NASA Technical Memorandum 104615

NASAwide Electronic Publishing System--Electronc Printing and Duplicating, Stage-2 Evaluation Report (Goddard Space Flight Center)

Richard C. Tuey, Robert L. Lane, and Susan V. Hart

JANUARY 1995
NASAwide Electronic Publishing System--
Electronic Printing and Duplicating,
Stage-2 Evaluation Report
(Goddard Space Flight Center)

Richard C. Tuey
National Aeronautics and Space Administration
Washington, D.C.

Robert L. Lane
Susan V. Hart
Goddard Space Flight Center
Greenbelt, Maryland

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771
1995
EXECUTIVE SUMMARY

The purpose of the extension of the NASA-wide electronic duplicating system evaluation to include the Goddard Space Flight Center (GSFC) was to expand the agencywide functionality for electronic duplicating and through its inclusion, assess whether this technology would be more cost effective than the current process. Additional elements which differs from previous evaluation is the inclusion of the Xerox Document on Demand (XDOD) system and the use of a two phase approach to the evaluation. This report continues the evaluation reported in "NASA Electronic Publishing System -- Electronic Printing and Duplicating Evaluation Report" (NASA TM 106242) and "NASA Electronic Publishing System -- Stage 1 Evaluation Report" (NASA TM 106510).

The report is presented in three sections; the Introduction describes the duplicating configuration under evaluation; the Background and History is a chronological description of the evaluation segmented by phases-1 and -2. Included in this section of the report are the evaluation schedule, printing and duplicating requirements, storage and communication requirements, electronic publishing system configuration, existing processes, proposed processes, billing rates, costs and productivity analysis, and the return on investment based upon the data gathered to date. The phase-1 analysis demonstrated that GSFC should proceed with the evaluation of the DocuTech and XDOD on a 90-day evaluation or phase-2 cycle to actually demonstrate that the proposed system would meet the needs of GSFC's printing and duplicating requirements. The Phase-2 90-day Evaluation section describes the benchmark requirements, pre-benchmark testing, benchmark results, validation of the cost analysis, and the final comparative cost summaries. The appendices contain supporting information. The following paragraphs document the cost savings and potential productivity increases as a direct result in the acquisition of the Xerox networked DocuTech and the Xerox Document on Demand systems.

The first year potential cost savings ($462,000), excluding labor costs, and productivity gains in terms of reduction in response time (78 to 1,150 percent) are shown in Figure 1 and 2 respectively. Figure 1 shows the comparative costs for GPO and in-house duplicating, the networked DocuTech/XDOD costs, and the phase-2 revenue gained using the cost algorithm assigned during the phase-2 90-day evaluation cycle for annual impressions of 19,015,638.

Specific details on the costs are shown in Figure 16, Pricing and Table 6, Final comparative cost summaries. Specific details on productivity gains are shown in Figure 19, Productivity comparisons, and Table 2, Pre-benchmark comparisons.

![Figure 1. Cost comparisons.](image1)

![Figure 2. Productivity gains.](image2)
In summary, the phase-2 evaluation validates that the networked DocuTech and XDOD is cost effective and more efficient than the current process of printing, duplicating and editing. Figure 21 displays a cost benefit ratio of 0.60 (reference column G, roll 80) and return on investment ratio of 1.21 (reference column c, roll 72) which include an inflation factor of 2.5% per year for supplies and labor costs. Alternative cash flow comparisons over a five year period are display by Figure 21 by referring to Roll 66 - GPO
Roll 67 - In-House duplicating
Roll 68 - GPO/In-House duplicating combined
Roll 69 - DocuTech only
Roll 70 - DocuTech and Xerox Document on Demand (DocuTech/XDOD)

Figure 2A displays the computed savings through the use of the DocuTech/XDOD versus the previous method of sending all work to GPO and in-house duplicating, reference Table 6 and Figure 21. The return on investment during the first year increases to 2.70 (reference column C, roll 73), if an assumption can be made that a 0.5% productivity increase will occur through the use of this technology.

Additionally, potential future savings can be obtained in terms of mailing and storage costs. These potential savings have not been computed at this time as the current process versus a re-engineer process operational requirements have not been collected. However, once this data has been gather, the savings can be calculated using the information provided in the section on storage and communication requirements.

Figure 2B displays the first year of operational costs by cost component. The one-time charge is for technical support, training, and purchase of network software for the DocuTech. The cost per thousand of $21.51 is based upon an annual volume of 19,015,638 impressions versus cost per thousand of $27.37 for 29,353,644 impressions, reference Table 6 and Figure 21.
TABLE OF CONTENTS

INTRODUCTION ................................................................................................................. 1

BACKGROUND AND HISTORY ........................................................................................... 1
  Phase 1 - Chronology ........................................................................................................ 1
  Phase 2 - Chronology ........................................................................................................ 4
  Evaluation Schedule .......................................................................................................... 8
  Printing and Duplicating Requirements ............................................................................. 8
  Storage and Communication Requirements ....................................................................... 9
  Electronic Publishing System Configuration .................................................................... 11
  Existing Processes ........................................................................................................... 13
  Proposed Processes ........................................................................................................ 18
  Billing Rates for Electronic Publishing System Evaluation .............................................. 22
  Cost Analysis .................................................................................................................. 22
  Productivity Analysis ....................................................................................................... 27
  Phase 1 - Return on Investment ....................................................................................... 27

Phase 2 - 90-DAY EVALUATION ....................................................................................... 28
  Benchmark Requirements ............................................................................................... 28
  Pre-Benchmark File Transfer Testing .............................................................................. 29
  Benchmark Results ......................................................................................................... 32
  Validation of Cost Analysis .............................................................................................. 35
  Final Comparative Cost Summaries .................................................................................. 37

ACRONYMS AND ABBREVIATIONS .................................................................................... 39

REFERENCES ..................................................................................................................... 41

APPENDIX 1 - MEMBERS OF EVALUATION TEAM .......................................................... 43

APPENDIX 2 - COMPARATIVE CENTRAL PRINTING AND COPIER SPECIFICATIONS .... 45

APPENDIX 3 - NASA GENERAL COUNSEL RULING - JCP's DUPLICATING_THRESHOLDS
............................................................................................................................................ 47

APPENDIX 4 - FTP Log ...................................................................................................... 49
INTRODUCTION

The NASA Scientific and Technical Information Office (STIO) has been assigned the responsibility to include the Goddard Space Flight Center (GSFC) in the NASAwide Electronic Publishing System - Electronic Printing and Duplicating. This responsibility resulted from a need to assist the GSFC to reengineer their printing and duplicating services. As part of this evaluation, the GSFC printing and duplicating services will be examined to determine the cost benefits in the integration into the NASAwide electronic duplicating configuration. This evaluation will be conducted in two phases; the first phase will determine whether the installation of an electronic printing and duplicating system is cost effective and meets the printing and duplicating requirements for GSFC, and the second phase will consist of a 90-day evaluation of a printing and duplicating system on site with a benchmark conducted within 60 days from installation and acceptance to demonstrate that the system will meet the GSFC requirements and to validate the productivity gains.

During the phase-I evaluation cycle, a zero base cost acquisition of the phase-2 evaluation cycle will be implemented. That is, sufficient ongoing printing and duplicating work will be identified to be accomplished on the phase-2 evaluation cycle without violating Joint Committee on Printing (JCP) thresholds, thereby permitting the reallocation of funding from this work to the electronic printing and duplicating system.

Currently, six NASA installations (Lewis Research Center, Jet Propulsion Laboratory, Kennedy Space Center, Marshall Space Flight Center, Johnson Space Center, and Ames Research Center) have the electronic duplicating system installed. All will have networked capability by the end of 1994. The GSFC's electronic duplicating system will be determined through the evaluation of the networked DocuTech 135 in fulfilling the storage/duplicating/finishing requirements and to determine whether it is the best and most cost effective solution for Goddard.

The author acknowledges the many individuals who have contributed to the material contained in this evaluation report. Specific thanks go to the following individuals: Ms. Betty Graham, technical editor, Goddard Space Flight Center, who spent many hours in making this report available to NASA Headquarters; the Printing Management staff for their outstanding contributions in assembling and executing the networked DocuTech system evaluation at GSFC; the Publications staff for their outstanding contributions in assembling and executing the documents on demand evaluation at GSFC; Ms. Marilyn Tolliver and the Logistics Management staff in providing challenging applications for the networked DocuTech/Documents on Demand system; Ms. Hermina Thompson, Xerox Corporation, for her expertise and contributions in documenting the current process and proposed processed flow for applications on the networked DocuTech. There are many other contributors who are not named here, but who are mentioned in appendix 1 or throughout the evaluation report. Without their participation, this evaluation report could not have been written.

BACKGROUND AND HISTORY

Phase 1 - Chronology

The following is a chronology of highlights of the stage-2 project:

Mar 94 GSFC's Printing Management Officer has accepted Code JTT's assistance in the conduct of a cost benefit study to assist them in making the determination for the acquisition of an electronic duplicating system. This confirmation was accomplished on March 22, 1994. The Institutional Printing Management Officer (IPMO) will be gathering the necessary production statistics and coordinating with GSFC organizational codes on their duplicating requirements.
A meeting was scheduled with the GSFC staff responsible for printing and duplicating on March 30, 1994, to initiate the evaluation and to determine evaluation team assignments.

On March 30, 1994, Code JTT (Dick Tuey) met with GSFC staff to brief them on the progress to date regarding the networked DocuTech evaluation. GSFC attendees were

1. Beth Booker, Code 239 286-9594
2. Bob Lane, Code 253.2 286-5449
3. Theresa Wirth, Code 253 286-4422
5. Sue Hart, Code 253.1 286-2800
6. Richard Schmadebeck, Code 682 286-3089
7. Preston Pope, Code 253.2 286-8673
8. Dwaine Kronser, Code 253 286-7976
9. Marilyn Tolliver, Code 230 286-2211

The general tone of the meeting was favorable to the evaluation, and some concerns were expressed by the attendees. Before a system such as the networked DocuTech can be acquired, it must be demonstrated that there are overall savings and not just a break-even scenario. The meeting ended with Mr. Kronser assigning Mr. Lane the task of determining who will participate as evaluation team members for the study. A later phone conversation with Mr. Lane indicated that he, Ms. Wirth, and Mr. Pope will examine the current duplicating work with their users to assess whether the DocuTech would be a viable option for them. Input from these discussions was conveyed to Mr. Tuey during the first week of April 1994.

Mr. Bob Lane provided a brief overview of the status of their requirements identification and indicated that progress has been made and a major application that could be moved to the DocuTech had been identified. Discussions concerning this application and other requirement determinations was scheduled for April 15 at GSFC.

At the scheduled meeting, representatives of GSFC (Mr. Bob Lane, Mr. Preston Pope, Ms. Theresa Wirth) and Code JTT (Mr. Fred Moore, Mr. Dick Tuey) readdressed the overall requirements for a networked electronic publishing system. Mr. Lane and Mr. Moore agreed to identify a list of Government Printing Office (GPO) printing requirements by May 9 which could be diverted to the acquisition of a 90-day evaluation of an electronic duplicating system without violating the GPO printing thresholds. The amount of GPO printing required would be the identification of enough GPO work to fund approximately $7,000 per month for 3 months. By using this alternative, no additional funding will be required. During the meeting, Ms. Wirth expressed some concern that the schedule to have an initial evaluation report completed by June 24 was extremely optimistic. Mr. Tuey stated that the goal was not to identify all requirements but enough to provide the funding for the 90-day period. Once the system is installed and GSFC staff are aware of its existence and capabilities for doing their duplicating work cheaper and faster, it will sell itself.

On May 17, 1994, Code JTT staff (Mr. Fred Moore and Mr. Dick Tuey) met with GSFC staff (Mr. Dwaine Kronser, Mr. Bob Lane, and Mr. Don Ellis) regarding the networked electronic publishing system. Mr. Kronser's past concerns have now been satisfied by the NASA
General Counsel's ruling that NASA has no legal requirement to comply with the JCP duplicating threshold of 5,000/25,000 production units (reference the General Counsel's letter of May 4, 1994.) (Appendix 3.) With this ruling in hand, GSFC is now prepared to move forward with the evaluation of a networked electronic publishing system as originally proposed on March 22, 1994. Mr. Kronser and staff will decide the direction the evaluation should take. During this interim period, Mr. Tuey will proceed with the documentation as identified by the evaluation schedule in Figure 1. Mr. Kronser will explore the setup of an account whereby funds can be accumulated from various GSFC users of printing and duplicating services to pay for the 90-day evaluation of an electronic publishing system.

May 94

During the week of May 23, 1994, Code JTT staff assisted the GSFC in preparing the Justification for Other Than Full and Open Competition (JOFOC) for the evaluation of the networked DocuTech 135B/Documents on Demand System. Pricing information and verification of the utility of the system is currently in process by Xerox, with submission of this information to NASA by the first week in June 1994.

Code JTT staff (Fred Moore and Dick Tuey) met with Xerox staff (Scott Friedlander, Hermina Thompson, and Karen Murphy) on May 31, 1994, to discuss the GSFC applications being considered for the evaluation, along with the evaluation costs that will be incorporated into the JOFOC. Ms. Thompson provided an extensive analysis of the proposed applications that support the no-cost increase in duplicating and publication costs for GSFC's Printing and Duplicating Services Section and Publications and Graphics Services Section.

Jun 94

On June 7, 1994, the JOFOC for the acquisition of the networked DocuTech/Documents On Demand system on a Lease to Ownership Plan (LTOP) was completed, along with the phase-1 evaluation report to be discussed with GSFC staff on June 8.

On June 8, 1994, Code JTT staff (Fred Moore and Dick Tuey) met with GSFC staff (Dwaine Kronser, Bob Lane, Preston Pope, Susan Hart, and Luann Bindschadler) to review the JOFOC and phase-1 draft evaluation report for the acquisition of the networked DocuTech/Documents On Demand system. Based upon the information gathered to date, Mr. Dwaine Kronser is now convinced that the proposed evaluation of the subject system is a worthwhile project and that it will meet, in terms of real dollars, a yield of 25% reduction in duplicating costs for its customers. Clarification as to the requirements of the electronic document interchange project between Code JTT and GSFC (Sue Hart) was accomplished with slight modification to the Memorandum of Understanding (MOU) between GSFC's Code 253.1 and Code JTT. During this meeting, GSFC agreed to edit the stage-2 evaluation report for Code JTT.

GSFC staff (Bob Lane) has requested that Xerox provide a briefing on the morning of June 24, 1994, to five GSFC staff who will be providing funding for the 90-day evaluation of the networked DocuTech/Documents on Demand system. The GSFC staff are specifically interested in the use of the networked DocuTech for GSFC forms or handbooks, and demonstration of this type of application is being prepared for the GSFC staff by Xerox staff who will meet with them on June 22, 1994, in preparation for the June 24 demonstration.

On June 24, 1994, Xerox briefed and demonstrated the DocuTech to GSFC and Headquarters staff at their Rosslyn, Virginia, customer demonstration center. Attendees were
Mr. Scott Friedlander provided a brief overview of the capabilities of the DocuTech along with samples of actual publications, forms, brochures, etc., produced by the DocuTech from other Federal Agencies. Ms. Hermina Thompson and Ms. Karen Murphy demonstrated the capabilities of the DocuTech for specific GSFC applications. These were the scanning in of a two-sided printed form (Procurement Request Package Route Sheet), a three-part Plant Operations Management Division (POMD) Work Request with instructions for completing the form on the backside of the third page, and a 100-page handbook printed on both sides with inserts, followed by the reproduction of copies for each of the GSFC attendees. The GSFC staff were favorably impressed with the capabilities of the DocuTech and are anxious to thoroughly evaluate its capabilities on site.

On June 29, 1994, Code JTT staff (Fred Moore and Dick Tuey) met with GSFC staff (Bob Lane) to finalize the specific pricing and components for the 90-day evaluation of the DocuTech/Documents on Demand system. At this time, Bob Lane's coordination with the GSFC budget staff decided that for accounting purposes, it would be easier to fund the evaluation directly from within Code 253, instead of transferring funds from other codes within GSFC.

Phase 2 - Chronology

Jul 94  By July 11, 1994, Bob Lane had received a work order number (fund citation) to prepare the purchase requisition for the 90-day evaluation of the DocuTech/Documents on Demand system. Supporting documentation to the purchase order are the JOFOC and the Phase-1, NASAwide Electronic Publishing System - Stage-2 Evaluation Report, both dated July 1, 1994. Bob Lane confirmed the installation date of the Xerox DocuTech/Xerox Documents on Demand (XDOD) system as July 29, 1994. DocuTech training was scheduled for July 25, 1994, with initial operation on August 1, 1994. The schedule for installation has been accelerated from the estimated installation date of September 14, 1994, to July 29, 1994, a reduction of 47 calendar days.

On July 22, 1994, Dick Tuey met with Sue Hart to coordinate the GSFC prototype Scientific and Technical Information (STI) Electronic Document Interchange system and its physical location during the phase-2 evaluation cycle. As part of the evaluation of the networked DocuTech, Xerox is providing a bundled documents on demand system, which will be evaluated to determine if it meets the operational needs of the GSFC Publications and Graphics Section. A separate project plan is being prepared for this effort, but will be implemented in a manner that does not impact the overall production of the networked DocuTech. After meeting with Sue Hart, Dick Tuey met with Bob Lane and Debra Mitchell (duplicating technician) regarding the physical location of the networked DocuTech, along with a discussion on the initial establishment of user account codes. This will enable the Printing and Duplicating Services Section to gather the necessary data to determine the appropriate algorithm for charging the GSFC customers for their duplicating services.
On July 29, 1994, Headquarters staff (Fred Moore and Dick Tuey) met with GSFC staff (Bob Lane, Susan Hart, and Dwaine Kronser), Jorge Scientific Corporation (Jason Delooze), and Xerox staff (Karen Murphy, Linda Dickerson, Angela Howell, and Scott Friedlander) on the status of the networked DocuTech/XDOD installation and the evaluation requirements. A brief overview was provided by Dick Tuey, who covered general objectives of the evaluation, key benchmark requirements, key reference documents, and the phasing schedule for the prototype STI Electronic Document Distribution project and the networked DocuTech. After the full installation of the networked DocuTech/XDOD, biweekly status meetings will be scheduled to ensure that the evaluation system is meeting all the requirements of GSFC and that any problems which show up can be addressed immediately and resolved by Xerox.

On August 26, 1994, Headquarters staff (Fred Moore and Dick Tuey) met with GSFC staff (Bob Lane, Susan Hart, and Dwaine Kronser), Jorge Scientific Corporation (Jason Delooze), and Xerox staff (Karen Murphy, Linda Dickerson, Brett Raaum, Hermina Thompson, and Lorenzo Barnes) on the status of the networked DocuTech/XDOD installation. Mr. Bob Lane indicated that two problems need to be resolved by Xerox, the first dealing with additional training for the GSFC duplicating operator regarding extended storage, and the second regarding the response time in repair calls, e.g., the cover insertion module. Ms. Hermina Thompson provided an extensive briefing covering the DocuTech installation implementation strategy for GSFC. Items covered during the briefing were roles and responsibilities (Xerox, GSFC, and Headquarters), installation support, customer training, technical problem resolution, application development, and system consultative services. The XDOD delivery and installation have been scheduled for August 29, 1994, with training targeted for September 12, 13, and 14. Delivery occurred on August 30, 1994.

On August 29, 1994, Dick Tuey received the first set of statistical user accounts from Debbie Mitchell, GSFC DocuTech operator. Ms. Mitchell will be faxing these reports at the end of each week during the phase-2 evaluation cycle.

On August 30, 1994, the Printing and Duplicating Services Section held a Focus Group Session with GSFC external and internal users. Mr. Bob Lane introduced Dick Tuey (NASA Headquarters) and William Davis (Government Printing Office) to the attendees. Dick Tuey provided an overview of the NASAwide Electronic Publishing System -- Electronic Printing and Duplicating, and William Davis provided an overview of the services that the GPO provides. Bob Lane provided an overview of the GSFC Printing and Duplicating Services Section's organizational structure. Xerox (Scott Friedlander) provided a brief overview of the functionality of the DocuTech and Xerox Documents on Demand system. Following the presentations, a roundtable discussion with all attendees was conducted. In summary, many concerns, issues, and problems with printing by GPO and capabilities of the DocuTech were covered. Fred Moore emphasized his philosophy, that once a print job is submitted, it should be done right the first time, no reprinting or discounts. Additionally, he suggested to Bob Lane that subsequent sessions, such as today's session, be conducted again.

On September 8, 1994, Sue Hart provided a brief status of the XDOD installation. The installation appears to be completely in place; however, Xerox has not demonstrated that the system is ready to be used. A Transmission Control Protocol/Internet Protocol (TCP/IP) unique address has been assigned to the XDOD system. At this time, GSFC staff training for the XDOD system is in a state of flux because of conflicting schedules and will slip to the week of September 19, 1994. Xerox staff (Karen Murphy) has been notified to ensure that
communication links between the Networked DocuTech and XDOD are operational for the September 27, 1994, GSFC Open House.

On September 30, 1994, Dick Tuey met with Debbie Mitchell, GSFC duplicating technician on gathering statistics (by job, number of impressions, time to duplicate the job on the 5090 versus the DocuTech, quality of output, and difficulty level in duplicating the specific job) with respect to the jobs being duplicated on the DocuTech. Debbie Mitchell mentioned that proper training from Xerox should be performed off site rather than on site. An example is the on-site extended storage training which have taken 8 hours, of which only 1.5 hours were spend. A call to Xerox sales staff, Karen Murphy, voicing this concern was made by Dick Tuey who indicated that she would take care of any issues regarding the training.

The November 2, 1994 benchmark for the DocuTech/XDOD has been delayed to November 16, 1994 due to problems associated with communications to the DocuTech and XDOD servers. Since early October 1994, Xerox staff and GSFC staff have been attempting to resolve the communication problems. On October 24, 1994, Dick Tuey was able to communicate with the DocuTech Print Server. A file was sent to the Print Server, however, it did not appear to have received the file as there was no indication that it had been received as it did not appear in the subdirectory as a file. A call to Steve Witty, GSFC service desk on October 24, 1994 indicated that it appears that the communication problem has not been resolved. Xerox staff, Karen Murphy has setup a meeting with all appropriate Xerox personnel to resolve all expectations for a working DocuTech/XDOD system on October 28, 1994.

On October 25, 1994, Dick Tuey was successful in sending (File Transfer Protocol (FTP)) a 4.5-megabyte file to the Xerox Print Server from his personal computer (PC) work station which took approximately 2.3 minutes. The transfer rate varied from 32 to 35 kilobytes per second. Attempts at sending a file to the XDOD work station has so far been unsuccessful. At about 3:30 p.m., the same day, Dick Tuey successfully transmitted a file to the XDOD work station; however, he could not view the receipt of the file by XDOD. This confirmation was provided by the Xerox technician at a PC work station who could view the files on the XDOD workstation. The Xerox technician is in the process of resolving the viewing problems and hope to have all communication problems with the XDOD work station resolved by October 26, 1994.

As of October 28, 1994, 7:22 a.m., Dick Tuey had not been able to successfully communicate with XDOD; however, a successful transfer of a 3-megabyte file to the DocuTech was successful. On October 28, 1994, Xerox staff (Hermina Thompson, Karen Murphy, Scott Friedlander, Linda Dickerson, and Collin Nichols) and Headquarters staff met on November 16, 1994, to resolve issues regarding the requirements envisioned for the XDOD and benchmarking of the DocuTech. During the meeting, it was concluded that the XDOD software needed to be reloaded, since it might have been corrupted after so many patches and modifications to the XDOD software to enable it to communicate with Dick Tuey’s PC. At 2:00 p.m. that day, Debbie Mitchell, DocuTech operator, had printed the four Postscript print files transferred directly to the DocuTech’s print server from Dick Tuey’s PC.
As of October 31, 1994, 9:30 a.m., the XDOD was not operating. Coordination with Steve Witty, GSFC Service Desk staff, indicated that Steve could not get into Windows; the system is currently locked. A call to Xerox, Karen Murphy, was made at 9:40 a.m. to alert her of the problem with the XDOD system at GSFC.

On November 2, 1994, Dick Tuey attempted to logged in to the DocuTech and was not able to connect. On November 3, 1994, Dick Tuey successfully logged in to the DocuTech at 7:55 a.m. At 7:58 a.m., the same date, Dick Tuey attempted to logged in to the XDOD, first using xdod.gsfc.nasa.gov and next using 128.183.32.194 as the IP addressess. Neither IP was successful.

On November 14, 1994, Dick Tuey received an outline of the benchmark tests from Ms. Mary Collins for DocuTech and XDOD to be conducted on November 16, 1994. An attempt at transferring files from Dick Tuey's PC work station was not successful.

On November 15, 1994, at 6:15 a.m., Dick Tuey was successful in completely transferring 4 files from his PC work station to the XDOD client/server. A complete log showing the FTP transactions was printed out to document the transfer, plus a screen dump of before and after the transfer.

On November 16, 1994, at 6:23 a.m., Dick Tuey successfully transferred 4-files from his PC work station to the XDOD client/server. A FTP log for this transfer is documented in appendix 4. The official benchmark for the Xerox DocuTech and XDOD systems began at 8:30 a.m. and ended with a printout of the production statistics by the DocuTech at 4:45 p.m. In attendance were

**DocuTech:**  
Xerox staff - Mr. Collin Nichols, Ms. Hermina Thompson, Ms. Karen Murphy, Ms. Angie Howe, Mr. Scott Friedlander, Mr. Dave Daniels, and Ms. Linda Dickerson.

Operator - Ms. Debra Mitchell

NASA staff - Mr. Bob Lane and Mr. Dick Tuey

**XDOD:**  
Xerox staff - Ms. Hermina Thompson, Ms. Karen Murphy, and Ms. Angie Howe, Mr. Dave Daniels

Operator - Mr. Steve Witty

NASA staff - Ms. Susan Hart

Mr. Tuey with assistance from Mr. Lane prepared the documentation for the DocuTech benchmark. Ms. Hart prepared the documentation for the XDOD benchmark. Xerox staff were available to assist in case there were any major operational problems with the DocuTech or XDOD systems, none were encountered. Operators for the DocuTech and XDOD performed all functions without direct assistance by the Xerox staff.
Evaluation Schedule

Figure 3 shows an overall phasing schedule for the completion of the cost benefit analysis in support of a delivery of an evaluation system to validate the cost benefit analysis. The delivery, installation, benchmark, and determination on the retention of the electronic duplicating system are portrayed in the milestone schedule.

![Figure 3. Evaluation phasing schedule.](image)

Printing and Duplicating Requirements

The minimum printing and duplicating requirements for the electronic printing and duplicating system must meet the following requirements:

1. The ability to receive electronic files concurrently with the scanning of hard copy.
2. Capacity to print greater than 100 pages per minute.
3. Resolution of 600 dots per inch (dpi).
4. Tape binding.
5. Saddle stitching (8.5- x 11-inch page and 5.5- x 11-inch page).
6. Stapling (single and dual stitching).
7. Electronic media (Diskettes, Local Area Network (LAN), Wide Area Network (WAN), Internet).
8. The merging of preprinted covers (8.5- x 11-inch cover and 5.5- x 11-inch cover).
9. Printing of address label or image to designated location on any page of a job.
10. Extended storage.
11. Accounting by organization to allow cost recovery.
12. Printing on demand from authorized points within GSFC.
13. Storing, accessing, and printing documents on demand.

Storage and Communication Requirements

The optical disk capacity for a Write Once Read Many (WORM) or Rewriteable (5.25-inch disk) at 600 dpi with a 10:1 compression is calculated as follows:

1. An 8.5- x 11-inch page = 93.5 square inches.
2. Black text on white background.
3. Superior quality reproduction, 600 dpi (pixels).
5. Scanning at 600 dpi = 360,000 bits per square inch.
6. One page, no compression, 93.5 x 360,000 = 33,660,000 bits.
7. Therefore, 33,660,000 bits divided by 8 = 4,207,500 (4.208 MB) bytes on one page.
9. 154.5 x compression ratio of 10 = 1,545 pages per 5.25-inch disk.
10. Total number of pages divided by 1,545 = X number of 5.25-inch disks needed.
11. Assuming an average number of pages per publication = 20 pages.
12. Average number of publications per disk = 1,545 divided by 20 = 77.24 publications.

Typically, the number of pages stored on an optical disk will vary based on variation in the density of the information on a page. The number will also depend on the resolution of the raster image, measured in dots per inch as calculated above. For planning purposes, Xerox's experience with their documents on demand system has shown that the amount of disk space required for a 600-dpi scanned page is approximately 190 kilobytes (KB) with ± 25 KB. Optimally, a 650-MB disk could hold 650 MB divided by 190 KB/page @ 600 dpi = 3,400 pages or 3,400 divided by 20 = 170 publications.

During the phase-2 evaluation cycle, the proposed configuration (disk storage) for the mastering and accessing of technical publications will be validated through actual usage but, at present, is more than adequate to cover the 90-day evaluation using the more conservative calculation of 77.24 publications stored per disk. Projected sizing and performance requirements will be analyzed via the use of simulation techniques.

The estimated cost of a single magneto-optical storage disk (5.25-inch) is $250 each or $1,750 per box of ten disks. The cost per storage of a single 20-page publication would come to

$250 per disk divided by 170 publications = $1.47 per publication, or conservatively
$250 per disk divided by 77.24 publications = $3.24 per publication.

The storage of publications such as forms, handbooks, brochures, and TMs for later usage requires

1References, Number 4
physical space. For example, the warehouse for NASA Headquarters has a cost of $18.18 per square foot fully loaded. Specifically, this cost consists of the following breakdown:

1. Lease of Space $ 9.45 per sq ft
2. Contract Expenses $ 8.14 per sq ft
3. Overhead $ .59 per sq ft
Total Cost $18.18 per sq ft

Given the cost per square foot, it can be estimated that the storage of 100 copies of a 20-page document would come to approximately $9.45 divided by 100 = $ 0.0945 per copy. Since the publication would need to be identified and stored by some unique identification number, the physical space would be the same, regardless of the quantity of the same publication. Therefore, the cost for the storage of the publication would increase as the quantity of publications went down.

The communication capacity will vary according to the quality, speed, and bandwidth at the Goddard Space Flight Center. In calculating the response time, the following table provides the quality versus speed versus bandwidth for each page (8.5 x 11 inch or 400 words @ 200 dpi estimated @ 50 KB with a 10:1 compression ratio) being transferred or accessed over the Internet.

<table>
<thead>
<tr>
<th>Quality (dpi)</th>
<th>Page (Bytes/Bits)</th>
<th>1 Channel 64 Kbps</th>
<th>1.5 Mbps/T1</th>
<th>44.7 Mbps/T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>50 K/400 K</td>
<td>6.25 sec.</td>
<td>0.27 sec.</td>
<td>0.01 sec.</td>
</tr>
<tr>
<td>300</td>
<td>106 K/850 K</td>
<td>13.3 sec.</td>
<td>0.57 sec.</td>
<td>0.02 sec.</td>
</tr>
<tr>
<td>400</td>
<td>190 K/1.5 M</td>
<td>23.4 sec.</td>
<td>1.00 sec.</td>
<td>0.34 sec.</td>
</tr>
<tr>
<td>600</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

Using the above table, the transmission of a 20-page publication @ 400 dpi would take approximately

1. 23.4 sec, at 64 Kilo bits per second (Kbps), times 20 = 468 seconds or 7.8 minutes.
2. 1.0 sec, at 1.5 Mega bits per second (Mbps), times 20 = 20 seconds.
3. 0.34 sec, at 44.7 Mbps, times 20 = 6.8 seconds.

During the phase-2 evaluation cycle, the validation of the timing @ 600 dpi (request to receipt) for selected publications will be undertaken and documented.

The cost for the mailing of a 20-page publication via the U.S. Postal Service within the United States comes to

1. First Class = $ 1.44 1 to 3 days' transit (1 day within city, 2 days within 600 miles, 3 days greater than 600 miles)
2. Fourth Class = $ 1.21 2 weeks' transit
3. Overnight = $ 9.95 12 hours' transit
The proposed networked electronic publishing system which will meet the requirements cited above is displayed by Figures 4 and 5. Figure 5 provides an overview of the electronic publishing system network logical architecture, identifying a technical publication work group within a NASA center for transforming paper masters into digital image files, structuring them into electronic documents, indexing and storing them into a digital document base, and providing software tools for electronic access and viewing with the provision to prepare a job ticket for printing and reprinting them on demand via the networked duplicating work group within a NASA center.

Figure 4. Networked electronic publishing system components.

Figure 5 displays the hardware and communication interfaces between the NASA centers, work groups and access by the multiple client (user) platforms. Users can review their technical publications on the technical publication work group document server before submitting a job ticket to the duplicating work group for printing on demand by the networked DocuTech.
Specific components of the technical publication work group consist of

1. Mastering (Capture) Station
   a. PC 486/33 with 16MB ram
   b. 1.05 GB hard drive
   c. 3.5" 1.44 MB floppy
   d. 5.25" 1.2 MB floppy
   e. Serial mouse
   f. Monitor
   g. Ethernet controller card
   h. Interface card

2. Scanner
   a. 600 dpi
   b. Automatic document handler
   c. 20 pages per minute
   d. Up to 11- x 17-inch sheets

3. Document Server
   a. Sparc System 10 with 48MB ram
   b. 424 MB disk drive
   c. 1.05 GB SCSI-2 drive
   d. Sun CD ROM reader
   e. 3.5" floppy drive
   f. Monitor
   g. SBUS SCSI-2 ethernet card

4. Laser Printer With 2MB Memory

5. Integrated Software
   a. Xerox document management services
   b. Xerox distributed imaging services
   c. MS Windows
   d. MS DOS
   e. Gupta SQLBase for Windows
   f. Beame & Whiteside TCP/IP communications
   g. Xerox document server software
   h. Sun OS Software
   i. Gupta SQLBase for Unix

Specific components of the networked duplicating work group consist of

1. DocuTech Network Production Publisher NP 135B
2. Network Printer Server
3. Network Print Server Job Manager
4. Signature Booklet Maker
5. Covers Insertion Module
6. Extended Storage
7. Integrated Software
   a. Xerox DocuTech
   b. MAC 5 Netware
   c. TCP/IP Netware

---

**Figure 5. EPS network logical architecture.**

**Existing Processes**

Figure 6 represents a general flow diagram of the process steps by a user in duplicating a publication. The upper half of the figure identifies the steps for duplicating via the Xerox 5090, and the lower half identifies the steps for printing a publication when it is submitted to GPO. The duplicating requirement for the steps presented is identified in the upper right corner of Figure 6.

Specific steps are documented and presented as Figures 7 (general description) and 8 (Director’s Weekly). Each figure describes the steps required to produce the document, the total time for each step, general comments about the step, and functional position of the staff person performing the step in question (e.g., SDT for service desk technician and PS for printing specialist). The processing time has been provided as a total number from submission of the publication to its delivery to the customer.
Under the cost per copy program, the duplicating machines are located at the specific user site and are charged according to usage.

**Figure 6. Duplicating process.**

In determining the recovery of costs for the 90-day evaluation, a review of the GSFC's Printing Management Office Fiscal Year Report of Contract Printing, dated April 15, 1994, was made. Out of the many jobs listed in the report, a selection of eight jobs or five application categories was made. These eight jobs formulated the basis for full cost recovery of the evaluation. During the phase-2 or the 90-day evaluation cycle, there is no limit on the amount of duplicating done on the networked DocuTech; therefore, it can be assumed that the cost recovery will be more than adequate to cover the evaluation costs.

As described in the preceding paragraph, the eight jobs are further broken down into a matrix of key document characteristics. The matrix (Figure 9) identifies, by each job, the application category type, size of the document (8.5 x 11, 11 x 17, 5.5 x 8.5), type of finishing, the document content (text, line art, graphics, halftone), the number of pages, the frequency (weekly, monthly, bimonthly, biyearly, quarterly), and the total annual volume.

Coinciding with the key document characteristics, a second matrix (Figure 10) identifies, by each job, the amount of time (elapsed and actual time spent) by functional position in delivery of a final product for a customer from submission to its receipt.
## General Description

<table>
<thead>
<tr>
<th>Step No.</th>
<th>Steps Required to Produce the Key Document</th>
<th>Total Time</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Customers submit one of the following job requests: GSFC 25-11 Printing &amp; Duplicating Request GSFC 25-33 Publications Request GSFC 25-5 Presentation &amp; Graphics Request GSFC 25-7 Still Photography Request</td>
<td>5-10 m</td>
<td>The GSFC 25-11 Printing &amp; Duplicating Request Jobs are the primary focus of this analysis.</td>
</tr>
<tr>
<td>2</td>
<td>The job request is entered into the Management Information Cost Tracking System (MCTIS). An Information Management Division (IMD) Number is assigned, and available funding is noted on the request.</td>
<td>5 m</td>
<td>SDT</td>
</tr>
<tr>
<td>3</td>
<td>The job requirements are reviewed to determine how the job will be processed.</td>
<td>3-5 m</td>
<td>SDT</td>
</tr>
<tr>
<td>4</td>
<td>The customer is redirected to a printing specialist if it is determined that the job cannot be processed by the Service Desk or Bldg 16W.</td>
<td>1 m</td>
<td>SDT</td>
</tr>
<tr>
<td>5</td>
<td>Job requirements are reviewed for clarification with the customer.</td>
<td>5-20 m</td>
<td>Printing Specialist (PS)</td>
</tr>
<tr>
<td>6</td>
<td>Contractor is identified to process the job.</td>
<td>2-10 m</td>
<td>PS</td>
</tr>
<tr>
<td>7</td>
<td>The job is entered into the JTX cost analysis program, and funding is allocated.</td>
<td>5 m</td>
<td>PS</td>
</tr>
<tr>
<td>8</td>
<td>Seven copies of the 25-11 are printed and distributed.</td>
<td>5-10 m</td>
<td>PS</td>
</tr>
<tr>
<td>9</td>
<td>The contracting courier picks up the jobs twice daily from the outgoing box for processing.</td>
<td>4 hours</td>
<td>Contracting Courier</td>
</tr>
<tr>
<td>10</td>
<td>The contracting courier returns the completed job to the requester, the warehouse, or the mail room.</td>
<td>3-5 days</td>
<td>Contractor</td>
</tr>
<tr>
<td>11</td>
<td>Mail room personnel generate labels.</td>
<td>15 m</td>
<td>Mail Room Clerk</td>
</tr>
<tr>
<td>12</td>
<td>Labels are manually affixed to each copy.</td>
<td>30 m - 4 hours</td>
<td>Mail Room Clerk</td>
</tr>
<tr>
<td>13</td>
<td>Copies of the job are sorted by distribution destination for courier pickup or US Mail pickup.</td>
<td>1 hour</td>
<td>Mail Room Clerk</td>
</tr>
<tr>
<td>14</td>
<td>Courier picks up the mail and delivers to each building.</td>
<td>2-4 hrs</td>
<td>GSFC Transportation Driver</td>
</tr>
</tbody>
</table>

**Total Processing Time:** 3 - 5 Days 13:21 Minutes

*Figure 7. General description of current process.*
<table>
<thead>
<tr>
<th>Step No.</th>
<th>Steps Required to Produce the Key Document</th>
<th>Total Time</th>
<th>Comments</th>
<th>Functional Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Each Code submits its input on Wednesday.</td>
<td>6.5 hrs</td>
<td>All submissions are due weekly on Wednesday (electronically due 12:00; hard copy 2:00).</td>
<td>Service Desk Technician (SDT)</td>
</tr>
<tr>
<td>2</td>
<td>Archives Code submissions from the previous week.</td>
<td>5 m</td>
<td></td>
<td>SDT</td>
</tr>
<tr>
<td>3</td>
<td>Reviews and imports submissions for the current week into a working file.</td>
<td>5-20 m</td>
<td>Time is based on how many codes submit input for the week.</td>
<td>SDT</td>
</tr>
<tr>
<td>4</td>
<td>Validates information.</td>
<td>3 m</td>
<td></td>
<td>SDT</td>
</tr>
<tr>
<td>5</td>
<td>Runs a test print to local network laser printer.</td>
<td>30-40 m</td>
<td>Time depends on length of each submission.</td>
<td>SDT</td>
</tr>
<tr>
<td>6</td>
<td>Makes format edits only if required.</td>
<td>30-40 m</td>
<td>Time depends on number of formatting errors.</td>
<td>SDT</td>
</tr>
<tr>
<td>7</td>
<td>Reprints entire report if required.</td>
<td>1 hr</td>
<td>Time depends on number and length of submission.</td>
<td>SDT</td>
</tr>
<tr>
<td>8</td>
<td>Electronically sends confirmation notices to the Codes after 2:00 on Wednesday.</td>
<td>5-10 m</td>
<td></td>
<td>SDT</td>
</tr>
<tr>
<td>9</td>
<td>Manually assembles all hard copy submission in numerical order by code.</td>
<td>10-20 m</td>
<td>Time depends on number of manual submissions.</td>
<td>SDT</td>
</tr>
<tr>
<td>10</td>
<td>Automatically enters the electronic submissions from the Codes into an index. Manually registers the copy submissions.</td>
<td>5 m</td>
<td></td>
<td>SDT</td>
</tr>
<tr>
<td>11</td>
<td>Prints the indexed organization chart and places it on top of the week's submissions.</td>
<td>5-10 m</td>
<td></td>
<td>SDT</td>
</tr>
<tr>
<td>12</td>
<td>Blue numbers the pages on the back.</td>
<td>13-15 m</td>
<td></td>
<td>SDT</td>
</tr>
<tr>
<td>13</td>
<td>Completes a GSFC 25-11 and gives the package to a printing specialist.</td>
<td>5 m</td>
<td></td>
<td>SDT</td>
</tr>
<tr>
<td>14</td>
<td>Reviews the job for completeness and places a cover on top of the package.</td>
<td>3-20 m</td>
<td>Time depends on job complexity.</td>
<td>Printing Specialist (PS)</td>
</tr>
<tr>
<td>15</td>
<td>Enters the job into the JTX cost analysis program, and allocates funding.</td>
<td>5 m</td>
<td></td>
<td>PS</td>
</tr>
<tr>
<td>16</td>
<td>Prints and distributes seven (7) copies of the 25-11.</td>
<td>5-10 m</td>
<td></td>
<td>PS</td>
</tr>
<tr>
<td>17</td>
<td>The contracting courier picks up the jobs twice daily from the outgoing box for processing.</td>
<td>4 hr</td>
<td></td>
<td>Contracting Courier</td>
</tr>
<tr>
<td>18</td>
<td>The contracting courier returns the completed job to the requestor, the warehouse, or the mail room.</td>
<td>3-5 days</td>
<td>There is a 3 - 5 day turnaround time; however, much of the work is returned completed the following day. (Time represented in the Total Processing Time is 24 hours).</td>
<td>Contractor</td>
</tr>
<tr>
<td>19</td>
<td>Mail room personnel generate labels.</td>
<td>15 m</td>
<td></td>
<td>Mail Room Clerk</td>
</tr>
<tr>
<td>20</td>
<td>Affixes the labels manually to each copy.</td>
<td>30 m - 4 hrs</td>
<td>Time depends on the size of the job.</td>
<td>Mail Room Clerk</td>
</tr>
<tr>
<td>21</td>
<td>Sorts copies of the job by distribution destination for courier pickup or US Mail pickup.</td>
<td>1 hr</td>
<td>Time depends on the size of the job.</td>
<td>Mail Room Clerk</td>
</tr>
<tr>
<td>22</td>
<td>Courier picks up the mail and delivers to each building.</td>
<td>2-4 hrs</td>
<td></td>
<td>GSFC Courier</td>
</tr>
</tbody>
</table>

Total Processing Time: 47:37 hours
<table>
<thead>
<tr>
<th>Job Title</th>
<th>Application Category</th>
<th>Size</th>
<th>Finishing</th>
<th>Document Content</th>
<th>Volume</th>
<th>Frequency</th>
<th>Annual Volume Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director’s Weekly Booklet</td>
<td>Booklet</td>
<td>8.5 x 11</td>
<td>Dual Stitch</td>
<td>Text, Line Art</td>
<td>46,500</td>
<td>Weekly</td>
<td>2,418,000</td>
</tr>
<tr>
<td>Goddard Weekly Booklet</td>
<td>Booklet</td>
<td>8.5 x 11</td>
<td>Dual Stitch</td>
<td>Text, Line Art</td>
<td>41,385</td>
<td>Weekly</td>
<td>2,152,070</td>
</tr>
<tr>
<td>GEWA Newsletter</td>
<td>Newsletter</td>
<td>11 x 17</td>
<td>Fold</td>
<td>Text, Line Art</td>
<td>44,000</td>
<td>Monthly</td>
<td>2,288,000</td>
</tr>
<tr>
<td>Goddard Newsletter</td>
<td>Newsletter</td>
<td>11 x 17</td>
<td>Saddle Stitch</td>
<td>Text, Graphics, Line Art, Halftone</td>
<td>100,000</td>
<td>Monthly</td>
<td>1,200,000</td>
</tr>
<tr>
<td>NSSDC Newsletter</td>
<td>Newsletter</td>
<td>11 x 17</td>
<td>Saddle Stitch</td>
<td>Text, Graphics, Line Art, Halftone</td>
<td>20,000</td>
<td>Monthly</td>
<td>240,000</td>
</tr>
<tr>
<td>GSFC 17-92 Request for Training Form</td>
<td>Form</td>
<td>8.5 x 11</td>
<td>Multipart Carbonless Form Paper</td>
<td>Text, Line Art</td>
<td>10,000</td>
<td>6 Months</td>
<td>20,000</td>
</tr>
<tr>
<td>1994 GSFC Honor Awards</td>
<td>Pamphlet</td>
<td>5.5 x 8.5</td>
<td>Saddle Stitch</td>
<td>Text, Graphics, Line Art, Halftone</td>
<td>17,200</td>
<td>Quarterly</td>
<td>68,800</td>
</tr>
<tr>
<td>Request for Proposals</td>
<td>Book</td>
<td>8.5 x 11</td>
<td>3 Hole Punch</td>
<td>Text, Graphics</td>
<td>103,853</td>
<td>Monthly</td>
<td>1,246,240</td>
</tr>
<tr>
<td>HST</td>
<td>Document</td>
<td>8.5 x 11</td>
<td>Single Stitch</td>
<td>Text</td>
<td>4,638</td>
<td>Monthly</td>
<td>55,650</td>
</tr>
<tr>
<td>SF-2080</td>
<td>Form</td>
<td>8.5 x 11</td>
<td>Multipart</td>
<td>Text, Line Art</td>
<td>9,725</td>
<td>Monthly</td>
<td>116,700</td>
</tr>
<tr>
<td>FY 94 OMPT</td>
<td>Document</td>
<td>8.5 x 11</td>
<td>Single Stitch</td>
<td>Text, Graphics</td>
<td>5,146</td>
<td>Monthly</td>
<td>61,760</td>
</tr>
<tr>
<td>Project Plans</td>
<td>Document</td>
<td>8.5 x 11</td>
<td>Dual Stitch</td>
<td>Text, Graphics</td>
<td>4,250</td>
<td>Monthly</td>
<td>51,000</td>
</tr>
<tr>
<td>EOS</td>
<td>Document</td>
<td>8.5 x 11</td>
<td>Single Stitch</td>
<td>Text</td>
<td>4,250</td>
<td>Monthly</td>
<td>51,000</td>
</tr>
<tr>
<td>NASA Newsletter</td>
<td>Newsletter</td>
<td>11 x 17</td>
<td>Saddle Stitch</td>
<td>Text, Graphics, Line Art, Halftone</td>
<td>13,520</td>
<td>Monthly</td>
<td>162,240</td>
</tr>
<tr>
<td>XRONOS</td>
<td>Pamphlet</td>
<td>8.5 x 11</td>
<td>Single Stitch</td>
<td>Text, Graphics</td>
<td>14,125</td>
<td>Monthly</td>
<td>169,500</td>
</tr>
<tr>
<td>Legacy</td>
<td>Pamphlet</td>
<td>8.5 x 11</td>
<td>Single Stitch</td>
<td>Text, Graphics</td>
<td>19,167</td>
<td>Monthly</td>
<td>230,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9,225,520</td>
</tr>
</tbody>
</table>

Figure 9. Document characteristics.
**Key Document Handling Matrix (by Functional Position)**

<table>
<thead>
<tr>
<th>Key Document Title</th>
<th>Service Desk Technician</th>
<th>Printing Specialist</th>
<th>Contractor</th>
<th>Mail Room Clerk</th>
<th>GSFC Transportation Courier</th>
<th>Warehouse Support</th>
<th>Publication Archive</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director's Weekly</td>
<td>6.5h</td>
<td>35m</td>
<td>4h</td>
<td>3-5d</td>
<td>3h</td>
<td>4h</td>
<td>1h</td>
<td>0</td>
</tr>
<tr>
<td>Goddard Weekly</td>
<td>6.5h</td>
<td>35m</td>
<td>4h</td>
<td>3-5d</td>
<td>5:15h</td>
<td>4h</td>
<td>1h</td>
<td>0</td>
</tr>
<tr>
<td>GEWA Newsletter</td>
<td>15m</td>
<td>35m</td>
<td>4h</td>
<td>1d</td>
<td>5:15h</td>
<td>4h</td>
<td>1h</td>
<td>0</td>
</tr>
<tr>
<td>Goddard News</td>
<td>15m</td>
<td>1:30h</td>
<td>4h</td>
<td>5+d</td>
<td>5h</td>
<td>4h</td>
<td>1h</td>
<td>0</td>
</tr>
<tr>
<td>NSSDC News</td>
<td>15m</td>
<td>1:30h</td>
<td>4h</td>
<td>5+d</td>
<td>5h</td>
<td>4h</td>
<td>1h</td>
<td>0</td>
</tr>
<tr>
<td>NASA Technical Memorandum</td>
<td>15m</td>
<td>1h</td>
<td>4h</td>
<td>5+d</td>
<td>3h</td>
<td>4h</td>
<td>1h</td>
<td>30m</td>
</tr>
<tr>
<td>GSFC 17-92 Request for Training Form</td>
<td>10m</td>
<td>35m</td>
<td>4h</td>
<td>5d</td>
<td>0</td>
<td>4h</td>
<td>1h</td>
<td>10m</td>
</tr>
<tr>
<td>1994 GSFC Honor Awards</td>
<td>10m</td>
<td>1h</td>
<td>4h</td>
<td>5+d</td>
<td>0</td>
<td>4h</td>
<td>1h</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15:02h</strong></td>
<td><strong>6:20h</strong></td>
<td><strong>40h</strong></td>
<td>32:33d</td>
<td>26:30h</td>
<td><strong>40h</strong></td>
<td><strong>8h</strong></td>
<td><strong>40m</strong></td>
</tr>
</tbody>
</table>

**Figure 10. Elapse time (current process).**

Legend: m = minutes, h = hours, d = days

**Proposed Processes**

Generally, the electronic duplicating process steps are shown by Figure 11 and are described by the section on "Proposed Process."

**Figure 11. DocuTech process steps.**
With the networked production DocuTech, the user has three alternatives in the submission of the publication. The first, as has been followed in the past, is to submit the publication in hard copy form to be duplicated in house on the Xerox 5090 or on the on-site duplicating machine (cost per copy); the second is to submit the publication on a diskette; and the third is to electronically transmit the publication to the networked DocuTech’s print server. Assuming that a list of mailing addresses is submitted with the publication, these addresses will be merged with each publication. The final result is a finished publication to be picked up by a mail room clerk for distribution.

In analyzing each of the jobs destined to be duplicated on the networked production DocuTech, Figure 12 displays, in matrix form, the estimated time that each job will take. This total processing time is determined by the operator who first analyzes the job and sets up (programs) the DocuTech. Essential steps in the process are to scan originals, to make program adjustments, to set up paper trays, to run proof copy, to perform image editing, to print the job, and to set up the booklet maker as appropriate for a 5.5” x 8.5” saddle stitch booklet.

Figures 13 and 14 provide a step-by-step analysis of the proposed process (general description and Director’s Weekly) by laying out in matrix format the job sequence: a description of the steps required to produce the document within the job sequence, the functional position required to perform the job sequence, and the original time and proposed time for the job sequence. Time- and cost-saving opportunities are flagged by an “X” for the specific job sequence in the matrix.

The concurrency capability of the Xerox DocuTech Production Publisher allows multiple jobs to be in progress on the system at the same time. Key considerations are that the originals are only scanned once; a job can be printing while the next job is being scanned; jobs can be sent via the network while printing, scanning, or programming a job; jobs can be sent via floppy disk while receiving from the network, or printing, scanning, or programming a job; jobs can be stored on the system for printing later; printing and scanning can be interrupted to print another job and resume with original job when finished; and finally, paper stock can be replenished while the system is still printing.

<table>
<thead>
<tr>
<th>Key Document Title</th>
<th>Analyze &amp; Program</th>
<th>Scan Originals</th>
<th>Program Adjustment</th>
<th>Set Up Paper Trays</th>
<th>Run Proof</th>
<th>Image Editing</th>
<th>Print Job</th>
<th>Set Up Booklet Maker</th>
<th>Total Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director’s Weekly</td>
<td>5m</td>
<td>5m</td>
<td>5m</td>
<td>3m</td>
<td>1m</td>
<td>0</td>
<td>5h</td>
<td>0</td>
<td>5:24h</td>
</tr>
<tr>
<td>Goddard Weekly</td>
<td>5m</td>
<td>4m</td>
<td>5m</td>
<td>3m</td>
<td>5m</td>
<td>0</td>
<td>5h</td>
<td>0</td>
<td>5:18h</td>
</tr>
<tr>
<td>GEWA Newsletter</td>
<td>5m</td>
<td>1m</td>
<td>5m</td>
<td>3m</td>
<td>1m</td>
<td>0</td>
<td>5:43h</td>
<td>0</td>
<td>5:27h</td>
</tr>
<tr>
<td>Goddard News</td>
<td>5m</td>
<td>1m</td>
<td>30m</td>
<td>3m</td>
<td>1m</td>
<td>3m</td>
<td>12:30h</td>
<td>0</td>
<td>13:13h</td>
</tr>
<tr>
<td>NSSDC News</td>
<td>5m</td>
<td>1m</td>
<td>30m</td>
<td>3m</td>
<td>1m</td>
<td>3m</td>
<td>4h</td>
<td>0</td>
<td>4:43h</td>
</tr>
<tr>
<td>NASA Technical Memo</td>
<td>5m</td>
<td>5m</td>
<td>20m</td>
<td>3m</td>
<td>1m</td>
<td>1m</td>
<td>2h</td>
<td>0</td>
<td>2:35h</td>
</tr>
<tr>
<td>GSFC 17092 Request</td>
<td>5m</td>
<td>1m</td>
<td>5m</td>
<td>3m</td>
<td>1m</td>
<td>0</td>
<td>7:40h</td>
<td>0</td>
<td>7:55h</td>
</tr>
<tr>
<td>Form</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994 GSFC Honor</td>
<td>5m</td>
<td>1m</td>
<td>1h</td>
<td>3m</td>
<td>1m</td>
<td>3m</td>
<td>2:15h</td>
<td>1h</td>
<td>3:28h</td>
</tr>
</tbody>
</table>

Figure 12. DocuTech processing time.

Legend: m = minutes, h = hours
<table>
<thead>
<tr>
<th>Step No.</th>
<th>Steps Required to Produce the Key Document</th>
<th>Functional Position</th>
<th>Before Time</th>
<th>After Time</th>
<th>Time Saving Opportunities</th>
<th>Cost Saving Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Customers submit one of the following job requests: GSFC 25-11 Printing &amp; Duplicating Request GSFC 25-33 Publications Request GSFC 25-5 Presentation &amp; Graphics Request GSFC 25-7 Still Photography Request</td>
<td>Service Desk Technician (SDT) &amp; Customer</td>
<td>5-10 m</td>
<td>5-10 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The job request is entered into the Management Information Cost Tracking System (MICTS). An IMD Number is assigned, and available funding is noted on the request.</td>
<td>SDT</td>
<td>5 m</td>
<td>5 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>The job requirements are reviewed to determine how the job will be processed.</td>
<td>SDT</td>
<td>3-5 m</td>
<td>3-5 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The customer is redirected to a printing specialist if it is determined that the job cannot be processed by the Service Desk or Bldg 16W.</td>
<td>SDT</td>
<td>1 m</td>
<td>1 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Job requirements are reviewed for clarification with the customer.</td>
<td>Printing Specialist (PS)</td>
<td>5-20 m</td>
<td>5-20 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Contractor is identified to process the job.</td>
<td>PS</td>
<td>2-10 m</td>
<td>2-10 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>The job is entered into the JTX cost analysis program and funding is allocated.</td>
<td>PS</td>
<td>5 m</td>
<td>5 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Seven copies of the 25-11 are printed and distributed.</td>
<td>PS</td>
<td>5-10 m</td>
<td>5-10 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>The contracting courier picks up the jobs twice daily from the outgoing box for processing.</td>
<td>Contracting Courier</td>
<td>4 hours</td>
<td>4 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>The contracting courier returns the completed job to the requester, the warehouse, or the mail room.</td>
<td>Contractor</td>
<td>3-5 days</td>
<td>2-8 hrs</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>Mail room personnel generate labels.</td>
<td>Mail Room Clerk</td>
<td>15 m</td>
<td>0</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Labels are manually affixed to each copy.</td>
<td>Mail Room Clerk</td>
<td>30 m - 4 hours</td>
<td>0</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>Copies of the job are sorted by distribution destination for courier pickup or US Mail pickup.</td>
<td>Mail Room Clerk</td>
<td>1 hour</td>
<td>1 hour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Courier picks up the mail and delivers to each building.</td>
<td>GSFC Transportation Driver</td>
<td>2-4 hrs</td>
<td>2-4 hrs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Processing Time: 3 - 5 Days 13:21 Minutes

**Figure 13. General description (process comparisons).**
<table>
<thead>
<tr>
<th>Step No.</th>
<th>Steps Required to Produce the Key Document</th>
<th>Functional Position</th>
<th>Before Time</th>
<th>After Time</th>
<th>Time Saving Opportunities</th>
<th>Cost Saving Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Each Code submits its input on Wednesday.</td>
<td>Service Desk Technician (SDT)</td>
<td>6.5 hrs</td>
<td>6.5 hrs</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>Archives Code submissions from the previous week.</td>
<td>SDT</td>
<td>5 m</td>
<td>5 m</td>
<td>x x</td>
<td>x x</td>
</tr>
<tr>
<td>3</td>
<td>Reviews and imports submissions for the current week into a working file.</td>
<td>SDT</td>
<td>5:20 m</td>
<td>5:20 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Validates Information.</td>
<td>SDT</td>
<td>3 m</td>
<td>3 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Runs a test print to local network laser printer.</td>
<td>SDT</td>
<td>30-40 m</td>
<td>30-40 m</td>
<td>x x</td>
<td>x x</td>
</tr>
<tr>
<td>6</td>
<td>Makes format edits only if required.</td>
<td>SDT</td>
<td>30-40 m</td>
<td>30-40 m</td>
<td>x x</td>
<td>x x</td>
</tr>
<tr>
<td>7</td>
<td>Reprints entire report if required.</td>
<td>SDT</td>
<td>1 hr</td>
<td>1 hr</td>
<td>x x</td>
<td>x x</td>
</tr>
<tr>
<td>8</td>
<td>Electronically sends confirmation notices to the Codes after 2:00 on Wednesday.</td>
<td>SDT</td>
<td>5-10 m</td>
<td>5-10 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Manually assembles all hard copy submission in numerical order by code.</td>
<td>SDT</td>
<td>10-20 m</td>
<td>10-20 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Automatically enters the electronic submissions from the codes into an index. Manually registers the copy submissions.</td>
<td>SDT</td>
<td>5 m</td>
<td>5 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Prints the indexed organization chart and places it on top of the week's submissions.</td>
<td>SDT</td>
<td>5-10 m</td>
<td>5-10 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Blue numbers the pages on the back.</td>
<td>SDT</td>
<td>13-15 m</td>
<td>13-15 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Completes a GSPC 25-11 and gives the package to a printing specialist.</td>
<td>SDT</td>
<td>3 m</td>
<td>3 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Reviews the job for completeness and places a cover on top of the package.</td>
<td>Printing Specialist (PS)</td>
<td>3-20 m</td>
<td>3-20 m</td>
<td>X X</td>
<td>X x</td>
</tr>
<tr>
<td>15</td>
<td>Enters the job into the Job Tracking System (JTX) cost analyst program, and allocates funding.</td>
<td>PS</td>
<td>5 m</td>
<td>5 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Prints and distributes seven (7) copies of the 25-11.</td>
<td>PS</td>
<td>5-10 m</td>
<td>5-10 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>The contracting courier picks up the jobs twice daily from the outgoing box for processing.</td>
<td>Contracting Courier</td>
<td>4 hr</td>
<td>4 hr</td>
<td>X X</td>
<td>X x</td>
</tr>
<tr>
<td>18</td>
<td>The contracting courier returns the completed job to the requester, the warehouse, or the mail room.</td>
<td>Contractor</td>
<td>3-5 days</td>
<td>3-2 days</td>
<td>X X</td>
<td>X x</td>
</tr>
<tr>
<td>19</td>
<td>Mail Room personnel generate labels.</td>
<td>Mail Room Clerk</td>
<td>15 m</td>
<td>0</td>
<td>X X</td>
<td>X x</td>
</tr>
<tr>
<td>20</td>
<td>Affixes the labels manually to each copy.</td>
<td>Mail Room Clerk</td>
<td>30 m - 4 hrs</td>
<td>0</td>
<td>X X</td>
<td>X x</td>
</tr>
<tr>
<td>21</td>
<td>Sorts copies of the job by distribution destination for courier pickup or US Mail pickup.</td>
<td>Mail Room Clerk</td>
<td>1 hr</td>
<td>1 hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Courier picks up the mail and delivers to each building.</td>
<td>GSPC Courier</td>
<td>2-4 hrs</td>
<td>2-4 hrs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Processing Time: 47:37 hours

**Figure 14. Director's Weekly current process.**
Phase 1 - COMPARATIVE COST AND PRODUCTIVITY ANALYSIS

Billing Rates for Electronic Publishing System Evaluation

Figure 15 displays the cost algorithm for the networked DocuTech for full cost recovery for the phase-2 evaluation cycle. The production numbers match those identified by Figure 9 and, for the initial cost analysis purposes, represent those printing and duplicating jobs which can be transferred to the networked DocuTech Publisher system. As identified earlier, all duplicating work done on the 5090 during the benchmark will be done on the DocuTech, along with the cost recovery jobs during the 90-day evaluation.

Cost Analysis

Figure 16 displays the basic costs for the networked DocuTech Publisher system during the phase-2 evaluation and the operational costs after the evaluation. Using 1.342 cents per page times the number of estimated yearly pages gives the total recovery costs during the phase-2 evaluation; Figure 15 displays the production profile required to break even. This monthly total of 616,965 impressions is derived directly from the total estimated impressions displayed in the upper (right corner) matrix portion of Figure 15 (Column M, Roll 3). In interpreting Figure 15, columns are represented by upper case letters and the rolls are represented by numeric numbers. The production profile is shown in Figure 9 where jobs of a similar nature can be categorized as Type 1, that is, Job 1, and so forth. A total of five application categories of jobs are displayed for this analysis.

Figure 17 provides a matrix of the estimated production volume to achieve a break-even point after the phase-2 evaluation. Until the actual production workload statistics are gathered, an estimated workload of 1,562,404 impressions is required to fully recover all costs for the networked DocuTech Publisher and Documents on Demand in its fully configured mode, reference Figure 17 (Column M, Roll 31). At this stage of the analysis, the cost algorithm for the networked DocuTech does not attempt to recover costs for staffing, space, or special training requirements for the system.

Figure 18 reflects all cost parameters and displays the 5-year cash outflow for four alternatives. The first alternative is printing through GPO commercial printing; the second alternative is duplicating through the cost per copy program, the third is duplicating through the use of the networked DocuTech Publisher without the Document On Demand module, and the fourth alternative is duplicating through the use of the networked DocuTech Publisher/Documents on Demand with all available features. As of July 1, 1994, the calculations presented in Figure 18 are not reflective of the potential costs for the system. This figure will be updated during the phase-2 evaluation cycle and the text changed accordingly.

Figure 18 also displays a comparison of the four alternatives over a 5-year cash-flow period. Supplemental analyses are displayed for each alternative, such as Net Present Value, Present Value, Average Cost Per Year, Average Cost Per Thousand, and the Benefit/Cost Ratio plus benefits of the highest alternative against the remaining three alternatives. Finally, identification of productivity gains is derived on a global basis with potential gains for the installation ranging from 0.5 to 6.0 percent. The average full time equivalent (FTE), including benefits, is calculated for all civil servants within the installation and, when determined, provides the potential cost avoidance when a networked DocuTech Publisher has been installed.
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production Workload To Recover Monthly Evaluation Costs - Phase 1 Justification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td>Rate</td>
<td>Misprint’s Dolate</td>
<td>Goldmark Dolate</td>
<td>CRED Pareane</td>
<td>Goldmark Pareane</td>
<td>NSB Pareane</td>
<td>RAS TKE</td>
<td>CSRK 17–3 Effect Ave</td>
<td>Training Ave</td>
<td>100% CSRK Pareane Ave</td>
<td>100% RAS Pareane From YFFC</td>
<td>CPE Cost</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Total Impressions</td>
<td>1</td>
<td>0.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1-Sided Prints</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2-Sided Prints</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11x17 Prints</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11x17 Impressions</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Single Print Jobs</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Scans</td>
<td>30</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hands</td>
<td>200</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Single Stitches</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dual Stitches</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Booklets</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11x17 Booklets</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Weekly Cost:**
- $250.81
- $453.00
- $667.76
- $2,112.51
- $2,703.00
- $875.00
- $1,710.00
- $100.00
- $4,834.00
- $3,388.00

**Est. 90 Day Eval Cost:**
- $2,400.52
- $5,567.76
- $1,112.51
- $2,703.00
- $875.00
- $1,710.00
- $100.00
- $4,834.00
- $3,388.00

**Average Monthly Cost:**
- $2,000.84
- $1,858.92
- $7,874.77
- $1,358.34
- $3,388.00
- $154.33
- $108.18
- $275.36
- $3,388.00
- $16,941.66

**Est. Annual Impressions:**
- $2,418,000
- $2,152,024
- $528,000
- $1,200,000
- $240,000
- $321,360
- $120,000
- $55,404
- $4,903,584

**Cost Per Impression:**
- $0.0119
- $0.0119
- $0.0119
- $0.0119
- $0.0119
- $0.0119
- $0.0119
- $0.0119

**Jobs Annually:**
- 50
- 50
- 50
- 50
- 50
- 50
- 50
- 50
- 50

**Pages Per Job:**
- 20
- 20
- 20
- 20
- 20
- 20
- 20
- 20
- 20

**Cost Per Publication:**
- $1.12
- $1.00
- $0.00
- $0.11
- $0.13
- $1.19
- $0.00
- $0.00
- $0.50

**Monthly Eval Costs:**
- $3,665.00
- $1,688.66
- $3,388.00
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66

**Revenue:**
- $7,495.59
- $3,388.00
- $3,388.00
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66

**CPE Cost:**
- $7,495.59
- $3,388.00
- $3,388.00
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66
- $1,388.66

**ROI:**
- 1.38

**Figure 15. Phase-1 production profile.**
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cost Item</td>
<td>List Price</td>
<td>GSA Provisional Remot</td>
<td>DDC (or) 2000</td>
<td>ONT (or) 640</td>
<td>Total Daily</td>
<td>Monthly</td>
<td>Charge/Supply</td>
<td>Total</td>
<td>Notes</td>
</tr>
<tr>
<td>2</td>
<td>240v Network Hub Adapter with Reel Transport (IP:240M)</td>
<td>270,000</td>
<td>0</td>
<td>42,296</td>
<td>213,200</td>
<td>1,800,800</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>240v Network Print Server (1 piece)</td>
<td>24,000</td>
<td>821</td>
<td>0</td>
<td>6,666</td>
<td>27,042</td>
<td>254</td>
<td>254</td>
<td>254</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>240v Job Manager Portable (4 pieces)</td>
<td>4,000</td>
<td>74</td>
<td>1,050</td>
<td>3,200</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>Daily Production (5 days/week) 40,500</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Signature Bonded Binder Holder - (20,000 - 6,250 (SR1082)</td>
<td>50,000</td>
<td>1,175</td>
<td>6,500</td>
<td>41,500</td>
<td>350</td>
<td>350</td>
<td>350</td>
<td>Weekly Production 225,500</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Cover Insertion Module (Retail only with Signature Bonded Binder Holder)</td>
<td>12,000</td>
<td>0</td>
<td>2,500</td>
<td>8,500</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>Monthly Production 810,000</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>240v Labeling (Large Market)</td>
<td>5,000</td>
<td>0</td>
<td>0</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>240v Extended Storage (2500) (8 Mbytes, optical drive 605 mb) (SR13)</td>
<td>6,000</td>
<td>0</td>
<td>8,065</td>
<td>31,735</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>Recommended Mfr Avery 750K, 1,000K</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>BIP (RPM, RPM) (Open Market)</td>
<td>4,000</td>
<td>0</td>
<td>0</td>
<td>4,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>240v Network (Open Market)</td>
<td>600</td>
<td>0</td>
<td>0</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>LAN Manager</td>
<td>6,000</td>
<td>0</td>
<td>0</td>
<td>6,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Consulting Services &amp; Technical Support</td>
<td>12,000</td>
<td>0</td>
<td>12,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Extended Warranty Renewal (3 Months)</td>
<td>14,750</td>
<td>0</td>
<td>14,750</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Computers Trade-in Incentive RDP CD Press (Model SR1064)</td>
<td>7,000</td>
<td>0</td>
<td>7,000</td>
<td>7,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Subtotal</td>
<td>428,499</td>
<td>12,950</td>
<td>71,185</td>
<td>343,329</td>
<td>291</td>
<td>291</td>
<td>291</td>
<td>291</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Remotes on Demand Capture Solution</td>
<td>66,424</td>
<td>0</td>
<td>66,424</td>
<td>37</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>BIP Laser Class Plotter (EH2040) and Interlink 25 (EH2040)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Upgrade IP scanner monitor to 21 inch monitor</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>PC Processors Upgraded to 486/66</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Image Print Paths (IP35) for I/Print Server</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>XPD (RPM, RPM)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>On-site seeding</td>
<td>3</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Subtotal</td>
<td>60,849</td>
<td>4,005</td>
<td>64,854</td>
<td>1,198</td>
<td>77</td>
<td>77</td>
<td>77</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Total</td>
<td>489,348</td>
<td>17,010</td>
<td>71,185</td>
<td>618,594</td>
<td>392</td>
<td>392</td>
<td>392</td>
<td>392</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>System Service Agreement - 2 BR (Q (all copiers - 3BR)</td>
<td>n/a</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,160</td>
<td>1,160</td>
<td>1,160</td>
<td>1,160</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Site Service Agreement - High Speed FAX (Up to 1.9 MB) - 2BR (all BR)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>System Service Agreement - One BR (2 BR (all BR) - 3BR)</td>
<td>n/a</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2,655</td>
<td>2,655</td>
<td>2,655</td>
<td>2,655</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Service Training</td>
<td>3,500</td>
<td>0</td>
<td>3,500</td>
<td>950</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>240vnet Publisher Security Administration</td>
<td>n/a</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>240vnet Publisher Site Administration</td>
<td>1 day</td>
<td>n/a</td>
<td>1</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>240vnet Publisher including Network/Share</td>
<td>2 day</td>
<td>n/a</td>
<td>2</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>240vnet Network Publisher Switching</td>
<td>n/a</td>
<td>0</td>
<td>n/a</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>240vnet Network Publication Switching</td>
<td>n/a</td>
<td>0</td>
<td>n/a</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>240vnet Network Publisher Switching</td>
<td>n/a</td>
<td>0</td>
<td>n/a</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>240vnet Network Publisher Switching</td>
<td>n/a</td>
<td>0</td>
<td>n/a</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>240vnet Network Publisher Switching</td>
<td>n/a</td>
<td>0</td>
<td>n/a</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>240vnet Network Publisher Switching</td>
<td>n/a</td>
<td>0</td>
<td>n/a</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>240vnet Network Publisher Switching</td>
<td>n/a</td>
<td>0</td>
<td>n/a</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>240vnet Network Publisher Switching</td>
<td>n/a</td>
<td>0</td>
<td>n/a</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>240vnet Network Publisher Switching</td>
<td>n/a</td>
<td>0</td>
<td>n/a</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Supplies</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Dry Ink (EH655/9/5)</td>
<td>250/total</td>
<td>180</td>
<td>0.000180</td>
<td>90</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Developer</td>
<td>250/total</td>
<td>150</td>
<td>0.000150</td>
<td>75</td>
<td>75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Toner Unit</td>
<td>250/total</td>
<td>300</td>
<td>0.000300</td>
<td>150</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Drum Unit</td>
<td>250/total</td>
<td>45</td>
<td>0.000450</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Drum Unit</td>
<td>250/total</td>
<td>45</td>
<td>0.000450</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Supplies</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Total</td>
<td>494,798</td>
<td>17,060</td>
<td>71,185</td>
<td>633,043</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All pricing numbers are subject to change, for planning purposes only.

Figure 16. Pricing.
<table>
<thead>
<tr>
<th>Category</th>
<th>Rate</th>
<th>Job 1</th>
<th>Job 2</th>
<th>Job 3</th>
<th>Job 4</th>
<th>Job 5</th>
<th>Job 6</th>
<th>Job 7</th>
<th>Total from PPC</th>
<th>Costs</th>
<th>Impressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Impressions</td>
<td>15</td>
<td>252,000</td>
<td>90,000</td>
<td>500,000</td>
<td>250,000</td>
<td>100,000</td>
<td>20,000</td>
<td>5,000</td>
<td>335,404</td>
<td>27,450</td>
<td>1,562,404</td>
</tr>
<tr>
<td>1-Sided Prints</td>
<td>15</td>
<td>45</td>
<td>40</td>
<td>50</td>
<td>25</td>
<td>0</td>
<td>1,000</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$17,450</td>
</tr>
<tr>
<td>2-Sided Prints</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5,000</td>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$10,000</td>
</tr>
<tr>
<td>11x17 Prints</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$2,500</td>
</tr>
<tr>
<td>11x17 Impressions</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$0,000</td>
</tr>
<tr>
<td>Single Print Jobs</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$0,000</td>
</tr>
<tr>
<td>Sheets</td>
<td>30</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$1,630</td>
</tr>
<tr>
<td>Bird's</td>
<td>200</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,000</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$200,000</td>
</tr>
<tr>
<td>Single Stitched</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$0,500</td>
</tr>
<tr>
<td>Dual Stitcher</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$20,000</td>
</tr>
<tr>
<td>Total Booklets</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$6,000</td>
</tr>
<tr>
<td>11x17 Booklets</td>
<td>20</td>
<td>300</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>$4,000</td>
</tr>
</tbody>
</table>

| Total Cost | $1,790.16 | $1,200.70 | $1,792.15 | $3,770.36 | $1,600.96 | $215.83 | $81.50 | $3,850.00 | $27,645.00 |
| Number of Jobs         | 35    | 40    | 10    | 0     | 10    | 20    | 20    | 20    | 146           | 17    |
| Pages Per Pub          | 24    | 26    | 26    | 26    | 26    | 26    | 26    | 26    | 26            | 26    |
| Number of Orig Pages   | 840   | 500   | 500   | 500   | 500   | 500   | 500   | 500   | 500           | 500   |
| Number of Pub          | 300   | 100   | 1,000 | 2,000 | 5,000 | 1,000 | 250   | 250   | 250           | 250   |
| # of SIMP Pages        | 252,000 | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 252,000       | 252,000 |

Estimated TPL $ 1,562,404

25% Budget Reduction, ROI = 1.97

Figure 17. Phase-2 estimated production profile.
### Combined Annual Operating Expenses As Reported in JCP Form 1

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Maintenance</th>
<th>Supplies</th>
<th>Labor</th>
<th>Space</th>
<th>Depreciation</th>
<th>Cost</th>
<th>Date Adj</th>
<th>Rent</th>
<th>One Time Purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>P/D</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dupilating (CMQ)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>JCP Total</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- GPO Total Impressions: 29,353,644
- Inflations: 2.50%
- Shifts: 1
- In-House Duplicating: 5,500,483
- Estimated DocuTech: 19,015,636

### Final Cost Benefit Calculations - GSFC

#### Workload Profile:
- Stapling, single and dual; Perfect binding; Saddle stitching, 11 x 17 and 5.5 x 8.5
- Hard copy; electronic media, diskette and electronic file transmittal

#### Combined Annual Operating Expenses

<table>
<thead>
<tr>
<th>Service Life</th>
<th>Base</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Service Life $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment (GPO Horizontal)</td>
<td>Not Applicable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Network HWBW</td>
<td>Not Available</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Labor (OS 1-5)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Supplies</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>Not Applicable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>Not Applicable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Space</td>
<td>Not Applicable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Finishing</td>
<td>Not Applicable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>593,210</td>
<td>628,046</td>
<td>653,247</td>
<td>689,842</td>
<td>754,730</td>
<td>3,118,201</td>
<td></td>
</tr>
</tbody>
</table>

#### Cost Per Thousand:

- 214.56
- 227.10
- 232.65
- 232.25
- 228.60
- 22.67

### Cost Benefit and Productivity Calculations

- Figure 18. Cost benefit and productivity calculations.
Productivity Analysis

<table>
<thead>
<tr>
<th>Application Category</th>
<th>Original Elapse Time @ Printer + Mailing</th>
<th>Original Processing Time</th>
<th>Proposed Elapsed Time @ DocuTech + Mailing</th>
<th>Proposed Processing Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Director's Weekly</td>
<td>3 - 5 days</td>
<td>18:26 hours</td>
<td>&lt; 1 day</td>
<td>5:24 hours</td>
</tr>
<tr>
<td>2. Goddard Weekly</td>
<td>3 - 5 days</td>
<td>18:26 hours</td>
<td>&lt; 1 day</td>
<td>5:18 hours</td>
</tr>
<tr>
<td>3. GEWA Newsletter</td>
<td>1 day</td>
<td>15:05 hours</td>
<td>&lt; 1 day</td>
<td>5:57 hours</td>
</tr>
<tr>
<td>4. Goddard News</td>
<td>5 + days</td>
<td>15:45 hours</td>
<td>&lt; 1 day</td>
<td>13:13 hours</td>
</tr>
<tr>
<td>5. NSSDC News</td>
<td>5 + days</td>
<td>15:45 hours</td>
<td>&lt; 1 day</td>
<td>4:43 hours</td>
</tr>
<tr>
<td>6. NASA TM</td>
<td>5 + days</td>
<td>13:45 hours</td>
<td>&lt; 1 day</td>
<td>2:35 hours</td>
</tr>
<tr>
<td>7. GSFC 17-92 Training Form</td>
<td>5 days</td>
<td>9:45 hours</td>
<td>&lt; 1 day</td>
<td>7:55 hours</td>
</tr>
<tr>
<td>8. 1994 GSFC Honor Awards</td>
<td>5 days</td>
<td>10:10 hours</td>
<td>&lt; 1 day</td>
<td>3:28 hours</td>
</tr>
<tr>
<td>Total</td>
<td>Range 1 - 5 + Days</td>
<td>117:12 hours</td>
<td>&lt; 1 day</td>
<td>48:55 hours</td>
</tr>
</tbody>
</table>

Figure 19. Productivity comparisons.

Figure 19 shows that a percentage gain of approximately 80% is obtained when a customer's duplicating job is submitted to the networked DocuTech. Previously, a duplicating job would take 5 plus days and now takes less than 1 day to deliver the end product to the customer. Specifically, the processing time is reduced from 117 hours, 12 minutes to 48 hours, 55 minutes or approximately 58% reduction in processing time.

Phase 1 - Return on Investment

During the phase-1 evaluation and analysis of the benefits and costs, it has been conclusively identified that full cost recovery can be achieved without any additional funds required, reference Figure 15. Specifically, the cost for the phase-2 evaluation is $17,899, and the revenue to cover this cost is estimated to be $24,245 for the application categories identified. During the phase-2 evaluation period (90 days), there will be no restrictions on the number of impressions produced. As described earlier, actual production statistics will be gathered by customer account code to validate the estimated revenues to cover the operational costs of the networked DocuTech/Documents on Demand system. For the phase-2 evaluation, the Return on Investment (ROI) identified during the phase-1 evaluation is \( \text{ROI} = \frac{\text{Gained}}{\text{Cost}} = \frac{24,245}{17,899} = 1.35 \)

Or more specifically, for every dollar invested, $1.35 is returned. Physical storage and mailing costs will not be considered in this analysis as cost savings are over and above the savings identified by the acquisition of the networked DocuTech/XDOD systems.
Phase 2 - 90-DAY EVALUATION

Benchmark Requirements

On designated day of the benchmark demonstration test, 7 hours of production duplicating work shall consist of the following minimum work requirements:

Test 1  Daily workload from Xerox 5090 and at least 2 hours of previous daily workload in queue ready to be released for output by 8:30 a.m., the day of the test. [Test capacity to perform workload.]

Test 2  Assembly of publication by Publication and Graphics Services Section to be sent to DocuTech for duplicating after demonstrating cut and paste, merging of pages, renumbering of selected pages, and cover changes from XDOD. [Test functionality of XDOD and receipt and transfer of designated publications to DocuTech.]

Test 3  Demonstration of mail merge through Set Labeling for selected publication with multiple addresses. [Test functionality of addressing.]

Test 4  Receipt of latest version of Evaluation Report (assembly of 4 Postscript files) and Joint Electronic Document Distribution Plan from Code JTT PC workstation to XDOD client/server. [Test functionality of receipt and transfer of files from remote PC workstation to XDOD.]

Test 5  Receipt of latest version of Evaluation Report (assembly of 4 Postscript files) and Joint Electronic Document Distribution Plan from the XDOD server. The Evaluation Report will be finished as a tape-bound publication and the Joint Electronic Document Distribution Plan will be finished as a saddle stitch publication. [Test functionality of finishing capabilities and cover insertion module.]

Test 6  Scan, cut and paste, assembly of selected pages on XDOD, Earth Observing System publication. Transfer of designated pages to DocuTech for assembly with stored electronic files to be assembled as a final publication. [Test functionality of receipt and transfer of files from remote Macintosh workstation plus functionality of XDOD.]

Test 7  Compare quality of output:
   a.  Source versus first copy, 25th copy, and 50th copy
   b.  Graphics
   c.  Half tones
   d.  Finishing (saddle stitch, single stitch, double stitch, taping)
   e.  Finishing (saddle stitch - 8.5 inch x 11 inch and 5.5 inch x 8.5 inch)
   [Test output quality.]

Test 8  Concurrency of operations:
   a.  Duplicating during scanning of new job
   b.  Receipt of electronic files to be duplicated during duplicating and scanning of new jobs
   c.  Cut and paste during duplicating
Test 9  Test storage of ripped files from Print Server to Extended Storage and retrieval for duplicating by DocuTech. [Test functionality of Extended Storage.]

Test 10  Print accounting statistics at end of benchmark. [Test functionality of DocuTech accounting program.]

Pre-Benchmark File Transfer Testing

Table 1, below, documents the pre-benchmark testing for the transfer and printing of publications to the XDOD and DocuTech located at GSFC. Verification of successful transmission and receipt of the publication is confirmed by comparing the print product from an Apple LaserWriter located within Code JTT's LAN-connected printers and the printed output from the DocuTech. A second single thread test is the successful receipt of a file transfer from the Code JTT PC work station to the XDOD client server and the subsequent transfer of the same publication from the XDOD to the DocuTech Print Server for subsequent printing by the DocuTech.

<table>
<thead>
<tr>
<th>Date &amp; Time</th>
<th>File Name</th>
<th># Bytes</th>
<th>Source Program</th>
<th>PS Print File</th>
<th>PS Bytes</th>
<th>Pages</th>
<th>Transfer Rate Kb/s</th>
<th>Output Verified DocuTech</th>
<th>Output</th>
<th>XDOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/24/94 10:13 am</td>
<td>JTEDIPLN.WPD</td>
<td>2,917,473</td>
<td>WP 6.0a</td>
<td>EDIPLN.PS</td>
<td>4,552,503</td>
<td>37</td>
<td>33</td>
<td>Yes</td>
<td>DocuT-N</td>
<td>XDOD-N</td>
</tr>
<tr>
<td>10/25/94 2:45 pm</td>
<td>EVALRPT.WPD</td>
<td>2,970,512</td>
<td>WP 6.0a</td>
<td>EVALRPT1.PS</td>
<td>1,140,695</td>
<td>18</td>
<td>71</td>
<td>Yes</td>
<td>DocuT-N</td>
<td>XDOD-N</td>
</tr>
<tr>
<td>10/26/94 8:38 am</td>
<td>EVALRPT.WPD</td>
<td>2,983,449</td>
<td>WP 6.0a</td>
<td>EVALRPT1.PS</td>
<td>1,143,378</td>
<td>18</td>
<td>64</td>
<td>Yes</td>
<td>DocuT-Y</td>
<td>XDOD-N</td>
</tr>
<tr>
<td>10/28/94 7:22 am</td>
<td>JTEDIPLN.WPD</td>
<td>1,249,954</td>
<td>WP 6.0a</td>
<td>EDIPLN.PS</td>
<td>3,038,333</td>
<td>38</td>
<td>74</td>
<td>Yes</td>
<td>DocuT-Y</td>
<td>XDOD-N</td>
</tr>
<tr>
<td>10/28/94 8:45 pm</td>
<td>JTEDIPLN.WPD</td>
<td>1,249,954</td>
<td>WP 6.0a</td>
<td>EDIPLN.PS</td>
<td>3,038,333</td>
<td>38</td>
<td>26</td>
<td>Yes</td>
<td>XDOD-N</td>
<td></td>
</tr>
<tr>
<td>11/3/94 11:30 pm</td>
<td>JTEDIPLN.WPD</td>
<td>1,278,481</td>
<td>WP 6.0a</td>
<td>EDIPLN.PS</td>
<td>3,375,855</td>
<td>38</td>
<td>52</td>
<td>Yes*</td>
<td>DocuT-Y**</td>
<td></td>
</tr>
<tr>
<td>11/4/94 6:30 am</td>
<td>RDPEDI.WPD</td>
<td>98,377</td>
<td>WP 6.0a</td>
<td>EDIPLN.RP</td>
<td>1,548,159</td>
<td>1</td>
<td>52</td>
<td>Yes*</td>
<td>DocuT-Y**</td>
<td></td>
</tr>
<tr>
<td>11/4/94 6:30 am</td>
<td>EVALRPT.WPD</td>
<td>3,014,439</td>
<td>WP 6.0a</td>
<td>EVALRPT1.PS</td>
<td>2,711,023</td>
<td>25</td>
<td>59</td>
<td>Yes*</td>
<td>DocuT-Y**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EVALRPT2.PS</td>
<td>3,563,580</td>
<td>WP 6.0a</td>
<td>EVALRPT2.PS</td>
<td>2,711,023</td>
<td>25</td>
<td>59</td>
<td>Yes*</td>
<td>DocuT-Y**</td>
<td></td>
</tr>
<tr>
<td>Date &amp; Time</td>
<td>File Name</td>
<td># Bytes</td>
<td>Source Program</td>
<td>PS Print File</td>
<td>PS Bytes</td>
<td>Pages</td>
<td>Transfer Rate Kb/s</td>
<td>Output Verified LW</td>
<td>Output DocuTech XDOD</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------</td>
<td>----------</td>
<td>----------------</td>
<td>---------------</td>
<td>----------</td>
<td>-------</td>
<td>---------------------</td>
<td>--------------------</td>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>11/7/94 10:50 am</td>
<td>JTEDIPLN.PS</td>
<td>1,278,481</td>
<td>WP 6.0a</td>
<td>EDIPLNA.PS</td>
<td>3,375,855</td>
<td>38</td>
<td></td>
<td>Yes*</td>
<td>XDOD-R***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RDPEDI.WPD</td>
<td>98,377</td>
<td>WP 6.0a</td>
<td>EDIPLNRP.PS</td>
<td>1,548,159</td>
<td>1</td>
<td></td>
<td>Yes*</td>
<td>XDOD-R***</td>
<td></td>
</tr>
<tr>
<td>11/15/94 6:15 am</td>
<td>EVALRPT.WPD</td>
<td>3,014,439</td>
<td>WP 6.0a</td>
<td>EVALRPT1a.PS</td>
<td>2,711,071</td>
<td>25</td>
<td></td>
<td>Yes*</td>
<td>XDOD-Y***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EVALRPT2b.PS</td>
<td>3,563,580</td>
<td>3</td>
<td></td>
<td>Yes*</td>
<td>XDOD-Y***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EVALRPT3a.PS</td>
<td>3,220,400</td>
<td>13</td>
<td></td>
<td>Yes*</td>
<td>XDOD-Y***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EVALRPT4a.PS</td>
<td>1,220,519</td>
<td>1</td>
<td></td>
<td>Yes*</td>
<td>XDOD-Y***</td>
<td></td>
</tr>
</tbody>
</table>

Note: *Font - TimesNewRomanPS Regular 11 pt  [w/postscript.drv on AppleLaser II NTX] **Font - Times New Roman Regular 11 pt  [h/windows/ppcl5e.drv on HP Laserjet 4M/M] N*** File Not received by XDOD  Y*** File successfully received by XDOD

Table 1. (Continued).

Attempts at Connecting to XDOD

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/28/94</td>
<td>7:22 am</td>
<td>On continuous ping</td>
</tr>
<tr>
<td></td>
<td>8:10 am</td>
<td>Successful ping</td>
</tr>
<tr>
<td></td>
<td>8:45 am</td>
<td>Start transfer</td>
</tr>
<tr>
<td></td>
<td>8:48 am</td>
<td>Transfer stopped at 794,624 bytes or 26% complete</td>
</tr>
<tr>
<td></td>
<td>10:58 am</td>
<td>Abort transfer, unsuccessful</td>
</tr>
<tr>
<td>10/31/94</td>
<td>10:03 am</td>
<td>Unsuccessful ping</td>
</tr>
<tr>
<td>11/3/94</td>
<td>7:55 am</td>
<td>Unsuccessful ping</td>
</tr>
<tr>
<td></td>
<td>11:30 am</td>
<td>Unsuccessful ping</td>
</tr>
<tr>
<td>11/4/94</td>
<td>6:36 am</td>
<td>Unsuccessful ping</td>
</tr>
<tr>
<td></td>
<td>7:22 am</td>
<td>Unsuccessful ping</td>
</tr>
<tr>
<td></td>
<td>7:43 am</td>
<td>Unsuccessful ping</td>
</tr>
<tr>
<td>11/7/94</td>
<td>6:02 am</td>
<td>Unsuccessful ping</td>
</tr>
<tr>
<td></td>
<td>10:40 am</td>
<td>Start transfer, successfully completed (2 files)</td>
</tr>
<tr>
<td></td>
<td>10:50 am</td>
<td>Start transfer</td>
</tr>
<tr>
<td></td>
<td>10:55 am</td>
<td>Transfer stopped at 1,404,928 bytes or 51% complete</td>
</tr>
<tr>
<td></td>
<td>11:30 am</td>
<td>Abort transfer, unsuccessful</td>
</tr>
<tr>
<td>11/16/94</td>
<td>6:23 am</td>
<td>Successful transfer of all 4-files to XDOD and DocuTech</td>
</tr>
</tbody>
</table>
Access to XDOD From Code JTT Work Station Using PC and Windows

1. Select FTP application icon.
2. Select Settings Option and highlight Preferences
   . Turn off "Retrieve detailed file listing"
3. Select Connect
   Host: xdod.gsfc.nasa.gov
   User: xxxxxxxx
   Password: yyyyyyy
4. Remote XDOD directory should be "C:\PUBDROP\XSFER"

Access to DocuTech From Code JTT Work Station Using PC and Windows

1. Select FTP application icon.
2. Select Settings Option and highlight Preferences
   . Turn on "Retrieve detailed file listing"
3. Select Connect
   Host: docutech.gsfc.nasa.gov
   User: zzzzzzzz
   Password: kkkkkkk
4. Select Remote Subdirectory
   Remote XDOD directory should be "/sys/users/sunusers/switty"
5. Select Binary
6. Locate file under Local Directory to be transferred
7. Select Copy to Remote Directory
8. Successful receipt of file will show file under "switty" Subdirectory.

<table>
<thead>
<tr>
<th>Table 2. Pre-Benchmark Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>39 page publication</td>
</tr>
<tr>
<td>Present Procedure</td>
</tr>
<tr>
<td>Electronic File To DocuTech</td>
</tr>
<tr>
<td>Productivity Improvement</td>
</tr>
<tr>
<td>Percent Improvement</td>
</tr>
</tbody>
</table>

Note: Transit time between pickup from Apple LaserWriter to copier and stapling not identified
## Benchmark Results

### Table 3. Benchmark Results.

<table>
<thead>
<tr>
<th>Test</th>
<th>Functionality</th>
<th>Score</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inclusion of daily production workload</td>
<td>2</td>
<td>As displayed by Figure 18, Test 1, 7 regular production jobs were completed concurrently with the benchmark tests.</td>
</tr>
<tr>
<td>2a</td>
<td>XDOD functionality</td>
<td>2</td>
<td>The XDOD operator took eight minutes to scan text pages, paste in halftone, scan full page photo, and merge cover into file to create intended document. After several adjustments, the final image produced was an improvement in quality from the original.</td>
</tr>
<tr>
<td>2b</td>
<td>File transfer to DocuTech from XDOD</td>
<td>2</td>
<td>As displayed by Figure 18, Test 2b, files transferred to the DocuTech were successfully received and ripped in preparation for the print queue.</td>
</tr>
<tr>
<td>3</td>
<td>Set labeling</td>
<td>2</td>
<td>A two sided announcement page was individually affixed with 450 different address labels out of 500 copies printed. Reference Figure 18, Test 3.</td>
</tr>
<tr>
<td>4</td>
<td>File transfer from Hqts PC to XDOD &amp; DocuTech</td>
<td>2</td>
<td>As displayed by Figure 18, Test 4 and Appendix 4, four files were successfully transferred to the XDOD and DocuTech.</td>
</tr>
<tr>
<td>5</td>
<td>Print copy of electronic files</td>
<td>2</td>
<td>As displayed by Figure 18, Test 5, the electronic version of the XDOD electronic file received earlier from the Headquarter's PC work station was successfully printed with three types of finishing, single staple, dual staple, and tape.</td>
</tr>
<tr>
<td>6a</td>
<td>Tabs</td>
<td>2</td>
<td>A previously stored EOS publication file was retrieved from extended storage, five tabs with appropriate headings were merged with ten copies of the publication being printed. Reference Figure 18, Test 6.</td>
</tr>
<tr>
<td>6b</td>
<td>Transfer of EOS pub from Macintosh work station</td>
<td>2</td>
<td>The EOS publication (17 Mb) was sent to the XDOD by the Publication staff's Macintosh to the XDOD with 10 seconds to prepare and 13 minutes to transfer.</td>
</tr>
<tr>
<td>7</td>
<td>Output quality</td>
<td>2</td>
<td>As displayed by Figure 18, Test 7, output quality met all the performance specifications where applicable. Dual stapling on the booklet maker for the 5.5 inch x 8.5 inch pub was slightly off center which can be corrected by the Xerox maintenance staff.</td>
</tr>
<tr>
<td>8</td>
<td>Concurrency</td>
<td>2</td>
<td>As displayed by Figure 18, Test 8, the job functions as itemized were accomplished concurrently with the printing of Test 1, 4, 5, 6, and 9.</td>
</tr>
<tr>
<td>9</td>
<td>Extended Storage</td>
<td>2</td>
<td>As displayed by Figure 18, Test 9, extended storage was successfully demonstrated.</td>
</tr>
<tr>
<td>10</td>
<td>Accounting</td>
<td>2</td>
<td>A printout of all work produced during the day was provided at 4:45 p.m., November 16, 1994.</td>
</tr>
<tr>
<td></td>
<td>Composite</td>
<td>24</td>
<td>Fully successful</td>
</tr>
</tbody>
</table>
In summary, the Xerox networked DocuTech and the Xerox Document on Demand system fully met the functional requirements expected. Lessons learned during the phase-2 evaluation and the benchmark are

**XDOD**

1. Transfer of file size to the XDOD by Macintosh can be confirmed with further validation by XDOD operator to ensure that file integrity was not contaminated during the transfer.

2. With additional experience with the XDOD system, compensations can successfully be made for some degree of over- or under-exposure or capturing an image from color paper.

3. With the ability for the XDOD to view, delete, and replace stored files on the DocuTech Print Server, the XDOD operator will need to pay specific attention to the network drives that he/she maybe transferring files to.

**DocuTech**

1. With the availability of concurrency offered by the networked DocuTech, attention needs to be paid to the scheduling of the workload to provide a maximum throughput with the least amount of effort. The optimal mix will be achieved as the DocuTech operator becomes familiar with the networked jobs along with the hard copy jobs to be scanned. That is, the mix of production jobs that require single stitching, dual stitching, taping, set labeling, slip sheets, cut and paste, and tabs need to be group together to achieve maximum production. I.e., minimizing the amount of setup by the DocuTech Operator will increase the production and reduce the overall costs of the Printing and Duplicating Services Section.

2. Scheduling of production jobs for the booklet maker need to be group to avoid the necessity to reset the booklet maker for saddle stitch jobs requiring 5.5 inch x 8.5 inch finishing versus those jobs requiring 8.5 inch x 11 inch finishing. The adjustment to the booklet maker takes approximately 20 to 30 minutes each time a change in the size of the finishing is required.

3. Whenever possible, the submission of completed electronic files that have completed the clearance procedure by the Publications and Graphics Services Section is the desired mode of operation. Use of the XDOD for cut and paste, assembly and duplicating requirements (electronic job ticketing) is recommended mode of operation.

**Other**

1. Involve the network organization during the initial implementation to ensure that communication connections between the networked DocuTech, XDOD, and the user community are operational for Macintosh, Personal Computer, and SUN workstations. Check packet transmission sizes, if XDOD locks up during a file transfer.

2. To achieve an estimated annual production of 19,015,638 impressions, based upon the benchmark effective production volume, a two shift operation will need to be instituted. Figure 21, Final cost/benefit analyses, alternative 4 covers these costs through the use of two duplicating operators and coverage for maintenance and supplies.
Figure 20. Benchmark results.
Validation of Cost Analysis

The phase-1 cost analysis is validated through the collecting of production statistics generated by the networked DocuTech and is displayed by Tables 4 and 5. Production statistics were gathered weekly by user account codes which have been programmed into the networked DocuTech. Supporting information for each user account code can be found in appendix 4.

Table 4. Production Statistics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>33,427</td>
<td>71,905</td>
<td>80,840</td>
<td>21,294</td>
<td>8,992</td>
<td>7,392</td>
<td>33,720</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>26,285</td>
<td>34,451</td>
<td>46,640</td>
<td>75,841</td>
<td>106,528</td>
<td>102,312</td>
<td>66,878</td>
<td>54,072</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>3,720</td>
<td>6,994</td>
<td>1,950</td>
<td>462</td>
<td>3,133</td>
<td>3,133</td>
<td>2,406</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>14,516</td>
<td>39,713</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4,572</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>9,517</td>
<td></td>
<td>18,802</td>
<td>2,406</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>30,771</td>
<td>7,668</td>
<td>5,758</td>
<td>4,812</td>
<td>18,604</td>
<td>2,613</td>
<td>17,725</td>
<td>6,222</td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>37,403</td>
<td>4,004</td>
<td>5,976</td>
<td>1,001</td>
<td>462</td>
<td>2,002</td>
<td>2,204</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>80,840</td>
<td>75,840</td>
<td>106,528</td>
<td>102,312</td>
<td>66,878</td>
<td>54,072</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>3,133</td>
<td>23,436</td>
<td>12,341</td>
<td>40,289</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>999999</td>
<td>312,799</td>
<td>137,403</td>
<td>132,287</td>
<td>180,977</td>
<td>131,401</td>
<td>161,006</td>
<td>102,802</td>
<td>135,467</td>
<td>110,309</td>
</tr>
<tr>
<td>Total Impres</td>
<td>312,799</td>
<td>137,403</td>
<td>132,287</td>
<td>180,977</td>
<td>131,401</td>
<td>161,006</td>
<td>102,802</td>
<td>135,467</td>
<td>110,309</td>
</tr>
<tr>
<td>Cum Impres</td>
<td>312,799</td>
<td>450,202</td>
<td>582,489</td>
<td>763,466</td>
<td>894,867</td>
<td>1,055,873</td>
<td>1,158,675</td>
<td>1,294,142</td>
<td>1,404,451</td>
</tr>
</tbody>
</table>

Revenue | $1734.63 | $3,396.30 | $2,394.28 | $2,940.83 | $2,740.18 | $3,756.71 | $2,152.46 | $3,128.36 | $2,357.11 |

Cum Revenue | $1,735 | $5,131 | $7,525 | $10,466 | $13,206 | $16,963 | $19,115 | $22,244 | $24,601 |

Cost/Pg | $0.0055 | $0.02472 | $0.01810 | $0.01625 | $0.02085 | $0.02333 | $0.02054 | $0.02309 | $0.02137 |

Table 5 identifies the results of the Benchmark shows that using the current assigned cost algorithm, a revenue of $600.34 was received for the day. To breakeven, the total number of impressions for the day need to be 87,764 to cover the annual operational DocuTech costs of $358,709, per Figure 21.
Table 5. Production Statistics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>9,410</td>
<td>16,194</td>
<td>3,199</td>
<td>6,812</td>
<td>8,406</td>
<td>16,426</td>
<td>8,406</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>27,763</td>
<td>10,199</td>
<td>33,355</td>
<td>20,913</td>
<td>3,550</td>
<td>29,830</td>
<td>3,550</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>9,328</td>
<td>14,715</td>
<td>10,548</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td></td>
<td>10,683</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>21,038</td>
<td>111</td>
<td>2,205</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BchMk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3,741</td>
<td>3,741</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>23,890</td>
<td>5,537</td>
<td>9,911</td>
<td>11,377</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>999999</td>
<td>389</td>
<td>409</td>
<td>5,762</td>
<td>3,023</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Impres</td>
<td>91,818</td>
<td>38,895</td>
<td>85,478</td>
<td>40,659</td>
<td>38,184</td>
<td>68,665</td>
<td>38,184</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cum Impres</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Revenue</td>
<td>$2,006.64</td>
<td>$852.26</td>
<td>$1,438.90</td>
<td>$831.66</td>
<td>$600.34</td>
<td>$1,998.47</td>
<td>$600.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cum Revenue</td>
<td>$26,608</td>
<td>$27,460</td>
<td>$28,899</td>
<td>$29,730</td>
<td>$30,331</td>
<td>$32,329</td>
<td>$32,329</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Cost/Pg</td>
<td>$0.02185</td>
<td>$0.02191</td>
<td>$0.01683</td>
<td>$0.02045</td>
<td>$0.01572</td>
<td>$0.02910</td>
<td>$0.01572</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Designated cost algorithm for the Networked DocuTech are

<table>
<thead>
<tr>
<th>Category</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total impressions</td>
<td>9</td>
</tr>
<tr>
<td>1-sided prints</td>
<td>15</td>
</tr>
<tr>
<td>2-sided prints</td>
<td>20</td>
</tr>
<tr>
<td>11-inch x 17-inch prints</td>
<td>25</td>
</tr>
<tr>
<td>11-inch x 17-inch impressions</td>
<td>15</td>
</tr>
<tr>
<td>Single print jobs</td>
<td>15</td>
</tr>
<tr>
<td>Scans</td>
<td>30</td>
</tr>
</tbody>
</table>
Binds 200
Single stitches 5
Dual stitches 10
Total booklets 24
11-inch x 17-inch booklets 2

Final Comparative Cost Summaries

Table 6. GPO/In-house Costs

<table>
<thead>
<tr>
<th>GPO Programs</th>
<th>Total Jobs</th>
<th>Total Impressions</th>
<th>Total Obligated</th>
<th>% Produced On DocuTech</th>
<th>DocuTech Estimated Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-M</td>
<td>75</td>
<td>2,355,491</td>
<td>$68,000</td>
<td>95%</td>
<td>$64,600</td>
</tr>
<tr>
<td>680-S</td>
<td>43</td>
<td>1,948,305</td>
<td>$20,210</td>
<td>100%</td>
<td>$20,210</td>
</tr>
<tr>
<td>722's</td>
<td>505</td>
<td>24,773,568</td>
<td>$480,000</td>
<td>43%</td>
<td>$184,900</td>
</tr>
<tr>
<td>872</td>
<td>33</td>
<td>275,280</td>
<td>$25,000</td>
<td>25%</td>
<td>$6,250</td>
</tr>
<tr>
<td>Totals</td>
<td>656</td>
<td>29,353,644</td>
<td>$593,210</td>
<td></td>
<td>$275,960</td>
</tr>
</tbody>
</table>

Inhouse Production

| Total | 948 | 5,500,483 | $209,000 | 75% | $158,750 |

Grand Total of GPO Contract & Inhouse Production $432,710

Yearly Cost for DocuTech (Excludes Labor Costs)

LTOP $108,000
Maintenance/Click Charges $ 81,000
Supplies $ 60,000

Total $249,000

Cost Per Copy

Without DocuTech: \( \frac{(593,210 + 209,000)}{29,353,644} \) copies = $0.02737 per copy
DocuTech: \( \frac{249,000}{19,015,638} \) copies = $0.01309 per copy

Annual Savings

Savings = Grand Total of GPO Contract & Inhouse Production - Yearly Cost of DocuTech
= $432,710 - $249,000 = $183,310
= Percent Reduction of 42.36%
### Figure 21. Final cost/benefit analyses.
<table>
<thead>
<tr>
<th>ACRONYMS AND ABBREVIATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC</td>
</tr>
<tr>
<td>B/C</td>
</tr>
<tr>
<td>CD ROM</td>
</tr>
<tr>
<td>Code JTT</td>
</tr>
<tr>
<td>DPI</td>
</tr>
<tr>
<td>DOS</td>
</tr>
<tr>
<td>EDD</td>
</tr>
<tr>
<td>EPS</td>
</tr>
<tr>
<td>FTE</td>
</tr>
<tr>
<td>FTP</td>
</tr>
<tr>
<td>GB</td>
</tr>
<tr>
<td>GSFC</td>
</tr>
<tr>
<td>GPO</td>
</tr>
<tr>
<td>HTM</td>
</tr>
<tr>
<td>IPMO</td>
</tr>
<tr>
<td>JCP</td>
</tr>
<tr>
<td>JPL</td>
</tr>
<tr>
<td>JOFOC</td>
</tr>
<tr>
<td>JSC</td>
</tr>
<tr>
<td>JTX</td>
</tr>
<tr>
<td>KB</td>
</tr>
<tr>
<td>Kbps</td>
</tr>
<tr>
<td>KSC</td>
</tr>
<tr>
<td>LAN</td>
</tr>
<tr>
<td>LaRC</td>
</tr>
<tr>
<td>LeRC</td>
</tr>
<tr>
<td>LTM</td>
</tr>
<tr>
<td>LTOP</td>
</tr>
<tr>
<td>MB</td>
</tr>
<tr>
<td>Mbps</td>
</tr>
<tr>
<td>MOU</td>
</tr>
<tr>
<td>NP</td>
</tr>
<tr>
<td>NPMO</td>
</tr>
<tr>
<td>NPV</td>
</tr>
<tr>
<td>MSFC</td>
</tr>
<tr>
<td>MS</td>
</tr>
<tr>
<td>OS</td>
</tr>
<tr>
<td>PC</td>
</tr>
<tr>
<td>PDL</td>
</tr>
<tr>
<td>POMD</td>
</tr>
<tr>
<td>PS</td>
</tr>
<tr>
<td>PV</td>
</tr>
<tr>
<td>RAM</td>
</tr>
<tr>
<td>ROI</td>
</tr>
<tr>
<td>RP</td>
</tr>
<tr>
<td>SBUS</td>
</tr>
<tr>
<td>SCSI</td>
</tr>
<tr>
<td>Abbreviation</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>SDT</td>
</tr>
<tr>
<td>SQL</td>
</tr>
<tr>
<td>SP</td>
</tr>
<tr>
<td>STIO</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TM</td>
</tr>
<tr>
<td>WAN</td>
</tr>
<tr>
<td>WORM</td>
</tr>
<tr>
<td>XDOD</td>
</tr>
</tbody>
</table>
REFERENCES


5. Xerox Documents on Demand (XDOD) Personal & Workgroup Configuration Solution Product Description, 4th ed., Xerox No: X409-042 (No Date), Xerox Corporation, USCO Solutions and Services Organization, McLean, Virginia.

6. Avedon, Don M., 1994, Introduction to Electronic Imaging, 2d ed., Association for Information and Image Management, Silver Spring, Maryland.
**APPENDIX 1 - MEMBERS OF EVALUATION TEAM**

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dwaine A. Kronser</td>
<td>GSFC Technical Information Services Branch/IPMO</td>
</tr>
<tr>
<td>2</td>
<td>Bob Lane</td>
<td>GSFC Printing &amp; Duplicating Services Section</td>
</tr>
<tr>
<td>3</td>
<td>Fred Moore</td>
<td>NASA Printing Management Officer</td>
</tr>
<tr>
<td>4</td>
<td>Preston Pope</td>
<td>GSFC Printing &amp; Duplicating Services Section</td>
</tr>
<tr>
<td>5</td>
<td>Dick Tuey</td>
<td>NASA Electronic Publishing System Project Coordinator</td>
</tr>
<tr>
<td>6</td>
<td>Theresa Wirth</td>
<td>GSFC Printing &amp; Duplicating Services Section</td>
</tr>
<tr>
<td>7</td>
<td>Susan Hart</td>
<td>GSFC Publications &amp; Graphics Services Section</td>
</tr>
<tr>
<td>8</td>
<td>Marilyn Tolliver</td>
<td>GSFC Logistics Management Division</td>
</tr>
<tr>
<td>8</td>
<td>Mary Collins</td>
<td>GSFC Electronic Document Distribution Project</td>
</tr>
</tbody>
</table>
## Alternative 3 and 4 Plus Other Options

<table>
<thead>
<tr>
<th>Spec</th>
<th>Alt 3 - Network DocuTech (Copier/Central Printer)</th>
<th>Alt 4 - 4233 (Central Printer)</th>
<th>4090 (Central Printer)</th>
<th>5090 (Copier)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>135 ppm</td>
<td>135 ppm</td>
<td>92 ppm</td>
<td>135 ppm</td>
</tr>
<tr>
<td>Resolution</td>
<td>600 dpi</td>
<td>600 dpi</td>
<td>300 dpi</td>
<td>300 dpi</td>
</tr>
<tr>
<td>Imaging</td>
<td>Laser</td>
<td>Laser</td>
<td>Laser</td>
<td>Light Lens</td>
</tr>
<tr>
<td>Max Paper Size</td>
<td>11&quot; x 17&quot;</td>
<td>11&quot; x 17&quot;</td>
<td>8.5&quot; x 14&quot;</td>
<td>11&quot; x 17&quot;</td>
</tr>
<tr>
<td>Stock Bias</td>
<td>800</td>
<td>8,900 (+ roll feed opt.)</td>
<td>1,500 (+2,000 add. opt.)</td>
<td>8,300</td>
</tr>
<tr>
<td>Duplexing</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Stacker</td>
<td>8&quot; x 10&quot; to 9&quot; x 14&quot; x 3,000 max</td>
<td>2 @ 2,500 ea</td>
<td>2 @ 750 ea (3,000 max)</td>
<td>8&quot; x 10&quot; to 9&quot; x 14&quot; x 3,000 max</td>
</tr>
<tr>
<td>Stitcher</td>
<td>8x10-9x14, 2-70 sheets (42K, speed)</td>
<td>opt (finishing partner)</td>
<td>opt stitcher (2-50 pps)</td>
<td>8x10-9x14, 2-70 sheets (42K, speed)</td>
</tr>
<tr>
<td>Saddle Stitch</td>
<td>5.5x8.5 &amp; 11x17 in line (opt. sign book maker)</td>
<td>opt (finishing partner)</td>
<td>opt (finishing partner)</td>
<td>no</td>
</tr>
<tr>
<td>Thermal Binder</td>
<td>8.5x11&quot; 15-125 sheets, 425 bonds (feed)</td>
<td>opt (finishing partner)</td>
<td>opt (finishing partner)</td>
<td>no</td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>1,000,000 per month</td>
<td>4,000,000 per month</td>
<td>1,000,000 per month</td>
<td>1,000,000 per month</td>
</tr>
<tr>
<td>CPU</td>
<td>Xerox CPU's</td>
<td>DEC 2-11</td>
<td>DEC 2-11</td>
<td>DEC 3-11</td>
</tr>
<tr>
<td>RAM</td>
<td>16 mb</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>1,140 mb</td>
<td>2 @ 182mb ea std (1,124 mb opt)</td>
<td>2 @ 170mb ea std (1,123 mb opt)</td>
<td>n/a</td>
</tr>
<tr>
<td>Interface</td>
<td>Ethernet XNS</td>
<td>Ethernet XNS</td>
<td>Ethernet XNS</td>
<td>n/a</td>
</tr>
<tr>
<td>Resident PDL</td>
<td>Interpress</td>
<td>Interpress</td>
<td>Interpress</td>
<td>n/a</td>
</tr>
<tr>
<td>Emulations</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>n/a</td>
</tr>
<tr>
<td>Post Manager</td>
<td>Xeroxman</td>
<td>Functionality in Network Server</td>
<td>Functionality in Network Server</td>
<td>n/a</td>
</tr>
<tr>
<td>Network Server - HW</td>
<td>Xeroxman</td>
<td>Sun Space 10</td>
<td>Sun Space 10</td>
<td>n/a</td>
</tr>
<tr>
<td>Network Server - SW</td>
<td>PS or HP/PCL, Novell, TCP/IP, AppleTalk</td>
<td>PS or HP/PCL, Novell, TCP/IP, AppleTalk</td>
<td>PS or HP/PCL, Novell, TCP/IP, AppleTalk</td>
<td>n/a</td>
</tr>
<tr>
<td>Media Server - HW</td>
<td>Xeroxman</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Media Server - SW</td>
<td>DOS, OS/2, Mac, SUN, PostScript or HP/PCL</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>RAM</td>
<td>8 mb std, 16 mb optional</td>
<td>32 mb standard</td>
<td>32 mb standard</td>
<td>n/a</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>450 mb</td>
<td>424 mb standard</td>
<td>424 mb standard</td>
<td>n/a</td>
</tr>
<tr>
<td>PDL's</td>
<td>Postscript level 2 - Adobe, PCL 4 &amp; 5</td>
<td>PS 582, HP PCL 4 &amp; 5, TIFF, ASCII, CCITT</td>
<td>PS 582, HP PCL 4 &amp; 5, TIFF, ASCII, CCITT</td>
<td>n/a</td>
</tr>
<tr>
<td>Client Support</td>
<td>IBM PC, Apple Macintosh, Unix Workstation</td>
<td>IBM PC, Apple Macintosh, Unix Workstation</td>
<td>IBM PC, Apple Macintosh, Unix Workstation</td>
<td>n/a</td>
</tr>
<tr>
<td>Scanner</td>
<td>Speed rate @ 2.5 sec per page, 23 ppm</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Supply Media</td>
<td>Dry ink = 220k, developer = 750k, fuse agent = 250k</td>
<td>Dry ink = 220k, developer = 600k, fuse agent = 140k</td>
<td>Dry ink = 220k, developer = 300k, fuse agent = 140k</td>
<td>n/a</td>
</tr>
<tr>
<td>Administration (Accounting)</td>
<td>Stores up to 10,000 accounts</td>
<td>Not applicable, internal to computer complex sub control system</td>
<td>Not applicable, internal to computer complex sub control system</td>
<td>Stores up to 10,000 accounts</td>
</tr>
</tbody>
</table>

Note: Alternative 3 - Central Printer @ Computer Center & Alternative 4 - Copier @ Duplicating Facility [Data Source: Xerox Corporation, Mr. Bob Sullivan, Federal District Operators]

Figure 22. Comparative specifications.
National Aeronautics and Space Administration

Headquarters
Washington, DC 20546-0001

GP(94-38058)  May 4, 1994

TO: JTT/Fred W. Moore
FROM: GP/Nina M. Lawrence
SUBJECT: Department of Justice (DOJ) Memorandum of April 7, 1994 on Extension of Joint Committee on Printing (JCP) Authority to Duplicating

This is in response to your memorandum of April 21, 1994 in which you inquired whether NASA has to comply with the JCP's duplicating threshold of 5,000/25,000 production units for duplicating facilities. There is no legal requirement that NASA comply with the JCP duplicating threshold. As a matter of policy, NASA may choose to abide by the threshold.

The conclusions reached by the DOJ in its April 7, 1994 memorandum are legally binding on executive branch entities, including NASA. To summarize, DOJ stated that section 207 of Public Law 102-392 gives neither the Government Printing Office nor the JCP any authority over duplicating services, and any attempt by the JCP to assert such authority is invalid. Also, the JCP's "Government Printing and Binding Regulations" are not binding on executive branch entities, but merely provide guidance for the JCP and any entities that choose to abide by them.

If you have any questions, please contact me.

Nina M. Lawrence
Deputy Associate General Counsel
(Intellectual Property)
250 9587 command okay
9587 sendtp/5pm
225 Transfer complete
323 14637 kbytes and (73 Kbytes/sec)
250 1
200 Type ret to 1
9587 151,182,171,242,3,126
250 9587 command okay
9587 sendtp/5pm
225 Transfer complete
125 277 kbytes and (69 Kbytes/sec)
9587 deleted, rfc_message
221 Endftp
The NASA Scientific and Technical Information Office was assigned the responsibility to continue with the expansion of the NASAwide networked electronic duplicating effort by including the Goddard Space Flight Center (GSFC) as an additional node to the existing configuration of networked electronic duplicating systems within NASA. The subject of this report is the evaluation of a networked electronic duplicating system which meets the duplicating requirements and expands electronic publishing capabilities without increasing current operating costs. This report continues the evaluation reported in "NASA Electronic Publishing System -- Electronic Printing and Duplicating Evaluation Report" (NASA TM-106242) and "NASA Electronic Publishing System -- Stage 1 Evaluation Report" (NASA TM-106510). This report differs from the previous reports through the inclusion of an external networked desktop editing, archival, and publishing functionality which did not exist with the previous networked electronic duplicating system. Additionally, a two-phase approach to the evaluation was undertaken; the first was a paper study justifying a 90-day, on-site evaluation, and the second phase was to validate, during the 90-day evaluation, the cost benefits and productivity increases that could be achieved in an operational mode. A benchmark of the functionality of the networked electronic publishing system and external networked desktop editing, archival, and publishing system was performed under a simulated daily production environment. This report can be used to guide others in determining the most cost effective duplicating/publishing alternative through the use of cost/benefit analysis and return on investment techniques. A treatise on the use of these techniques can be found by referring to "NASA Electronic Publishing System - Cost/Benefit Methodology" (NASA TM-106662).