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REPORT TO THE CONGRESS



LM097054

Ways To Improve Management Of Automated Data Processing Resources

Department of the Navy

**BY THE COMPTROLLER GENERAL
OF THE UNITED STATES**

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

This is our report on ways for the Department of the
Navy to improve its management of automated data processing
resources.

We made our review pursuant to the Budget and Account-
ing Act, 1921 (31 U.S.C. 53), and the Accounting and Audit-
ing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director,
Office of Management and Budget; the Secretary of Defense;
and the Secretary of the Navy.

A handwritten signature in cursive script, appearing to read "Thomas B. Atch".

Comptroller General
of the United States

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COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

WAYS TO IMPROVE
MANAGEMENT OF AUTOMATED
DATA PROCESSING RESOURCES
Department of the Navy

D I G E S T

WHY THE REVIEW WAS MADE

GAO wanted to know how effectively the Navy was managing its automated data processing resources which cost about \$300 million a year.

- design, develop, and maintain interim and nonstandard systems operating on that equipment, and
- supplement saturated computers with commercial computer time (See p. 6.)

FINDINGS AND CONCLUSIONS

The Navy's Automatic Data Processing Program is having difficulty achieving its major objectives, particularly in its efforts to develop standard information and data systems--which are the key to the program's objectives--with standard equipment on a command and functional basis.

Why hasn't standardization been successful?

Standardization has been unsuccessful primarily because Navy management allows local commanders to influence unduly the design of standard systems. Commanders have modified standard systems or developed systems to suit local needs without regard to the Navy's overall program objectives and management needs. The problem of command influence on the Navy's program will continue into a new generation of computer equipment. (See p. 9.)

Instead of producing timely, standardized, and cost-effective systems, many of these efforts have generated a series of costly and prolonged systems developments. (See p. 3.)

A family of systems which are "standard" in name only and many of which are still under development, now forms much of the foundation for data processing and for further systems improvements within the Navy. (See p. 9.)

Thus the Government is paying millions of dollars each year to

- sustain systems efforts beyond their scheduled completion dates,
- operate and maintain standard equipment acquired for those systems without achieving expected benefits and to retain older computer equipment because of system delays,

The Navy has installed or is installing late-model computer equipment for many of those systems in an

effort to upgrade them, despite the fact that those systems

- are not fully standardized,
- are not adequate, and
- are not designed to exploit the latest computer technology. (See p. 9.)

How can the program be improved?

Implementation of the Navy's program, which generally provides the necessary policies, procedures, principles, and instructions to guide systems development, can be substantially improved if the Navy resolves the problem of command influence.

This can be accomplished by requiring the commands to adhere to the program's fundamental requirements for systems development and management through more stringent control by the Department's top data processing managers. The specific areas where improvements are needed, in both development and management, are system studies, redesign of systems, justification of system projects, and standardization. (See pp. 10, 12, 18, and 20.)

RECOMMENDATIONS

The Secretary of the Navy should:

- Require that system studies be documented and that the documentation be part of the equipment justification.
- Review the Navy's information and data processing systems to identify, on a system-by-system basis, those actions that are needed to estab-

lish a program for upgrading and standardizing each system.

- Issue the commands more definite guidance for making economic analyses and establish a program for educating the field organizations in the economic analysis technique. Further, the guidance should require that the economic analysis be performed before systems are submitted for review and approval by higher management. Provision should also be made for obtaining appropriate assistance from the Naval Audit Service in evaluating the analysis before it is submitted for approval.
- Amend his instructions for redesign to require that the alternative of redesign be considered as part of any economic analysis made to support system projects.
- Require the Director, Department of the Navy, Automatic Data Processing Management, to establish monitoring procedures to insure compliance with the redesign policy. (See p. 30.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

The Assistant Secretary of the Navy (Financial Management) acknowledged that improvements could and should be made in the Automatic Data Processing Program and essentially agreed with GAO's proposals.

However, he was concerned that GAO findings could lead to damaging misconceptions regarding the effectiveness of the Department's program and said that the findings should be viewed in the light of changing conditions. He stated also that the Navy's cur-

rent position was not unique when compared with that of other computer-dependent organizations. (See pp. 24 and 35.)

The Assistant Secretary disagreed with GAO's contention that the Department's management philosophy of "centralized policy direction and decentralized execution" unduly influenced the development and operation of standard information and data processing systems. He acknowledged that the philosophy strongly influenced the approach to developing effective information systems but believed it to be valid. (See pp. 26 and 36.)

The Assistant Secretary said that the Navy's Automatic Data Processing Program was currently being directed along GAO's recommendations and that GAO's report confirmed that this approach was reasonable. He informed GAO that the following actions related to GAO's proposals are being taken.

--The Navy is updating its management instruction for system development to amplify documentation requirements to insure that all potentially significant facts are documented and that all documentation, which forms the basis for acquisition decisions, is kept available for review. It will require mission function sponsors to formally review projects to confirm the validity and priority of their specifications and to authorize their funding. It will also require system proponents to use the Naval Audit Service to evaluate costly economic analyses.

--To improve the use of the economic analysis technique, the Navy has (1) formally trained many operational analysts in its graduate studies program, (2) promulgated some very detailed instructions in May 1972, (3) aided in the development of Department of Defense Instruction 7041.3 of October 18, 1972, and (4) begun training, open to all personnel, in economic analysis at the Navy Logistics Management School in Washington, D.C.

--The Navy is studying ways to institute a self-teaching course to exploit its economic analysis training capability.

--The Navy will insure that it fully documents its redesign considerations in the future. (See pp. 29, 35, and 38.)

These actions, particularly the ones related to system studies and economic analysis, should improve the Department's management of its data processing resources.

The Assistant Secretary's assurance that the Navy will fully document future redesign considerations, however, is not an adequate response to GAO's proposal concerning the redesign policy of the Department of Defense.

GAO believes that the commands will not implement that policy effectively unless the Secretary of the Navy amends his instructions to require the commands to consider redesign as part of any economic analysis made to support system projects and establish monitoring procedures to insure

that the redesign policy is followed.
(See p. 30.)

The Assistant Secretary listed numerous actions the Navy was taking to improve its data processing operations. While these actions are beneficial, they are generally not directed toward the immediate improvement or upgrading of the kinds of systems addressed in GAO's report.
(See p. 30.)

MATTERS FOR CONSIDERATION
BY THE CONGRESS

Findings and recommendations in this report should be of special interest to (1) the House Committee on Appropriations, which has been concerned with the cost, efficiency, and effectiveness of data processing management in the Federal Government and (2) other committees and members concerned with increasing productivity in the Department of Defense and in the Federal Government generally.

CHAPTER 1

INTRODUCTION

DEPARTMENT OF THE NAVY'S AUTOMATIC DATA PROCESSING PROGRAM

The Department of the Navy uses over 1,100 general-purpose computers for primarily logistic and administrative functions. Since 1959 the Department has spent more than \$2.8 billion--and in fiscal year 1975 plans to spend an additional \$332 million--to operate and maintain them and to design and develop the required software and the associated information and data processing systems.

Data processing resources are managed through the Department of the Navy's Automatic Data Processing Program. The program is basically the compilation of Navy policies, objectives, plans, procedures, and principles for managing its resources and for developing its data processing capabilities. It was formally established in 1959 and provides general guidance to Navy organizations for the technical advancement and effective, efficient, and economical use of computer equipment and techniques.

The program's general guidance represents sound philosophy and principles for the long-range development of the Department's data processing capabilities and for exploiting computer technology, telecommunications, and management science techniques. The program is headed by the Department's Senior Automatic Data Processing Policy Official and the Director, Department of the Navy, Automatic Data Processing Management.

OBJECTIVES AND PRINCIPLES OF THE NAVY PROGRAM

The objectives of the program were initially established in a general plan promulgated by the Secretary of the Navy in April 1959 and reaffirmed in March 1966 through Secretary of the Navy Instruction 10462.7B. The major objectives were to facilitate (1) the ultimate convergence of automated management information system into a compatible aggregate, which could be termed "a Department of the Navy management information system," (2) the systematic evolution and

application of automatic data processing equipment and associated techniques in improving information flow to and from management with optimal uniformity, compatibility, and responsiveness (3) the ultimate development and exploitation of automatic data processing equipment and related advanced scientific techniques, and (4) the orderly development of standardization to improve information interchange.

The plan also provided governing policies, principles, concepts, and procedures to guide the Navy organizations toward the program's objectives. It outlined the major stages of system development and provided explicit instructions for essential feasibility study and planning; equipment acquisition; and system design, installation, and conversion. The plan also established general principles concerning the need for (1) preparing economic analyses to determine benefits of automation and its impact on direct and indirect costs, (2) exploiting the full capabilities of available equipment and the management sciences, (3) automating applications which have a legitimate history and purpose with consistency and prudent speed, and (4) continuously anticipating and implementing reorganization.

In September 1970 the Navy modified the program because the Department of Defense increased its emphasis on improving management of automated data processing resources and on exploiting computer technology to provide more timely, accurate, and meaningful information for making key management decisions. The modifications stressed the need for better automated data systems planning, costing, and overall control. At that time the Navy also established more generalized program objectives. They were to insure exploitation and cost-effective use of automated data processing, and efficient acquisition and management of its resources.

Our review was directed toward evaluating the extent to which the Navy has achieved these objectives.

CHAPTER 2

ADVERSE EFFECTS OF PROLONGED SYSTEMS DEVELOPMENT

HAS THE PROGRAM BEEN SUCCESSFUL?

In the light of the resources spent on it, the Navy's Automatic Data Processing Program generally has not satisfactorily progressed toward its major objectives. The need for better progress is conspicuous when viewing the Department's efforts to develop standard information and data systems--which are the key to the program's objectives--with standard equipment on a command and functional basis. Instead of producing timely, standardized, and cost-effective systems, many of these efforts have generated a series of costly and prolonged systems developments, as illustrated on page 4.

The development of many of the Department's systems was initiated in the early and middle 1960s. Development efforts were generally made through either the equipment approach, whereby the acquisition of computer equipment preceded system design, or the multilead activity concept, whereby each activity autonomously designed and developed pieces of the system on a best-functional-knowledge basis rather than on a central design basis. Neither of these methods conformed to program guidance.

The equipment approach had four phases: (1) installation and testing of the new computer system, (2) conversion of the existing workload to the new computer system, (3) unilateral development of programs to meet interim and special needs of local commanders, and (4) design and development of the standard system. This approach enabled the commands to immediately install and operate the new computers and to achieve early operational benefits from them. However, while the emphasis was on getting the new computers operational, the design and development of the standard systems continually fell behind their scheduled completion dates because of problems caused by the changing computer technology, lack of coordination and central direction, and/or lack of computer capacity. Consequently, those systems today, although partially operational, are not fully developed or standardized.

Examples of Prolonged Systems Development

| <u>Title of system</u> | <u>Development start-up-date</u> | <u>Current status of development (note a)</u> | <u>Estimated operational and development costs since FY 1969 (note b) (millions)</u> |
|--|----------------------------------|---|--|
| Management Information System for Naval Shipyards | Mar. 1960 | Continued through FY 1978 | \$119.2 |
| Uniform Automated Data Processing System for Inventory Control Points | Oct. 1961 | Continued through FY 1975 | 109.6 |
| Uniform Automated Data Processing System for Industrial Naval Air Stations | Jan. 1963 | Continuing--firm milestones not established | 94.0 |
| Management Information System for Ordnance Production Activities | Oct. 1965 | Continued through FY 1978 | 89.8 |
| Uniform Automated Data Processing System for Stock Points (Upgrade) | Sept. 1966 | Continued through FY 1976 | 132.2 |

^aCurrent status according to Navy ADP Five-Year Plan, FY 1974-79.

^bThis is the first year that the Department aggregated its costs by system for budget purposes.

Development efforts today are directed toward completing the efforts that were initiated in the 1960s, fully implementing those standard systems, and in some cases upgrading systems to the capability of newer computers installed since then.

Inadequate progress in developing standard systems has also been noted by the Department. In a memorandum to the Chief of Naval Material, dated May 6, 1969, the Department's Senior Automatic Data Processing Policy Official cited the following problems related to the Navy's management and development of systems.

- "1. Standard management structures and management disciplines do not exist in the systems commands which are capable of dealing with the development of large-scale information systems.
- "2. The hardware power growth is not reflected in a comparable increase in capability to obtain, process, and use information or in reduced resource costs.
- "3. Extraordinary emphasis is placed upon computer hardware. Not enough effort is devoted to determining information requirements, system planning, system design, and information use. Hardware is installed before systems are developed.
- "4. The multilead activity concept for developing systems has resulted in failure, in almost every instance, to develop viable systems.
- "5. There is no effective mechanism for controlling changes and modifications to major ongoing systems.
- "6. Control is ineffective over the development of unique, duplicative applications at similar activities.
- "7. Many systems are poorly designed and inflexible. Too many old first and second generation programs are being run on new computers. This is costly, degrades hardware performance, and does not produce tangible management improvements.

"8. Many questionable applications are being placed upon computers without cost/benefit analysis justification. Too many decisions are made by data processing analysts and programmers instead of managers and users.

"9. There is ineffective overall control over distribution of data processing personnel and establishment of resource priorities."

That memorandum resulted in each system command's establishing (1) a standard management organization and steering group for controlling and monitoring systems developments and (2) a central organization for designing and maintaining systems. Those changes were beneficial but were made too late to check the development cycles of most of the Department's standard systems.

HOW HAS PROLONGED SYSTEMS DEVELOPMENT
AFFECTED AUTOMATED DATA PROCESSING
RESOURCES AND BENEFITS?

The Department's inability to develop and implement standard systems on a timely basis is costing the Government millions of dollars each year to

- sustain systems efforts beyond their scheduled completion dates,
- operate and maintain computer equipment without benefiting from standardization,
- retain and operate older computer equipment because of systems delays,
- design, develop, and maintain interim and unique systems operating on that equipment, and
- supplement saturated computers with commercial computer time.

The resulting impact on Government data processing resources is illustrated by the following examples.

Example 1 - The Naval Ordnance Systems Command will spend about \$17 million through fiscal year 1975 to sustain the development of its Management Information System for Ordnance Production Activities beyond its scheduled full implementation date of December 1968. This expenditure is because of difficulties encountered in the multilead activity concept and the redirection of effort after centralizing system development.

Example 2 - Since 1967 the Naval Ordnance Systems Command has spent more than \$10 million to lease 14 computer systems and to purchase some of their components. The equipment, acquired for the Management Information System for Ordnance Production Activities is expected to produce more than \$14 million in discounted cost savings. However, this system is not complete and thus the more than \$10 million for its equipment has not produced the expected savings.

In addition, each ordnance activity has spent an indeterminate amount to operate and maintain that equipment and to independently develop and maintain local processing systems and programs to enable it to use the equipment on an interim basis. Much of the effort and related cost could have been avoided through expeditious system development.

Example 3 - The Naval Ship Systems Command has been developing its Shipyard Management Information System since about 1960. Its completion has been delayed since at least 1966 because of the command's efforts to replace existing equipment with newer equipment. This delay has adversely affected the shipyards' data processing resources in a number of ways. First, seven shipyards¹ spent about \$14.4 million to lease, purchase, and maintain antiquated computer equipment which could have been replaced early at a lower cost. They spent \$3.8 million to lease, purchase, and maintain other equipment, and more than \$75 million to operate and support all equipment without fully implementing the shipyard system and without substantially achieving the

¹At the time of our review, seven shipyards were operating the standard shipyard system on standard computer equipment, while three shipyards--Portsmouth, Pearl Harbor, and Puget Sound--were operating interim computer systems.

expected benefits of that system. Second, three shipyards spent over \$23 million to operate and maintain interim computer systems and to design, develop, maintain, and operate local data systems which are similar to each other and the standard system that will replace them. Third, inadequate computer capacity required the shipyards to purchase computer time from commercial and Government sources to continue their data processing operations. From fiscal year 1971 through fiscal year 1973, computer time cost over \$2 million.

CHAPTER 3

OPPORTUNITIES TO IMPROVE NAVY'S

MANAGEMENT OF AUTOMATED DATA PROCESSING RESOURCES

WHY HASN'T STANDARDIZATION BEEN SUCCESSFUL?

The Department has not been successful in developing standard information and data processing systems primarily because its management philosophy allows commanders to unduly influence the design of standard systems and to modify standard systems or to develop systems for local needs without regard to the Department's program objectives and management needs. System designers adhere more to the desires of individual commanders than to the Department's basic policies, principles, and procedures.

This management philosophy is a major factor in the development and operation of a family of systems which are "standard" systems in name only. Those systems are basically a conglomeration of (1) standard programs which in many cases have been modified by commanders to meet their individual needs and (2) unique programs which have been designed and developed locally to either supplement or replace standard programs.

That family, still under development, now forms much of the foundation for automated data processing activities and for further system improvements within the Department. In many cases the Department has installed or is installing late-model computer equipment for those systems in an effort to upgrade them. The commands are converting their systems to use the new equipment although those systems are not fully standardized, are not adequate, and are not designed to exploit the latest computer technology. (See pp. 10, 12, and 18). Thus the problem of command influence will continue into a new generation of computer equipment.

Command influence must not continue to deter development of standard systems capable of meeting management information needs at all appropriate levels within the commands and the Department. The development of such systems not only reduces the need for data processing resources but also

(1) enables all levels of management within a command to plan, monitor, and control systems and procedures for accomplishing the command's overall mission on a common basis, (2) provides the interface needed to support common headquarters systems, and (3) facilitates the transfer of personnel from one command to another without extensive retraining.

HOW CAN THE PROGRAM BE IMPROVED?

Implementation of the Department's program, which in our opinion provides the necessary policies, procedures, principles, and instructions to guide systems development efforts, can be substantially improved if the Department resolves the problem of command influence. This can be accomplished by requiring the commands and the commanders to adhere to the program's fundamental requirements for systems development and management and through more stringent control of systems development by the Department's top data processing managers.

Numerous areas in both development and management control need improvements. These areas have been identified through reviews discussed below.

Need for studies before acquiring computer equipment

The Department realizes that developing data processing systems and/or acquiring computer equipment must be preceded by studies which form the basis for (1) identifying information requirements, (2) determining the kind of system needed, and (3) developing specifications to select and acquire computer equipment. Guidelines for such studies were issued in April 1959 and were incorporated into Secretary of the Navy Instruction 5236.1 on December 17, 1971.

Thus Navy policy is that computer equipment acquisitions will be preceded by and based upon well-documented studies which provide an adequate factual basis for concluding that (1) the functions requiring equipment are essential and (2) computer equipment is essential to or is the most cost-effective alternative for performing these functions.

The policy also requires that all automated data systems be designed to achieve maximal effectiveness and operational economy, and that the lowest overall cost alternative be determined before acquiring computer equipment. When followed, this policy has effectively minimized system development costs and has developed systems which satisfy information requirements. However, the Department has not enforced the preparation of these studies, a fact contributing to its lack of success in developing useful information and data systems.

There were no well-documented studies in our reviews of Naval Ordnance Management Information System, Uniform Automated Data Processing System for Inventory Control Points, and Uniform Automated Data Processing System for Naval Industrial Air Stations. The reviews showed that the computer equipment acquired was not suitable for the planned systems. Some of that equipment had to be augmented and some was used for interim systems because of system development delays.

Moreover, recent examination of the Uniform Automated Data Processing System for Stock Points and the Naval Shipyard Management Information System showed that these conditions still exist. Our review of the system for stock points showed that the Naval Supply Systems Command acquired replacement computer equipment without a system reevaluation or a reappraisal of the management information and data processing system requirements. That equipment later had to be supplemented because the required studies had not been made. Supplementing basic equipment tends to increase the cost of system development.

In the case of the shipyard system, the Naval Ship Systems Command, in March 1972, contracted for computer equipment to replace inadequate older equipment and to provide the capacity needed to complete system development and implementation. Equipment specifications were prepared without the required studies even though the command was aware that the system's ability to serve management needs was questionable and that an entirely new system based upon the advances made in the management sciences and computer technology was probably needed. After the specifications were prepared, the command identified several hundred problems, including some that required system

improvements and some that may require additional equipment and computer capability.

These problems are normally identified during the preparation of the studies required by Navy policy. For example, problems identified by the ship systems command included new reporting requirements, inadequate outputs, voluminous outputs, and the needs to change reporting frequencies, to simplify transactions, and to computerize applications in such areas as material control and labor cost reporting.

Nevertheless, the equipment was installed. The shipyard system was converted to the new equipment as is in most instances, despite the command's beliefs that the system was of questionable adequacy and would be inefficient because it could not exploit new computer capabilities since it was designed on the basis of outmoded computer technology.

Need to improve and extend standard systems

Department policy requires that automated data systems be fully standardized and be developed and maintained centrally. The purposes of the policy are to reduce costs for equipment, system design and development, and system operations and maintenance, and to facilitate the interchange of information and personnel.

Department commands and activities have established central design and maintenance offices. However, those offices generally have failed to accomplish standardization or to develop viable systems for management needs.

The central design offices have not been successful because they have concentrated on developing and maintaining systems which the Department admits are poorly designed and inflexible. Specifically, the Navy has stated that those systems are the result of (1) inadequate determination of information requirements, (2) poorly planned development to meet those requirements, (3) acquisition of new computer equipment before systems are developed, and (4) ineffective control of standardization. These conditions had not changed during the continued development of the

Uniform Automated Data Processing System for Stock Points and the Shipyard Management Information System.

Uniform Automated Data Processing
System for Stock Points

The Uniform Automated Data Processing System for Stock Points was designed and developed during the early 1960s. In 1965, after it became operational, the Fleet Material Support Office, Mechanicsburg, Pennsylvania, was established as the system's central design and maintenance office. Since 1966 that office has concentrated on acquiring new computer equipment and extending the stock point system to additional activities, but has not been monitoring the system to reevaluate its adequacy in managing the stock points or to determine whether further standardization could be accomplished.

New equipment is being installed at the stock points under a project plan called Mark II. The Supply Systems Command intends to continue using the same applications initially designed and programmed for the older machines, believing that there is inadequate manpower to redesign the system.

The command and the Support Office did not study the stock points data and information requirements before acquiring the new equipment. We found that the stock points replaced or supplemented many of the system's standard programs with local programs¹ and in other cases made unauthorized changes to standard programs.

For example, at the Oakland Naval Supply Center we identified 24 standard programs that were not being used for one or more of the following reasons.

--No known use for program output.

¹According to Support Office records, at least 4 Naval Supply Centers had almost 900 nonstandard programs, before the Mark II project.

--Takes too long to run and is uneconomical compared to the benefits received.

--Output does not produce information required to fulfill local and headquarters user needs.

--Input preparation and time frame incompatible with reporting format.

Further, all Navy stock points have developed similar computer applications that provide automated procedures in functional areas for which no standard programs are available. We found no technical reason for the development of these applications on a unique basis. Some of the functional areas are listed below.

| <u>Function</u> | <u>Number of stock points that have a similar system</u> |
|--|--|
| Savings bonds accounting | 4 |
| Supply operations assistance program | 4 |
| Preventative maintenance (fuel) | 5 |
| Property accounting | 4 |
| Pass action/refer transaction accounting | 8 |
| Purchase system | 7 |
| Servmart accounting | 5 |

The conversion of the stock point system as is to the new equipment promoted the continuation and duplication of local systems. The stock point system's inability to meet all or most information and data requirements encouraged the stock points to modify and develop local systems and programs. This required relatively large staffs of programmers and system analysts which could better be devoted to improving the system. It also increased the cost of the system. For example, the Support Office and the stock points had to hire contractors and obtain assistance from other Federal agencies to help them convert about 245 standard programs and over 1,000 local programs to newer equipment.

For the above reasons, officials at the stock points that we visited believed that the system was not fulfilling their needs.

Shipyards Management Information System

The Shipyards Management Information System was designed during the period 1960 through 1964. In 1965, after the system became partially operational in the Boston Naval Shipyards, the Naval Ship Systems Command established the Computer Applications Support and Development Office as the central office for design, programming, system analysis, and maintenance. One of the initial efforts by that office was to completely implement the system at seven shipyards and to extend it to three additional shipyards. New computer equipment was required to replace equipment considered obsolete and inadequate, to process shipyard workloads, and to provide the three additional shipyards with standard equipment.

Efforts to acquire new equipment began about February 1966 and culminated in a contract award to Honeywell Information Systems, Inc. in March 1972. The computer equipment was installed in the shipyards. The shipyard system was converted as is to that equipment, even though the Navy was aware that improvements were needed. Those improvements were not identified and planned as part of the acquisition process to insure that they were effected by the equipment selected. The Department's instructions require this type of determination to be made before equipment is acquired.

As early as 1967 the command was aware that the system needed to be improved. This is evident in the command's Management Information Systems Plan, dated March 1967, wherein the command described the system as follows:

"b. The NAVSHIPS MIS [Naval Shipyards Management Information System] Phase I, as it is structured today, is oriented to middle and line management. It produces almost solely operational reports of a routine and recurring nature. Except for PERT/CPM it makes minimal use of management science techniques accepted and employed throughout industry. It permits a wide variety of manual procedures in source data feeder systems. It does not require uniformity of organizational structure. It fails to require a one-for-one correspondence between the logical elements of

industrial control; work packages, material packages and plans and specification packages. It fails to provide predictive information concerning the interdependent product value factors of cost, time, and quality. It has not yet made the transition from a data system to an information system.

"c. The NAVSHIPS MIS Phase I, as it is structured today, is extremely inflexible, non-modular and difficult to change. It is fundamentally a tape-oriented batch processing system. The aforementioned criteria of this system results in the inability of the NAVSHIPS MIS Phase I to be responsive to shipyard top management needs and the effective implementation of Command and Higher Authority programs."

The conversion of the system as is provided limited standardization among the shipyards because the system was developed to meet only the minimum requirements of the shipyard managers. The shipyards were required to use the system as the foundation for their computer operations. But they were permitted to add requirements they considered essential to efficient operation, provided that the additions did not alter the standard programs.

Nevertheless the shipyards developed and used local computer programs to supplement or replace standard programs. From 1966 to 1971 the seven shipyards developed and used an estimated 1,500 local programs compared with about 280 standard programs.

The Navy cited two reasons for the large number of local programs.

"(1) There are locals that exist because certain information is needed or desired and is not being provided by NAVSHIPS MIS. Since NAVSHIPS MIS is not an all inclusive system, processes have been developed and implemented locally to cover essential areas of shipyard information processing that are not included in NAVSHIPS MIS. However, locals have also been developed to satisfy an information desire of a particular yard. Such information requirements are usually generated from within the shipyard to meet a

particular idiosyncrasy. Locals that are so tailored to an individual yard often result in programs that are slight modifications of the standard NAVSHIPS MIS program.

"(2) There are locals that exist because a shipyard has not accepted the uniform, documented NAVSHIPS MIS. To get around NAVSHIPS MIS and to avoid having to change existing manual procedures and processes, and yet to be able to meet the imposed requirement to run NAVSHIPS MIS, locals have been developed that interface with NAVSHIPS MIS. These locals are concerned mainly with manipulating data to make it acceptable to NAVSHIPS MIS. Such locals arise either due to a lack of understanding of the standard NAVSHIPS MIS system or due to an unwillingness to accept a standard system; or in some instances, because a standard system was imposed on a non-standard base. Because the shipyards were operating in a non-standard environment, locals were required to interface with the existing environment."

The command has attempted to remedy this situation by establishing a Management Information System Executive Group to monitor the system. In 1969 the group initiated a study of all programs and reports to promote use and acceptance of the standard reports, to determine why there was a proliferation of local programs particularly in areas with standard programs, and to identify commonality of local programs which would indicate a need to enlarge the scope of the present system.

The study, completed in calendar year 1971, after a request for equipment proposals was issued, was primarily an evaluation of local and standard reports used by the seven shipyards. It resulted in the following recommended actions.

| <u>Recommended action</u> | <u>Standard reports</u> | <u>Local reports</u> |
|---|-------------------------|----------------------|
| Cancel | 58 | 147 |
| Retain without change | 91 | - |
| Retain in modified form | 53 | - |
| Retain with an unspecified format | 169 | 233 |
| Retain pending additional studies | - | 143 |
| Retain pending changes to standard system | - | 49 |
| Add to standard system | <u>17</u> | <u>8</u> |
| Total | <u>388</u> | <u>580</u> |

The group also eliminated 2,379 local programs through cataloging and utilization reporting of computer programming.

Many recommendations were implemented. However, there were several hundred recommendations whose implementation or re-study was deferred until the replacement computers were installed in the shipyards.

The study identified numerous deficiencies that needed to be corrected. Most importantly, it highlighted the shipyards' limited use of the standard reports and programs and the narrowness of the system's scope. The system's narrow scope helped result in the large number of local reports and programs that will remain in use after installing the replacement computer. Specifically, 425 local reports and about 928 local programs were certified for continued use as opposed to 330 standard reports and about 300 standard programs. This situation illustrates the need for the command to further study and improve the system to extend its standardization and scope.

Need to enforce redesign policy

In July 1966 the Secretary of Defense established a policy requiring the defense components to redesign their data processing systems before acquiring the so-called third-generation computers of the middle 1960s, whose advanced capabilities made most automated data processing systems obsolete unless redesigned.

The policy was modified in January 1971 and is now in Department of Defense Directive 4105.55, dated May 19, 1972, and in Secretary of the Navy Instruction 5236.1, dated December 17, 1971. The policy still requires Defense components to redesign systems when new equipment is acquired for replacement or augmentation. However, it permits the components to defer redesign if deferment is supported by documentation--including an estimate of redesign costs--and by a plan identifying early redesign tasks and objectives following installation of the equipment. The policy corrects the tendency of many Defense components to convert systems without taking advantage of the new equipment's capabilities.

Our reviews of the Naval Shipyard Management Information System and the Uniform Automated Data Processing System for Stock Points noted that those systems were not being redesigned for their new computers and that the Naval Supply and Ship Systems Commands neither documented their reasons for not redesigning nor developed a plan for early redesign. (See pp. 13 and 15.)

We discussed this matter with officials of the Directorate for Automation Policy and Standards, Assistant Secretary of Defense (Comptroller). We were told that policy implementation was the responsibility of the Senior Automatic Data Processing Policy Official in each department. In the Navy he is the Assistant Secretary of the Navy (Financial Management).

We also discussed the matter with representatives of the Navy's Director of Automatic Data Processing Management, who is directly responsible to the Department's Senior Automatic Data Processing Policy Official. They were unaware of the command's failure to comply with the policy. Also, although the Secretary of the Navy had promulgated the policy, procedures for compliance had not been developed.

In our opinion, the redesign policy is good because it requires the Defense components acquiring new computers to be aware of and to use the latest computer technology in order to promote effective and efficient computer operations. Moreover, it is an essential policy because of the large quantity of older model computers in the Department of Defense inventory, which are gradually being replaced by

later model computers. Enforcement of the policy would insure that the information and data processing systems associated with those computers will be upgraded to include the latest technology when cost and benefits make such incorporation advisable.

Need to improve
process of justifying system projects

The economic analysis technique is a systematic approach for choosing how to employ scarce resources and for achieving a given objective most efficiently and effectively. It defines objectives and identifies the most cost-effective way to achieve each objective.

In July 1970 the Assistant Secretary of Defense (Comptroller) incorporated the technique into guidelines for the quantitative management of the development of automated data processing systems within the military departments and agencies. Those guidelines require the departments to justify system development projects through economic analysis and to monitor and manage them through milestone progress reports and updates of the economic analysis. The Navy, using those guidelines, established the Automated Data System Development Plan, which is based upon the economic analysis technique, the key to approving and managing system projects.

However, our reviews of the economic analysis studies prepared by the Naval Supply and Ship Systems Commands to justify acquisition of computer equipment showed that they were incomplete and contained questionable savings or benefits. The Navy needs to improve its use of this technique before it can rely upon such studies. A more detailed explanation of our analyses review is discussed below.

Incomplete economic analyses

The guidelines for making an economic analysis are in Department of Defense Instruction 7041.3, dated October 18, 1972. They state that the essential features include an identification and analysis of each alternative with a clear presentation of its costs and benefits or effectiveness. These features were lacking in the studies prepared by the stock point and shipyard systems.

For example, the Naval Ship Systems Command's economic analysis defined the problem as required. It said that the primary reason for computer replacement was that the present computers lacked capacity to support the reporting requirements. However, the command did not identify any adverse impacts from reporting problems. Nor did it quantify the benefits of each alternative analyzed, to provide a basis for selecting the most cost-beneficial alternative. The analysis therefore was incomplete and did not provide an adequate basis for determining whether the investment in new computers was cost beneficial.

The economic analysis prepared by the Naval Supply Systems Command considered only two alternatives--the retention of existing equipment and its replacement--although other alternatives could have been postulated and analyzed. Those alternatives included redesigning existing procedures to reduce peaks and valleys in the data processing cycle, reducing workload, using remote terminals to process the workload of certain stock points in lieu of new computers for those locations, and using consolidated computer centers to serve collocated stock points and shipyards.

After the analysis was approved and the computer equipment contract was awarded, the Naval Audit Service, at the request of the Chief of Naval Operations, analyzed the alternative of consolidating or collocating some of the replacement equipment at selected supply points. That analysis indicated that consolidation could be cost beneficial but that the constraints of the selected equipment precluded that alternative. The service determined that such a study should have been made before selecting the equipment.

Economic analysis contained
questionable savings

The Naval Ship Systems Command's economic analysis quantified the benefits of implementing the Shipyard Management Information System and installing the Honeywell computer at Puget Sound, Pearl Harbor, and Portsmouth Naval Shipyards. The analysis indicated that the conversion would increase information and data processing costs of the three shipyards by \$631,000 over the 5-year economic life but

would also produce benefits of \$4,357,000--a net cost savings of \$3.7 million. However, the data showed that only about \$55,000 worth of those benefits could result in budget reductions. In addition, a part of \$675,000 of those benefits may result in budget reductions, while the remaining \$3,627,000 would not result in budget reductions because either the improvements that were to generate the savings had already been made or the estimated savings were based on increased personnel productivity. The benefits are therefore questionable and do not provide the assurance needed for supporting the Navy's decision to extend the shipyard system.

While we recognize the difficulties of making an economic analysis, particularly the quantification of benefits, we believe it is imperative that each analysis be as comprehensive as possible since sound decisions depend upon their quality. In the above cases, we believe that the commands' analyses did not adequately support the Assistant Secretary of the Navy's decisions to acquire replacement computers for the stock point and shipyard systems.

Furthermore, the manner in which the commands made their analyses shows the Navy's need for more stringent control over the use of economic analysis techniques and for conscientiously detailed evaluations of alternatives by the approving authorities. Improvement is particularly important since the use of the technique is the key to the Navy's successful management of system development projects costing millions of dollars.

CHAPTER 4

CONCLUSIONS, AGENCY COMMENTS AND OUR EVALUATION,

AND RECOMMENDATIONS

CONCLUSIONS

The Department's Automatic Data Processing Program is primarily concerned with the design and development of information systems and their modification, improvement, and redesign. Such efforts are costly, complex, and time consuming, and are constrained by time and affected by a changing technological environment. Moreover, they greatly affect the functional users and the efficiency and effectiveness of operations. Each effort requires numerous systems analysts and programmers, who are generally in short supply, and financial and managerial resources that are limited. Consequently, the success of such efforts and of the Department's program is highly dependent upon proper management of the data processing resources available.

The Department's management has not been effective, primarily because of the underlying problem of command influence. That problem remains under a new management system initiated in 1970 and will not be resolved until the Department more strictly controls systems development.

Accordingly, we made certain proposals to the Secretary of the Navy to improve the Department's control over systems development. The proposals would require the Department's components to adhere to its established policies and procedures for system design and development.

These policies and procedures include but are not limited to those related to the preparation and use of feasibility or system studies; development of standard uniform systems; redesign of systems before acquiring equipment; and preparation and use of economic analysis studies before initiating system development efforts.

The components also would be required to provide the Department's data processing managers with documentation of adherence during various phases of a project. This more

disciplined approach would, in our opinion, improve overall management and foster more efficient and effective use of the Department's data processing resources.

AGENCY COMMENTS AND OUR EVALUATION

By letter dated October 16, 1974 (see app. I), the Assistant Secretary of the Navy (Financial Management), on behalf of the Secretary of Defense, commented on our findings and proposals. He acknowledged that improvements could and should be made in the Department's Automatic Data Processing Program and essentially agreed with our proposals. However, he expressed concern that some of our findings could lead to damaging misconceptions regarding the effectiveness of the Department's program.

The Assistant Secretary said that the results of the Navy's system development efforts would not appear to be particularly unique if compared with that of other organizations in Government and industry. He stated that our findings did not consider the learning-curve effects in managing data processing activities and that these activities should be viewed in the light of changing conditions.

Our review showed that the guidelines for systems development were promulgated by the Navy in 1959. These guidelines, in our opinion, remain valid. The top automatic data processing echelons in the Navy have benefited from the learning curve, as shown by their continuing attempts at more uniformity and standardization. Our point is that the improvements needed have not permeated the subordinate commands. Therefore, if past delays are to be avoided, more control over the subordinate commands is needed.

The Assistant Secretary of the Navy said that our finding on prolonged systems development and its impact on benefits was misleading because those systems are actively supporting the Navy's missions. He stated that in those cases where large-scale information systems, such as those in the report, are planned, developed, and implemented on an incremental basis, significant operational benefits and economic payoffs could be realized before completing the total system.

Many of the systems cited in our report have been at least partially operational for a number of years, indicating that the Navy has benefited from them. However, the issue is the Navy's ability to fully develop timely, viable, and cost-effective standard systems. The history of those systems and the number of unique programs supplementing standard systems show that the Navy has not been effective in developing standard systems.

The Assistant Secretary contends that it is neither practical nor realistic to evaluate large-scale complex automatic data processing systems from a viewpoint that systems development is not complete until all original objectives of the total system have been met and all unique programs have been replaced by standard programs.

In evaluating systems development within the Department, we used the criteria promulgated through its Automatic Data Processing Program. Those criteria have existed since 1959. They are just as good for today's complex computers as they were for first-generation computers. They outline the major stages of systems development accepted by the automatic data processing community as essential for success. They include instructions for the system study; for planning the objectives and milestones of the system project; for equipment acquisition; for detailed system design, programming, coding, installation, and conversion; and for postimplementation evaluation. It also provides for the use of economic analysis techniques to determine the benefits of automation and its impact on direct and indirect costs and for exploiting the full capabilities of available equipment and the management sciences. Consequently, using the criteria for evaluating the Navy's systems development efforts is most appropriate.

The Assistant Secretary contended that the costs presented in the report were also misleading because they were primarily for operating systems which actively supported the accomplishment of the Navy's missions rather than development costs as purported. He also stated that defining descriptive cost categories which accurately distinguished between development and operating expenses for information systems was difficult. He said that it was more complicated in those cases where systems were planned, developed, and implemented on an incremental or modular basis wherein some

subsystems became operational while development continued on other subsystems.

We are aware that our presentation of systems costs includes both operational and development costs. We did not attempt to separate the development costs, primarily because the Navy's cost accounting system does not allow such separation. The Assistant Secretary alluded to this problem and indicated that the Navy also did not know what the development costs of those systems were. Nevertheless, the costs presented, although not precise, show the costliness of those systems.

The Assistant Secretary discussed the influence of the Department's management philosophy of "centralized policy direction and decentralized execution" on the development and operation of standard information and data processing systems. He acknowledged that the philosophy strongly influenced the approach to developing effective information systems, noting that systems standardization was limited by variations in missions, functions, and tasks of the Navy's operating and support forces.

His comments reinforce our concern with the adverse impact that the Department's management philosophy has had on standard information and data processing systems. There is ample evidence that the philosophy is detrimental to standardization. It permits a commander to exercise his will on standardization actions in which the Department's interests are and should be paramount. We believe that the philosophy, as it applies to information and data processing systems, should be limited to those requirements that are truly unique to a command so that the Navy's policy of "standardization to the maximum extent possible" can be carried out to the benefit of the Government.

The policy of standardization does not contradict the Department's philosophy, although it may justifiably limit a commander's decisionmaking latitude in the area of system development and operation. Limitation is not uncommon within the Department's management structures, since each commander has a superior and is required to follow the policies, instructions, and procedures issued by the higher command and to use those resources, which include standard weapons and standard equipment, allocated to him. Thus, by conforming

to the standardization policy, the commands would not be relinquishing any authority they should have.

The Department's Automatic Data Processing Program certainly must produce systems capable of providing the information resources the commanders need to manage their functions. However, the program should not permit commanders to unilaterally develop systems that should be standardized, to change or modify standard systems, or to elect to not use standard systems.

The program should be directed toward Navy-wide objectives, including standardization. It should recognize the truly unique requirements of the commanders and provide for them within the framework of standardization; i.e., the development, maintenance, and operation of unique systems should be controlled by the standard system monitor, to reduce the amount of local resources needed for them. The program should also provide the needed controls to insure that only authorized systems are operated. Program managers are authorized by the Assistant Secretary of the Navy (Financial Management), the Chief of Naval Operations, and the Commandant of the Marine Corps to operate the program within the above framework. That authority should be exercised to achieve maximum standardization.

The Assistant Secretary said that formalizing and standardizing the total set of management tasks essential to the Navy's missions has not been feasible, because of the variations in missions, special tasking, or other differences among commands. He stated that the Department, however, recognized that resolving unnecessary differences in the functional management systems employed for control of similar operations was a prerequisite to further standardization of information systems developed to support those systems. He also said that, to achieve more standardization, the Navy (1) was actively participating in a management systems standardization effort currently underway within the Department of Defense and (2) expected all officials charged with command coordination and support responsibilities to develop and use standard information processing systems to support functional systems that were formally prescribed for uniform application.

We believe that resolving the unnecessary differences in the Navy's functional management systems for similar operations is the key to successfully developing, expanding, and improving standard information and data processing systems.

The Department is taking some corrective actions to facilitate standardization. We endorse those actions, particularly the Department's participation in the Department of Defense standardization effort. However, it should be noted that this effort is directed toward interservice standardization. A similar effort is needed within the Navy to standardize, in all commands, those functions susceptible to standardization which are not being addressed by the Department of Defense study.

The Assistant Secretary said that the Navy was replacing unique computer programs with standard programs on a deliberate, controlled basis. He cited Navy Supply Systems Command Instruction 5230.12 of June 10, 1972, as establishing rigid restrictions for developing new computer programs. He stated that, at present, standard programs accounted for more than 80 percent of the data processing work performed on the computers at activities supported by the Navy's Uniform Automated Data Processing System for Stock Points and Shipyard Management Information System. He said that, in following the instruction, the Navy "has developed and has been successfully operating a family of effective automated information systems which have provided and continue to provide significant, useful payoffs in performance and economy."

The Department has taken some actions to resolve the problem of command influence on standard systems. The fact that the Department took those actions supports our position that it has not been successful in developing standard systems.

The Assistant Secretary's statement that the Navy developed and was successfully operating a family of effective systems implies that the problem of unique programs has been adequately controlled. But, as demonstrated in this report, throughout the 1960s and early 1970s the Navy permitted the commands to develop unique programs without

regard to standardization and has still not entirely checked their proliferation. This has been costly to the Government. For example, in April 1972 the Naval Supply Systems Command reported that its three inventory control points--for which the Uniform Automated Data Processing System for Inventory Control Points was developed--were spending an estimated \$1,787,200 annually for unique programs.

The Assistant Secretary said that the Navy found our proposals to be essentially in accord with its own assessments. He said that the Navy's Automatic Data Processing Program was currently being directed along the lines recommended and that our report confirmed that the approach was reasonable. According to the Assistant Secretary, the following actions related to our proposals are being taken.

- The Navy is updating its management instruction for system development to amplify documentation requirements for all potentially significant facts and to insure that all documentation for acquisition decisions is kept available for review. It will also require mission function sponsors to formally review projects to confirm the validity and priority of their specification and to authorize their funding. It will also require system proponents to use the Naval Audit Service to evaluate costly economic analyses.
- To improve the use of the economic analysis technique, the Navy (1) has formally trained many operational analysts in its graduate studies program, (2) promulgated some detailed instructions in May 1972, (3) aided in the development of Department of Defense Instruction 7041.3 of October 18, 1972, and (4) conducted training in economic analysis, open to all personnel, at the Navy Logistics Management School in Washington, D.C.
- The Navy is studying how to institute a self-teaching course to exploit its economic analysis training capability.
- The Navy will insure that it fully documents its redesign considerations in the future.

These actions, particularly the ones related to system studies and economic analysis, should improve the Department's management of its data processing resources. The Assistant Secretary's statement that the Navy will fully document future redesign considerations, however, is not reassuring. Command prerogatives may still allow circumvention of that policy, unless the Secretary of the Navy amends his instructions to require the commands to consider redesign as part of any economic analysis made to support system projects and establishes monitoring procedures to insure that the redesign policy is followed.

Concerning our proposal for improving and extending standard systems and incorporating into them the latest technology when economically feasible, the Assistant Secretary listed numerous actions that the Navy has taken, or is planning, to improve its data processing operations. While those actions are beneficial, they are generally not directed toward the immediate improvement or upgrading of the kinds of systems addressed in our report. We believe that the Secretary of the Navy should review the Navy's information and data processing systems to identify, on a system-by-system basis, the actions needed to upgrade their quality and to extend standardization, and then establish a program for accomplishing those actions. We believe that this approach would provide commands the incentive to establish specific objectives for their data processing operations and to develop short- and long-range plans to upgrade their systems and operations within economic constraints.

RECOMMENDATIONS TO THE SECRETARY OF THE NAVY

We recommend that the Secretary of the Navy:

- Require that system studies be documented and that the documentation be part of the equipment justification.
- Review the Navy's information and data processing systems to identify, on a system-by-system basis, those actions that are needed to establish a program for upgrading and standardizing each system.

- Issue the commands more definitive guidance for making economic analyses and establish a program for educating the field organizations in the economic analysis technique. Further, the guidance should require that the economic analysis be performed before systems are submitted for review and approval by higher management. Provision should also be made for obtaining appropriate assistance from the Naval Audit Service in evaluating the analysis before it is submitted for approval.
- Amend his instructions for redesign to require that the alternatives of redesign be considered as part of any economic analysis made to support system projects.
- Require the Director, Department of the Navy, Automatic Data Processing Management, to establish monitoring procedures to insure compliance with redesign policy.

CHAPTER 5

SCOPE OF REVIEW

Our review was primarily concerned with the Department of the Navy's management and control over its data processing resources used to develop and implement information and data systems within the Department of the Navy's Automatic Data Processing Program. We used the Management Information System for Naval Shipyards and the Uniform Automated Data Processing System for Stock Points as the basis for our review. We also used information from past reviews of such systems as the Management Information System for Ordnance Production Activities, Uniform Automated Data Processing System for Inventory Control Points, and Uniform Automated Data Processing System for Industrial Naval Air Stations.

We evaluated the Department's management and controls by comparing the developing command's actions with the program's policies, objectives, plans, principles, and procedures. We also interviewed responsible officials and reviewed planning documents, economic analyses, design proposals, equipment specifications, internal reports, application programs, and various memorandums. Our work related to the shipyard and stock point systems was performed at the following locations.

Chief of Naval Operations, Washington, D.C.
Automatic Data Processing Equipment Selection Office,
Washington, D.C.
Naval Material Command, Washington, D.C.
Naval Supply Systems Command, Washington, D.C.
Naval Ship Systems Command, Washington, D.C.
Fleet Material Support Office, Mechanicsburg,
Pennsylvania
Computer Applications Support and Development Office,
Boston, Massachusetts
Naval Supply Center, Norfolk, Virginia
Naval Supply Center, Oakland, California
Naval Supply Center, San Diego, California
Boston Naval Shipyard, Boston, Massachusetts
Hunters Point Naval Shipyard, San Francisco, California
Mare Island Naval Shipyard, Vallejo, California
Pearl Harbor Naval Shipyard, Honolulu, Hawaii

Portsmouth Naval Shipyard, Kittery, Maine
Puget Sound Naval Shipyard, Bremerton, Washington

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DEPARTMENT OF THE NAVY
OFFICE OF THE SECRETARY
WASHINGTON D C 20350

Oct 16, 1974

Mr. Fred J. Shafer
Director, Logistics and Communications
Division
General Accounting Office
Washington, DC 20548

Dear Mr. Shafer:

The draft General Accounting Office report on Ways to Improve Management of Automated Data Processing Resources in the Department of the Navy of 27 June 1974 (GAO Codes 73802 and 77814) has been forwarded to the Department of the Navy for review and evaluation and for direct reply on behalf of the Secretary of Defense. The Navy appreciates the opportunity to make some observations concerning the draft.

The 15-year period covered in the draft report effectively spans the history of computer systems applications within both government and industry. During this period, 1959-1974, the Department of the Navy has made some significant strides in developing and operating effective automated information systems to support a wide range of command, management, operational and support functions ashore and afloat. There is no question that improvements can and should continue to be made in the Department's ADP Program, and the recommendations presented in the report correlate closely with measures already implemented and planned.

For a number of reasons, however, some of the findings cited in support of those constructive recommendations have been presented in a manner which invites misinterpretation. The retrospective examinations into the development histories of Navy automated data systems since 1959, when viewed in isolation, tend to leave the reader without a suitable yardstick by which to determine that the Navy's experience is or is not unique in comparison with other computer-dependent organizations in government and industry. It is believed that the Navy's current position would not appear particularly unique in such a relative comparison. The learning curve effects in managing the applications of ADP, particularly with respect to information system economics and control of the development process, have been paced by rapid, continuing changes not only in technology but also in policies, administrative procedures, technical definitions and terminology. It is hoped that any inadvertent basis for potentially damaging misconceptions regarding the effectiveness of the Navy's evolving ADP Program will be viewed in light of these changing conditions and remedied in the course of refining the draft report.

GAO note: Page references in this appendix may not refer to the final report.

APPENDIX I

On page two and elsewhere in the draft report, the Department's management philosophy is cited as a primary cause for "lack of success" in implementing its Automatic Data Processing Program. This philosophy emphasizes two basic principles, namely: centralized policy direction and decentralized execution. These two principles have been continuously tested and repeatedly confirmed as effective guidelines for management of the Navy's large-scale, complex and diverse operations. They were reaffirmed in the course of a major management review in 1963 and found to be valid within the context of the formalized DOD programming system. They were reconfirmed and reinforced in 1966 with the implementation of the formal Resources Management Systems within the Department. These principles have proved effective in accommodating to necessary changes within the Department and to essential differences in the missions, functions and tasks within the operating and support forces. They promote the exercise of operational responsibilities at the lowest possible command echelon, and they continue to be reflected in the assignment of duties to Navy commanding officers by Article 0702, U.S. Navy Regulations, 1973. The Department's basic management philosophy is considered to remain valid, and the supporting ADP Program must necessarily accommodate to the requirements which that philosophy implies. These requirements strongly influence the approach to developing effective information systems support for command and management functions within the Navy and probably account in large measure for the observations cited on pages two, fifteen and sixteen of the draft report.

The extent to which formal standards can be imposed on the Navy's functional management systems has tended to be limited by variations in missions, special tasking or other differences among commands. Thus far, it has not proved feasible to formalize and standardize the total set of management tasks essential to the performance of the Navy's missions. The Department recognizes, however, that the resolution of unnecessary differences in the functional management systems employed for control of similar operations is a prerequisite to achieving further standardization of automated information systems developed to support those functional management systems. Accordingly, the Navy is actively participating in a management systems standardization effort currently underway within the Department of defense. The Department does currently operate a number of management, administrative and support systems which are applicable throughout the naval service in the performance of certain functions and tasks common to all commands and activities. Where such systems have been formally prescribed for uniform application, their supporting information processing systems are also expected to be standardized and utilized by all officials charged with command, coordination and support responsibilities. In support of this policy, for example, the Chief of Naval Material issued a directive (NAVMAT Instruction 5231.1 of 9 November 1973, subject: Automated Data Systems Planning Information) which prescribes preferred ADP applications for support of functions performed by each type of organizational activity within the Naval Material Command and requires formal waiver for any deviations. The benefits from this directive and from other similar internal actions are expected to have salutary, operational and economic effects in the future for the Navy ADP Program.

APPENDIX I

Some statements on page one and in chapter two of the draft report imply that the Navy has had certain ADP systems under development for periods ranging from 8 to 14 years without realizing any significant and useful benefits from these developmental efforts. Those implications appear to reflect a view that an ADP system development is not complete until all original goals and objectives of the total system have been met and until all unique ADP applications programs have been replaced by standard applications in activities supported by the new ADP system. The Navy contends that this view of ADP system development cannot be applied in a practical, realistic manner in evaluating large-scale, complex ADP systems of the types addressed in the draft report.

As indicated on page seven of the draft report, the Secretary of the Navy promulgated a plan in April 1959, the prime objective of which was to provide information processing capabilities to support the Navy and Marine Corps in the management of resources for maximum effectiveness of the operating forces. That plan was reaffirmed in March 1966 by SECNAV Instruction 10462.7B. The first step in the execution of that plan was to determine how the Navy could exploit computer technology in the performance of its missions. Follow-on steps were oriented toward an orderly, evolutionary convergence of computer applications towards an ultimate aggregation of efficient, responsive and compatible automated information systems which convey the advantages of ADP technology to essential command, management and support functions. Because some management and support functions have proved more readily susceptible to automation than other functions, the rates of exploitation through ADP systems developments have not been uniform across the spectrum of useful applications. While this condition impedes the Navy's progress toward its intended automation development goals, it has not forestalled the interim attainment of substantial payoffs from the Navy's ADP Program.

In pursuing its automated objectives, the Navy has been frequently confronted with two basic development alternatives; namely, to implement selected systems applications on an incremental basis and thus realize important operational and economic benefits at the earliest possible point in time or to defer all potential benefits for whatever period of time may be required to develop and then implement all included applications on a "full-system" or "turnkey" basis. Neither alternative is free of disadvantages. The Navy has found it necessary to strive for a balanced combination of both alternatives in the expectation that operating experience, resource availability, priority of need and other practical constraints will require frequent reevaluation and adjustment of the most careful developmental planning. The Navy has been replacing unique computer programs with standard programs on a deliberate, controlled basis. For instance, the Naval Supply Systems Command issued NAVSUP Instruction 5230.11 of 10 June 1972 which sets forth rigid restrictions on the development of new computer programs. At the present time, standard programs account for better than 80% of the data processing work performed on the computers at activities supported by the Navy's standard UADPS-SP system and the Shipyard MIS System. In following this course of action, the Navy has developed and has been successfully operating a family of effective, automated information systems which have provided and continue to provide significant, useful payoffs in performance and economy.

APPENDIX I

The information systems cost figures presented in the draft report appear in a manner which is also misleading. It may be inferred that those figures represent charges for the development of several ineffective systems, when primarily they represent expenditures for operating information systems which have actively supported the accomplishment of the Navy's missions.

The definition of descriptive cost categories which accurately distinguish between development and operating expenses for information systems presents a difficult problem. This problem is more complicated in those cases where large-scale information systems are planned, developed and implemented on an incremental or modular basis where some subsystems become operational while development continues on other subsystems. Nevertheless, the experience derived from these systems' operations invariably serves as a sound basis for the refinement and evolutionary improvement of systems performance. In addition, significant operational benefits and economic payoffs also are likely to be realized prior to final completion of the total system. The true test of these systems is how well they perform in times of emergency. Enclosure (1) displays a comparison of wartime workload and staffing at the Naval Supply Center, Oakland, California, during FY 1952 (Korean conflict) and FY 1967 (Vietnam conflict). This comparison shows that the workload in FY 1967 was significantly greater in all areas except in freight processing operations. The freight terminal processing functions and 561 personnel were incorporated into the Military Traffic Management and Terminal Service Command in 1965. The work force in FY 1967 was 4,000 personnel, a reduction of 6,839 below the adjusted work force level of FY 1952. This large manpower reduction was attributable in large measure to automation, and the JADPS-SP ADP system was a major aspect of that automation. Enclosure (1) also shows a similar although somewhat less dramatic situation for the Naval Supply Center, Norfolk, Virginia.

With respect to the recommendations and suggestions presented in the draft report, the Navy finds them to be essentially in accord with its own assessments. The Navy ADP Program is currently being directed generally along the lines recommended, and the draft report provides confirmation that the approach is reasonable. For example, the Navy requires that designated mission/function sponsors in the office of the Chief of Naval Operations formally review significant ADP projects, confirm the validity and priority of the operational requirements for those projects, approve the procedural content or functional performance specifications of automated systems, and authorize the expenditure of funds for such projects. The Navy is also well along in its planning for additional ADP Program management improvements in order to:

- a. increase the use of commercial/industrial activities program as a means of verifying estimated costs of information system development.
- b. strengthen prohibitions against changes to vendor-supplied operating software by Navy activities.

APPENDIX I

c. control ADS modifications in a manner similar to weapon systems configuration control.

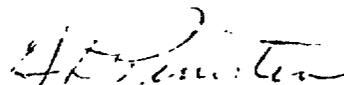
d. utilize qualified, proven experts from both the public and private sectors in technical design reviews of major information systems proposals.

e. promulgate a comprehensive, long-range Navy ADP plan to extend the utility of its existing planning base line.

Recognizing that the dominant share of its annual ADP budget must currently be allocated to ADP operations and that its ADP equipment inventory includes a large number of owned second generation computers, the Navy is attaching high priority to improvements and cost reductions in computer operations. One major program to achieve such improvements is addressed in CNO letter Ser 91/233 of 28 February 1974, subject: ADS (Automated Data System) Plans for DPSC's (Data Processing Service Centers). With the full and active support of major commanders, this program will initiate large-scale data processing service center operations in key areas of Navy activity. The program will reduce data processing costs and eliminate less efficient, obsolescent computer installations by transferring their processing workloads to major service centers. Service center operations will be funded on a reimbursable basis through which all services will be fully chargeable to the users. This procedure will assure that ADP expenses can be identified directly to the activities supported and the functions served. Among the important advantages expected to accrue from that procedure will be the capability to measure the functional utility of Navy computer applications against their costs.

In summary, the Navy is essentially in accord with the recommendations and suggestions of the draft report, but the Navy believes that the findings and discussions -- as opposed to the recommendations -- may do unintentional harm to the Navy ADP Program. The reported evaluations of Navy ADP systems, based upon facts available in 1974, do not adequately reflect the significant uncertainties attendant to past management decisions and the need to balance technical risks of a new technology against the penalties of deferred operating benefits. Omission of these important elements may well inject a bias into the perspective of some reviewers and thus jeopardize the Navy's prospects for needed progress in this important field. For this reason, it was particularly encouraging to learn that key members of your staff have engaged in several constructive, informal discussions of the draft report with representatives of the Navy ADP Management staff. I was especially pleased to learn that your staff participants were very encouraged by the Navy's actions to implement management improvements in the ADP program.

Sincerely,



Encl:

- (1) Comparison of Workload and Staffing of the Naval Supply Center, Oakland, California and the Naval Supply Center, Norfolk, Virginia
- (2) Recommendations and Comments

APPENDIX I

WORKLOAD AND STAFFING

NAVAL SUPPLY CENTER,
OAKLAND, CALIFORNIA

| | <u>FY 52</u> <u>KOREA</u> | <u>FY 67</u> <u>VIETNAM</u> |
|------------------------------|------------------------------|--------------------------------|
| Inventory Line Items Carried | 540,000 | 900,000 |
| Demands | 3,200,000 | 5,500,000 |
| Issues | 2,400,000 | 3,500,000 |
| Receipts | *296,000 | 600,000 |
| Measurement Tons In | 1,700,000 | **1,010,000 |
| Measurement Tons Out | 2,700,000 | **1,010,000 |
| Personnel | 11,400 | 4,000 |

* Represents shipments — The work unit used in FY 52.

** Workload reduction primarily attributed to the incorporation of the freight terminal operation and 561 personnel of the work force into the Military Traffic Management and Terminal Service Command in 1965.

NAVAL SUPPLY CENTER,
NORFOLK, VIRGINIA

| | <u>FY 52</u> <u>KOREA</u> | <u>FY 67</u> <u>VIETNAM</u> |
|------------------------------|------------------------------|--------------------------------|
| Inventory Line Items Carried | 544,967 | 841,019 |
| Demands | 3,370,000 | 5,480,000 |
| Issues | 3,340,000 | 3,720,000 |
| Receipts | 576,217 | 542,243 |
| Measurement Tons In | 2,300,000 | 2,040,000 |
| Measurement Tons Out | 2,500,000 | 2,300,000 |
| Personnel | 7,343 | 4,278 |

Enclosure (1)

RECOMMENDATIONS AND COMMENTS

Recommendation. To assure that system studies are made prior to the acquisition of computer equipment, we recommend that the Secretary require that such studies be documented and that the documentation be provided as part of the equipment justification.

Comment. Except for the pioneering efforts of the 1950's and the 1960's, the Navy has required that these studies be made and documented prior to the acquisition of equipment. The Navy, as a part of its on-going review of its program, is currently updating its OPNAV Instruction 5231.1, subject: Automated Data System Development; procedures for the management of. This update will further amplify documentation requirements to ensure that in the future that the source of all potentially significant facts are properly documented and that all of this documentation, which forms the basis for acquisition decisions, is kept available for review at later dates. It also will formalize the requirement for the Chief of Naval Operations' mission/function sponsors to formally review significant ADS projects that purport to support their areas of responsibility, to confirm the validity and priority of their operational requirements, procedural content or functional performance specifications and to authorize the expenditure of funds for these projects.

Recommendation. To improve and extend standard systems, we recommend that the Secretary establish an improvement program to upgrade the quality of the Department's information and data systems, and to incorporate the latest technology where economically feasible.

Comment. The Navy has been pursuing such a program since 1960. This program has two facets. One was to adapt the new ADP technology to the Navy's use and the other was to foster advances in the technology itself. As a result, the Navy has caused the early introduction of real-time and on-line interactive systems, networking of large data systems over long distances, COBOL and other higher level languages (currently it is working on this for mini-computers), data base management systems (including those with tutorial capabilities for non-ADP specialists), modeling and simulation, and other sophisticated decision-making systems. Presently the Navy is sponsoring several ADP software and hardware research and development efforts and is utilizing the Navy Laboratory Computer Committee to advise on future courses to follow. Also recognizing that the largest share of the annual ADP budget is allocated to operations and that its ADP equipment inventory includes a large number of owned, second generation computers, the Navy is attaching high priority to improvements and cost reductions in computer operations. One major program to achieve such improvements is addressed in CNO letter Ser 91/233 of 23 February 1974, subject: ADS (Automated Data Systems) Plans for DPSC's (Data Processing Service Centers). This letter states the steps to be taken to upgrade its data processing service

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centers' operations in order to improve their responsiveness, to reduce their processing costs per unit and to continue to eliminate its less efficient, obsolescent computer installations by moving their processing workloads to these service centers. The above letter states that all operations will be fully chargeable to the user so that the costs of all efforts can be weighed against their potential benefits to the supported mission of the requesting activity. This effort has the full and active support of its key commanders.

In addition to the above and to standardization efforts addressed in the basic letter, the Navy is also well along in its planning to:

- a. increase the use of commercial/industrial activities program as a means of verifying estimated least costs of system development.
- b. strengthen prohibitions against changes to vendor-supplied operating software by Navy activities.
- c. control ADS modifications in a manner similar to that applied to weapon systems configuration control.
- d. utilize qualified, proven experts from both the public and private sectors in technical design reviews of major information systems proposals.
- e. promulgate a comprehensive, long-range Navy ADP plan to extend the utility of its existing planning base line.
- f. utilize the standard DOD ADP system reporting and inventory procedures to isolate additional system consolidation candidates.

Recommendation. To improve the utilization of the economic analysis technique, we recommend that the Secretary issue to the commands more definitive guidance for making economic analyses and establish a seminar program to educate the field organizations in the economic analysis technique. We further recommend that the Secretary require economic analyses be certified by the Naval Audit Service prior to their review and approval by higher management and that systems not be approved until an appropriate analysis has been made.

Comment. Although much has been pioneered, learned and applied, this area will require a continuing effort to cause improvement. The systems studied in this report were those that were well underway prior to 1972 when the DOD and the Navy brought the more sophisticated economic analysis techniques to bear on such areas as ADP. While the Navy's earlier studies lacked comprehensive documentation of their economic analysis effort, much has been done since then. For example, the Navy has: (a) formally trained many operational analysts in its graduate studies program, (b) promulgated some very detailed instructions in NAV Instruction 5231.1 of 31 May 1972, (c) significantly aided in the development of DOD Instruction 7041.3 of 18 October 1972, and (d)

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conducts training in economic analysis at the Navy Logistics Management School in Washington, DC, which all its personnel may attend. The Navy realizes that in order to more fully exploit this capability it must carry such training out to its cognizant field activities personnel and is currently studying ways to institute a self-teaching course for this effort.

The Navy does concur that the Naval Audit Service could aid, as necessary, in the evaluation of the significant facts of those economic analysis that will result in large expenditures of funds. The Naval Audit Service is authorized to conduct post-installation reviews, to aid in the establishment of the criteria for particular economic analyses, and to evaluate the validity of selected significant facts of these analyses. These actions are being incorporated into its planned update of OPNAV Instruction 5231.1 of 30 May 1972.

Recommendation. To ensure that the redesign policy of the Department of Defense is followed, we recommend that the Secretary amend his instructions for redesign to require that the alternative of redesign be considered as part of any economic analysis made to support system projects. We further recommend that the Secretary require the Director, Department of the Navy Automatic Data Processing Management, to establish monitoring procedures to assure that this policy is complied with.

Comment. The Navy concurs with both ideas and has practiced them whenever practical and feasible. Unfortunately, previous studies did not fully document the alternative of redesign versus the alternative of new ADPE or why it was cost effective to first transfer the old systems to new equipment and then to redesign them to take advantage of additional savings or techniques. (The DOD Directive 4105.55 of 21 January 1971 amended its previous instructions to recognize the fact that it might be cost effective to transfer existing systems to new equipment without immediate redesign in order to realize a net savings that would accrue from the use of the less costly replacement equipment.) The Navy will ensure that it fully documents its redesign considerations in the future.

APPENDIX II

PRINCIPAL OFFICIALS
RESPONSIBLE FOR THE ADMINISTRATION OF
ACTIVITIES DISCUSSED IN THIS REPORT

| | <u>Tenure of office</u> | |
|--|-------------------------|------------|
| | <u>From</u> | <u>To</u> |
| <u>DEPARTMENT OF DEFENSE</u> | | |
| SECRETARY OF DEFENSE: | | |
| James R. Schlesinger | June 1973 | Present |
| William P. Clements, Jr. (acting) | May 1973 | June 1973 |
| Elliot L. Richardson | Jan. 1973 | Apr. 1973 |
| Melvin R. Laird | Jan. 1969 | Jan. 1973 |
| Clark M. Clifford | Mar. 1968 | Jan. 1969 |
| Robert S. McNamara | Jan. 1961 | Feb. 1968 |
| ASSISTANT SECRETARY OF DEFENSE (COMPTROLLER): | | |
| Terence E. McClary | June 1973 | Present |
| Donald R. Brazier (acting) | Jan. 1973 | June 1973 |
| Robert C. Moot | Aug. 1968 | Jan. 1973 |
| Robert N. Anthony | Sept. 1965 | July 1968 |
| <u>DEPARTMENT OF THE NAVY</u> | | |
| SECRETARY OF THE NAVY: | | |
| J. William Middendorf II | Apr. 1974 | Present |
| John W. Warner | May 1972 | Apr. 1974 |
| John H. Chafee | Jan. 1969 | Apr. 1972 |
| Paul R. Ignatius | Sept. 1967 | Jan. 1969 |
| Charles F. Baird (acting) | Aug. 1967 | Sept. 1967 |
| Robert H. Baldwin (acting) | July 1967 | Aug. 1967 |
| Paul H. Nitze | Nov. 1963 | July 1967 |

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Tenure of office
From To

ASSISTANT SECRETARY OF THE NAVY
(FINANCIAL MANAGEMENT):

| | | |
|---------------------------|-----------|-----------|
| G.D. Penisten | Oct. 1974 | Present |
| Rear Admiral Sam H. Moore | Apr. 1974 | Oct. 1974 |
| Robert D. Nesen | May 1972 | Apr. 1974 |
| Frank Sanders | June 1971 | Apr. 1972 |
| Charles A. Bowsher | Dec. 1967 | June 1971 |
| Paul Masterton (acting) | Aug. 1967 | Oct. 1967 |
| Charles F. Baird | Jan. 1966 | July 1967 |