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This report discusses the potential for use of bar codes at the Naval Publications and Forms Center in its physical distribution activities. It identifies specific uses for bar coding, costs of implementation and expected benefits. It also addresses the potential for automating several processes which are now conducted manually at the Center.

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**BAR CODE APPLICATIONS
AT THE NAVAL PUBLICATIONS
AND FORMS CENTER**

July 1986

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John R. Symons

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Executive Summary

BAR CODING OPPORTUNITIES AT THE NAVAL PUBLICATIONS AND FORMS CENTER

Bar coding offers substantial opportunities for improving productivity, accountability, and responsiveness at the Naval Publications and Forms Center. Combined with automated system enhancements, it will permit the capture of significantly more production data than is now possible. Management can then have more of the information it needs for closer management of receipts, inventories, and issues.

We recommend adopting bar coding and enhancing automation in four broad areas:

RECEIVING offers potential for bar coding. Bar coded identification on exterior packaging (applied at the source) will substantially decrease receipt-processing time and increase the productivity of the receiving section.

STORAGE operations can be made considerably more visible through use of a "receipts in process" file that remains active until an item is stored and its bar code is scanned. Benefits include improved control of material between receipt and storage, earlier availability of new receipts for issue, and the ability to measure both backlogs and the effectiveness of storage operations.

ISSUES, similarly, will benefit from creation of an "issues in process" file that remains active until the bar coded Issue/Receipt Data Form attached to an item passes a bar code scanner in the shipping area. Visibility, backlog information, and issue effectiveness measures will improve.

SHIPPING, which now depends almost exclusively on the U.S. Postal Service, can be made much more economical through use of an automated diverting system

that will scan the bar coded zip code, weigh the parcel, and send the parcel by the most cost-effective means that customer priorities allow.

Implementation of these bar coding recommendations will enable the Naval Publications and Forms Center to track its high volume of products more accurately and process its throughput more efficiently.

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1. INTRODUCTION

The Naval Publications and Forms Center (NPFC) is a field activity under the Naval Supply Systems Command (NAVSUP) located in Philadelphia, Pennsylvania. It is the largest publications and forms activity in the Department of Defense (DoD) and, in terms of requisitions processed, one of the largest DoD stock point activities.

NPFC manages the inventory and receives and distributes all Navy publications, forms, and directives, and since 1962 it has been the single stock point for military specifications and standards. More recently, it assumed stock point and inventory control responsibilities for all DoD directives and instructions as well as for all Navy recruiting aids. Table 1-1 lists the various items stocked by NPFC.

TABLE 1-1. NPFC ITEMS STOCKED

TYPE OF COMMODITY	NUMBER OF LINE ITEMS
Naval Publications	153,100
Naval Forms	7,000
Directives:	
DoD	1,350
Department of the Navy	9,500
Aero Letter	<u>6,800</u>
Total	17,650
Data Item Descriptions	2,600
Recruiting Aids	300
Specifications and Standards	73,000
Total Items Stocked	253,650

Approximately half of the line items stocked by NPFC are forms and publications, known as COGI (Cognizance Code I) items. They are recorded on a modified version of the Navy's Uniform Inventory Control Point system. Stock

numbers are assigned to all COG I items, and formal inventory management records are maintained on a Master Data File (MDF). Remote terminals, located in the Receiving and Storage areas, are used to update COG I receipt due-in records during the receiving process and to add or change warehouse locations in the MDF. Documents for COG I issues, however, are printed in another building and hand-carried every morning to the storage areas to be removed from storage and subsequently shipped.

The other half of the items stocked and managed by NPFC are known as warehouse controlled items. Included in that category are all military specifications and standards and DoD directives. Those items are not assigned stock numbers, and no inventory records are maintained for them. As stocks are depleted, warehouse clerks advise the inventory managers that reprints are required. Reprints or revisions are forwarded by Receiving directly to the warehouse for storage and subsequent issue. It is important to note that NPFC expects to discontinue managing most warehouse controlled items in the near future when the Naval Publications and Printing Service introduces the Naval Print On Demand System (NPODS).

In addition to all naval units, NPFC's retail customers include thousands of other DoD organizations that use DoD directives, and tens of thousands of DoD and private concerns that use military specifications and standards.

NPFC customers may use any of several methods to order publications and forms. Military specifications and standards may be ordered by mailed request (in any form), telegram, or telephone. Naval publications, however, must be ordered using one of three DoD forms or through the Military Standard Requisition and Issue Procedures (MILSTRIP). Forms that must be paid for by the customer and classified Navy directives must also be requisitioned by MILSTRIP.

The workload at NPFC includes some 19,000 issues per day. (An issue is the fulfillment of a requisition for one item; if the requisition specifies 100 copies of the item, it is considered one issue.) The majority of these issues are requisitioned by customers on a random basis from shelf stocks. However, a large number of daily issues are processed in bulk. Examples of the latter include outfittings and special projects. An outfitting is the issuance of a complete set of publications and forms to a given naval unit. Examples include the issuance of a set of publications and forms to a newly designated aerial unit or a newly commissioned ship. Normally, an outfitting is requisitioned by the sponsoring command in bulk and processed by NPFC as a package. Special projects are also bulk issues, usually military specifications and standards that are processed for commercial customers as a package. Table 1-2 summarizes NPFC average daily issues by category.

**TABLE 1-2. NPFC AVERAGE DAILY ISSUES
FROM STOCK**

CATEGORY	AVERAGE DAILY ISSUES
Publications (COG I) ¹	5,884
Forms (COG I)	357
Specifications and Standards	4,762
Directives	3,057
Outfittings	940
Disposals	181
Special Projects	3,912
Total Average Daily Issues	19,093

¹Includes most recruiting aids and all classified publications.

To stock its quarter of a million line item inventory, NPFC uses 620,000 square feet of enclosed warehouse space. Some 8,900 linear feet of mechanized conveyors move approximately 220 receipts per day to Storage and 19,000 issues per day to

Shipping. Unique to publications and forms storage is a relatively standard bin size, generally 3.4 cubic feet (18 inches cube), used in storing material. This standardization is possible because the vast majority of items stocked are printed on 8.5 x 11 inch paper. Nearly 360,000 such retail locations (bins) are used to store loose copies of each line item managed by NPFC. Overflow copies are stored in approximately 26,000 open bay and pallet rack storage locations known as bulk storage.

A substantial portion of the NPFC workload consists of distributions, or transshipments of newly received publications or revisions to publications. Distribution addressees are usually identified by the publication's sponsor on mailing lists maintained by NPFC. The Naval Air Systems Command (NAVAIR), for example, determines the number of copies and addressees to whom a revision to the F-18 aircraft flight manual should be sent. Upon receipt of the new revision, NPFC distributes the appropriate number of copies to the NAVAIR-provided list of addressees; the remaining copies are then sent to stock for future issuance. In addition to 19,000 daily issues, NPFC averages approximately 5,000 distributions per day.

NPFC has taken some initial steps to introduce bar coding into its distribution operations. These steps include the application of a bar coded location label on each of its warehouse locations and a bar coded stock number label to a sample copy of each COGI publication stocked. However, to date, no scanning of bar codes has been introduced in NPFC's day-to-day operations. In this context, we were asked to review potential bar code applications in each of NPFC's operations.

This study identifies receiving, storage and issue, classified document handling, and shipment shortfalls with emphasis on those that could be improved by bar coding. It then offers recommendations for introducing bar code technology to NPFC. A description of the operational processes is presented in Appendix A.

Appendix B contains NPFC workload data, and Appendix C contains a summary, by stock class, of the number of publications now in stock that have stock numbers printed on them.

2. PROBLEMS IN NPFC OPERATIONS

The procedures used to physically handle NPFC-managed items are straightforward and labor-intensive. Compared with other supply activities in NAVSUP, NPFC has little automation and much of the record keeping in its stock point management processes is done manually. It has an impressive conveyor system, abundant space, and a large work force but suffers from an inefficient layout and an inability to trace material and to collect the information necessary for management control. Many opportunities exist for modernizing and automating NPFC's operations, and bar coding can play an important role in the Center's future.

In our review of the day-to-day operations of the NPFC receiving, storage and issue, classified material distribution, and shipping processes, we identified problems in existing operations. Those problems are discussed in this chapter and recommendations for corrections are presented in Chapter 3. A description of the four processes is provided in Appendix A.

THE RECEIVING PROCESS

Identifying Shipment Contents

Approximately 90 percent of the cartons that NPFC receives from vendors are not marked with the information needed by NPFC to identify the contents. On approximately 75 percent of the stock numbered items received, the stock number does not appear on the shipping label and, in many cases, on the interior contents. This lack of marking inhibits quick identification of the shipment and delays the receiving process. It also affects warehouse operations since items stored in bulk or retail storage cannot be easily identified. NPFC has requested sponsors to mark new receipts with a stock number on the document itself and, as part of its ongoing location entry effort, is applying stock number labels on one copy

of each COG I item in retail storage. No efforts are underway to improve carton labeling.

Lack of Due-In Data

Nearly 30 percent of all COG I receipts are delayed in Receiving because publication sponsors do not furnish NPFC with advanced due-in data (prearrival information on expected shipments identifying shipment contents). In these cases, considerable research by Receipt Control is required before the receipt can be processed. Since most COG I material is ordered by sponsors who are not under NPFC's control, obtaining due-in data is a serious problem. Any bar code application in Receiving must depend on pre-positioned data, and timely throughput is only possible if new receipts are expected in advance.

Customer Returns

Approximately 30 percent of NPFC's receipts are customer returns. Two problems with returns are: many returns are poorly documented by the activity that sends the material (so research is necessary before disposition is possible), and the volume of many returns is so low that the cost of NPFC's handling (and the cost of mailing them to NPFC) exceeds the savings that result from the return. NPFC management is aware of both problems, and its general policy is that low volume returns (fewer than 10 copies) are not sent to stock. Even that number appears to be below the break-even threshold, especially when the cost of postage is considered.

Receiving Floor Layout

No matter how straightforward the identification process is, all material NPFC receives is temporarily stored pending identification, and thus, throughput is unnecessarily slow. Many factors contribute to this problem; poor marking of material and containers and lack of due-in data have already been addressed; other problems are inefficient floor layout and poor access to computer terminals. Receiving occupies an area of approximately 30,000 square feet and is divided into

two areas: a small receipts processing area primarily for U.S. Postal Service (USPS) receipts and a bulk receipts area primarily for pallet-size shipments. In both areas, we note a lack of conveyors and an abundance of temporarily stored material. The Small Receipts area contains eight large metal racks capable of holding several hundred shipments; Bulk Receipts uses open-bay storage to retain shipments during the receipt-processing cycle. Warehouse controlled material moves relatively smoothly through Receiving but must be temporarily stored while Receipt Control clerks check with item managers for special handling instructions (such as initial distributions). Once instructions have been prepared, the material must be located (in the appropriate rack or bay) and moved.

COG I material, on the other hand, remains within Receiving for a relatively long time. For the 70 percent of COG I incoming shipments that have clean receipts (receipts that have accurate due-in data that is accessible in moments), material can be delayed in Receiving for several hours while the sample copy is hand-carried to a computer terminal for data input and preparation of a storage document. Delays of several days and sometimes weeks are experienced for the remaining 30 percent while Inventory Control resolves the identity problem (usually by determining the correct stock number), updates the MDF, and processes the receipt. Poor access to remote terminals prevents any type of moving receipts process. Receipt Control uses three remote terminals to process receipts. Two of them are located in a small enclosed room (120 square feet), centrally located yet still some 100 feet from the small item receipt area and 125 through 150 feet from the bulk holding bays. A third terminal is located in a large office area approximately 200 feet removed from the processing area. At no point does the material being processed (including the COG I clean receipts) flow near a remote terminal. It is apparent that improvements to the receiving layout would have significant impact on NPFC's productivity.

Lack of Automation for Warehouse Controlled Items

No automation exists for managing warehouse controlled items. Although NPFC orders these items and maintains initial distribution instructions, it has no way of making such information useful on the receiving floor. If the receiving clerk were able to gain access to due-in and disposition information while checking in a shipment of warehouse controlled items, those items would not have to be temporarily stored; the quantity required for an initial distribution could be set aside and the remainder sent to stock for issue. NPFC management has avoided any investments that would improve productivity of warehouse controlled materials handling because the NPODS is anticipated in the near future.

STORAGE AND ISSUE PROCESS

Manual Routing of Receipts to Storage

Currently, NPFC receiving clerks manually determine the final destination of some 220 retail receipts a day and then affix markers on the tote boxes for routing them to one of 17 work stations in the retail warehouse. This process is laborious, particularly in the look-up effort that involves scanning a multipage listing manually for conveyor address assignment. Automation is clearly called for, particularly after random storage becomes prevalent, to eliminate the need to physically look up work station addresses.

Lack of Management Control Data on Receipts in Process

Because it has no automated system to track material between receipt and storage, NPFC management cannot measure the effectiveness of its warehousing work force in stocking material. Most large stock point systems contain a receipt-in-process file to which a record is posted for each receipt upon acceptance in the Receiving section and deleted when the material is stored. Such a file would provide NPFC with traceability and offer management a much more accurate look at the effectiveness of its storage operations.

Outdated Methods in Conducting Location Surveys

Currently, location surveys use punch cards sorted in warehouse location sequence to verify that the stock is in its correct location. This approach is prone to error, largely from transcription mistakes in handwriting the corrective actions. Modernization of the location survey process would allow more accurate entry of corrected data.

Lack of Stock Numbers on Publications

Currently, stock numbers are not imprinted on the cover pages of two-thirds of NPFC stocked publications. Warehouse clerks use the date of the publication or revision to ensure they are issuing the correct item. NPFC is in the process of soliciting publication sponsor support to reduce this deficiency through a series of agreements to imprint a bar coded stock number on the front cover of Navy publications. However, an interim solution is necessary since current stocks can be expected to remain on hand for years.

No Proof-of-Shipment Capability

NPFC has no system to confirm that items identified for issue are actually picked and shipped. Once issue documentation has been prepared, the current management information system assumes that shipment will be made and provides no more information on that issue. NPFC management lacks the accurate information needed to measure issue backlogs, issue/shipping responsiveness, and number of shipments each work day. Such information is vital to the productivity management capability NPFC desires.

Lack of a Location Matrix File

Stock locations for COG I material are loaded in the MDF. Only one record is maintained in this file for each COG I line item, and the number of locations for each record is restricted to one retail and three bulk locations. Since some items require more space than that, the MDF cannot provide any information

on which retail or bulk locations are empty. This deficiency prevents the development of any type of automatic location assignment capability (such as that in use at the Army's publications center in Baltimore), the logical next step in warehouse automation. Manual logs are kept to show locations of warehouse controlled items in the bulk warehouses (all bulk storage is random) since these items have no MDF records. A location matrix file would allow location contents to be automated in a common format for both COG I and warehouse controlled material and would allow for more efficient use of warehouse space.

Nonuse of the Weight Data Field

The MDF currently contains a data field in each record for the weight of the item, but NPFC does not use this field. We believe that weights of single copies should be determined and stored in the MDF for future automatic location assignment and shipment planning applications. Both of these capabilities are needed at NPFC, but both require information on the weight (as an estimator of volume), and that is not available at present.

CLASSIFIED MATERIAL HANDLING AND DISTRIBUTION PROCESS

Classified material receipt, storage, issue, and shipping are currently carried out successfully with virtually no automated support. Accountability is paramount, and manual records are the primary means for ensuring that audit trails are available and clear. At present, bar coding would have little impact on classified material handling and distribution without a substantial increase in automated support.

Current processing of material requires much manually prepared paperwork. Receipt procedures necessitate holding all material in a temporary holding area while a form is sent to another building, processed, and sent back. Warehouse locations are kept in both manual card files and in the MDF records. Shipments are held while mailing labels are typed, matched to registry numbers, logged on a

manifest, and affixed to the material. We found at least 14 different forms and two log books used in the receipt, storage, and issuing cycle for NPFC classified commodities.

While manual records have proven to be relatively accurate and traceable, they are prohibitively time-consuming. Thirty-three employees are responsible for approximately 10,000 classified line items stocked (a ratio of approximately one employee for every 300 line items). That ratio compares to a ratio of one employee for more than 1,600 line items in the rest of NPFC. Extra effort is inherent to the special security requirements for classified materials, but an investment in automation is likely to pay off handsomely in the Classified Material Branch at NPFC.

THE SHIPPING PROCESS

Lack of a Work-Scheduling System

The current packing-and-shipping process at NPFC functions without any form of work scheduling. The manpower requirement differences among packing jobs dictate the need for some type of scheduling. For example, two extremes of manpower expenditures in the packing area are envelopes and cartons. Three staff-hours of labor are required to fill 900 envelopes, and 40 staff-hours are needed to fill 900 cartons. At present, the packing supervisor has no way of determining whether a shipment or a distribution requires envelopes, shrink-wrap, or cartons until he sees the material to be shipped. The shipping supervisor needs information for scheduling the section's work, particularly for distributions.

The Packing Floor Lacks Flow

Initial distributions are placed in random locations on the packing floor until the address labels and documentation are produced. During this waiting period, material may become disorganized or inaccessible, which could result in longer processing times. (During one visit, for example, we observed some inbound

shipments that had been on the packing floor for more than 90 days.) At workload peaks, this impediment could become significant in view of the restricted space in the area. After a distribution is completed, the remaining material is returned to Receiving for its warehouse location to be assigned. Thus, initial distributions are essentially received two separate times, a process that does not allow for the timely completion of the receipt process and hinders filling any requisitions that might occur during this period.

Overdependence on the U.S. Postal Service

All shipments that are eligible for parcel post are shipped through the U.S. Postal Service (USPS) without regard to cost. No routine determination is made at NPFC whether to ship by USPS or United Parcel Service (UPS) because NPFC does not monitor its mailing costs. Such costs cannot be determined since the Navy as a whole is billed by USPS on the basis of a sample taken at two other origins. (The Army Forms and Publications Center in Baltimore, which has a similar role and a comparable volume of mail, indicates that mail costs average \$1 million a quarter.) This condition will change by September 1989 when all DoD activities will be required to positively account for mail costs. That requirement will necessitate contemporaneous accounting of mail costs at NPFC. NPFC has proposed to meet this requirement by purchasing a \$4.5 million off-the-shelf automated system known as the Computerized Automated Materials Handling System (CAMHS). The CAMHS would automatically translate orders from a computer into sorting, diverting, labeling, and reporting operations while the material was on a conveyor system. It would utilize bar codes, a process control computer, and a series of diverters and conveyors to separate shipments into 20 different classes. While the CAMHS is progressive, the proposed 4-month amortization appears ambitious (our samples did not substantiate claimed current costs), and the system's capabilities duplicate many of those already existing in NPFC's current requisition processing

and materials release process. A simpler system for obtaining lowest-cost means of shipping and positive accountability of mailing costs is needed.

3. CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

Bar coding offers many opportunities for increasing productivity at NPFC, but it can only be effective if certain other changes are also made. In Receiving, bar codes can be most effective only if the due-in data provided by sponsors is substantially improved and if the Receiving floor layout is changed. In Storage and Issue, bar codes can offer significant improvements in the collection of management control data but only if two new computer files are established. The almost total absence of automation in the classified document handling and distribution process makes the use of bar coding in that process impractical. In Shipping, the ability to account for mailing costs depends on the purchase of a sorting system that uses bar codes to identify packages and destinations.

NPFC has not yet incorporated bar coding in its day-to-day warehouse operations. However, it has taken some steps to facilitate future applications; for example, it has affixed a bar coded bin label to each of its bin and bulk locations to assist in warehouse location surveys. In addition, it recently initiated a program to have bar coded stock number labels affixed to the front cover of future Navy publications.

Much more is needed. The following recommendations outline those actions necessary to capitalize on the full potential of bar coding in NPFC's physical distribution processes.

THE RECEIVING PROCESS

Print a Bar Coded Stock Number on Publications

Our random sampling of publications stocked at NPFC revealed that two out of every three *do not* have stock numbers printed on the front cover. This

omission complicates quick and accurate identification of publications being received, stocked, and issued.

Partially to correct this deficiency and partially in response to publication sponsor requests, NPFC management recently initiated a program to have a bar coded stock number label applied to the front cover of each newly printed Navy publication. We endorse that action for several reasons. First, stock numbers on publications permit warehouse clerks to pick the correct publication more accurately. Second, after a significant percentage of the NPFC inventory is bar coded, development of a new warehouse location survey system that uses bar coded bin numbers and stock numbers should follow. (This point is discussed further in the Storage and Issue recommendations.) Third, field-level publication managers can use bar coded stock numbers to inventory and confirm the currency of their publication libraries.

We recommend that NPFC and the Naval Publications and Printing Service (NPPS) explore the feasibility of printing the stock number directly on future publications, in bar code if possible, rather than continuing the application of labels by hand to each copy. NPPS has indicated that few printing contractors are able to print 3 of 9 bar codes within the provisions of MILSTD-1189A, and NPFC has experienced difficulty convincing some publication sponsors that stock numbers belong on the covers of publications. Emphasis at the appropriate level of NAVSUP can solve both problems.

Print a Bar Coded Stock Number on Shipping Labels

Nearly all printers who ship to NPFC use the standard Government Printing Office shipping label (GPO Form 905). The label is filled in by the printer and applied to shipping cartons, facilitating receipt processing at NPFC. Currently, the stock number is printed on approximately 10 percent of the shipments processed through Receiving. Absence of the stock number on the exterior container (and in

many cases even on the interior contents) considerably delays timely processing of the receipt.

Receiving processes approximately 140 COG I receipts a day. When the stock number appears on the publication or form, the receipt control clerk enters the 13-digit stock number into a computer terminal. This process, when accurately performed, takes approximately 15 seconds. If the stock number is not readily apparent, this process can take up to 5 minutes while the clerk attempts to cross reference the publication number. Having a bar coded stock number affixed to the shipping label will result in a considerably more effective Receiving operation. Use of bar code scanners (see the recommendation to reconfigure receiving floor layout) will speed up the computer entry of receipt data by an estimated one half a manyear per year. This time equates to an annual direct labor saving of \$6,300. More importantly, the use of bar code scanners will also result in faster throughput and smaller backlogs in receiving.

Therefore, we recommend that NAVSUP instruct the NPPS to require printers to include a bar coded stock number (for COG I items) or a bar coded publication number (for warehouse controlled items) on the Government Printing Office (GPO) shipping label prior to shipment to NPFC. Since most printers do not have the equipment to generate 3 of 9 bar codes, it may be necessary for the Navy to provide a bar code for the printer's use. It can easily provide such a bar code in one of two ways using NPPS's high-speed laser printer capability. One way is for NPPS to provide, along with the contractual documentation, a set of preprinted bar code labels that the printer must apply to the GPO label at time of shipment. The alternative is for NPPS to preprint the entire GPO shipping label with the bar code included for subsequent application by the printer at time of shipment.

We recommend the second method as the preferred one. Preprinting the shipping label ensures not only a quality bar coded stock or publication number; it

also ensures that the remaining information that NPFC needs from the label is accurately prepared. After initial programming needed to produce the label format, the cost per order for the bar coded shipping label would be less than \$1.

Improve Due-In Data

Due-in data are not available on 30 percent of COG I receipts, which then require research before they can be processed. Inventory control usually takes one or 2 days to research the discrepancies. This problem is primarily created when certain publication sponsors fail to provide NPFC with timely receipt due-in data.

Periodically, NPFC management emphasizes to publication sponsors that they should submit a Forms and Publications Status Report (FPSR) or NAVSUP Form 1088 whenever a change, reprint, or new publication is generated. The fact that due-in data are not provided for 30 percent of COG I receipts illustrates that a number of sponsors are not complying with NPFC's requests. We estimate, based on a daily average of 42 receipts requiring additional research, that some 50 man-hours each business day are dedicated to reconstruction of due-in records so that the rejected receipts can be processed. In addition, the need to store the material on the receiving floor temporarily for one or 2 days creates additional, unnecessary congestion. We estimate that more than \$100,000 can be saved annually at NPFC if accurate due-in data are provided on 95 percent or more of the NPFC COG I receipts.

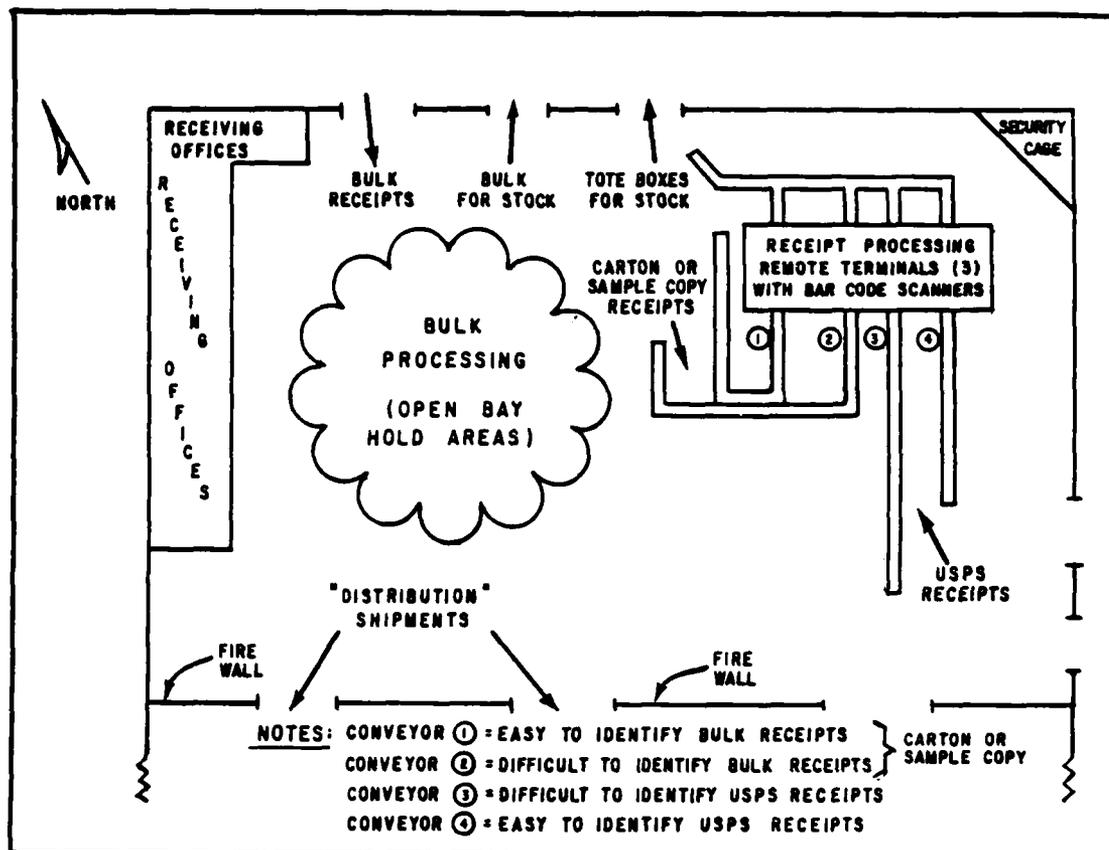
We recommend that NPFC continue to emphasize to publication sponsors the importance of timely FPSR data. In addition, we recommend that NAVSUP assist NPFC in resolving the problem for commands that fail to comply. Reducing receiving processing delays will considerably improve NPFC's support of customers.

Reconfigure Receiving Floor Layout

In assessing the receiving process, we noted problems with material flow and the locations of the three remote terminals. We believe those conditions can be improved considerably by installing a small item conveyor system within Receiving.

We recommend a detailed layout study be performed before implementing this recommendation; however, the layout shown in Figure 3-1 is offered as an improvement over the current layout.

FIGURE 3-1. PROPOSED RECEIVING LAYOUT



The selected system design should include three hand-held bar code scanners positioned on the receiving lines tied to three remote terminals with access to the MDF. When a bar coded stock or publication number is available, the scanner would access the MDF as the initial step in receipt processing. The clerk would then manually enter the remaining data required to process the receipt (confirmation of the requisition number, quantity received, tote box or open bay location, date processed, etc.).

We also recommend that three bar code label printers be procured as output devices at the three work stations. The printers would generate bar coded Material Movement Documents (MMDs), that would replace the DD Forms 1348 which are now used as storage documents. A separate recommendation with a suggested MMD format is proposed in the recommendations for Storage and Issue.

The recommended layout (Figure 3-1) provides for in-line processing of both carton receipts and the smaller flats received from USPS. We suggest that readily identifiable receipts, i.e., forms or publications with stock or publication numbers, be processed on one set of lines and the difficult-to-identify items be processed on the remaining set of lines.

We have estimated costs for these improvements as follows: assuming use of existing conveyors and remote terminals, the only costs incurred for conveyors would be for relocation, which we estimate would not exceed \$15,000. Acquisition and installation costs for three bar coded scanners would be \$2,500 each; the three thermal bar code printers, \$5,000 each. Software modifications to accommodate this equipment should be no more than \$10,000. An enclosure for the work stations is necessary; we would estimate that cost at \$75,000 for a stand-alone heated/air conditioned premanufactured facility that would be modified to accommodate four flow-through conveyor lines. In summary, we believe the entire reconfiguration project can be accomplished for less than \$125,000. A detailed layout study should be performed prior to initiating such a project.

Enter Weight per Copy on COG I Inventory Management Records

The weight data field on the MDF can be used to improve the shipment planning processes. In addition, since most NPFC stocked items are printed on standard 8.5 x 11 inch stock, we believe the NPFC storage operation is an excellent candidate for automatic bin assignment of newly stocked forms and publications.

We recommend that NPFC purchase three electronic scales, at a cost of approximately \$2,000 each, to weigh publication receipts. (Forms and warehouse controlled items would be excluded.) As each receipt is processed, an individual copy of the publication would be weighed by the Receipt Control clerk, and the actual weight entered into the MDF. By knowing the per-copy weight, NPFC will be able to develop a shipping analysis system for preplanning the daily packaging and freight routing of NPFC shipments.

The use of the weight field in the MDF would allow NPFC to begin building the data base it will need to eventually implement an automatic bin assignment system. Such a system will depend on the capability to categorize publications by storage space required. We recommend that weight be used as an estimator of volume for categorization purposes.

Automate Warehouse Controlled Due-Ins

Inventory management records are not maintained on warehouse controlled items (military specifications and standards, and DoD and Navy directives). When such an item is identified for reorder by a storage clerk, a recommended order quantity is forwarded to Inventory Control. When the order is placed, the quantity and date ordered is annotated on a handwritten order record card. When the reorder is received, a copy of the warehouse controlled item is forwarded to Inventory Control for manual posting of the receipt on the order record card.

Currently, NPFC processes an average of 78 warehouse controlled item receipts daily. Although the entire warehouse controlled inventory is expected to be phased out under the NPODS sometime in the future, we are convinced that steps should be taken now to automate at least a portion of this manual and very labor-intensive process.

We recommend that a warehouse controlled item due-in file be established. When a warehouse controlled item is ordered or reordered, a due-in record would be created and filed by publication number. Included in the record would be requisition quantity, date of order, date due-in, requisition number, publication title, and date, as well as the quantity to be distributed, and the distribution address directory number. Upon receipt of the shipment, a scan of the bar coded shipping label would permit quick and accurate access to the due-in file, giving the receiving clerk immediate access to disposition instructions and the inventory manager notice that the item is on hand. Should the order involve a distribution, the system could automatically request that a set of address labels be prepared a certain number of days prior to the due-in date.

We recommend that the due-in file for warehouse controlled items be established on the existing mainframe computer so the scan of initial receipts would produce disposition instructions for either COG I or warehouse controlled receipts automatically. Expansion of NPFC's automated system, however, has been severely restricted. If it is not available for this application, we recommend a stand-alone system be procured for the due-in file.

The automation of warehouse controlled due-ins would result in several improvements. Throughput time within Receiving would be decreased substantially since the "distribution decision" would be immediately available to the Receipt Control clerk. Newly received material could be sent to Storage while only the quantity required for distribution is held in Receiving for mailing labels. (This latter step is now taking up to two days, holding up the entire quantity in Receiving pending the distribution/stock decision.) Subsequent issuances from stock to customers would be enhanced by several days. Further, the automated due-in file would permit periodic review and reconciliation of outdated due-ins.

Costs to implement this recommendation will depend somewhat on hardware availability. Assuming that existing mainframe equipment and remote terminals in Receiving can be used to create a separate data base for warehouse controlled items, the costs would be limited to software development. Should the mainframe computer not be available, a small stand-alone minicomputer or a super-microcomputer with approximately five terminals could be programmed to accommodate the warehouse controlled due-in file. We estimate that hardware costs would be approximately \$14,000 and a software package an additional \$5,000.

In summary, for less than \$20,000, warehouse controlled due-ins could be automated. Savings in both processing time and in labor required to post receipts would amortize the costs in less than 1 year.

Enhance Customer Return Policy

Approximately 30 percent of NPFC receipts are customer returns. A portion of these are "automated" returns in that they represent the return of current publications because the ship to which they are addressed is undergoing overhaul. These returns were initially reported as unit excesses to NPFC using standard MILSTRIP reporting techniques. NPFC screening of its MDF requirements resulted in the pulling of these reported excesses as customer returns. We consider these returns as valid, and recommend the process be continued.

We are concerned, however, with the other customer returns that often include out-of-date publications or changes that should not be retained for stock. These returns represent approximately 25 percent of the receipts processed by NPFC. Processing these returns often results in extended delays and requires significant research to identify correct stock numbers.

We recommend that NPFC's customer return policy be reevaluated and that the cost of postage and stock number research be included as a real cost to the

Navy. Customers should be advised of the resulting policy and should be periodically reminded of it.

STORAGE AND ISSUE

Develop a Bar Coded Material Movement Document (MMD)

Receiving clerks forwarding retail receipts to stock are now required to manually determine which of 17 storage work stations to send them to. Experienced clerks are generally able to do this from memory. However, new and substitute clerks are required to compare each DD Form 1348 to work station listings so that photosensitive address markers can be correctly positioned on tote boxes. These markers ensure the automatic routing of approximately 250 tote boxes a day on NPFC's automated conveyor system.

We recommend that NPFC replace the DD Form 1348 now being used for storage of new receipts with a bar coded MMD. The MMD would include warehouse location and storage work station numbers, a bar coded stock number, a bar coded quantity to be stored, and the publication date, number, and title. Automatic assignment of the storage work station number would save approximately half a manyear that is now spent manually assigning work station addresses to each tote box. The automatic station number assignment capability, along with bar coded MMDs, will also permit future installation of an automated conveyor switching system. The system will use bar codes, rather than manually positioned photo sensitive markers, to activate switches. (Use of the remaining bar coded data on the MMD will be discussed later in this chapter.) Figure 3-2 provides a suggested MMD format.

Costs for the new MMD would include programming changes to revise the output now used to produce the DD Form 1348 into the proper new format. Other costs would be for the purchase of three thermal printers for the MMDs and software costs for the construction of a bin-location-to-work-station-number cross reference

FIGURE 3-2. PROPOSED MATERIAL MOVEMENT DOCUMENT

BL2 FP516160451234 DIC REQUISITION NBR	10 
7 B 30 09 V	WORK STATION
PRIMARY WAREHOUSE LOCATION	
 0367LP0071010 NS 95774	
FREQUENCY CONVERSION TABLES FOR POLARIS	
STOCK/PUBLICATION NUMBER AND TITLE	
 250	ALTERNATE LOCATIONS
QUANTITY UI: EA	RETAIL: N/assigned BULK 1: 6C 34 12 A BULK 2: 6B 16 19 B BULK 3: N/assigned

file. We recommend that all programming for these changes be done by NPFC systems personnel who are familiar with the existing system and fully capable of implementing these changes. We estimate that 360 manhours (\$4,500) would be required to complete both programming actions. Costs of the three thermal bar code printers (approximately \$5,000 each) have already been included in our estimate for reconfiguring the receiving floor layout.

In summary, we estimate that using a bar coded MMD will save approximately half a manyear and will facilitate the future development of a completely automatic routing system for retail receipts from the receiving floor to their respective work stations. Total cost is approximately \$19,500.

Create a Receipt-in-Process File

Currently NPFC lacks any automated tracking system between material receipt and storage. We recommend that a receipt-in-process file be established that would consist of one record for each receipt that has been processed in Receiving but not yet stored in its warehouse location. A record will be opened as each receipt is posted to the MDF, and closed when the warehouse clerk scans the MMD's stock number and quantity and the bar coded bin location label. NPFC management will benefit from management reports' made possible by the file, that measure unstored material backlogs, average times to move receipts to Storage, and "over age" storage actions. Further development could produce productivity statistics for individual warehouse clerks or work teams. The net result of the new file will be improved customer support.

We estimate that 2,000 manhours would be required to design, test, and implement a receipt-in-process file. In addition, approximately 30 portable handheld bar code scanners would be required for stock clerks to read MMDs and location labels. System design costs are estimated at \$25,000, and equipment costs as follows: 30 handheld portables, at \$1,500 each (\$45,000) plus \$10,000 for mainframe upload capability. In summary, creation of a receipt-in-process file would cost approximately \$80,000.

Develop a Location Matrix/Empty Bin File

Without a location matrix (or empty bin) file, empty bin availability must now be determined by visual inspection. As NPFC converts the majority of its stocks in the next months to random storage (from sequential storage), the value of such a file becomes far greater by allowing warehouse personnel to minimize unused storage space. A natural outgrowth of this file, particularly in view of the standard size of the large majority of NPFC stocks (8.5 x 11 inch), is the follow-on development of an automatic location assignment capability. This capability exists in similar

warehouse operations, e.g., the Army Forms and Publications Center in Baltimore. NPFC is an excellent candidate for development of an automated storage system.

We recommend that NPFC develop a location matrix file that interfaces with the MDF. As locations are assigned or eliminated, the location matrix file would first be updated, and the MDF automatically updated from it. The principal cost for this development would be software design, test, and implementation, which we estimate at 2,000 hours, or \$25,000.

Loading the initial data base will be a substantial undertaking but will be greatly facilitated by existing bar coded bin location labels and the bar coded stock numbers now being affixed to all COG I retail stocks. We estimate the initial loading of approximately 360,000 retail locations, and 26,000 bulk locations could be completed using portable scanners in 2,000 manhours at a labor cost of \$13,500. Existing remote terminals can be used to update files in the future; additional hardware costs would be minimal, probably less than \$10,000. In summary, a location matrix/empty bin file could be developed and placed in operation for less than \$50,000.

Develop a Location Survey System Using Bar Coding

A bar code project that can be implemented at NPFC in the near term is the replacement of the Center's outmoded method of conducting location surveys with a new system that uses bar code scanners. Location numbers are currently bar coded and NPFC is in the process of applying bar coded stock numbers to sample copies of each COG I item in retail storage. Random storage of COG I retail stocks will soon be complete. All of the necessary tools will soon be in place for a bar code location survey system.

We recommend that NPFC revise its warehouse location survey system by incorporating bar code scanning in the process. The new STATLOC system now being tested by NAVSUP for naval supply centers should be considered for use at

NPFC. Design, test, and implementation of new software will be required since NPFC does not use NAVSUP's uniform data system, but existing hand-held scanner and interface software should be usable as is. We estimate 1,000 manhours, at a cost of \$12,500, will be required for software development. No equipment costs will be incurred since hand-held scanners are currently available at NPFC.

Create an Issue-in-Process File

Bar coding offers NPFC the opportunity to establish an issue/shipment confirmation system. This proof of shipment capability, common to most distribution operations, has not been developed at NPFC. Currently, when a COG I issue is produced, the computer assumes the form or publication is picked and shipped. There is no confirmation that these actions actually occur.

We recommend NPFC create an issue-in-process file. When an issue is generated, the customer's requisition number will be stored on the issue-in-process file along with the current time. The requisition will be picked, processed, and forwarded to packaging. During the packaging process, the requisition number would be scanned and the time recorded; the issue-in-process file would then be cleared. The accumulated data would provide a basis for building a set of management reports showing times to process customer requisitions through the picking, packing, and shipping activities, and the extent of issue backlogs.

The issue-in-process file can provide supervisors with much-improved visibility over production rates and work station backlogs and can also help improve issue effectiveness.

We estimate that 2,000 manhours, or \$25,000 would be required to design, test, and implement the software for an issue-in-process file. We have recommended the purchase of a bar-code activated package diverter system in our recommendations on Shipping. Since a common bar code scanner will feed both that

system and the issue-in-process file, we will not discuss the cost of scanners at this time.

Use the New Issue-and-Receipt Data Form

NAVSUP recently developed a new issue-and-receipt data form (IRDF) that utilizes bar codes and contains both a bar coded requisition number and a bar coded zip code number on its mailing label. The requisition number should be scanned to close the issue-in-process file and to provide proof of shipment. The bar coded requisition and zip code numbers are important in our subsequent recommendations on shipping. The IRDF provides NPFC with the opportunity to use a tested and approved mailing label format that will satisfy its bar coded data requirements in shipping and also provide its customers with the opportunity to receive publications automatically.

We recommend that the IRDF be adopted for use at NPFC. Hardware required to print the IRDF is already in place within the NPFC compound. We estimate 500 manhours (\$6,250) would be required to convert the existing issue document print systems to accommodate the new IRDF.

CLASSIFIED MATERIAL HANDLING AND DISTRIBUTION PROCESS

Develop an Automated Receipt-Processing System

We recommend the development of an automated receipt-processing system. The current classified material receipt process places complete control of inventories in the item manager's hands, and newly received material stays in the receiving area until the item manager determines how it is to be stored. With an automated receipt-processing system, the role of the item manager need not be diminished - control of inventories could remain at that level, but material stocking instructions would be formulated before the material arrives rather than after. When material is accepted, counted, and entered into the new system, disposition instructions and storage documentation could be generated immediately. The need

for the tally book, buck slip (NPFC form 4401), and temporary storage area would be eliminated, and processing time would be substantially reduced.

Develop a Warehouse Locator System

We recommend the development of a warehouse locator system to eliminate the tremendous workload associated with the double-posting of locations to the control record cards and the MDF. Even a personal-computer-based system could be designed to automatically exchange location changes with the MDF, while preserving the safety of a backup record. The system could be designed to self-audit against the MDF records more quickly and more frequently than is now possible.

Automate the Shipment Processing System

We recommend that NPFC employ a system that prints mailing labels, assigns registry numbers, and produces registered mail lists in the packaging area to streamline the cumbersome handling that is now necessary. Faster throughput and improved accountability would result.

Bar Code Only After Automation

The three automated systems recommended would greatly increase the capabilities of the Classified Material Branch at NPFC. As presently configured, little benefit would be derived from bar coding in the classified warehouse. Even bar coded location survey procedures would be of little use since manual location records would still have to be updated. (It should be noted, however, that location numbers in Building 8, which houses classified material, have been bar coded.) One minor application that could be implemented quickly would be to scan the Optical Character Recognition (OCR) registry numbers to produce the registered mail list on a microcomputer, but the savings that would result would be negligible. Since current LOGMARS emphasis is on bar codes rather than OCR, this marginally beneficial application would require an exception to LOGMARS policy.

Should the three automated systems be implemented, bar codes could make them even more attractive. Receipts could be posted more quickly and accurately if NPFC vendors (i.e., printers) place bar coded shipping labels on exterior containers that identify the contents. Location numbers could be scanned when an item is stored or moved to update the warehouse locator system. Finally, bar coded issue documents (such as the IRDF) could be scanned to activate the shipment management system to produce mailing labels, registry numbers, and manifests as well as to provide proof of shipment.

PACKAGING AND SHIPPING

Develop a Shipment Planning System

Two key recommendations – to use the weight data field and create an issue-in-process file – will assist NPFC in developing a shipment planning system. Currently, the shipping method decision is made when the issue arrives in Packaging. About 10 percent of NPFC's shipments are currently packed on pallets and manifested for freight shipment.

We recommend development of a Shipment Analysis and Planning System that will project the next day's packaging workloads. The issue-in-process file could provide the raw data for the analysis program, and from the issue quantity and weight-per-copy data, the analysis would recommend type of packaging and mode of shipment. Packaging would use the daily analysis to schedule its workload. Manifests and Government/Commercial Bills of Lading could also be preplanned and prebuilt.

Creating such a system would require the implementation of our previous recommendations concerning the MDF weight data field and the issue-in-process file. Once implemented, the Shipment Analysis and Planning System would require only software development; we estimate 1,000 manhours (\$12,500) of systems design and testing would be required.

Improve Flow of Initial Distributions to Packaging

Adoption of two earlier recommendations – to improve due-in data and to automate warehouse controlled due-ins – would speed up considerably the “distribution decision” process for initial distributions. Currently, decisions regarding quantity to be shipped, method of packing, and mode of shipment are made through a time-consuming process that requires from several hours to several days. Preplanned distributions would provide Packaging with better workload planning data and ensure more timely delivery of address labels. In addition, the forecasted due-in dates could be used in the recommended Shipment Analysis and Planning System.

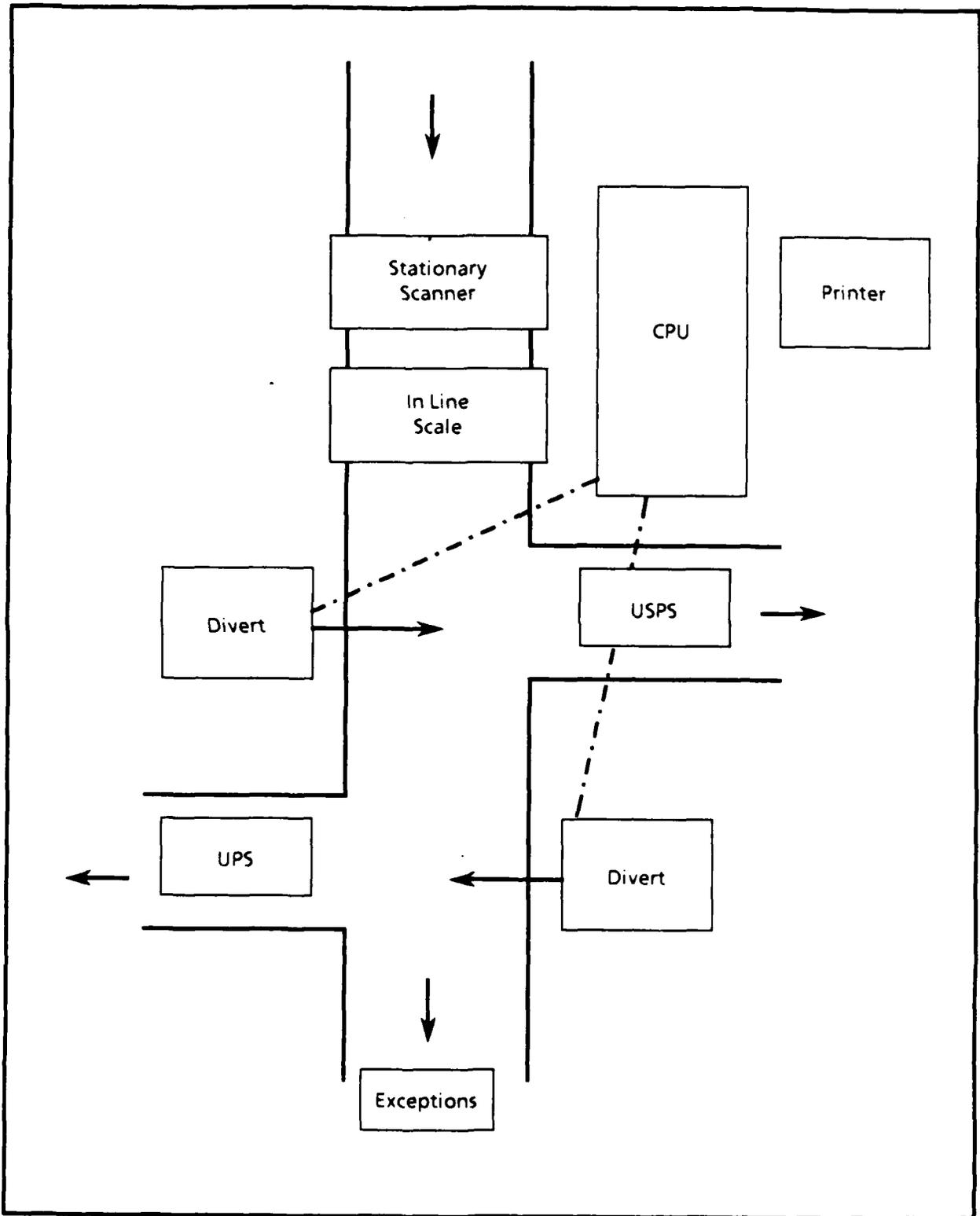
The costs of implementing our recommendations associated with improved material flow have been presented with the specific recommendations.

Create a USPS/UPS Decision Process (With Proof-of-Shipment)

Currently NPFC has not developed a capability to benefit from sending larger parcel post by UPS rather than the USPS. Most material is shipped by USPS, with UPS being used only rarely.

We recommend NPFC adopt a simple means for determining the best method of shipment. A bar code scanner and dynamic scale coupled to a processor could automatically determine the least cost method of shipping small parcels using the bar coded zip code from the IRDF shipping label. A series of conveyor diverters could then physically move the items into the appropriate path. A manifest would be generated using the requesters' requisition number (also bar coded on the IRDF shipping label) as a unique identifying number to link parcels to the manifest. Both USPS and UPS will accept manifests in lieu of individually metered packages. The illustration in Figure 3-2 describes the intended equipment layout. We have identified at least two commercially available off-the-shelf systems capable of performing these tasks.

FIGURE 3-2. SYSTEM LAYOUT



The recommended system should accomplish the following four major objectives:

- Provide positive accountability and manifesting of outgoing UPS and USPS parcel post shipments
- Choose the least-cost alternative between UPS and USPS
- Provide proof-of-shipment files for each requisition
- Provide management data to support the expansion of the current system to the consolidation of shipments for the less expensive means of transportation, e.g., the common carrier.

The recommended system will use a fixed bar code scanner to read the IRDF as the issue moves along a conveyor line. The scanner will read the customer requisition number and the zip code, and weight data will be fed into a microprocessor. The product is a decision to ship by UPS or by USPS. The material will be moved through diverters activated by the microprocessor and will be manifested by requisition number; manifests can be printed on demand to accompany the respective shipment. Parcels not identified by the bar code scanner will be moved to a shipping clerk who will use a metered scale to determine the most efficient method of shipment. Further, the customer requisition number, appearing on the IRDF, will be scanned and transmitted to the mainframe computer where it will be compared with the issue-in-process file and used to close out records in that file as proof of shipment. Mismatched document numbers will be managed as exceptions. Another by-product of this system is management data that indicates the number of shipments to each destination. From these data, the feasibility of consolidating shipments to a particular destination to take advantage of lower freight rates can be determined. (A common carrier costs \$17 per hundred weight as compared to \$49 for the same USPS shipment.) If a large number of consolidations are justified, a third diverter and path might then be added as a freight consolidation station.

The capital investment in this smaller system is quite reasonable, approximately \$65,000 for each system (we see a need for two systems at the current volume of shipments) as compared with \$4.5 million for the more sophisticated CAMHS, which NPFC had requested.

Cost data presented in the CAHMS system description indicate that the cost difference alone between UPS and USPS would represent a potential savings of approximately 15 percent annually. Our most conservative estimate reflects a cost savings of at least \$600,000 annually. At that conservative estimate, the cost of the two scales and conveyor modifications would be paid back in less than three months. While CAMHS is a stand-alone system and would require a total retrofit of current operations at NPFC, the recommended system could be integrated into current systems and would also make effective use of the new IRDF.

A final benefit to the recommended system is that it is flexible and can be expanded as requirements are identified. Software changes, additional computer hardware, conveyors, and diverters could be phased in as the requirements dictate.

SUMMARY OF RECOMMENDATIONS

The recommendations we have made are intended as the best approach to incorporating bar codes into NPFC's existing operations to satisfy current and near-term needs. They are not intended to optimize the physical distribution operations at the Center, but are meant to incorporate bar coding at a level that is both necessary and cost effective. The following is a summary of our recommendations.

- NAVSUP should direct NPFC and NPPS to explore the feasibility of having bar coded stock numbers printed directly on future publications instead of applying labels by hand to each copy. Several technical issues will need to be resolved before printing costs can be determined, but potential savings are substantial.
- NAVSUP should instruct NPPS to require printers to apply a GPO shipping label (preprinted by NPPS) with a bar coded stock number (for COG I material) or publication number (for warehouse controlled material) for all orders sent to NPFC. Cost: less than \$1 per order after initial formatting by NPPS.

- NPFC should make every effort to improve the availability of due-in data provided by publication sponsors. NAVSUP should assist in resolving the problem of commands that fail to comply.
- NPFC should reconfigure its receiving floor layout to improve flow and eliminate the need to temporarily store materials that can be easily processed. Bar code readers and printers should be incorporated into the new configuration. We recommend a detailed layout design study, but estimate the cost of reconfiguration to be less than \$125,000.
- NPFC should record the item weight of each COG I item it receives in the MDF both as an aid to shipment planning and to permit future development of an automatic bin assignment system. Cost estimate: \$6,000 for three electronic scales.
- NPFC should establish an automated due-in file for warehouse controlled items that will produce disposition instructions immediately for the receiving clerk. We recommend that it be established on the mainframe system so it can be accessed by scanning the GPO label in the receiving area. Estimated cost: less than \$20,000.
- NPFC should reevaluate its current customer return policy in light of mailing and stock number research expenses. The revised policy should be widely disseminated.
- NPFC should replace the DD Form 1348 now being used for the storage of newly received material with a bar coded MMD. The MMD should include an automatically assigned storage work station number, eliminating the present procedure of looking up work station addresses for each receipt. Estimated cost for programming is \$4,500. The cost of printers is included in the cost of reconfiguring the receiving floor layout.
- A receipt-in-process file should be developed by NPFC. It should consist of one record for each receipt that has been processed in Receiving but has not yet been stored. Cost of creating and implementing this file is approximately \$80,000.
- NPFC should develop a location matrix file that interfaces with the MDF to make possible more efficient use of warehouse space. Cost of creating the file and uploading locations is less than \$50,000.
- The location survey procedures now in use should be replaced by NPFC with procedures that use bar code scanners. Approximate cost for local programming is \$12,500.
- NPFC should create an issue-in-process file to account for requisitions between generation of issue documentation and material shipment. Cost of implementation is approximately \$25,000.
- NPFC should adopt the new NAVSUP IRDF that includes both a bar coded requisition number and a bar coded zip code number on its mailing label. Cost of implementation: approximately \$6,250.

- The classified material handling and distribution process should be considered for automatic data processing by NPFC. The process is very labor-intensive and offers many opportunities for productivity improvement. Bar coding should be considered after automation. We recommend that three automated systems be considered: an automated receipt processing system, a warehouse locator system, and an automated shipment processing system.
- NPFC should develop a shipment analysis and planning system that will permit the Shipping supervisor to budget shipping resources. Such a system will cost approximately \$12,500.
- NPFC should purchase and install a stand-alone shipping system that will scan destinations, weigh parcels, and determine the least cost means of shipment. The system should be modified to provide proof of shipment information to the issue-in-process file. Estimated cost is \$130,000.

APPENDIX A
NPFC PROCESS OPERATIONS

This appendix describes the receiving, storage and issue, classified materials handling and distribution, and shipping processes at the Naval Publications and Forms Center (NPFC).

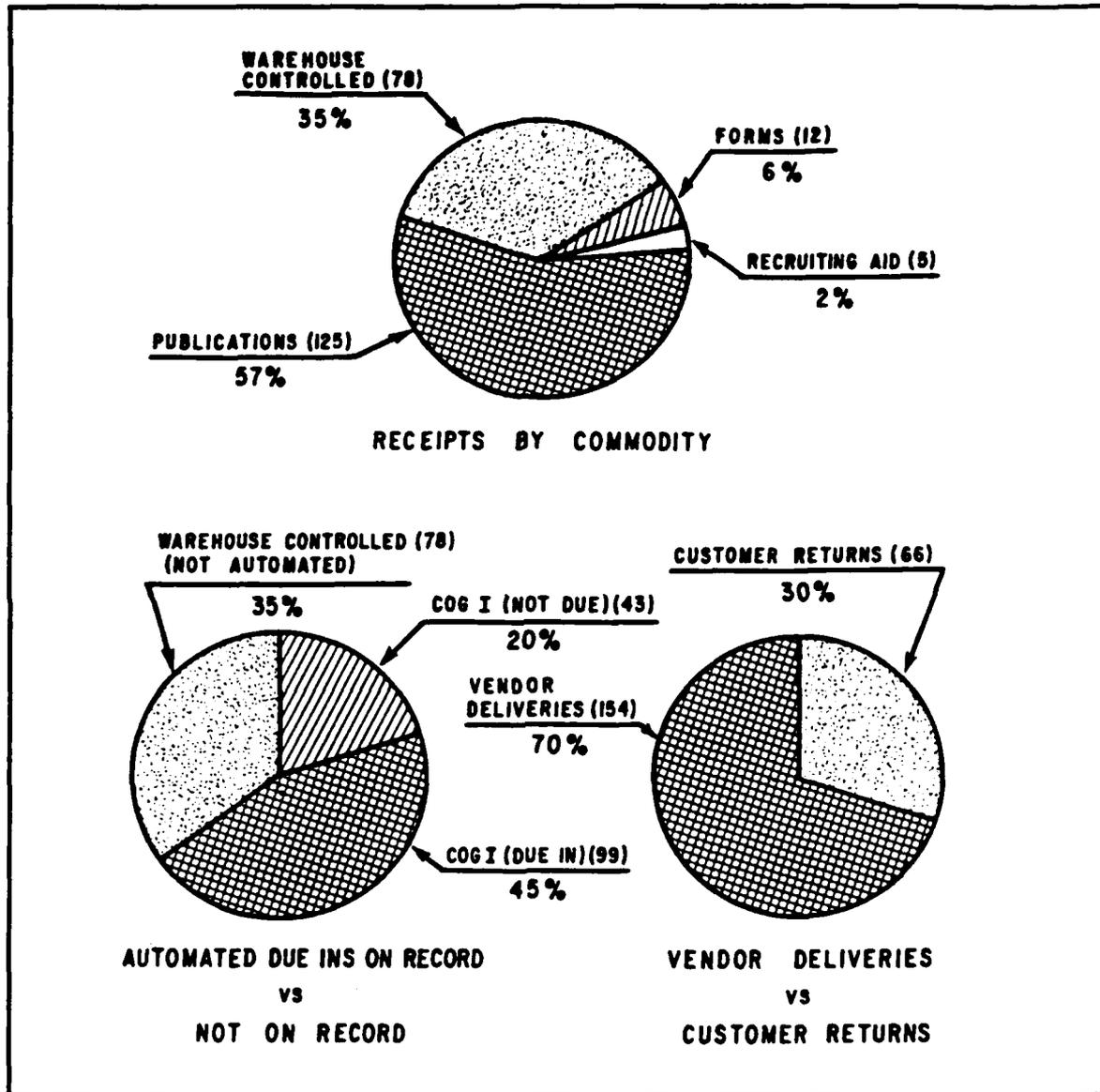
THE RECEIVING PROCESS

Currently, receiving new items and reprints at NPFC is both labor-intensive and time-consuming. All receipts must be temporarily stored while their contents are identified (identification is sometimes extremely difficult). Due-in data are frequently not available, and access to computer terminals is limited. For 65 percent of all receipts, receipt data are processed by remote terminal to the NPFC Master Data File (MDF), but almost 30 percent of these "automated" receipts cannot be easily identified and must be processed further; delays of hours and sometimes days are not uncommon. The remaining 35 percent of receipts are for warehouse controlled items and are not posted to the computer; however, they must still be temporarily stored pending identification and posting to an informal receipt file maintained by the Inventory Control section. When their processing is completed, they are forwarded directly to stock. Figure A-1 illustrates NPFC's receipt volumes.

The receiving process ensures that vendor (i.e., printer) shipments and customer returns are accurately loaded to one of the two NPFC inventory accounting systems. Approximately 60 percent of NPFC receipts are delivered by the U.S. Postal Service (USPS), and the remainder arrive by commercial truck or, on occasion, by United Parcel Service (UPS). About 30 percent of the receipts are customer returns (items exceeding customer needs) and they arrive almost exclusively by USPS. An average of 220 shipments are checked in during each 10.5-hour, staggered day shift, five days

a week. Occasionally, backlogs dictate that some processing be scheduled for evenings and Saturdays.

FIGURE A-1. NPFC DAILY RECEIPTS



NPFC uses one of two different receiving processes to check shipments in, with the type of commodity dictating the applicable process. Publications, forms, and most recruiting aids are three commodities processed on an automated inventory

management system. That system is a variation of the Navy's standard Uniform Inventory Control Point (UICP) system that has been refined by NPFC over the years, and it uses remote computer terminals to check in and process these three commodities.

The two remaining commodities managed by NPFC, military specifications and military standards (MILSPECs/MILSTDs) and departmental directives and instructions, use a second NPFC receiving system. They are known as warehouse controlled items, and formal inventory management records are not maintained on them nor are they assigned stock numbers. Their receiving process is much simpler.

Warehouse controlled receipts are processed as follows: for smaller receipts, the shipment is placed in a hold bin within the Receiving area; for larger receipts, the entire shipment is placed in a hold bay on the Receiving floor. In both cases, a temporary four-digit numeric control number is assigned to the shipment and marked on at least one carton.

Further processing includes:

- Examining the outside shipping label for quantity, publication title, publication number, and NPFC requisition number.
- Opening the package or container to verify its contents (by checking the publication number, title, and date) and the shipment quantity.
- Comparing the quantity imprinted on the carton label and delivery ticket or invoice with the quantity received.
- Forwarding up to three sample copies of the shipment to Receipt Control for additional processing. Receipt Control initiates, if required, distributions of the printed matter. (Some 25 distributions occur per day, requiring the ordering of address labels and reshipment of the material.) Receipt Control then forwards two copies of the warehouse controlled item to Inventory Control for (1) quality assurance check and (2) posting of the receipt quantity in handwriting to an informal file maintained on cards in publication number sequence.
- Forwarding the remaining material, upon clearance by Receipt Control, to the warehouse for stockage and eventual issue.

In 1985, NPFC processed a daily volume of 78 warehouse controlled item receipts consisting of MILSPECs, MILSTDs, directives, or instructions.

COG I (forms, publications, and most recruiting aids) receipt processing is more involved. COG I MDF records are automated and preposted. From the onset, it is important that precise identification of the item and an accurate quantity count be introduced into the automated inventory management records. Three remote terminals located in Receiving allow access to and updating of the MDF stock number records.

COG I receipts are processed as follows. As in the case of warehouse controlled items, smaller shipments are placed in temporary processing bins and larger shipments are placed in temporary hold bays within Receiving. Again, temporary control numbers are assigned. Further processing includes:

- Checking the outer container shipping label for stock or publication number, title, date, quantity, and NPFC requisition number.
- Examining the shipment contents for stock number, title, and date. If an invoice is available, it is also reviewed for quantity, NPFC requisition number, stock number, and publication number and title. The quantity received is confirmed, usually by visual check. If warranted, an actual count of the shipment is performed. The quantity received is annotated on the cover of a sample copy along with the four-digit numeric hold bin/bay control number. The 14-digit NPFC requisition number, when available, is also annotated on the cover. (In the case of customer return shipments, an NPFC form 4401, (Receiving Data) is prepared by the clerk who checks the shipment in, and it is attached to the sample copy.)
- Forwarding a sample copy of the shipment to Receipt Control for posting to the MDF. Using the stock number or publication number, the receipt control clerk displays the MDF record on a remote terminal screen. (NPFC receiving clerks are able to display stock number records on 70 percent of their COG I receipts. "Stock Number Not Loaded" is the principal reason the record cannot be displayed.) The clerk then compares the NPFC requisition number and due-in quantity on file with those being processed. If they match, the quantity received is entered to a receipt buffer file and subsequently loaded during end-of-day processing to the MDF. When the sample document/item can not be identified by stock or publication number to a stock number record (30 percent of all COG I receipts cannot) the receipt control clerk prepares an NPFC form 4401 (informally known as a buck slip), attaches the buck slip to the sample copy, and forwards the package to Inventory Control for further examination and identification. The product of the MDF posting process is a multipart DD Form 1348,

which is printed at the remote terminal with instructions for stocking the receipt. The receipt control clerk retains Copy 1 of each DD 1348 for internal file and attaches the remaining DD 1348(s) to the sample copy. (For receipts that have no due-in data, Copy 5 is also pulled and forwarded to Inventory Control.)

- Returning the checked-in sample copy with a DD 1348 attached to the temporary hold location for reconciliation. The clerk, noting the four-digit control number, matches the sample document to the original shipment. The entire shipment is then processed to the warehouse to be stocked for subsequent issue or for backorder release.

Receiving processes approximately 12 form and 125 publication receipts a day in the automated mode. Recruiting aid receipts are minimal, (approximately five a day). Combined with the approximately 78 warehouse controlled items (i.e., MILSPEC/MILSTDs, directives, and instructions), each processed manually, NPFC processes approximately 220 receipts per day (70 percent of which are estimated to be printer deliveries; the remainder are customer returns).

Twenty-eight wage grade employees are assigned to receipt-processing duties: six general schedule (GS) employees perform clerical duties and operate the three remote terminals in Receiving, and 22 wage grade employees perform checking-in and truck-lift operator functions.

THE STORAGE AND ISSUE PROCESS

NPFC storage and issue operations are of considerable magnitude. Using 620,000 square feet (over 9 football fields) of warehouse space, NPFC stocks some 254,000 line items, the majority of which are printed on standard letter size (8.5 x 11 inch) stock. These warehouses issue a total of 19,000 line items per work day.

Most line items stocked by NPFC are stored in medium size shelf bins; each location is approximately 18 inches cube (3.4 cubic feet). These locations, known as retail locations, are permanently assigned for the life of the stock number. When the quantity in stock will not fit in the bin, the overflow is placed in adjacent bins or in wholesale (or bulk) storage areas.

Issue documents are sequenced by location to facilitate the 19,000 stock issuances per day. Daily printing of routinely issued documents is controlled by warehouse zones; routine issues are generated for each zone on a weekly basis. Higher-priority requisitions are generated daily.

Management information needed to monitor the storage and issuance operations at NPFC is now available only by compilation of manual logs. Receipts are considered to be stored after a fixed period of time elapses from MDF entry, and issues are considered filled once issue documentation is generated.

NPFC uses two different storage systems to stock assets; approximately 80 percent of its assets are stored under a *sequential number* storage system. Bin numbers are not used in the sequential system; assets are simply stored in identifying number sequence, usually in publication number, or when available, stock number sequence. The second storage system is known as the *random stow* system. Random stowage requires that specific bin location numbers be assigned to each asset stored and that such assignment be recorded either manually or on the MDF. (NPFC maintains its storage location assignments on the MDF by stock number; a separate location data file does not exist.) This assignment can either be permanent or temporary, depending on the availability of warehouse space. Retail locations are permanently assigned for as long as the asset is stocked by NPFC. Currently only 20 percent of the NPFC assets are stored using the random stowage system. However, during 1986, NPFC plans to convert 60 percent of its warehouse assets, essentially all forms and publications (COG I assets), and most recruiting aids to the random stow system.

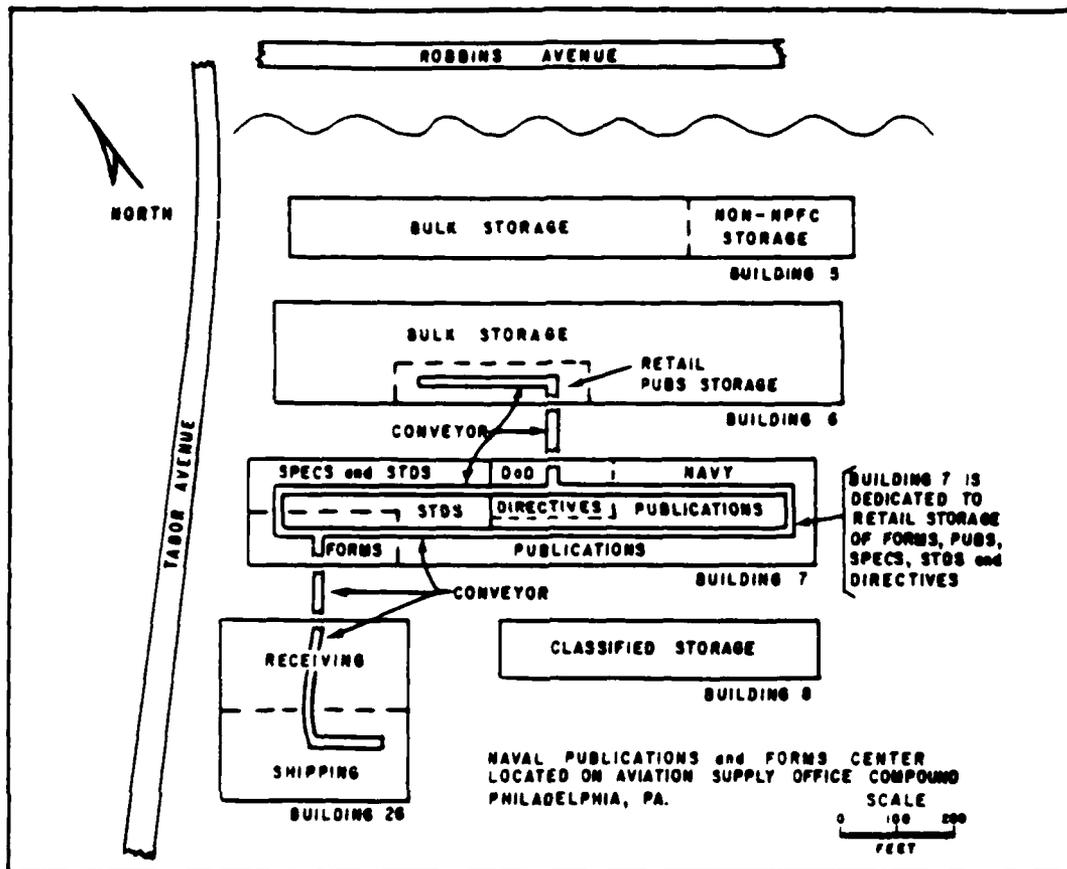
NPFC is somewhat unique in that all of its assets are stored first in medium-size shelf bin storage areas known as *retail storage*. Most retail storage locations are a standard size roughly 18 inches cube or 3.4 cubic feet. A total of 375,000 square feet of covered warehouse space is used to store 250,000 line items in

the retail storage warehouses. Occasionally, small retail overflows are stored in the next adjacent bin location; larger overflows are stored in separate warehouse areas known as *bulk storage*. Some 40,000 line items are stored in 380,000 square feet of bulk storage warehouses. Bulk storage at NPFC uses both pallet racks, usually four pallets high, and open bay storage, again, using pallets stacked three to four pallets high. Warehouse 7 is used exclusively for retail storage. Warehouse 6 is used mostly for bulk storage; only 10 percent of Warehouse 6 is configured for retail storage. The NPFC portion of Warehouse 5 is dedicated entirely to bulk storage. Figure A-2 provides a schematic layout of NPFC retail and bulk storage

Certain NPFC-managed commodities are assigned 13-digit stock numbers; other commodities are not. More specifically, the publications, forms, and most recruiting aid commodities (also known as COG I assets) are assigned stock numbers as they are introduced into the inventory. These stock numbers are used to (1) identify the property and (2) provide a basic reference number that allows access to MDF records. Stock numbers are imprinted on all forms and, based on our random sampling, on 33 percent of the publications in stock. (See Appendix C for the results of our sampling by publication prefix.) This means that two out of every three of the NPFC stocked publications do not have stock numbers imprinted on the cover page. Since all retail stocks are removed from their outer containers during the checking-in process, the lack of stock numbers on such a large proportion of the publications stocked complicates accurate identification of the assets during the stow and pick processes.

The other commodities – military specifications and standards, DoD and Navy directives, and some recruiting aids – do not have stock numbers assigned. Formal inventory management records are not maintained on these commodities, which are known as warehouse controlled items and are identified and stocked by publication number.

FIGURE A-2. NPFC FACILITIES



When NPFC Receipt Processing identifies an inbound shipment for stock, a bin notice, known as either a receipt paper or a blue bin card, accompanies the asset to retail storage and, when applicable, to bulk storage. NPFC processes approximately 220 receipts a day to its retail storage area, and about 100 of those receipts are also processed to bulk storage.

Receipts for retail storage are forwarded in a plastic tote box on an extensive conveyor system to one of 17 work stations within the retail areas. (Again, the outer shipping containers/wrappers have been removed during the checking-in process.) A photosensitive marker is manually placed on the tote box by the receiving clerk; the

marker directs the container to the proper address or work station for further processing and stowage by the warehouse clerk.

Bulk receipts for stock are forwarded to the bulk storage areas in Warehouse 5 or 6 by warehouse tractor and trailer trains. The distance is approximately 400 yards by outdoor roadway to the bulk storage work stations.

For every receipt, a bin notice accompanies the material. One retail and up to three bulk locations may be printed on the bin notice when the asset is warehoused under the random stow system. Should no location appear (or should all locations reflected be full), the warehouse clerk is expected to rewarehouse as necessary and load the new locations to the MDF.

Replenishment of retail stocks from bulk is quite labor-intensive. For COG I material, retail stocks are replenished by the warehouse clerk during the issuing process. If the clerk determines that retail stocks are low, a replenishment order is initiated and processed. For warehouse controlled items, retail stock level is monitored on a continuing basis to determine whether bulk replenishments need to be requested. For both COG I and warehouse controlled items, bulk storage is solicited before reprinting as a source of replenishment. NPFC generates approximately 700 bulk-to-retail replenishment actions per day.

NPFC issue documentation is generated five days a week; at night it is generated in a batch mode. The frequency depends on the Issue Priority Group (IPG). IPG I issues are generated daily, Sunday night through Thursday night for issue action the following day; IPG II issues are generated four days a week: Sunday, Tuesday, Wednesday, and Thursday nights (backorder releases are generated on Monday evenings); and IPG III documentation is generated on a daily basis by warehouse zone so that all warehouse locations are addressed at least once a week. Issue documents are generated in retail warehouse location sequence when there is a

retail location loaded on the MDF; otherwise, issue documents are printed in stock number sequence.

Each workday, approximately 19,000 various types of issue documents are hand-carried from the Aviation Supply Office (ASO) Computer Support Center to the Storage Division's Programming Branch for breakdown into batch quantities of 100 documents per batch. This breakdown process facilitates supervisor assignment of workloads. The preponderance of the 19,000 issue transactions are retail issues, numbering some 14,000 per day; outfittings and special projects number almost 5,000 transactions per day, and bulk issues amount to less than 300 issues per day. The remainder consist of disposal actions.

The storage division employs 14 GS and 94 wage grade employees. These personnel are broken down into five branches: retail publications; bulk storage, retail forms, specifications, and standards; classified (addressed in the next section); and programming.

CLASSIFIED MATERIAL HANDLING AND DISTRIBUTION PROCESS

Classified and sensitive material stocked by the NPFC is received, stored, issued, and shipped independently in Building 8 (Figure A-2). Material stored in Building 8 includes all classified stocks (up to and including Secret), serialized forms (such as military identification card blanks), and material that might be pilfered (such as flag officer stationary).

Incoming material is accepted at the only entrance to Building 8 and immediately logged into the tally book if it is to be stored in the building. (All registered mail for NPFC is delivered to Building 8; that which is not stored in the building is transported to Building 26 for receipt processing.) Each line item is assigned a unique four-digit "tally number" that is marked both on a buck slip (NPFC Form 4401/1) and a stock record card that is attached to the container. The stock number (if available), date received, date processed, quantity, number of

cartons, Government Bill of Lading (GBL) number, and requisition number are then entered on the buck slip, and it is forwarded to the item manager in Building 26. The item manager makes all computer entries associated with the receipt (except for returns for which entries are made in Building 8) and sends the buck slip back to Building 8 with storage instructions. In the first nine months of 1985, an average of 1,850 line items were received each month. Nearly 90 percent of all receipts were by registered mail or GBL and the remainder by Armed Forces Courier Service.

The next step in the classified material receiving process is performed in Building 8, where a DD Form 1348 is manually typed with storage instructions. As with unclassified items, retail and bulk storage is used. Material going to bulk storage is marked with stock tags (pink for secret, white for all other material), and when it is stored, the DD Form 1348 is marked with the location and quantity on hand. Retail stocking is carried out the same way except that no stock tags are used. The completed DD Form 1348s are sent to the Classified Storage Office where the stock locations are posted both to the MDF and to manual Control Record Cards. Any changes to stock locations are reported to the office on Stock Location Change Notice forms filled out in triplicate by the warehouse clerks.

There are six warehouse stations in Building 8, three on the ground floor and three on the mezzanine. All Secret retail stocks are located at one station, and Confidential and Unclassified stocks are at the remaining five. A conveyor system directs tote boxes to the appropriate station.

Requisitions for classified material are processed through the NPFC computer system in three priority groups just as they are for unclassified documents. Issue documents for Confidential and Unclassified material are sorted and sent directly to the appropriate station. Those for Secret material are posted to the Control Record Card file first. The bulk and retail quantities as well as the date are entered on the DD Form 1348, and it is initialed by the classified storage clerk. When the

requisition is picked, the remaining stock is counted, the count is written on the DD Form 1348, and the form is initialed. Any discrepancies are investigated immediately.

In the shipping area, the order is recounted, sorted, and packaged. The packer determines the mode of shipment based on the classification of the material and type of activity it is sent to, and whether the recipient is located in the Continental United States. Material is shipped in all but exceptional circumstances by either first class or registered mail. For registered mail, two copies of the DD Form 1348 are sent to the Classified Storage Office where mailing labels are manually typed and registry numbers are assigned with preprinted registry labels supplied by the USPS. The registry numbers are printed in Optical Character Recognition (OCR) format. A manual USPS Registered Mail List (USPS Form 3854) is prepared, listing all registry numbers in each shipment, and is used to transfer accountability to the USPS truck driver. The driver is also provided with two copies of each mailing label.

The last copy of the DD Form 1348 is returned to the classified storage office for proof-of-shipment purposes. In the first nine months of 1985, the Classified Material Branch processed an average of 11,000 issues a month, 9,900 from its retail stocks and the remainder from bulk. Many of the bulk issues were for retail stock replenishment.

The Classified Material Branch has 24 wage grade and 9 GS employees.

THE SHIPPING PROCESS

Shipments consist either of material that is requisitioned from a location in stock (including requests for specifications and standards and COG I requisitions) or of material that is received and forwarded to an ultimate destination (transshipped) as distributions. These transshipments are the initial issues of documents in which a portion of the material received is shipped to preselected activities and the remainder is sent to a warehouse location pending future issue.

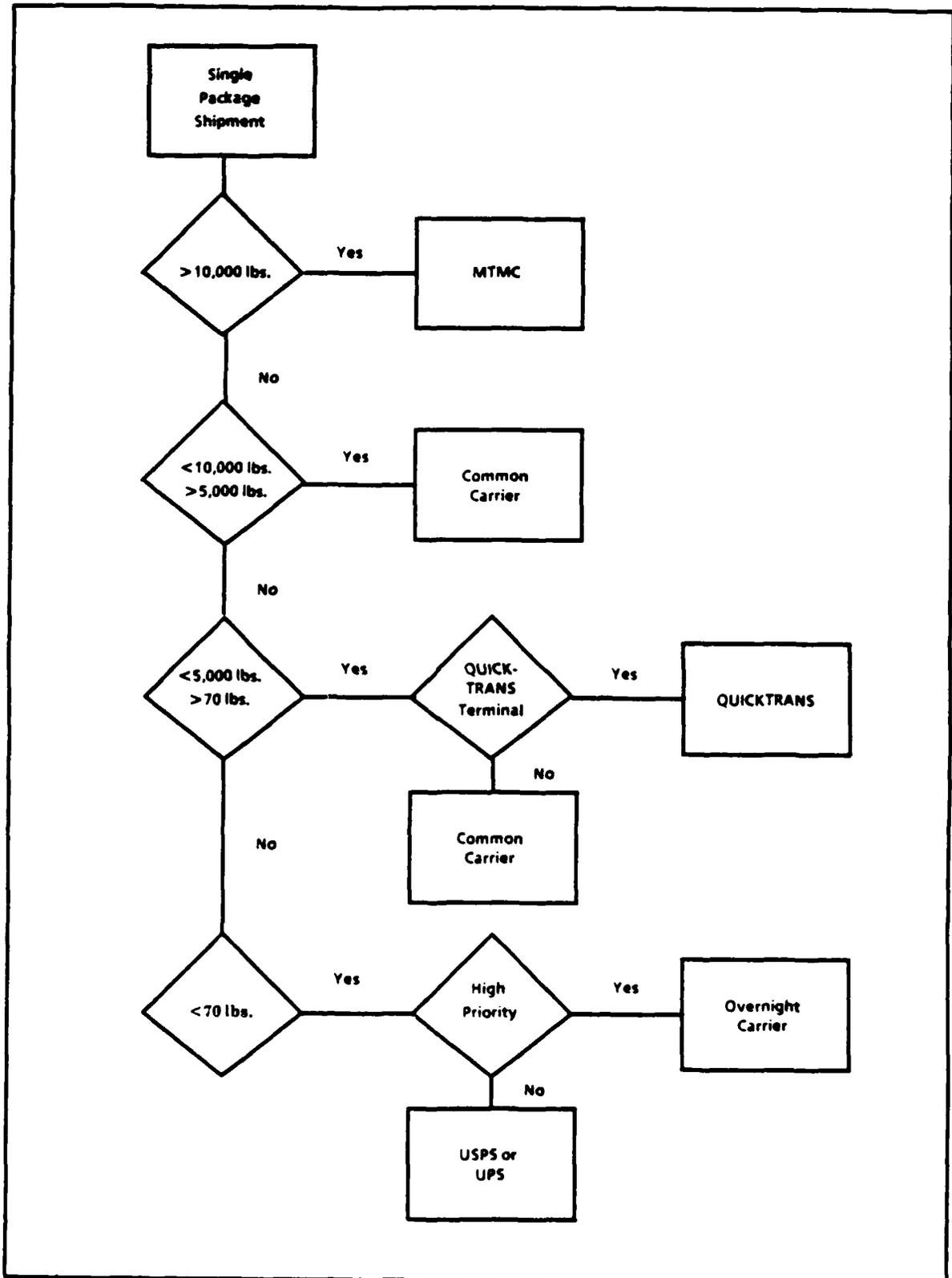
The three basic criteria for determining the mode of shipment from NPFC are size, required delivery date, and required traceability. The logic flow for this determination is shown in Figure A-3.

Unclassified publications, forms, specifications, standards, directives, and similar material ordered in small quantities are picked by the warehouse clerk, put in clear plastic heat-sealable bags with shipping documentation, placed in a tote box, and conveyed to the shipping floor. There the bags are processed for shipping by heat sealing with the address label visible from the outside. Since the bags are generally within USPS parameters and usually do not have to be shipped by traceable means, they are sent on a conveyor line to wheeled bins (called commutators) and loaded into USPS trucks. An employee removes the bags from the conveyor and places them into the commutator for the appropriate class of mail, distinguishing priority mail by the color of the shipping label.

When an order does not fit into a heat-sealable bag, it is bound together with issue documentation and placed by the warehouse clerk into a tote box and conveyed to the packing/shipping area. It is then packaged using either a shrink wrap process, envelopes, cartons, or in some cases, mailing tubes. If it does not have to be shipped by traceable means, it is sent on a conveyor line to commutators and loaded into a USPS truck. Large requisitions (more than three cartons) are consolidated. Again, all classes of post are mailed in this manner.

Shipments that cannot be accommodated by the tote boxes and those whose weight or size render them ineligible for USPS shipment are sent to the freight area. Shipments sent on pallets are secured by a plastic spin-wrapping process, and the method of shipment is determined by the weight and destination. If a common carrier is used, the selection is made from Leonard's Motor Rate Guide and a government tender rate sheet. If the destination has a QUICKTRANS terminal, QUICKTRANS is the preferred method of shipment. Shipments greater than

FIGURE A-3. SHIPMENT MODE DETERMINATION



1,000 pounds are referred to the Military Traffic Management Command (MTMC) in Bayonne, New Jersey.

Shipments requiring transportation by traceable means are sent by UPS or, in cases of high priority, by Federal Express for overnight delivery. Common carrier, QUICKTRANS, and MTMC shipments are all considered traceable. Classified shipments are sent by registered mail.

For transshipments, or distributions, the process is somewhat different. Once an item is received at NPFC, it is sent to Receipt Control to determine whether if the receipt is an initial issue. If it is so identified, all the material is sent to a location on the packing floor, and a computer input is processed by Receipt Control to produce labels for the intended addresses. When the labels are printed and delivered, a DD Form 1348 is produced and sent to the packing section with the address labels and other applicable documentation. That form indicates the quantities to be shipped and the quantity to be sent to storage. Once the documentation is received at the Packing section, the material is packed and sent using the same processes that are used for requisitions. The balance of the material that was not shipped is sent back to Receiving for assignment to a storage location.

There are 19 wage grade and 3 GS positions with packing and marking responsibilities and 3 GS positions with freight classification and routing duties. Student workers are also employed as package handlers.

APPENDIX B
NPFC WORKLOADS

Tables B-1 and B-2 reflect two different ways of depicting NPFC workloads. Table B-1 addresses several distribution functions, e.g., receipts, stock actions, issues, etc. Table B-2 addresses only COG I issues. Different data sources were used to build the tables: Table B-1 data are taken from a summary of 1 year's accumulation of Weekly Workload reports, which are manually tabulated reports generated by various work sections on a weekly basis. Table B-2 data, on the other hand, were taken from daily computer reports reflecting only COG I (forms and publications) issues; approximately 250 computer days were averaged to compile the data for each of the five different days of the week.

TABLE B-1. NPFC AVERAGE WORKLOADS

(Line Items)

TYPE OF TRANSACTION	DAILY	WEEKLY	MONTHLY
I Receipts, Total Processed			
A. COG I			
Publications	113	567	2457
Forms	16	78	338
COG I Total	129	645	2795
B Warehouse Controlled			
Specifications	58	289	1252
Directives	5	27	117
Warehouse Control Total	63	316	1369
C. Total Receipts	192	961	4164
II. Stock Actions			
A COG I			
Publications	162	812	3519
Forms	15	74	321
COG I Total	177	886	3839
B Warehouse Controlled			
Specifications	80	398	1725
Directives	13	65	282
Warehouse Controlled Total	93	463	2006
C Total Stockage Actions	270	1349	5845
III Issues			
A COG I			
Publications	5423	27115	117498
Forms	357	1783	7726
COG I Total	5780	28898	125225
B Warehouse Controlled			
Specifications	4762	23809	103172
Directives	3057	15287	66244
Warehouse Controlled Total	7819	39096	169416
C Outfittings, Total	4847	24237	105027
D Disposals, Total	181	905	3922
E Total Issue Actions	18627	93136	403589
IV Classified			
A Receipts	55	274	1187
B Issues	461	2305	9988
C Replenishments	70	348	1508
D Disposals	28	139	602

NOTE: The above data, extracted from one year's accumulation of NPFC Weekly Workload reports, constitute a representative sampling of NPFC workloads. The data, however, are not all-inclusive; rewarehousing actions and other special projects are not included. Each datum represents one line item, e.g., one receipt, one issue, etc.

TABLE B-2. NPFC AVERAGE DAILY ISSUES BY ISSUE PRIORITY GROUP (IPG) AND COMMODITY

(Line Items)

ISSUE PRIORITY GROUP AND CATEGORY OF ISSUE	DAY OF WEEK					TOTAL BY CATEGORY
	Monday	Tuesday	Wednesday	Thursday	Friday	
IPG I						
Classified	27.1	16.1	25.5	31.0	25.1	124.8
Unclassified	374.5	248.9	272.3	317.1	323.4	1536.2
Total IPG I	401.6	265.0	297.8	348.1	348.5	1661.0
IPG II						
Classified	202.2	106.5	201.0	153.4	163.4	826.5
Unclassified	2927.6	564.0	3238.6	1366.6	2384.6	10481.0
Total IPG II	3129.8	670.5	3439.6	1519.6	2548.0	11307.5
IPG III						
Classified	272.3	136.7	184.9	135.1	315.5	1044.5
Unclassified	3974.7	3589.7	3277.4	1758.4	1630.3	14230.5
Outfittings	342.1	663.4	805.5	628.1	726.6	3165.7
Disposals	49.5	60.5	61.1	46.7	98.0	315.8
Special Projects	406.9	221.4	238.7	217.9	223.2	1308.1
Other	191.6	40.8	25.9	16.0	34.3	308.6
Total IPG III	5237.1	4712.5	4593.5	2802.2	3027.9	20373.2
TOTAL ISSUES, ALL IPGs	8768.5	5648.0	8330.9	4669.9	5924.4	33341.7

NOTE: This table addresses only COG 1 (forms and publications) daily issues. The data represent daily averages, using approximately 50 days of computer reports to calculate the data reflected for each day of the week.

APPENDIX C
PUBLICATIONS WITH STOCK NUMBER ON COVER

Certain publications stocked at NPFC have NPFC-assigned stock numbers appearing on the front cover; others do not. We sampled the publications inventory to determine, by prefix (stock class), which publications have stock numbers printed on the front cover. The results of our sampling are provided in the following two tables. Table C-1 is sequenced by publication prefix; Table C-2 is sequenced by percent of publications with stock numbers appearing on the front covers.

Our sample included only those prefixes having more than 100 publications assigned. A sufficient number of publications were sampled in each prefix to obtain a 90 percent confidence that the percent of publications with a stock number printed on its cover is within 5 percent of the percentage obtained in the sample.

Based on our sampling, we conclude that 33 percent of those prefixes sampled have stock numbers imprinted on the front cover. Based on this percentage, it is reasonable to conclude that stock numbers appear on the covers of approximately 51,000 of the 154,000 publications stocked at NPFC.

TABLE C-1. IN PUBLICATION PREFIX SEQUENCE

PREFIX	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
204	1326	NAVSEA	97	1288	
240	108	NAVSEA	N/A	N/A	See Note 2
242	262	NAVSEA	N/A	N/A	See Note 2
270	146	NAVSEA	95	139	
280	1854	SEA/ELEX	17	309	
281	354	SEA/ELEX	16	56	
282	383	SEA/ELEX	0	0	
283	128	NAVSEA	8	10	
284	282	SEA/ELEX	8	22	
285	246	SEA/ELEX	7	17	
301	103	NAVSEA	58	60	See Note 3
316	208	NAVSEA	58	121	See Note 3
317	122	NAVSEA	58	71	See Note 3
320	681	NAVSEA	58	395	See Note 3
322	280	NAVSEA	58	162	See Note 3
324	469	NAVSEA	58	272	See Note 3
326	213	NAVSEA	58	124	See Note 3
333	101	NAVSEA	58	59	See Note 3
334	1156	NAVSEA	58	670	See Note 3
335	458	NAVSEA	58	266	See Note 3
336	162	NAVSEA	58	94	See Note 3
338	326	NAVSEA	58	191	See Note 3
341	1081	NAVSEA	58	627	See Note 3
342	113	NAVSEA	58	66	See Note 3
345	308	NAVSEA	58	179	See Note 3

- NOTES
- 1 Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix.
 - 2 Prefix not sampled. Stock inaccessible. Prefix not included in totals.
 - 3 The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 - 4 The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-1. IN PUBLICATION PREFIX SEQUENCE (CONTINUED)

PREFIX	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
346	187	NAVSEA	58	108	See Note 3
347	3183	NAVSEA	58	1846	See Note 3
348	1391	NAVSEA	58	807	See Note 3
349	539	NAVSEA	58	313	See Note 3
351	414	NAVSEA	58	240	See Note 3
355	123	NAVSEA	58	71	See Note 3
358	255	NAVSEA	58	148	See Note 3
359	584	NAVSEA	58	339	See Note 3
361	1336	NAVSEA	58	775	See Note 3
362	1169	NAVSEA	58	678	See Note 3
363	806	NAVSEA	58	467	See Note 3
365	1701	NAVSEA	58	987	See Note 3
367	382	SEA/ELEX	58	222	See Note 3
378	372	NAVSEA	58	216	See Note 3
381	159	NAVSEA	58	92	See Note 3
387	379	NAVSEA	58	220	See Note 3
389	303	NAVSEA	58	176	See Note 3
391	1071	NAVSEA	58	621	See Note 3
392	379	NAVSEA	58	220	See Note 3
393	310	NAVSEA	58	180	See Note 3
410	343	INTELL	N/A	N/A	See Note 2
423	2249	INTELL	N/A	N/A	See Note 2
424	957	INTELL	N/A	N/A	See Note 2
450	185	INTELL	58	106	
500	210	NAVPER	54	114	
501	1807	TRNG/ED	1	12	
502	339	TRMG/ED	92	312	

- NOTES
- 1 Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix
 - 2 Prefix not sampled. Stock inaccessible. Prefix not included in totals
 - 3 The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 - 4 The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-1. IN PUBLICATION PREFIX SEQUENCE (CONTINUED)

PREFIX	TOT PUBS N PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
503	149	TRNTG	51	77	See Note 2
507	107	TRNG/ED	87	93	
508	210	RECRUIT	N/A	N/A	
509	137	TRNG/ED	3	3	
510	111	MEDICS	0	0	
512	166	COMPTRLR	100	166	
514	3372	NTEC	3	91	
515	271	COMPTRLR	25	68	
516	258	COMPTRLR	41	106	
518	103	SHPBLD&LOG	16	16	
525	551	FACILITIES	0	0	
526	258	NAVSUP	14	35	
530	276	NAVSUUP	70	194	
532	215	NAVSUP	88	189	
533	199	ICPs	100	199	
579	113	CNO	0	0	
585	536	COMPTRLR	0	0	
610	1925	ORDNANCE	0	0	
613	161	NAVSEA	0	0	
627	1155	ORDNANCE	0	0	
626	105	ORDNANCE	0	0	
630	1355	ORDNANCE	0	0	
631	4009	ORDNANCE	0	0	
640	717	ORDNANCE	0	0	
690	395	CNO	N/A	N/A	See Note 2
697	229	ICPs	N/A	N/A	See Note 2
698	791	MIXED	N/A	N/A	See Note 2

- NOTES
- 1 Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix
 - 2 Prefix not sampled. Stock inaccessible. Prefix not included in totals
 - 3 The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 - 4 The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-1. IN PUBLICATION PREFIX SEQUENCE (CONTINUED)

PREFIX	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
699	135	MIXED	N/A	N A	See Note 2
800	273	NAVAIR	0	0	See Note 4
801	10922	NAVAIR	0	0	See Note 4
803	7789	NAVAIR	0	0	See Note 4
805	3610	NAVAIR	0	0	See Note 4
810	586	NAVAIR	0	0	See Note 4
811	758	NAVAIR	0	0	See Note 4
813	469	NAVAIR	0	0	See Note 4
816	10062	NAVAIR	0	0	See Note 4
818	8366	NAVAIR	0	0	See Note 4
819	1392	NAVAIR	0	0	See Note 4
850	255	NAVAIR	0	0	See Note 4
851	272	NAVAIR	0	0	See Note 4
893	112	NAVAIR	0	0	See Note 4
894	899	NAVAIR	0	0	See Note 4
900	493	NAVSEA	96	474	
901	202	NAVSEA	26	52	
903	524	NAVSEA	100	524	
904	358	NAVSEA	91	326	
905	6852	NAVSEA	97	6676	
910	11707	NAVSEA	3	341	
913	615	NAV'ELEX	7	45	
916	190	NAVSEA	100	190	
920	709	NAVSEA	98	697	
922	154	NAVSEA	100	154	
924	525	NAVSEA	100	525	

- NOTES:
- 1 Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix
 - 2 Prefix not sampled. Stock inaccessible. Prefix not included in totals
 - 3 The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 - 4 The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-1. IN PUBLICATION PREFIX SEQUENCE (CONTINUED)

PREFIX	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
934	596	NAVSEA	98	582	
935	185	NAVSEA	97	180	
936	123	NAVSEA	95	117	
938	307	NAVSEA	98	302	
941	397	NAVSEA	95	377	
947	1774	NAVSEA	100	1774	
948	946	NAVSEA	95	903	
949	301	NAVSEA	99	297	
951	254	NAVSEA	100	254	
958	122	NAVSEA	98	120	
959	277	NAVSEA	96	265	
961	427	NAVSEA	97	415	
962	545	NAVSEA	94	511	
963	208	NAVSEA	98	204	
965	758	NAVSEA	98	736	
967	13411	SEA/ELEX	92	12305	
969	1309	SEA/ELEX	91	1195	
978	341	NAVSEA	99	336	
981	273	NAVSEA	89	243	
987	192	NAVSEA	95	183	
988	5680	NAVSEA	N/A	N/A	See Note 2
989	399	NAVSEA	100	399	
991	1391	NAVSEA	99	1377	
992	134	NAVSEA	5	7	
TOTALS					
Prefixes Sampled:	149384	N/A	33	48790	
NPFC:	154071	N/A	N/A	N/A	

- NOTES:
- 1 Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix
 - 2 Prefix not sampled. Stock inaccessible. Prefix not included in totals
 - 3 The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 - 4 The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-2. IN PERCENT STOCK NUMBER ON COVER SEQUENCE

PREFIX	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
512	166	COMPTRLR	100	166	
533	199	ICPs	100	199	
903	524	NAVSEA	100	524	
916	190	NAVSEA	100	190	
922	154	NAVSEA	100	154	
924	525	NAVSEA	100	525	
947	1774	NAVSEA	100	1774	
951	254	NAVSEA	100	254	
989	399	NAVSEA	100	399	
991	1391	NAVSEA	99	1377	
978	341	NAVSEA	99	336	
949	301	NAVSEA	99	297	
920	709	NAVSEA	98	697	
938	307	NAVSEA	98	302	
958	122	NAVSEA	98	120	
963	208	NAVSEA	98	204	
934	596	NAVSEA	98	582	
965	758	NAVSEA	98	739	
905	6852	NAVSEA	97	6676	
961	427	NAVSEA	97	415	
205	1326	NAVSEA	97	1288	
935	185	NAVSEA	97	180	
900	493	NAVSEA	96	474	
959	277	NAVSEA	96	265	
948	946	NAVSEA	95	903	

NOTES

- 1 Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix
- 2 Prefix not sampled. Stock inaccessible. Prefix not included in totals
- 3 The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
- 4 The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-2. IN PERCENT STOCK NUMBER ON COVER SEQUENCE (CONTINUED)

PREFIX	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
987	192	NAVSEA	95	183	
270	146	NAVSEA	95	139	
941	397	NAVSEA	95	377	
936	123	NAVSEA	95	117	
962	545	NAVSEA	94	511	
502	339	TRNG/ED	92	312	
967	13411	SEA/ELEX	92	12305	
969	1309	SEA/ELEX	91	1195	
904	358	NAVSEA	91	326	
981	273	NAVSEA	89	243	
532	215	NAVSUP	88	189	
507	107	TRNG/ED	87	93	
530	276	NAVSUP	70	194	
301	103	NAVSEA	58	60	See Note 3
316	208	NAVSEA	58	121	See Note 3
317	122	NAVSEA	58	71	See Note 3
320	681	NAVSEA	58	395	See Note 3
322	280	NAVSEA	58	162	See Note 3
324	469	NAVSEA	58	272	See Note 3
326	213	NAVSEA	58	124	See Note 3
333	101	NAVSEA	58	59	See Note 3
334	1156	NAVSEA	58	670	See Note 3
335	458	NAVSEA	58	266	See Note 3
336	162	NAVSEA	58	94	See Note 3
338	329	NAVSEA	58	191	See Note 3

- NOTES:
- 1 Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix
 - 2 Prefix not sampled. Stock inaccessible. Prefix not included in totals
 - 3 The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 - 4 The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-2. IN PERCENT STOCK NUMBER ON COVER SEQUENCE (CONTINUED)

PREFIX	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
341	1081	NAVSEA	58%	627	See Note 3
342	113	NAVSEA	58%	66	See Note 3
345	308	NAVSEA	58%	179	See Note 3
346	187	NAVSEA	58%	108	See Note 3
347	3183	NAVSEA	58%	1846	See Note 3
348	1391	NAVSEA	58%	807	See Note 3
349	539	NAVSEA	58%	313	See Note 3
351	414	NAVSEA	58%	240	See Note 3
355	123	NAVSEA	58%	71	See Note 3
358	255	NAVSEA	58%	148	See Note 3
359	584	NAVSEA	58%	339	See Note 3
361	1336	NAVSEA	58%	775	See Note 3
362	1169	NAVSEA	58%	678	See Note 3
363	806	NAVSEA	58%	467	See Note 3
365	1701	NAVSEA	58%	987	See Note 3
367	382	SEA/ELEX	58%	222	See Note 3
378	372	NAVSEA	58%	216	See Note 3
381	159	NAVSEA	58%	92	See Note 3
387	379	NAVSEA	58%	220	See Note 3
389	303	NAVSEA	58%	176	See Note 3
391	1071	NAVSEA	58%	621	See Note 3
392	379	NAVSEA	58%	220	See Note 3
393	310	NAVSEA	58%	180	See Note 3
450	185	INTELL	58%	106	
500	210	NAVPERS	54%	114	
503	149	TRNG/ED	51%	77	
516	258	COMPTRLR	41%	106	

- NOTES:
1. Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix.
 2. Prefix not sampled. Stock inaccessible. Prefix not included in totals.
 3. The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 4. The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-2. IN PERCENT STOCK NUMBER ON COVER SEQUENCE (CONTINUED)

PREFIX	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
901	202	NAVSEA	26	52	
515	271	COMPTRLR	25	68	
280	1854	SEA/ELEX	17	309	
518	103	SHIPBLD&LOG	16	16	
281	354	SEA/ELEX	16	56	
526	258	NAVSUP	14	35	
284	282	SEA/ELEX	8	22	
283	128	NAVSEA	8	10	
913	615	NAVELEX	7	45	
285	246	SEA/ELEX	7	17	
992	134	NAVSEA	5	7	
910	11707	NAVSEA	3	341	
514	3372	NTEC	3	91	
509	137	TRNG/ED	3	3	
501	1807	TRNG/ED	1	12	
282	383	SEA/ELEX	0	0	
510	111	MEDICS	0	0	
525	551	FACILITIES	0	0	
579	113	CNO	0	0	
585	536	COMPTRLR	0	0	
610	1925	ORDNANCE	0	0	
613	161	NAVSEA	0	0	
626	105	ORDNANCE	0	0	
627	1155	ORDNANCE	0	0	
630	1355	ORDNANCE	0	0	

- NOTES
- 1 Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix
 - 2 Prefix not sampled. Stock inaccessible. Prefix not included in totals
 - 3 The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 - 4 The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-2. IN PERCENT STOCK NUMBER ON COVER SEQUENCE (CONTINUED)

PREF-X	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W STK NUMBER	NBR PUBS W STK NUMBER (SEE NOTE 1)	REMARKS
631	4009	ORNANCE	0	0	
640	717	ORDNANCE	0	0	
800	273	NAVAIR	0	0	See Note 4
801	10922	NAVAIR	0	0	See Note 4
802	925	NAVAIR	0	0	See Note 4
803	7789	NAVAIR	0	0	See Note 4
805	3610	NAVAIR	0	0	See Note 4
810	586	NAVAIR	0	0	See Note 4
811	758	NAVAIR	0	0	See Note 4
813	469	NAVAIR	0	0	See Note 4
816	10062	NAVAIR	0	0	See Note 4
818	8366	NAVAIR	0	0	See Note 4
819	1392	NAVAIR	0	0	See Note 4
850	255	NAVAIR	0	0	See Note 4
851	272	NAVAIR	0	0	See Note 4
893	112	NAVAIR	0	0	See Note 4
894	899	NAVAIR	0	0	See Note 4
240	108	NAVSEA	N/A	N/A	See Note 2
242	262	NAVSEA	N/A	N/A	See Note 2
410	343	INTELL	N/A	N/A	See Note 2
423	2249	INTELL	N/A	N/A	See Note 2
424	957	INTELL	N/A	N/A	See Note 2
508	210	RECRUIT	N/A	N/A	See Note 2
690	395	CVO	N/A	N/A	See Note 2
697	229	ICPs	N/A	N/A	See Note 2

- NOTES
1. Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix.
 2. Prefix not sampled. Stock inaccessible. Prefix not included in totals.
 3. The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" series sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 4. The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

TABLE C-2. IN PERCENT STOCK NUMBER ON COVER SEQUENCE (CONTINUED)

PREFIX	TOT PUBS IN PREFIX	SPONSORING COMMAND	PERCENT SAMPLE W/STK NUMBER	NBR PUBS W/STK NUMBER (SEE NOTE 1)	REMARKS
698	791	MIXED	N/A	N/A	See Note 2
699	135	MIXED	N/A	N/A	See Note 2
988	5680	NAVSEA	N/A	N/A	See Note 2
TOTAL Prefixes Sampled.	149384	N/A	33	48790	
NPFC Total.	154071	N/A	N/A	N/A	

- NOTES:
- 1 Calculated by multiplying the percentage obtained in the sample by the total number of publications managed in that prefix
 - 2 Prefix not sampled. Stock inaccessible. Prefix not included in totals
 - 3 The "300" series of prefixes total 20,847 NAVSEA publications, all stocked in random sequence. Random stockage precludes efficient sampling by prefix. Hence, 450 publications ranging throughout the entire "300" series of prefixes were sampled. The results of the "300" sampling are reflected against each of the "300" prefixes. We conclude that 58% of the "300" series publications have stock numbers printed on the cover.
 - 4 The "800" series, NAVAIR publications, by policy, do not include the assigned stock number on the cover. A random sampling of several hundred "800" series publications confirmed this.

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