NASA Technical Memorandum 104620

NASAwide Electronic Publishing System— Electronic Printing and Duplicating, Stage 3 Evaluation Report (LaRC)

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EXECUTIVE SUMMARY

The NASAwide electronic duplicating system evaluation was extended to include the Langley Research Center (LaRC) to expand the agencywide functionality for electronic duplicating and assess whether this technology would be more cost effective than the current process at LaRC. Additional elements which differ from previous evaluations are the inclusion of the printing of the magneto optical disk file produced by the Goddard Space Flight Center's (GSFC) networked DocuTech and the demonstration of the Xerox Job Ticket from remote workstations (MacIntosh, SUN/OS, and PC). This report continues the evaluation reported in References 1 to 4.

The report is presented in four sections: The Introduction describes the duplicating configuration under evaluation and the Background contains a chronological description of the evaluation segmented by phases 1 and 2. This section includes the evaluation schedule, printing and duplicating requirements, storage and communication requirements, electronic publishing system configuration, existing processes, and proposed processes; billing rates, costs and productivity analysis, and the return on investment based upon the data gathered to date. The third section contains the Phase 1— Comparative Cost and Productivity Analysis. This analysis demonstrated that LaRC should proceed with a 90-day evaluation of the DocuTech and follow with a phase 2 cycle to actually demonstrate that the proposed system would meet the needs of LaRC's printing and duplicating requirements. The Phase 2—90-day Evaluation section describes the benchmark requirements, benchmark results, cost comparisons, benchmark observations, and recommendations. These are documented after the recommendations.

Based upon the phase 1 and phase 2 results, the benchmark observations, and the associated benefits and cost analysis, the following recommendations are given:

1. Conduct an extensive business process reengineering of the printing and duplicating requirements and workflow processes across all organizational entitities within LaRC.

2. Retain the networked DocuTech, however, remove all duplicating presses and related equipment, and divert this workload to the networked DocuTech, Xerox 5090, and GPO when this option is most cost-effective and timely.

3. Acquire the set labeling functionality of the networked DocuTech to reduce the manual labor involved in affixing mailing addresses to publications for distribution to LaRC duplicating customers.

4. Develop an implementation plan to enable all LaRC authors to generate and transmit their finished publications electronically to the networked DocuTech after approval by the Research Publishing and Printing Branch.

Assuming that the recommendations as proposed are adopted, the potential cost and productivity savings could be significant. For example, by conducting a business process reengineering analysis, future savings can be obtained from mailing and storage costs through the use of information provided in the section on storage and communication requirements. The suggested operational profile for the future is as follows:

Item	Fiscal Year	GPO Cost	Column A JCP Report	Column C JCP Report	Networked DocuTech	Source
$ per 1,000 Units	1994	$19.89	$27.56	(a)[1]	$18.23 (2 Mth Eval)	Table 6, 7, 13
Total Units	1994	32,352,200	17,611,983	1,272,364	956,459	Table 7
JCP Report	1994	$643,644	$485,302	$436,494	Eval started FY 95	Table 7
Est. $ per 1,000 Units	1995	$19.89	$27.56	(a)	$25.82	Table 15
Est. Total Units	1995	17,011,968	4,796,607	915,600	14,400,000	Table 15
Estimated 1995 Costs		$338,368	$132,194	$410,936	$371,808 Report in column A	Tables 7 & 15

Based upon the recommendations proposed, the estimated operational costs for fiscal year 1995 is approximately $867,604 compared with $1,472,440 for fiscal year 1994, which is a reduction of $604,836 (41.08%). Obviously, this cannot occur unless a complete business process reengineering of the printing and duplicating workflow processes have been accomplished. The $604,836 savings do not reflect the productivity gains that would arise from the shift of hard copy output to electronic document publishing.

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[1]This cost is highly overstated because operations other than printing include non-production personnel costs, distribution costs, administrative costs, color copiers, Mita copiers, and engineering drawing costs, etc. Isolation of direct costs corresponding to the equipment listed and units reported results in a cost per thousand units of $71.64

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INTRODUCTION

The NASA Scientific and Technical Information Office (STIO) was assigned the responsibility to include the Langley Research Center (LaRC) in the NASAwide Electronic Publishing System — Electronic Printing and Duplicating. This responsibility resulted from a need to assist LaRC with reengineering their printing and duplicating services. As part of this evaluation, the LaRC printing and duplicating services were examined to determine the cost benefits of integration into the NASAwide electronic duplicating configuration. This evaluation was conducted in two phases. Phase 1 consisted of a study to determine whether the installation of an electronic printing and duplicating system would be cost-effective and meet the printing and duplicating requirements for LaRC. Phase 2 consisted 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 determine whether the system would meet the LaRC requirements and to validate the productivity gains.

During the phase 1 evaluation cycle, a zero base cost acquisition of the phase 2 evaluation cycle was implemented. That is, sufficient ongoing printing and duplicating work was identified that could be used in the phase 2 evaluation cycle without violating the Joint Committee on Printing thresholds, thereby permitting the reallocation of funding from this work to the electronic printing and duplicating system.

As of December 1994, eight NASA installations (Lewis Research Center, Jet Propulsion Laboratory, Kennedy Space Center, Marshall Space Flight Center, Johnson Space Center, Goddard Space Flight Center, Ames Research Center, and Headquarters) have installed electronic duplicating systems. All will have network capability by mid-1995. Before installing an electronic duplicating system at the Langley Research Center, the networked DocuTech 135 was evaluated to determine whether it fulfilled the storage, duplicating, and finishing requirements and to determine whether it is the best and most cost-effective solution for Langley.

The authors acknowledge the many individuals who have contributed to the material contained in this evaluation report. Specific thanks goes to the following individuals: Donna Roper, Technical Publications Editor, Langley Research Center, who spent many hours in making this report available to NASA Headquarters; Mary McCaskill and the Research Publishing and Printing Branch staff (especially, Crystal Marsh and Andy Papp) for their outstanding contributions in assembling and executing the networked DocuTech system evaluation at LaRC. In addition, many other contributors who are not named here but are mentioned in the evaluation report. Without their participation, this evaluation report could not have been written.

BACKGROUND

Phase 1—Chronology

The following is a chronology of highlights of the stage 3 project:

Aug 94   Receipt of letter dated July 29, 1994, from the Director of the Internal Operations Group to Associate Administrator for Management Systems and Facilities requesting technical assistance for LaRC Electronic Duplicating, Cost Analysis, and Evaluation Report.

On August 2, 1994, STIO began the evaluation process for LaRC's Electronic Duplicating Phase 1 cycle of the evaluation. The NASA Printing Management Officer

requested and received a preliminary cost estimate for the Networked DocuTech and Documents on Demand system from Xerox. The LaRC printing and duplicating system configuration is essentially identical to GSFC's. Therefore, much of the system specifications and requirements are similar; only the duplicating and publishing requirements differ. In terms of the Document on Demand system, LaRC has an existing system that will meet all functional requirements.

On August 31, 1994, Dick Tuey met with LaRC staff (Jerry Hansbrough, Barbara Pasternak, Harold Orr, Mary McCaskill, and Christine Ryan) regarding the study effort. After the preliminary briefings, Dick Tuey met with Christine Ryan, who assisted with the provision of all statistical data required to perform the cost analysis. Harold Orr provided the floor plan (appendix B) for the printing and duplicating facility and the location of the proposed electronic printing and duplicating system.

Sep 94

On September 2, 1994, Dick Tuey completed the initial cost analysis with the assistance of Christine Ryan. The justification for other than full and open competition (JOFOC) was completed with supporting production and cost data for presentation to Jerry Hansbrough and Mary McCaskill by Dick Tuey. In attendance were Fred Moore, Harold Orr, and Christine Ryan. Upon completion of the presentation, Hansbrough met with McCaskill to complete any additional coordination on proceeding with a purchase request for a 90-day evaluation of the electronic printing and duplicating system. Sufficient data existed to support the acquisition of the electronic printing and duplicating system at that time. Hansbrough then assigned Christine Ryan as the LaRC Team Leader in the acquisition, installation, and networked operation of the electronic printing and duplicating system.

Tuey continued with the Phase 1 portion of the evaluation report with its completion and delivery to McCaskill who would have the report edited. On September 2, 1994, Dick Tuey met with Donna Roper who had agreed to participate in the Joint STI Electronic Document Distribution (EDD) Project, formerly referred to as the Joint STI Electronic Document Interchange Project (EDI). Discussions with Roper concerning the Langley Technical Report Server (LTRS) clearly indicated that LaRC did not need the Document on Demand system component of the electronic printing and duplicating system because LaRC already had the functionality that is desired by the other participating Centers (GSFC, ARC, and LeRC) and CASI. The integration of LaRC into the EDD would be accomplished via the STI Joint Electronic Document Distribution Plan. References 5 to 7 document LaRC's experimental electronic dissemination project. The STI Joint EDD project hopes to build upon Langley's experience and expertise for the replication of their system.

On September 6, 1994, Fred Moore prepared a memo to Mary McCaskill referencing the General Counsel opinion (appendix D) that no legal requirement exists for duplicating thresholds of 5,000/25,000 production units. Moore will revise the NASA Printing Management Handbook to let each Center's Institutional Printing Management Officer (IPMO) determine the Center's duplicating thresholds.

On September 8, 1994, a draft of Phase 1 of the NASAwide Electronic Publishing System — Electronic Printing and Duplicating, Stage 3 Evaluation Report (LaRC) was mailed to Mary McCaskill to be edited by her staff.

Phase 2—Chronology

Oct 94 On October 24, 1994, Chrisine Ryan sent Dick Tuey the DocuTech production statistics through October 22, 1994. Accounting of all DocuTech production work began on October 9, 1994. Ryan will fax a weekly summary of the accounting statistics at the two letter code level.

Nov 94 On November 8, 1994, Headquarters staff (Dick Tuey and Tom Hanson), GSFC staff (Michael Grabenstein and Paul Baker), and CASI staff (Roy Stiltner) met with Michael Nelson at LaRC on the LTRS as well as the NASA Technical Report Server (NTRS). Michael Nelson demonstrated the ease of including new citations from a researcher into the Langley Technical Report Server from his Sun workstation, which currently serves as the LTRS and the NTRS system. The researcher provided the citation in refer format via electronic mail as an attachment. In about 15 minutes, Michael Nelson was able to demonstrate that the new citation was available for searching in LTRS. During this time, Nelson also demonstrated the inclusion of a new subdirectory for 1995. Obviously, in a production environment (several hundred citations a day), this manual process would not be feasible.

On November 9, 1994, Headquarters staff (Dick Tuey and Tom Hanson, GSFC staff (Michael Grabenstein and Paul Baker), and CASI staff (Roy Stiltner) met with the LaRC staff (Harold Orr, Christine Ryan, and Mary McCaskill) on the status of the networked DocuTech installation. Except for the network portion of the DocuTech, all components were working. Some concerns were expressed by LaRC staff in that Xerox was not providing the customer service as advertised, and Xerox's emphasis was to provide value added items (e.g., process flow analyses, training, and technical support) at cost rather than provide these as part of the evaluation process. These concerns were conveyed to Dave Daniels at the Corporate Xerox Office: Daniels will meet with the LaRC Xerox team to address these concerns.

Nov 94 On November 21, 1994, Dick Tuey received an e-mail from Donna Roper on the procedure to be used for transmitting this evaluation report to LaRC for editing.

On November 30, 1994, Dick Tuey transferred this report dated November 30, 1994 to LaRC.

Jan 95 On January 5, 1995, Dick Tuey mailed the editorial changes to this evaluation report provided by Donna Roper on December 10, 1994. Assuming no significant schedule slippages, the DocuTech benchmark was scheduled for the week of January 23, 1995.

On January 10, 1995, Dick Tuey confirmed with Mary McCaskill the scheduling of the benchmark for the networked DocuTech for January 24. The selection and identification of the benchmark requirements were to be accomplished on January 20, 1995. From the statistics gathered to date, the duplicating volume currently diverted to the DocuTech does not justify retaining the system.

On January 20, 1995, Dick Tuey met with LaRC and Xerox staff regarding the networked DocuTech benchmark set for January 24, 1995 from 7:00 a.m. to 4:00 p.m. LaRC staff in attendance were Marvin Whitney, Crystal Marsh, Christine Ryan,

Harold Orr, and Andy Papp. Xerox staff in attendance were Gabriel Perry and Wayne Woodwire. An extensive review of the requirements was accomplished with full concurrence by Xerox staff and the LaRC staff that the requirements could be met during the day of the test. The benchmark requirements are outlined in the section "Benchmark Requirements."

On January 24, 1995, Headquarters staff (Dick Tuey and Fred Moore), LaRC staff (Harold Orr, Christine Ryan, Andy Papp, and Crystal Marsh), and Xerox staff (Tom Bennett, Andy Horton, Tim Firman, Midge Clawson, Theresa Baker, and Dave Daniels) were in attendance during the benchmark. The benchmark of the networked DocuTech started at 7:04 a.m. and ended at 5:00 p.m. the same day. Results of the benchmark is covered in the section "Benchmark Results." A significant difference in this benchmark was the printing of a Goddard Space Flight Center publication created on their networked DocuTech, saved on a magneto optical disk produced by their extended storage device, and subsequently printed on LaRC's networked DocuTech after retrieval from its extended storage device.

On January 25, 1995, Headquarters staff (Dick Tuey and Fred Moore) and LaRC staff (Harold Orr, Mary McCaskill, and Christine Ryan) met regarding the results of the benchmark. Lessons learned during this evaluation indicated that to obtain accurate production statistics by account code, the production statistics to date must be printed by the networked DocuTech prior to the start of the benchmark as well as after the benchmark. Secondly, the magneto optical disk (MOD) produced at GSFC must be physically transported to the LaRC site before the file can be printed. Electronic transmission of a ripped file produced by the DocuTech could not be accomplished during this benchmark. Finally, the job ticket from a PC workstation could not be demonstrated.

Feb 95   On February 3, 1995, Fred Moore requested additional production statistics from Harold Orr. Further production statistics were requested on February 6, 1995. All NASA centers received a request for their 1st quarter production statistics categorized by GPO, JCP Form 1, Column A, and JCP Form 1, Column C.

On February 7, 1995, Dick Tuey completed the analysis of the data gathered to date regarding the networked DocuTech. The executive summary was completed on February 8, 1995.

On February 8, 1995, the final draft evaluation report was electronically submitted to Donna Roper to complete the final editing of the report at LaRC. A hard copy was also send via the LaRC pouch mail in case Donna Roper is not able to read the electronic file. Incorporation of these edits will be accomplished by Dick Tuey before its publication by Langley Research Center as a Technical Memorandum.

Evaluation Schedule

Figure 1 shows an overall schedule for the completion of the cost-benefit analysis in support of delivering an evaluation system to validate its performance. The delivery, installation, benchmark, and determination on the retention of the electronic duplicating system are included in the milestone schedule.

NASAwide ELECTRONIC PUBLISHING SYSTEM
EVALUATION AND IMPLEMENTATION TASKS
LANGLEY RESEARCH CENTER

2/22/1995

Task Descriptions	FY94			FY95					
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Requirements Identification		▼ ▼							
Document Existing Processes		▼ ▼							
Document Proposed Processes		▼ ▼							
Cost Analysis		▼ ▼							
Productivity Analysis		▼ ▼							
Cost Benefit Analysis		▼ ▼							
Evaluation Report	▼							▽	
Acquisition Of Electronic Printing & Duplicating System for 90-Day Evaluation		▼ ▼							
90-Day Evaluation				▼				▼	
Retention of EPS System								▽	
LaRC Meetings	▼	▼		▼	▼			▼ ▼	

▽ Scheduled Start/End   ▼ Scheduled Completion

Figure 2. Evaluation schedule.

Significant tasks are displayed along with any significant milestone events. Some significant milestones are:

1.	Letter request to STI Office for assistance	07/29/94
2.	Initial evaluation study completed	09/02/94
3.	Networked DocuTech installation	10/14/94
4.	Pre-Benchmark coordination	01/20/95
5.	Benchmark and debriefing	01/24/95 to 01/25/95
6.	Unedited Final Evaluation Report completed	02/08/95
7.	Evaluation Report published as TM	02/95

Printing and Duplicating Requirements

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

1. Ability to receive electronic files concurrently with the scanning of hard copy.
2. Capacity to print greater than 100 pages/min.

3.   Resolution of 600 dots/in. (dpi).
4.   Tape binding.
5.   Saddle stitching (8.5- x 11-in. page and 5.5- x 8.5-in. page).
6.   Stapling (single and dual stitching).
7.   Electronic media (diskettes, LAN, WAN, Internet).
8.   Merging of preprinted covers (8.5- x 11-in. cover and 5.5- x 8.5-in. 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-in. disk) at 600 dpi with a 10 to 1 compression ratio is calculated as follows:

1.   An 8.5- x 11-in. page = 93.5 in².
2.   Black text on white background.
3.   Superior quality reproduction, 600 dpi (pixels).
4.   A 5.25-in. disk = 650 MB.
5.   Scanning at 600 dpi = 360,000 bits/in².
6.   One page, no compression, 93.5 x 360,000 = 33,660,000 bits.
7.   Thus, 33,660,000 bits divided by 8 = 4,207,500 (4.208 MB) bytes on one page.
8.   Given a 5.25-in disk, 650 MB divided by 4.208 MB =154.5 pages.
9.   154.5 x compression ratio of 10 = 1,545 pages per 5.25-in. disk.
10. Total number of pages divided by 1,545 = 'n' number of 5.25-in. disks needed.
11. Assuming an average number of pages per publication = 20 pages.
12. Average number of publications per disk = 1,545/20 = 77.25 publications.

Typically, the number of pages stored on an optical disk varies with the density of the information on a page. The number also depends on the resolution of the raster image, which is measured in dots per inch as previously calculated.   Experience with Xerox's Documents on Demand system has shown that the amount of disk space required for a 600-dpi scanned page is approximately 190 KB. (See ref. 8) Optimally, a 650-MB disk can hold 650 MB divided by 190 KB/page at 600 dpi equals 3,421 pages or 3,421 divided by 20 equals 171 publications.

During the Phase 2 evaluation cycle, the proposed configuration (disk storage) for mastering and accessing technical publications was evaluated through actual usage. However, this configuration was more than adequate to cover the 90-day evaluation with the use of the more conservative calculation of 77.25 publications stored per disk. Projected sizing and performance requirements were analyzed with the use of simulation techniques.

The estimated cost of a single magneto-optical storage disk (5.25 in.) is $250 each or $1,750 for 10 disks. The cost per storage of a single 20-page publication is as follows: $250 per disk divided by 171 publications = $1.46 per publication, or conservatively $250 per disk divided by 77.25 publications = $3.24 per publication.

The storage of publications such as forms, handbooks, brochures, and TM's for later use requires physical space. For example, the warehouse for NASA Headquarters costs $18.18/ft² fully

loaded. Specifically, this cost consists of the following breakdown:

Lease of space $ 9.45/ft²
Contract expenses $ 8.14/ft²
Overhead $ 0.59/ft²
Total cost $18.18/ft²

Given the cost per square foot, the storage of 100 copies of a 20-page document is approximately $ 0.0945 per copy ($9.45 divided by 100). The publication needs to be identified and stored by some unique identification number; the physical space is the same, regardless of the quantity of the publication. Therefore, the cost for the storage of the publication would increase as the quantity of publications decreases.

The communication capacity varies according to the quality, speed, and bandwidth at the LaRC. In calculating the response time, the following table provides the quality, speed, and bandwidth for each page (8.5- x 11-in. or 400 words at 200 dpi estimated at 50 KB with a 10:1 compression ratio) being transferred or accessed over the Internet. (See ref. 9.)

From table 1, the transmission time for a 20-page publication at 400 dpi is as follows:

23.4 sec at 64 Kbps x 20 = 468 sec or 7.8 min
1.0 sec at 1.5 Mbps x 20 = 20 sec
0.34 sec at 44.7 Mbps x 20 = 6.8 sec

During the Phase 2 evaluation cycle, the timing at 600 dpi (request to receipt) for selected publications was evaluated and documented.

Table 1. Communication Line Capacities

Quality, dpi	Page, bytes/bits	Bandwidth, sec		
		1 Channel 64 Kbps	24 Channels 1.5 Mbps/T1	672 Channels 44.7 Mbps/T3
200	50 K/400 K	6.25	0.27	0.01
300	106 K/850 K	13.3	0.57	0.02
400	190 K/1.5 M	23.4	1.00	0.34
600	TBD	TBD	TBD	TBD

The cost for the mailing a 20-page publication via the U.S. Postal Service within the United States is as follows:

First class: cost is $ 1.44 for 1 to 3 days transit (1 day within city, 2 days within 600 miles, 3 days greater than 600 miles)
Fourth class: cost is $ 1.21 for 2 weeks transit
Overnight: cost is $ 9.95 for 12 hours transit

Electronic Publishing System Configuration

Figures 2 and 3 show the proposed networked electronic publishing system that meets the

requirements. Figure 3 provides an overview of the electronic publishing system network logical architecture. The figure identifies a technical publication work group 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. The floor plan layout for the networked DocuTech is shown in appendix B.

Figure 3 also displays the communication interfaces between the NASA Centers. Work groups are identified by Publications and Graphics, Printing and Duplicating within each Center. Access to these work groups by the Center's multiple client (customer) platforms is achieve through connection to the technical publication work group document server. Once the document is ready for printing, a job ticket must be submitted to the duplicating work group for printing on demand by the networked DocuTech.

Specific components of the technical publication work group or its equivalent may consist of the following:
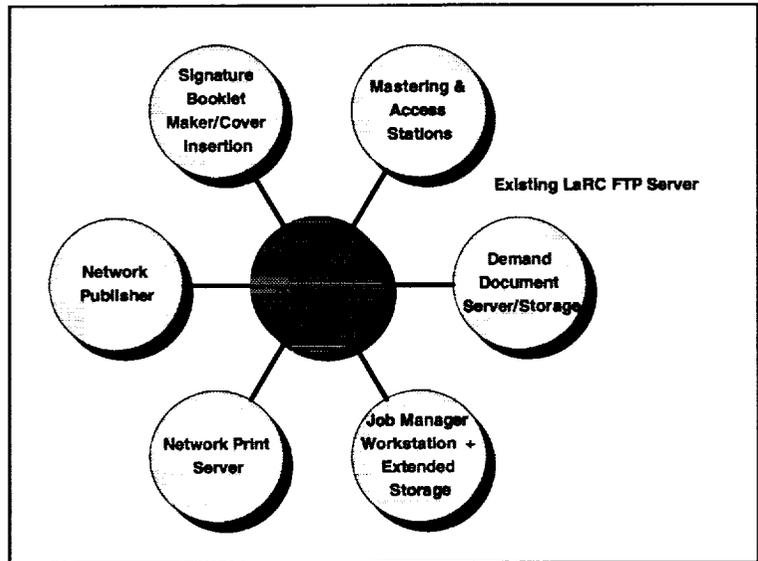
Figure 2. Networked electronic publishing system components.

1.   Mastering (Capture) Station (not ordered during evaluation)
      a. PC 486/33 with 16MB RAM
      b. 1.05 GB hard drive
      c. 3.5-in. 1.44 MB floppy
      d. 5.25-in. 1.2 MB floppy
      e. Serial mouse
      f. Monitor
      g. Ethernet controller card
      h. Interface card

2.   Scanner (not ordered during evaluation)
      a. 600 dpi
      b. Automatic document handler
      c. 20 pages/min
      d. Up to 11- x 17-in. sheets

3.   Document Server (not ordered during evaluation)
      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-in. floppy drive
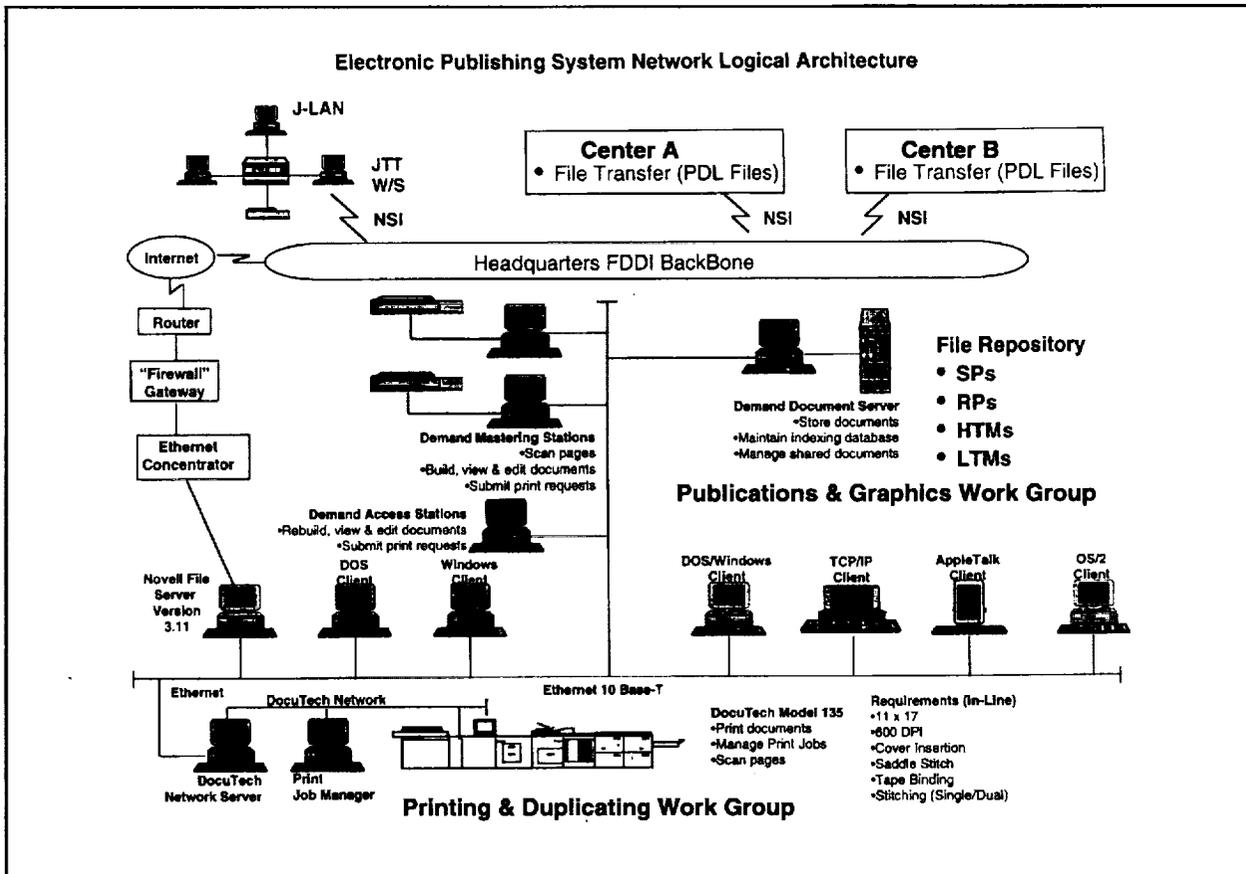
Figure 3. EPS network logical architecture.

   f. Monitor
   g. SBUS SCSI-2 Ethernet card

4.   Laser Printer with 2 MB Memory (not ordered during evaluation)

5.   Integrated Software (not ordered during evaluation)
   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 (appendix C, Alternative 3) of the networked duplicating work group consist of the following:

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

8.   Set Labeling (not ordered during evaluation)

Existing Processes

Table 2 shows the steps required to have a document printed or duplicated. The table includes 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 each step (e.g., PC for printing clerk and PS for printing specialist). The processing time is provided as the total time from the submission of the publication to its delivery to the customer.

In determining the recovery of costs for the 90-day evaluation, an extensive review of the LaRC's Contract-Reprographics Administrative Management Information System (C-RAMIS) accounting records was performed. From this information, Table 3 provides the statistical justification for full cost recovery during the 90-day evaluation cycle. During the evaluation cycle, there is no limit on the amount of duplicating that can be performed on the networked DocuTech; therefore, the cost recovery should be more than adequate to cover the evaluation costs.

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Table 2. General Description of Current Process

| Department/Work Group: Printing and Duplicating Services Section | | | | |
| Name of Key Document: General Description | | | | |
Step No.	Steps Required To Produce Key Document	Total Time	Comments	Functional Position
1	Customer submits one of the following job requests: LF-77 Request for Reporoduction LF-100 Approval for Color Printing	5 — 10 min	LF-77's informal and form reports are the focus of this analysis	Printing Clerk (PC) Printing Specialist (PS) and Customer
2	The job requirements are reviewed to determine where the job will be processed.	3 — 5 min	The following printing sources are considered: • Duplicating, • Reproduction, • Canon Color Copier, or • Sent to outside contractor.	PC, PS
3	Job requirements are reviewed for clarification with the customer.	5 — 20 min	Time depends on customer's understanding of job requirements; suggestions are often requested by customer.	PC, PS
4	The job is entered into the Contract Reprographics Administrative Management Information System (C-RAMIS) and assigned a job number.	2 — 3 min		PC, PS
5	Job is scheduled, LF-77 and job scheduling sheet accompany all duplicating jobs.	2 — 3 min	If reproduction job, PC assigns equipment. If duplicating job, SSC supervisor assigns equipment. If contracted out job, PS determines appropriate direct-deal contractor or GPO.	PC, PS SSC Supervisor
6	Print Job	3 — 8 hr	Assigned equipment	Duplicating Operator
7	Contracting courier picks up jobs, when contacted	4 hr		Contracting Courier
8	Contracting courier returns completed job to P&RS (B1152) or the warehouse (B1206).	4 — 26 days	There are a total of 8 direct-deal contracts with varying turnaround times. Jobs sent to GPO also have varying turnaround times.	Contractor
9	If applicable, PC, computer clerk (CC) or customer generates labels	15 min		PC, CC Customer
10	If applicable, labels are manually affixed or machine labelled.	30 min — 4 hr	Time depends on subject category, standard distribution list (SDL), or labels supplied.	Distribution Personnel
11	If applicable, jobs are presorted by distribution destination for mailroom pickup or U.S. mail pickup.	15 min — 1 hr	Time depends on volume of job.	Distribution Personnel
12	Mailroom courier pick ups mail and delivers to each building.	2 — 4 hr	Time depends on volume of job.	LaRC Mailroom Delivery Service
Total Processing Time: 4 — 26 days plus 7:19 — 21:41 hrs				

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Table 3. Phase 1 Justification

Production Workload To Recover Monthly Evaluation Costs - Phase 1 Justification

Categories	Rate	LaRC This Week	LD97	1994 Humor Awards	Info Guide	NASA CR	NASA TM	NASA TP	1090	24505	Davidson	Costs	Avg Mthly Imp
Total Impressions/Job	15	21600	60000	42120	45500	23757	14588	19910	NA	NA	NA	$3,322.13	1,280,359
1-Sided Prints	15	0	0	0	0	0	0	0	NA	NA	NA	$0.00	
2-Sided Prints	20	0	0	0	0	0	0	0	NA	NA	NA	$0.00	
11x17 Prints	25	5400	3000	0	6500	692	330	317	NA	NA	NA	$405.98	
11x17 Impressions	15	0	0	0	0	0	0	0	NA	NA	NA	$0.00	
Single Print Jobs	15	0	0	0	0	0	0	0	NA	NA	NA	$0.00	
Scans	30	4	20	52	84	36	44	44	NA	NA	NA	$8.52	
Binds	200	0	0	0	0	0	0	0	NA	NA	NA	$0.00	
Single Stitches	5	0	0	0	0	0	0	0	NA	NA	NA	$0.00	
Dual Stitches	10	0	0	0	0	0	0	0	NA	NA	NA	$0.00	
Total Booklets	24	0	0	810	0	0	0	0	NA	NA	NA	$19.44	
11x17 Booklets	20	5400	3000	0	6500	692	330	317	NA	NA	NA	$324.78	
Weekly Cost	1	$567.12	$86.90	$12.55	$18.80	$7.47	$4.52	$4.31	NA	NA	NA	$701.08	= Total Wkly $
GPO/1090/Dup Cost	NA	$3,012.00	$571.00	$639.00	$5,024.00	$3,967.64	$903.73	$1,611.73	$2,220.00	$295.00	$343.00		= Eval Recovery
Est 90 Day Eval Cost	NA	$6,805.44	$1,035.60	$652.80	$977.52	$388.58	$234.99	$224.24	$6,660.00	$885.00	$1,029.00	$18,893.16	= Total Mthly $
Average Monthly Cost	4	$2,268.48	$345.20	$652.80	$977.52	$388.58	$234.99	$224.24	$2,220.00	$295.00	$343.00	$5,091.80	= Total Yrly $
Average Annual Cost	12	$29,490.24	$4,142.40	$652.80	$977.52	$4,662.90	$2,819.88	$2,690.82	$26,640.00	$3,540.00	$4,116.00	$79,732.56	= Total Yrly Imp
Est Annual Impressions		1,123,200	240,000	42,120	45,500	3,421,008	700,224	500,760	3,213,855	2,951,998	3,125,639	15,364,304	= Avg $/Page
Cost Per Impression		$0.02626	$0.01726	$0.01550	$0.02148	$0.00136	$0.00403	$0.00537	$0.00829	$0.00120	$0.00132		= Similar Jobs
#Jobs Annually	NA	52	4	1	1	144	48	36	2,655	605	450		= Avg # Pg/Pub
Pages Per Pub	NA	1	5	13	21	9	11	11	118	38	33		
# Original Pages		4	20	52	84	36	44	44	26,020	1,907	1,228	29,439	= Avg $/Pub
Cost Per Publication		$0.11	$0.35	$0.81	$1.90	$0.05	$0.18	$0.24	NA	NA	NA		

Mthly Eval Costs =	$7,928	Mthly Revenue =	$5,091.80	1090/Dup =	$8,574.00	GPO Costs =	$15,728.10	ROI=	0.79
Mthly Eval w/o XDOD =	$6,292	Final 90 Day Eval =	$26,155.00					ROI=	1.00

Proposed Processes

The electronic duplicating process steps are shown in figure 4 and are described in this section.
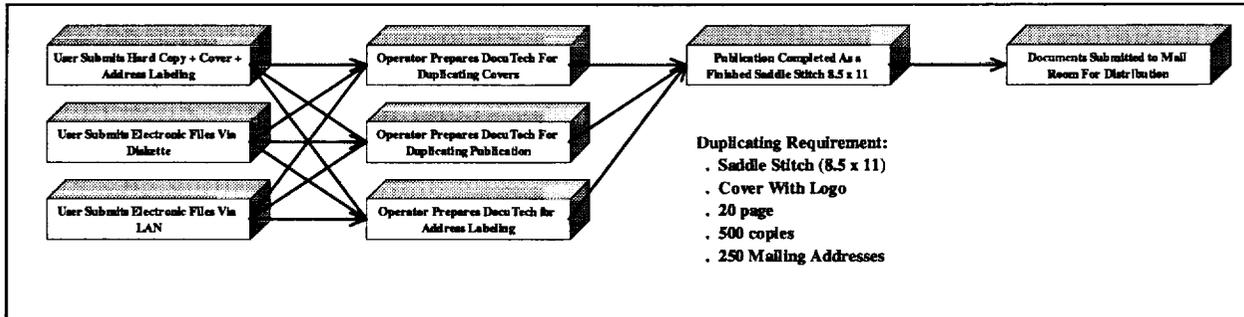
Figure 4. DocuTech process steps.

With the networked production DocuTech, the customer has three alternatives in the submission of the publication. The first is to submit the publication in hard copy form to be duplicated in house on the Xerox 5090 or on the on-site duplicating equipment. 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. When 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 that will be picked up by a mail room clerk for distribution.

In analyzing each of the jobs identified for duplication on the networked production DocuTech, table 4 shows the estimated time for each job. 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 as follows: (1) scan originals, (2) make program adjustments, (3) set up paper trays, (4) run proof copy, (5) perform image editing, (6) print the job, and (7) set up the booklet maker as appropriate for 5.5- x 8.5-in. saddle stitch booklet.

Table 4. DocuTech Processing Time

DocuTech Production Publisher Process Analysis									
Key Document Title	Analyze & Program	Scan Originals	Program Adjustment	Set Up Paper Trays	Run Proof	Image Editing	Print Job	Initial Set Up Booklet Maker	Total Processing
Customer Job (1 - 118 pages) (317 - 6500 Pubs)	1 — 5 min	.5 — 6 min	1 — 5 min	3 min	0.5 — 1 min	0	2.67 — 7.41 hr	3 min — 1 hr	2.82 — 8.74 hr

PHASE 1—COMPARATIVE COST AND PRODUCTIVITY ANALYSIS

Billing Rates for EPS Evaluation

Table 5 shows the cost algorithm (rate column) for the networked DocuTech for the full-cost recovery during the Phase 2 evaluation cycle along with those identified jobs for cost-analysis purposes. These printing and duplicating jobs were transferred to the Networked DocuTech Publisher system during the evaluation. As previously stated, selected duplicating jobs that do not violate the JCP criteria plus in-house duplicating work performed on the Xerox 5090 and duplicating

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presses will be performed on the DocuTech, along with the cost-recovery jobs during the 90-day evaluation.

Cost Analysis

Table 5 shows the basic costs for the networked DocuTech Publisher system during the Phase 2 evaluation and the operational costs after the evaluation. The estimated cost per page during the Phase 2 evaluation is $0.0047 ($18,893 / 1,280,359 x 3), which does not include paper or supplies. Table 5 shows the production profile required to break even. This monthly total of 1,280,359 impressions is derived directly from the total estimated impressions displayed in the upper right corner of table 5.

Table 5 is a matrix of the estimated production volume to fully recover all costs after the Phase 2 evaluation. Until the actual production workload statistics are gathered, an estimated workload of 15,364,304 impressions per year represents an extrapolation of those jobs identified in table 5. Completion of the analysis is covered in the section on validation of cost analysis.

Table 6 is a matrix of all DocuTech costs itemized by its individual components. The costs are broken down by 90-day evaluation charges, charges for one time purchases, cost per copy, monthly maintenance, monthly LTOP, training, technical support, and supplies. Total 90-day evaluation charges and estimated annual charges are calculated to provide the required cost recovery to break even. The last column of the table reflects the final purchase order prices for the 90-day evaluation and the ongoing LTOP charges over a 5-year period.

Table 7 shows all cost parameters and the 5-year cash outflow for four alternatives. The top portion of the table represents the cost of printing and duplicating identified in the JCP report for fiscal year 1994. The first alternative is printing and duplicating through the GPO, the second alternative is duplicating reported as column A in the JCP Report, Form 1, the third alternative is duplicating reported as column C in the JCP Report, Form 1, and the fourth alternative is duplicating through the use of the networked DocuTech Publisher. The calculations presented in table 7 reflect the full costs for the system which includes one time charges, labor, supplies, maintenance, space and LTOP costs.

Table 7 also shows 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.

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Table 5. Phase 2 Workload

Estimated Annual Production Workload To Recover LTOP Costs Based Upon Phase 2 Evaluation Cycle

Categories	Rate	LaRC Title Work	LPEF	1994 Honor Awards	Info Guide	NASA CR	NASA TM	NASA TP	1999	2XXX	Dividers	Costs	Impressions
Total Impressions/Job	25	21600	60000	42120	45900	23757	14588	13910	3213855	2951998	3125639	$237,824.18	15,364,304
1-Sided Prints	15	0	0	0	0	0	0	0	0	0	0	$0.00	
2-Sided Prints	25	0	0	0	0	0	0	0	156118	11442	7369	$4,373.23	
11x17 Prints	25	5400	3000	0	6500	692	330	317	0	0	0	$405.98	
11x17 Impressions	15	0	0	0	0	0	0	0	0	0	0	$0.00	
Single Print Jobs	15	0	0	0	0	0	0	0	0	0	0	$0.00	
Scans	30	4	20	52	84	36	44	44	312235	22885	14738	$10,504.26	
Binds	200	0	0	0	0	0	0	0	0	0	0	$0.00	0
Single Stitches	5	0	0	0	0	0	0	0	2655	605	450	$18.55	0
Dual Stitches	10	0	0	0	0	0	0	0	0	0	0	$0.00	0
Total Booklets	24	0	0	810	0	0	0	0	0	0	0	$19.44	
11x17 Booklets	20	5400	3000	0	6500	692	330	317	0	0	0	$324.78	
Total Annual Cost		$29,490.24	$4,142.40	$652.80	$977.52	$388.58	$234.99	$224.24	$60,710.51	$45,198.39	$47,476.36	$253,470.41	= Total Cost
Cost Per Impression		$0.02626	$0.01726	$0.01550	$0.02148	$0.00136	$0.00403	$0.00537	$0.00829	$0.00120	$0.00132	$0.02600	= Avg $/Page
Number of Jobs		52	4	1	1	144	48	36	2,655	605	450		= Similar Jobs
Pages Per Pub		1	5	13	21	9	11	11	118	38	33		= Avg # Pg/Pub
Number of Orig Pages		4	20	52	84	84	44	44	26,020	1,907	1,228	240	= # Original Pgs
Number of Pubs		280,800	12,000	810	6,500	8,304	3,960	3,804	156,118	11,442	7369		= # SBMF Pgs
# of SBMF Pages		280,800	60,000	10,530	136,500	896,832	174,240	125,532	0	0	0	1,558,902	
Cost Per Publication		$0.11	$0.35	$0.81	$1.80	$0.05	$0.18	$0.24	$0.98	$0.05	$0.04	$0.02600	= Avg $/Pub

	W/O XDOD	
@ Current Alg	$0.02600	Cost/Page
FY 93 volume	9,291,492	1090/Dup Copies
GPO Reassign	6,072,812	GPO Copies
Incl 1090/Dup	15,364,304	Est Yrly copies
Est Volume	$399,472	Recovery
Avg DocuTech $	$234,508	Avg Annual $
Revenue @/Pg	$399,472	$0.02600
25% Reduction	$299,604	25% Reduction

Estimated Yrly $ $253,470.41

After 25% Reductions, ROI = 1.28

	One Time	Full System	Total	Without XDOD	Total w/o XDOD	Final P.O. (Assuming One Time + 14.4 Million/Yr)
Net DocuTech/XDOD		$102,420		$86,484		$82,575
Maintenance		$122,532		$122,088		$85,920
Supplies		$17,736		$17,736		$119,941
Annual		$242,688		$226,308		$288,436
Year 1	$6,000	$242,688	$248,688	$226,308	$232,308	$294,436
Year 2	$15,000	$242,688	$257,688	$226,308	$241,308	$303,436
Year 3	$10,000	$242,688	$252,688	$226,308	$236,308	$298,436
Year 4	$5,000	$242,688	$247,688	$226,308	$231,308	$293,436
Year 5	$5,000	$242,688	$247,688	$226,308	$231,308	$293,436
Total	$41,000	$1,213,440	$1,254,440	$1,131,540	$1,172,540	$1,483,180
Average	$8,200	$242,688	$250,888	$226,308	$234,508	$296,636

Table 6. Base Costs

Cost Item	GSA List Price	90 Day Eval Charges	Tradein	One Time Purchases	LTOP (60 Mth) Factor = .021002	Maintenance	Charge/Copy	Total Monthly	Total Monthly
DocuTech Network Publisher With ByPass Transport (NP135B)	213,200	0					1,200,000		
DocuTech Network Print Server, 1 gb (NG-I) l Mod 3 & 4	27,040	882				194		194	
DocuTech Job Manager Workstation (JM-I) l Mod 3 & 4	3,000	72				25		25	
Signature Booklet Maker Finisher - > 250,000 = .0023 (SBMF)	41,500	1,176				392		392	
Cover Insertion Module (Works only with Signature Booklet Maker)	8,500	0							
Set Labeling (Open Market)	5,000	0							
DocuTech Extended Storage (DES-C)l Mod 5/Magneto Optical Drive (650 mb) (8Y9)	33,135	735				290		290	
NSF TCP/IP Netware (Open Market)	4,995	0							
Mac5 Netware (Open Market)	0	0							
LAN Manager	6,000	0							
IPP Soliel 1.1	561					185			
Consulting Services & Technical Support	10,000	0							
Subtotal	352,931	2,865	7,500	0	7,255	1,086		901	
Documents on Demand Capture Station (XDOD)	63,205	13,725							
300 DPI Laser Draft Printer (HP4M) and Interface Kit	Inc in XDOD	600				398			
Upgrade 19' greyscale monitor to 21" color monitor	Inc in XDOD	405							
PC Processor Upgraded to DX2/66	Inc in XDOD	n/c							
Image Print Path (IPP) for 1.1 Print Server	Inc in XDOD	n/c							
SCAN FIX	Inc in XDOD	n/c							
On site analyst	na	n/c							
Subtotal	63,205	14,730	0	0	1,327				
Total	416,136	17,595	7,500	0	8,582				
System Service Agreement - FSM Plan (all copies. = .0066)	n/c	0				1,142	7,680	8,822	
Sys Serv Agrmt - High Vol FSM (Up to 1.2 Mil =.0037 & >= .002) l Mod 5	n/c	0				2,720	4,440	7,160	
Copies over 1,200,000	TBD					na	0	0	
System Service Agreement - Run Length (1st ten orignl = .0098 + all copies = .0023)	n/c	0				2,805	TBD	TBD	
Operator Training	5 days	0		1,650					
DocuTech Publisher Security Administration	1 day			275					
DocuTech Publisher Site Administration	1 day			275					
DocuTech Network Publisher Site & Security Network/Media Server	1/2 day			275					
DocuTech Network Publisher Operator Network/Media Server	1 day			425					
DocuTech Network Services Network Administration	2 days			875					
DocuTech Network Services Print Job Management	2 days			875					
DocuTech Extended Storage	1 day			425					
DocuTech Signature Booklet Maker Operator	1 day			425					
DocuTech Signature Booklet Maker Cover Insertion Module	Per Session			225					
DocuTech Document Prep & Submission for Network Server	1/2 day			275					
DocuTech Customized Training & Technical Support	$55/Hour			0					
Supplies									
Dry Ink ($156.00/Carton) l Mod 5	220k/Unit	180			0.0008182			982	
Developer	750k/Unit	194			0.0002587			310	
Fuser Agent	250k/Unit	39			0.0001552			186	
Stitcher Wire	32k/Reel	47			0.0014550			0	
Binding Tape	445/Reel	93			0.2089888			0	
Supplies Subtotal								1,478	
Total		17,595		6,000	0	4,204			

Total 90 Day Evaluation Costs (Unlimited number of copies)		17,595	-		Inc In Flat Rate	0	17,595
One Time Costs		0	na			0	0	na
Total LTOP (Full System)	416,136	5,865			0	4,204	5,918	15,987

Annual $ = 191,843

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

Total Copies/Yr= 14,400,000   Cost/Page 0.01332247

Table 7. Cost and Benefit Calculations

COST BENEFIT CALCULATIONS - LaRC

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 Expense As Reported In JCP Form 1 dated 12/5/94

Equipment	Maintenance	Supplies	Labor	Space	Depreciation	Cost	Date Acq	Rental	One Time Purchases
Printing (Col A):	83,652	147,695	178,431	18,862	38,902	485,302		17,760	0
Duplicating (Col C):	27,537	22,137	354,865	0	25,561	436,494		6,394	0
JCP Total:	111,189	169,832	533,296	18,862	64,463	921,796		24,154	0

Annual GPO Volumes 32,352,200 Inflation = 2.50% Shifts= 1
Annual Printing Volumes (JCP Form 1, Column A) 17,611,983 Paper = 0.0050
Annual Duplicating Volumes (JCP Form 1, Column C) 1,272,364
Estimated Annual Volume 51,236,547
Estimated Annual Volume for Networked DocuTech 14,400,000 Work shifted from JCP Form 1, Column A

Alternative 1 (GPO)

Service Life	Base	Year 1	Year 2	Year 3	Year 4	Year 5	Service Life $	
Investment (GPO Contracts)	Not Applicable	583,578	598,167	613,122	628,450	644,161	3,067,478	
Network HW/SW	Not Applicable	0	0	0	0	0	0	
Labor (GS 11-5)	0	60,066	61,568	63,107	64,685	66,302	315,727	GPO Coordinator
Supplies	Not Applicable	0	0	0	0	0	0	
Maintenance	Not Applicable	0	0	0	0	0	0	
Depreciation	Not Applicable	0	0	0	0	0	0	
Space	Not Applicable	0	0	0	0	0	0	
Finishing	Not Applicable	0	0	0	0	0	0	Included in Final Product
Alternative 1 Total:	0	643,644	659,735	676,228	693,134	710,463	3,383,204	
Cost Per Thousand:		$19.89	$20.39	$20.90	$21.42	$21.96	20.91	

Alternative 2 (In-House, Column A JCP Form 1)

Service Life	Base	Year 1	Year 2	Year 3	Year 4	Year 5	Service Life $	
Investment (On Site Dupl)		17,760	17,760	17,760	17,760	17,760	88,800	
Network HW/SW	Not Available	0	0	0	0	0	0	
Labor (WG 9-2)	0	178,431	182,892	187,464	192,151	196,954	937,892	Duplicating Operators
Supplies	0	147,695	151,387	155,172	159,051	163,028	776,333	
Maintenance	Not Applicable	83,652	83,652	83,652	83,652	83,652	418,260	
Space	0	18,862	19,334	19,817	20,312	20,820	99,145	
Depreciation	Not Applicable	38,902	38,902	38,902	38,902	38,902	194,510	
Alternative 2 Total:	0	485,302	493,927	502,767	511,828	521,116	2,514,940	
Cost Per Thousand:		$27.56	$28.04	$28.55	$29.06	$29.59	28.56	

Alternative 3 (JCP Form 1, Column C)

Service Life	Base	Year 1	Year 2	Year 3	Year 4	Year 5	Service Life $	
Investment	0	6,394	6,394	6,394	6,394	6,394	31,970	
Network HW/SW (incl in LTOP)	Not Applicable	0	0	0	0	0	0	
Labor (GS 9-5)	0	354,865	363,737	372,830	382,151	391,705	1,865,287	Duplicating Operators
Supplies (includes Paper)	0.0050	22,137	22,690	23,258	23,839	24,435	116,359	
Maintenance (Per Copy)		27,537	88,980	88,980	88,980	88,980	383,457	
Depreciation (10%)		25,561	25,561	25,561	25,561	25,561	127,805	
Space	Not Applicable	0	0	0	0	0	0	
Finishing	Not Applicable	0	0	0	0	0	0	
Alternative 3 Total:	0	436,494	507,362	517,023	526,925	537,075	2,524,878	
Cost Per Thousand:		$343.06	$398.76	$406.35	$414.13	$422.11	396.88	

Alternative 4 (Networked DocuTech)

Service Life	Base	Year 1	Year 2	Year 3	Year 4	Year 5	Service Life $	
Investment (LTOP)	0	82,575	82,575	82,575	82,575	82,575	412,874	NetDocuTech
Network HW/SW (incl in LTOP)	Not Applicable	0	0	6,579	6,579	6,579	19,737	
Labor (WG 9-2)	0	68,000	69,700	71,443	73,229	75,059	357,430	Duplicating Operators
Supplies (includes Paper)	0.0050	119,941	122,940	126,013	129,163	132,392	630,449	
Maintenance (>1.2M = .002)		85,920	93,890	93,890	93,890	93,890	461,480	
One Time Charges	Training/Tech Support	6,000	15,000	10,000	5,000	5,000	41,000	
Space	0	9,431	9,667	9,908	10,156	10,410	49,572	
Finishing	Not Applicable	0	0	0	0	0	0	
Alternative 4 Total:	0	371,867	393,771	400,408	400,592	405,906	1,972,543	
Cost Per Thousand:		$25.82	$27.35	$27.81	$27.82	$28.19	27.40	

Alternative Cash Flow Comparisons

		Year 1	Year 2	Year 3	Year 4	Year 5		
Alternative 1	0	643,644	659,735	676,228	693,134	710,463	3,383,204	
Alternative 2	0	485,302	493,927	502,767	511,828	521,116	2,514,940	
Alternative 3	(0)	436,494	507,362	517,023	526,925	537,075	2,524,878	
Alternative 4	(0)	371,867	393,771	400,408	400,592	405,906	1,972,543	
Return On Investment #4		1.64	1.55	1.52	1.52	1.50		Assumes Productivity Increase of 0.5% /Yr

Alternatives	Initial Cash Outflow	Interest Rate	NPV	PV	Benefits	B/C Ratio	Avg Cost/Yr	Avg Cost/Thousand
Alternative 1	0	6.50%	2,803,179	2,811,903	0	Not Applicable	676,641	$20.91
Alternative 2	0	6.50%	2,085,582	2,090,257	868,264	0.35	502,988	$28.56
Alternative 3	(0)	6.50%	2,086,782	2,098,517	858,326	0.34	504,976	$396.88
Alternative 4	(0)	6.50%	1,635,472	1,639,451	1,410,661	0.72	394,509	$27.40

	Pay Period 3	Annual Productivity Savings Based On .5% to 6% Per Year						
		Productivity - .5%	Productivity - 1%	Productivity - 2%	Productivity - 3%	Productivity - 4%	Productivity - 5%	Productivity - 6%
Total Hours/Pay Period	137,053	685	1,371	2,741	4,112	5,482	6,853	8,223
FTE/Pay Period	1,713	9	17	34	51	69	86	103
Avg $/FTE (incl Benefits)	$71,153							
Average Savings/Yr	Not Applicable	$609,483	$1,218,967	$2,437,933	$3,656,900	$4,875,866	$6,094,833	$7,313,799

Productivity Analysis

Table 8. Productivity Comparisons

Application Category	Customer job(s) 1 — 118 pages
Original elapse time at printer plus mailing	5 — 27 days
Original processing time	4 — 10 hrs
Proposed elapsed time at DocuTech plus mailing	< 1 day
Proposed processing time	2.82 — 8.74 hrs

Table 8 shows a reduction in elapsed time from a minimum of 5 days to less than 1 day. Thus, the table shows a percentage gain of approximately 80 percent reduction in providing the customer the end product. Processing time is reduced from minimal of 4 hours to 2.82 hours or a 30 percent reduction.

Phase 1—Return on Investment

During the Phase 1 evaluation and analysis of the benefits and costs, it was conclusively shown that full cost recovery can be achieved without any additional funds required. (See Table 5.) Specifically, the cost for the Phase 2 evaluation is $18,875, and the revenue to cover this cost is estimated to be $18,893 for the publications identified. During the Phase 2 evaluation period (90 days), there were no restrictions on the number of impressions produced. As described previously, actual production statistics were gathered by customer account code to validate the estimated revenues to cover the operational costs of the Networked DocuTech. For the Phase 2 evaluation, the return on investment (ROI) identified during the Phase 1 evaluation is

ROI = Gained divided by Cost = $18,893/$18,875 = 1.00 (See table 3.)

Or more specifically, for every dollar invested, $1.00 is returned. Physical storage and mailing costs have not been considered in this analysis. Potentially, for the ongoing production, table 5 shows a ROI of 1.28 after a 25 percent reduction in calculated revenues based upon the cost algorithm input into the networked DocuTech's accounting system.

PHASE 2—90-DAY EVALUATION

Benchmark Requirements

For the benchmark demonstration test, 7 hours of production duplicating work consisted of the following minimum work requirements:

Test 1   Select daily workload from Xerox 5090 and duplicators and at least 2 hours of previous daily workload in queue (print server) ready to be released for output by 7:00 a.m., the day of the test. Jobs should be either scanned the day before the test or be made electronically available in the print queue. (Test capacity of DocuTech to perform daily workload.)

Test 2	Assemble selected publications by Research Publishing and Printing Branch to be sent to DocuTech for duplicating.
Test 3	Demonstrate use of Xerox Job Ticket from remote user workstation. Designated remote workstations are from the Research Publishing and Printing Branch and second designated source. (Test functionality of use of job ticket from remote work stations, SUN/OS and MacIntosh.)
Test 4	Receipt of latest version of Evaluation Report and STI Electronic Document Distribution Report from Code JTT client workstation as an Adobe PostScript electronic document for duplicating and finishing as a tape-bound publication to DocuTech Print Server. (Test functionality of receipt and transfer of files from Headquarters PC work station.)
Test 5	Receipt of latest version of Evaluation Report and STI Electronic Document Distribution Report from Research Publishing and Printing Branch anonymous file server. (Test functionality of receipt and transfer of files from remote file server on site (LaRC).)
Test 6	Scan, cut and paste, assembly of selected pages on DocuTech (tables 6 and 7 of the LaRC Evaluation Report transmitted originally via FTP to the Research Publishing and Printing Branch's file server from Headquarters PC workstation. Job subsequently FTP to networked DocuTech Print Server from Research Publishing and Printing file server. (Test functionality of DocuTech.)

Test 7   Compare quality of output:
- a. Source versus 1st copy, 25th copy, and 50th copy
- b. Graphics
- c. Half tones
- d. Finishing (saddle stitch, single stitch, double stitch, thermal taping)
- e. Finishing (saddle stitch, 8.5- x 11 in. and 5.5- x 8.5 in.)
  (Test output quality.)

Test 8   Concurrency of operations:
- a. Duplicating during scanning of new job
- b. Receipt of electronic files to be duplicated during and scanning of new jobs
- c. Scan, cut and paste during duplicating
  (Test concurrency.)

Test 9	Test storage of ripped files from Print Server to Extended Storage and retrieval for duplicating by DocuTech. Printout of ripped file on optical disk from GSFC DocuTech publication. (Test functionality of extended storage.)

Test 10   Print accounting statistics during conduct and at end of benchmark. Accounting statistics required are:
- a. Duplicating cycle time for each saddle stitch job
- b. Duplicating cycle time for each stapling job
- c. Duplicating cycle time for each thermal tape job
- d. Electronically received jobs

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e. Ripped file from GSFC via optical disk

Benchmark Results

Benchmark results for quality are scored according to the following ratings: Excellent = 5, Good = 4, Fair = 3, Poor = 2, and Unacceptable = 1. Table 9 displays the results in response to test 7.

Table 9. Output Quality

Job	Copy			Remarks
	1st	**25th**	**50th**	
TP 3480	5	5	5	Saddle stitched, cover insertion module
TP 3465	5	5	5	Saddle stitched, cover insertion module
TP 3452, Vol 4	5	5	5	Saddle stitched, cover insertion module
TP 3476	5	5	5	Saddle stitched, 4 pages halftones, cover insertion module
CR 194978	5	5	5	Saddle stitched, 9 pages halftones, cover insertion module
TM 109164	5	5	5	Saddle stitched
CR 195027	5	5	5	Dual stitched
Eudora	5	5	NA	Dual stitched
Quick Mail Guide	5	5	NA	Saddle stitched, 5.5 in. x 8.5 in.
X2B4A88D	5	NA	NA	Electronic, Mac File from Research Publishing and Printing Branch (RPPB), proof copy
809B270A.MJD	5	NA	NA	Electronic, SUN/OS File from RPPB, proof
eddpub	5	NA	NA	Electronic, PC PostScript originated at Hqts, proof
Iaevlrpt	5	NA	NA	Electronic, PC PostScript originated at Hqts, proof
EOS, GSFC	5	NA	NA	Optical Disk, ripped at GSFC, proof copy with tabs
EOS, GSFC	5	NA	NA	Optical disk, ripped at GSFC, proof copy, no tabs
Iaevlrpt	5	5	NA	Single staple
Iaevlrpt	5	5	NA	Double staple
Iaevlrpt	5	5	NA	Thermal tape
Iaevlrpt	5	NA	NA	Scan, cut and paste, tables 6 and 7

Table 10 displays the characteristics of the workload submitted to the networked DocuTech during the benchmark. Abbreviations are SBM = signature booklet maker, CIM = cover insertion module, NA = not applicable, SS = single stitch, DS = double stitch, TT = thermal tape, C&P = cut and paste, HT = halftones, Impr = impressions.

Table 10. Job Characteristics

Job	Pages	Copies	Binding	Print time, min	Total Impr	Remarks
TP-3480	44	405	SBM/CIM	237	8,912	Job scanned previous day
TP-3465	52	50	SBM/CIM	34	1,301	Job scanned previous day
TP-3452	56	50	SBM/CIM	39	1,401	Job scanned previous day
TP-3476	56	50	SBM/CIM	27	1,401	Job scanned previous day, 4 pages of HTs
CR-194978	40	50	SBM/CIM	26	1,001	9 pages of HTs
TM-109164	56	50	SBM	29	1,401	Signature booklet maker
CR-195027	59	25	DS	13	1,476	Double stitch
Eudora	148	25	DS	29	3,676	Double stitch
QuickMail G	35	25	Stack	8	876	Stack
X2B4A88D	15	Proof	NA	NA	15	Electronically transmitted via job ticket from MacIntosh
809B270A.MJD	21	Proof	NA	NA	21	Electronically transmitted via job ticket from SUN/OS workstation
eddpub	39	Proof	NA	NA	39	Electronically transmitted via RPPB file server
laevlrpt	33	Proof	NA	NA	33	Electronically transmitted via RPPB file server
laevlrpt	33	25	SS	7	801	Single stitch
laevlrpt	33	25	DS	7	801	Double stitch
laevlrpt	33	25	TT	8	801	Thermal tape
EOS	88	Proof	NA	7	87	7 minutes to transfer to DocuTech from extended storage (42 MB)
EOS - with tabs	95	Proof	NA	7	94	7 minutes to transfer to DocuTech from extended storage (42 MB)

Table 11 summarizes each test, its functionality, and the test results for each test. Table 12 displays a list of each job runned on the networked DocuTech, the total number of impressions, the time in minutes taken to print the complete job, the effective impressions per minute, and the type of finishing for each job. Table 12 also provides a column for total number of impressions if the job was thermal tape versus Signature Booklet Maker/Cover Insertion Module using an effective rate of 100.13 impressions per minute.

Table 11. Test Results

Test	Functionality	Test Results
1	Inclusion of daily work load	Effective copies per min for 11 x 17 SBM jobs was 39.31.
2	Electronic file transfer	Assembly and transfer of files from Research Publishing and Printing Branch was fully successful.
3	Job Ticket	Use of Job Ticket demonstrated for the MacIntosh and SUN/OS workstations, was not demonstrated using a PC workstation.
4	Hqts remote electronic file transfer	Electronic files FTP to LaRC file server and subsequently transmitted to networked DocuTech was fully successful.
5	On site remote electronic file transfer	See test 4.
6	Scan, cut, and paste	Demonstrated the scan, cut, and paste functionality using the LaRC Evaluation Report.
7	Output quality	Output quality at 1st, 25th and 50th copy was excellent. Finishing for SS, DS, TT, and SBM was good.
8	Concurrency	Fully demonstrated concurrency, e.g., SBM, electronic file receipt, scan, cut, and paste occurred simultaneously.
9	Extended storage	Demonstrated the retrieval of stored file and the printing of a file created by GSFC on a magneto optical disk manually brought to LaRC.
10	Accounting	Fully met the accounting requirements.

Table 12. Production Statistics

Job	Impressions	Minutes	Effective Impressions/Min	Finishing	If Thermal Tape - # Imp	Remarks
TP 3480	8,912	237	37.60	SBM/CIM	23,731	
TP 3465	1,301	34	38.26	SBM/CIM	3,404	
TP 3452	1,401	39	35.92	SBM/CIM	3,905	
TP 3476	1,401	27	51.89	SBM/CIM	2,704	
CR 194978	1,001	26	38.50	SBM/CIM	2,603	
5.5 x 8.5	451	5	90.20	SBM	501	
Total	14,467	368	39.31		36,848	
TM 109121	1,401	29	48.31	DS		
CR 195027	1,476	13	113.54	DS		
Eudora	3,676	29	126.76	DS		
QuickMail	876	8	109.50	Stack		
Total	7,429	79	94.04		7,429	
laevlrpt	801	7	114.43	SS		
laevlrpt	801	7	114.43	DS		
laevlrpt	801	8	100.13	TT		
Total	2,403	22	109.23		2,403	
Scan	303	28	10.82		303	
Setup		103				
Grand Total	24,602	600	41.00		46,983	10 hr day
Standard Day		480			37,586	8 hr day
					826,898	22 days

Validation of Cost Analysis

The Phase 2 cost analysis was validated by collecting production statistics generated by the Networked DocuTech. These statistics are displayed by the following table. Production statistics were gathered weekly by customer account programmed into the networked DocuTech.

Table 13. Phase 2 Production Statistics

Account Code	Week 1 (10/9 — 10/15)	Week 2 (10/16 — 10/22)	Week 3 (10/23 — 10/29)	Week 4 (10/30 — 11/5)	Week 5 (11/6 — 11/12)	Week 6 (11/13 — 11/19)	Week 7 (11/20 — 11/26)	Week 8 (11/27 — 12/3)	Week 9 (12/4 — 12/10)
Code A	10,901		18,456	46,823	5,208	17,969	6,873	3,404	2,057
Code B						10,801		18,383	3,005
Code C	625			11,691	13,192	13,192		771	1,212
Code D	1,400	10,060	35,573	180	23,845	6,932	15,677	5,279	22,101
Code E									
Code F									
Code G		14,552	18,582	50,019	34,030		31,627	20,018	10,776
Code H									
Code I		188,632		16,894				859	
Code J				11					
Misc									
Total Impressions	12,926	213,244	72,611	125.418	76,275	48,894	54,177	48,714	39,151
Cumulative Impressions	12,926	226,170	298,781	424,199	500,474	549,368	603,545	652,259	691,410
Revenue	$631.82	$8,140.09	$3,122.65	$4,863.38	$3,785.11	$2,865.60	$3,332.93	$2,418.50	$2,531.47
Cumulative Revenue	$632	$8,772	$11,895	$16,758	$20,543	$23,409	$26,742	$29,160	$31,692
Cost/Pg	$0.04868	$0.03817	$0.04301	$0.03878	$0.04962	$0.05861	$0.06152	$0.04967	$0.06466

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Table 13. Production Statistics (continued)

Account Code	Week 10 (12/11 — 12/17)	Week 11 (12/18 — 12/24)	Week 12 (12/25 — 12/31)	Week 13 (1/1 — 1/7)	Week 14 (1/8 — 1/14)	Week 15 (1/15 — 1/21)	Week 16 (1/22 — 1/24)	Week 17 (1/29 — 2/4)	Benchmark 1/24/95
Code A	13,313	72,586	40,700	67,765	13,709	10,081	1,245		
Code B									
Code C									
Code D	53,421	17,075	6,711	5,367	2,219	16,580	18,708		
Code E					766,050				
Code F									
Code G	2,295	13,264	45,684		135,505	10,960	5,537		
Code H				1,482					
Code I									
Code J									
Misc							4,533		
Total Impressions	89,029	102,925	93,095	74,614	915,393	37,567	30,023		25,865
Cumulative Impressions	760,439	863,364	956,459	1,031,073	1,946,466	1,984,033	2,014,056		25,865
Revenue	$4,627.34	$6,597.15	$4,897.81	$4,953.09	$5,966.03	$1,827.17	$1,507.60		$1,298.94
Cumulative Revenue	36,319	$42,916	$47,814	$52,767	$58,732.97	$60,560	$62,068		$1,299
Cost/Pg	$0.06703	$0.06410	$0.05261	$0.06638	$0.00652	$0.04864	$0.05022		$0.05022

Designated cost algorithm for the Networked DocuTech are as follows:

Category	Rate
Total impressions	25
1-sided prints	15
2-sided prints	25
11-in. x 17-in. prints	25
11-in. x 17-in. impressions	15
Single print jobs	15
Scans	30
Binds	200
Single stitches	5
Dual stitches	10
Total booklets	24
11-in. x 17-in. booklets	2

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Customer account codes are as follows:

Code A	Office of Director
Code B	Aeronautics Program Group
Code C	Space and Atmospheric Sciences Program Group
Code D	Research and Technology Group
Code E	Technology Applications Group
Code F	Not Assigned
Code G	Internal Operations Group
Code H	Office of the Comptroller
Code I	High-Speed Research Project Office
Code J	Hypersonic Vehicles Office
Miscellaneous	Charges to Duplicating Facility

Cost Comparisons

Table 14 displays the cost comparisons at various stages of the networked DocuTech evaluation cycle. For example, Phase 1 represents a paper study which covers the estimated cost recovery achieved by inputting the cost algorithm into the networked DocuTech's accounting software versus the proposed evaluation cost over a 3 month period. Phase 2 represents a paper study which covers the estimated cost recovery achieved with the same cost algorithm for a 12 month period. The Phase 2 actual represents weekly accounting statistics gathered from October 9 through December 24, 1995 with the same algorithm. Finally, the benchmark are those statistics gathered for the workload that day.

Table 14. Cost Comparisons

Description (For Period Under Evaluation)	Phase 1	Phase 2	Phase 2 (Actual)	Benchmark 1/24/95
Reference	Table 3	Table 5	Table 6 & 13	Table 13
Total Impressions	1,280,359	15,364,304	2,014,056	25,865
Networked DocuTech Cost	$6,292	$234,508	$26,155	$436
Estimated Cost Recovery	$5,092	$399,472	$62,068	$1,299
Cost Per Copy (Zero Base)	$.00681	$0.01526	$0.01294	$0.01685
Cost Per Copy (Recovery)	$0.01476	$0.02600	$0.03082	$0.05022
Remarks	Initial Estimate	Initial Estimate	Actual Numbers	One Day

Table 15 summarizes the production profile for fiscal year 1994 and the first three months of fiscal year 1995.

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Table 15. Production Profile (Total Impressions)

Item	Impressions FY 1994	Impressionss FY 1995 (Oct-Jan)	Remarks
GPO	32,352,200	5,670,656	Projected FY 1995 = 17,011,968
JCP Form 1, Column A	17,611,983	6,704,069	Projected FY 1995 = 20,112,207
JCP Form 1, Column C	1,272,364	305,200	Projected CY 1995 = 915,600

Table 16 provides a detail breakdown of the Fiscal Year 1994 JCP Report for Column C cost components.

Table 16. FY94 JCP Report - Column C Cost Components

Cost Item	Column C
Maintenance - 7500/7100/CLc1/550	$ 26,397
Rental - Mita 95/Mita 96	$ 6,392
Depreciation - 7500/7100/CLC1/550	$ 21,574
Labor - one operator	$ 24,263
Supplies - Color Copiers/Engineering Drawings	$ 12,529
Space	$ 0
Total	$ 91,155
Total Units	1,272,364
Cost Per Thousand	$ 71.64

Benchmark Observations

The following observations were made from the analysis of the production statistics gathered during the evaluation period, the fiscal year 1994 JCP report submitted to the NASA Printing Management Officer, and the results of the benchmark testing. During the benchmark, the start and ending times for the jobs were not scientifically measured; that is, they represent approximate timings and not computer clock readings generated by the networked DocuTech. The networked DocuTech measures only the start of the job and does not register the completion time for the same job. These observations are as follows:

1. The networked DocuTech does not perform at its rated throughput of 135 pages per minute (8.5 in x 11 in) based upon the production profile used during the benchmark. Specifically, table 12 shows that during the benchmark testing for six signature booklet maker jobs, the effective throughput was approximately 39.31 pages per minute. The effective throughput increases to 100.13 pages per minute when the jobs were switched to thermal tape.

2. Based upon the cost algorithm input into the networked DocuTech, the cost recovery was

more than adequate to fully recover the cost of the evaluation assuming that LaRC is on a fee-for-service status. Specifically, Table 13 shows the recovery of $62,068 with an evaluation cost of $26,155. (see table 6.) The cost per page comes to $.03082 based upon the cost algorithm and $0.01299 per page based upon the evaluation cost.

3.   The analysis of the fiscal year 1994 JCP report shows that use of the GPO is cost- effective and should be continued. Table 7 shows that the cost per thousand impressions is $19.89 (assuming that fiscal year 1995 GPO costs remain the same as fiscal year 1994).

4.   The analysis of the fiscal year 1994 JCP report shows that column C of Form 1 does not justify the level of staffing for the number of impressions produced. Table 13 shows a cost per thousand impressions to be $343.06.

5.   The analysis of the fiscal year 1994 JCP report for column A of Form 1 and the cost of the networked DocuTech shows that by changing the production profile of the jobs submitted to the networked DocuTech, the cost per impression drops from $0.02756 to $0.02582. (see Table 13.) This amount includes all cost elements (e.g., space, staffing, supplies).

6.   Through the use of business process reengineering of the printing and duplicating requirements andworkflow processes within the facility, significant cost savings could be obtained. For example, cost savings could be achieved by the elimination of color (except for functional uses), minimizing the use of saddle stitch publications, removing all duplicating presses (eliminates the use of chemicals, etc), diverting duplicating presses workload to the networked DocuTech, Xerox 5090, and GPO where appropriate, and having a single duplicating operator run more than one duplicator.

7.   The 1st, 25th, and 50th copies produced by the networked DocuTech were compared, and all copies were of excellent output quality. It did not matter whether the original document was scanned or electronically submitted

Recommendations

Based upon the phase 1 and phase 2 benchmark results, benchmark observations, and the associated cost benefits analysis, the following recommendations are given:

1.   Conduct an extensive business process reengineering of the printing and duplicating requirements/workflow processes across all organizational entitities within LaRC.

2.   Retain the networked DocuTech, however, remove all duplicating presses and related equipment, and divert this workload to the networked DocuTech, Xerox 5090, and GPO when this option is most cost-effective and timely.

3.   Acquire the set labeling functionality of the networked DocuTech to reduce the manual labor involved in the affixing of mailing addresses to publications for distribution to LaRC duplicating customers.

4.   Develop an implementation plan to enable all LaRC authors to generate and transmit their finished publications electronically to the networked DocuTech after approval by the Research Publishing and Printing Branch.

ACRONYMS

ARC	Ames Research Center
Code JTT	Scientific and Technical Information Office
CIM	Cover Insertion Module
DPI	dots per inch
DS	double stitch
FTE	full-time equivalent
GPO	Government Printing Office
GSFC	Goddard Space Flight Center
EDD	electronic document distribution
EPS	electronic publishing system
JSC	Lyndon B. Johnson Space Center
KSC	John F. Kennedy Space Center
LAN	local area network
LaRC	Langley Research Center
LeRC	Lewis Research Center
LTRS	Langley Technical Report Server
LTOP	lease to ownership plan
JCP	Joint Committee on Printing
JPL	Jet Propulsion Laboratory
JOFOC	justification for other than full and open competition
IPMO	Institutional Printing Management Officer
MOD	magneto optical disk
MSFC	George C. Marshall Space Flight Center
NA	not applicable
NPMO	NASA Printing Management Officer
NPV	net present value
PV	present value
ROI	return on investment
SBM	Signature Booklet Maker
STIO	Scientific and Technical Information Office
SS	single stitch
TT	thermal tape
WAN	wide area network
WORM	write once read many
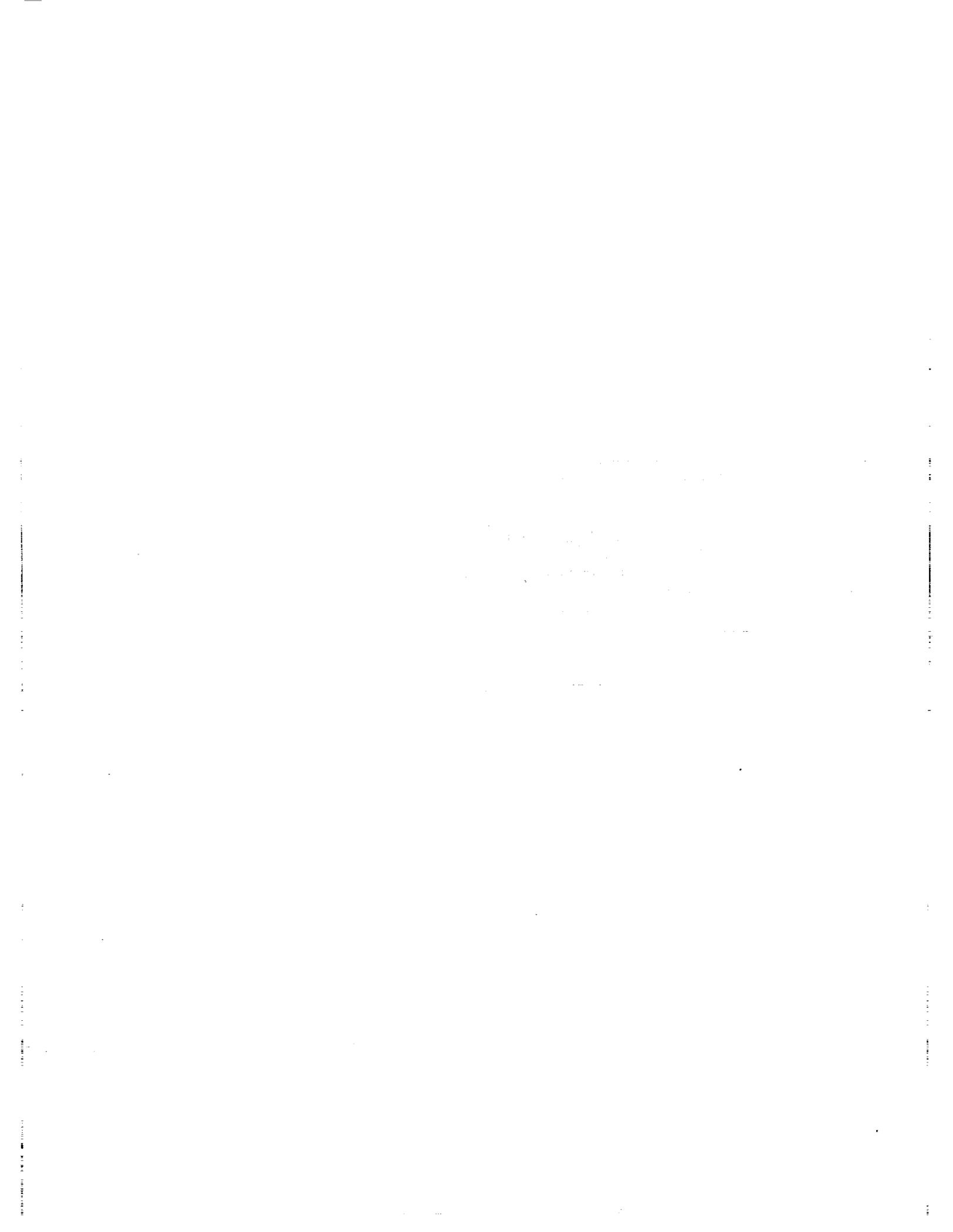
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APPENDIX A

Members of Evaluation Team

Mary McCaskill	LaRC, Research Publishing & Printing Branch, IPMO
Harold Orr	LaRC, Printing & Reproduction Section
Fred Moore	NASA, Printing Management Officer
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Dick Tuey	NASA, Electronic Publishing System Project Coordinator
Donna Roper	LaRC, Technical Publications Editor
Andy Papp	LaRC, Senior Systems Analyst
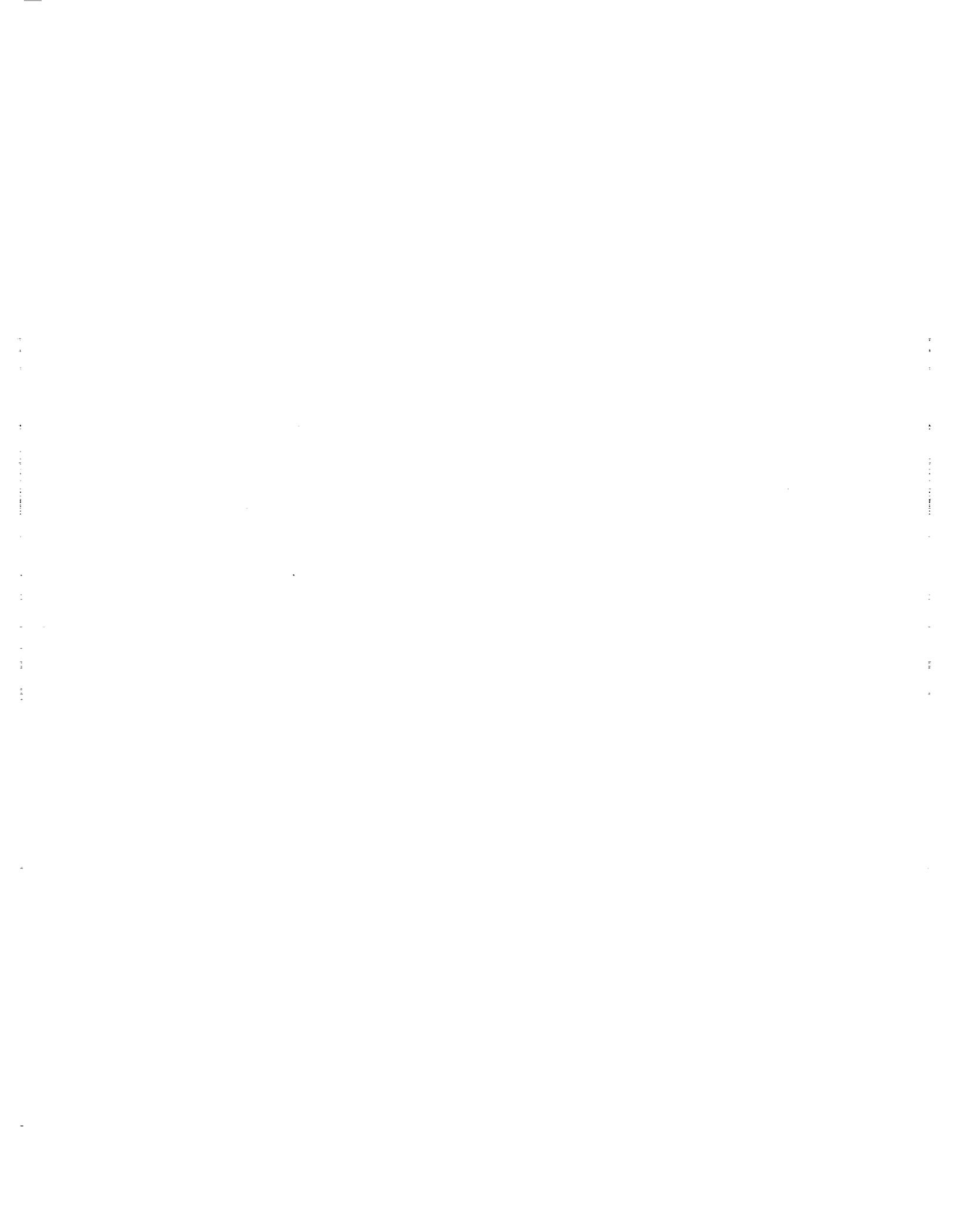
APPENDIX B

Printing and Duplicating Floor Plan

FIRST FLOOR PLAN
16,270 SQ. FT.

GRAPHIC SCALE - PLANS ONLY

CONSTRUCTION: 1152   DECEMBER 1941
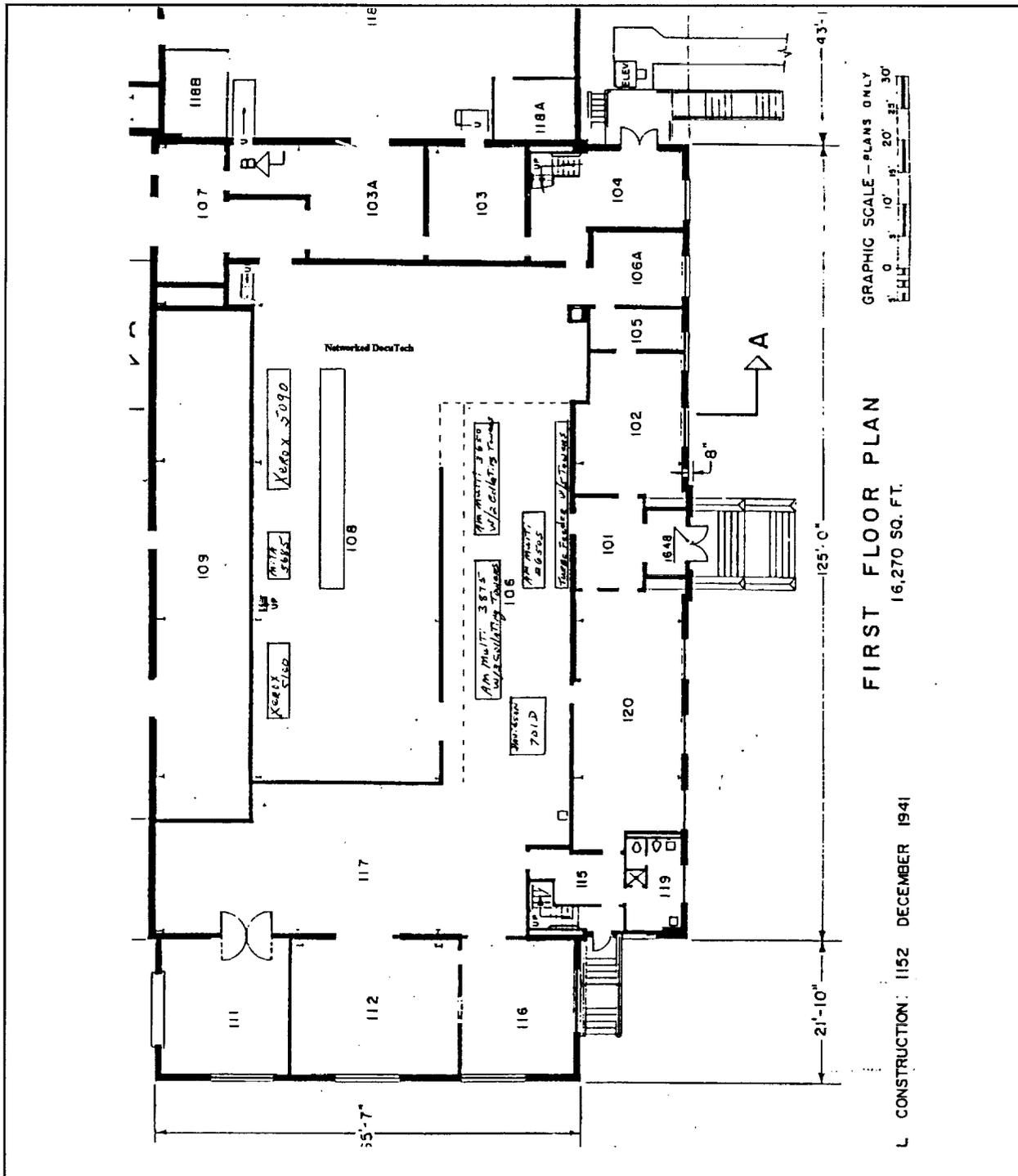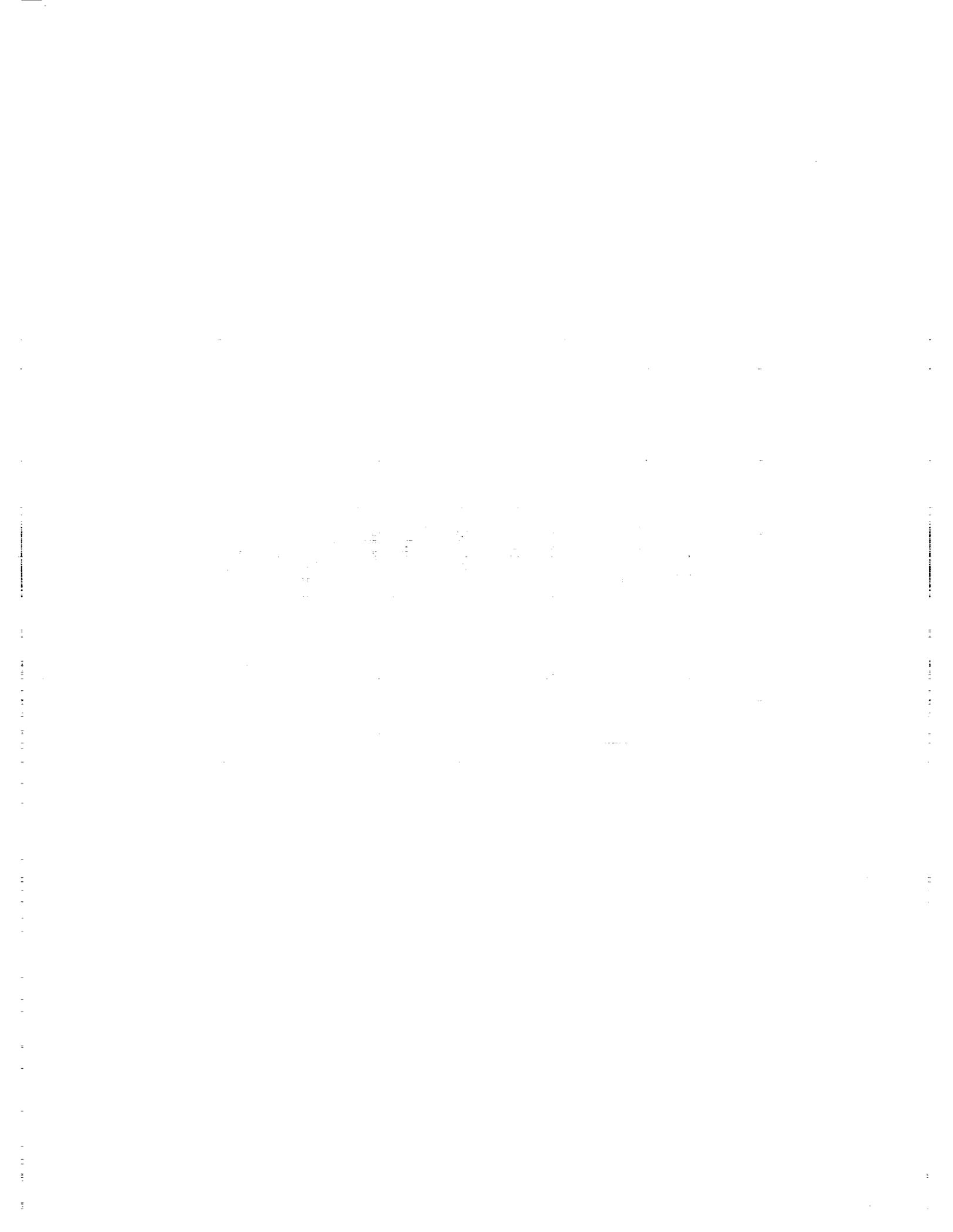
APPENDIX C

Comparative Central Printing and Copier Specifications

Specs	Alt 3 - Network DocuTech (Copier/Central Printer)	Alternative 3 and 4 Plus Other Options		
		Alt 4 - 4135 (Central Printer)	4090 (Central Printer)	5090 (Copier)
Speed	135 ppm	135 ppm	92 ppm	135 ppm
Resolution	600 dpi	600 dpi	300 dpi	300 dpi
Imaging	laser	laser	laser	Light Lens
Max Paper Size	11" x 17"	11" x 17"	8.5" x 14"	11" x 17"
Stock Bins	3	4 (+1 roll feed opt.)	2 (+2 opt.)	3
Stock Capacity	4,300	6,900 (+ roll feed opt.)	1,500 (+2,000 add opt.)	4,300
Duplexing	yes	yes	yes	yes
Stacker	8" x 10" to 9" x 14", 3,000 max	8" x 10" to 9" x 14", 3,000 max	8" x 10" to 9" x 14", 3,000 max	8" x 10" to 9" x 14", 3,000 max
Stitcher	8x10-9x14", 2-70 sheets (32K /spool)	opt. (finishing partner)	opt. stitcher (2-50 pgs.)	8x10-9x14", 2-70 sheets (32K /spool)
Saddle Stitch	5.5x8.5 & 11x17 in line (opt. sign book maker)	opt. (finishing partner)	opt. (finishing partner)	no
Thermal Binder	8.5x11" 15-125 sheets, 425 binds /reel	opt. (finishing partner)	opt. (finishing partner)	8.5x11" 15-125 sheets, 425 binds /reel
Duty Cycle	1,000,000 per month	4,000,000 per month	2,000,000 per month	1,000,000 per month
CPU	6 Xerox CPUs	DEC J-11	DEC J-11	34 microprocessors, 5 mips
RAM	16 mb	n/a	n/a	n/a
Hard Drive	1,140 mb	2 @ 182mb ea. std (1,124 mb opt)	2 @ 170mb ea. std (1,123 mb opt)	n/a
Interface	Ethernet XNS	Ethernet XNS	Ethernet XNS	n/a
Resident PDL	Interpress	Interpress	Interpress	n/a
Emulations	None	None	None	n/a
Print Manager	80386 PC	Functionality in Network Server	Functionality in Network Server	n/a
Network Server - HW	80386 PC	Sun Sparc 10	Sun Sparc 10	n/a
Network Server - SW	PS or HP/PCL, Novell, TCPO/IP, Appletalk	PS or HP/PCL, Novell, TCP/IP, Appletalk	PS or HP/PCL, Novell, TCP/IP, Appletalk	n/a
Media Server - HW	80386 PC	n/a	n/a	n/a
Media Server - SW	DOS, OS/2, Mac, SUN, PostScript or HP/PCL	n/a	n/a	n/a
RAM	8 mb std, 16 mb optional	32 mb standard	32 mb standard	n/a
Hard Drive	650 mb	424 mb standard	424 mb standard	n/a
PDL's	Postscript level 2 - Adobe, PCL 4 & 5	PS 1&2, HP PCL 4 &5, TIFF, ASCII, CCITT grp 4	PS 1&2, HP PCL 4 &5, TIFF, ASCII, CCITT grp 4	n/a
Client Support	IBM PC, Apple Macintosh, Unix Workstation	IBM PC, Apple Macintosh, Unix Workstation	IBM PC, Apple Macintosh, Unix Workstation	n/a
Scanner	Scan rate @ 2.5 sec per document, 23 ppm	n/a	n/a	n/a
Supply yields	Dry ink = 220k, developer = 750k, fuser agent = 250k	Dry ink = 260k, developer = 600k, fuser agent = 250k	Dry ink = 105k, developer = 300k, fuser agent = 140k	n/a
Administration (Accounting)	Stores up to 10,000 accounts	Not applicable, internal to computer complex job control system	Not applicable, internal to computer complex job control system	Stores up to 10,000 accounts

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

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APPENDIX D

NASA General Counsel Ruling—JCP's Duplicating Thresholds

National Aeronautics and
Space Administration

Headquarters
Washington, DC 20546-0001

Reply to Attn of: 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)

REPORT DOCUMENTATION PAGE

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13. ABSTRACT *(Maximum 200 words)*

The report is presented in four sections: The Introduction describes the duplicating configuration under evaluation and the Background contains a chronological description of the evaluation segmented by phases 1 and 2. This section includes the evaluation schedule, printing and duplicating requirements, storage and communication requirements, electronic publishing system configuration, existing processes, and proposed processes; billing rates, costs and productivity analysis, and the return on investment based upon the data gathered to date. The third section contains the Phase 1—Comparative Cost and Productivity Analysis. This analysis demonstrated that LaRC should proceed with a 90-day evaluation of the DocuTech and follow with a phase 2 cycle to actually demonstrate that the proposed system would meet the needs of LaRC's printing and duplicating requirements, benchmark results, cost comparisons, benchmark observations, and recommendations. These are documented after the recommendations.

14. SUBJECT TERMS

Electronic publishing, Duplicating, Cost analysis, FTP, Network duplicating, Cost benefit analysis, Return on investment, Justification

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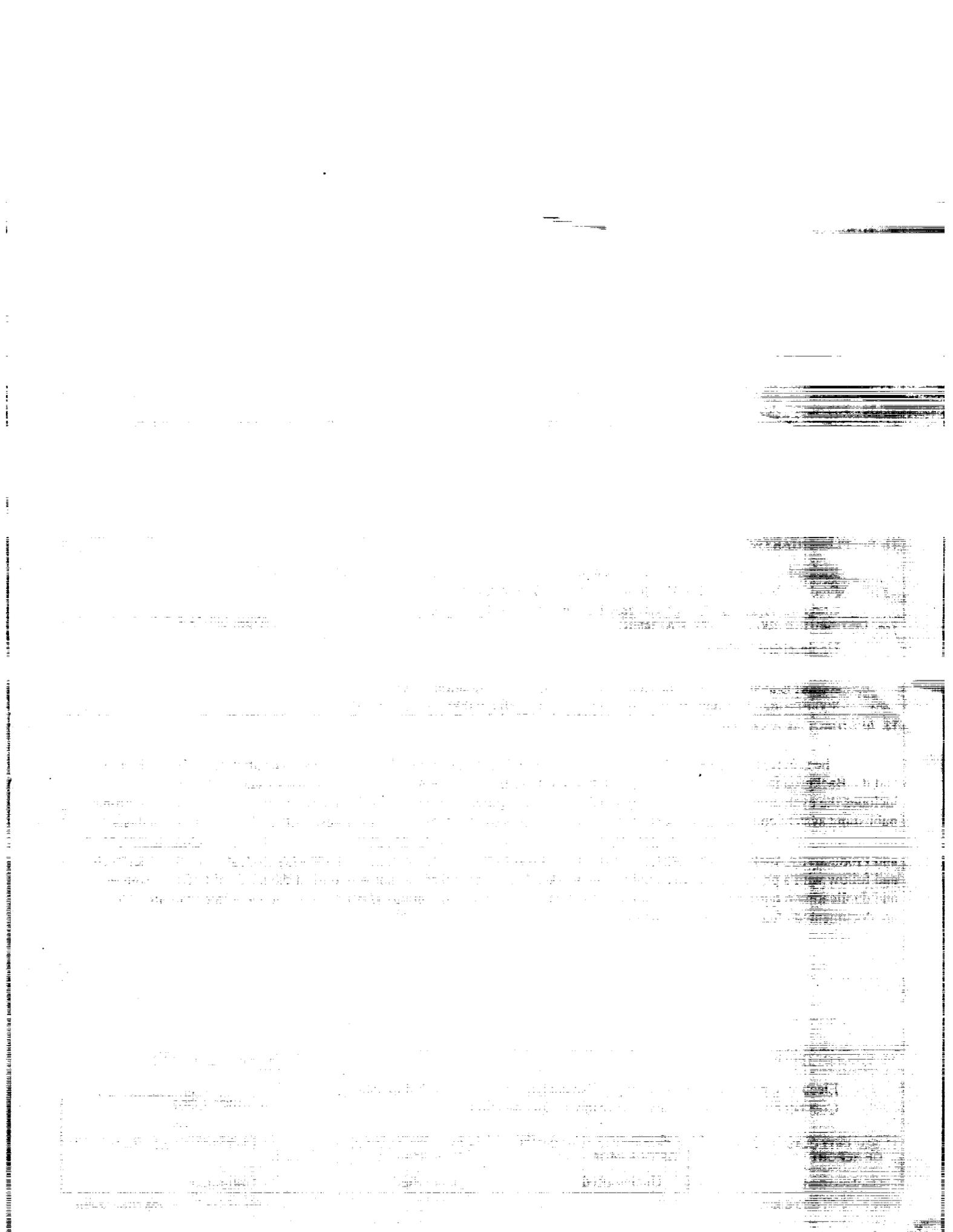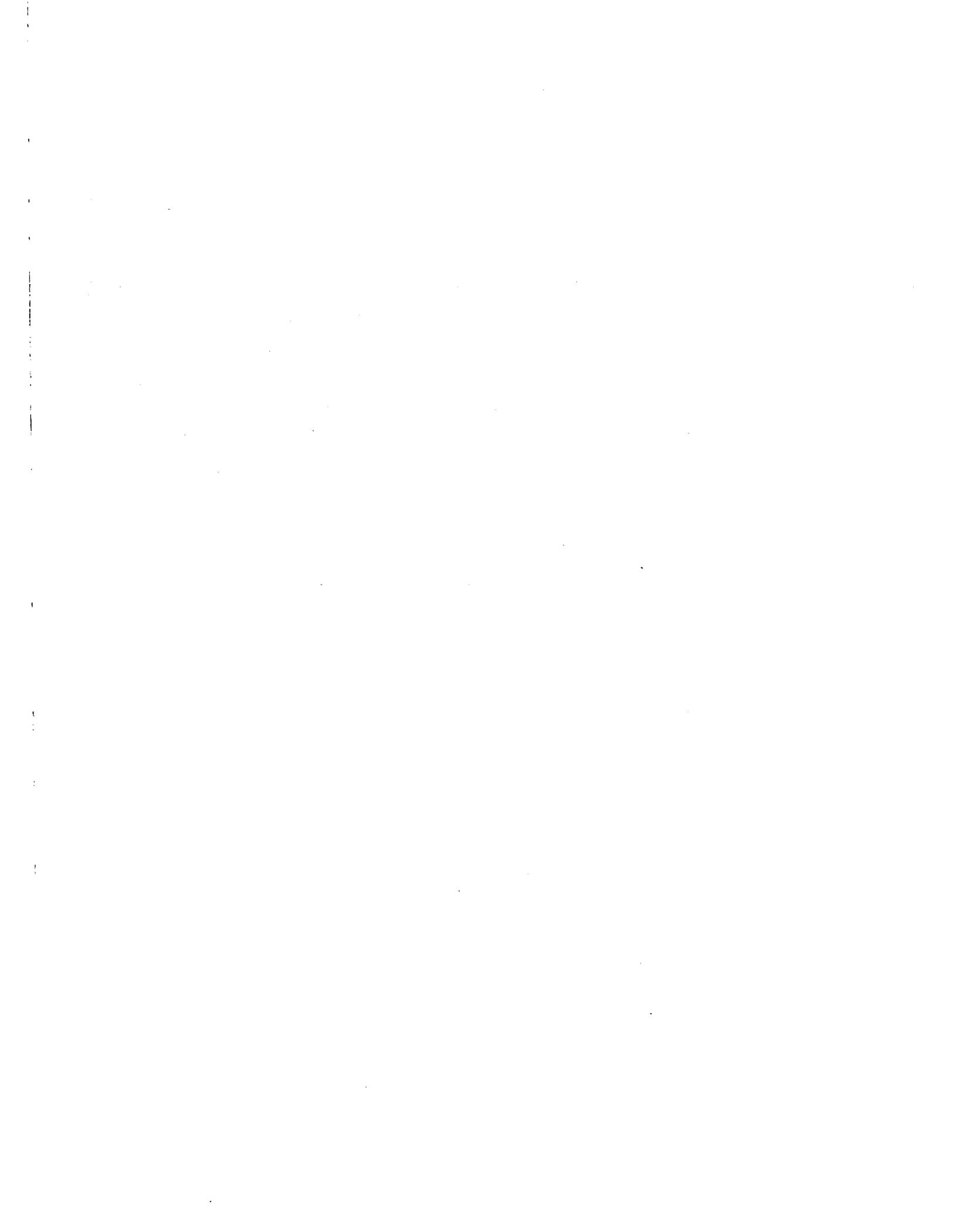
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