of approximately one pint of fuel sample. Adherence to this requirement should be implemented through training, supervision, recordkeeping, and worker performance evaluations. It is estimated that present samples are approximately two to three times the required sample size. Therefore, the quantity of fuel sample waste could be reduced by between one third and two thirds by strict adherence to the required sample size.

No extra labor hours should be required to implement this option, while waste handling labor hours may be reduced due to less waste generated. Also, lower waste disposal costs and fuel savings should occur.

Alternative to "Clear and Bright" Analysis

The current "clear and bright" analysis is used to visually observe fuels for water and sediment. Alternative techniques for fuel surveillance were considered to replace the "Clear and Bright" analysis, allowing for a minimum sample of fuel to be taken. There are indicators of new and alternative techniques, such as lasers, to be used for fuel surveillance that might require smaller samples. No proven alternative techniques, however, could be identified. The Defense Fuel Supply Center, which manages Air Force fuel supply, requires visual testing of fuels as a part of fuel surveillance. It appears that "Clear and Bright" analysis is an industry norm and should continue to be used until new and improved techniques are identified.

AIRCRAFT WASHING

Environmentally Friendly A/C Washing Soaps

ATC uses Aircraft Soap Types 1, 2, 4, and 5. Rinsate from aircraft washing is discharged to the publicly owned (wastewater) treatment works (POTW) through the sanitary sewer from the new wash rack and at the stormwater sewer from the old wash rack. According to the ATC, the POTW is satisfied with the discharge and requires no permits. Similarly, the ATC has determined that discharge to stormwater sewer is also not environmentally threatening based on the test results. This information indicates no apparent need to consider replacing the current soaps with any alternative "environmentally friendly" soaps.

The Material Safety Data Sheets (MSDSs) of the soaps being used indicate that the following compounds are present:

Type 1	Dipropylene Glycol Methyl Ether, Hexylene Glycol, Morpholine
Type 2	Dipropylene Glycol Methyl Ether
Type 4	Mineral Spirits, 2-Butoxyethanol, Hexylene Glycol
Type 5	Naphtha, 2-Butoxyethanol, Hexylene Glycol

The measurement of these constituents in the discharge from aircraft washing is beyond the requirements of the permit for the new wash rack. In the future, additional chemicals such as these found in aircraft soaps may be of concern in wastewater discharges. Consideration should be given to conducting a limited sampling program to determine the concentration of soap constituents in discharged washwater. Target chemicals could be measured and their use quantities tracked to allow for development of a predictor for all soap species. It is likely that future concerns may develop by the POTW, local or state environmental agencies for the rinsate discharge to the sanitary or stormwater sewer.

The U.S. Air Force was contacted to identify soaps they were using for aircraft washing. Information received is summarized as follows:

Soap	Hazardous Ingredients
Megapower 1000-66	Petroleum Aromatic Distillate, Diethyl Glycol Monobutyl Ether
AVIAWASH 4000	None
AVIAWASH 5000	Sodium Metasilicate Pentahydrate, Quateranary Ammonium Sulphate
Turboclean	None

AVIAWASH Green Gel	Sodium Metasilicate Pentahydrate

Megapower Cleaner meets the requirements of MIL-C85570A Type I (QPL). No information could be obtained on the specifications of the other soaps. These soaps are also not devoid of the ingredients which may raise concern with the exception of AVIAWASH 4000 and TURBOCLEAN. The ATC personnel should investigate whether these soaps would be effective in meeting their needs and consider replacing the existing soaps to reduce discharges of potentially toxic materials.

Aircraft Washing Specifications

During the aircraft washing observations and conversations with the ATC personnel, it was determined that the soap is mixed with water without employing required measurements. In addition, the cleaning crew sometimes uses unauthorized soaps which are brought from outside of the base, especially when the crew is unsatisfied with the results of the specified soaps. Due to these practices, the constituents and their concentrations in the rinsate may not be as insignificant as in previous waste streams.

This option recommends that aircraft cleanup operations be standardized with clearly written specifications regarding the type and quantity of soaps to be used, measurement and mixing procedures, soap application procedures, rinsing procedures, absorbent use procedure, etc. It is understood that such standard specifications exist but are often ignored. In order to overcome this, increased supervision, training, environmental awareness and task reporting should be considered. Failure to follow proper procedures and use authorized materials may result in water quality problems in the future and the required change to a closed system for aircraft washing.

Optimize Oil/Water Separation System

ATC personnel indicated the oil/water separator associated with the west wash rack was not meeting performance expectations. The separator was believed to be either inadequately designed or improperly installed. The ATC should initiate an effort to evaluate the performance of the unit and determine whether any oil and grease is currently being discharged and what alternatives are available to mitigate this problem and gain satisfactory performance.

POTENTIAL DEMONSTRATION PROJECTS

Several projects were identified as a result of this PPOA which, if successful, would improve the understanding of pollution prevention alternatives with broader applicability than the ATC. The most significant projects are:

1. Lifecycle Analysis of Aircraft Cleaning. Conduct an indepth assessment of the cleaning needs and alternatives available from a lifecycle perspective in order to identify the preferred approach for each cleaning need in aircraft maintenance and repair. Consideration should be given to chemical species, application technology, unit size, etc.

2. Conditioned-Based Oil Replacement. Assess the costs and benefits of tracking oil condition, rather than flight or operating hours, as the criteria for changing engine and gearbox oil.

3. Fuel Sampling and Analysis. Investigate alternative approaches to demonstrating on a continuous basis that onboard fuel supplies meet the expectations of the current "clear and bright" criteria for aircraft operation. The alternatives available for allowing fuel samples to be returned for reuse should also be identified.

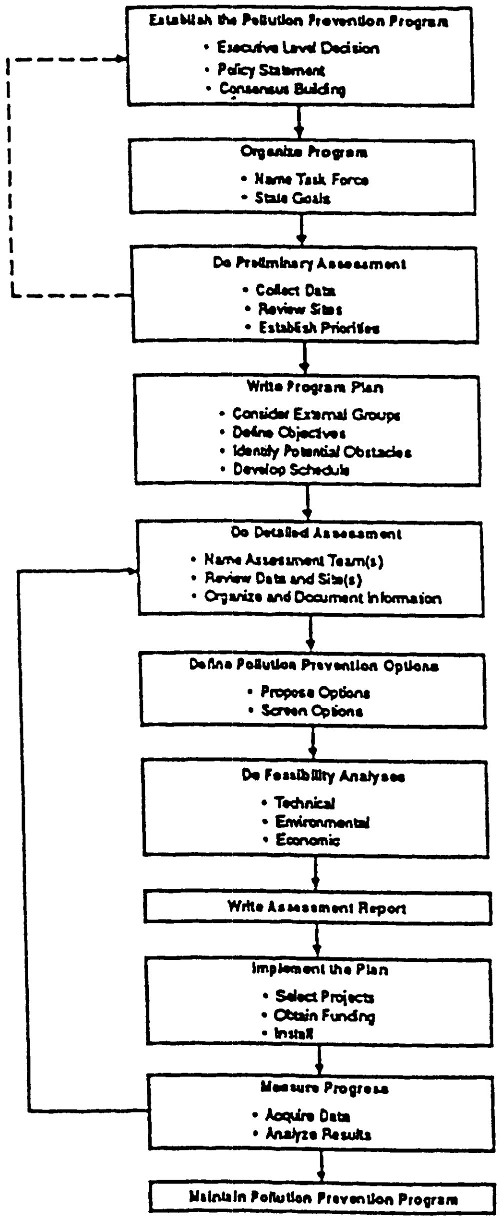
The Assessment Team believes additional work in each of these areas could identify pollution prevention alternatives which could be directly applied at other facilities with flight missions.

APPENDIX A
PPOA WORKSHEETS

Firm USCG ATC	Pollution Prevention Assessment Worksheets	Prepared By Burch
Site Mobile, Alabama	TRC-001	Checked By Memon
Date November 3-5, 1993	Proj. No. PES T003.001	Sheet 1 of 1 Page ___ of ___

WORKSHEET
1

ASSESSMENT OVERVIEW



Firm USCG ATC Site Mobile, Alabama Date November 3-5, 1993	**Pollution Prevention Assessment Worksheets** TRC-001 Proj. No. PES T003.001	Prepared By Burch Checked By Memon Sheet 1 of 1 Page ___ of ___

WORKSHEET
2

SITE DESCRIPTION

Firm: U.S. Coast Guard

Plant: Aviation Training Center

Department:

Area:

Street Address: Bates Field

City: Mobile

State/Zip Code: Alabama 36608

Telephone: (205) 639-6451

Major Products: Basic operational training units for fixed and rotary wing aircraft and a fixed wing search and rescue unit

SIC Codes:

EPA Generator Number: AL3690307910

Major Unit:

Product or Service:

Operations: Flight and search and rescue training including use of flight simulators

Aircraft maintenance and repair including structural mechanical and electronic components

Facilities/Equipment Age: Facility commissioned in 1966; formerly Air Force Reserve Facility adjacent to Mobile Municipal Airport

Firm USCG ATC	**Pollution Prevention Assessment Worksheets**	Prepared By Memon
Site Mobile, Alabama	TRC-001	Checked By Burch
Date November 3-5, 1993	Proj. No. PES T003.001	Sheet 1 of 8 Page ___ of ___

WORKSHEET
3

PROCESS INFORMATION

Process Unit/Operation: FLIGHT SIMULATOR COMPLEX

Operation Type:
- ☐ Continuous
- ☐ Discrete
- ☐ Batch or Semi-Batch
- ☐ Other ________

Document	Status					
	Complete? (Y/N)	Current? (Y/N)	Last Revision	Used in this Report (Y/N)	Document Number	Location
Process Flow Diagram	NA					
Material/Energy Balance						
Design	NA					
Operating	Y	Y		Y		
Flow/Amount Measurements	N					
Stream						
Analyses/Assays	NA					
Stream						
Process Description	Y	Y	Y			
Operating Manuals	N					
Equipment List	N					
Equipment Specifications	N					
Piping and Instrument Diagrams	N					
Plot and Elevation Plan(s)	N					
Work Flow Diagrams	N					
Hazardous Waste Manifests	N					
Emission Inventories	N					
Annual/Biennial Reports	N					
Environmental Audit Reports	Y	Y	Y			
Permit/Permit Applications	N					
Batch Sheet(s)	N					
Materials Application Diagrams	N					
Product Composition Sheets	N					
Material Safety Data Sheets	Y	Y	Y			
Inventory Records	Y	Y	Y			
Operator Logs	N					
Production Schedules	N					

Firm USCG ATC Site Mobile, Alabama Date November 3-5, 1993	**Pollution Prevention Assessment Worksheets** TRC-001 Proj. No. PES T003.001	Prepared By Burch Checked By Memon Sheet 2 of 8 Page ___ of ___

WORKSHEET
3

PROCESS INFORMATION

Process Unit/Operation: AIR CRAFT MAINTENANCE SHOPS

Operation Type:
- ☐ Continuous
- ☐ Discrete
- ☐ Batch or Semi-Batch
- ☐ Other ______

Document	Status: Complete? (Y/N)	Current? (Y/N)	Last Revision	Used in this Report (Y/N)	Document Number	Location
Process Flow Diagram	NA					
Material/Energy Balance						
Design	NA					
Operating	Y	Y		Y		
Flow/Amount Measurements	N					
Stream						
Analyses/Assays	NA					
Stream						
Process Description	Y	Y	Y			
Operating Manuals	N					
Equipment List	N					
Equipment Specifications	N					
Piping and Instrument Diagrams	N					
Plot and Elevation Plan(s)	N					
Work Flow Diagrams	N					
Hazardous Waste Manifests	N					
Emission Inventories	N					
Annual/Biennial Reports	N					
Environmental Audit Reports	Y	Y	Y			
Permit/Permit Applications	N					
Batch Sheet(s)	N					
Materials Application Diagrams	N					
Product Composition Sheets	N					
Material Safety Data Sheets	Y	Y	Y			
Inventory Records	Y	Y	Y			
Operator Logs	N					
Production Schedules	N					

Firm USCG ATC Site Mobile, Alabama Date November 3-5, 1993	Pollution Prevention Assessment Worksheets TRC-001 Proj. No. PES T003.001	Prepared By Memon Checked By Burch Sheet 3 of 8 Page ___ of ___

WORKSHEET 3

PROCESS INFORMATION

Process Unit/Operation: AIRCRAFT FUELING

Operation Type: ☐ Continuous ☐ Discrete ☐ Batch or Semi-Batch ☐ Other ______

Document	Status					
	Complete? (Y/N)	Current? (Y/N)	Last Revision	Used in this Report (Y/N)	Document Number	Location
Process Flow Diagram	NA					
Material/Energy Balance						
Design	NA					
Operating	Y	Y		Y		
Flow/Amount Measurements	N					
Stream						
Analyses/Assays	NA					
Stream						
Process Description	Y	Y	Y			
Operating Manuals	N					
Equipment List	N					
Equipment Specifications	N					
Piping and Instrument Diagrams	N					
Plot and Elevation Plan(s)	N					
Work Flow Diagrams	N					
Hazardous Waste Manifests	N					
Emission Inventories	N					
Annual/Biennial Reports	N					
Environmental Audit Reports	Y	Y	Y			
Permit/Permit Applications	N					
Batch Sheet(s)	N					
Materials Application Diagrams	N					
Product Composition Sheets	N					
Material Safety Data Sheets	Y	Y	Y			
Inventory Records	Y	Y	Y			
Operator Logs	N					
Production Schedules	N					

Firm USCG ATC Site Mobile, Alabama Date November 3-5, 1993	**Pollution Prevention Assessment Worksheets** TRC-001 Proj. No. PES T003.001	Prepared By Burch Checked By Memon Sheet 4 of 8 Page ___ of ___

WORKSHEET
3

PROCESS INFORMATION

Process Unit/Operation: AIRCRAFT SURVIVAL SHOP

Operation Type: ☐ Continuous ☐ Discrete ☐ Batch or Semi-Batch ☐ Other ______

Document	Status					
	Complete? (Y/N)	Current? (Y/N)	Last Revision	Used in this Report (Y/N)	Document Number	Location
Process Flow Diagram	NA					
Material/Energy Balance						
Design	NA					
Operating	Y	Y		Y		
Flow/Amount Measurements	N					
Stream						
Analyses/Assays	NA					
Stream						
Process Description	Y	Y	Y			
Operating Manuals	N					
Equipment List	N					
Equipment Specifications	N					
Piping and Instrument Diagrams	N					
Plot and Elevation Plan(s)	N					
Work Flow Diagrams	N					
Hazardous Waste Manifests	N					
Emission Inventories	N					
Annual/Biennial Reports	N					
Environmental Audit Reports	Y	Y	Y			
Permit/Permit Applications	N					
Batch Sheet(s)	N					
Materials Application Diagrams	N					
Product Composition Sheets	N					
Material Safety Data Sheets	Y	Y	Y			
Inventory Records	Y	Y	Y			
Operator Logs	N					
Production Schedules	N					

Firm USCG ATC Site Mobile, Alabama Date November 3-5, 1993	**Pollution Prevention Assessment Worksheets** TRC-001 Proj. No. PES T003.001	Prepared By Burch Checked By Memon Sheet 5 of 8 Page ___ of ___

WORKSHEET
3

PROCESS INFORMATION

Process Unit/Operation: PAINT, COMPOSITES AND METAL SHOPS

Operation Type:
☐ Continuous ☐ Discrete
☐ Batch or Semi-Batch ☐ Other ________

Document	Status					
	Complete? (Y/N)	Current? (Y/N)	Last Revision	Used in this Report (Y/N)	Document Number	Location
Process Flow Diagram	NA					
Material/Energy Balance						
Design	NA					
Operating	Y	Y		Y		
Flow/Amount Measurements	N					
Stream						
Analyses/Assays	NA					
Stream						
Process Description	Y	Y	Y			
Operating Manuals	N					
Equipment List	N					
Equipment Specifications	N					
Piping and Instrument Diagrams	N					
Plot and Elevation Plan(s)	N					
Work Flow Diagrams	N					
Hazardous Waste Manifests	N					
Emission Inventories	N					
Annual/Biennial Reports	N					
Environmental Audit Reports	Y	Y	Y			
Permit/Permit Applications	N					
Batch Sheet(s)	N					
Materials Application Diagrams	N					
Product Composition Sheets	N					
Material Safety Data Sheets	Y	Y	Y			
Inventory Records	Y	Y	Y			
Operator Logs	N					
Production Schedules	N					

Firm USCG ATC Site Mobile, Alabama Date November 3-5, 1993	**Pollution Prevention Assessment Worksheets** TRC-001 Proj. No. PES T003.001	Prepared By Memon Checked By Burch Sheet 6 of 8 Page ___ of ___

WORKSHEET
3

PROCESS INFORMATION

Process Unit/Operation: AIRCRAFT WASHING

Operation Type:
- ☐ Continuous
- ☐ Discrete
- ☐ Batch or Semi-Batch
- ☐ Other ____________

Document	Status					
	Complete? (Y/N)	Current? (Y/N)	Last Revision	Used in this Report (Y/N)	Document Number	Location
Process Flow Diagram	NA					
Material/Energy Balance						
Design	NA					
Operating	Y	Y		Y		
Flow/Amount Measurements	N					
Stream						
Analyses/Assays	NA					
Stream						
Process Description	Y	Y	Y			
Operating Manuals	N					
Equipment List	N					
Equipment Specifications	N					
Piping and Instrument Diagrams	N					
Plot and Elevation Plan(s)	N					
Work Flow Diagrams	N					
Hazardous Waste Manifests	N					
Emission Inventories	N					
Annual/Biennial Reports	N					
Environmental Audit Reports	Y	Y	Y			
Permit/Permit Applications	N					
Batch Sheet(s)	N					
Materials Application Diagrams	N					
Product Composition Sheets	N					
Material Safety Data Sheets	Y	Y	Y			
Inventory Records	Y	Y	Y			
Operator Logs	N					
Production Schedules	N					

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WORKSHEET
3

PROCESS INFORMATION

Process Unit/Operation: BATTERY SHOP

Operation Type: ☐ Continuous ☐ Discrete ☐ Batch or Semi-Batch ☐ Other ________

Document	Status: Complete? (Y/N)	Current? (Y/N)	Last Revision	Used in this Report (Y/N)	Document Number	Location
Process Flow Diagram	NA					
Material/Energy Balance						
Design	NA					
Operating	Y	Y		Y		
Flow/Amount Measurements	N					
Stream						
Analyses/Assays	NA					
Stream						
Process Description	Y	Y	Y			
Operating Manuals	N					
Equipment List	N					
Equipment Specifications	N					
Piping and Instrument Diagrams	N					
Plot and Elevation Plan(s)	N					
Work Flow Diagrams	N					
Hazardous Waste Manifests	N					
Emission Inventories	N					
Annual/Biennial Reports	N					
Environmental Audit Reports	Y	Y	Y			
Permit/Permit Applications	N					
Batch Sheet(s)	N					
Materials Application Diagrams	N					
Product Composition Sheets	N					
Material Safety Data Sheets	Y	Y	Y			
Inventory Records	Y	Y	Y			
Operator Logs	N					
Production Schedules	N					

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WORKSHEET
3

PROCESS INFORMATION

Process Unit/Operation: AVIONICS SHOP

Operation Type: ☐ Continuous ☐ Batch or Semi-Batch ☐ Discrete ☐ Other ______

Document	Status					
	Complete? (Y/N)	Current? (Y/N)	Last Revision	Used in this Report (Y/N)	Document Number	Location
Process Flow Diagram	NA					
Material/Energy Balance						
Design	NA					
Operating	Y	Y		Y		
Flow/Amount Measurements	N					
Stream						
Analyses/Assays	NA					
Stream						
Process Description	Y	Y	Y			
Operating Manuals	N					
Equipment List	N					
Equipment Specifications	N					
Piping and Instrument Diagrams	N					
Plot and Elevation Plan(s)	N					
Work Flow Diagrams	N					
Hazardous Waste Manifests	N					
Emission Inventories	N					
Annual/Biennial Reports	N					
Environmental Audit Reports	Y	Y	Y			
Permit/Permit Applications	N					
Batch Sheet(s)	N					
Materials Application Diagrams	N					
Product Composition Sheets	N					
Material Safety Data Sheets	Y	Y	Y			
Inventory Records	Y	Y	Y			
Operator Logs	N					
Production Schedules	N					

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WORKSHEET **4**

INPUT MATERIALS SUMMARY

SEE SECTION 2 OF WMOA

Attribute	Description		
	Stream No. ____	Stream No. ____	Stream No. ____
Name/ID			
Source/Supplier			
Component/Attribute of Concern			
Annual Consumption Rate			
Overall			
Component(s) of Concern			
Purchase Price, $ per ________			
Overall Annual Cost			
Delivery Mode[1]			
Shipping Container Size & Type[2]			
Storage Mode[3]			
Transfer Mode[4]			
Empty Container Disposal Management[5]			
Shelf Life			
Supplier Would			
— accept expired material? (Y/N)			
— accept shipping containers? (Y/N)			
— revise expiration date? (Y/N)			
Acceptable Substitute(s), if any			
Alternate Supplier(s)			

Notes:
1. e.g., pipeline, tank car, 100 bbl tank truck, truck, etc.
2. e.g., 55 gal drum 100 lb paper bag, tank, etc.
3. e.g., outdoor, warehouse, underground, aboveground, etc.
4. e.g., pump, forklift, pneumatic transport, conveyor, etc.
5. e.g., crush and landfill, clean and recycle, return to supplier, etc.

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WORKSHEET **5**

PRODUCTS SUMMARY

NO PRODUCTS FROM OPERATION

Attribute	Description		
	Stream No. ____	Stream No. ____	Stream No. ____
Name/ID			
Component/Attribute of Concern			
Annual Production Rate			
Overall			
Component(s) of Concern			
Annual Revenues, $ ______			
Shipping Mode			
Shipping Container Size & Type			
Onsite Storage Mode			
Containers Returnable (Y/N)			
Shelf Life			
Rework Possible (Y/N)			
Customer Would			
— relax specification (Y/N)			
— accept larger containers (Y/N)			

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WORKSHEET
6

WASTE STREAM SUMMARY

AIRCRAFT SIMULATORS

Attribute	Description		
	Stream No. ___	Stream No. ___	Stream No. ___
Waste ID/Name:	Hyd. Fl. Liq	Cleanup Waste	
Source/Origin	Leak/Spill	Spills	
Component or Property of Concern	Simulator	Simulator	
Annual Generation Rate (units ______)	110 gal	395 lbs	
Overall			
Component(s) of Concern			
Cost of Disposal			
Unit Cost ($ per: ______)	-0.03/gal	0.46/lb	
Overall (per year)		$180	
$0.50/gal for water			
Method of Management[1]	Off-site	Off-site	
	recycle	recovery	

Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET
6

WASTE STREAM SUMMARY

AIRCRAFT MAINTENANCE

Attribute		Description					
		Stream No. ___		Stream No. ___		Stream No. ___	
Waste ID/Name:		Mixed solvents		Shelf life		Containers	
Source/Origin		Cleaning		Misc		Misc	
Component or Property of Concern		Haz Waste		Haz Waste			
Annual Generation Rate (units ______)		24 Gal		24 Gal		600 lbs	
Overall							
Component(s) of Concern							
Cost of Disposal							
Unit Cost ($ per: Gal)		13 gal		13 gal			
Overall (per year)		$312		$312			
Method of Management[1]		Offsite		Offsite		Landfill	
		Recovery		Recovery			
Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET
6

WASTE STREAM SUMMARY

AIRCRAFT MAINTENANCE

Attribute	Description		
	Stream No. ___	Stream No. ___	Stream No. ___
Waste ID/Name:	Oil	Hydraulic Fluid	SAF-Kleen Solv
Source/Origin	Eng/Gear Box	Hydr Systems	Cold Cleaner
Component or Property of Concern	Haz Waste	Haz Waste	Haz Waste
Annual Generation Rate (units Gals)	937	744	180
Overall			
Component(s) of Concern			
Cost of Disposal			
Unit Cost ($ per: Gal)	-0.03	-0.03	2.80
Overall (per year)	$28	$22	$508
$0.50/gal for water	50	50	
Method of Management[1]	Heat Recovery	Heat Recovery	Offsite Recycle

Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET
6

WASTE STREAM SUMMARY

AIRCRAFT FUELING

Attribute	Description		
	Stream No. ____	Stream No. ____	Stream No. ____
Waste ID/Name:	Fuel JP-4	Fuel Absorbents	
Source/Origin	Samp./Strip Tk	Spills	
Component or Property of Concern	Hangar/F. Farm	Fuel Trans.	
Annual Generation Rate (units ________)	12,000 gals	2,767 lbs	
Overall			
Component(s) of Concern			
Cost of Disposal			
Unit Cost ($ per: ________)	-0.03/gal	1.00/lbs	
Overall (per year)			
$0.50/gal for water			
Method of Management[1]	off site/ recycle	off site recovery	

Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET 6

WASTE STREAM SUMMARY

AIRCRAFT SURVIVAL SHOP

Attribute	Relative Wt. (W)	Description					
		Stream No. ___		Stream No. ___		Stream No. ___	
Waste ID/Name:		Adhesives		Containers			
Source/Origin		Shelf life		Misc.			
Component or Property of Concern		Haz. Waste		Haz. Waste			
Annual Generation Rate (units ______)		6 qts					
Overall							
Component(s) of Concern							
Cost of Disposal							
Unit Cost ($ per: ______)							
Overall (per year)							
Method of Management[1]		Landfill		Landfill			
Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET
6

WASTE STREAM SUMMARY

PAINT/COMPOSITES/METAL SHOPS

Attribute		Description					
		Stream No. ___		Stream No. ___		Stream No. ___	
Waste ID/Name:		SafKleen Sol.		Paint Slops		Containers	
Source/Origin		Paint Guns		Painting		Paints	
Component or Property of Concern		Haz. Waste		Haz. Waste			
Annual Generation Rate (units ___)		360 gals		452 lbs		120 lbs	
Overall							
Component(s) of Concern							
Cost of Disposal							
Unit Cost ($ per: ___)		5.80/gal		0.20/lb			
Overall (per year)		$2,088		$91			
Method of Management[1]		off site recycle		Landfill		Landfill	
Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET 6

WASTE STREAM SUMMARY

PAINT/COMPOSITES/METAL SHOPS

Attribute	Description		
	Stream No. ___	Stream No. ___	Stream No. ___
Waste ID/Name:	Blast. Media		
Source/Origin	Pt. Removal		
Component or Property of Concern	Haz. Waste		
Annual Generation Rate (units ___)	1,042 lbs		
Overall			
Component(s) of Concern			
Cost of Disposal			
Unit Cost ($ per: ___)	0.20/lb		
Overall (per year)	$205		
Method of Management[1]			

Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET 6

WASTE STREAM SUMMARY

BATTERY SHOP

Attribute	Description		
	Stream No. ____	Stream No. ____	Stream No. ____
Waste ID/Name:	NiCad Batt.	Merc. Batt.	Lithium Batt
Source/Origin	Aircraft		
Component or Property of Concern	Batt. Shop	Batt. Shop	Batt. Shop
Annual Generation Rate (units ________)	30 lbs	9 lbs	10 lbs
Overall			
Component(s) of Concern	KOH		
Cost of Disposal			
Unit Cost ($ per: ________)	$1.20/lb	$3.00/lb	$6.00/lb
Overall (per year)	$36	$27	$60
Method of Management[1]	Haz. Waste	Haz. Waste	Haz. Waste

Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET 6

WASTE STREAM SUMMARY

BATTERY SHOP

Attribute	Description		
	Stream No. ___	Stream No. ___	Stream No. ___
Waste ID/Name:	Auto Batt.		
Source/Origin	Automobiles		
Component or Property of Concern	Basewide		
Annual Generation Rate (units ________)	20 Batteries		
Overall			
Component(s) of Concern			
Cost of Disposal			
Unit Cost ($ per: ________)	$0.70/lb		
Overall (per year)			
Method of Management[1]			

Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET
6

WASTE STREAM SUMMARY

AVIONICS SHOP

Attribute	Description		
	Stream No. ____	Stream No. ____	Stream No. ____
Waste ID/Name:	Containers		
Source/Origin	Clean/Solder		
Component or Property of Concern	Haz. Waste		
Annual Generation Rate (units ________)			
Overall			
Component(s) of Concern			
Cost of Disposal			
Unit Cost ($ per: ________)			
Overall (per year)			
Method of Management[1]			

Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

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WORKSHEET 6

WASTE STREAM SUMMARY

AIRCRAFT WASHING

Attribute	Description		
	Stream No. ___	Stream No. ___	Stream No. ___
Waste ID/Name:	Wash Rinsate	Wash Rinsate	Absorbents
Source/Origin	A/C Washing	A/C Washing	A/C Washing
Component or Property of Concern	West W Rack	East W Rack	Wash Racks
Annual Generation Rate (units ___)			120 lbs
Overall			
Component(s) of Concern			Oil
Cost of Disposal			
Unit Cost ($ per: ___)			$0.46/lb *
Overall (per year)			$55
Method of Management[1]	Stormwater Sewer	Sanitary Sewer	Off site Recovery

Priority Rating Criteria[2]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(RxW)		Σ(RxW)		Σ(RxW)	
Priority Rank							

Notes: 1. For example, sanitary landfill, hazardous waste landfill, on-site recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

2. Rate each stream in each category on a scale from 0 (none) to 10 (high).

* Assumed same cost of disposal as for simulator spill clean up waste.

USCG AVIATION TRAINING CENTER
MOBILE, ALABAMA
PPOA BRAINSTORMING SESSION
11/4/93

I. GENERAL OPPORTUNITIES TO REDUCE WASTE GENERATION

A. INPUT MATERIALS

Limit variety of products for same function/application
Reduce quantities purchased and stored
Manage shelf life criteria for material purchase and use
Match unit sizes with usage patterns
Investigate alternative which are more environmentally friendly
Consolidate distribution to control variety and quantities of materials
Management of "Homer" materia use and waste generation

B. WASTE MANAGEMENT

Eliminate rain water entry to Bowser
Segregate waste to improve value of components for reuse
Recover spills for reuse rather than disposal with adsorbents
Containment of spills to allow for recovery
Sample reuse
Recycle/recover batteries rather than disposal
Automotive battery exchange

C. AWARENESS

Communication of environmental information and objectives
Reducing stress between job completion and safety/hazardous material management
User friendly language
Alternative communication methods such as:

- Computerized maintenance system job sheets (CMS) to document environmental information and procedures
- Management policy
- Maintenance instructions (TIMI)
- Briefings
- Recognition programs
- Hazardous material training program tailored to USCG Aviation
- Supervisory inspection programs (material, wastes, procedures, etc.)

II. OPPORTUNITIES TO INVESTIGATE BY PROCESS

A. FUEL HANDLING ISSUES

Fuel samples:
- Fuel samples are estimated at 1 gal/plane/day (approximately 12,000 gal/yr)
- Alternatives to "clear and bright" analysis and sample size reduction
- Reuse samples in diesel fuel or possibly return to fuel tanks

Spills:
- Containment at tank farm
- Equipment to recover spills rather than adsorbents
- Prevention - eliminate "stuck valve" on truck leading to overflow
- Provide supervision of filling operation all shifts
- Recycle fuel drained during maintenance (defueling) from lines clearing, fuel cell and pump repair

B. PLANE WASHING

Environmentally friendly soaps that meet performance expectations
Soap/water mixing and application specifications
Oil/water separation before discharge

C. COMPOSITE/PAINT SHOP

Current successes:
- Material distribution - quantities and control
- Paint gun cleaning - solvent reuse, timing (before hardening)

Paint application opportunities:
- Low pressure/high volume paint gun use in booth and hanger reducing pain usage rate
- Using smaller paint guns, application, etc.
- Electrostatic application?
- Effectiveness of water wall - uneven curtain, disposal of water, solids, etc.
- Re-formulation of coatings
- Consolidation and control of paint activities across ATC
- Use of pain gun rather than aerosol cans

D. RAFT-ASM SHOP

Reduce variety of glues
Change wipe/cleaning solvent from toluene

E. NON-DESTRUCTIVE INSPECTION WHEELS

Frequency of analysis
Alternative solvents

F. FLIGHT SIMULATORS

Current Successes
+ Recovery of oil for reuse elsewhere
Leak prevention program
Use of vacuum pickup & wringing out pads
Use of reconditioned rags for cleanup
Awareness training
Contract incentives for waste minimization

G. AIRCRAFT MAINTENANCE

Current success
+ CMS - computerize maintenance system with authorized chemical use list
Locker consolidation for all airframe shops
  Centralized management of hazardous materials
Shelf life
  Lot extension verification
  Inventory control: "almost in time" - FIFO
Variety reduction
Unit size matching to use rates
"Sure shot" vs. aerosols product delivery system
Alternative cleaning solvents
  Safety Kleen 105 Mineral Spirits vs. BIO-7 aqueous cleaner
  Parts washing - develop life cycle analysis to evaluate alternatives
  MIL Spec's 87936 and 87937 - alternative cleaners (aqueous & semi-aqueous)
  Waste oil - segregation of fuel from oil & other wastes (segregated can drain/crush)
  Replace oil based on oil analysis rather than fixed timeline
  Oil change life vs. commercial stds. for acid viscosity metal, acidity, viscosity, metals content, etc.
  Current required oil replacement schedule:

Air Frame	Engine Oil	Gearbox Oil
Falcon	150 hrs	450 Hrs
Dauphin (H65)	150 hrs	450 Hrs
Jay Hawk (H60)	On condition of oil	On condition of oil

Containment and recovery of hydraulic fluids for reuse
Investigate environmentally friendly antifreezes

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WORKSHEET 7

OPTION GENERATION

Meeting format (e.g., brainstorming, nominal group technique) Brainstorming

Meeting Coordinator W. Burch

Meeting Participants A. Memon, J. Smith, LCDR Fitzpatrick, ADC Peri, CWO Siggins

List Suggestion Options	Rationale/Remarks on Option
SEE ATTACHED	

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OPTION DESCRIPTION

Option Name: Pollution Prevention Awareness

Briefly describe the option: Increased communication of pollution prevention policy and objectives -- in information distributed, training courses, etc.

Waste Stream(s) Affected: All

Input Material(s) Affected: All

Product(s) Affected: N/A

Indicate Type:

- [x] Source Reduction
  - ___ Equipment-Related Change
  - X Personnel/Procedure-Related Change
  - ___ Materials-Related Change
- [x] Recycling/Reuse
  - ___ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ___

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OPTION DESCRIPTION

Option Name: Simulator Contract Incentives for Waste Minimization

Briefly describe the option: Changes in the Simtech contract to implement leak prevention and maintenance program on the same lines as the simulator availability.

Waste Stream(s) Affected: Hydraulic fluid spill clean up.

Input Material(s) Affected: Hydraulic fluid

Product(s) Affected: N/A

Indicate Type:

- [x] Source Reduction
  - ____ Equipment-Related Change
  - _X_ Personnel/Procedure-Related Change
  - ____ Materials-Related Change
- [ ] Recycling/Reuse
  - ____ Onsite
  - ____ Offsite
  - ____ Material reused for original purpose
  - ____ Material used for a lower-quality purpose
  - ____ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ________ Date: ________

Approved for study? _X_ yes ____ no By: Assessment Team

Reason for Acceptance or Rejection: Reduced spill clean up

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OPTION DESCRIPTION

Option Name: Flight Simulator Hydraulic Fluid Recovery

Briefly describe the option: Use a wringer to recover hydraulic fluid from spill clean up absorbents and reduce the weight of discarded absorbent and reuse the absorbents. Also, this will allow waste liquid hydraulic fluid collection for reuse/recycle.

Waste Stream(s) Affected: Hydraulic fluid spill clean up

Input Material(s) Affected: Hydraulic fluid

Product(s) Affected: N/A

Indicate Type:

☒ Source Reduction
- X Equipment-Related Change
- X Personnel/Procedure-Related Change
- ___ Materials-Related Change

☒ Recycling/Reuse
- X Onsite
- X Offsite
- X Material reused for original purpose
- ___ Material used for a lower-quality purpose
- X Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection: Reduction in waste disposal

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OPTION DESCRIPTION

AIRCRAFT MAINTENANCE

Option Name: Centralized Material Control

Briefly describe the option: Combine material lockers for three air frame and and engine shops to improve control of materials -- monitor shelf life, limit use of duplicating materials, control purchasing to "just-in-time" and quantity and size matching usage rates.

Waste Stream(s) Affected: All

Input Material(s) Affected: Reduce variety of materials; Reduce shelf-life losses.

Product(s) Affected: N/A

Indicate Type:

☒ Source Reduction
- ___ Equipment-Related Change
- ___ Personnel/Procedure-Related Change
- _X_ Materials-Related Change

☐ Recycling/Reuse
- ___ Onsite
- ___ Offsite
- ___ Material reused for original purpose
- ___ Material used for a lower-quality purpose
- ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ______ Date: ______

Approved for study? _X_ yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ______

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OPTION DESCRIPTION

AIRCRAFT MAINTENANCE

Option Name: Alternative Cleaning Solvents

Briefly describe the option: Investigate replacement of organic solvent cleaning with alternative cleaners such as current Bio-7 semi-aqueous terpene cleaner. Conduct life-cycle analysis of materials and cleaning needs.

Waste Stream(s) Affected: Cold cleaner spent solvent.

Input Material(s) Affected: Cleaning solvents

Product(s) Affected: N/A

Indicate Type:

- ☒ Source Reduction
  - X Equipment-Related Change
  - ___ Personnel/Procedure-Related Change
  - X Materials-Related Change
- ☐ Recycling/Reuse
  - ___ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ___

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OPTION DESCRIPTION

AIRCRAFT MAINTENANCE

Option Name: Alternative Dispensing System Aerosols

Briefly describe the option: Over 1000 Aerosol containers are dispensed each year in the application of cleaners and other products; each can contains both active ingredient and vehicle. Volume filled by vehicle and vehicle itself are waste.

Compressed air filled dispensers, "sure shots," would accomplish same delivery.

Waste Stream(s) Affected: Containers, air emissions

Input Material(s) Affected: Aerosol products reduced

Product(s) Affected: N/A

Indicate Type:

☐ Source Reduction
- ___ Equipment-Related Change
- ___ Personnel/Procedure-Related Change
- X Materials-Related Change

☐ Recycling/Reuse
- ___ Onsite
- ___ Offsite
- ___ Material reused for original purpose
- ___ Material used for a lower-quality purpose
- ___ Material sold

Originally proposed by: Assessment Team **Date:** 11/4/93

Reviewed by: ___ **Date:** ___

Approved for study? X yes ___ no **By:** Assessment Team

Reason for Acceptance or Rejection ___

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OPTION DESCRIPTION

AIRCRAFT MAINTENANCE

Option Name: Condition-Based Oil Replacement

Briefly describe the option: Currently, engine and gearbox oils are replaced based on frequency of use. Dolphin helicopter relies on periodic analysis of oil's condition. Consider approach for all aircraft.

Waste Stream(s) Affected: Waste oil

Input Material(s) Affected: Engine and gearbox oil

Product(s) Affected: N/A

Indicate Type:

- [x] Source Reduction
  - ___ Equipment-Related Change
  - ___ Personnel/Procedure-Related Change
  - X Materials-Related Change
- [ ] Recycling/Reuse
  - ___ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ___

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OPTION DESCRIPTION

AIRCRAFT MAINTENANCE

Option Name: Alternative Container Sizes

Briefly describe the option: Large volume use of hydraulic fluid and lubricating oil indicates replacement of quart cans with gallon containers (or other size) should be considered.

Waste Stream(s) Affected: Containers, waste oil

Input Material(s) Affected: Lubricating oils and hydraulic fluids

Product(s) Affected: N/A

Indicate Type:

- ☒ Source Reduction
  - ___ Equipment-Related Change
  - ___ Personnel/Procedure-Related Change
  - X Materials-Related Change
- ☐ Recycling/Reuse
  - ___ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ___

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OPTION DESCRIPTION

Option Name: Fuel Transfer Spill Prevention

Briefly describe the option: Prevent spillage of fuel in transfer activities by strict supervision of transfer activities, stuck valve maintenance, and overfill prevention. This will allow a reduction in spill waste and fuel consumption.

Waste Stream(s) Affected: Fuel spills

Input Material(s) Affected: JP-4 fuel

Product(s) Affected: N/A

Indicate Type:

☒ Source Reduction
- ___ Equipment-Related Change
- X Personnel/Procedure-Related Change
- ___ Materials-Related Change

☒ Recycling/Reuse
- X Onsite
- ___ Offsite
- X Material reused for original purpose
- ___ Material used for a lower-quality purpose
- ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ______ Date: ______

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection Prevention of spills, therby JP-4 could be used for its original purpose or diesel.

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OPTION DESCRIPTION

Option Name: Reduce Fuel Sample Size

Briefly describe the option: Fuel samples arethe major fuel waste stream. The reduction of fuel sample size will accordingly reduce the waste generated resulting in reduced waste management cost.

Waste Stream(s) Affected: Fuel samples

Input Material(s) Affected: JP-4 fuel

Product(s) Affected: N/A

Indicate Type:

- [X] Source Reduction
  - ___ Equipment-Related Change
  - _X_ Personnel/Procedure-Related Change
  - ___ Materials-Related Change
- [X] Recycling/Reuse
  - _X_ Onsite
  - ___ Offsite
  - _X_ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ______ Date: ______

Approved for study? _X_ yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ______

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OPTION DESCRIPTION

Option Name: Alternative to "Clear and Bright" Analysis

Briefly describe the option: This analysis requires large quantities of fuel sampling. Incorporation of new technology such as laser technology may allow performing this analysis without taking samples or as many samples.

Waste Stream(s) Affected: Fuel samples

Input Material(s) Affected: JP-4 fuel

Product(s) Affected: N/A

Indicate Type:

- [X] Source Reduction
  - X Equipment-Related Change
  - X Personnel/Procedure-Related Change
  - ___ Materials-Related Change
- [X] Recycling/Reuse
  - X Onsite
  - ___ Offsite
  - X Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ______ Date: ______

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ______

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OPTION DESCRIPTION

Option Name: Recover Fuel From 2500 Tanks at Fuel Farm

Briefly describe the option: Fuel and water stripped from the holding tanks at the fuel farm are collected in this tank. Water could be separated and fuel filtered to recycle fuel back to the holding tanks.

Waste Stream(s) Affected: Strip tank fuel

Input Material(s) Affected: JP-4 fuel

Product(s) Affected: N/A

Indicate Type:

☒ Source Reduction
- X Equipment-Related Change
- X Personnel/Procedure-Related Change
- ___ Materials-Related Change

☒ Recycling/Reuse
- X Onsite
- ___ Offsite
- X Material reused for original purpose
- ___ Material used for a lower-quality purpose
- ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection: Avoid sale of waste fuel at low revenue, and use the fuel for the original purpose.

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OPTION DESCRIPTION

Option Name: Bowser Waste Segregation

Briefly describe the option: Bowser waste includes two waste streams, i.e., oils and fuel. These two streams should be segregated and collected separately in two bowsers, allowing opportunity for reuse after cleaning or increase waste quality for sale. JP-4 can be used as diesel on support vehicles on base.

Waste Stream(s) Affected: Waste oils
Waste JP-4 Fuel

Input Material(s) Affected: Waste oil
JP-4 fuel

Product(s) Affected: N/A

Indicate Type:

- ☒ Source Reduction
  - ___ Equipment-Related Change
  - _X_ Personnel/Procedure-Related Change
  - ___ Materials-Related Change
- ☒ Recycling/Reuse
  - _X_ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - _X_ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? _X_ yes ___ no By: Assessment Team

Reason for Acceptance or Rejection: Avoid sale of waste oil/fuel at low revenue. Increase in waste oil/fuel quality. Reuse of waste fuel as diesel.

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OPTION DESCRIPTION

Option Name: Eliminate Rainwater Entry to Bowser

Briefly describe the option: Eliminate rainwater entry to bowser by covering it when left open unattended. Also estimate water by dipstick in the bowser and remove any settled water. This will eliminate or drastically reduce water content of waste oil/fuel stored, thereby increasing the waste oil/fuel sale value as well as offer opportunity for usage for lower quality purposes.

Waste Stream(s) Affected: Waste oil
Waste fuel JP-4

Input Material(s) Affected: JP-4 fuel
Oils

Product(s) Affected: N/A

Indicate Type:

- [X] Source Reduction
  - X Equipment-Related Change
  - X Personnel/Procedure-Related Change
  - ___ Materials-Related Change
- [X] Recycling/Reuse
  - X Onsite
  - X Offsite
  - X Material reused for original purpose
  - X Material used for a lower-quality purpose
  - X Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ________ Date: ________

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection Increase in waste fuel/oil quality for sale or reuse/recycle.

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OPTION DESCRIPTION

Option Name: Spill Containment

Briefly describe the option: Construct a permanent containment around transfer stations at the fuel farm, and use temporary containments at fuel transfer activities everywhere else. This will prevent contamination of the environment and will allow easy recovery of the spilled fuel either by vacuum or by absorption. The recovered fuel can either be reused after cleaning or used as diesel.

Waste Stream(s) Affected: JP-4 fuel spill

Input Material(s) Affected: JP-4 fuel

Product(s) Affected: N/A

Indicate Type:

☒ Source Reduction
- X Equipment-Related Change
- X Personnel/Procedure-Related Change
- ___ Materials-Related Change

☒ Recycling/Reuse
- X Onsite
- ___ Offsite
- X Material reused for original purpose
- X Material used for a lower-quality purpose
- ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection: Prevention of clean up cost of environmental deterioration and reuse of the spilled material.

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OPTION DESCRIPTION

AIRCRAFT SURVIVAL SHOP

Option Name: Alternative Wipe Solvents

Briefly describe the option: Replace Toluene with acetone for preparation of raft surface material prior to gluing.

Waste Stream(s) Affected: Air emissions

Input Material(s) Affected: Toluene, Acetone

Product(s) Affected: N/A

Indicate Type:

- [x] Source Reduction
  - ___ Equipment-Related Change
  - ___ Personnel/Procedure-Related Change
  - _X_ Materials-Related Change
- [ ] Recycling/Reuse
  - ___ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ____________ Date: ____________

Approved for study? _X_ yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ____________

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OPTION DESCRIPTION

PAINT/COMPOSITE/METAL SHOPS

Option Name: Paint Application Alternatives

Briefly describe the option: Greater reliance on HVLP systems; reduced size of application gun when feasible; replace aerosol use with HVLP.

Waste Stream(s) Affected: Spent solvents

Input Material(s) Affected: Paints

Product(s) Affected: N/A

Indicate Type:

- ☒ Source Reduction
  - ___ Equipment-Related Change
  - ___ Personnel/Procedure-Related Change
  - X Materials-Related Change
- ☐ Recycling/Reuse
  - ___ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ___

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OPTION DESCRIPTION

Option Name: Aircraft Battery Reclamation

Briefly describe the option: Investigate manufacturer reclamation program whereby old batteries are accepted by the manufacturer for recycling/recovery. NiCad, Mercury, and Lithium batteries can be reclaimed by this method. Some manufacturers even offer small payment or rebate on new battery purchases in exchange.

Waste Stream(s) Affected: Aircraft batteries (NiCad, Lithium, Mercury)

Input Material(s) Affected: NiCad, Lithium, and Mercury batteries

Product(s) Affected: N/A

Indicate Type:

[X] Source Reduction
- ___ Equipment-Related Change
- X Personnel/Procedure-Related Change
- ___ Materials-Related Change

[X] Recycling/Reuse
- ___ Onsite
- X Offsite
- ___ Material reused for original purpose
- ___ Material used for a lower-quality purpose
- X Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection: Saving of battery disposal cost; Saving in new battery purchase.

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OPTION DESCRIPTION

Option Name: Automotive Battery Exchange

Briefly describe the option: Instead of disposal of automotive batteries through DRMO at cost, arrangements with the auto supplier should be made to exchange old batteries with new ones at reduced cost for the new ones and saving of the waste battery disposal.

Waste Stream(s) Affected: Waste automotive batteries

Input Material(s) Affected: Automotive batteries

Product(s) Affected: N/A

Indicate Type:

- ☒ Source Reduction
  - ___ Equipment-Related Change
  - _X_ Personnel/Procedure-Related Change
  - ___ Materials-Related Change
- ☐ Recycling/Reuse
  - ___ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team **Date:** 11/4/93

Reviewed by: ______ **Date:** ______

Approved for study? _X_ yes ___ no **By:** Assessment Team

Reason for Acceptance or Rejection Saving in disposal cost and reduction in input material cost.

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OPTION DESCRIPTION

Option Name: Aircraft Washing Spec Adherence

Briefly describe the option: Follow measurement procedures before mixing liquid soap with water to minimize use of soap. Also, use specified procedures of applying the soap and rinsing in order to prevent streaking.

Waste Stream(s) Affected: Washing rinsate

Input Material(s) Affected: Soaps

Product(s) Affected: N/A

Indicate Type:

- [x] Source Reduction
  - ___ Equipment-Related Change
  - X Personnel/Procedure-Related Change
  - ___ Materials-Related Change
- [ ] Recycling/Reuse
  - ___ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

Approved for study? X yes ___ no By: Assessment Team

Reason for Acceptance or Rejection ___

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OPTION DESCRIPTION

Option Name: Optimize Oil/Water Separation System

Briefly describe the option: Look into the design and placement of the existing oil/water separator in order to evaluate whether any changes are required that will optimize the operation.

Waste Stream(s) Affected: Washing rinsate

Input Material(s) Affected: Soaps

Product(s) Affected: N/A

Indicate Type:

☒ Source Reduction
- X Equipment-Related Change
- ___ Personnel/Procedure-Related Change
- ___ Materials-Related Change

☐ Recycling/Reuse
- ___ Onsite ___ Material reused for original purpose
- ___ Offsite ___ Material used for a lower-quality purpose
- ___ Material sold

Originally proposed by: Assessment Team Date: 11/4/93

Reviewed by: ___ Date: ___

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Reason for Acceptance or Rejection ___

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OPTION DESCRIPTION

Option Name: Environmentally Friendly Aircraft Washing Soaps

Briefly describe the option: Recommend alternative soaps which are more environmentally friendly and that do the same or better job.

Waste Stream(s) Affected: Washing rinsate

Input Material(s) Affected: Soaps

Product(s) Affected: N/A

Indicate Type:

- ☒ Source Reduction
  - ___ Equipment-Related Change
  - ___ Personnel/Procedure-Related Change
  - X Materials-Related Change
- ☐ Recycling/Reuse
  - ___ Onsite
  - ___ Offsite
  - ___ Material reused for original purpose
  - ___ Material used for a lower-quality purpose
  - ___ Material sold

Originally proposed by: Assessment Team **Date:** 11/4/93

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