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GOVERNMENT AGENCIES

by

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SHIP ACQUISITION LESSONS LEARNED/FEEDBACK LOOPS FOR U.S. GOVERNMENT AGENCIES

BY
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Abstract

This report summarizes a study carried out on U.S. Government Agencies Ship Acquisition processes. The focus of the study includes identification and analysis of the various lessons learned mechanisms with feedback loops used in ship acquisition processes. Key acquisition lessons learned mechanisms with feedback loops are discussed, including: internal feedback within the ship acquisition organization, upper level management feedback, user feedback, formal training feedback, research and development feedback, industry feedback, and other feedback. Recommendations are given concerning areas in which feedback loops are incomplete or lacking.

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INTRODUCTION

1.1 History/Background

U.S. government agencies procurement processes are large, complex, and difficult to manage. U.S. Government procurement is the largest business enterprise in the world affecting the security, industrial base, and economic condition of our nation. Annual purchases by DOD alone total almost $170 billion [9]. (Numbers in brackets refer to references listed in this study.)

With the single exception of rocket and spacecraft acquisitions, ship acquisitions are the highest cost and most complex acquisitions U.S. Government agencies undertake. Many factors influence the level of complexity for a given ship acquisition program. Between the Navy and the Coast Guard, government agencies acquire a wide variety of ships, ranging from sophisticated submarines and nuclear aircraft carriers to much smaller auxiliary and patrol vessels.

Ships require many years to design and build after a decision is made to proceed with a particular design. The process of defining the ship to be built requires up to five years and is heavily influenced by the design requirements of the combat systems to be included. Once built, ships

typically have a useful operational life of 30 years or more, during which they may be upgraded from time to time with improved combat systems or new capabilities reflecting technological advances.

The process of weapons acquisition in general, including ship acquisitions, has been the subject of considerable study over the years. Typical criticism of DOD has focused on the acquisition resulting in ships that do not perform as intended, cost too much, and take too long to acquire. Examples of recent studies include the Naval Ship Procurement Process Study (Department of the Navy) following the huge shipbuilder claims generated in the late 1970's, and more recently the President's Blue Ribbon Commission on Defense Management (Packard Commission).

Lessons learned mechanisms with feedback loops complete the path for the many internal and external influences of the ship acquisition process. A recent U.S. Coast Guard study [14] indicated that establishing a lessons-learned mechanism with feedback loops was a critical success factor for the Office of Acquisition. This study attempts to serve as an early step in obtaining this goal.

A three-phase systems approach was used in this study to examine and analyze lesson learned mechanisms with feedback loops. These three phases are:

1. Document survey phase
2. Interview phase

3. Recommended lessons learned mechanisms with feedback loops.

In the initial phase a review was made of written material relating to government procedures in U.S. Government agencies for acquiring vessels, aircraft and other major weapon systems. Particular attention was given to how the lessons learned mechanisms with feedback loops affected the acquisition processes. In phase two, interviews were conducted with a representative sample of personnel from program/project offices, supporting functional codes, and review and appraisal organizations to validate key events selected in phase one, identify those areas where actual practice differs from that specified in written procedures, identify informal lessons learned mechanisms with feedback loops, and identify locations in the acquisition process where lessons learned mechanisms with feedback loops are lacking. In phase three, the data collected were assessed and recommended lessons learned mechanisms with feedback loops for ship acquisition processes were developed.

1.2 Study Objectives

The objectives of this study are:

- To examine and analyze lessons learned mechanisms with feedback loops in ship acquisition processes used by U.S. Government agencies.
- To examine and analyze lessons learned mechanisms with feedback loops in other major acquisition processes

(aircraft, missiles, etc.) used by U.S. Government agencies which could be useful in ship acquisition processes.

- To determine where lessons learned mechanisms with feedback loops are lacking in major acquisition processes used by government agencies.
- To provide new teaching materials for U.S. Coast Guard and U.S. Navy officers studying ship acquisition at the Massachusetts Institute of Technology.

Furthermore, the study is intended as an aid to federal agencies in making decisions regarding ship acquisition lessons learned mechanisms and feedback loops. At the present time, there is a tightening of budgets that requires that each dollar be spent wisely. In addition, the media has managed to get plenty of mileage out of stories of U.S. Government acquisition attempts that have ended in cost overruns or deliveries behind schedule. Consequently, it is important that all government agencies learn from their mistakes in the acquisition process relating to major expenditures such as ships.

In summary, identify the key lessons learned mechanisms and feedback loops that successful ship acquisition strategies require.

1.3 Study Scope

The scope of the study is generic in nature. The study

does not dwell on specific ship acquisition regulations, directives, instructions, or terminology within a particular agency. Rather than examing a specific acquisition process, the study focuses on key parameters in alternative strategies. Specific ship acquisition terminology used will be defined in each case. The following ship types were deliberately excluded from the scope of the study:

- Submarines
- Aircraft carriers
- Nuclear powered ships

These ship types are considered rather unique regarding today's marketplace situation in the U.S. shipbuilding industry. The research is considered particularly applicable to the acquisition of Navy and Coast Guard conventially powered surface combatant ships and less complex commercial type ships.

The analysis methods employed in conducting the study included a review of existing major government system acquisition literature, interviews with knowledgeable ship acquisition professionals in the Navy, Coast Guard, academia and industry, and interviews with knowledgeable aircraft acquisition professionals in the Navy, Army, Air Force and academia.

Literature reviews included the DIALOG Ocean Abstracts, Defense Systems Management College Publications, Government Accounting Office, Department of Defense and Navy

Instructions, and National Technical Information Service automatic databases. A standard set of questions were asked in the interviews to identify acquisition lessons learned mechanisms with feedback loops and their merits. A broad range of acquisition professionals were interviewed to obtain the input of actual acquisition experience. These interviews were extremely valuable in the analysis of lessons learned mechanisms with feedback loop strategies useful to the ship acquisition process.

1.4 Definitions

Definitions as used in this study.

Acquisition Category - Navy designation for acquisition programs - ACAT I (major); ACAT II, III, IV (Less than major).

Acquisition Process - The sequence of acquisition activities starting from the agency's reconcillation of its mission needs, with its capabilities, priorities and resources and extending through the introduction of a system into operational use and successful achievement of program objectives.

Availability - A measure of the degree to which an item is in an operable and commitable state at the start of a mission when the mission is called for at an unknown time.

Concurrency - An acquisition strategy which combines developmental test and evaluation with operational test and evaluation.

Effectiveness - The overall degree of mission

accomplishment of a system used by representative personnel in the context of the organization, doctrine, tactics, threat, and environment in the planned employment of the system.

Follow on Test and Evaluation - The test and evaluation which is conducted after the production decision to continue and refine the estimates made during previous operational test and evaluation to evaluate changes, and to evaluate the system to insure that it continues to meet operational needs and retain its effectiveness in a new environment or against a new threat.

Feasibility - The likelihood that a system design concept can be produced using existing production technology while simultaneously meeting quality, production rate, and cost requirements.

Government Furnished Material (GFM) - Material provided by the government to a contractor in support of an item to be delivered to the government.

Government Furnished Equipment (GFE) - Equipment provided by the government to a contractor in support of an end item to be delivered to the government.

Government Furnished Information (GFI) - Information provided by the government to a contractor in support of an end item to be delivered to the government.

Life Cycle Cost - The sum total of the direct, indirect, recurring, nonrecurring, and other related costs incurred or estimated to be incurred, in the design, development,

production, operation, maintenance and support of a major system over its anticipated useful life span.

Maintainability - The ability of an item to be retained in or restored to specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair.

Producibility - The relative ease of producing an item or system. This is governed by the characteristics and features of a design that enable economical fabricaton, assembly, inspection, and testing using available production techniques.

Reliability - The duration or probability of failure-free performance under stated conditions.

Risk - The chance that some element of an acquisition program produces an unintended result with an adverse effect on system effectiveness, suitability, costs, or availability for deployment.

Ship Acquisition Organization - NAVSEA for U.S. Navy, Office of Acquisition for U.S. Coast Guard.

Suitability - The degree to which a system can be placed satisfactorily in field use, with consideration being given to availability, compatibility, transportability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistic supportability, and training requirements.

Supportability - The degree to which system design

characteristics and planned logistics resources meet system requirements

Testability - A design characteristic which allows the status (operable, inoperable, or degraded) of an item and the location of any faults within the item to be determined in a timely fashion.

Upper Level Management - Above NAVSEA or Office of Acquisition in the chain of command.

U.S. Government Agency - A major organizational subdivision of U.S. Government. For example: The Army, Navy and Coast Guard are agencies of the U.S. Government.

The terms project and program are used interchangeably throughout the report. Their context includes a ship acquisition effort of major significance to government agencies.

1.5 Basic Premises

A number of basic premises become apparent throughout this study. These premises are considered central themes throughout the report, and will be discussed repeatedly.

First, ship acquisitions are very complex processes with the following types of characteristics:

- The quality of the ship/system acquired is considered essential.
- A fair and reasonable price for the private contractor is in the best interests of all parties.

- Often third-party agents assist in design, sub-system construction and even feedback efforts.
- A major up front effort by the agency is very important.

Second, ship acquisition processes are constantly changing:

- Changing national needs.
- Advances in technology.
- Increasing sophistication and capability of potential threats.
- Changes in procurement statutes, regulations, and policies.

Third, the basic premises of U.S. Government agencies acquisition processes pertain as well to ship procurement as they do to aircraft, missiles or other military systems; however, there are a number of distinctions that are, to varying degrees, particular to ships:

- The size and complexity of combatant ships make them unique among weapon systems.
- The multistep ship acquisition process introduces special problems.
- Shipbuilding industry differs markedly from other defense industries.
- Ship acquisition often requires concurrency in development and production.
- Ships are often produced in small numbers.
- Ship construction times are very long.

Appendix E contains a more complete list of special characteristics of ship acquisition as compared to other armed forces major acquisitions.

Fourth, there are numerous lessons learned mechanisms with feedback loops that affect ship acquisition processes. A simple block diagram of basic feedback loops in a ship acquisition process are shown in Figure 1 on page 20. This block diagram is the basic outline of this study from which each feedback loop will be examined.

1.6 Organization of Report

The remainder of the report is organized as follows:

Chapter 2 - Internal feedback within the ship acquisition organization - Discusses lessons learned mechanisms with feedbacks loops internal within the ship acquisition organization including: Matrix support feedback such as logistics, contracts or technical; internal reviews/boards; internal studies; informal feedback; and acquisition guides.

Chapter 3 - Upper Level Management Feedback - Discusses lessons learned mechanisms with feedback loops from upper-level management including: Formal such as regulations, directives or instructions; reviews such as milestones or boards; streamlining; and direct involvement.

Chapter 4 - Sponsor/user feedback - Discusses lessons learned mechanisms with feedback loops from operators including: Reports, technical and operational; operational testing and evaluation; inspections; and informal.

Chapter 5 - Formal Training Feedback - Discusses lessons learned mechanisms with feedback loops from formal training including: Schools, such as DSMC; acquisition professional career paths, military and civilian; on-the-job training efforts; and teaching methods.

Chapter 6 - Research and Development Feedback - Discusses lessons learned mechanisms with feedback loops from research and development efforts including: Design; and developmental test and evaluation.

Chapter 7 - Industry feedback - discusses lessons learned mechanisms with feedback loops from industry including: Claims; changes; contract incentives; design input; reports; and industry organizations.

Chapter 8 - Other Feedback - Discusses lessons learned mechanisms with feedback loops from other processes including: External studies; GAO reports; news media; symposia; seminars; academia; and Program Manager's Support System.

Chapter 9 - Conclusions - Outlines the major conclusions of this study. Identifies incomplete or missing feedback loops. The key issues concerning effective ship acquisition lessons learned mechanisms with feedback loops are presented.

Five appendices are included at the end of the report. Appendix A lists the acquisition professionals interviewed as part of this study. Appendix B contains a list of acronyms used in this report. Appendix C contains a list of department of defense and agency directives considered pertinent to the

BASIC SHIP ACQUISITION FEEDBACK LOOPS

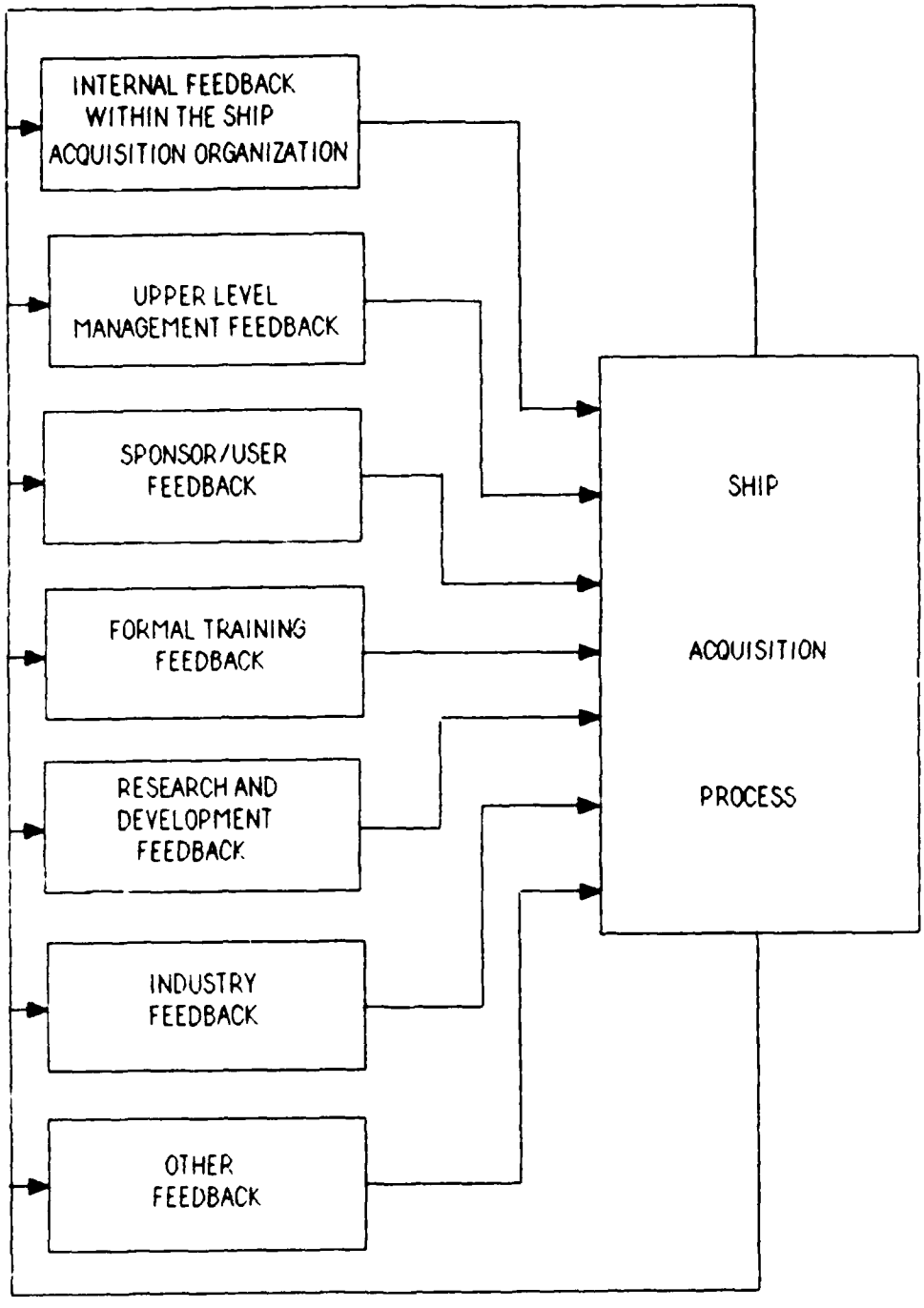

FIGURE (1)

ship acquisition process. Appendix D is a case study of the U.S. Navy's MSH program. Appendix E contains special characteristics of ship acquisition as compared to other armed forces major acquisitions.

CHAPTER 2

INTERNAL FEEDBACK WITHIN THE SHIP ACQUISITION ORGANIZATION

Internal feedback within the ship acquisition organization is defined as feedback within the NAVSEA organization -- for the U.S. Navy and the Office of Acquisition -- for the U.S. Coast Guard. Feedback from upper level management above NAVSEA and the Office of Acquisition in the chain of command and other feedback external to the ship acquisition organization is discussed in Chapters 3 through 8.

This chapter will focus on the various feedback loops internal to the ship acquisition organization. The ship acquisition process will not be explained. See references 21 and 24 for an explanation of the ship acquisition process.

2.1 Matrix

The principal responsibility of a program manager (PM) is to procure ships from the shipbuilding industrial base that satisfy the U.S. Government Agency's operational requirements. Specific responsibilities of the PM include:

(a) Development -- Develop an organization and plan to efficiently acquire the appropriate numbers and types of ships to meet an U.S. Government Agency's requirements.

(b) Design -- Develop and review the adequacy of hull design, machinery design, and full ship system integration.

(c) Construction -- Upon award of contract, the contractor begins executing the shipbuilding effort in accordance with the ship specifications, contract drawings, contract guidance drawings and government or industry specifications and standards. Throughout the construction process, the PM remains responsible for the successful completion of the ship within the established constraints [17].

To assist the PM in meeting these responsibilities, U.S. Government agencies use matrix management. The matrix management operation is designed to give centralized control of a large number of diverse functions with decentralized management. In this matrix, the technical and administrative experts are located in functional groups where they provide direct support to numerous PM's as the need arises. These matrix support groups are not dedicated to a single program but divide their time among all of the programs that require attention at any given time.

Such organizational structure allows a relatively small number of persons to manage large and complex problems on a longterm, dedicated basis and provides prompt support for these program personnel by specialists located in individual functional groups. These specialists are exposed to numerous state-of-the-art developments, and have the advantage of a synergistic environment in which lessons learned on a program can be applied toward solving problems on other programs.

Although actual matrix organizations vary with different U.S. Government agencies, the basic matrix groups are as follows:

Management -- This matrix groups provides primarily advice for business management. They assist with acquisition strategy and plans including the acquisition plan, the test and evaluation plan, and other administrative requirements.

Financial -- This matrix group prepares and submits project budget request and cost estimates. They also provide contract solicitation, negotiation, award and administrative services.

Technical -- This matrix support group assists and/or accomplishes the technical aspects of the program including design, writing of specifications and other technical requirements.

Integrated logistics -- An integrated logistics support is a composite of all support disciplines required to ensure effective and economical support of the ship. This matrix groups provides and/or assists with maintenance plans, manpower plans, supply support plans and other integrated logistic support functions.

Construction -- This matrix support group is the representative for the U.S. Government agency at the contractor's shipyard. This office administers the shipbuilding contract for the U.S. Government agency. Additionally, it coordinates the activities of representatives

of other governmental elements at the shipyard and participates in inspections required through the construction phase. There is daily contact between the PM and this support group once construction has started.

Other -- Depending upon the program, other groups also provide matrix support. An example is the acquisition of sub-systems and/or support equipment.

Interaction and feedback between the PM and matrix support groups themselves is essential. Each matrix group's actions can have an effect on other groups in the matrix. An example of this is how integrated logistics support must be involved with design support so that logistic support options and trade-offs can be considered before the design is finalized.

These matrix support groups also close the feedback loops from groups external to the ship acquisition organization. Examples of these feedback loops are:

- For government in-house designs, industry inputs into the design process provide valuable exchange of information that benefits both industry and the U.S. Government design effort.
- User operational and technical reports on existing ship systems assists matrix-technical groups in making decisions on future ship systems.

These and other feedback loops external to the ship acquisition organization are more fully explained in Chapters

3 through 8.

2.2 Reviews/Boards

There are numerous reviews/boards throughout the ship acquisition process. Each of these reviews/boards are a lessons learned mechanism with feedback loop. This section will discuss reviews/boards conducted within the ship acquisition organization. Many of these reviews/boards conducted within the ship acquisition organization precede reviews/boards conducted by upper level management and/or sponsors/users. See Chapter 3 for an explanation of reviews/boards conducted by upper level management. See Chapter 4 for an explanation of reviews/ boards conducted by sponsors/users.

Reviews/boards are conducted to provide objective progress measurement and feedback on ship acquisition programs. Satisfactory progress and validation of project objectives are established as pre-requisites to entering the next phase of the ship acquisition process.

Names of reviews/boards vary with different ship acquisition organizations. Since no two ship acquisition processes are the same, reviews/boards for each ship acquisition process are also different. The basic breakdown of reviews/boards conducted on a ship acquisition are:

- Business
- Technical

- Financial
- Logistics
- Construction
- Competition Advocate/Acquisition Streamlining

Business reviews/boards identify and check administrative matters of the program. The purpose of these checks is to identify any potential problem of the program early enough to initiate changes if required. The overall procurement and contracting approaches are checked. Plans for logistics and testing are reviewed. Often business reviews/boards precede upper level management reviews/boards. An example business review/board is the Acquisition Review Board of the U.S. Navy.

The objective of technical reviews/boards is to ensure the final ship will fulfill its requirements. The technical review process is critical to reducing program risk. It provides the discipline necessary to ensure timely identificaton of problems and their solutions. An example technical review board is the Senior Design Review of the U.S. Navy conducted at the end of the preliminary and contract designs.

Several reviews of the financial activities of a program are conducted each year. They serve as checks to the source selection, cost estimating and provide current financial status. An example financial review is the Ship Cost Adjustment Review of the U.S. Navy.

Logistics reviews/boards ensure all supply, training,

manpower plans will meet the intended program objectives of reliability, maintainability and availability. An example logistics review/board is the Logistics Review Group of the U.S. Navy.

Construction reviews/boards properly relate costs, schedule and technical accomplishment. Periodic reviews are held to insure the two major areas of concern, resource expenditure and technical accomplishment, are meeting intended goals. An example of a construction review/board is the supervisor of shipbuilding periodic update meetings with the contractor for the U.S. Navy.

Competition Advocate/Acquisition Streamlining offices review contract solicitations for enforcibility, technical adequacy and operational suitability. Specifications and standards are reviewed to ensure they are cost effective. Additionally, the Competition Advocate/Acquisition Streamlining offices review many of the acquisition process plans prior to approval by a higher authority.

The independence and competence of the reviewers/board members is essential. Design reviews must be performed by technically competent personnel who are able to review design analysis results and design maturity, and to assess the technical risk of proceeding to the next phase of the development process. A review conducted by someone not technically competent is useless, and possibly dangerous.

2.3 Internal Studies

Numerous studies internal to the ship acquisition organization are conducted and/or sponsored by the ship acquisition organization in an effort to provide guidance and incorporate lessons learned from previous ship acquisition programs.

The following are examples of some of these studies:

(a) Acquisition Review, October 1987. A report by an acquisition review team assessment of a recent shipbuilding program to determine:

- What undue risk was introduced?
- Why the program had problems?
- What NAVSEA could have done to avoid these problems?
- What lessons learned were gained from the experience?

The results of the study produced eighteen specific findings on the program studied [22].

(b) DDG-51 Ship Acquisition Program -- Ship Systems Engineering Standards Implementation Lessons Learned, December 1987. The intent of this document is to provide visibility and insight into the structure and methodologies which were employed in bringing the naval warfare system's modularity concept to fruition, and how it is being applied to real world ship combat systems. The lesson learned objectives of this document are to:

- Trace the progress and problems encountered in actual ship acquisition.

- Relate the parallel effort required to incorporate ship systems engineering.
- Provide methods and lessons learned serving as a baseline for application to future ship acquisition programs.
- Serve as a beacon of success, thus providing encouragement and incentive for future extension of ship systems engineering standards to other functional elements and ship types.

(c) Ship Acquisition Management Responsibilities Milestone Manual, January 1984. This report has been created to serve as a unique, dynamic instrument devoted to the principles of contemporary ship acquisition managment. Specifically tailored for a particular ship project office, the report incorporates review comments from NAVSEA and OPNAV offices and reflects "lessons learned" from previous acquisition programs [20].

(d) Ship Engineering in NAVSEA 05, September 1983. This report assesses how ship engineering is currently being performed, analyzes directives that help to implement and/or constrain it's execution, and formulates a strategy for SEA 05 to conduct its business in a more effective and efficient manner.

A strategy is set forth addressing the following:

- SEA 05 in-house engineering capability.
- Support from contractors and other Navy activities.
- Life cycle management within SEA 05.

- Relationships between SEA 05 and Ship Logistics Managers/Ship Acquisition Project Managers.
- Priorities within SEA 05 [19].

(e) Surface Ship Acquisition Process Model, July 1986. This study develops a generic surface ship acquisition process model from program initiation to contract award for the lead ship. The national model depicts the principal events and activities that occur in each phase and identifies the documents that are prepared to support program execution and review. A corollary objective is to identify those instructions and regulations impacted by recent changes to the Navy organization [21].

(f) The Year 2000 Plan, June 1984. The purpose of this study is to develop a road map pointing the way for the NAVSEA 05 organization of the future. Specifically:

- To define the goal of where the NAVSEA 05 organization should be by the year 2000.
- To focus the mission of the NAVSEA 05 organization.
- To plant the seeds of self-renewal in the NAVSEA 05 organization [18].

A more complete list of ship acquisition internal studies that provide feedback on the ship acquisition process can be found in the reference section of this study and the annotated bibliography of reference 24. The Navy's NAVSEA organization and the Coast Guard's Office of Acquisition would also be able to provide other internal studies.

2.4 Informal

A significant amount of the feedback loops which exist within the ship acquisition organization are via informal methods. Examples of these lessons learned mechanisms with feedback loops are:

(a) PM to PM -- Often a manager in charge of many programs will gather many PM's together for program updates. PM's can share their experiences for problems discussed at these meetings. Additionally, a wealth of information is exchanged on a one-on-one basis, PM to PM.

(b) PM to individuals internal to the ship acquisition organization -- The ship acquisition organization has many individuals, both civilian and military, with vast experience on many previous ship acquisition programs. Additionally, discussions with personnel in field stations of the ship acquisition organization provides valuable information and improves liaison with these field stations.

(c) PM to Individuals external to the ship acquisition organization -- Informal communication with individuals external to the ship acquisition organization is another source of information. Many of these individuals belong to organizations discussed in Chapters 3 through 8.

2.5 Acquisition Guide

An excellent lessons learned mechanism with feedback loop is the acquisition guide. The acquisition guide is a low

cost, small manpower operation that results in a wealth of information on the acquisition process. Each reviewing authority and matrix support group within the ship acquisition organization puts together a brief one or two page summary on what the key points to a successful acquisition are from their point of view. Included in this summary are past lessons learned where other PM's have encountered difficulties. These summaries are then grouped together by topics into one guide. Combining the summaries into one guide is accomplished by one person as a collateral duty.

The purpose of the Acquisition Guide is to "pull together" the activities and critical documentation required and put these requirements in a concise, maintainable, and easy to use format to help acquisition managers plan ahead. The need for managers to know the process and sequence of events and average time to complete events is essential for planning and ensuring timely obligation of funds budgeted. In addition, corporate mangement, by seeing the entire process, can focus on better ways to manage that process by minimizing the number of reviews, maximizing parallel vice serial reviews, establishing time limits for each reviewer, and providing a feedback system for performance measurement against the established time standards.

These actions will result in streamlining the internal acquisition process to the minimum required time, which together with effective planning by the acquisition manager

will achieve higher program obligation rates [16].

The acquisition guide does not supercede existing notices, instructions, directives on the ship acquisition process.

The acquisition guide provides:

- Corporate management a single consolidated overview of all internal acquisition processes.
- A quick ready reference identifying the reviews, approval and documentation requirements during the entire acquisition process.
- Helpful advice from the "corporate memory" to program managers, especially those managers involved in the process for the first time.
- A list of key personnel to assist the manager through the acquisition process.
- Quick feedback to managers on key issues.

Distribution of the acquisition guide to all personnel involved in the acquisition process is essential. Updates to the guide are provided on a periodic basis. However, if a significant change or lesson learned requires immediate dissemination, a one page update can be used.

Although presently not used by any U.S. Government Agency ship acquisition organization, the acquisition guide is successfully used by the Naval Air Systems Command of the U.S. Navy. The Naval Air System Command Acquisition Guide could easily be adopted to the ship acquisition process for use by a

ship acquisition organization.

It is interesting to note that NAVSEA has made a conscious decision not to have a periodic newsletter or guide related to ship acquisition. Years ago such an activity was undertaken. However, it was discontinued because NAVSEA felt the benefits were not commensurate with the costs. The author talked with NAVSEA PM's who would like to see the periodic acquisition newsletter/guide resurrected as well as some who thought they were already receiving too much paper.

INTERNAL FEEDBACK WITHIN THE SHIP ACQUISITION ORGANIZATION

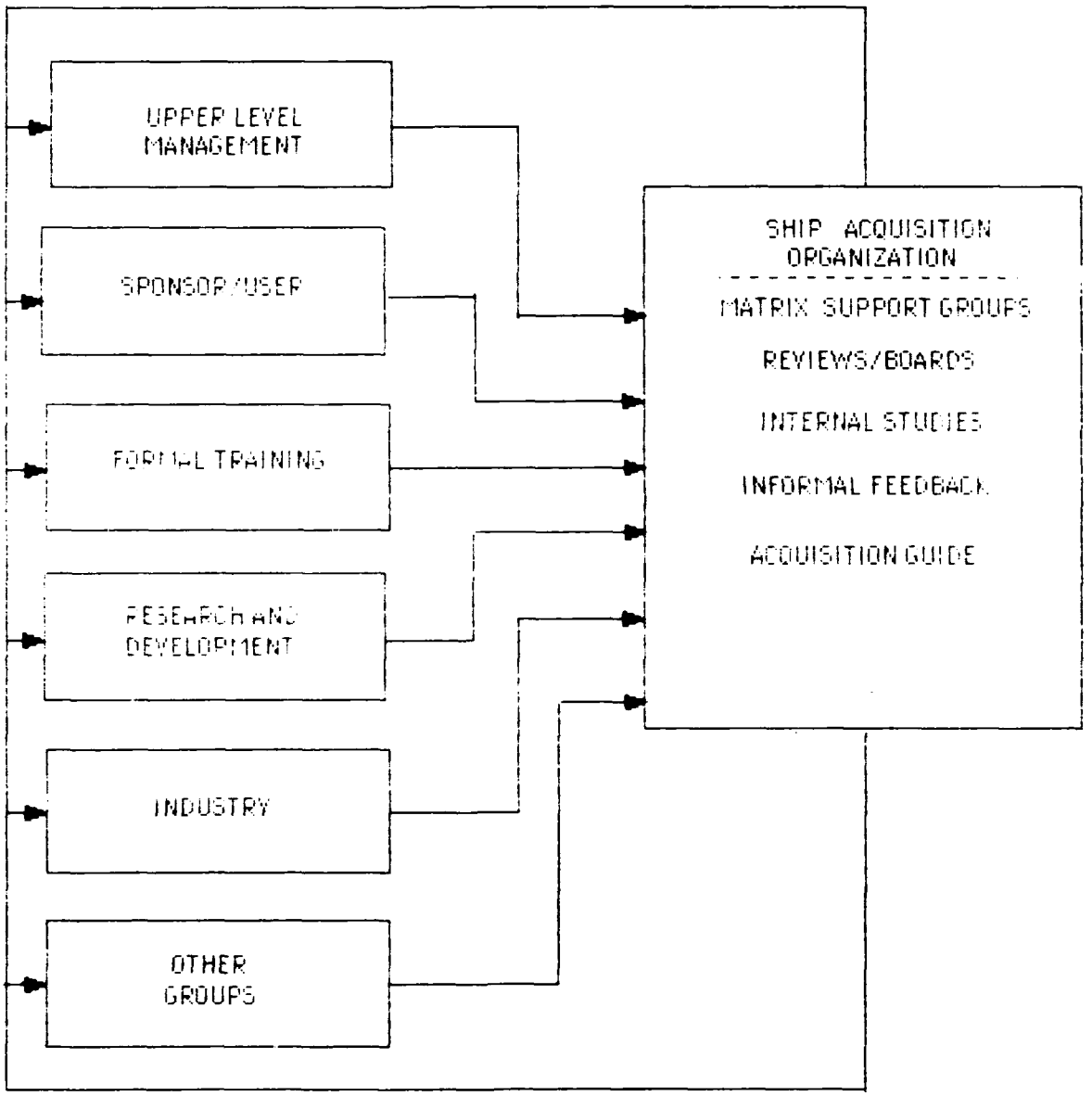

FIGURE (2)

CHAPTER 3

UPPER LEVEL MANAGEMENT FEEDBACK

Upper level management feedback is defined as feedback from organizations/individuals above NAVSEA for the U.S. Navy and above the Office of Acquisition for the U.S. Coast Guard. There is an overlapping of the definitions of upper level management and sponsor/user feedback. Many of the upper level management military personnel are also operators. For this report, operators in upper level management, as referenced to the ship acquisition organization, are considered upper level management. Other operators not in upper level management are defined as sponsors/users.

References made to upper level management throughout this chapter can refer to a multitude of organizational levels. It could be the Executive Branch of the United States Government; at other times it could be a military leader of the service referenced.

3.1 Regulations/Directives/Instructions

Acquisition regulations, directives and instructions promulgate policy guidelines on ship acquisition to ship acquisition organizations. Additionally, these acquisition regulations, directives and instructions often apply to many upper level management organizations. Principal features of

the regulations, directives and instructions that impact directly on ship acquisitions include:

- Competitive exploration of alternative design concepts.
- Delineation of lines of authority, responsibility and accountability are emphasized.
- Details of program documentation.
- Continuing mission area analyses and reaffirmation of mission need is required at each decision point.
- Adherence to established program initiation procedures.
- Maximize use of competition.
- Streamlining administrative procedures.
- Controlling cost growth within programs.
- Tailoring for each program acquisition strategy encompassing all internal and external elements of the acquisition process.
- Pursuing readiness and sustainability based on realistic operational availability thresholds as primary objectives, equal in priority with achieving specified performance levels, from the start of a program.
- Increasing program stability.
- Applying established or evolving technology having a high probability of success.
- Making well-balanced trade-offs between life-cycle costs, system effectiveness, and schedule.

Many initiatives to improve the acquisition of major defense systems have been undertaken by recent administrations

and congresses. Emphasis has focused on acquisition strategies and control methods to make the acquisition process more efficient. Examples of acquisition strategies in the ship acquisition world include total package procurement of the late 1960's and early 1970's, lead ship/follow ship prototyping, and multiyear procurement. Example acquisition control initiatives include DOD's Acquisition Improvement Program (Carlucci Initiatives) and the Federal Acquisition Regulations.

Such government acquisition policy initiatives filter down to ship acquisition organizations via regulations, directives and instructions. Examples are:

(a) Office of Management and Budget Circular No. A109- Established a government-wide policy for all executive branch agencies to follow in the acquisition of major systems, including ships. The document provides overall policy for ship acquisition in government agencies, including acquisition strategy and planning.

(b) Department of Defense Instruction 5000.2 - Establishes DSARC process, procedures, requirements and documentation. Establishes formats for Justification for Major System New Start, System Concept Paper, Decision Coordinating Paper and Integrated Program Summary.

(c) Department of Defense Directives 5000.3 - Mandates the policy for the conduct of test and evaluation in the acquisition of defense systems.

(d) Secretary of the Navy Instruction 5000.1B - Establishes policy and procedures for all system acquisitions. In this instruction, the Secretary of the Navy recognizes the uniqueness of the ship acquisition process must be considered wher implementing upper level management acquisition policies. Thus, unique development procedures and milestones are established for ship acquisitions.

(e) Secretary of Transportation Instruction 4200.14B - Establishes policy and procedures for Coast Guard acquisitions.

3.2 Reviews/Boards

There are numerous reviews/boards throughout the ship acquisition process. Each of these reviews/boards are a lesson-learned mechanism with feedback loop. Section 2.2 discusses reviews/boards conducted within the ship acquisition organization. Many reviews/boards conducted within the ship acquisition organization precede reviews/boards conducted by upper level management. This section will discuss reviews/boards conducted by upper level management. See Chapter 4 for an explanation of reviews/boards conducted by sponsors/users.

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- Business
- Technical
- Financial
- Logistics
- Construction
- Competition Advocate/Acquisition Streamlining

See Section 2.2 for an explanation of the different types of reviews/boards. Examples of upper level management reviews/boards are:

(a) Coast Guard Acquisition Review Council - Chaired by the Coast Guard Acquisition Executive, the Coast Guard Acquisition Review Council monitors implementation of the concepts embodied in OMB Circular A-109 in the Coast Guard, reviews project progress and plans at major project milestones, and approves system baselines. The Chief Counsel, Resource Director/Comptroller, all Operating Program Directors, and Acquisition Support Program Director are permanent members. Support Program Directors are members when their subordinates have been tasked with performing work for the project under review.

(b) Defense Systems Acquisition Review Council - A high level advisory group which appraises the Secretary of Defense on the program status and readiness of each major defense system to proceed to the next phase in the acquisition process.

(c) Navy's Ship Characteristics and Improvement Board - This special panel provides recommendations to the Chief of Naval Operations on all aspects of ship acquisition and improvement at various points in the ship design process.

(d) Post Program - Post program reviews are often conducted on programs which experienced difficulties.

3.3 Streamlining

The objective of streamlining is to identify, develop, and implement improvements in the acquisition process. Streamlining includes deleting unnecessary requirements or references, tailoring specifications, substitution of commercial products when feasible, and maximum use of off-the-shelf items. Areas within acquisition processes that provide the greatest benefits from streamlining efforts include:

- defining mission requirements
- specifications and standards
- milestone requirements
- contract terms and conditions
- scheduling
- testing and evaluation [17]

Inherent in the streamlining of any acquisition is the potential for increased risk. If so, the potential payoffs or

benefits must then outweigh the risk if a decision maker is expected to assume the additional risk. During streamlining, it is imperative that the total system be viewed.

Several ways to handle risk in the streamlining environment are through:

- Risk avoidance - Identify and analyze alternatives and select the least risk/no risk alternative.
- Risk transfer - Put more of risk on the contractor through warranties, fixed priced contracts, etc.
- Risk assumption - Streamline but assume a greater risk.

Upper level management of both the U.S. Navy and U.S. Coast Guard ship acquisition organizations have streamlining organizations. These streamlining organizations review all ship acquisitions to ensure streamliing principles are followed. An example of a streamlining organization is the Streamlining Advocate of the U.S. Navy. He reports to the Assistant Secretary of the Navy, Shipbuilding and Logistics, on all ship acquisition streamlining efforts.

3.4 Direct Involvement

Upper level management's direct involvement in the ship acquisition process can come from many organizations and in many forms. For the U.S. Navy, the following upper level management organizations can have a direct effect on a ship acquisition program.

- Chief Naval Operations Office

- Secretary of Navy Office
- Secretary of Defense Office
- Executive Branch of U.S. Government
- Legislative Branch of U.S. Government

For the U.S. Coast Guard, the following upper level management organizations can have a direct effect on a ship acquisition program.

- Commandant of the Coast Guard Office
- Secretary of Transportation Office
- Executive Branch of U.S. Government
- Legislative Branch of U.S. Government

Possible upper level management direct involvement methods include:

- Direct orders.
- Informal top level talks.
- Withholding, reducing or increasing funding.

Upper level management direct involvement may be in the form of specific technically oriented guidelines or may be more general guidance. Specific technically oriented guideline examples include:

- Setting maximum length of a ship.
- Setting maximum manning level of a ship.
- Selecting specific weapon systems.

General guidance examples include:

- Setting general performance requirements.
- Setting constraints on cost.

- Setting schedule requirements.

An example of upper level management direct involvement in the ship acquisition process was the U.S. Navy's DDG-51 guided missile destroyer program. In an effort to meet unit cost goals of $1.1 billion for the lead ship and $700 million for follow-on ships (1983 dollars), the Secretary of the Navy ordered structural and system design changes. Specifically, the Secretary of the Navy set the maximum beam width of the DDG-51 [34].

UPPER LEVEL MANAGEMENT FEEDBACK

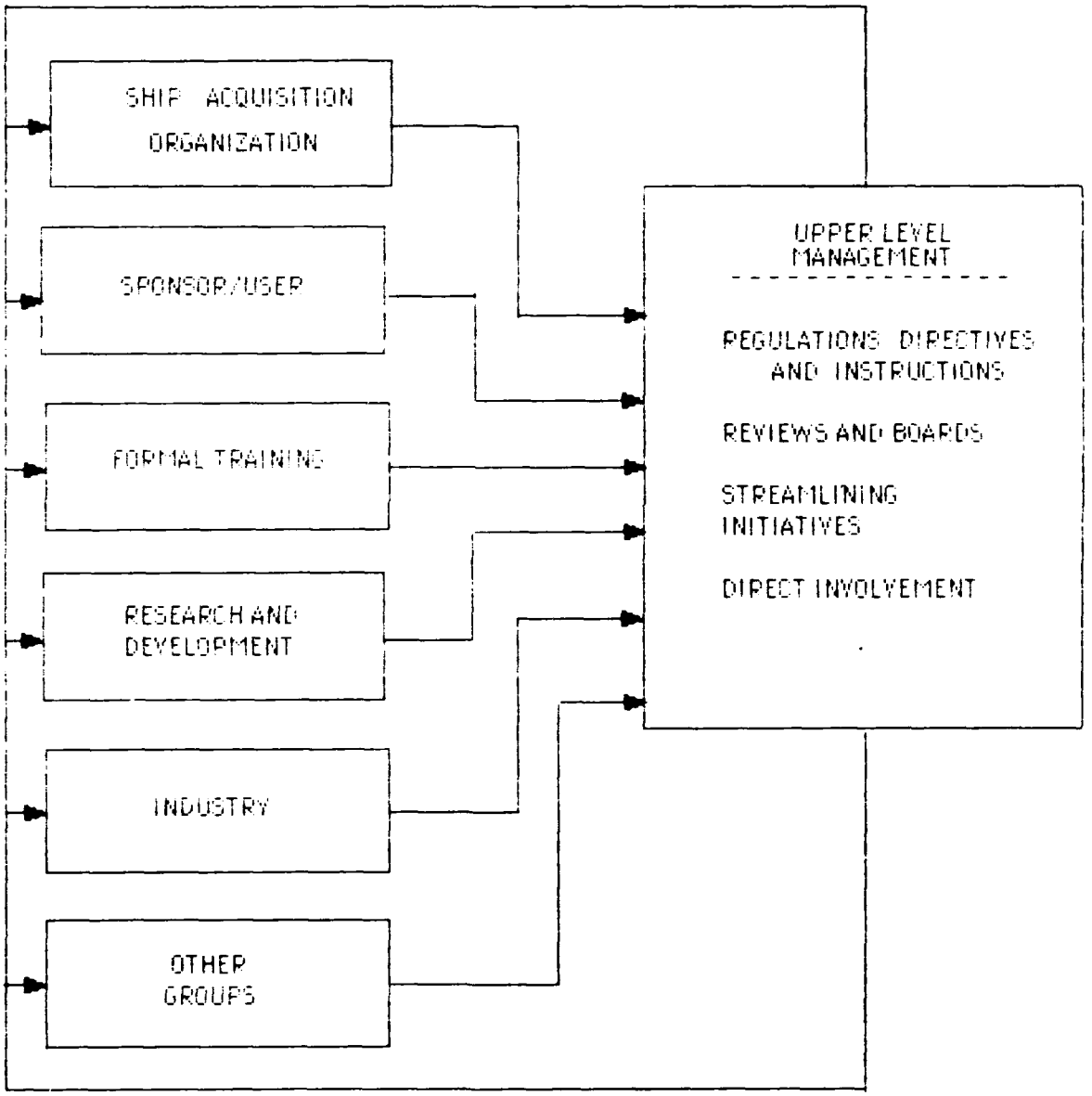

FIGURE (3)

CHAPTER 4

SPONSOR / USER FEEDBACK

Sponsor/user feedback is defined as feedback from the military personnel who actually operate the ships. There is an overlapping of the definitions of upper-level management and sponsor/user feedback. Many of the upper level management military personnel are also operators.

For this report, operators in upper level management, as referenced to the ship acquisition organization, are considered upper level management. Other operators, not in upper level management, are defined as sponsors/users. References made to sponsor, user or operator throughout this chapter can refer to a multitude of organizational levels. It could be a three-star admiral; at other times it could be a commander in charge of an element within the sponsor/user organization.

Testing and evaluation is often conducted by organizations separate to the sponsor/user organization. However, all test and evaluation is discussed in this chapter with the exception of developmental test and evaluation which is discussed in Chapter 6.

4.1 Reports

Sponsors/users want ships that are effective weapon

systems able to perform their missions successfully in their intended environment. One method the sponsor/user uses to get lessons learned from ship performance to the ship acquisition organization is through reports. Usually these reports also go to upper level management. There are two basic groups of reports, technical and operational.

Technical reports provide information on ship equipment/system failures, down time, difficulty in obtaining spare parts, etc. This information is then used by the ship acquisition organization to improve existing equipment/systems problems, make choices on equipment/system types to use in new acquisitions, etc. An example technical report used by the ship acquisition organization is the casualty reporting system used by both the U.S. Navy and U.S. Coast Guard.

Mission area analysis is done on a continuing basis to assess the ability of current ships' capabilities to meet mission requirements. This analysis is reported via operational reports. Upper level management uses these reports and other data obtained from intelligence sources to determine when current ship capabilities are less than required to meet mission requirements. At this point, much of the previous lessons learned and experiences are turned into basic requirements definitions for a new ship. The ship acquisition organization usually assists upper level management is shaping these basic requirements definitions. Operational reports from the recent U.S.S. Stark incident

present an example of how operational reports provided lessons learned to the ship acquisition organization.

4.2 Operational Testing and Evaluation

Testing and evaluation organizations are not unique to the sponsor/user organization. Usually they are separate organizations which report directly to upper level management. However, most of the personnel in these test and evaluation organizations are operators on assignment away from the sponsor/user organization. Thus, operational testing and evaluation is included in this chapter.

There are two basic types of test and evaluation: developmental and operational. Developmental test and evaluation is discussed in Chapter 6 of this report. Operational test and evaluation is conducted to estimate a system's operational effectiveness and operational suitability, identify needed modifications, and provide information on tactics, doctrine, organization and personnel requirements. Testing is expensive and time consuming but compared to the development and construction costs of a complex, expensive ship that cannot fulfill its designed mission, the costs and time involved are inconsequential.

Engineering feedback and correction of deficiencies found during testing are an essential part of the design and engineering process. Classic engineering requires feedback from the operator to the responsible engineer regarding the

performance of the equipment or system in question. Additionally, successful accomplishment of test and evaluation objectives are essential so proper decisions can be made regarding commitment of significant additional resources to a program or to advance it from one acquisition phase to another.

The long design, engineering and construction period of a major ship will normally preclude completion of the lead ship and accomplishment of tests prior to the decision to proceed to follow on ships. Thus, it is critical that tests be conducted properly so any problems identified can be corrected on follow on ships.

The U.S. Navy and U.S. Coast Guard are required to have organizations, separate and distinct from the ship acquisition organization and the sponsor/user organization, that are responsible for operational test and evaluation. Example organizations for the U.S. Navy are the Operational Test and Evaluation Force and the Board of Inspection and Survey. An example U.S. Coast Guard organization is the Provisional Acceptance Trial Board.

4.3 Inspections/Reviews

Inspections are similar to testing and evaluation with the exception of the time frame in which they are held. Inspections are usually held on ships that have already gone through testing and evaluation and are now operating ships of the fleet.

Inspections provide technical and operational information on operating ships. Inspection deficiencies are documented and analyzed. The results of the findings and recommendations are sent to upper level management with the ship acquisition organization also receiving a copy. The ship acquisition organization uses these lessons learned in the design and acquisition of new ships.

General deficiencies found by inspection teams include:

- Loss or serious degradation of required operational capabilities.
- A serious or likely safety hazard to personnel or material.
- Failure of installed systems and/or equipments to meet approved characteristics, specifications, or requirements for material performance.
- Shortages or inadequacies of repair parts, tools, equipage, test equipment technical publications, technical drawings, administrative maintenance, or other logistic concerns.

Of special concern for the ship acquisition organization are recurring deficiencies.

An example U.S. Navy inspection organization is the Board of Inspection and Survey. The Board of Inspection and Survey does a thorough inspection of every U.S. Navy surface ship every three years.

Items emphasized at the inspections are:

- That general specifications for ships of the U.S. Navy must be the standard for construction of warships.
- That operational reliability must be a primary consideration in warship design.
- That ship survivability must be given greater emphasis in ship design [3].

As mentioned in Chapters 2 and 6, the Board of Inspection and Survey also conducts design reviews of new ship acquisitions early in the design process.

4.4 Informal

Much of the communication between the ship acquisition organization and the sponsor/user is informal. The ship acquisition organization works closely with the sponsor/user regarding the ship program and possible changes. This constant contact allows the ship acquisition organization to be familiar with the various needs of the ship sponsor/user and the unique circumstances of the type of ship planned.

Many of the military personnel in the ship acquisition organization are ship sponsors/users temporarily assigned to the ship acquisition organization. Additionally, other military personnel in the ship acquisition organization have had shipboard experience. The operating knowledge these two groups bring to the ship acquisition organization is extremely useful and provides lessons learned to the ship acquisition organization.

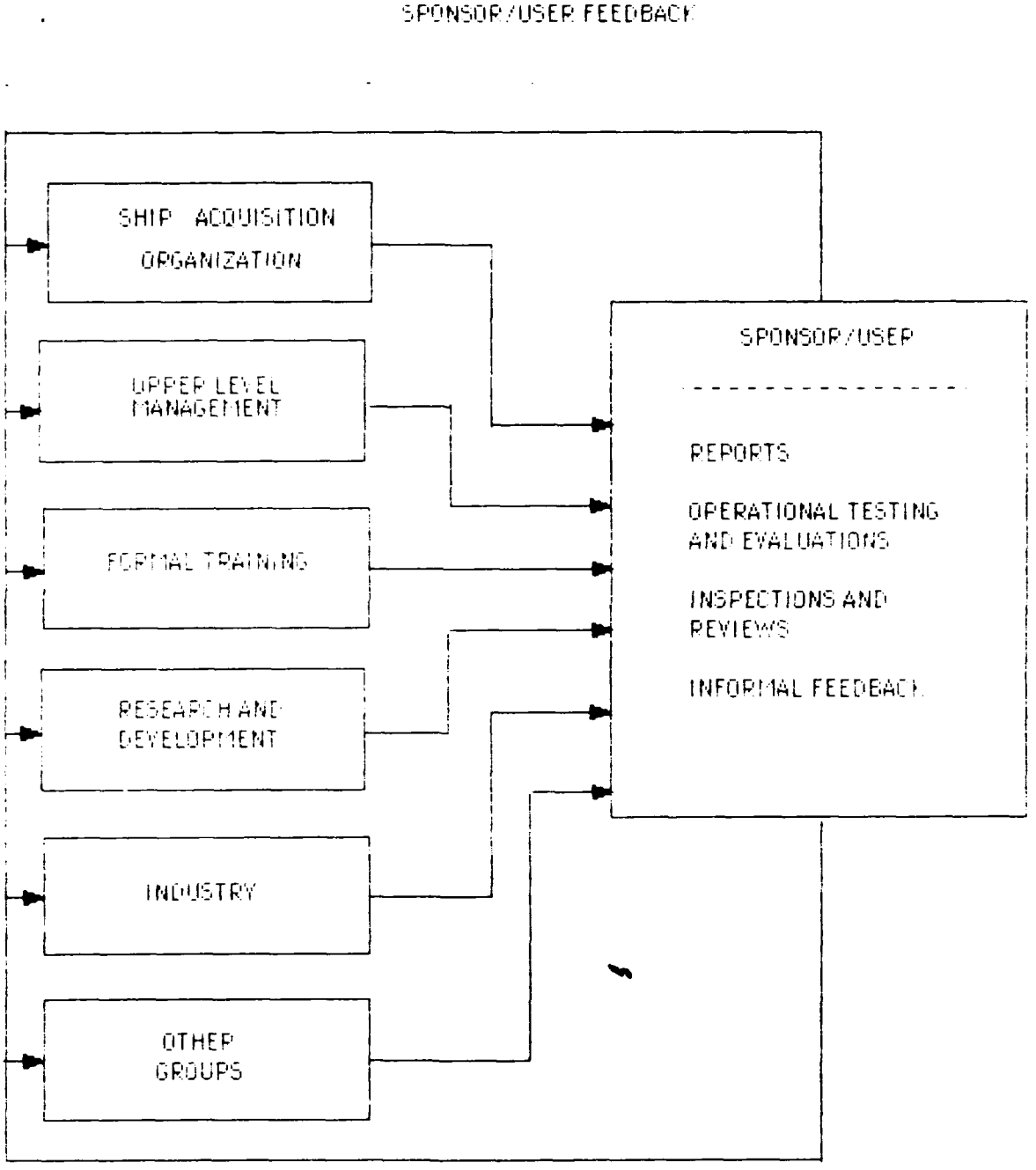
SPONSOR/USER FEEDBACK
SHIP ACQUISITION ORGANIZATION
UPPER LEVEL MANAGEMENT
FORMAL TRAINING
RESEARCH AND DEVELOPMENT
INDUSTRY
OTHER GROUPS
SPONSOR/USER
REPORTS
OPERATIONAL TESTING AND EVALUATIONS
INSPECTIONS AND REVIEWS
INFORMAL FEEDBACK

FIGURE (4)

CHAPTER 5

FORMAL TRAINING FEEDBACK

Formal training feedback is defined as feedback provided through a systematic program of studies or efforts provided by previous or present assignments.

5.1 Schools

A major method to get past lessons learned and new innovative ideas into the ship acquisition process is through schools. Defense Systems Management College at Fort Belvoir, Virginia is the major U.S. Government school for senior acquisition personnel. However, there are many U.S. Government schools, institutions and training centers in the Washington, D.C. area available to the ship acquisition personnel of the U.S. Navy and U.S. Coast Guard.

Ship acquisition organizations, upper level management, sponsors/users and even industry provide lessons learned/ feedback into the curriculum at these schools.

Some of the schools and training centers in the Washington, D.C. area and a sample of some of the courses they have available are listed below:

(a) Acquisition/Logistics Management Training Center -- Located in the Washington, D.C. area, this training center provides short courses in management-related areas. The school provides new civilian naval civil service personnel

with an introduction to the Navy. Additionally, courses are offered that would be valuable to veterans of the ship acquisition process. Example courses offered are:

- Planning, Programming and Budgeting System -- a five day overview of the PPBS system.
- System acquisition management -- a five day overview of the acquisition process. The course content relies heavily on class involvement with students sharing their past acquisition experiences.

(b) Defense System Management College --

The Defense Systems Management College (DSMC) is a Department of Defense (DOD) institution dedicated to providing education to the defense acquisition community and, in particular, program management office personnel. Education is provided in the program management policies, philosophies, skills, and techniques necessary for the effective and efficient execution of defense weapon systems acquisition projects.

In addition to its educational mission, DSMC has a research mission. Research in applied management science is conducted to support the above educational mission and to support the DOD acquisition community.

The third DSMC mission is dissemination of information to the DOD acquisition community.

Besides the main campus at Fort Belvoir, Virginia, DSMC has established four regional centers in the United States at which selected courses of instruction are offered:

- Huntsville
- St. Louis
- Los Angeles
- Boston

Example courses offered are:

- Program Management Course -- This 20-week course is a study of program management from the PM's point of view. Instruction is designed to increase the student's ability to manage successfully a defense system acquisition program through functional knowledge, case studies, lessons learned, and a series of student-interactive decision exercises. This course is now a mandatory prerequisite for all new PM's.
- Technical Management Course -- This three-week course provides an introduction to concepts, scope, and application of technical management disciplines to the systems acquisition process. Disciplines include system engineering, integrated logistics support, test and evaluation and production [9].

Note: The program management course is highly desireable for all higher ranking personnel, both civilian and military, in a program office. Unfortunately, DSMC has limitations on the number of students it can accommodate. Therefore, NAVSEA is presently developing their own mini-program management course to accommodate those who are unable to attend DSMC. NAVSEA expects this course to get started in September 1988.

(c) Local colleges/universities -- Local colleges and

universities also provide ship acquisition personnel an opportunity to take courses. An example is the Northern Virginia Graduate Center in the Washington, D.C. area.

(d) Industrial War College -- The Industrial War College is located at Ft. McNair, Washington, D.C. A major portion of the instruction is finance and contract related. An overview of the acquisition and production processes is included in the studies. Field trips to industrial sights are also part of the curriculum.

(e) NAVSEA Institute -- NAVSEA Institute has engineering, technical and professional courses for NAVSEA personnel, although personnel from other commands within the Navy also attend. The courses are usually taught in the late afternoon or evening so as not to interfere with normal working hours. Taught in connection with Virginia Tech, college credit and even a degree program are possible from NAVSEA Institute. The Institute faculty consists of Virginia Tech professors, NAVSEA personnel, and other personnel in the Navy or connected to the Navy in some way. Example course descriptions:

- Operations research methodology -- Probabilistic operations research models of interest to several academic disciplines: inventory control, queuing theory, and Monte Carlo simulation.
- Ship acquisition for engineers -- To provide an instructional course that will enhance the engineer's understanding of ship acquisition project management. To reinforce these instructions, practical applications and

assignments are also provided. Upon completion of this course, the engineer will be able to participate in the ship acquisition process with understanding and respond to ship acquisition tasks in a positive, meaningful and productive manner [17].

5.2 Career Paths

Ship acquisition personnel receive feedback via past experiences they encounter during previous assignments. Career paths provide a systematic approach to certification, selection, training and career development of individuals in the acquisition management profession.

Career path development can be shaped by:

- Requiring specific training
- Acquisition assignments
- Education (discussed in Section 5.1)
- Field experience (Operation experience on ships, in shipyards, etc.)
- Recommending other training
- Professional societies (SNAME, etc.)

Assignments must be of sufficient length to ensure not only effective experience and evaluation, but also continuity of management. Personnel should be selected for assignment on basis of skills, experience and demonstrated ability to successfully perform the contemplated assignment. Certification points are required to ensure that personnel have met developmental requirements of a program manager or

deputy program manager.

Career paths for ship acquisition personnel of the U.S. Navy and U.S. Coast Guard vary considerably. The U.S. Navy acquires many more ships than the U.S. Coast Guard. There are considerably more civilian and military personnel in the U.S. Navy's ship acquisition organization. With these larger numbers of personnel, the efforts to establish career paths for the military and civilian personnel in the U.S. Navy are considered worthwhile efforts.

The U.S. Navy currently has career paths in acquisition for both military and civilian personnel. Involved in ship acquisition are Materiel Professional and Engineering Duty Officers. The civilian counterpart, the Civilian Materiel Professional, is presently being defined at NAVSEA. The objectives of these programs are to enhance the performance, certify qualifications and provide developmental opportunities for candidates of top ship acquisition management positions.

Conversely, the U.S. Coast Guard has a much smaller personnel base to draw from. These limited personnel resources make it more difficult to establish career paths in ship acquisition. Operational career paths have priority for military personnel. Civilian personnel numbers are too small to easily establish career paths for them.

5.3 Teaching Methods

Teaching methods that can be used in training feedback efforts include:

- lectures
- guest speakers
- field trips
- case studies

Lectures are the traditional method of training at schools. Lessons learned from the ship acquisition organization, upper level management, sponsors/users, industry and other organizations are presented in an effective manner.

Guest speakers provide the opportunity for personnel from organizations involved in the ship acquisition process to give first-hand knowledge of their experiences. Additionally, the interaction provided by industry, upper level management, and sponsor/user involvement with ship acquisition personnel is also valuable.

Field trips provide ship acquisition personnel the opportunity to witness first-hand the ship acquisition process at various stages, such as design, construction, etc.

An excellent method used by schools to present lessons learned in a formal training method is through the use of case studies. Few ship acquisition case studies now exist in acquisition training programs. The great majority of teaching materials and courses are aimed at the acquisition of objects that can be mass produced (e.g. missiles, planes). Appendix D is an example case study of the Navy's MSH program.

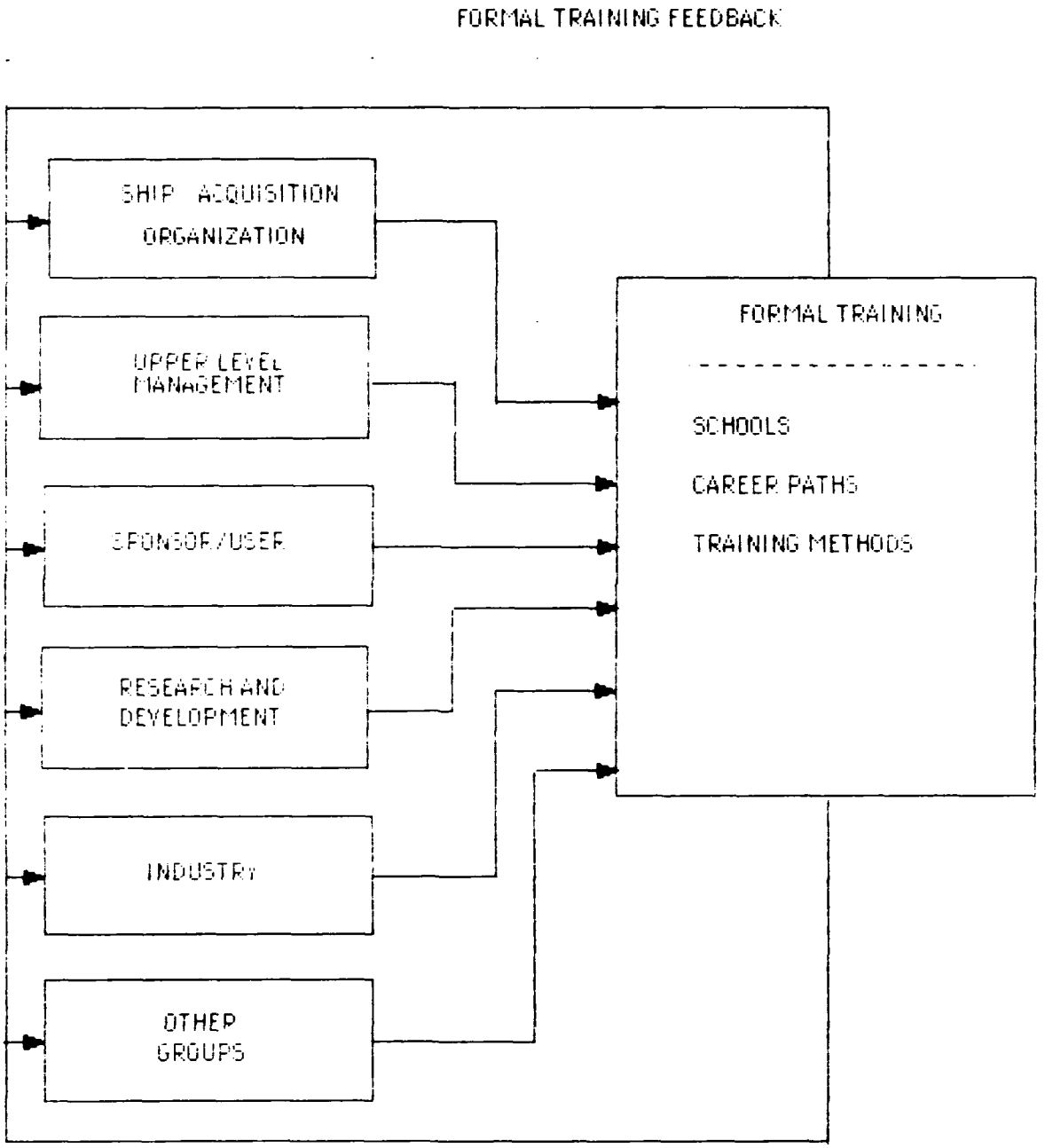
FORMAL TRAINING FEEDBACK
SHIP ACQUISITION ORGANIZATION
UPPER LEVEL MANAGEMENT
SPONSOR/USER
RESEARCH AND DEVELOPMENT
INDUSTRY
OTHER GROUPS
FORMAL TRAINING
SCHOOLS
CAREER PATHS
TRAINING METHODS

FIGURE (5)

CHAPTER 6

RESEARCH AND DEVELOPMENT FEEDBACK

A key factor in the allies' WORLD WAR II victory was the effective use of new technologies. Today, new weapons and technologies pile up upon themselves as the pace of the technological change accelerates. Weapons seem to become obsolete almost at the time of their introduction into the fleet. Thus, efficient use of research and development assets is essential to ensure new technologies get to the fleet quickly.

Many of the decisions made in the ship acquisition process are based on information supplied by research and development organizations. Research and development organizations often conduct studies based on new and innovative ideas. However, much of the research is based on problems identified or suggestions made from upper level management, sponsors/users, test and evaluation organizations, and industry. Thus, research and development organizations close the loop to ship acquisition organizations on some of lessons learned obtained by upper level management, sponsors/users, test and evaluation organizations, and industry.

6.1 Research and Development

Research, development and engineering is required for product improvement of existing systems and for next generation systems. Research and development organizations provide feedback to the ship acquisition organization on the status of research projects currently under development and which could/will be used in current/future acquisitions. Government research labs, private research labs, academia, industry, and ship acquisition organizations all perform research and development functions.

The impact of the ocean environment upon the tactical and strategic forces and their operations and system performance must be understood and accounted for to most effectively employ naval forces. In this regard, all ship research and development programs must consider appropriate environmental factors from program initiation through test and evaluation to full operational capability.

Current acquisition processes push state-of-the-art technology. A multitude of complex sub-systems can complicate development, engineering and construction processes. Both of these factors increase the likelihood of problems. Additionally, the problem of concurrent development makes risk assessment a key to a successful ship acquisition.

Risk is the uncertainty of obtaining objectives in system and hardware acquisitions, usually expressed in terms of probability. After program initiation and prior to full scale

engineering development, the program must include efforts to identify, control and reduce program risk. Reduction of system capabilities is one approach that should be considered to reduce technical risk. Industry must participate in risk reduction efforts to achieve a clear understanding of program objectives, to produce schedule realism, and effective cost estimates.

Research and development organizations' risk management objectives include:

- Identification of potential problem areas prior to the time when they actually impact the acquisition program adversely.
- Presentation to the ship acquisition organization of the magnitude of the risk, its implication and the courses of action being taken or recommended to eliminate or minimize the risk. These must not be regarded as one-time actions. The ship acquisition organization must be kept informed by tracking the development in an identified risk area until the problem has been corrected or reduced to an acceptable level.

Ship acquisition often has a high degree of concurrency between development and construction. Ship acquisition prototyping is seldom used above the sub-system level. The amount of concurrency is directly related to the amount of risk in the program.

The amount or degree of concurrency should be keyed on

the extent of potential savings in acquisition time balanced against technical, cost, and supportability risk and urgency of the acquisition program. In general, the more concurrency you have the more risk involved in the program.

Full scale prototyping of ships is expensive and time consuming. However, system prototyping is possible and does reduce the risk of a ship acquisition program.

The use of land-based and sea-based test sites to prove computer programs and hardware compatibilities and aid in other facets of system integration is essential for reducing risks. Land-based test sites may serve the following purposes:

- As an aid in design, development, integration and test of combat systems.
- As a production tool to aid in the test and checkout of equipments for the lead and follow ships.
- As a training aid for fleet personnel.
- For use in configuration management, to test proposed design changes in hardware and computer programs [1].

Thus, risk can be reduced by bringing to development only mature systems and preplanned product improvements for follow-on insertion of those technologies that are not sufficiently mature. This means that in so far as possible, engineering development would consist primarily of systems integration, integrated logistics support and construction preparedness. Those programs requiring more research will remain in the

research and development labs.

Another method of reducing risk is by using non-developmental items. Non-developmental items refer to hardware and software that are already developed, available and capable of fulfilling U.S. Government agency requirements, thereby minimizing or eliminating the need for costly, time-consuming government-sponsored research and development programs. Non-development items offer the opportunity to rapidly field state of the art technology. Non-developmental items are usually off-the-shelf or commercial type products, but may also include equipment already developed by or for the U.S. Government.

6.2 Design

Some ship acquisition programs have experienced difficulties and delays in achieving operational status of the total ship system. The need is to identify an acquisition approach that will avoid these problems and achieve a fully integrated ship system in a timely and cost-effective manner. The difficulty results primarily from the complexity of a ship and its many systems.

In order to achieve effective combat systems integration, early attention must be given to total system design. While the roots of the integration problem are at the beginning of a program, the problems have manifested themselves at the time the systems are being tested. A special ongoing effort is needed for integrating and testing the systems during detailed

design and construction [1].

Ship design falls under research and development in the ship acquisition process. Ship design is accomplished by the ship acquisition organization, industry or some type of joint effort between the ship acquisition organization and industry. Industry involvement may come from one company or from many companies competing. Early and continual ship builder involvement in the ship design is essential to a smooth transition from design and engineering to construction.

The ship design organization is a major focal point for lessons learned to which other organizations can feedback information. Research and development organizations feedback on the status of current programs under development. Industry provides inputs on design which affect ship construction. Additionally, due to the long ship acquisition process, ship mission profiles may change. Thus, the design organization may also receive feedback from sponsors/users and upper level management. The design and ship acquisition organizations using inputs from research and development organizations, industry, sponsors/users and upper level management identify the costly design requirements where the increase system performance is small relative to the level of resources required. Those design requirements should be critically reviewed to assess the impact on warfighting capability that results from their reduction or elimination.

An example of outside involvement in the ship design

process is the Navy's Board of Inspection and Survey review of contract drawings and specifications. These reviews may last 3-4 days with hundreds of comments generated as a result. All comments must be satisfactorily resolved between the Board of Inspection and Survey and the design team or the open issues are submitted to the OPNAV sponsor for adjudication.

6.3 Developmental Test and Evaluation

Testing and evaluations are undertaken to demonstrate feasibility, address areas of risk and determine design alternatives and trade-offs necessary to best achieve project objectives. There are two basic types of tests and evaluations: developmental and operational. Developmental test and evaluation is explained in this section. Operational test and evaluation is covered in Chapter 4.

Developmental test and evaluation is conducted to assist engineering design and developemnt process and to verify attainment of technical performance specifications and objectives. It includes test and evaluation of components, subsystems, hardware/software integration, and systems. Testing and evaluation of compatibility and interoperability with existing or planned equipment and systems are also included. Developmental test and evaluation is accomplished by research and development organizations, industry and the ship acquisition organizations.

Today, prototypes are seldom used in the ship acquisition

process. The long design, engineering and construction period of a ship will normally preclude completion of the lead ship and accomplishment of test thereon prior to the decision to proceed with follow ships. Therefore, successive phases of developmental test and evaluation are accomplished early at the land-based or sea-based test installations and on the lead ship to reduce risk and minimize the need for modification to follow on ships. To assure these tests are properly time phased, that adequate resources are available, and that duplicative or redundant testing is eliminated, a properly integrated test program is required. Deficiencies disclosed by developmental test and evaluation provide valuable lessons learned to the builders of follow-on ships.

Close contact between developmental test and evaluation as well as operational test and evaluation organizations is essential. Besides reducing duplicate testing, lessons learned by developmental test and evaluation organizations can be passed to the operational test and evaluation organizations.

RESEARCH AND DEVELOPMENT FEEDBACK

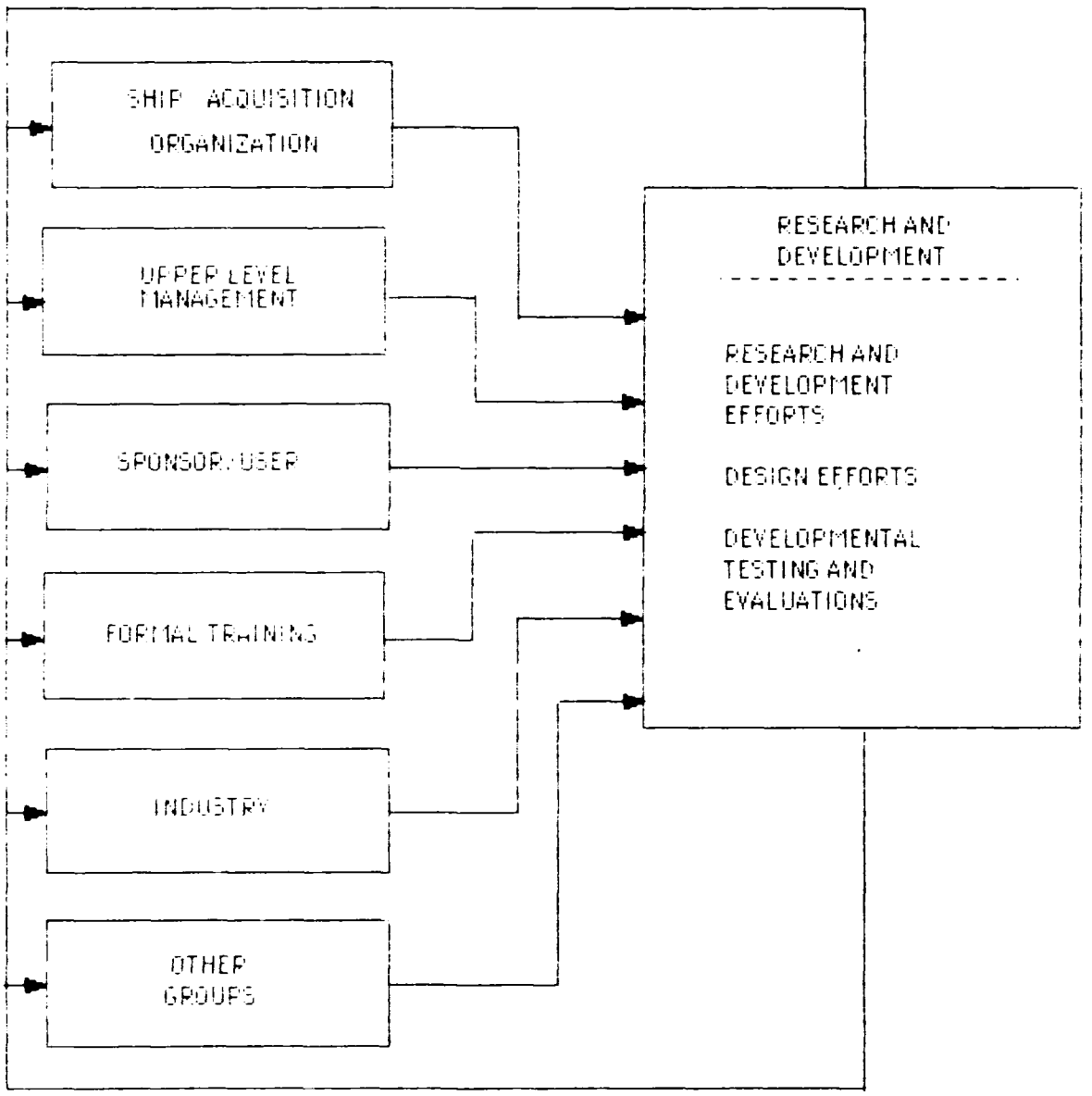

FIGURE (6)

CHAPTER 7

INDUSTRY FEEDBACK

U.S. Government agencies are responsible for 98% of the dollar value of all ships built and 90% of the ship overhaul and repair work accomplished in the United States [8]. The number of shipyards that can compete on a ship order goes from one (for an aircraft carrier) or two (for a nuclear submarine) to a few dozen (theoretical for a small non-combatant). Additionally, many other factors make ship acquisition and the shipbuilding industry unique as compared to other defense acquisitions and industries. (A more complete list of the differences in ship acquisition and other major defense acquisitions is contained in Appendix E.)

The news media is full of reports of problems U.S. Government agencies have with shipbuilding companies. Allegations of overpricing of spare parts or system components, criminal investigations of alleged overcharging and questionable charges to overhead, malfunctioning and nonfunctioning weapon systems, and evidences of atrocious quality control abound. However, it is to the advantage of both U.S. Government agencies and industry that the relationship between them be a good one.

Industry provides important feedback to the ship

acquisition organization and upper level management. This feedback can come in the form of positive feedback like the value engineering or in the form of negative feedback like an industry claim against the U.S. Government. These lessons learned provide the ship acquisition organization valuable information for use on future ship acquisitions.

7.1 Claims

The relationship between the U.S. Government and the Defense Industry is unique as compared to the normal free market. Special arrangements often include:

- Administered prices and profits.
- Unusual risk-sharing.
- Unilateral contract abrogation rights.
- Government shaping the product (vice the free market).

Many of the goals of U.S. Government and defense industry vary greatly. Goals of government include:

- A weapon system is produced/constructed under or on time; under or within budget; and meets all requirements for operability, maintainability and reliability.
- Maintaining a strong industrial base necessary for a strong defense.
- Ensuring that competition is vigorously pursued on each acquisition where it makes sense.

Goals of industry include:

- Using of assets wisely.
- Maximizing profits.

- Acceptable cash flows.
- Good long term health.
- Stability.
- A fair share of the market.
- Technological advancement.

Considering their unique relationship and the many conflicting goals between government and industry, it is not surprising that often an adversarial relationship exists. Add the many disadvantages of ship building such as no or little prototyping, long construction times, industry's heavy reliance on the government for business, etc., and it is easy to see why problems will evolve. These problems often result in court cases or claims. These court cases and claims provide valuable lessons learned to the ship acquisition organization and upper level management.

Government court cases against industry include:

- Recovery of overpayments.
- Recovery of spare parts overpricing.
- Failure to meet specified performance standards.
- Failure to make delivery dates [28].

Industry claims against the government include:

- Delays due to late delivery of government furnished material, equipment or information.
- Disruption of schedule due to design changes.
- Subcontractor problems [35].

An important aspect of claims avoidance programs is the

documentation of significant contract events. The rationale for this process is that adequate documentation is the key to the government's ability to verify, qualify, or refute contractor claims.

To ensure documentation is accomplished the U.S. Navy has an office in NAVSEA which provides assistance and guidance to SUPSHIPS on claims matters. This office compiles statistics on claims from quarterly reports submitted by SUPSHIPS, supplies feedback on lessons learned from prior claims, provides training in claims avoidance, is involved in the processing of claims, and conducts contract management reviews once every 3 years at each SUPSHIP. These reviews include examining actions taken by the SUPSHIPS to avoid claims. SUPSHIP Operations Review Teams from NAVSEA's Industrial and Facilities Management Directorate also look at claims avoidance programs during their SUPSHIP effectiveness reviews, which also are conducted on a 3-year cycle [35].

Historically, when a shipbuilder discovered that it was in a loss position or was approaching such a position, claims would often be made against the government. In the Naval Ship Procurement Process Study of the late 1970's [1], a study team's appraisal of lessons learned from an analysis of the 1970's claims situation showed that the Navy suffers from unrealistic prices in the long run since shipbuilders facing losses on contracts are likely to submit claims [35]. Thus, it is important that ship acquisition organization

appropriately tailor contracts on a case by case basis including limitations and duration in order to achieve a cost-effective agreement in light of the technical risk and other program uncertainties.

7.2 Changes

Industry provides feedback to the ship acquisition organization via engineering change proposals. These engineering change proposals provide a large amount of technical information considering the large number of changes that occur during ship construction. Typically, a destroyer size combatant can have as many as 1,000 changes.

Changes can have numerous causes, such as:

- Concurrent development of weapon systems and ship construction.
- Improvements to systems previously developed.
- Errors/omissions in plans, specifications, and drawings.
- Additional requirements established after contract award [28].

Formal changes modify contracts in writing. They are made only to correct deficiencies or errors in design, meet operational requirements, provide for safety of personnel and equipment, or save money.

A constructive change results from ship acquisition organization action or inaction that causes the shipbuilder to do additional or different work than is required by the

contract [28].

7.3 Other Acquisition Process Involvement

Mutual distrust between government and its contractors impedes the ship acquisition process. The concept that the government can get a better deal when it has an adversarial relationship with industry is wrong, just as wrong as the opposite extreme of mutual blind faith. It is advantageous for both industry and government to proceed on the basis of informed trust. That approach to the acquisition process is based on cooperation, teamwork, and joint planning for the best, while being prepared for the worst.

The Fleet Ballistic Missile program is an outstanding example of how the ship acquisition organization and industry managers, working side-by-side in such an environment, can make a real difference in the final outcome of a program. When President Eisenhower approved this project in 1955, immense technical problems had yet to be overcome. The solid fuel missile did not exist, and knowledge of inertial guidance, ship navigation, and hypersonic aerodynamics was inadequate. Moreover, the United States had not even launched a missile from a submerged submarine. Yet five years later, the USS George Washington left Charleston, South Carolina, on its first operational patrol, armed with 16 nuclear missiles. Much credit for this feat goes to the Navy, which convened the steering task group of key Navy and contractor executives who still meet regularly to apply their joint skills to program

problems [40].

Ships are unique, high cost, often not fully tested complex technology that is at the leading edge of the state of the art. They are often used in remote parts of the world not readily available to contractor service representatives. Industry involvement in the ship acquisition process must start early in the design process and carry on through construction and testing.

Some of the possible modes of participation of U.S. industry in ship acquisition process include:

- R&D (see Chapter 6)
- Design
- Contractor
- Testing

Hiring shipbuilders to critique the on going design is frequently employed, as is farming out the design to all interested shipyards for a free review. Either of these methods help remove some of the ambiguity out of the specifications. Additionally, design comments also facilitate the shipbuilders to generate a more realistic price proposal. A collocated design team where shipbuilders and ship acquisition personnel work on design together is another method where industry provides design feedback to the ship acquisition organization.

Once construction has started, cost and schedule performance is monitored by the ship acquisition organization.

Its responsibilities include reviewing the contractor's management and operations controls to determine whether the direct and indirect costs charged to government contracts are reasonable, allocable and allowable. Additionally, contractor reports and briefings are given to the government on a periodic basis.

Testing coordination between the contractor and government is essential. Usually contractor testing precedes government testing. Government observation of contractor testing is very helpful and provides lessons learned on future government tests.

7.4 Industry Organizations

Industry organizations provide lessons learned on the ship acquisition process via reports they publish, symposia, seminars, or direct contact with the ship acquisition organization.

An example industry organization is the Shipbuilders' Council of America.

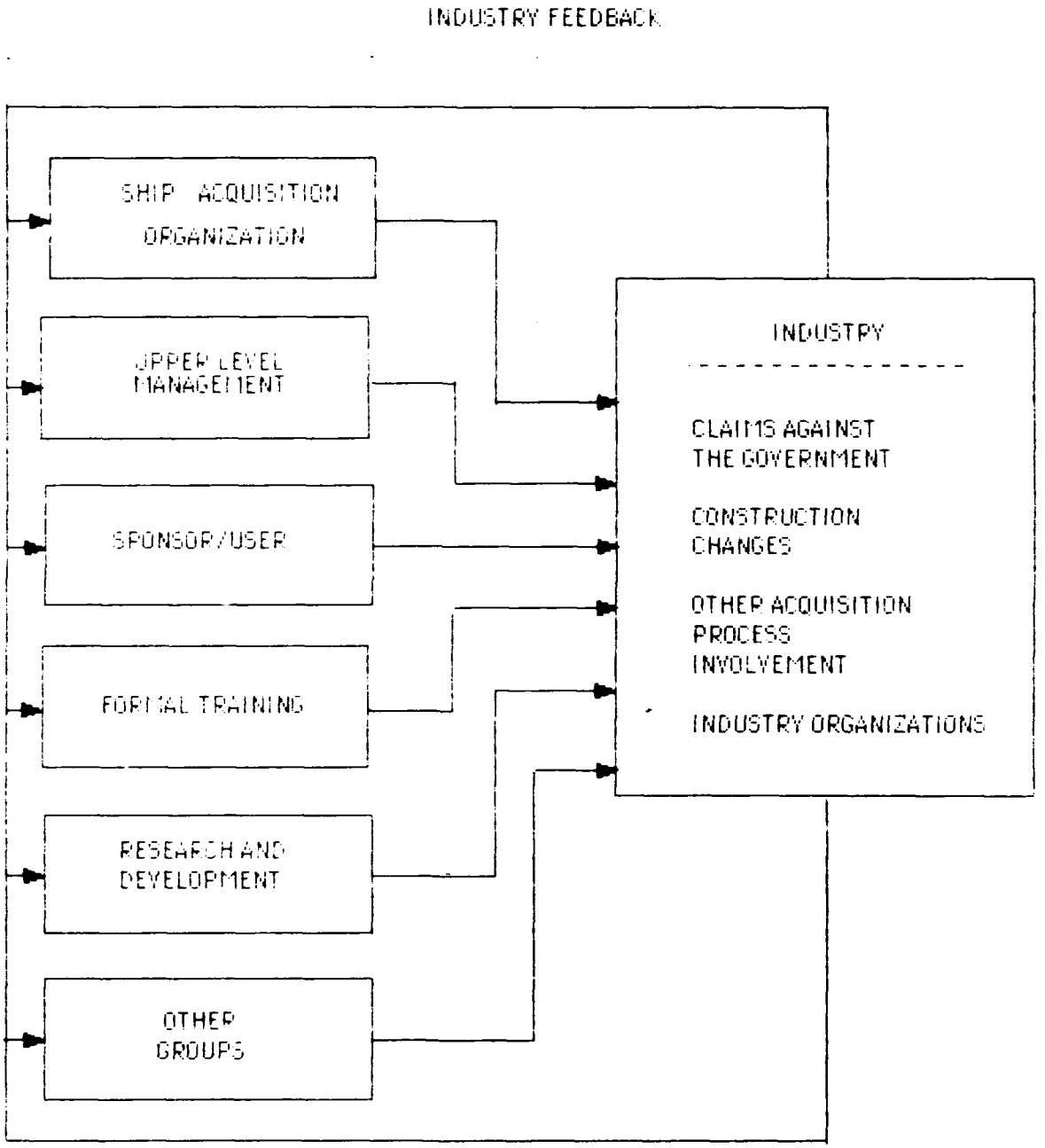
INDUSTRY FEEDBACK
SHIP ACQUISITION ORGANIZATION
UPPER LEVEL MANAGEMENT
SPONSOR/USER
FORMAL TRAINING
RESEARCH AND DEVELOPMENT
OTHER GROUPS
INDUSTRY
CLAIMS AGAINST THE GOVERNMENT
CONSTRUCTION CHANGES
OTHER ACQUISITION PROCESS INVOLVEMENT
INDUSTRY ORGANIZATIONS

FIGURE (7)

CHAPTER 8

OTHER FEEDBACK

Other feedback is defined as feedback which does not fit into any of the other groups of feedback.

8.1 External Studies

Since annual ship acquisition purchases by U.S. Government agencies run into billions of dollars, much attention and emphasis is given by numerous organizations external to the ship acquisition process. These external organizations conduct studies, analyze and write papers on acquisition process. Some of the long-standing concerns addressed include: inadequate competition, program stability, contract types, profit policy, waste, fraud, abuse, industrial base, risk assessment and others. These studies provide feedback to the ship acquisition community by bringing forth errors, identifying problems, recommending changes and even noting past and present acquisition policies and actions which they consider beneficial.

The following are examples of some of the publications in which these studies can be found:

(a) Defense Management Journal (DMJ) (periodical) - Countless articles on defense management including ship acquisition.

Example DMJ Article Abstract related to ship acquisition

feedback:

Author: Fisher, Andrea L.

Title: "DOD Needs a Professional Acquisition Corps"

Date: 3rd Qtr, 1986

Abstract: This article discusses the need for a professional acquisition corps within DOD. A case is made for increasing the emphasis on acquisition as a profession within DOD. The author proposes a model for establishing and maintaining an elite corps of acquisition professionals [24].

(b) DSMC Publications - DSMC provides numerous publications with information on the acquisition community.

Example DSMC publications:

The "Acquisition Strategy Guide" - provides a wealth of information for program manager's concerning the development and execution of an acquisition strategy.

The bi-monthly periodical "Program Manager" is one vehicle for the transmission of information on policies, trends, events, and current thinking affecting program management and defense systems acquisition [8].

(c) Department of the Navy - There are numerous acquisition studies and reports published by the Department of the Navy external to the ship acquisition organization. Many of these reports are applicable to ship acquisition.

Two examples of Department of the Navy publications are:

"Best Practices - How to Avoid Surprises in the World's Most Complicated Technical Process - The Transition from Development to Production." - NAVSO P-6071, March 1986.- This manual attempts to enhance the enlightenment of both government and industry by identifying specific practices in current use and their potentially adverse consequences in terms of cost, schedule, performance and readiness. It describes the proven best practices which avoid or alleviate these consequences, and provides background information to understand their rationale [10].

"Naval Ship Procurement Process Study," July 1978. - A very extensive study on the Navy's ship acquisition process. Its goal was to examine and validate U.S. Navy ship acquisition policies and procedures and to offer suggestions regarding changes to selected policies with a view to maximum curtailment of future shipbuilder claims. The one and one-half years of research included interviews with personnel in industry and a number of Navy personnel. Although the report is quite old, and many changes have taken place since it was completed, many of the findings, conclusions, and recommendations are still valid today [1].

(d) Intercollegiate Case Clearing House (ICCH) - Case studies on a wide range of topics including ship acquisition.

Example ICCH article abstract related to ship acquisition feedback:

Author: Evered, Roger

Title: "Case Study - Cost Estimating for the Guided Missile Frigate (FFG - 7)"

Date: 1980

Abstract: This case study discusses the role of cost estimating in the Navy's FFG-7 program. The issues of design-to-cost, life-cycle costs, and fly-before-buy are also discussed. The case includes a history of cost estimating of the FFG-7 program and problems encountered [24].

(e) Naval Engineers Journal (NEJ) (periodical) - Many articles on a wide variety of naval related topics such as scientific and technical data but also information related to ship acquisition, design, and management.

Example - NEJ Article Abstract related to ship acquisition feedback:

Author(s): Baker, Capt. Robert; Reed, Cdr. Michael

Title: "Twenty Steps to a Better Fleet: INSURV Review of Surface Ship Design Engineering"

Abstract: This article reports on the Navy's Board of Inspection Survey's (INSURV) findings regarding fleet characteristics resulting from past Navy ship design efforts. Twenty engineering principles have been identified in six different areas. The paper emphasizes: standardization of GENSPECS, the importance of operational reliability, and continued attention to ship survivability [24].

(f) Rand Corporation Studies - The more than 25 years of research conducted at the Rand Corporation on military research development and procurement provide a unique analytical perspective.

See Michael Rich, Edmund Dews and C.L. Batton. Improving the Military Acquisition Process. Lessons Learned from Rand Research, Report R-3373-AF/RC (Santa Monica, CA: Rand Corporation, February 1986); The preface of this report lists the most notable of the Rand Studies.

(g) Society of Naval Architects and Marine Engineers (SNAME) (periodical) - Numerous articles on general acquisition management, ship production, contract claims, etc.

Example SNAME Article Abstract related to ship acquisition feedback:

Author: Bachko, Nicholas

Title: Towards Improved Shipbuilding Contracts in the 1980's."

Date: April 1978

Abstract: This paper discusses elements of commercial shipbuilding contracts, including escalation clauses and contract claims. The author outlines contract financial pressures, the impact of changes and trends in shipbuilding contracts. Some recommendations to improve the pro forma ship construction contract are also given [24].

Other non-government organizations that provide feedback to the ship acquisition organization are the American Society

of Naval Engineers (ASNE), American Logistics Association (ALA), Society of Logistics Engineers (SOLE), and American Society of Military Comptrollers (ASMC) plus trade associations such as the Shipbuilders Council of America. These organizations provide invaluable advice concerning the feasibility of the Project Manager's acquisition strategy and technical approach.

A more complete list of ship acquisition and ship acquisition feedback articles can be found in the reference section of this study and the annotated bibliography of reference 24.

8.2 Special External Studies

Three types of external studies are considered to be special in that they are direct reports to the President of the United States, Congress of the United States and Departments of the United States Government. These reports are President's Blue Ribbon Commission on Defense Management, General Accounting Office and Inspector General Reports. Feedback from these reports deserves particular attention since they can have a direct impact on support and funding for acquisition programs or future programs.

(a) The Presidents Blue Ribbon Commission on Defense Management

These studies by defense management experts assess the effectiveness of U.S. defense management. As one might expect, particular attention is given to defense acquisition

management, organization and procedures.

Example "Presidents Blue Ribbon Commission on Defense Management" Report abstract:

Title: "A Formula for Action - A Report to the President on Defense Acquisition"

Abstract: This report assesses the effectiveness of the U.S. defense acquisition system. A comparison is presented between defense acquisition and other government and private systems. A model is identified, based on other successful acquisition efforts. Key recommendations address: acquisition streamlining; cost reduction through technology; program stability; competition; the use of commercial products; and the quality of acquisition personnel [24].

(b) General Accounting Office (GAO)

The GAO is the means by which Congress obtains information on any number of government programs including U.S. Navy and Coast Guard Ship Acquisition programs.

Below are three example GAO report abstracts relating to ship acquisition feedback:

Title: Acquisition - DOD's Defense Acquisition Improvement Program (NSIAD-86-148)

Date: July 1986

Abstract: This report reviews DOD's implementation of the Defense Acquisition Improvement Program initiatives. Areas investigated include: program stability; multiyear

contracts; economic production rates; and competition. The report concludes that although the initiatives have not fully achieved their intended results, there have been improvements in the acquisition process [24].

Title: Information on the Coast Guard's Polar-Class Icebreaker Ship Construction Program and Operational Testing (CED-76-135)

Date: August 1986

Abstract: This report updates a GAO staff study of June 1975 concerning the Coast Guard's procurement of two polar-class icebreakers. The report discusses: project costs; delivery schedule; contractor performance on the POLAR SEA; the status of contractor claims against the govenrment; and status of contractor claims under the self-insurance clause of the contract [24].

(c) Inspector General (IG)

The office of the Inspector General can be expected to audit a ship acquisition project at least once during its life and will probably do so several times.

8.3 News Media

News media has a large interest in investigating and reporting on how efficiently U.S. Government agencies invest huge amounts of government money in ship acquisitions. This reporting often has been full of accounts of conflicts of interest, cost overruns, spare parts overpricing, contractor

fraud, and failures to meet performance goals.

Although many of these reports are exaggerated or based on poor information, they give the public, Congress and even the military users of the equipment a negative view of ship acquisition management.

Newspapers, radio and television feedback can have an impact on the support and funding of acquisition programs or future programs. Thus, close observation of this feedback is considered essential.

An example of news media feedback is a Time magazine article of February 1, 1988, "Mission: Just About Impossible - the Pentagon's New Procurement Czar Looks for Ways to Save."

8.4 Symposia/Seminars

Symposia/seminars provide a medium in which a dynamic forum of dialogue with key professionals working in or with the acquisition community can take place. Key professionals in attendance usually include senior officials, program managers, staff officers, researchers from the Department of Defense and Department of Transportation, federal civilian agencies, academia, and industry. Ideas, experiences and views are exchanged and discussed.

Research papers on problem areas in the acquisition community and how these problem areas are/or might be solved are combined into one publication for distribution throughout the acquisition community. This allows other acquisition personnel who cannot attend the symposium seminar the

opportunity to obtain acquisition information.

An example symposium is the Federal Acquisition Research Symposium sponsored by the Department of Defense and the General Services Administration. This symposium is held annually [7].

8.5 Academia

Since U.S. Government agencies acquisitions make up a large portion of U.S. business, colleges and universities conduct numerous studies and much research on these acquisitions. U.S. Government agencies recognize the usefulness of these studies and research and often sponsor these projects.

This study is an example of an academia study sponsored by a U.S. Government Agency.

8.6 Program Manager's Support System

The Program Manager's Support System (PMSS) is currently under development at DSMC. The purpose of the PMSS is to provide a management tool for managers in a program management office to assist them in their decision-making process and to help them execute their project in a more effective and efficient manner.

The PMSS is intended to support the defense Program Manager and his/her first echelon staff; for example, the Chief Engineer, the Plans and Programs Officer, the Configuration Manager, the Integrated Logistics Support

Manager, etc. The PMSS also can be utilized by other managers in the acquisition community, for example, by headquarters level executives, program management officers in major projects, and field activity managers.

The PMSS will:

- be an integrated software system operable on various hardware systems;
- Provide capability to 1) integrate program management functional areas of responsibility, 2) generate program alternatives and impacts caused by various management actions and technical activities, 3) assess these impacts on the program management responsibilities and 4) utilize other decision-making support methodologies.
- Provide educational tools to facilitate the teaching of program management functions at educational institutions involved with defense systems acquisition program management.

The PMSS consists of two major parts, functional modules and the integrated PMSS. Functional modules are software programs that can be used as stand-alone programs to assist in program management areas of responsibility such as planning, acquisition strategy development, program management plan generation, cost estimating, scheduling, program objectives memorandum development, budget generation, budget execution monitoring, financial management, systems engineering, production planning, integrated logistics support planning,

test issues identification, Test and Evaluation Master Plan generation, configuration management, document generation, document evaluation and monitoring, program office staffing and organization, etc. These modules support specific functions of program management operations.

The integrated PMSS will provide a capability called Program Overview, which shows in a color-coded (green, yellow, red) mode, the overall status of the program by the program hierarchical information categories. This provides the program manager an "instant" visual picture of his/her program status and quickly pinpoints program areas that require further management attention. The integrated PMSS will provide capability for a program manager to tackle unstructured problems and address "What if...?" and "Should I...?" questions. The integrated PMSS will integrate the functions of the functional modules so that a program manager can look across his/her program and address such questions as "What is the impact on my program if I get a 10% cut?" or "What is the impact on my program if the technology I need slips six months?", or "What is the impact on my program if there is a schedule delay?", etc. The integrated PMSS looks across and within all functional areas of responsibility to assess the impact on the program and help the program manager develop alternatives for recovery.

The PMSS also will provide executive support aids such as briefing presentation aids, electronic mail, calendaring

capability and telephone dialers. It also will include support capabilities such as word processing, spreadsheets, data-base managment and decision tools.

The PMSS is not a managment information system, nor is it the decision-maker. It is a manager's tool to assist the program manager in his/her decision making process. the PMSS will permit the integration of the user's experience, judgement and intuition to allow the user to evaluate available alternatives and ultimately, aid the user to make better, more timely decisions [9].

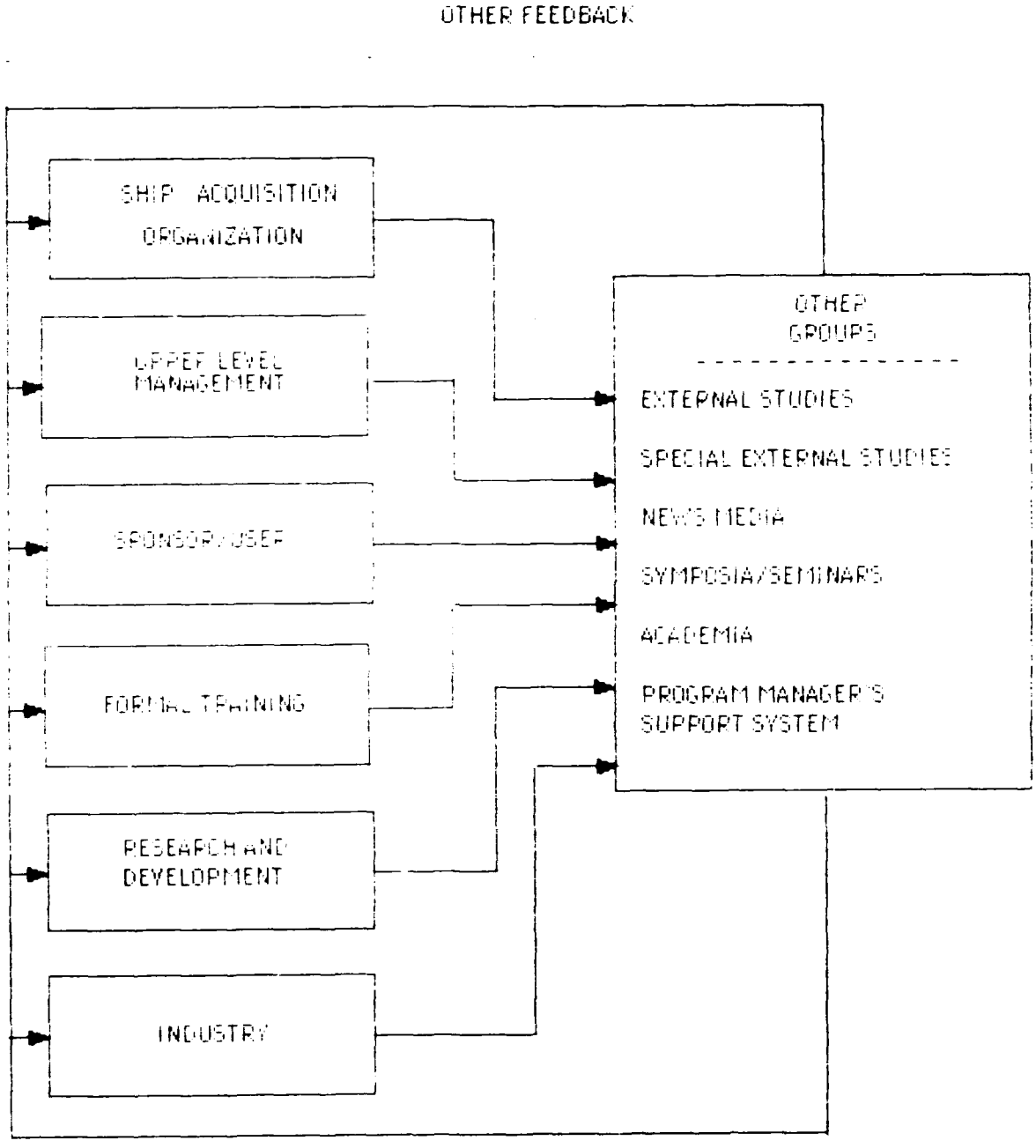
OTHER FEEDBACK
SHIP ACQUISITION ORGANIZATION
UPPER LEVEL MANAGEMENT
SPONSOR/USER
FORMAL TRAINING
RESEARCH AND DEVELOPMENT
INDUSTRY
OTHER GROUPS
EXTERNAL STUDIES
SPECIAL EXTERNAL STUDIES
NEWS MEDIA
SYMPOSIA/SEMINARS
ACADEMIA
PROGRAM MANAGER'S SUPPORT SYSTEM

FIGURE (3)

CHAPTER 9

CONCLUSIONS

This chapter presents a brief summary of the report, a comparison of Navy and Coast Guard Acquisition differences, key study findings, recommendations, and areas considered for future study.

9.1 Summary

The objective of this report is to aid U.S. Government agencies in making decisions regarding lessons learned mechanisms with feedback loops. With the tightening of budgets, it is important that ship acquisition organizations learn from their mistakes. The intention is to identify the key lessons learned mechanisms with feedback loops required for successful ship acquisition (See Section 9.3). The scope of the study is generic in nature, making it applicable to both the U.S. Coast Guard and U.S. Navy. The study does not dwell on specific directives, regulations, or terminology. An additional objective is to provide teaching materials in this subject area for use with U.S. Coast Guard and Navy officers at postgraduate training at M.I.T. (and elsewhere).

For any successful changes in present lessons learned collection procedures to be accomplished the following is required:

- Top level commitment.
- A certain amount of quality resources (manpower and funds).
- Continuity of effort (cannot start and stop and then start again).
- Apply case by case application of procedures (Coast Guard's small size may prevent incorporation of some ideas).

The ship acquisition organization is the key organization in the ship acquisition process. Lessons learned in the ship acquisition process and on ships acquired must return to the ship acquisition organization. The ship acquisition organization must use these lessons learned to improve the ship acquisition process and the ships they acquire. Chapters 2 through 8 identify the various feedback loops in which lessons learned are returned to the ship acquisition organization. A summary of the feedback loops discussed in Chapters 2 through 8 is provided below. Note that many of the feedback loops do not go directly to the ship acquisition organization, but first feedback to another organization which provides feedback to the ship acquisition organization. An example of this is that reports from sponsors/users often go to upper level management prior to reaching the ship acquisition organization.

Internal feedback loops within the ship acquisition organization comes from:

- Matrix support groups
- Reviews and boards
- Internal studies
- Informal means
- The acquisition guide

Upper level management provides feedback to the ship acquisition organization via:

- Regulations, directives and instructions
- Reviews and boards
- Streamlining initiatives
- Direct involvement.

Sponsors/users provide feedback to the ship acquisition organization via:

- Reports
- Operational testing and evaluations
- Inspections and reviews
- Informal feedback

Formal training organizations provide feedback to the ship acquisition organization via:

- Schools
- Career paths
- Training methods

Research and development organizations provide feedback to the ship acquisition organization via:

- Research and development efforts
- Design efforts

- Developmental testing and evaluations

Industry provides feedback to the ship acquisition organization via:

- Claims against the government
- Construction changes
- Other acquisition process involvement
- Industry organizations

Other groups provide feedback to the ship acquisition organization via:

- External studies
- Special external studies
- News media
- Symposia/seminars
- Academia
- Program Manager's Support System

9.2 Differences Between the Navy and the Coast Guard

The Navy's and Coast Guard's ship acquisition organizations are the two major ship acquisition organizations of the U.S. Government. There are some significant differences between these two ship acquisition organizations. They include:

- The Navy's ship acquisition organization is much larger.
- Support groups of the Navy's ship acquisition process consist of much larger organizations. The technical resources that NAVSEA has available is much greater than

their Coast Guard counterpart.

- The Navy's ship acquisition organization has a large civilian staff which provides stability to the organization burdened with numerous military transfers.
- The Navy's military and civilian personnel are able to have career paths directly related to the ship acquisition process. The Coast Guard, with limited personnel resources, is unable to have a more structured ship acquisition career path.
- The DOD and DOT organizations, regulations, instructions, directives, and reviews are considerably different.
- The Navy acquires many more ships than the Coast Guard.
- Data requirements and reports are more extensive in the Navy's ship acquisition process. Coast Guard requirements are fewer and more flexible.
- The Coast Guard holds less central control over field organizations.
- The Coast Guard ship acquisition organization has recently developed and has few personnel with a lot of experience (relative to the Navy).
- The sponsor/user of the Navy controls the acquisition money. In the Coast Guard, the Office of Acquisition is the money controller.

The Coast Guard can benefit from judicious use of Navy expertise in ship acquisition. Such activities can range from informal contact with experienced Navy personnel or a project

to formal involvement of the Navy in a Coast Guard ship acquisition.

9.3 Key Feedback Points / Recommendations

The first major weapon system for the U.S. Government started with the authorization for the procurement of six large frigates by the U.S. War Department in 1794. Seventeen months later six keels were laid but only three of the frigates were built due to schedule slippage and cost overruns [8]. Similar problems with ship acquisitions exist today. A key to successful ship acquisition is to solicit and utilize the lessons learned of past programs on present and future programs.

A number of key feedback points are apparent throughout this study. They focus on the areas where lessons learned are considered to have the greatest influence on the ship acquisition process. This section identifies the key lessons learned mechanisms with feedback loops required for successful ship acquisition. Additionally, comments are made concerning present or possible use by current ship acquisition organizations. The discussion below follows the sequence of Chapters 2 through 8.

Internal feedback within the ship acquisition organization (Chapter 2):

The operational world does not remain static. Systems must be upgraded. New systems are brought on-line to meet changing roles and missions. Such developments must be

anticipated, planned for, and incorporated into a developing system. It is inaccurate to expect a system to meet operational expectations when it goes on-line if no provisions are made for the dynamics of the situation.

A major consideration in the ship acquisition process is to identify cost-capability tradeoffs with a view toward elimination of those performance capabilities having marginal return on investment. The need for review and assessment of incremental improvements in operational performance as a function of additional resource investment, in terms of non-recurring development and recurring life cycle costs, should continue throughout the entire life of of the program. The ship acquisition organization is the leading advocate for conducting this continuing analysis and evaluation for ship acquisitions.

Comment -- The ship acquisition organization is a focal point for many of the lessons learned mechanisms with returning feedback loops. The ship acquisition organization must use these lessons learned to improve the ship acquisition process and the ships they acquire. Specifically, they must identify and correct recurring deficiencies and improve on existing systems.

It is best to keep formal and informal feedback loops to the ship acquisitions organization simple and direct. An example is the technical organization of the ship acquisition organization. The technical organization requires inputs from

the sponsor/user on any problems with current shipboard systems. The technical organization uses these lessons learned to improve shipboard systems and in turn passes information to the design organization to incorporate into new ship designs. The flow of information from the sponsor/user to the technical organization and from the technical organization to the design organization must be easily accomplished through simple and direct communications.

An excellent lesson learned mechanism with feedback loop is the acquisition guide. NAVAIR procedure of collecting and periodically disseminating acquisition lessons learned. Although presently not used by any ship acquisition organization, the acquisition guide is a low cost, small manpower operation that results in a wealth of information on the acquisition process. The NAVAIR acquisition guide is currently run by one person as a collateral duty. However, benefits are received by many throughout the NAVAIR organization. The Coast Guard is currently developing procedures to collect and disseminate lessons learned related to ship acquisition.

Upper level management feedback (Chapter 3):

The ship acquisition organization must give upper level management special attention. Decisions made by the upper level management can directly affect any ship acquisition program. Ship acquisition organizations must continuously evaluate the effects of any upper level management policy

changes.

Comment -- Both the Navy and Coast Guard ship acquisition organizations presently give upper level management adequate attention.

Sponsor/User feedback (Chapter 4):

Perhaps the greatest values in the review process are getting the project back on track, providing management with renewed confidence, and assessing the health of the project. Inspections, reviews and boards are outstanding methods of obtaining lessons learned. Inspections, reviews and boards are conducted to provide objective progress measurement and feedback on the ship acquisition process. Classic engineering requires feedback from the operator to the responsible engineer regarding the performance of the equipment or system in question.

Comments -- Inspections, reviews and boards internal to the ship acquisition are very useful. However, inspections, reviews, and boards separate from the ship acquisition organization provide an impartial view often needed to critique a program. The Navy's Board of Inspection and Survey does an outstanding job of inspecting as an organization separate from the acquisition progress. The Coast Gurad has no Board of Inspection and Survey equivalent.

Formal training feedback (Chapter 5):

A major method to get past lessons learned and new innovative ideas into ship acquisition process is through

schools and use of appropriate teaching materials. Defense acquisition will improve only in direct relation to the availability and application of sufficient numbers of well-qualified professional personnel.

Comment -- Use of ship acquisition personnel after successful ship acquisition tours as instructors of new ship acquisition personnel could be very beneficial. This instruction would be separate from normal defense acquisition training due to its specialization.

Additionally, appropriate training materials are necessary. The majority of the acquisition teaching materials and courses are aimed at the acquisition of objects that can be mass-produced (e.g. missiles, planes). Courses and case studies with a ship acquisition view are needed. Interactive computer programs may also prove valuable.

Research and development feedback (Chapter 6):

Testing and evaluations provide key feedback on the ability of the ship to meet desired goals. Upper level management and the ship acquisition organization use results of testing and evaluations to help make decisions on commitment of additional resources to a program or to advance it from one acquisition phase to another.

Comments -- A key to obtaining useful information from testing and evaluations is ensuring the tests are conducted under realistic environmental conditions. Current tests are often not tested under realistic conditions. Thus, upper

level management and ship acquisitions organizations decisions are made using incorrect data.

Industry feedback (Chapter 7):

Industry provides important feedback to the ship acquisition organization. Research and development, design, technical, financial, integrated logistics and construction matrix support groups all receive important lessons learned from their interaction with industry.

Comments -- The key to maximum use of industry feedback is keeping the information flowing freely. Thus, each matrix support group needs to establish contact points with industry. To ensure future use of lessons learned from industry requires an organizational effort by each matrix support group. An effort already in use is the NAVSEA office which compiles statistics on claims, provides feedback on lessons learned from prior claims and conducts contract management reviews once every three years at each SUPSHIP. Industry involvement in the ship design process has demonstrated useful results. Similar efforts by other matrix support groups would also be beneficial.

Other feedback (Chapter 8):

The Naval Ship Procurement Process Study of July 1978 [1] is an example of an extensive study that addresses the avoidance of claims against the Navy by private U.S. shipbuilders. Do the ship acquisition personnel of today benefit from these past studies on ship acquisition?

There are numerous amounts of lessons learned information from external studies, new media, sympcsia/seminars and academia. The problem is the amount of information is too large and broad based. Most ship acquisition organization professionals do not have the time required to review this enormous amount of feedback.

Comment -- The ship acquisition organization needs an overall coordinator who will screen, condense and route this large amount of feedback to the personnel in the ship acquisition organization who need it. Technical information goes to the technical people, contract information goes to the contract division, etc. This information coordinator would have to have a good understanding of the basic ship acquisition process. A system similar to the Program Manager's Support System to organize the information for future ship acquisition organization personnel would also be useful.

Some of the recommendations made throughout this section would stretch the current personnel limits of the already under-staffed ship acquisitions of the Navy and Coast Guard. However, the benefits of some of these recommendations may well be worth the cost. An example is the use of successful ship acquisition personnel is the training of new ship acquisition personnel. Presently, no extensive formal training is accomplished by former successful ship acquisition personnel except on-the-job training. Can you imagine pilot

training being accomplished without the use of successful pilots? Although costly, the use of successful ship acquisition personnel in the training of new ship acquisition personnel could easily pay for itself over time. Possibly, the use of successful ship acquisition personnel could be accomplished by part-time assignments in these training efforts.

9.4 Future Studies

The focus of this study is to help U.S. Government agencies in identifying and developing ship acquisition lesson learned mechanisms with feedback loops. A generic approach was taken so that conclusions would be applicable to both the Navy and the Coast Guard.

Throughout this study, numerous topics for future studies were discovered. They include:

- Expand the current focus to take a more detailed look at the acquisition of aircraft and other major weapon systems by U.S. Government agencies.
- Look at how success is measured in ship acquisition programs.
- Examine the research and development efforts of ship acquisitions programs from before program initiation through ship acceptance.
- Evaluate claims by industry against U.S. Government ship acquisition programs.

- Investigate the success of streamlining efforts in the ship acquisition process.
- Develop more case studies of actual ship acquisitions to use in training efforts.

REFERENCES

1. Assistant Secretary of the Navy Manpower, Reserve Affairs and Logistics, July 1978. Navy Ship Procurement Process Study. Department of the Navy.

2. Augustine, N.R. Augustine's Laws and Major System Development Programs. Defense Systems Management Review.

3. Capt. Baker, R.C., Cdr. Reed, M.R., March 1985. Twenty steps to a Better Fleet: Inserv Review of Surface Ship Design Engineering. Naval Engineers Journal.

4. Biery, F.P. Are Other Acquisition Strategies Superior to the P(3)I Approach? Defense Management Journal.

5. Carpenter, J.D., Finne, P.C., December 1972. Navy Ship Procurement. Naval Engineers Journal.

6. Corporate Planning Division (SEA 905), June 1987. Strategic Plan for the Naval Sea Systems Command. Naval Sea Systems Command.

7. Defense Systems Management College. Proceedings 1985 - Federal Acquisition Research Symposium. Defense System Management College.

8. Defense Systems Management College, October 1985. The Program Manager's Notebook. Defense Systems Management College.

9. Defense Systems Management College, January 1987. The Program Manager's Support System. Defense Systems Management College.

10. Department of the Navy, March 1986. Best Practices - How to Avoid Surprises in the World's Most Complicated Technical Process - The Transition from Development to Production. Department of the Navy.

11. LCdr. Ertner, J.D., Cdr. Cassedy, W.At.; May 1984. A Comparison of Naval Ship Design and Acquisition Procedures in U.S. and Canada. Naval Engineers Journal.

12. Fischer, A.L., 1986. DOD Needs a Professional Acquisition Corps. Defense Management Journal, third quarter.

13. Headquarters Naval Material Command, 1984. Navy Program Manager's Guide. Naval Material Command.

14. Index Group, Inc. and Transportation Systems Center, 1987. Critical Success Factors Alignment Working Session Summary of Results. United States Coast Guard Office of Acquisition (G-A).

15. Moritz, S., Horrochs, B., June 1987. The Coast Guard's Acquisition of Island Class Patrol Boats. George Washington University Paper.

16. Naval Air Systems Command, 1987. NAVAIR Acquisition Guide. Naval Air Systmes Command.

17. NAVSEA Institute, 1987. Ship Acquisition on Management For Engineers Course Notes. NAVSEA Insitute.

18. NAVSEA 05B. The Year 2000 Plan. Naval Sea Systems Command.

19. Naval Sea Systems Command (SEA05), Sep. 1985. Ship Engineering in NAVSEA 05. Naval Sea Systems Command.

20. Naval Sea Systems Command, January 1984. Ship Acquisition Management Responsibilities Milestone Manual (SAMM) - Auxiliary and Special Mission Ship Acquisition Project Office (PMS-383). Naval Sea Systems Command.

21. Naval Sea Systems Command (SEA 901), July 1986. Surface Ship Acquisiton Process. Naval Sea Systems Command.

22. Naval Sea Systems Command, Oct. 87. Acquisition Review. Naval Sea Systems Command.

23. Rich, M.D., Dews, E., 1987. Improving Defense Acquisition - A Strategy to Meet the Challenge. Defense Management Journal, first quarter.

24. Strong, S.C., 1987. An Approach to Ship Acquisition Strategy Development for U.S. Government Agencies. Ocean Engineering Thesis, MIT.

25. Capt. Tibbits, B.F., USN, Gale, P.A., Aug. 1986. The Naval Ship Design/Production Interface. Society of Naval Architects and Marine Engineers Journal of Ship Production.

26. United States General Accounting Office, 1976. Information on the Coast Guard's Polar-Class Ice Breaker Ship Construction Program and Operational Testing. United States General Accounting Office.

27. United States General Accounting Office, Apr. 1978. The Navy's Trident Fleet - Some Success but Several Major

Problems. United States General Accounting Office.

28. United States General Accounting Office, Jan. 1980. Better Navy Management of Shipbuilding Contracts Could Save Millions of Dollars. United States General Accounting Office.

29. United States General Accounting Office, Apr. 1981. Need to Extend the Period of Availability for Navy Shipbuilding Funds. United States General Accounting Office.

30. United States General Accounting Office, Apr. 1981. Need to Extend tne Period of Availability for Navy Shipbuilding Funds. United States General Accounting Office.

31. United States General Accounting Office, December 1985. Navy's Plan to Second Source Ageis Shipyard Integration and Testing. United States General Accounting Office.

32. United States General Accounting Office, June 1986. Allegations About Trident Submarine Program Matters. United States General Accounting Office.

33. United States General Accounting Office, July 1986. DOD's Defense Acquisition Improvement Program: A Status Report. United States General Accounting Office.

34. United States General Accounting Office, Aug. 1986. Case Study of the Navy DDG-51 Guided Missile Destroyer Program. United States General Accounting Office.

35. United States General Accounting Office, Aug. 1986. Navy Contracting - Cost Overruns and Claims Potential on Navy Shipbuilding Contracts. United States General Accounting Office.

36. United States General Accounting Office, Aug. 1986. Case Study of the Navy Minesweeper Hunter Program. United States General Accounting Office.

37. United States General Accounting Office, Feb. 1987. The B-1B Aircraft Program. United States General Accounting Office.

38. United States General Accounting Office, May 1987. Fiscal Year 1986 Contract Award for Construction of SSN 688 Submarines. United States General Accounting Office.

39. United States General Accounting Office, June 1987. Strategic Forces - Supportability, Maintainability, and Readiness of the B-1B Bomber. United States General Accounting Office.

40. Wendit, R.L. Practical Implications Acquisition Policy Reform. Defense Management Journal.

41. Colonel Woody, J.R., USAF, 1982. DOD Procurement Policy: The Effect on Aerospace Financial Risk. Defense Management Journal, third quarter.

APPENDIX A

ACQUISITION PROFESSIONALS INTERVIEWED

Department of the Navy

Capt. C. Duff, USN

Capt. Kaufman, USN

Capt. D. Klinkhammer, USN

Capt. Percival, USN

Capt. B. Tibbits, USN

Cdr. J. Conway, USN

Cdr. W. Rodger, USN

LCdr. Sullivan, USN

Cdr. D. Tidball, USN

Mr. T. Dewland

Mr. D. Forrest

Mr. G. Hoffman

Mr. J. Hope

Mr. R. Kiss

Mr. A. Knobler

Mr. A. Lathers

Mr. B. McAnich

Mr. J. McGinn

Mr. J. McInnis

Mr. E. Shoults

Mr. W. Tarbell

Mr. L. Tilbert

Ms. S. Wagner

Defense Systems Management College

LCol. J. Armstrong, USAF

Maj. Reuther, USA

Dr. F. Frisch

Mr. B. Rudwick

Mr. J. Sheldon

Department of Transportation

Capt. J. Maka, USCG

Capt. B. Miller, USCG

Capt. Schmidt, USCG

Capt. Swartz, USCG

Capt. Snyder, USCG

Cdr. Jasman

Mr. J. Leotta

Lt. J. Tuttle

Industry

Mr. E. Mortimer

Other

Mr. J. Leader, Industrial War College

APPENDIX B

LIST OF ACRONYMS

AEDO	Aeronautical Engineering Duty Officer
AP	Acquisition Plan
ARB	Acquisition Review Board
CDR	Contract Design Report
CE	Concept Exploration
CICA	Competition in Contracting Act of 1984
CNO	Chief of Naval Operations
COR	Circular of Requirements
DAB	Defense Acquisition Board
DAR	Defense Acquisition Regulations
DOD	Department of Defense
DOP	Development Options Paper
DOT	Department of Transportation
DSARC	Defense Systems Acquisition Review Council (JRMB)
DSMC	Defense Systems Management College
D&V	Demonstration and Validation
FAR	Federal Acquisition Regulations
FSD	Full-Scale Development
GAO	General Accounting Office

GFE	Government Furnished Equipment
GFI	Government Furnished Information
GFM	Government Furnished Material
IG	Inspector General
JMSNS	Justification for Major System New Start
JRMB	Joint Requirements and Management Board
MSH	Mine Sweeper Hunter
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NDCP	Navy Decision Coordination Paper
NPDM	Navy Program Decision Meeting
OJT	On-the-Job Training
OMB	Office of Management and Budget
ONR	Office of Naval Research
OPNAV	Office of the Chief of Naval Operations
OR	Operational Requirements
PDR	Preliminary Design Review
P&D	Production and Deployment
PM	Program/Project Manager
PMSS	Program Manager's Support System
PPBS	Planning, Programming and Budgeting System
R&D	Research and Development

SCIB	Ships Characteristics and Improvement Board
SECNAV	Secretary of the Navy
SHAPM	Ship Acquisition Project Manager
T&E	Test and Evaluation
TOR	Tentative Operational Requirement
TLR	Top Level Requirements
TSARC	Transportation Systems Acquisition Review Council
USAF	United States Air Force
USA	United States Army
USCG	United States Coast Guard
USN	United States Navy

APPENDIX C

LIST OF PERTINENT DIRECTIVES

This Appendix contains a list of pertinent DOD and Navy directives.

DOCUMENT	TITLE	DATE(D.M.Y)
DOD		
DOD DIR 1130.2	Management and Control of Engineering and Technical Services	26.01.83
DOD DIR 4000.26	Post Production Support	19.08.86
DOD DIR 4105.62	Selection of Contractual Services for Major Defense Systems	6.01.76
DOD DIR 4105.68	Defense Acquisition Research	30.09.85
DOD DIR 4151.1	Use of Contractor and Govt Resources for Management of Material	15.08.82
DOD INST 4200.15	Manufacturing Technology Program	24.05.85
DOD INST 4245.3	Design to Cost	6.04.83
DOD INST 4245.4	Acquisition of Nuclear-Survivable Systems	2.09.83
DOD INST 4245.6	Defense Production Management	19.01.84

DOD INST 4245.9	Competitive Acquisition	17.08.84
DOD DIR 5000.1	Major System Acquisition	12.03.86
DOD DIR 5000.2	Major System Acquisition Procedures	12.03.86
DOD DIR 5000.3	Test and Evaluation	12.03.86
DOD MAN 5000.3	Test and Evaluation Master Plan (TEMP) Guidelines	1.10.86
DOD DIR 5000.29	Management of Computer Resources in Major Defense Systems	26.04.76
DOD INST 5000.31	Tactical Embedded Computers	24.11.76
DOD DIR 5000.38	Productivity Readiness Reviews	24.01.79
DOD DIR 5000.39	Acquisition and Management of ILS for Systems and Equipment	17.11.83
DOD DIR 5000.40	Reliability and Maintainability	8.07.80
DOD DIR 5000.43	Acquisition Streamlining	15.01.86
DOD INST 5010.19	Configuration Management	1.05.79
DOD DIR 5126.34	Defense Procurement Management Review Program	11.08.77
DOD INST 7000.2	Performance Measurement for Selected Acquisitions	10.06.77

DOD INST 7000.3G	Preparation and Review of Selected Acquisition Reports	20.05.80
DOD INST 7000.10	Contract Cost Performance, Funds Status and Cost/Schedule Status Reports	3.12.79
DOD INST 7000.11	Contractor Cost Data Reporting (CCDR)	27.03.84
DOD INST 7220.31	Unit Cost Reports	17.01.86
DOD INST 7220.32	Defense Acquisition Executive Summary	28.03.84

SECNAV

SECNAVINST 4200.25C	Defense Procurement Management Review Program	17.12.84
SECNAVINST 4200.27A	Proper Use of Contractor Personnel	23.06.76
SECNAVINST 4200.31A	Contracted Advisory and Assistance Services	23.10.85
SECNAVINST 4200.32	Design to Cost	12.07.84
SECNAVINST 4210.6	Acquisition Policy	20.11.85
SECNAVINST	Effective Acquisition of Navy	16.01.87

4210.7A	Material	
SECNAVINST 4210.7	Engineering and Technical Services	23.01.94
SECNAVINST 4801.1B	Defense Productivity Management	17.03.86
SECNAVINST 4860.42C	Use of Contractor and Government Resources for Management of Material	3.10.84
SECNAVINST 5000.1B	System Acquisition	8.04.83
SECNAVINST 5000.39A	Acquisition and Management of Integrated Logistics Support (ILS)	3.03.86
SECNAVINST 5200.32	Management of Embedded Computer Resources in DON Systems	11.06.79
SECNAVINST 5420.188	Navy Program Decision Meetings	11.06.79
SECNAVINST 7000.15C	Contract Cost Performance, Funds Status and Cost/Schedule Status Reports	17.03.80
SECNAVINST 7000.17B	Contractor Cost Performance Measurement for Selected Acquisitions	14.04.78
<u>OPNAV</u>		
OPNAV INST	Nuclear Survivability of Navy and	28.01.84

3401.3	Marine Corps Systems	
OPNAV INST 3960.10B	Test and Evaluation	23.08.83
OPNAV INST 4100.3A	Department of the Navy Integrated Logistics Support System	6.11.72
OPNAV INST 4105.1	Integrated Logistics Support Review and Appraisal	16.07.86
OPNAV INST 4130.2	Navy Configuration Management System	22.09.84
OPNAV INST 4350.2A	Engineering and Technical Support - Management and Control	19.08.81
OPNAV INST 5000.42C	RDT&E Acquistion Procedures	10.05.86
OPNAV INST 5000.49A	Integrated Logistic Support in the Acquistion Process	30.01.87
OPNAV INST 5000.50	Navy Training Simulator and Device Acquistion	9.04.85
OPNAV INST 5311.7	Determining Manpower Personnel, and Training Required for Acquisitions	12.08.85
OPNAV INST 5420.2N	CNO Executive Board	7.08.84

OPNAV INST 9010.300A	Development of Naval Ship Characteristics	11.01.85

NAVMAT

NAVMATINST 3000.1A	Reliability of Naval Material	22.04.77
NAVMATINST 3000.2	Operational Availability of Weapon Systems and Equipments - Definition and Policy	21.01.81
NAVMATINST 4105.4	Navy Logistics Auditor Qualification Program	2.12.83
NAVMATINST 4130.1A	Configuration Management	1.06.74
NAVMATINST 4200.49	Selection of Sources	28.02.77
NAVMATINST 4200.55	Competitive Acquistion	27.02.85
NAVMATINST 4801.2A	Production Readiness Reviews	7.01.83
NAVMATINST 5000.19E	Acquistion Program Review	23.03.83
NAVMATINST	Acquistion Strategy Paper	6.05.83

5000.29A		
NAVMATINST 5210.4	Acquistion Documentation	6.08.84
<u>NAVSEA</u>		
NAVSEAINST 3960.2C	Test and Evaluation	11.01.86
NAVSEAINST 3960.5	Policy on Ship Testing	31.05.84
NAVSEANOTE 4105	ILS Plan Preparation Guide	28.06.85
NAVSEAINST 4120.3A	Defense Standards and Specifications Program	16.03.82
NAVSEAINST 4120.4A	DoD Parts Control Program	3.06.83
NAVSEAINST 4120.5	Application and Tailoring of Specifications Standards and Related Documents	26.01.85
NAVSEAINST 4221.2	Non-Government Specifications and Standards	14.08.80
NAVSEAINST 4121.3	NAVSEA Specifications Control Board	1.04.83

NAVSEAINST 4160.3	Technical Manual Management Program	7.07.82
NAVSEAINST 4200.8C	Service Contracting and Contract Support Services Authorization in NAVSEA and Supporting Activities	31.12.86
NAVSEAINST 4200.11	Procurement Request Processing	31.05.79
NAVSEAINST 4200.13A	Development, Approval and Endorsement of Acquistion Plans	6.05.85
NAVSEAINST 4200.15	Sole Source Acquistion in Excess of $250,000	24.02.83
NAVSEAINST 4282.1	Award Fee Type Contracts - Minimum Requirements Related Thereto	31.05.83
NAVSEAINST 4341.2A	Policy on Government Furnished Material for New Construction and Conversion	7.02.86
NAVSEAINST 4366.1	Extraordinary Contractual Actions	5.05.86
NAVSEAINST 4720.16	Logistics Management Procedures for Configuration Changes Installed Outside of Depot Level Availabilities	28.06.85
NAVSEAINST	Expanded Ship Work Breakdown	13.02.85

4790.1A	Structure for Ships, Ship Systems, and Combat Systems	
NAVSEAINST 4800.2	Readiness for Production	6.01.84
NAVSEAINST 5000.3B	Acquistion Program Appraisal Within NAVSEA	1.06.83
NAVSEAINST 5000.4	Naval Sea Systems Command Ship Acquistion Policy Manual	28.07.81
NAVSEAINST 5000.5	Ship Project Directive System - Implementation of	19.06.84
NAVSEAINST 5000.6	Control of the Acquistion Program Requirements Document	26.05.85
NAVSEAINST 5910.2B	Proper Use of Contractor Personnel	25.11.85
NAVSEANOTE 7300	Rough Order of Magnitude Cost Estimate for SCN Appropriation	2.01.86
NAVSEAINST 7300.14	Classificatin of Shipbuilding and Conversion, Navy Cost Estimates for Ships	3.06.80
NAVSEAINST 7700.1A	Selected Acquisition Report, System Status Report and Major Weapon Systems Acquisition Inventory	1.08.81

NAVSEAINST 9070.5A	Design Reviews of NAVSEA Acquisition Programs - Policy and Procedures for	13.05.83
INSERV		
INSERVINST 4730.8G	Reports of Trials, Material Inspections and Surveys Conducted by the Board of Inspection and Survey	28.11.84
INSERVINST 4730.11F	Preparation of Deficiency Forms	10.06.83
INSERVINST 4730.19	Summary of Recurring Deficiencies Noted During Trials and Material Inspections of Surface Ships	11.06.76
OMB		
Office Management and Budget Circular A-109	Major System Acquisition	05.04.76
DOT		
DOT Instruction 4200.14A	Major Systems Acquisition Review and Approval	17.05.78

APPENDIX D

MSH CASE STUDY (DRAFT)

This case study was written by Henry S. Marcus, asociate professor, Massachusetts Institute of Technology. The study was written as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. The majority of the case study is taken verbatim from the General Accounting Office report "DOD Acquisition, Case Study of the Navy Minesweeper Hunter Program", August 25, 1986. Also used were: "Naval Ship Design: The Shipbuilders' Emerging New Role" by Robert A. Johnson, from Naval Engineers Journal May 1985, for a verbatim description of the proposed vessels; Requests for Proposals; internal Naval documents; and interviews.

THE U.S. NAVY MINESWEEPER HUNTER PROGRAM

ORIGIN OF PROGRAM

In February 1980, the Naval Sea Systems Command was directed by the Chief of Naval Operations to initiate cost and feasibility studies to meet the current mine countermeasure coastal requirement. U.S. and foreign shipbuilders were requested to submit proposals to design and build the new class of Minesweeper Hunter ships. The primary mission will be locating and sweeping or neutralizing mines--whether they be acoustic, magnetic or contact mines--in the coastal waters, harbors and bays of the United States. They may operate in

conjunction with both airborne mine countermeasures helicopters and mine countermeasure ships in coastal waters. Additional contingency mission tasks include route surveys tasks, channel conditioning, underwater search, search and rescue, and collection of hydrographic and oceanographic data.

The Navy investigated different low cost designs of minehunters of varying capability tailored for the coastal mission.

DEVELOPMENT OF THE ACQUISITION STRATEGY

Although the program officially began in February 1980, it was not until October 1982 that the first acquisition strategy was approved. The second program manager stated that there were earlier drafts of acquisition plan approaches, but, since nothing was decided at the time, there was no need to finalize an acquisition strategy.

According to the first program manager, the original acquisition strategy that he had developed was never finalized because the Assistant Secretary of the Navy (Shipbuilding and Logistics) directed some changes. He stated that the original plan had been basically the same as that for the mine countermeasure lead ship and called for (1) in-house development of concept design, (2) assistance for ship system design support from industry shipbuilders, (3) a single contractor for design finalization and lead ship construction under a cost type contract, (4) a gap year in 1985 to make

final changes and adjustments, and (5) delivery of the first production ship in 1987. The first program manager stated that in March 1981, when the strategy was being developed, it was general Navy practice to use cost type contracts and ship design support contractors for lead ship development. He noted that concept design had been completed and the project had moved as far as preliminary design under the original acquisition approach.

In December 1981, the Commander, Naval Sea Systems Command convened a Ship Acquisition Improvement Panel to discuss results of the concept design. The first program manager stated that the estimated cost for each ship was over $100 million. However, this figure was considered too high by top Navy officials, who had determined that the ship should not cost more than about $75 million. The first program manager stated that it was more a question of what was affordable at the highest Navy levels than a deliberate effort to set a price cap. He noted that at this point the affordability issue was driving the ship's design.

On January 22, 1982, the Secretary of the Navy expressed concern that the operational requirements be reexamined for cost and performance trade-offs and that results of the review be provided by March 15, 1982. He also expressed concern that the Navy had not adequately examined foreign ship designs and their use of glass reinforced plastic hulls. The Assistant Secretary of the Navy (Shipbuilding and Logistics) restated

these concerns to the Naval Sea System Command's Deputy Commander for Ship Design and Integration at a meeting on January 28, 1982. The Deputy Commander related the results of this meeting to the Commander, Naval Sea Systems Command.

On March 16, 1982, an Acquisition Review Board was conducted and several options were discussed, including overseas procurement and licensing of foreign minesweeper concepts for production in the United States. Equipment subsystem procurement, including engine and propeller systems selections, as well as hull material alternatives were also discussed. On March 31, 1982, the Assistant Secretary of the Navy (Shipbuilding and Logistics) requested a further review of alternative which was scheduled for April 13, 1982.

ORIGINAL PLAN CANCELLED

The first program manager stated that as a result of the April 1982 meeting with the Assistant Secretary of the Navy (Shipbuilding and Logistics), the original acquisition plan was rejected and the concept design phase was extended to accommodate a new strategy.

The first program manager explained that the strategy was changed because the program office was having difficulty in meeting cost objectives. He stated that as a result of cost cutting efforts, five different design alternatives were developed, with estimated prices for both wood and glass-reinforced plastic. The program manager stated these proposals were also evaluated as too costly and that the Assistant

Secretary of the Navy (Shipbuilding and Logistics) directed that a technical assessment team be organized in May 1982 to evaluate the capabilities of the mine hunters of our European allies.

The overall approach of the new strategy was to have the shipbuilders design the ship so that it did not exceed the cost ceiling. To meet the cost objectives, requirements were tailored and general specifications for surface ships were selectively waived. Specifically, the ship's operational requirements and performance capability were tailored in the areas of minesweeping depth, speed, mission duration, and on-board administrative/ maintenance support to meet the coastal mission.

The strategy used a competitive elimination approach, in which every qualified shipbuilder was welcome to compete at the onset, using their own design, a foreign design, a previous Naval Sea Systems Command feasibility design, or any combination thereof. Contractors were to be progressively elminated in a three-phase process.

The first program manager stated that about this time he requested retirement. In May 1982, he left the task of compliance with the new program directions, including development of the acquisition strategy, to his deputy. The program manager added that he sent his deputy, who had been involved with the development of the Saudi Arabian minesweeping program, to participate in the foreign

technological assesment team.

The first program manager stated that it was generally believed that the new acquisition approach was better suited to acquiring the ship within budget and schedule constraints. However, he added that either strategy would have resulted in a vessel which met Navy mission requirements.

ACQUISITION STRATEGY APPROVED AND NEW PROGRAM MANAGER ASSIGNED

In a May 27, 1982 memorandum to the Secretary of the Navy, the Vice Chief of Naval Operations discussed the Minesweeper Hunter platform, equipment, and payload acquisition. He also offered for consideration the option of having U.S. builders submit proposals which would satisfy U.S. Navy top level requirement needs through the use of a Naval Sea Systems Command design, or a foreign design (via license to produce). The memorandum recommended against an "as is" direct procurement of a foreign mine hunter, stating the Naval Sea Systems Command was working toward an excellent design that would meet all Navy requirements and capitalize on foreign technology. However, it was pointed out that the design would likely exceed the Chief of Naval Operations revised cost objective of $65 million per ship. The deputy program manager stated that the new strategy was an attempt to incorporate the foreign technology desired by the Assistant Secretary without encountering the legal difficulties associated with direct foreign procurement.

The Assistant Secretary of the Navy (Shipbuilding and Logistics), in a memorandum dated June 16, 1982, concurred with this approach as presenting the best opportunity to meet both the Navy's operational requirements and its financial ceiling. He requested that to enable a fiscal year 1984 start, an acquisition plan be completed no later than July 15, 1982. The memorandum further required that industry be requested to bring innovative and cost conscious capabilities to bear in meeting the requirements in the shortest period of time and at an affordable cost.

When the first program manager retired from the Navy in 1982, he stated that his replacement, who was knowledgeable in the mine warfare area and was intimately familiar with the potential builders, was an excellent choice for the job.

The second program manager, a Navy captain, was originally commissioned an unrestricted line officer and served in a variety of positions aboard destroyers. In 1966, he converted to engineering duty officer when he received a master's degree and a naval engineers degree from the Massachussetts Institute of Technology. Before his assignment to this program, he served in acquisition related assignments for 13 years. His assignments included project officer for amphibious ships, a 2 year tour as a Naval Sea Systems Command technical director developing acquisition strategies and plans, 5 months at the Defense Systems Management College, 1 year at the Industrial College of the Armed Forces, and 4

years as a supervisor of shipbuilding.

The second program manager did not assume his new responsibilities until August 1982, after 2 months of mine countermeasures training at the Mine Warfare Command in Charleston, South Carolina. He stated that when he reported, the program was in a state of transition as not all senior Navy people were in agreement on having industry design and build the Minesweeper Hunter. However, he stated that by October 1982 a decision was made.

The second program manager inherited the revised acquisition approach and thus was basically tasked with implementing a top level strategy decision. He stated that the basic premise of the acquisition strategy was that it would be competitive and that his task was to divide the acquisition package into logical, competitive steps. He also stated that he reviewed the mission need to ensure that it would be satisfied by the strategy and recommended that the requirements document be carefully defined in order to meet the constrained resource requirement. This recommendation was accepted.

A new contracting officer was assigned to the program office in August 1982. His background included a business/public administration degree with 1 year of work toward a master's degree in business adminstration, plus 11 years contracting experience in various shipbuilding and overhaul programs. He divided his time between four Navy ship

programs. In his opinion, this arrangement did not present problems in completing the work required for the program.

A preliminary inquiry letter was released to potential bidders on October 1, 1982, to solicit interest. The acquisition strategy for the Minesweeper Hunter was prepared by the program office and initially approved by the Naval Sea Systems Command Deputy Commander for Acquisition on October 5, 1982. Requirements for the ship were approved by the Chairman of the Ships Characteristics and Improvement Board on November 9, 1982. On March 18, 1983, the acquisition strategy received final approval from the Chief of Naval Materiel.

Navy guidance required lead ship acquisition in fiscal year 1984 at a ceiling price of $65 million, $31 million of which was allocated for the shipbuilder's detailed design and construction contract. The cost for government furnished equipment, escalation, Navy efforts and change orders were not included in the $31 million for design and construction. The lead ship award also contained an option for four other ships in fiscal year 1986 and four in fiscal year year 1987. Two additional groups of four ships each are scheduled to be competitively awarded in fiscal years 1988 and 1989 to meet the approved planning goal of 17 ships.

According to the acquisition strategy, the cost and schedule constraints were the basis for the competitive, progressive elimination process.

SOURCE SELECTION PROCESS

Development of the source selection plan was a joint effort on the part of the program office and the contracting officer with the program office assuming the lead development responsibility. In September 1982, the procurement process started for a two-phase design strategy under fixed-price competitive contract terms. Both the program manager and the contracting officer stated that in considering contract type, they were involved in risk assessment. However, the second contracting officer stated that he is ultimately responsible for determining the contract type. He also stated that recently the Secretary of the Navy has favored fixed-price contracts.

To determine industry interest in the acquisition, on October 1, 1982, the contracting officer sent a preliminary inquiry letter to the sources considered capable of satisfying the requirement.

The competitive solicitation was prepared by the contracting officer in conjunction with the program office. The solicitation and proposed contract were then reviewed by the Naval Sea Systems Command General Counsel. A draft was made available to prospective offerors in October 1982 and an industry briefing was conducted on October 26, 1982, to solicit remarks, questions and concerns. A first draft source selection plan was promulgated on November 9, 1982.

After a notice of procurement appeared in the Commerce Business Daily. A ship design request for proposal (RFP) was

issued by the Naval Sea Systems Command to industry on December 7, 1982.

The request for proposal was subsequently provided to all shipbuilders or design agents (foreign or domestic) who requested it.

The contracting officer held a conference for all prospective offerors on January 12, 1983, to respond to their questions and clarify the Navy's requirements.

Both the second program manager and the contracting officer stated that the development of the request for proposal was a joint effort of the program and contracting offices. The program manager stated that he monitored the development of the request for proposal to ensure compliance with the requirements and the acquisition strategy and to ensure that no part of the proposal was released without his review. The contracting officer stated that he developed the business terms/conditions and evaluation criteria sections with input from the program manager and basically reviewed and modified remaining sections for compliance with existing regulations.

On February 10, 1983, the Secretary of the Navy delegated source selection authority to the Commander, Naval Sea Systems Command, and the program was designated a high priority program, with the Secretary of the Navy as the final decision authority. The Chairman and members of the Source Selection Advisory Coucil were designated on March 9, 1983. Two

additional advisors were added on April 12, 1983. According to the November 11, 1984, Minesweeper Hunter Proposal Analysis Report, the Chairmen of the Source Selection Advisory Council and the Source Selection Evaluation Board attempted to retain the same personnel throughout the selection process in order to maintain continuity of policy and technical evaluation. The report states that substantially the same personnel conducted all the competitive phase I to III evaluations.

PHASE I

On March 15, 1983, six proposals were received from the following offerors:

1. Bell Aerospace Textron, New Orleans, La.
2. Marine Power and Equipment Company, Seattle, Wash.
3. Marinette Marine Corporation, Marinette, Wis.
4. Peterson Builders, Incorporated, Sturgeon Bay, Wis.
5. The Willard Company, Fountain Valley, Calif.
6. van der Giessen de Noord, The Netherlands

The second program manager considered this a good response because only 15 companies out of over 150 attending the initial bidder conference requested proposal information. He explained that proposal development is a costly process and only serious contenders make the investment.

All proposals were formally evaluated and the results summarized by the Source Selection Advisory Council in the Proposal Analysis Report dated April 6, 1983. The selection

was based on evaluation of the below listed categories which appear in descending order of importance as stated in the RFP. Bidders are aware of relative importance but not weighting factors.

Category a. Approach to Phase I Contract Design

Category b. Approach to Phase II Contract Design and Continuation

Category c. Management Capability (Design and Construction)

Category d. Experience (Design and Construction)

Category e. Facilities/Personnel Capability (Design and Construction)

Category f. Approach to Cost and Schedule Control (Design and Construction)

Category g. Price (although in this case, a price of $250,000 had already been set)

Selections were made by the source selection authority on April 8, and four $250,000 fixed price contracts for phase I preliminary design were signed April 15, 1983, with the following selected offerors:

Bell Aerospace Textron,

Marinette Marine Corporation,

Peterson Builders, Incorporated, and

van der Giessen de Noord.

Each shipbuilder proposed a unique concept to meet the MSH requirements: Bell Aerospace Textron proposed an aluminum- or glass-reinforced plastic (GRP) variant surface effect ship

(SES) based on the SES-200 design; the Marinette Marine Corporation proposed a GRP monohull based on the Italian Lerici class minehunter; Peterson Builders proposed a wooden hull MSH based on an MSO design; van der Giessen der Noord, teaming up with Todd Pacific Shipyard Corp., Seattle Division, proposed the GRP Tripartite class minehunter as the basis for their design.

During the period from April 15, 1983 to August 15, 1983, each of the four contractors developed their phase I design using the requirements, statement of work, and other guidance included in the contracts. The Naval Sea Systems Command maintained a "hands-off" policy during this period as called for in the acquisition strategy. However, contractors were permitted to submit formal questions regarding terms of the contract requirements. Responses were provided in written form only, and were given to all four competitors without divulging the source of the question. Each contractor was also given access to the Naval Sea Systems Command's technical library.

Under the terms of the contracts, the Naval Sea Systems Command conducted a 2 day design review at each of the four sipbuilders' facilities from June 13 to 29, 1983, and a second review at the Naval Sea Systems Command from August 1 to 4, 1983.

Phase II

On August 15, 1983, the four competitors submitted their phase I design data packages and phase II proposals. These

submissions were evaluated from August 15 to September 23, 1983, by the Source Selection Evaluation Board, which conducted the technical evaluation and, from September 26 to 29, by the Source Selection Advisory Council, which reviewed the Board's findings and conducted separate deliberations. The evaluation categories for continuation into Phase II are listed below in descending order of importance:

Category a. Phase I Contract Design Package

Category b. Approach to Phase II Contract Design and Continuation

Category c. Management Capability (Design and Construction)

Category d. Approach to Cost and Schedule Control/Price Estimate (Design and Construction)

Category e. Facilities/Personnel Capability (Design and Construction)

Category f. Experience (Design and Construction)

Category g. Approach to Logistics Support

Category h. Price Phase II (although a price of $1 million had already been set)

Because of its concerns about deficiencies and errors in the proposals, the Advisory Council decided that before it made its selection, it would hold discussions with all four offerors and review their best and final offers. On September 30, 1983, the offerors were notified that such discussions would be held. The Naval Sea Systems Command provided written formal questions on October 4, 1983, with discussions

occurring between October 5 and 14. Best and final offers were received on October 18, 1983. The Board conducted evaluations from October 19 to 22, 1983, and the Council was reconvened October 24 to 25, 1983. The final scores were evaluated and the Council's report was prepared and presented to the Source Selection Authority (SSA) on October 26, 1983. The SSA selected Bell Aerospace and Marinette Marine to perform phase II contract design. On November 2, 1983, the Assistant Secretary of the Navy (Shipbuilding and Logistics) conducted an informal program review of the selection with representatives from the Chief of Naval Operations and Naval Materiel Command in attendance. On the same day, firm fixed-price options for $1 million each were exercised with the two contractors.

Both contractors planned to utilize foreign GRP technology. Bell Aerospace Textron proposed a GRP SES, changed from their previous aluminum design. Most of the ship structure was to be of foam core GRP-sandwich construction as employed on the Swedish Landsort class MCM vessels built by Karlskronavarvet AB of Karlskrona, Sweden. The ship proposed by Bell was based on a lengthened version of the SES-200 (189-ft. length overall and a 39-ft. beam) SES hull.

The Marinette Marine Corporation continued to develop their 162-ft. LOA, 36-ft. beam GRP monocoque hull ship based on the Lerici class designed and built by Intermarine S.p.A. of La Spezia, Italy. This ship displaced about 600 tons and

utilized two Voith-Schneider cycloidal propellers for main propulsion.

Phase III

On January 20, 1984, the phase III request for detailed design and lead ship construction proposals was issued to the two phase II contractors. It required delivery of proposals on July 2, 1984, and stated that the contract would be awarded for the proposal that was most advantageous to the government, price and other factors considered.

Risk Analysis (Taken Verbatim from Acquisition Strategy, 325-82, 24 July 1984, Rev. 2)

The major risk areas are considered to be schedule (low risk), ship cost (low to medium risk), technical development (low risk), and follow ship production competition (medium risk). The acquisition strategy has been structured to respond to these risk factors.

Schedule risk was originally considered to be high as a result of program initiation in August 1982 with ASN (S&L) directed lead ship award in FY 84. With only 24 months available to conduct concept design, preliminary design, contract design, a competitive LSDD&C solicitation, evaluation and contract award, meeting the schedule was a high risk. However, as shown previously all milestones to date have been completed, up to and including receipt of the LSDD&C proposals. The LSDD&C contract award will occur during

September 1984. Accordingly, schedule risk has been downgraded to low.

Because of the CNO-directed lead ship cost ceiling of $65M, the competing contractors' proposals require a design development limitation that lead ship detail design and construction not exceed $31M based on December 1983 dollars. ($65M minus Government Furnished Equipment (GFE) and other government expenses). Both LSDD&C competitors indicate this target will be met. However, development of the low magnetic, high shock minehunter has enough unknown factors to be considered a medium cost risk. Evaluation of the LSDD&C price proposals of the competing offerors prior to lead ship contract award will further refine the overall program cost risk which is considered to be low to medium at this time.

Technical risk associated with the development of the competing ship designs is low. Each of the proposed designs is based on proven foreign applications. Marinette Marine Corporation is proposing a Glass Reinforced Plastic (GRP) monohull design incorporating the proven Italian Lerici Class technology while Bell Aerospace Textron plans a GRP Surface Effect Ship using Swedish minehunter GRP hull technology. Additionally, the HM&E and combat systems will be installed in other ship classes, primarily MCM, prior to MSH requirements.

Production risk will be minimized through the use of Production Readiness Reviews (PRR). A PRR Plan will be submitted to SEA 90 (the Navy's Acquisition Review

Directorate) for approval in accordance with NAVSEAINST 4800.2 such that all PRR's will be completed and reports, identifying risk areas and corrective actions, submitted prior to the start of fabrication of the lead ship by the winning contractor. The PRR Plan will also address PRR's for follow-on production in the event a second source is selected.

In accordance with standard DOD policy, follow-ship production is intended to be competitive in FY 88 and FY 89. However, the uniqueness of the competing designs and investment in production tooling and molds, coupled with the relatively small program (17 ships), may result in little or no interest from a second source shipbuilder. Therefore, the risk of not having outyear competition is medium.

Follow-On Production Strategy

The acquisition strategy also provided for competition during the follow-on construction of 16 ships in accordance with standard Department of Defense policy as mandated by section 797 of the Defense Appropriation Act, which requires either a plan for competition during production or certification that quantities are not sufficient to warrant such action. The current program manager stated that although the planned 16-ship follow-on production quantity is a questionable range for more than one builder, a second source contractor is still an option; therefore, there will be at least the threat of competition. The strategy for follow-on production was altered from one that gave the lead

ship contractor the option to construct four ships and kept an alternate contractor in competition for some of the follow-on vessels to one that allowed the Navy to extend to the lead shipbuilder options for eight ships under fixed price incentive contract terms (fiscal year 1986 and fiscal year 1987 groups of four ships each). Industry competition is planned for ship construction after FY 87. Program officials stated that the arrangements to involve a second contractor early in the follow-on construction were dropped as impractical because of significant design differences between competitors.

The revised acquisition strategy states that although the Navy preferred to compete the fiscal year 1987 ships, competition would be a high risk because of uncertainties about the detailed design at the time of solicitation and award.

The evaluation categories for phase III were:

Category a. Price, the total target price for nine ships (Life cycle costs, delivery schedules and projected escalation costs were not evaluated.)

Category b. Contract design, the proposed contract designs and integrated logistic support as presented in various technical drawings, specifications, and reports

Category c. Approach to detail design and construction

The evaluation was to give consideration not only to the proposed design and management capabilities of the offerors,

but to the assessment of technical and management risk. The request for proposal stated that categories a and b were substantially more important than category c, and although weights were assigned to each category (but not known to the offerors), factors and items within each category were not individually weighted.

As in phase I, the Naval Sea Systems Command maintained a "hands-off" policy during the phase II design period, although it responded to officially submitted questions. Design reviews were conducted in January, April, and June of 1984, and on July 2, 1984, both contractors submitted their phase II data packages and phase III proposals.

During the period July 2 to 28, 1984, the Source Selection Evaluation Board (SSEB) conducted technical and management evaluations. Over 30 separate evaluators were used, each a specialist in technical, management, integrated logistics support, or ship construction disciplines. The contract design packages from both contractors were reviewed and evaluated. These packages consisted of detailed ship specifications, design drawings, and technical reports, as well as numerous other proposal documents containing planning schedules, foreign licenses, description of intended facilities, manpower, management, and subcontracting.

Based on the Evaluation Board's technical and management reports, the Advisory Council determined that each proposal contained numerous deficiencies. As a result, on August 8,

1984, the contracting officer sent questions to both contractors. Ninety-one questions were addressed to Marinette Marine Corporation and 138 to Bell Aerospace, covering such technical areas as drawings, arrangements, structures, noise, stability, magnetic signature, and propulsion. In addition, there were questions about management, support, business terms and conditions, and price.

The questions were discussed with Bell on August 13, 1984 and with Marinette Marine Corporation on August 15, 1984. Responses to the questions were received on August 22, 1984. The Naval Sea Systems Command reopened discussions on August 28 for 1 day to discuss the issue of technical manuals. Best and final offers were received on August 30, 1984.

From August 30 to September 5, 1984, the Evaluation Board evaluated the best and final offers. On September 6 to 7, 1984, the Advisory Council reconvened and reviewed those evaluations. The Advisory Council stated that based on offeror responses, almost all of the Navy's major design concerns had been addressed and that they viewed both design offers as acceptable.

Although both proposals were acceptable, the Advisory Council and the Evaluation Board had some technical and performance concerns with one offer. At this point, prices for all nine ships were disclosed to the Advisory Council and tentative numerical scores were assigned to both proposals based on the technical evaluations of the SSEB.

Because of technical concerns in both proposals, the Advisory Council concluded that a second round of discussions would be required. Accordingly, questions were prepared and reviewed on September 12, 1984 and released to the contractors by the contracting officer on September 14, 1984. Discussions were held with one offeror on September 18, but the other declined to participate. Responses to the questions as well as the second best and final offers were received on September 24, 1984. The contract would be fixed price incentive. The share ratio would be 60/40 with a ceiling price of 135% of the target price. Marinette Marine bid $224,490,008, Bell Aerospace $149,407,174 - for a total price difference of $75,082,834. Bell Aerospace bid $26.8 million for the first ship, a total of $64.6 million (16.1 million each) for ships #2-5, and a total of $57.9 million ($14.5 million each) for ships #6-9.

During the period September 24 to October 2, 1984, the Evaluation Board evaluated the responses. On October 3, 1984, the Advisory Council was reconvened, and an overall summary of proposal strengths and weaknesses was presented. The Council found that the Marinette Marine design was more fully developed, meeting Navy performance requirements at a lower risk, but at a much higher price. The Bell Aerospace design presented a higher technical risk at a much lower price. Navy concerns included the following: an SES minesweeper vessel of this size and material had never been built, the yard had

never used this material (and had never built a ship but were constructing several landing craft), this material had never been shocked tested to the U.S. Navy's strict requirements, and the weight of the ship could be higher than estimated. While the Bell Aerospace design met minimum performance standards, the Council believed design changes might be required if the design assumptions did not prove correct during detail design.

The Navy also had some concerns with Marinette Marine. A vessel of the size and material of their design had never been constructed in the U.S. (although it had in Italy). In addition, the yard had never used this material.

APPENDIX E

SPECIAL CHARACTERISTICS OF SHIP ACQUISITION

As part of the background research for this thesis, many differences were noted between ship acquisitions and other major armed forces acquisitions. This appendix contains special characteristics of ship acquisition as compared to other major armed forces' acquisitions.

- Ships are far more complex than other weapon systems in terms of size, technical complexity, missions, variety of weapons on a single platform, and difficulty in integration of systems.
- The average time to design and build a ship is much longer than for other weapon systems.
- The average life of a ship is longer than that of most other weapon systems.
- Other weapon systems are produced in much higher numbers. Manufacturers realize a learning curve benefits on production of many units.
- The training provided at government acquisition programs (e.g.) DSMC is more applicable to other weapon systems than to ships.
- The amount of joint government-industry planning effort is more for aircraft than ships. Airframe manufacturers

have more impact on new designs than do shipyards.

- When changes are made to a design or deficiencies corrected, NAVAIR seems to have more emphasis on centralized control and required response time than does NAVSEA.
- The number of prototypes developed and the amount of related field testing is greater with other weapon systems than with ships. More development is done concurrent with construction with ships.
- The government has embraced acquisition streamlining concepts to a greater extent with planes than with ships.
- More standardization is done with other weapon systems than with ships.
- More claims against the government are made by shipbuilders than airframe manufacturers.
- The Navy has a major in-house design capability for ships; the government does not possess such a capability for aircraft or other weapon systems.
- The government seems to apply matrix management better in aircraft than in ship acquisition.
- With aircraft, the contractor has more control or choice and interfaces concerning suppliers of equipment. With ships the government takes greater control and supplies more equipment.
- The average cost of a prototype test with other weapon systems is less than with vessels.

- Other weapon system manufacturers can compete in domestic and foreign new construction commercial markets; U.S. shipyards have the U.S. Navy and U.S. Coast Guard as basically their only customers for new construction.
- U.S. airframe manufacturers have a history of sophisticated and extensive use of computers; shipyards do not.
- It is past and current practice to find more middle managers with degrees in engineering in the airframe manufacturing industry than in shipyards.
- There are on the order of five to ten major airframe manufacturers, who can compete on most new government aircraft. The number of shipyards that can compete on a ship order go from one (i.e. aircraft carrier) or two (i.e. nuclear submarine) to a few dozen or more (theoretical for a small non-combatant).
- Many feel that airplanes and the airframe industry are perceived as "new" and "modern" with the ability to benefit from R&D funding; ships and shipyards are perceived as mature, not being able to benefit from R&D, particularly in the H, M & E areas.
- Airframe manufacturers make much greater use of independent research and development funds than do shipyards.
- When a U.S. government agency (e.g. Navy) proposes a specific design, it must compete against other agencies

(e.g. Air Force) and their designs; such is not the case with ships.

- Weather is more of a factor in ship than airframe construction.
- System integration is much more difficult with ships han other weapon systems.
- Times required to correct deficiencies on ships may take years vs. months or weeks for other weapon systems.
- As compared to NAVSEA, the Canadian Unified Defense Organization ship acquisition requires less reviews by upper level management.
- Unit price cost is much higher for ships than other weapon systems.
- Supervision of workers in shipbuilding industry is much more difficult than with other weapon system industries.
- Typically, one company will construct other weapon systems. Additionally, the company will retain life cycle management for the life of the weapon system. Ships are often constructed by more than one company. After the ship is accepted by government, government becomes the life cycle manager.
- R&D efforts are much more coordinated with other weapon sytems than with ships.
- With few exceptions, U.S. ship building companies have experienced financial difficulties.