

**THE APPLE PILOT EVALUATION  
FOR  
THE NATIONAL ENFORCEMENT INVESTIGATIONS CENTER  
U.S. ENVIRONMENTAL PROTECTION AGENCY**

**March 11, 1988**

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## **EXECUTIVE SUMMARY**

The NEIC Apple Pilot Evaluation was designed to determine applicability of the Apple Macintosh SEs and an AppleTalk Network in meeting the needs of the NEIC Word Processing Center and individual secretarial/clerical workstations. Six months of use revealed that:

1. The system met the basic capabilities of the IBM System 6 (existing word processing technology).
2. The Macintosh SE, LaserWriter and ImageWriter printers are suitable replacements for the Lexitron and its applications, with some exceptions (i.e., printing of multiple-part forms, envelopes and labels).
3. The local area network provides for effective telecommunications between physically separated buildings, the electronic transfer of files, queueing/spooling of printers and configuration compatibility between Apple and IBM equipment.
4. The graphics station and desktop publishing capabilities significantly enhance current NEIC capabilities.

This document details the evaluation leading to the conclusions above and presents additional features being evaluated. Areas for additional evaluation include:

- Network software and hardware fine-tuning
- Cost analyses
- User groups
- User support
- NEIC's future needs

## **1.0 Introduction**

In May of 1987, in cooperation with the Office of Information Resources Management (OIRM) and the National Data Processing Division (NDPD), NEIC began a pilot study of the AppleTalk network as a means of integrating the Agency's IBM compatible PC technology with the Apple Macintosh technology. The primary goal of NEIC in this study was to determine the utility of the Macintosh for word processing, both in the centralized word processing group and for individual clerical staff. Graphics and desktop publishing capabilities were also investigated. The following report summarizes NEIC's initial findings and poses some additional areas for evaluation.

Completion of this report on the Apple Pilot, has resulted in determining specific applicability of the Macintosh and the AppleTalk network. NEIC will continue to refine its investigation of additional Macintosh and network features.

The background (Section 2.0) of NEIC's current equipment and technology is important to understand in relation to NEIC's word processing needs. Several aspects were analyzed for this Apple/Network Pilot: (1) The compatibility of NEIC's new and existing equipment, (2) the conformance to existing agency standards, (3) the Apple/IBM PC connectivity, (4) the compound document production, and (5) the desktop publishing capabilities. Included are the methodology used in setting up this evaluation, as well as the Apple/IBM PC network diagram and an inventory of software and hardware used (Section 3.0). Initial objectives/questions are addressed in Section 4.0. In completing this report of the Apple Pilot, areas for additional investigation were encountered. These factors will comprise NEIC's continuing evaluation of the system and are discussed in Section 5.0. Finally, Section 6.0 concludes this report, citing results and the advantages and disadvantages of the Apple System.

## **2.0 Background**

To support the enforcement mission, activities at NEIC include traditional secretarial duties such as the typing of documents, as well as operation of a word processing center for high volume report preparation. As with most organizations within the Agency, NEIC possesses several generations of office system technologies. These technologies range from an early version of the IBM System 6 word processing system to the newly acquired IBM compatible personal computers; midway between are memory typewriters and Lexitron word processors.

NEIC was actively looking to replace the aging and incompatible IBM System 6 configuration, as well as to upgrade or replace the Lexitron equipment. Word processing requirements of NEIC had grown beyond the capabilities of the System 6 configuration and maintenance of the system frequently resulted in production bottlenecks. The time was opportune for revamping existing hardware and software.

NEIC explored the utility of NBI and Wang systems to upgrade technology. Concurrently, the Agency was seeking to establish an individual workstation environment, which had the capability to perform computing functions, as well as word processing. The Agency PC contract was viewed as a mechanism to create executive workstations using IBM PC ATs. Eventually, these PCs could also serve as the secretarial workstation alternative. NEIC investigated other alternatives to maintain consistency for developing Agency microcomputer-based standards.

In cooperation with the Office of Information Resources Management (OIRM), NEIC reviewed the functional word processing and associated requirements to determine an approach. In conducting that analysis, the following requirements were established:

- Compatibility of new and existing equipment - To the extent possible and practicable, the new and existing equipment must be capable of exchanging data and files. Already acquired IBM PC

equipment was to be considered a valuable component of a newly configured system.

- **Conformance to existing Agency standards** - Agency efforts to standardize PC hardware and software, particularly for word processing must be integrated into the solution.
- **Connectivity** - The system must be networked in such a way that files can be moved from unit to unit, and IBM PCs must be able to be included within that network.
- **Compound document production** - Multiple staff members from diverse disciplines work on different elements of many NEIC projects. This includes the task of preparing the final report. Each participating staff member must be able to independently complete his/her portion of the work without the need for rekeyboarding. The means must be available to bring the various portions together, move them into the intended position within the whole report, and move the entire copy back to the reviewing community to provide a review or final copy.
- **Desktop Publishing Capability** - NEIC reports are considered vital to communication of findings and evaluations and, therefore, fine copy must be integrated with text, graphics, charts, diagrams, etc. The system must incorporate the traditional keyboarding and printing functions to provide high quality typesetting and pasteup services to enhance the ease as well as visual appeal of NEIC reports, newsletters, announcements, etc.

To examine alternatives and supplements to the IBM PC technology, NEIC was selected to pilot a network of Apple Macintosh SEs in conjunction with IBM PC ATs. Microsoft Word was selected to serve as the resident word processing package on the Macintosh and on selected IBM PC ATs because it: (1) Accommodated most all of the Word Processing Center's need for formulas, tables and complex scientific text; (2) most closely mimicked the System 6, and (3) was one of the few word processing packages of its caliber,



compatible on both IBM and Apple personal microcomputers at the time of selection. The Apple Macintosh and AppleTalk network met all the requirement specifications (on paper) outlined above. NEIC set out to pilot the equipment for its specific situation.

The network was installed by July 3, 1987. Training on the use of the hardware and software took place simultaneously with installation. The time period for the pilot was 4 months. Issues evaluated were:

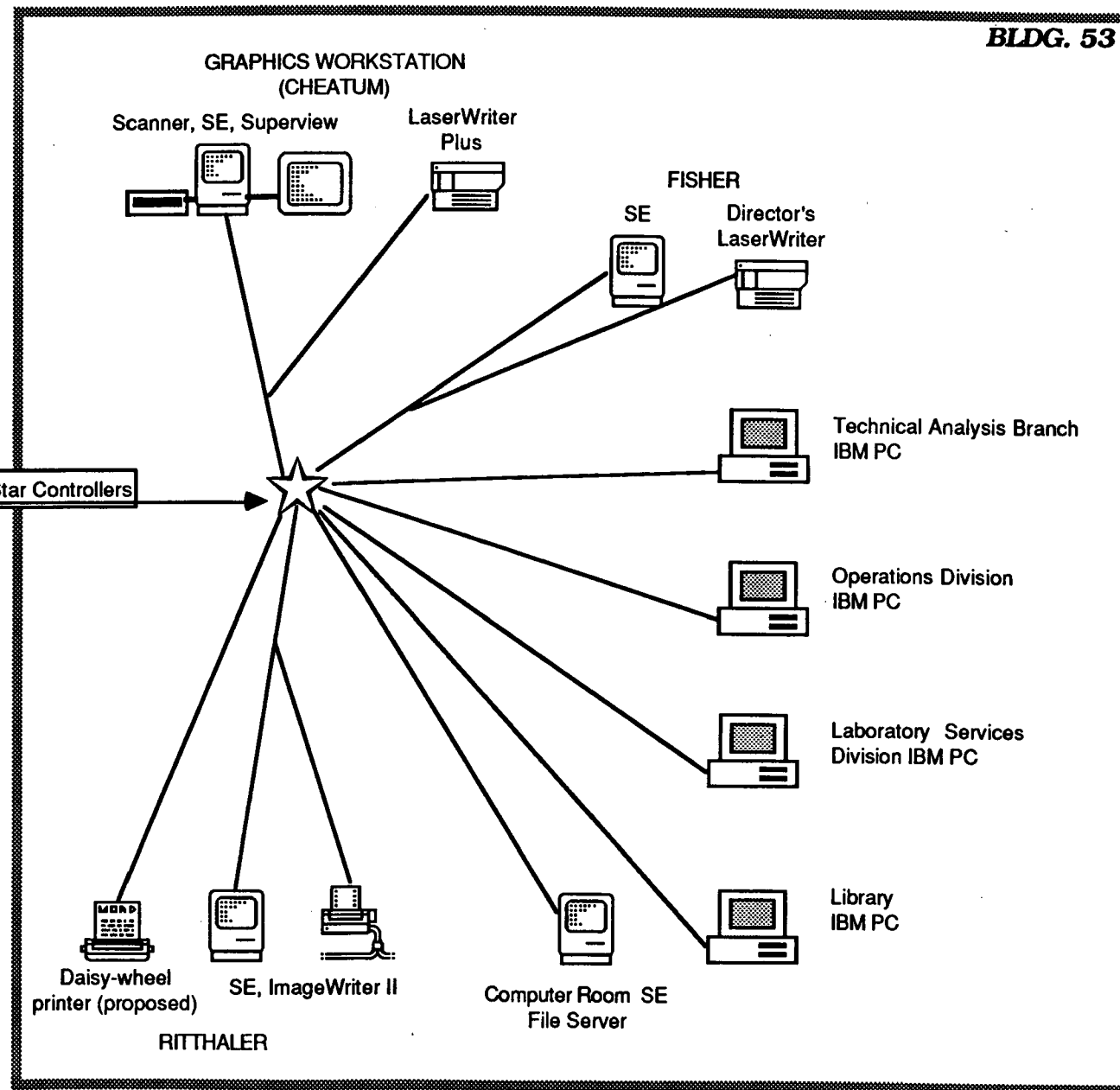
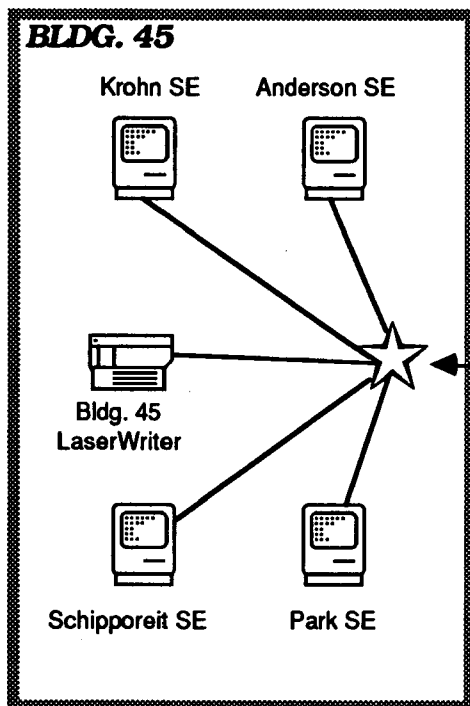
1. Does the system meet the current capabilities of the IBM System 6?
2. Are a Macintosh SE and printer suitable replacements for the Lexitron at the executive secretary's workstation for keyboarding, printing and E-Mail purposes?
3. Does the local area network provide for effective telecommunication between physically separated buildings, the electronic transfer of files, queueing/spooling of printers, and configuration compatibility between Apple and IBM equipment?
4. Do the graphics station and desktop publishing capabilities significantly enhance current NEIC capabilities?

### **3.0 Methodology**

Implementation of Apple hardware, software and local area network began in the summer of 1987. Below, the timeline of events, areas of responsibility and an inventory of software are listed. Falcon Microsystems of Landover, Maryland performed the system integration and installation. A discussion of general methodology follows.

#### **3.1 Timeline of Events**

|                        |   |
|------------------------|---|
| July 3, 1987           | Installation of the Apple hardware, software and local area network. System included 7 Macintosh SEs with MS Word, 4 IBM PC ATs with MS Word, and a complete network between two NEIC buildings. Network component training (LAN, Macintosh as File Server, OCR Scanner) was provided to telecommunications and PC personnel (Falcon Microsystems). Please see <b>Figure 1</b> for a diagram of the NEIC Macintosh network. |
| July 6, 1987<br>8A-12N | Training began - Introduction to Macintosh, TOPS and general software. All initial training was provided by a representative of Falcon Microsystems and by a local vendor - Adams Computers.  |
| July 6, 1987<br>1P-4P  | Introduction to MS Word I for pilot users (Falcon & Adams)  |
| July 7, 1987<br>8A-12N | Introduction to MS Word II for pilot users (Falcon & Adams)   |



# NEIC MACINTOSH NETWORK (using TOPS software)



FIGURE 1

July 7, 1987      Presentation of graphics I (MacDraw and  
1P-4P              CricketDraw) (Adams)

July 8, 9, 10      Presentation Graphics II (More, Adobe Illustrator,  
PageMaker) (Adams)

### **3.2    Areas of Responsibility**

Gary Young              Project Implementation  
Chief, Information  
Management  
Branch

George Allison              Network/Equipment installation oversight  
Chief, ADP                  (Falcon)  
Section

Keith Krieger              Network itself (particularly the PC ATs in  
CSC Information              the network and the Macintosh as File  
Management                  Server)  
Specialist

Marcia Colvin              Onsite MS Word user support,  
Management                  documentation of the use of MS Word on  
Assistant                      the Macintosh and on the IBM PC AT

Veronica Bladt              Onsite user support for the Macintosh, PC  
CSC Associate                  Coordinator  
Mini-Computer  
Specialist

Denise Cheatum              Onsite user support for Macintosh graphics  
Computer  
Assistant

### 3.3 Inventory of Software

Initially installed software included:

#### Graphics

|                   |   |
|-------------------|---|
| Adobe Illustrator | Produces high quality, finely-detailed line art   |
| CricketDraw       | Object-oriented drawing program, similar to MacDraw has some additional "special effects" |
| MacDraw           | Drawing package   |
| More              | Outlining, presentation and organization chart package                                    |
| PageMaker         | Desktop publishing software   |
| SuperPaint        | Paint package   |
| PublishPac        | Used to scan text and images on DEST Scanner  |

#### Word Processing

|         |                          |
|---------|--------------------------|
| MS Word | Word processing software |
|---------|--------------------------|

#### Communications/Other

|                |   |
|----------------|---|
| AST 4000       | Software for the computer room's hard disk drive  |
| FileMaker Plus | Database management program with graphic format capability (e.g., forms, presentations) |
| Hypercard      | Information organizer, user definable database, used for linking information            |
| MacTerminal    | Terminal emulation software   |
| Node Check     | Checks the AppleTalk network status   |

|                 |   |
|-----------------|---|
| Peek            | Checks the AppleTalk network quality  |
| SuperLaserSpool | Printer spooler program which allows use of Macintosh while waiting for files to be printed |
| Switcher        | Allows numerous applications to be open at the same time                                    |
| TOPS            | Allows several users to share the same file or to send and copy a file over the network     |
| Traffic Watch   | A network analyzer  |

### **3.4 General Methodology**

After the early July training sessions, the system was configured as in Figure 1. The AppleTalk Pilot called for the network to serve nine separate locations within Building 53 and one location in Building 55. The two buildings were provided communications via existing telephone lines. Details of NEIC's communications methodology may be found in Appendix A. Building 55, housing the Word Processing Center, was set up with three Macintosh SEs. The graphics station (Cheatum), the computer room (File Server), and two secretarial stations (Ritthaler and Fisher) were also configured with Macintosh SEs.

The File Server was to serve several purposes: (1) To maintain document files for NEIC multiple users, (2) to serve as a device through which IBM files could be sent to a Macintosh and vice versa, and (3) to be used as a basic Macintosh by the computer operators.

The Introduction to Macintosh, TOPS, network component and MS Word training were all custom-tailored to NEIC's needs. Preparation for training required substantial time upfront from vendors and NEIC user support personnel.

Users were instructed to use the network and/or their Macintosh whenever possible, in place of a Lexitron or System 6. Each maintained a problem log and the PC coordinator, Veronica Shray, remained on-call to assist with trouble shooting. Users experienced an expected adjustment period and made extensive use of troubleshooting support until they became comfortable with the hardware and software. Constant contact was maintained with the users.

A 3-day graphics training course was provided to additional NEIC users. A local vendor, Adams Computers, taught the class.

Answers to original evaluation issues were solicited on an ongoing basis. Two Macintosh Users meetings were held over this evaluation period. Problem logs were evaluated and solutions were provided through local NEIC expertise or through the vendor. The installation of Version 3.1 of MS Word solved many of the problems users had encountered with Version 3.0. Interviews with pilot users were frequently conducted.

In addition to testing Word Processing Center needs, most facets of the secretarial workstation were used and evaluated (i.e., typing, data entry, E-Mail and local applications). E-Mail procedures (using MacTerminal) were documented and distributed.

Currently, use of the File Server and network are being further evaluated. Users answers from a followup questionnaire are being tabulated. Additional hardware is being researched which will accommodate multiple-forms, labels and envelope typing; SuperView screen problems; and other, minor (but solvable) issues. Further system evaluation is detailed in Section 5.0.

#### **4.0 Questions Evaluation and Discussion**

##### **4.1 The Apple system vs. the IBM System 6**

The Apple system basically meets the current capabilities of the IBM System 6.

###### **4.1.1 Macintosh and MS Word**

The Macintosh system using Microsoft Word for word processing surpasses the IBM System 6 in almost all areas except for one. The major exception to MS Word was that large reports could not be worked with as an all-in-one document. We were told by Microsoft Technical Support that MS Word Version 3.0 does not operate efficiently when documents are longer than about 15 to 20 pages. The word processing operators learned to work with that limitation by separating a report into sections and then linking them for printing, pagination and table of contents. The linking feature in MS Word was somewhat cumbersome for the word processing operators.

Installation of MS Word, Version 3.01, provided for all-in-one manipulation of reports up to about 24 pages. The PageMaker graphics package, it was discovered, allows for even larger document manipulation, as well.

Originally, operators encountered the bomb icon on the screens and total system lock-ups almost everyday in working with MS Word 3.0. Two floppy disks had unrecoverable disk errors from unknown causes. With the upgrade to MS Word 3.01, the bomb icon problem has occurred only occasionally.



## **4.2 The Apple System vs. the Lexitron Workstation**

The Macintosh SE and printers are suitable replacements for the Lexitron at the executive secretaries' workstations for keyboarding, printing, timekeeping, and E-Mail purposes, with some exceptions.

### **4.2.1 Keyboarding and the Mouse**

The touch on the keyboard is fine for long periods of typing. The operators did not find noticeable differences between the System 6, Lexitron, memory typewriter or Macintosh keyboards. For one Macintosh user, the keyboard was initially awkward because of the change from a typewriter to a computer keyboard. Two operators felt that having to use the mouse was inconvenient and took additional time. When they were typing, they preferred not to leave the keyboard to issue the commands. Other users found working with the mouse sufficient for executing a command. The keyboard touch is suitable for the graphics operator, and the mouse is required for graphics.

Followup interviews indicate little or no awkwardness with the mouse still exists. Some users have employed the use of a 'turbo mouse': the user moves a large sphere on a stationary unit, taking up much less desk/table space. Most commands can also be issued from the keyboard, as well as with the mouse.

### **4.2.2 Printer Location and Needs**

The printer locations are fine. Sharing LaserWriters (letter quality) is a valid concept. As use grows, additional units may be required. A secretary can

use an ImageWriter (Dot Matrix) for the draft of a document and prints the final version on the LaserWriter with ease.

Current printers do not accommodate the need for printing labels, envelopes and multiple-part forms. However, as mentioned in Section 4.2.5, we believe this can be solved with alternative hardware.

#### **4.2.3      Timekeeping, Data Entry and Project Tracking on the Mainframes**

The Macintosh handles the timekeeping function, data entry into the Criminal Docket and Project Tracking on the mainframes accurately and with the same or fewer keystrokes than the VT100.

#### **4.2.4      E-Mail**

Reading mail is easy to access. The steps are stored in a utility program within MacTerminal, allowing the user to sign off the E-Mail system sooner than when reading the mail on the Lexitron. When sending a file from MS Word to an E-Mail box the conversion to an ASCII file is required to save the file in the proper format before transmitting.

#### **4.2.5      Macintosh Advantages and Disadvantages for Word Processing**

The spelling feature is excellent. The Macintosh has many more features than the System 6, plus several methods of communication with the Word Processing Center. The print on the LaserWriter is superior to the print of the memory typewriter because it offers so many more features, such as: (1) Italics,

(2) underlining, (3) different fonts and point sizes, (4) boldface, and (5) other type styles. The storage for the memory typewriter appeared to be adequate and the operator does not see a major difference in storage capacity.

NEIC is currently investigating a hardware solution for the current configuration's inability to feed and print labels, envelopes and multiple-part forms. We are attempting to interface a dot matrix printer into the network to accommodate these needs.

The DEST Scanner is not a viable solution for Word Processing's document conversion need. Text requires substantial cleanup after scanning. The DEST Scanner will not scan proportional spaced typing at all. The Word Processing operators feel they can type a page faster than the time it takes to scan and edit unrecognized characters and paragraph returns.

NEIC has recently purchased a Kurzweil Optical Character Reader (OCR) that may suit word processing needs for scanning (basically for document conversion to the new system). NEIC is testing the Kurzweil's ability to scan documents and send the text to PC data files. Results have been favorable.

#### **4.3 The Local Area Network**

The local area network provides for effective telecommunications between physically separated buildings, the electronic transfer of files, queueing/spooling of printers, and configuration compatibility between Apple and IBM equipment.

#### **4.3.1      Telecommunications Between Buildings**

Two physically separated buildings have been successfully networked. The buildings are currently networked with the TOPS software and two Star Controllers. It is a single network. When a user is sending a file to a printer, the network searches the complete network (both buildings) until it finds the one the user has chosen. (Details of the communications methodology may be found in Appendix A.)

#### **4.3.2      Electronic Transfer of Files**

The electronic transfer of IBM PC files to the Apple Macintosh, and vice versa, is easily accommodated through the File Server. Of the three purposes for the File Server, this Apple/IBM transfer was a function most used. Otherwise, the electronic transfer of files through the network was used mostly to send a document to print on an ImageWriter or LaserWriter. The network has been tapped very little, to date, for its "Publishing" feature for multiple users. As authors become more familiar with, and have access to the Apple Macintosh, we expect this use will greatly increase.

The only problem encountered, thus far, is the transfer of an IBM PC-created document to a specific printer within the network. Though TOPS (the communications software) allows a user to specify a specific LaserWriter destination, the specified device is never found. The software will work if it is allowed to search the entire network and print on the next available LaserWriter. We believe this is a TOPS

print software limitation and will hopefully be corrected with the upgrade to TOPS 2.0.

#### **4.3.3 Queueing/Spooling and Location of Printers**

There is sufficient buffer capacity with the spooler software to free up the Macintosh during large print jobs. Occasionally, a document did not print because of a timeout procedure within the Laser spooler. If the job was too complex, the laser spooler gave a message saying the job was sent to the printer but nothing printed. The user then had to issue the print command again or deinstall the laser spooler in order to get the document to print.

PageMaker bypasses the Laser Spooler; therefore, the Macintosh is tied up until the document is completely transmitted to the printer. However, an upgraded version of SuperLaser Spool has just been announced and is advertised as being compatible with PageMaker, providing an alternative to tying up the Macintosh.

#### **4.3.4 Configuration Compatibility**

As mentioned in 4.3.2 above, the File Server facilitates IBM-Apple compatibility well. Although like software operates differently on the IBM PC AT than on the Apple Macintosh SE (specifically, MS Word), a user familiar with his/her own machine is not affected. The newsletter, mentioned in Section 4.4.1, was a valuable test in combining documents created in various word processing packages sent through the network to create a single report.

The printer location configurations are suitable for Macintosh and IBM users. If the need arises, the Apple printers would work out as backup printers. There was a definite increase in traffic wherever a common-use LaserWriter was located. Occasionally, the printed documents will print on letterhead instead of plain paper because letterhead was left in the paper tray. IBM users do not always get their documents printed on the specified LaserWriter using the AppleTalk network, as discussed in Section 4.3.2.

#### **4.3.5      Security**

There is not a security problem with files transmitted to and through the File Server. Document or file security is handled in three ways:

- (1) The most obvious is to use floppy diskettes for confidential documents. Files are stored to floppy diskettes which are then kept secured.
- (2) A document published on the network can be password-protected through the TOPS software, allowing only those users with the password to read or write to the document.
- (3) Each document on the hard disk can be write-protected.

#### **4.4      Graphics and DeskTop Publishing**

The graphics station and desktop publishing capabilities significantly enhance current NEIC capabilities.

#### **4.4.1      DeskTop Publishing, Graphics, Typesetting and Pasteup Capabilities**

The system provides NEIC with a desktop publishing capability that it did not have previously. For example, the NEIC newsletter was compiled from articles keyboarded from various users with various word processing packages. All the articles were sent to the graphics department Macintosh using the AppleTalk network. The DeskTop publishing software using PageMaker, text and graphics were integrated to produce a very high quality newsletter.

The system is able to produce fine copy and incorporate various pieces including text, graphics, charts, diagrams, etc. It easily incorporates text and graphics into MS Word. The two graphical fonts, Cairo and Mobile, are very easy to use and will print into MS Word documents on the LaserWriter or ImageWriter. When using Cricket Draw, the drawing will not always print on the LaserWriter. It will always print on the ImageWriter, but the copy is not as clear and detailed. We are in the process of incorporating charts and diagrams.

The system incorporates the traditional keyboarding and printing functions to provide high quality typesetting and pasteup services to enhance the ease of production as well as visual appeal of NEIC reports, newsletters, announcements, etc. The above options are very easy to use with a LaserWriter printer; the final copy has a very high quality appeal. The same "typeset look" can be created using the LaserWriter and PageMaker.

#### **4.4.2 Macintosh and the Tektronix**

The Macintosh graphics are much easier to use than the Tektronix, especially for the infrequent user. Although Tektronix graphics are much more cumbersome to use, two of its advantages are the large color high resolution screen and color output devices. The Apple SuperView 19-inch monitor does not support all Macintosh products due to the required storage. The images on the 19-inch screen are sometimes actually smaller than when working on the smaller SE screen and, generally, resolution is poor. For example, Adobe Illustrator requires additional memory to be used on the larger screen.

Basically, with NEIC's current software (or software access), the Tektronix advantages include: Statistical analysis capabilities; graphs, bar charts, and pie charts through Cuechart; interface with the Zeta Plotter for large size presentation graphics; color output; access to packages, such as TELLAPLAN, TELLAGRAF and DISSPLA, as well as access and manipulation of mainframe data files. The Apple Macintosh advantages include: Its user friendliness and technology transferability, versatility in free-hand drawing and graphics creation, and the fact that it is a stand-alone system independent of a mainframe environment and communication problems.

A number of Tektronix advantages could also become Macintosh features with the addition of statistical and plotting software, the Macintosh-IBM gateway (allowing transfer of data files to and from the mainframe) and addition of an interface cable for the Zeta Plotter. The Macintosh II Plus also has a



color monitor and Apple promises a color printer soon.

#### **4.4.3      Output and Output Devices**

The ImageWriter was found to be inadequate for most graphics purposes. It is preferable to use the LaserWriter because of the differences in the print quality and speed. It can print on letter or legal size paper, but it is limited to an 8 1/2 inch width.

Due to the heavy printload from the graphics workstation, NEIC purchased a LaserWriter Plus, which also had additional fonts that were found useful by the graphics users.

The ImageWriter might be able to produce overheads in color if a color ribbon was purchased. We have not tried this because the quality of the output would not be acceptable for transparencies. The LaserWriter can produce transparencies in black and white only.

Our research indicates that the Macintosh, Tektronix and IBM PC can be hooked up to a common output device, specifically, the Hewlett Packard color plotter. Drivers to run the software will need to be purchased. The Tektronix color printer will work with the IBM PC with the purchase of an additional cable. The purchase of a special plotter driver would be required for the Macintosh SEs to use the Hewlett Packard or Zeta Plotter. (Tektronix has recently advertised an interface for one of their color printers and the Macintosh II.) Color transparencies or paper copies can be done on the plotter.

#### **4.4.4      Optical Character Reader (DEST Scanner)**

The DEST Scanner is being used most frequently by the graphics operator. The scanner works nicely with graphics because the operator is scanning drawings and not text. Scanning the drawing is more efficient than if the graphics operator were to draw the image herself.

The drawings scanned in are "cleaned up" or enhanced using a draw or paint package. Another use is to scan an image and use it as a "template" to create modified drawings of existing artwork. The scanner has been used mainly for line art rather than photographs.

#### **4.4.5      General Discussion**

Additional software packages or hardware that are needed to provide the full array of graphics services the user community desires include: Additional fonts for the LaserWriter; a drafting package; several clip art packages; a statistical package for creating line, pie and bar charts; MapMaker; an animation package; and possibly some specialized packages such as MacEarthworks for Chemistry or Operations, a high resolution color monitor, and color output device.

The Macintosh graphics capability has become a vital part of the desktop publishing environment at NEIC. It allows for the incorporation of graphics into text and provides typeset quality output for reports and other documentation.

The responsibility of the Information Management Branch is to provide state-of-the-art thinking in information management and in office automation. The quality of our output is extremely important. The LaserWriter and desktop publishing features allow production of high quality reports, enabling us to project the image of quality. The branch staff is able to produce professional-looking graphics/text products without a formal technical illustration staff.

#### **4.5 Other Areas of Interest**

##### **4.5.1 Maintenance, Backup Inventory and User Support**

None of the SEs have been repaired or have required maintenance since we received them. However, we are currently negotiating maintenance agreements with local vendors. All of the hardware and software problems were discussed over the phone with Falcon who offered some suggestions or options. Some of the suggestions helped clear up part of the problems and the majority of software problems have been cleared up since the new software for MS Word (Version 3.01) was installed.

Spare parts or spare equipment inventory necessary to provide sufficient redundancy include: Toner, cartridges, diskettes, paper, transparencies and possibly an extra mouse and extra cables.

User support on an individual basis, currently includes that from the PC Coordinator and from the Graphics technical support person. Apple users meetings provide the forum for demonstrations, training and group solution of new issues. The

meetings also provide a means to request additional training and to meet other users with varied and diverse levels of expertise.

The Macintosh has been well received by the clerical/secretarial, word processing and graphics communities. The demand on the current Macintosh terminals is constant, and additional units are required to meet the needs of the Branch, alone.

#### **4.5.2      Additional Items**

After adjusting to the mouse and icon technology, the learning curve for new software packages is greatly reduced. Users, especially in the graphics area, are constantly using the common use equipment, to the point that a sign-up schedule will be adopted.

A sluggish mouse problem was cleared up with a simple disassembly of the unit and cleaning with alcohol and a cotton swab. The mouse has become an invaluable tool for graphics and the Turbo-mouse offers another option for word processing and clerical work.

Users have requested the following training and demonstrations:

- Tables and dual column training
- MS Word for beginners (general new users)
- Overview of all software available
- Demonstrations of Hypercard

## **5.0 Planned Evaluations**

In the course of the pilot evaluation, NEIC encountered a number of areas which need further investigation. Most of the tasks listed below are underway.

### **5.1 Network Software and Hardware**

NEIC is upgrading the TOPS software (from Version 1.02 to Version 2.0) installed on the network. We are hopeful that this upgrade will provide for the IBM PC AT to print at a specific LaserWriter location (versus the next available printer, as stated in Section 4.3.2). The problem seems to reside in the TOPS Print portion of the software versus the TOPS file transfer portion.

Integration of bar chart, pie chart and diagram software into text will be tested. Statistics and plotting software is being investigated for manipulation of data files and for graphics purposes.

NEIC will test the transport of specific application files from the IBM PC AT (i.e., Lotus, dBase III Plus, etc.) to the Apple Macintosh applications, such as FileMaker. Also, NEIC may employ the use of PageMaker for production of 20 plus page reports.

To solve the problem with printing forms, labels and envelopes, NEIC has found two brands of 'intelligent network boards' that will allow the interface of a daisy wheel printer into the network. These boards emulate an AppleTalk network board and are installed in an interface box that connects to the network.

In an effort to enhance connectivity among networked, and previously unnetworked equipment, NEIC is looking at or installing the following options:

1. Installation of the Macintosh-IBM Gateway will allow data files to be uploaded to or downloaded from the IBM 4381 mainframe.
2. Interface of all computer graphics workstations, including the Tektronix, IBM PC, Macintosh and the IBM 4381. Also included is the evaluation of the interface cable from Macintosh to the Hewlett Packard and Zeta Plotter.

A complete Apple desktop publishing and graphics capability should include a color monitor and printer. NEIC will watch for the announcement of these pieces of equipment, as they apply to NEIC's configuration.

A Kurzweil OCR is being evaluated as a suitable scanner for word processing. The Word Processing Center's need for a scanner have included:

- Document conversion from the IBM System 6 to the Macintosh.
- New document transmittal to a data file such as the transmittal of Consent Decrees or Potential Responsible Party (PRP) reports to a data file.

The Kurzweil has successfully transferred a typed PRP report into a PC data file. After the Macintosh-IBM Gateway is installed, this media will also be evaluated.

NEIC is negotiating with a local vendor for a maintenance agreement for the Apple system components. Up to this point, we have had very little occurrence of equipment failure; however, a reliable maintenance agreement is necessary.

## **5.2 Cost Analyses**

NEIC will look into the Apple workstation and associated network costs versus other, available technology alternatives. IBM System 6 and Lexitron are obsolete, an intangible cost that must be factored into this evaluation. The costs of comparable IBM workstations will also be taken into account.

## **5.3 User Groups and User Support**

As each group or individual develops a particular expertise or network solution, this information has been, and will continue to be, shared through regular user group meetings. The user groups serve as an excellent forum for information exchange and update.

The NEIC graphic technical support person, Denise Cheatum and the current PC Coordinator, Vicki Dougherty, continue to provide on-call support for software and hardware questions. They regularly attend Federal Center Macintosh Users Special Interest group meetings to exchange local expertise. Valuable, local contacts have been established as well as common problems shared.

A followup questionnaire has been distributed to and collected from all network users. Questions address usage frequency and proficiency, the LAN, job effectiveness, system strengths and weaknesses, applications, equipment location and features, desktop publishing and graphics, additional needs, system security and system value. Results are being tabulated for further discussion.

## **5.4 Future Needs**

NEIC must continually remain aware of future office automation needs that equipment and network must accommodate. Currently, one 'Paperless Office' concept is being tested by automating the

Travel Advance/Voucher approval and paperwork process. The Travel Management System (TMS) will serve as the prototype for automating other paper-intensive processes at the NEIC. Another system currently under discussion is a Procurement Tracking System. Both of these and future 'Paperless Office' systems are considered as part of NEIC's needs for a network. Through users support groups and by maintaining state-of-the-art thinking in information management, NEIC must be able to manipulate existing hardware/software to meet future automation needs. The Apple Macintosh and AppleTalk network must be constantly evaluated in terms of meeting these needs.



## **CONCLUSIONS**

The Apple Macintosh SEs and IBM PC ATs linked through the local area network did, basically, meet the functional word processing and associated requirements for:

- Compatibility of new and existing equipment
- Conformance to Agency standards
- Apple/IBM PC connectivity
- Compound document production
- Desktop publishing

1. The Apple system basically meets the current capabilities of the IBM System 6.

The Macintosh system using Microsoft Word exceeds the capabilities of the IBM System 6, in all areas except one. MS Word, originally did not operate efficiently when documents were longer than about 15 to 20 pages. The upgrade to MS Word Version 3.01 provided for efficient production of up to 24 pages. Use of the PageMaker package in conjunction with MS Word (3.01) appears to be a solution for production reporting over 24 pages.

2. The Macintosh SE and printers are suitable replacements for the Lexitron workstations.

Operators found no substantial difference between Lexitron and Macintosh keyboards. Use of the mouse, a new factor with which to contend, received mixed acceptance, at first, particularly due to the fact that one must leave the keyboard to use the mouse for several commands (although many of the mouse commands have equivalent keyboard commands). The Macintosh successfully handled timekeeping, data entry, project tracking and E-Mail. It excelled in the areas of its spelling checker and quality (with many more features) of output. LaserWriters and the LaserWriter Plus are the printers of choice (due to better resolution and increased speed - 6 seconds per page).

The current printer configuration does not print envelopes, labels or forms, but an alternative hardware solution is being investigated.

The DEST Scanner is not a viable alternative for WP scanning; however, the limitations may not be true of other scanners on the market.

3. The local area network provides for effective telecommunication between physically separated buildings, the electronic transfer of files, queueing/spooling of printers and configurations compatibility between Apple and IBM. The TOPS print software does not properly route to specific laser printers for IBM PC-created documents, but this will hopefully be resolved with the upgrade to TOPS Version 2.0.

The File Server was most often used for the transfer of files between IBM PC AT and Apple Macintosh SE. Security is not a problem using the network.

4. The graphics station and desktop publishing capabilities significantly enhance NEIC's capabilities. The AppleTalk network allows the use of multiple word processing packages and hardware for assembly of quality publications - such as the NEIC newsletter. Graphics have successfully been incorporated into text. The ease of use has encouraged many new users to redesign forms and manuals, create organization charts, diagram instead of describe, and in general, liven up data processing documentation of all kinds. We anticipate the rapid expansion of report graphics.

The DEST scanner is a useful tool for graphics applications only.

The Macintosh and Tektronix graphics packages each had advantages when compared to each other.

The SuperView 19 inch screen is useful for page layout only, due to poor text resolution. Again, graphics and desktop publishing is best suited to the LaserWriter or LaserWriter Plus output quality.

The Macintosh and its network appears to be a viable alternative to current word processing technology at NEIC. Its advantages are:

- Shared document capability
- Quality and quantity of graphics, text, fonts and output in general
- Incorporation of graphics into text
- Use of the network to link IBM and Apple technology
- Output is of camera-ready quality
- Learned skills on one package are very transferable to a new package

The current system configuration, however, also has its disadvantages:

- A short period of adjustment to the mouse
- Minor bugs in TOPS print software
- Peculiarities with MS Word (such as for long reports)
- Possible hardware limitations for particular printing/scanning functions (i.e., envelopes, forms and label printing, SuperView screen resolution and lack of color output)

As mentioned within this report, most of these current disadvantages are currently under evaluation. Positively, NEIC feels there are hardware/software solutions for most of the issues.

NEIC concludes that the Macintosh system, as detailed herein, is a feasible alternative for centralized word processing and for individual clerical staff. It greatly enhances NEIC's graphics/desktop publishing capabilities. Finally, the network is a viable means of integrating the Agency's IBM compatible PC technology with Apple Macintosh technology.

## APPENDIX

### A COMMUNICATIONS METHODOLOGY

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### COMMUNICATIONS METHODOLOGY

The AppleTalk Pilot called for the network to serve nine separate locations within Building 53 and one location in Building 55. Although the two buildings are no more than 300 feet apart, the only practical means of providing communications between buildings was via the existing telephone wiring. Since all the telephone lines are routed through the central switchboard area in a building located approximately one quarter mile away, it was estimated that the total length of a circuit between buildings would be slightly more than one-half mile.

The technology using telephone circuitry for connecting an AppleTalk network has been developed by Farallon Computing of Berkeley, California. Their "Phone-Net" products include connectors to interface Apple equipment to twisted-pair telephone wires, and star controllers to permit a centralized star topology as opposed to a serial, "daisy-chain" approach. The NEIC network was designed to have a star controller located in each building joined by a local area data circuit, provided by the telephone company. Consideration was given to the possibility of placing a third star controller as a repeater, midway in the circuit between buildings provided access could be obtained at a suitable point.

A local company, Mountain Cable Industries, was given a contract to install the network wiring within Building 53. Four-pair number 24 solid telephone cable was used to provide for both AppleTalk and asynchronous ASCII communications. The computer room was selected as the location to install the star controller in Building 53, since the ASCII communications wiring must terminate at the Develcon port selector located in the computer room.

When the installation of equipment began, the circuit between buildings was first tested using a single Macintosh on each end. The two machines were able to communicate with no noticeable errors. However, when star controllers were introduced at each end, the error rate jumped up to about 10%. This level of errors caused problems, particularly with the laser printers. The LaserWriters seemed to give up after a large number of errors on the network, and print was lost.

The difficulties with the line between buildings were researched with the aid of a time domain reflectometer (TDR) borrowed from the National Computer Center. With this device it was possible to measure the length of the line and observe any signal reflections which might be present if the line had been improperly installed. The TDR showed that there were no serious reflections, but the length of the line was approximately 3,800 feet, exceeding the maximum recommended by Farallon.

Since the initial installation of the star controllers introduced some errors to the line between buildings, the idea of using a third one as a repeater seemed much less feasible. The problem was finally solved by connecting two circuits in parallel. Since the standard data circuit provides both transmitting and receiving pairs for full duplex operation, and AppleTalk requires only a single pair (half duplex), another pair was readily available. The parallel connection reduced the error rate to less than 1%, and the problems that had been observed were eliminated.