NOSC TD 880
Revision 1

AD-A190 215

NOSC

NAVAL OCEAN SYSTEMS CENTER San Diego, California 92152-5000

(2)

NOSC TD 880
Revision 1

Technical Document 880
Revision 1
February 1988

NOSC Program Managers Handbook

Approved for public release; distribution is unlimited.

NAVAL OCEAN SYSTEMS CENTER

San Diego, California 92152-5000

E. G. SCHWEIZER, CAPT, USN
Commander

R. M. HILLYER
Technical Director

FOREWORD

The course in which you are about to participate, entitled "Introduction to Program Management," and this accompanying handbook are intended to provide you with an awareness of the scope and importance of program management at the Naval Ocean Systems Center and to impart to you the management philosophies that I believe will be important to your success, individual development, and career growth.

It is my belief that NOSC is a key part of the Navy's Systems Acquisition Team and that our Center's reputation depends on the capabilities of our program managers. Therefore, it is imperative that each individual charged with program management responsibilities discharges those responsibilities in a way that fulfills DoD and Navy statutory requirements and ensures that the Navy receives the maximum benefit from its investment. In addition to these legalistic requirements, we must operate with efficiency and complete integrity. And, while it is a well-worn phrase, it really is often our responsibility to ensure that the Navy is able to operate as a "smart buyer" in a very complicated and highly technical market place. In the final analysis, we have succeeded only if we provide the Navy with effective and affordable timely solutions and capabilities that are superior to those of the threat.

It is my intent that this course provide the framework for training new and potential program managers as well as establishing a standard by which functioning program managers can measure themselves. Because this course and handbook are directed toward program management as it is accomplished at the Naval Ocean Systems Center, your feedback on the course and supporting documentation is encouraged. As the need arises, this course and document will be updated to reflect changes in the program management environment as well as changes in statutory law governing the methods of accomplishing our business.

R.M. Hillyer

NAVAL OCEAN SYSTEMS CENTER

San Diego, California 92152-5000

E. G. SCHWEIZER, CAPT, USN
Commander

R. M. HILLYER
Technical Director

FOREWORD

The course in which you are about to participate, entitled "Introduction to Program Management," and this accompanying handbook are intended to provide you with an awareness of the scope and importance of program management at the Naval Ocean Systems Center and to impart to you the management philosophies that I believe will be important to your success, individual development, and career growth.

It is my belief that NOSC is a key part of the Navy's Systems Acquisition Team and that our Center's reputation depends on the capabilities of our program managers. Therefore, it is imperative that each individual charged with program management responsibilities discharges those responsibilities in a way that fulfills DoD and Navy statutory requirements and ensures that the Navy receives the maximum benefit from its investment. In addition to these legalistic requirements, we must operate with efficiency and complete integrity. And, while it is a well-worn phrase, it really is often our responsibility to ensure that the Navy is able to operate as a "smart buyer" in a very complicated and highly technical market place. In the final analysis, we have succeeded only if we provide the Navy with effective and affordable timely solutions and capabilities that are superior to those of the threat.

It is my intent that this course provide the framework for training new and potential program managers as well as establishing a standard by which functioning program managers can measure themselves. Because this course and handbook are directed toward program management as it is accomplished at the Naval Ocean Systems Center, your feedback on the course and supporting documentation is encouraged. As the need arises, this course and document will be updated to reflect changes in the program management environment as well as changes in statutory law governing the methods of accomplishing our business.

R.M. Hillyer

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION: UNCLASSIFIED	1b RESTRICTIVE MARKINGS
2a SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT: Approved for public release; distribution is unlimited.
2b DECLASSIFICATION/DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S): NOSC TD 880, Revision 1	5 MONITORING ORGANIZATION REPORT NUMBER(S)
6a NAME OF PERFORMING ORGANIZATION: Naval Ocean Systems Center; 6b OFFICE SYMBOL (if applicable)	7a NAME OF MONITORING ORGANIZATION
6c ADDRESS (City, State and ZIP Code): San Diego, CA 92152-5000	7b ADDRESS (City, State and ZIP Code)
8a NAME OF FUNDING/SPONSORING ORGANIZATION; 8b OFFICE SYMBOL (if applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c ADDRESS (City, State and ZIP Code)	10 SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO	PROJECT NO	TASK NO	AGENCY ACCESSION NO
In-house			

11 TITLE (include Security Classification)

NOSC PROGRAM MANAGERS HANDBOOK

12 PERSONAL AUTHOR(S)

various

13a TYPE OF REPORT	13b TIME COVERED	14 DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
Handbook	FROM ____ TO ____	February 1988	

16 SUPPLEMENTARY NOTATION

17 COSATI CODES

FIELD	GROUP	SUB GROUP

18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

Handbook to accompany NOSC Program Managers course.

20 DISTRIBUTION/AVAILABILITY OF ABSTRACT: ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS	21 ABSTRACT SECURITY CLASSIFICATION: UNCLASSIFIED
22a NAME OF RESPONSIBLE INDIVIDUAL: R. Nees	22b TELEPHONE (include Area Code): (619) 553-1154; 22c OFFICE SYMBOL: Code 805

DD FORM 1473, 84 JAN

83 APR EDITION MAY BE USED UNTIL EXHAUSTED
ALL OTHER EDITIONS ARE OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

CONTENTS

EXECUTIVE SUMMARY 1

CONTENTS

SECTION 1
EXECUTIVE SUMMARY

1.1 PURPOSE

The *NOSC Program Managers Handbook* is designed as a ready reference document for those who have taken the NOSC course, "Introduction to Program Management." It is *not* intended to be a thorough examination of each topic. However, the handbook provides its user with basic information regarding the topic along with some references and resources, including NOSC instructions and other applicable documentation. It also provides guidance for program managers* as they carry out their varied functions, and gives examples of the forms or requirements that accompany particular activities.

The target audience for this handbook is a group of interested, skilled, and experienced program managers who know what it is like to manage a program in the real world. Perhaps the thought has occurred to them that the "system" does *not* work. Perhaps their experience has reflected the following six phases of a project:

Enthusiasm
Disillusionment
Panic
Search for the Guilty
Punishment of the Innocent
Praise and Honors for the Nonparticipants.

However, part of the purpose of this handbook is to demonstrate that the "system" *does* work when implemented by skilled program managers. Center management provides policy and guidance certainly, but it is the task and responsibility of program managers to implement the guidance and policy, that is, to make the "system" work. It is hoped that the users of the handbook will be those successful managers.

1.2 ORGANIZATION

The *NOSC Program Managers Handbook* contains an executive summary and sections for each of the 18 topics addressed during the management course:

~~Section 1.~~ Executive Summary;
Section 2. How Projects Originate and Develop;
Section 3. Program Management Functions and Responsibilities,
Section 4. Proposal Development and Marketing;
Section 5. Staffing, Team Building, and Communication;
Section 6. Major Systems Acquisition;
Section 7. Planning, Scheduling, and Assessment;

*While the term "program managers" has a particular DoD denotation, in this handbook the term is used in a broad sense and includes program, project, and product managers.

Section 8. Systems Engineering;
Section 9. Contracting;
Section 10. Financial Management;
Section 11. Human Factors;
Section 12. Design Review;
Section 13. Hardware Product Assurance,
Section 14. Software Product Assurance;
Section 15. Test and Evaluation;
Section 16. Technical Information Support;
Section 17. Computerized Assistance;
Section 18. Computer-Aided [illegible]gistics,
Section 19. Follow-On Training,

1.3 FORMAT

Apart from the executive summary, each of the sections follows a general, numbered outline. That numbered outline depends first on the section number (2 through 19). The first subsection (X.1) is always the introduction. From that point on, the outline is unique for each section.

1.4 AN INVITATION

This handbook is a document in process. As such it will be constantly updated and revised to reflect the latest information and thought in each of the topic areas. If contributors wish to revise and extend their remarks, they are invited to do so. If any of the participants has suggestions on how to improve the handbook or ideas on how the material could be more effectively presented, please contact the cognizant personnel. Any constructive counsel is welcome.

1.5 ACKNOWLEDGMENTS

Grateful thanks are extended to the session leaders for the time and effort expended in preparing their presentations. Each one of them is a volunteer who thought that the topic was significant, that it deserved airing in front of Center program managers, and that NOSC would perform its mission better with better informed program managers.

HOW PROJECTS ORIGINATE AND DEVELOP

2

CONTENTS

SECTION 2
HOW PROJECTS ORIGINATE AND DEVELOP

2.1 INTRODUCTION

2.1.1 References

Navy Program Manager's Guide, 1985
Navy RDT&E Management Guide, NAVSOP-2451
NOSC Planning Calendar, NOSC TD 1189
NOSC Program Planning Guidance Memorandum
The Planning, Programming, and Budgeting System (PPBS) Course Materials, Office of the Director, DON Program Information Center (26 June 1985), Washington, DC 20350.
DoDI 5000.2 and DoDI 5000.3
SECNAVINST 5000.1
OPNAVINST 5000.42
NOSC Memo 013/49-85, Policy and Procedures for FY86 IR Program, of 20 March 1985
NOSC Memo 014/173-85, FY86 IED Proposals, of 9 August 1985
NOSC Memo 021/21-85, Information on Major Bid and Proposal (MB&P) Program, of 18 September 1985

2.1.2 Summary

Projects originate from military needs which arise from changes in threat or in tactics, from the need to replace obsolete equipment, and from technological innovations that promise to address military needs. Operationally inspired needs are documented by formal requirements documents. The process for transforming the needs into requirements also identifies funding that formally initiates the project. Technology-originated projects are initiated through ongoing technology programs that address continuing military needs. Technology programs include Block Programs, independent research (IR) programs, independent exploratory development (IED) programs, product improvement programs, and mission area support programs. Projects in the technology base are normally justified against the program charter.

2.2 GENERAL

The conduct of research and development is focused upon meeting Fleet needs in the near term and distant future. Because resources are limited and needs can arise with alarming suddenness, careful and responsive program origination and management are required. This class session will offer a brief overview of the existing organizations and processes employed in Navy research, development, test, and evaluation.

While Fleet needs and deficiencies are topics of semiannual messages to and from Fleet commanders, they are the constant topics of discussion throughout the Navy, Marine Corps, and Coast Guard. Arising threats, new mission roles, obsolescence of existing capabilities and equipment, technology breakthroughs and maturation, and the needs posed by joint-force operations and foreign-sales demands, all affect initiation, scope, and direction of research and development efforts.

In our age of technology where so much can be done, the matter of choice in applications engineering is crucial to national defense. The use of ancient simple weapons was extensive and long-lived. Modern weapons systems are tailormade to exploit a diminishing set of target vulnerabilities and countermeasures, and so are more expensive to field and of shorter use against a responsive threat organization.

In efforts to respond to changes in world and national circumstances, maritime strategies and U.S. Navy roles and objectives can also change in function, scope, and priority. National requirements for purposes of "presence," "sea control," and "projections of force," etc., shift in emphasis. Balance of appropriate roles and strengths among our armed forces also affects R&D objectives, resources, and the economics and use of logistics.

Timing is as essential in RDT&E as it is in the capability and technology choices; seldom is cost *not* a governor of the process. Because resource needs normally exceed resources, the Navy employs an advocacy system in OPNAV and between the services in DoD to hammer out the Five-Year Defense Program (FYDP). The unfortunate feature of the process is that there is the need for an almost constant, urgent defense of proposals against often worthy alternatives, all of which may be valid and timely options.

The material for this overview of RDT&E program management has been drawn largely from two documents:

a. The Navy Program Manager's Guide, 1985 edition NAVMAT P-9494 (NOSC Library Accession 110582)

b. The Planning, Programming, and Budgeting System (PPBS) course materials, Office of the Director, DON Program Information Center (26 June 1985), Washington, DC 20350

Each document refers the reader to an extensive list of documents in order to provide current authoritative information addressing specifics. The grand scheme, however, is apparent in a review of the major concepts and processes of the organizations presented in these recent documents, each of which is subject to revision at least annually. The Navy Program Manager's Guide, for instance, is in revision in part because NAVMAT no longer exists. The U.S. Navy Postgraduate School (NPGS) is the new sponsor for this document. You will find this source very readable and useful, and so should consider it as a desk reference for your program management office.

As stated in the introduction to the Navy Program Manager's Guide, the purpose is to assist the manager by outlining the system acquisition process, identifying participants and describing their roles, describing the procedures necessary to move the program from one milestone to the next, and identifying possible pitfalls along the way. This guide was prepared under direction of Dr. George Handler of the Naval Weapons Center, China Lake, California. Because it is so extensive and provides details useful to program managers in Navy laboratories, as well as in headquarters organizations, it is an important text to accompany the presentation for our topic: How Projects Originate and Develop.

NOSC program management guidance and support are described in an extensive series of NOSC tructions, directives, and notes kept current by the various offices responsible. Keeping current on .... of these is difficult without maintaining a set of current instructions in the program office for reference. Indeed, setting up a program office is left to the ingenuity of the manager, though organization, files, and operations should be described in documents maintained for convenience and efficiency among employees of the office.

NOSC memorandums describing organization and independent research (IR), independent exploratory development (IED), and bid and proposal processes include the following

NOSC Memo 013/49-85, Policy and Procedures for FY86 IR Program, of 20 March 1985

NOSC Memo 014/173-85, FY86 IED Proposals, of 9 August 1985

NOSC Memo 021/21-85, Information on Major Bid and Proposal (MB&P) Program, of 18 September 1985

A most useful NOSC document, TD 1189, is a single page, poster-size schedule summary for R&D planning guidance. The title is *NOSC Planning Calendar*, and it is updated annually.

It should be noted that the involvement of NOSC in more responsible roles in major program management makes it desirable for aspiring managers to attend one or more of the following more extensive courses on the subject:

Defense Systems Management College
Naval Material Career Development Institute
Federal Acquisition Institute
USN or Department of Defense PPBS course (joint service programs are also addressed)

The most important documents shaping current acquisition policy are Department of Defense Doc. 5000.1 and its implementing instructions:

DoDI 5000.2 and DoDI 5000.3
SECNAVINST 5000.1
OPNAVINST 5000.42

These are drafted addressing major programs, for which the Secretary of Defense chooses to act as program decision authority (PDA), but each applies to all lesser programs in principle, when tailored to the nature and cost of each.

Generally, DON acquisition policy calls for a program initiation decision to be made by the proper program decision authority and approval for program start to be integrated with the planning, programming, and budgeting system (PPBS). At each subsequent major milestone, the program manager is required to prepare milestone review documentation (MRD) and have it reviewed and submitted to the PDA for approval.

NOSC program or project managers are required to provide documentation support for sponsor compliance with these requirements, together with representation of technical work and planning.

2.3 PROJECT ORIGINATIONS

Projects are initiated to respond to the real or perceived needs of the Fleet. These needs arise from new threats, from new tactics, from new capabilities of technology, and from the obsolescence of old equipment. Often the Fleet needs are a combination of these forcing functions.

Inherent in any new threat is a need to counter the threat. For instance, a new enemy submarine might be quieter and carry more lethal armaments. This increases the need to better detect and track enemy submarines; it may also increase the priorities of our ongoing programs to detect and track submarines. Part of this response might be to develop new tactics that improve our detection capabilities. Another response might be to upgrade sensor systems. We might develop a new system that can exploit a peculiarity of the new sub's design. We might provide a new form of command control system to provide a quicker response to this new threat. Some new threats require very comprehensive responses while others can be countered effectively by relatively minor enhancements to existing countermeasures. The total countermeasure response is not to automatically develop new equipments; often, procedural changes in "tactics" are sufficient.

"New tactics" refers to more than mere conduct-of-war procedures on the front line. In the sense used here, "tactics" refers to all organizational and procedural changes to the day-by-day conduct of the Navy profession. Therefore, organizational changes that impose new responsibilities on a commander may imply a need for that commander to have better decision-making tools. New tactics may be developed to counter a perceived enemy threat; this may generate a need to tie information from diverse sources into one database. New tactics exploiting previously unrecognized potentials of a weapons system might increase the data-rate requirements in existing communications links. In other words, "new tactics" may have implications for the equipment and systems needed to support their successful implementation.

New capabilities of technology are constantly needed to address emerging military needs. However, every advancement of the state-of-the-art also creates new needs in itself by the mere potential of its application. For instance, microelectronic technology is critical to adding more capabilities to existing equipment within the same box. Indeed, the art of war always has more technological demands than can be supported by current technology. However, a breakthrough in technology can create a new level of threat to the enemy and can enable more effective tactics to be employed. It is usually the technologist (i.e., *YOU*) who recognizes these potentials rather than the operators. Furthermore, the understanding of current and future capabilities of technology is essential to the assessment of future threats/tactics. The Center's charter includes a responsibility to conduct this assessment in the technology areas for which it has a lead laboratory role or for which it is a designated "center of excellence."

Regardless of the merit of a new idea, a newly recognized need, or the continual seriousness of a problem, the *GEE-WHIZ* phenomenon is often exploited to get the project approved, to get the need recognized as a formal requirement. The *GEE-WHIZ* phenomenon is nothing more than the appeal of "the latest" technology. The military art is so dependent upon technological advancements that the habit of this dependency takes on meaning of its own. Thus, a given approach to a problem may be entirely satisfactory in all aspects for the past 30 years and into the foreseeable future, but a new approach incorporating *GEE-WHIZ* technology may become an attractive alternative anyway. The phenomenon exists as both good and evil to be wielded wisely by technologists in their task to support the Fleet.

Equipment has a usable service life which is often shorter than the platforms (or commands) serviced. The long acquisition cycle virtually guarantees that no operational system is "cutting edge" technology. Even when this factor is not a problem, the cost of ownership starts to rise rapidly for obsolescent equipment. There is a continuing need to replace such equipment or to at least upgrade the equipment to incorporate up-to-date technologies that can be economically supported. Other factors leading to equipment replacement/upgrade include reliability, maintainability, or logistics/part support problems, operability/interoperability features needed, survivability issues, additional capabilities, greater performance, etc. Whatever the source of obsolescence (i.e., need to upgrade or replace), the existing equipment provides a baseline to which the needs can be referenced. Projects that have their roots in these needs are qualitatively different from projects originating from purely operational considerations because the needs are stated in technical terms (3 dB more power, 6 mph faster, 50 percent higher MTBF, 33 percent cheaper to maintain, etc.) rather than in operational mission terms.

In this discussion, you will note that "needs" were identified rather than "requirements." This is simply to recognize the quirk in the Navy acquisition system that requirements only exist in formal statements issued by OPNAV when it has attached funding to a need and approved a project/program to address it. Many needs exist that will never become formal requirements. The demand of "needs" always exceeds the resources available for "requirements." A project does not become initiated formally until the *REQUIREMENT* exists. The process of transforming needs into requirements is an art to be mastered. How this process occurs has a profound affect upon how the project is chartered, funded, and managed by you. The process can result in Center participation in one of three ways:

- a project may be directed to us
- a project may be offered to us
- a project may be proffered by us

The results are different because the persons responsible for providing the energy to push the *NEEDS* through the bureaucratic band-stop filter called the acquisition system are in fundamentally different positions within that bureaucracy.

2.3.1 Directed Programs

Directed programs occur when an authority in the acquisition system directs the Center to be involved in a program. Invariably, the program enjoys a high priority, has high visibility, and has a well-established need. An authority able to direct the Center resources in this way also has the authority to establish prioities and needs in the acquisition system bureaucracy. High visibility occurs because of the interest of the directing party. There are not very many programs that might fall into this catagory (fewer than 1 percent), because the persons with such authority are limited to the Chief of Naval Operations and higher authority.

When the Center receives a directed program, the program relationships are normally as follows:

- The laboratory role is well defined—usually as a technical consultant.
- The Center participation is directed because of its charter responsibilities and established expertise.
- Program participants might be name requested or specially selected.

Usually the tasking is well funded, and the schedule is very tight.

Directed programs are of special interest to the Navy, DoD, or the administration. The need is most often created by administration priority goals, so a formal requirement statement may be generated after the fact of program initiation. The justifications for obtaining congressional approval are part of the budget submission and outrank the normal requirements statements.

If directed to participate on such a program, propose adequate resources to do the required tasks and to cover possible contingencies. Directed programs are such a high visibility that success is demanded.

2.3.2 Offered Programs

Offered programs comprise less than 10 percent of Center programs and are of two types that can best be described as follows:

- A pet program of somebody who doesn't have sufficient authority to direct, only request, Center participation.
- A program offered to the Center because of past performance, recognized expertise, and established working relationships—even individual reputations.

In this first case, the offered program has much the same character as a directed program, except the offerer does not have sufficient authority to direct the establishment of requirements and acquisition system priorities. Part of the tasking may involve helping the offerer justify the program up the chain of command. This is probably even more true in the second case, where the program participation is probably based on personal working relationships developed over the years. The requirements are usually not well defined and the initial program outline may not be sensible; part of the task is to bring sanity to the program as an expert. Assume as much responsibility as you can comfortably. Ensure that your tasking is adequately proposed and that contingencies are fully acknowledged, if not fully funded. It is normally up to the Center's program leader to obtain the big picture necessary to adequately plan the program, justify requirements, and otherwise fill out the paperwork to satisfy the bureaucracy.

2.3.3 Proffered Programs

The proffered program originates with the technologist (you). You perceive the need, conceive the good idea addressing that need, generate the proposal, help to market the requirement, and otherwise assume the responsibility for driving the program through to a successful conclusion. Very often this can only be done by selling others that it was their idea. Everything in your proposal is negotiable, but keep in mind that it is competing for scarce resources. The funding for directed programs is "fenced" (protected) by those in the position to direct them, and offered programs have a well-placed champion in the system. Proffered programs have to be "sold" to a champion or otherwise justified so well that the management of the acquisition system will grant them some priority. Good ideas seldom, if ever, sell themselves on their own merit; there are simply too many good ideas and not enough resources to address them. Often the good idea must appeal to nonaltruistic motives of those in acquisition system management in order to get approved.

2.3.4 Program Justification

Programs may be justified by operationally recognized needs or by needs to incorporate new technology. The document that formalizes needs into requirements is the Operational Requirement (OPNAVINST 5000.42). Certain small projects and technology based programs do not require an OR, but they must be justified, nonetheless. Anybody may draft an OR (even the Russian Embassy) and submit it to OPNAV, but the OPNAV sponsor must see merit enough to incorporate the requirement into the program plan. When so received, the draft OR becomes a Tentative OR (TOR) and funds may be released to prepare a development options paper (DOP); when the budget is approved covering the TOR, the TOR becomes an OR, and the project is formally initiated.

Technology initiated programs may originate out of the technology base programs (independent research/independent exploratory development, block programs, continuing program elements, funded technical investigations, etc.); or from needs to replace obsolete equipment or from needs to infuse new technology into the art of war. Typically, the early investigations that precede formal program initiation must be funded and justified through one of the technology base programs. These are typically limited to $200K annually, $1M total. The justifications must conform to the rules of the program administrator and show support for the stated purposes of the program. Formally established requirements are necessary for technical or product improvements over $1M total and for all military improvements.

Operationally initiated programs are established through Fleet-generated draft ORs or through Fleet-identified deficiencies. (Often the Center is able to find a Fleet champion for its good ideas so that the project appears to be operationally initiated.) Operationally initiated programs are often accorded a higher priority by the acquisition system because support of the Fleet is its primary charter.

OPNAVINST 5000.42 provides all the definitions and formats for documents required to keep the acquisition system bureaucracy fed. Procedures are outlined for program approvals. A key document for every program is the Test and Evaluation Master Plan (TEMP) (OPNAVINST 3960.10, SPAWARINST 3960.3, NAVSEAINST 3960.2, and NAVAIRINST 3960.2). For USMC projects, see MCO 5000.10 and MCO 5000.11. The project manager should become thoroughly familiar with these instructions.

APPENDIX 2A
NAVAL OCEAN SYSTEMS CENTER CHARTER RESPONSIBILITIES

Mission: To be the principal Navy RDT&E Center for command and control, communications, ocean surveillance, surface- and air-launched undersea weapons systems, and submarine Arctic warfare.

Lead Laboratory Responsibilities (and Block Program assignments):

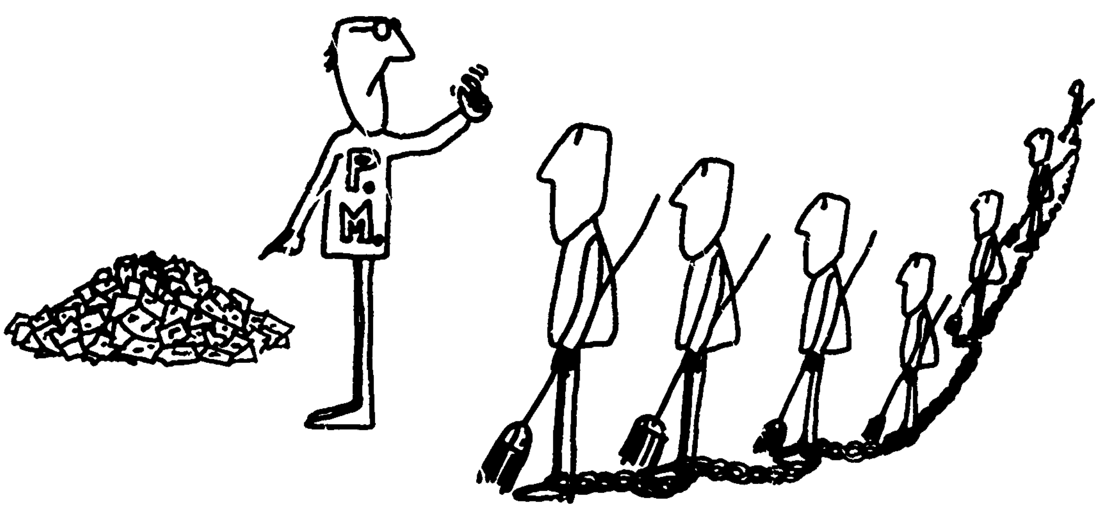
- Ocean Surveillance
- Lasers and Microelectronics
- Communications and Networking
- Combat Direction
- Computer Technology
- Strategic Undersea Surveillance
- Marine Mammals
- Arctic Technology
- Deep Ocean Technology

Technology Leadership Assignments:

- Multiplatform command control and communications (C3) systems
- Multiplatform combat systems integration
- Ocean surveillance (electromagnetic/electrooptic/acoustic reconnaissance and search)
- Deep ocean engineering
- Shipboard internal communications
- Marine biosciences
- Environmental description and prediction for ocean surveillance and C3
- Surface ship ASW fire control
- Surface- and air-launched torpedos
- Signals warfare and countermeasures
- Teleoperator and remote presence systems
- Over-the-horizon targeting (OTH-T)

3

PROGRAM MANAGEMENT FUNCTIONS AND RESPONSIBILITIES —RELATIONSHIPS TO LINE MANAGEMENT



CONTENTS

SECTION 3
PROGRAM MANAGEMENT FUNCTIONS AND RESPONSIBILITIES—RELATIONSHIPS TO LINE MANAGEMENT

3.1 INTRODUCTION

3.1.1 References

Navy Program Management Guide, 1985
NOSC Program Planning Guidance Memorandum
NOSC Instructions & Notes

3.2.2 Summary

Program/project managers have responsibilities toward the line management of the organization they are employed by and toward the program chain-of-command. These responsibilities sometimes create conflicting demands that the PM must resolve. The successful PM understands these demands and the organizational systems that create them. The keys to meeting these demands successfully are RESPONSIVENESS and COMMUNICATIONS.

3.2 GENERAL

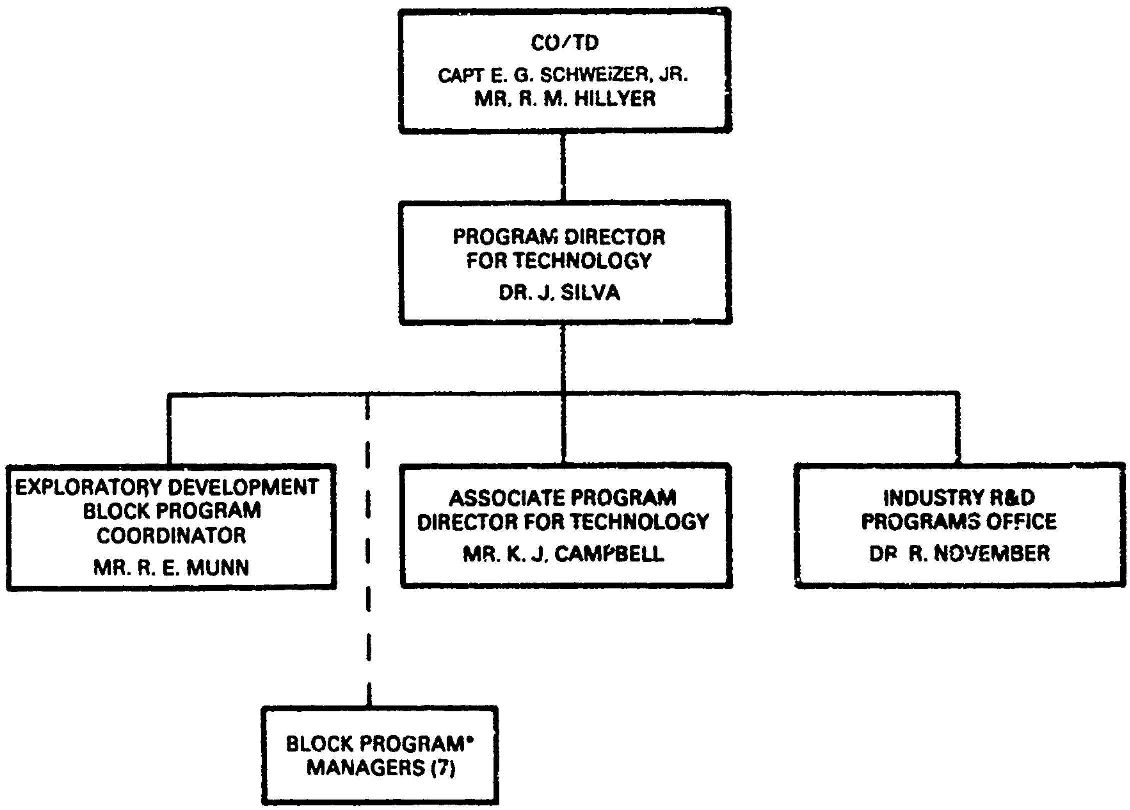
The establishment, conduct, and conclusion of an RDT&E program at NOSC presumes awareness and compliance with basic functions, forms, and communication standards imposed by the sponsor and by local and higher organizational levels of authority and resource allocation. The NOSC independent exploratory development (IED) and technical base management organization is shown in Figure 3.1.

Above all, the program must fit in with other efforts. In order to maintain support for the program, the sponsor must be given adequate results in each component area. Most R&D programs are composites of efforts at several sites among industry, academic, and Navy activities.

It is crucial that the various program participants set and meet milestones and represent progress and products accurately for the program's sponsor. This support will enable your sponsor to deliver on obligations successfully.

In order to conduct your program at NOSC, your program must fit in with local resources and services; this includes your use of contractual assistance.

There will be presentations describing most of the NOSC support capabilities available during this course. The purpose of this section is to describe the relationship of the program manager to other NOSC organizational groups and to outside organizations. Organizational details are subject to change, but the essentials remain valid.



*Also report to Line Management (Department Heads)

Figure 3.1. IED and technical base management organization.

The role of the program manager is not that of a big or bigger "wheel" in the process, but rather a combination of initiator, catalyst, counselor, investigator, and reporter, among others. Responsibility, like virtue, is its own reward, but it is essential in RDT&E programs. A prime example is in the NASA space shuttle program, where "success breeds failure," just as it does in large, challenging, successful Navy programs. We are tempted to take each further extension or application for granted. It is the responsibility of the program manager to examine and test the waters before taking risks and venturing outside of the planned process and schedule, even though there are demands to change at every step.

The Navy, as part of DoD, is party to joint program developments as well as independent efforts, so oversight by higher DoD managers has resulted in the adoption of 24 initiatives to improve the acquisition process (Table 3.1). These initiatives recognize potential and existent frailties in our RDT&E programs, most which recur and must receive corrective attention or prevention through constant awareness.

During the various stages of RDT&E, external influences affect decisions and progress. Perhaps the ultimate influence is competition for limited resources, which can happen at any stage and any organizational level. Priority is necessary to compete successfully for resources. Anticipation, planning, and negotiation will normally avoid confrontation. Conflict is costly. Paving the way well ahead of program needs is effort well spent.

The complexity of doing RDT&E business increases daily. More plans, reports, status-keeping, and audits are to be expected. Only good organization and procedures maintained throughout the program can satisfy the demands, while freeing the productive personnel to conduct the program.

Team development is an important topic which will be stressed later in the course. The essential requirements for development toward future programs can be stressed here. The justification for this course has existed for many years. Program managers have been developed in all the different ways up to now. Some came with industrial experience, some with academic training, and most have developed through on-the-job training with a mentor at some stage in their careers. All were shaped by the teams of which they were a part.

The performance of a project team must be reviewed by time management and their program progress and success must be monitored as well. Quality assurance in individual employee performance is the objective of the demonstration program, which relies upon performance toward objectives, with its incentive awards. No less important are assessment and incentive awards for program teams and managers for the quality of their performance and products measured against system performance goals and schedule and cost targets.

Every citizen has the right to expect ethical behavior from those who work in government. The principles are clear, and corruption is widely reported and punished. Ethics, however, are applied in the subtle everyday actions and relationships within your team. Fairness and compliance are perhaps useful watchwords.

Being overly accommodating can be ruinous. Security breaches are often traced to accommodation: too little time to check the area, to check the lock, to log documents, or to safeguard the information from unauthorized disclosures. Overly accommodating poor performance by members places a weak link in your chain and undue burdens on other team members—who notice and respond. Accommodating imposed changes in schedule or system details—without assessing impact downstream on other obligations—can wreck the best program through loss of performance, credibility, sponsorship, and future opportunity.

The references offered here are doctrinal and procedural. The essence of how to do program management, with enjoyment, comes from reading, discussing, and experiencing management functions. I hope that this portion of this course makes the role appear attractive, challenging, and rewarding.

Table 3.1. DoD acquisition improvement program—the Carlucci Initiatives (Kuhl revision)

Program managers shall . . .

1. Be given responsibility, authority, resources, and proper requirements and funding statements.
2. Be given authority to be flexible in tailoring acquisition strategy.
3. Extend responsibility, authority, and accountability to the lowest effective organizational level.
4. Examine low and high risk technologies in acquisition strategy development.
5. Consider program improvement in program planning.
6. Pursue economical rates of production within constraints as a basic goal.
7. Consider and pursue a policy of standardization whenever and wherever beneficial.
8. Ensure that DON personnel take a businesslike approach with industry in terms of motivation and teamwork goals.
9. Solicit industry's comments on draft PFPs when those comments are likely to be beneficial.
10. Inform industry accurately regarding the funding available for a particular program and not mislead in any way.
11. Ensure that acquisition strategies ascribe value to a viable industrial base.
12. Procure data only when needed and if it is sufficient for life-cycle maintenance.
13. Provide effective estimates of resources and see that they are used throughout.
14. Use realistic estimates for program budgets and schedule profiles.
15. Minimize total life-cycle costs with a view to influence acquisition strategy.
16. Emphasize value engineering when participating in cost saving programs.
17. Consider multiyear procurement in all applicable situations.
18. Employ independent Navy cost analysis in contract negotiations whenever possible.
19. Pursue competition vigorously when a potential benefit exists.
20. Minimize contract changes; but once changes have been issued, expedite them.
21. Expedite the entire acquisition process to the greatest degree possible.
22. Use past performance, experience, and cost realism in source selection and cost reimbursable contracting.
23. Emphasize reliability, maintainability, and producibility from initial design onward.
24. Insist that logistic support standards will not be compromised.

It is said that the best recipe for stress avoidance is
Expect changes
Assist others to expect and accommodate changes
Reward yourself for things you do well and try to make that your style.

As Helen Hayes responded to an interviewer:

Success is how others assess what you have done;
achievement is your own assessment.

Figures 3.2 through 3.6 present general information for program management and cover such things as the needs document; the planning, programming, and budgeting system (PPBS) events; and the acquisition process.

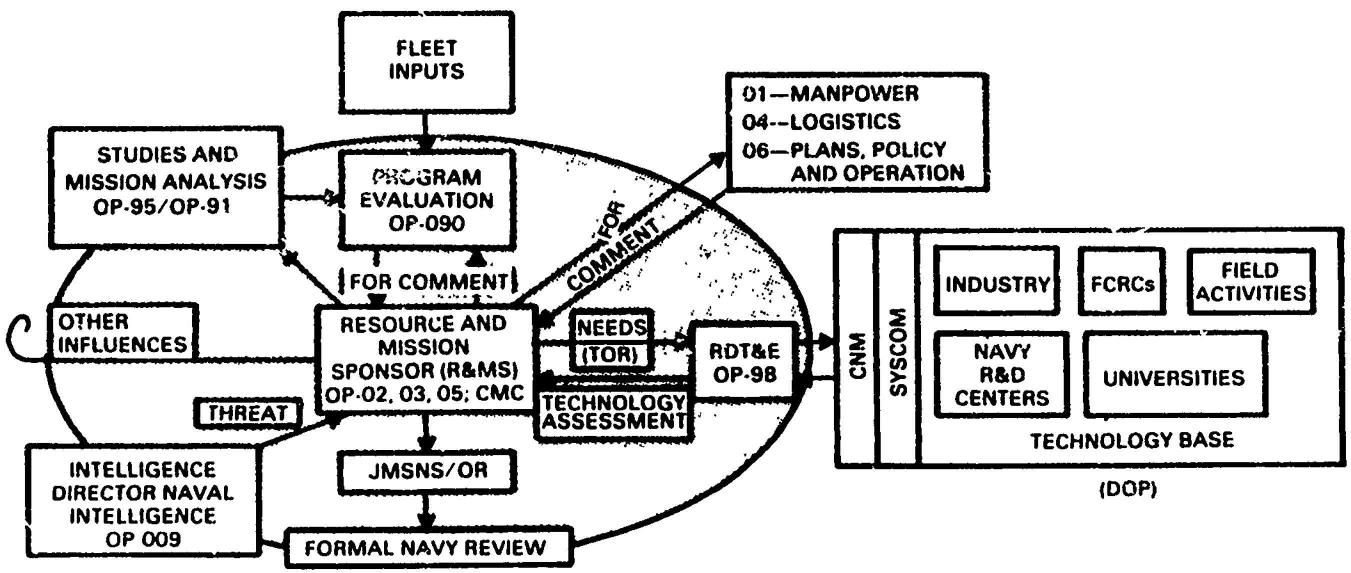
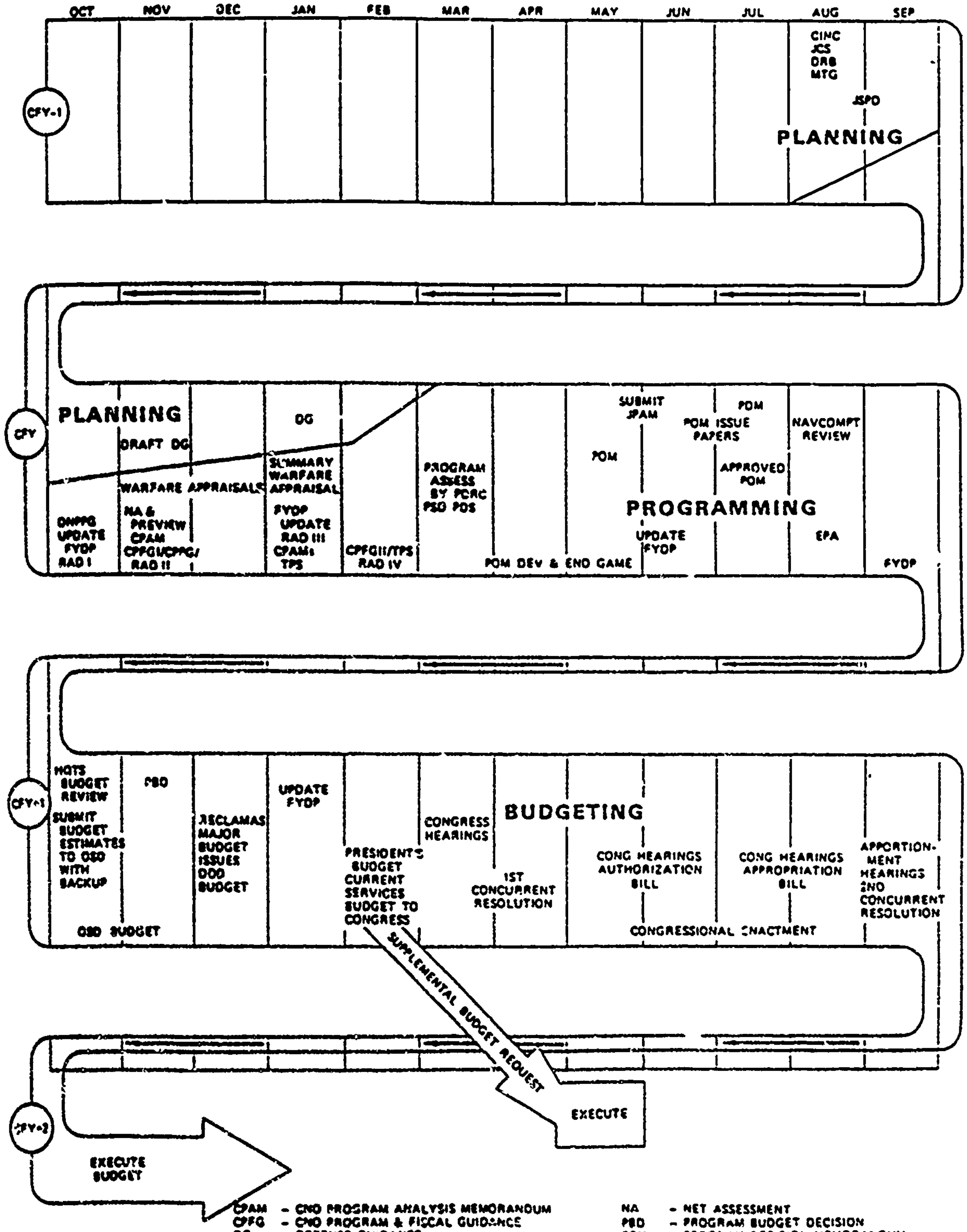
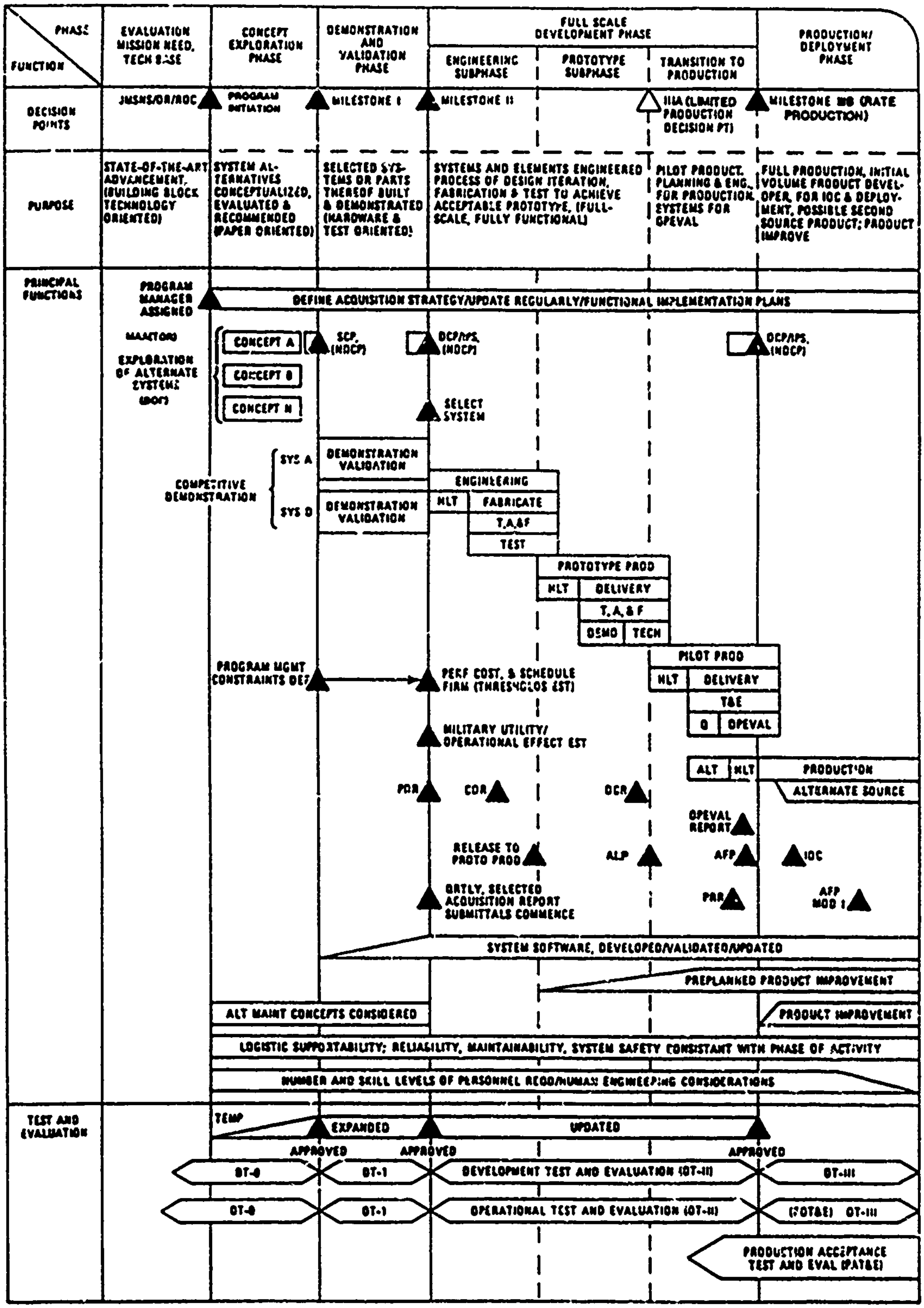


Figure 3.2. Development of the needs document within OPNAV.



CPAM – CNO PROGRAM ANALYSIS MEMORANDUM
CPFG – CNO PROGRAM & FISCAL GUIDANCE
DG – DEFENSE GUIDANCE
DNPPG – SECNAV PLANNING & PROGRAMMING GUIDANCE
DRB – DEFENSE RESOURCES BOARD
EPA – EXTENDED PLANNING ANNEX
FYDP – FIVE YEAR DEFENSE PROGRAM
JPAM – JOINT PROGRAM ASSESSMENT MEMORANDUM
JSPD – JOINT STRATEGIC PLANNING DOCUMENT
NA – NET ASSESSMENT
PBD – PROGRAM BUDGET DECISION
PDM – PROGRAM DECISION MEMORANDUM
PDRC – PROGRAM DEVELOPMENT REVIEW COMMITTEE
PDS – PROGRAM DECISION SUMMARY
POM – PROGRAM OBJECTIVES MEMORANDUM
PSD – PROGRAM SUMMARY DOCUMENT
RADs – RESOURCE ALLOCATION DISPLAYS
TPS – TENTATIVE PROGRAM SUMMARY

Figure 3.3. Sequence of PPBS events.



AFP – APPROVAL FOR FULL PRODUCTION
ALP – APPROVAL FOR LIMITED PRODUCTION
ALT – ADMINISTRATIVE LEAD TIME
CDR – CRITICAL DESIGN REVIEW
DCP/IPS – DECISION COORDINATED PAPER/ INTEGRATED PROGRAM SUMMARY
DCR – DESIGN CERTIFICATION REVIEW
HLT – HARDWARE LEAD TIME
IOC – INITIAL OPERATIONAL CAPABILITY
JMSNS – JUSTIFICATION FOR MAJOR SYSTEM NEW START
MND – MISSION NEED DETERMINATION
NDCP – NAVY DECISION COORD PAPER (FOR LESS THAN MAJOR PROGRAMS)
PDR – PRELIMINARY DESIGN REVIEW
PRR – PRODUCTION READINESS REVIEW
Q – PRODUCT QUALIFICATION
T, A, & F – TEST, ANALYZE AND FIX
TEMP – TEST AND EVALUATION MASTER PLAN

Figure 3.4. Summary overview of the acquisition process.

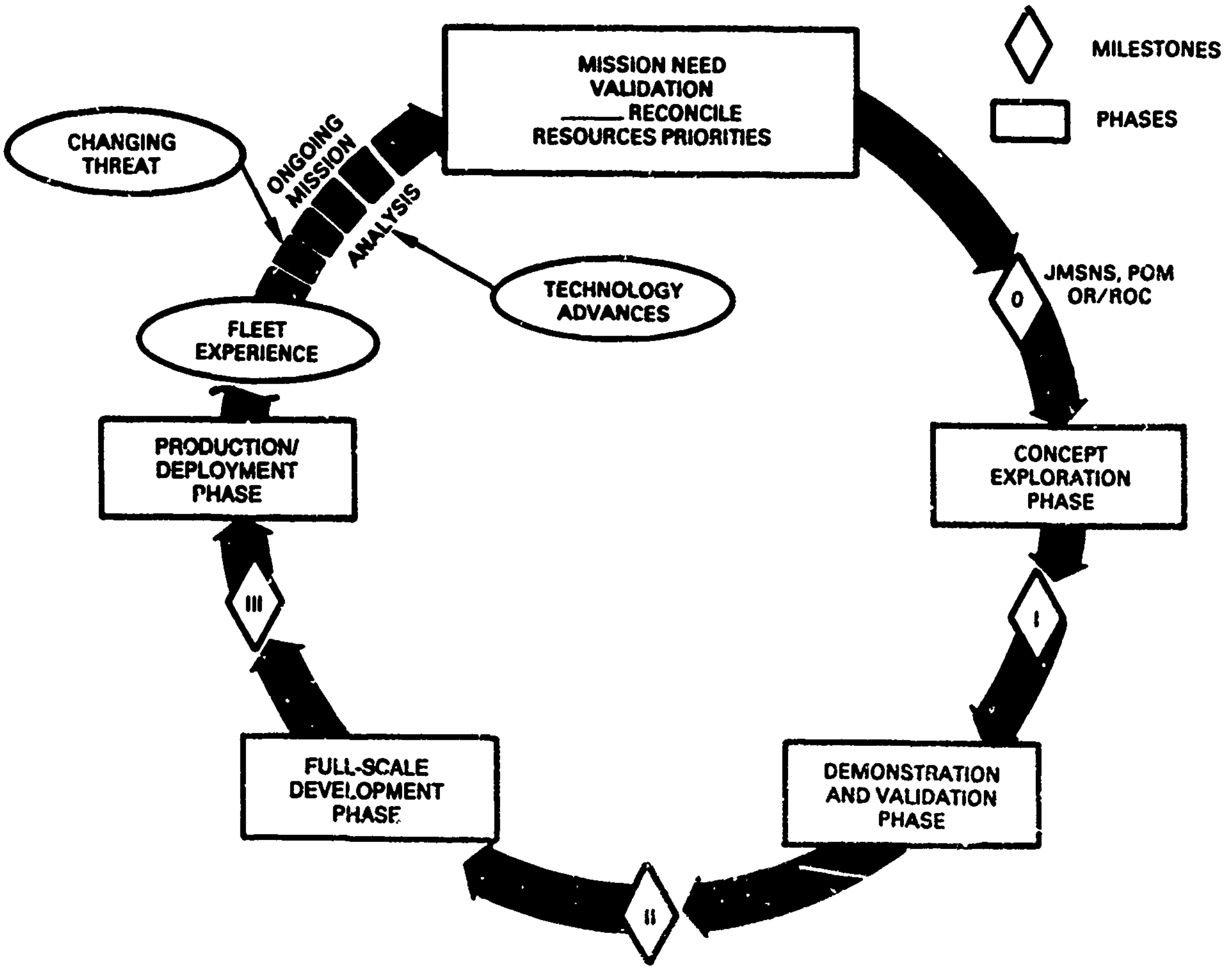


Figure 3.5. Acquisition phases milestones.

	INTERFACES \ ACQUISITION EVENTS OR DOCUMENTS	TOR/DOP/JMSNS/OR/ROC	CHARTER PROGRAM MANAGER	ACQUISITION STRATEGY	PRINCIPAL DEVELOPMENT ACT., LEAD FIELD ACTIVITY	RAN/D&F	RFP	BUSINESS CLEARANCES	SOURCE SELECTION PLANS	CONTRACT(S) AWARD	SYSTEMS USE PROFILE	TEMP	DEVELOPMENT TEST AND EVALUATION	OPERATIONAL TEST AND EVALUATION	ILS PLAN	NAVY TRAINING PLAN (NTP)	SYSTEM SAFETY PROGRAM PLAN	PREPRODUCTION RELIABILITY/ DESIGN REVIEW	PRODUCTION READINESS REVIEW	SELECTED ACQUISITION REPORT (SAR)	MILESTONE DOCUMENTATION PREPARATION & APPROVAL
DIRECTION	SECDEF	■ 1							■												■ 1
DIRECTION	DAE/DSARC	*		*																	*
DIRECTION	OSD/OJCS	* / ○										■ /									*
DIRECTION	SECNAV	[2]							□												[2]
DIRECTION	NAE					■															*
DIRECTION	CNO	[3]										□									[4]
DIRECTION	OPNAV	●										*				■				*	[5]
DIRECTION	OPTEVFOR/FLT	/ ○									* /	● /	△ /	▲ /		* /	* /	* /	* /		△ /
MANAGEMENT	ASN	[7]	■	■								*									[6]
MANAGEMENT	SPAWAR, ACQ	*	*	*	*	*	*					*							▲		□
MANAGEMENT	SPAWAR, R&M	*		*		*	*					*						▲	△		*
MANAGEMENT	SPAWAR, LOG	*					*					*			■	*	*	*	*		*
MANAGEMENT	SPAWAR, CONTRACTS	*	●	*			■	■	*	■		*									*
MANAGEMENT	SPAWAR, FIN	*					*					*								*	*
MANAGEMENT / EXECUTION	SYSCOMS	△	*		○	△	△		△	■	*				*	▲	△	△	△		△
EXECUTION	PM/PMO	△	○	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●
EXECUTION	NAVY RDT&E CTR	△		△	▲	△	△		△		▲	△	▲	△	△	△	△	△	△		△
EXECUTION	CONTRACTORS												▲		△	△	△		△		

■ REVIEWS/APPROVALS
□ PRIOR REVIEW/APPROVAL
* REVIEWS

● PREPARES ISSUES
○ MAY PREPARE
▲ PERFORMS

△ ASSISTS

OSD / OJCS
OPTEVFOR / FLT

1 – MND & MILESTONE I, II & III * DECISION FOR ACAT I
2 – MND & MILESTONE I, II & III DECISION FOR ACAT IIS
3 – MND DECISION FOR ACATs IIC, III & IV
4 – MILESTONE I, II & III DECISION FOR ACAT IIC
5 – MILESTONE I, II & III DECISION FOR ACAT III
6 – MILESTONE I, II & III DECISION FOR ACAT IV (NORMALLY DELEGATED TO SYSCOM COMMANDER)
7 – PRIOR REVIEW/APPROVAL OF DOP

* MILESTONE III DECISION ORDINARILY DELEGATED TO SERVICES EXCEPT IF THRESHOLDS BREACHED.

Figure 3.6. Interfaces of events, documents, and organizations in the acquisition process.

3.3 RESPONSIBILITIES TOWARD LINE MANAGEMENT

The PM must be responsible toward the administrative chain-of-command; after all, that is where the paycheck comes from. The line management is responsible for administering laws, regulations, instructions, directives, internal/management controls, budgetary directions, and a host of initiatives "to improve management, to streamline acquisition procedures, and to avoid fraud, waste, and abuse."

The line management is responsible for the management of the Center's resources. The PM is dependent upon the support and commitment of line management to obtain the personnel, facilities, and administrative support which are essential to the success of the project. The first formal commitment of line management is the laboratory program summary (LPS) with DD1498. An approved LPS is required to accept sponsor funding in all but a few minor cases; therefore, it behooves the prospective PM to keep the administrative chain-of-command informed of prospective taskings and the associated project planning. Seldom does a single branch, division, or department have all of the resources necessary to support a project; therefore, the support of other organizations within the Center must be obtained. For small, short-term involvements, other code assistance can be arranged informally. However, long-term relationships between codes should be formally established by an internal work agreement (IWA) or memorandum of understanding (MOU). An IWA or MOU commits line mangement in both administrative chains-of-command to achieve certain project goals within a given schedule for an agreed-to level of funding; it may establish permanent points of contact in each organization and define special working relationships for the assigned tasks.

Once the line management of the Center is committed to support a task, the PM is responsible for carrying out the management responsibilities of the Center as they apply to that project. These responsibilities include the proper administration of funding, the adherence to proper procedures for procurements, physical security, ADP security, CMS security, document control, and plant property management, and supporting management constraints for carryover funding and management-to-payroll guidelines. Since some of these responsibilities may conflict with the most efficient accomplishment of the project, it is imperative for the PM to keep line management informed and to anticipate potential impacts of management edicts—often exceptions can be obtained when specific problems are created by new rules, or line management can assist in mitigating the impact on the project.

Beyond these explicit responsibilities, the PM must be ethical. The Standards of Conduct (Ethics in Government Act of 1978) require "avoiding action resulting in, or creating the appearance of

—Using government position for private gain

—Giving preferential treatment to persons or organizations

—Impeding government efficiency or economy

—Losing complete independence or impartiality

—Making a government decision outside official channels

—Adversely affecting public confidence in government integrity."

The PM, as the leader of the project participants, should be a pillar of personal honesty and integrity.

3.4 RESPONSIBILITIES TOWARD THE PROGRAM CHAIN-OF-COMMAND

The PM exists to satisfy the specific requirements that justify the establishment of the program/project. These requirements flow down through the chain-of-command that is responsible for the funding allocated to address the requirement. Not surprisingly, the concerns of the project chain-of-command include funding/budget issues, schedules/milestones, project progress toward satisfying the stated requirements, support system requirements, and project politics. Changing technology, "bells and whistles," and changes to requirements are real issues of interest to the project chain-of-command because (1) there may be a true impact on the project or (2) each individual in the chain must fulfill the need to contribute to the project. The PM must be aware of these influences in order to communicate effectively with this chain-of-command. Another perspective to keep is that each member of the project chain-of-command is a member of an organization with its own distinct administrative chain-of-command with similar generic organizational concerns as NOSC. However, organizational edicts will reflect the needs and personality of the organization; therefore, a project edict may conflict with Center policy. Also, a project chain-of-command may overlap over a dozen administrative chains-of-command, so the potential for conflict is great. The successful PM gets "in tune" with each organization and its idiosyncracies and applies this information to format how project communications take place.

The greatest need of the project chain-of-command is responsiveness. As in successful businesses where "the customer is always right" and "service is our most important business," these attitudes are important in the PM business as well. Communications in response to the project chain-of-command must be accurate, credible, inexpensive, timely, and professional. Some requests may seem ridiculous—they must still be handled responsively and responsibly. The immediate acquisition manager (AM) sponsoring the project depends upon the good advice of the PM and the project team; however, the AM also needs support when circumstances direct actions that the PM may not agree with. The responsive PM gains the respect and trust of the project chain-of-command and is often able to turn poor situations into good. Very few in the project chain-of-command can help the project, but almost everyone can hinder it. Therefore, the effective PM keeps the needs of the project chain-of-command satisfied.

3.5 RESPONSIBILITIES TOWARD THE PROJECT/PROGRAM TEAM

The PM is a project manager but also a team leader. People are led; materials, funds, and schedules are managed. The PM must communicate to the project team the goals of the project, instill in each participant a feeling of contribution and worthiness, support the needs of each team member's assignment, monitor team progress, anticipate problems, make decisions so that each team member has clear direction, and ensure that the extraordinary accomplishments of team members are recognized. The PM must delegate responsiblities and authority to the task team leaders and then hold them accountable for performance. No PM can, or should, do everything alone—it must be accomplished through people. The successful PM recognizes this fact and attempts to bring out the best in each team member.

The outstanding PM is one who serves as a model of commitment, dedication, and moral integrity for everybody on the project team.

3.6 THE SUCCESS PATTERN

The successful PM will share certain characteristics with all other successful PMs. The unsuccessful PM will lack one or more of these characteristics:

a. Knows the job—The PM knows the acquisition system and the chains-of-command better than most of the people running their individual "fiefdoms." The PM knows the requirements better than anyone else in the project chain-of-command. The PM knows where to go for assistance, for advice, for expertise, and for decisions beyond the PM's authority. The PM has a clear and complete view of the project goals (including "should be done" goals, not merely those goals explicitly stated) and applies this knowledge in the planning and decision-making processes.

b. Takes responsibility—The PM acts as the ultimate authority for the project. The PM is willing to assume the total responsibility for the project—often this provides *de facto* authority because others in the chain-of-command are relieved to not have to make tough decisions.

c. Makes decisions—The PM makes decisions *on time*. Often projects get into trouble for lack of clear direction. Even a "bad" decision is better than no decision if it clearly defines the immediate tasks. The successful PM assesses what decisions must be made immediately (and makes them) and what decisions require more/better information (and tasks the team to develop the required information). The PM is not afraid to admit a mistake and to correct a decision when it is clearly wrong, but decisions are not changed easily—waffling or flip/flopping is as confusing to the team as not having any direction.

d. Conveys strength and dedication (stubbornness, bull-headedness, single-mindedness)—The PM has a single-mindedness toward achieving the project goals. The PM is willing to do whatever is necessary to accomplish these ends, except that he/she is also a pillar of ethical behavior. When "the system" puts a roadblock in the way, the PM investigates alternatives "over, around, under, or through." A major manifestation of this dedication is in the responsiveness to the chain-of-command.

e. Communicates "infectiously"—The PM must be an effective communicator. Briefing skills are particularly important. The PM rarely has the true authority needed to do the job, so the ability to convince others of the rightness of a decision becomes essential. Communication is a major key to success with the chains-of-command. Communicating "infectiously," the PM instills excitement, fervor, and commitment in the audience and brings people onboard the project bandwagon. The same principles apply in the PM's task of leading the project team.

f. Leads—The PM must lead the project team. The PM's leadership abilities often are essential to establishing the team concept among the otherwise diverse project participants. Through leadership, the project participants are also inspired to the dedication and commitment to the project that the PM exhibits. "It is no trick to get outstanding people to do an effective job. It takes an effective leader to take average people and get them to do an outstanding job."

g. Delegates—Although the ultimate project authority, the PM delegates responsibility with authority to the project task leaders. The task leaders participate in the planning process (as much as possible), accept the assigned responsibilities, and are held accountable to the tasked performance standards. Task leaders are encouraged to redelegate within their own task structure. The PM never considers himself/herself any less responsible: a mistake by a team member reflects directly on the PM, but the PM also trusts the team members to act responsibly and to the best interest of the project. Errors are quickly detected and corrected by the program controls/project team structure. Nobody is expected to be perfect, but everyone is held to his/her best effort. Typical successful projects are executed by small, dedicated teams. The small team size promotes the effectiveness of the PM's personal leadership influence and the ability to hold each team member accountable to the tasks.

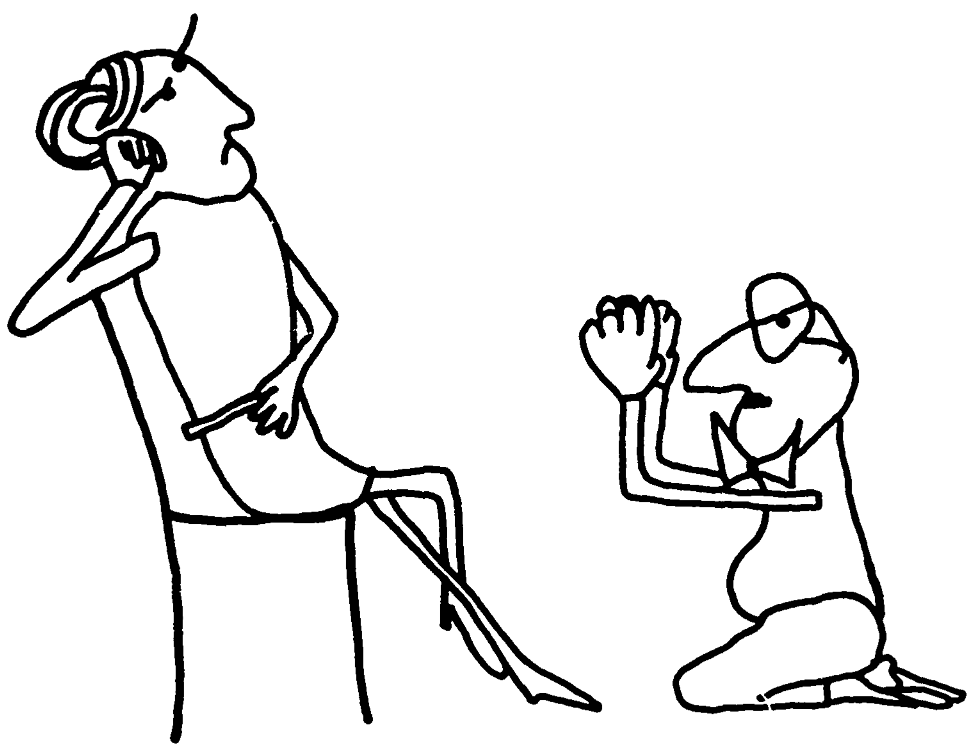
3.7 PROGRAM/PROJECT CHARTER

A program or project charter formalizes the objectives and obligations of the PM. Ideally, the charter is established in writing from both the sponsoring acquisition manager and the PM's department head. In practice, some charter elements are documented in the statement of work accompanying the tasking, and other elements are established in the PM's goals and objectives. It behooves the PM to ensure that these individual directions do not conflict; this is most easily accomplished by keeping the administrative chain-of-command aware of the potential task statements. The following are the minimum elements of a true PM charter:

- Objective System Description—a brief statement of the requirements the project is responding to
- Project Scope—the start, finish, and resource constraints
- Authorities
- Limitations of Authorities
- Responsibilites
- Relationship to the Sponsoring Authority—reporting requirements, task expectations beyond mere project execution
- Special Operation Relationships (who does what to whom)
  a. Activities higher in the project chain-of-command
  b. Activities outside the Navy
  c. Other field/support activities
- Staffing and Organization
- Project Transition or Disestablishment

PROPOSAL DEVELOPMENT AND MARKETING

4



CONTENTS

SECTION 4
PROPOSAL DEVELOPMENT AND MARKETING

4.1 INTRODUCTION

4.1.1 General

The purpose of this section is to provide information that wili facilitate marketing and the preparation of proposals. As can be noted from the contents, marketing in all categories from 6.1 through 6.6 and nonprogram 6 RDT&E is covered as well as joint service and/or foreign RDT&E. Some "road maps" as well as other guidelines are also included.

4.1.1 References

The references listed below were used in the preparation of this section. Copies are held by the NOSC R&D Planning Guidance Group. Feedback from Program Managers and students who have taken the NOSC Program Managers Course has also been included.

DoD Directive 5000.1, Major System Acquisitions
DoD Instruction 5000.2, Major System Acquisition Procedures
DoD/GAO Programming and Budgeting System
Navy Program Manager's Guide, 1985 Edition
NOSC Program Managers Handbook, July 1986
Navy Programming Manual
OPNAVINST 5000.42C, Research, Development, and Acquisition Procedures
RDT&E/Acquisition Management Guide, 10th Edition
Technical Marketing and Proposal Preparation Course by Hyman Silver, Oct 1986

4.2 MARKETING

4.2.1 Definitions

Marketing

is the analyzing, planning, and controiling of organizational resources, policies, and activities with a view to satisfying the needs and wants of current and potential Center sponsors and/or customers.

Informal Marketing

is any verbal commitment, inquiry, or offer to perform work for a sponsor or customer, with the objective that such discussion will lead to a proposal submission requiring formal acceptance by both the initiating activity and the sponsoring and/or customer activity.

4.2.2 Marketing Objective

The prime objective of marketing is to understand what the Navy might need and to obtain work within the NOSC mission that enhances and strengthens the Navy, Marine Corps, joint service, or other DoD/government agencies' ability to perform their mission.

4.2.3 Marketing Principles

Development of marketing principles at the Center is closely related to sponsor interface. This direct interface provides a ready means for NOSC program and project management to explore new ideas and concepts with sponsors directly responsible for development and funding support of NOSC mission-oriented programs. Much of the Center's support is obtained through direct sponsor interface and often new work requests result as a natural follow-on to existing efforts. Effective dialogue with sponsors is a prerequisite. Personal contact is considered the most effective way of enhancing and selling the technical, scientific, and managerial expertise of the Center.

4.2.4 General Guidelines for Marketing

The following should be considered in support of effective marketing:

a. Ensure that work is in response to a valid Navy need. If no formal need exists, draft a requirement to assist the sponsor in the approval process. For a Technology Base program, review the ONT Mission Area Strategies and pertinent approved Block Plans. For Advanced or Engineering Development, review pertinent Naval Plans, Warfare Appraisals, TORs, ORs, or JMSNS. Copies may be obtained from the Navy Acquisition R&D Information Center (NARDIC), NOSC, 1023 E. Green Street, Pasadena, CA, Tel: (213) 792-2452 or NAVSEA-2452.

b. Review NOSC TD 799, entitled *Windows of Opportunity for Naval Systems*; update with current plans and program schedules relevant to your product line. Identify target platform/system windows and estimate force level and inventory needs. Construct estimates of funds available and look for "windows of opportunity" as funding requirements fall and open "windows" in your product area.

c. Ensure there is no obvious duplication or redundant effort. (Query the DTIC data bank and check the NOSC Technical Library.) Identify related work and determine if there is any duplication of effort. Identify sponsors and others involved.

d. Identify, describe, and characterize the immediate customer(s), both the organizations and the individuals who represent them. Develop a survey of requirements and views through interviews and examination of publications. (See the "Organizational Chart Service," Defense Marketing Service publications, and DoD "yellow pages" available through the NOSC R&D Planning Guidance Group.)

e. Identify Fleet, shore, and Marine Corps units that provide the best opportunity for obtaining information and understanding of the users' needs and problems. Discuss your approach with local liaison offices and technical officers assigned to NOSC.

f. Develop a comprehensive description of NOSC's market, including potential as well as immediate customers. Know the "competition" and the relative strengths and limitations of their concepts as well as yours. (To get an objective evaluation of the competition, a systems analysis may be necessary.)

g. Ensure that marketing efforts are synchronized in time to support the RDT&E planning, programming, and budgeting cycles. (Refer to NOSC TD 1189 entitled *NOSC Planning Calendar* and NOSC briefing material entitled "How the Puzzle-Palace Works.")

h. Participate in related IR&D reviews to ensure awareness of related R&D and potential sources of contract support.

i. Plan and prepare program proposals in consonance with the Navy/DoD planning, programming, and budgeting cycle, and provide effective support to sponsors in obtaining funds for the programs.

j. If the program has joint-service potential, expand above efforts to appropriate users.

k. If the area involves Research (6.1) or Exploratatory Development (6.2), seek advice from the NOSC Technology Base Block Plan Managers.

l. For programs involving intelligence or other sensitive work, contact the NOSC Intelligence Office.

m. For general assistance, contact the NOSC R&D Planning Guidance Group.

n. Additional guidelines and instructions for conducting marketing by initiating proposals are included here.

4.2.5 Selling Capabilities

Make the product and capabilities known. Take every opportunity to provide visibility for NOSC resources and capabilities. Be prepared to provide briefings, both internal and external. Make presentations at related symposiums and publish papers. "Advertise" current accomplishments in the NOSC "Technical Briefs"; this publication is distributed widely to sponsors. Join and become an active member of related societies/associations. Incorporate proposed programs in documents such as those listed in Table 4.1.

Table 4.1. List of key documents in which proposed programs could be discussed or in which the "requirement" could be established.

Fleet R&D Objectives/Deficiency Reports
Pertinent master plan
Pertinent SYSCOM's Sponsor Proposed Program (SPP)
Pertinent OPNAV Resource Sponsor's Issue Papers
Pertinent OPNAV Warfare Appraisal
TORs, DOPs, and ORs
Mission Areas Strategies (6.2)
Key Naval Needs (6.1)

4.2.6 Finding a Sponsor

Be prepared. Review and study the appropriate referenced documents that impact or are issued by that sponsor. There are many helpful documents in the areas of planning, guidance, Navy deficiencies, budget, and the RDT&E process itself. In addition to the documents listed under the References of the INTRODUCTION, Table 4.2 lists some additional major planning/needs/requirements documents that are available. Study the basic documents that relate to the area of interest. Keep in mind the following questions. What does the Navy need? Where is the threat going? How much money is flowing? Who is buying? Selling? Understand which documents apply and the need of the sponsor or prospective sponsor. Market expertise will solve problems. Build credibility as an expert by using the language of the disciplne under consideration and portray an awareness and understanding of the sponsor's problems.

Table 4.2. Major Planning Documents.

5000.1/5000.2/5000.3/5000.42C series of instructions
Annual Posture Statements by SECDEF, SECNAV, CJCS, ASN(RE&S); USDR&E, CNO, OP-098, etc.
ASW Master Plan
Attack Submarine Warfare Plan
Avionics Master Plan
"CIRCA 2000" (NISC Long-Range Threat Document)
CNO's Goals and Objectives
CNO Long-Range Planning Conference Proceedings
CNO Program Assessment Memorandum (CPAM) on
- —Maritime Strategy
- —RDA
- —Total Force

Defense Guidance
Department of the Navy Program Planning Guidance (DNPPG)
DIPP (Defense Intelligence Publication for Planning)
Extended Planning Annex
EW Master Plan
Joint Intelligence Estimates for Planning (JIEP)
Joint Strategic Planning Document (JSPD)-especially Annex D
Key Naval Needs (promulgated by ONR)
Maritime Strategy
Master Plan for Embedded Computers
Mission Area Strategies
Naval Aviation Plan
Naval C2 Plan
Navy Study Plan (DONSTAPA)
National Intelligence Estimate (NIE) 11-15
NORAD Master Plan (USAF)
POM Serials (published by OP-90i)
RDDOs from CINCs (also see SITREP messages)
Space Master Plan
Special Warfare Master Plan
Sponsor Program Proposals (SPPs)
Surface Warfare Plan
Tech Base Planning Guidance & TTPG
Top-Level Warfare Requirements (TLWRs)
USMC C2 Master Plan
USMC Midrange Objectives Plan
Warfare Appraisal/CPAMs:
- —Amphib/SPAWAR
- —AAW
- —ASW
- —Chemical
- —EW
- —Maritime Strategy CPAM
- —Mine
- —RDA CPAM
- —Space
- —Strategic
- —Strike/ASWU
- —Summary
- —Tactical C3
- —Tactical Nuclear
- —Total Force CPAM

(The NOSC R&D Planning Guidance Group has most of the documents listed in Table 4.2.)

In many cases, it may be necessary to apply an existing solution to a problem. Be on the lookout for sponsors. Take advantage of Fleet, Lab, and even industry conferences where the sponsors are speakers. Use opportunities at conferences to question key players. Also, refer to the conference when asking for appointments in the future.

When meeting a prospective sponsor consider the following concerns:

The sponsors don't know
—who you are
—your organization
—your product area/line
—what your organization stands for
—your organization's customers
—your organization's record and reputation

In meeting a prospective sponsor, first sell yourself, then ideas, and finally our organizational resources.

4.2.7 Market Research

NOSC TD 799, entitled *Windows of Opportunity for Naval Systems* (U), SECRET, illustrates one method for discovering opportunities. (Remember that in order to reach an initial operational capability (IOC) date, R&D may have to start up to 14 years beforehand!) Figure 4.1 shows windows of opportunity as related to IOC dates for various representative systems. Examine the systems by answering the following questions: What systems are currently in the Fleet? When were the systems purchased? When will they wear out? What happened with past systems? What is the status of current systems? What systems are being considered for the future? Have I missed the window? Should I focus on a midlife upgrade or a new start?

Another method for predicting a possible opportunity involves "affordability forecasting" (Figure 4.2). In this approach, examine an area of interest under the control of a sponsor from the perspective of funding history and market share. In other words, determine how much funding is available and when the funds become available, then attempt to target the time of optimum cash flow in the area of interest.

4.2.8 Market Research via Interviews

The best way to find out what will be needed and when the "windows of opportunity" will open is by direct interviews. (These should not be mixed with selling because the sponsor may not respond favorably later.)

a. Have an "objective" market analyst conduct the interview. (The interview is done for information, not sales, so listen to what the sponsor actually says, not what you want to hear.) Find out what this prospective sponsor thinks.

b. If you are operating as your own market analyst, call the prospective sponsor personally. (Ask the sponsor for his/her views on the future for the area of interest.)

c. Do your homework. Read the publications authored by that office or which impact that office; prepare questions and issues based on that information.

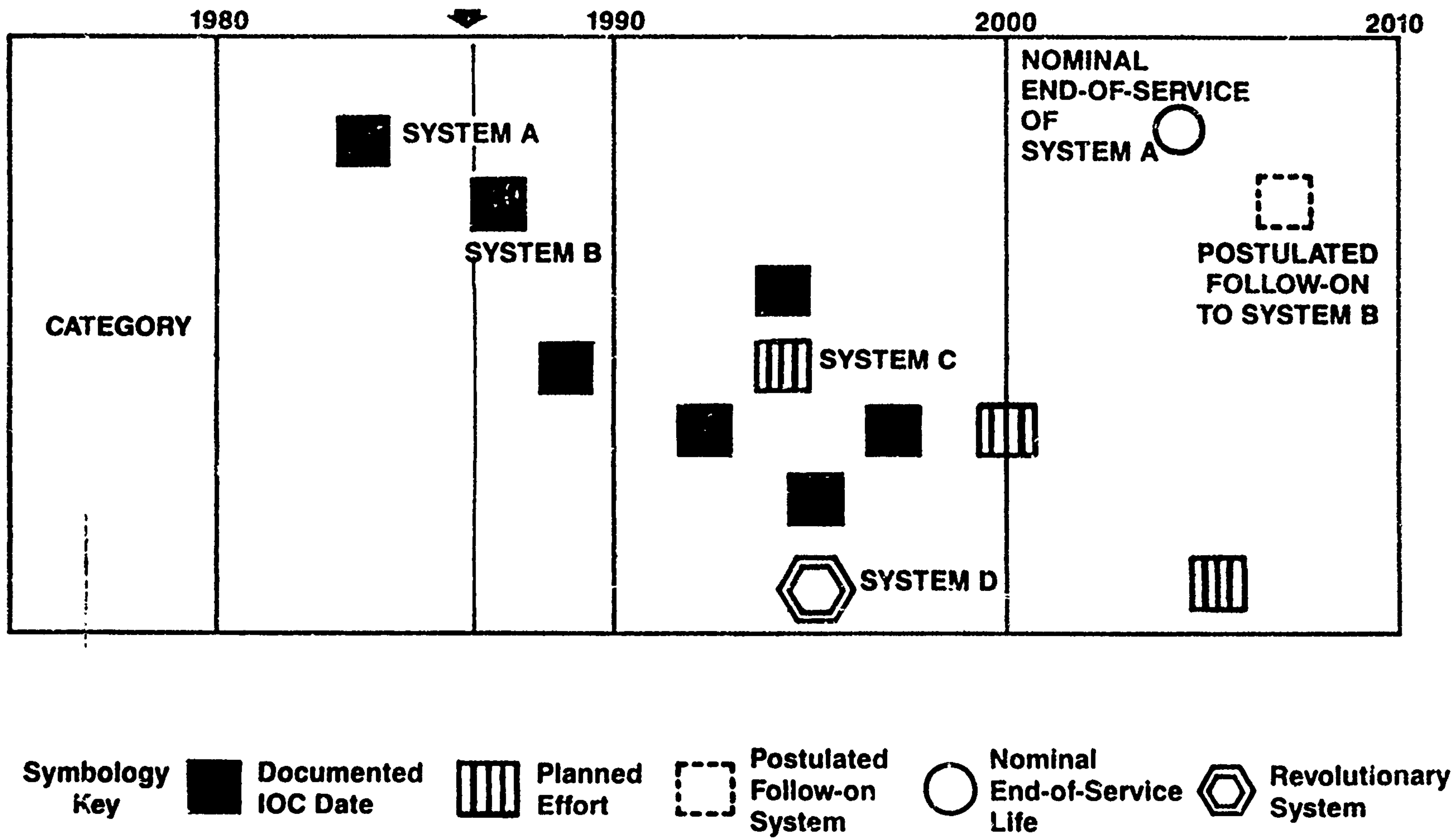


Figure 4.1. Windows of opportunity.

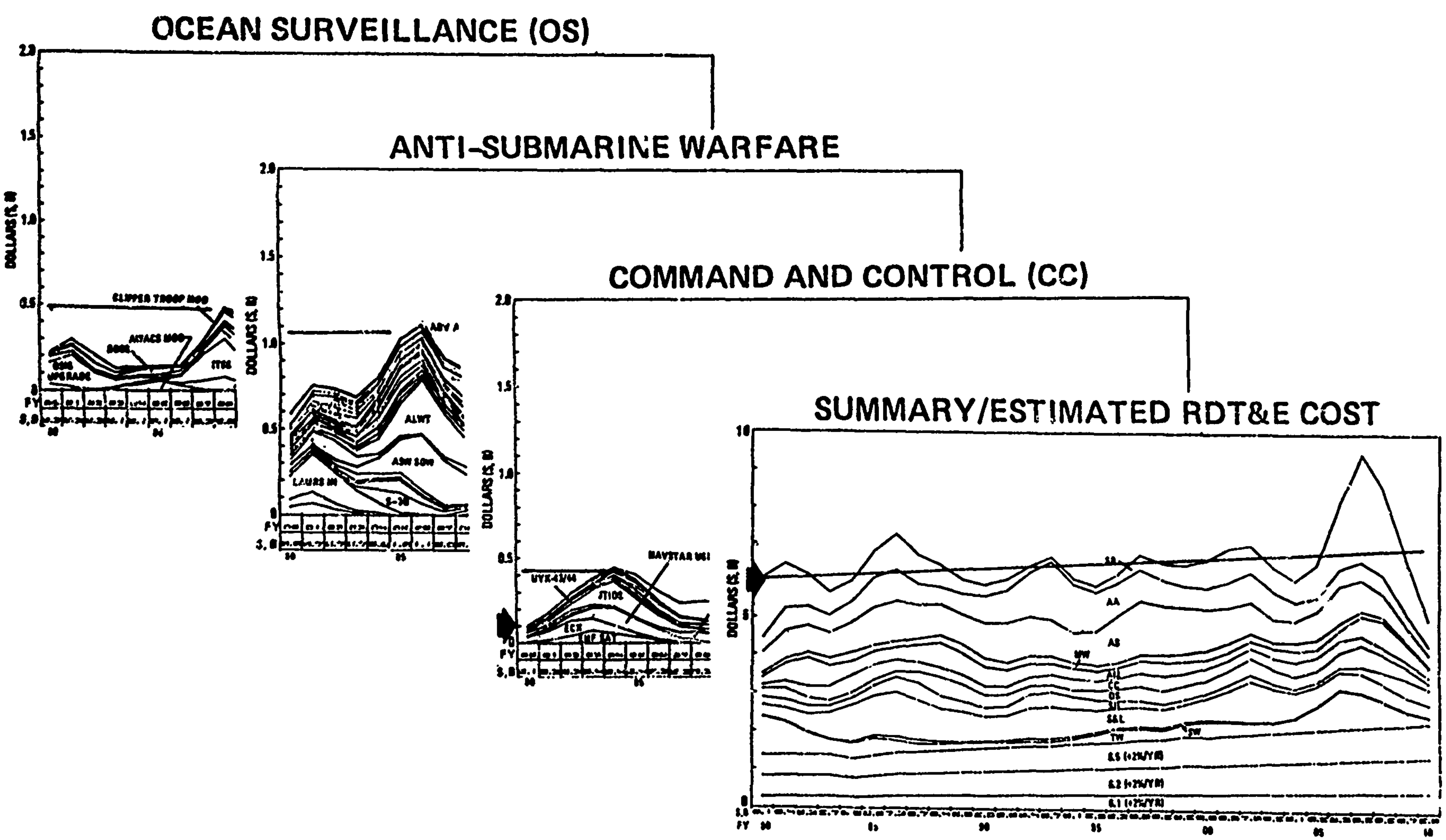


Figure 4.2. Affordability forecasting — when does cash flow in my business?

d. Make sure proper clearances are forwarded.

e. Compile a questionnaire ahead of time. Establish priorities among the questions in case the interview time is cut short. Start with simple yes/no questions and then move into the open-ended inquiries. The sequence of questions should reflect a logical flow, a smooth transition from topic to topic. Once the questionnaire is prepared, conduct a dry run. Do not take a tape recorder to the interview. The sponsor will talk more freely if not recorded. If certain specific information is to be retained during the interview, take notes. (Later, after the interview is over, impressions may be taped so they are not lost.)

f. Develop and use interviewing skills. Ensure that the prospective sponsor is doing 90 percent of the talking. Conduct the interview in the sponsor's office (home territory). Sometimes it helps to loosen up a sponsor by showing a hard copy of a viewgraph that reflects your interpretation or summary of their publications, related plans, issues, etc. (This is one way to indicate preparedness and familiarity with the situation.) Establish the prospective sponsor as the expert. Remember that lunches are good for establishing rapport but are not the place for hard data or classified ideas. Finally, ask what other people you should see and what other material should be read. Leave the prospective sponsor something like a data plot, photographs, charts, etc., and attach your business card.

4.2.9 Winning/New Marketing Strategies

After gathering insight into the marketplace, develop a market strategy. Marketing strategies should consider the following items:

a. Identify "targets" early. When the customer is contacted for a proposal following the marketing survey, communicate in the customer's language and to the customer's biases.

b. Select targets that match strengths; limit the number of targets to be pursued at any one time.

c. Identify weaknesses in abilities to compete and start correcting them by training, hiring, and teaming. Increase contact with Fleet users and competitors.

d. Know the customer's requirements/goals; read studies and Fleet operational reports related to the product area.

e. Determine if the customer considers you a "front runner"(i.e., in the top three contenders); if not, ask how to build up confidence for future proposals.

f. Obtain management's commitment and commit resources to staff a good proposal team. Give the team sufficient time and resources (should be proportional to the size of the project).

g. Help document the operational need. Submit requirement via CINCs (work through your local NSAP office).

h. Consider showcasing the proposed system in war games.

i. Participate in high-level studies, appraisals, strategies, master plans, etc., or cultivate those who do so to influence their recommendations to improve visibility.

j. Support the sponsor (establish an NSTEP assignment—establish an "agent in place").

k. Offer to bail out troubled programs and your competition.

l. Support the emerging Weapons Systems Architecture/Weapons Systems Engineering (WSA/WSE) process.

4.3 UNDERSTANDING THE RDT&E PROCESS

In order to effectively market, it is necessary to have a basic understanding of the procedures used for planning, programming, and budgeting as they pertain to the Technology Base, Advanced Development, and Engineering Development programs.

4.3.1 The Planning, Programming, and Budgeting System

The Planning, Programming, and Budgeting System (PPBS) is a system that supports the DoD decision-making process. The Department of the Navy's RDT&E Management Guide contains information on the PPBS. Figure 4.3 is included to provide a simple overview of the PPBS process.

4.3.2 The Program Objectives Memorandum (POM)

The POM is the document by which the Navy describes and proposes its total program to OSD. It includes all Navy programs and force-level objectives and presents 8 years of budget information.

4.3.3 The 2-Year POM Cycle

Under the new 2-year POM cycle (Figure 4.4), the POM is prepared every other year, which is referred to as the "on-year." During an "on-year," the cycle commences during early November and ends with the POM submission to SECDEF in May of the following year.

The first year of the 2-year POM development cycle is called the "off-year." It focuses on appraisals and on the "State of the Navy." The appraisal process, which consists of a series of appraisals, extends over a 6-month period as shown in Figure 4.4. These appraisals provide the opportunity for identification and analysis of emergent major issues. Commencing in May of the POM development off-year, the DON Program Strategy Board (DPSB) reviews proposals for adjustments to a single midyear Five Year Defense Program (FYDP) update. The DON Consolidated Planning and Programming Guidance (DNCPPG) is the product of the appraisal and DPSBD processes and becomes the foundation for the second year of the POM development cycle (the "on-year").

Actions during the on-year will focus on resolution of previously identified issues and earlier POM development by the OPNAV resource sponsors. Final development of the POM will commence upon issuance of the DNPPG during early November.

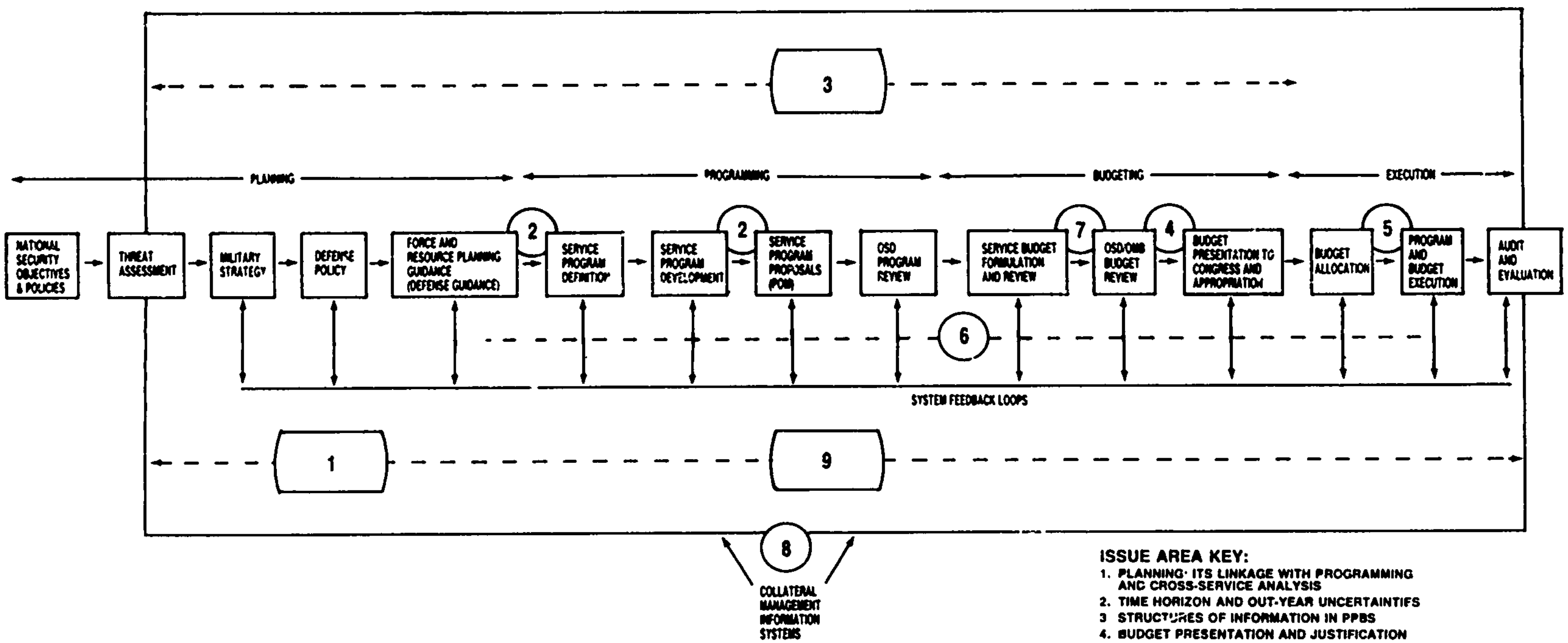
4.3.4 Phases of POM Development

The three phases of POM development and their timeframes are

Program Planning — (5 months)

Programming — (5 months)

Final POM Development — (3 months)



ISSUE AREA KEY:

1. PLANNING: ITS LINKAGE WITH PROGRAMMING AND CROSS-SERVICE ANALYSIS
2. TIME HORIZON AND OUT-YEAR UNCERTAINTIFS
3. STRUCTURES OF INFORMATION IN PPBS
4. BUDGET PRESENTATION AND JUSTIFICATION
5. MANAGERIAL FLEXIBILITY AND LEGISLATIVE CONTROL
6. TIMING AND WORK INTENSITY
7. PROGRAMMATIC ANALYSIS OF OPERATING ACCOUNTS
8. COMPATIBILITY AMONG MANAGEMENT INFORMATION SYSTEMS
9. MANAGEMENT REVIEW, EVALUATION, AND FEEDBACK

Figure 4.3. The Planning, Programming, and Budgeting System.

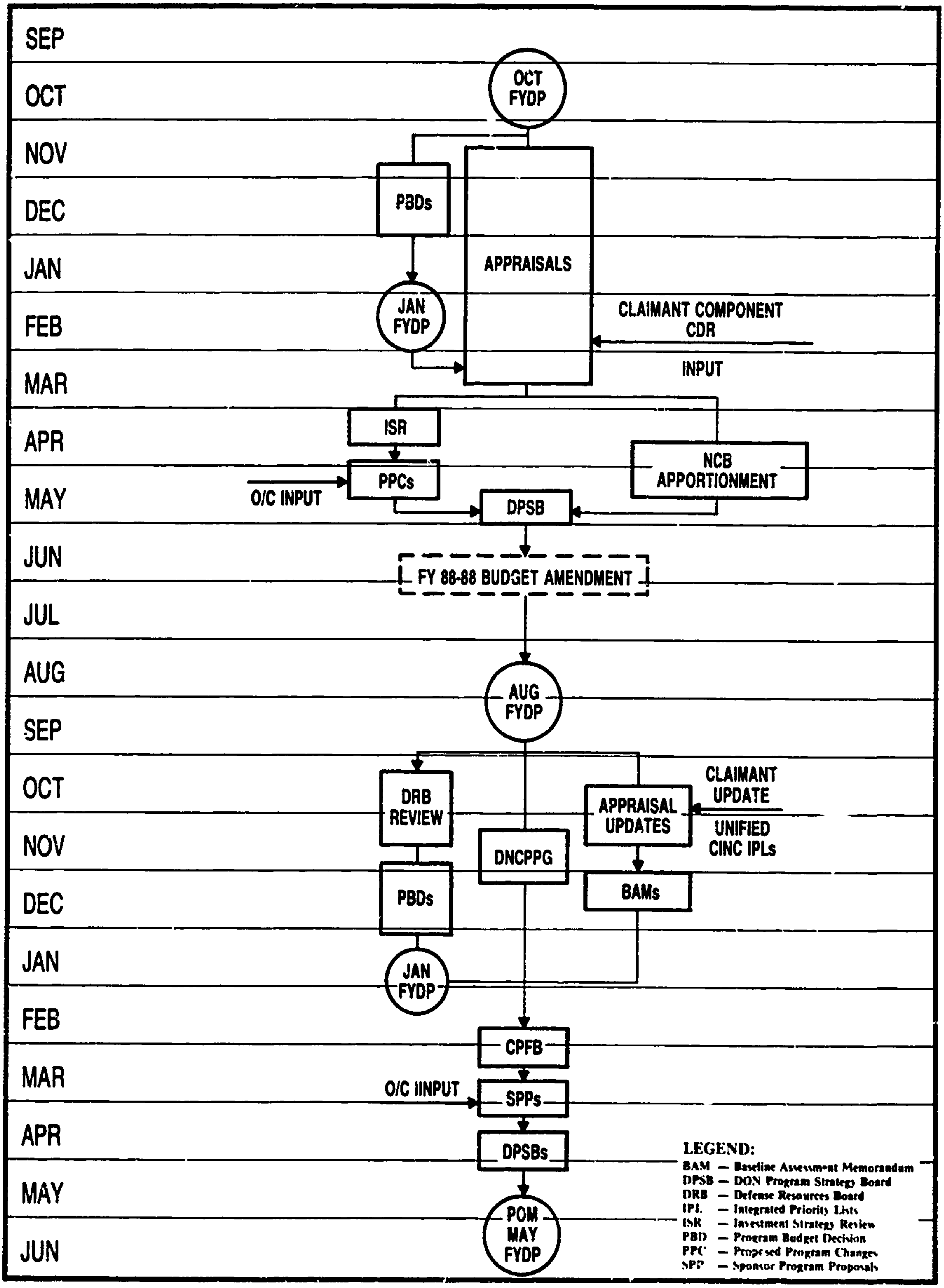


Figure 4.4. The 2-year POM cycle.

4.3.5 Marketing in Synch with the POM Process

Since timing is very important in proposing/getting programs into the POM, the POM-90 schedule is included (see Appendix 4A). As can be seen from Figure 4.5 and Appendix 4A, the POM process is lengthy. As the process progresses and programs are programmed, it becomes more difficult to market a program (see Figure 4.5). Therefore, unless the proposed program is urgently needed by the Navy, it should be proposed early in the cycle. (If it is marketed late in the POM process, other programs may have to be deleted to provide funds, thus making marketing more difficult.)

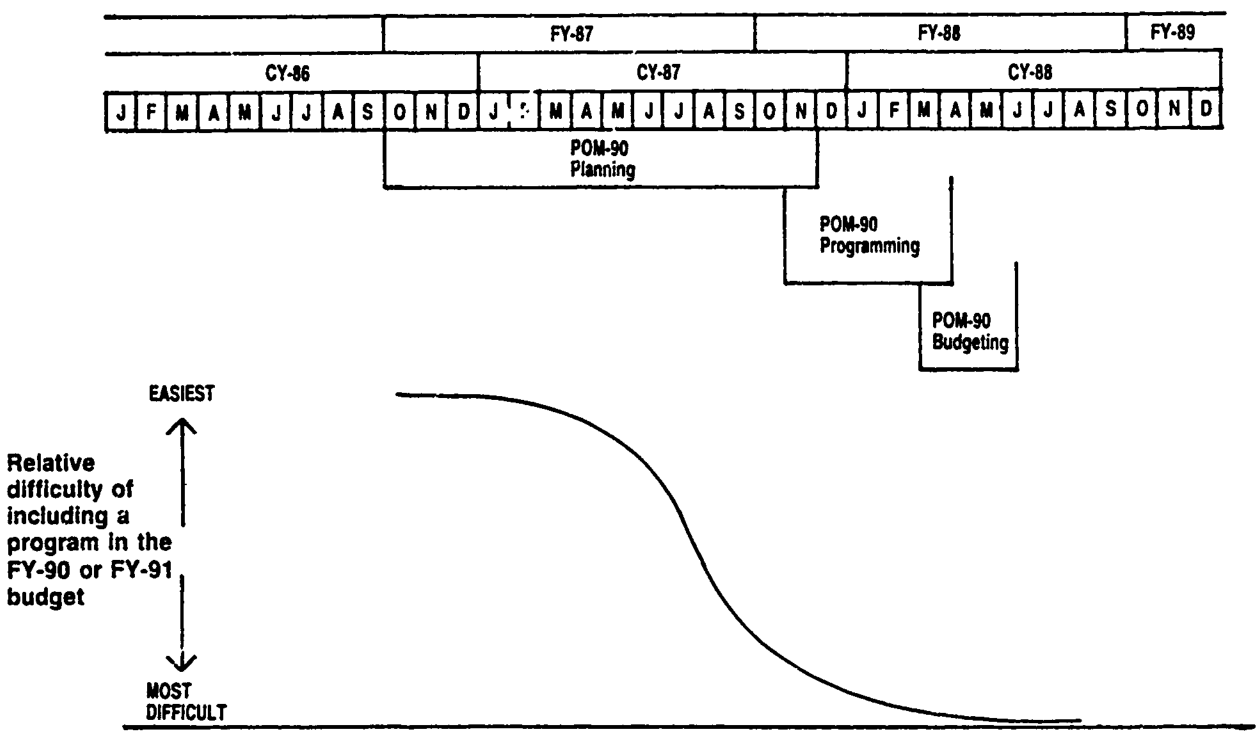
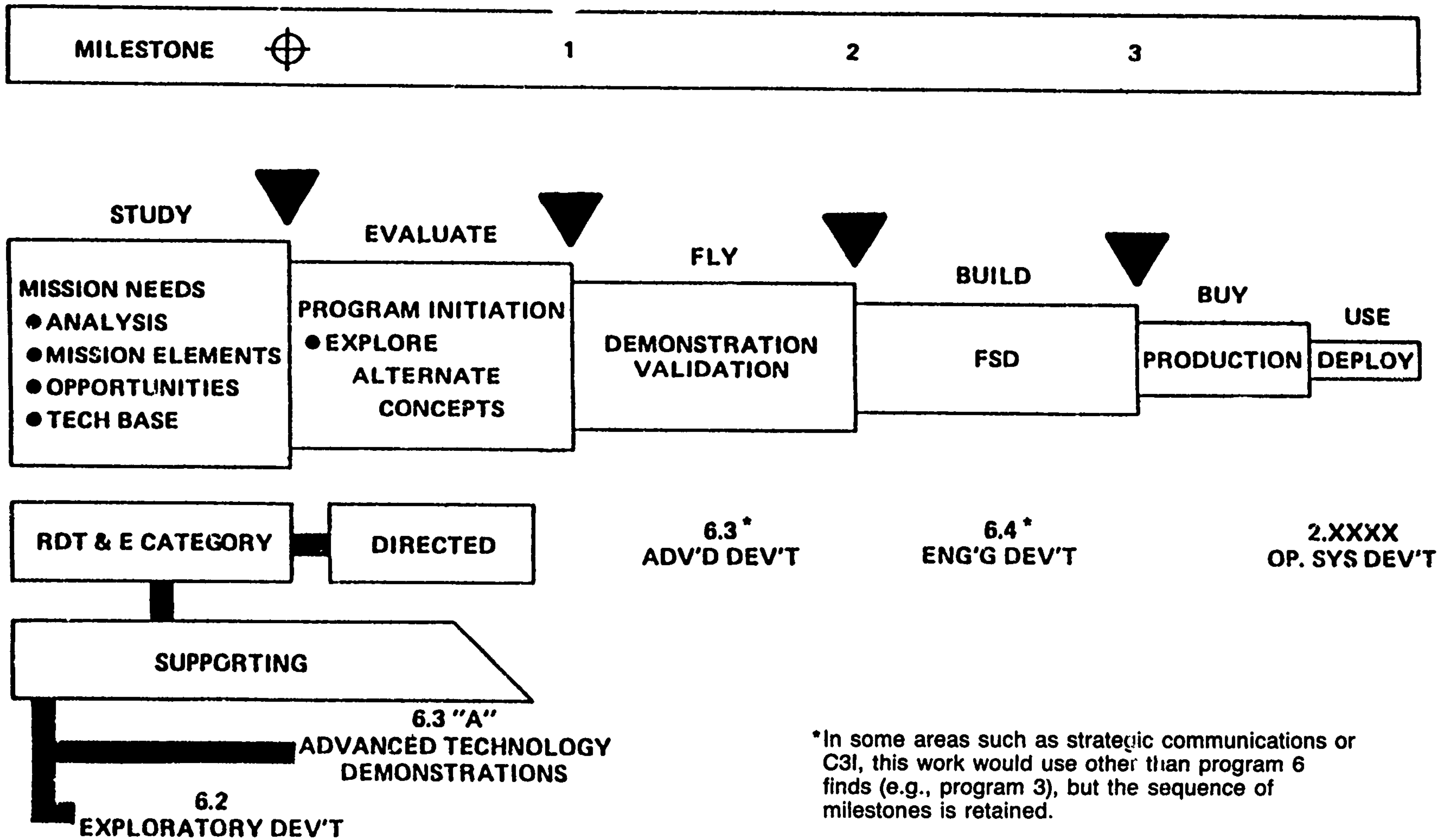


Figure 4.5. Development of POM-90 using the 2-year POM development cycle.

4.4 THE SYSTEM ACQUISITION PROCESS

Figure 4.6 presents a simplified overview of the system acquisition process. The process is discussed in terms of DoD's RDT&E program categories, for example, Research (6.1), Exploratory Development (6.2), and Advanced Development (6.3). (*NOTE*: Advanced Developments also can occur under non-RDT&E accounts such as Strategic Warfare (Program 1), General Purpose Forces (Program 2), and C3I (Program 3). Category 6.3 also includes Advanced Technology Demonstrations (6.3A). Table 4.3 summarizes the acquisition categories (ACATS) and related information. Figures 4.7 and 4.8 and Tables 4.4 and 4.5 show the organizations/offices/people involved. Finally, Figure 4.9 illustrates the length and involvement of the process.



*In some areas such as strategic communications or C3I, this work would use other than program 6 finds (e.g., program 3), but the sequence of milestones is retained.

Figure 4.6. An overview of the system acquisition process.

Table 4.3. Definitions and responsibilities for acquisition categories (ACAT).

Acquisition Categories (ACAT)	Criteria	Decision	Documentation Requirements	
I	Major Programs: • >200M RDT&E in production • National urgency • As directed	SECDEF	TOR DOP *JMSNS	SCP DCP and TEMP
II S — — — — II C	Less than Major Programs: • >100M RDT&E or >200M Prod	SECNAV —————— CNO	TOR DOP OR	NDCP & TEMP
III	• Significant impact on military characteristics	DCNO/ DMSO	TOR DOP OR	TEMP
IV T	• All other acquisitions • OPEVAL required	SYSCOM COMMANDER	TOR DOP OR	TEMP
IV M	All others	SYSCOM COMMANDER	TOR DOP OR	TEMP

TOR — Tentative Operational Requirement
DOP — Development Options Paper
JMSNS — Justification of Major Systems New Start
OR — Operational Requirement
DCP — Decision Coordination Paper
SCP — System Concept Paper
NDCP — Navy Decision Coordination Paper
TEMP — Test and Evaluation Master Plan

*The JMSNS starts as an OR within the Navy and ACAT I status and other endorsement by JCS.

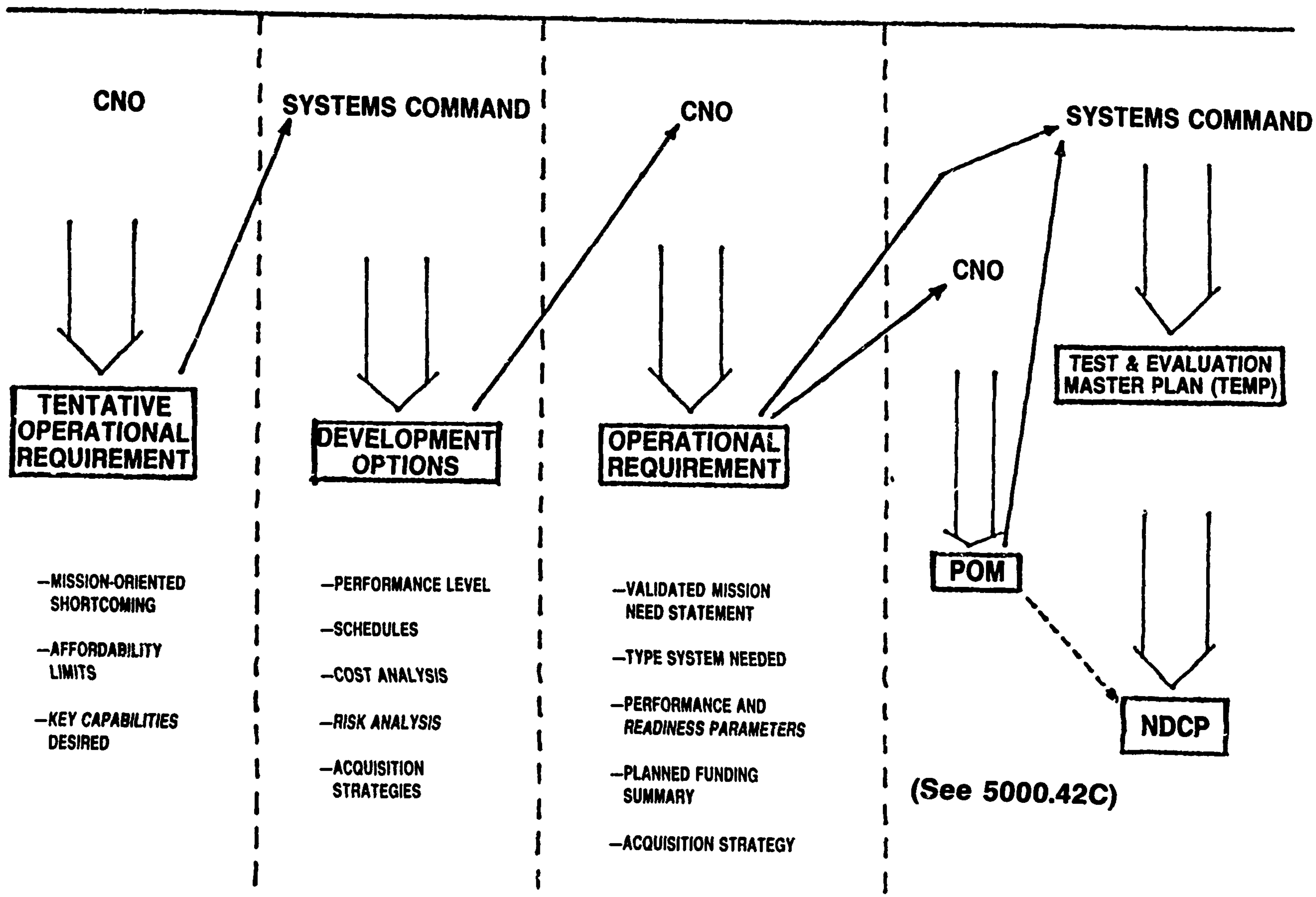


Figure 4.7. An overview of the systems acquisition process.

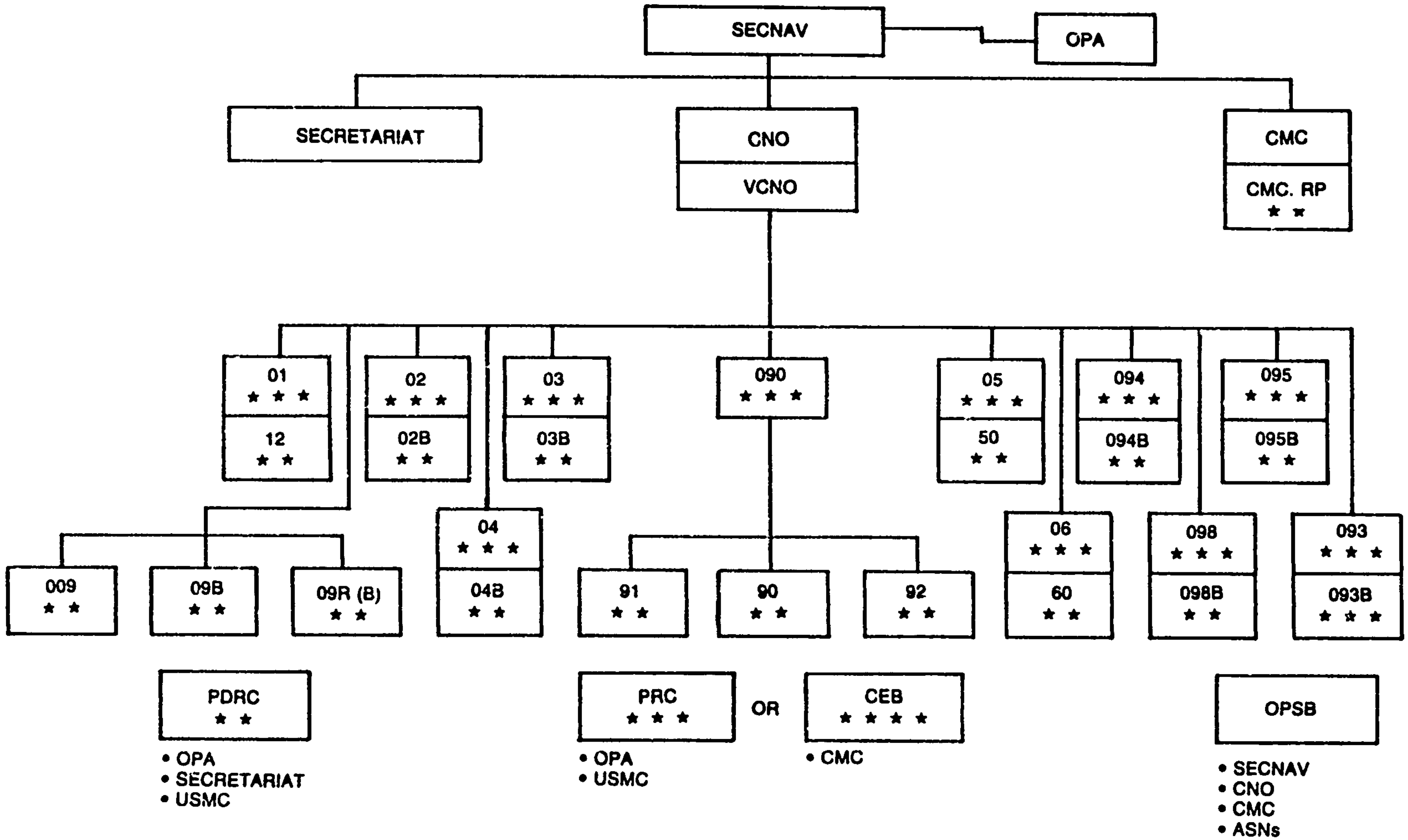


Figure 4.8. Offices/people involved in the systems acquisition decision process.

Table 4.4. Resource sponsors and tasks.

PLATFORM SPONSORS

Aviation	OP-05
Submarine	OP-02
Surface	OP-03

SUPPORT SPONSORS

C3	OP-094
Command/Administration	OP-098
Intelligence	OP-009
Logistics	OP-04
Manpower, Personnel, Training	OP-01
Medical	OP-093
Military Assistance	OP-08
Plans, Policy, Operations	OP-06
Underseas Surveillance/Oceanography	OP-095

TASKS OF PLATFORM AND SUPPORT SPONSORS

- Develop programs
- Participate in appraisals/CPAMs
- Initiate the OR

Table 4.5. Summary of claimants' responsibilities.

- Have primary responsibility for program execution.
- Submit suggested programs to sponsors (SYSCOMS provide pricing information).
- Review and comment on proposed programs.

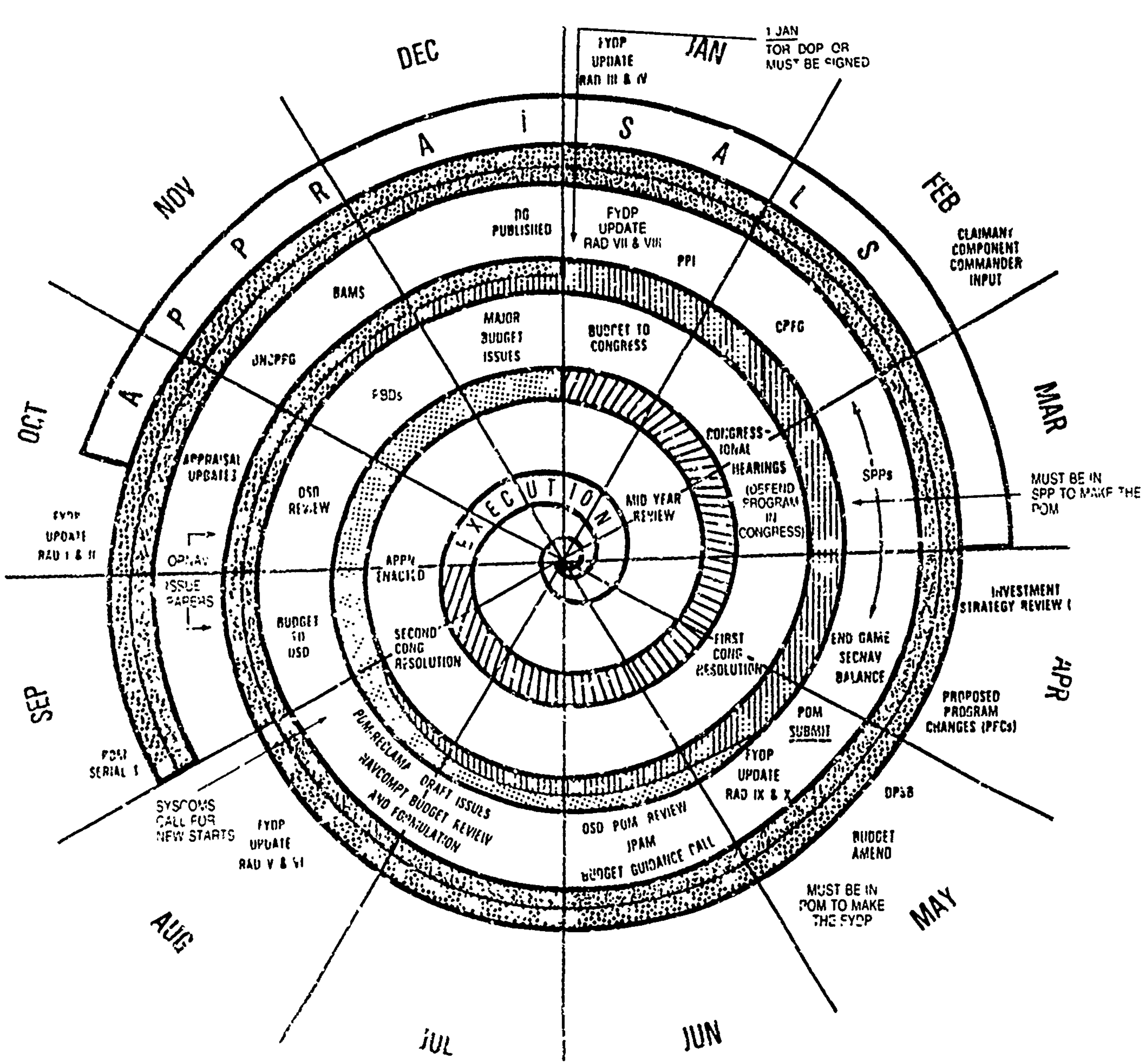


Figure 4.9. The PPBS schedule of events.

4.5 RESEARCH (primarily Navy 6.1)

The Chief of Naval Research (CNR) (Figure 4.10) is responsible for Navy Research (6.1) which includes the preparation and submission of inputs to the POM process. CNR is provided major assistance by the Office of Naval Research (ONR). Money appropriated for Research is distributed by CNR to the Claimants. ONR is the Principal Claimant. Other Claimants include NRL, NORDA, the NPGS, NMRCD, and a few other activities with very minor research programs. (The SYSCOMs no longer receive Navy 6.1 money, i.e., they are not a 6.1 Claimant.)

4.5.1 Sources of 6.1 Funding and Marketing of 6.1

a. CNR 6.1 Funding

About half of NOSC's 6.1 funds are received from CNR via the Technical Director of ONR. These funds are for the Independent Research (IR) Program. The amount is determined by the Technical Director of ONR following review of previous IR programs. However, the detailed project structure of the IR Program is determined indirectly by NOSC. IR is "independent" of Washington control. Each year the Technical Director of NOSC issues a call (about March/April) for proposals from the NOSC technical community to do high-risk research. Written preproposals are reviewed by the Program Director for Research who decides which proposals will be made orally to a group of peers selected specifically for each meeting These proposals are evaluated and the resulting recommendations are sent to the Technical Director. The aggregate of projects selected by the Technical Director constitutes the NOSC Independent Research Program.

b. Funding from ONR Code 11

NOSC also receives 6.1 money (PE61153N) from ONR Code 11 as a result of proposals. It is with this type of funding that NOSC strives to transition high-risk IR work into exploratory development. Proposals are encouraged in this area from NOSC technical personnel performing IR work. Individuals are encouraged to discuss their potential proposals with the NOSC Program Director for Research and to prepare such proposals. The ideal time to submit proposals is in the spring, prior to start-up of the next fiscal year.

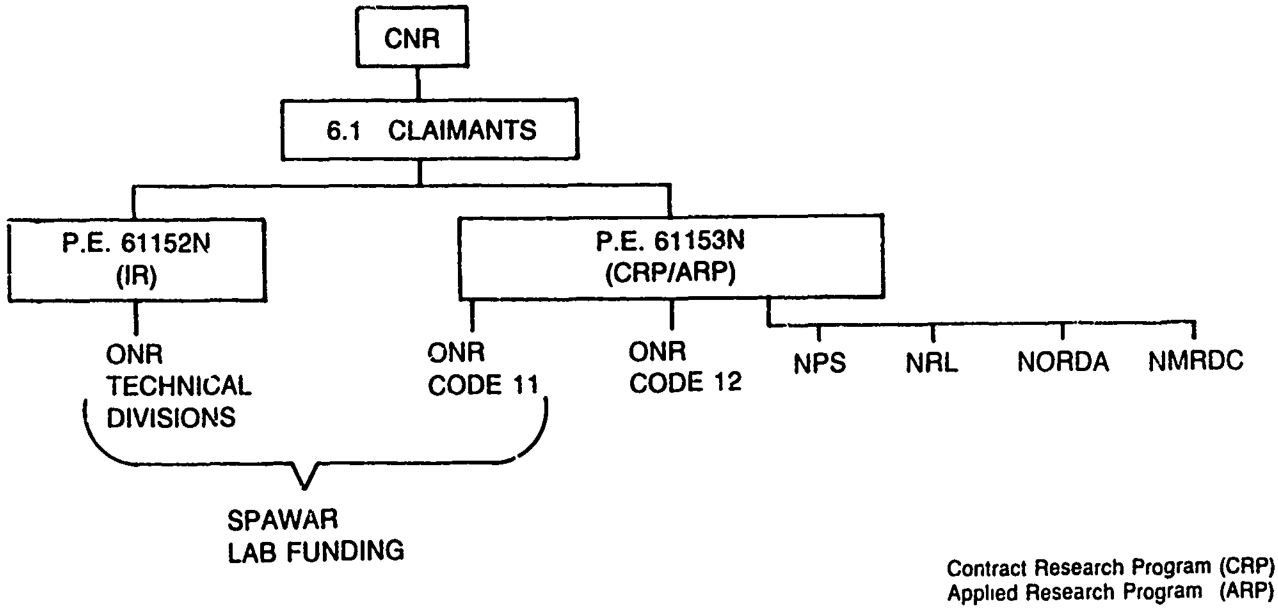


Figure 4.10. The organization for research (6.1).

c. "Cost Sharing" of 6.1 by ONR Code 11

There is a special category program under ONR Code 11, popularly called "cost sharing." Cost sharing was established to encourage the participation in Code 11 programs by Navy Centers. For this program, ONR Code 11 holds back some 61153N funds to assist ONR Technical Officers in their sponsorship of especially noteworthy Navy Center research proposals. Near the start of the fiscal year, ONR Technical Officers present their proposals for the cost-sharing program. These proposals are essentially the same as have been presented to the Technical Officers by the Navy Centers. At the same time, each of the Centers prepares a priority list to submit for all those projects that the ONR Technical Officers are submitting for cost sharing. ONR Code 11 then, based on an ONR evaluation and Center priorities, decides which projects qualify. For "sharing the cost" proposals, additional funding equal to that already earmarked by the Technical Officers is provided, that is, funding for the project is doubled. Those Technical Officers who do not succeed may still support the Center with whatever funds that are available.

d. 6.1 Funding from ONR Code 12

The 6.1 money that ONR Code 12 is responsible for is the same money that had been previously provided by ONR to the SYSCOMs. NOSC expects to be a recipient of a substantial fraction of this 6.1 money. Individuals are encouraged to submit proposals to ONR Code 12 via the NOSC Program Director for Research. Discussions should take place as early as possible. The ideal time to submit proposals to ONR is in the spring prior to start-up of the next fiscal year or any time prior to 1 October.

e. 6.1 Funding from DARPA

It is possible for NOSC to get 6.1 money from DARPA. However, DARPA frequently requires that much of the work be channeled to industry. This mode of operation is contrary to the Research

Policy of NOSC because this Center must observe the 70/30 in-house/out-house rule, but this can be partially alleviated through the use of RCPs. This work often involves high risk/high payoff efforts involving special accesses and can often provide a route to build up expertise and access needed for future work processes.

f. 6.1 Funding from Army and Air Force

Our sister services also sponsor research with 6.1 Army and 6.1 Air Force funds. This is mostly administered through the Army Research Office (ARO) or the Air Force Office of Scientific Research (AFOSR). Proposals are made to those offices or other Army or Air Force offices which they may designate. Such proposals are made directly by line organization personnel. The proposals should be for good basic research of joint interest to the Navy and the other services.

g. 6.3 Funding Used for Research

The Strategic Defense Initiatives (SDI) Program is categorized as 6.3 type funds. However, under this umbrella, some basic research is done. The NOSC Program Director for Research monitors all SDI Research work which is sponsored in the Navy, the ONR, and in the other services where it is coordinated through ARO or AFOSR. Such work is on-going at NOSC.

h. Research from Other Agencies

It is permissible to make research proposals to other federal agencies provided the work is of interest to the Navy. Currently we have work sponsored by NASA, DOE, and other agencies. These proposals are made on a case basis. They must necessarily constitute only a minor fraction of the NOSC Research Program.

4.5.2 Road Map for 6.1 Marketing and Proposals

Figure 4.11 indicates where 6.1 marketing could be targeted and how 6.1 proposals should generally be reviewed/routed/submitted.

Table 4.6 summarizes possible 6.1 marketing actions and the timeframe for such actions. This is included to guide individuals in taking 6.1 actions at the appropriate time.

4.6 EXPLORATORY DEVELOPMENT (6.2)

4.6.1 6.2 Responsibility

The Chief of Naval Research (CNR), Office of Naval Technology (ONT), is responsible for advisory and oversight of the Exploratory Development Program of the Navy. This includes preparation and submission of the Exploratory Development input to the POM. The approximate schedule (may vary somewhat from year to year) for getting inputs from the Block Claimants, and for conducting the necessary reviews, and finalizing the 6.2 Program is shown in Figure 4.12.

4.6.2 NOSC Organization for 6.2

Figure 4.13 shows the NOSC organization for managing the seven Exploratory Development blocks for which NOSC is responsible.

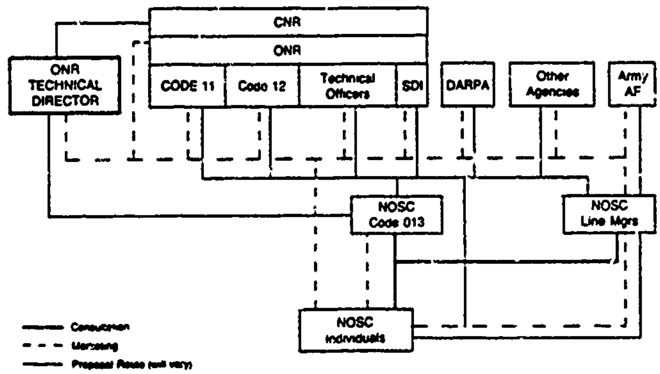


Figure 4.11. Marketing and proposals (6.1) by NOSC.

Table 4.6. Summary of possible 6.1 marketing actions and their associated timeframes.

Possible Action	Timeframe
1. Think of/seek out good research items.	Continuous
2. Discuss your idea with the NOSC Program Director for Research.	May be scheduled at any time during the year, but the ideal time is October through March.
3. Arrange to present your idea for informal criticism (e.g, at NOSC Program Director for Research's "Research Coffee."	
4. For Independent Research, submit a preproposal to the NOSC Program Director for Research in response to the Technical Director's solicitation for such proposals.	April/May
5. For ONR proposals, informally discuss your idea with ONR. Ascertain the best individual to contact by discussion with the Program Director for Research.	Spring or anytime
6. Make an Informal Proposal to ONR. Discuss first with the Program Director for Research.	
7. Submit a Formal Proposal (DD 1498) to ONR. Discuss with the Program Director for Research and your line management.	
8. Discuss your idea informally with DARPA, Air Force, or Army. Consult with the Program Director for Research.	
9. Make an informal Proposal to DARPA. Consult with the Program Director for Research.	
10. Make a Formal Proposal (DD 1498) to DARPA. Get assistance from Program Director for Research and concurrence of your line management.	
11. Discuss possible proposals with key personnel in other agencies that sponsor research and make formal proposals to those agencies in whatever format they specify.	

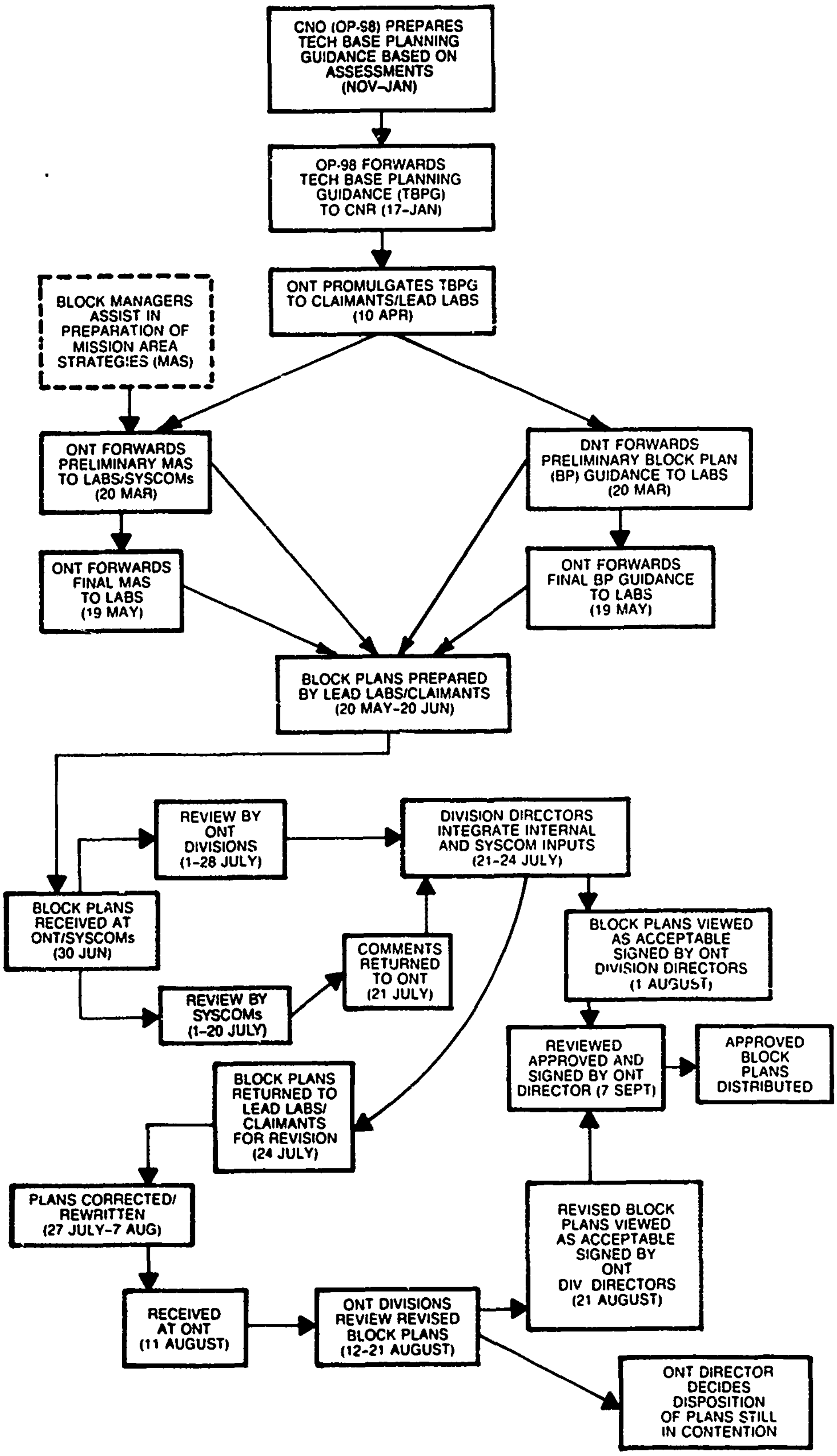
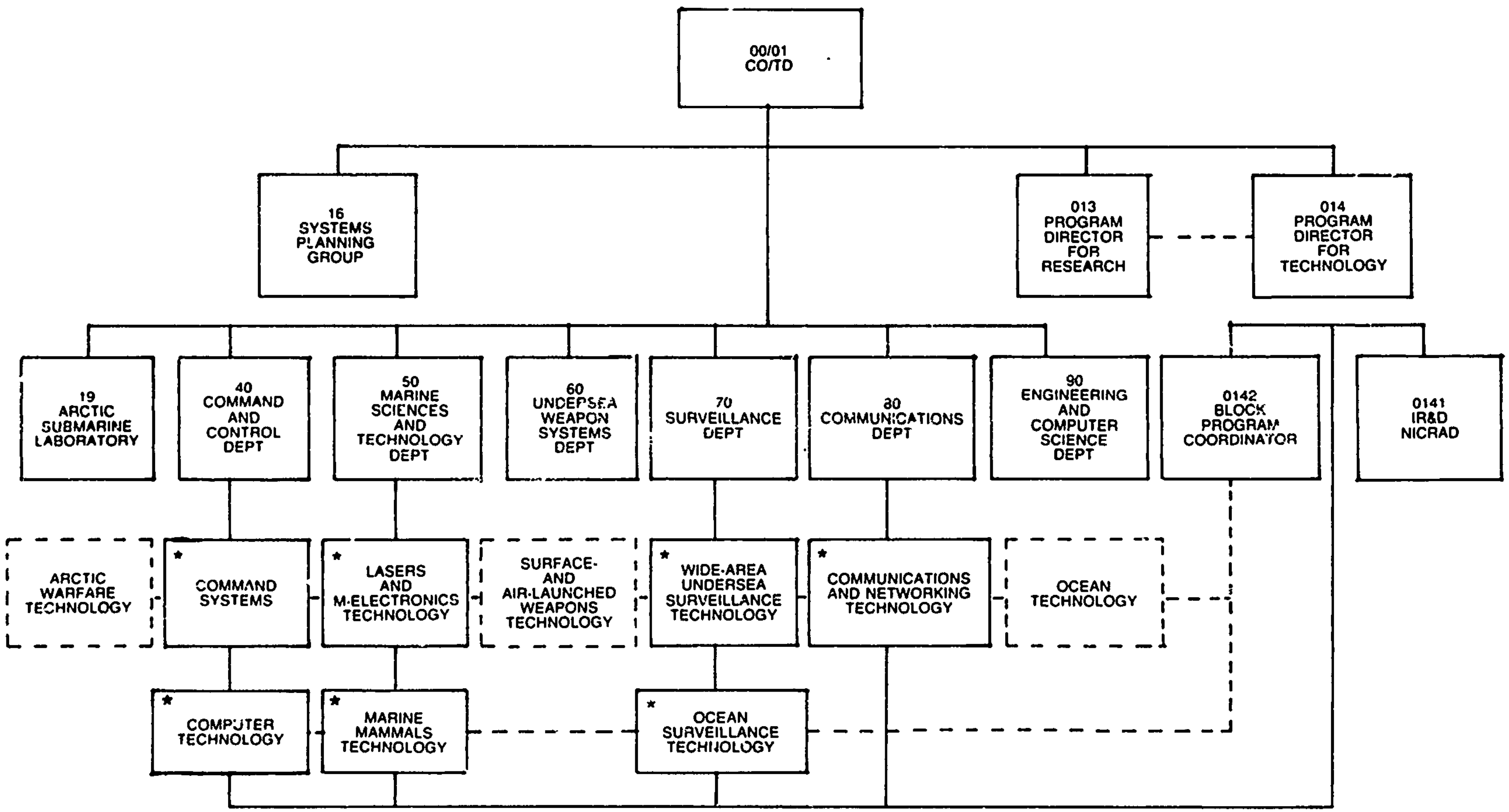


Figure 4.12. Exploratory Development Block Plan preparation, review, and approval.



* See Table 4 7 for current NOSC Block Program Managers

Figure 4.13. Block Program management at NOSC.

4.6.3 Marketing of 6.2

Marketing of 6.2 programs should be conducted primarily with the Block Managers as shown in Table 4.7 and Figure 4.13. However, as shown in Figure 4.12, the SYSCOMs review and comment to ONT on the Block Plans prepared by the Lead Laboratories/Claimants necessitates that some dialogue at the SYSCOM level be initiated depending on the nature of the project. For those cases where the proposed program falls under the cognizance of another Block Manager, some marketing should be conducted at that activity. (See Appendix 4B for a complete list of Block Plan Managers at other Laboratories/Centers.)

Table 4.7. List of NOSC Block Plan Managers.

Technical Area	Block Plan Manager	Code
Command Systems	J. Maynard	402
Communications & Networking	J. Clapp	808
Computer Technology	R. Wasilausky	423
Lasers & Micro-electronics	I. Lagnado	5503
Marine Mammals	H. Porter	51
Ocean Surveillance	V. Pusateri	705
Wide-Area Undersea Surveillance	D. Hanna	705

NOTE: These individuals are (for all practical purposes) extensions of ONT and should be approached as you would any Washington sponsor.

4.6.4 Summary of 6.2 Marketing Actions

Table 4.8 provides a summary of possible 6.2 marketing actions and their associated timeframes.

Table 4.8. Summary of possible 6.2 marketing actions and their associated timeframes.

	Possible Action	Timeframe
1.	Discuss your proposed 6.2 with the appropriate 6.2 Block Manager. (See Table 4.7 for a list of NOSC Block Plan Managers.)	October–March
2.	Discuss informally with potential sponsor(s).	October–March
3.	Develop a proposal (LPS). (See Appendix 4C for sample.)	March–April or earlier
4.	Have your proposal reviewed by your supervisor. Informally discuss the proposal with NOSC Block Manager. Obtain in-house clearance for marketing involving Block Plans outside NOSC.	April
5.	Submit your proposal formally to the Block Plan Manager.	Mid-May
6.	Prepare the Laboratory Program Summary (LPS).	
7.	Prepare, staff, and submit a Formal Proposal (LPS) (except DARPA). See NOSC Code 7405 for DARPA proposal support.	
8.	Contact the NARDIC Pasadena Office, AV 360 2452, regarding USAF or Army 6.2. NOTE: Non-Navy/USMC work requires the TD's approval.	
9.	Participate in IR&D reviews as an aid to Technology Base marketing.	

4.6.5 Review of 6.2 Marketing and Proposals

Figure 4.14 depicts the procedure for review and submission of 6.2 proposals by NOSC technical personnel. This procedure will vary with the nature of the program and the prospective sponsor.

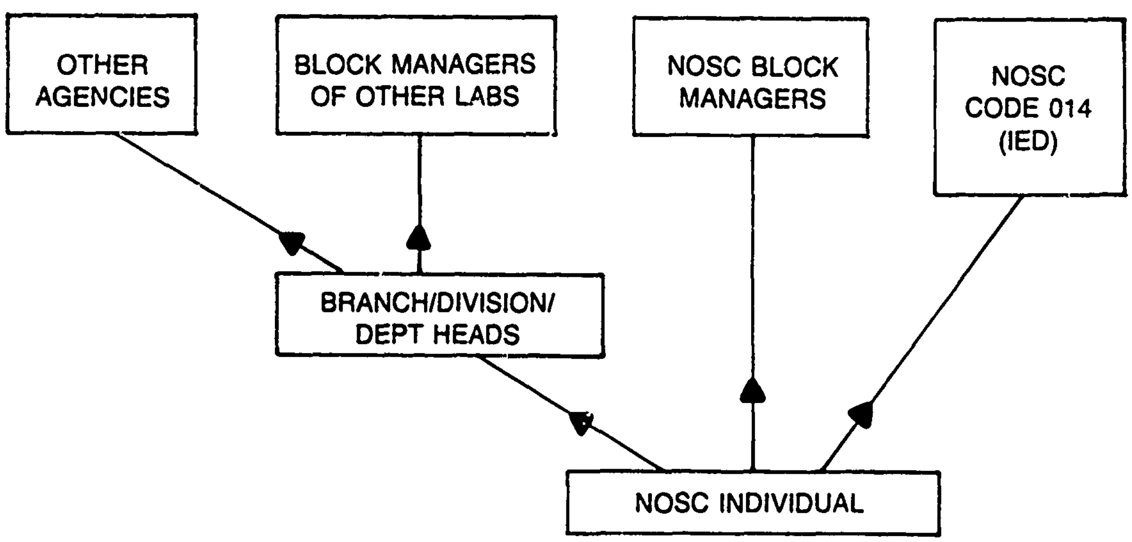


Figure 4.14. Marketing and proposals (6.2) by NOSC.

4.7 ADVANCED TECHNOLOGY DEMONSTRATIONS (6.3A)

CNO, OP-987, administers 6.3A, and ONT provides advisory support to OP-987 on these programs. Proposals are prepared by the laboratories and shown in Figure 4.15. ONT evaluates 6.3A proposals from the laboratories. In 1987, each laboratory was limited to submitting no more than four 6.3A proposals along with their Block Plans (submitted about mid-July). At NOSC, the 6.3A proposals were obtained from Department Heads. The General Board voted on and prioritized the proposals. Any program proposed for transition from 6.2 to 6.3A must be ready for such transition and have strong NOSC, SYSCOM, ONT, and OP-987 support. With creation of the Balanced Technology Initiative (BTI) program and Conventional Defense Initiative (CDI) programs by Congress, there is increased opportunity for 6.3A high risk/high payoff demonstrations. These programs are managed by OP-987 as adjuncts to their regular 6.3A program. When proposing any type of advanced demonstration, it is critical to have an OPNAV resource sponsor who will promise to pick up the effort at the completion of a demonstration, given that it is successful. Most proposals fail due to the lack of this OPNAV support.

Non-Acquisition programs such as 6.3A must follow the approval process outlined in OPNAVINST 5000.42C and generate Non-Acquisition Program Definition Documents (NAPDDs).

4.8 SOURCES OF TECHNOLOGY BASE GUIDANCE/NEEDS

The following are recommended documents for ascertaining Navy needs as pertain to the Technology Base (6.1 and 6.2), and these are held by the R&D Planning Guidance Group.

- Fleet R&D Objectives/Deficiency Reports
- Mission Area Strategies (Guides Exploratory Development (6.2))
- Master Plans
- OPNAV Warfare Appraisals
- Key Naval Needs (Guides Research (6.1))

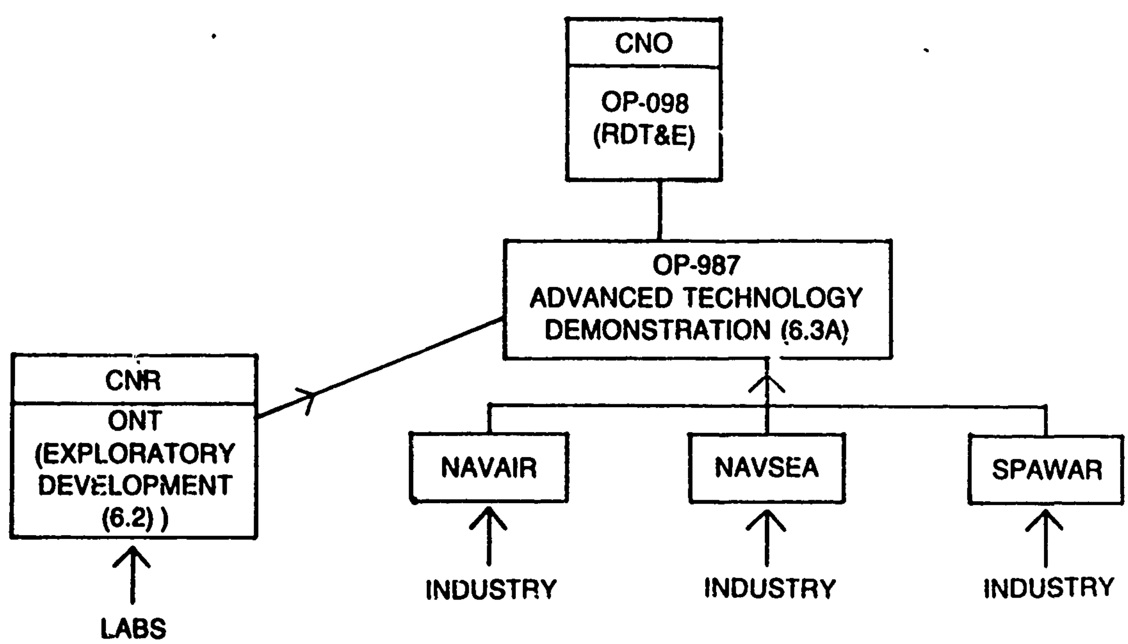


Figure 4.15 Organization for 6.3A program.

4.9 ADVANCED DEVELOPMENT (6.3), ENGINEERING DEVELOPMENT (6.4), AND OPERATIONAL SYSTEM DEVELOPMENT (6.6)

The RDT&E process for 6.3, 6.4, and 6.6 programs and those developments conducted with Program 1, 2, and 3 funds are much more complex than for the Technology Base (6.1 and 6.2). The process is not centralized such as the Block Plans for 6.2. The process for 6.3, 6.4, 6.6, etc., will be covered in this section only to the extent necessary to properly address the marketing and proposals' aspects.

As explained in OPNAVINST 5000.42C, when the need for a new system is perceived and is believed to be affordable, OPNAV transmits to the appropriate SYSCOM a Tentative Operational Requirement (TOR) which describes the needed capability in general terms. All TORs are sent via SPAWAR. In response to the TOR, the assigned SYSCOM(s) prepares a Development Options Paper (DOP) that contains a menu of options from those of minimum capability and cost to advanced systems with greater capability and cost. All DOPs are forwarded to OPNAV via SPAWAR. OPNAV then selects the alternative that best matches the desired capabilities with affordability considerations. OPNAV then issues an Operational Requirement (OR); for Acquisition Category I systems, a Justification Major System New Start (JMSNS) is also issued. When an OR is approved by OPNAV, it signifies the intent to fund the acquisition, and the sponsor must show funding in the POM within 3 years, or it automatically dies.

Within OPNAV, a TOR or OR/JMSNS is originated and submitted by the cognizant code. It is then reviewed within OPNAV by those codes that are involved or have an interest. The TOR or OR/JMSNS is then approved by OP-098 and promulgated by OP-098 as explained. Figure 4.16 shows the organizational structure for the preparation and processing of TORs, DOPs, and ORs/JMSNS.

In order for a system acquisition to be included in the Program Objectives Memorandum (POM), there must be an approved OR/JMSNS for that system by 1 January for the upcoming POM year (the on-year).

Since TORs, DOPs, and ORs/JMSNS are needed to initiate an acquisition, NOSC should, where appropriate, assist in their preparation.

Additional information on the research, development, and acquisition procedures is contained in OPNAVINST 5000.42C; it is highly recommended that it be studied. See Appendix 4A.

NOTE: The use of Category 1: strategic; 2: general purpose forces; or 3: C3I funds for RDT&E is a sponsor-controlled option; the process is roughly the same for all programs when viewed from a NOSC perspective.

4.10 ON-GOING AND/OR PROGRAMS TO BE INITIATED

Consider marketing in the areas of 6.3, 6.4, and 6.6 by trying to get a piece of a program that is ongoing or is just being initiated. Getting a small piece of a larger program and doing it well often leads to a larger piece, etc., and builds experience with lower risk. Again, start marketing early before all the pieces have been assigned.

4.11 TOP-LEVEL WARFARE REQUIREMENTS (TLWR)

TLWRs are relatively new and are described in detail in a CNO CONFIDENTIAL memorandum, Serial 0905C/6C349644 of 18 Aug 1986. They provide a master blueprint for future operational forces

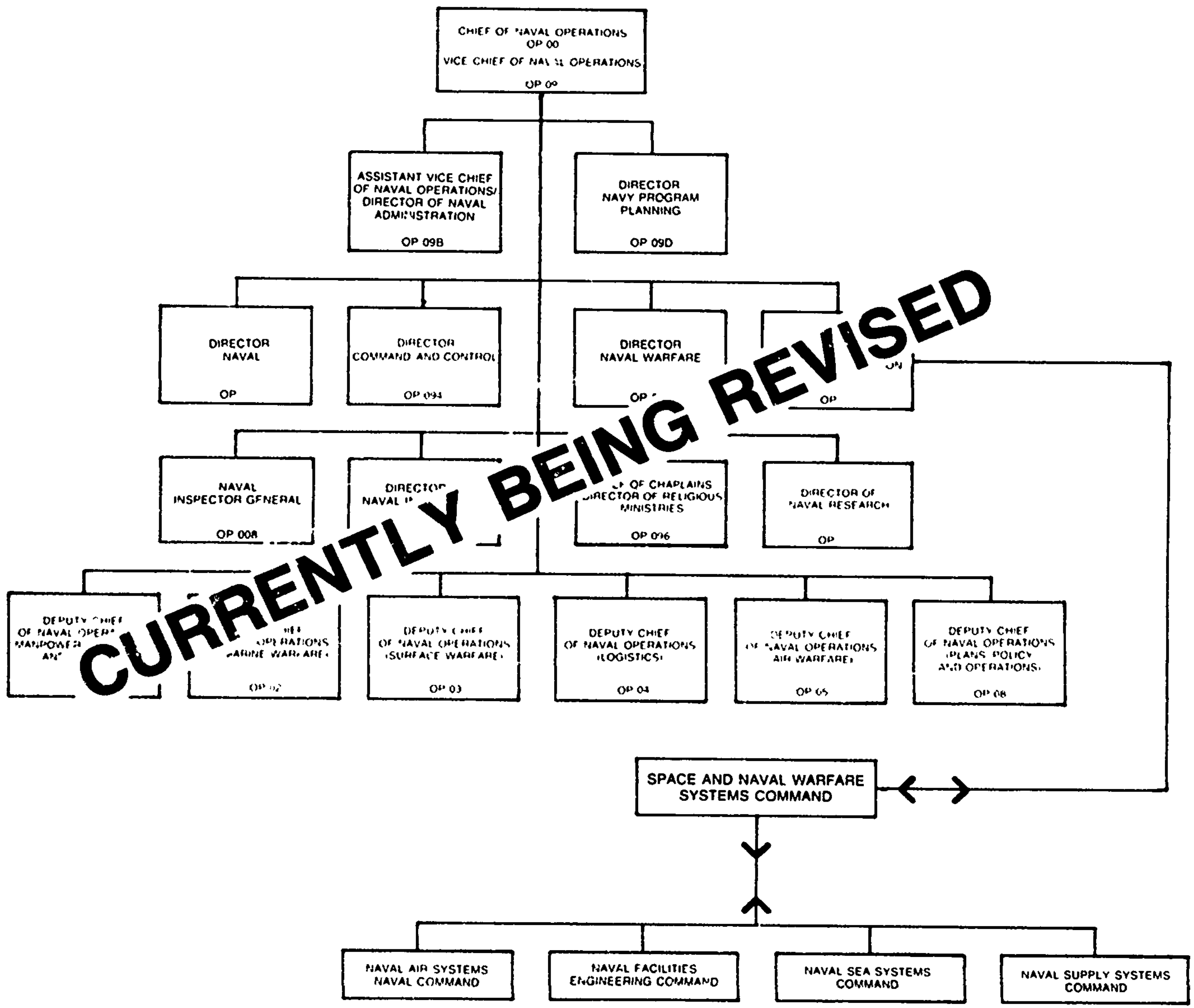


Figure 4.16 Basic organization for the preparation and processing of TORs, DOPs, and ORs/JMSNS.

and mission areas within each force. The objective of the TLWR process is to provide force-level operational requirements that enhance multimission capabilities, drive technological development, and pace the threat into the 21st Century. In the future it is expected that the TOR/DOP/OR process previously described will be preceded by the TLWR WSA/WSE process.

The research, development, and acquisition process, which starts with a Tentative Operational Requirement (TOR), provides a force-level frame of reference for development of requirements to be met by TORs and ORs. Equally important, the TLWR process provides a means of assessing the war-fighting value of independently generated TORs and ORs. The TLWR process is illustrated in Figure 4.17. Participating/assisting in the TLWR process provides marketing opportunities.

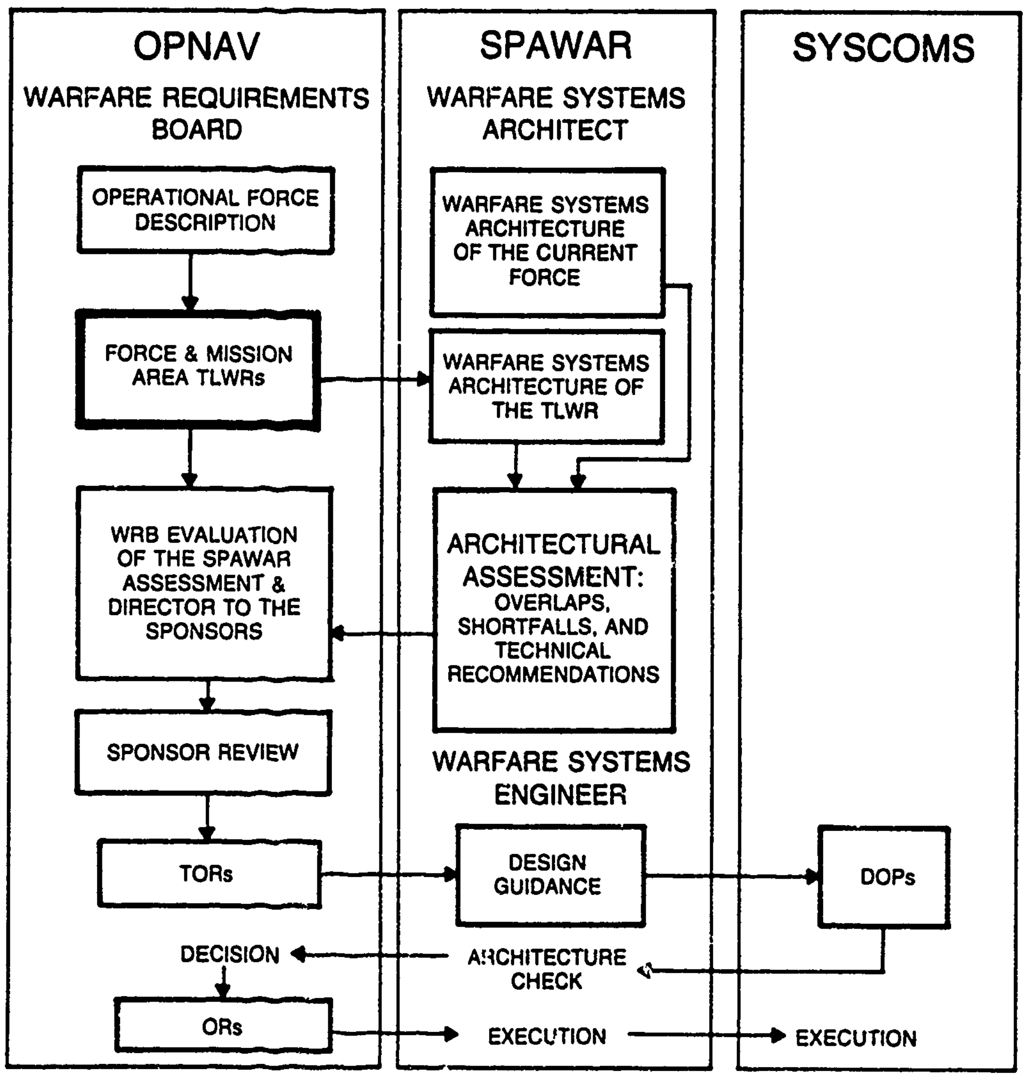


Figure 4.17. The TLWR process.

4.12 INTERNATIONAL PROGRAM FOR NEW INITIATIVES (IPNI)

4.12.1 General

It is possible to obtain 6.2, 6.3, 6.4, or 6.6 money under the IPNI. As a result of Congressional mandate and CNO direction, funding is available for several new IPNIs. These include Foreign Weapons Evaluation, NATO Cooperative Test, and NATO Research and Development Programs. Any program proposed under the IPNI must be in response to, or in support of, a Tentative Operational Requirement (TOR), an Operational Requirement (OR), or a Justification Major System New Start (JMSNS). In order to get a 6.2 program, it must be tied to a system or other for which there is a TOR, OR, or JMSNS.

4.12.2 Areas of Preferred Candidate Proposals

Proposals for doing work under the IPNI are desired in the following areas:

- Foreign equipment in production and operation
- Equipment that has a performance advantage over U.S. systems
- Alternatives to U.S. equipment in initial development
- Projects with low cost and with high payoff
- Willingness of foreign governments/contractors to share evaluation costs

IPNI proposals are prepared in response to a CNO sponsor request, by a SYSCOM/ONR initiative, or as a Naval activity recommendation. Figure 4.18 depicts the IPNI proposal submittal and approval process.

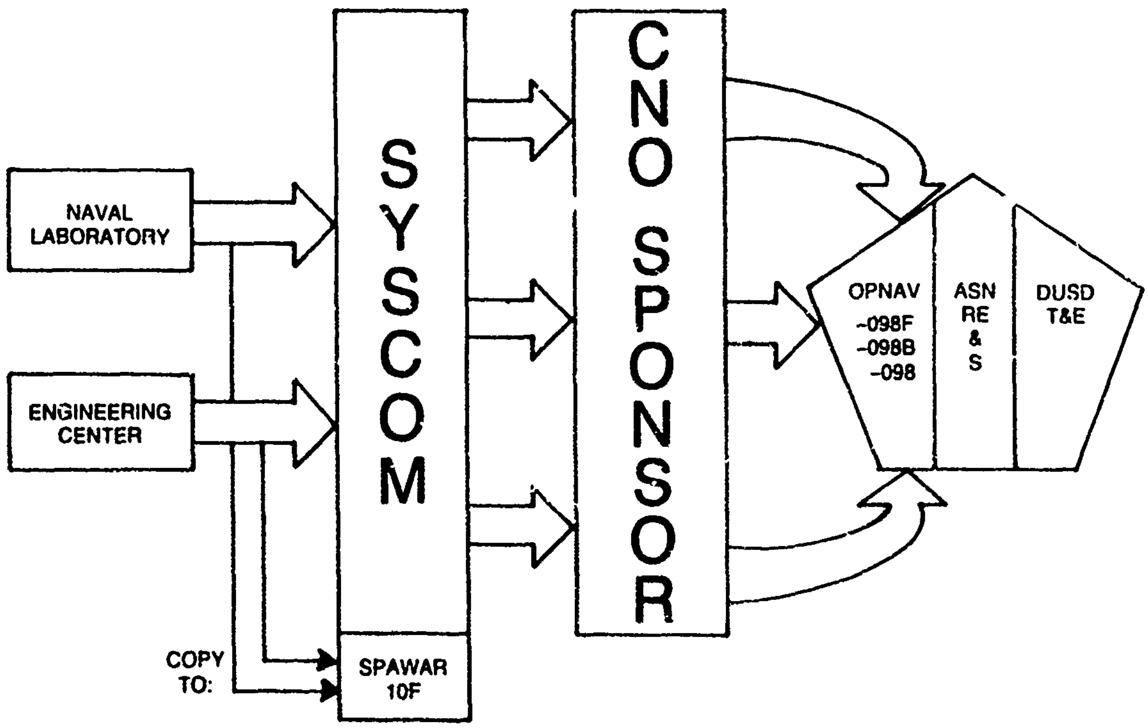


Figure 4.18. IPNI proposals.

4.12.3 Sources of Information for Seeking Out Candidates

The following are recommended sources of information that may help identify a candidate for IPNI:

- Foreign literature from Allied countries
- Foreign embassy Naval Attache releases
- Technical reports from information exchange projects
- Consolidated listings by foreign governments
- Vendor brochures
- Foreign periodicals
- Information provided to the Labs by SPAWAR 10F
- SECNAVINST and OPNAVINST 3960 contain detailed information on the IPNI Program including points-of-contact within OPNAV and the SYSCOMs, a checklist, and formats.

For assistance on IPNI, contact the office of the Exploratory Development Program Manager at NOSC, Code 014.

4.13 JOINT SERVICE RDT&E

OPNAVINST 5000.42C strongly encourages the use of a joint development effort for those programs where there is a commonality of requirements between the Services sufficient to support a common program. This should be considered when marketing an item that has potential for joint service usage and may be a way to do a program with less Navy money. ACAT I programs will automatically be required to be submitted for consideration as joint programs.

4.14 MARKETING OF STUDIES AND ANALYSES

CNO annually develops a Study Plan. The plan lists a series of studies, including assignments of responsibility, aimed at deficiencies made apparent in the process of preparing the Defense Guidance. When considering proposing major study efforts, the Study Plan should be reviewed to determine if any duplication exists. Inputs to the Study Plan are provided by OPNAV and the SYSCOMs. Major studies and analyses should be marketed similar to other types of work. The Systems Planning Group, Code 16, at NOSC has the responsibility for coordinating NOSC studies and will advise you as to where to locate sponsors.

4.15 PROPOSALS

4.15.1 General

This section includes information on the procedures for the preparation, review, approval, and submission of either informal or formal NOSC proposals.

Informal Proposal: Any document submitted to a sponsor for preliminary review and critique as a prelude to ultimate task definition

Formal Proposal: A document submitted to a sponsor that offers to perform specified work, for a specified amount of funding, within a specified time

Solicited Proposal: The response to a request from a sponsor, wherein the ultimate decision as to whether the Center will receive funding to accomplish an indicated task is dependent upon the nature and quality of that response

Nonsolicited Proposal: The submission of a proposal to a potential sponsor without a request for such a proposal

Submission of an informal proposal is in no sense informal marketing. Despite such labels as "preliminary," "informal," or "working papers," submission of a documented proposal is a tacit offer to commit NOSC resources. The later refusal to accept an assignment because of lack of resources would be counterproductive to future proposals. Accordingly, the procedures outlined here should be followed prior to initial submission of any type of proposal to a prospective sponsor.

Informal marketing leading to submission of a formal proposal, such as the Laboratory Program Summary (DD 1498) (see sample, Appendix 4C) has proven to be effective. Occasionally, a more elaborate formal proposal format or a draft Statement of Work is required or is more appropriate. In these instances, the NOSC Proposal Format of Appendix 4D should be used.

The Commander, NOSC, has the sole authority to commit NOSC's resources for accomplishment of proposed tasks. All such commitments are required to be reported via the the Laboratory Program Summary (DD 1498).

In order to anticipate requirements for growth or attrition, NOSC management must maintain a reasonable estimate of new business prospects. After submission, each proposal manager will be asked to report periodically on the status of proposals pending.

The method of proposal development recommended in this section comprises the development of an informal proposal followed by a formal proposal. Either an informal or formal proposal may be solicited or nonsolicited. Remember, a good proposal by itself is insufficient but a bad one is "lethal" and may hurt future proposals.

4.15.2 Developing Proposals

The submission of an informal proposal is a tacit offer to commit NOSC resources; do not oversell or exaggerate. Keep in mind that the informal proposal creates the opportunity; the formal proposal establishes the contract. For the informal proposal, use B&P funding (department or major) or current project funding if for the same sponsor and with the sponsor's knowledge. This process takes time; remember that your goal is to build a client/advisor versus a customer/salesman relationship. The following are some guidelines for developing a successful informal proposal.

a. Make sure the proposal is of "book" quality, that is, it should look professional but not too "slick."

b. Develop a point paper or self-narrated brief. It must skim well. Keep it short and profusely illustrated (illustrations should have instructive captions). It should appeal to experts as well as laymen.

c. Remember that the proposal teaches what it's all about. It establishes or creates the need, points out the opportunity, and provides the solution. It establishes the theme by addressing the superiority of the approach. It should consider credibility, risk control, timing, cost, management commitment, and the defined product or deliverable.

d. Develop the briefing. This is very important—the superiority of an idea or design is not so self-evident that it does not require supporting data and presentations. Therefore, prepare a first-class briefing designed for dialogue with the customer. Presentations should be to the point and be presented by those who have the expertise to field difficult questions.

e. If possible, bring some or all of the following items, which are in priority order, to establish credibility for the idea. NOTE: Items from the top of the list support the argument that you are farther along than your competition.

   Hardware
   Mockups
   Photos
   Engineering type drawings
   Artist sketches
   Reports
   Data

f. Sell the theme emphasizing that "we are farther along."

g. Detect/create a need/solution that the customer will recognize as valid and that is not available from the competition.

h. Offer the sponsor something he/she can't get elsewhere such as special experience, Fleet/intelligence access, contracting authority, staff support, etc. Know the competition's strengths, weaknesses, tactics, and pricing information. Point out where you have more to offer, but don't "bad-mouth" your competition (especially if it's in-house or at another Navy Lab.)

i. Know the leverage points (i.e., critical thresholds, costs, etc.; make compromises elsewhere to preserve these).

j. Cultivate a champion at headquarters on the sponsor's staff; treat that person well; invite the sponsor or his/her staff to NOSC for a review of available hardware and resources. Use your "champion" to gain access to decision matters and to pull decision makers together for briefings, etc. Provide your "champion" with a first-class briefing package.

k. Thoroughly review the proposal and make changes that will improve the document.

l. Offer to assist the sponsor and the sponsor's staff in performing their job, writing papers, documentation, TORs, etc. When you go to a sponsor with requests for action, take ready drafts for that action.

m. Provide your sponsor with e-mail capability if possible. (It is an excellent way to provide drafts and staff support.) Telecopies are also helpful.

Several things should be kept in mind when developing a proposal. First, prior experience is less important than the best proposal. Second, time spent on a good presentation pays off more often than additional analysis. Be sure to bring in additional talent to the team as the requirements unfold, and additional expertise is needed. Brief the proposal to NOSC upper management, if appropriate. Their commitment and interest will help when the proposal is presented to the sponsor.

4.15.3 Formal Proposal

The following observations are intended to provide some help in approaching the formal proposal.

a. Use the Laboratory Program Summary (DD Form 1498) format and seek department administrative support when preparing a proposal.

b. Identify and solidify resources. Verify manpower availability, vault space, costs/schedule, and obtain necessary signatures and letters of agreement.

c. A cover letter is most helpful (signed out as high as possible in the NOSC chain of command to show management support).

d. Large programs will be done by letters of agreement; assignment of responsibility to (e.g., deputy PM, lead Lab, etc.). These will need your staff support in addition to writing SOWs, etc.

4.15.4 Format and Contents of Proposals

Appendix 4C is a sample of a Laboratory Program Summary, DD Form 1498. The 1498 is the official record of NOSC's commitment to the performance of any given task. An approved 1498 is required for each on-going project and is necessary for funds to be released.

Appendix 4D contains information on the format and contents for proposals when the 1498 cannot be used. Also included is a complete description of each item of such a proposal.

For those cases where a Statement of Work is required, the format and contents may be the same as for a proposal (see Appendix 4D) but more detail will be necessary. (Some activities consider the Laboratory Program Summary as being too brief and will require a draft Statement of Work.)

4.15.5 Steps for Developing and Staffing of Proposals

Appendix 4E contains a step-by-step procedure for the planning, preparation, review, submission, and briefing of proposals.

4.16 INITIATION OF NEW PROJECTS

When the Center receives a task assignment and funding in response to a proposal submission, the approved form 11ND-NOSC 3920/9 with the assigned NOSC project number constitutes authority for immediate establishment of a funding resource number. When task assignments are received as a result of marketing proposals, a 1498 should be prepared. When task assignments are received that are not the result of a proposal, the cognizant department head will ensure that suitable technical plan schedules and cost estimates are prepared and incorporated in a DD 1498, plus Form 11ND-NOSC-3920/9 for management review and numbering. The department head's signature on the 121ND-NOSC-3920/9 certifies that he/she has positively ensured that all necessary support has been coordinated with performing divisions and departments. These completed forms are the official record of NOSC's commitment.

APPENDIX 4A

POM-90 SCHEDULE OF EVENTS

POM-90 SCHEDULE OF EVENTS

EXAMPLE

POM-90 DUE DATE	EVENT	LEAD/ ASSIST	MECHANISM
JULY 87	Maritime strategy appraisal	OP-06	PDRC and CEB
JULY-AUG 87	Apportionment Review of FY 88-89	OP-92/ Claimants	Meetings
AUG 87	C3I Appraisal	OP-094	PRC
AUG 87	Revised fiscal guidance for Summary Warfare Updates	OP-90	Document
AUG 87	Submit Extended Planning Annex (due 17 AUG)	OP-91	Document
AUG/SEP 87	Medical Strategy CEB	OP-093	Pre-CEB and CEB
SEP 87	Publish RAD V and RAD VI • Resource allocation display of SEPT DON FYDP (reflects FY 88-89 apportionment review) • RAD VI forwarded to claimants	OP-90	POM Serials with computer printout
SEP 87	MPT Strategy CEB	OP-01	Pre-CEB and CEB
SEP 87	Electro-magnetic interference (EMI) CEB	OP-094	Pre-CEB and CEB
SEP 87	Non-nuclear ordnance (NNOR) output briefings	OP-095	NNOP board
OCT 87	Surface Ship Maintenance strategy CEB	OP-03	Pre-CEB and CEB
OCT 87	Navy position on Theater Nuclear Warfare (TNW)	OP-095	Pre-CEB and CEB
OCT 87	Summary Naval Warfare Appraisal update	OP-095	PDRC and CEB
OCT 87	Investment Strategy Review Update	OP-91	PDRC and CEB
OCT 87	Competitive Strategy Review	OP-06	PDRC and CEB
OCT 87	Implementation/Defense Guidance review	OSD	DRB meetings
NOV 87	Training CEB (semi-annual)	OP-01	PDRC and CEB
NOV 87	Space Appraisal	OP-094	PDRC and CEB
NOV 87	Distribute outline of Draft FY-89 Total Force Report to Congress	OP-06	Document
NOV 87	Claimant POM-90 issues reviewed and distributed (due 1 NOV)	OP-90	Issue papers
NOV 87	Unified CINC IPL submission (due 11 NOV)	OSD	Documents

NOV 87	Component Commanders POM-90 issues received and distributed (due 15 NOV)	OP-90	Issue papers
NOV 87	Planning and Programming Guidance DSPB	OP-90	DON Program Strategy Board
NOV 87	Issue DON Consolidated Planning and Programming Guidance (DNCPPG)	OP-90	POM Serial
OCT-DEC 87	Distribute baseline assessment memoranda • Costs based on force and support levels —Manpower, Personnel and Training —Logistics, including BOS —Ship Maintenance/Modern. —Naval Reserve —Physical Security (non-BOS) —Mapping, Charting and Geodesy	 OP-01 OP-04 OP-03 OP-09R OP-09N OP-006	 Documents only
DEC 87	Defense Guidance issued (30 DEC is target date)	OSD	Memorandum
JAN 88	Reprice MPN for RAD VII	OP-01/NMPC	Memorandum
JAN 88	Publish RAD VII and RAD VIII • Resource allocation display of JAN FYDP • RAD VIII forwarded to claimants	OP-90	POM Serials with computer printout
JAN 88	Publish CPFG • Final programming guidance • Fiscal controls • Guidance to sponsors for development of SPPs	OP-90	POM Serial
JAN 88	Medical SPP presentation	OP-093	PDRC/PRC
FEB 88	Joint Service Program Briefings	RS/OP-90	Presentations to other services
FEB 88	Submit Medical Sponsor Program Proposal (SPP)	OP-093	Documents and database inputs
FEB 88	Draft Medical POM review by DPSB	OP-90	DON Program Strategy Board
FEB 88	Complete verification of database update (medical)	OP-90/ OP-093	Examination of computer printouts
FEB 88	Resource sponsors submit heads-on reports on major POM-90 program requirements (to provide early perspective of total program requirements during Medical POM DPSB)	Resource Sponsors	Documents (guidance to be provided by separate memo)
FEB 88	Provide Initial SCN/APN Plans	OP-03/05	Documents and database inputs

FEB-MAR 88	Resource Sponsors Submit Sponsor Program Proposals (SPP)	OP-01 OP-02 OP-03 OP-04 OP-05 OP-06 OP-009 OP-09B OP-006 OP-094 OP-095 OP-098	Documents and database inputs
FEB-MAR 88	Complete verification of program database update	OP-90 analysts/ Resource Sponsors	Examination of computer printouts
FEB-MAR 88	Submit Sponsor Program Proposal Decision Documents (SPPDs) • Each resource sponsor responds to top five issues from each claimant and to all component commander issues which define CINC IPL issues.	Resource Sponsors	OP-90 will forward documents and resource displays to claimants
FEB-MAR 88	Issue CNO guidance to resource sponsors for EPA development	OP-91	POM Serial
FEB-MAR 88	OPN/WPN displays to SYSCOMs for repricing	OP-92	Computer printouts
FEB-MAR 88	SPP Presentations • Detailed briefing/documentation • OPs-90B/06/006/009 provide documentation only	Resource Sponsors	PRC/PDRC
FEB-MAR 88	CIVPERS Review	OP-90	Examination of computer printouts
FEB-MAR 88	Forward Database Displays and SPPDs to claimants for review and comment	OP-90	Documents
FEB-MAR 88	SYSCOMs deliver OPN/WPN repricing to OP-92	SYSCOMs/ OP-92	Documents
MAR 88	Draft Medical POM Submission to OSD(HA)	OP-90	Memorandum with computer printouts

MAR 88	Distribute Post-SPP Assessments —Manpower, Personnel and Training —Logistics, including BOS and strategic —Ship Maintenance/Modern. —Naval Reserve —Physical Security (non-BOS) —Mapping, Charting and Geodesy	 OP-01 OP-04 OP-03 OP-09R OP-09N OP-006	Memoranda
MAR 88	OP-090/Appropriation Sponsor Reviews	OP-90/92 Appropriation Sponsors	Meetings
MAR 88	Post SPP Training Assessment	OP-01	PDRC
MAR 88	POM-90 DPSB Review	OP-90	Briefing to DPSB by resource pillar
MAR 88	Final reprice of MPN	OP-12/NMPC	Memorandum
MAR 88	Establish final manpower controls	OP-90/ OP-12	Memorandum
MAR 88	Claimants submit SPP comments/reclama to OP-90	Claimants	Documents
MAR 88	POM documentation in accordance with POM Preparation Instructions (PPI)	Resource Sponsors	Documents
MAR 88	Submit EPA Platform Procurement Plans	OP-02/03 05/095	Documents to OP-91
MAR 88	Database lock and final balancing	OP-90	Adjust database to fiscal controls
APR 88	Submit POM-90 to OSD	OP-90	Letter, database tape, documents
APR 88	Publish RAD IX and RAD X • Resource allocation display of APR FYDP • RAD X forwarded to claimants	OP-90	POM Serials with computer printout
APR 88	Resource sponsor inputs for EPA	Resource Sponsors	Documentation
MAY 88	Submit EPA	OP-91	Documentation
JUN 88	POM 90 program review	OSD	DRB meetings
JUL 88	Final program decisions	OSD	Memorandum

APPENDIX 4B

LIST OF BLOCK PLAN MANAGERS AT EACH NAVY LABORATORY/CENTER

BLKNUM	BLKORG	BLKTITLE	MGRNAME	MGRORGCODE	MGPPHONE	ORGCITY	ORGZIP
ND1A	DTNSRDC	SURFACE SHIP TECHNOLOGY	Mr Lincoln Cathers	012.4	202-227-1378	Bethesda MD	20084
ND2B	DTNSRDC	SHIP & SUBMARINE MATERIALS	Mr Ivan Caplan	012.5	301-267-2636	Bethesda MD	20084
ND2A	DTNSRDC	LOGISTICS	Mr Joseph Sheehan	012.6	202-227-1026	Bethesda MD	20084
ND3A	DTNSRDC	SUBMARINE TECHNOLOGY	Mr. Lincoln Cathers	012.4	202-227-1378	Bethesda MD	20084
EO3A	EODTC	EOD TECHNOLOGY					
CC1A	MCDEC	MARINE CORPS PROGRAMS	COL R Zalles, USMC	D062			
NA1A	NADC	AIRBORNE SURVEILLANCE	Otto Kessler	509	215-441-1569	Warminster PA	18974
NA1B	NADC	AIR PLATFORMS & SYSTEMS	Ken Green	60C1	215-441-1379	Warminster PA	18974
NA2A	NADC	AIRCRAFT MATERIALS TECHNOLOGY	Irv Shaffer	60C2	215-441-2824	Warminster PA	18974
NA2B	NADC	NAVIGATION & A/C C3	Walt Shoppe	40B	215-441-2378	Warminster PA	18974
NA3A	NADC	AIR ASW SURVEILLANCE	Tony Madera	50D	215-441-1067	Warminster PA	18974
WV1A	NAVAIR	NAVAL AIR VEHICLE TECHNOLOGY					
WV2A	NAVAIR	ADVANCED AIRCRAFT MATERIALS					
YE2A	NAVFAC	FACILITIES & ENVIRON PROTECTION	Milon Essoglou		703-325-8533		
SN3A	NAVSEA	NUCLEAR PROPULSION					
TP2A	NAVSUP	PROTECTIVE CLOTHING					
NC3A	NCSC	MINE CM/TORPEDO CM/SPEC W/F	Mr Donald Folds	401		Panama City FL	32407
EP2A	NEPRF	ATMOSPHERIC SUPPORT				Monterey CA	93943
MB2A	NMRDC	MEDICAL CBR DEFENSE & BIOMED TECH					
OB2A	NOBS	ASTRONOMY					
RD2A	NORDA	OCEANOGRAPHIC SUPPORT					
RD3A	NORDA	ENVIRONMENTAL ACOUSTICS					
NO1A	NOSC	INTEGRATED OCEAN SURVEILLANCE	Mr Vincent Pusateri	705	619-225-6711	San Diego CA	92152
NO2A	NOSC	LASERS & MICROELECTRONICS	Dr Isaac Lagnado	5503	619-225-6735	San Diego CA	92152
NO2B	NOSC	COMMUNICATIONS & NETWORKING	Dr Gerald Clapp	808	619-225-2044	San Diego CA	92152
NO2C	NOSC	COMMAND SYSTEMS TECHNOLOGY	Mr John Maynard	402	619-225-6614	San Diego CA	92152
NO2D	NOSC	COMPUTER TECHNOLOGY	Mr Robert Wasilausky	423	619-225-2083	San Diego CA	92152
NO3A	NOSC	WIDE AREA UNDERSEA SURVEILLANCE	Mr Dean Hanna	705	619-225-6545	San Diego CA	92152
NO3B	NOSC	MARINE MAMMALS TECHNOLOGY	Mr Homer Porter	51	619-225-7366	San Diego CA	92152
NP2A	NPRDC	PERSONNEL, TRAINING & HUMAN FACTORS	Mr Orv Larson		619-225-6400	San Diego CA	92152
RL1A	NRL	SPACE TECHNOLOGY	Peter Wilhelm	7700	202-767-6547	Washington DC	20375
RL1B	NRL	SURFACE SURVEILLANCE	Dr Merrill Skolnik		202-767-2336	Washington DC	20375
RL1C	NRL	ELECTRONIC WARFARE	Dr John Montgomery		202-767-6278	Washington DC	20375
RL2A	NRL	LASER HARDENED MATERIALS	Dr David Nagel	6600	202-767-2931	Washington DC	20375
RL2B	NRL	MW/MMW/EO TECH & ELECTRONIC MATLS	Dr Gerald Borsuk	6800	202-767-3525	Washington DC	20375
RL2C	NRL	DECISION SUPPORT	Dr John R Davis	7500	202-767-2303	Washington DC	20375
RL3A	NRL	ASW SUPPORT TECHNOLOGIES	Dr David Bradley		202-767-3482	Washington DC	20375
NS1A	NSWC	SURFACE LAUNCHED WEAPONRY	Mr Danny Brunson	606	703-663-8211	Dahlgren VA	22448
NS2A	NSWC	WEAPONS MATERIALS	Dr William Messick	F205	202-394-1137	Silver Spring MD	20903
NS2B	NSWC	CBR DEFENSE	Mr Joe Brumfield	H31	703-663-8621	Dahlgren VA	22448
NS3A	NSWC	EXPLOSIVES & UNDERSEA WARHEADS	Mr Donald Phillips	R10A	202-394-2519	Silver Spring MD	20903
NS3B	NSWC	MINES	Mr Ronald Tipton	U041	202-394-1272	Silver Spring MD	20903
NT2A	NTSC	SIMULATION & TRAINING DEVICES TECH	Robert Breaux		A/V 791-4492	Orlando FL	[illegible]
NU2A	NUSC	SUBMARINE COMMUNICATIONS				New London CT	06320
NU3A	NUSC	TORPEDO PROPULSION				Newport RI	
NU3B	NUSC	SUBMARINE/SURFACE SHIP ASW SURVEILL				New London CT	06320
NU3C	NUSC	COMBAT CONTROL	John Davis			Newport RI	
NW1A	NWC	AIR LAUNCHED WEAPONRY	[illegible] Bever		A/V 437-2544	China Lake CA	93555
NW2A	NWC	MISSILE SUPPORT	Dr Tom Loftus	0176	A/V 437-3241	China Lake CA	93555
OP1A	ONR	AAW/ASUW & SURFACE/AEROSPACE TECH				Arlington VA	22217
OR2A	ONR	SUPPORT TECHNOLOGIES PROGRAM				Arlington VA	22217
OR2B	ONR	FINANCIAL MGT & MOBILITY				Arlington VA	22217
OR3A	ONR	NON-ACOUSTIC ASW	Dr Richard Whiting	123	202-696-4713	Arlington VA	22217
OR3B	ONR	ASW & UNDERSEA TECHNOLOGY	CAPT E.C. Craig	122	202-696-4713	Arlington VA	22217
OT1A	ONT	SPECIAL TARGET RADAR				Arlington VA	22217
OT3A	ONT	ADVANCED U/S WEAPONS 6 & C	Dr Edward Liszka ARL/PSU	AR3A??	814-946-4321	State College PA	16804
OT3B	ONT	HIGH GAIN SYSTEMS	Newell Booth			Arlington VA	22217
ID1A	SPAWAR	TACTICAL DIRECTED ENERGY TECH					
IA2A	SPAWAR	AGED SUPPORT					
IITA	SPAWAR	SEACON					
ID3A	SPAWAR	ARIADNE	CDR K E Evans	PDW124-7		Washington DC	
IITA	SPAWAR	NSAP					
OTTA	ONT	POST-DOC FELLOWSHIP PROG					
OTTA	ONT	LABORATORY IED PROGRAMS					

APPENDIX 4C

SAMPLE OF A LABORATORY PROGRAM SUMMARY (DD 1498)

CLASSIFICATION: UNCLASSIFIED

NOSC - SD 3320/2 Rev 12-81

DD FORM 1498

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY

1. Agency Accession	DN234 851
2. Date of Summary	01 Oct 86
Report Control Symbol	
3. Date Prev Sum'ry	15 Feb 86
4. Kind of Summary	D-Change
5. Summary Scty	U
6. Work Security	C
7. Regrading	NA
8a. Disb'n Instr'n	DX
8b. Specific Data Contractor Access	Yes / No
9. Level of Sum	A. Work Unit

10. No/Codes	Program Element	Project Number	Subproj/Task	Work Unit Number / Div-NOSC Project
a. Primary	SCN	NSEA	NSEA	944-MS17
b. Contributing	0	0	0	MW
c. Product Area Code	32	Undersea Countermeasures		

11. TITLE (Precede with Security Classification Code): (U) MINE NEUTRALIZATION SYSTEM

12. SCIENTIFIC AND TECHNOLOGICAL AREAS: 1908 Underwater Ordnance; 0906 Telemetry; 1310 Marine Engineering

13. START DATE: Jul 72

14. ESTIMATED COMPLETION DATE: Sep 88

15. FUNDING AGENCY: DN NA

16. PERFORMANCE METHOD: C.In-House

17. CONTRACT/GRANT

a. Dates/Effective: NA — Expiration: NA

b. Number: NA

c. Type: NA — d. Amount: NA

e. Kind of Award: NA — f. Cum Total: NA

18. RESOURCES ESTIMATE

Fiscal Year		a. Professional Man Years	b. Funds (in thousands)
Preceding	86	7.0	2075
Current	87	7.0	1237
	88	4.0	830

19. RESPONSIBLE DOD ORGANIZATION: 391345

Name: NAVAL SEA SYSTEMS COMMAND (NSEA)
Mine Warfare Sys Project

Address: Washington, DC 20362

Responsible Individual

Name: ZORA,G.(NSEA-PMS407D22)

Telephone: 202-692-4352

20. PERFORMING ORGANIZATION: 393159

Name: NAVAL OCEAN SYSTEMS CENTER (NOSC)
Eng/Computer Science Dept

Address: San Diego, CA 92152-5000

Principal Investigator (Furnish SSAN if U.S. Academic Institution)

Name: WHEELER,H.C.(NOSC-944)

Telephone: 519-225-6862

Associate Investigators

Name: NA

Name: NA

21. GENERAL USE: M-Military Application Only

22. KEYWORDS (Precede EACH with Security Classification Code): (U)Deep Ocean Technology; (U)Mine Countermeasures Equipment; (U)Remotely Controlled Undersea Vehicles;

23.(U)OBJECTIVE. Provide NAVSEA design, fabrication, test and product assurance support in several areas relating to the development of the Mine Neutralization System.

24.(U)APPROACH. NOSC is Technical Direction Agent (TDA) for MNS Program, and is responsible for following tasks: a) assist NAVSEA in directing contractor for MNS production and b) maintain drawing baseline.

25.(U)PROGRESS(Jan-May 86). Technical agent activities were continued. Monitoring of the Honeywell production contract involved attendance at several management, design review and test planning meetings. Documentation was reviewed for the production contract of MNS. Evaluation of engineering change proposals (ECPs) for drawing correction and design improvement continues. Other contract delivery line items (CDRLs) are being reviewed. Preliminary component and systems tests have started on the second two units. Factory acceptance tests were completed on the first system. Handling system redesign for a low magnetic signature was completed and the first two systems shipped. One handling system was shipped to mine countermeasures Ship 2 (MCM-2).

* Available to contractors upon originator's approval

OPNAVINST S5513.7B-17 CG Applies.

CLASSIFICATION INFORMATION/GUIDANCE

OCT 85 LPS p: 5-421

CLASSIFICATION: UNCLASSIFIED

CLASSIFICATION	NAVAL OCEAN SYSTEMS CENTER LABORATORY PROGRAM SUMMARY	NOSC SD 3320.3 (Rev. 8-84)
2UNCLASSIFIED		

1 AGENCY ACCESSION	10 A 4 DIV NOSC PROJ NO	26 A WAR FMM CODE	25 B NOSC GOAL	27 TECH AGENT (IF DIF FROM BLK 19)
DN234 651	944-MS17			

19 SPONSOR ACRONYM	10 A 1 PROG ELE	10 A 3 SUB PROJECT/TASK	26 PRIOR IDENTIFICATION (IF DIF FROM LINE 10)
NSEA	SCN	NSEA	

28. MANPOWER AND COST ESTIMATES	PFY	CFY	CFY + 1	CFY + 2	CFY + 3	CFY + 4
MAN-YEARS: A. CIVILIAN - PROFESSIONAL	7.0	7.0	4.0			
B1. CIVILIAN - TOTAL	8.0	8.0	5.0			
B2. MILITARY - TOTAL						
LABOR AND OVERHEAD C1. CIVILIAN LABOR & OVERHEAD ($K)	1450.0	977.0	540.0			
C2. MILITARY OVERHEAD ($K)						
C3. TOTAL LABOR & OVERHEAD ($K)	1450.0	977.0	540.0			
D1. MATERIALS AND EQUIPMENT ($K)	10.0	0.0	0.0			
D2. TRAVEL AND PER DIEM ($K)	60.0	60.0	40.0			
D3. OTHER (COMPUTER & TRANSFERS) ($K)						
E. CONTRACTS ($K)	555.0	300.0	250.0			
F TOTAL PLANNING ESTIMATE ($K)	2075.0	1337.0	830.0			
G. FUNDS AVAILABLE ($K)	1587.7*					
H. RCP FUNDING (DO NOT INCLUDE ABOVE ($K))	0.0					

I. SPECIAL REQUIREMENTS/NOTES

*Includes 2.7K FY84 and 384.9K FY85 carryover.

29. BACKGROUND, 30. PLANS AND MILESTONES, 31. REFERENCES, 32 MAJOR CONTRACTS, 33. SPECIAL REQUIREMENTS

29.(U)BACKGROUND. Current mine neutralization methods employ vectored surface craft carrying neutralization charges to disable bottom mines. Moored mines generally are cleared using a variety of mechanical and influence sweep gear. Certain mines may be more readily amenable to neutralization through the use of a tethered remote controlled vehicle capable of dropping a charge on a bottom case or attaching a cable cutter to a mooring line. Such a vehicle would be deployed from a fleet Ocean Minesweeper with a store of cutters and charges for extended and repeated operations consuming less time per neutralization than with conventional methods.

30.(U)PLANS AND MILESTONES.

FY86. Assist NAVSEA in direction of the MNS Production Contractor. Transition drawing baseline to Naval Mine Warfare Engineering Activity (NMWEA) Yorktown, VA.

31.(U)REFERENCES.

1. NUC TN 675, Remote Controlled Vehicle Mine Neutralization System (U), CONFIDENTIAL, Code 6512, Feb 1972.
2. NCSL Report, Design Tradeoff of a Controlled Underwater Neutralization Vehicle System (U), CONFIDENTIAL, Feb 1972.
3. NAVSEC Specification 6127-1A, Development Specification, Mine Neutralization Vehicle System (U), CONFIDENTIAL, 15 May 1972.
4. NUC TN 1350, Mine Neutralization Vehicle System Magnetic Signature and Analysis (U), CONFIDENTIAL, T. J. Keil, Jr., May 1974.

DEPARTMENT HEAD/DATE	DIVISION HEAD/DATE	BRANCH HEAD/DATE	PRINCIPAL INVESTIGATOR/DATE
01 OCT 86 SUMMARY DATE	CENTER APPROVALS		UNCLASSIFIED CLASSIFICATION

CLASSIFICATION	NOSC LPS TEXT WORKSHEET	NOSC WORK UNIT NO
3UNCLASSIFIED	NOSC - SD 3920/4 (Rev 12-81)	DN234 851/944-MS17

29 BACKGROUND, 30 PLANS & MILESTONES, 31 REFERENCES, 32 MAJOR CONTRACTS 33 SPECIAL REQUIREMENTS

5. NUC TN 1807, Mine Neutralization Vehicle (MNV) System Advanced Development Model (ADM) Description (U), CONFIDENTIAL, Advanced Systems Division, 1 Mar 1977.

6. NUC TN 1397, Mine Neutralization Vehicle (MNV) System Final Design Report (U), CONFIDENTIAL, MNV Task Team, Aug 1974.

7. NAVSEA Prime Item Development Specification for Locator MK 21 MOD 0 (U), 1 Mar 1977.

8. NOSC TN 266, Mine Neutralization Vehicle System Advanced Development Model: Test Results (U), CONFIDENTIAL, Advanced Systems Division, Dec 1977.

9. Technical Evaluation (TECHEVAL) Test Plan for the Mine Neutralization System (MNS) (U), Preliminary, CONFIDENTIAL, NOSC Code 5212, Sep 1980.

10. Low Mix Ship Mine Neutralization Study (U), CONFIDENTIAL, PMS 407, Oct 1982.

32.(U)MAJOR CONTRACTS.

	Item/Services ($K)	FY87	FY88	Estimated Delivery Date
1.	Software Support	100	75	Dec 87
2.	Engr. Support & Configuration Mgmt	50	50	Sep 88
3.	Production Engineering Support	150	125	Sep 88

33.(U)SPECIAL REQUIREMENTS. None.

01 OCT 86	UNCLASSIFIED
SUMMARY DATE	CLASSIFICATION

APPENDIX 4D

SAMPLE FORMAT AND CONTENTS OF A NOSC PROPOSAL WHEN THE 1498 IS NOT USED

TECHNICAL PROPOSAL

FOR

(Enter Proposal Title)

PREPARED
FOR

(Enter Sponsor's

Designation)

Date____________________

TABLE OF CONTENTS

*Minimum requirement for proposals

*Minimum requirement for proposals

LIST OF ILLUSTRATIONS

LIST OF TABLES

1. *SUMMARY

The Summary is the last portion of the proposal to be written. It can sometimes be combined with the Introduction very effectively.

1.1 GENERAL

Convince the prospective sponsor very quickly that NELC is competent in all respects and fully able to meet their requirements. Appeal to the sponsor's own self-interest by highlighting those key benefits (three or four at the most) which he/she will get by selecting NELC to perform the program. (BE BRIEF—one or two pages.) This summary should quickly answer the what, how, and why of the proposal.

1.2 *OPERATIONAL/TECHNICAL REQUIREMENTS (what)

a. We are going to take steps in solving the problem, etc.

b. Length of time work will be conducted is _____, and the expected results are _____ etc.

1.3 PROPOSED PLAN (how, brief)

Some examples of lead-ins are

a. We will supply five highly qualified engineers to implement the task at hand.

b. We will conduct the effort at NELC.

c. We will travel to __________ to gather data for evaluation.

1.4 NELC'S POSITION (why)

Some examples of why NELC should do this job are

a. The assignment of highly qualified personnel will be _______ .

b. Solid experience in ____________________ .

1.5 DELIVERABLES (Provide a brief description of the major deliverables.)

*Minimum requirement for proposals

2. INTRODUCTION

2.1 GENERAL

The purpose of this section is to introduce the proposal in terms of content and plan. Briefly outline the basic points of the proposed program and the philosophy underlying the approach. (This must set the stage.)

a. Purpose of this document.

b. Other relevant information.

3. PROBLEM

3.1 STATEMENT OF THE PROBLEM

This should be from an operational point of view in terms of satisfying the user's requirements. This is the "what" of the story rather than the "how."

A thorough discussion of the sponsor's requirements should be provided along with what NELC's program will provide (objectives). Factors such as compatibility, reliability, and maintainability should be emphasized.

Present sponsor's problem from a technical and economic standpoint. Set forth reasons which govern your proposed approach (reasons which make your choice valid). These must cover

a. General discussion of overall requirements

b. Satisfying overall requirements

c. Discussion of specific requirements

d. Satisfying specific requirements

e. Discussion and validation of derivation

f. System concepts

3.2 COMPLIANCE STATEMENTS

A statement of compliance or noncompliance with relevant specifications or requirements. All unrealistic or unreasonable performance requirements should be identified.

4. APPROACH

4.1 GENERAL

This is the "how" of the proposal. It should have a simple, easily followed theme, and the solution should be described step by step. The proposal task may be subdivided into subtask 1, subtask 2, etc.

4.2 PRODUCT DESCRIPTION

a. Technical Description. Provide a clear and accurate technical description of the hardware or system visualized. This should include drawings, sketches or diagrams where appropriate (avoid unnecessary repetition of information contained in the sponsor's proposal request). Identify technical data, if any, to be provided with hardware deliverables. Identify Government Furnished Equipment (GFE) required to support the proposed effort.

b. Uniqueness of Design, Process or Application. Describe any segment of the approach that is believed to be unique in design, process, or application. Also indicate any previous successful application of the concept. Emphasize the benefits to the sponsor.

c. Alternate Approaches. If applicable, briefly discuss alternate approaches which have been explored and rejected and the primary reason for rejection.

d. Relevant Specifications/Standards/Instructions. Identify relevant specifications or standards which will be met. Take exception to unrealistic or unreasonable performance requirements and deviations from specifications.

e. Areas of Risk. Clearly point out areas of significant risk with regard to performance, schedule, or cost, and explain reasons therefore.

4.3 TEST PLAN

Plans for technical and operational evaluations must be addressed separately as follows:

a. Technical Evaluation. Discuss the nature and duration of testing planned for technical evaluation of product, including test specifications or standards to be met. Identify special test equipment available or required.

b. Operational Evaluation. Discuss the nature and duration of testing planned for operational evaluation of product (reliability, maintainability, human factors, etc.), including test specifications or standards to be met.

4.4 QUALITY ASSURANCE PLAN

If the project involves hardware that will go to the Fleet for evaluation or permanent installation, a quality assurance plan must be addressed. The plan should discuss applicable specification requirements (MIL-Q-9858 or MIL-I-45208) and any exceptions to those specifications. Discuss applicable sections of NELCINST 4855.2 (Quality Assurance Manual) and how they apply to the project deliverables.

4.5 MAINTENANCE AND SUPPORT

When included as part of the specifications, provide a description of proposed plan for satisfying the maintenance, support, personnel and training requirements of the hardware or system proposed. This description may serve as a foundation for development of a support program concurrent with development of the hardware or system. Discuss:

a. Number of types of personnel required for maintenance

b. Description of any new or special skills required

c. Depth and duration of material support, initial provisioning spares, rotational or replenishment spares

d. Tool and test equipment requirements for product support

e. Publications and documentation packages for operational test and checkout, daily servicing, scheduled and unscheduled maintenance, component repair and rework

4.6 SCHEDULE

This section will of necessity vary from proposal to proposal. However, as a minimum the following points must be addressed:

a. Provide a graphic schedule of activities, events and milestones of specific accomplishments anticipated. Indicate in time frames when study tasks will be concluded, when preliminary or final system design is completed, etc. Provisions should be made for periodic review and evaluation at appropriate intervals.

b. A brief narrative of each event should be included.

c. List the type, scope, frequency and issue dates of technical progress reports planned.

d. List of deliverable items, including data items listed on form DD-1423 with accompanying Data Item Description, form DD-1664.

5. MANAGEMENT

5.1 GENERAL

This section should reflect three logical areas: (1) organization, (2) manpower projection or phasing, and (3) personnel. This section explains NELC's organization and how the proposal team relates. It finally introduces the personnel who will actually work on the project.

5.2 ORGANIZATION

Show the current NELC organization together with the program and technology organizations respectively. Also, show the proposed organization structure that will provide the support for accomplishing the proposed task. Organization structures should be in the format as provided in NELCINST 5400.24.

5.3 MANPOWER PROJECTION

Information concerning manpower projection should be provided by man-month or man-years, as applicable. Following is an example of the type of manpower data needed.

MANPOWER PROJECTION

MAN-MONTHS AFTER TASKING

Title	1	2	3	4	5	6	TOTALS
Project Manager	.5	.5	.5	.5	.5	.5	3.0
Task Manager	1.0	1.0	1.0	1.0	1.0	1.0	6.0
Electronics Engineer	2.0	3.0	3.0	3.0	2.0	1.0	14.0
Product Assurance Engineers	.5	1.0	1.0	1.0	1.0	.5	5.0
Programmers	1.0	2.0	2.0	2.0	1.0	1.0	9.0
Program Analyst	.1	.1	.1	.1	.1	.1	.6
TOTAL	5.1	7.6	7.6	7.6	5.6	4.2	37.6

5.4 MANAGEMENT PLAN

Define the management plan for implementation of the proposed task. Items covered should address, but not be limited to, the following

a. Program Planning and Control

b. Work Breakdown Structure (WBS)

c. Milestones

d. Time Dependence Chart

e. Financial Plans

f. Configuration and Data Management

g. Integrated Logistic Support (ILS)

h. Quality Assurance Management

i. Reliability

j. Test and Evaluation

6. EXPERIENCE

6.1 GENERAL

This section is of significant importance for it is a credential of capability. It should describe experience on similar or related projects and should be tailored specifically for each proposal.

6.2 NELC EXPERIENCE

Describe how existing equipment and systems in which NELC is now engaged, or has successfully completed, may be applied or related to the techniques and hardware to be developed under this proposal.

6.3 KEY PERSONNEL

a. List only those key persons who may be assigned to work on the project starting with project manager, task manager, electronics engineer, etc.

b. Identify personnel considered outstandingly qualified in the specific technical areas involved. Attach a "typical" resume.

c. List previous experience of each in the specific technical area or related areas. Include number and type of degrees held, professional and honor societies, patents held, awards, etc.

7. FACILITIES AND SECURITY

7.1 GENERAL

This section describes NELC facilities available for the proposed task and the security measures that will be used to safeguard the program.

7.2 FACILITIES

a. List and discuss facilities available at NELC which are planned for use in conducting necessary research, development, production and testing required in the program. Cite savings to sponsor, when applicable, if availability of unique facilities reduces procurement costs.

b. Include description and estimated procurement cost and delivery schedule for additional facilities, equipment or special tooling which will be required.

7.3 SECURITY

Indicate security levels and how they will be safeguarded. Reference can be made to DoD INSTR 5220.22-M, Industrial Security Manual for Safeguarding Classified Information. Also, mention application of the Security Manual, NELCINST 5500 6.

8. COST SUMMARY

Note: The cost summary may be separately bound.

8.1 GENERAL

This section of the proposal summarizes the costs, labor, and travel requirements to perform the proposed task.

The amount and type of data will usually be specified in the sponsor's proposal request. If a cost breakdown is not specifically requested, costs should be as general as possible. An outline of detailed cost elements is provided for planning purposes.

8.2 LABOR COSTS

Labor charges should reflect:

a. Man-hours in categories such as project manager, task manager, electronics engineer, etc.

b. Costs to include hourly rates and totals

c. Overhead rates for each category

d. Outside labor should state hourly rate to be charged for contractor personnel (if any), and total contractor support to be provided

8.3 TRAVEL COSTS

a. Commercial Travel

b. Local Travel

c. Per Diem

8.4 SUPPORT COSTS

a. Graphics

b. Photo Branch

c. Computer Time

d. Duplication Charges

e. Other

8.5 MATERIAL COST

List estimated cost for material.

8.6 MAJOR PROCUREMENTS

a. List line item description

b. List estimated cost for each major procurement

8.7 ADDITIONAL

Additional workhour and material requirements; include statement to cover any contingencies.

8.8 TOTAL COSTS

List total costs to complete proposed task.

9. ABBREVIATIONS AND NONSTANDARD TERMS

9.1 GENERAL

Following is a list of abbreviations and non-standard terms:

9.2 DEFINITIONS

Terms	Definition

APPENDIX 4E

STEP-BY-STEP PROCEDURE FOR PREPARATION AND STAFFING OF PROPOSALS BY NOSC

1.0 STEP-BY-STEP PROCEDURE FOR PREPARING AND STAFFING PROPOSALS

1.1 GENERAL

It is recognized that each marketing opportunity is unique, and proposal events peculiar to any one opportunity may require a deviation from standard sequences. Nevertheless, the intent of Figure 4E-1 is to provide a guide for the preparation of a proposal. It is the responsibility of every manager involved to ensure that deviations from the standard sequence do not result in serious curtailment of these interactions. The steps that follow are keyed to Figure 4E-1.

1.2 RECEIPT OF PROPOSAL REQUEST OR REQUIREMENT (Block A)

a. Proposal development procedures normally begin with the receipt of an informal or formal proposal request or the receipt of a formal or an informal requirement.

b. Informal Proposal Request. Most NOSC proposals result from verbal requests made during informal marketing contacts with sponsors. If any doubt exists regarding the appropriateness of the requested management code, the cognizant program office/division head should refer the matter to the department head(s) concerned for resolution before proceeding further.

c. Formal Proposal Request Addressed to a Specific NOSC Code. The great majority of formal (documented) proposal requests received by NOSC indicate a particular code which the sponsor desires to manage the proposed task. In these instances, the mail room will forward the proposal request directly to that code for action, with information copies to the cognizant department head. If any doubt exists regarding the appropriateness of the cognizant management code, the matter should be resolved by the department head(s) involved and/or the Technical Director before proceeding further.

d. Formal Proposal Request Addressed to NOSC. On occasion, NOSC receives a formal Proposal Request with no indication of desired performing code. In such cases, the Proposal Request will be referred to the appropriate department, division, or program office for action.

e. Other Requirements for a Proposal. In some instances, a legitimate requirement for a proposal may be recognized by an activity (including NOSC) not in a position to fund the necessary effort. If preparation of an unsolicited proposal seems appropriate, procedures should follow those described in the case of an informal proposal request.

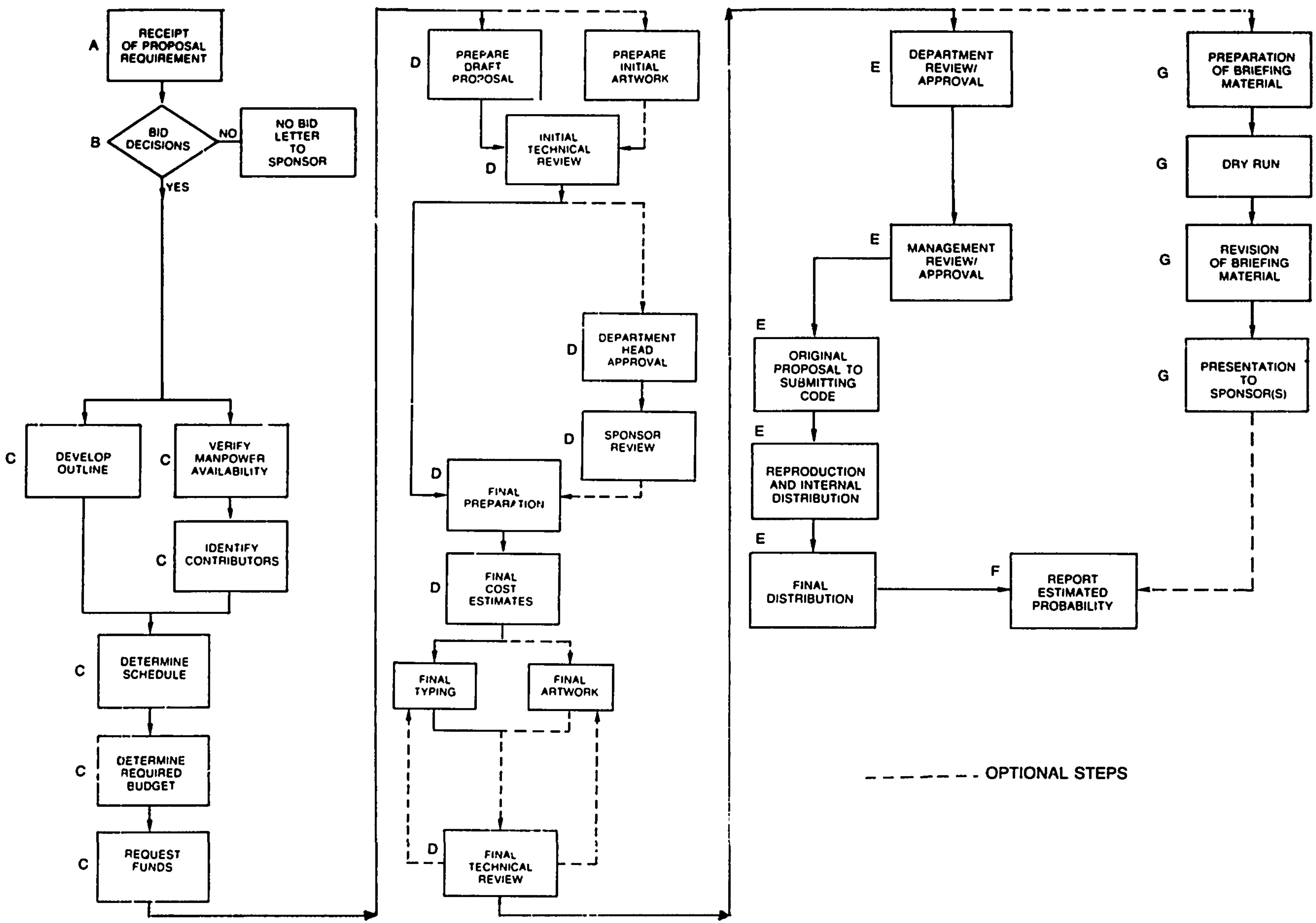


Figure 4E-1. Sequence of events for developing a proposal.

1.2.1 Bid Decision (Block B)

After receipt of a proposal request, the preliminary decision to bid or not to bid the proposed task must be made. This decision should be based upon whether the task falls within the NOSC mission area of responsibility, the size and desirability of the proposed task, the availability of required talent, facilities, etc., and must be in consultation with all divisions or departments expected to play a major role. The decision to proceed is the responsibility of the cognizant management code. Table 4E-1 provides a rough guide to the level of review expected.

Table 4E-1. Level of review.

Level of First Year's Funding	Bid Decision Made by
Less than $300K	Program Office/Division Head
Between $300K and $1M	Department Head
Over $1M	Technical Director

Obviously, a preliminary "bid" decision may be reversed during subsequent technical review, as more data become available, or during the formal management review required prior to external distribution of the proposal. If it is decided that no bid will be submitted, the cognizant management code should prepare a letter stating the reasons for not bidding. Whenever possible and appropriate, the reply should include recommendations for an alternate development agency, contractor, etc. This letter should be signed out using the same guidelines as that provided for bid decisions.

1.2.3 Detailed Planning for Preparation of Proposals (C blocks)

a. The proposal task manager, working with others as appropriate, should complete the following detailed planning actions:

(1) Develop an outline for the proposal. Procedures for using the NOSC Program Summary format and for the NOSC Alternate Proposal Format have been previously discussed.

(2) Verify manpower availability.

(3) Determine, by name, contributors to each section.

(4) Determine schedule for completion and review.

(5) Determine required budget.

(6) If necessary, prepare and submit request for funds for proposal preparation, etc., from the general development fund.

1.2.4 Preparation and Review (D blocks)

a. Prepare draft proposal (include initial artwork). Ensure that the full meaning of acronyms or technical abbreviations and nonstandard terms in the text are spelled out at least once.

b. Have the proposal reviewed internally by all cognizant NOSC individuals.

c. If desired or required, have the proposal reviewed externally before completing the final draft. If this course of action is taken, clearly mark the draft proposal as "Working Paper" prior to any distribution of copies.

d. Incorporate valid review comments and complete final cost estimates, typing, and artwork.

e. Obtain an final review from cognizant NOSC codes. Cognizant codes will review and sign where appropriate on 11ND-NOSC 5605/3. When more than one program office/division is to be involved in the proposed task, a breakout of the manpower and cost estimate, showing the amounts planned for each participating division, must be included on the form 11ND-NOSC 3920/9.

1.2.5 Approval of a Proposal for Distribution (E blocks)

a. For those proposals requiring department head review/approval, as set forth earlier, cognizant department head's signature on the 11ND-NOSC 3920/9 shall certify that he/she has positively ensured that all necessary internal agreements have been negotiated with performing division and departments, before forwarding the proposal to the originating code.

b. For proposals requiring review and approval by the Technical Director, as explained earlier ($ thresholds), such action should be completed.

c. Upon receipt of final approval of the proposal, the cognizant code is authorized to prepare and sign the letter of transmittal that initiates the external distribution of the proposal. Where possible, proposals should be hand-delivered to sponsors. If submissions are intended to more than one potential sponsor, separately addressed copies should be prepared for each. Experience has shown that "information" addressees are prone to wait and see, pending a final decision by the "action" addressee. Hand-delivered proposals should be properly cleared through the NOSC mail room prior to delivery to ensure that an official record of transmittal is maintained.

1.2.6 Reporting Probability of Proposal Acceptance (H blocks)

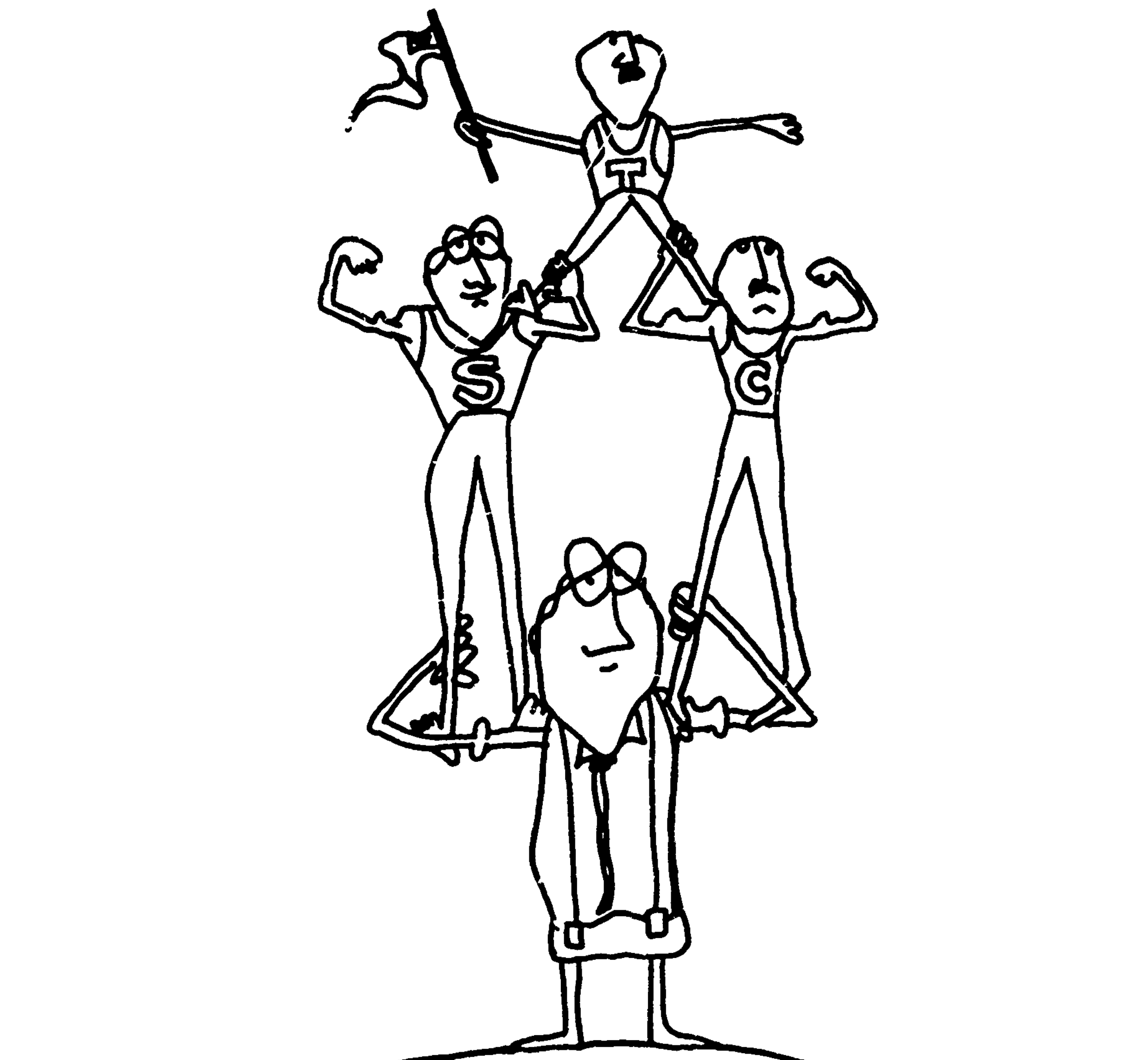
If not previously accomplished, the cognizant management code should ensure that the estimated probability of acceptance of the proposal is reported to the branch, division and/or department head involved.

1.2.7 Briefing Material (G blocks)

A well-planned briefing presented to potential sponsor(s) concurrently with the proposal package usually enhances the probability that the proposed task will be funded. Such briefings may be formal or informal but should be carefully tailored to the anticipated audience and circumstances. Managers at all levels are urged to acquaint themselves with the variety of materials available as briefing aids, and the requirements, capabilities, and limitations of various briefing techniques. Preparation of appropriate briefing materials should begin as soon as proposal details are sufficiently well known to allow time for adequate, professional standards of quality. Normally, such briefings should be reviewed at the level of the supervisor responsible for the proposal task, prior to presentation to potential sponsors.

STAFFING, TEAM BUILDING, AND COMMUNICATION

5



CONTENTS

SECTION 5
STAFFING, TEAM BUILDING, AND COMMUNICATION

5.1 INTRODUCTION

5.1.1 References

In Search of Excellence
The One-Minute Manager
Negotiating to Yes
How to Develop Your Executive Ability

5.2 STAFFING, TEAM BUILDING, AND COMMUNICATION

What do we mean by staffing, team building, and communication? Briefly stated our subjects can be brought together as follows: enough people, with the right expertise when you need them, working harmoniously toward a common set of goals with greatest efficiency.

In the following pages each of the elements of our topic will be discussed. In *staffing* ("enough people, with the right expertise when you need them...") you are looking for people with the following characteristics:

Motivated
Educated
Available
Affordable
Experienced
High priority for *your* requirements

In *team building* (your staff "working harmoniously toward a common set of goals...") it is important that you keep the following ideals in mind:

Goals of the project placed above self-interest
Mutual trust and respect
Everyone contributes

And, finally in *communication* (your staff "working harmoniously ... with greatest efficiency") open communication is a necessity; this open communication includes listening and understanding, has no filters, and holds no untoward surprises.

You program managers have reason for optimism: NOSC hires good people who are educated, motivated, and experienced. Your job is to shape them into a team, motivate them, and lead them. The bottom line is that good managers have good people working for them.

What is the secret then of being a good manager? First, it is hard work on your part. Second, it is the consistent application of general management methods that work. Third, it is hard work.

The following subsections, though still brief, discuss staffing, team building, and communication in more detail.

5.2.1 Staffing

Staffing, in most instances, is the easiest part. We can do it by the numbers, acquiring our personnel from coworkers at NOSC, other Navy laboratories, and support contractors. There is a real need to identify your technical expert so you have an authoritative viewpoint early in your program. As you build your staff it is helpful to keep in mind that for many jobs inner drive and motivation are more important than genius.

It is also important that you do not forget support staff; this includes the Supply and Accounting staffs here at NOSC, already in place to help implement your programs. You will probably find that your biggest problems are not technical. Most programs experience problems related to contracting, and "system" constraints probably exceed technological problems. This might be related to the fact that in the Library of Congress there are 1,152 lineal feet of documents governing the supply/acquisition process. The NOSC Supply and Accounting staffs will be your trailblazers through this acquisition jungle.

5.2.2 Team Building

5.2.2.1 The Basic Rule. Put simply, the rule says do not mess with human nature. Human nature reflects the law of egocentrism: each person is, and regards himself as, the center of his own world of experience and action. This can be seen in the way people see themselves. A self-assessment performed by a random sample of 100 males produced the following results:

a. Ability to get along with others

All 100 ranked themselves in the top 50 percent of the population
60 percent ranked themselves in the top 10 percent of the population
25 percent ranked themselves in top 1 percent of the population

b. Leadership

70 percent rated themselves in the top 25 percent of the population
2 percent felt they were below average as leaders

c. Athletic ability

60 percent ranked themselves in the top 25 percent of the population
6 percent indicated they were below average

5.2.2.2 Motivation. It is best to recognize what human nature is and proceed from there. Getting along with human nature requires that we recognize that people do things because it's in their best interest to do them. Thus, be aware of the following motivating factors:

Self-fulfillment
Anticipated satisfaction in achievement
Recognition and respect
Opportunity to contribute
Accountability and trust-expectations

Interestingly, pay is not at the top of the list.

Figures 5.1 through 5.5 present the Just in Time (JIT) MK46 production line case history that demonstrates how motivating factors can be applied effectively.

5.2.2.3 Decision Making. The basic practice to remember here is do not make all the decisions yourself. If you feel you must make every decision, you merely limit the quality of your program, ensure that nothing happens when you are gone, and fail to build the sense of ownership in the rest of your team. As you allocate decision making responsibilities you will see that confidence inspires confidence, and success breeds success. The program will be the winner.

5.2.2.4 Modifying Behavior. Whenever there is a team effort there is bound to come a time when, for whatever reasons, some team member is performing his or her task at a minimal or subminimal level. You as program manager will need to and, it is hoped, want to address this problem. The first step, often forgotten, is to praise good work and behavior. Secondly, in contrast to the counsel of *The One-Minute Manager*, use criticism sparingly. If you must criticize, never criticize a team member in front of others nor in an emotional outburst. Also focus on criticizing the act, not the individual. Explore ways of saying what needs to be said; for instance, the use of the phrase "Are you aware. . .?" can provide a reasonably comfortable transition into discussing a possible area of trouble.

5.2.2.5 Conflict Management. There is another inevitability when two or more human beings are working together for any length of time. There will be some conflict. The law of egocentrism is still at work. The following are some useful preliminary steps to managing conflicts:

Get the facts
Separate the emotion from the problem
Listen to understand
Look for points of agreement
Look for graceful ways out

It would be very useful to familiarize yourself with the negotiating approaches presented in Table 5.1 and practice them as you have opportunity.

5.2.2.6 The Basic Rule and You. Remember that the law of egocentrism applies to you too. Thus, it is in your best interest to develop a strong team. Finally, recognize that the same factors that motivate you motivate your team as well. The particulars may be different, but the principles remain the same.

5.2.3 Communication

Whenever you have a group of people working together there will be communication. The question is, however, will it be good communication or poor communication? This is the choice. Will we have open, straightforward, two-way communication? Or will we have limited, one-way communication fueled by rumor?

We know that good communication is required for effective team building and project efficiency and that the lack of good communication leads to poor efficiency. People worry if they think there is something that will affect them that they do not know. They worry about their own self-interests, and worry is more likely to be caused by rumor than fact. There can even be a geographical or location component to the communication; Figure 5.6 was taken from *In Search of Excellence*. Good communication takes work.

- PE/QE CROSS TRAINING
- LAYOUTS AND INSPECTION PROCEDURES ARE COMBINED (INSP-ASSM-INSP)
- OPERATORS RESPONSIBLE FOR QUALITY OF THEIR WORK
- INSPECTORS ARE AUDITORS
- EVERYONE CONTRIBUTES TO QUALITY

Figure 5.1. JIT ground rules.

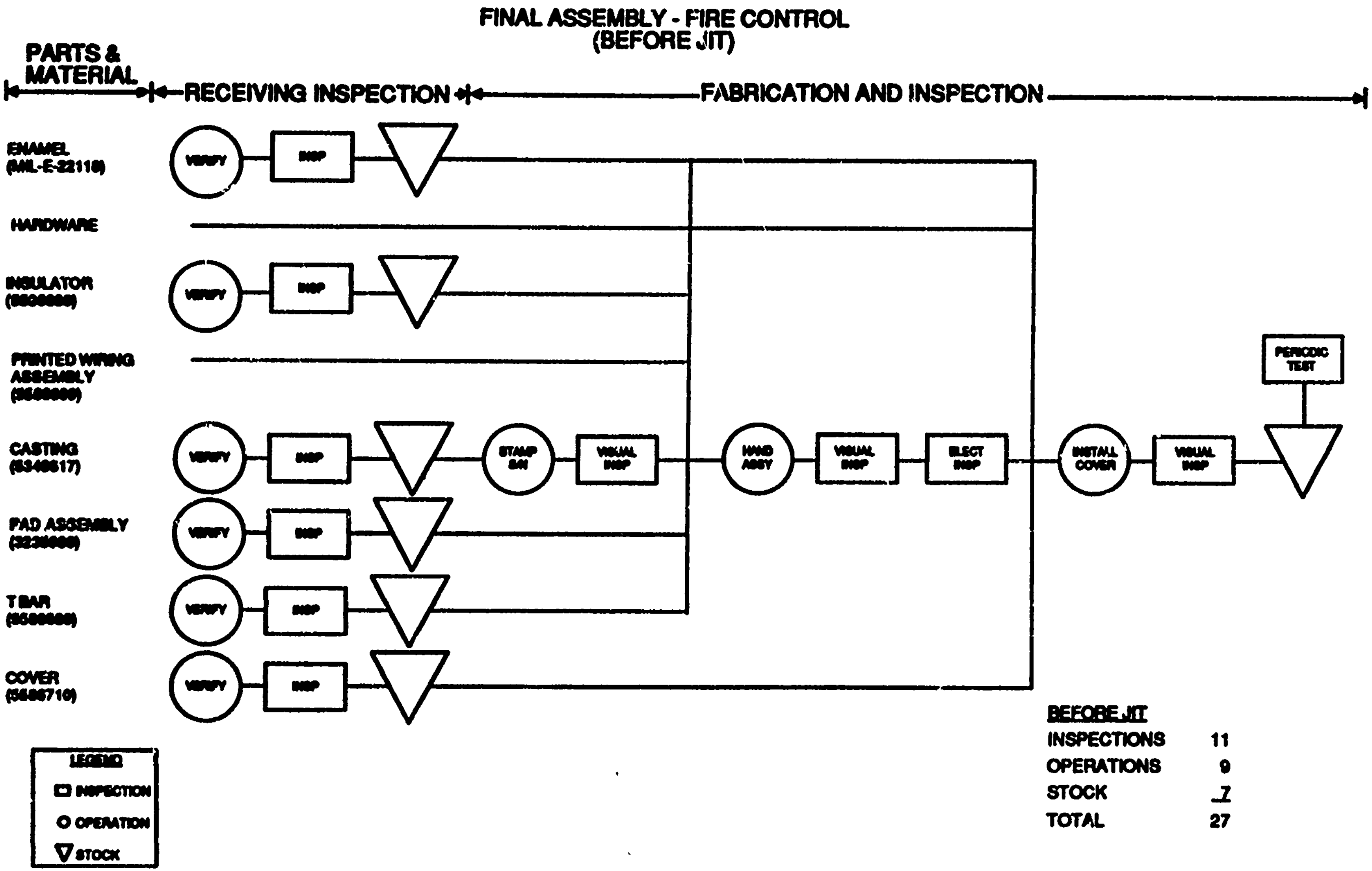


Figure 5.2. Process flow diagram.

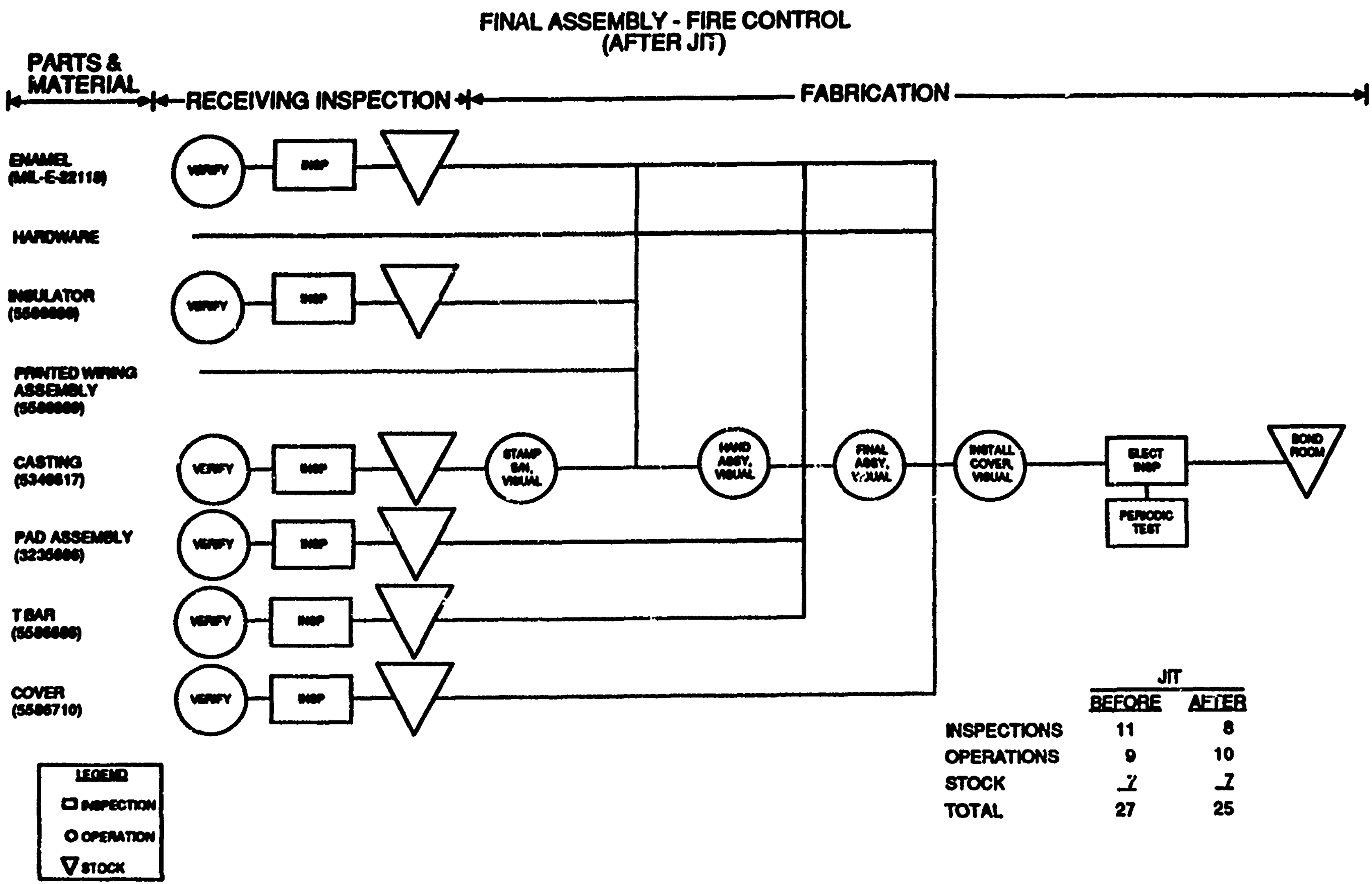


Figure 5.3. JIT process flow diagram.

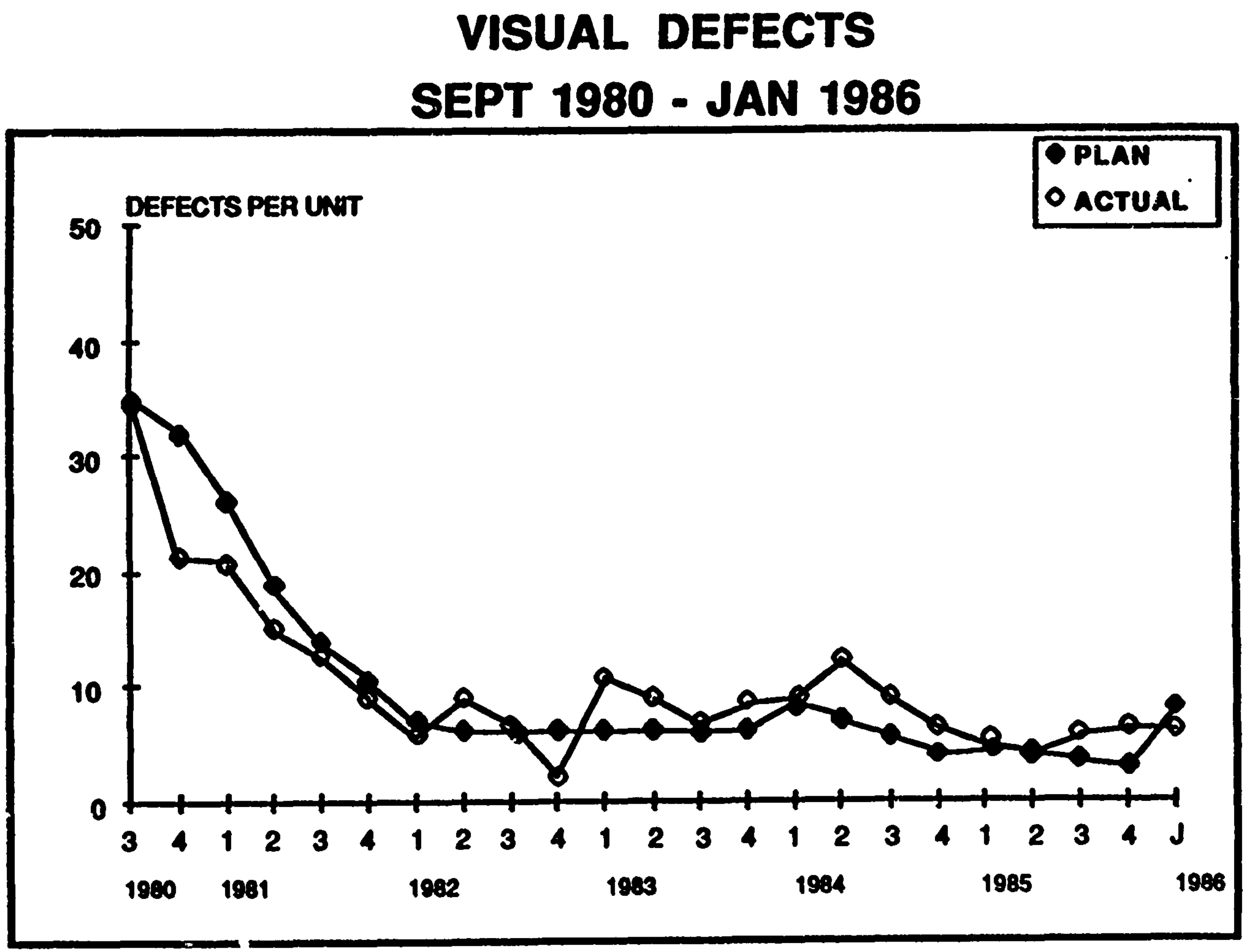


Figure 5.4. MK 46 quality trends.

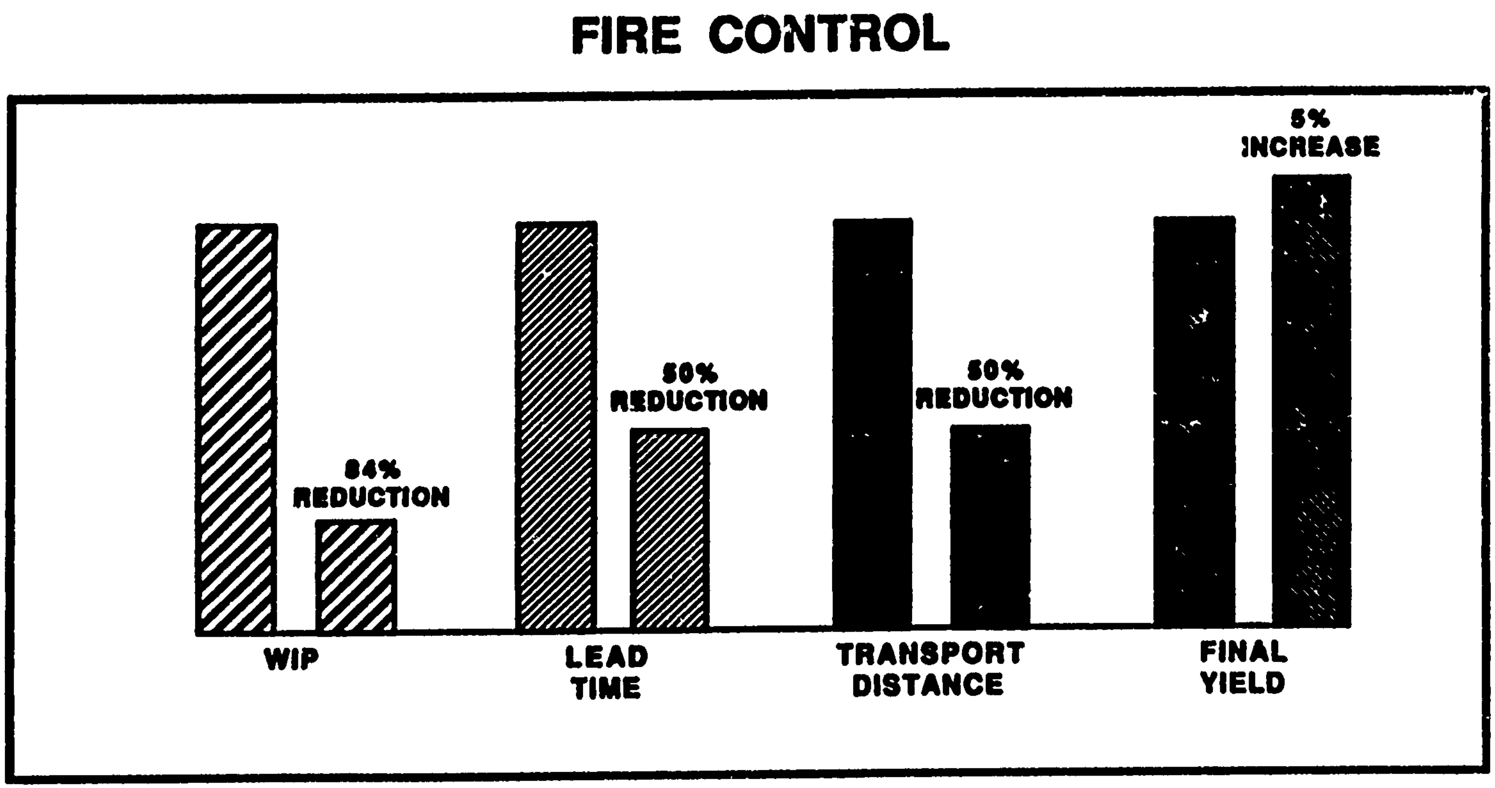


Figure 5.5. Benefits of JIT.

Table 5.1. Negotiating approaches.

Problem Positional bargaining: Which game should you play?		Solution Change the Game — Negotiate on the Merits
SOFT	HARD	PRINCIPLED
Participants are friends	Participants are adversaries	Participants are problem-solvers
The goal is agreement	The goal is victory	The goal is a wise outcome reached efficiently and amicably
Make concessions to cultivate the relationship	Demand concessions as a condition of the relationship	Separate the people from the problem
Be soft on the people and the problem	Be hard on the problem and the people	Be soft on the people, hard on the problem
Trust others	Distrust others	Proceed independent of trust
Change your position early	Dig in to your position	Focus on *interests*, not positions
Make offers	Make threats	Explore interests
Disclose your bottom line	Mislead as to your bottom line	*Avoid* having a bottom line
Accept one-sided losses to reach agreement	Demand one-sided gains as the price of agreement	Invent options for mutual gain
Search for the single answer: the one they will accept	Search for the single answer: the one you will accept	Develop multiple options to choose from; decide later
Insist on agreement	Insist on your position	Insist on using objective criteria
Try to avoid a contest of will	Try to win a contest of will	Try to reach a result based on standards independent of will
Yield to pressure	Apply pressure	Reason and be open to reason; *yield to principle, not pressure*

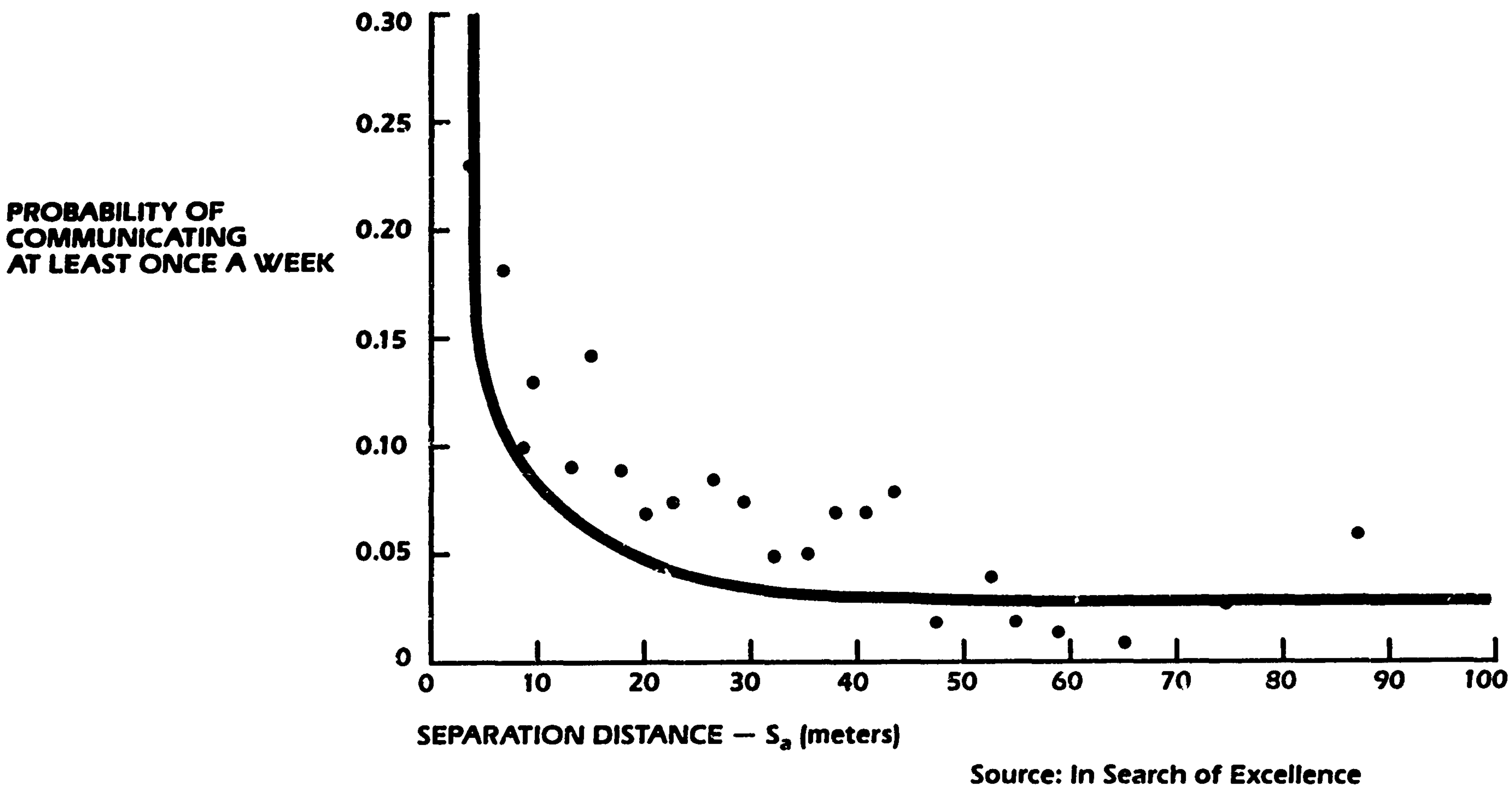


Figure 5.6 Effect of location on communications in R & D and engineering labs.

Good program communication can be promoted through implementing the following approaches:

Regular meetings
Management by walking around (not announced, scheduled tours)
Tell them more than they need to know, let them filter for themselves
Listen, consider, evaluate, discuss
Remember to cooperate with human nature
Do not shoot the messenger (value the person who tells you hard truths)

5.3 IMPLEMENTATION/EXECUTION

The bottom line is that management techniques are relatively simple to delineate and learn. The key then to good program management is implentation and execution.

The authors of *In Search of Excellence* (Chapter 1), in reviewing studies of 62 successful companies, found many similarities among them. These companies exhibited the following characteristics from 1961 through 1980:

Compound asset growth
Compound equity growth
Highest average ratio of market value to book value
Highest average return on capital
Highest average return on equity
Highest return on sales.

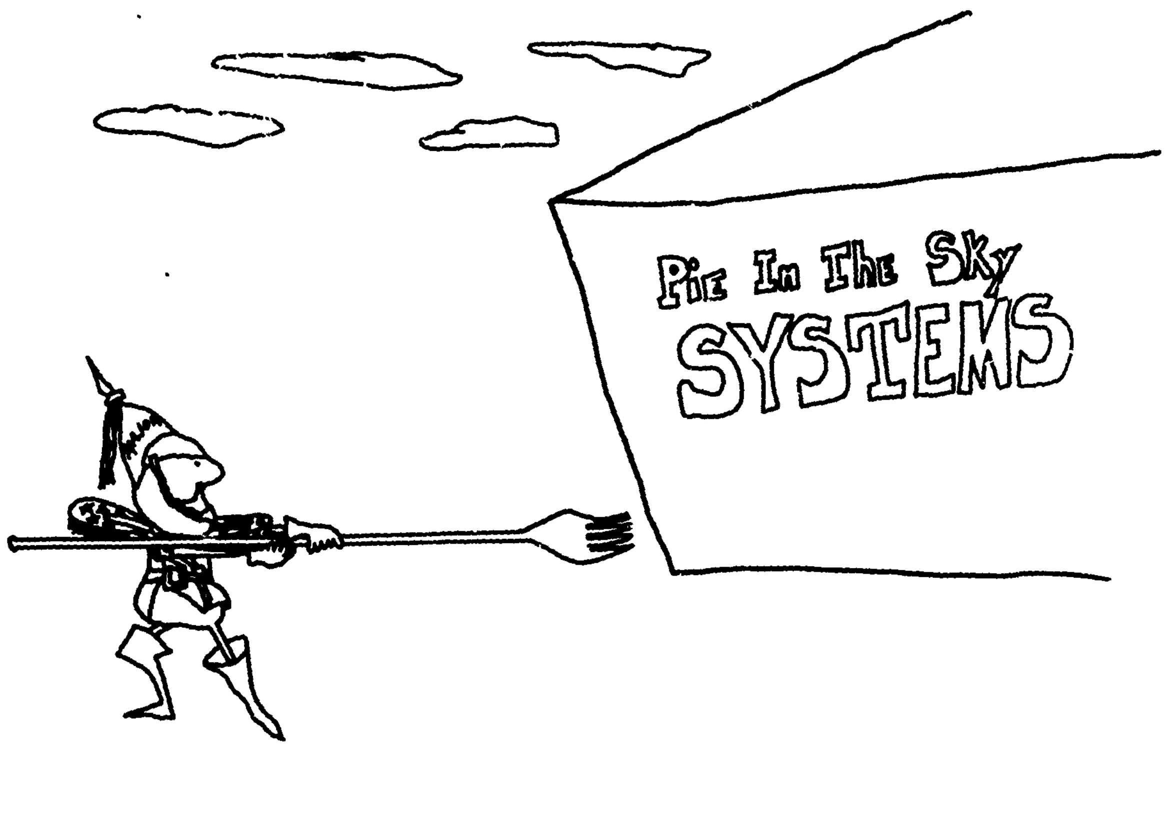
Table 5.2 presents the eight common basic principles identified as the attributes that "characterize most nearly the distinction of the excellent, innovative companies."

A final word. The principles governing staffing, team building, and communication are well known. It is your task to work at implementing them for your program and learning how they work in the real world. Then you can also model them and teach them to your coworkers.

Table 5.2. Principles of excellence and innovation.

Principle	Comments
1. A Bias for Action	Break the problem into parts (chunking) Use small Ad Hoc task forces with limited life, (specific assignment for a short period of time) "Do it, fix it, try it" — characterizes experimenting organizations Simplify Chaotic actions are better than inaction Ready, fire, aim, learn
2. Stay Close to the Customer	Figure out what he needs Provide it Quality Nichemanship Listen to the user
3. Autonomy and Entrepreneurship	Break the corporation into small companies Encourage them to think independently and competitively Support innovation Communicate "The new idea either finds a champion or dies..." Edward Schon, MIT
4. Productivity through People	Create an awareness that their best efforts are essential Success will be recognized Focus on people — build a team
5. Hands-on, Value Driven	Managers keep in touch A belief in being the "best" A belief in the details of execution A belief in the importance of people A belief in superior quality and service Practice management by walking around
6. Stick to the Knitting	Build diversification strategies on some central skill or strength
7. Simple Form, Lean Administrative Staff	Minimum staff at the corporate level Subunits should have their own staff support (supply, personnel, finance) Simple organizations — accountability and autonomy
8. Simultaneous Loose-Tight Properties	Coexistence of firm central direction and maximum individual autonomy, entrepreneurship, and innovation

MAJOR SYSTEMS ACQUISITION 6



CONTENTS

SECTION 6
MAJOR SYSTEMS ACQUISITION

6.1 INTRODUCTION

6.1.1 References

"Project Management: An Overview," James J. O'Brien, *Project Management Quarterly*, Volume VIII, Number 3, September 1977. *SCAN*.

6.2 THE WORLD OF PROGRAM MANAGEMENT

6.2.1 The Role of the Program Manager

A fundamental Department of Defense (DoD) policy is that the acquisition of major weapon systems will be directed by responsible managers under the concept of program management.

The concept of program management is to provide centralized management authority over all of the technical and business aspects of a program. The program manager's role, then, is to tie together, to manage, and to direct the development and production of a system meeting performance, schedule, and cost objectives which are defined by his/her Service and approved by the Secretary of Defense (SECDEF). The essence of the program manager's role is to be the agent of the Service in the management of the system acquisition process and to focus the authority and responsibility of the Service for running the program. Program managers have the vantage of a large perspective of the program and the interrelationships among its elements. Program managers must be the major motive force for propelling the system from conception to completion.

Recently, a panel of military program managers examining their role likened it to that of the general manager of a small company. The comparison is especially apt. It would be impossible to write a meaningful position description for that job. It is equally impossible to write one for the program manager's job. What the general manager does is whatever is needed to move the affairs of the business. The general manager does one thing at one time and another thing at another time—whatever is most needed at the moment to achieve the objectives. A general manager is not a "doer" of any job—there are other managers charged with the doing. But general managers see to it that what they want is done, and what they want is a harmony of things done so that their objectives are achieved. The role implies reliance on others to do the work; but it also implies controlling and coordinating the work so that no one aspect dominates others to the detriment of the harmony of the whole.

This touches upon what is likely to be the most important function of the program manager: getting people to communicate with each other to achieve a common understanding of the needs of the program and their place in the harmony of the total program effort.

6.2.2 Service Responsibility

It is an oversimplification, but basically correct, to identify three players and their respective roles: the Service, the program manager, and the Office of the Secretary of Defense (OSD). The Service is responsible for identifying its operational needs and defining the new systems required to meet those needs. It is also responsible for the formulation of the acquisition strategy for the orderly development and production of the systems. The program manager is the agent of the Service for the formulation and execution of the strategy. OSD is the keeper of the Service conscience—it reviews and approves the Service strategy and program. But the center of systems acquisition, authority, and responsibility lies in the Service—more specifically, it is the Service Secretary.

Approval improperly exercised means direction in practice. It is possible to withhold approval until the one approach desired by the approving authority is reluctantly proposed (or stumbled upon) by the organization or person seeking the approval. That way of exercising approval is directing—albeit obliquely. He/she who exercises "approval" power in that mode is seen to have assumed the role of directing, while perhaps planning to dodge responsibility if things go wrong.

However, the role of line and staff authority has been delineated in the DoD Directive 5000.1—"Major System Acquisitions" dated 18 January 1977.

> When a line official above the program manager exercises decision authority on program matters, the decision shall be documented as official program direction to the program manager. The line official shall be held accountable for the decision. The role of staffs as functional advisors does not include the authority, responsibility or accountability for program decisions.*

Approval means something else, especially in the context of OSD's role in military program management. It denotes a dictionary definition of the word "approval": "to accept as satisfactory." That is to say, it is the Service's role to formulate the system requirements and plan for implementation. It is OSD's role to accept the Service's product as satisfactory—provided it is consistent with major policy objectives. It is also OSD's role to evaluate the performance of the Services in implementating the approved programs. But the Service has the final responsibility for getting the job done.

6.2.3 Judgment and Flexibility

The concept of program management came about because the ordinary way of doing things was not adequate for the task of managing the acquisition of complex weapon systems. Extraordinary management—program-oriented management—was essential if all of the aspects of the program were to be handled correctly and expeditiously.

To achieve this extraordinary management, there is another OSD policy which complements the policy requiring program management: military program managers should be free to exercise judgment and flexibility. Although program managers are the agents of the Service, they should operate in an environment in which they select and tailor to the specific needs of their program those management systems and formal techniques that will help the program. Program managers should operate in an environment conducive to the exercise of judgment. There is no pet formula program managers can adopt. They must decide for themselves what methods, techniques, and systems to use. If program managers are responsible for planning, directing, and controlling a program, they must have the authority to get the job done.

*Dept of Defense, "Major System Acquisitions," Directive 5000.1, 18 January 1977, p 6.

Stated another way, the program manager is encouraged to adapt standard techniques to the peculiar requirements of the program. In turn, program managers have a right to expect that those in the Services who are going to approve management plans and techniques will exercise their power of approval properly. That is to say, plans and techniques will be accepted as satisfactory if they comply with basic policy directives. Program managers have a right to expect that their plans will not be judged by the standard of meticulous compliance with innumerable details hidden away in regulations, directives, instructions, handbooks, manuals, standards, specifications, or similar documents.

What program managers have a right to expect and what in fact they will be offered are often quite different. Experienced program managers would remind the new program manager that often one must struggle to obtain the management flexibility he/she is supposed to be given. Higher authorities, and especially their staff organizations, tend to standardize their requirements and to insist on the use of familiar techniques and methods. Their initial disposition is to avoid changes and exceptions to the general rule. Requests for deviations are rarely conceded without being pushed and sold.

6.2.4 Functional Support

The use of judgment and the exercise of flexibility are difficult to achieve in the environment of military program management. The most significant reason for this is that the operation of program management envisions two organizational elements. In some few cases the program office is staffed with all or most of the capability to perform the functional activities. In these cases the program office is largely self-sufficient and does not have to rely on much support from functional activities outside of the line authority of the program manager. Coordination is simplified, but the problems associated with organizing and staffing the program office are magnified. Usually, however, there is a small, centralized management authority consisting of the program manager and his/her program office. This office is served by functional organizations which support the centralized authority and which are responsible to it for the execution of assigned tasks. This environment, where the resources for doing the work are largely outside of the line authority of the program manager, is a natural source of conflict.

The practical fact is that there are usually several programs competing for the limited resources of the same functional organizations. Those functional elements are also supporting the normal activities of their parent organizations—the day-to-day, nonprogram activities. When personnel are not available to support all of the demands, program managers find less responsiveness than they desire from the functional elements. The situation is made even more difficult because the functional elements were there long before the program started and they plan to be there long after the program ends.

Another aspect of this problem is the tendency of functional specialists to see their discipline as the central core of a successful program. Their commitment to their specialty leads them to try to dictate to the program what will or must be done—as distinguished from advising what should be done. Further, there is no lack of regulations with which they can bolster their claim. One of the most difficult concepts to put across to functional specialists is that the program manager is responsible for determining what will be done. The functional specialist is responsible for how it is done—the how being his area of expertise.

> There is a natural tendency for the functional managers to standardize their operations or efforts, to perform to standards, or to build a standard model. A program manager must, through influence, force functional areas to depart from a standard and build something that fits in with the other parts of the project. Someone has to force these people to take action when these actions increase a functional manager's risk or use resources at a greater rate than expected. The program manager's role is to balance this risk over all portions of the project. Therefore, the program manager must have authority to move quickly to balance risk.*

*George A. Steiner and William G. Ryan, *Industrial Project Management*, the Macmillan Company, 1968, p 29.

The obverse is equally true, however. Once the government program manager has obtained the necessary assurance, he/she should relax control and concede to contractors a measure of freedom to exercise judgment and flexibility.

Problems with functional specialists are not something new:

> The expert, in fact, simply by reason of his immersion in a routine, tends to lack flexibility of mind once he approaches the margins of his special theme. He is incapable of rapid adaptation to novel situations. He unduly discounts experience which does not tally with his own. He is hostile to views which are not set out in terms he has been accustomed to handle. No man is so adept at realizing difficulties within the field that he knows; but, also, few are so incapable of meeting situations outside that field. Specialism seems to breed a horror of unwonted experiment, a weakness in achieving adaptability, both of which make the expert of dubious value when he is in supreme command of a situation.*

The environment of program management therefore places an extraordinary premium on talent for leadership as distinguished from command, on persuasion as distinguished from direction. The environment requires an emphasis on informal authority, *de facto* authority, or influence as distinct from power. One student of program management has described this authority as derived in part from the program manager's "persuasive ability, his rapport with extraorganizational units, and his reputation in resolving opposing viewpoints within the parent unit and between the external organizations."**

Persuasion is not the only way to get things done. One defense program manager said that on many occasions he overcame the opposition of functional specialists by "working harder than they did." This program manager found that he could so overwhelm a specialist with facts, figures, and analysis that it became too much of an effort for the specialist to refute the program manager's position.

The comments of this program manager highlighted a point made by several others that there is a need for a strong analytical capability in the program office to coordinate a program whose parts were organizationally and geographically widely dispersed. A talent for analysis and ability to work with people were the key criteria in their selection of program office personnel.

6.2.5 Engagement and Disengagement

In common with the way a general manager must operate, the program manager relies on others to do the work. But program managers cannot escape the responsibility for the result. If they are responsible, they must be satisfied that what is done in the program makes sense and is consistent with their plans. If program managers cannot be persuaded that it is right for their program, they must direct it to be done the way they want.

Much has been written about the role of industry and the relationship that should obtain between the defense program manager and the industry counterpart. Much has been said about "disengagement"—getting out of industry's hair and letting them do the job they have contracted to do. The goal is laudable and, the way it is stated, the idea is entirely consistent with good management concepts. But the ultimate responsibility for a successful program rests squarely on the Service and on the military program manager as its agent. Program managers cannot disengage in any literal sense. They must manage contracted work in just the same sense as they manage all the other parts of the

* Harold J. Laski, "The Limitations of the Expert," *Harper's Magazine*, December 1930. Quoted in *Specialists and Generalists*, a selection of readings by the Committee on Government Operations, U.S. Senate, 90th Congress, 2d Session, 1968, p 53.

** David I. Cleland, "Project Management," *Air-University Review*, Vol. XVI, No. 2, January-February, 1965. Reprinted in a book of readings compiled by David I. Cleland and William R. King, *Systems, Organizations, Analysis, Management*, McGraw-Hill Book Company, 1969.

program. More precisely, in this case they manage contractor management of their program. It is not a question of whether they manage; it is only a question of how they manage—or mismanage.

Industry program managers and government program managers are agreed on this point:

> It seems clear that the Government program manager must exercise rather tight control until such time as he is assured that the industrial project manager has the technical and managerial competence to perform as required.*

6.2.6 The Soft Sell

Newly appointed program managers may be dismayed to discover that there is less than complete and enthusiastic support for their programs within their Service and OSD. Every weapon system competes with all the others for limited resources, and competition is especially fierce in periods of tight budgets. At every level in the hierarchy, commanders and staff personnel are confronted by demands from program and functional managers for far more money than is available or can reasonably be obtained. Budget recommendations and decisions must be made that will inevitably favor some programs over others.

Program managers who have done their homework and have kept key people informed about their system's programs and progress will improve the odds that funds for their program will not be reduced. We are not suggesting that program managers affect a hard-sell stance or that they patrol corridors to buttonhole unwary staff people. What we are suggesting is that a program manager should be attuned to the information needs and biases of the people who influence budget decisions. This implies a kind of low-key salesmanship—of the soft-sell, helpful variety.

> One of the program manager's greatest sources of authority involves the manner in which he builds alliances in his environment—with his peers, associates, superiors, subordinates, and other interested parties. The building of alliances supplements his legal authority; it is the process through which the project manager can translate disagreement and conflict into authority (or influence power) to make his decisions stand. Sometimes the power and control of the project manager represents a subtle departure from his legal authority.*

Program managers must keep in touch with what is going on above them. They have to be aware of what is expected by higher authority—both in their Service and at the OSD level. They should know the typical questions being asked at major program review points, and they should be aware that these requirements for information by higher authority are constantly changing.

Program managers speak at length on the need to instill confidence in superiors. This confidence is a foundation of rapport with superiors which, in turn, is one of the main sources of the program manager's authority. When it is obvious to functional managers supporting the program that the program managers have this rapport with their superiors, they will not need to rely as much on formal authority. One of the ways this confidence can be instilled is by demonstrating a knowledge of the program in the widest context. Knowledge of the program must embrace the threat, the direction in which the threat is moving, other systems in the inventory that address the threat, program schedules, costs, technology—in short, everything important about the program.

---

*Steiner and Ryan, op. cit., p 125.

6.3 DEFENSE COMMUNIQUE ON DEFENSE ACQUISITION MANAGEMENT

(The statement by Dr. Richard D. Delauer, Under Secretary of Defense for Research and Engineering before the Senate Armed Services Committee, November 16, 1983 on Defense Acquisition Management offers valuable guidelines.)

6.3.1 Management Philosophy

Our approach to management is one in which we strive for a proper balance between policy formulation and resource allocation on one hand, and decentralized program execution on the other. In order for this concept to be effective, it is imperative to have the necessary management oversight to ensure that policies and plans are being implemented. Since the Carlucci initiatives were adopted over two years ago, the Department has made great progress in implementing this philosophy. Within the Department we have made significant progress toward implementing a more efficient and effective management focus

Before I describe the major organizations and offices which are involved in managing the acquisition process within the Department, let me outline briefly the process. Our defense requirements are established each year by the Secretary in cooperation with the Services and the Joint Chiefs [of Staff (JCS)] through defense guidance. The Services submit a 5-year plan called the Program Objective Memorandum (POM) to the Secretary based upon defense guidance. The Service plans are analyzed for completeness and consistency with our basic policies. Any inconsistencies result in issues which are brought before the Defense Resources Board (DRB).

The DRB, chaired by the Deputy Secretary, is the major decisionmaking body in the Department's resource allocation process. Participative management governs the Board's activities since high-level representatives from all major DoD components, including the Service secretaries and JCS participate in DRB decisions. The focus of DRB attention, however, is upon issues where resources do not fulfill policy objectives.

During this year's program review, issues settled by the DRB accounted for about 3 percent of the total funding requests submitted in this year's POM. Moreover, this small proportion represented only issues of highest priority where the DRB decided that the initially proposed resource were not appropriate for the required task.

As a partner in defense acquisition management, Congress shares the responsibility to participate in policy formulation and implementation oversight. However, it seems that over the years, Congress has digressed from an oversight role in which it would participate in the establishment of policy objectives and measure progress toward achieving the policy goals. Unfortunately, congressional oversight has become far too detailed to provide policy makers or the public with a coherent view of our accomplishments or our needs. The solution to this problem comes down to asking the right questions, receiving the appropriate information, and intervening only when things go off track.

For example, we should be asking questions about our objectives on the basis of mission areas. "Where are we going," we should ask, "in strategic forces; air, sea, and land mobility; conventional forces, etc.?" We have worked this problem pretty well in the areas of strategic offensive forces and in air mobility for example. We haven't yet done well at all, however, in sea and land mobility or in the general area of conventional forces.

We have observed, however, congressional oversight in practice has become more of an annual exercise in line-item management. Due to the parochial interests of constituencies and the increase in size and diversity of congressional staffs, every year we must assume a "prevent defense" on a programmatic basis. What is needed is increased awareness of our mission goals and our progress toward their achievement—not whether this or that program needs to be adjusted.

The information which is provided to Congress needs to reflect the oversight function which I have described. For example, the Selected Acquisition Reports (SARs) to Congress need some modification in order to be more meaningful for effective oversight. First, I believe SARs should be based on a 5-year planning period rather than for the total program inventory objective as is presently the case. The problem is that adjustments to these outyear inventory objectives change program costs. The result looks like poor management rather than a reflection of the uncertainties of these outyear projections. To make valid estimates of the inventory objectives of our major systems beyond a 5-year period and have them be meaningful is almost impossible. We recognize the need to have planning figures for the total program, but the uncertainty in these numbers must also be acknowledged.

In addition, congressional oversight should be practiced on a "by-exception" basis where only the major problems are addressed. Recent changes brought about by the Nunn-McCurdy Act have increased the reporting requirement for major systems by almost 50 percent. This additional requirement necessitates thousands of additional hours of preparation and review for a variety of systems, many of which are not sufficiently mature to establish a meaningful baseline. Moreover, the programmatic structure of the SAR reinforces the line item management mentality of which I have already spoken.

Everyone agrees that what is needed most of all in the acquisition process is greater stability. Yet, each year we observe that hundreds of programs are adjusted by the Congress in accordance with undefined priorities. The following year, we must return to Congress to attempt to get essential programs back on track. As a result of our adjustment and other inefficiencies, it now takes from 12 to 17 years to complete the acquisition process for most major items. If we could simply recognize the instability which we introduce into the acquisition process and the consequent cost (both in dollars and national security), we will have achieved a major step forward. We are improving stability through many of our initiatives such as multiyear procurement, economic production rates, and realistic budgeting. However, much more needs to be done. I strongly endorse the Secretary's recommendation, for example, that the Congress adopt a 2-year budget cycle to help alleviate the instability problem. I believe it would reduce the average time needed for completion of the acquisition process, and would also mean significant cost savings in the long run.

6.3.2 Funding Distinctions

Another contributing factor to inefficient management which constrains the acquisition process is the artifical distinction which is made among various types of funding. The acquisition process embraces exploratory research, engineering development, manufacturing assembly, and deployment. To assume that these phases can be defined and funded in a rigid manner (RDT&E and production) is nonsense. It is artificial and expensive. Resources should be applied as is necessary to do the job in the most efficient way. Line managers who are close to the program should retain the flexibility to make these judgments and act accordingly. If we could remove this artificial distinction in characterizing funds, I believe we could save money and shorten the process as much as 10 to 20 percent.

We are now trying to add more emphasis to the critical transition period from R&D to manufacturing. We are establishing a new DoD directive to enhance our attention to this problem, and I am looking at ways to strengthen the production and manufacturing areas within DoD. I think we need to beef-up the R&E (research and engineering) organization in this area. We may well need additional manpower spaces to devote to this problem.

Another subject which causes us great concern is the present definition of competitive procurement. The way we keep score is very misleading to the uninitiated and we need to redefine the terms. Practically all of our programs are initially competitive, and we examine the acquisition strategy in great detail to seek opportunities for dual sourcing. We particularly try to pursue competition at the subcontractor and vendor levels. Because our procurement programs are funded on an annual basis, however, we do not get credit (in a competitive sense) for follow-on buys for programs which reaped the benefits of competition earlier. It makes no sense, for example, to develop a second source for an F-15 or F-16 aircraft at this point. These programs experienced vigorous competition early in their development. The same is true for most of our major programs. This is just another area where we suffer bad press for something which is really not a problem.

6.3.3 Organization of DoD Acquisition Management

A number of organizations and offices play a variety of roles in the defense acquisition process within the context of the management philosophy I have described. Let me briefly summarize some of the more important and discuss their respective roles: I have already mentioned the DRB and the vital role which it plays. Of course, there is also the Under Secretary of Defense (Research and Engineering/Defense Acquisition Executive). As the principal advisor to the Secretary on scientific and acquisition issues, I exercise oversight on scientific and technical matters of basic applied research, and the development and acquisition of our weapons systems. It is my duty to ensure that activities in these areas adhere to departmental policies and national security objectives. I participate in the review and evaluation of requirements and priorities and make certain that our programs are designed to accommodate operational requirements. It is also my responsibility to follow up and evaluate programs for carrying out approved acquisition policies and standards. Through my participation in the planning, programming, and budgeting system, I review proposed programs and resources and recommend resource allocations in accordance with national security policy and priorities. Finally, as Defense Acquisition Executive (DAE), I serve as the chairman of the Defense Systems Acquisition Review Council (DSARC) which exercises oversight and advises the Secretary on the management process, policies, and procedures for acquiring our major programs.

Though the list of my duties and other organizational commitments could go on, let me just emphasize an important aspect of my job about which some of the members of the [Senate Armed Services] Committee have indicated concern. The concern involves an apparent conflict of interest between my role as manager of research and engineering and as the director of acquisition.

Quite frankly, for a variety of reasons, I see no conflict at all. First, there is considerable overlap between the functions of development and production which requires constant oversight in order to manage the transition effectively. Development and production cannot be neatly separated. My office possesses the technical and management skills to exercise effective oversight in this area.

Second, by virtue of my role in the planning, programming, and budgeting process, as well as my position as DAE, I can help to ensure that consistency exists between our policies and requirements and the systems which we acquire. Although the ultimate responsibility regarding this fundamental objective is shared by the Secretary, the President, and the Congress, the important pieces of the puzzle must begin to fit together at some point in the management process. My duties assure that this process can appropriately be undertaken in the office of the Under Secretary for Research and Engineering.

Another important element within the Deparment's oversight function was instituted by the Secretary shortly after he took office. Each week on a rotating basis, the service secretaries report to the Secretary on one or two major programs to discuss problems and possible solutions. For some of our more critical systems, program personnel provide regular reports directly to the Secretary on a biweekly or monthly basis. These Secretarial Performance Reviews are an essential part of the management philosophy I described at the outset of my statement: high level oversight of high priority major issues.

No discussion of acquisition management is complete without recognizing the hard work accomplished by the various program offices, the buying commands, the Joint Logistics Commanders, and the Defense Logistics Agency. The personnel employed in these organizations perform an outstanding job of executing the programs, policies, and procedures which confront them daily. We are doing our best to make their jobs easier through various acquisition reforms such as reducing the number of directives and carefully screening contractual data requirements. We maintain close contact with the Joint Logistics Commanders to ensure that these and other important acquisition reforms which affect the buying community are fully implemented.

6.3.4 Oversight

The Inspector General (IG) is another important participant in the acquisition management oversight function. The IG performs essential audits and reviews to ensure that waste, fraud, and abuse are purged from the system. In addition, we receive valuable insights on how to improve the acquisition management process from the Council on Integrity and Management Inprovement (CIMI) which is chaired by the Deputy Secretary. The Council is a high level group which meets to explore new ideas and opportunites for progress in management on a DoD-wide basis. Specific management issues are regularly considered and the Council makes recommendations to the Secretary for his resolution. The Defense Science Board is another important organization which is external to the Department and which draws together management ideas from key elements within DoD, industry, academia, and the scientific community.

Finally, I must recognize my "right-hand woman" who serves as the Deputy for Acquisition Management. Mary Ann Gilleece is my principal advisor on acquisition matters and is the primary policy maker for all DoD procurement and production policy. She is responsible for implementing federal policies on acquisition, the formulation and revision of defense acquisition regulations, specifications and standards, and other policies. Ms. Gilleece is also my principal advisor in deliberations of the DSARC on acquisition matters, including the implementation of acquisition improvement program initiatives.

The members of this committee are doubtless aware of many of the important strides we have made in implementing various initiatives of the [Acquisition Improvement Programs (AIP)]. I won't review in detail the progress we have made through the good efforts of Ms. Gilleece and many others, but let me highlight some changes we have initiated within the DSARC process which make our management more efficient and effective.

6.3.5 DSARC [Defense Systems Acquisition Review Council]

[DSARC is an OSD-level recommending body that is in the decisionmaking process, but does not provide funds.] First, as I stated at the outset, we have instituted controlled decentralization throughout the process. The Service secretaries, for example, now serve as full members of the DSARC and contribute to policy formulation and program execution. [Other members of the council include the USDRE chairman, USD (Policy), ASD (MI&L), ASD (C), DIR (PA&E), chairman of the JCS, and DIR (OT&E).] At the same time, we have streamlined the acquisition process in order to accelerate the results and avoid micromanagement. The front-end review of new programs is now done during the POM review process to ensure that the new starts are both required and affordable.

In addition, by revising the threshold which defines a major system to $200 million in R&D and $1 billion in procurement, we have ensured that high level management attention is placed on programs of major significance. Major milestone decisions on 10 programs were delegated back to the services when we instituted this change in 1981, and milestone decisions for an additional 10 or so programs have been precluded from the DSARC process since that time. Partly as a consequence, DSARC activity during the last 3 years has decreased significantly from 12 meetings in 1981 to 5 meetings thus far in 1983. I should add that much of what might have required a DSARC in the past has been replaced by much less formal program reviews which focus on specific major problem areas. Fewer prereviews and reduced documentation have been a major benefit.

All major programs proceed through the DSARC process to milestone II when a program is baselined at full-scale development. If a program stays within baseline objectives, the final production decision is made at the appropriate management level, i.e., the Service. If a program exceeds its baseline objectives, however, it remains subject to further DSARC review before a production go-ahead can be given.

At each DSARC milestone we review acquisition strategy and examine the potential for competition, including the possibility for dual sourcing. We ensure that support and readiness are given proper consideration, and determine whether a program meets the criteria to become a multiyear candidate. In addition, greater emphasis is now being placed in the DSARC on improved production engineering preparation to ease the difficult transition from development to manufacturing. We also examine other AIP initiative areas such as the potential to apply a preplanned product (P3) improvement approach. In addition, the Cost Analysis Improvement Group (CAIG) examines cost estimates at each milestone in order to ensure realistic budget estimates. In short, each DSARC meeting is an opportunity to confirm that the acquisition policies we have adopted are being considered and executed properly at lower levels of management. The DSARC process is alive and well and more effective than ever as a means to improve our management of the acquisition process.

6.3.6 Other Management Issues

The Committee has also indicated its interest in the area of joint service program management as a means to increase efficiency and otherwise reduce the aggregate costs of weapons systems development and procurement. Although the benefits of joint service programs can be attractive, expensive failures have occurred too often in the past and counsel caution as we proceed forward. A balanced approach is needed whereby specific service requirements are carefully examined to ensure compatibility before proceeding on a joint basis. Our basic goal is to increase cross-service coordination in the development and use of the systems and technology of similar purposes to obtain maximum performance at minimum cost.

Some recent examples where we are making important progress involve joint activities in specific mission areas. The Navy and the Air Force, for example, have achieved important progress in coordinating their efforts regarding Fleet air defense and sea control. The decision to designate a number of B-52s to support the Navy's sea control mission is a good example of the benefits of improved cross-service coordination and management. Similar efforts are being conducted in the deep interdiction mission area where hardware development as well as employment doctrine and concepts are being examined on a joint basis. We are confident that the results of this joint effort will produce an effective means to solve the second echelon problem in the most economical way possible.

6.3.7 Joint Requirements and Management Board

We are considering some important steps to institutionalize our approach and practices concerning joint service programs. As a result of a study conducted this past summer by the Defense Science Board, a Joint Requirements and Management Board comprising the service Vice-Chiefs, the Director of the Joint Staff, and OSD components is being contemplated. The Board's primary purpose would be to provide a rigorous review of the requirements process and identify those with potential for joint service applicability. The Board would provide a more systematic way of examining the possibilities for joint programs than we have had in the past.

Another area of particular interest these days concerns the acquisition of spare parts; the horror stories have created understandable concern among all of us. First, may I point out that our system of management works. Employees of the Department discovered and reported the problem, and the management of the Department has taken corrective measures. Secretary Weinberger's 10 points program on spare parts procurement reform has already revised much of the way in which we do business.

Contracts to purchase spares are being written to ensure that spares are purchased competitively to the maximum extent possible. Steps are being taken to ensure that manufacturers of parts are identified and that complete technical data packages become available so that we appoint at the mercy of the prime contractor in the future. The bidders for the new fighter engine (Pratt and Whitney and General Electric) are being required to submit plans to show how they will develop two or more qualified subcontractors who would remain available for production of the 30 replenishment spares with the highest procurement value. Since those high value parts comprise about 80 percent of the value of the engine, we can focus our efforts on gaining competition for the remaining 20 percent.

In addition, we are building incentives and disincentives into the spares management process. The Air Force sergeant who reported a case of pricing abuse was recently awarded $1,100 (the amount the Air Force was being charged for the spare part). Where an employee's negligence has contributed to excessive prices, we are taking disciplinary action. Where industry is at fault, we will use every legal means to obtain refunds in case of overcharge.

The Department and the Congress are partners in the process of acquisition management. I have attempted to describe just a few of the major characteristics and objectives of the departmental acquisition organization and management for you today. However, our organization and its efforts cannot be successful unless every member of this Committee and the Congress as a whole understands their purpose and potential benefit. Moreover, each member of Congress should simultaneously consider the appropriate management role of the legislative branch in the acquisition process. Are national or parochial interests being served when Congress votes in a particular way? Is national security truly enhanced? When the Congress votes to reduce funds for a particular program, do the members understand the cost impact for the future? Certainly, the answers to these questions vary from member to member. The concepts, however, are important to bear in mind lest we seek inappropriate microsolutions to problems which are truly macro in nature.

[Figures 6.1 and 6.2 present the life cycle of typical major system acquisitions and life-cycle costing for those acquisitions.]

6.4 THE DEPARTMENT OF DEFENSE ORGANIZATIONAL STRUCTURE

6.4.1 Introduction

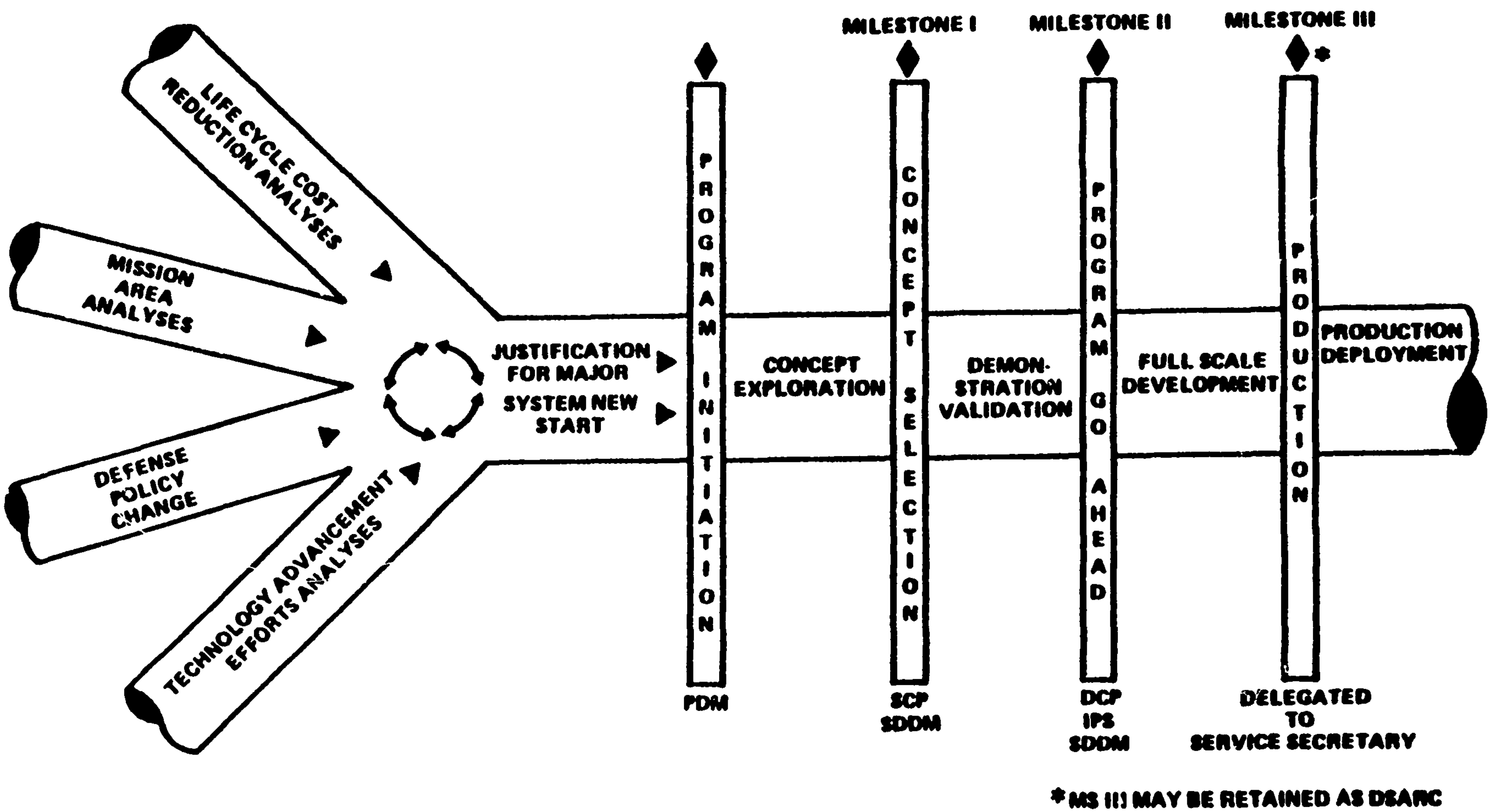


Figure 6.1. The life cycle of major system acquisitions.

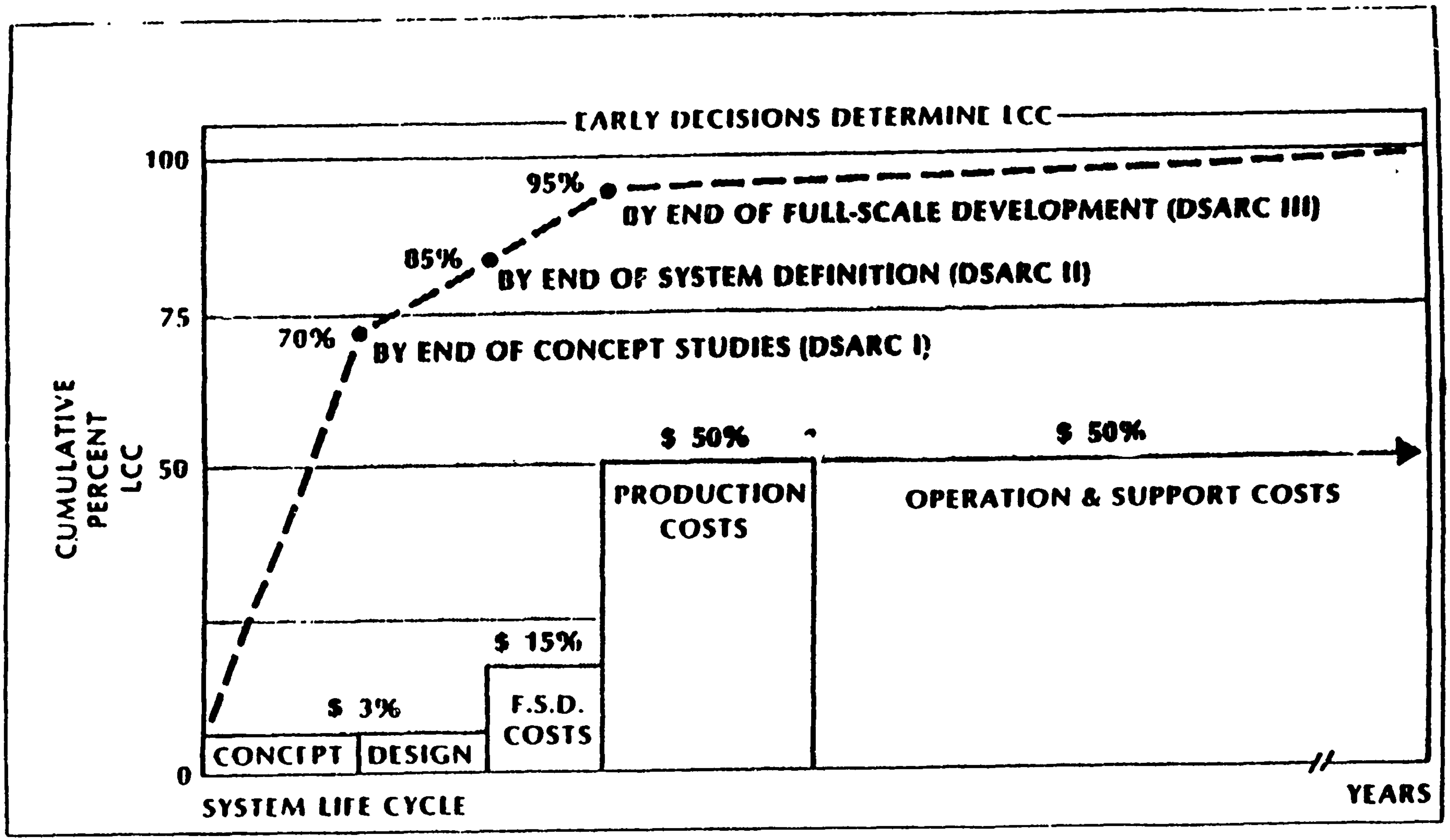


Figure 6.2. Life cycle costing in system acquisition.

6.4.1.1 The Department of Defense (DoD) (DoD Directive 5100.1). DoD is responsible for providing the military forces needed to deter war and protect the security of the United States. The major elements of these forces are the Army, Navy, Air Force, and Marine Corps. Under the President, who is also Commander-in-Chief, the Secretary of Defense exercises direction, authority, and control over the Department which includes the Office of the Secretary of Defense, organization of the Joint Chiefs of Staff three military departments, nine unified and specified commands, the DoD Inspector General, twelve defense agencies, and six OSD field activities (Figure 6.3).

In order to support the forces that DoD provides, the acquisition of major systems is an inevitable necessity. Some brief definitions should be helpful for considering the items in this section. A *major system* exhibits the following characteristics:

a. It has been determined, at the discretion of the agency's head (e.g., the Secretary of Defense), to be critical to fulfilling the agency's mission.
b. It entails the allocation of relatively large resources.
c. It warrants special management attention.

Besides having the characteristics noted above, a *DoD major system* has been designated as such based on the following considerations:

a. Risk, need, or other item of SECDEF interest
b. Joint service or multinational acquisition
c. Estimated RDT&E and procurement funds
d. Estimated operations, maintenance, and support manpower requirements
e. Congressional interest.

DoD Directive 5000.1 describes major systems and DoD major systems in greater detail. The directive emphasizes the following themes:

a. Flexibility (tailored acquisition strategy)
b. Minimize time to field new capability
c. Balance between cost and effectiveness
d. Linkage with PPBS
e. Maximize collaboration with allies
f. Integration of support considerations into process
g. Integration of threat considerations into process
h. Decentralization:

    SECDEF—two milestone decisions on major systems services—all other management on major systems.

The directive addresses the management of nonmajor programs as well. "The management principles and objectives in this Directive (DoDD 5000.1) shall also be applied to the acquisition of defense systems not designated as major." This particularly includes tailored application and decentralized management responsibility.

Examples of current major systems are listed in Table 6.1.

6.4.1.2 The Office of the Secretary of Defense (OSD). OSD is the principal staff element of the Secretary in the exercise of policy development, planning, resource management, fiscal, and program evaluation responsibilities (Figure 6.4). OSD includes the immediate offices of the Secretary and Deputy Secretary of Defense, Under Secretary of Defense for Policy, Under Secretary of Defense for Research and Engineering (USDRE), Assistant Secretaries of Defense, General Counsel, Assistants to the Secretary of Defense, and such other staff offices as the Secretary establishes to assist in carrying out assigned responsibilities.

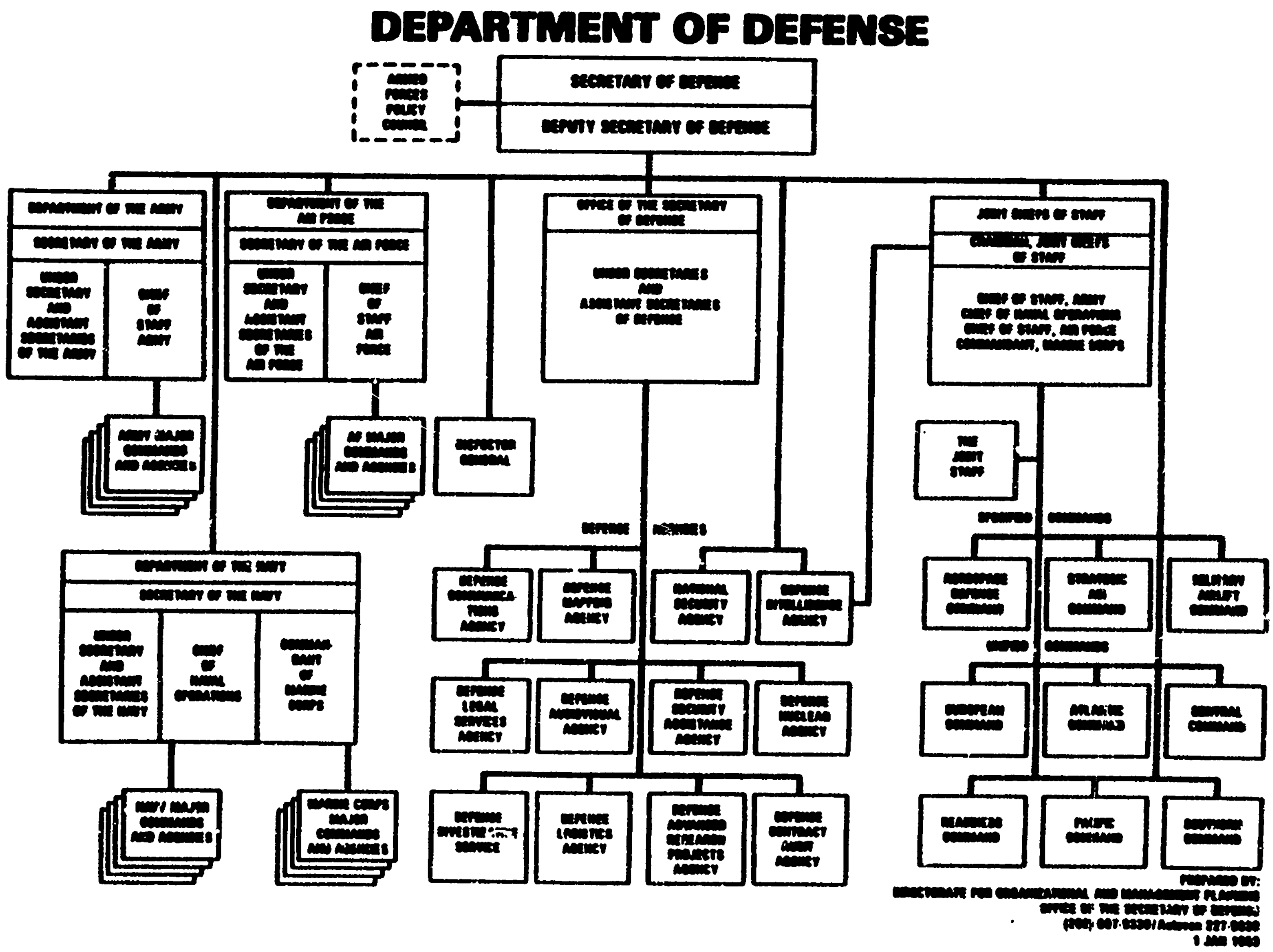


Figure 6.3. The Department of Defense.

Table 6.1. Current major systems.

ARMY(13)	NAVY(14)	AIR FORCE(14)
M1E1 (120 MM GUN)	*HARM	*NAVSTAR USER EQUIP
RPV	F/A-18	*IIR MAVERICK
AHIP	*ASPJ	*JTIDS
*MPGS	VTXTS	ENHANCED JTIDS
*JTACMS	ASW/SOW	*AMRAAM
MLRS/TGW	DDG-51	*COMBAT ID SYS
LADS	TRIDENT II	ATF
SHORAD C^2	SUBACS	AMLS
SINCGARS	CV HELO	*JSTARS
LHX	*JVX	*I-S/A AMPE
GAMP	HFIP	C-17
MSE	NEW SSN	*WIS
*JATM	MK-50	SBSS
	VFMX	AASM

*LEAD SERVICE FOR JOINT SERVICE PROGRAM

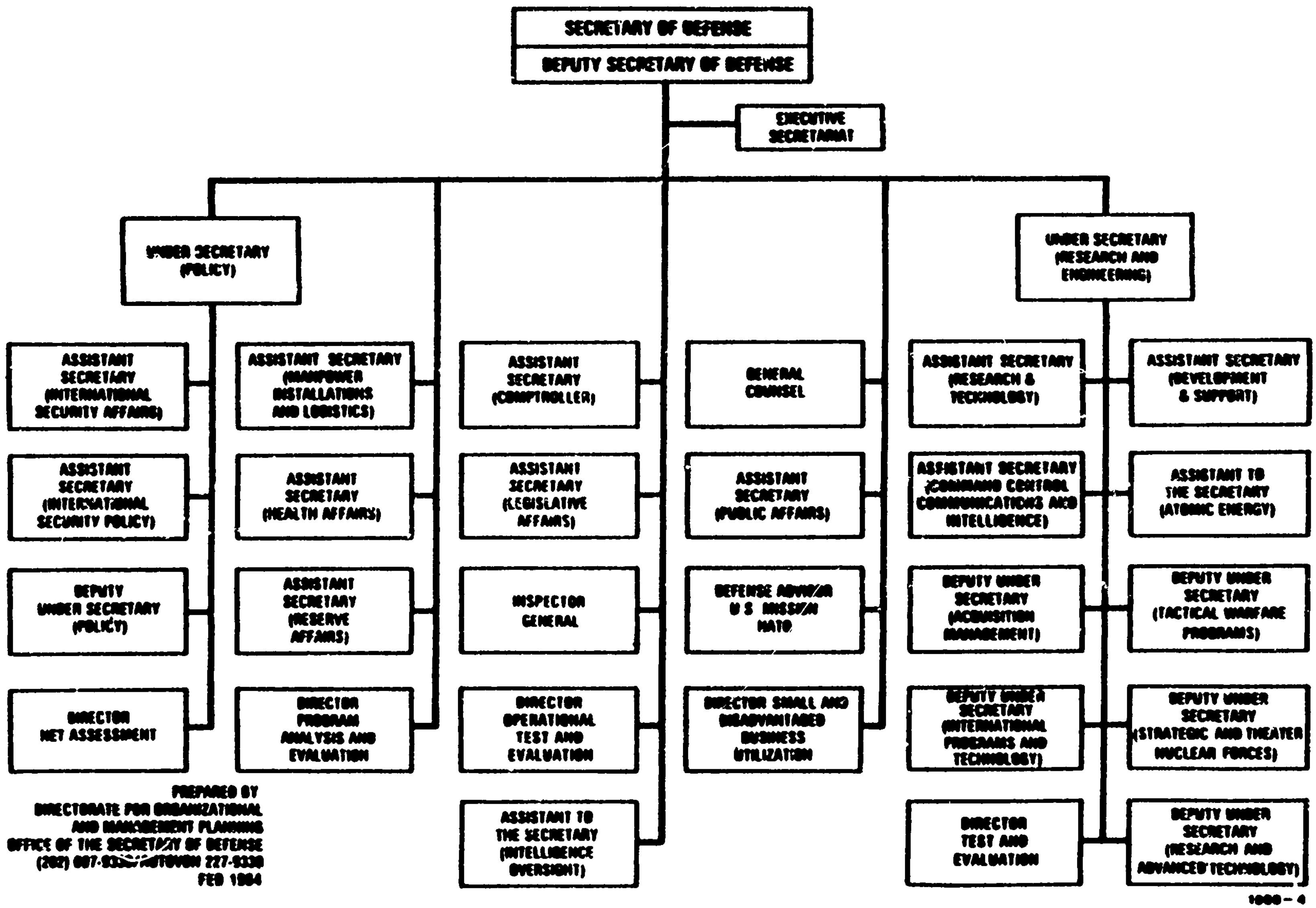


Figure 6.4. Office of the Secretary of Defense.

The organizational struture of USDRE is presented in Figures 6.5 and 6.6. The USDRE has three major roles:

a. Principal advisor to the SECDEF for scientific and technical matters
b. Defense acquisition executive (DSARC chairman)
c. U.S. representative to the NATO Conference of National Armament Directors (CNAD).

6.4.1.3 The Military Departments (DoD Directive 5100.1). These include the Departments of the Army, Navy, and Air Force (the Marine Corps is a part of the Department of the Navy). Each military department is separately organized under its own Secretary and functions under the direction, authority, and control of the Secretary of Defense. The military departments are responsible for organizing, training, supplying, and equipping forces for assignment to the unified and specified commands (U/S Commands).

6.4.1.4 The Joint Chiefs of Staff (JCS) (DoD Directive 5100.1). The JCS are the principal military advisors to the Secretary of Defense as well as to the President and the National Security Council. Members of the Joint Chiefs of Staff, other than the Chairman, are the senior military officers of their respective Services and are responsible for keeping the Secretaries of the military departments fully informed on matters considered or acted upon by the Joint Chiefs of Staff.

6.4.1.5 The Armed Forces Policy Council (AFPC) (DoD Directive 5105.3). The AFPC advises the Secretary of Defense on matters of broad policy relating to the Armed Forces and such other matters as the Secretary may direct. Its members report regularly on important matters under their cognizance which are of interest to the Department of Defense. In addition to members identified below, such other officials of the Department of Defense, and other departments and agencies in the Executive Branch as may be designated by the Secretary of Defense, are invited to attend appropriate meetings of the AFPC. Council membership is as indicated:

Secretary of Defense, Chairman
Deputy Secretary of Defense
Secretaries of the Military Departments
Chairman, Joint Chiefs of Staff
Under Secretaries of Defense
Chief of Staff, Army
Chief of Naval Operations
Chief of Staff, Air Force
Commandant, Marine Corps

6.4.1.6 The Unified and Specified Commands (U/S Commands) (DoD Directive 5100.1). The U/S Commands are responsible to the President and the Secretary of Defense for the accomplishment of the military missions assigned to them. Combatant units of the military departments are assigned to, and under the operational command of, Commanders of unified and specified commands. Unified commands are composed of assigned components of two or more Services. They include the European Command, Pacific Command, Atlantic Command, Southern Command, Readiness Command, and Central Command. Specified commands are usually composed of forces from one Service, but may include units and have representation from other Services. They include the Aerospace Defense Command, Strategic Air Command, and Military Airlift Command. The military chain of command runs from the President to the Secretary of Defense and, through the Joint Chiefs of Staff, to the Commanders of unified and specified commands. Orders to these Commanders are issued by the President or the Secretary of Defense, or by the Joint Chiefs of Staff by authority and direction of the Secretary of Defense.

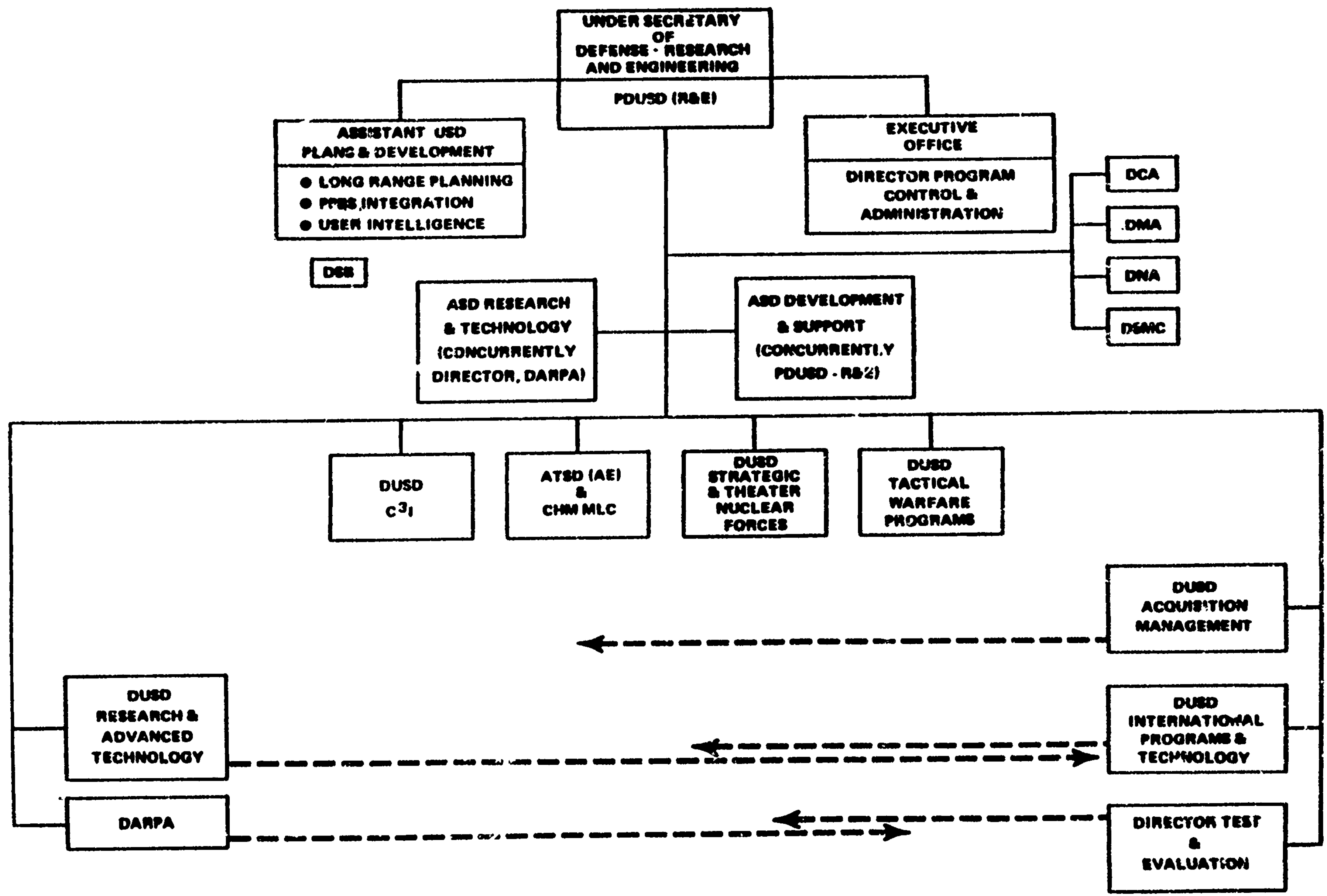


Figure 6.5. Office of the Under Secretary of Defense for Research and Engineering.

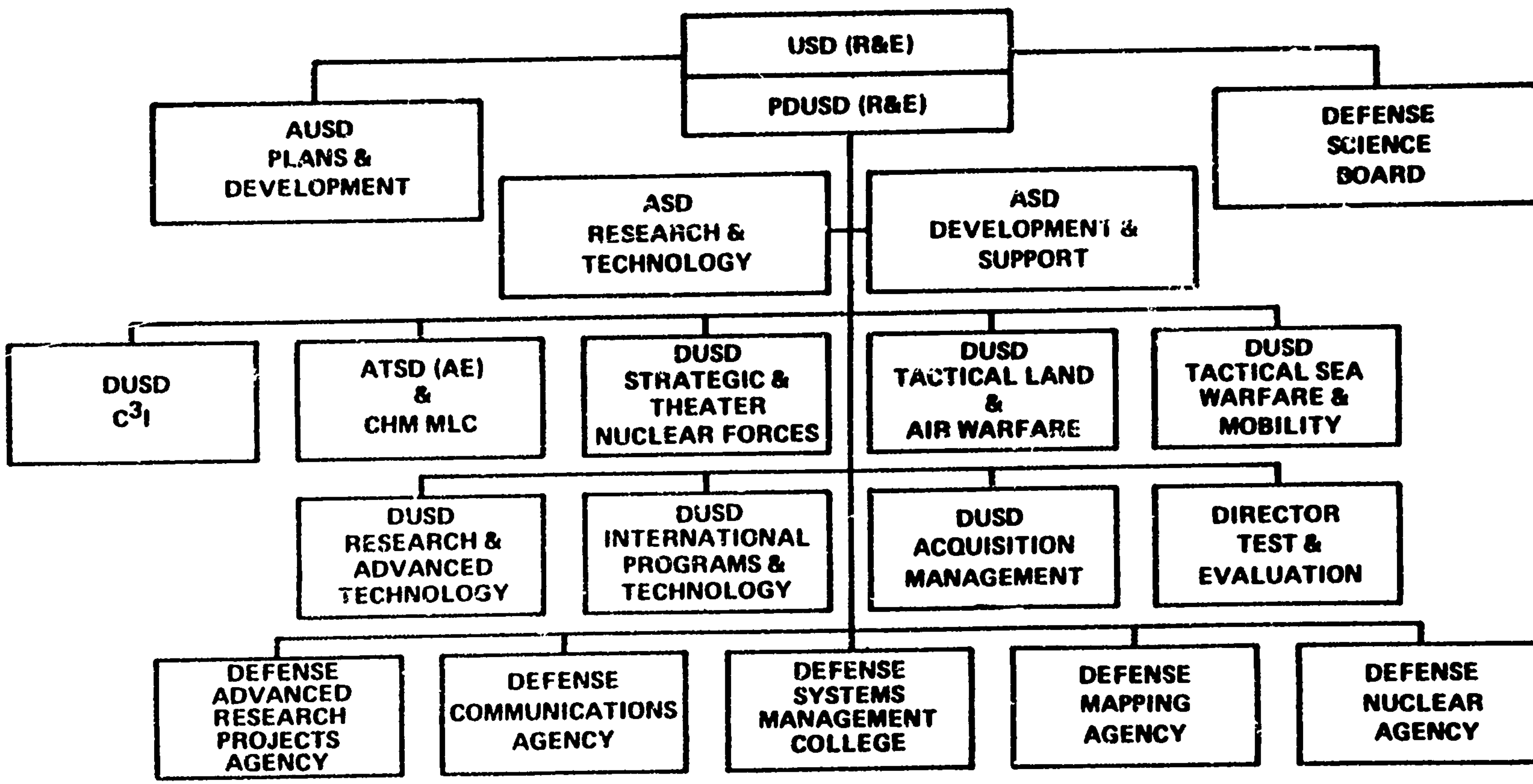


Figure 6.6. Under Secretary of Defense—Research & Engineering.

6.4.1.7 The Inspector General (IG) of the Department of Defense (DoD Directive 5106.1). The IG, under the provisions set forth by Public Law 95-452, serves as an independent and objective official in the Department of Defense who is responsible for conducting, supervising, monitoring, and initiating audits and investigations relating to programs and operations of the Department of Defense. The Inspector General provides leadership and coordination and recommends policies for activities designed to promote economy, efficiency, and effectiveness in the administration of, and to prevent and detect fraud and abuse in, such programs and operations. The Inspector General is also responsible for keeping the Secretary of Defense and the Congress fully and currently informed about problems and deficiencies relating to the administration of such programs and operations and the necessity for, and progress of, corrective action.

6.4.1.8 The Defense Agencies. These agencies, authorized by the Secretary of Defense pursuant to the provisions of Title 10, United States Code, perform selected support and service functions on a Departmentwide basis.

6.4.1.9 The OSD Field Activities. These field activities are established by the Secretary of Defense, under the provisions of Title 10, United States Code, to perform selected support and service functions of a more limited scope than the defense agencies.

6.4.1.10 The Uniformed Services University of the Health Sciences (USUHS) (DoD Directive 5105.45). The USUHS, under the policy guidance of the Secretary of Defense and operational direction of a Board of Regents, is a fully accredited 4-year School of Medicine whose primary mission is to select, educate, and train qualified applicants to become military physicians. The curriculum is expanded from that of the civilian schools to include subjects of specific military importance, such as command and control, tropical medicine, environmental extremes, occupational hazards, nonconventional weapons, wartime surgery, and public health. USUHS also has educational programs leading to the Ph.D. degree in the basic medical sciences, a Masters of Public Health program, and a continuing medical education program.

6.4.2 Organizations and Functions—Office of the Secretary of Defense

The Office of the Secretary of Defense (OSD) is the principal staff element used by the Secretary of Defense to exercise direction, authority, and control over the Department of Defense. The mission of OSD as an organizational entity, in coordination with other elements of DoD, is as follows:

Develop and promulgate policies in support of United States national security objectives.

Provide oversight to assure the effective allocation and efficient management of resources consistent with Secretary of Defense approved plans and programs.

Develop appropriate evaluation mechanisms to provide effective supervision of policy implementation and program execution at all DoD levels.

Provide the focal point for departmental participation in the United States security community and other Government activities.

In addition, each OSD principal staff official, in his or her respective areas of functional assignment, is responsible for performing the following:

Conduct analyses, develop policies, provide advice, make recommendations, and issue guidance on DoD plans and programs.

Develop systems and standards for the administration and management of approved plans and programs.

Initiate programs, actions, and taskings to ensure adherence to DoD policies and national security objectives and to ensure that programs are designed to accommodate operational requirements.

Review and evaluate programs for carrying out approved policies and standards.

Inform appropriate organizations and personnel of new and significant trends or initiatives in assigned areas of functional responsibilities.

Review proposed resource programs, formulate budget estimates, recommend resource allocations, and monitor the implementation of approved programs.

Participate in those planning, programming, and budgeting activities that relate to assigned areas of functional responsibilities.

Review and evaluate recommendations on requirements and priorities.

Promote coordination, cooperation, and mutual understanding within the Department of Defense and between DoD and other Federal agencies and the civilian community.

Serve on boards, committees, and other groups pertaining to assigned functional areas, and represent the Secretary of Defense on matters outside the Department of Defense.

Develop information and data, prepare reports. and/or testimony for presentations to congressional committees or in response to congressional inquiries.

Represent the DoD with congressional committees or individual Members of the Congress.

Perform such other duties as the Secretary of Defense may from time to time prescribe.

6.4.2.1 Immediate Offices of the Secretary and Deputy Secretary of Defense. The Secretary of Defense is the principal defense policy advisor to the President and is responsible for the formulation of general defense policy, for policy related to all matters of direct and primary concern to the DoD, and for the execution of approved policy. Under the direction of the President and subject to the provisions of the National Security Act of 1947, as amended, the Secretary exercises direction, authority, and control over the Department of Defense.

The Deputy Secretary of Defense assists in the administration of the Department. The Deputy Secretary is delegated full power and authority to act for the Secretary of Defense and to exercise the powers of the Secretary upon any and all matters concerning which the Secretary is authorized to act pursuant to law.

The Executive Secretary of the Department of Defense supports the Secretary and Deputy Secretary by executing the following responsibilities: coordinates DoD participation in the interagency process involving national security management, defense policy, programs and resources for the DoD, with the White House, the NSC, State Department, CIA, and other agencies as appropriate; is the Secretariat for both the Armed Forces Policy Council (AFPC) and the Secretary's Performance Review (SPR) Board; performs liaison with the White House Military Office, including Presidential support activities; serves as the DoD point of contact for intergovernmental affairs; processes requests for DoD support from the White House and other departments/agencies; processes Special Air Mission (SAM) transportation requests for OSD and non-DoD agencies; manages and controls all correspondence, information, and action documents for the Secretary and Deputy Secretary; and performs any special project directed by either the Secretary or Deputy Secretary.

The Assistant to the Secretary and Deputy Secretary for Executive Personnel is responsible for staffing noncareer positions throughout the DoD, approval of staffing for DoD boards and committees, recommending candidates for Presidential boards and committees, approving appointment of DoD headquarters level experts and consultants; acts as noncareer DoD contact with Office of Assistant to the President for Intergovernmental Affairs, and serves as primary DoD liaison with the White House Personnel Office in dealing with such matters.

6.4.2.2 Under Secretary of Defense (Policy) (USD (P)) (DoD Directive 5111.1). Under the direction of the Secretary of Defense, the USD(P) is responsible for the following functions:

Integration of DoD plans and policies with overall national security objectives

Representation of DoD as directed in matters involving the National Security Council, Department of State and the intelligence community, and other departments, agencies, and interagency groups with responsibilities in the national security area

Oversight and coordination of the formulation and implementation of DoD planning and policy concerning political-military affairs, such as arms limitation negotiations; contingency planning; intelligence analyses and collection requirements; nuclear weapons and targeting; communications, command, and control (C_3); and, the use of outer space

Oversight and coordination of policy review concerning intelligence planning and requirements, counterintelligence and investigative programs, security plans and programs, and sensitive intelligence matters including arrangements with foreign governments

Review of evaluations and the development of recommendations to the Secretary of Defense concerning plans and requirements for, and capabilities of, existing or proposed United States or foreign forces and their deployment with particular attention to performance of missions which are or may be critical in consideration of United States national security policy

Coordination of DoD participation in the preparation of, and followthrough on, NATO Short-Term Initiatives and Long-Term Programs, and the integration of NATO considerations in the development and formulation of DoD decisions

Law of the Sea

Military Assistance Advisory Groups (MAAG) and missions pertaining to security assistance.

Negotiation and monitoring of agreements with foreign governments

Development of DoD policy positions, recommendations, and coordination of all matters concerning disarmament and arms control to include START and MBFR and other Defense-related international negotiations

DoD focal point for long and midrange policy planning on strategic international security matters

Formulation of policy related to strategic offensive and defensive forces, theater nuclear matters and capabilities, arms control negotiations, and the relationship between strategic and theater force planning and budgets

Oversight of DoD activities related to the North Atlantic Treaty Organization and East-West economic policy, including East-West trade, technology transfer issues, and issues affecting the defense industrial mobilization base

Formulating, planning, conducting, and preparing net assessments for the Secretary of Defense

Formulating plans and policy related to general purpose forces, non-European regional security requirements, and related budget considerations

Developing policies, plans, and procedures for the discharge of Department of Defense functions in national emergencies; providing support to DoD and other U.S. Government or State agencies on civil defense and related matters.

These functions are carried out through the following key personnel:

Deputy Under Secretary of Defense for Policy

Assistant Secretary of Defense (International Security Affairs)

Assistant Secretary of Defense (International Security Policy)

Director of Net Assessment.

In addition, the Under Secretary of Defense for Policy exercises direction, authority, and control over the

Defense Investigative Service

Defense Security Assistance Agency

6.4.2.3 Under Secretary of Defense (Research and Engineering) (USDRE) (DoD Directive 5126.1). Under the direction of the Secretary of Defense, the USDRE is responsible for the following functions:

Scientific and technical information

Basic and applied research

Design and engineering, including life-cycle considerations

Development and acquisition of weapon systems, including procurement policy and production planning. This function includes national, strategic, and tactical communications; command and control; and intelligence activities.

Development test and evaluation in accordance with DoD Directive 5000.3, to include review and approval of the T&E Master Plan (TEMP)

Environmental services

Assignment and reassignment of research, engineering, and acquisition responsibility for systems, activities, and programs

Coproduction and research interchange with friendly and allied nations, in conjunction with the Under Secretary of Defense for Policy

Contract placement and administration for research, development, and weapon systems acquisition programs

Military applications of atomic energy, nuclear weapons development and acquisition, security, safety, R&D, deployment, employment and targeting, and theater nuclear force modernization.

The above functions are carried out with the support of the following key personnel:

Assistant Secretary of Defense (Command, Control, Communications, and Intelligence)

Assistant Secretary of Defense (Development and Support)

Assistant Secretary of Defense (Research and Technology)

Assistant to the Secretary of Defense (Atomic Energy)

Deputy Under Secretary (Acquisition Management)

Deputy Under Secretary (International Programs and Technology)

Deputy Under Secretary (Research and Advanced Technology)

Deputy Under Secretary (Strategic and Theater Nuclear Forces)

Deputy Under Secretary (Tactical Warfare Programs)

Director, Test and Evaluation.

In addition, the USDRE exercises direction, authority, and control over

Defense Advanced Research Projects Agency

Defense Communications Agency

Defense Mapping Agency

Defense Nuclear Agency

6.4.2.4 Assistant Secretary of Defense (Comptroller) (ASD(C)) (DoD Directive 5118.3). Under the direction of the Secretary of Defense, the ASD(C) is responsible for the following functions:

Planning, programming, and budgeting system (PPBS), including programming coordination and control

DoD budget formulation and execution, resources allocation, and surveillance over utilization

Focal point for budgeted savings under economy and efficiency initiatives

Information to support justification of the budget to Congress

Focal point for joint OSD and Office of Management and Budget (OMB) review of the budget

Coordination with OMB on management reviews and analyses performed in connection with the budget process

Initiatives to strengthen Departmentwide resource management and to improve management information provided to senior officials

Financial management including financial accounting and reporting systems; internal control systems; pricing policy including Foreign Military Sales pricing; banking and credit union services on DoD installations; and international financial affairs

Policies and procedures on the reporting, preparation, and dissemination of statistical information

Senior DoD official for information resources management including oversight of acquisition and use of information technology and related resources for business and administrative purposes

Organizational analysis and management planning

DoD privacy program in compliance with the Privacy Act of 1974

OSD historical program and DoD historical program coordination

Policy guidance and coordination on matters of administrative support received or provided by DoD components

Cost performance measurement systems

Focal point for selected acquisition reports (SARs) and unit cost reporting

Special studies and analyses related to comptroller responsibilities

Member and Executive Secretary of the Defense Resources Board, member of the Cost Analysis Improvement Group, member of the Defense Systems Acquisition Review Council, member and Executive Secretary of the DoD Council on Integrity and Management Improvement, and Chairman of the Major Automated Information Systems Review Council.

In addition, the ASD(C) exercises direction, authority, and control over

Defense Contract Audit Agency

Washington Headquarters Services (through the Deputy Assistant Secretary of Defense (Administration) who has collateral responsibility as Director, Washington Headquarters Services).

6.4.2.5 Assistant Secretary of Defense (Manpower, Installations and Logistics) (ASD(MI&L)) (DoD Directive 5124.1). Under the direction of the Secretary of Defense, the ASD(MI&L) is responsible for the following functions:

Total force structure analysis as related to quantitative and qualitative manpower requirements, manpower utilization, logistics, readiness, and support

The allocation of the total force structure among DoD components and between the active and reserve components within the military departments

Civilian and military personnel management programs and systems, including attraction and retention of military personnel; personnel utilization; compensation, retired pay, per diem, travel, and transportation allowances; civilian and military personnel career development, training, and education; labor-management relations; morale, discipline, and welfare; and community services

Development of civilian and military manpower programs and logistics programs to meet peacetime readiness and wartime sustainability requirements of the DoD

Nonappropriated fund instrumentalities

Weapons support

Logistics

Equal opportunity, equal employment opportunity, and DoD contractor compliance with equal employment opportunity requirements in government contracts

Readiness

Energy

Installations management

Conservation of resources

Economic adjustment

Review and evaluation of the requirements of the Defense System Acquisition Review Council (DSARC) weapon programs and proposed weapon systems for adequacy of readiness goals and resources, including manpower, personnel, training, logistics, installations support, reliability, maintainability, and design safety.

In addition, the ASD(MI&L) exercises direction, authority, and control over

Armed Forces Chaplains Board

Defense Logistics Agency

Department of Defense Dependents Schools

Office of Ecnonomic Adjustment

DoD Explosives Safety Board

Defense Race Relations Institute

Defense Advisory Committee on Women in the Services

6.4.2.6 Director of Operational Test and Evaluation (DOT&E) (Title 10, United States Code, Section 136a) (DoD Directive 5141.2). Under the provisions of Title 10, U.S.C. 136a, and under the direction of the Secretary of Defense, the DOT&E is the principal staff assistant and advisor to the Secretary of Defense on OT&E in the DoD and the principal OT&E official within the senior management of the DoD. In this capacity, the DOT&E is responsible for the following functions:

Prescribe policies and procedures for the conduct of OT&E within the Department of Defense.

Provide advice and make recommendations to the Secretary of Defense, and issue guidance to and consult with the heads of the DoD components with respect to OT&E in the DoD in general, and with respect to specific OT&E to be conducted in connection with a major defense acquisition program.

Designate selected special interest weapons, equipment, or munitions as major defense acquisition programs.

Develop systems and standards for the administration and management of approved OT&E plans for major defense acquisition programs.

Monitor and review all OT&E in the DoD to ensure adherence to approved policies and standards.

Coordinate operational testing conducted jointly by more than one DoD component.

Review and make recommendations to the Secretary of Defense on all budgetary and financial matters relating to OT&E, including operational test facilities and equipment.

Initiate plans, programs, actions, and taskings to ensure that OT&E for major defense acquisition programs is designed to evaluate the operational effectiveness and suitability of U.S. military weapon systems.

Review and report to the Secretary of Defense on the adequacy of operational test planning, priorities, support resources, execution, evaluation, and reporting for major defense acquisition programs while avoiding unnecessary duplication.

6.4.2.7 Director, Program Analysis and Evaluation (DPA&E) (DoD Directive 5141.1). Under the direction of the Secretary of Defense, the DPA&E is responsible for performing analyses, identifying issues, and evaluating alternative programs for the following functions:

Force review of active and reserve components

Strategic and theater nuclear forces

Weapon systems and major items of material, including critical reviews of requirements, performance, and life-cycle costs of current and proposed weapon systems

Nuclear warhead requirements

Support systems

Deployment plans and overseas basing requirements

Mobility force programs and prepositioning plans

Material support programs and war reserve stocks

Force readiness and capabilities

Implications for manpower resources of specific force structure plans

Contingency plans

Security assistance programs

Allied and foreign military requirements and capabilities

The DPA&E also provides support to the Secretary of Defense through

Economic analyses and impact thereof on Defense programs

Cost Analysis Improvement Group leadership and support (in accordance with DoD Directive 5000.4).

Appendix 6A

Navy Acquisition Process

NAVY ACQUISITION PROCESS

NAVY ACQUISITION REFERENCE DOCUMENTS

DODD 5000.1 of 29 March 1982	"Major System Acquisitions"
DODI 5000.2 of 8 March 1983	"Major System Acquisition Procedures"
DODD 5000.3 of 26 December 1979	"Test and Evaluation"
SECNAVINST 5000.1B of 8 April 1983	"System Acquisition"
OPNAVINST 5000.42B of 20 August 1983	"RDT&E/Acquisition Procedures"
OPNAVINST 3960.10B	(Contains guidance for development of program TEMP)
OPNAVINST 5000.49	(Contains ILS guidance for RDT&E/ Acquisition)

"Navy Program Managers Guide" of July 1983 (Available from Navy Publications Form Center, Philadelphia)

NAVY ACQUISITION PROCESS

	ACAT I	II s	II c	III	IV (M/T)
DECISION AUTHORITY	SECDEF	SECNAV	CNO/CMC	DCNO/DMSO	CNM/CMC (OR DESIGNEE)
DECISION FORUM	DSARC	DNSARC	CEB OR ARC	SPONSOR REVIEW	ARB OR OTHER NMC REVIEW
ACAT CRITERIA	$200M R&D OR * $1B PROCUREMENT	$100M R&D or * $500M PRODUCTION or SPECIAL INTEREST	$100M RDT&E * OR $500M PRODUCTION OR CNO DISCRETION	AFFECTS MILITARY CHARACTERISTICS OR INTERACTS WITH ENEMY	ALL OTHER PROGRAMS (IVT NOT EXPECTED TO INTERACT WITH ENEMY)
DOCUMENTATION REQUIRED	JMSNS - PROGRAM INITIATION SCP - 1st MILESTONE DCP/IPS - 2nd MILESTONE AND TEMP	OR/ROC/NDCP AND TEMP	NDCP AND TEMP	TEMP (AND MINI-NDCP IF NEEDED)	AS PRESCRIBED BY CNM (USUALLY MINI-NDCP)
MILESTONE REVIEW					
● MILESTONE 1	SECDEF(SDDM)	SECNAV(SNDM)	CNO	INCLUSION IN POM	INCLUSION IN POM
● MILESTONE 2	SECDEF	SECNAV	CNO	SPR	CNM (OR DESIGNEE)
● MILESTONE 3 **	SECNAV	SECNAV	CNO	SPR	

* FY 1980 $

** FOR LARGE PROGRAMS

ORGANIZATION OF THE DEPARTMENT OF THE NAVY*

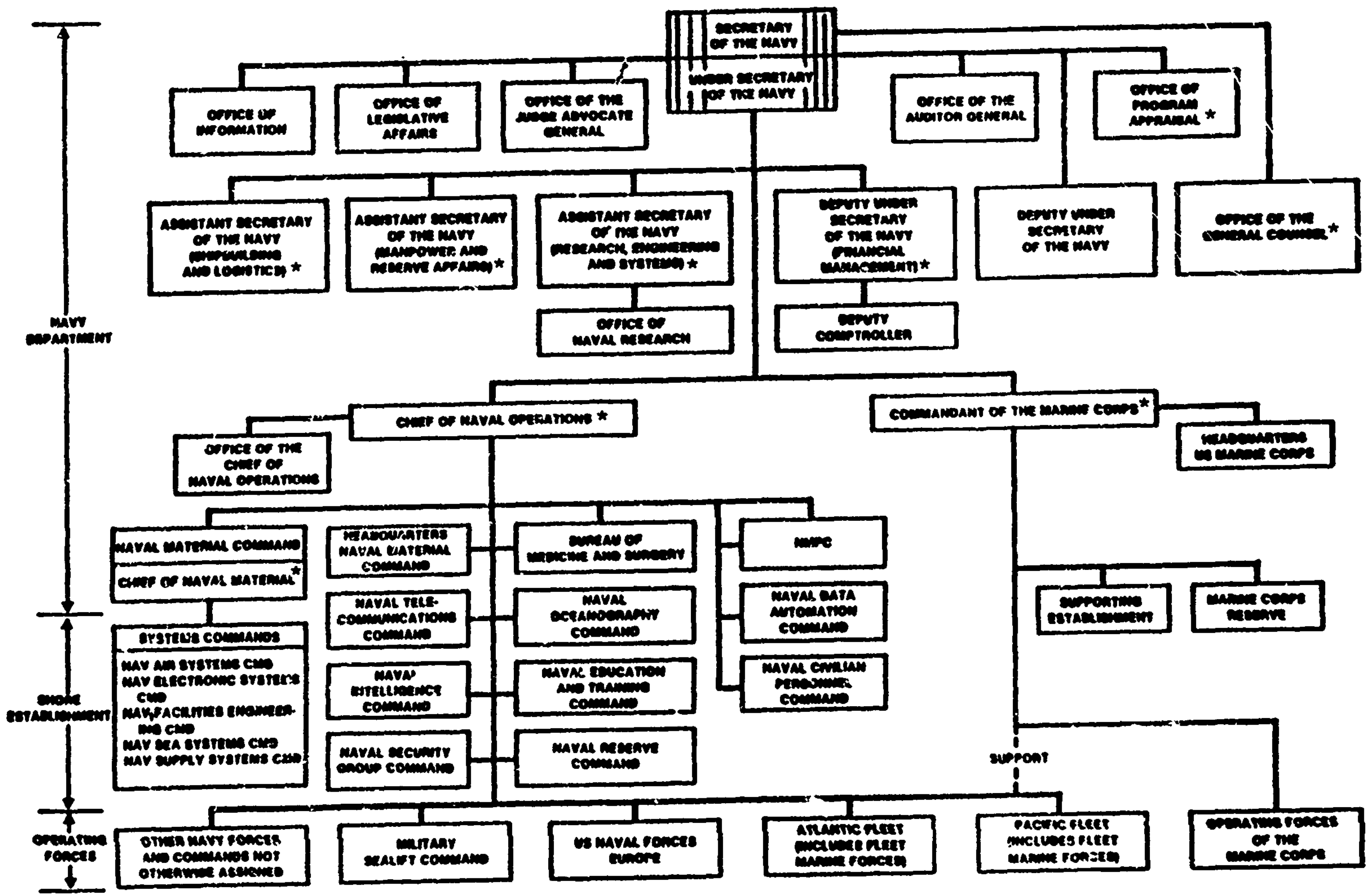


*Chart does not reflect current reorganization.

NAVY ACQUISITION EXECUTIVE (NAE)

Assistant Secretary of the Navy (Research, Engineering and Systems)

- Designated programs through Milestone III except ships

Assistant Secretary of the Navy (Shipbuilding and Logistics)

- Designated programs after Milestone III
- Ships in all phases

Assistant Secretary of the Navy (Manpower and Reserve Affairs)

- All aspects of manpower and training affecting system acquisition

136.1251.8990

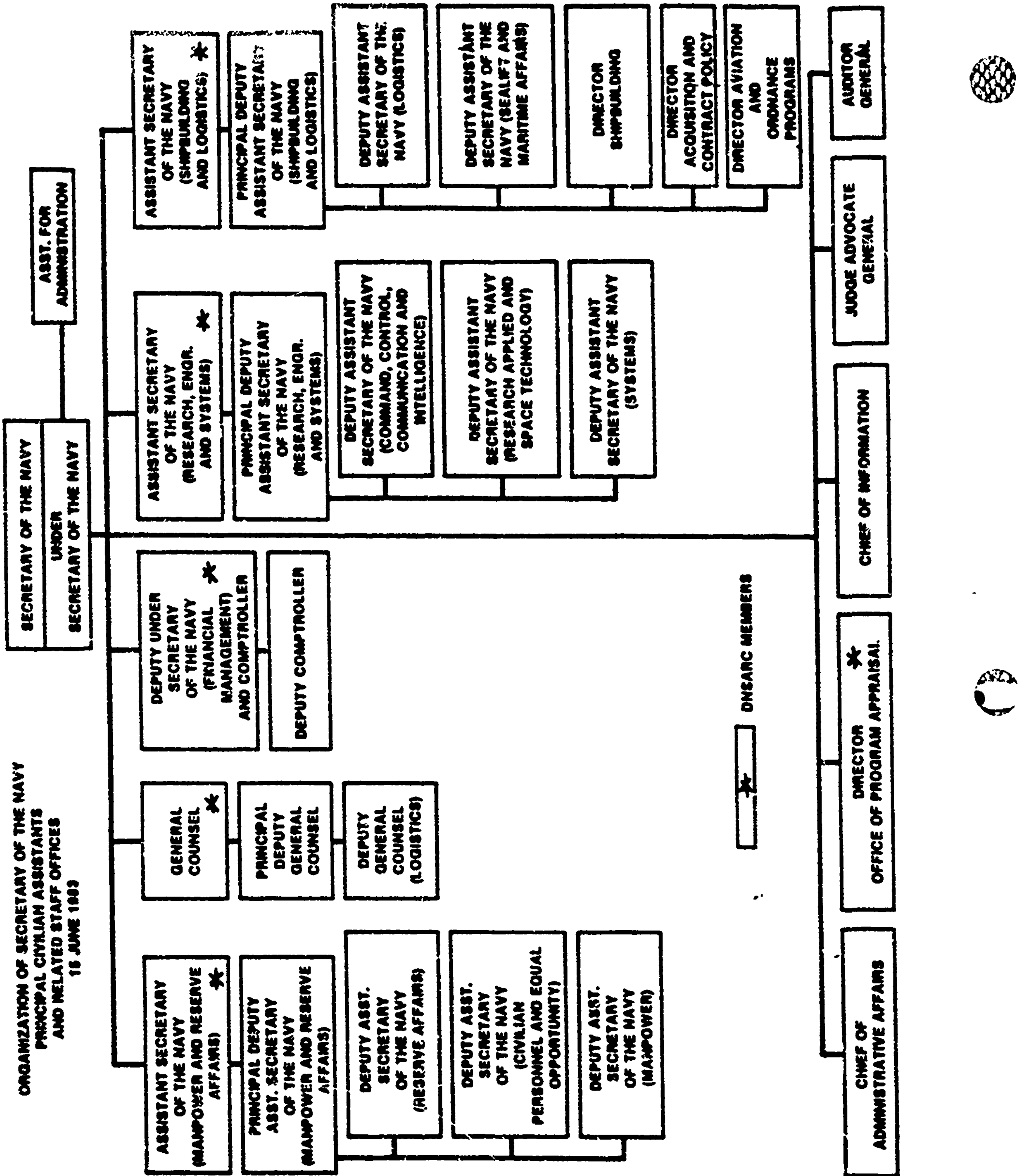
DNSARC/DON RESOURCES BOARD*

Membership:

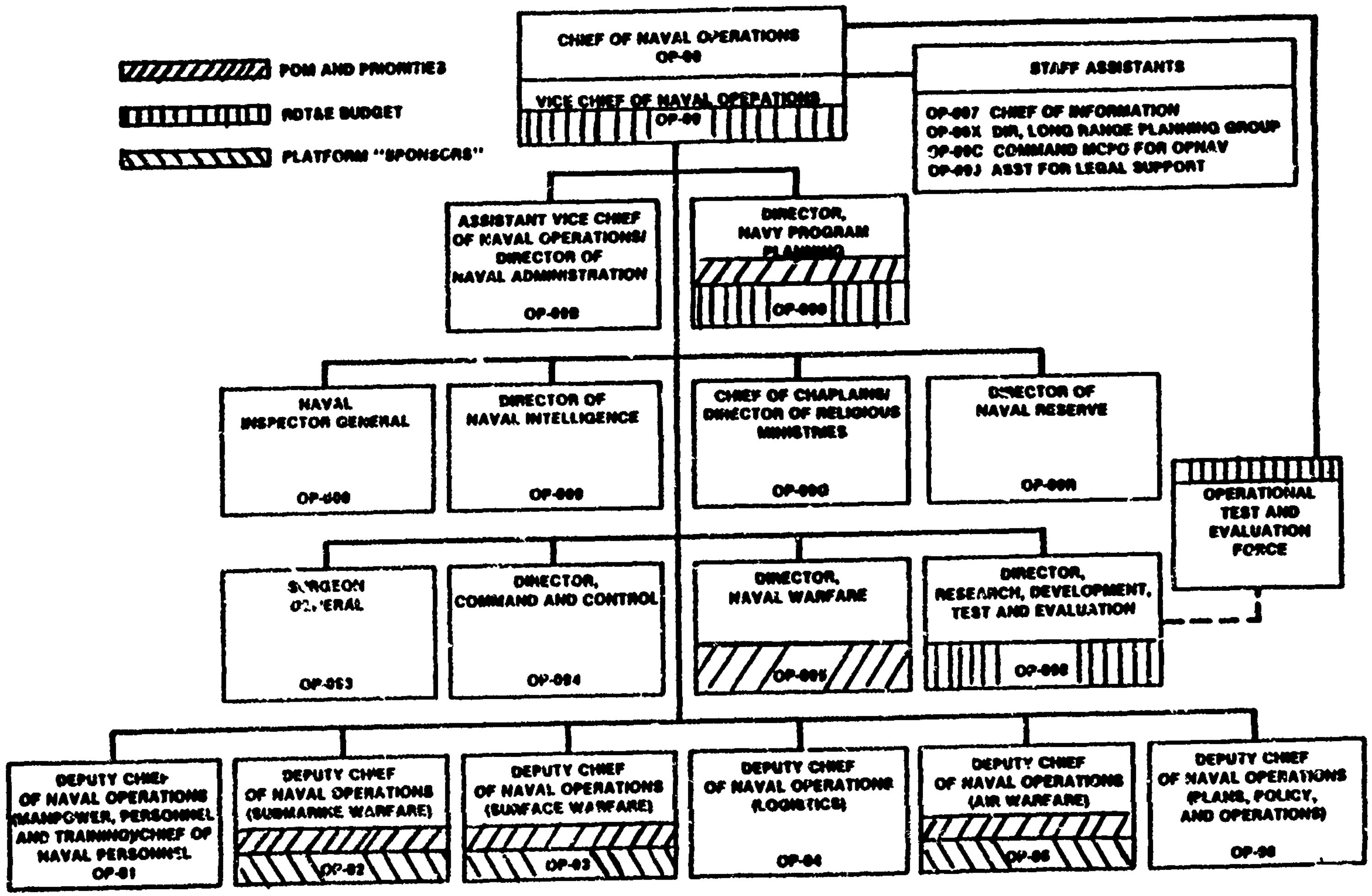
- ASN (R,E&S)
- ASN (M&RA)
- ASN (SB&L)
- DEPUNDERSECNAV (FM)
- Director, OPA (Executive Secretary)
- Director, Office of the General Counsel
- CNO
- CMC
- CNM

* As DON Resources Board, chaired by UNDERSECNAV, insure proper correlation between the acquisition process and PPBS cycle, advising SECNAV on annual POM and budget submission to OSD.

136.1251.5890


ORGANIZATION OF SECRETARY OF THE NAVY
PRINCIPAL CIVILIAN ASSISTANTS
AND RELATED STAFF OFFICES
15 JUNE 1983
SECRETARY OF THE NAVY
UNDER SECRETARY OF THE NAVY
ASST. FOR ADMINISTRATION
ASSISTANT SECRETARY OF THE NAVY (MANPOWER AND RESERVE AFFAIRS) *
PRINCIPAL DEPUTY ASST. SECRETARY OF THE NAVY (MANPOWER AND RESERVE AFFAIRS)
DEPUTY ASST. SECRETARY OF THE NAVY (RESERVE AFFAIRS)
DEPUTY ASST. SECRETARY OF THE NAVY (CIVILIAN PERSONNEL AND EQUAL OPPORTUNITY)
DEPUTY ASST. SECRETARY OF THE NAVY (MANPOWER)
GENERAL COUNSEL *
PRINCIPAL DEPUTY GENERAL COUNSEL
DEPUTY GENERAL COUNSEL (LOGISTICS)
DEPUTY UNDER SECRETARY OF THE NAVY (FINANCIAL MANAGEMENT) AND COMPTROLLER *
DEPUTY COMPTROLLER
ASSISTANT SECRETARY OF THE NAVY (RESEARCH, ENGR. AND SYSTEMS) *
PRINCIPAL DEPUTY ASSISTANT SECRETARY OF THE NAVY (RESEARCH, ENGR. AND SYSTEMS)
DEPUTY ASSISTANT SECRETARY OF THE NAVY (COMMAND, CONTROL, COMMUNICATION AND INTELLIGENCE)
DEPUTY ASSISTANT SECRETARY OF THE NAVY (RESEARCH APPLIED AND SPACE TECHNOLOGY)
DEPUTY ASSISTANT SECRETARY OF THE NAVY (SYSTEMS)
ASSISTANT SECRETARY OF THE NAVY (SHIPBUILDING AND LOGISTICS) *
PRINCIPAL DEPUTY ASSISTANT SECRETARY OF THE NAVY (SHIPBUILDING AND LOGISTICS)
DEPUTY ASSISTANT SECRETARY OF THE NAVY (LOGISTICS)
DEPUTY ASSISTANT SECRETARY OF THE NAVY (SEALIFT AND MARITIME AFFAIRS)
DIRECTOR SHIPBUILDING
DIRECTOR ACQUISITION AND CONTRACT POLICY
DIRECTOR AVIATION AND ORDNANCE PROGRAMS
* DNSARC MEMBERS
CHIEF OF ADMINISTRATIVE AFFAIRS
DIRECTOR OFFICE OF PROGRAM APPRAISAL *
CHIEF OF INFORMATION
JUDGE ADVOCATE GENERAL
AUDITOR GENERAL

OFFICE OF THE CHIEF OF NAVAL OPERATIONS

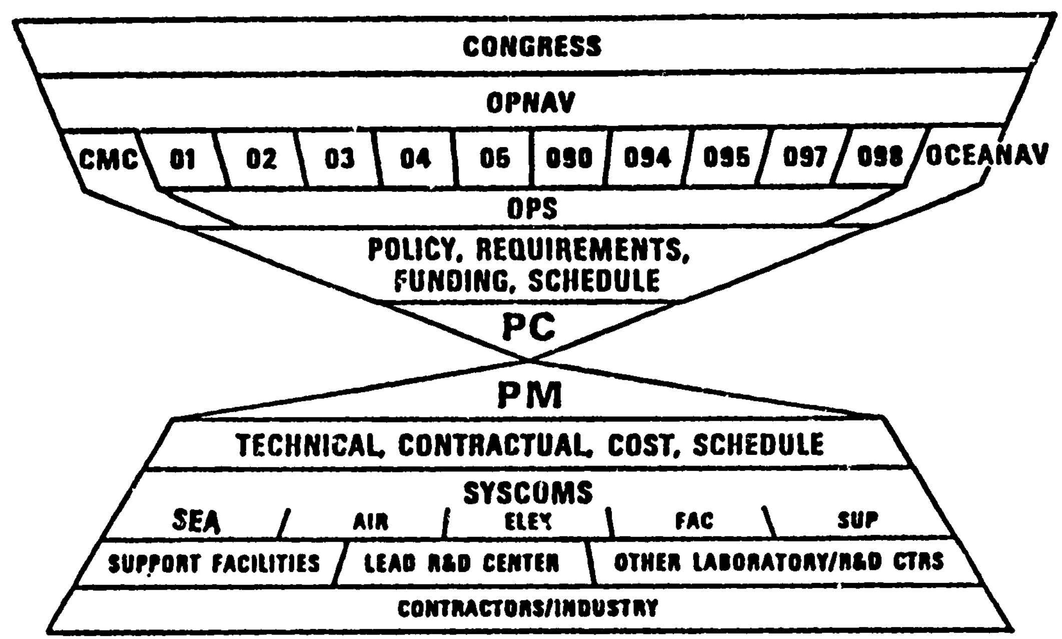


PROGRAM COORDINATOR

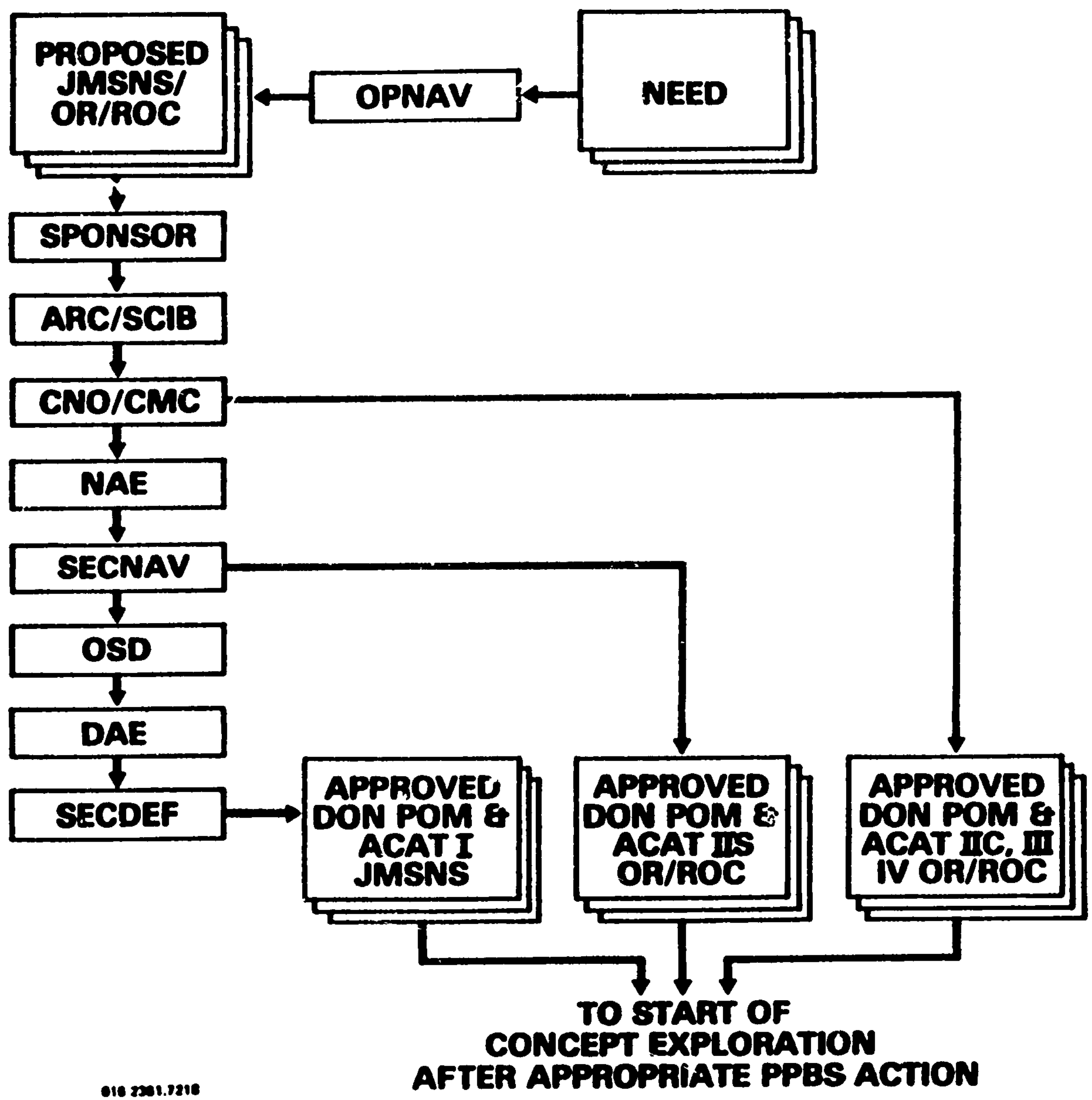
- PM's FOCAL POINT AT OPNAV
- ASSESSES PROGRESS OF PROJECT AGAINST REQUIREMENTS
- IDENTIFIES NEED FOR MODIFICATION OF REQUIREMENTS
- OBTAINS CNO APPROVAL OF REQUIRED CHANGES

* KNOW YOUR PC
* KEEP HIM/HER INFORMED

THE PROGRAM COORDINATOR/PROJECT MANAGER INTERFACE



NAVY MISSION NEED REVIEW AND APPROVAL



NAVY PROGRAM INITIATION PROCEDURES (OPNAVINST 5000.42)

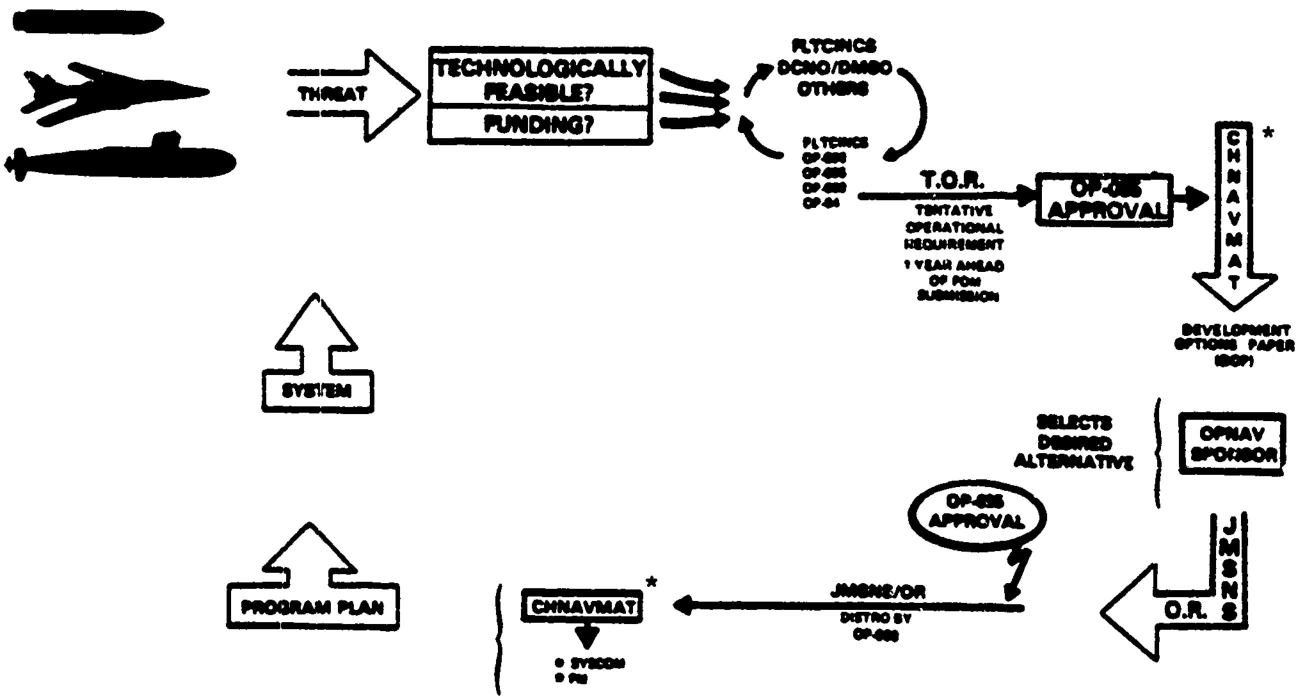


*Chart does not reflect current reorganization.

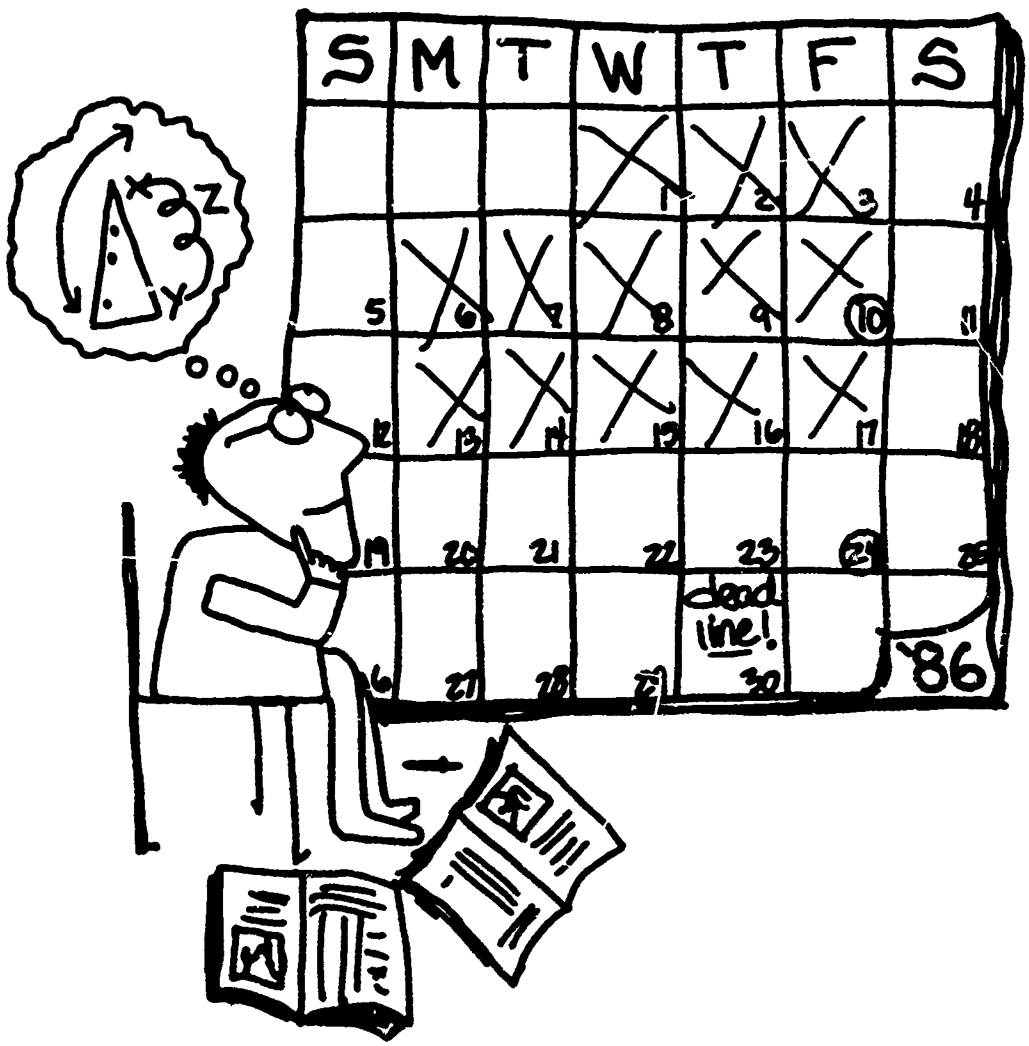
NAVY MILESTONE III DECISIONS

- Approved for Full Production (AFP)
  - System meets all technical and operational thresholds
  - ILS requirements fully demonstrated during OT&E
  - No additional development or corrective action required
- Approved for Limited Production (ALP)
  - Aim at AFP for following year AFP/ALP decision
  - No more than 1 year's production
  - COMOPTEVFOR considers system operationally effective and suitable, with clear plan and funding for corrections
- Not approved for production

136.1251.5990

PLANNING, SCHEDULING, AND ASSESSMENT

7



CONTENTS

SECTION 7
PLANNING, SCHEDULING, AND ASSESSMENT

7.1 INTRODUCTION

7.1.1 References

There are many formal planning documents that make up the Navy RDT&E planning process:

- Defense Guidance (DG) documents
- Technology and Description (TAD) document
- Joint Long Range Strategic Appraisal (JLRSA) document
- Joint Strategic Planning Document (JSPD)
- Joint Program Assessment Memorandum (JPAM)
- DON Policy and Planning Guidance (DNPPG)
- CNO Policy and Planning Guidance (CPPG)
- CNO Program Analysis Memorandum (CPAM)
- Program Objective Memorandum (POM)
- Department of the Navy Five-Year Program (DNFYP)
- R&D Plan
- Science and Technology Objective (STO)
- Operational Requirement (OR)
- Marine Corps related documents
- Department of the Navy RDT&E Management Guide
  - NAVSO P 2457
- Navy System Management instructions used by NOSC
  - Major Systems Acquisition (DODIR 5000.1)
  - RDT&E Acquisition Procedures (OPNAVINST 5000.42B)
  - Project Master Plan (NAVMATINST 5200.11B)
  - Integrated Logistics Support (NAVMATINST 4000.20B)
  - Configuration Management (NAVMATINST 4130.1A and OPNAVINSTs 4130.1 and 4130.2)
  - Test and Evaluation (OPNAVINST 3960.10B)
  - Design Requirements Baseline (NAVMATINST 4130.1A)

7.2 GENERAL

Project management is performed at NOSC by an individual with the title of "Project Manager." The project manager has specific responsibility for achieving project objectives and accomplishing project assignments. Any manager who is the cognizant individual responsible for performance on a project is termed "project manager." The extent that a project manager becomes involved in managing a project depends on the size of the project. Some of the smaller projects in the Center may not require the many formal approaches for project management that a larger project may require. The project manager should tailor requirements to the needs of the specific project. Whenever possible, project managers should use the guidelines as delineated in this section.

The project manager and the support personnel assigned to the project provide for the development of project technical and administrative plans, procedures, and practices as necessary to facilitate a high degree of technical and management performance. These plans and procedures should mesh harmoniously with other Center practices and procedures. Procedures should be established and maintained for obtaining operational and functional support from a variety of resources such as other departments, other government activities, and independent contractors. Project managers have the responsibility for planning and administering assigned resources within approved project and operational budgets. They approve estimates of funding requirements prior to incorporation into project budgets. Proper planning will set the stage for allocation of resources to the project and ensure that plans, programs, budgets, and schedules are properly integrated and time phased. In addition, initial project planning should consider the establishment of a complete project chronological history that ensures the availability of accurate information concerning all significant events and decisions relating to the project, and from which the project can be reconstructed step by step. The project manager should be aware of the current status and progress of the assigned project and be able to convey that information to appropriate Center and higher command officials as may be required. Technical content of reports and quality of technical data should be reviewed to assure that high professional standards are maintained. Security precautions in accordance with DoD policy should be strictly followed and enforced.

Project managers assume responsibility for the management, planning, direction, and control of project resources necessary for project completion. Project managers have specific authority and responsibility for directing a system's overall progress through the conceptual, validation, full scale development, production, deployment, and Fleet support phases of Navy weapons system acquisition and/or the completion of the project.

The following documents should be prepared, as necessary, for each significant project:

a. Project functions

b. Project organization chart

c. Organizational relationship chart

d. Functional areas of responsibility

e. Financial plan

f. Milestone charts

g. Network plans and/or schedules

h. Work breakdown structure

i. Acquisition plan, when applicable

j. Value engineering plan

k. Integrated logistics support plan

l. Configuration management plan

m. Test and evaluation plan

n. Security plan

o. Training plan

p. Safety plan

q. Quality assurance plan

r. Data management plan

s. Human engineering plan

t. Project master plan

u. Project management plan

A primary function of project management is the implementation of a useful planning and control system. Control systems are required to ensure that allocation of resources and/or acquisition of services and equipment stay within the limits of planned resources. The management planning and control concepts discussed here have been in existence for many years in both government and industrial organizations. These techniques provide for timely and accurate management decisionmaking.

7.3 PLANNING AS A TOOL

Project plans are necessary to facilitate an organized, mutually supportive set of documents which translate program authorization, control, and visibility into easily understood road maps. The documentation should be designed so as to enhance the ability of management to react in a timely and favorable manner with regard to the direction of the project.

The techniques used in planning should consider elements such as scope and complexity of the project, available project information and data, and project commitments. Also, the cost of providing control and reporting documentation must be considered. Any such control and reporting documentation should be clearly specified in advance so that budget requirements are included in the overall project funding requirements.

Choosing proper management techniques early in project development enhances the capability of management to attain project objectives and goals. One technique that is commonly used is termed "management by exception." Management by exception is defined as comparing project plans and status with desired results for the purpose of correcting those conditions that do not support overall objectives and goals. By employing management by exception principles, management is able to spend a greater amount of time in areas that offer the probability of attaining maximum gain to the project. Another technique commonly used is termed "management by objectives." Management by objectives is defined as directing resources towards the accomplishment of planned goals. The functions of management by objectives are planning, organizing, staffing, directing, and controlling. The attainment of planned goals is contingent upon clear, concise, and well understood policies designed to enhance goals which are important and different. Rewards will flow from accomplishing the extraordinary goal.

7.4 PROJECT MANAGEMENT PLAN

The project management plan should contain sections such as introduction, approach, project management organizational structure and management controls, milestones and schedules, financial plan, and work breakdown structure. An example of a project management plan is offered in Appendix 7A.

7.5 INTEGRATED PLANNING

Integrated planning sessions are one of the most important tools available to project management. All project management personnel should be trained in management techniques that enhance integrated planning. Periodic planning sessions that provide an open forum of information flow through all disciplines related to the project are necessary during project initiation, development, test and evaluation, and acceptance. Planning sessions that generate networks of activities and events, establish technical sequence and flow constraints, and identify critical paths should be generated to provide the basis for allocating resources and planning realistic timeframes for meeting project objectives. Participants in integrated planning sessions should be alert to external constraints that may impact on the timely completion of the project. Networking, through planning sessions, establishes the critical path of the project and permits planning of resources to improve or alleviate any identified slippage in the project schedule.

Task responsibility matrices are necessary to assure that all segments of the project development effort have been effectively assigned. The matrix should identify with both technical personnel assignments and the technical effort involved in the assignment. Supportive documents such as the project organizational structure and the work breakdown structure should be used in developing an effective responsibility matrix.

7.6 MILESTONES

Establishing milestones for each major segment of a system under development is termed milestone scheduling. Milestones are similar to network events in that both reflect points in time. The term "milestones" is used to identify significant events that must be accomplished in order to complete the project successfully. Milestone dates may be established for both start and completion events of activities. Accomplishment of a significant event signifies a completed milestone. Milestones may also be portrayed on Gantt charts, networks, and line charts.

The number of milestones chosen for scheduling and control purposes depends on the size of the project. Ordinarily, at least 2 weeks should separate milestone events. Milestones are to reflect those events that, if not accomplished on schedule, will have significant impact on the project. One of the most important functions of project management is to assure that milestone dates are negotiated and realistically established in consonance with both internal and external project requirements.

The following typical milestone events are provided as examples:

a. Obtain project go-ahead

b. Start functional specifications

c. Functional specifications complete

d. Start system design

e. System design complete

f. Start procurements

g. Start system software development

h. Start fabrication

i. Contractor delivers hardware

j. Fabrication complete

k. Procurements received

l. Start assembly of system

m. System software complete

n. System installation complete

o. Start test and evaluation

p. Test and evaluation complete

q. Start operations evaluation

r. Operations evaluation complete

s. Deliver to Fleet

t. Project complete

Appendix 7B provides the format for detailed milestone reporting, the format for summary milestone reporting, and the instruction for preparation and completion of milestone reports. Milestone reports should be monitored and maintained on a continual basis.

7.7 TECHNICAL SEQUENCE AND FLOW—NETWORKS

The network is a planning, scheduling, and project appraisal document which may be used as an effective management control tool. Project uncertainties such as potential slippages, schedule impacts, problems requiring management decisions, and decision trade-offs may be identified by the use of the network. A typical network is illustrated in Figure 7.1. In constructing networks as a planning tool, the following two principals should apply:

a. The network must satisfy the needs of the project and be flexible enough to incorporate any project changes which may occur.

b. The network must be comprehensive to the user, provide timely information and be worth the cost of development and maintenance.

The network should contain the following elements:

a. Activity—an incremental element of the network that defines a specific effort to be accomplished over a period of time. The activity is usually portrayed as a line identified by the activity title.

b. Event—a point in time on a network usually portrayed as a circle at the beginning and end of an activity. The event may be identified by a unique number.

c. Time—elements of time assigned to each activity usually portrayed in decimal increments, i.e., 1.0 equals 1 week, 2.0 equals 2 weeks, etc.

d. Critical path—the longest path or controlling chain of activities within a network in which any slippage will delay the network end event.

Network logic display represents the planned flow of activities and constraints as known or perceived by the personnel responsible for performance. Identification of activities and constraints are best defined during integrated planning sessions. Project managers should participate in the integrated planning sessions to establish network logic. Time spans are assigned to each activity when it is established that the network logic is a responsible portrayal of the activities to be accomplished.

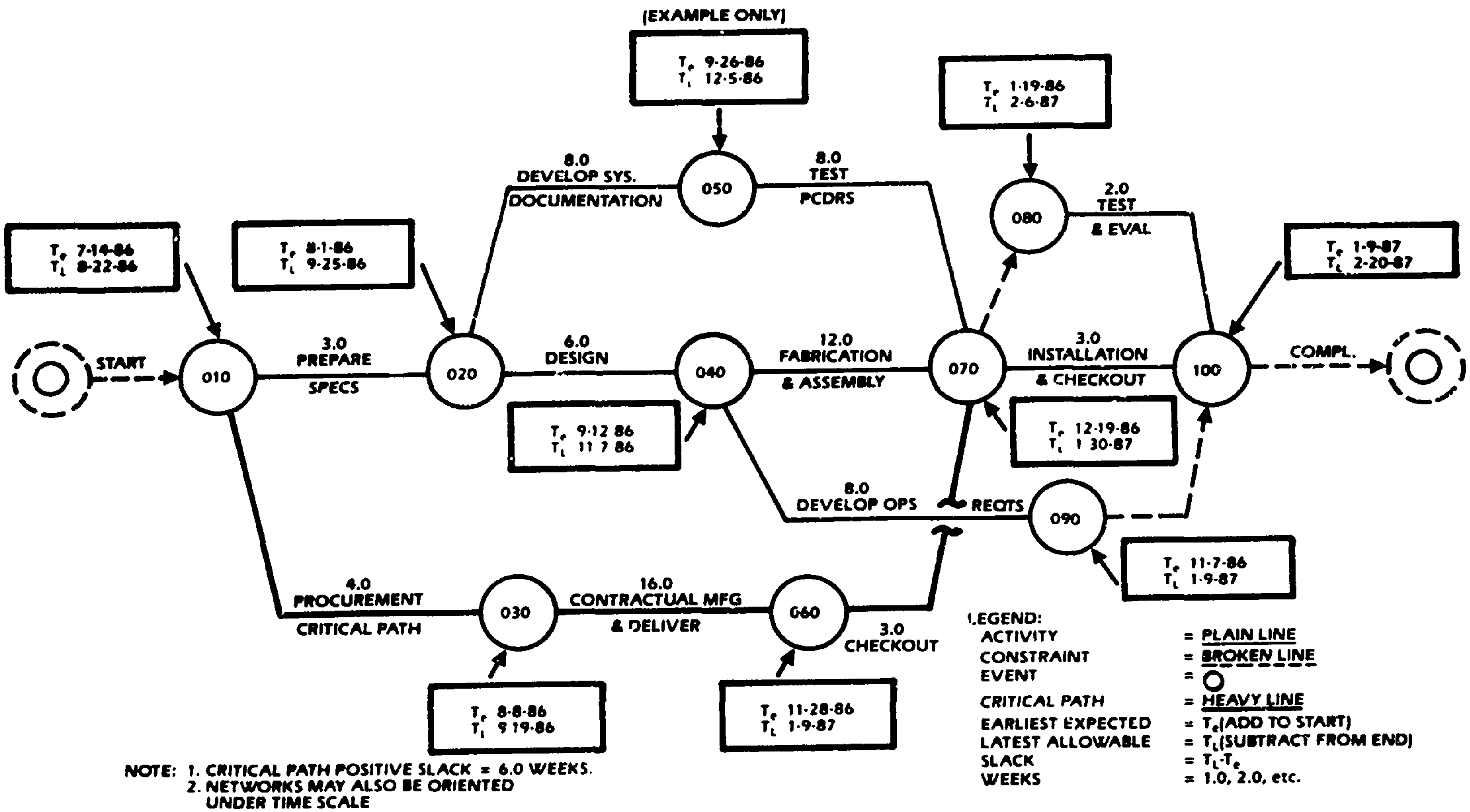


Figure 7.1. Technical sequence and flow network activity oriented.

Latest allowable dates (T_L) are determined by subtracting activity time spans from the ending event date. The longest path determined is the critical path.

Earliest expected completion dates (T_e) are determined by adding time spans of uncompleted activities from time now through the ending activity.

Slack is determined by subtracting the earliest expected completion date from the latest allowable date (T_L-T_e). The resultant positive or negative slack determines the critical path.

The earliest expected date (T_e) may be used to designate interim milestones.

7.8 WORK BREAKDOWN STRUCTURE

The work breakdown structure (WBS) is defined as "a product- or task-oriented document which depicts the end item of a project, its subdivisions, interrelationships, and levels of detail." A controllable unit of work or element in a WBS is termed a work package. The primary function of the WBS is to provide a systematic, end item-oriented breakdown of hardware, software, services, and other work packages that are required to make up the total system. Indentures in the WBS are defined as work package levels, i.e., the first level is the system end item, the second level consists of work package segments of the end item, each of which may be further segmented. Each work package is identified by an element number. WBS's should be built to the level of detail that most significantly depicts the work to be performed. The lowest level of detail, however, should be a controllable level in areas of performance, schedule, and cost. Graphic and indenture examples of WBSs are provided in Figures 7.2 and 7.3, respectively. Preparation of the WBS is governed by MIL-STD-881A. The WBS is a valuable tool in the development of projects, systems, equipment, or other material and service items. Its use is indicated for any project which can be broken down into a significant number of controllable work packages. The WBS is easily prepared manually for smaller, short-lived projects. For larger, longer projects, automation is available and recommended.

7.8.1 Automated Work Breakdown Structure System

To facilitate WBS reporting requirements, an automated WBS generation system is available. In addition to the planning function of the WBS, machine-generated reports are available to provide the project manager with timely information (on an as-required basis) of the cost estimates versus to-date charges and obligations at all levels of the structure.

The following reports in WBS format are available:

a. Report WBS1 includes all levels of the structure. There are three data format options for this report (Appendix 7C):

Option 1	Option 2	Option 3
Estimates	Estimates	Estimates
* (YTD) Charges	* (YTD) Costs	** (ITD) Costs
*** (MTD) Charges	*** (MTD) Costs	*** (MTD) Costs
Balance	Encumbrance	Encumbrance
	Balance	Balance

* Year to Date
** Inception to Date
*** Month to Date

Each of the above reports conclude with a recap by project number as shown in Appendix 7D.

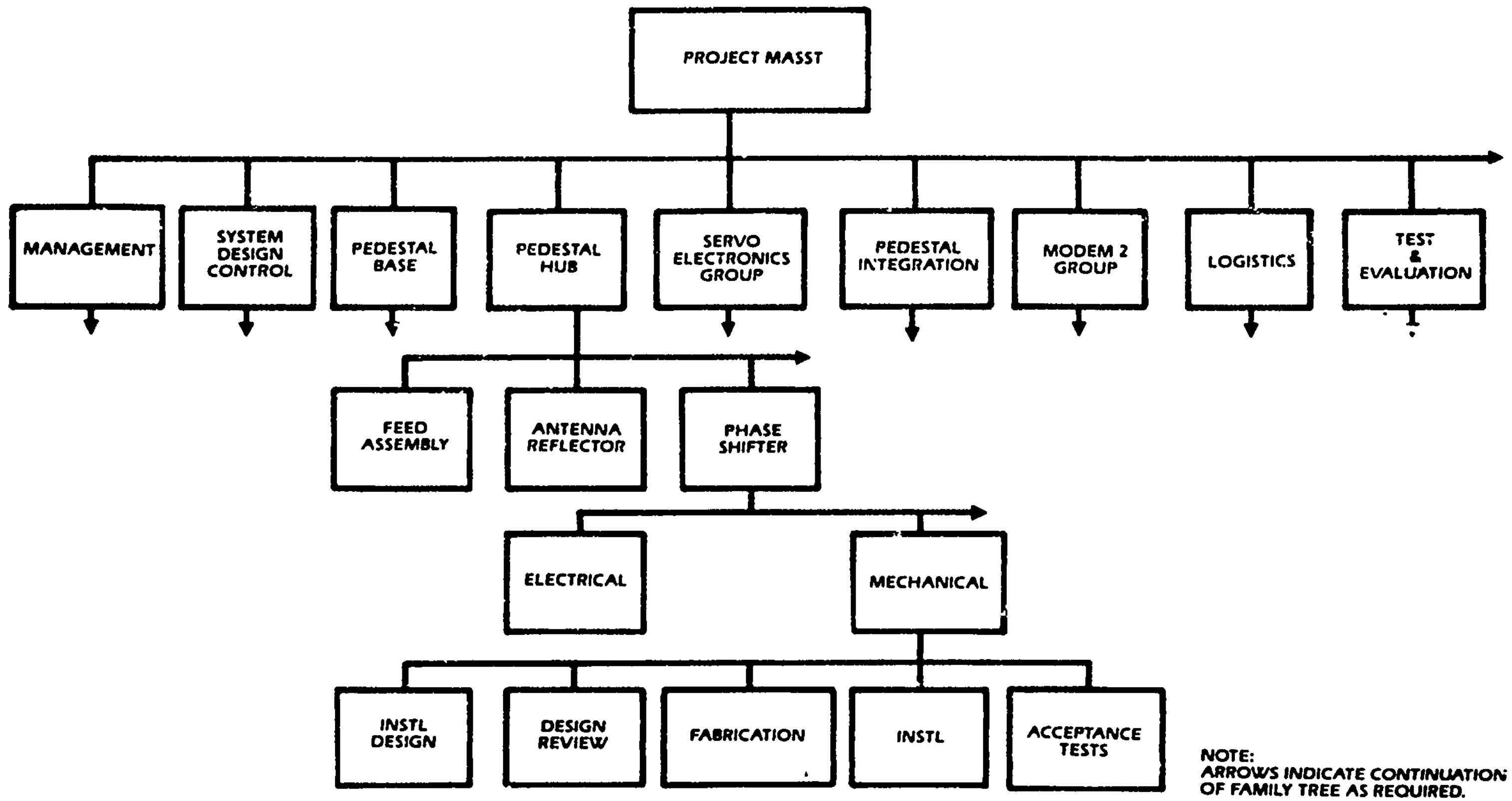


Figure 7.2. Work breakdown structure (graphic example).

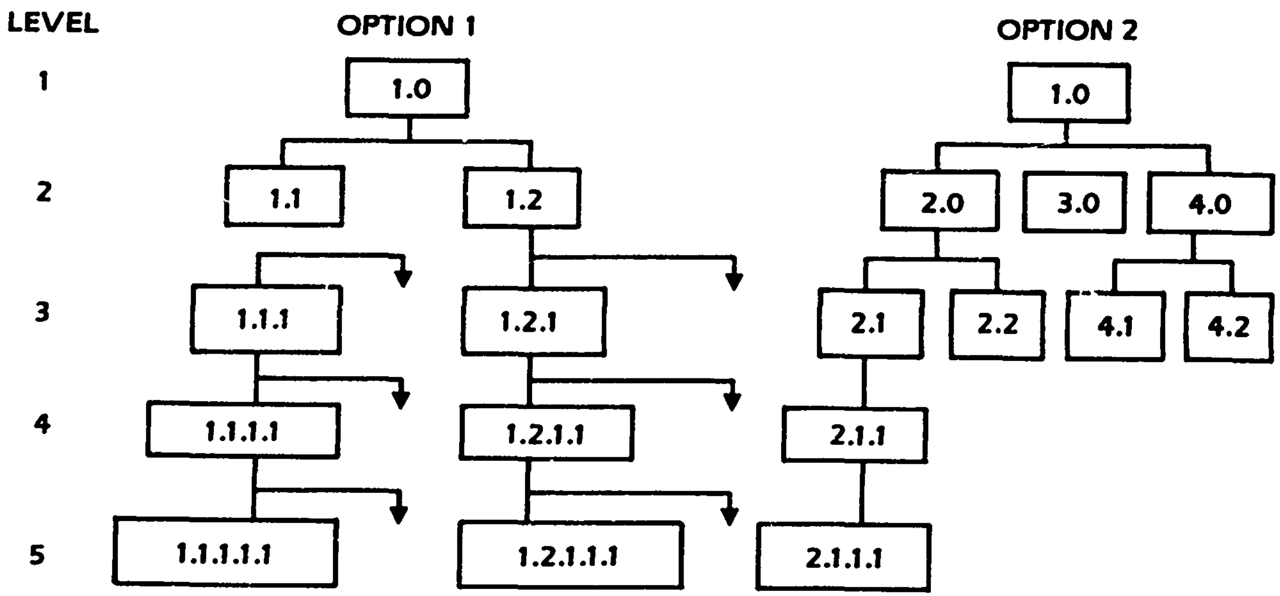


Figure 7.3. Work breakdown structure element numbering system.

b. Report WBS2 is the same as above except this structure only shows the first three summary levels (levels 1, 2, and 3). See Appendix 7E.

c. Report WBS3 is a heavily indented report showing each element number within the WBS, along with the total estimate of each work package and the WBS work package level. See Appendix 7F.

To initiate a WBS within the automated work breakdown structure system, the project manager should direct the preparation of the WBS, ensuring that the WBS worksheet shown in Appendix 7G is prepared in accordance with the instructions included with it. Completed forms, along with instructions as to which report options and what reporting frequency is desired, may be submitted to data processing for action.

A WBS element number should be established for each work package of the WBS. Figure 7.3 provides two options that may be used in structuring a WBS element numbering system.

7.8.2 WBS Element Description Record

In conjunction with the WBS, a WBS Element Description Record as formatted in Appendix 7H should be filled out for each element to a practical level in the WBS. Instructions for preparing the WBS Element Description Record are also included. These records should be maintained as an integral part of project plans.

7.9 PROJECT PLANNING RANGE

Adherence to directives is a critical part of project management. To this end, a project management questionnaire has been developed to aid the project manager in determining a broad range of directive subjects that require consideration during the project development phase. The questionnaire covers such subjects as project authorizations, funds, project management, project documentation, procurements, systems engineering, data management, integrated logistics support, product assurance, test and evaluation, security, and safety. The project management questionnaire, as delineated in Appendix 7I, is provided as a guide to the management decision process.

7.10 SCHEDULES

7.10.1 Bar Charts

Bar charts are used as a visual indicator depicting size variations when compared to a given scale. They provide a relatively simple visual aid to the project manager and function as a management tool for communicating status and/or decisionmaking.

7.10.2 Gantt Charts

Gantt charts portray performance or output related to time and are commonly used as master schedules, progress charts, and milestone charts. Gantt charts were first developed by Henry L. Gantt early in the twentieth century. Since then, many variations have been used successfully. The primary purpose of Gantt charts is to convey schedule conditions and status to the manager. They are also used to track actual completion data.

A series of activities is portrayed on a Gantt chart by the use of horizontal bars under a dateline. The area under a dateline is commonly referred to as the plotting plan. Bars or lines may be color coded to signify status and/or progress. Color coding provides a ready means for the manager to determine the status of ongoing tasks.

Constraints are portrayed on the plotting plan by the use of vertical dash lines. Arrows are used to signify direction of constraints. Dash lines used in a horizontal direction signify unscheduled time. Specific points in time or events are indicated by the use of small symbols such as triangles, squares, etc. Legends are placed just below and to the right of the plotting plan.

Figure 7.4 is provided as an example of a master schedule illustrating the Gantt chart concept. Schedule sequence, status, and progress should be portrayed in such a manner that it is readily understood by the reader.

7.10.3 Line Charts

Line charts plot the movement of one or more quantities over a period of time. Time units are shown horizontally and quantities are shown vertically. Schedule versus actual information may be measured by plotting actual data at specific points in time during the life of the schedule.

7.11 PROJECT PROGRESS REPORTS

7.11.1 General

Progress reports have been prepared and submitted to sponsors in many different formats over the past years. Appendix 7J provides a project progress report format. Status that is pertinent to overall project management and of specific interest to the sponsor is reflected in the progress report. Conveyance of internal details and/or milestones that are not significant are to be avoided.

7.11.2 Objectives

The standard progress report format is designed to provide a tool for project reviews and assessment. To this end the project progress report

a. Provides for continuity of status reporting

b. Provides a better understanding of project status, progressions, problems, and planned corrective actions

c. Facilitates rapid and understandable review by higher management

d. Provides a common outline for historical cataloging

e. Allows for comparative analysis data within and between projects.

7.11.3 Procedure

Reporting of financial data through the project progress report is contingent upon specific requirements of both the project manager and the sponsor. Appendix 7J also provides the instruction for preparation and completion of the progress report.

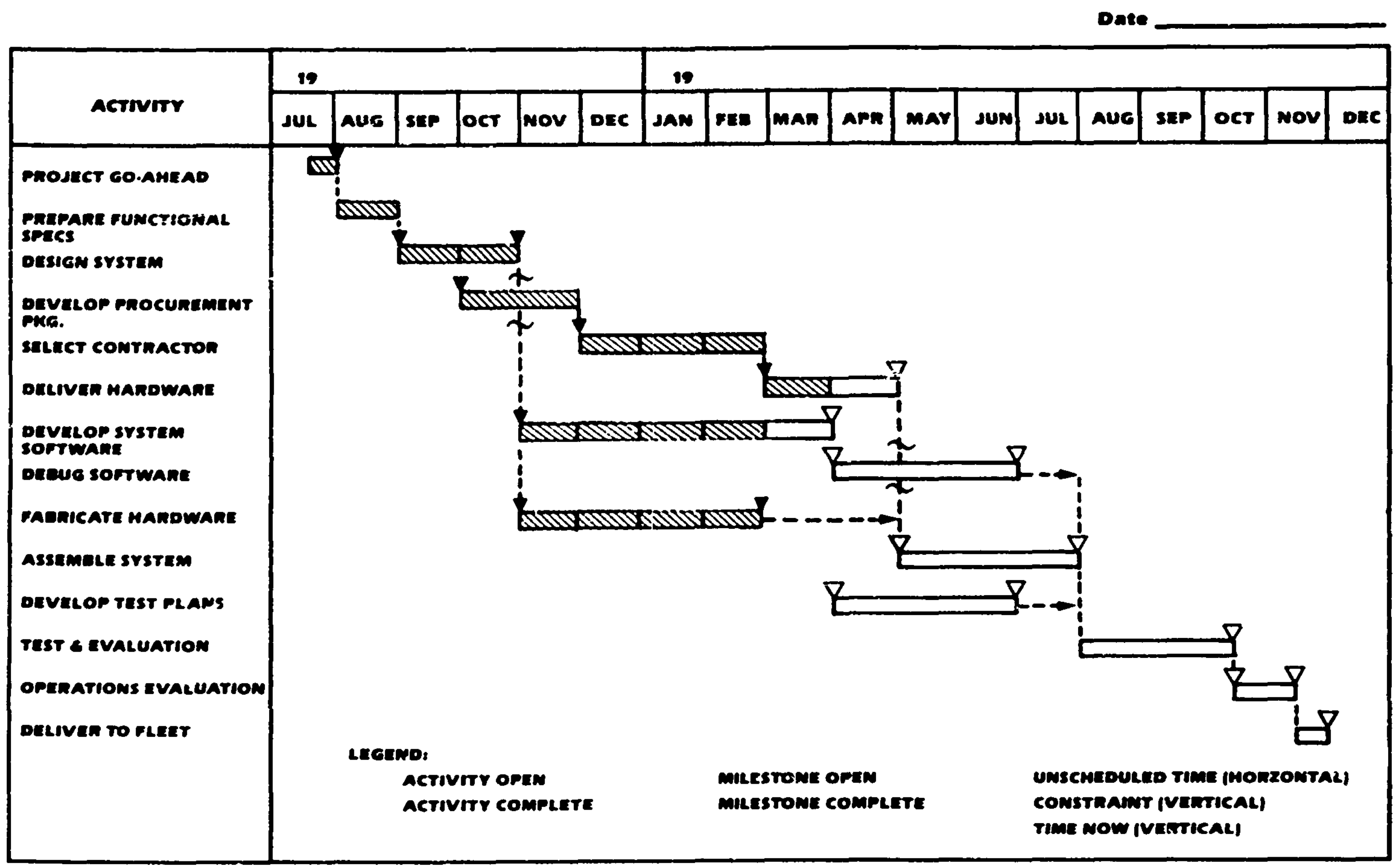


Figure 7.4. Master schedule (Gantt chart example).

7.12 PROCUREMENT PLANNING

7.12.1 Contract/Purchase Order Planning

Procurement planning is defined as a series of decisions directed to the integration of procurement with technical and financial plans during the acquisition cycle. The planning process must be performed well in advance of procurement initiation in order to foresee potential procurement problems. The planning process applies to all major and minor procurements. Several directives are available with regards to procurement planning. They are SECNAVINST 4200.31, NAVMATINST 4200.30D, NAVMATINST 4200.49, NAVMATINST 4200.50C, NAVMATINST 4200.52, NAVMATINST 4200.54, NAVMATINST 4200.55, OPNAVINST 5000.42B, SPAWARINST 4200.6D, NAVMATINST 5000.29A, and FAR Section 1, Part 21, Appendix J.

The responsibility for procurement planning lies with the project manager. The degree of planning required for procurements depends to a great extent on the dollar amount of the procurement. The Contract Division is responsible for providing expertise in the area of procurements to all of the technical, scientific, and management personnel at NOSC. The project manager has the responsibility for reviewing and taking responsibility for procurement requirements being processed in support of the project.

The planning of procurements is interrelated with early requirement definition accomplished during the exploratory and advanced development stages of system development. Determination of hardware and software requirements of a system is an integral part of the system engineering process. Plans for procurement actions should be formed during development of functional and system specifications.

The goal of advanced procurement planning is to obtain a successful system, in a timely manner, at the lowest total cost to the Navy. Realistic milestones with adequate lead times should be depicted on a graphic timetable display. This scheduling action should be accomplished well in advance of procurement package preparation. Procurement milestones should be interrelated as part of all other activities of the system development in order to determine the most critical areas with regards to lead time. Graphic displays, such as the Gantt chart in Figure 7.4, may be used in the procurement planning process.

7.12.2 Acquisition Plans (APs)

Acquisition plans are formal documents prepared for the purpose of defining major procurement programs during the life cycle of systems development. The schedule impact of long lead time major procurements is of primary concern to project managers. To this end, project managers should ensure that approaches and requirements for acquisition plans are considered. Acquisition planning may be defined as a series of decisions directed to the integration of procurement, technical, and financial plans during the project/weapon systems acquisition cycle. Federal Acquisition Regulations (FAR), Part 7, addresses acquisition plans. Project managers should contact the Supply Department for guidance in preparing acquisition plans.

Appendix 7A

Model Project Management Plan

(See subsection 7.4)

Name of Project

Project Management Plan

Prepared by

NOSC

Code 805

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

1.1 PURPOSE

The purpose of this Project Management Plan is to present the development approach for the ______(project)______ and to define the management tools and resources that will be utilized. The plan is logically divided into six sections covering all aspects of NOSC project management:

Section	Title
1	Introduction
2	Approach
3	Project Management
4	Milestones and Schedules
5	Financial Plan
6	Work Breakdown Structure

1.2 TASK ASSIGNMENT

The ______(project)______ was established in response to (RCO, etc.) on ______(date)______. The essential elements of the Project are to conduct design, development, teest and evaluation of ______(project)______.

The Principal Development Activity (PDA) for ______(project)______ is ______(sponsor)______. The Naval Ocean Systems Center (NAVOCEANSYSCEN), San Diego, California, has been designated the Performing Activity (PA) by ______(sponsor)______ task assignment letter ______(date)______.

1.3 PROBLEM DEFINITION AND BACKGROUND

Describe the problem and circumstances that led to the requirement for this project. Also, generally define the historical background.

1.4 OBJECTIVES

Define the objectives of the project and the expected results of the effort. (The objectives may be to develop a feasibility model and then an advanced development model (ADM) which will finally lead to an engineering development model (EDM)).

1.5 GENERAL SYSTEM DESCRIPTION

In general terms, supported by a block diagram, describe the system. (One or two paragraphs).

SECTION 2

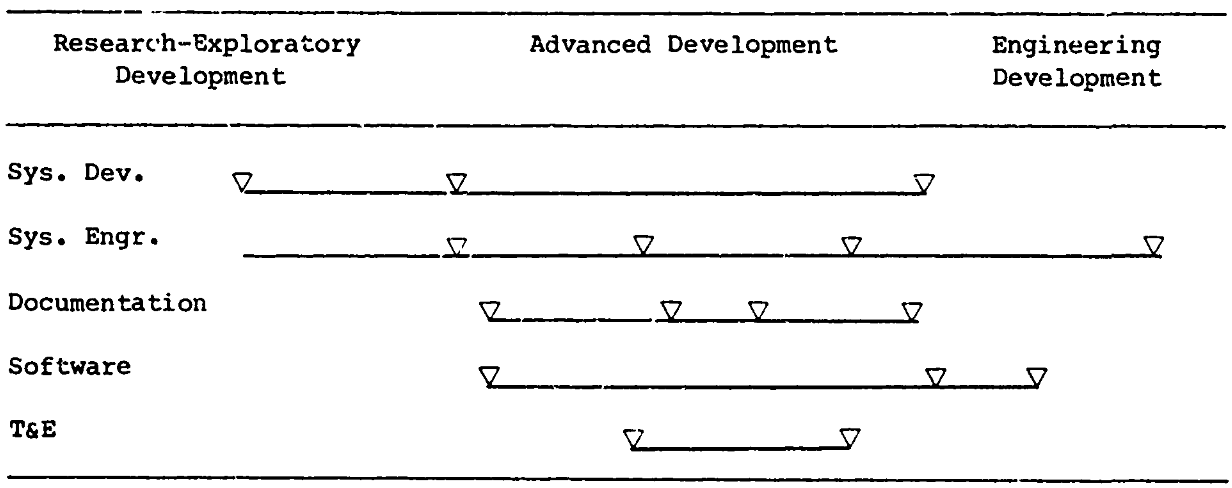
APPROACH

2.1 GENERAL

This section defines the approach to be taken in solving the problem defined in paragraph 1.3. It includes the development approach which covers such areas as planning, design, fabrication, and test and evaluation. This is then followed by the technical approach which goes more into the technical details.

2.2 DEVELOPMENT APPROACH

Explain who will develop each objective (ADM/EDM), what tests will be performed, including use of COMOPTEVFOR and/or other agencies. Also include development of specifications and the procurement packages. A general technical sequence and flow diagram may be used to support the text; e.g.,



This section may be expanded to include a brief description of the proposed technical approach.

2.2.1 Pre-Task Planning

The detailed planning and definition of tasks and responsibilities shall be accomplished as follows:

a. Summary Work Breakdown Structure (WBS) should be prepared and included in Section 6. In conjunction with the preparation of this WBS, WBS Element Description Records should be prepared and maintained as an integral part of this plan. These records shall be used for negotiation with the responsible activities to finalize the detailed tasks and responsibilities to be delegated.

b. Contractual specifications and procurement package data identified by the finalized EM definition shall be prepared prior to entering the design and fabrication phase.

c. Test planning shall be implemented relevant to technical evaluation requirements.

2.2.2 Design and Fabrication

Factors to be considered in the EM design are addressed in the EM definition. Design development shall be guided by continuing in-house design reviews and by formal design reviews as scheduled in Section 4. As occurring design reviews, design requirements shall be modified on the basis of updated evaluations or changes in relative criticality disclosed during these reviews.

Quality assurance shall be obtained by means of inspection and testing of components and subassemblies prior to assembly integration.

2.2.3 Test and Evaluation

Tests and evaluations are to be conducted as reflected in the WBS. Test plans and procedures, with subsequent test results, shall be submitted for integration into the overall support test plan and engineering test report as appropriate.

2.2.4 Preliminary EDM Procurement Preparation

To provide a smooth transition for entering into engineering development, data evolving from each event in the scheduled program shall be collected by the project. These data shall be used in the preparation of descriptions of services and materials for procurement packages to be used in soliciting invitations for bids in competitive procurement.

2.3 TECHNICAL APPROACH

Write a comprehensive narration of the system and the technical approach as to development of the system.

SECTION 3

PROJECT MANAGEMENT

3.1 GENERAL

The Principal Development Activity (PDA) for (project) is (sponsor). NAVOCEANSYSCEN is the Performing Activity for development and management of the (project). Specific responsibility in fulfillment of project objectives are assigned to NAVOCEANSYSCEN by (sponsor) in the form of (refer to sponsor authorization). This section identifies the organizational structure and management controls employed in fulfillment of the objective.

3.2 ORGANIZATION

Figure 3-1 depicts the relationships among organizations involved in the (project). NAVOCEANSYSCEN, Code (managing code) is the (project) and is responsible for project management. NAVOCEANSYSCEN technology codes will accomplish specified work in support of the (project) development under specific work assignments. Other activities and contractors will be tasked as required.

3.3 MANAGEMENT CONTROL SYSTEM

Management controls will be exercised by the (project) over task assignments, manpower expenditures, cost, and scheduling. These controls will be keyed to specific elements of a Work Breakdown Structure (WBS) constituting the bases for task identification and baseline configuration identification. The WBS is described in Section 6.

3.3.1 Task Assignments

Tasks/Work packages as identified on the WBS Element Description Record will be assigned to appropriate Project Managers. Manpower and funding will

EXAMPLE: only show cognizant codes and tasks.

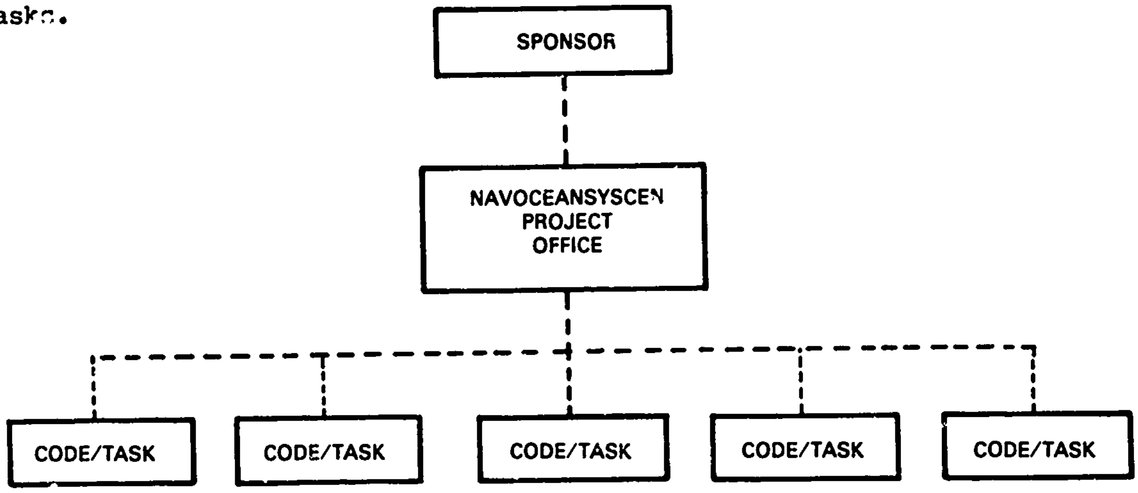


Figure 3-1
Organizational Chart

be allocated to these tasks for subsequent correlation with expenditure rates tabulated by the cognizant NAVOCEANSYSCEN Project.

3.3.2 Cost Control

The planned expenditure rate for (project) is shown in Figure 3-3 for FY (_____). Cumulative costs identified by weekly MIS printouts for each task will be correlated with the projection. Using this method, the effects of major program expenditures and unexpected trends in the expenditure rate will be readily determined, permitting program adjustments or corrective action to be taken. The financial plan by WBS element is given in Section 5.

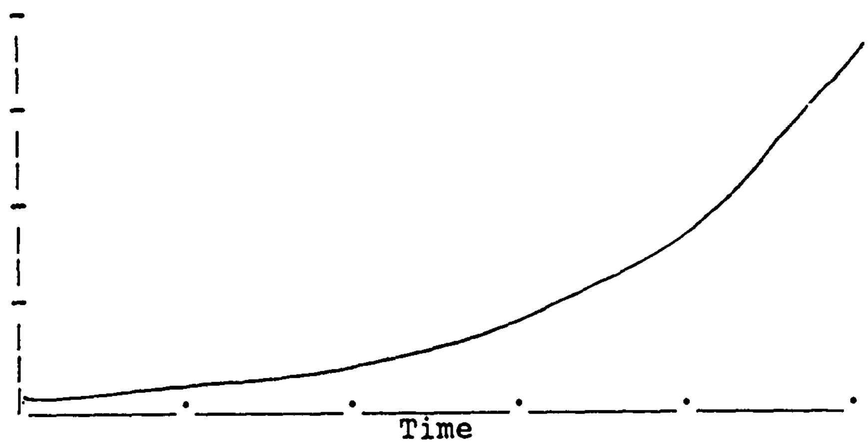


Figure 3-3 Expenditure Profile

3.3.3 Manpower Expenditure

The cumulative total manhours expended against each activity and/or work package will be tabulated. The rate of expenditure will be correlated with the anticipated rate shown on the Manpower Loading Chart in Table 3-1.

3.3.4 Milestone Control

The (project) milestones will be monitored and controlled by periodic reviews of the milestone lists in Section 4. Progress for each activity will be correlated to these lists permitting corrective action to be taken as required.

3.3.5 Design Reviews

Design reviews will be held periodically with all participating project organizations and NAVOCEANSYSCEN technical codes. The reviews are significant as a medium of assuring technical compatibility at component interfaces. Design reviews direct management attention to the status of accomplishment and significant technical or management problems. System Preliminary Design Reviews (PDRs) and Critical Design Reviews (CDRs) will be held as required, with all cognizant participants and the sponsor.

Table 3-1. Manpower Loading

WBS NO.	DESCRIPTION	FY-	FY-

3.4 MANAGEMENT REPORTS

3.4.1 Monthly Reports

Monthly reports of status will be submitted to (sponsor) on appropriate NAVOCEANSYSCEN project progress report formats. The reports will include the status of milestone accomplishment, the status of funds and significant events occurring during the month.

3.4.2 Conference Reports

Narrative reports will be submitted of formal and informal conferences with staff personnel or other commands.

3.4.3 Design Review Reports

Reports of Design Review Meetings will be made and furnished to (sponsor) and all supporting project organizations and/or NAVOCEANSYSCEN codes.

3.5 SYSTEM ENGINEERING

3.5.1 System Definition

The primary tasks of system engineering during Advanced Development involve derivation of an optimum equipment configuration and software control mechanisms that will achieve the capability of the system to search, acquire, track and communicate. The basic system components and functional area performance requirements have been defined and are documented in the Type A System Specification. This phase of system engineering will culminate with preliminary test results upon completion of subsystem bench tests.

3.5.2 System Optimization

As system testing progresses from bench tests through final testing, data will be obtained that will prove the functional design integrity or indicate areas where trade-offs are necessary. Reconfiguration studies will be conducted as appropriate during the period following these tests. The results will permit finalization of the system and critical item specifications for the EDM procurement package. During Engineering Development, the system engineering function will be expanded to include all aspects of reliability, maintainability and support required by the operational configuration.

3.6 CONFIGURATION MANAGEMENT

Formal configuration management will be implemented at the beginning of the Engineering Development Phase. It is desirable to maintain design flexibility until the optimum configuration has been established. Appropriate control will be exercised by the (project) to assure adequate documentation of the design and translation of pertinent data to the final system and critical item specifications for the EDM. Planning for configuration management will be undertaken concurrent with the preparation of the EDM procurement package.

SECTION 4

MILESTONES AND SCHEDULES

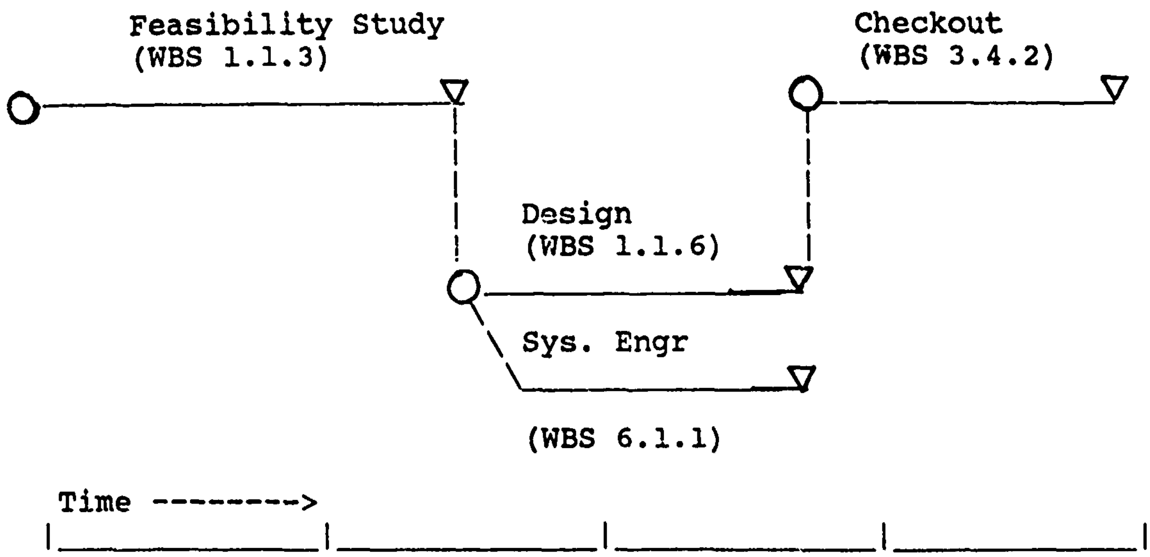
4.1 GENERAL

The milestones and schedules for the (project) will be included in this section; each milestone should be keyed to the related WBS element number. (See Section 6).

4.2 PROJECT MILESTONES AND SCHEDULES

Development of the (project) involves accomplishment of specific tasks which are sometimes dependent on completion of previous tasks. The major tasks, their relationship to each other, and the schedule should be shown in Figure 4-1, Time Dependency Chart. All major milestones should also be identified on this chart. (Table 4-1 is a list of the (project) milestones and Table 4-2 is a list of deliverables.)

EXAMPLE



Prepare a flow chart showing dependencies, WBS, and task descriptions. This chart may be a large foldout page.

Figure 4-1. Time Dependency Chart

NOTE: This should be one of the first tasks accomplished by the Project Manager.

Figure 4-1. Milestones

Related WBS	Milestone	Date

Table 4-2 List of Deliverables

WBS ELEMENT NUMBER	DELIVERABLE	TYPE OF DELIVERABLE	DATE OF DELIVERABLE
7.2.7	EM Definition	Preliminary	
6.1.2	Program Plan	Final	
7.2.7	EM Definition	Final	
7.2.7	EM Development Support Test Plan	Final	
5.3.1	Installation Plan	Final	
6.1.2-7.3	Program Plan (Updated)	Final	
7.2.5	System Engineering Test Report	Final	
7.2.6	EDM Spec and Data Package	Final	

E X A M P L E

SECTION 5

FINANCIAL PLAN

5.1 FINANCIAL REQUIREMENTS

The total cost for ______(project)______ is shown in Table 5-1. Cost for major activities and lower work elements (level 3) for each FY is shown in Table 5-2. Labor and overhead, major procurement, material and travel costs from the individual tasks (level 4) identified in the Work Breakdown Structure of Section 6 were utilized in the preparation of these cost summary figures.

Major procurement and material costs can be summarized by subsystem in subsequent tables. Corresponding level 3 Work Breakdown Structure line item numbers can be shown in the major procurement and material summary tables to permit cross reference to the corresponding tasks in the WBS.

5.2 COST CONTROL

The NAVOCEANSYSCEN Management Information System (MIS) will be used to report and document cost control. This MIS consists of computerized reports of all expenditure (labor, material, and travel) and will be delivered to the project manager on a weekly basis. The reports will be keyed to the WBS (see detail Section 6). The project manager will correlate technical progress to project milestones and financial status on a regular basis to assess total project status. With this information, the project manager will exercise effective cost control of the project.

5.3 FINANCIAL REPORTING

A summary of project/subsystem financial status will be delivered to the program manager (sponsor) on a quarterly basis.

5.4 COST ANALYSIS

Include this paragraph, if required. (Trade-offs, options, etc., can be included if necessary.)

LABOR AND OVERHEAD			MAJOR PROCUREMENT	MATERIAL		TOTAL		
NOSC	NRL	NUSC			TRAVEL	FY	FY	FY
871.5	178.6	169.4	1336.1	177.4	38.0	2771.0		
396.6	88.0	559.7	100.0		48.0		1192.3	
1268.1	266.5	228.8	1436.1	177.4	86.0			3462.9

Table 5.1 Total Project Cost

E X A M P L E

WORK BREAKDOWN STRUCTURE (WBS)

LEVEL WORK PACKAGE (PROJECT)	LABOR AND OVERHEAD			MAJOR PROCUREMENT	MATERIAL	TRAVEL	TOTAL
	NOSC	NRL	NUSC				
1.0 Terminal Development and Test	871.5	178.6	169.4	1336.1	177.4	38.0	2771.0
2.0 Experimental Periscope Terminal	452.4	43.0	58.6	1036.1	177.4	15.0	
3.0 Training							
4.0 Peculiar Support Equip.							
5.0 System Test and Evaluation	173.7	135.6	25.3	300.0		6.0	
6.0 System/Project Mgmt	171.8		72.8			15.0	
7.0 Data	73.6		12.7			2.0	

Table 5.2 Cost Summary of Major Activities

E X A M P L E

SECTION 6

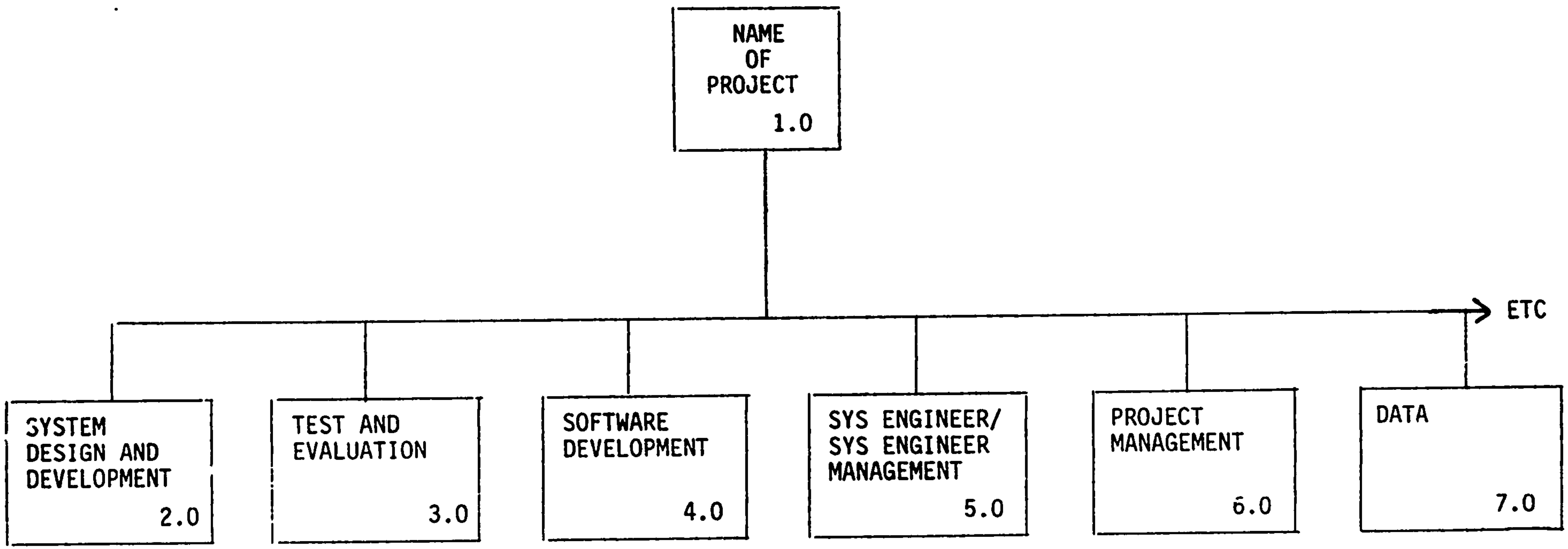
WORK BREAKDOWN STRUCTURE

6.1 INTRODUCTION

The major (project) management-control tool will be the work breakdown structure (WBS). The WBS is a product-oriented device composed of hardware, software, services, and other work tasks which result from project engineering efforts during the development and production of a project. The WBS system enables a project manager to logically breakdown the overall task into smaller workable segments that can individually be implemented, managed, and controlled whereupon completion, the total task will be accomplished. Each task in this system is assigned a WBS element number which can be controlled, by ADP, as to status, costs, and recording.

6.2 (PROJECT) WORK BREAKDOWN STRUCTURE

Figure 6-1 displays the product to be developed and relates the elements of work to be accomplished to each other and to the end product. Table 6-1 is an indentured form of the WBS which enables easy revising and updating. WBS Element Description Records will be prepared for each work package in the WBS, indicating milestones, deliverables, and responsibilities for that particular work package. (See Figure 6-2).



NOTE: (This figure should be followed by subordinate figures showing the breakdown for each major WBS, e.g., 2.0, 3.0, 4.0, etc.)

Figure 6-1. (Project) Overall WBS

TABLE 6-1

WORK BREAKDOWN STRUCTURE

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
1.0 PROJECT			
	2.0 SYSTEM PROJECT MANAGEMENT		
		2.1 PROJECT	
		2.1 MANAGEMENT	
			2.1.1 PROGRAM PLAN
			2.1.2 CONFIG. MANAGEMENT
			2.1.3 QUALITY ASSURANCE
			2.1.4 COST & SKED MGNT
			2.1.5 DATA MANAGEMENT
			2.1.6 I.W.A,.'S & CONTRACT
			2.1.7 REPORTS & BRIEFING
		2.2 SYSTEM ENGINEERING & MANAGEMENT	
			2.2.1 SYSTEM EFFECTIVENESS (RMAILS)
			2.2.2 SPECIFICATIONS (A&B)
			2.2.3 SYSTEMS INTEGRATION
			2.2.4 SYSTEM DESIGN ENGINEERING
			2.2.5 HUMAN FACTORS
			2.2.6 SECURITY
	3.0 INJECTION TERMINAL SUBSYSTEM		
		3.1 INTEGRATION & ASSEMBLY	
			3.1.1 ASSY/SUB-ASSY INTERFACES
			3.1.2 ELECTRICAL INTE-GRATION
			3.1.3 MECHANICAL INTE-GRATION
		3.2 COMPUTER PROGRAMS	
			3.2.1 EXECUTIVE ROUTINES
			3.2.2 FUNCTION ROUTINES
			3.2.3 DIAGNOSTIC & MAIN-TENANCE ROUTINES
			3.2.4 I/O CONTROL ROUTINES
		3.3 I/O SUB-ASSEMBLIES	
			3.3.1 MSG ENTRY DEVICE
			3.3.2 DISPLAY
			3.3.3 HARD COPY DEVICE
			3.3.4 CONTROL
			3.3.5 MMPS MESSAGE OUTPUT
			3.3.6 SELF-TEST
		3.4 ADP SUB-ASSEMBLIES	
			3.4.1 ARITHMETIC SUB-ASSY
			3.4.2 MEMORY
			3.4.3 EXEC. CONTROL
			3.4.5 I/O CONTROL

EXAMPLE

WBS ELEMENT DESCRIPTION RECORD
11ND-NELC-3920/16 (1-73)

	ORIGINAL DATE	REVISION DATE	REVISION LTR	SHEET 1 OF 1
WBS ELEMENT NO.	**WBS ELEMENT TITLE**			
1.2.3.4	ILS SUPPORT			

ENGINEERING TASK DESCRIPTION

1.2.3.4 INTEGRATED LOGISTICS SYSTEM (ILS) SUPPORT

Monitor ILS work performed under contract. Review the ILS plans of the various segment and subsystem managers for compatibility with the over-all program ILS plan.

(1) Prepare an analysis of the T&E Plans

(2) Provide inputs to the Configuration Management Plan, Project Base Line, System Specifications, Technical Interface Specifications, Peripheral System Interface Specifications, T&E Master Plan, System Test Plan and COMSEC Area Plan.

EXAMPLE

Figure 6-2 WBS Element Description Record (1 of 2)

Appendix 7B

Milestone Reporting

(See subsection 7.6)

MILESTONE REPORT

		WEEK ENDING 3/
MILESTONE REPORT – DETAIL		PROJECT 4/

NO.	MILESTONE IDENTIFICATION	MILESTONE DATE			CHECK ONE		CURRENT WEEK MISSED
		SCHED	REVISED	ACTUAL	MADE	MISSED	
5/	6/	7/	8/	9/	10/	11/	12/
		13/		TOTALS			

DISCUSS MILESTONES MISSED (INCLUDE REASONS, EFFECT ON PROJECT, REMEDIAL ACTION TAKEN, AND WHEN)

14/

SIGNATURE	DATE
15/	16/

MILESTONE REPORT

SUMMARY

FROM: CODE: 17/

TO: CODE: 18/

PROJECT	PROJECT NAME	WEEK ENDING 19/ CUMULATIVE MISSIONS SCHED	MADE	MISSED	CURRENT WEEK DUE	MADE	MISSED
20/	21/	22/	23/	24/			25/
	26/ TOTAL						

DISCUSS MILESTONES MISSED (INCLUDE REASONS, EFFECT ON PROJECT, REMEDIAL ACTION TAKEN, AND WHEN)

27/

SIGNATURE 28/	DATE 29/

EXHIBIT B-2

(Reference paragraph 5.0 of the course syllabus)

Instruction for the Preparation and Completion of Milestone Reports

Applicable blocks on the milestone report will be completed as follows:

Block	Entry Item	Instructions
1.	From	Provide the code of the cognizant project manager, as applicable.
2.	To	Provide the code of activity that the milestone report is being directed to. Usually this is the project/division office/sponsor.
3.	Week Ending	Enter the week ending date covered by the milestone report.
4.	Project	Enter the four digit project number.
5.	No.	Enter sequential numbers as required. This field serves to identify the milestone by a single reference number.
6.	Milestone/Identification	Enter the milestone names listed in sequence by earliest date first.
7.	Schedule	Enter the schedule date that the milestone is to be accomplished.
8.	Revised	Enter revised dates, if applicable. This block will be used only when scheduled milestone dates require revision in consonance with project objectives.
9.	Actual	Enter the actual completion of accomplishment date of the milestone.
10.	Check One - Made	Enter a check mark if milestone was made.
11.	Check One - Missed	Enter a check mark if milestone was missed.

Block	Entry Item	Instructions
12.	Current Week - Missed	Enter a check mark if milestone missed during the current reporting week.
13.	Totals	Enter the total count of check marks in block columns 10, 11, 12.
14.	Discuss Milestones Missed	Provide reasons, effects on project, remedial action taken or to be taken, and when.
15.	Signature	Project manager enters signature.
16.	Date	Self explanatory.
17.	From	Provide the code number from which the milestone report is being directed.
18.	To	Provide the code number to which the milestone report is being directed.
19.	Week Ending	Enter the week ending date covered by the detail milestone reports.
20.	Project	Enter the project.
21.	Project Name	Enter the name of the project.
22.	Schedule	Enter the number of milestones scheduled.
23.	Made	Enter the number of milestones made.
24.	Missed	Enter the number of milestones missed.
25.	Current Week Missed	Enter the number of milestones missed for the current week only.
26.	Total	Enter totals for each of the block columns 22, 23 and 24.
27.	Discuss Milestones Missed	Provide reasons, effect on project, remedial action taken or to be taken, and when.
28.	Signature	Enter authorized signature.
29.	Date	Self explanatory.

Appendix 7C

Report WBS1 Options

(See subsection 7.8.1)

REPORT NO. WBS1-1
PERIOD ENDING 12/28/85

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814

RUN 006 14:37 PAGE 1

JOB ORDER	ELEMENT NUMBER	ELEMENT TITLE	LEVEL		LABOR HOURS	LABOR DOLLARS	SERVICE CONTRACTS	N/A	TRAVEL	OTHER MATERIAL	TOTAL
	1.0	JTIDS SUMMARY WORK BREAKDOWN STRUCTURE - NOSC FY86	1	ESTIMATES	17,809	971,000	5,101,000	0	41,000	75,000	6,185,000
				YTD CHARGES	12,099	682,051	2,888,960	0	54,441	53,543	3,678,995
				MTD CHARGES	3,227	183,984	1,431,322-	0	5,281	8,496-	1,250,553-
				BALANCE	5,710	288,949	2,212,040	0	13,441-	21,457	2,506,005
	1.1	PROJECT MANAGEMENT	2	ESTIMATES	1,440	141,000	23,000	0	8,000	21,000	193,000
				YTD CHARGES	2,010	114,772	15,187	0	14,542	32,724	177,225
				MTD CHARGES	550	31,498-	5,526	0	2,252	8,811	48,087
				BALANCE	570-	26,228	7,813	0	6,542-	11,724-	15,775
CC54815T11	1.1.1	ENGINEERING MANAGEMENT	3	ESTIMATES	460	88,000	0	0	6,000	0	94,000
				YTD CHARGES	1,246	75,717	0	0	13,243	0	88,960
				MTD CHARGES	303	22,011	0	0	1,436	0	23,447
				BALANCE	765-	12,283	0	0	7,243-	0	5,040
CC54815T12	1.1.2	BUSINESS MANAGEMENT	3	ESTIMATES	480	27,000	0	0	0	0	27,000
				YTD CHARGES	373	20,287	3,536	0	508	22,464	46,795
				MTD CHARGES	93	4,351	1,944-	0	505	4,464	7,379
				BALANCE	107	6,713	3,536-	0	508-	22,464-	19,795-
	1.1.3	JTIDS LIBRARY CONFIGURATION/DATA MANAGEMENT	3	ESTIMATES	480	26,000	20,000	0	0	9,000	55,000
				YTD CHARGES	391	18,768	0	0	791	6,947	26,506
				MTD CHARGES	107	5,136	0	0	308	2,928	8,372
				BALANCE	89	7,232	20,000	0	791-	2,053	28,494
CC54315T13	1.1.3.1	IN-HOUSE COMPUTER & OTHER CHARGES	4	ESTIMATES	480	26,000	0	0	0	9,000	35,000
				YTD CHARGES	391	18,768	0	0	791	6,947	26,506
				MTD CHARGES	107	5,136	0	0	308	2,928	8,372
				BALANCE	89	7,232	0	0	791-	2,053	8,494
CC54315T14	1.1.3.2	CONTRACTOR SUPPORT - SAIC	4	ESTIMATES	0	0	20,000	0	0	0	20,000
				YTD CHARGES	0	0	0	0	0	0	0
				MTD CHARGES	0	0	0	0	0	0	0
				BALANCE	0	0	20,000	0	0	0	20,000
	1.1.4	JTIDS PC NETWORK MGT TECHNICAL SUPPORT	3	ESTIMATES	0	0	3,000	0	2,000	12,000	17,000
				YTD CHARGES	0	0	11,651	0	0	3,313	14,964
				MTD CHARGES	0	0	7,470	0	0	1,419	8,889
				BALANCE	0	0	8,651-	0	2,000	8,687	2,036
CC54315T16	1.1.4.1	IN-HOUSE COMPUTER & OTHER CHARGES	4	ESTIMATES	0	0	0	0	2,000	12,000	14,000
				YTD CHARGES	0	0	0	0	0	3,127	3,127
				MTD CHARGES	0	0	0	0	0	1,233	1,233
				BALANCE	0	0	0	0	2,000	8,873	10,873

REPORT NO. WBS1-2
PERIOD ENDING 12/23/35

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814

PAGE 1
RUN C06 14:37

JOB ORDER	ELEMENT NUMBER	ELEMENT TITLE	LEVEL		LABOR HOURS	LABOR DOLLARS	SERVICE CONTRACTS	N/A	TRAVEL	OTHER MATERIAL	TOTAL
	1.0	JTIDS SUMMARY WORK BREAKDOWN STRUCTURE - NOSC FY86	1	ESTIMATES	17,809	971,000	5,101,000	0	41,000	75,000	6,185,000
				YTD COSTS	12,099	682,051	103,140	0	54,441	52,705	892,337
				MTD COSTS	3,227	183,984	103,140	0	5,281	14,319	306,724
				ENCUMBRANCE	0	0	2,785,820	0	0	838	2,786,658
				BALANCE	5,710	288,949	2,212,040	0	13,441-	21,457	2,506,005
	1.1	PROJECT MANAGEMENT	2	ESTIMATES	1,440	141,000	23,000	0	8,000	21,000	193,000
				YTD COSTS	2,010	114,772	2,170	0	14,542	32,286	163,770
				MTD COSTS	550	31,498	2,170	0	2,252	8,802	44,722
				ENCUMBRANCE	0	0	13,017	0	0	438	13,455
				BALANCE	570-	26,228	7,813	0	6,542-	11,724-	15,775
CC54815T11	1.1.1	ENGINEERING MANAGEMENT	3	ESTIMATES	480	88,000	0	0	6,000	0	94,000
				YTD COSTS	1,246	75,717	0	0	13,243	0	88,960
				MTD COSTS	363	22,011	0	0	1,436	0	23,447
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	766-	12,283	0	0	7,243-	0	5,040
CC54815T12	1.1.2	BUSINESS MANAGEMENT	3	ESTIMATES	440	27,000	0	0	0	0	27,000
				YTD COSTS	373	20,287	0	0	508	22,464	43,259
				MTD COSTS	60	4,351	0	0	508	4,464	9,323
				ENCUMBRANCE	0	0	3,536	0	0	0	3,536
				BALANCE	107	6,713	3,536-	0	508-	22,464-	19,795-
	1.1.3	JTIDS LIBRARY CONFIGURATION/DATA MANAGEMENT	3	ESTIMATES	460	26,000	20,000	0	0	9,000	55,000
				YTD COSTS	391	18,768	0	0	791	6,929	26,488
				MTD COSTS	107	5,136	0	0	303	2,919	8,363
				ENCUMBRANCE	0	0	0	0	0	18	18
				BALANCE	69	7,232	20,000	0	791-	2,053	28,494
CC54815T13	1.1.3.1	IN-HOUSE COMPUTER & OTHER CHARGES	4	ESTIMATES	480	26,000	0	0	0	9,000	35,000
				YTD COSTS	391	18,768	0	0	791	6,929	26,488
				MTD COSTS	107	5,136	0	0	308	2,919	8,363
				ENCUMBRANCE	0	0	0	0	0	18	18
				BALANCE	89	7,232	0	0	791-	2,053	8,494
CC54815T1A	1.1.3.2	CONTRACTOR SUPPORT - SAIC	4	ESTIMATES	0	0	20,000	0	0	0	20,000
				YTD COSTS	0	0	0	0	0	0	0
				MTD COSTS	0	0	0	0	0	0	0
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	0	0	20,000	0	0	0	20,000
	1.1.4	JTIDS PC NETWORK MGT TECHNICAL SUPPORT	3	ESTIMATES	0	0	3,000	0	2,000	12,000	17,000
				YTD COSTS	0	0	2,170	0	0	2,893	5,063
				MTD COSTS	0	0	2,170	0	0	1,419	3,589
				ENCUMBRANCE	0	0	9,481	0	0	420	9,901
				BALANCE	0	0	5,651-	0	2,000	8,687	2,036

REPORT NO. WBS1-3
PERIOD ENDING 12/28/85

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814

PAGE 1
RUN 006 14:37

JOB ORDER	ELEMENT NUMBER	ELEMENT TITLE	LEVEL		LABOR HOURS	LABOR DOLLARS	SERVICE CONTRACTS	N/A	TRAVEL	OTHER MATERIAL	TOTAL
	1.0	JTIDS SUMMARY WORK BREAKDOWN STRUCTURE - NOSC FY86	1	ESTIMATES	17,809	971,000	5,101,000	0	41,000	75,000	6,185,000
				ITD COSTS	12,099	682,051	103,140	0	54,441	52,705	892,337
				MTD COSTS	3,227	183,986	103,140	0	5,281	14,319	306,724
				ENCUMBRANCE	0	0	2,785,820	0	0	838	2,786,658
				BALANCE	5,710	288,949	2,212,040	0	13,441-	21,457	2,506,005
	1.1	PROJECT MANAGEMENT	2	ESTIMATES	1,440	141,000	23,000	0	8,000	21,000	193,000
				ITD COSTS	2,010	114,772	2,170	0	14,542	32,286	163,770
				MTD COSTS	550	31,498	2,170	0	2,252	8,802	44,722
				ENCUMBRANCE	0	0	13,017	0	0	438	13,455
				BALANCE	570-	26,228	7,813	0	6,542-	11,724-	15,775
CC54815T11	1.1.1	ENGINEERING MANAGEMENT	3	ESTIMATES	480	88,000	0	0	6,000	0	94,000
				ITD COSTS	1,246	75,717	0	0	13,243	0	88,960
				MTD COSTS	363	22,011	0	0	1,436	0	23,447
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	766-	12,283	0	0	7,243-	0	5,040
CC54815T12	1.1.2	BUSINESS MANAGEMENT	3	ESTIMATES	480	27,000	0	0	0	0	27,000
				ITD COSTS	373	20,287	0	0	508	22,464	43,259
				MTD COSTS	80	4,351	0	0	508	4,464	9,323
				ENCUMBRANCE	0	0	3,536	0	0	0	3,536
				BALANCE	107	6,713	3,536-	0	508-	22,464-	19,795-
	1.1.3	JTIDS LIBRARY CONFIGURATION/DATA MANAGEMENT	3	ESTIMATES	480	26,000	20,000	0	0	9,000	55,000
				ITD COSTS	391	18,768	0	0	791	6,929	26,488
				MTD COSTS	107	5,136	0	0	308	2,919	8,363
				ENCUMBRANCE	0	0	0	0	0	18	18
				BALANCE	89	7,232	20,000	0	791-	2,053	28,494
CC54815T13	1.1.3.1	IN-HOUSE COMPUTER & OTHER CHARGES	4	ESTIMATES	480	26,000	0	0	0	9,000	35,000
				ITD COSTS	391	18,768	0	0	791	6,929	26,488
				MTD COSTS	107	5,136	0	0	308	2,919	8,363
				ENCUMBRANCE	0	0	0	0	0	18	18
				BALANCE	89	7,232	0	0	791-	2,053	8,494
CC54815T1A	1.1.3.2	CONTRACTOR SUPPORT - SAIC	4	ESTIMATES	0	0	20,000	0	0	0	20,000
				ITD COSTS	0	0	0	0	0	0	0
				MTD COSTS	0	0	0	0	0	0	0
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	0	0	20,000	0	0	0	20,000
	1.1.4	JTIDS PC NETWORK MGT TECHNICAL SUPPORT	3	ESTIMATES	0	0	3,000	0	2,000	12,000	17,000
				ITD COSTS	0	0	2,170	0	0	2,893	5,063
				MTD COSTS	0	0	2,170	0	0	1,419	3,589
				ENCUMBRANCE	0	0	9,481	0	0	420	9,901
				BALANCE	0	0	8,651-	0	2,000	8,687	2,036

Appendix 7D

Report WBS1 Recap

(See subsection 7.8.1

REPORT NO. WBS1-1
PERIOD ENDING 12/28/85

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814
RECAP BY PROBLEM NUMBER

PROBLEM NUMBER		LABOR HOURS	LABOR DOLLARS	SERVICE CONTRACTS	N/A	TRAVEL	OTHER MATERIAL	TOTAL
CC54	ESTIMATES	17,809	971,000	5,101,000	0	41,000	75,000	6,185,000
	YTD CHARGES	12,099	682,051	2,888,960	0	54,441	53,543	3,678,995
	MTD CHARGES	3,227	183,984	1,431,322-	0	5,281	8,496-	1,250,553-
	BALANCE	5,710	288,949	2,212,040	0	13,441-	21,457	2,506,005

REPORT NO. WSS1-2
PERIOD ENDING 12/26/85

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814
RECAP BY PROBLEM NUMBER

PROBLEM NUMBER		LABOR HOURS	LABOR DOLLARS	SERVICE CONTRACTS	N/A	TRAVEL	OTHER MATERIAL	TOTAL
CC54	ESTIMATES	17,809	971,000	5,101,000	0	41,000	75,000	6,185,000
	YTD COSTS	12,099	682,051	103,140	0	54,441	52,705	892,337
	MTD COSTS	3,227	183,984	103,140	0	5,261	14,319	306,724
	ENCUMBRANCE	0	0	2,785,820	0	0	838	2,786,658
	BALANCE	5,710	288,949	2,212,040	0	13,441-	21,457	2,506,005

REPORT NO. W3S1-3
PERIOD ENDING 12/23/85

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814
RECAP BY PROBLEM NUMBER

PROBLEM NUMBER		LABOR HOURS	LABOR DOLLARS	SERVICE CONTRACTS	N/A	TRAVEL	OTHER MATERIAL	TOTAL
CC54	ESTIMATES	17,809	971,000	5,101,000	0	41,000	75,000	6,185,000
	ITD COSTS	12,099	682,051	103,140	0	54,441	52,705	892,337
	MTD COSTS	3,227	183,984	103,140	0	5,281	14,319	306,724
	ENCUMBRANCE	0	0	2,785,820	0	0	838	2,786,658
	BALANCE	5,710	288,949	2,212,040	0	13,441-	21,457	2,506,005

Appendix 7E

Report WBS2

(See subsection 7.8.1)

REPORT NO. WB32-1
PERIOD ENDING 12/28/85

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814

JOB ORDER	ELEMENT NUMBER	ELEMENT TITLE	LEVEL		LABOR HOURS	LABOR DOLLARS	SERVICE CONTRACTS	N/A	TRAVEL	OTHER MATERIAL	TOTAL
	1.0	JTIDS SUMMARY WORK BREAKDOWN STRUCTURE - NOSC FY86	1	ESTIMATES	17,809	971,000	5,101,000	0	41,000	75,000	6,183,000
				YTD CHARGES	12,099	682,051	2,888,960	0	54,441	53,543	3,678,995
				MTD CHARGES	3,227	187,984	1,431,322-	0	5,281	8,496-	1,250,333-
				BALANCE	5,710	288,949	2,212,040	0	13,441-	21,457	2,506,005
	1.1	PROJECT MANAGEMENT	2	ESTIMATES	1,440	141,000	23,000	0	8,000	21,000	193,000
				YTD CHARGES	2,010	114,772	15,187	0	14,542	32,724	177,225
				MTD CHARGES	550	31,498	5,526	0	2,252	8,811	48,087
				BALANCE	570-	26,228	7,813	0	6,542-	11,724-	15,775
CC5481ST11	1.1.1	ENGINEERING MANAGEMENT	3	ESTIMATES	480	88,000	0	0	6,000	0	94,000
				YTD CHARGES	1,246	75,717	0	0	13,243	0	88,960
				MTD CHARGES	363	22,011	0	0	1,436	0	23,447
				BALANCE	766-	12,283	0	0	7,243-	0	5,040
CC5481ST12	1.1.2	BUSINESS MANAGEMENT	3	ESTIMATES	480	27,000	0	0	0	0	27,000
				YTD CHARGES	373	20,287	3,536	0	508	22,464	46,795
				MTD CHARGES	87	4,351	1,944-	0	505	4,464	7,379
				BALANCE	107	6,713	3,536-	0	508-	22,464-	19,795-
	1.1.3	JTIDS LIBRARY CONFIGURATION/DATA MANAGEMENT	3	ESTIMATES	480	26,000	20,000	0	0	9,000	55,000
				YTD CHARGES	391	18,768	0	0	791	6,947	26,506
				MTD CHARGES	107	5,136	0	0	308	2,928	8,372
				BALANCE	89	7,232	20,000	0	791-	2,053	28,494
	1.1.4	JTIDS PC NETWORK MGT TECHNICAL SUPPORT	3	ESTIMATES	0	0	3,000	0	2,000	12,000	17,000
				YTD CHARGES	0	0	11,651	0	0	3,313	14,964
				MTD CHARGES	0	0	7,470	0	0	1,419	8,889
				BALANCE	0	0	8,651-	0	2,000	8,687	2,036
	1.2	SYSTEM ENGINEERING	2	ESTIMATES	3,250	164,000	0	0	8,000	6,000	178,000
				YTD CHARGES	1,770	102,910	0	0	5,269	0	108,179
				MTD CHARGES	398	23,151	0	0	1,645	0	24,796
				BALANCE	1,480	61,090	0	0	2,731	6,000	69,821
	1.2.1	PRIME MISSION EQUIPMENT ENGINEERING	3	ESTIMATES	3,250	164,000	0	0	8,000	6,000	178,000
				YTC CHARGES	1,770	102,910	0	0	5,269	0	108,179
				MTD CHARGES	398	23,151	0	0	1,645	0	24,796
				BALANCE	1,460	61,090	0	0	2,731	6,000	69,821
	1.4	SYSTEM TEST AND EVALUATION	2	ESTIMATES	8,023	382,000	4,626,000	0	15,000	18,000	5,078,000
				YTD CHARGES	5,865	318,406	2,671,773	0	33,245	19,569	3,042,993
				MTD CHARGES	1,608	88,083	1,421,849-	0	1,239	17,307-	1,349,833-
				BALANCE	2,158	63,594	1,954,227	0	18,245-	1,569-	1,995,007

JOB ORDER	ELEMENT NUMBER	ELEMENT TITLE	LEVEL		LABOR HOURS	LABOR DOLLARS	SERVICE CONTRACTS	N/A	TRAVEL	OTHER MATERIAL	TOTAL
	1.0	JTIDS SUMMARY WORK BREAKDOWN STRUCTURE - NOSC FY86	1	ESTIMATES	17,809	971,000	5,101,000	0	41,000	75,000	6,185,000
				YTD COSTS	12,099	682,051	103,140	0	54,441	52,705	692,337
				MTD COSTS	3,227	183,984	103,140	0	5,281	14,319	306,724
				ENCUMBRANCE	0	0	2,785,820	0	0	838	2,786,658
				BALANCE	5,710	288,949	2,212,040	0	13,441-	21,457	2,506,005
	1.1	PROJECT MANAGEMENT	2	ESTIMATES	1,440	141,000	23,000	0	8,000	21,000	193,000
				YTD COSTS	2,010	114,772	2,170	0	14,542	32,286	163,770
				MTD COSTS	550	31,498	2,170	0	2,252	8,802	44,722
				ENCUMBRANCE	0	0	13,017	0	0	438	13,455
				BALANCE	570-	26,228	7,813	0	6,542-	11,724-	15,775
CC54815T11	1.1.1	ENGINEERING MANAGEMENT	3	ESTIMATES	480	88,000	0	0	6,000	0	94,000
				YTD COSTS	1,246	75,717	0	0	13,243	0	88,960
				MTD COSTS	363	22,011	0	0	1,434	0	23,447
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	766-	12,283	0	0	7,243-	0	5,040
CC54815T12	1.1.2	BUSINESS MANAGEMENT	3	ESTIMATES	480	27,000	0	0	0	0	27,000
				YTD COSTS	373	20,287	0	0	508	22,464	43,259
				MTD COSTS	80	4,351	0	0	503	4,464	9,323
				ENCUMBRANCE	0	0	3,536	0	0	0	3,536
				BALANCE	107	6,713	3,536-	0	508-	22,464-	19,795-
	1.1.3	JTIDS LIBRARY CONFIGURATION/DATA MANAGEMENT	3	ESTIMATES	480	26,000	20,000	0	0	9,000	55,000
				YTD COSTS	391	18,768	0	0	791	6,929	26,488
				MTD COSTS	107	5,136	0	0	308	2,919	8,363
				ENCUMBRANCE	0	0	0	0	0	18	18
				BALANCE	89	7,232	20,000	0	791-	2,053	28,494
	1.1.4	JTIDS PC NETWORK MGT TECHNICAL SUPPORT	3	ESTIMATES	0	0	3,000	0	2,000	12,000	17,000
				YTD COSTS	0	0	2,170	0	0	2,893	5,063
				MTD COSTS	0	0	2,170	0	0	1,419	3,589
				ENCUMBRANCE	0	0	9,481	0	0	420	9,901
				BALANCE	0	0	8,651-	0	2,000	8,687	2,036
	1.2	SYSTEM ENGINEERING	2	ESTIMATES	3,250	164,000	0	0	8,000	6,000	178,000
				YTD COSTS	1,770	102,910	0	0	5,269	0	108,179
				MTD COSTS	398	23,151	0	0	1,645	0	24,796
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	1,480	61,090	0	0	2,731	6,000	69,821
	1.2.1	PRIME MISSION EQUIPMENT ENGINEERING	3	ESTIMATES	3,250	164,000	0	0	8,000	6,000	178,000
				YTD COSTS	1,770	102,910	0	0	5,269	0	108,179
				MTD COSTS	398	23,151	0	0	1,645	0	24,796
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	1,480	61,090	0	0	2,731	6,000	69,821

REPORT NO. WBS2-3
PERIOD ENDING 12/28/85

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814

RUN 006 14:37

JOB ORDER	ELEMENT NUMBER	ELEMENT TITLE	LEVEL		LABOR HOURS	LABOR DOLLARS	SERVICE CONTRACTS	N/A	TRAVEL	OTHER MATERIAL	TOTAL
	1.0	JTIDS SUMMARY WORK BREAKDOWN STRUCTURE - NOSC FY86	1	ESTIMATES	17,809	971,000	5,101,000	0	41,000	75,000	6,185,000
				ITD COSTS	12,099	682,051	103,140	0	54,441	52,705	892,337
				MTD COSTS	3,227	183,984	103,140	0	5,281	14,319	306,724
				ENCUMBRANCE	0	0	2,785,820	0	0	838	2,786,658
				BALANCE	5,710	288,949	2,212,040	0	13,441-	21,437	2,506,005
	1.1	PROJECT MANAGEMENT	2	ESTIMATES	1,440	141,000	23,000	0	8,000	21,000	193,000
				ITD COSTS	2,010	114,772	2,170	0	14,542	32,286	163,770
				MTD COSTS	550	31,498	2,170	0	2,252	8,802	44,722
				ENCUMBRANCE	0	0	13,017	0	0	438	13,455
				BALANCE	570-	26,228	7,813	0	6,542-	11,724-	15,775
CC54815T11	1.1.1	ENGINEERING MANAGEMENT	3	ESTIMATES	480	88,000	0	0	6,000	0	94,000
				ITD COSTS	1,246	75,717	0	0	13,243	0	88,960
				MTD COSTS	363	22,011	0	0	1,436	0	23,447
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	766-	12,283	0	0	7,243-	0	5,040
CC54815T12	1.1.2	BUSINESS MANAGEMENT	3	ESTIMATES	480	27,000	0	0	0	0	27,000
				ITD COSTS	373	20,287	0	0	508	22,464	43,259
				MTD COSTS	80	4,351	0	0	508	4,464	9,323
				ENCUMBRANCE	0	0	3,535	0	0	0	3,536
				BALANCE	107	6,713	3,536-	0	508-	22,464-	19,795-
	1.1.3	JTIDS LIBRARY CONFIGURATION/DATA MANAGEMENT	3	ESTIMATES	480	26,000	20,000	0	0	9,000	55,000
				ITD COSTS	391	18,768	0	0	791	6,929	26,488
				MTD COSTS	107	5,136	0	0	308	2,919	8,363
				ENCUMBRANCE	0	0	0	0	0	18	18
				BALANCE	89	7,232	20,000	0	791-	2,053	28,494
	1.1.4	JTIDS PC NETWORK MGT TECHNICAL SUPPORT	3	ESTIMATES	0	0	3,000	0	2,000	12,000	17,000
				ITD COSTS	0	0	2,170	0	0	2,893	5,063
				MTD COSTS	0	0	2,170	0	0	1,419	3,589
				ENCUMBRANCE	0	0	9,481	0	0	420	9,901
				BALANCE	0	0	8,651-	0	2,000	8,687	2,036
	1.2	SYSTEM ENGINEERING	2	ESTIMATES	3,250	164,000	0	0	8,000	6,000	178,000
				ITD COSTS	1,770	102,910	0	0	5,269	0	108,179
				MTD COSTS	398	23,151	0	0	1,645	0	24,796
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	1,480	61,090	0	0	2,731	6,000	69,821
	1.2.1	PRIME MISSION EQUIPMENT ENGINEERING	3	ESTIMATES	3,250	164,000	0	0	8,000	6,000	178,000
				ITD COSTS	1,770	102,910	0	0	5,269	0	108,179
				MTD COSTS	398	23,151	0	0	1,645	0	24,796
				ENCUMBRANCE	0	0	0	0	0	0	0
				BALANCE	1,480	61,090	0	0	2,731	6,000	69,821

Appendix 7F

Report WBS3

(See subsection 7.8.1)

ELEMENT NUMBER	LEVEL 1 2 3 4 5 6 7 8	TOTAL ESTIMATES
1.0	JTIDS SUMMARY WORK BREAKDOWN STRUCTURE - NCSC FY86	6,185,000
1.1	PROJECT MANAGEMENT	193,000
1.1.1	ENGINEERING MANAGEMENT	94,000
1.1.2	BUSINESS MANAGEMENT	27,000
1.1.3	JTIDS LIBRARY CONFIGURATION/DATA MANAGEMENT	55,000
1.1.3.1	IN-HOUSE COMPUTER & OTHER CHARGES	35,000
1.1.3.2	CONTRACTOR SUPPORT - SAIC	20,000
1.1.4	JTIDS PC NETWORK MGT TECHNICAL SUPPORT	17,000
1.1.4.1	IN-HOUSE COMPUTER & OTHER CHARGES	14,000
1.1.4.2	CONTRACTOR SUPPORT - SDSUF	3,000
1.2	SYSTEM ENGINEERING	176,000
1.2.1	PRIME MISSION EQUIPMENT ENGINEERING	176,000
1.2.1.1	PME ENGINEERING SUPPORT	79,000
1.2.1.1.1	PME ENGINEERING SUPPORT MANAGEMENT	19,000
1.2.1.1.2	PME ENGINEERING SUPPOR (GENERAL)	60,000
1.2.1.3	JTIDS REL NAV TRPNL DSN/DEVEL SUPPORT	28,000
1.2.1.5	NET MANAGEMENT	59,000
1.2.1.5.1	NET MANAGEMENT ENGR SUPPORT	53,000
1.2.1.5.2	NET MANAGEMENT COMPUTER CHARGES	6,000
1.2.1.6	MESSAGE STANDARDIZATION	12,000
1.4	SYSTEM TEST AND EVALUATION	5,038,000
1.4.1	FSD TEST AND EVALUATION	622,000
1.4.1.1	TEST & EVALUATION PLANNING & COORDINATION	244,000
1.4.1.1.1	SYSTEM T&E DIRECTION & MANAGEMENT	27,000
1.4.1.1.2	FSD T&E TEST DIRECTOR	27,000
1.4.1.1.3	TEST DOCUMENTATION	27,000
1.4.1.1.4	FSD T&E CONTRACT SUPPORT	163,000
1.4.1.1.4.1	TEST PLANS/PROCEDURES - CSC	105,000
1.4.1.1.4.2	REL NAV SUPPORT - ORINCON	50,000
1.4.1.1.4.3	ADP SECURITY - COMPUSEC	8,000
1.4.1.2	TEST OPERATIONS/FACILITY MANAGEMENT	378,000
1.4.1.2.1	TEST OPERATIONS SUPPORT IN-HOUSE	77,000
1.4.1.2.1.1	TEST OPERATION SUPPORT	43,000
1.4.1.2.1.2	TEST ANAL & CDT&E SUPPORT	25,000
1.4.1.2.1.3	FACILITY/TEST OPNS MATERIAL	9,000
1.4.1.2.2	TEST OPNS/FACILITY SUPPORT - CONTRACT	301,000
1.4.1.2.2.1	TEST OPERATORS - SEI	60,000
1.4.1.2.2.2	FACILITY USAGE - ICSTF	235,000
1.4.1.2.2.3	TEST OPNS - DATA LINES	6,000
1.4.2	JDES DEVELOPMENT	4,183,000
1.4.2.1	JDES INCREMENT I DEVEL/MAINT	575,000
1.4.2.1.1	JDES INCREMENT I - IN-HOUSE SUPPORT	214,000
1.4.2.1.1.1	JDES SYSTEM ENGR	76,000
1.4.2.1.1.2	RF SUPPORT	14,500
1.4.2.1.1.3	MODELING/DSH ANAL	27,500
1.4.2.1.1.4	DXC SYS ENGR DEVEL	63,000
1.4.2.1.1.5	SIMULATION DEVEL SPPT	27,000
1.4.2.1.1.6	COMPUTER USAGE/MATERIAL	6,000
1.4.2.1.2	JDES INCREMENT I - CONTRACT SUPPORT	361,000
1.4.2.1.2.1	INCR I SPPT - DOCUMENTATION - SAI	75,000

REPORT NO. 6BS3
PERIOD ENDING 12/26/85

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814

ELEMENT NUMBER	LEVEL	DESCRIPTION	TOTAL ESTIMATES
1.4.2.1.2.2	6	INCR I SPPT - MBIU/NIAU - ADS.	45,000
1.4.2.1.2.3	6	JDES SUPPORT - SDSUF	12,000
1.4.2.1.2.4	6	INCR I SPPT - E-2C/F18 - SDC	21,000
1.4.2.1.2.5	6	INCR I MODS - DAS/CFS - SAI	60,000
1.4.2.1.2.6	6	INCR I MOODS - NIAU - ADS	70,000
1.4.2.1.2.7	6	SLOW MOVER VAN - INTERMETRICS	75,000
1.4.2.1.2.8	6	JDES SUPPORT HARDWARE	3,000
1.4.2.2	4	INCR II DEVEL/MAINT - BOEING	3,500,000
1.4.2.3	4	INSTALLATION/LAB MODIFICATIONS	84,000
1.4.2.3.1	5	JDES INSTALLATION MGT	20,000
1.4.2.3.2	5	JDES INSTALLATION - CONTR SPPT	64,000
1.4.2.3.2.1	6	INSTL/MODS RACK ENCL - TRACOR	40,000
1.4.2.3.2.2	6	INSTL/MODS MINI RANGER - SEI	24,000
1.4.2.4	4	CONFIGURATION MGT SPPT F/JDES CONTRACT	24,000
1.4.2.4.1	5	CM SPPT IN-HOUSE	3,000
1.4.2.4.2	5	CM SPPT - CONTRACTOR	21,000
1.4.2.4.2.1	6	CM DRAWING SPPT - SEI	21,000
1.4.3	3	QUALITY ASSURANCE CERTIFICATION	233,000
1.4.3.1	4	QA CERTIFICATION IN-HOUSE	17,000
1.4.3.2	4	QA CERTIFICATION CONTRACTOR SPPT	216,000
1.4.3.2.1	5	INCREMENT I TESTING - SAI	130,000
1.4.3.2.2	5	INCREMENT II QA TEST - SAI	50,000
1.4.3.2.3	5	DT-II TEST SPPT FSD - SAI	36,000
1.5	2	SITE/PLATFORM INTEGRATION	740,000
1.5.3	3	SHIP INTEGRATION	740,000
1.5.3.1	4	JTIDS ANTENNA/EM ENVIRONMENT ANAL,MEASUREMENT&TEST	197,000
1.5.3.1.1	5	IN-HOUSE SUPPORT	145,000
1.5.3.1.1.1	6	ANTENNA & EM ANAL & TST	92,000
1.5.3.1.1.2	6	EMC ENGR CONSULT/ANAL	31,000
1.5.3.1.1.3	6	EM MEASUREMENT/TEST SPPT	14,000
1.5.3.1.1.4	6	EM/ANTENNA ENGR SPPT	8,000
1.5.3.1.2	5	CONTRACT SUPPORT	52,000
1.5.3.1.2.1	6	EM STUDIES - ECAC	50,000
1.5.3.1.2.2	6	TACAN CERTIFICATION - NESEC VJO	2,000
1.5.3.2	4	INTEGRATION ENGRG	163,000
1.5.3.2.1	5	IN-HOUSE SUPPORT	73,000
1.5.3.2.1.1	6	INTEGRATION ENGR MGT	14,500
1.5.3.2.1.2	6	INTEGRATION ENGR SPPT (CODE 814)	26,500
1.5.3.2.1.3	6	INTEGRATION ENGR SPPT (LA)	5,000
1.5.3.2.1.4	6	INTEGRATION ENGR NIP RVW	12,000
1.5.3.2.1.5	6	SHIP INTEGRATION MATERIAL	15,000
1.5.3.2.2	5	CONTRACT SUPPORT	90,000
1.5.3.2.2.1	6	HIGH RISK ANAL - INTERMETRICS	25,000
1.5.3.2.2.2	6	INTGR ENGR SPPT - INTERMETRICS	50,000
1.5.3.2.2.3	6	SHIP INTGR SPPT - NESEC VJO	15,000
1.5.3.3	4	INSTALLATION ENGINEERING	380,000
1.5.3.3.1	5	IN-HOUSE SUPPORT	80,000
1.5.3.3.1.1	6	SHIP INSTL ENGR MGT	14,500
1.5.3.3.1.2	6	SHIP INSTALLATION ENGR SPPT	50,500
1.5.3.3.1.3	6	SHIP INSTALLATION MATERIAL	15,000

REPORT NO. W353 JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM PAGE 3
PERIOD ENDING 12/28/85 JTIDS PROJECT OFFICE NOSC CODE 814 RUN 006 14:37

ELEMENT NUMBER	LEVEL 1 2 3 4 5 6 7 8	TOTAL ESTIMATES
1.5.3.3.2	CONTRACT SUPPORT	300,000
1.5.3.3.2.1	MATERIAL ACCTG & SSPT - SEI	100,000
1.5.3.3.2.2	SHIP INSTL - SUPSHIPS	200,000
1.6	LOGISTICS SUPPORT	36,000
1.6.1	IN-HOUSE SUPPORT	26,000
1.6.2	CONTRACT SUPPORT	10,000
1.6.2.1	LOGISTICS SUPPORT - MANTECH	10,000

Appendix 7G

The Work Breakdown Structure (WBS) Worksheet

(See subsection 7.8.1)

WORK BREAKDOWN STRUCTURE WORKSHEET

CONTROL NO. 17	18 WBS NO 23	24 PROJECT TITLE 73
1	1/	3/
2	2/	4/

1 17	18 19	20 LEVEL 1 ELEMENT TITLE 69
1.0	0 1	5/

1 ELEMENT NUMBER 17	LEVEL NO 18 19	20 ELEMENT TITLE 69	70 JOB ORDER NO 79	80
6/	7/	8/	9	

NAME 10/	CODE 11/	EXT 12/	DATE 13/	SHEET 14/ OF

Instruction for the Preparation and Completion
of Work Breakdown Structure Worksheets

Block	Entry Item	Instruction
1, 2	WBS Number	Enter an arbitrary number to distinguish this WBS from any other. This number may be assigned by the project manager. Input the number in both blocks a and 2. Fill out only on page 1, not necessary on succeeding pages.
3, 4	Project Title	Enter title of project to include two lines. The title will be used as a page heading on all reports for this WBS. Each line should be centered. Fill out on page 1 only, not necessary on succeeding pages.
5	Level 1 Element Title	Enter the title of level 1 (left justified). Fill out on page 1 only, not necessary on succeeding pages.
6	Element Number	Enter the element number (left justified). Input with decimal points, i.e., 1.4.13.6.3, 2.3.5.2 etc.
7.	Level Number	Enter level of this element. Input as 02 for level 2, 06 for level 6, etc.
8.	Element Title	Enter the element title (left justified).
9	Job Order Number	Input a job order number for detail elements as required. If more than one job order number is associate with a detail element, input a duplicate line for each (left justify).
10	Name	Enter the name of the person filling out forms.

Block	Entry Item	Instruction
11	Code	Enter the code of person filling out forms.
12	Extension	Enter telephone extension of person filling out forms.
13	Date	Enter the date forms filled out.
14	Sheet	Enter the sheet number and total number of necessary sheets, in sequence.

Appendix 7H

The Work Breakdown Structure (WBS) Element Description Record

(See subsection 7.8.2)

WBS ELEMENT DESCRIPTION RECORD

	ORIGINAL DATE 1/	REVISION DATE 2/	REVISION LETTER 3/	SHEET OF 4/

WBS ELEMENT NO.	WBS ELEMENT TITLE
5/	6/

ENGINEERING TASK DESCRIPTION

7/

Instruction for the Preparation of the WBS Element Description Record

Block	Entry Item	Instruction
1	Original Date	Enter the date the original WBS element was completed.
2	Revision Date	Enter the date each time the WBS element record is revised.
3	Revision Letter	Enter a revision letter each time the WBS element record is revised, beginning with A for the first revision, B for the second, etc.
4	Sheet ___ of ___	Number of WBS element record sheets.
5	WBS Element No.	Enter the assigned WBS element number for each task, i.e., 1.1, 1.1.2, 2.3, etc. Job Order number may also be included here if desired.
6	WBS Element Title	Provide a short descriptive title for WBS element.
7	Engineering Task Description	Describe each task in detail providing a of description, technical requirements.

Appendix 7I

Project Management Questionnaire

(See subsection 7.9)

Project Management Questionnaire

Prepared by

NOSC

Code 805

PROJECT MANAGEMENT QUESTIONNAIRE

I. PROJECT AUTHORIZATION

Directive	Subject	Questions
OPNAVINST 5000.42B	Operational Requirements and Objectives	1. Has project authorization been received?

II. FUNDS

Directive	Subject	Questions
SECNAVINST 5000.1B	System Acquisition	1. Has adequate funding been received? 2. Has a financial plan been prepared?
SPAWAR 4200.6D FAR/DFARS Part 7.105	Acquisition Plan (AP)	1. Is an AP required? 2. Is there a valid AP? 3. What is AP identifica

III. PROJECT MANAGEMENT

Directive	Subject	Questions
SECNAVINST 5000.1 3910.3 5430.7 5430.67 5410.85 DODDIR 5100.1 NAVMATINST 3910.20	Organization	1. Has organization structure been established? 2. Have support resources been obtained?
NOSC GUIDES	Staffing	1. Is manpower level adequate? 2. Is the staff trained for project requirements? 3. Is there backup for key personnel.
NOSC GUIDES	Procedures	1. Is there a current functional chart? 2. Are the WBS elements defined?
NAVMATINST 5000.21A 5000.22A	Project Management	1. Who is handling "public information" about the system?

EXHIBIT L

(Ref para 8.0 of the Course Sylubus)

NAVMAT P-9494 NAVSO P-2457		2. Are relevant project recor. available? 3. Who is responsible for liaison with the user? 4. Are user's requirements reviewed for possible improvement? 5. Is someone tracking progress of other closely related systems that could affect this system?
DODINST 7000.2	Performance Measurement	1. If project exceeds $25M of RDT&E funds or $100M of cumulative project investment, is DODINST 7000.2 followed?
	Program Review	1. Does project review provide coverage for cost, schedule accomplishment, technical performance, and logistic support?
MIL-STD-881A NOSC GUIDES	Work Breakdown Structure (WBS)	1. Has a WBS been prepared? 2. Does it include all task descriptions? 3. Have provisions been made for updating?
NAVMATINST 4855.1A SELNAVINST 4000.31	Quality Assurance (QA)	1. Have the elements of QA been considered for the material life cycle, i.e., contract definition, engineering development, production and service life? 2. Has life cycle costing been considered?

IV. PROJECT DOCUMENTATION

	System Description	1. Is there a system description written (non-technical)?
NAVMATINST 5200.11B	Project Master Plan (PMP)	1. Is a PMP required? 2. If PMP is NOT required, is an alternate prepared? 3. Has it been approved? 4. Does it cover: Historical data Current requirements/ objectives Summary highlights System description

		Project management plan Project milestone plan Definition plan Development, test, and evaluation plan Production, installation and base loading plan ILS plan Personnel and training plan System effectiveness plan Reliability/maintainability plan?
MIL-M-38784 MIL-M-15071G OPNAVINST 4160.2 SECNAVINST 5233.1B	Tech Manuals	1. Are technical manuals (hardware/software) required? 2. Will they be contracted or done in-house? 3. Have outlines been prepared and approved? 4. Has a valid verification plan been prepared? 5. Have the manuals been validated/verified?
NOSC GUIDES	Progress Reports	1. Do progress reports cover: Complete status Potential problems Financial status Milestone report/status Critical problems?
MIL-STD-490	Specifications	1. Has a system spec (Type A) outline been developed and approved? 2. Has the system spec been developed? 3. Have development specs (Type B) been developed? 4. Have product specs (Type C) been developed?
SECNAVINST 5233.1B	Software	1. Have the software specs been developed? Performance spec Design spec Subprogram design specs Common data base design documentation Program package Operators manual

page 3 of 10

V. PROCUREMENT

FAR	Contract Service	1. Have contractual services been requested from Code 21?
NOSC SUPPLY		2. Has complete procurement package data been compiled?
FAR/DFARS 7.105		3. Has interface between the project and NOSC procurement been established?
		4. Are contractual actions consistent with NOSC procurement practices and lead time?
		5. Is an Acquisition Plan required?
FAR	Contractor	1. Does this project require contractor assistance?
NOSC SUPPLY		2. Has procurement package been planned, prepared, processed and awarded?
		3. Does the contract include sufficient reporting requirements to provide government visibility?
SECNAVINST 7000.17B NAVMATINST 7000.17E	Contractor Cost Performance Measurement for Selected Acquisitions	1. Will the provisions of this directive to Selected Acquisitions apply to this project?
NAVMATINST 4000.15A	Data	1. Are the contract data requirements specified?
		2. Are all specs clear, unambiguous and unrestrictive?
ONM 4335.8	Performance	1. Are contractor performance evaluations made?

VI. SYSTEM ENGINEERING

MIL-STD-490	Specifications	1. Are detailed specs prepared in-house prior to procurement action?
		2. Are design specs complete before development?
		3. Does the Government own all manufacturers' drawings and specs developed?
		4. Are design specs accurate and adequate so that competition will be possible for future procurements?

page 4 of 10

		5. Have feasibility and effectiveness studies been completed and evaluated before major software or hardware commitments are made?
NAVMATINST 4120.97B DOD 4120.3M MIL-STD-680	Standardization	1. Has the system been analyzed with the intent of standardizing common parts, components, and subsystems? 2. Will contract specifications call for standardization?
	Review	1. Is a preliminary design review schedule? 2. Are critical design reviews scheduled?
MIL-STD-499A	Systems Engineering Management	1. Will systems engineering management be implemented? 2. Has a System Engineering Management Plan (SEMP) been prepared?
MIL-STD-499A	Integration/ Interface	1. Has the impact of interdependent tasks on ultimate project completion been evaluated? 2. Have existing systems been studied for interface or transition to the new system? 3. Have detailed interface characteristics of all associated systems been described? 4. Has a person been assigned responsibility for interface control?

VII. DATA MANAGEMENT

NAVMATINST 4000.15A DOD 5010.12	Data Management	1. Will project technical data management be in accordance with the instructions? 2. Has a data manager been appointed? 3. Has a data management plan been prepared? 4. Has a data depository been established?

5. Has a spec tree been established?

MIL-STD-490	Specs
MIL-M-15071G	Manuals
MIL-M-38784	Manuals
WS-8506	Software
MIL-E-16400F	Electronic Equipment
MIL-STD-1369	ILS
MIL-STD-1472	Human Engineering
MIL-STD-785	Reliability

6. Data change provisions established?
7. Have Forms DD-1423 been prepared

VIII. INTEGRATED LOGISTIC SUPPORT (ILS)

NAVMATINST 4000.20B

DOD 4100.35

SECNAVINST 4000.20A

MIL-STD-1369(EC)

Training

1. Has a training plan and schedule been prepared?
2. Does the training plan cover operators, maintenance, personnel and support personnel?
3. Are schedules for personnel training consistent with development, production, and installation schedules?
4. Does the training plan include requirements for training devices and aids to support the training program?

Validation and Verification (V&V)

1. Have V&V plans been prepared?
2. Have site activation surveys and reports been made?

Maintenance

1. Has a maintenance plan been developed?
2. Does the maintenance plan identify maintenance functions and describe maintenance levels at which all subsystem and components are to be processed?
3. Will standardization goals be established early in the project cycle?
4. Is there a system for reporting malfunctions, problems, etc?

	Spares	1. Is there a plan for developing spares and repair parts requirements?
NAVMATINST 4855.1A	Quality Assurance (QA)	1. Has QA been considered for both hardware and software? 2. Who is going to perform QA on tech data (manuals, procedures, drawings)?
MIL-STD-480, 481, 482 & 483	Configuration Management (CM)	1. Is CM required (hardware/software)? 2. Has a CM plan been prepared? 3. Have baselines been established?
NAVMATINST 4130.1A		4. Have all items been identified and listed?
OPNAVINST 4130.1	Software (CM)	5. Has a change control board (CCB) been established?
OPNAVINST 4130.2		6. Are all changes reported to the CCB? 7. Does the CCB secretary report results of each meeting and maintain records?
DODDIR 5010.19(D)		8. Do all subsystems have representatives and alternates?
NAVMATINST 3900.9A	Human Factors	1. Have human engineering considerations been imposed upon concept formulation, design and development of the system?
MIL-STD-1472A MIL-H-46855		2. Has a human engineering plan been prepared?
NAVMATINST 4858.8A	Value Engineering (VE)	1. Has the program and budgetary planning provided for VE considerations and effort during the contract definition and engineering development phases?
FAR, SECT 1, PART 17		2. Has a VE program requirement spec and plan been prepared for application in the system development contract?
MIL-V-38352		3. Do project management plans provide for the continuing integration of VE considerations throughout the life cycle of the systems?
MIL-STD-100A MIL-D-1000 MIL-D-1000/2 MIL-D-1000/1 MIL-D-5480	Drawings	1. Will drawings be prepared in accordance with MIL-STDS? 2. Is there a schedule for the acquisition and development of provisioning documentation?

		3. Does the schedule for procurement and delivery of parts conicide with system delivery?
	Support Equipment	1. Is there a plan for the development of support equipment requirements? 2. Does the schedule for procurement and delivery of approved support equipment coincide with system delivery?
	Packaging and transportation	1. Have packaging and transportation requirements been established for: Operational items End items to be repaired Spare and repair parts

IX. PRODUCT ASSURANCE

NAVMATINST 3000.1	Reliability	1. Has a reliability/maintainability program been established?
NAVSEAINST 3900.2	Reliability and Maintainability	2. Have the SYSCOM's particular requirements been satisfied?
NAVELEXINST 4858.2	Reliability	
NAVELEXINST 4858.3	Maintainability	3. Have the Center's requirements been satisfied?
NAVAIRINST 13070.2	Reliability and Maintainability	
NAVMATINST 4855.1	Quality Assurance (QA)	1. Has a Quality Assurance program been established?
NAVSEAINST 4855.5	Quality Assurance (QA)	2. Have the SYSCOM's particular requirements been satisfied?
NAVELEXINST 4855.2	Quality Assurance (QA)	3. Have the Center's requirements been satisfied?
NAVAIRINST 5400.23	Quality Assurance (QA)	
NAVSEA OD 46574B	Weapons and Combat Systems Product Assurance	

NOSC TD 870	Product Assurance Requirements	1. Has a product assurance program been established?
NOSC TD 432	Product Assurance Guidelines	2. Has the product assurance program plan been completed and approved?
MIL-STD-470/785 882/1472		
NAVMAT P-949		

X. TEST AND EVALUATION (T&E)

ONRINST 5210.2B OPNAVINST 3690.10B SECNAVINST 5233.1B NAVMATINST 3960.6A NAVMATINST 3960.7A	Test and Evaluation (Software/ Hardware)	1. Have overall levels of acceptable performance been established by users? 2. Has a T&E Plan been developed? 3. Does the T&E Plan agree with development schedule? 4. Does component testing take place prior to system testing? 5. Does the test plan include testing of interfaces with associated subsystems? 6. Have training programs been planned and scheduled for test, evaluation, installation and maintenance personnel? 7. Does the test plan clearly delineate the responsibilities and relationships of all agencies (contracting and government) in preparing for the test and evaluation phase? 8. Have test procedures been prepared? 9. Has liaison been established with the Chief and the Commander, Operational Test and Evaluation Force (COMOPTEVFOR) early in the project cycle? 10. At completion of test and evaluation, will all end items be delivered concurrently with documentation and evaluation reports to the user?

XI. SECURITY		
OPNAVINST 5510.1G DOD 5200.1R		1. Has an appropriate Security Classification Plan or Guide been developed for the system components, and documents?
OPNAVINST 5239.1A NOSCINST 5500.1A	ADP Security	1. Have any appropriate security measures been taken if you are acquiring, developing, using, or reconfiguring ADP resources?
XII. SAFETY		
OPNAVINST 5100.8F MIL-STD-882A NAVMATINST 5100.6A	System Safety Program Plan (SSPP)	1. Has a SSPP been prepared in accordance with MIL-STD-882A? 2. Have the SSPP requirements been included in the funding schedules, milestones, and WBS?
NOSCINST 5100.8 BUMEDINST 6470.1A NAVSEA OP3565 NAVAIR 6-1-529 SPAWAR 0967-LP-624-60 NOSCINST 2470.1C OPNAVINST 2410.11B	Electromagnetic Environment	1. Does the electromagnetic environment provide for protection against microwave hazards? 2. Have Center frequency coordination and supporting procedures been followed?

page 10 of 10

Appendix 7J

Project Progress Report

(See subsection 7.11)

PROJECT PROGRESS REPORT

FROM: 1/

TO: 2/

PROJECT NO. 3/	PROGRAM PROJECT 4/				REPORTING PERIOD 5/		DATE 6/
SUB-PROJECT 7/		TASK NO. 8/			SPONSOR 9/		
PRINCIPAL INVESTIGATOR 10/		CODE	TELEPHONE	ASSOCIATE INVESTIGATOR 11/		CODE	TELEPHONE

ACTIVITY STATUS

DUE THIS REPORTING PERIOD

12/

DUE NEXT REPORTING PERIOD

13/

ACTIVITIES IN PROCESS AT END OF REPORTING PERIOD

14/

1 of 3

24/

PROJECT PROGRESS REPORT

MILESTONE STATUS						
15/ NO	16/ MILESTONE IDENTIFICATION	17/ MILESTONE DATE			CHECK ONE 18/	
		SCHED	REVISED	ACTUAL	MADE	MISSED
	19/			TOTALS		

DISCUSS MILESTONES MISSED *(Include reasons, effect on project, remedial action taken, and when)*

20/

PROJECT PROGRESS REPORT

24/ PAGE 3

CURRENT CRITICAL PROBLEMS *(State Nature of problem, impact on project, action to be taken or recommended, and when for each problem)*

21/

ANTICIPATED CRITICAL PROBLEMS *(State Nature of problem, impact on project, action to be taken or recommended, and when for each problem)*

22/

CONTRACTS/PURCHASE ORDER STATUS

CONTRACTOR	AMOUNT	ITEM	DUE DATE	STATUS
23/				

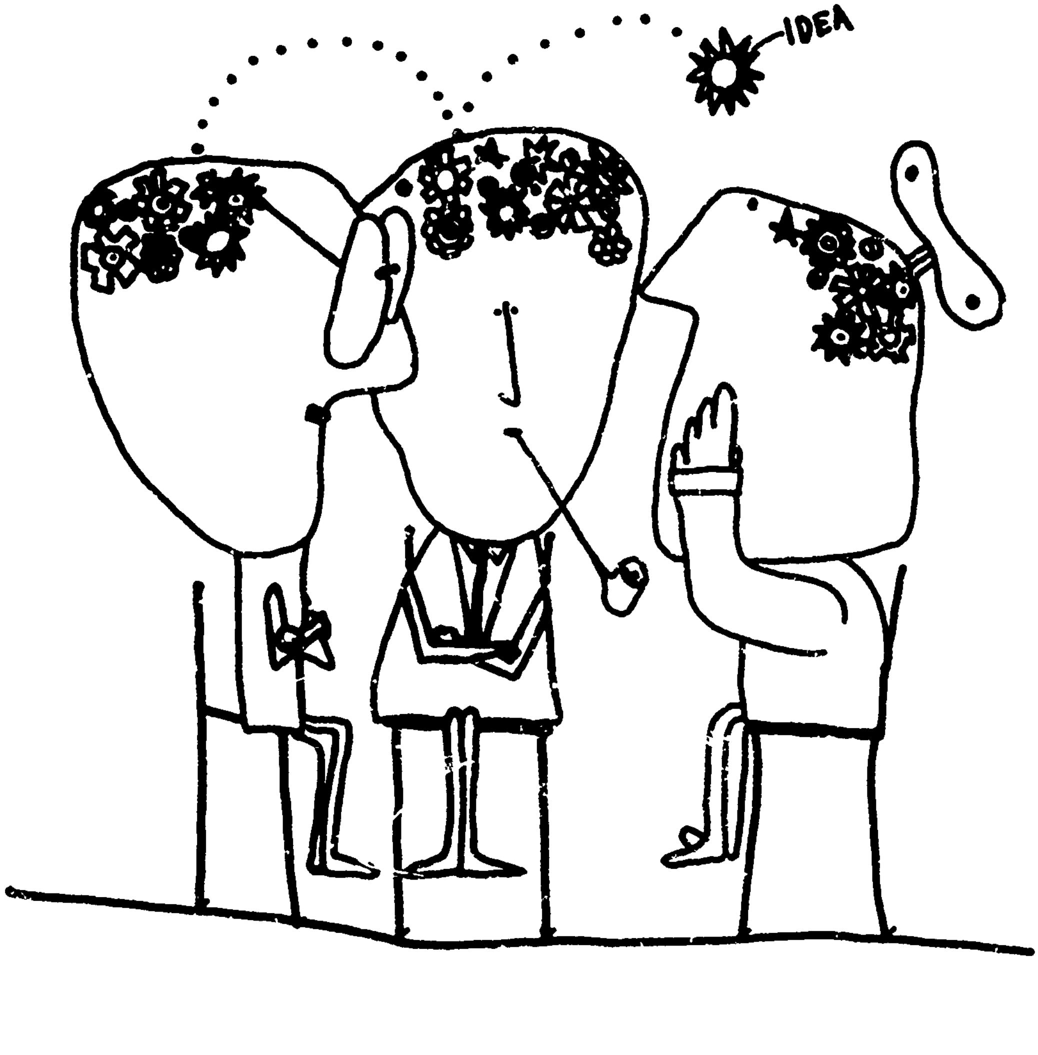
3 of 3

Instruction for preparation and Completion of Project Progress Report

Block	Entry Item	Instruction
1	From	Enter originator's name and code.
2	To	Enter addressee's name and code.
3	NOSC Project	Enter the four digit project number.
4	Project	Enter the short title of the program or project. Identifying acronym may be used, if applicable.
5	Reporting Period	Enter the ending date of the period covered in the progress report.
6	Date	Enter the preparation date of the report.
7	Sub-Project	Enter the System Command's identification number.
8	Task	Enter the System Command's task number.
9	Sponsor	Enter the System Command that sponsors the project.
10	Principal Investigator	Enter the name, code and telephone number of the person responsible for directing the project effort.
11	Associate Investigator	Enter the name, code and telephone number of the primary person responsible for the technical work.
12	Due this Reporting Period	Provide names and status of activities scheduled to be completed during this reporting period.
13	Due Next Reporting Period	Provide names and status of activities scheduled to be completed during the next reporting period.
14	Activities in Process	Provide names and status of activities in process that are related to the accomplishment of milestones.

Block	Entry Item	Instruction
15	Milestone Status Number	Enter sequential number identified.
16	Milestone Identification	Enter name of milestone.
17	Milestone Date	Enter the milestone schedule date. If the milestone schedule date is revised, enter the revised date. Enter date that milestone is completed.
18	Check One - Made/Missed	Enter check mark under appropriate colunm as to milestone made or missed.
19	Totals	Enter number milestones made and number milestones missed in appropriate column.
20	Discuss Milestones Missed	Provide reasons, effect on program/ project, remedial action taken or to be taken, and when.
21	Current Critical Problem	Provide the nature of critical problem, impact on project, action to be taken or recommended, and when.
22	Anticipated Critical Problem	Provide nature of anticipated problem and remediall action planned or taken.
23	Contracts/ Purchase Orders	Provide contractor's name, if applicable, item or name of procurement, due date, and status.
24	Security Classification	Enter the security classification, i.e., CONFIDENTIAL, SECRET, etc., in the upper left-hand and lower right-hand corners of each page.

SYSTEMS ENGINEERING 8



CONTENTS

SECTION 8
SYSTEMS ENGINEERING

8.1 INTRODUCTION

8.1.1 References

MIL-STD-881A	Work Breakdown Structures for Defense Material Items
MIL-STD-499A	Systems Engineering
NOSC TD 108	Project Manager's Guide
NOSC TD 250	Suggestions for Designers of Navy Electronic Equipment

8.1.2 Summary

Systems engineering is both an engineering art and a management discipline. This module for project managers is a concise treatment, which only touches on the key topics and issues, of a very complex topic. Systems engineering is defined and then related to project management. The tasks of systems engineering and systems engineering management are described, and commoly encountered project problems are highlighted. Planning and management tools of importance to project managers are related from a systems engineering perspective. Because of the nature of systems engineering, this module tends to tie together other course topics.

8.2 DEFINITIONS

Systems Engineering: Systems engineering is the application of scientific and engineering efforts to

a. Transform an operational need into a description of system performance parameters and a system configuration through the use of an iterative process of definition, synthesis, analysis, design, test, and evaluation.

b. Integrate related technical parameters and ensure compatibility of all physical, functional, and program interfaces in a manner that optimizes the total system definition and design.

c. Integrate reliability, maintainability, safety, survivability, human, and other such factors into the total engineering efforts to meet cost, schedule, and technical performance objectives (MIL-STD-499).

Chief Systems Engineer: The individual tasked to supervise the systems engineering tasks. Organizationally, the chief systems engineer is also a deputy project manager who is responsible for monitoring and managing the technical progress of the project.

8.3 SYSTEMS ENGINEERING

Systems engineering is the "glue" that binds the project product to the original need. The original requirements statement is provided in operational terms and is usually too incomplete to support technical design decisions. Systems engineering tasks analyze and refine requirements, translate operational requirements into technical requirements, and provide the technical project monitoring and controls that ensure that the product meets performance requirements within the cost and schedule goals of the project. Figures 8.1 through 8.5 reflect some of the issues of concern to those involved in systems engineering.

Often the requirements statement is inadequate to support the project effort. Requirements may be excessive to any imagined mission, attempt to violate physical laws, or be incompletely stated. Any of these problems must be resolved before resources are committed to the design.

Other problems are created by the need to "know everything" prior to beginning the project when, in fact, the project may be advancing the state-of-the-art. Systems engineering disciplines, combined with the information resources of the Center, enable the project team to identify decision points and apply appropriate resources to gain sufficiently accurate information for those decisions.

The chief (or lead) systems engineer is (normally) a deputy project manager. In this role, he/she establishes technical process, ensures communication within the technical team, and oversees the internal review processes. Other major management tasks include costing disciplines and risk management.

Systems engineering includes extensive costing disciplines. These range from techniques of more accurately estimating and projecting project task costs to techniques of establishing and tracking design-to-cost targets and life cycle cost targets. These disciplines are very important to the successful employment of the project product; decisions made in the conceptual phase, through which only a few percent of the total project cost is actually expended, often affect total life cycle costs by as much as two orders of magnitude. Systems engineering allows these cost factors to be properly incorporated in the project decisions before the actual dollars can be known.

Risk management is a tremendously important field, but one which is frequently overlooked. The management of technical risks is a systems engineering function, but many of the risk management techniques bear heavily on project planning. The management of project risks (cost, schedule, and political risks) is a project management responsibility; nevertheless, the project manager may depend heavily on the systems engineer for expertise in project risk management as well. The techniques of risk management are now expressed in well-defined procedures. Projects employing risk management are not, of course, guaranteed success, but project managers who manage risks well are significantly more successful than those who do not.

Throughout the project life, the systems engineering depends heavily on project team experts in design, product assurance, test and evaluation, and other project disciplines The most critical "original" systems engineering tasks occur during the requirements definition and conceptual phases where solid engineering decisions must be made before much of the information used by the other disciplines is developed. It is during these phases that operational requirements are transformed into technical requirements. In the validation, design, production, and deployment phases, the systems engineering role becomes increasingly a design assurance role, coordinating the other technical tasks. As the project product reaches deployment, virtually all tasks are being executed by the designated team experts, and the project manager often assumes the role of the systems engineer. Exceptions to this normal trend include very large projects and projects with continuing product improvement efforts.

Systems engineering interacts with design to determine the appropriate levels of standardization and design ownership; to ensure EMX issues (these are issues concerned with an integrated approach to the study of the total effect of electromagnetics) are properly accounted for; and to make build/buy/modify decisions. Systems engineering and product assurance cooperated to determine level of repair and government/industry design interfaces. These decisions apply to both hardware and software design issues. Another important systems engineering design task is the control of hardware/software interfaces. Each of these areas create test and evaluation issues that the test director and the systems engineer resolve together.

LEVELS OF INFORMATION FOR DECISION MAKING.

0. Noneducated guess 1. Educated guess by a nonexpert 2. Educated guess by an expert	guesses
3. Expert advice 4. Research and analysis	information developed from experience
5. Analysis and simulation 6. Diagnosis of prior experience 7. Partial testing in use (such as a Fleet Research Investigation or Development Assist) 8. Full-scale testing in use (such as an Operational Assist or OPEVAL)	validated information

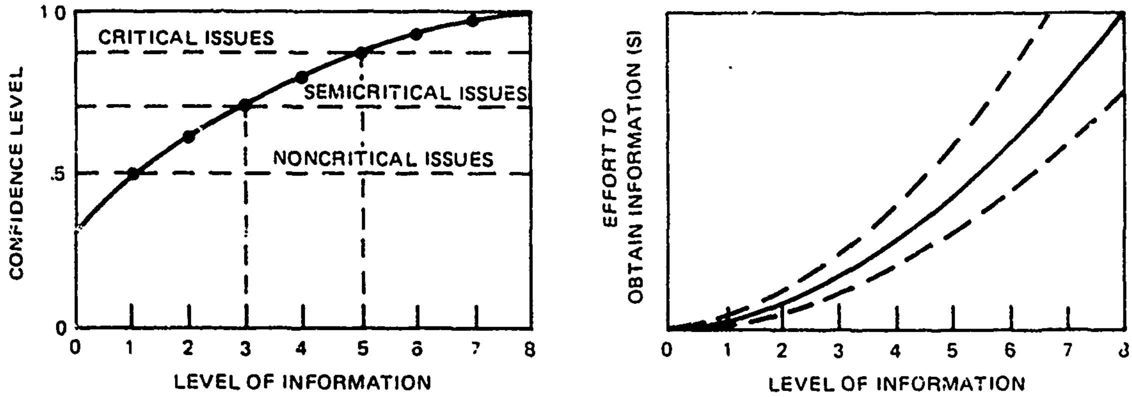


Figure 8.1. Level of information versus confidence and effort to obtain.

ACQUISITION CATEGORY	PROJECT SIZE RDT&E $	PRODUCTION $	
I	> 50M	> 200M	(VERY LARGE)
II	> 20M	> 50M	(LARGE)
III	> 5M	> 20M	(INTERMEDIATE)
IV A	> 1M	> 5M	(INTERMEDIATE)
IV B	> 300k	> 1M	(SMALL)
IV C	> 100k	> 300k	(SMALL)
IV D	EVERYTHING ELSE		(VERY SMALL)

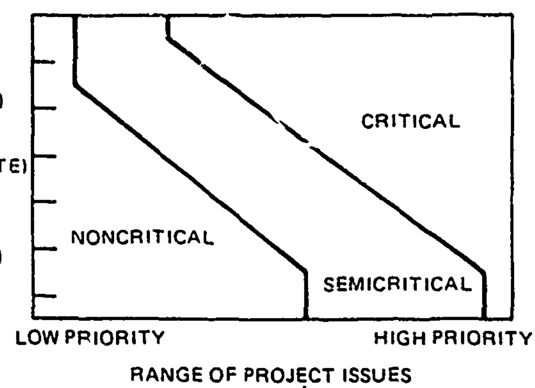
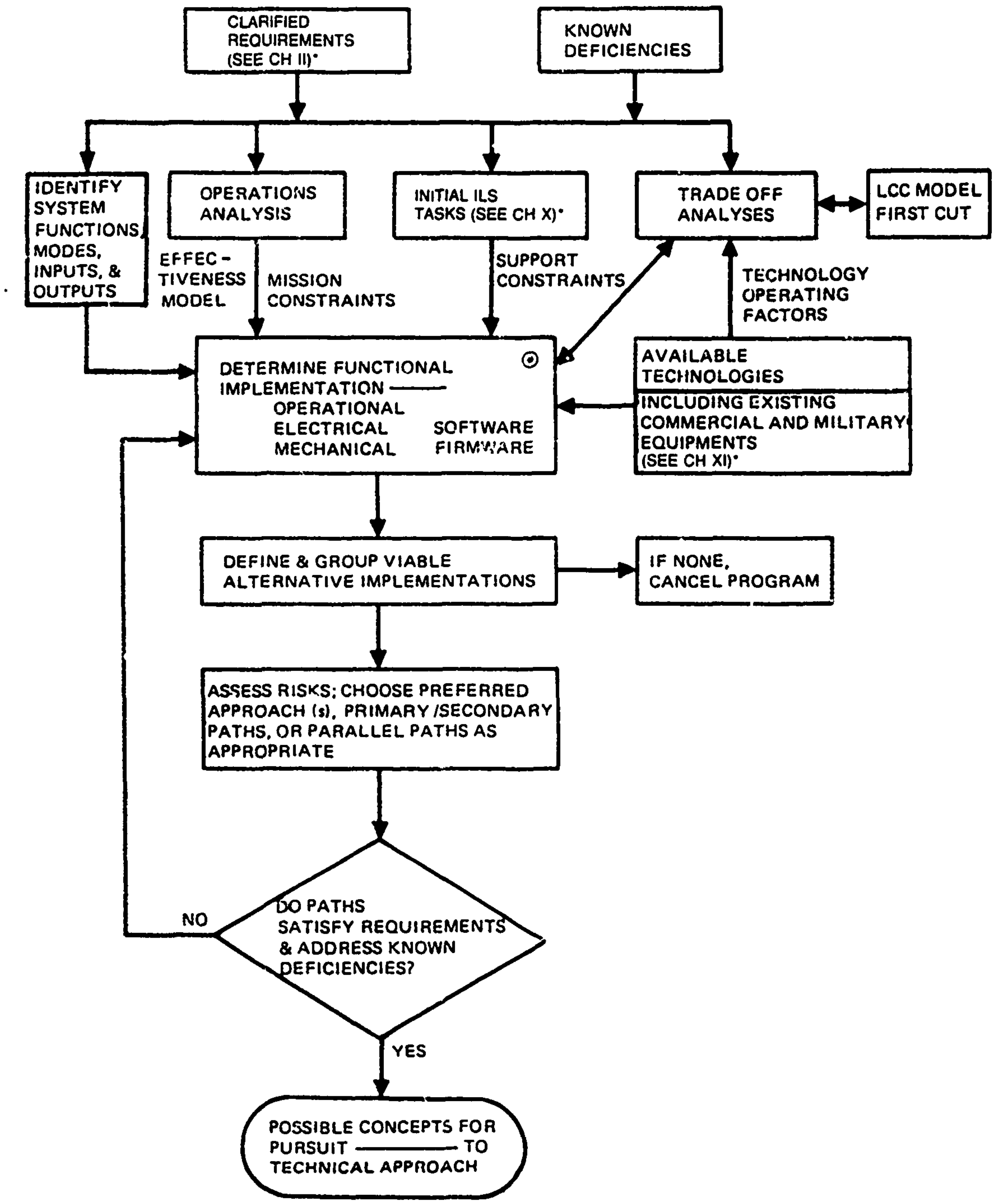


Figure 8.2. Project size versus range of project issues.



*TD 108, Program Manager's Guide

Figure 8.3. Concept formulation.

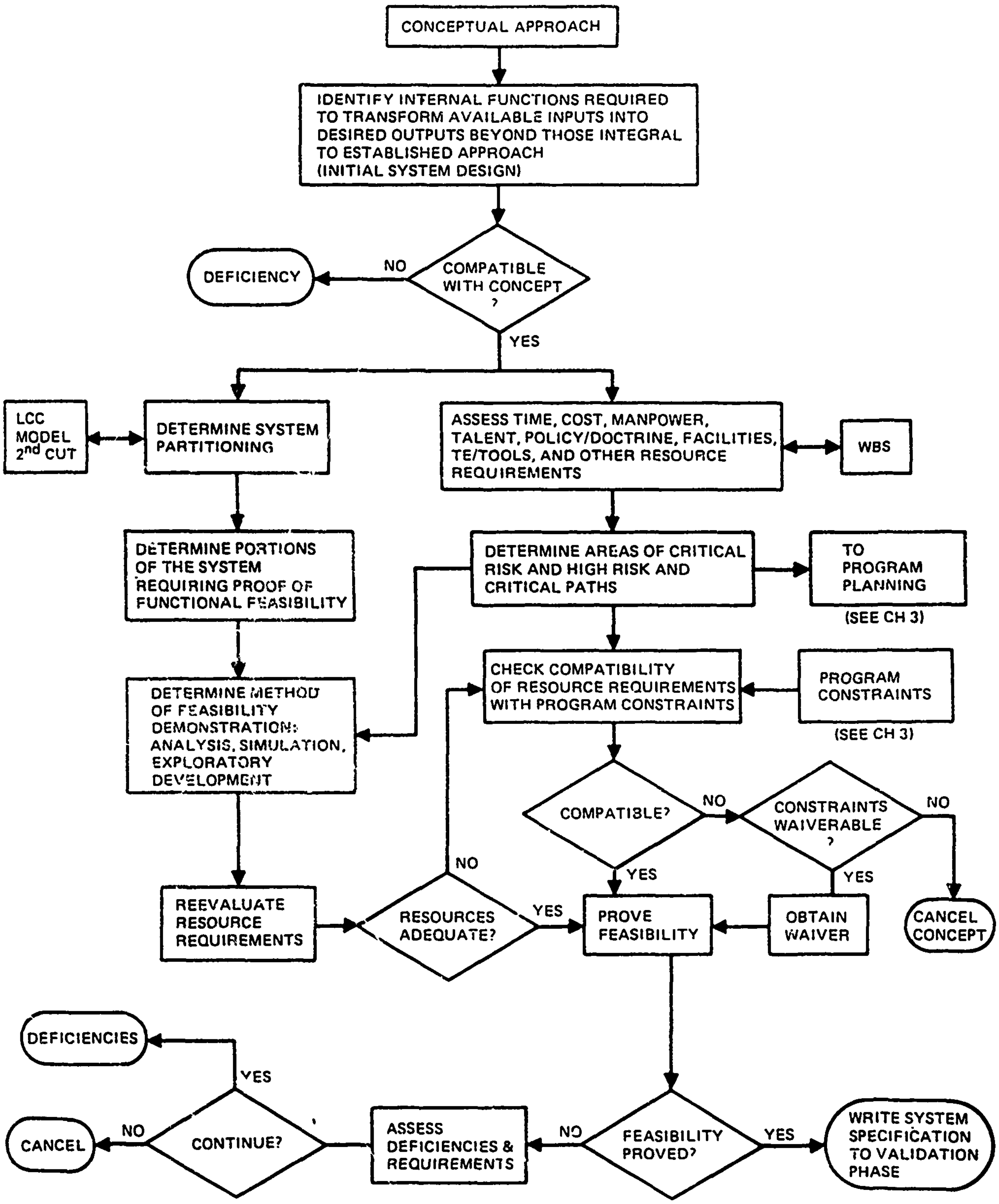
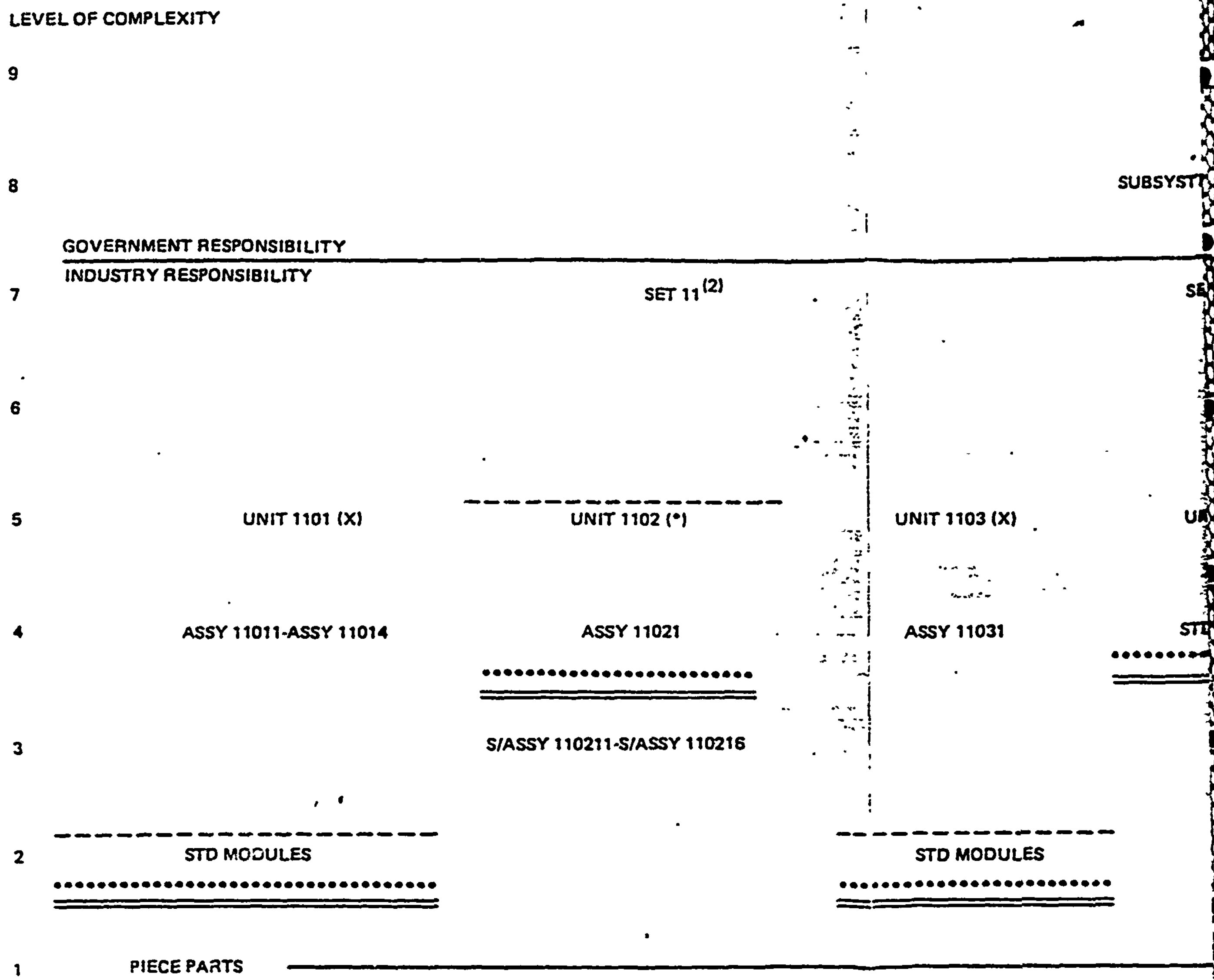
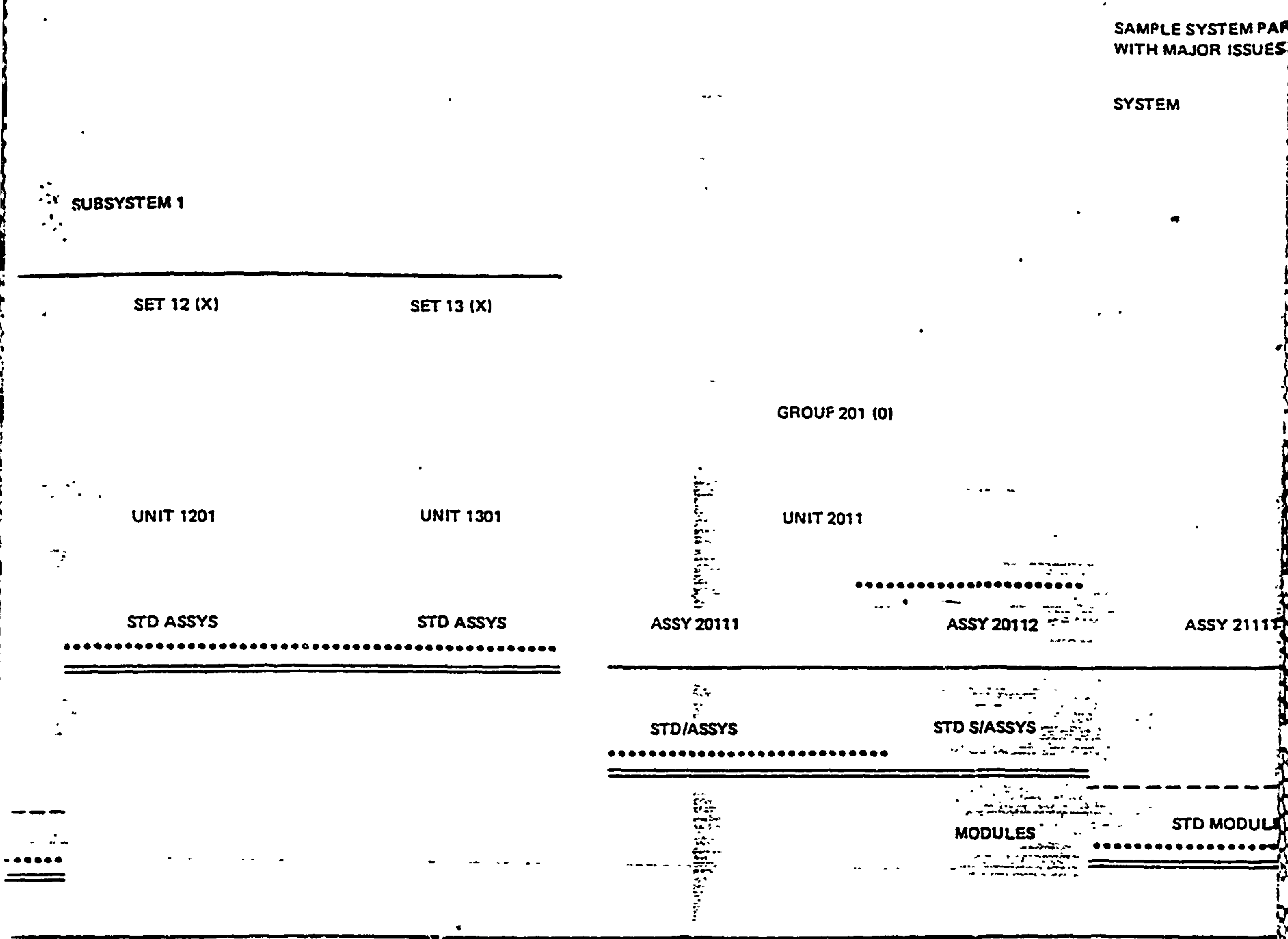


Figure 8.4. Technical approach (for each possible concept).


LEVEL OF COMPLEXITY
9
8
SUBSYST
GOVERNMENT RESPONSIBILITY
INDUSTRY RESPONSIBILITY
7
SET 11(2)
SE
6
5
UNIT 1101 (X)
UNIT 1102 (*)
UNIT 1103 (X)
UN
4
ASSY 11011-ASSY 11014
ASSY 11021
ASSY 11031
STD
3
S/ASSY 110211-S/ASSY 110216
2
STD MODULES
STD MODULES
1
PIECE PARTS

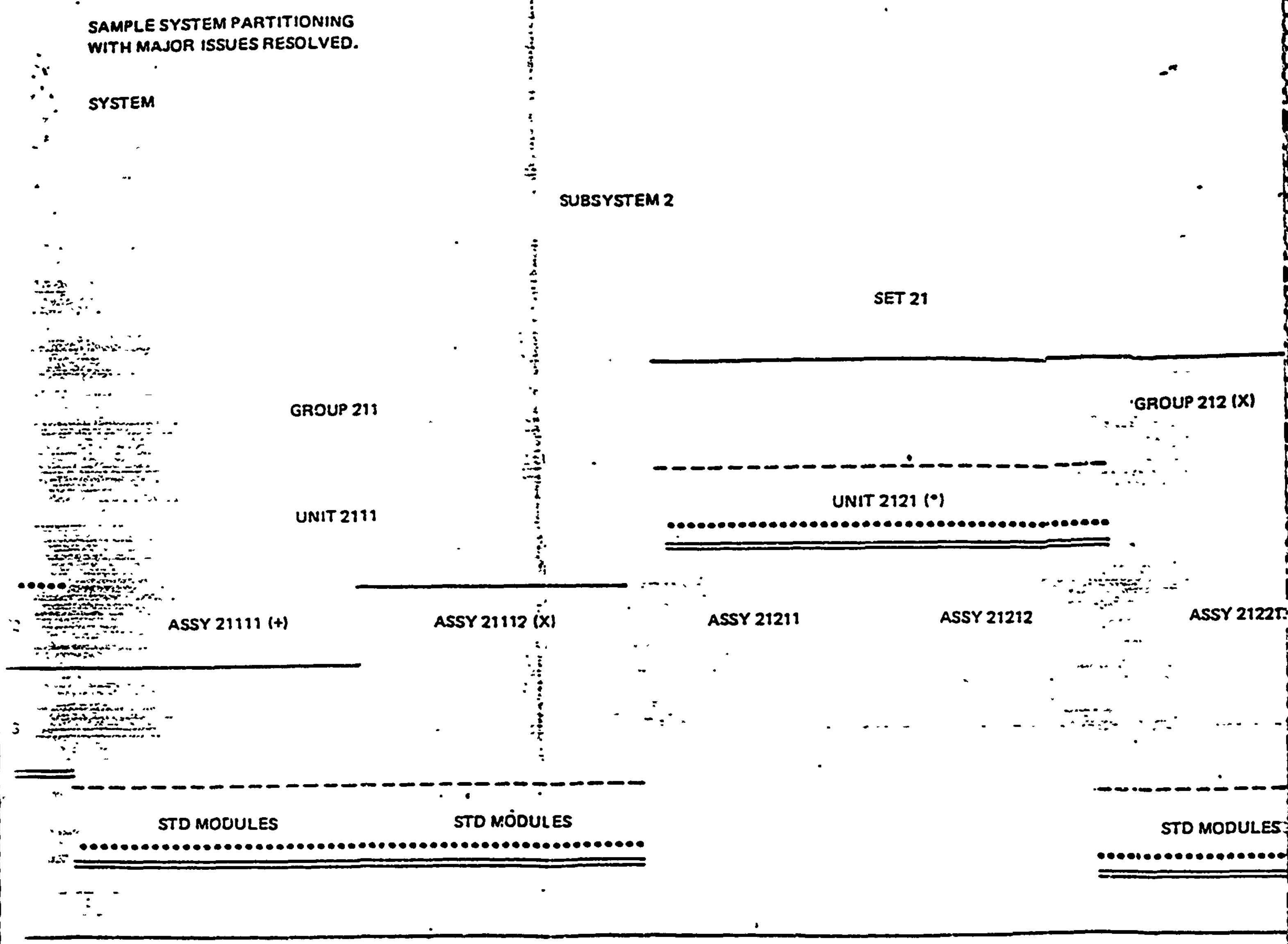


SAMPLE SYSTEM PA
WITH MAJOR ISSUES
SYSTEM
SUBSYSTEM 1
SET 12 (X)
SET 13 (X)
GROUP 201 (0)
UNIT 1201
UNIT 1301
UNIT 2011
STD ASSYS
STD ASSYS
ASSY 20111
ASSY 20112
ASSY 2111
STD/ASSYS
STD S/ASSYS
MODULES
STD MODUL

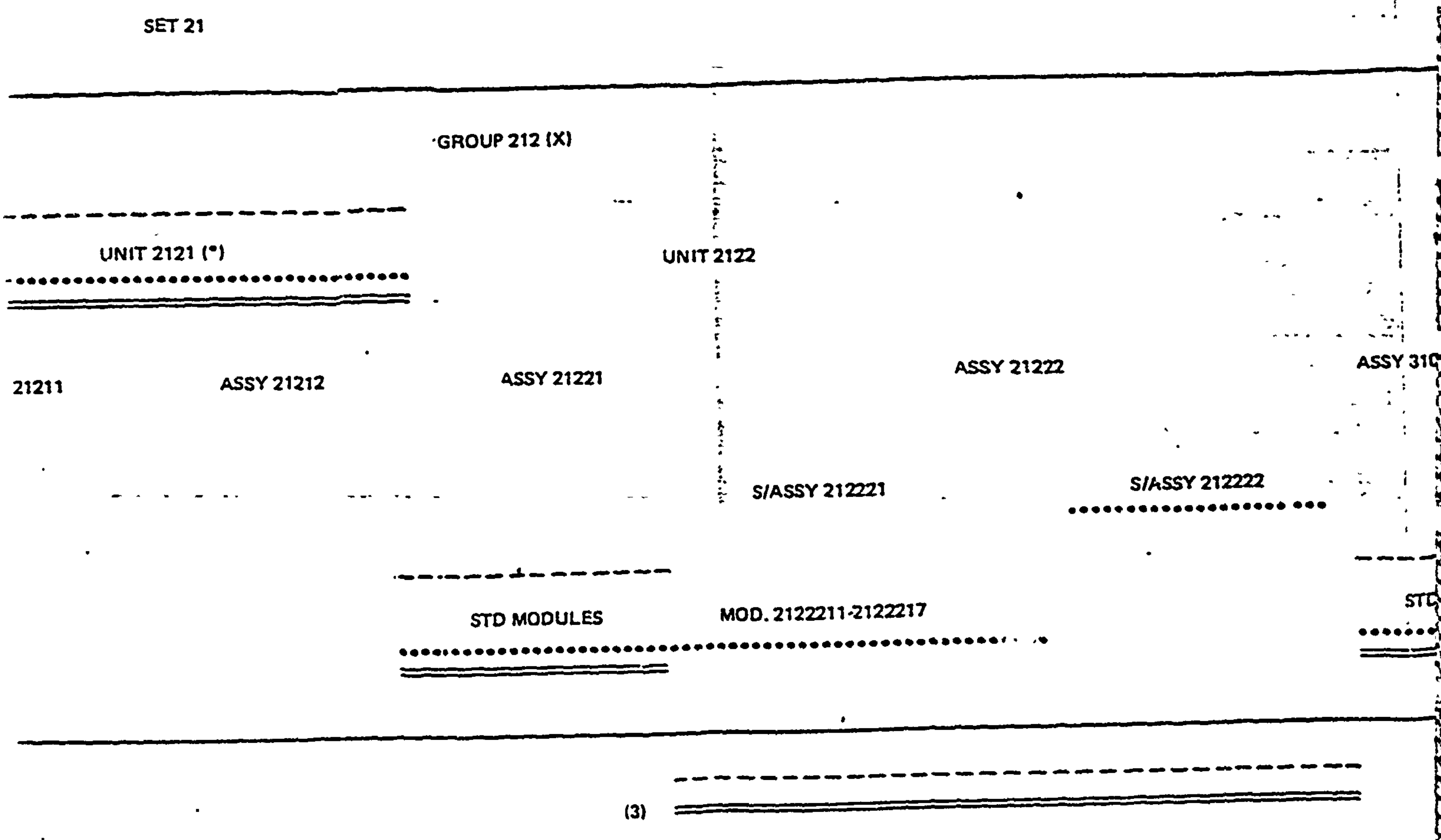
1

2

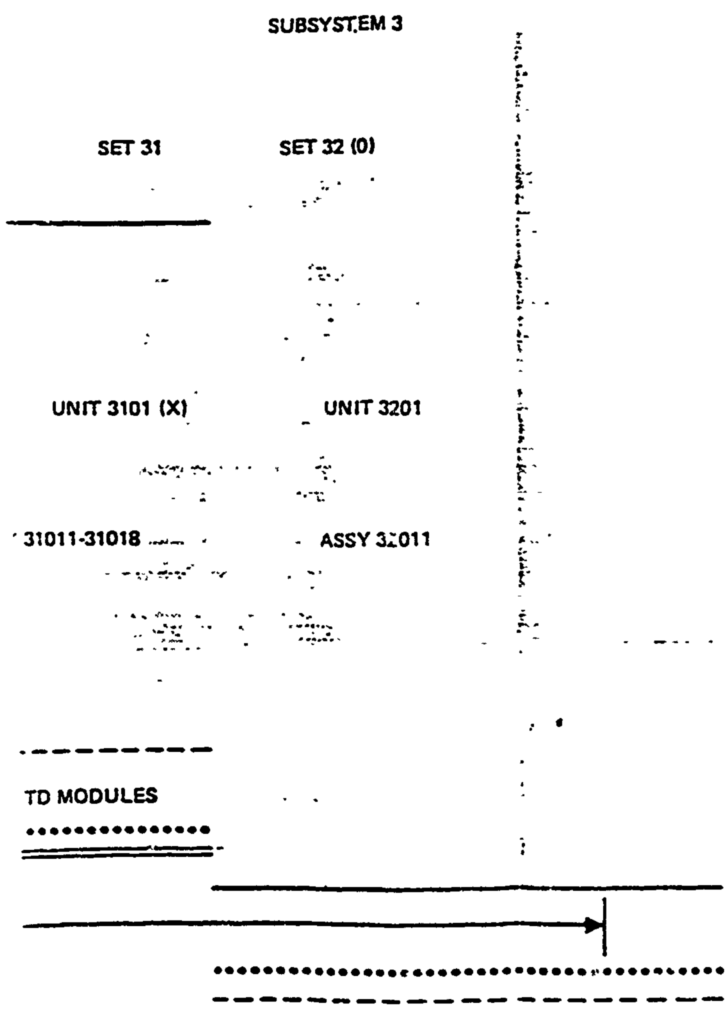
285


SAMPLE SYSTEM PARTITIONING
WITH MAJOR ISSUES RESOLVED.
SYSTEM
SUBSYSTEM 2
SET 21
GROUP 211
GROUP 212 (X)
UNIT 2111
UNIT 2121 (*)
ASSY 21111 (+)
ASSY 21112 (X)
ASSY 21211
ASSY 21212
STD MODULES
STD MODULES
STD MODULES

2 385 1


SET 21
GROUP 212 (X)
UNIT 2121 (*)
UNIT 2122
21211
ASSY 21212
ASSY 21221
ASSY 21222
S/ASSY 212221
S/ASSY 212222
STD MODULES
MOD. 2122211-2122217
(3)

3
485



NOTES: (1) THE LEVEL OF DESIGN OWNERSHIP DETAILS EVERY DESIGN CHARACTERISTIC ABOVE THE LEVEL AND FUNCTIONALLY DESCRIBES THE ITEMS BELOW.

(2) THE TWO COMMERCIAL UNITS ARE PROCURED BY A CONTRACTOR AND INTEGRATED INTO AN ITEM WITHIN THE CONTRACTOR'S TASKED RESPONSIBILITY. IF UNIT 1102 WERE SUPPLIED GFE, THE GOVERNMENT WOULD ASSUME INTEGRATION RESPONSIBILITIES FOR SET 11.

(3) THIS PORTION OF THE SYSTEM INCLUDES A NUMBER OF SYSTEM PECULIAR FUNCTIONS WHICH REQUIRE CLOSE CONFIGURATION CONTROL.

(4) THE LEVEL OF STANDARDIZATION IS SET TO CONFORM TO THE LOWEST OF LOR OR LODO. EACH PARTITION ABOVE THIS LEVEL IS CONTROLLED BY A FUNCTIONAL SPECIFICATION FOR STANDARDIZATION PURPOSES.

GOVERNMENT/INDUSTRY SYSTEM INTEGRATION BOUNDARY

LEVEL OF DESIGN OWNERSHIP (1)

LEVEL OF REPAIR

LEVEL OF STANDARDIZATION (4)

(*) COMMERCIAL EQUIPMENT

(X) INDUSTRY DEVELOPED

(+) EXISTING MILITARY EQUIPMENT

(0) IN-HOUSE DEVELOPED

Figure 8.5. Sample system partitioning with major issues resolved.

585

8.4 ACTION ITEMS

a. Select and involve a chief systems engineer in the proposal stage and carry his/her involvement throughout the project. Changes in systems engineer have had a more negative impact on the project historically than changes in the project manager. The chief systems engineer should be technically knowledgeable in the key project issues, able to communicate and work well with others, dedicated, practical, and inquisitive.

b. Make use of the extensive support assets in Codes 16, 17, 91, 92, 93, 95, and 96. These codes have people experienced in the many critical disciplines associated with systems engineering.

c. Make use of NOSC TD 108. The tips and information contained in NOSC TD 108 are project-tested and proven practical.

d. Formulate the project work breakdown structure in accordance with MIL-STD-881, but extend the WBS to the least significant configuration item. In order to accommodate the natural desire to organize the project functionally (which is more convenient in establishing work agreements and intercode funding), use the last digit of each work package to encode the performing organization. When using computer support, the program can track the project using the WBS configuration or using the project functional organization.

8.5 THE PATTERN OF SUCCESS*

The role of the project manager is to acquire equipment which will perform the required functions at an affordable price and by the time they are needed. In these days of constrained budgets, "affordable" may be defined as the least total cost to the government only with the proviso that the functions to be performed are worth that expenditure. Literally hundreds of studies have looked at defense acquisitions over the past 30 years. Reading the conclusions and recommendations from a 1949 report is like reading the results of a 1974 report. Project after project fails to achieve its goals. Each report is clear; projects fail to meet performance objectives, overrun costs by 150 percent, and slip schedules 25 to 50 percent. In the vast majority of cases, the project goals were not achieved for the following reasons: misspecification (usually gross overspecification creating artificial technical problems), failure to manage risks, obscuring of the project goals through extraneous paperwork requirements, and failure to define adequately what is required. These reasons are, however, only the symptoms of underlying problems in the acquisition community. The TELCAM project looked at successes and failures in industry as well as government; the successful project has the same traits whether in industry or in government. An acquisition project also shares many traits with a small business, so TELCAM also solicited information from the Small Business Administration. Again, success is a pattern, whereas failure is a deviation from that pattern. The major difference between failures in industry and failures in government is that a failing project in industry is usually rapidly terminated; the government failure usually plods on to an elegant wreck.

What is the elusive pattern of success? The projects cited as successes will have two main features:

A strong, knowledgeable project manager who acts as the ultimate authority for all project matters—tasking, budgeting, technical decisions, etc.

A small, dedicated team executing project tasks.

*Excerpted and adapted from NOSC TD 108.

The key words above are strong, knowledgeable, ultimate authority, small, dedicated, and team. Excellent studies of the nuclear power program,[1] the Polaris system,[2] and NTDS[3] are available which show these forces at work. "Strong" appears to be a peculiar necessity in the government projects, as each success seems to attain that status in spite of "the system." An ultimate goal of acquisition R&D must be to change "the system" to allow average individuals to be successful project managers. Until that goal is reached, there is still enough of a task to create knowledgeable managers. Some spectacular failures have been managed by strong, unknowledgeable individuals. A project needs a strong champion in order to "steal" sufficient authority to become a purposeful autonomous entity, but authority unwisely wielded is disaster. The government project manager is not held accountable for his/her actions; accountability is the "quality assurance" incentive used to check authority in industry.

The first procurement of muskets by the Army in 1798 seemed straightforward. Eli Whitney promised to produce and deliver muskets built by assembly-line techniques, and using interchangeable parts, within 8 months; actual delivery was made 10 years late. Our military procurement problems actually predate the nation itself; one verse of "Yankee Doodle" went

> And there we saw a thousand men
> As rich as Squire David,
> And what they wasted every day
> I wish it could be saved

referring to one of General Washington's encampments.

On March 27, 1794, Congress appropriated $768,000 for the *construction and manning* of six frigates. Each frigate was to cost $100,000. When the UNITED STATES, CONSTITUTION, and CONSTELLATION were finally launched in 1797, each cost close to $300,000.

The innumerable instances of procurement problems which have occurred repeatedly over the years have only worsened with time. The evolving acquisition system operated in ignorance in the 1790s, and this basic ignorance exists today throughout the acquisition community. Less than 30 percent of the project managers interviewed by TELCAM knew the operational objective of their project; only 5 percent could relate technical features of the project to operational considerations. Only 2 percent of the project managers were aware of any actions being taken on their project to reduce risks of any kind; only half knew what progress was being made or what difficulties were being encountered on major tasks! Under these circumstances, it is a wonder even greater failures do not occur than those already found. One of the major factors aggravating this situation is the lack of project manager accountability for the end item in the field. A project manager may only influence 4 years of project life, whereas the end item may be in use for over 20 years. The project manager determinations affect all but a few percent of the total life cost of a project.

Figure 8.6 shows the percentage of total ownership costs committed during conceptual planning, design, development, acquisition, and operations for past major programs. In the past, decisions made during the concept and planning phases committed 70 percent of the total life-cycle cost funds of a program, while design, development, acquisition, and operations accounted for only 30 percent of that total cost. The effects of application of life-cycle cost analysis through the planning and RDT&E phases of a program, and the "design to cost" concept on new programs are expected to change this distribution considerably by affecting a larger portion of that early 70 percent commitment.

Notice that 90 percent of the total project cost is fixed after only 10 percent of the funds have been expended. Unless the project manager assumes responsibility for the total, it is impossible to attain

[1]Nuclear Navy (1946-1962), RG Hewlett and F Duncan, Chicago, 1974
[2]The Polaris System Development, Sapolsky, Harvard, 1972
[3]The NTDS Development, RW Graf, United Research, Inc, 29 Jan 1964

the lowest possible project cost. Considering that *support costs may be altered by as much as two orders of magnitude by decisions in the conceptual phase*, it can be seen that a naïve approach to project management can have a devastating effect on operating budgets; likewise, sound management can lead to a highly efficient use of funds.

The acquisition manager should try to obtain equipment which is fully capable of doing the required job and which has the following characteristics:

Reliable
Maintainable
Supportable
Procurable
Producible

8.6 THE PROJECT MANAGER

A manager and a project are established for a single purpose. It makes no difference that the project is designated a major program and its manager a program manager, or that the project is called a tasking with a project engineer in charge. Program manager, acquisition manager, and project manager are, for the purposes of the discussion, synonymous, being different in scope but like in character. Project management is the planning, executing, directing, and controlling of a relatively short-term project or systems-oriented organization established for the completion of specific goals. Those specific goals will be the acquisition and implementation of military equipment and the subgoals associated with each phase of the cradle-to-grave life of that equipment; however, the principles presented are basic, universal, and adaptable to many other project circumstances.

The project manager ideally will plan, organize, monitor, and direct the project to its goals as effectively as possible. Efficiency is a secondary consideration, since maximum efficiency often compromises effectiveness. It is generally agreed that, in the competitive atmosphere of military affairs, ineffectiveness is catastrophic. Organizations which manage for efficiency are called functional organizations. In executing their tasks, the project managers will draw on expert assistance from many functional areas and will establish lines of organization control which will allow them to manage efficiently. In general, project managers have two cardinal rules to follow:

Do not do it yourself—accomplish through the project organization.

Organize your resources to fit the project—be prompt and precise in defining the organization.

The project organization exists within an organization (which will normally be functionally organized). In order to reach its goals, it must live within the chain of command of its parent organization, and it must establish a chain of command within itself. A chain of command is an organization of three elements: responsibility, authority, and accountability. Usually a project's charter will define the project goals without mention of these three elements. Organization instructions may define project manager responsibilities in a general way with only implications of assigning authority and no actual accountability. In practice, the project managers should assume that they are fully responsible for meeting their project goals and they should assume all the authority allowed by law and by their supervision to meet reponsibilities. Within the project organization, project managers will clearly assign responsibilities, delegate appropriate authority, and hold accountable each responsible individual. The key to success will often be the manager's authority and ability to exercise and delegate it. Outside the project, managers should elicit the cooperation of those who have authority above them, to ensure that they are backed up by keeping their chain of command informed truthfully, concisely, and

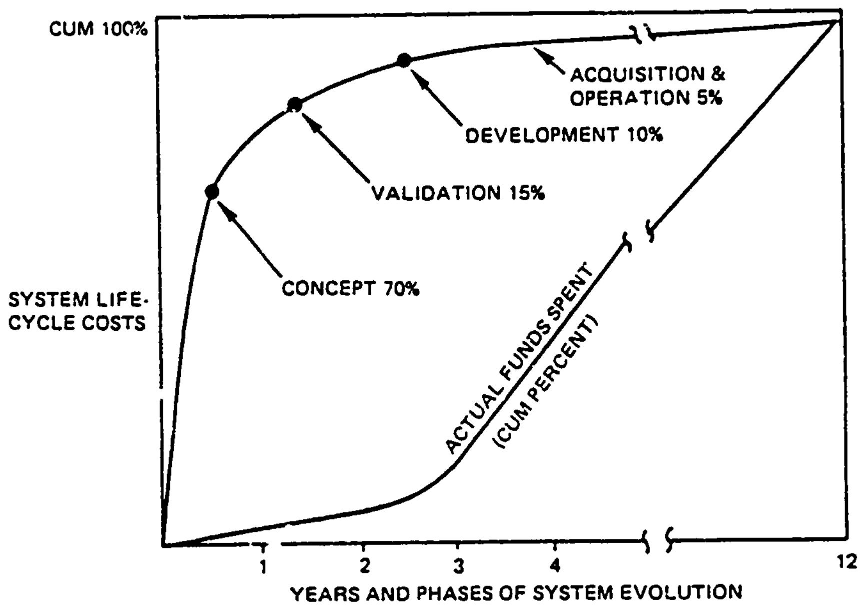


Figure 8.6. Systems funds committed by initial planning decisions.

specifically. Authority is the power to make decisions. It is important to remember that *small decisions must be made.* A *"no decision" is worse than a "wrong decision"* because with the wrong decision managers know what they did and can correct it; with no decision, the situation will inevitably grow worse, perhaps without any indication of the appropriate corrective action. Admiral Nimitz was reputed to have said, "the time for taking all means for a ship's safety is while you are still able to do so." Decisions are required to solve problems; solutions usually result from perspiration—not inspiration. When managers have a problem, they have basically two methods available to solve it; the important thing is that the decision be made.

PROBLEM SOLVING

Classical Method

1. What is the problem?
2. What are the alternatives?
3. What is the best alternative?

Scientific Method

1. Define the problem
2. State objectives
3. Formulate a hypothesis
4. Collect data
5. Classify, analyze, and interpret data against the hypothesis
6. Draw conclusions, generalize, restate, or develop new hypotheses.

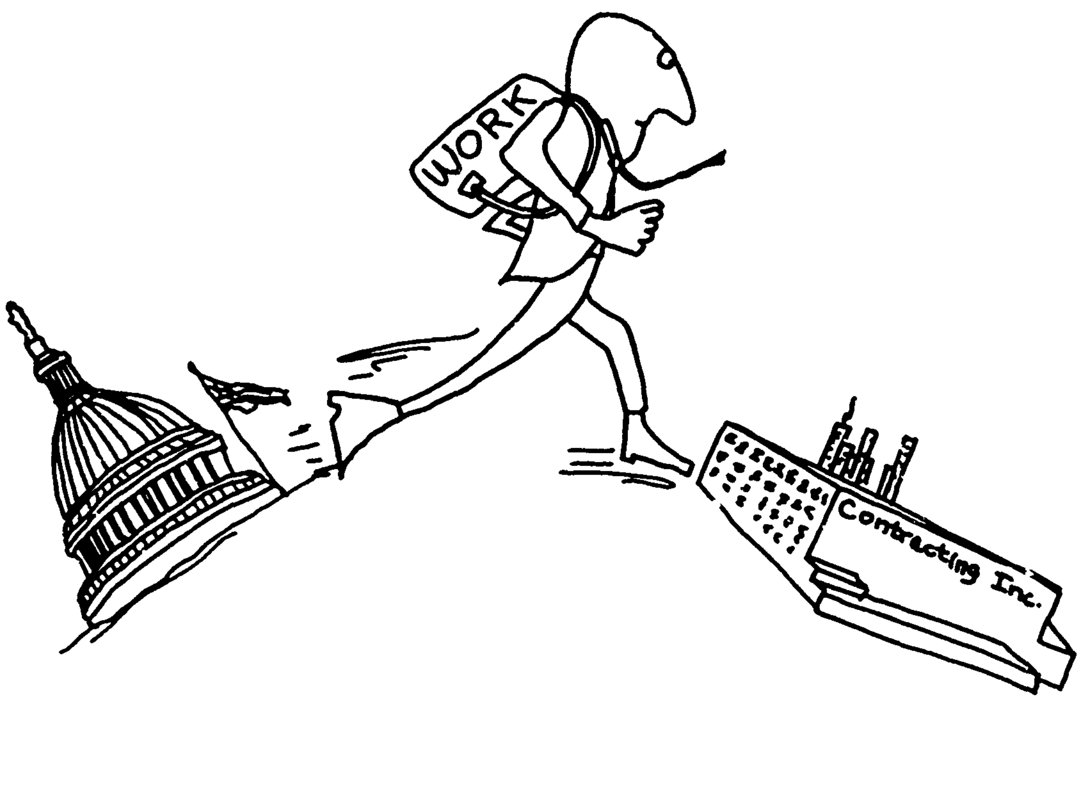
The solution should be kept in perspective by asking, "Is it adequate?" and "Is it too elaborate?"

In order to make decisions, the manager must be informed. The manager uses the project organization and procedures to keep informed of project activities, usually using some form of convenient management information system. Again, the solution is tailored to the needs. On small projects, the project manager will keep directly informed about all the specifics of the project. On large projects, the project manager will rely mainly on reports and plans and will focus on exceptions to the overall plan.

In order to obtain up-the-line cooperation to get higher order decisions, the project manager should know the project and also related projects. In knowing the project, the manager can confidently relate accurate information to his/her superiors. This confidence and frankness can play a role in generating trust which will be valuable if problems requiring outside assistance arise. Also, the knowledge of other projects will assist the manager in recognizing the parent organization's perspective and in establishing a priority to obtain the needed decision. Avoiding "tunnel mindedness" can be very helpful when competing for a share of limited organization resources—especially funding. Avoid "buttering up" reports to show only good news; major problems cannot be covered up and will torpedo this facade. The project must satisfy the parent organization's goals.

The Project Manager's Guide (NOSC TD 108) is offered in recognition of the fact that most project managers are good technical people who may be inexperienced managers. It is also an attempt to offer practical methods to implement the recommendations of the various government studies on reducing costs (see appendix B of the guide), many of which are not addressed by directives and instructions. It is hoped that the guide will serve as a useful navigational tool for managers as they weave their project's course through instructions, budgets, specifications, and the like to a successful implementation in the Fleet.

CONTRACTING 9



CONTENTS

SECTION 9
CONTRACTING

9.1 INTRODUCTION

This section provides a general overview of the procurement process. Both Small Purchase procedures and Contracts procedures will be discussed. These procedures are complex and continuously changing, therefore the information provided here is only intended to familiarize the program manager with the basic workings of the current system. Assistance on individual procurements should be obtained by consulting with NOSC acquisition personnel.

9.1.1 References

NOSC TD 1038, Contract Requirements Guide for Technical Personnel
Navy Supply Acquisition Regulation Supplement (SUPARS) (NAVSUP Publication 560)
NOSCINST 4200.6B
NOSCINST 4330.2A
NOSCINST 4340.1
NOSCINST 4614.1C
DFARS 70.314
DFARS 25.105
DFARS 25.7401
DFARS 25.108
OPNAVINST 5239.1A
NOSCINST 5500.1A
SECNAVINST 4210.7

9.2 ORGANIZATION

The procurement function is performed by the Contracts Division, Code 21. The Contracts Division is part of the Supply Department headed by the Supply Officer, Code 20, and the Deputy Supply Officer, Code 201. Figure 9-1 shows the organization of the Supply Department.

9.3 ACQUISITION CYCLE

The phases that make up the procurement cycle consist of planning, preparation and submission of a requirements package, solicitation, source selection, award, administration, and closeout. NOSC Technical Document 1038, *Contract Requirements Guide for Technical Personnel*, provides information on acquisition planning, requirements package (RP) preparation, and source selection. Contract administration issues as they relate to the requiring technical personnel are covered in the Contracting Officer's Technical Representative (COTR) course. These phases of the procurement cycle will therefore not be covered here.

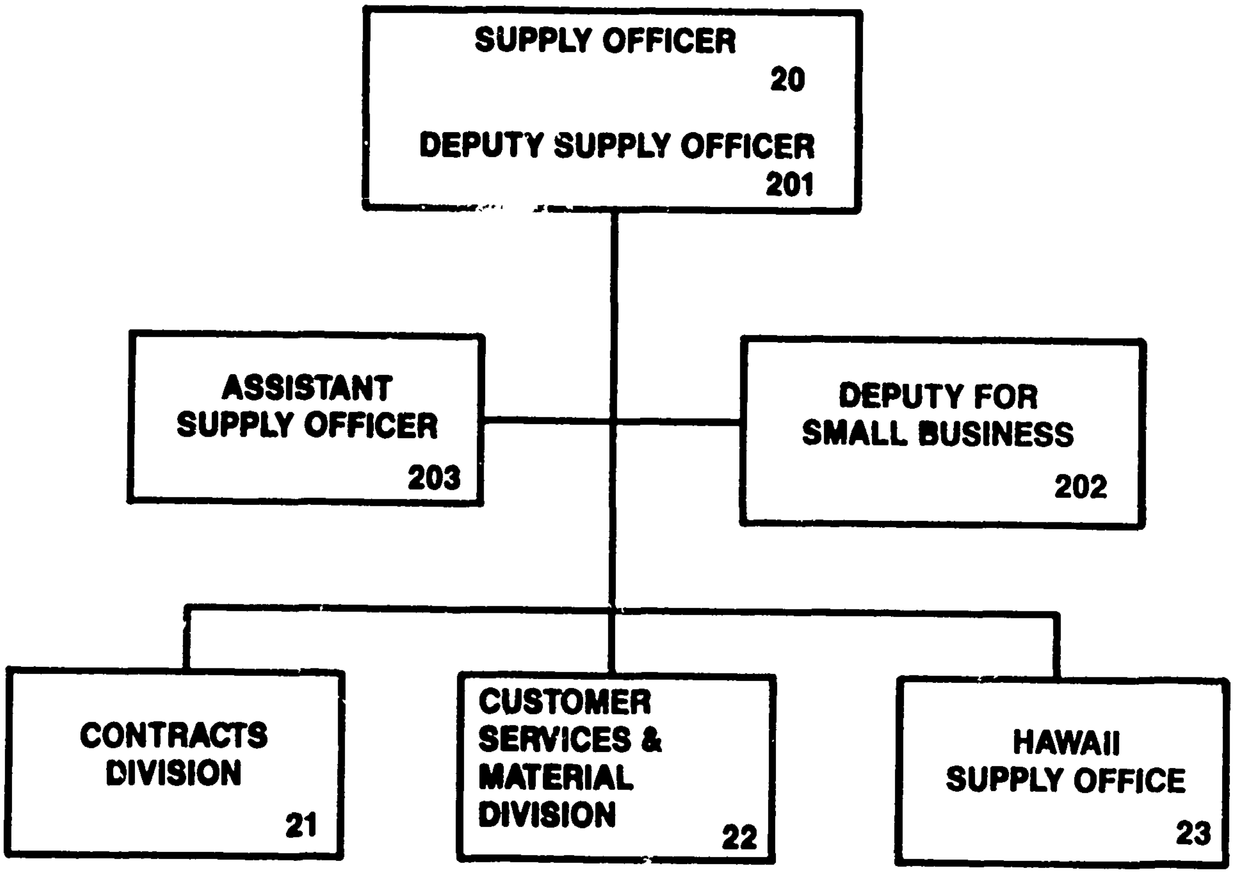


Figure 9-1. Supply Department organization.

9.4 ACQUISITION RESPONSIBILITY

When an RP is received in the Supply Department, it is screened to ensure that the necessary documentation has been provided and that appropriate approvals have been obtained. The supply system is checked to determine if the required supplies can be obtained from stock and to ensure that the commodity does not require forwarding to an assigned agency for centralized buying. If the RP is complete, and the required supplies cannot be obtained through the stock system or by an assigned agency, the request is forwarded to the cognizant contracts branch or purchase branch for processing.

Requirements over $25,000 that are not covered by a GSA contract are sorted by code. Figure 9-2 shows the Contracts Division organizational chart with a list of the codes assigned to each contracts branch. Requirements under $25,000 and requirements covered by GSA contract (regardless of dollar value) are sent to the Purchase Branch. Within the Purchase Branch, the requirement is assigned to a Section based on the commodity being acquired. Table 9-1 provides a listing of the commodities processed by each Section.

In addition to these factors, requirements where patent clauses are appropriate will be forwarded to the contract branch cognizant for the requester's code regardless of the dollar value. Also, requirements that will result in an Indefinite Quantity type contract will *usually* be processed by the code's cognizant contracts branch regardless of the dollar value.

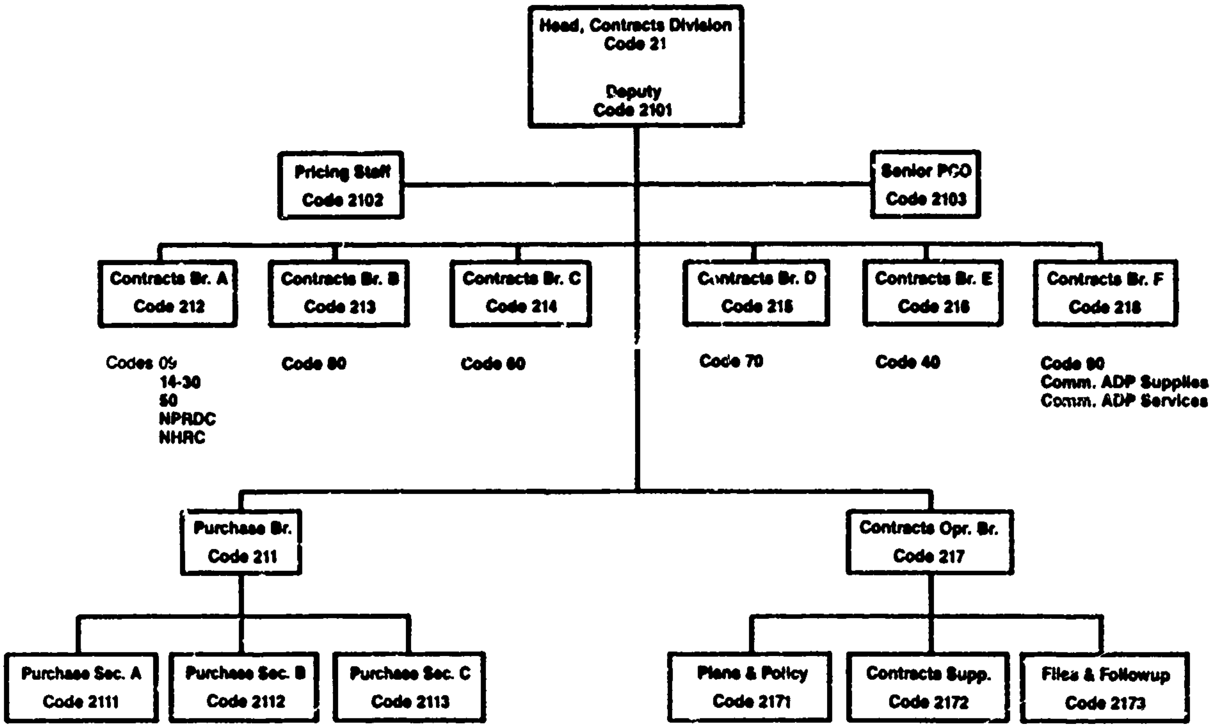


Figure 9-2. Contracts Division and assigned codes.

9.5 SMALL PURCHASE PROCEDURES

9.5.1 Processing of Small Purchase Requirements Packages

When an RP is received in the Purchase Branch, Code 211, it is time-stamped by the receptionist. The receptionist sorts the RPs into two stacks, one for sole source requirements and one for competitive requirements. Each stack is then sorted into groups by priority rating.

Sorted RPs are given to the cognizant Section Head to

a. Screen RPs for deficiencies;

b. Review RPs to determine if they are contained on the "List of Items Requiring Special Attention" set forth in Appendix D to the Navy Supply Acquisition Regulation Supplement (SUPARS) (NAVSUP Publication 560);

c. Route stubs over $25,000 to the Deputy for Small Business for review;

d. Route stubs over $5,000 to the Deputy for Small Business when approval for dissolution of a small business set-aside is required; and

e. Assign the RP to a buyer.

Upon receipt of the RP, the buyer

a. Considers the priority rating to determine the order in which to process the requirement;

b. Determines whether the requirement is on GSA schedule;

c. Reviews the specification for obvious errors and questions specifications that appear to restrict competition or that contain ambiguous or contradictory statements;

Table 9-1. Commodities processed by each section.

PURCHASE BRANCH - CODE 211

SECTION A (CODE 2111)

Cables/Interface Cables
Communications Equipment
Daisy Print Wheels
Diskettes
Electrical Equipment
Electronic Equipment
Lab Equipment
Laser Print Wheels
Magnetic Tape & Cartridges
Marine Supplies
Test Equipment
Wire

SECTION B (CODE 2112)

Chemicals
Clothing
Copiers
Furniture
Gas
Hardware
Lumber
Medical Equipment/Supplies
Metals
Office Supplies
  (including ribbons and dust covers for Office Equipment)
Photographic Equipment/Supplies
Safety
Security
Subscription Books
Typewriters
Vugraphs/Graphic Supplies

SECTION C (CODE 2113)

Automatic Data Processing Equipment (ADPE)/Supplies
ADPE Services
Printers/Plotters
Software
Software Licenses

Each section is responsible for acquiring repair services, maintenance services, and studies to develop statements of work, applicable to commodities under their cognizance.

d. Determines the appropriate method of solicitation, either written Request for Quotation (RFQ) or oral solicitation;

e. Synopsizes requirements over the thresholds specified by regulation or justifies exempting these requirements;

f. Solicits offerors;

g. Sends quotations to technical personnel for evaluation of the technical acceptability of the supplies/services, if necessary. (See Figure 9-3, the sample request for technical evaluation and Figure 9-4, the sample technical evaluation);

h. Requests additional funds, if required; and

i. Places the order.

9.5.2 Small Business/Small Purchase Set-Asides

Each acquisition of supplies or services that has an anticipated dollar value of $25,000 or less and is subject to small purchase procedures shall be reserved exclusively for small business concerns unless one of the following situations exist:

a. The purchase must be made from required sources of supply, such as Federal Prison Industries and Industries for the Blind and Other Severely Handicapped.

b. The contracting officer determines in writing that there is no reasonable expectation of obtaining quotations from two or more responsible small business concerns (or at least one, if the purchase does not exceed $2,500*) that will be competitive in terms of market price, quality, and delivery.

c. The contracting officer does not receive a quotation from a responsible small business concern at a reasonable price or the quotation does not meet the required delivery date or specification. In these cases, the contracting officer may cancel the small business/small purchase set-aside and compete the purchase on an unrestricted basis.

9.5.3 Purchases Not Over $2,500*

Purchases not exceeding $2,500 may be accomplished without soliciting competition *if* the contracting officer finds no reason to question the reasonableness of the price. Because the administrative cost of verifying price reasonableness may more than offset potential savings from detected instances of overpricing, the purchase price is only verified when

a. The buyer or contracting officer suspects the price may be unreasonable based on previous procurement history or personal knowledge.

b. The acquisition is for an item for which no comparable pricing information is readily available (e.g., an item that is not the same as, or is not similar to, other items that have been recently purchased on a competitive basis).

The Federal Acquisition Regulation (FAR) Part 13 requires that purchases under $2,500 be distributed equitably among qualified suppliers. If practical, a quotation shall be solicited from other than the previous supplier before placing a repeat order.

---

*The $2,500 threshold was increased from $1,000 by a Class Deviation to the Federal Acquisition Regulation (FAR) and Defense Federal Acquisition Regulation Supplement (DFARS). The purpose of the deviation is to determine whether the increased threshold will result in overall cost savings to the government by reducing the time and resources needed to place an order. Based on information collected during the deviation period, a determination will be made to either (1) return the threshold to $1,000 or (2) revise the regulations to increase the threshold to $2,500.

SAMPLE

21 June 19XX

From: A. C. Buyer, Code 2111
To: T. C. Requester Code 919

Subj: REQUEST FOR TECHNICAL EVALUATION

Encl: (1) Quotations from Contractors
(2) Sample Technical Evaluation

1. Enclosure (1) is applicable to stub requisition number CA213-88, and is forwarded to you for technical evaluation. Enclosure (2) is a sample technical evaluation provided for guidance purposes only.

2. The following contractors have submitted quotations:

   a. S. J. Landon Co.
   b. W. J. Miller Co.
   c. P. A. White Co.
   d. Smith & Associates

3. Please perform a technical evaluation of each contractor's offer to determine if their product meets all of the requirements set forth in the government's specifications. Your written evaluation must include:

   a. Identification of the government specification(s) the product does not meet with a statement that the product is not acceptable;

OR

   b. A statement that the contractor is offering a product that meets the specification in its entirety.

(Note: In order for a contractor to be considered for an award, the product offered must meet or exceed the specification.)

4. No specific format is necessary for your technical evaluation. A memorandum is sufficient.

5. For further information, please contact the undersigned at X2819.

A. C. BUYER

Figure 9-3. Sample request for technical evaluation.

SAMPLE

27 June 19XX

From: T. C. Requester Code 919
To: A. C. Buyer, Code 2111

Subj: TECHNICAL EVALUATION

Ref: (a) Stub Number CA213-88
(b) Request for Technical Evaluation from Code 2111 dated 21 June 19XX

Encl: Quotations

1. The technical evaluation requested by reference (b) has been accomplished and the results are as follows:

a. S. J. Landon Co.

Offered:	Speed at 40 rpm	Required:	80 rpm
	Tolerance at .025%		.01%
	Voltage at 100V		250V

Not acceptable to user

b. W. J. Miller Co.

Offered:	Speed at 50 rpm	Required:	80 rpm

Not acceptable to user.

c. P. A. White Co.
Offered a product that meets all of the critical specifications.

d. Smith & Associates
Offered a product that meets all of the critical specifications.

2. Both P. A. White Co. and Smith & Associates have offered acceptable products.

T. C. REQUESTER

Figure 9-4. Sample technical evaluation.

9.5.4 Purchases Over $2,500 but Not Exceeding $25,000

9.5.4.1 Competition Requirements. The contracting officer shall solicit quotations from a reasonable number of sources to promote competition to the maximum extent practicable and ensure that the purchase is advantageous to the government, price and other factors considered, including the administrative cost of the purchase. Generally, the solicitation of three sources is considered adequate to meet the requirement of promoting competition to the maximum extent practicable. If possible the buyer must solicit quotations from two sources not included in the previous solicitation.

If only one quotation is receive in response to a competitive request for quotations, or the price variance between multiple quotations reflects a lack of adequate competition, a statement shall be included in the purchase file giving the basis for the determination that the price is fair and reasonable.

Solicitations may be limited to one source if the contracting officer determines that only one source is reasonably available. This determination must be supported by a sole-source justification from the requester. NOSCINST 4200.6B provides the required format for a sole-source justification and instructions for its completion. Educational services from a nonprofit institution are exempt from the requirement for a sole-source justification.

9.5.4.2 Determinations of Price Reasonableness for Purchase Orders. The preferred way to determine price reasonableness in purchases over $2,500 is by competitive quotations. In the case that only one quotation is received, or in the case that a lack of competition exists due to wide variances in the price quotations received, the buyer must take further action to determine the price to be fair and reasonable. The methods the buyer can use to make this determination are listed here in order of preference.

a. Price analysis. The buyer must determine that the item is sold commercially in substantial quantities at a price listed in a regularly maintained and published catalog or price list.

b. Value analysis. The buyer must establish *all* of the following facts to support a determination of price reasonableness:

   1. The cost is equal to the item's usefulness
   2. All the features of the item are needed
   3. There is not an alternate item which would be a suitable substitute
   4. The item could not be bought for less

c. Independent government estimate/technical analysis. The requester must provide a reliable independent cost estimate. This estimate must be supported by documentation showing how the estimate was arrived at and should include the amount and type of labor and material required and the cost of each. (See NOSCINST 4330.2A.) By comparing the government estimate with the contractor's quotation, the buyer determines if the price quoted is fair and reasonable.

d. Cost analysis. A cost breakdown is obtained from the contractor. Each element of the price is reviewed by the requester and the buyer to determine if the price quoted is fair and reasonable.

With the exception of the price analysis method, the requester plays a major role in the analysis of the price quotation for items where adequate competition does not exist. The requester must provide the *detailed* supporting information necessary for the buyer to determine price reasonableness.

9.6 GENERAL PROCUREMENT REQUIREMENTS

This section provides information on procurement requirements related to both small purchases and contracts.

9.6.1 Stub Requisition

A stub requisition, NOSC-SD 4235/4 (REV 11-83), must be included with every request for procurement. Table 9-2 provides instructions for completing this form.

Table 9-2. Stub requisition instructions.

Block	Legend	Information to be Inserted
1	Code	Code submitting the requisition
1	Stub Number	Block of numbers assigned by data processing
2	Estimated Cost	Total dollar value of all items on the requisition
3	From: Requester's Name	Name of the person requesting material or services
4	Extension	Telephone extension of the requester
5	Other than NOSC	This block is completed by tenants only (i.e., NPRDC, NHRC, and Public Works)
6	Job order	Enter the appropriate job order or RCP number
7	Fund expiration date	Indicate the actual expiration date of the funds. If the sponsor has imposed an administrative expiration date, indicate this date in block 29.
8	Funded by Project Order	Indicate if the acquisition will be funded by project orders
9	Type of Funding	Indicate the type of funds being cited
10	GFE/GFM authorized	Indicate if government furnished equipment/material will be provided. If so, comply with the requirements of NOSCINST 4340.1.
11	Sole Source	Indicate if the acquisition will be Sole Source. If so, provide documentation IAW NOSCINST 4200.6B.
12	Accept Substitute	Indicate if alternate products would be acceptable
13	Date Material Required	Enter MO/DAY/YR. (See Note (1) on page 9-12)
14	Priority	Enter appropriate priority designator IAW NOSCINST 4614.1C
15–17	Deliver to: Name/ Extension/Code	Enter the name, telephone extension, and code of the person TO WHOM material must be delivered
18–20	Location/Bldg. Trailer/Room	Enter the exact location where material is to be delivered
21–22	Requester Signature, Date	The requester must sign and date the stub. By doing so, the requester certifies that the procurement conforms to the sponsor's intended use of the funds cited.
23–24	Approval Signature, Date	Stubs must be signed by authorized individuals as specified in NOSCINST 4614.1C. NOTE: *The same individual cited in block 3 or 21 cannot sign in this block*

Table 9-2. Stub requisition instruction (contd).

25-27	Internal Approval	Signature of the individual authorized to approve acquisitions of certain commodities requiring internal approval (see the list in Technical Document 1038). The code and date must also be provided.
28	Appropriation	This block must be filled in by tenant activities only. The headings in this block are self-explanatory.
29	Description	Enter full description, unit of issue, estimated unit price, quantity, and suggested sources. If additional space is required, use NOSC-SD form 4235/4A, "Stub Requisition Continuation."
30-32	NOT APPLICABLE	SUPPLY ACTION

NOTE (1). Date Material Required. Each requisition must specify a realistic delivery date based on total lead time to acquire the supplies or services. Lead time is defined as the total time elapsed from the initial formulation of the requirement to actual receipt of the required supplies or services. Total lead time consists of the following

a. Requisition Lead Time. The time from the initial preparation of an RP to the receipt of a procurement-ready RP by the cognizant contract branch.

b. Procurement Administrative Lead Time (PALT). The number of calendar days that elapse from receipt of an RP in the purchasing component to the effective award date of the contract or order. PALT time may be estimated using the timeframes set forth in Table 1 of NOSC TD 1038. If you require assistance, contact your contracting officer for an estimate of PALT for a particular procurement.

c. Production Lead Time. The time from the effective date of the contract to the delivery date specified in the contract. The delivery date must be an actual date, for example, 25 June, or 120 days after the date of contract award, rather than "ASAP" (as soon as possible). If earlier deliveries are acceptable, this should also be noted. A required delivery date is one of such importance that meeting it justifies paying a premium. If the required delivery date is such that upon its passing, the urgency for the requirement diminishes (e.g., the sailing date of a ship), this should be made clear in the RP. The intended end use should be identified with an estimate of financial loss or extent of failure to carry out the mission, if this date is not met. This background information or urgency may enable the contracting officer to negotiate in lieu of formally advertising, regardless of the priority number assigned, and to request approval for the use of overtime premium costs in certain instances.

Unreasonable delivery dates at best cost extra money. At worst, vendors will not bid on, or will protest, a solicitation with unreasonable delivery dates. Both actions will normally delay award far beyond what would have originally been a reasonable delivery date.

9.6.2 Synopsis Requirements

A synopsis is a public notice of proposed contract actions and contract awards. The primary purpose of the synopsis is to improve small business access to acquisition information and enhance competition by identifying contracting and subcontracting opportunities.

All proposed actions in the amount of $25,000 and above must be synopsized in the Commerce Business Daily (CBD). Also, requirements of $10,000 and over must be synopsized if there is not a reasonable expectation that at least two responsive offers will be received from responsible offerors.

Solicitations cannot be issued until at least 15 days after the synopsis is *published* in the CBD. In addition, synopsized procurements must allow a minimum response time of 30 days from the date the solicitation is issued. There is one exception to the 30-day response time. ADP requirements under GSA schedules require only a 15-day waiting period after publication in the CBD prior to award of the order in accordance with DFARS 70.314.

There are some exceptions to the requirement for synopsizing. The ones most likely to apply to NOSC are as follows:

a. The purchase action is classified, and the synopsis cannot be worded to eliminate disclosure of classified information.

b. The requirement is of such an unusual and compelling urgency that the government would be injured unless the purchasing office is permitted to limit the number of sources and not comply with the time periods stipulated by regulation.

c. The requirement is for foreign military sales requiring acquisitic be made from specified sources.

d. The requirement must be made through another government agency as required by regulation or authorized by statute.

e. The purchase action is an order placed under a requirements contract. Requirements not in excess of $50,000 to be purchased under nonmandatory ADP Federal Supply Schedule (FSS) contracts are exempt from the synopsis requirements.

If one of these exceptions applies, the requester should cite the applicable exception and explain the basis for its use. For example, if unusual and compelling urgency is cited, the requester must describe the circumstances that created the urgency and the impact to the government if the requirement is not met by a specified date.

9.6.3 Buy American Act

The Buy American Act requires that in the acquisition of supplies, only domestic end products shall be acquired for public use in the United States. The restrictions of the Buy American Act do not apply to articles, materials, and supplies

a. For use outside the United States;

b. For which the cost would be unreasonable;

c. For which the agen · head determines that domestic preference would be inconsistent with the public interest;

d. That one or more agencies have determined are not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality; or

e. Purchased specifically for commissary resale.

Unreasonable Cost. DFARS 25.105 provides procedures to evaluate the cost of foreign items to determine if the cost of domestic items are unreasonable under exception (b).

Inconsistent with the Public Interest. Under exception (c), the Secretary of Defense has determined that it is inconsistent with the public interest to apply the restrictions of the Buy American Act to the acquisition of defense equipment which is mined, produced, or manufactured in one of the countries specified in DFARS 25.7401. A list of these countries is also included in part 3.4.3 of TD 1038.

Nonavailability. FAR and DFARS 25.108 include lists of articles, materials, and supplies that are subject to exception (d). Agencies may make additional determinations for unlisted items and shall submit these item determinations to the FAR Council for possible addition to the list.

The acquisition of foreign end products or components on the basis of nonavailability shall be made only after a determination of nonavailability has been made and the acquisition is approved

a. at a level above the contracting officer, if the amount involved is estimated not to exceed $25,000;

b. by the chief of the contracting office concerned, if the acquisition is from $25,001 to $250,000;

c. by the head of the contract activity (HCA) or his immediate deputy, if the acquisition is from $250,001 to $2 million; or

d. by the Secretary of the Navy or his designee at a level no lower than an HCA, if the acquisition is estimated to exceed $2 million.

The format for a determination of nonavailability is shown in Figure 9-5. The approval levels indicated are for acquisitions of $25,000 or less.

Acquisitions may be made without this determination if the acquisition is for spare and replacement parts that must be restricted to the original manufacturer or his/her supplier. (In this case, the acquisition must be supported by a sole-source justification if it is $2,500 or more in value.)

9.7 MISCELLANEOUS PROCUREMENT TOPICS

9.7.1 Automatic Data Processing (ADP) Security

Certain security measures may be required when you are acquiring ADP resources. Guidance is available from your Division ADP Systems Security Officer (DADPSSO), the ADP Security Office, OPNAVINST 5239.1A, and NOSCINST 5500.1A.

9.7.2 Nondevelopment Items (NDI)

In accordance with SECNAVINST 4210.7, "Effective Acquisition of Navy Material," the use of Nondevelopment Items (NDI) will be the principal means of satisfying the material needs of the Navy. NDIs are defined as already developed and available hardware and/or software that are capable of fulfilling Navy requirements, thereby minimizing or eliminating the need for costly, time-consuming Government-sponsored research and development (R&D) programs. NDI is usually off-the-shelf or commercial-type products but may also include equipment already developed by or for the Navy, other military services, or foreign military forces.

NDI solutions to stated requirements shall be aggressively pursued by each program manager throughout the acquisition process.

When an Acquisition Plan (AP) is required, it must include a description of the extent to which NDI is planned for use in proposed acquisitions and shall clearly justify those cases where the use of NDI is not feasible or cost effective.

NAVAL OCEAN SYSTEMS CENTER
SAN DIEGO, CALIFORNIA 92152-5000

DETERMINATION OF NONAVAILABILITY

Ref: (a) Procurement Request No. ____________________
(b) Buy American Act (41 U.S.C. 10a-d)
(c) Federal Acquisition Regulation (FAR) Subpart 25.1
(d) Department of Defense FAR Supplement (DFARS) Subpart 25.1
(e) Navy Acquisition Regulations Supplement (NARSUP) Subpart 25.1
(f) Navy Supply Acquisition Regulation Supplement (SUPARS) Subpart 25.1

1. The requirement set forth in reference (a) is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities, of a satisfactory quality. In support of this determination, the following information is provided:

(a) Identification of the contractor:

____

____

(b) Description of the item being acquired:

____

____

____

____

(c) The unit and quantity:

____

____

(d) The unit price and estimated delivery cost of the foreign end product:

____

____

Figure 9-5. Format for a determination of nonavailability.

Procurement Request No.: ______________________

(e) The unit price and estimated delivery cost of the unavailable domestic end product:

____

____

(f) A brief statement indicating the earliest practicable date the domestic end item can be made available, if not immediately available to meet requirements:

____

____

(g) A brief statement establishing the necessity for the acquisition and indicating considerations which have been given to the feasibility of foregoing the requirement:

____

____

____

____

____

____

(h) A statement establishing the nonavailability of any similar or substitute domestic end items, indicating both the required characteristics available only in the foreign end item and the deficiencies of the domestic items:

____

____

____

____

____

Figure 9-5. Format for a determination of nonavailability (contd).

Procurement Request No.: ____________________

(i) A statement describing the relationship of the requirement to the production of any item on the Master Urgency Planning List:

____

____

____

____

2. Based on the foregoing, the reference (a) requirement is determined nonavailable in accordance with references (b) and (c).

Requester	Code	Date
Contracting Officer	Code	Date
Level Higher	Code	Date

Figure 9-5. Format for a determination of nonavailability (contd).

FINANCIAL MANAGEMENT 10

CONTENTS

SECTION 10
FINANCIAL MANAGEMENT

10.1 INTRODUCTION

10.1.1 References

NOSCINST 7300.5C of 6 May 1986, Letters of Intent
NOSCINST 7300.3B of 21 June 1984, Incremental Programming on RDT&E-funded Contracts
NOSCINST 7300.2B of 18 October 1985, Control of Cost Overruns
NOSCINST 7300.6A of 8 May 1986, Correction of Financial Transactions
NOSCINST 7321.1C of 3 November 1986, Plant and Minor Property Control and Accountability
NOSCINST 7300.7A of 2 July 1986, Multiple Funded Contracts

10.2 GOALS AND OBJECTIVES

10.2.1 Budget Division

Figure 10.1 introduces the Budget Division, Code 10, and the following goals and objectives are directed toward improving Center financial management for the benefit of both staff and program managers.

a. Provide training and background necessary to carry out financial management responsibilities.

b. Improve communications with personnel in the financial arena.

c. Improve Center financial planning and budgeting.

d. Assist managers/staff in the understanding and use of Center financial reports.

e. Explain the statutes and regulations that restrict what managers can do financially.

f. Improve Center financial management.

10.2.2 Accounting Division

Figure 10.2 introduces the Accounting Division, Code 12. Code 12 is responsible for

a. Control of Center plant account

b. Payroll

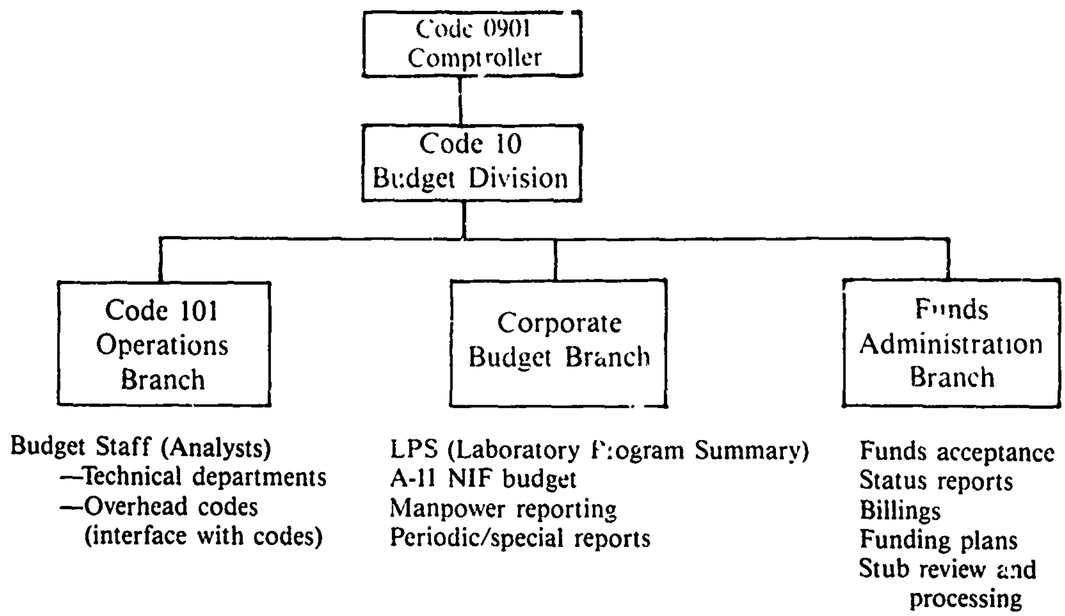


Figure 10.1. Budget Division, Code 10.

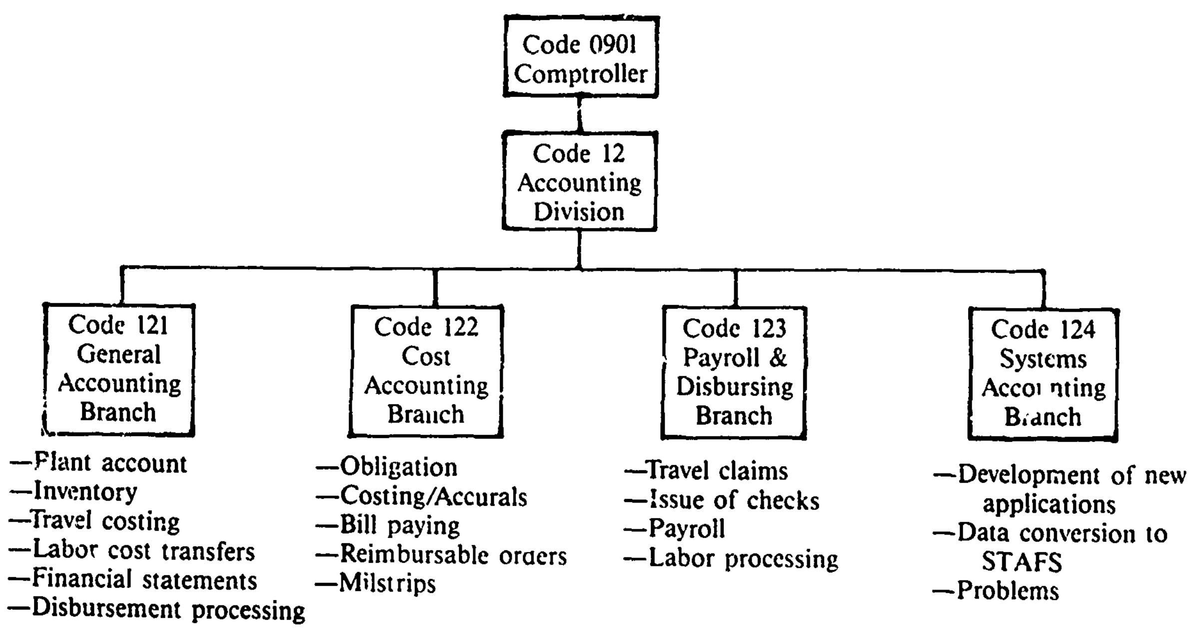


Figure 10.2. Accounting Division, Code 12.

c. Disbursing

d. Vendor payments

e. Process commitments/obligations/costs

f. Preparation of various Center financial reports

10.3 THE NAVY INDUSTRIAL FUND (NIF): WHAT IS IT?

a. The Navy Industrial Fund (NIF) is an accounting system based on the 1949 National Security Act (see Figure 10.3).

b. Revolving fund concept

c. Advantages
   Modern accounting methods
   Start work before funds are available
   Simple compared to other government accounting systems
   All costs originally charged to working capital
   Cost data available by job orders and cost center
   Gives total cost to project

10.4 STABILIZED RATES

a. History

b. Make up of rate

c. How it is applied and to whom

10.5 OVERHEAD/RATES/SURCHARGES

10.5.1 Funded Rates (NOSC Costs)

a. Acceleration — Rate added to labor to recover cost of fringe benefits and leave.

b. General Overhead — Rate added to all direct labor hours to pay for those functions which are general in nature, that is, personnel, supply, comptroller, public works, etc.

c. Productive — Costs within direct cost center which cannot be related to a project. Sometimes called indirect overhead.

10.5.2 Unfunded Rates (Navy Costs)

a. General — Statistical cost of military in general cost center.

b. Production — Statistical cost of military in direct cost center, not working on project.

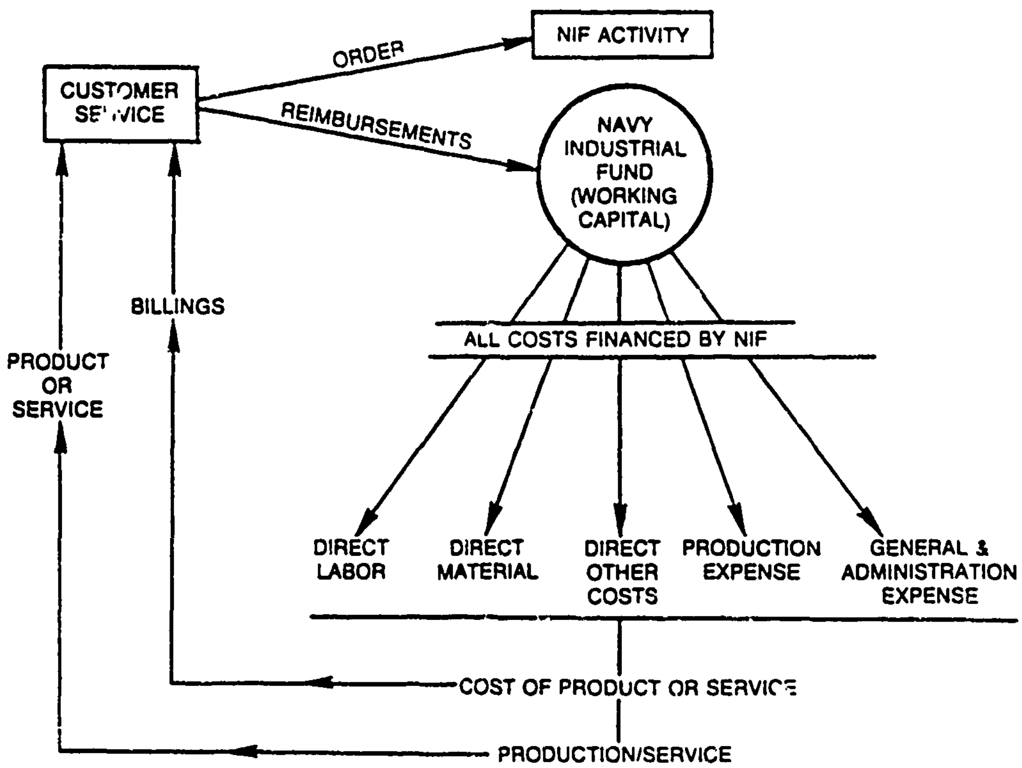


Figure 10.3. The cycle of operations under Navy Industrial Fund (NIF) financing.

10.5.3 Surcharges

a. Civilian retirement

b. Interest on investment

c. Administrative surcharge

d. Packing

e. Transportation

10.6 PROJECT MANAGEMENT REQUIREMENTS

The following are basic requirements in the financial management of projects:

a. Determination should be made, with assistance from the budget analysts, that the funds provided are appropriate for the work to be performed.

b. Work cannot start until the customer order is issued.

c. Only authorized work and associated costs can be charged to job orders under a customer order. All personnel should ensure that they use the correct job order when incurring costs.

d. Prompt action should be taken by the project manager to obtain increased funding when it is evident that work cannot be completed within the current authorization.

e. Immediate action should be taken to stop work on a customer order when funds are depleted.

10.7 ACCEPTANCE OF FUNDS

10.7.1 Funds Required Prior to Start of Work

a. Work cannot be initiated nor costs incurred prior to receipt and acceptance of a valid sponsor order.

b. Exceptions: Commander's Orders/Letter of Intent. These provide the only means of starting work in advance of a regular sponsor order.

c. Procedures at start of fiscal year.

10.7.1.1 Commander's Order. The Commander's Order is characterized by the following:

a. It is limited to an emergency situation such as

Loss or damage when immediate action is necessary to prevent additional loss or damage.

Problem in Fleet requiring immediate attention to avoid loss of life or damage.

Events occasioned by unforeseen security situations.

b. The Center must have documented communication from the sponsor that a funded order will be issued promptly.

c. A Commander's Order expires within 30 days of issuance.

d. A Commander's Order is limited to $250,000.

e. It cannot be used to overcome administrative lead time, which should be considered in advance planning.

10.7.1.2 Letter of Intent. The Letter of Intent is characterized by the following:

a. It may be issued by the sponsor in the interest of economical operations in advance of a regular order.

b. Documentation from the sponsor is required.

c. Accounting citation is required.

d. It constitutes an obligation on the part of issuer.

e. Amount of funding authorized should be stated.

f. It is limited to 30 days performance period.

g. NOSCINST 7300.5C of 6 May 1986.

10.7.2 Types of Funding Documents

The Navy and other agencies use various order forms. Regardless of the form used, these are basic requirements:

a. Work or services must be adequately described.

b. The completion date must be specified.

c. The Center must be substantially in a position to perform the work ordered expeditiously.

d. Government-furnished material (GFM) must be identified.

e. The citation of funds must be sufficient to cover total cost of the requested work.

f. Complete accounting data must be included for billing purposes.

There are several types of orders:

a. *Reimbursable Orders* — Costs are initially charged to the Center NIF account and then billed to the sponsor for reimbursement. This is the most common method of funding. Under this type of order at least 70 percent of the work must be performed in-house.

b. *Direct Fund Citations* — These are issued within DoD. They are used when the request involves primarily procurement or travel. The work is not financed by the Center's NIF account. The accounting cited on the order is used directly on any contract or travel order issued by the Center. The issuer receives copies of contracts or travel orders issued and accounts for all obligations and expenditures.

c. *Cash Deposits* — Required when work is performed for non-DoD federal agencies, private parties, and state or local governments. Deposit required in advance before work can start.

10.7.2.1 Reimbursable Orders. This subsection describes reimbursable orders.

a. Work Request (NAVCOMPT Form 2275)

Issued between Navy headquarters and field activities, and between field activities.

Required for reimbursable work funded by RDT&E, Navy appropriation.

Used for services of a continuing nature and for purposes not applicable to a project order.

At least 70 percent of the work must be performed in-house.

Completion date cannot extend beyond expiration date of financing appropriation or parent order.

Expiration dates for RDT&E, Navy-funded orders are subject to incremental funding restrictions (NOSCINST 7300.3B).

b. Work Request (NAVCOMPT Form 2276A)

Can be accepted as either a reimbursable order or a direct citation, or a combination of both.

Can be accepted as a project order.

c. Requisition (DD Form 1149)

Issued by Fleet units and ships to field activities.

At least 70 percent of the work must be performed in-house.

Similar to a work request (NAVCOMPT Form 2275).

Can be accepted as a reimbursable order or on a direct citation basis.

d. Project Order (NAVCOMPT Form 2275)

Issued between Navy headquarters and field activities and between field activities.

Analogous to contracts placed with commercial firms.

Description of work and terms of order must be specific, certain, and definite.

Work must commence within a reasonable period of time. Project order cannot be issued if start of work is contingent upon issuance of other documents or other authorizing action.

Must serve a bona fide need existing in fiscal year in which issued.

At least 70 percent of the work must be performed in-house.

Completion date can extend beyond expiration date of financing appropriation. All work, including contract or material deliveries, must be completed by date shown on order.

Cannot be issued for primary purpose of extending appropriation.

Must be fully financed from current obligational authority.

Changes in scope or value may be made at any time during period that financing appropriation is available for obligation.

Amendments after expiration of the financing appropriation can be made for
- Price increases (no change in scope)
- No cost changes in scope or completion date.

Project orders cannot be issued when the primary purpose of the order is
Major new construction of real property
Education, training, transportation, travel, printing, communication, etc.

e. DARPA Order

Issued by DARPA to other agencies.

At least 70 percent of the work must be performed in-house.

Can be accepted as a reimbursable order or on a direct citation basis.

Since funding is R&D, expiration dates are controlled by incremental funding policy.

f. Military Interdepartmental Purchase Request (MIPR) (DD Form 448)

Issued between different defense agencies — Navy, Army, Air Force, etc.

At least 70 percent of the work must be performed in-house.

Can be accepted as a project order if it meets qualifications.

Completion date requirements vary depending on appropriation.

g. Orders from non-DoD federal agencies

Issued by other federal agencies such as NASA, DOE, NOAA, Interior, etc.

Forms vary from agency-unique purchase orders to memorandum of understanding.

At least 70 percent of the work must be performed in-house.

Completion dates vary depending on agency rules.

Must have cash advance.

10.7.2.2 Direct Cite Orders. Documents that are to be direct cited, such as requests for contractual procurement (RCPs) or "direct cite" military interdepartmental purchase requests (MIPRs), are accepted through a slightly different procedure than reimbursable orders:

An LPS/DD1498 is not required.

If the requested procurement is not mission related, approval from SPAWAR is required before the Center accepts.

RCPs are reviewed by the Supply Officer, Code 20, prior to acceptance.

NOSC job orders are not used when initiating contracts. The accounting cited on the RCP or MIPR is used directly on the contract. A copy of the RCP or MIPR should be attached to each stub issued.

This subsection describes direct fund citations.

a. Request for Contractual Procurement (RCP) (NAVCOMPT Form 2276)

Issued between Navy headquarters and field activities and between field activities.

Must relate to in-house NOSC program; otherwise CNM approval for acceptance is required.

Should be used for specific contracts.

Should not be used for smaller material purchases.

If supporting in-house services are required, these should be funded by a separate reimbursable order.

Expiration dates vary with appropriation.

b. Requisition (DD Form 1149)

Issued by Fleet units and ships to field activities.

Same rules as for RCP.

c. Letter of Authorization for Travel

Issued between Navy activities to fund specific travel requirements.

d. DARPA Order

Issued by DARPA to other agencies.

Same rules as for RCP.

e. Military Interdepartmental Purchase Request (MIPR) (DD Form 448)

Issued between different defense agencies — Navy, Army, Air Force, etc.

Same rules as for RCP.

10.7.3 Center Acceptance Procedures

All funding documents received on Center are forwarded to Code 103. After internal review and acceptance by the project manager, Code 103 accepts the document and returns it to the sponsor. An accepted reimbursable order becomes an obligation on the sponsor's books. Figure 10.4 presents the fund acceptance procedures for reimbursable orders.

Before acceptance of a fund document, the budget analyst and the project manager must review it to ensure plans are current and that various requirements relating to the document are met.

The following questions are to be considered when accepting a new funding document:

Is the LPS current and approved by the appropriate Center official?

Will 70 percent of the work on a reimbursable order be performed in-house? If not, an RCP or other direct cite document is required.

Is the funding sufficient to complete work?

Is the completion date adequate?

For RDT&E funded work, does the completion date conform to incremental funding requirements?

For project orders, are special requirements met?

Is the type of funding appropriate for the work being performed?

Are purchases of investment items planned? Are funds appropriate?

Are special reporting or accounting requirements specified in the document? Can these be accommodated? by whom?

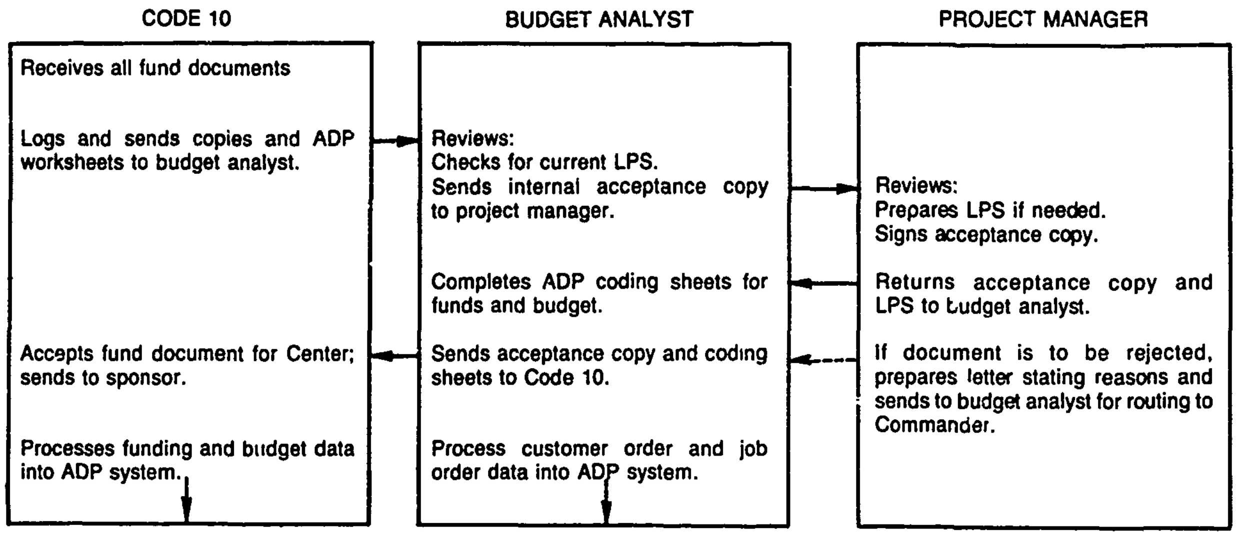


Figure 10.4. Fund acceptance procedure for reimbursable orders.

10.7.4 Comparison of Appropriations

Figure 10.5 and Table 10.1 show appropriations from an expense/investment point of view, while Table 10.2 presents the types of funding appropriations. Table 10.3 presents DoD program elements with a detailed notation of the research and development categories.

The following listings provide a comparison of the different uses of appropriations.

a. Research and Development

Basic and applied research

Studies — theoretical, feasibility, design, engineering, cost effectiveness

Experimental or prototype hardware — design, develop, fabricate, test

Software for tactical and strategic systems (requiring hardware R&D) — design, develop, integrate, test

Product improvement — when expanding current performance envelope

Development test and evaluation (DT&E)

Initial operational test and evaluation (IOT&E)

Investment items and expense necessary for an R&D project

b. Procurement Appropriations (APN, OPN, SCN, WPN)

Investment hardware and software not requiring R&D

Production direct support — production engineering, quality assurance, production testing, equipment assembly (excludes production/procurement program management)

Product improvement — when item is in production and improvement is within current performance envelope

Test articles — acquisition of test articles required for follow-on operational test and evaluation (FOT&E)

c. Operations and Maintenance

Fleet support

Maintenance and repair of operational items

Product improvement of items in operational inventory when items are no longer in production and when improvement is within current performance envelope

Follow-on operational test and evaluation (FOT&E) (except for acquisition of test articles)

Expense items — labor, material, supplies, travel, services

Equipment costing less than $5,000

	Expense	Investment
RDT&E		
Operators and Maintenance	●	●
Procurement	●	
Aircraft (APN)		
Weapons (WPN)		●
Ships (SCN)		●
Other (OPN)		●
Other		●
FMS		
Other Agencies		
Special Deposits		

Figure 10.5. Appropriations.

Table 10.1. Investment/Expense.

(Specific definitions are contained in NAVCOMPT manual vol. 7)

Expense	**Investment**
Equipment costing less than $5,000	Equipment costing $5,000 or more (including software)
Labor used for operations, maintenance and services	Labor used in assembly, production, or construction of investment item and for direct support costs
Spare assemblies and parts not centrally managed	Spare assemblies and parts centrally managed
Nonrepairable spare parts	Modification kits and assemblies
Consumable material and supplies	APA material
Movable furnishings, furniture, and galley equipment (some exceptions)	Facility construction and direct support costs, design engineering
Services	Initial outfitting of major end item of equipment
Rental and leases (some exceptions)	Ammunition and explosives
General motion picture procurement or development	Procurement/production direct support Production testing Quality assurance Product engineering Equipment assembly
Procurement/production program management	
Maintenance and repair Labor, material and equipment incorporated into end-item Replacement of equipment or assemblies installed in major end-item	
Modification (alteration, conversion, modernization) Labor (except for ship conversion) Locally procured material	
Minor construction (less than $200,000 not funded by MILCON or family housing appn)	

Table 10.2. Types of funding appropriations.

Types, Structure, Availability, Uses

	Appn Symbol	Name	Acronym	Availability	Used For
1.	17–1205	Mil. Construction	MCON	No-Year	Investment
		Purpose: Acquisition, construction, installation, and equipment of temporary or permanent public works and facilities of the Navy.			
2.	17–1319	Research, Development, Test, and Evaluation	RDT&E,N	2 Years (12 months for labs)	Research and development Investment and expense
		Purpose: Basic and applied scientific research, development, test, and evaluation.			
3.	17–1453	Military Personnel	MPN	1 Year	Expense
		Purpose: Pay and allowance of Navy military personnel on active duty.			
4.	17–1506	Aircraft Procurement	APN	3 Years	Investment
		Purpose: Construction, procurement, production, modification, and modernization of aircraft, including ordnance, spare parts, and accessories.			
5.	17–1507	Weapons Procurement	WPN	3 Years	Investment
		Purpose: Procurement of missiles, torpedoes, guns, and supporting equipment for naval forces and Marine air forces.			
6.	17–1611	Shipbuilding and Conversion	SCN	5 Years	Investment
		Purpose: Construction, acquisition, or conversion of vessels, including armor and armament thereof.			
7.	17–1804	Operations and Maintenance	O&MN	1 Year	Expense
		Purpose: Expense, not otherwise provided for, necessary for operation and maintenance of the Navy.			
8.	17–1810	Other Procurement	OPN	3 Years	Investment
		Purpose: Procurement, production, and modernization of equipment not otherwise provided for.			
9.	17–4912	Navy Industrial Fund	NIF	No-Year	Expense/Investment (limited)
		Purpose: Production of goods and services at industrial and commercial type activities on a reimbursable basis.			

Table 10.3. DoD program elements with a detailed notation of the research and development categories.

DoD Program Elements

0	Support of Other Nations
1	Strategic Forces
2	General Purpose Forces
3	Intelligence and Communications
4	Airlift and Sealift
5	Guard and Reserve Forces
6	Research and Development
7	Central Supply and Maintenance
8	Training, Medical and Other General Personnel Activities
9	Administration and Associated Activities

R&D Categories

6.1	Research	Scientific study and experimentation directed toward fundamental knowledge and understanding needed for the solution of identified military problems
6.2	Exploratory Development	All effort directed toward the solution of specific military problems, short of major development programs
6.3	Advance Development	All projects which have moved into the development of hardware for experimental or operational test
6.4	Engineering Development	Those development programs being engineered for service use but which have not yet been approved for procurement or operation
6.5	Management and Support	Development, test, and evaluation not separately provided for. Includes facility and military support resources
6.6	Operational Systems Development	All effort having the primary objective of producibility demonstration and R&D phases of final service test of logistical and operational employment of a system approved for procurement and operational deployment

10.7.5 Navy RDT&E Incremental Funding Policy

a. Specific guidance is contained in NOSCINST 7300.3B of 21 June 1984.

b. Goal — to budget and finance RDT&E work in 12-month increments coincident with the fiscal year.

c. Effect on Center Funding

Limits period of time during which the Center can use funds

Limits amount of funding that can be placed on contracts

d. General Policy (see Figure 10.6)

RDT&E appropriation is a 2-year appropriation, but it is usually limited to 12 months availability for labs.

The 12-month availability period can be extended for award of contracts for material or equipment which were initiated during the first 12-month increment, where award was delayed because of contractual or technical problems.

Service contracts awarded by the Center with RDT&E funds cannot extend beyond the completion date on sponsor work request.

Multiyear contracts funded by RDT&E should be funded in annual increments to coincide with the fiscal year.

Fully funded short term contracts (18 months or less) may be issued when it is not feasible to increment.

When budgets are prepared for RDT&E funded projects, managers should take into account these incremental funding requirements.

10.8 SPENDING/CONTROL OF FUNDS

10.8.1 NOSC Project Numbering Structure

The NOSC numbering structure integrates a project number with a customer order and job order numbers. This provides for identification of different areas of work at the project number level, provides funds control at the customer order level, and provides cost accounting by job order. Figure 10.7 illustrates this structure.

Example: CC54831A01

Project No. *CC54*

Customer Order *CC54831A*

Job Order *CC54831A01*

10.8.1.1 Project Number. The project number (the first four alphanumeric characters) identifies the type of work to be performed relative to various Center mission areas and to the specific project effort within that area of work. These mission area indicators are listed in Table 10.4.

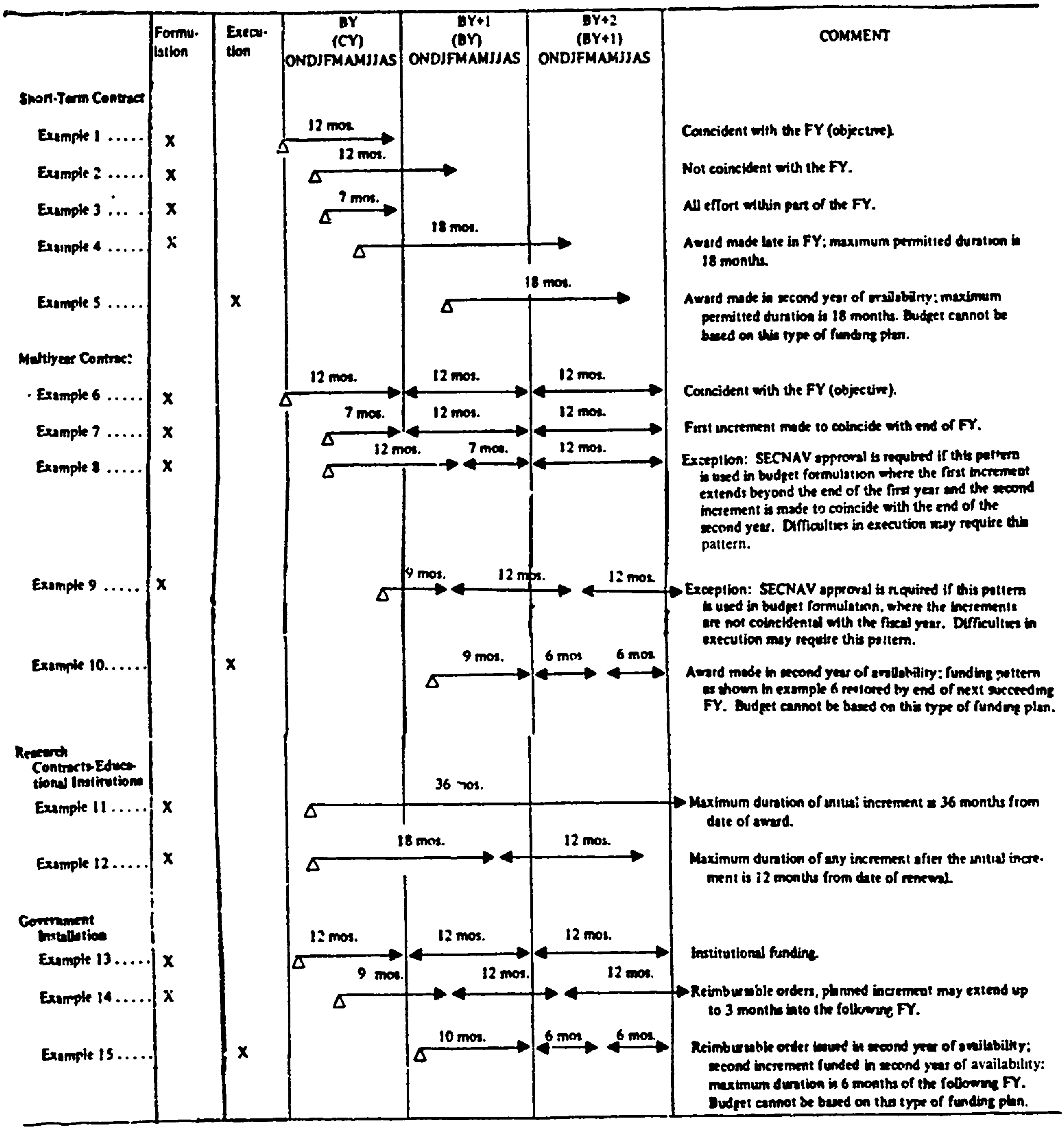


Figure 10.6. RDT&E incremental funding.

10.8.1.2 Customer Order Number. The customer order (the first eight alphanumeric characters) is an extension of the project number, and it identifies the NOSC division managing the customer order, the fiscal year of the funding, and the specific sponsor order which is funding that work. This is the level at which funds are allocated and funds control maintained. In certain limited cases, customer orders may be multiple funded (see subsection 10.8.2 for the ground rules).

NOSC Job Order Example: WT01614A01

Project Number	(4 characters)	—	WT01
Customer Order	(8 characters)	—	WT01614A
NOSC Job Order	(10 characters)	—	WT01614A01

Mission Area	Specific Project	Cognizant Division	Fiscal Year	Customer Order Serial	Job Order Serial
WT	01	61	4	A	01

Project Number — A four-character code identifying the NOSC project.

Character Number	Significance
1	Alpha code for major mission area
2	Alpha code for mission subcategory area
3 & 4	Numeric serial code identifying specific project

Customer Order Number — An eight-character alphanumeric code identifying specific funding or tasks under a project. It includes the project number plus four additional characters.

Character Number	Significance
5 & 6	Two-character numeric code identifying the cognizant division.
7	Single numeric code identifying the fiscal year in which the funds are allocated (e.g., 1984 = 4).
8	Single alpha code identifying the customer order assigned funding. Fund control is exercised at this level.

NOSC Job Order Number — A 10-character alphanumeric code that identifies specific tasks or work areas under a customer order as needed for management control. It includes the customer order number plus two additional characters.

Character Number	Significance
9 & 10	Two-character numeric/alpha serial code used for breakout of the customer order into job packages recording and reporting purposes.

Figure 10.7. Explanation of the 10-character NOSC job order number.

Table 10.4. Mission area indicator in the NOSC project numbering system.

A. SYSTEMS ANALYSIS

AS	Systems Analysis

C. COMMAND, CONTROL, AND COMMUNICATIONS

CC, CD	Command Control
CE, C^3	Systems Human Engineering
CF, C^3	Integration Facility
CG, CH	Communications — General
CM, CN	Communications — Naval Vessels
CS, C^3	Systems
CT	Tactical Sensors

E. ENGINEERING TECHNOLOGY

EC	Computer Sciences
EE	Electronics Technology
EM	Mechanical Engineering
ES	Real-Time Simulation
ET	Manufacturing Technology

F. FLEET SUPPORT

FA	Fleet-Funded Programs
FM	Navy Fleet Support
FN	NSAP Programs

H. HYDROMECHANICS

HM	Hydromechanics

M. MARINE SCIENCE AND TECHNOLOGY

MA	Environmental Acoustics
MB	Airborne Acoustics
MB	Deployed Systems
ME	Environmental Quality
MJ	Radiation Physics
MM	Marine Mammal Technology
MP	EM/EO Propagation
MR	Arctic R&D
MS, MT	Systems & Technology

N. EQUIPMENT & FACILITIES

NC	Construction/Installation
NE	Equipment/Instrumentation
NI	NICRAD Program

P. PROPOSAL

PL	Proposals/Planned Projects

Project Number
4 Characters
X X XX

Serial number identifying specific project.

Letter code identifying sub-category of mission area.

Letter code identifying major mission area.

Sample:

NEARTIP — WT01

ALWT — WT02

Table 10.4. Mission area indicators in the NOSC project numbering system (contd).

S. SURVEILLANCE PROGRAMS	
SA	Aerospace Surveillance
SS	Surface Surveillance
ST, SU, SV	Undersea Surveillance
SX	Ocean Surveillance
SY	Surveillance Systems
T. TESTS AND SERVICES	
TA	ADP/Computer Services
TC	Calibration Services
TD	SACS/FORACS
TE	Environmental Testing
TG	Graphics
TM	Machine Shop Services
TR	Range Testing
TT	Tenant/Military Support
W. WEAPONS SYSTEMS	
WC	Fire Control Programs
WL	Launcher Programs
WM	Missile Programs
WS	Sonar Programs
WT	Torpedo Programs
WX	Countermeasure Programs
X. MISCELLANEOUS SERVICES	
XA, XB, XC, XD, etc.	Miscellaneous
Z. INDEPENDENT PROGRAMS	
ZD, ZE	Independent Exploratory Development (IED)
ZR, ZS, ZT	Independent Research (IR)

10.8.1.3 Job Order Number. The job order is an extension of the customer order formed by adding two digits. It is used to identify specific segments of cost under a customer order as needed for management purposes. The total 10-character job order is used on all financial transactions such as timecards, travel orders, and stub requisitions for procurement.

10.8.2 Multiple Funded Customer Orders

Mixing of funds on a customer order is permitted in certain exceptional cases:

a. Work or end product described on each fund document is the same.

b. Fund documents are of the same type (i.e., all work request, project orders, or other type).

c. Work described on the fund documents is identical in scope (i.e., all require identical portions of various cost elements — labor, material, contracts, etc.).

d. The work schedule starting and completion dates are the same.

e. The fund documents contain identical terms — all reimbursable type orders.

f. Fund documents are received in same year. Carryover funds cannot be mixed with new funds.

g. Funds are under the same appropriation — all RDT&E, all O&MN, etc.

h. RDT&E funds are within the same R&D category (i.e., all 6.1, 6.2, 6.3, etc.).

Where a fund document contains multiple accounting line items (ACRNs) for the same project, these ACRNs must be established as separate customer orders if sponsor task statements correlate to the separate line item. Where no correlation is possible, the funds can be mixed.

Funding segments of a multiple funded customer order will be billed on a percentage basis.

10.8.3 Overhead/Service Center Number Structure

A 10-digit "job order" structure is used to account for overhead and service center expense. The number structure does not contain a project number. Instead, it relates to the cost center having cognizance of the work and the type of expense based on prescribed NIF expense elements. Figure 10.8 shows the NOSC expense account numbering structure.

NOSC Expense Account Number Example: 7140042001

Type of Expense	Cognizant Code	Expense Element or Function	Expense Account Serial
7	1400	420	01
(General Overhead)	(Personnel Division Officer)	(Travel)	(1st Serial)

Figure 10.8. The 10-digit NOSC expense account numbering structure.

10.8.3.1 Type of Expense. A one-digit code identifies the type of expense (4 = service center, 6 = indirect expense, 7 = general expense, 8 = special center-funded function, etc.).

10.8.3.2 Organizational Code. A four-digit code identifies the cognizant organization at the section level.

10.8.3.3 Function. A three-digit code identifies the function where such breakout is required (e.g., training, building maintenance, etc.) or identifies the element of expense (e.g., gas, telephone service, etc.). Table 10.5 provides a representative listing of the expense element/function codes.

Table 10.5. The expense element/function code structure.

10	Severance Pay	40	EEO Training & Support
11	Regular Labor	41	Other Training
12	Overtime	42	Travel (except relocation)
15	Downtime	43	Printing/Duplication
16	Allowed Time	45	Communications
17	Awards	47	Relocation Travel
18	Military Duty	48	Vehicle Rental
19	Traumatic Injury	51	Electricity
23	Material & Supplies	52	Gas
24	Minor Equipment	53	Water
26	Depreciation	54	Salt Water
27	Fuels/Lubricants—Ships	55	Steam
28	Fuels/Lubricants—Other	57	Sewage
30	Other Services—Government	61	MUR Buildings
31	Other Services—Commercial	62	MUR Roads & Grounds
32	Other Services—PWC SDiego	63	MUR Equipment
33	ADP Rentals	65	MUR Mechanical Systems
34	Equip. Rental—non-ADP	66	Janitorial
35	Transportation of Things	67	MUR Service Craft
36	Lease of Land/Buildings	68	Alterations
37	Standard Level User Charges (SLUC)	69	Other Public Works Services
38	Technical Info Services	71	Bids & Proposals
39	Computer Usage	98	Transfers In
		99	Transfers Out

10.8.3.4 Serial. A two-digit code that can be used as necessary to categorize expenses for special purposes.

10.8.4 Commitment/Obligation/Cost/Accrual

a. Use of funds and expiration dates

	Spending Action Required by Expiration Date
Work Request	Obligate/performance on service contract
RCP	Obligate/performance on service contract
Project Order	Completion of work

b. Definitions

Commitment	Reservation of funds for planned procurement
Obligation	Legally binding order/contract/task
Cost	Receipt of goods and services
Accrual	Estimate of value (goods/services) received in a period

c. Types of transactions

See the types of transactions charted in Figure 10.9.

	Commitment	*Obligation*	*Cost*
Labor			X
Travel			X
Stub Requisition	X		
Purchase Order		X	
Contract		X	
Delivery Order		X	
Work Request/MIPR/P.O. (when accepted)		X	
RCP — when contract is awarded		X	
GBL (government bill of lading)		X	
Invoice			X

Figure 10.9. Types of transactions.

10.8.5 Overruns (Reference NOSCINST 7300.2B of 18 October 1985)

a. Prevention of overruns

Review spending trend.

Determine if funds are sufficient.

Advise sponsor ahead of time.

Obtain additional funds.

Stop work — advise all personnel working on project.

b. Center write-off authority

NOSC can absorb small variances (except for Foreign Military Sales [FMS] and private parties) as follows:

Sponsor orders of $10,000 or less — the smaller of $500 or 10 percent of the order.

Sponsor orders over $10,000 — the smaller of $1,000 or 5 percent of the order.

These variances are written off to Center operating results by the Budget Office, Code 10.

c. Disposition of overruns

Cancel or reduce outstanding commitments.

Determine if undelivered material is needed by another project. Initiate transfer.

Prepare letter to sponsor requesting additional funds.

If the sponsor officially advises that funds are not available, the overrun is charged to Center operating results.

d. Overrun reports

Jeopardy

Stop work

Overrun notification

Overruns outstanding

10.9 CORRECTION OF FINANCIAL TRANSACTIONS (NOSCINST 7300.6A of 8 May 1986)

10.9.1 Correction of Labor Charges

Correction of labor charges will be done by either of the following methods:

a. By sending to Code 12 amended time/labor distribution card(s). The card(s) will show both the erroneous and the new job order number and hours and describe the error being corrected. The erroneous job order number and hours will be circled. Each week's labor charge being corrected must be on a separate time/labor distribution card and identify the week being corrected. (See NOSCINST 7300.6A for detailed requirements.)

b. By sending a copy of the "Project/Overhead Status Report" (Report No. 0C1710-7100). The transaction or multiple transactions in error should be highlighted or underlined. The correct job order to be charged should be listed by the transaction being corrected. A description of the error must be included in the report and be signed by the appropriate approving official.

10.9.2 Correction of Nonlabor Charges

Correction of nonlabor charges will be done by sending to Code 12 a Change in Stub Requisition Cost Data (Form 11ND NOSC 7300/3) or a memorandum.

10.9.3 Timeframes

a. Requests for correction of labor charges received by Code 12 *WITHIN 2 WEEKS* of the date reports containing the error were distributed must (1) give an explanation of the error and (2) bear the approval signature of the employee's supervisor, the project manager, the branch head or the division head, as appropriate. Explanations such as "out of funds," "clerical error," "on travel," etc., are unacceptable reasons for correction. Describe the *error*. Such requests will be processed upon approval of the Head, Accounting Division, Code 12.

b. All other transfer requests received by Code 12 (including labor corrections over 2 weeks old) must (1) give a thorough justification and (2) bear the approval signature of the appropriate division head. Such requests will be processed by Code 12 only upon the written approval of the Comptroller, Code 0901.

10.10 PLANT AND MINOR PROPERTY CONTROL & ACCOUNTABILITY (NOSCINST 7321.1C of 3 Nov 1986)

10.10.1 Definitions

a. *Plant Property.* Plant property is all Navy-owned real property and personal property of a capital nature (i.e., with a unit cost of $5,000 or more and a useful life of more than 2 years). There are four classes of property for purposes of management and financial control. The four classes are divided into two groups: real property and personal property.

b. *Real Property*

1. Class 1 — Land.

2. Class 2 — Buildings, improvements, and utility systems. Included in this category are the costs of equipment and the installation of equipment that becomes an integral part of a building, improvement, or utility system.

c. *Personal Property*

1. Class 3 — Equipment having an estimated or actual cost to place in use of $5,000 or more per item, a useful life of 2 years or more, and not classified as "industrial plant equipment."

2. Class 4 — Industrial plant equipment having an estimated or actual cost to place in use of $5,000 or more per item.

d. *Minor Property.* Minor property is property having a unit cost of $300 to $4,999, plus all audiovisual equipment regardless of cost.

10.10.2 Acquisition

Equipment may be financed by

a. *Sponsor.* Plant and minor property purchased with sponsor funds must also be tagged with property decals and includes equipment procured for technical evaluation under special task assignments, equipment unique to a single project, and equipment designed and developed for a single project. Sponsor-purchased items must be disposed of in accordance with the sponsor's instructions.

b. *Asset Capitalization Program (ACP).* Plant property items with a value of $5,000 or greater and a useful life of 2 years or more are procured under the ACP. These items are picked up in the plant property system and later depreciated to a Center job order number. These items will be completely depreciated before disposal.

c. *NIF Funded.* Minor property is financed with Center overhead funds. These purchases are charged to the job order upon receipt of the equipment.

d. *Transfers.* Equipment items are acquired through transfer from

1. *Other Activities.* Equipment is transferred from other activities to the Center. Transfer of accountability is done by an official letter from the transferring activity enclosing the original DD Form 1342.

2. *Sponsors*. Sponsors may furnish plant and minor property to the Center at no cost by

   (a) Authorizing issues from the Appropriation Purchases Account (APA).

   (b) Diverting purchases to the Center under contracts controlled by the sponsor. Authority for the transfer of these items to the Center without cost must be included on the sponsor's order (e.g., Project Order or Work Request) or an amendment thereto. Unless otherwise specified, these items will be picked up in plant and minor property as "New Contributed Equipment" and disposed of later when the item is no longer of any use to the Center.

3. *Donated Property*. The Commander, NOSC, may, under special circumstances, accept personal property as a gift from a private party. Such items must be tagged and accounted for in the same manner as "New Contributed Equipment" and disposed of by the Center when the item is no longer of use.

10.10.3 Depreciation

a. Depreciation records a decrease in the value of assets due to wear and tear or decay.

b. Depreciation is recorded on all assets monthly. Sponsor owned and new contributed assets are statistically depreciated. Assets purchased through ACP and old contributed items must be depreciated as an actual expense. *Only* ACP assets require full depreciation over the life of the asset or upon its disposition. Depreciation can be charged to any job order.

10.11 MULTIPLE FUNDED CONTRACTS (NOSCINST 7300.7A of 2 July 1986)

10.11.1 Policy

a. Multiple funding is to be avoided when possible.

b. Multiple funded delivery/task orders should be infrequent. A purpose of a delivery order contract is to provide a means to order specific work definable to a single source of funding. Costs on a multiple funded delivery/task must be traceable to the correct fund source.

c. Multiple funding must be approved by the Comptroller, Code 0901, before recording an obligation.

d. In no instance will approved multiple funding specify the recording of expenditures on customer orders on a "first-in, first-out" basis.

e. Costing to the customer orders identified on a multiple funded contract, task, or delivery order will be based upon rationale approved by Code 0901 (e.g., number of units procured, the proportion of funds each customer order provides to the total funding) before award.

10.11.2 Responsibilities

a. NOSC program managers are responsible for completing a NOSC Procurement Funding Plan (Form NOSC-SD 7300/20) for all stubs that will result in a completion ("C" type) and/or delivery order ("D" type) contract.

b. The Comptroller, Code 0901, and the Contracts Division, Code 21, are responsible for approving the procurement funding plan when multiple funding is indicated.

10.11.3 Contract Characteristics

a. *Severable*— a contract or task that can logically and reasonably be broken in smaller increments. The test of whether a contract or task is severable or not is whether a smaller portion of the effort can be defined and/or described such that inspection for the purpose of determining compliance can reasonably be made and thereby a basis for acceptance or rejection of the service or supply exists. A contract that calls for a contractor's time and effort rather than a concrete end product would be considered a severable effort. The contract objective is for the Government to receive value as work is being done. A severable contract may not extend beyond the work request expiration or year of the appropriation, whichever is sooner.

b. *Nonseverable* — a contract or task that is the smallest inspectable unit of work. A task is nonseverable when it cannot be further subdivided and when each subdivision can be evaluated for contractor compliance with the Statement of Work. The contract objective is for the Government to receive value when the work is complete. Nonseverable contracts may extend beyond the expiration date of the funding order and/or the year of the appropriation. However, a "*bona fide* need" requirement stipulates that a delivery cannot be set so far into the future so as to imply that there was not a *bona fide* need in the fiscal year ordered.

HUMAN FACTORS 11

CONTENTS

SECTION 11
HUMAN FACTORS

11.1 INTRODUCTION

11.1.1 References

MIL-STD-1472 C, Human Engineering Design Criteria for Military Systems, Equipment and Facilities, 2 May 1981

MIL-H-46855B, Human Engineering Requirements for Military Systems, Equipment and Facilities, 21 January 1979

Human Factors Design Handbook, Wesley E. Woodson, McGraw-Hill Book Company, 1982

Air Force Logistics Command, Human Factors Engineering Computer Based Instructional Course

NOSC TD 250, Revision A, Suggestions for Designers of Navy Electronic Equipment, May 1985

11.1.2 Summary

See text. Also consider the words of Albert Einstein, "Concern for man himself and his fate must always form the chief interest of all technological endeavors."

11.2 GENERAL

Human Factors, Human Engineering, Human Factors Engineering, Man-Machine Interface, Human-Computer Interface, User-Computer Interface, Man-Machine Technology, Ergonomics. These are all terms that are used, sometimes interchangeably, to indicate those investigators who treat the human user as part of the system design process. Human factors engineering, or HFE, is the practice of designing products so that a human being can use these products for their designed purposes, operate them easily, service them, and support them *in situ*. All of this should be accomplished with a minimum of stress and a maximum of efficiency. In simple terms, human factors are characteristics of people — characteristics such as size, shape, ability to see and hear, strength, intelligence, temperament, forgetfulness, and weakness. Such characteristics — the human factors — must be taken into account so that human beings and things made for their use will go well together.

11.2.1 Purpose

The purpose of this section is to provide NOSC program managers with an understanding of the need for and benefits of including human factors expertise as part of the program design team and to provide some useful references to consult for answers to human factors questions.

11.2.2 Background

A report by the Navy Research Advisory Committee on Man-Machine Technology in the Navy, December 1980, stated

> The human element has become the most critical, most problematic and most costly component of the Navy. Meanwhile, increasingly complex hardware systems are being developed and procured for Fleet use.
>
> Given present trends, the Navy will find itself unable to operate and maintain its systems, in either the short or long term, with the numbers of skilled personnel necessary for effective mission accomplishment.

A Report to the Congress of the United States by the Comptroller General in January, 1981, "Effectiveness of U.S. Forces Can Be Increased Through Improved Weapon System Design" concluded

> There are indications that human ineptitude or poor human reliability may cause over 50 percent of all weapon system failures. The increasingly complicated nature of modern military systems together with internal military personnel problems suggests that human-induced errors both in operations and maintenance could also increase unless more attention is paid to this problem during design and development. Weapon systems designs have been dictating manpower requirements. What is needed is a continuing interface between the system designers and the manpower planners with manpower requirements influencing system design and vice versa.
>
> If the design of systems is to adequately consider all the human limitations (including skill levels, proficiency, availability, environmental stress, and fatigue), military specifications, standards, and handbooks must address these factors. Existing documents do not. Also, common methodologies and sources of data are needed to forecast skill levels of potential military personnel 5 to 10 years in the future. This information, which would be extremely valuable to system designers and testers, is currently not available.
>
> Finally, there does not appear to be sufficient emphasis on testing systems from a human reliability standpoint particularly in the developmental stages of the acquisition process. This could result in design errors requiring expensive modifications after the system is deployed.

An Army technical memorandum indicated the importance of the operator's and maintainer's relationship to an item of hardware.

> People are the only responsible agents in the system. No matter how small the roles assigned to people, they are responsible roles. People determine whether the system is ready to operate, what it is to do, how and when it is to do it, when and what variations in performance are to occur, and what constitutes adequate or complete performance. People decide, control, guide change, and evaluate. They are expected to anticipate, detect, compensate for, and explain any undesirable variations in performance. And their errors assume a significance commensurate with their responsibilities.

These relatively recent reports point out the importance of the human being as a system component and reiterate problems that have existed as long as human beings have been required to use tools to perform work. The need for human factors as a discipline escalated during World War II when the armed forces recruited thousands of men from all walks of life and faced the problems of training them to perform unfamiliar tasks quickly with military hardware.

SECTION 11
HUMAN FACTORS

11.1 INTRODUCTION

11.1.1 References

MIL-STD-1472 C, Human Engineering Design Criteria for Military Systems, Equipment and Facilities, 2 May 1981

MIL-H-46855B, Human Engineering Requirements for Military Systems, Equipment and Facilities, 21 January 1979

Human Factors Design Handbook, Wesley E. Woodson, McGraw-Hill Book Company, 1982

Air Force Logistics Command, Human Factors Engineering Computer Based Instructional Course

NOSC TD 250, Revision A, Suggestions for Designers of Navy Electronic Equipment, May 1985

11.1.2 Summary

See text. Also consider the words of Albert Einstein, "Concern for man himself and his fate must always form the chief interest of all technological endeavors."

11.2 GENERAL

Human Factors, Human Engineering, Human Factors Engineering, Man-Machine Interface, Human-Computer Interface, User-Computer Interface, Man-Machine Technology, Ergonomics. These are all terms that are used, sometimes interchangeably, to indicate those investigators who treat the human user as part of the system design process. Human factors engineering, or HFE, is the practice of designing products so that a human being can use these products for their designed purposes, operate them easily, service them, and support them *in situ*. All of this should be accomplished with a minimum of stress and a maximum of efficiency. In simple terms, human factors are characteristics of people — characteristics such as size, shape, ability to see and hear, strength, intelligence, temperament, forgetfulness, and weakness. Such characteristics — the human factors — must be taken into account so that human beings and things made for their use will go well together.

11.2.1 Purpose

The purpose of this section is to provide NOSC program managers with an understanding of the need for and benefits of including human factors expertise as part of the program design team and to provide some useful references to consult for answers to human factors questions.

11.2.2 Background

A report by the Navy Research Advisory Committee on Man-Machine Technology in the Navy, December 1980, stated

> The human element has become the most critical, most problematic and most costly component of the Navy. Meanwhile, increasingly complex hardware systems are being developed and procured for Fleet use.
>
> Given present trends, the Navy will find itself unable to operate and maintain its systems, in either the short or long term, with the numbers of skilled personnel necessary for effective mission accomplishment.

A Report to the Congress of the United States by the Comptroller General in January, 1981, "Effectiveness of U.S. Forces Can Be Increased Through Improved Weapon System Design" concluded

> There are indications that human ineptitude or poor human reliability may cause over 50 percent of all weapon system failures. The increasingly complicated nature of modern military systems together with internal military personnel problems suggests that human-induced errors both in operations and maintenance could also increase unless more attention is paid to this problem during design and development. Weapon systems designs have been dictating manpower requirements. What is needed is a continuing interface between the system designers and the manpower planners with manpower requirements influencing system design and vice versa.
>
> If the design of systems is to adequately consider all the human limitations (including skill levels, proficiency, availability, environmental stress, and fatigue), military specifications, standards, and handbooks must address these factors. Existing documents do not. Also, common methodologies and sources of data are needed to forecast skill levels of potential military personnel 5 to 10 years in the future. This information, which would be extremely valuable to system designers and testers, is currently not available.
>
> Finally, there does not appear to be sufficient emphasis on testing systems from a human reliability standpoint particularly in the developmental stages of the acquisition process. This could result in design errors requiring expensive modifications after the system is deployed.

An Army technical memorandum indicated the importance of the operator's and maintainer's relationship to an item of hardware.

> People are the only responsible agents in the system. No matter how small the roles assigned to people, they are responsible roles. People determine whether the system is ready to operate, what it is to do, how and when it is to do it, when and what variations in performance are to occur, and what constitutes adequate or complete performance. People decide, control, guide change, and evaluate. They are expected to anticipate, detect, compensate for, and explain any undesirable variations in performance. And their errors assume a significance commensurate with their responsibilities.

These relatively recent reports point out the importance of the human being as a system component and reiterate problems that have existed as long as human beings have been required to use tools to perform work. The need for human factors as a discipline escalated during World War II when the armed forces recruited thousands of men from all walks of life and faced the problems of training them to perform unfamiliar tasks quickly with military hardware.

SECTION 11
HUMAN FACTORS

11.1 INTRODUCTION

11.1.1 References

MIL-STD-1472 C, Human Engineering Design Criteria for Military Systems, Equipment and Facilities, 2 May 1981

MIL-H-46855B, Human Engineering Requirements for Military Systems, Equipment and Facilities, 21 January 1979

Human Factors Design Handbook, Wesley E. Woodson, McGraw-Hill Book Company, 1982

Air Force Logistics Command, Human Factors Engineering Computer Based Instructional Course

NOSC TD 250, Revision A, Suggestions for Designers of Navy Electronic Equipment, May 1985

11.1.2 Summary

See text. Also consider the words of Albert Einstein, "Concern for man himself and his fate must always form the chief interest of all technological endeavors."

11.2 GENERAL

Human Factors, Human Engineering, Human Factors Engineering, Man-Machine Interface, Human-Computer Interface, User-Computer Interface, Man-Machine Technology, Ergonomics. These are all terms that are used, sometimes interchangeably, to indicate those investigators who treat the human user as part of the system design process. Human factors engineering, or HFE, is the practice of designing products so that a human being can use these products for their designed purposes, operate them easily, service them, and support them *in situ*. All of this should be accomplished with a minimum of stress and a maximum of efficiency. In simple terms, human factors are characteristics of people — characteristics such as size, shape, ability to see and hear, strength, intelligence, temperament, forgetfulness, and weakness. Such characteristics — the human factors — must be taken into account so that human beings and things made for their use will go well together.

11.2.1 Purpose

The purpose of this section is to provide NOSC program managers with an understanding of the need for and benefits of including human factors expertise as part of the program design team and to provide some useful references to consult for answers to human factors questions.

11.2.2 Background

A report by the Navy Research Advisory Committee on Man-Machine Technology in the Navy, December 1980, stated

> The human element has become the most critical, most problematic and most costly component of the Navy. Meanwhile, increasingly complex hardware systems are being developed and procured for Fleet use.
>
> Given present trends, the Navy will find itself unable to operate and maintain its systems, in either the short or long term, with the numbers of skilled personnel necessary for effective mission accomplishment.

A Report to the Congress of the United States by the Comptroller General in January, 1981, "Effectiveness of U.S. Forces Can Be Increased Through Improved Weapon System Design" concluded

> There are indications that human ineptitude or poor human reliability may cause over 50 percent of all weapon system failures. The increasingly complicated nature of modern military systems together with internal military personnel problems suggests that human-induced errors both in operations and maintenance could also increase unless more attention is paid to this problem during design and development. Weapon systems designs have been dictating manpower requirements. What is needed is a continuing interface between the system designers and the manpower planners with manpower requirements influencing system design and vice versa.
>
> If the design of systems is to adequately consider all the human limitations (including skill levels, proficiency, availability, environmental stress, and fatigue), military specifications, standards, and handbooks must address these factors. Existing documents do not. Also, common methodologies and sources of data are needed to forecast skill levels of potential military personnel 5 to 10 years in the future. This information, which would be extremely valuable to system designers and testers, is currently not available.
>
> Finally, there does not appear to be sufficient emphasis on testing systems from a human reliability standpoint particularly in the developmental stages of the acquisition process. This could result in design errors requiring expensive modifications after the system is deployed.

An Army technical memorandum indicated the importance of the operator's and maintainer's relationship to an item of hardware.

> People are the only responsible agents in the system. No matter how small the roles assigned to people, they are responsible roles. People determine whether the system is ready to operate, what it is to do, how and when it is to do it, when and what variations in performance are to occur, and what constitutes adequate or complete performance. People decide, control, guide change, and evaluate. They are expected to anticipate, detect, compensate for, and explain any undesirable variations in performance. And their errors assume a significance commensurate with their responsibilities.

These relatively recent reports point out the importance of the human being as a system component and reiterate problems that have existed as long as human beings have been required to use tools to perform work. The need for human factors as a discipline escalated during World War II when the armed forces recruited thousands of men from all walks of life and faced the problems of training them to perform unfamiliar tasks quickly with military hardware.

While human beings and machines have been around for a long time, the profession of human factors engineer is relatively young, and it is generally made up of people from varying disciplines such as cognitive and industrial/organizational psychology, physiology, engineering, (all types), industrial design, computer science, anthropology, sociology, systems analysis, biomechanics, operations research, and business and management science. Human factors is truly an interdisciplinary profession with the common purpose of enhancing the performance of the entire system while including the human user as an integral part of that system design.

Human factors engineering is a discipline born of crisis. After every system failure resulting in catastrophic loss, from World War II pilots mistaking landing gear levers for throttles to the Three Mile Island and Chernobyl nuclear disasters and to the space shuttle explosion, accident investigators have tried to pinpoint the causes of failure and in many instances have concluded that the system failed because of human error. Whenever human beings are part of the system there will be human errors. The task of designers is to predict what those are likely to be and take appropriate measures to preclude their occurrence. System designers are most successful in this endeavor when they adopt a human-centered design philosophy and enlist the aid of human factors experts. The tasks of the human factors engineer are then to (1) evaluate the human being as a system component and his or her contribution to the total system; and (2) to influence the selections among design alternatives as they relate to people.

11.3 THE HUMAN BEING AS SYSTEM COMPONENT

In evaluating the human user as a primary system component, the human factors engineer will take into account such human capabilities as the following

a. Information sensors
b. Information processors
c. Response mechanisms
d. Their unique properties as human beings

Human beings as system components exhibit variability in

a. Dimensions
b. Perceptions
c. Reactions
d. Tolerances

All of these human variables are well documented in the anthropometric literature. The *Human Factors Design Handbook* by Woodson has several chapters devoted to the subject. However, it is well to note that even among "homogeneous" populations, for example all Navy males between 17 and 24, the range of dimensions can be considerable. Variability is usually expressed in terms of percentiles. Most designs should accommodate a wide range, generally the 2nd to 98th or 5th to 95th percentile ranges. A piece of equipment that is designed for the "average" reach, the 50th percentile, will be out of reach for 50 percent of the intended users. "Average" is a statistical term which applies only to groups. Most people will fall into the "average" range on only a few variables.

Variability of human dimensions can best be handled for a wide range of people by employing adjustability. There are certain applications, space suits for example, where it will be necessary to customize the design for each segment of the population. Designing for the mythical average user is sometimes acceptable, but usually is preceded by extensive research and iterative design. An example of a design for an average user might be a telephone or computer keyboard.

When designing prototype tests, the following key dimensions in human performance should be considered

a. Speed versus accuracy

b. Skilled versus unskilled

c. Performance standards and criteria

d. Hawthorne effect and related "artifacts"

e. Individual differences

f. Training

Performance standards and criteria should be specified before the test is run. The use of control and experimental groups of subjects should be the rule, otherwise the test results will be contaminated by the subjects having been given previous training. Training effects can cause confounding of test results due to either positive or negative transfer of training. An example of positive transfer of training would be the elevated score on a word processing test that a subject who had previous experience on a typewriter might obtain. Negative transfer of training would occur if a person had been trained to operate a shift lever with his/her left hand and the new design required right hand operation.

The Hawthorne effect is named after some studies that were done in an industrial plant in Hawthorne, Pennsylvania, some years ago. Researchers told factory workers that they were studying productions rates and that certain workers would be selected to participate. They observed that production rates went up even without making any changes to the workers environment. In fact, when lighting was increased, production went up, and when lighting was decreased production also went up. The moral of this story is that certain behaviors may occur merely because people are aware that they are being watched. Human factors engineers will be able to help design tests to guard against such artifacts and avoid wasted time and money.

11.4 OPTIMUM SYSTEM PERFORMANCE

System performance is defined as the interaction between human behavior and the performance of nonhuman system elements such as equipment, procedures, and environmental support facilities. Human behavior in the system includes not only the human operator or user, but the behavior of those others who have to maintain the system in operable condition and still others who are involved in developing the various supporting documents and equipment and the training courses and materials. It is well to note that improvements in human performance may or MAY NOT affect system performance. Therefore, systems design is creating optimum system performance by matching and integrating people, processes, and materials ... not necessarily optimizing all three factors.

11.5 BENEFITS OF HUMAN FACTORS ENGINEERING

When human factors concerns are identified early in the design cycle and appropriate alternatives are selected with the user in mind as an integral system component, the resultant benefits include the following

a. Increased productivity and performance
b. Minimized operator stress and error

c. Reduced skill level requirements
d. Improved system reliability
e. Improved marketability and longevity

The consequences of not considering human factors issues during system design can be disastrous because human errors are inevitable as long as humans are operators, maintainers, and trainers. Human capabilities do not equal human characteristics. The fact that humans are capable of discerning a warning light or alarm does not guarantee that they will take any action if false alarms are frequent. Human adaptation is never free; it always comes at some cost that may not be the concern of the program manager, but ultimately will contribute to the system total life-cycle costs by requiring expensive retrofits, special support equipment, additional training, or production of additional spare parts. While it is true that people are the most flexible element in system design, they are the most difficult to redesign. The costs of poor design are tremendous in terms of personnel selection, training, and adaptability.

11.6 HFE METHODOLOGICAL TOOLS AND DESIGN AIDS

In addition to the human perception, reaction, tolerance, and anthropometric databases that human factors experts have compiled over the years, there are other specific methodological tools that are employed to identify human factors issues in system design.

Task analysis is a means of breaking down operations into smaller units in order to determine whether those functions should be correctly allocated to the human user or should be automated.

Job analysis is a means of determining how many tasks are incorporated into each job unit and then taking a critical look at the tasks within each job to determine whether or not it is beneficial to both human beings and the system to group tasks that way.

Systems analysis is a means of looking at the entire system, including the human user's contribution, to determine how all parts of the system work together, whether any part is overloaded or underused, and especially to consider the affects of those system components that have been heretofore neglected.

Human performance research is being carried out at many government and private laboratories throughout the country and the world. This research unfortunately lags behind recent technological leaps, especially in the user-computer interface realm. Researchers may be involved in testing prospective users on particular aspects of user-interface design for something like a new radar operator's work station or they may be doing more basic research into generic questions; for example, in determining whether a trackball or a mouse provides the user with more positive feedback and control. With the vast diversity in equipment and systems being designed just in the Navy, it is unlikely that any design will be able to get by without having some human performance research done. On the other hand, there is a large body of published literature on experiments that have already been performed, so it will not be necessary in most cases to do basic research, but will be possible to build on the results already achieved by others to shorten the amount of necessary human performance testing.

Standards, criteria, and checklists are often most helpful. A list of the more pertinent of these to Navy systems is included under the reference section. A few tables and a questionnaire are included at the end of this article to aid designers in allocation of function and ensure they have addressed all of the major human factors issues.

The last of the tools and design aids is anecdotal wisdom. This category takes in all the knowledge that has been gathered too recently to appear in publication, maybe as recently as the last project the human factors engineer worked on. HFE people generally keep informed about the latest developments by attending conferences, reading periodicals, talking to colleagues, and doing their own research. This category has taken on added significance with the explosion in new features being invented almost daily for computer users.

11.7 ALLOCATION OF FUNCTION OR WHO DOES WHAT?

After performing a task analysis it will be necessary to make some decisions about allocating functions either to the human user or to some other system component. In making these decisions, designers must consider what people WILL do (characteristic performance), not what they can do (capability). Keep in mind the example of false alarms already discussed. Most contemporary decisions involve the LEVEL and NATURE of semiautomation that is appropriate as opposed to traditional manned versus unmanned systems. The space shuttle was uniquely qualified to put people in orbit, sustain life while certain tasks could be carried out, and safely return to the earth. It was an almost ideal testbed for zero-G experimentation. The fact that it could also launch satellites contributed to the decision to develop an ambitious launch schedule to help it "pay its way." A much better decision in the case of satellite launch, as it now appears, would have been to allocate that function to an unmanned spacecraft. Likewise, for many other less sophisticated systems, the fact that it is possible for either a machine or a human being to perform a function does not necessarily require it. The information included in the Appendix of this section compares and contrasts human and machine capabilities and limitations and should be used to help decide who ultimately does what.

11.8 CONCLUSION

Human factors engineering, encompassing a body of knowledge about human behavior in systems, is a multidisciplinary field that advocates enhancing system performance, while including the human user as a primary system component, and provides tools and design aids to assist system designers in identifying and overcoming human factors problems.

All this effort has still not succeeded in solving all the problems. System designers should be aware of some of the lingering and, perhaps, eternal problems listed here.

11.8.1 Problems with Users

a. Don't care about the elegance, sophistication, or complexity of the design — only what it can (or can't) do for them

b. Will do the unexpected

c. Will base their conception of the system on inadequate knowledge

d. Won't ask for help when they need it

e. Will fail to observe the prominently displayed instructions

f. Quickly develop habits that are hard to change

g. Can be "suspicious" of the system

h. Sometimes fear that they will break the system

11.8.2 Problems with Engineers

a. They assume too much about users.

b. They tend to focus on hardware-oriented system criteria (e.g., processing speed).

c. They "get attached" to hardware (also software).

d. Many will never use the systems that they design.

e. They are suspicious of "soft" sciences like psychology (this isn't always inappropriate!).

11.8.3 Problems with Behavioral Scientists

a. Research reports often lack design-relevant interpretations and recommendations.

b. Laboratory studies may not generalize to an operational context.

c. Lack of familiarity with hardware systems can lead to the study of "unreal" variables.

d. Obsession with advanced statistical methods can lead to intense scrutiny of trivial factors.

11.8.4 Still More Problems

a. Standards are adopted for political reasons.

b. Economic incentives often promote the status quo.

c. There is a tendency to translate old concepts and models to new technology (this can be limiting).

d. Creative problem-solving requires diverse backgrounds, including people who know LITTLE OR NOTHING ABOUT THE TECHNICAL LIMITATIONS.

e. "Implicit assumptions" can plague otherwise excellent designs.

11.8.5 The Final Word

Successful system design places early focus on users and tasks, employs empirical measurements of human performance, and iterates the design in order to achieve optimum system performance. Human factors expertise should be applied in system planning, system design and implementation, system evaluation, and system modification. Unfortunately, human factors are often applied only where government requires it, or too early in system planning, or too late in system design, or, the ultimate, when everything else has been tried. There are enough stories circulating about equipment poorly designed, inoperable, unsupportable, lacking standardization, with poor accessibility, and poor man-machine interface to keep human factors experts going for years trying to clear up the problems. The alternative is for system designers and program managers to avail themselves of the human factors expertise resident at NOSC to ensure that they will become one of the success stories. Or, in the words of that preeminent scientist, Albert Einstein,

> Concern for man himself and his fate must always form the chief interest of all technological endeavors.

Appendix 11A

Auxiliary Human Factors Information

The following items are included in the Appendix:

Human Factors Engineering (HFE) Computer-Based Instructual (CBI) Course

Log-On Procedures for Introduction to Human Factors Engineering

Human Factors in Engineering and Design, Ernest J. McCormick, McGraw-Hill, Inc., 1976 (an excerpt)

Human Limitations and Machine Alternatives

Allocation of Function/Allocation of Function Procedures

HUMAN FACTORS ENGINEERING (HFE) COMPUTER-BASED INSTRUCTIONAL (CBI) COURSE

The HFE CBI course is an adaptation of the ARMY/NAVY self-paced HFE text developed by Brogan, et. al., of the ARMY HEL in 1981.

The course objectives are

1. An understanding of common HFE terms
2. An awareness of sources of HFE information
3. An ability to integrate HFE into a development or modification program with minimum guidance and direction from experienced HFE personnel
4. An ability to determine HFE requirements
5. An understanding of the kinds of factors and forces which affect human performance
6. An awareness of HFE test methods
7. An awareness of human performance reliability factors
8. An awareness of time and error performance measures
9. An understanding of the major HFE techniques
10. A familiarity with task analyses
11. An awareness of the relationship between HFE and reliability
12. An ability to apply HFE standards, specifications, and references

NONPROPRIETARY SOFTWARE

The applications software is wholly developed and owned by the Air Force Logistics Command. There is nothing proprietary in the software. Therefore, it can be provided, free, to any DoD agency that finds a need to implement CBI courseware. Given the currently high licensing fees for commercially available CBI software, our CBI software may be able to save one of your development programs a considerable amount of money.

COURSE WORK

The course can be accessed by almost any computer terminal that has a 300 or 1200 BAUD telephone modem. As long as our computer resources are not overbooked by too many students, we'll provide an accessible HFE CBI course for all DoD personnel and contractors with active DoD contracts. The phone company, however, will charge you for a commercial long distance phone call if you use a commercial long distance line to hook-up your modem.

LOG-ON PROCEDURES FOR
INTRODUCTION TO HUMAN FACTORS ENGINEERING

These instructions explain procedures to access the HFE self-paced course on the AFLC computer. Almost any computer terminal can be used as a dumb terminal to access the course. Most terminals have switches on them that can be set to various configurations. Your terminal must be configured with

BAUD RATE	300 OR 1200 (ASYNCHRONOUS LINE)
DUPLEX	HALF (OR FULL IF SELF ECHO IS ON)
PARITY	EVEN
CARRIAGE RETURN	WITHOUT LINE FEED
CHARACTER TYPE	7 BIT ASCII PLUS 1 BIT EVEN PARITY, 1 START BIT, 1 STOP BIT

Phone the AFLC computer at

1200 BAUD RATE LINE — AV 787-8243 or COMMERCIAL (513) 257-8243
300 BAUD RATE LINE — AV 787-8247/53/57/65 or COMMERCIAL (513) 257-8247/53/57

After the carrier tone is present on the phone line and the telephone receiver is connected to your computer modem, you must enter each of the following commands with a carriage return after each one:

WHEN THE COMPUTER DISPLAYS,	THEN THE STUDENT ENTERS:
?	ZW,,TSS (or use VD,,TSS)
USER ID—	HUMAN$FACTORS
PROBLEM NUMBER-	WP1906
*	FRN HFE/TUTOR,E

It is important that the above commands are entered exactly as shown above, that is, do not insert spaces where none are shown. Use the @ symbol to internally delete characters that you have misspelled.

After entering the last command above, the computer will require about 20 to 40 seconds to load and compile the program. Then, the computer will lead you, step by step, through the self-paced course by listing information to you and asking questions.

If you use an autovon line to link your terminal to the AFLC computer, it is always subject to interruption. If this occurs, the computer will remember where you were in the lesson and will restart you at the point that you were interrupted. Have patience and start the above log-on procedure again. Use a commercial phone line if problems with autovon persist.

Your organization will not be charged for the AFLC computer time. The course is free to all DoD employees and contractor personnel with active DoD contracts. The phone company, however, will charge you for a commercial line, if used. A training certificate will be sent to you when you finish all the lessons.

To exit the program:

For teletype terminals, depress the interrupt button and follow the instructions that are listed to you.

For CRT terminals, enter the letter B whenever a question is asked of you. Then follow the instructions that are listed to you.

IF YOU HAVE PROBLEMS, CONTACT NAT DAVIS — AV 787-5571 OR (513) 275-5571.

Human Factors in Engineering and Design,
Ernest J. McCormick, McGraw-Hill Inc., 1976 (an excerpt)

The questions given below should be viewed as they would be relevant to the ultimate user population. The fulfillment of one objective may of necessity be at the cost of another.

In a general sense these questions may serve as "reminders" of some of the human factors considerations that should be taken into account in the design process.

1. What are the functions that need to be carried out to fulfill the system objective?
2. If there are any reasonable options available, which of these should be performed by human beings?
3. For a given function, what information external to the individual is required? Of such information, what information can be adequately received directly from the environment, and what information should be presented through the use of displays?
4. For information to be presented by displays, what sensory modality should be used? Consideration should be given to the relative advantages and disadvantages of the various sensory modalites for receiving the type of information in question.
5. For any given type of information, what type of display should be used? The display generally should provide the information when and where it is needed. These considerations may take into account the general type of display, the stimulus dimension and codes to be used, and the specific features of the display. The display should provide for adequate sensory discrimination of the minimum differences that are required.
6. Are the various visual displays arranged for optimum use?
7. Are the information inputs collectively within the reasonable bounds of human information-receiving capacities?
8. Do the various information sources avoid excessive time-sharing?
9. Are the decisionmaking and adaptive abilities of human beings appropriately utilized?
10. Are the decisions to be made at any given time within the reasonable capability limits of human beings?
11. Granting that aspects of some systems will be automated, is the basic control of the system that of the individual?
12. When physical control is to be exercised by an individual, what type of control device should be used?
13. Is each control device easily identifiable?
14. Is the operation of each control device compatible with any corresponding display, and with common human response tendencies?
15. Are the operational requirements of any given control (as well as of the controls generally) within reasonable bounds? The requirements for force, speed, precision, etc., should be within limits of virtually all persons who are to use the system. The man-machine dynamics should so capitalize on human abilities that, in operation, the devices meet the specified system requirements.

16. Are the control devices arranged conveniently and for reasonably optimum use?

17. If there is a communication network, will the communication flow avoid overburdening the individuals involved?

18. Are the various tasks to be done grouped appropriately into jobs?

19. Do the tasks which require time-sharing avoid overburdening any individual or the system? Particular attention needs to be given to the possibility of overburdening in emergencies.

20. Is there provision for adequate redundancy in the system, especially of critical functions? Redundancy can be provided in the form of backup or parallel components (either men or machines).

21. Are the jobs of such a nature that the personnel to perform them can be trained to do them?

22. If so, is the training period expected to be within reasonable time limits?

23. Do the work aids and training complement each other?

24. If training simulators are used, do they achieve a reasonable balance between transfer of training and costs?

25. Is the work space suitable for use by the range of individuals who will use the facility?

26. Are the environmental conditions (temperature, illumination, noise, etc.) such that they permit satisfactory levels of human performance and provide for the physical well-being of individuals?

27. In any evaluation or test of the system (or components) does the system performance meet the desired performance requirements?

28. Does the system in its entirety provide reasonable opportunity for the individual(s) involved to experience some form and degree of self-fulfillment and to fulfill some of the human values that we should all like to have the opportunity to fulfill in our daily lives?

29. Does the system in its entirety contribute generally to the fulfillment of reasonable human values? In the case of systems with identifiable outputs of goods and services, this consideration would apply to those goods and services. In the case of systems that relate to our life space and everyday living, this consideration would apply to the potential fulfillment of those human values that are within the reasonable bounds of our civilization.

In the resolution of these and other kinds of human factors considerations, one should draw upon whatever relevant information is available. This information can be of different types, including principles that have been developed through experience or research, sets of normative data (such as frequency distributions of, say, body size), sets of factual data of a probability nature (such as percentage of signals that are detected under specified conditions), mathematical formulas, tentative theories of behavior, hypotheses that have been suggested by research investigations, and even the general knowledge acquired through everyday experience.

HUMAN LIMITATIONS AND MACHINE ALTERNATIVES

HUMAN	MACHINE
Is a poor monitor of infrequent events or of events which occur over a long period of time	Can be constructed to detect infrequent events or events which occur frequently over a long period of time reliably
Has a limited channel capacity	May have as much channel capacity as can be afforded
Is subject to coriolis effects, motion sickness, disorientation, etc.	Is not subject to these effects
Has extremely limited short-term memory for factual material	May have as much short-term (buffer) memory as can be afforded
Is not well suited to data coding, amplification, or transformation tasks	Is well suited to these tasks
Performance is degraded by fatigue and boredom	Performance is degraded only by wearing out or by lacking of calibration
Performance is degraded by long duty periods, repetitive tasks, and cramped or unchanged positions	Is less affected by long duty periods and performs repetitive tasks well; some may be restricted by position
Becomes saturated quickly in terms of the number of things that can be done and the duration of the effort	Can do one thing at time so fast that it seems to do many things at once, for a long period of time
May introduce errors by misidentification, reintegration, or closure	Uses these processes
Expectation or cognitive set may lead an operator to see what he or she expects or wants to see	Does not exercise these processes
Much human mobility is predicated and based on gravity relationships	May be built to perform independently of gravity
Is adversely affected by g forces	Is unaffected by g forces
Can generate only relatively small forces and cannot exert large forces for very long or very smoothly	Can generate and exert forces as needed
Generally requires a review or rehearsal period before making decisions based on items in memory	Goes directly to stored information for a decision
When performing a tracking task, requires frequent reprogramming; does best when changes are under 3 rad/s	Has no such limitations
Has a build-in response latency of about 200ms in a go-no-go situation	Has no response latency

From Woodson (1982)

ALLOCATION OF FUNCTION (Page 1 of 2)

Who Does What?

Must consider what people WILL do (characteristic performance), not what they can do (capability)

Most contemporary decisions involve the LEVEL and NATURE of semiautomation that is appropriate as opposed to traditional manned versus unmanned systems

ALLOCATION OF FUNCTION PROCEDURES

Comparison of Human Capabilities With Machine Alternatives

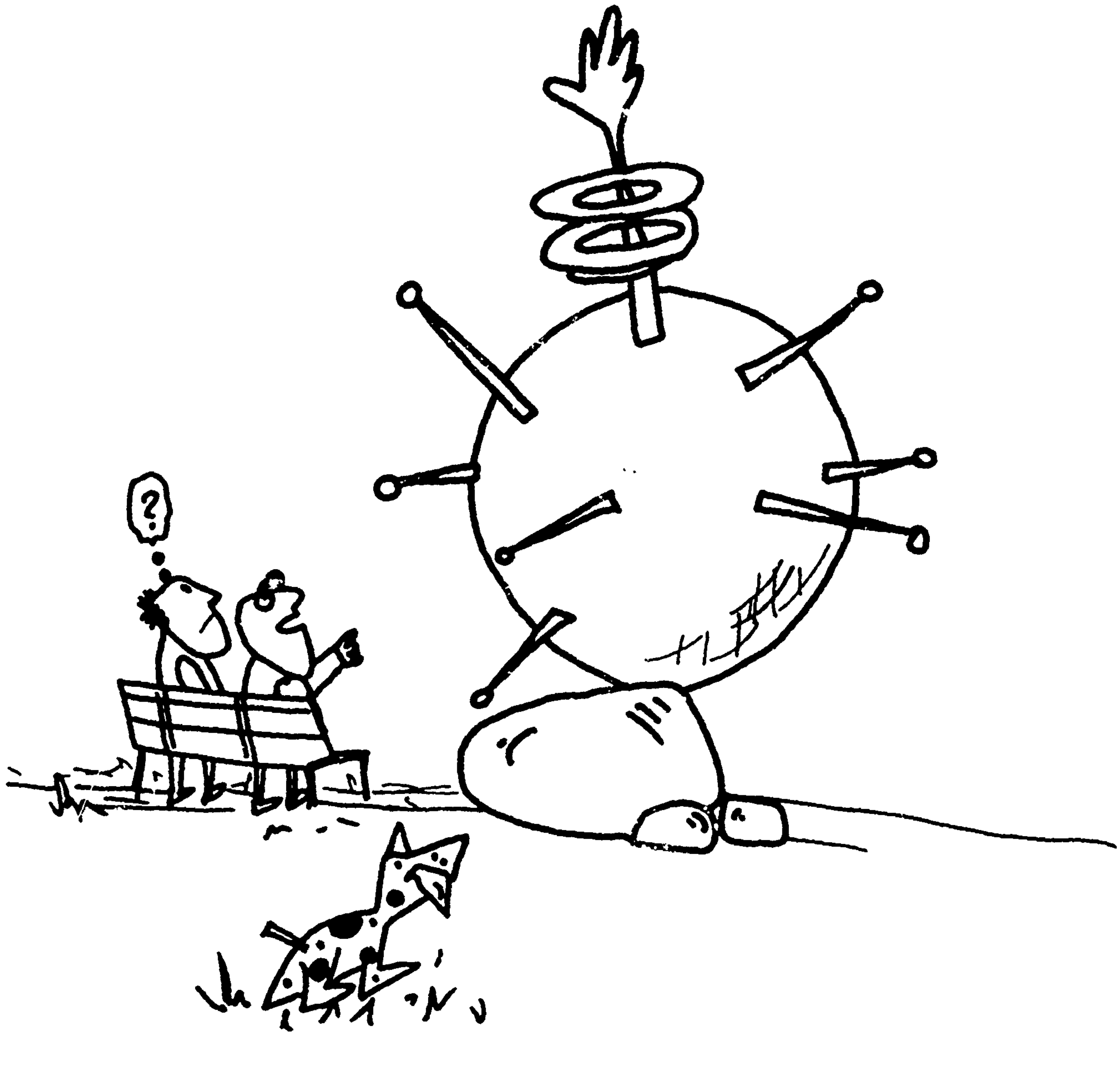
HUMAN	MACHINE
Can recognize and use information redundancy (pattern) in the real world to simplify complex situations	Has limited perceptual constancy and is very expensive
Has high tolerance for ambiguity, uncertainty, and vagueness	Is highly limited by ambiguity and uncertainty in input
Can interpret an input signal even when subject to distraction, noise, or message gap	Performs well only in a generally clean, noise-free environment
Is a selecting mechanism and can adjust to sense specific inputs	Is a fixed sensing mechanism, operating only on that which has been programmed for it
Has very low absolute thresholds for sensing (e.g. vision, audition, and touch)	To have the same capability, becomes extremely expensive
Has excellent long term memory for related events	To have the same capability, becomes extremely expensive
Can become highly flexible in terms of task performance	Is relatively inflexible
Can improvise and exercise judgment on the basis of long term memory and recall	Cannot do this; is best at routine, repetitive functions
Can perform under transient overload; performance degrades gracefully	Stops under overload; often fails all at once
Can make inductive decisions in novel situations: can generalize	Has little or no capability for induction or generalization
Can modify performance as a function of experience; can "learn to learn"	Is not characterized by trial-and-error behavior
Can override own actions, should the need arise	Can do only what it is built to do
Is reasonably reliable; can add reliability to system performance by selection of alternatives	Is reliable only at the expense of increased complexity and cost, and then only for routine functions
Complements the machine, that is, can use it in spite of design failures, can use it for a different task, or can use it more efficiently than it was designed to be used	Has no such capability

ALLOCATION OF FUNCTION (Page 2 of 2)

HUMAN	MACHINE
Complements the machine by aiding in sensing, extrapolating, decisionmaking, goal setting, monitoring, and evaluating	Has no capacity for performance different from what was originally designed
Can acquire and report information incidental to the primary mission	Cannot do this
Can perform time-contingency analyses and predict events in unusual situations	Does very poorly at this
Is relatively inexpensive for corresponding complexity and is generally in good supply, but must be trained	Is more limited in terms of complexity and supply by cost and time
Is light in weight and small in size for function achieved for most situations	To have functional equivalence of the human, requires more weight, power, and cooling facilities
Is relatively easy to maintain, demands a minimum of "in-task" extras	Maintenance problems become disproportionately serious as complexity increases

From Woodson (1982)

DESIGN REVIEW 12



CONTENTS

SECTION 12
DESIGN REVIEW

12.1 INTRODUCTION

12.1.1 References

NOSC TD 870, Product Assurance Program Requirements
NOSCINST 4855.1, NOSC Product Assurance Program
NAVMATINST 3000.1A, Reliability of Naval Material
NOSCINST 3912.1, Design Review Committee

12.1.2 Summary

This section explains NOSC's design review policies and states Center policy relative to design approval and release of NOSC-developed components, subsystems, systems, and major items of system software.

12.2 DESIGN REVIEW GOALS

The primary goal of the design review process is to ascertain that the development programs at the Center have a high probability of success in meeting their technical requirements and will be operationally effective and sustainable when delivered to the Fleet. The process is provided to assist the program manager in this regard. In addition, these independent reviews will provide the basis for advice to the technical director on all technical and material matters of concern pertaining to the development, operation, and production of a component, subsystem, system, or major item of system software, developed by and which is the responsibility of the Center, for decisions related to the fielding of the product. The design review committee will also provide this function in those instances where the Center acts as design agent or technical direction agent or has other major design responsibility for systems or subsystems. The committee will also provide this function in those instances where the Center has other significant responsibilities related to the use of unproven items as, for example, in operational exercises or scientific sea tests. Figure 12.1 offers a sample outline for a major system presentation.

12.3 PRODUCT ASSURANCE

Guidance and reference material related to the NOSC product assurance program are provided in NOSCINST 4855.1 and NOSC TD 870.

12.4 TYPES OF REVIEWS

NAVMATINST 3000.1A states that, at a minimum, the design reviews shall include preliminary design review (PDR) of the design approach prior to initiation of detailed design; a critical design review (CDR) of the detailed design prior to drawing release and fabrication of formal test articles; a design certification review (DCR) of the final design subsequent to qualification testing and prior to Navy operational test and evaluation and production start; and a final production review (FPR) at the time of a first article configuration inspection (FACI) of the as-produced design following manufacture and acceptance testing of the first end item configured for delivery to the Fleet. If standard reviews are conducted by the sponsor as part of the system development process, the design reviews are in concert with these scheduled reviews. Figure 12.2 indicates timing of reviews within the major systems acquisition cycle.

12.4.1 Mandatory Reviews

All major acquisition programs require mandatory reviews. These include development of large systems with many components destined for large production numbers and eventual long life in the Fleet (e.g., MK 50 torpedo, MILSTAR SATCOM).

All man-machine interfaced programs involving safety considerations require mandatory reviews.

All hardware/software/firmware systems leaving NOSC for installation supporting any DoD activity, even for a limited installation period, also require mandatory reviews.

12.4.2 Negotiable Reviews

Reviews are negotiable for minor systems or feasibility models designed for limited production. Minor systems include smaller systems with fewer components for feasibility demonstration or limited production that may still have long life in the Fleet, for example, AUSS (Advanced Undersea Search System), SLC (Submarine Laser Communication) system, and Advanced Combat Direction System (ACDS).

Reviews are also negotiable for nondeliverable demonstration testbeds.

12.4.3 Reviews Not Required

Test instrumentation

Nondeliverable test hardware

Nondeliverable experimental devices

Minor support equipment

12.5 RESPONSIBILITIES

12.5.1 Department Head

It is the responsibility of every department head to identify in a timely way those components, subsystems, systems, and major items of software that must undergo design review.

INTRODUCTION

- Purpose of Review

BACKGROUND

- Operational Requirement
- Program Summary WBS (Sponsor's)
  - Narrative System Description
- Program Objectives
  - System Performance
  - Cost
  - Schedule
- Management Approach (Sponsor's)
  - Program Plan
  - Acquisition Plan
  - Delegation of Responsibilities
  - - Sponsor
  - - Contractors
  - - Centers/Labs/etc.
    - - NOSC
    - - Tasking Documents
  - - Interface Agreements, Work Agreements

MANAGEMENT OVERVIEW

- Subprogram WBS (NOSC)
- Organization
- Accountability Matrix (WBS vs Organization Chart)
  - Assignments of Responsibility
- Management Practices
  - Planning
  - Reporting
  - Cost/Schedule Tracking and Analysis
  - Design Review Schedule
- Management Review Schedule
- Schedule
  - Milestone Objectives
- Budget
  - Fiscal
    - Current
    - Out Years
  - Manpower
    - Total and by Departments
  - Other Resources
- Procurement Plans/Status
  - Subsystems
  - Components
  - Support/Services

Figure 12.1. Sample outline for a major system presentation (1 of 2).

TECHNICAL PROGRAM

- System Engineering
  - System Requirements (Specifications)
    - Performance
    - Environmental
      - Life-Cycle Profile
      - System Level
  - System Functions
      - Functional Allocations
    - Subsystem Requirements
        - Performance
        - Environmental
        - Reliability Allocations
        - Safety Requirements (Operational/Handling/Storage)
        - Maintainability Allocation and Philosophy
        - Cost Allocation
- Test & Evaluation
  - System Level
  - Subsystem Level
    - Performance
      - Environmental
      - Reliability
      - Maintainability
      - Safety (Systems)
      - Human Factors
- Documentation Plans/Status
  - Level
  - Verification/Validation
- Product Assurance Plans/Status
  - Quality Control
  - Producibility
  - Configuration Management
- ILS Plans/Status
  - Support Concept
  - Responsibilities
  - Manuals
  - Support Equipment

CONCLUSIONS

- Risks
  - Technical
  - Cost
  - Schedule
- Problem Summary
  - Problems
  - Solutions/Effort
  - Recommendations

Figure 12.1. Sample outline for a major system presentation (contd).

Program Cycle DoD Directive 5000.1	Program Initiation		Full Scale Development			Production Deployment
Program Phases	Concept Formulation	Demonstration & Validation	Full Scale Development			Production/ Deployment
Subphases			Engineering	Prototype	Pilot Production	Unlimited Production
DoD/Navy Program Milestones	Δ Milestone I Program Initiation Decision		Δ Milestone II Development Decision			Δ Milestone III Production Decision
Navy Center Program Reviews		Δ (1) Preliminary Design Review (PDR)	Δ (2) Critical Design Review (CDR)		Δ (3) Design Certification Review (DCR)	Δ (4) Final Production Review (FPR)

Figure 12.2. Major defense systems acquisition cycle.

12.5.2 Design Review Committee

It is the responsibility of the design review committee to

a. Plan and conduct the particular design review.

b. Advise the NOSC program manager of the results of the design review.

c. Advise the Commander and technical director regarding the successful attainment of a program's requirements as established by the task assignment or indicate that deviations from the original requirements are known and acceptable.

d. Assist the Center System Safety Branch, Code 921, in the course of the review, by identifying the critical system safety risks and appropriately relating these to the design requirements and the safety measures being taken.

e. Verify for the technical director that adequate producibility and design evaluation have been attained prior to release to production.

f. Submit recommendations to the technical director concerning the full or limited production release to the cognizant project agency of a NOSC-developed item, subsystem, or system.

g. Review, prior to release, any Center letter to the cognizant project agency that recommends release to production and states any limitations or compromises.

12.5.3 Organization of the Design Review Committee

The committee membership is as follows:

*Chairperson**: The chairperson is the cognizant department head of the subject program.

Assistant to the Chairperson: A person selected by the chairperson to assist the chairperson and project engineer to see that all data required by the design review committee is acquired prior to the meeting, to identify action items, to write up minutes of the meeting, and to follow up in completing outstanding issues or action items.

*Permanent Member**: The Deputy Technical Director, Code 02, assures that the review process is followed and that recommendations are complete and rational.

Permanent Recorder: Design Review Office, Code 021, defines design review requirements, assists in selection of review committee members with the assistant to the chairperson, maintains files of Center experts, maintains archives of program reviews, and records completion of outstanding action items as forwarded by the assistant to the chairperson.

Review Team Members: The team members are selected from across the Center by the chairperson and Code 021 and are invited to participate by the assistant to the chairperson via channels. These members ought to include

Another technical department head

NOSC technical officer(s) having appropriate technical or Fleet background

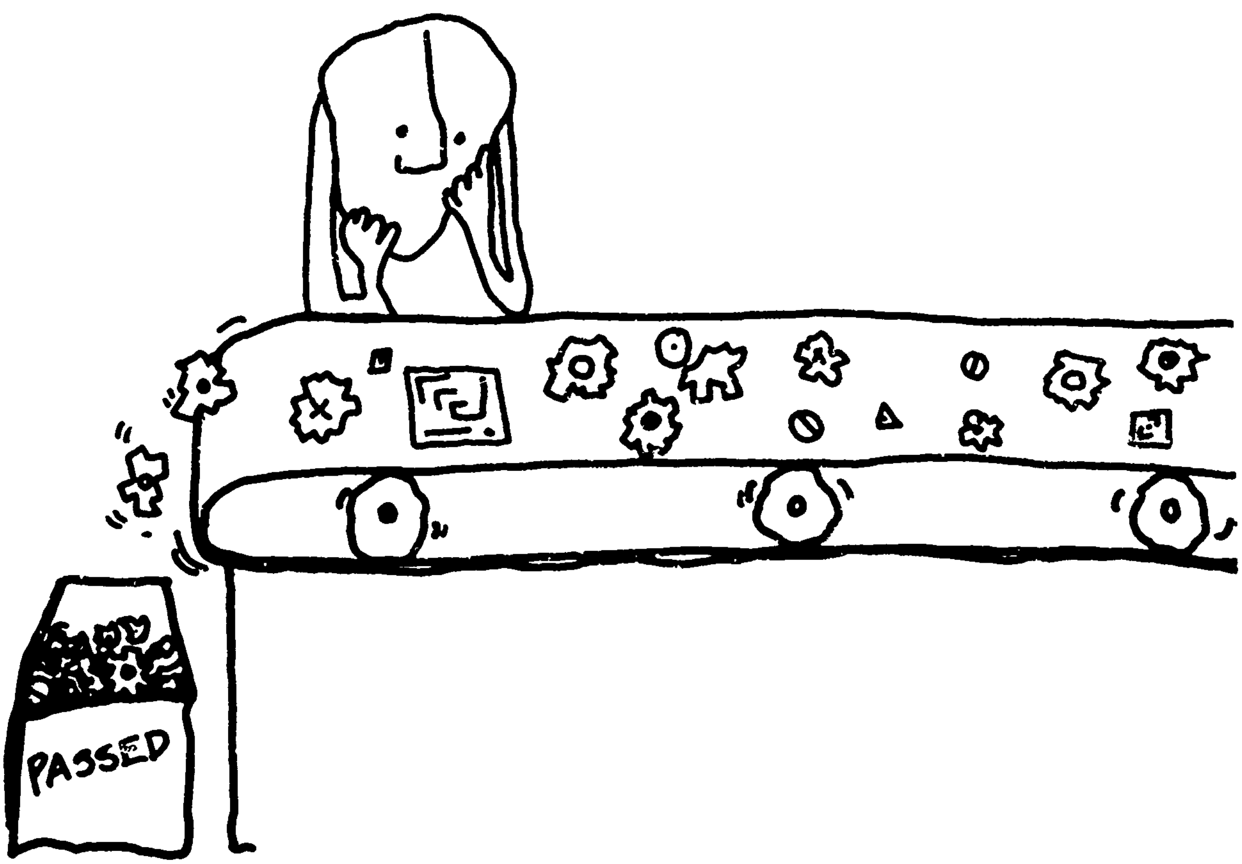
Independent technical experts from the scientific and engineering departments, individually selected by the chairperson, with line management approval, to meet the particular needs of each design review.

*For design reviews for minor systems, these responsibilities may be delegated to the appropriate division heads on a case-by-case basis with the approval by the Technical Director, Code 01.

Ex-Officio Advisory Members: These include additional technical experts, as required.

See NOSCINST 3912.1, Design Review Committee, latest issue. (NOSCINST 3912.1 is updated annually.)

HARDWARE PRODUCT ASSURANCE 13



CONTENTS

SECTION 13
HARDWARE PRODUCT ASSURANCE

13.1 INTRODUCTION

13.1.1 References

NOSC TD 432, Product Assurance Requirements Guide for Naval Ocean Systems Center Projects
MIL-STD 470

13.2 HARDWARE PRODUCT ASSURANCE OVERVIEW

Product assurance includes those various engineering and technical management disciplines that, when coordinated and integrated with the design effort, enhance the suitability of an item of equipment for production and Fleet use. Figure 13.1 illustrates what product assurance activities take place during the various life-cycle phases. The primary objective of a product assurance program is to ensure that products supplied to the Fleet will achieve a level of overall quality consistent with the operational requirements. In order to meet this primary objective, the hardware product assurance program is planned and structured to provide the following

Participation with the designer in developing reliable, maintainable, and safe systems/equipment

Assurance that the systems/equipment Fleet logistic support requirements have been fully identified and integrated and that those requirements will be satisfied

Assurance that systems/equipment designs are producible and are fully disclosed and documented for production

Assurance that those systems/equipment items that are fabricated in production conform to the engineering drawings and specifications and are of high overall quality

Assurance that those systems/equipment items that are introduced into the Fleet are fully supported throughout their life cycle.

The specific concerns of hardware product assurance, therefore, are

Reliability
Maintainability
Availability
System safety
Human compatibility
Quality
of design, design documentation, and produced products
Configuration integrity
Producibility

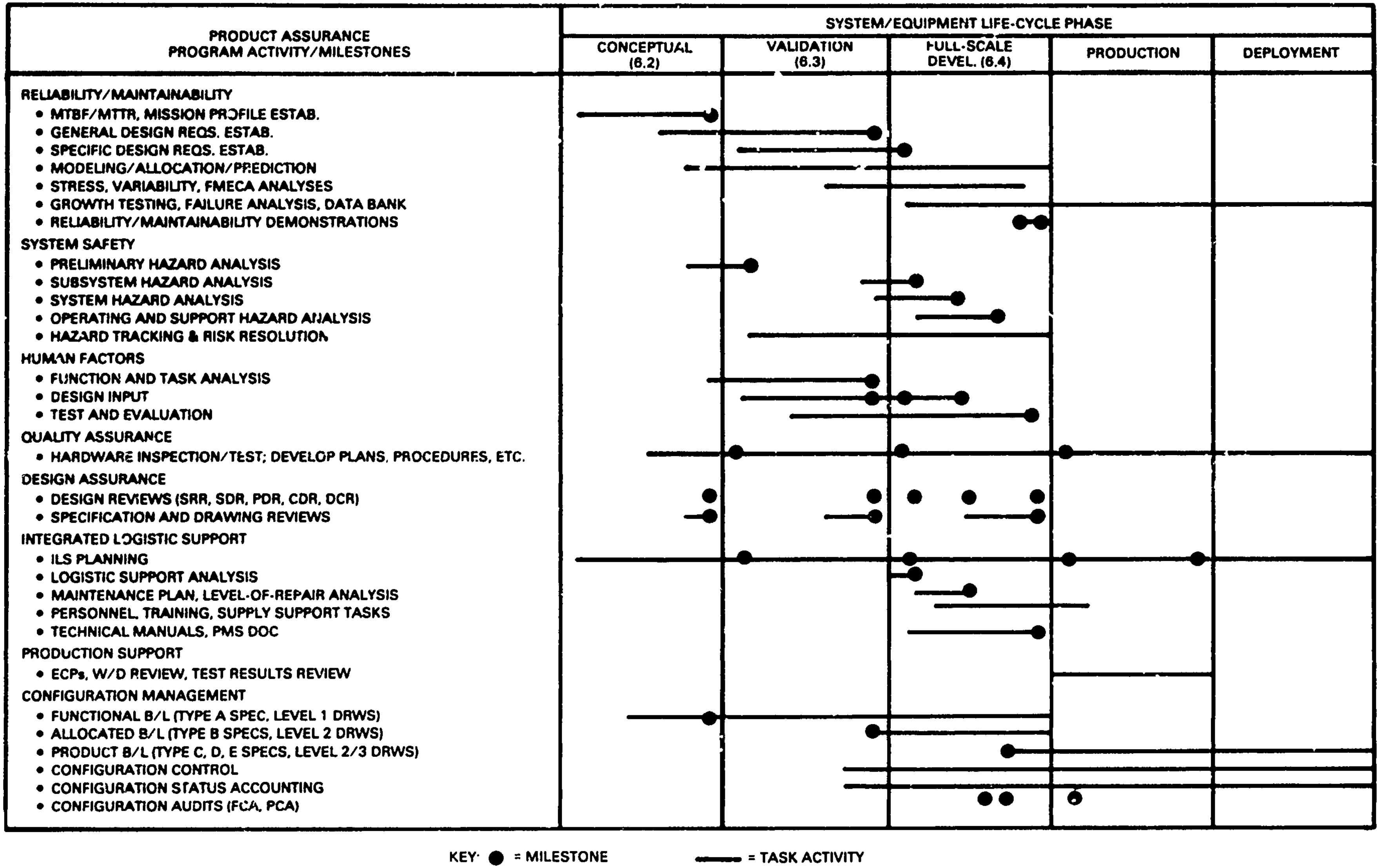


Figure 13.1. Product assurance activity during various life-cycle phases.

Spares reprocurability
Logistic supportability

These concerns have been ordered in a set of engineering and technical management disciplines that make up the typical hardware product assurance program. These disciplines are

Reliability/maintainability assurance
System safety assurance
Human factors
Quality assurance
Configuration management
Design assurance
Integrated logistic support

These disciplines will be outlined in detail in subsections 13.3 through 13.7. Each of these subsections will begin with a definition of the terms associated with the subject and will include a review of the most significant policy directive(s) that guides the discipline activity. The major task elements that typically are considered when planning the requirements for the program (e.g., the quality assurance program) are identified and described; an expanded view of certain program elements (e.g., environmental stress screening) is provided. NOSC Technical Document 432, Product Assurance Requirements Guide for Naval Ocean Systems Center Projects, provides additional background regarding these elements and provides recommended contractual requirements statements that may be used in contract statements of work. TD 432 also provides an extensive list of product assurance directives.

13.3 RELIABILITY/MAINTAINABILITY ENGINEERING

13.3.1 Definitions

13.3.1.1 Reliability/Maintainability Engineering. This is the continuing analysis and monitoring of system/equipment design, operation, and maintenance, throughout its life-cycle, to assure that it performs satisfactorily under the required conditions and for the required period of time.

13.3.1.2 Reliability. Reliability is the extent to which a system/equipment is capable of performing its intended function under stated conditions without failure. The measurement of reliability is expressed two ways: mean-time-between-failures (MTBF) and probability of success (R).

a. **Mean-Time-Between-Failures.** MTBF is the total functioning life of a population of a system/equipment divided by the total number of failures within the population during a particular measurement interval. Can be expressed in time (hours), cycles, miles, events, or other measure of life applicable to continuous or intermittently operated systems/equipment.

b. **Probability of Success.** R is the probability that an item will perform its intended function for a specified time interval or mission. It is expressed as a decimal value and is always with an associated confidence level, and it is appropriate for use in connection with items for which operating time is undefinable (e.g., explosive devices, rockets, and torpedoes).

13.3.1.3 Maintainability. Maintainability is the ability of a failed system/equipment, based on its design characteristics, to be restored to operation. This is expressed by mean-time-to-repair (MTTR), which is the total corrective maintenance time performed on a population of a system/equipment divided by the total number of corrective maintenance actions performed. It is usually expressed in hours.

13.3.1.4 Supportability. This is the ability to satisfy material and administrative requirements associated with restoring the operation of a failed system/equipment.

13.3.1.5 Availability. Availability is the measure of the degree to which a system/equipment is in an operable and committable state at the start of a mission that is called for at an unknown time.

a. Inherent availability (Ai) is the measure of a system's/equipment's performance predicated on the inherent design factors of reliability and maintainability.

$$Ai = \frac{MTBF}{MTBF + MTTR}$$

b. Operational availability (Ao) represents the expected percentage of time that a system/equipment will be ready to perform satisfactorily in an operating environment.

$$Ai = \frac{UPTIME}{UPTIME + DOWNTIME}$$

$$Ai = \frac{MTBF}{MTBF + MDT}$$

MDT = mean downtime (includes both maintainability and supportability factors).

13.3.2 Reliability Program Policy

13.3.2.1 Objectives. The Reliability Program objectives serve to

a. Reaffirm the close relationship between good, conservative design and product reliability

b. Redirect reliability program emphasis towards the engineering and manufacturing specifications, disciplines, and controls by which reliable systems/equipment are designed and produced

13.3.2.2 Policy. The following are policy considerations.

a. Reliability is as important as functional performance.

b. Defense Systems Acquisition Review Council (DSARC) I (release to validation phase development): the development concept paper (DCP) is to address reliability requirements

c. DSARC II (release to full-scale development): the DCP is to state that reliability will be *by design*, not just left to change: the mission profile will be defined and quantitative reliability requirement will be established.

d. DSARC III (release to production): the DCP is to include a statement of reliability achievement with explanation of any shortfalls and planned corrective actions.

e. Reliability requirements are to be included in all planning and procurement documents and are to be a major factor in the source selection and contracting process. Where appropriate, reliability and quality incentives should be included in contracts.

13.3.2.3 Technical Requirements. The technical requirements are noted here.

a. Specific engineering (e.g., design) and manufacturing disciplines to be invoked. Examples would include

MIL-STD-454, Standard General Requirements For Electronic Equipment

MIL-STD-188, Military Communication System Technical Standard

MIL-MDBK-5C, Metallic Materials and Elements for Aerospace Vehicle Structures

MIL-MDBK-251, Reliability/Design Thermal Applications

MIL-E-' ;400, Electronic Interior Communications and Navigation Equipment, Naval Ship and Shore, General Specification For

MIL-STD-275, Printed Wiring for Electronic Equipment

MIL-P-55110, Printed-Wiring Boards

NAVMAT P4855-1, Navy Power Supply Reliability

NAVMAT P4855-2, Design Guidelines for Prevention and Control of Avionic Corrosion

WS-6536*, Procedures and Requirements for Preparation and Soldering of Electrical Connections

b. Explicit reliability program requirements to include

Mission profile definition

Allocation of numerical reliability requirements

Parts and materials program

Conservative parts and materials derating criteria

Electrical, mechanical, and thermal stress analyses

Failure modes, effects, and criticality analysis

Sneak circuit analysis

Worst case analysis of tolerance buildup

c. Integrated test program to assess reliability growth prior to reliability demonstration

Qualification testing to environmental extremes

Acceptance testing to mission profile environmental conditions, following burn-in. Use of environmental stress screening (e.g., NAVMAT P9492, Navy Manufacturing Screening Program; NAVSEANOTE 3900)

d. Reliability tests, where warranted

Reliability development/growth tests where undertainty exists (e.g., new technology devices, highly complex equipment items)

Reliability demonstration of production prototype units

e. Continuous assessment of reliability in design and testing

f. Failure reporting, analysis, and corrective action

Failures recorded in formal reporting and tracking system

Failures analyzed to identify cause

Failures corrected to prevent recurrence

*NOTE: Eventually, DoD-STD 2000 will replace WS-6536 as the Navy's soldering standard.

g. Control over contractor programs and progress, through

    Design reviews (PDR, CDR, DCR)

    Certification of test results

    Submittal of reports

    Technical audits (e.g., POS).

13.3.3 Maintainability Program Policy

13.3.3.1 The maintainability requirements are defined in MIL-STD-470. The relationships and requirements

a. Reaffirm the inseparable relationship between material design and reliability and maintainability (R&M)

b. Direct the program emphasis to the engineering and manufacturing specifications, disciplines, and controls

c. R&M requirements shall be considered equal to functional performance.

d. R&M requirements shall be addressed as a major issue at the DSARC I, II, and III reviews.

e. Qualitative maintainability requirements (MTTR) are to be established for systems/equipment.

f. R&M requirements are to be included in all procurement documents and contracts for new equipment development. Where appropriate, R&M incentive clauses are to be used.

g. R&M programs are to be established in connection with acquisitions and will include

    Maintainability test program

        Problems to be recorded in a formal reporting and tracking system

        Problems to be analyzed to determine necessary corrective action

        Corrective action to be taken until MTTR requirement satisfied

    Control over contractor programs through design reviews, certification of test results, submittal of reports, and technical audits

    R&M allocations and predictions

    Logistics support analysis to be conducted

h. Realistic qualitative and quantitative (MTTR) maintainability design requirements are to be specified that strike an optimum balance between logistic support capability, potential life-cycle costs, and a fully maintainable system.

i. Maintainability requirements are to be included in all planning and procurement documents.

j. Maintainability program, citing appropriate elements of MIL-STD-470, is to be established including

    Program plan
    Maintainability predictions
    Program and design reviews
    Maintainability testing
    Appropriate data items

13.3.4 Reliability Engineering Program Elements

13.3.4.1 Program Planning, Monitoring, and Control. These elements include

a. Program planning — Definition of the reliability program (MIL-STD-785) in a plan that identifies and describes all program monitoring, control, design, analysis, evaluation, test, demonstration, and documentation elements.

b. Subcontractor/Supplier monitoring and control — Monitoring by the prime contractor of all subcontractor/supplier reliability program efforts and ensuring compliance with the overall program requirements

c. Program/Design reviews — Review of the reliability program progress at specified points in time and conduct of, as minimum, preliminary and critical design reviews per MIL-STD-1521

d. Failure reporting — Establishment of a closed-loop failure reporting system providing for the analysis of and correction of failures

e. Failure review board — Review of significant system/equipment failures, failure trends, and the status of corrective actions

13.3.4.2 Design, Analysis, and Evaluation. These elements include

a. Reliability modeling — Preparation of functional flow and reliability block diagrams of the system/equipment down to the functional module replacement level. Developing the math model and equations necessary to enable numerical allocations and predictions.

b. Reliability allocation — Allocation of quantitative system/equipment reliability requirements (mean-time-between-failures) to lower assembly units and to functional modules based on mission and environmental profile and historical data. Reliability allocation is a "top-down" process.

c. Reliability/Available trade-off studies — Determination of the optimum design approach for considerations of both reliability and availability through the use of redundancy, high reliability components, component derating, special environmental protection, environmental stress screening, etc.

d. Parts and materials selection, application, and control — Establishment of minimum quality levels and application requirements for electrical (e.g., ER level "P" or better) and electronic components (e.g., JANTX semiconductors or better; MIL-M-38510 Class "B" microcircuits or better) and establishment of derating criteria using NAVSEA TE000-AB-GTP-010 guidelines. Establishment of a parts identification and control program in accordance with MIL-STD-965, procedure 1.

e. Reliability prediction — Prediction of the numerical reliability value (MTBF) of the functional modules using MIL-STD-756, MIL-HDBK-217, or other data; and, using the module data and available test data, the prediction of the numerical reliability value for the system/equipment. Reliability prediction is a "bottom-up" process.

f. Stress analysis — Performance of electrical and thermal stress analyses of electrical and electronic components using NAVSEA TE000-AB-GTP-010 as a guide and performance of structural stress analyses of critical application mechanical components.

g. Variability analysis — Performance of parameter variability (worst case) analyses of electrical and electronic components using NAVSEA TE000-AB-GTP-010 as a guide and performance of mechanical tolerance studies of functional interface features of mechanical and electromechanical devices.

h. Sneak circuit analysis — Analysis of critical circuits to identify latent paths which could cause occurrence of unwanted functions or could inhibit desired functions.

i. Failure modes, effects, and criticality analysis (FMECA) — Identification of potential design weaknesses by determining the ways an item may fail, the cause of the failure mode, and effects and criticality of the failure using MIL-STD-1629.

j. Reliability data bank — Collection of reliability data, that is, equipment operating time, cycle data, failures, failure modes, and failure criticality to assist in making predictions and in determining the need for corrective actions.

k. Life-cycle effects analysis — Determination of the long term effects of storage, handling, transportation, maintenance, and repeated testing for the purpose of making life-cycle failure predictions and establishing system/equipment control policies.

13.3.4.3 Test and Demonstration. These elements include

a. Environmental stress screening — Establishment of preconditioning requirements (e.g., "burn-in," temperature cycling, and vibration) for components, subassemblies, and major functional units in order to stabilize the equipment's characteristics and to stimulate early failures due to marginal components or workmanship

b. Reliability growth testing — Establishment of a growth testing program, concentrating on mission-critical failure mode detection, in order to provide early detection and correction of reliability problems

c. Reliability demonstration — Demonstration by formal testing that the system/equipment mets its specified reliability requirements, using MIL-STD-781 or other equivalent plant

d. Production testing — Establishment of a production reliability test program to verify that system/equipment reliability has not been degraded by workmanship defects, low quality components, or by other production related factors

13.3.4.4 Design Strategies. The following strategies serve to satisfy system reliability:

a. Redundancy — Designing one or more alternate signal paths into the system through addition of parallel elements

b. Graceful degradation — Multiple redundancy allowing for automatic switching from a malfunctioning system element to a backup system element

c. High reliability design — Use of high quality, conservatively derated components. Advantages over other strategies include

    Reduced initial acquisition costs likely
    Lower support costs
    Reduced maintenance
    Increased availability
    Reduced spares requirements
    Reduced weight requirements

13.3.4.5 Component Derating. Component derating is discussed here:

a. Component failure rates and therefore equipment MTBF are directly related to stress.

b. In order to develop a reliable design, the designer must identify and control component stress levels.

c. Derating is increasing the ratio (margin of safety) between part design limits and the applied stresses (i.e., electrical, thermal).

d. Derating provides added protection from part variances, decreased part degradation rate, and increased expected life.

e. The use of properly screened and qualified components that are conservatively derated in their circuit application *is the best assurance of reliable electronic hardware.*

f. The case for using quality components is evident from the following

Components represent approximately 25 percent of the equipment cost when commercial grade electronic components are used.

If ER level "P" active and passive electrical components, MIL-S-19500 JANTX discrete semiconductors, and MIL-M-38510 class "B" microcircuits are used, the parts cost is increased by 100 to 200 percent, and the equipment cost is increased by 25 to 50 percent. However, the predicted equipment *MTBF is increased 14 to 20 times* over that of equipment constructed with commercial grade components!

13.3.4.6 Environmental Stress Screening (ESS). ESS is discussed in these items:

a. Environmental stress screening is the application of electrical and environmental (temperature, vibration) stress to precipitate latent defects (components, workmanship) at levels of assembly where defect correction is most cost effective.

b. ESS is not a test, it is a manufacturing process.

c. There is no relationship between the environmental levels used for ESS and those used for qualification testing. ESS levels, typically temperature, often are higher than qualification levels.

d. Properly designed ESS will not damage good hardware, nor appreciably reduce its useful life.

e. Environmental stress screening plan guidelines

Thermal cycling (applies 100 percent to components and 100 percent to modules, units, or assemblies)

Cycling between — 40°C (−40°F) and 90°C (194°F) with a 5°C/minute minimum rate of change

10 cycles minimum (20 to 30 desirable) with sufficient dwell time (10 minutes for modules) to ensure stability

During environmental stress screening, power application to be observed

Performance measurements on modules, etc., to be made atn operating temperature extremes during cycling on systematic basis

Following cycling, components (i.e., discrete semiconductors, integrated circuits) to be subjected to

Electrical tests (i.e., static, dynamic, functional) at 25°C and 125°C

Particle impact noise tests on hybrids and unglassivated semiconductors having cavities

Hermeticity test recommended for sealed devices

Vibration (applies 100 percent to modules, units, or assemblies)

Random vibration in two axes for 10 minutes minimum, per axis

Acceleration spectrum of $0.04g^2/Hz$ from 20 to 2,000 Hz with 3 dB/octave roll off from 80 to 20 Hz and from 350 to 2,000 Hz

Performance measurements to be made before and after cycling.

ESS plan should be adjusted as product matures during full-scale development and during production (based on process results).

ESS requirements, when fully mature, should be included on engineering drawings for units, modules, and assemblies that may be reprocured as spares.

13.3.5 Maintainability Engineering Program Elements

13.3.5.1 Program Planning, Monitoring, and Control. These elements include

a. Program planning — Definition of the maintainability program (MIL-STD-470) in a plan that identifies and describes all program monitoring, control, design, analysis, evaluation, demonstration, and documentation elements.

b. Subcontractor/Supplier monitoring and control — Monitoring by the prime contractor of all subcontractor/supplier maintainability program efforts and ensuring compliance with maintainability program efforts and ensuring compliance with the overall program requirements

c. Program/Design reviews — Review of the maintainability program progress at specified points in time and conduct of, as a minimum, preliminary and critical design reviews per MIL-STD-1521

d. Maintainability deficiency reporting — Establishment of a closed-loop deficiency reporting system providing for the analysis of a correction of maintainability problems

13.3.5.2 Design, Analysis, and Evaluation. These elements include

a. Maintainability modeling — Preparation, in conjunction with the maintainability analysis, of maintainability block diagrams down to the major assembly or module replacement level. Development of the math model and equations necessary to enable numerical allocations and predictions

b. Maintainability allocation — Allocation, in conjunction with the maintainability analysis, of quantitative system equipment maintainability requirements (mean-time-to-repair) to the major assembly or to the module replacement level (a top-down process)

c. Maintainability analysis — Translation of various system/equipment analysis and Navy operating constraints data into detailed quantitative and qualitative maintainability requirements and into the detailed maintenance plan. Such analysis data includes operational and support requirements; environmental conditions; overall quantitative maintainability requirements; projected facilities/equipment/skills availability.

d. Maintainability design trade-off studies — Determination, in conjunction with the maintainability analysis and whenever design trade-offs are performed for other reasons, of the effect of the design approach on the maintainability aspects of the system/equipment

e. Maintainability design criteria — Establishment, in conjunction with the maintainability analysis, of those maintainability design criteria that are to be considered for incorporation into the design including accessibility; work space; work clearance; component interchangeability and standardization, limiting the numbers and varieties of tools and support equipment; use of maintenance-free components; adequate tolerance and wear factors; failure design; rapid fault detection and localization; ease of adjustment and calibration; limiting personnel numbers and skills requirements; application of human engineering principles; avoiding the potential for maintenance errors; etc.

f. Maintainability prediction — Prediction of the maintainability value (MTTR) of the system/equipment using MIL-HDBK-472 or other acceptable techniques. Such predictions should reflect applicable experience with similar systems/equipment (a bottom-up process)

g. Maintainability data bank — Establishment of a maintainability data bank, to be integrated with the reliability data bank, to assist in making predictions, and to assist in evaluating the demonstration results

h. Maintainability demonstration — Demonstration of the achievement of the qualitative and quantitative (MTTR) maintainability requirements for the system/equipment. To be accomplished in accordance with MIL-STD-471

i. Maintainability program reporting — Provision for periodic reports on the status of each maintainability program element

13.4 SYSTEM SAFETY ENGINEERING

13.4.1 Definitions

13.4.1.1 System Safety Engineering. This is the continuing analysis and monitoring of system/equipment design, operation, and maintenance to assure that the optimum degree of safety is attained within the constraints of operational effectiveness, time, and cost.

13.4.1.2 Safety. This is freedom from conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property.

1[illegible].3 System Safety. This is the application of engineering and management techniques to optimize [illegible] within the constraints of operational effectiveness, time, and cost throughout all life-cycle phases.

[illegible] [illegible]shap. This is an unplanned event or series of events that results in death, injury, occupational illn[illegible] damage to or loss of equipment or property.

13.4.1.5 Hazard. Condition prerequisite to a mishap.

a. Hazard categories:

I (catastrophic)	— Death or system loss
II (critical)	— Severe injury, severe occupational illness, or major system damage
III (marginal)	— Minor injury, minor occupational illness, or minor system damage
IV (negligible)	— Less than minor injury, occupational illness, or system damage

b. Hazard probabilities: 1 For individual item
2 For Fleet inventory

A (frequent) —	1	Likely to occur frequently
	2	Continuously experienced
B (probable) —	1	Will occur several times in life of item
	2	Will occur frequently
C (occasional) —	1	Likely to occur in life of item
	2	Will occur several times
D (remote) —	1	Unlikely, but possible to occur in life of item
	2	Unlikely, but can reasonably be expected to occur
E (improbable) —	1	So unlikely, it can be assumed it may not occur
	2	Unlikely to occur, but possible

13.4.2 System Safety Program Policy

13.4.2.1 Policy. System safety program to be established in connection with all acquisitions, to ensure

Regard for system safety is a fundamental element of the acquisition process.

Personnel will not be unnecessarily exposed to injury or health hazards.

Equipment and property will not be unnecessarily subjected to damage.

13.4.2.2 Technical Requirements. System safety program based on MIL-STD-882:

Program plan to be prepared

Hazard analyses to be conducted and hazards identified and categorized

Action taken to eliminate or control hazards, preferably by design

Where normal testing does not demonstrate safe operation, special safety tests to be conducted

Document program efforts

13.4.3 System Safety Engineering Program Elements

13.4.3.1 Program Planning and Control. These elements include

a. Program planning — Definition of the system safety program (MIL-STD-882) in a plan that identifies and describes all program monitoring, control, analysis, evaluation, testing, and documentation elements

b. Subcontractor monitoring and control — Monitoring by the prime contractor of all subcontractor system safety program efforts and ensuring compliance with the overall program requirements

c. Program/Design reviews — Review of the system safety program progress at specified points in time and conduct of, as a minimum, preliminary and critical design reviews per MIL-STD-1521

d. Failure reporting — Establishment of a closed-loop failure reporting system providing for the analysis of and correction of safety-related failures

13.4.3.2 Analysis and Evaluation. These elements include

a. Preliminary hazard analysis — Assessment of the initial risk of a system/equipment or concept in order to identify safety critical areas, evaluate hazards, and identify the safety design criteria to be used. The analysis considers the following for identification of hazards

Hazardous components (e.g., energy sources, fuels, propellants, explosives, pressure systems)

Safety-related interface considerations (e.g., materials compatibility, electromagnetic radiation interference, fire/explosion susceptibility, and propagation potential)

Environmental constraints, including the normal operating environment (e.g., vibration, shock, temperature, noise or health hazards, fire electrostatic discharge, lightning, X-ray, electromagnetic, and nuclear and laser radiation)

Operating, test maintenance, and emergency procedures (e.g., human error possibilities, environmental effects on human performance, life-support requirements in manned systems, crash survival/rescue)

Facilities, support equipment, training (e.g., provisions for storage, assembly, testing or training regarding hazardous systems or where toxic, flammable, explosive, corrosive, or cryogenic materials are used in these activities)

Safety-related equipment, safeguards, and alternate design approaches (e.g., interlocks, redundancy, fail-safe design features, personal protective gear, fire suppression systems)

b. Subsystem hazard analysis — Identification of hazards associated with component failures within a given subsystem. Performed when detailed design is completed. Analysis techniques used include

Fault hazard analysis — An inductive method of analysis involving a detailed investigation of subsystem component hazard modes, causes of hazards, and effects on the subsystem. The analysis may be qualitative or expanded to a quantitative one.

Fault tree analysis — A deductive analysis of all events, faults, and occurrences that could cause or contribute to the occurrence of undesired events. The analysis may be qualitative or quantitative.

Sneak circuit analysis — Attempts to identify latent (sneak) circuits and conditions that inhibit desired functions or cause undesired functions to occur without an accompanying component failure.

c. System hazard analysis — Performed on subsystem interfaces to determine the hazard problem areas of the total system. The fault hazard, fault tree, and sneak circuit analysis techniques are used. The analysis should consider the following subsystems relationships:

Compliance with safety criteria

Possible independent, dependent, or simultaneous failures

Safety degradation of one subsystem under normal operating conditions of another

d. Operating and support hazard analysis — Identification of potential hazards during production, installation, maintenance, testing, modification, transportation, storage, operation, training, or during other phases of use or disposal. Results of analysis will be used to control hazards and to determine appropriate safety requirements for personnel, procedures, and equipment, including

   Identifying times of high hazards and actions required to minimize risks

   Design changes necessary to eliminate or control hazards

   Identifying requirements for safety devices and equipment and required procedures for ensuring their proper operation

   Warnings, cautions, and emergency procedures for operation and maintenance

   Special procedures for operation, handling, storage, transportation, and modification

e. Safety testing and demonstrations — Performance of tests or demonstrations on safety critical equipment and procedures to determine the hazard severity or to establish the margin of safety of the design

f. System safety program report — Provision for periodic reports on the status of each system safety program element

13.5 QUALITY ASSURANCE

13.5.1 Definitions

13.5.1.1 Quality Assurance. This is the planned and systematic technical direction and surveillance of a producer's design, materials, components controls, manufacturing processes, and inspection and test practices to assure the delivery of systems/equipment that will satisfy the user's requirements.

13.5.1.2 Quality. This is the composite of all the attributes or characteristics, including performance, of a product.

13.5.1.3 Inherent Quality. This is the presence in the design of those attributes (e.g., performance, reliability, survivability, maintainability, system safety, human factors) necessary to satisfy the user's requirements (i.e., design quality).

13.5.1.4 Manufacturing Quality. This is the conformance of a manufactured product to its required drawings and specifications.

13.5.1.5 Achieved Quality. The ability of a manufactured product to satisfy the user's requirements, i.e. overall product quality.

13.5.2 Quality Assurance Program Policy

13.5.2.1 Policy. The policy is

a. Quality is to be a major factor in system planning, engineering, and management.

b. Inherent quality is established by the design.

c. Assurance of achieved quality requires a planned program.

d. Measurement of achieved quality must be continuous.

13.5.2.2 Program Requirements. The requirements are such that

a. Quality requirements are to be included in contracts and consideration given to quality during source selection.

b. Contractors' quality programs are to be evaluated and audited.

c. Engineering specifications are to include quality assurance provisions.

d. Quality requirements are to be based on operating environment.

e. Contractor developed test and inspection equipment programs are to be assessed.

f. Quality assurance requirements are to be established in connection with packaging, handling, shipment, and storage.

g. Quality assurance requirements are to be established in connection with maintenance operations.

h. Quality concepts are to be included in MIL-STDs, MIL-SPECS, and QPLs.

13.5.3 Quality Assurance Program Elements

13.5.3.1 Quality Assurance Program Plan. This is the plan for assuring the quality of the design, design documentation, and fabricated/assembled hardware and associated computer software.

13.5.3.2 Hardware Quality Assurance Program Provisions. These elements include

a. Management

Responsibility—Identifies the organization and individual responsible for program implementation, management, and control. Defines responsibilities and authority. Identifies chain-of-authority for reporting purposes.

Work instructions

Development hardware. Establishes requirement that special or nonroutine procedures (e.g., manufacturing, assembly, calibration, alignment, testing) be described by written work instructions

Fabrication/assembly of Fleet service systems/equipment. Establishes requirement that all manufacturing procedures to be described by detailed, written work instructions maintained under strict configuration control

b. Design control

Product baseline—Provides an exact definition (listing) of applicable drawings, specifications, and approved changes to which hardware will be fabricated, inspected, and tested.

Change control—Establishes the system for documenting, controlling, and accounting for engineering changes, deviations, and waivers, from both the administrative approval and hardware implementation standpoints.

c. Procurement actions (i.e., subcontracts, purchase orders)

Procurement requirements—Includes technical and quality assurance requirements such as MIL-Q-9858 quality program/MIL-I-45208 inspection system; piece part/first article/unit acceptance/lot acceptance inspection and/or test; ESS; change control; workmanship; soldering; government inspection/acceptance authority

Source inspection—Expresses ordering activity's intention to inspect units of product at source

Parts/Materials—Includes requirement that purchased components or fabricated items be inspected/tested by subcontractor upon receipt. Requires certifications for critical raw materials

d. Material control

Identification—Requires identification, segregation, and control of incoming material awaiting inspection, material having completed inspection and found acceptable, and nonconforming material

Handling control—Requires proper handling of material during processing

Storage control—Establishes requirements for preservation and packaging of completed material

Shipment control—Establishes requirements for proper preparation for shipment

e. Manufacture/Assembly

Process control—Establishes evaluations, controls, and inspections at appropriate points in the manufacturing process to ensure continuous control over quality of produced products

Special processes—Establishes requirements for methods and facilities used in connection with soldering, brazing, welding, bonding, encapsulating, plating, anodizing, heat treating, nondestructive testing, ESS, etc. Requires certification of personnel performing special processes.

Workmanship—Establishes requirements for general workmanship (MIL-STD-454, Requirement 9) practices and any special product workmanship provisions

f. Acceptance inspection and testing

First article/preproduction sample—Provides confidence that producer is capable of manufacturing items that meet the full performance and environmental requirements of the drawings and specifications

Unit acceptance—Establishes physical inspection and performance test requirements for conditional acceptance of individual units of lot; 100 percent testing of functional units and critical physical features. Large lots of homogeneous, noncritical units are inspected on a statistical sample basis.

Periodic production lot sample—Ensures that randomly selected production sample items meet the full performance and environmental requirements of the drawings and specifications. Determines acceptability of lot.

g. Corrective action

Noncomforming material—Establishes procedure for rework, repair, scrap, return to vendor, or other disposition (e.g., waiver action) of discrepant material.

Action to prevent recurrence—Establishes technical and/or administrative action necessary to prevent recurrence of the discrepancy. Includes monitoring of effectiveness of corrective action following implementation.

h. Measuring and testing equipment control—F sures all measuring and test equipment used for material acceptance or evaluation purposes .ibrated before use and is subject to a calibration recall program.

i. Quality information

Records—Establishes requirements to maintain records concerning inspections/tests of both conforming and nonconforming units of product

Quality cost data—Identifies the cost of both the prevention and correction of nonconforming suppiies

13.5.4 Why Inspect at the Piece Part Level?

Review the Burroughs Corporation experience concerning the comparative costs of locating and replacing a defective semiconductor at various assembly levels in an item of equipment—J. Zeccardi (Vice Pres. for Quality/Service)

Defect Found During	Cost to Locate/Replace
Inspection by supplier	\$.03
Incoming inspection at Burroughs	\$.30
Subassembly (circuit board) test	\$3.00
Assembly test	\$30.00
Equipment test	\$300.00
Field test	\$3,000.00

13.6 CONFIGURATION MANAGEMENT

13.6.1 Definitions

13.6.1.1 Configuration Management. This is the technical and administrative direction and surveillance of the functional and physical characteristics of system/equipment hardware or computer software.

13.6.1.2 Configuration Identification. This is the identification and documentation of the functional and physical characteristics of hardware/software with engineering drawings, parts lists, specifications, etc.

13.6.1.3 Configuration Control. This is the technical analysis and control of changes to these functional and physical characteristics as documented by engineering change proposals (ECPs), deviations, and waivers.

13.6.1.4 Configuration Status Accounting. This is the recording of the approved configuration identification in functional, allocated, or product baselines, and the reporting of the status of change (ECP) processing and implementation.

13.6.1.5 Configuration Audits. These are the formal verifications during Full-Scale Development, through physical testing (functional configuration audit) and examination (physical configuration audit), that the hardware and its related configuration identification meet contractual requirements and program needs.

13.6.1.6 Engineering Change Proposal (ECP). The ECP includes both a proposed engineering change and the documentation by which the change is described for purposes of incorporation into the affected drawings, etc.

13.6.1.7 Deviation. This is a specific written authorization, granted prior to the manufacture of an item, to depart from a particular design or performance requirement.

13.6.1.8 Waiver. This is written authorization to accept an item which during production or after having been submitted for inspection is found to depart from specified requirements.

13.6.2 Configuration Management Policy

The requirements of NAVMATINST 4130.1 are described by paragraph 3, following.

13.6.3 Configuration Management Program Elements

13.6.3.1 Configuration Identification. These elements are discussed below:

a. Functional baseline (basis for Validation phase)
   Type "A" system specification
   Level I system/equipment drawings

b. Allocated baseline (basis for Full-Scale Development)
   Type "A" system specification
   Type "B" development specifications
   Level II system drawings
   Interface control drawings

c. Product baseline (basis for production)
   Type "C" product, type "D" process, type "E" material specifications
   Level II/III system/equipment drawings
   Level III spare parts drawings
   Installation control drawings

13.6.3.2 Configuration Control (DOD-STD-480 describes). These elements include

Engineering change proposals (Class I, II ECPs)
Deviations (critical, major, minor)
Waivers (critical, major, minor)
Material review board actions

13.6.3.3 Configuration Status Accounting (MIL-STD-482 describes). These elements include

Baseline status
ECP, deviation, waiver approval status

ECP, deviation, waiver contract implementation status
"As built" configuration records
Fleet system/equipment configuration records

13.6.3.4 Configuration Audits (MIL-STD-1521 provides guidelines). These elements include

Functional configuration audit (FCA)
Physical configuration audit (PCA)

13.7 INTEGRATED LOGISTIC SUPPORT

13.7.1 Definition

Integrated logistic support is a composite of all the logistic support considerations necessary to assure the effective and economical support of a system/equipment throughout its life cycle; it is an integral part of the system acquisition process.

13.7.2 Integrated Logistic Support Program Policy

The requirements of NAVMATINST 4000.20, ILS Planning Policy, are described by paragraph 3, following.

13.7.3 Integrated Logistic Support Program Elements

13.7.3.1 Maintenance Plan. This element includes the description of the requirements and tasks to be accomplished for achieving, restoring, or maintaining the operational capability of a system/equipment. The basis for the maintenance plan is the maintenance concept that describes the manner in which a system/equipment will be maintained and supported. The maintenance concept can involve the following maintenance levels:

a. Organizational maintenance—Planned or corrective/unscheduled maintenance by the operational unit

b. Intermediate maintenance—Submarine/destroyer tenders (AS/AD), repair ships (AR), shore activities, submarine support facilities

c. Depot maintenance—Organic (Navy/DoD) or commercial designated overhaul points (DOP)

d. Direct Fleet support—Direct technical assistance to organization and intermediate levels (e.g., mobile technical units)

13.7.3.2 Manpower and Personnel. This includes requirements for the numbers (officers and enlisted personnel) and skills (classifications) of personnel to operate and maintain the system/equipment.

13.7.3.3 Supply Support. This addresses the requirements, including the initial operating requirements, for provisioning material needed at all maintenance levels including spare and repair parts and consumables. Supply support considerations include expected frequency of repair and need for early supply support, phased provisioning or prescreening, anticipated contractor depot support, and repairable material program. Supply support plan decisions are reflected in various items of provisioning technical documentation (e.g., provisioning parts list, common and bulk items list, interim support items list, long lead time items list, and tools and test equipment list).

13.7.3.4 Support and Test Equipment (S&TE). This includes requirements for special and standard test equipment, special and standard tools, fixtures, etc. and requirements for maintenance and calibration of these devices.

13.7.3.5 Training and Training Devices. This addresses requirements for training of personnel, including both initial and follow-on/refresher training, as well as requirements for training materials (e.g., instructor/lesson training course guides, student's training course guides) and for training devices or equipment including their development, fabrication, maintenance, and other support.

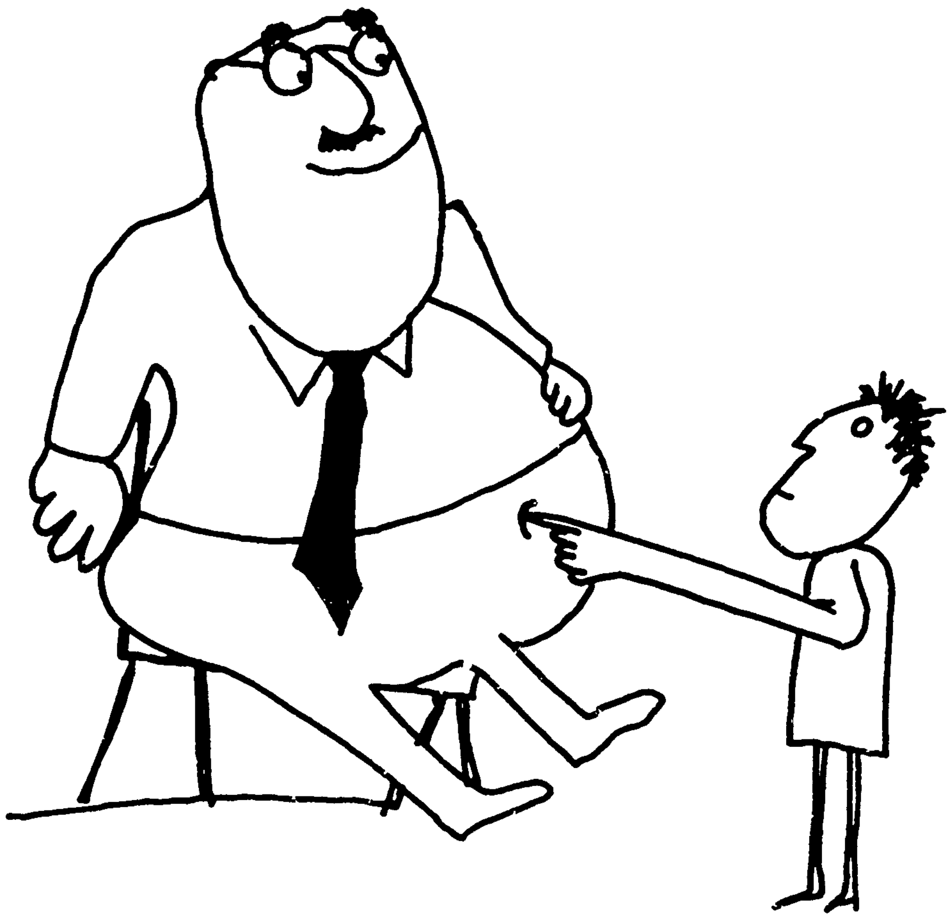
13.7.3.6 Technical Data. This includes requirements for technical manuals or other documents (e.g., maintenance requirements cards) for the organizational, intermediate, and depot maintenance levels, including the detailed format and technical contents; the validation and verification and the life-cycle maintenance; engineering drawings and product specifications acquisition and maintenance for use in procurement of systems/equipment and their spare parts and for depot repair operations.

13.7.3.7 Computer Resources Support. This includes requirements for all computer equipment and computer software and the requirements for their support.

13.7.3.8 Packaging, Handling, Storage, and Transportation (PHST). This includes requirements for preservation, packaging, packing, and marking, including special containers to prevent damage during shipment and storage; jigs, fixtures, or other equipment needed for movement during shipment; space and environment for storage, including storage related maintenance; primary and alternate modes of transportation.

13.7.3.9 Facilities. This addresses requirements for the construction or modification of new or existing facilities of all types, including assembly maintenance, and for storage facilities both afloat and ashore.

SOFTWARE PRODUCT ASSURANCE 14



CONTENTS

SECTION 14
SOFTWARE PRODUCT ASSURANCE

14.1 INTRODUCTION

14.1.1 References

See subsection 14.2.2.1.

14.1.2 Summary

Software development begins with the identification of the need for a computer software product and ends with the successful operation of the developed software in the user's environment. This section describes the Department of Defense's structured approach to the organization of the activities required throughout the development cycle.

The simplest analysis of the software development process yields a three-phase approach (Figure 14.1). These three steps, while common to the development and use of all computer programs, are independent of the size, complexity, or application. In fact, these steps may be all that are required if the program is very small and used exclusively by the implementer. However, a software development plan (SDP) designed around these three steps cannot succeed for larger software development projects.

The major problem with this approach is the lack of intermediate, measurable milestones to provide checkpoints for the development process. To introduce meaningful checkpoints would produce the software development methodology shown in Figure 14.2. Each phase or step ends with a measurable milestone (e.g., complete software specification, preliminary design, detailed design). Furthermore, each phase of the process will require iterations with adjacent phases and to a lesser degree iteration with phases further back in the process. This provides a fallback position allowing effective use of earlier work in the development process. The definition, refinement, and formalization of products and the monitoring techniques for these processes make up the project activities. This software development process is divided into six phases:

a. System requirements analysis

b. Detailed design

c. Coding

d. Unit testing

e. Integration testing

f. Computer software configuration item (CSCI) certification testing. Tasks performed within each phase of the software development process produce documents required to control and monitor the software design and to produce coded programs, verified and delivered to the user. Technical reviews are used to formalize the development control process and to validate budget and schedule reports.

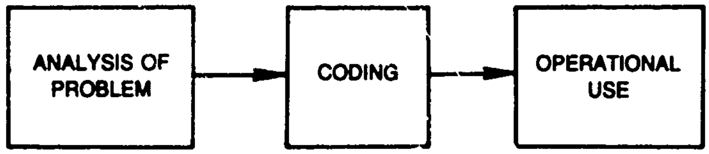


Figure 14.1. The three-phase software development process.

14.2 PROJECT MANAGEMENT

Early in the project definition phase for internal projects or during preproposal activities for competitive procurements, the selected project manager needs to take the lead in establishing the project starting point. This task includes identifying high-risk areas and establishing budgets, schedules, staffing plan, task allocations, support organizational requirements, project interface techniques, subcontractor requirements, and the project/customer interface approach. The planning for these activities is required to be included in the project management plan.

The project management plan (PMP) defines the project starting point. This plan also provides the definitions of what will be done, how, by whom, on what schedule, and which development and management tools and techniques will be used. The project manager controls the software development activities on the basis of plans prepared at the start of the project and updated as required. There are several management tools that can assist the project manager in successfully completing the software development project, e.g., schedules, WBS, documentation, configuration control, standards and conventions, and subcontracting. The PMP should include sections for each of these areas. The PMP should also describe the intended use of each of these management tools to support the project manager's task of planning, progress analysis, problem resolution, and project coordination.

14.2.1 Scope (DoD-STD-2167)

14.2.1.1 Purpose. DoD-STD-2167 establishes requirements to be applied during the development and acquisition of mission critical computer systems (MCCS).

14.2.1.2 Application. DoD-STD-2167 applies to

a. Deliverable software designated as a computer software configuration item (CSCI)

b. Development as part of a hardware configuration item (HWCI)

c. Nondeliverable development and test software

d. Deliverable unmodified commercial and reusable software

e. Modified commercial, GFI, and reusable software

14.2.1.3 Software Development by Government Agencies. The provisions of MIL-STD-2167 apply to government agencies acting as software developers. In this case, the term "contractor" refers to the government agency that is developing the software Any contractor of that government agency is classified as a subcontractor.

14.2.1.4 Tailoring MIL-STD-2167. The contracting agency will tailor DoD-STD-2167 to require only what is needed for each individual acquisition. Guidelines for applying this standard are provided in Appendix D of DoD-STD-2167.

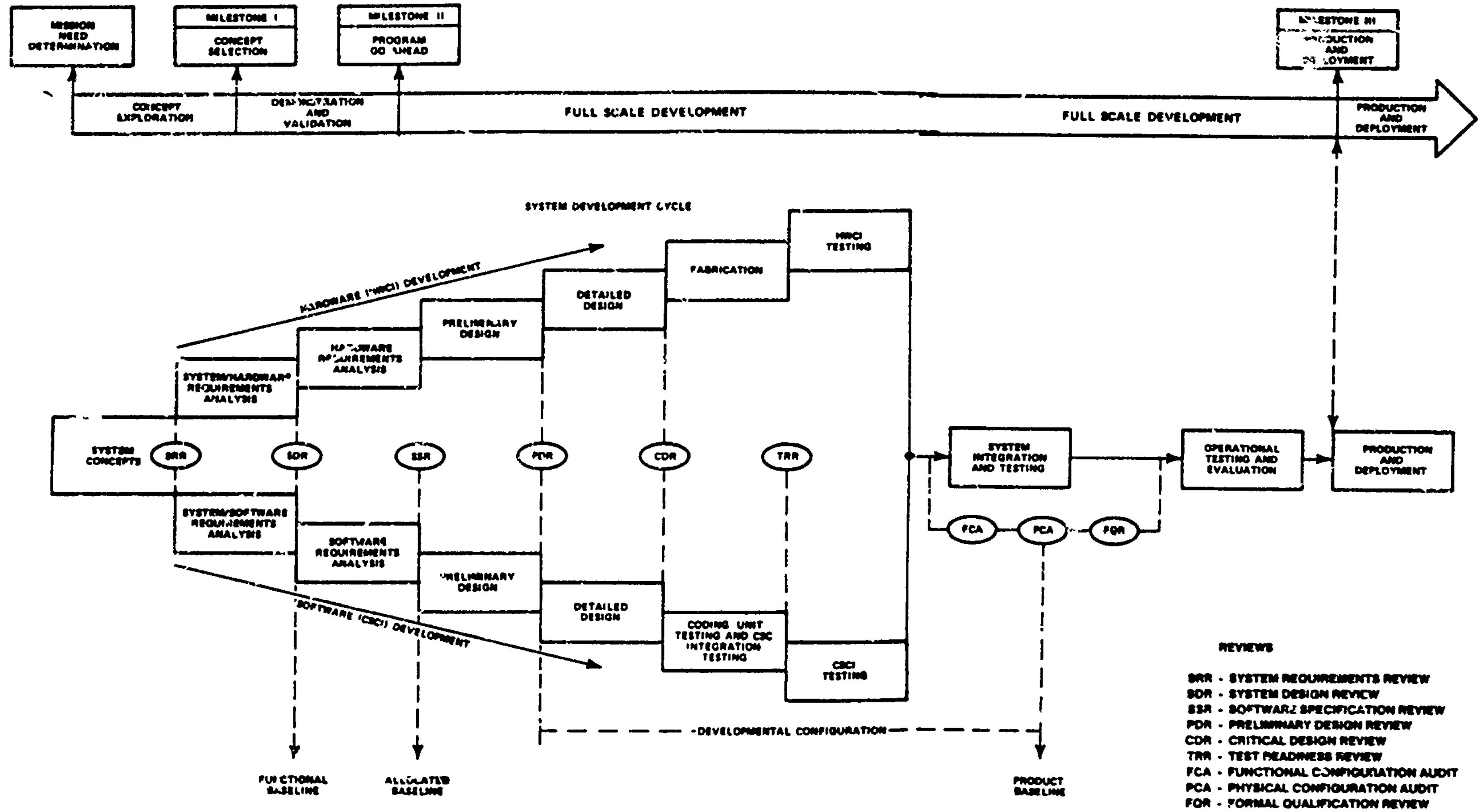


Figure 14.2 System development cycle within the system life cycle.

14.2.2 Government Documents

14.2.2.1 Specifications, Standards, and Handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of DoD-STD-2167 to the extent specified herein.

STANDARDS, MILITARY

DoD-STD-480	Configuration Control—Engineering Changes, Deviations, and Waivers
MIL-STD-481	Configuration Control—Engineering Changes, Deviations and Waivers (Short Form)
MIL-STD-483	Configuration Management Practices for Systems, Equipment, Munitions, and Computer Software
MIL-STD-490	Specification Practices
MIL-STD-881	Work Breakdown Structures for Defense Material Items
MIL-STD-1521	Technical Reviews and Audits for Systems, Equipments, and Computer Software
MIL-STD-1535	Supplier Quality Assurance Program Requirements

14.2.2.2 Other Government Documents, Drawings, and Publications. None. (Copies of specifications, standards, handbooks, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting agency or as directed by the contracting officer.)

14.2.2.3 Other Publications. None.

14.2.2.4 Order of Precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.

14.3 DEFINITIONS

14.3.1 Allocated Baseline

The initial approved allocated configuration identification as specified in DoD-STD-480.

14.3.2 Authentication

The procedure (essentially approval) used by the government in verifying that specification content is acceptable. Authentication does not imply acceptance or responsibility by the government for the specified item to perform successfully.

14.3.3 Baseline

A configuration identification document or a set of such documents (regardless of media) formally designated and fixed at a specific time during a configuration item's life cycle. Baselines, plus approved changes from those baselines, constitute the current configuration identification.

14.3.4 Certification

A process, which may be incremental, by which a contractor provides evidence to the contracting agency that a product meets contractual or otherwise specified requirements.

14.3.5 Computer Data Definition

A statement of the characteristics of basic elements of information operated upon by hardware in responding to computer instructions. These characteristics may include, but are not limited to, type, range, structure, and value.

14.3.6 Computer Software (or Software)

A combination of associated computer instructions and computer data definitions required to enable the computer hardware to perform computational or control functions.

14.3.7 Computer Software Components (CSC)

A functional or logically distinct part of a computer software configuration item. Computer software components may be top-level or lower-level.

14.3.8 Computer Software Configuration Item (CSCI)

See Configuration item (14.3.12).

14.3.9 Computer Software Documentation

Technical data or information, including computer listings and printouts, which document the requirements, design, or details of computer software; explain the capabilities and limitations of the software; or provide operating instructions for using or supporting computer software during the software's operational life.

14.3.10 Computer Software Quality (or Software Quality)

The degree to which the attributes of the software enable it to perform its specified end item use.

14.3.11 Configuration Identification

The current approved or conditionally approved technical documentation for a configuration item as set forth in specifications, drawings, and associated lists, and documents referenced therein.

14.3.12 Configuration Item

Hardware or software, or an aggregation of both, which is designated by the contracting agency for configuration management.

14.3.13 Developmental Configuration

The contractor's software and associated technical documentation that define the evolving configuration of CSCI during development. It is under the development contractor's configuration control and describes the software configuration of the design, coding, and testing effort. Any item in the development configuration may be stored on electronic media.

14.3.14 Firmware

The combination of a hardware device and computer instructions or computer data that reside as read-only software on the hardware device. The software cannot be readily modified under program control The definition also applies to read-only digital data that may be used by electronic devices other than digital computers.

14.3.15 Format Test

A test conducted in accordance with test plans and procedures approved by the contracting agency and witnessed by an authorized contracting agency representative to show that the software satisfies a specified requirement.

14.3.16 Functional Baseline

The initial approved functional configuration identification as specified in DoD-STD-480.

14.3.17 Hardware Configuration Item (HWCI)

See Configuration Item (14.3.12).

14.3.18 Informal Test

Any test which does not meet all the requirements of a formal test.

14.3.19 Modular

Pertaining to software that is organized into limited aggregates of data and contiguous codes that perform identifiable functions.

14.3.20 Product Baseline

The initial approved product configuration identification as specified in DoD-STD-480.

14.3.21 Software Development Library (SDL)

A controlled collection of software, documentation, and associated tools and procedures used to facilitate the orderly development and subsequent support of software. A software development library provides storage of and controlled access to software and documentation in both human-readable and machine-readable form. The library may also contain management data pertinent to the software development project.

14.3.22 Top-Down

Pertaining to an approach that starts with the highest level of a hierarchy and proceeds through progressively lower levels. For example, top-down design, top-down coding, top-down testing.

14.3.23 Unit

The smallest logical entity specified in the detailed design which completely describes a single function in sufficient detail to allow implementing code to be produced and tested independently of other units. Units are the actual physical entities implemented in code.

14.4 GENERAL REQUIREMENTS

The contractor/developer shall implement a software development cycle that includes the following six phases:

a. Software requirements analysis

b. Preliminary design

c. Detailed design

d. Coding and unit testing

e. CSC integration

f. CSCI testing

14.4.1 Computer Software Organization

Computer software developed in accordance with DoD-STD-1679 shall be organized as one or more CSCIs or other types of software. Each CSCI is part of a system, system segment, or prime item and shall consist of one or more top-level computer software components (TLCSCs). Each TLCSC shall consist of lower level computer software components (LLCSCs) or units. TLCSCs and LLCSCs are logical groupings. Units are the smallest logical entities, and the actual physical entities implemented in code. The static structure of CSCIs, TLCSCs, LLCSCs, and units shall form a hierarchical structure and shall uniquely identify all CSCIs, TLCSCs, LLCSCs, and units. The partitioning of the components and units may be based on functional requirements, data flow requirements, or other design considerations.

14.4.2 Software Quality

The contractor/developer shall plan and implement the software development project with the objective of building in quality. To achieve this quality the contractor shall

a. Establish and maintain a complete set of requirements

b. Establish and implement a complete process for developing the software (SDP, SCMP, and SSPM)

c. Establish and maintain a software quality evaluation process (SDEP)

14.4.3 Subcontractor Control

When NOSC is the software development agency, NOSC plays the role of a prime contractor. A prime contractor shall ensure that all subcontractors developing software and documentation comply with subcontracting requirements.

14.4.4 Nondeliverable Software, Firmware, and Hardware

The contractor/developer shall describe in the SDP the controls to be imposed on all nondeliverable software, firmware, and hardware used in the development and acquisition of deliverable software. As a minimum, the contractor/developer shall describe the provisions for

a. Modifications

b. Documentation

c. Configuration management

d. Design and coding standards

e. Testing

f. Quality evaluation

g. Certification

14.4.5 Firmware

The application of DoD-STD-2167 to firmware depends on whether the firmware is designated as a CSCI or as part of a HWCI. If the software to be implemented in firmware is considered part of the HWCI, the contractor/developer shall identify the applicable requirements in the SDP. These requirements are subject to the contracting agency approval/disapproval.

14.5 DEVELOPMENT PROCESS

14.5.1 Concept Exploration Phase

14.5.1.1 Purpose. The objectives of the concept exploration phase are to explore system concepts and to determine the feasibility of using computer resources to satisfy operational needs. This phase includes

a. Defining system level requirements

b. Analyzing development concepts

c. Analyzing alternative allocation of system requirements

d. Defining intersystem interfaces

e. Developing initial planning documents

14.5.1.2 Products. The following engineering products are developed during this phase:

a. Preliminary system/segment specification (SSS) DI-MCCR-80008

b. Preliminary test and evaluation master plan (TEMP)

c. Preliminary computer resource life cycle management plan (CRLCMP)

14.5.1.3 System Requirements Review (SRR) and Baseline. A system requirements review will be held to evaluate the adequacy of system requirements contained in the draft SSS in meeting the stated operational needs.

The authenticated SSS establishes the functional baseline. However, the SSS is normally authenticated at the system design review.

14.5.1.4 Activities, Plans, and Controls. After a need for a new mission capability has been identified and validated, a program will be initiated to explore alternative system concepts. Concept exploration may be directed toward refining proposed solutions or developing new concepts.

Exploratory activities may include

a. System engineering studies

b. Feasibility studies

c. Trade-off studies

d. Risk assessments

e. Requirements definition

f. Computer resource use studies

g. Operational concept analysis

h. Support concept studies

i. Test and evaluation planning

j. Initial software quality planning

k. Independent verification and validation planning

14.5.1.5 Management Documents. The following management documents are normally developed during this phase:

a. Initial software quality evaluation plan (SQEP) DI-MCCR

b. Initial computer resource life cycle management plan (CRLCM)

14.5.1.6 Quality Factors. Software quality planning will begin during this phase. Quality factors will be defined and the overall software evaluation process for the software development cycle will be established to the maximum extent possible. The planning will include a determination of the level of IV&V (independent validation and verification to be used during subsequent phases. Achieving software quality requires that the quality be built in from the start and that it be evaluated throughout the software development cycle.

14.5.1.7 Qualification Requirements. See Demonstration and Validation Phase (14.5.2).

14.5.2 Demonstration and Validation Phase

14.5.2.1 Purpose. The objectives of the demonstration and validation phase are to validate system requirements and to demonstrate that the system, including its computer resources, is suitable for engineering development. During this phase, system requirements are allocated and computer resource life cycle planning is completed.

14.5.2.2 Products. The following engineering products will be developed in final or preliminary form during this phase:

a. System/segment specification (SSS) (finalize)	DI-MCCR-80008
b. Computer resource life-cycle management plan (CRLCMP) (finalize)	
c. Test and evaluation master plan (TEMP) (finalize)	
d. Preliminary operational concept document (OCDP)	DI-MCCR-80023
e. Preliminary software requirements specification (SRS)	DI-MCCR-80025
f. Preliminary interface requirements specifications (IRS)	DI-MCCR-80026

14.5.2.3 System Design Review (SDR) and Baseline. The purpose of the SDR is to formally assess the allocated system requirements before proceeding with the software requirements analysis and the preliminary design of the software and hardware. The SDR will evaluate the optimization, traceability, completeness, and risk associated with the allocated requirements. A successful SDR will be predicted on the determination that the SSS is an adequate basis for developing hardware and software configuration items. The functional baseline defines the system as it enters the full-scale development (FSD) phase. If the SSS has not previously been authenticated it will be authenticated following the successful completion of the SDR and will establish the functional baseline. The functional baseline, established by the authenticated SSS, will be under government configuration control.

14.5.2.4 Activities, Plans, and Controls. System requirements will be completed and defined for each HWCI and CSCI. The contracting agency will plan for

a. System engineering studies

b. Feasibility studies

c. Trade-off and optimization studies

d. Risk management

e. Definition of the system requirements

f. Validation of requirements

g. Software support

h. Interface definition

i. Prototype computer resources

The continuous activities are

a. Computer resource life management planning

b. Computer resource working group (CRWG) support

c. Configuration management

d. Software quality evaluation

e. Test and evaluation planning

f. Independent verification and validation support

g. Operational concepts refinement

14.5.2.5 Management Documents. The contractor/developer shall develop and/or update and establish internal control over

a. Software development plan (SDP)	DI-MCCR-80030
b. Software configuration management plan (SCMP)	DI-MCCR-80009
c. Software quality evaluation plan (SQEP)	DI-MCCR-80010
d. Software standards and procedures (SSPM) manual	DI-MCCR-80011

14.5.2.6 Quality Factors. The quality factors pertaining to system quality will be specified. Typical quality factors are

a. Reliability

b. Modificability

c. Maintainability

d. Flexibility

e. Availability

f. Portability

g. Efficiency

14.5.2.7 Qualification Requirements. System level qualification requirements shall be specified during this phase. Typically, the following information is required:

a. Qualification methods

b. Philosophy of testing

c. Location of testing

d. Responsibility for tests

e. Test levels

f. Formal test

g. Formal test constraints

14.5.3 Software Requirements Phase

14.5.3.1 Purpose. The purpose of the software requirements is to define and document the functional, performance, interface, and qualification requirements for each computer software configuration item (CSCI). The requirements will be derived from the system requirements as defined in the system/segment specification (SSS).

14.5.3.2 Products. The engineering products produced during this phase are

a. Software requirements specification (SRS)	DI-MCCR-80025
b. Interface requirements specification (IRS)	DI-MCCR-80026
c. Completed operational concept document (OCD)	DI-MCCR-80023

14.5.3.3 Formal Design Reviews and Baseline. At the conclusion of the software requirements phase, a software specification review (SSR) is held. Upon completion of the SSR and when authenticated by the contracting agency, the SRS and IRSs will establish the allocated baseline for each CSCI. See MIL-STD-483, 1521B, and 490 regarding the baseline process.

14.5.3.4 Activities, Plans, and Controls. The contractor's/developer's plans, controls, and activities for software development shall include

a. Resources and organization

b. Schedules and milestones

c. Standards and procedures

d. Configuration management

e. Quality evaluation

f. Data rights

g. Nondeliverable software

h. Software that is part of a HWCI

i. Interface management between contractors

14.5.3.5 Management Documents. The contractor/developer shall develop or finalize and establish internal control over

a. Software development plan (SDP)	DI-MCCR-80030
b. Software standards and procedures manual (SSPM)	DI-MCCR-80011
c. Software configuration management plan (SCMP)	DI MCCR-80009
d. Software quality evaluation plan (SDEP)	DI-MCCR-80010

14.5.3.6 Quality Factors. The quality factor requirements applicable to each CSCI shall be specified, defined, and included in the software requirements specification. A candidate set of quality factors follows:

a. Correctness

b. Reliability

c. Efficiency

d. Integrity

e. Usability

f. Maintainability

g. Testability

h. Portability

i. Reusability

j. Interoperability

In addition to establishing quality factors, a traceability table mapping software requirements to corresponding system requirements shall be developed and maintained current and correct.

14.5.3.7 CSCI Qualification/Quality Evaluation Requirements. During this phase, the contractor/developer shall establish the qualification methods which will be used to show that the requirements of the CSCI have been satisfied. Typical qualification methods are

a. Demonstration

b. Testing

c. Analysis

d. Inspection

The contractor/developer is required to monitor the software development effort for consistency with the SDP, SCCMP, SCMP, and SQEP and to notify the contracting agency of proposed changes to these documents. The proposed changes are subject to disapproval by the contracting agency. In addition, the contractor/developer shall notify the contracting agency of any actions or procedures that deviate from the SDP, SSPM, SCMP, or SQEP.

14.5.4 Preliminary Design Phase

14.5.4.1 Purpose. The purpose of the preliminary design phase is to develop a top-level design for each CSCI which completely reflects the requirements contained in the SRS and the IRSs. In addition, the contractor should develop lower-level design for critical/high risk elements of the CSCI.

14.5.4.2 Products. The engineering products produced during this phase are

a. Software top-level design specification (STLDS)	DI-MCCR-80012
b. Software test plan (STP)	DI-MCCR-80014
c. Preliminary computer resources integrated support document (CRISD)	DI-MCCR-80024
d. Preliminary computer systems operators manual (CSOM)	DI-MCCR-80018
e. Preliminary software users manual (SUM)	DI-MCCR-80019
f. Preliminary computer systems diagnostics manual	DI-MCCR-80020

14.5.4.3 Formal Design Review and Baseline. The purpose of the preliminary design review (PDR) is to review the top-level design, the test plans, and the preliminary operation and support documents with the contracting agency and to demonstrate that

a. The top-level design satisfies the software requirement allocated from the software requirements specifications and the system requirements.

b. The test plan establishes adequate test criteria to qualify each CSCI and addresses all specified requirements.

c. The preliminary versions of the CSOM, SUM, CSDM, and CRISD, will, in final form, adequately address the operation and support of the computer system.

d. For critical lower-level elements being designed concurrently with the top-level elements, the preliminary versions of the SDDD, IDDs, and DBDDs should be reviewed.

Documents produced during the preliminary design phase are entered into the development configuration and controlled by the contractor/developer.

14.5.4.4 Activities, Plans, and Controls. The contractor/developer shall monitor the development effort for consistency and compliance with the

a. Software development plan

b. Software configuration management plan

c. Software quality evaluation plan

d. Software standards and procedures manual

During this phase, the contractor/developer shall establish the top-level design to each CSCI by allocating requirements from the SRS and IRSs to the top-level components of each CSCI. In defining each top-level component, the contractor/developer, as a minimum, shall identify

a. Top-level components place in the CSCI structure

b. Functions allocated to the top-level component

c. Memory size and processing time

d. Functional control and data flow

e. Known interrupts and special control features

f. Global data shared with other top-level components

g. Inputs, local data, interrupts, timing and sequencing, processing, and outputs of the top-level component

Test plans for both informal and formal test shall be developed.

Informal testing includes unit testing and integration testing. Information test documentation does not require government approval. However, it shall be made available for government review.

For unit testing, the contractor/developer shall identify

a. Overall test requirements

b. Test responsibilities

c. Schedule information

Formal testing consists of testing fully implemented CSCI(s) to demonstrate that each CSCI satisfies its specified requirements. Formal testing also applies to top-level components, low-level components, and unit testing when compliance with specified requirements cannot be demonstrated at the CSCI level. Formal test documentation requires government approval.

For formal test, the contractor/developer shall, as a minimum, identify

a. Test requirements

b. Test organization, responsibilities, and schedule

c. Classes/types of formal tests

d. Data recording, reduction, and analysis

e. Purpose of each formal test

14.5.4.5 Management Documents. No new management documents developed during this phase. Existing management documents should be reviewed and updated.

14.5.4.6 Quality Factors. Achieving software quality requires that quality be built in during the development process and evaluated during each phase. The appropriate quality factors and quality measurements should be prescribed in the SQEP and procedures. Flow-down of quality factors from the SRS to lower-level activities is a requirement.

14.5.4.7 Qualification/Evaluation Requirements. The contractor/developer is required to monitor the software development effort for consistency with the SDP, SSPM, SCMP, and SQEP and to notify the contracting agency of proposed changes. The changes are subject to disapproval by the contracting agency. In addition, the contractor/developer shall notify the contracting agency of any actions or procedures that deviate from the SDP, SSPM, SCMP, or SQEP.

14.5.5 Detailed Design Phase

14.5.5.1 Purpose. The purpose of the detailed design phase is to describe in detail the structure and organization of a particular CSCI and to describe the decomposition of the top-level components into low-level components and units.

14.5.5.2 Products. The engineering products produced during this phase are

a. Software detailed design document (SDDD)	DI-MCCR-80031
b. Software test description (STD)	DI-MCCR-80015
c Software development files, informal	
d. Informal test descriptions, informal	
e. Computer resources integrated support document (CRISD)	DI-MCCR-80024
f. Software programmer's manual (SPM)	DI-MCCR-80021
g. Interface design document (IDS)	DI-MCCR-80027
h. Data base design document (DBDD)	DI-MCCR-80028

14.5.5.3 Critical Design Review (CDR) and Baseline. The purpose of the CRD is to review the detailed design, test description, and operation and support documents with the contracting agency and to demonstrate that

a. The detailed design satisfies the requirement of the SRS and the IDSs.

b. The SDDD, IDDs, and DBDDs refine the design details of the CSCI in a manner consistent with the STLDD.

c. The STD provides adequate test cases for the formal test identified in the STP.

d. The updated versions of the CSOM, SUM, and CSDM will, in final form, adequately address the operation and support of the computer system.

e. The SPM, FSM, and CRISD adequately address software programming support, firmware support, and integrated computer resource support.

The SDDD, IDDs, and the DBDDs are a part of the development baseline.

14.5.5.4 Activities, Plans, and Controls. The contractor/developer shall monitor the development effort for consistency with the SDP, SSPM, SCMP, and SQEP and shall notify the contracting agency of proposed changes to these documents. The contracting agency has disapproval authority. In addition, the contracting agency must authorize any actions or procedures that deviate from the SDP, SSPM, SCMP, or SQEP

The contractor/developer shall establish the complete, modular, low-level design for each CSCI, and be refining top-level design into low-level components and low-level components into units. Each unit shall perform a single function.

The contractor/developer shall

a. Use top-down design unless other methodologies are described in the SDP and SSPM plans and the contracting agency has reviewed and not disapproved the SDP and SSPM documents.

b. Employ a design language.

c. Incorporate human factors.

d. Monitor size and timing estimates.

e. Establish software development files.

f. Document engineering analysis and trade-off studies.

g. Identify test requirements for informal tests.

h. Describe test cases for informal test.

i. Describe test cases for formal test.

j. Update CSOM, SUM, CSDM, and CRISD.

k. Prepare information to facilitate software and target computer compatibility.

l. Prepare information necessary to maintain firmware.

m. Conduct internal code, PDL, test, and design walkthroughs and reviews.

14.5.5.5 Management Documents. No new management documents produced during this phase. Existing management documents should be reviewed and updated.

14.5.5.6 Quality Factors

Achieving software quality requires that quality be built in during the development process and evaluated during each phase. The appropriate quality factors and quality measures should be prescribed in the SQEP and the quality procedures. Flow-down of quality factors from the SAS to lower-level activities is a requirement.

14.5.5.7 Qualification/Quality Evaluation Requirements. The contractor/ developer is required to monitor the software development effort for consistency with the SDP, SSPM, SCMP, and SQEP and to notify the contracting agency of proposed changes to these documents. The changes are subject to disapproval by the contracting agency. In addition, the contractor/developer shall notify the contracting agency of any actions or procedures that deviate from the SDP, SSPM, SCMP, or SQEP.

14.5.6 Coding and Unit Test Phase

14.5.6.1 Purpose. The objectives of this phase are to develop the code and demonstrate that the detailed design is accurately translated in code.

14.5.6.2 Products. The following engineering products are developed or updated during this phase:

a. Preliminary software test procedure (STPR) DI-MCCR-80016

b. Source code

c. Object code

d. Informal test procedures

e. Informal test results

f. Update CSOM, SUM, CSDM, SPM, and FSM as required

14.5.6.3 Formal Design Review and Baselines. Source code, object code, test document, and software development files are placed under internal configuration management and become a part of the development baseline. A formal design review is not held at this milestone.

14.5.6.4 Activities, Plans, and Controls. The contractor/developer's activities, plans, and controls normally consist of the following

a. Top-down coding and unit testing unless other methodologies have been proposed in either the SSPM or SDP and have received contracting agency approval. Candidates for a departure from top-down approach are critical units, government-furnished software, and commercially available software.

b. Use of coding standards.

c. Use of the software development folder (SDF).

d. Unit testing will be controlled by the test plans contained in the STP and performed in accordance with the unit test cases and unit test procedures contained in the SDF.

e. Record all unit test results in the unit development folder (UDF).

f. Maintain all documents in a current status.

g. Develop test procedures for integration test.

h. Conduct code and test in-process reviews.

14.5.6.5 Management Documents. The contractor/developer shall

a. Update the SDP, SSPM, SCMP, and SEQP as required

b. Produce internal review records

c. Produce updated SDFs

14.5.6.6 Quality Factors. The software quality metrics and measures that support quality factors evaluation should be a flow-down from higher-level requirements. The SQEP should address this process.

14.5.6.7 Qualification/Quality Evaluation Requirements. Formal qualification of components during this phase would only be performed on those units which contain functions that cannot be qualified at the CSCI level. Formal tests conducted during this phase require

a. Formal test procedures

b. Contracting agency approval of the test procedures

c. Test performed in accordance with the approved test procedures

The contractor/developer is required to monitor the software development effort for consistency with the SDP, SSPM, SCMP, and SQEP and to notify the contracting agency of proposed changes to these documents. The changes will be subject to disapproval by the contracting agency. In addition, the contractor/developer shall notify the contracting agency of any actions or procedures that deviate from the SDP, SSPM, SCMP, or SQEP.

14.5.7 Computer Software Components (CSC) Integration and Testing Phase

14.5.7.1 Purpose. The purpose of this phase is to integrate units of code that have been entered in the development configuration and to perform informal tests on aggregates of integrated units.

14.5.7.2 Products. The following products are normally updated and/or produced during this phase:

a. Software test procedures report (STPR)	DI-MCCR-80016
b. Updated computer operator's manual (CSOM)	DI-MCCR-80018
c. Updated software user's manual (SUM)	DI-MCCR-80019
d. Updated computer software diagnostics (CSDM)	DI-MCCR-80020
e. Updated software programmer's manual (SPM)	DI-MCCR-80021
f. Updated firmware support manual (FSM)	DI-MCCR-80022

g. Source code

h. Object code

i. Internal review reports

j. Informal integration test results

14.5.7.3 Test Readiness Review (TRR) and Baseline. The purpose of the TRR is to review the informal test results, formal test procedures, and operations and support documents with the contracting agency and to demonstrate that

a. The CSCI test procedure is complete.

b. Each CSCI is ready for formal test.

c. The CSOM, SUM, and CSDM adequately address the operation and support of the computer system.

The TRR is a formal review and will be officially acknowledged by the contracting agency. MIL-STD-1521A, Appendix F, describes the process. The information and data produced during this phase become part of the development configuration.

14.5.7.4 Activities, Plans, and Controls. These items include the following

a. Integrate and test aggregates of units in a top-down sequence.

b. Compare memory and processing time values with established allocations.

c. Modify, as necessary, all controlled or baselined documentation based on memory, processing time, and system resources comparisons.

d. Maintain configuration control over modified documents.

e. Document the results of all integration testing as described in the SSPM or SDP.

f. Update design documentation and code.

g. Complete detailed procedures from CSCI testing.

h. Conduct internal inprocess reviews.

i. Update, as necessary, the CSDM, SUM, CSOM, SPM, and FSM.

14.5.7.5 Management Documents. No necessary management documents are developed during this phase. Existing management documents should be reviewed and updated as required.

14.5.7.6 Quality Factors. Achieving software quality requires that quality be built in during the development process and evaluated during each phase. The appropriate quality factors and quality measurements should be described in the SQEP and the quality procedures. Flow-down of quality factors from the SRS to low-level activities is a requirement.

14.5.7.7 Qualification/Evaluation Requirements. Formal qualification of components during this phase would only be performed on those units/CSCs which contain functions that cannot be qualified at the CSCI level. Formal tests conducted during the phase require

a. Formal test procedures

b. Contracting agency's approval of the test procedures

c. Test performed in accordance with the approved test procedures

The contractor/developer is required to monitor the software development effort for consistency with the SDP, SSPM, SCMP, and SQEP and to notify the contracting agency of any proposed changes to these documents. The proposed changes will be subject to disapproval by the contracting agency. In addition, the contractor/developer shall notify the contractor agency of any actions or procedures that deviate from the SDP, SSPM, SCMP, or SQEP.

14.5.8 CSCI Testing Phase

14.5.8.1 Purpose. The objective of this phase is to snow that the CSCI satisfies its specific requirements, e.g., functional, interface, performance, and quality.

14.5.8.2 Products. During this phase, the contractor/developer normally produces and/or updates the following documents:

a. Completed computer software operator's manual (CSOM)	DI-MCCR-8001B
b. Completed systems user's manual (SUM)	DI-MCCR-80019
c. Completed computer software diagnostics manual (CSDM)	DI-MCCR-80020
d. Completed software programmer's manual (SPM)	DI-MCCR-80021
e. Completed firmware support manual (FSM)	DI-MCCR-80022
f. Version description document (VDD)	DI-MCCR-80013
g. Software product specification (SPS)	DI-MCCR-80029
h. Software test reports	
i. Record of internal reviews	
j. Updated source and object code	

14.5.8.3 Audits, Reviews, and Baselines. The purpose of the functional configuration audit (FCA) is to demonstrate to the contracting agency that the CSCI was successfully tested and meets the requirements of the SRS and the IRSs. The FCA also demonstrates to the contracting agency that the CSOM, SUM, and CSOM adequately address the operation and support of the computer system. The contractor will present the CSOM, SUM, and CSDM at the FDA.

The purpose of the physical configuration audit (PCA) is to demonstrate to the contracting agency that the SPS is complete and reflects an up-to-date technical description of the CSCI. The contractor shall present the SPS, VDD, and source code at the PCA.

The configuration identification documents for HWCIs and CSCIs comprise a system from a single product baseline. When the FCA and PCA for each CSCI have been completed and authenticated by the contracting agency, the SPS for the CSCI will be entered into the product baseline. See MIL-STD-1521B for information concerning the FCA and PCA process.

14.5.8.4 Activities, Plans, and Controls. The contractor/developer/IV&V contractor shall test the CSCI using formal test procedures approved by the contracting agency.

Individuals sufficiently independent from the software developer shall perform formal tests on each CSCI in accordance with the

a. Formal test plans

b. Formal test cases

c. Formal test procedures

The test reports accumulated by the independent test group shall report the results of all formal tests. The test reports shall include

a. Summary of tests results

b. Detail of test results

c. Evaluation of test results

d. Recommendations

e. Test procedure deviations.

The contractor/developer shall

a. Make necessary revisions to the design documentation

b. Make necessary revisions to the code

c. Perform all necessary retests

d. Update all SDFs.

The contractor/developer shall identify the exact version of each deliverable CSCI and the interim changes occurring between versions. The identification shall include

a. Inventory of materials

b. Inventory of CSCI contents

c. Class 1 changes installed

d. Class 2 changes installed

e. Adaptation data

f. Operational description

g. Installation instructions

h. Possible problems and known errors

The contractor/developer shall conduct internal in-process reviews during this phase and make all changes based on the results of the internal review prior to presenting the formal test results and completed operation and support documents to the contracting agency.

14.5.8.5 Management Documents. No new management documents are developed during this phase.

14.5.8.6 Quality Factors. The quality factors specified in the software requirements specification (SRS) apply during the CSCI testing phase. The applicable quality factors and the quality measures required to support the realization of the quality factors should be specified in the SQEP and the quality procedures.

14.5.8.7 Qualification Requirements. The contractor/developer shall conduct formal tests on each CSCI to show that the CSCI satisfies its specified requirements. Personnel conducting CSCI tests and analyzing formal test data shall be sufficiently independent from the individuals responsible for development to permit objective testing.

14.6 SOFTWARE QUALITY EVALUATION

14.6.1 Purpose

The purpose of the software quality evaluation plan (SQEP) is to describe the organization and procedures to be used by the contractor to determine the quality of the software and associated documentation.

The SQEP is used by the government to monitor the procedures, management, and work effort of the contractors' organizations performing software quality evaluation. The SQEP and the quality procedures are subject to disapproval by the contracting agency.

14.6.1.1 Quality Evaluation. The contractor/developer shall perform the planning and implement internal procedures to

a. Evaluate the requirements

b. Evaluate the methodology

c. Evaluate the products

d. Provide feedback and recommendation

e. Detect, report, and track problems

The method for accomplishing the above shall be specified in the SQEP.

14.6.2 Internal Reviews

14.6.2.1 Internal Reviews. The contractor shall conduct internal reviews to determine the following

a. Conformance to the methodologies proposed in the contractor's/ developer's planning document

b. Compliance with the methodologies proposed in DoD-STD-2167

c. Adequacy of the contractor's process and methodologies to produce quality products that will meet established requirements

d. Compliance of process with methodologies

e. Adequacy of in-process reviews to evaluate products

14.6.2.2 Evaluation Criteria. The contractor/developer shall use the following evaluation criteria:

a. Adherence to required format

b. Compliance with contracted requirements

c. Internal consistency

d. Understandability

e. Technical adequacy

14.6.2.3 Internal Reviews—All Phases. The contractor/developer shall conduct the following reviews during all phases of the software development cycle.

a. Review newly prepared or revised SDP, SSPM, SCMP, and SQEP for

1. Adherence to required format
2. Compliance with contracted requirements
3. Internal consistency
4. Understandability
5. Technical adequacy
6. Degree of completeness

b. Review the activities and the tools, procedures, and methodologies employed during the phase for consistency with the contractor's software development plans. Included in this review shall be evaluation of

1. Software configuration management
2. Software development library
3. Documentation contract
4. Storage and handling of media
5. Control of nondeliverables
6. Risk management
7. Corrective action
8. Conformance to standards and procedures

14.6.3 Internal Review—Software Requirements Analysis

The contractor/developer shall conduct internal reviews during the software requirements phase.

14.6.3.1 The OCD shall be reviewed for

a. Adherence to required format
b. Compliance with contractual requirements
c. Internal consistency
d. Understandability
e. Technical adequacy
f. Degree of completeness
g. Consistency with the SSS
h. High-level understanding

14.6.3.2 The ongoing SRS and IRSs shall be reviewed for

a. Adherence to required format

b. Compliance with contractual requirements

c. Internal consistency

d. Understandability

e. Technical adequacy

f. Degree of completeness

g. Traceability of requirements to system specification

h. Consistency of interface requirements with specifications for interfacing elements

i. Consistency of SRS and IRSs with one another

j. Testability of functional, performance, and interface requirements

14.6.3.3 The following management documents shall be reviewed for adequate control, technical feedback, and management feedback:

a. Software configuration management

b. Software development library

c. Documentation control

d. Storage and handling of media

e. Control of nondeliverables

f. Risk management

g. Corrective action

h. Conformance to all approved standards and procedures

14.6.4 Internal Review—Preliminary Design

14.6.4.1 Process. The contractor/developer shall conduct internal reviews during the preliminary design phase. The process shall be reviewed for adequate performance in the following areas:

a. Software configuration management

b. Software development library

c. Documentation control

d. Storage and handling of media

e. Control of nondeliverables

f. Risk management

g Corrective action

h. Conformance to all approved standards and procedures

14.6.4.2 General Product Reviews. All products shall be reviewed for

a. Adherence to required format

b. Compliance with contractual requirements

c. Internal consistency

d. Understandability

e. Technical adequacy

f. Degree of completeness

14.6.4.3 Specific Product Reviews. The specific products shall be reviewed for the following characteristics.

a. The top-level design and STLDD shall be reviewed for traceability to the SRS and IDRs.

b. The STP shall be reviewed for

1. Adequate test coverage
2. Consistency with the SDP
3. Adequate planning

c. The preliminary versions of the CSOM, SUM, and CSDM will be reviewed for

1. Consistency with SRS
2. Appropriate content
3. Consistency with one another

d. The preliminary CRISD shall be reviewed for

1. Consistency with government support concepts
2. Adequacy of support planning

14.6.5 Internal Review—Detailed Design

14.6.5.1 Process. The contractor/developer shall conduct internal reviews during the detailed design. The process shall be reviewed for

a. Software configuration management

b. Software development library

c. Documentation control

d. Storage and handling of media

e. Control of nondeliverables

f. Risk management

g. Corrective action

h. Conformance to all approved standards and procedures

14.6.5.2 General Product Reviews. All products shall be reviewed for

a. Adherence to required format

b. Compliance with contractual requirements

c. Internal consistency

d. Understandability

e. Technical adequacy

f. Degree of completeness

14.6.5.3 Specific Product Reviews. The specific products shall be reviewed for the following characteristics.

a. Review of evolving detailed design and the SDDD, IDDs, and DBDDs, as applicable for

1. Traceability to SRS, IRS, and STLDD

2. Use of appropriate design techniques

3. Consistency with one another

b. Review one STP for

1. Adequate test coverage

2. Consistency with design

c. Review software development files for accuracy of schedule and status.

d. Review unit test cases for

1. Traceability to the STP

2. Adequate test coverage

3. Consistency with design

e. Review integration test cases for

1. Traceability to the STP

2. Adequate test coverage

3. Consistency with design documentation

f. Review the updated CSOM, SUM, and CSDM for

1. Consistency with requirements and design

2. Appropriateness of content

3. Consistency with one another

g. Review the completed CRISD for

1. Consistency with government support concepts

2. Adequacy of support planning

h. Review the SPM and FSM for

1. Consistency with design documentation

2. Appropriateness of content for support personnel

14.6.6 Internal Review—Code and Unit Testing

14.6.6.1 Process. The contractor/developer shall conduct internal reviews during the code and unit testing phase. The process shall be reviewed for

a. Software configuration management

b. Software development library

c. Documentation control

d. Storage and handling of media

e. Control of nondeliverables

f. Risk management

g. Corrective action

h. Conformance to all approved standards and procedures

14.6.6.2 General Product Reviews. All products shall be reviewed for

a. Adherence to required format

b. Compliance with contractual requirements

c. Internal consistency

d. Understandability

e. Technical adequacy

f. Degree of completeness

14.6.6.3 Specific Product Reviews. The specific products shall be reviewed for the following characteristics:

a. The evolving and completed source code shall be reviewed for

1. Compliance with coding standards
2. Traceability to detailed design

b. The software development files shall be reviewed for

1. Accuracy of status and schedule
2. Unit test procedures
3. Unit test results
4. Traceability to unit test plans
5. Traceability to unit test cases
6. Readiness for units to be placed under CM

c. The STLDD, SDDD, IDDs, and DBDDs, as applicable, shall be reviewed for

1. Traceability to SRS
2. Use of appropriate design techniques
3. Consistency with one another

d. The updated source code, as applicable, shall be reviewed for

1. Compliance with coding standards
2. Consistency with the updated detailed design documentation

e. The informal integration test procedures shall be reviewed for

1. Traceability to CSC integration
2. Adequate test coverage
3. Consistency with design documents

f. The preliminary design STPR shall be reviewed for

1. Traceability to the STP and STD
2. Adequate test coverage
3. Consistency with design documents

g. The updated CSOM, SUM, and CSDM shall be reviewed for

1. Consistency with requirements and design documents
2. Appropriateness of content
3. Consistency with one another

h. The updated SPM and FSM shall be reviewed, as applicable, for

1. Consistency with design documentation
2. Appropriateness of content for support personnel

14.6.7 Internal Review–CSC Integration and Testing

14.6.7.1 Process. The contractor/developer shall conduct internal reviews during the CSC integration testing phase. The process will be reviewed for

a. Software configuration management

b. Software development library

c. Documentation control

d. Storage and handling of media

e. Control of nondeliverables

f. Risk management

g. Corrective action

h. Conformance to all approved standards and procedures

14.6.7.2 General Product Review. All products shall be reviewed for

a. Adherence to required format

b. Compliance with contractual requirements

c. Internal consistency

d. Understandability

e. Technical adequacy

f. Degree of completeness

14.6.7.3 Specific Product Reviews. The specific product shall be reviewed for the following characteristics:

a. The informal test results of CSC integration will be reviewed for

1. Traceability to CSC test cases
2. Traceability to CSC test procedures
3. Correct performance of the integrated CSCI
4. Readiness for the CSCI to undergo formal testing

b. The updated STLDD, SDDD, IDDs, and DBDDs shall be reviewed for

1. Traceability to software requirements
2. Use of appropriate design techniques
3. Consistency with one another

c. The source code shall be reviewed for

1. Compliance with coding standards
2. Consistency with update design documentation

d. The updated software development files shall be reviewed for accuracy of status and schedule

e. The completed STPR shall be reviewed for

1. Traceability to the STP and STD
2. Adequate test coverage
3. Consistency with design documentation

f. The updated CSOM, SUM, and CSDR shall be reviewed for

1. Consistency with requirements and design documentation
2. Appropriateness of content
3. Consistency with one another

g. The updated SPM and FSM shall be reviewed for

1. Consistency with design documentation
2. Appropriateness of content for support personnel

14.6.8 Internal Review—CSCI Testing

14.6.8.1 Process. The contractor/developer shall conduct internal reviews during the CSCO testing phase. The process will be reviewed for

a. Software configuration management

b. Software development library

c. Documentation control

d. Storage and handling of media

e. Control of nondeliverables

f. Risk management

g. Corrective action

h. Conformance to all approved standards and procedures

14.6.8.2 General Product Review. All products shall be reviewed for

a. Adherence to required format

b. Compliance with contractual requirements

c. Internal consistency

d. Understandability

e. Technical adequacy

f. Degree of completeness

14.6.8.3 Specific Product Review. The specific products/activities shall be reviewed for the following characteristics.

a. The CSCI testing shall be monitored to ensure that

   1. It is performed using the current controlled version of the code

   2. It is conducted in accordance with approved test plans, descriptions, and procedures

   3. Necessary retesting is accomplished

b. The STRs shall be reviewed for traceability of the CSCI test results to the CSCI test plans, test cases, and test procedures

c. The updated STLDD, SDDD, IDDs and DBDDs, as applicable, shall be reviewed for

   1. Traceability to software requirements

   2. Use of appropriate design techniques

   3. Consistency with one another

d. The updated source code, as applicable, shall be reviewed for

   1. Compliance with coding standards

   2. Consistency with the updated detailed design documentation

e. The software development files shall be reviewed for accuracy of status and schedule.

f. The SPS shall be reviewed for incorporation of design documentation and software listings consistent with the "as-built" software.

g. The VDD shall be reviewed for accuracy in reflecting the exact version of each CSCI.

h. The completed CSOM, SUM, and CSDM shall be reviewed for

1. Consistency with the SPS
2. Appropriateness of content
3. Consistency with one another

i. The SPM and FSM shall be reviewed for

1. Consistency with design documentation
2. Appropriateness of content

14.6.9 Evaluation

14.6.9.1 Formal Reviews and Audits. The contractor/developer shall evaluate the planning and preparation performed for each formal review and audit to ensure that

a. Required products (e.g. the data package) will be available for review

b. Necessary resources and material are available

c. Meeting agenda is coordinated

d. Cochairpersons are designated

e. Action items and action items sources are recorded

The following formal design reviews and audits are normally conducted during the system life cycle:

a. System requirement reviews (SRR)

b. System design review (SDR)

c. Software specification review (SSR)

d. Preliminary design review (PDR)

e. Critical design review (CDR)

f. Test readiness review (TRR)

g. Functional configuration audit (FCA)

h. Physical configuration audit (PCA)

i. Formal qualification review (FQA)

j. Production readiness review (PRR)

14.6.9.2 Evaluation of Subcontractor Products. Prior to accepting software or documentation developed from a subcontractor, the prime contractor shall evaluate the products for

a. Completeness

b. Technical adequacy

c. Compliance with subcontract requirements

14.6.9.3 Quality Records. The contractor/developer shall prepare and maintain records of each quality evaluation performed; quality records shall identify

a. Date of evaluation

b. Evaluation participants

c. Items or activities reviewed

d. Objectives of the evaluation

e. Detected problems

f. Recommendations

14.6.9.4 Quality Reporting. The contractor/developer shall prepare reports that provide to contractor management the results and recommendations from the quality evaluations. The quality evaluation reports shall identify

a. Evaluation activity

b. Detected problems

c. Remedial action

d. Trends

e. Recommended changes

14.6.9.5 Corrective Action System. The contractor/developer shall implement a corrective action system for all software and documentation that has been placed under contractor or government control. The corrective action system shall include provisions for

a. Reporting problems

b. Analyzing problems

c. Classifying problems by category and priority

d. Identifying corrective action

e. Identifying trends

f. Analyzing trends

g. Authorizing corrective action

h. Implementing corrective action

i. Reevaluating the problem after corrective action

j. Tracking problems

k. Closing out problems

l. Providing government visibility into critical problems based on categorization, priority schemes, and problems/change reports

14.6.9.6 Quality Cost Data. The contractor/developer shall collect and analyze the document data relative to the cost of detecting and correcting errors in all software and documentation that have been placed under contractor or government control. The specific data to be collected and the analyses to be performed shall be proposed by the contractor in either the SQEP or the SDP and shall be subject to contracting agency approval.

14.6.9.7 Products—Software Quality Evaluation. The following are included in the quality evaluation considerations:

a. Quality records. The contractor/developer shall prepare and maintain records of each quality evaluation.

b. Quality reports. The contractor shall prepare and maintain reports that summarize the results and recommendations of quality evaluations performed. These reports shall be made available for government review.

c. Certification. The contractor/developer shall collect and make available for government inspection evidence indicating the compliance with the requirements of the contract.

d. Independence. Each software quality evaluation shall be performed by individuals who have sufficient responsibility, authority, resources, and independence to accomplish objective evaluation of the products and activities being evaluated. The degree of evaluation independence shall be specified in the SQEP or SDP.

14.6.10 Software Project Planning and Control

14.6.10.1 Sizing and Timing. The contractor/developer shall derive sizing and timing parameters for each CSCI including minimum reserve capacities. The contractor will monitor these parameters and reallocate as necessary to meet requirements specified in the SRS.

14.6.10.2 Status and Cost Report. The contractor/developer shall maintain cost and schedule forecast, analysis, and reports. These reports shall conform to the WBS.

14.6.10.3 Test Documentation Control. The contractor/developer shall establish internal control over approved STP, STD, and STPRs. The contracting agency shall be notified of any proposed changes to these documents, and the contractor shall obtain approval before making any changes.

14.6.10.4 Software Development Library. The contractor/developer shall establish, implement, and control the content of the software development library.

14.6.10.5 Risk Management. The contractor/developer shall establish and implement the risk management procedures specified in the SDP for controlling risk. The procedures shall include

a. Identifying the risk areas and the consistent risk factors in each area

b. Assessing the probability of occurrence and the potential damage associated with each risk factor

c. Assigning appropriate resources to reduce the risk factors

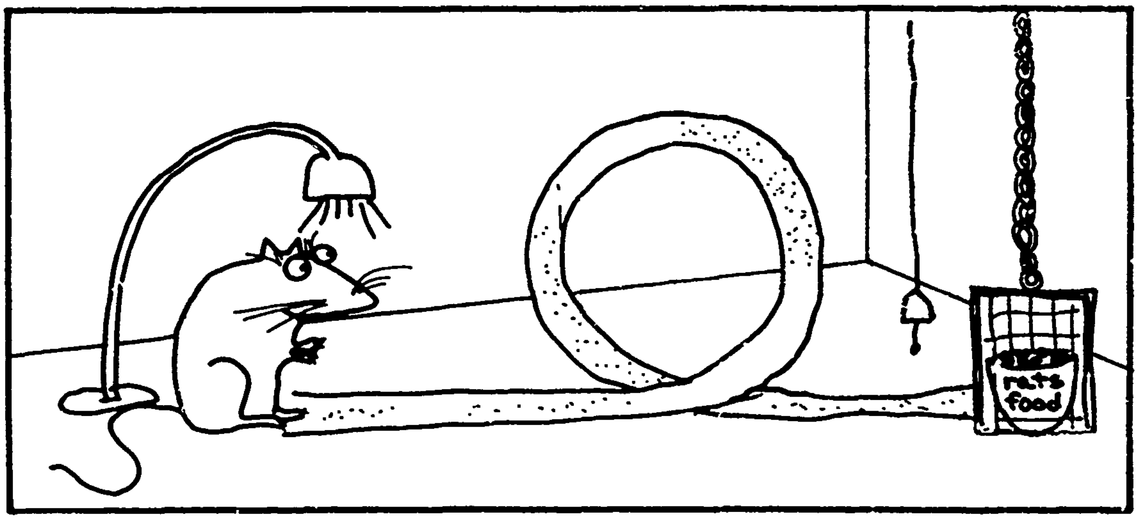
d. Identifying and analyzing the alternatives available for reducing the risk factors

e. Selecting the most promising alternative for each risk factor

f. Planning implementations of the selected alternatives for each risk factor

g. Obtaining feedback to determine the success of the risk reducing action for each risk factor

TEST AND EVALUATION 15



CONTENTS

SECTION 15
TEST AND EVALUATION

15.1 INTRODUCTION

15.1.1 References

MIL-STD-188C, Technical Standards for Military Communication Systems
MIL-STD-210B, Standard for Climatic Extremes
MIL-STD-490A, Standard for Specification Practices
MIL-STD-810, Environmental Test Methods and Engineering Guidelines
MIL-E-16400G, General Specification for Naval Ship and Shore Electronic, Interior Communications, and Navigation Equipment
NAVSO P-2457, Department of the Navy RDT&E Management Guide
NAVMAT P-9492, Navy Manufacturing Screening Program
OPNAVINST 3960.10, Test and Evaluation
OPNAVINST 5000.42, RDT&E/Acquisition Procedure
NOSC TD 108 Project Manager's Guide
NAVSEA, System Acquisition T&E Handbook
NAVSPAWAR, T&E Handbook, 3rd edition

15.1.1 Summary

Successful Test and Evaluation (T&E) is the major determining factor in program acquisition milestone decisions. This is true at any time, but especially during the acquisition process. This presentation is not intended to make *Test Directors* of each of you, but rather to present and review pertinent T&E information for program managers. Required T&E documents are identified, including Test and Evaluation Master Plans (TEMPS), test plans, procedures and reports. Considerations to be evaluated during site selections are listed. The purposes for a technical evaluation (TECHEVAL) and an operational evaluation (OPEVAL) are presented, as well as the OPEVAL Readiness Criteria. T&E services and capabilities provided by Support Engineering, Code 95, are reviewed, and examples of some NOSC programs are discussed.

15.2 DEFINITIONS

ACAT	Acquisition category
D/V (D&V)	Demonstration and Validation, phase I
DT I	Developmental Testing during D/V phase
DT II	Developmental Testing during Full-Scale Development, phase II
ADM	Advanced Development Model

EDM	Engineering Development Model
FSD	Full-Scale Development
FSP	Full-Scale Prototype
FOT&E	Follow-on T&E
MS	Milestone
OT	Operational Test
OPEVAL	Operational Evaluation
TECHEVAL	Technical Evaluation
PAT&E	Production Acceptance T&E

15.3 T&E DURING THE ACQUISITION PROCESS

There are four phases during the acquisition process: Conceptual—phase 0, Demonstration & Validation—phase I, Full-Scale Development—phase II, and Production and Deployment—phase III. The decision to proceed from one phase to the next is determined at meetings held by Defense Systems Acquisition Review Councils (DSARCs); this is where the milestone decisions are made. The results of T&E, Test Reports, and data are the major determining factors effecting the milestone decisions.

15.3.1 Milestone I (MS-I)

There is little if any T&E to support MS-I (usually studies) unless the project is using some new state-of-the-art technology. If so, some tests may be required to verify the feasibility of using such technology.

15.3.2 Milestone II (MS-II)

MS-II is based upon the DT-I and OT-I performed during the D/V, phase I. Again, the extent of testing is determined by the technology used. Current technology requires less T&E than "state-of-the-art." These tests are usually conducted on advanced development models (ADMs) and require appropriate test documentation. In the past there has been little if any OT-I testing, but recently a memo from the office of the Secretary of Defense has stated a need for OT involvement prior to MS-II. When writing the TEMP, during the conceptual phase or early in the demonstration and validation phase, it is necessary to make contact with the OPTEVFOR people. OPTEVFOR is responsible for the development of part IV of the TEMP, the OT&E outline. This is the time to get acquainted with the operational test director and to build up a rapport, which will work to your advantage because the OPEVAL report is a major influence as to whether your system will be approved for service use.

15.3.3 Milestone III (MS-III)

The decision to go into production, MS-III, is based on the results of DT-II and OT-II testing. These tests are performed on full-scale prototype units or engineering development models (EDMs). These units should be similar to the production units to reduce the risks of having the production units fail. Similarity may also eliminate some of the required first article tests. Several tests are conducted in parallel (i.e., environmental, performance, reliability, etc.), and some tests are destructive (shock, salt spray, fungus, etc.). Therefore, a number of test units may be required. The size of the system (program product), cost, and schedule will all have a bearing upon the quantity of test units planned.

15.3.3.1 TECHEVAL. The last test of DT-II is usually the TECHEVAL. Specific documentation is required for the TECHEVAL, test plans, procedures, and the TECHEVAL Test Report. The purpose of a TECHEVAL is to accomplish the following

Verify that the system meets its technical performance requirements

Verify compatibility with other systems and operational environment

Verify that the system is operationally satisfactory and ready for OPEVAL

15.3.3.2 OPEVAL. OT-II consists of an operational test conducted by an independent agency, OPTEVFOR, using military operators of the quantity and rates planned for use in the Fleet. This Navy crew shall have been trained by the curriculum developed for this program. Prior to entering OPEVAL, a system must meet the OPEVAL readiness criteria, which consists of

TEMP being current and approved

DT-II completed and reports published

All DT&E objectives and performance thresholds met

Engineering complete and all "ilities" satisfactory

System expected to perform successfully in OPEVAL

System maintenance documents, logistics support plan, failure mode and effects analysis (FMEA), life-cycle cost (LCC), and logistic support analysis supplied to OPTEVFOR

Spare parts available for OPTEVFOR

Navy training plan approved and provided to OPTEVFOR

OPEVAL crew consists of numbers and rates planned for the Fleet and training completed

All OPEVAL resources listed in the TEMP available

The safety program satisfactorily completed

15.4 CRITICAL T&E DOCUMENTS

The Test and Evaluation Master Plan (TEMP) is probably the most important T&E document, followed by an overall Navy Test Plan, a system performance specification, and other plans and procedures. A T&E Management Plan may be required, depending upon the size of the program. For smaller programs, the T&E management information and responsibilities are contained in the Navy Test Plan.

Environmental test plans and procedures are required to verify the requirements identified in the quality section of the specification. A test requirements document may be required depending upon the size of the program and the number of official specifications. For the larger programs, a test requirements document (TRD) is required, especially if there are a number of applicable specifications. This document lists all the test requirements and references the specification or specifications from which the requirement came. A TRD makes it much easier to keep a handle on the test requirements and to be sure that none of them is neglected or falls through the cracks.

Another critical T&E document is the TECHEVAL plan. It, along with procedures, is necessary for a successful TECHEVAL. Many of the other previously identified plans will also require procedures. For smaller projects, the plan/procedures can be one document. All of these tests require reports that document the results. Test reports provide the supporting data to keep a project moving from phase to phase at the various milestones.

15.5 TEST PLANNING

Test planning documents are required to assure ourselves, the program manager, and the sponsors, that all functions will be verified.

15.5.1 Test and Evaluation Master Plan

The Test and Evaluation Master Plan (TEMP) is the first test plan for the program to be developed. This should be done during the Conceptual Phase, prior to MS-I, or early in the D/V phase. The purposes of a TEMP are to

- Define and control adequate T&E
- Specify design criteria and evaluation processes
- Identify critical T&E issues
- Identify and reserve the required special resources
- Document major agreements between the SYSCOM and OPTEVFOR

The TEMP consists of

- Cover Page
  - TEMP number
  - Title
  - Program Elements
  - Development Command
  - Operational Test Agency
  - Review and approval signatures
- Administrative Information
  - Primary Points of Contact
    - Name, organization, phone number
- Part I, System Details
  - Mission Description
  - System Description
  - Required Technical Characteristics
  - Required Operational Characteristics
- Part II, Program Summary
  - Management, outline of responsibilities
  - Integrated Schedule

Part III, DT&E Outline
- Critical Technical Characteristics
- DT&E to Date
- Special Retest Requirements
- Future DT&E

Part IV, OT&E Outline
- Critical Operational Issues
- OT&E to Date
- Future OT&E

Part V, T&E Resource Summary
- Test Articles
- Test Sites
- Support Equipment
- Consumables
- Manpower requirements/training
- Resource Schedule

Additional Appendices as required

15.5.2 Test Plans

As usual there are a number of formats for test plans or "many ways to skin a cat." This outline includes all the required elements and will give you a checklist for any plan:

Introduction-objectives
Scope
Test support
Installation & checkout (I&C)
Test conditions & criteria
Test methods
Test schedule
Test documentation, procedures, reports

15.5.3 Site Selection

The selection of a test site is dependent upon the type of tests required. The selection is a process of getting the best combination of environments, while considering costs.

Why use a land-based site versus at-sea testing?

- Less expensive and enables controlled tests
- Reduces risks for final at-sea tests
- Frees up ships
- Wide range of permutations available
- Knowledgeable test team available and provides training for ship crews
- Allows stressing the system
- OPTEVFOR involvement (upon PA request)
- Validation of I&C procedures

15.6 CONDUCTING THE TESTS

The testing periods are usually just prior to the milestone decisions. There is very little, if any, testing before MS-I. The amount of testing on advanced development models (ADMs) is dependent on the type of technology being used—little testing for current technology and more for newer technologies. The full-scale development phase is the primary test period. This is where the developing agency must determine if the system is ready for OPEVAL and satisfies the criteria of "ready fo OPEVAL."

15.6.1 Test Team Selection

Selection of a Navy test director early in the program is essential. It identifies an individual responsible for T&E activities, provides continuity to the program, and gives the program manager a single point of contact for T&E status. When selecting a test team, maintain a continuity of personnel: use people that participated in the development of the test requirements documents or test plans. The key personnel should have had some past experience and should include some equipment specialists. Get some support from the developer and invite OPTEVFOR to participate or observe.

15.6.2 Conduct

When conducting the tests, know what data are required to verify performance. Be familiar with the test procedures; they should be dry-run before an official test run. Provide data sheets; use them! Maintain an operating log of all operations and identify individuals who make entries.

15.6.3 Reporting

Document the results of all tests. A trick of making sure you get the necessary data is to start the test report before you start the test. Once you see the holes in the report you can determine the data required to fill them. Collect all the data during and after testing and provide copies of supporting data with the test report. Explain how the data analysis was accomplished and make recommendations.

15.6.4 Environmental Testing

Environmental testing consists of testing the system under the various conditions it would encounter in actual operation. Environmental tests cover

Low temperature	High temperature
Humidity	Salt fog
Sunshine	Fungus
Wind velocity	Icing
Hydrostatic pressure	Altitude
Dust	Rain
Thermal shock	Transportability
Shock	Vibration

15.7 NOSC TEST FACILITIES

Building 29, sometimes known as the "test huts," houses most of the environmental test capabilities. It also houses the System Test Branch.

The Artic Laboratory has numerous high-pressure test vessels, as well as the capability for growing artic ice.

Buildings 600 and 605 are two large RFI enclosures, each having the capability to do large system testing. They also have computer support capabilities.

Bayside has the Dolphin submarine and does other underwater testing. Bayside also does torpedo and materials testing.

San Clemente Island has a missile test range and an underwater test range.

Morris Dam also does torpedo testing.

15.7.1 Code 951 Capabilities

The Electronic and Environmental Test Branch, Code 951, has the capability to conduct first article acceptance and performance testing of almost any radio receiver or transmitter and numerous other electronic equipment.

Four shielded enclosures are available to enable testing without external interference. Two enclosures are ducted together to enable the test stimulus and the unit under test to be shielded from each other. The largest enclosure is 20 by 24 by 15 feet.

Three vibration machines for electronic equipment testing are available with capability for loads up to 620 pounds and frequencies from 5 to 2500 Hz.

Two mechanical vibration machines are available, primarily for mechanical and shipboard vibration testing. They have a load capacity up to 10,000 pounds and frequencies from 5 to 40 Hz.

Shock machines are capable of loads up to 6000 pounds and up to 2000 g's.

Five climatic chambers are available to simulate environments of temperature, humidity, and altitude.

15.7.2 Code 954 Capabilities

The Systems Test and Evaluation Branch, Code 954, provides the following services:

Provides Navy test directors for programs
Develops quality sections of specifications
Drafts TEMPs
Develops test plans and procedures
Conducts tests
Develops test reports
Monitors contractors
Provides test consultation
Reviews procurement packages (T&E aspect)
Supports Design Reviews

15.8 PROJECT EXAMPLES

15.8.1 SCIACT (Secure Communication Integration of the AN/GSC-40 Command Post Terminal)

The SCIACT program developed a T&E Management Plan that identified the tests, test schedule, test organization and responsibilities, test personnel, and test facilities. The plan listed these tests:

Environmental
EMI
EMP
Tempest
System integration
System acceptance

A specific test plan and procedure was written for each test. The test personnel participated in the development of these documents and were thoroughly familiar with them when conducting the tests. The program was completed on schedule and performed satisfactorily in the field. Its success is attributed to good planning, competent and trained personnel, a good test director, and sufficient funding to do the task.

15.8.2 TRIDENT Integrated Radio Room

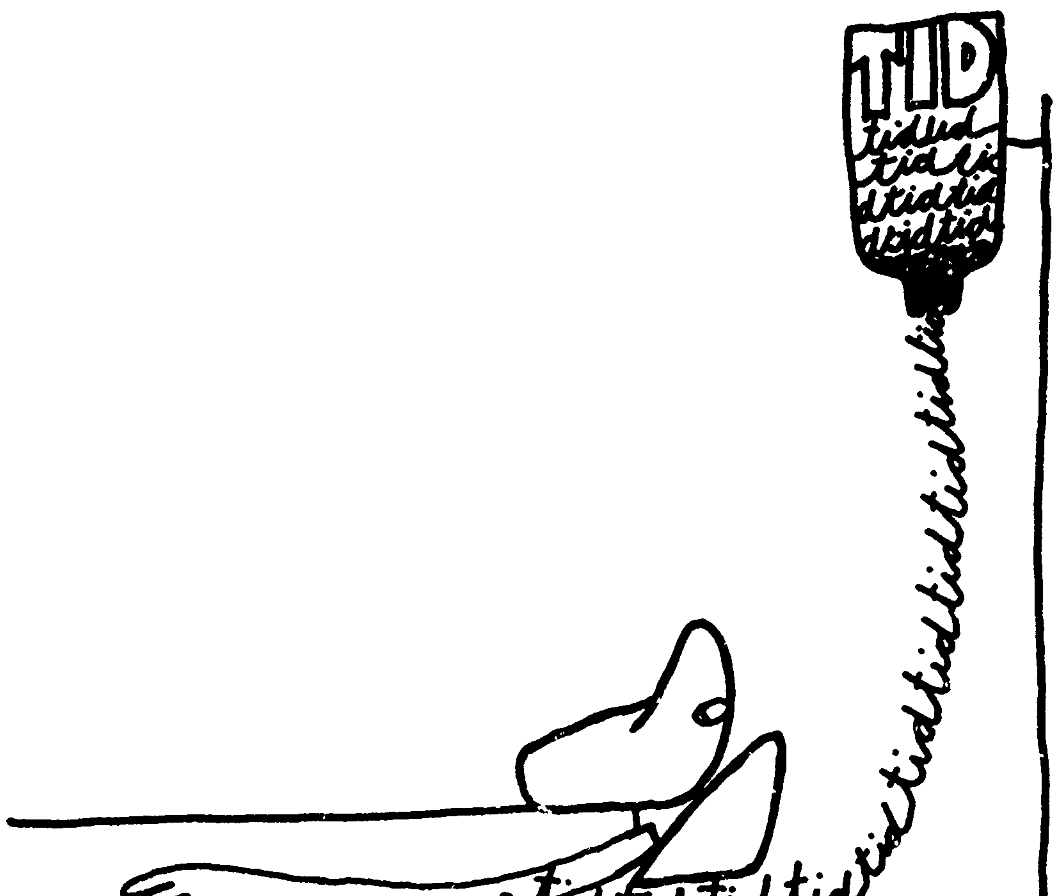
The Integrated Radio Room (IRR) program developed the external communications system for the TRIDENT submarine. This project also developed a good T&E program. This was a dual development FSP program from which a production contractor was to be selected, after Navy independent testing of each prototype. Due to overruns and schedule slippages, the dual independent Navy tests were not conducted, but each system (neither was completed) was simultaneously tested at each contractor's facility, with the help of the particular developing contractor. The results of these tests, plus the proposals of each contractor to complete their system, were evaluated, and one contractor was selected for a limited production.

The first unit delivered underwent a complete independent Navy acceptance and TECHEVAL. Tests were conducted on this system for more than 1 year, due to a delay in hull delivery. These tests caused numerous hardware and software changes to be made to the system. This resulted in an operational system being delivered to the first submarine.

15.8.3 Message Processing and Distribution System (MPDS)

This project rushed the hardware development and the T&E program. The operator terminals were advance breadboard models that were installed on the first operational platform. Likewise, the Data Acquisition and Distribution Unit was a laboratory model that was integrated into the first deliverable system. The reliability and MTBF was very poor (we are talking about the late 60s, early 70s when T&E was primarily a production acceptance test). The poor reliability created much user dissatisfaction, which was not easily overcome.

TECHNICAL INFORMATION SUPPORT 16



CONTENTS

SECTION 16
TECHNICAL INFORMATION SUPPORT

16.1 INTRODUCTION

16.1.1 References

DoD Instruction 5200.21; Dissemination of DoD Technical Information, 27 September 1979
DoD Directive 3200.12, DoD Scientific and Technical Information Program, 15 February 1983
SECNAV Instruction 3900.43, Navy Scientific and Technical Information Program, 29 December 1983
NAVMAT Instruction 4160.2, Technical Manual Management, 24 November 1980
NAVSEA Instruction 4160.3, Technical Manual Management Program (TMMP). August 1982
NOSC Instruction 4160.1A, Technical Manual Procedures, 1 November 1985
NOSC Instruction 5600.2D
NOSC Instruction 5400.2D
NOSC TD 178, Revision B
NOSC TD 611
NOSC TD 841, Distribution Statements for Technical Publications
NOSCINST 5290.1, Photographic, Video and Audiovisual Operations and Material Control
OPNAVINST 5290.1, Navy Audiovisual Management and Operations Manual
NOSCINST 5070.1B, NOSC Library Services, 19 November 1985
NOSCINST 3900.2B, Initiation of New Technical Work Assignments; Policies and Procedures for 6 April 1984
NOSCINST 4200.5, Procurement Requirements Package (PRP) Handbook, 30 August 1978
Effective Business and Technical Presentations, by George L. Morrisey
How to Prepare, Stage, and Deliver Winning Presentations, by Thomas Leech

16.1.2 Summary

Project documentation includes requirements for the publication of RDT&E results (in-house and contract) and technical manuals. Various DoD, Navy, and NOSC instructions specify requirements and procedures for preparation, production, and distribution of those documents. Lack of proper documentation or poorly prepared documentation adversely affects both DoD's RDT&E program and the life cycle of equipment or systems. Project managers are responsible for consulting Code 961 at the beginning of their projects to ensure proper planning and adequate funding to meet the specific requirements.

Effective visual communcations are key elements in project management. Photographic and video documentation and illustrations of experiments, concepts tests, analysis of events, and ongoing historical recordings are highly visible and tangible products from RDT&E efforts. A visual report produced from graphic and video media can ensure successful competition for funds and the imparting of knowledge and information in the most direct way. Further, the costs of obtaining the visual record are more than offset by savings of valuable scientific and engineering manhours that would otherwide be devoted to reports and briefs.

NOSC visual media specialists are dedicated to the needs of the RDT&E programs and projects. As part of the RDT&E team, they possess the unique insight to capture the visual record in the most cost effective way for your project.

To maximize the value of visual documentation, the most important consideration is to include visual media as a data requirement early into the program. This will allow for funding considerations of these requirements.

The Technical Libraries Branch offers a full range of library services as detailed in NOSCINST 5070.1B. Certain aspects of these services are particularly important to the project manager in planning for meeting project technical information needs.

Finally a few words on the importance of presentations complete the section.

16.2 PUBL ATION REQUIREMENTS

This sect on will discuss project managers' responsibilities in the area of publications. At NOSC, technical data related to publications are divided into the following categories:

Engineering data (e.g., logistic support plans, safety plans, and technical manuals)

Software data (e.g., manuals, source code, and supporting documents)

Research and development data (e.g., journal articles and NOSC technical reports)

The information presented in the following sections is generic to all three types of data. However, because of the stringent and complex requirements for technical manuals (part of engineering data), additional information on procedures and requirements for manuals has been included.

16.2.1 General Requirements

16.2.1.1 DoD Requirements. DoD's Scientific and Technical Information Program (STIP) requires that all significant results derived from DoD endeavors, including those generated under contract, be recorded as a technical publication within 6 months of the conclusion of the work. Both positive and negative results are to be recorded. These publications are to be made available to the DoD research and engineering community through the Defense Technical Information Center (DTIC) and supporting libraries. The Program also requires that these publications be prepared according to established standards for format, security markings, and distribution statements.

16.2.1.2 NOSC Requirements. NOSC instructions, which implement DoD requirements, establish the following procedures:

All NOSC Publications intended for external distribution must carry a NOSC publication number assigned by the Publications Branch. (The NOSC publication series consists of technical reports, technical documents [including documentation prepared by contractors], technical notes, and technical manuals.)

These publications must be reviewed by branch and division heads for technical adequacy and accuracy, security for classification, and public affairs for assignment of a distribution statement. (Although all publications carry distribution statements, only unclassified publications are reviewed by the public affairs office.)

The publications must be *formal* rather than *informal* publications. The distinction between formal and informal is whether the publication can be retrieved from, or is announced in, a database accessible to DoD employees. Examples include the Defense Technical Information Center and Navy Publications and Forms Center.

The publications must be accurate, comprehensible, and economically produced. Additionally, technical manuals must be available to meet user requirements throughout the life cycle of the equipment.

Funding for publications is considered an integral cost of the project and must be provided through project funds. For technical manuals, the cost must also be considered a part of the overall cost for delivery of an operational system or piece of equipment.

Technical manual specifications must be tailored to allow for factors such as user profile, maintenance plan, and training requirements.

Project managers often establish project documentation centers to produce their publications. While there is no problem with using these centers, the centers must operate under guidelines established by the Publications Branch. When you are ready to establish such a center, publications personnel will help you establish procedures specifically suited to your project.

16.2.2 RESPONSIBILITIES

16.2.2.1 Publications Branch. In providing documentation services to project managers, the Publications Branch has the following responsibilities:

Coordinate the Center's publications program and establish policy to direct that program.

Send documentation to the Defense Technical Information Center or the Navy Publications and Forms Center.

Provide primary and secondary distribution of NOSC publications.

Assign all formal publication numbers. This includes assignment of technical manual identification numbers required and controlled by systems commands.

Coordinate all technical manual efforts (e.g., logistics planning, in-process reviews, acquisitions, validation, verification, and changes).

16.2.2.2 Project Managers. As a project manager, you are responsible for ensuring that publications are an integral part of your project and that they are prepared and distributed. Your responsibilities include

Coordinating your project's documentation with Publications Branch personnel

Budgeting and funding publications

Ensuring that vour contractors are aware of their responsibilities

16.2.3 Planning for Publications

16.2.3.1 When to Start Planning. Planning for all publications must begin at the conceptual phase of a project and continue throughout its entire life cycle.

For technical manuals, planning should also occur at the conceptual phase of a project or, at the latest, concurrently with performance requirements.

16.2.3.2 Types of Information that Should be Published. Any information that can be used outside the project office should be published as a formal NOSC publication. Generally this includes the following types of information:

Information that contributes to increased knowledge of natural phenomena and the environment; to the solution of problems in the physical, behavioral, social, and management sciences; or to the expansion of knowledge in scientific areas.

Information that involves the extension of theoretical, practical, and useful applications of basic designs, ideas, and scientific concepts.

Information that documents the procedures and results of subjecting systems, items, materials, personnel, or techniques to simulated or actual operational conditions to determine characteristics, suitability, and compliance with specific requirements.

Information that provides values, appraisals, or results relevant to strengths, weaknesses, feasibility, potential, and military worth of efforts, concepts, or hardware.

16.2.3.3 Cost of Publications. For all publications other than technical manuals, the project manager should allow 5 to 10 percent of the project cost for documentation. Allow 10 percent if you plan on having someone other than project personnel do the original writing and research.

For technical manuals, allow $300 to $1000 per page. Specific costs for a project can be obtained from the technical manuals personnel in the Publications Branch.

16.2.3.4 Time Required for Publications. Production of a publication involves five basic steps: writing, editing, production, printing, and distribution. All these steps require time and allocation of personnel. For planning purposes, allow 8 to 10 weeks for preparation of a formal NOSC publication, if a written manuscript is provided to the branch. If you need original writing, additional time must be allowed; the time is dependent upon the specific task involved. When a copy of a publication is required for immediate use, arrangements can be made to prepare an advance copy within 24 hours.

For technical manuals, time must also be allowed for logistics certification, which is dependent upon availability of equipment and military personnel, and for specification tailoring. This tailoring will vary for each project and will depend upon factors such as system command requirements, users, and planned maintenance.

16.2.4 Distribution of Publications

16.2.4.1 Distribution Statements. All publications must be marked with a distribution statement. The purpose of the statement is to control the secondary distribution of the publication. Distribution statements are assigned by the technical codes and reviewed by security and public affairs offices. NOSC forms 5605 and 5720 are used for this purpose.

16.2.4.2 Inclusion in DoD Databases. All NOSC formal publications, with the exception of system-command-numbered technical manuals, must be available through the Defense Technical Information Center. (Information up to and including secret is sent to DTIC.) If the information in the publication is so sensitive that a copy cannot be provided to DTIC, DTIC must be given a bibliographic citation that announces the availability of the publication. At NOSC, the Publications Branch does this by use of the DD Form 1473.

Those publications that are specifically related to subjects such as chemical propulsion, tactical weapons guidance and control, infrared technology, plastics, reliability, and shock and vibration are also sent to appropriate information analysis centers. These centers are administratively managed and funded by the Defense Logistics Agency.

NOSC-numbered technical manuals are sent to DTIC. They can be provided to sponsors and used before a project moves to milestone II. However, they cannot be sent to the Navy Publications and Forms Center or used on shipboard except during the experimental phase of a project. Those manuals with system-command numbers are distributed to the Fleet through NPFC.

16.2.5 Contracts for Publication Services

Contracting is usually a part of project management and always results in documentation. When preparing your contract package, use the following guidelines:

Ensure that the contractor provides documents that are suitable for entry into DTIC. This means that the documents must be complete, legible, reproducible, technically accurate, and sufficiently detailed to permit use of the publication.

Use data item descriptions that are appropriate to the type of documentation being ordered (e.g., test plans, test results, research reports). The data management office can provide assistance in that area, as well as the publications personnel.

All publications ordered should be subject to preliminary government review before final acceptance. During this review, subject-matter experts outside the project should be asked to review the data. This allows any problems to be identified and corrected by the contractor.

Technical manuals are ordered by a contract exhibit that is called the technical manual contract requirement. This is a requirement for hardware manuals and an option for software manuals. Data item descriptions can no longer be used to order hardware technical manuals.

Data item descriptions are used to order such technical manual data as outlines and book plans.

Include electronic data as the original copy. This will allow the Publications Branch to save your original text and artwork.

16.2.6 Types of Publications

16.2.6.1 Technical Report. Definition: Presents results of an effort undertaken by NOSC toward an objective defined by a sponsor. May be a final, summary, or progress report. Subject matter usually categorized as RDT&E. Has specific format and content requirements. Is a formal, Center-approved publication.

Review and Release: All carry a formal distribution statement (*A* through *F* or *X*). All reviewed by branch and division heads, security, and, if unclassified, by PAO.

Distribution: Provided to DTIC (for sensitive information, only a DD Form 1473 is provided), sponsor, and NOSC. Additional distribution depends upon distribution statement and author's requests.

16.2.6.2 Technical Document. Definition: Covers class of publications not considered as reports (i.e., they do not report the results of a specific scientific or engineering effort). Subject matter usually categorized as software, engineering, or administrative. Includes publications such as proposals, reliability plans, safety plans, viewgraph compilations, conference proceedings, computer programs, engineering change proposals, and specifications. No specific format or content requirements. Is a formal, Center-approved publication.

Review and Release: All carry a formal distribution statement (*A* through *F* or *X*). All are reviewed by branch and division heads, security, and, if unclassified, by PAO.

Distribution: Provided to DTIC (for sensitive information, only a DD Form 1473 is provided), sponsor, NOSC, and appropriate DoD information analysis centers. Additional distribution depends upon distribution statement and author's requests.

16.2.6.3 Technical Manual. Definition: Describes specific equipment, weapon, or system and provides instructions for installation, operation, maintenance, overhaul, and/or personnel training. Includes both hardware and software. Has specific format and content requirements. Is a formal, Center-approved publication.

Category I manuals are prepared prior to milestone II, are prepared in support of R&D equipment and systems, and are used for computer software manuals.

Category II manuals are developed for Fleet use.

Review and Release: All carry a formal distribution statement (*A* through *F* or *X*). All are reviewed by branch and division heads, security, and, if unclassified, by PAO.

Distribution: Provided to sponsor and NOSC (system command manuals are also sent to NPFC). Additional distribution depends upon distribution statement and author's requests.

16.2.6.4 Technical Note. Definition: Contains informal or transitory information. Is considered a working paper. No specific format or content requirements. Is an informal paper that does not represent NOSC policy.

Review and Release: All carry a disclaimer that designates them as working papers. Cannot be assigned a formal distribution statement. All are reviewed by branch and division heads, security, and, if unclassified, by PAO.

Distribution: Provided only to sponsor and NOSC. No distribution to DoD databases.

16.3 VISUAL MEDIA

The intent of this subsection is to outline the visual media services available and how you may obtain them for your project support.

16.3.1 Audiovisual (Visual Media) Definitions

The following definitions are extracted from NOSCINST 5290.1, Photographic, Video and Audiovisual Operations and Material Control. These terms provide a common basis for the elements of audiovisual systems.

16.3.1.1 Audiovisual (AV) Visual Media. The use of sound or visual imagery or both to communicate information. The definition includes use of motion pictures, video, still photographs, slides and film-strips, audio, graphic illustrations, models, and displays. (Visual Media is basically the same as audiovisual.)

16.3.1.2 **Audiovisual Activity.** An organizational element or a function within an organization in which one or more individuals are classified as audiovisual or whose principal activity is to provide AV services and products or to manage AV resources. The term applies but is not limited to AV equipment, facilities, products, personnel, maintenance, supplies, procurement, and budget.

16.3.1.3 **Audiovisual Equipment.**

a. Items of a durable nature that are capable of continuing or repetitive use by an individual or organization for recording, production, reproduction processing, and exhibiting AV products or documentation. (Included are photographic, television, videotape or videodisc, audiotape or audiodisc, graphic arts and computer graphics equipment.)

b. Items that have an AV function as an integral part of a non-AV system or device (existing or under development) and that, when permanently removed, can be identified as an end-item of equipment.

16.3.1.4 **Audiovisual Product.** Audiovisual media elements such as still photography, graphic arts, still projections (overhead transparencies, slides, and filmstrips), motion pictures (film, videotape, and videodisc) and audio recordings (tape and disc). Production is a unique form of AV product and is usually addressed separately.

16.3.1.5 **Audiovisual Production.** A unified presentation that contains sound or visual imagery or both; is titled, edited, and/or accompanied by sound; and conveys a message through a recorded medium or broadcast. The term may also apply to combining or arranging any separate or combined audio or visual product(s) in continuity according to a plan or script. A production is the end-item of the production process. This term is synonymous with the Office of Management and Budget (OMB) use of the term "audiovisual product."

16.3.1.6 **Authorized Photographer/Recorder.** An employee who occasionally needs to use a camera, video, or sound recorder. The Camera/Video/Recording (CVR) Equipment Pass (form NOSC-SD 5512/21) is issued to these persons for a period not to exceed 12 months.

16.3.1.7 **Computer-Generated Graphics System.** An integrated computer, minicomputer, or microcomputer and software system designed and intended primarily for generation of graphic arts productions; or a system composed of selected computer, minicomputer, or microcomputer hardware components, plotters, and software systems whose primary purpose is to produce graphic arts displays, charts, and pictures.

16.3.1.8 **Dedicated AV Support Activity (DAVSA).** An AV activity that provides dedicated audiovisual support which is integral to the performance of the primary mission(s) of the Center. It does *not* include productions, production services, and related support functions.

16.3.1.9 **Graphic Arts.** Relates to the design, creation, and preparation of two- and three-dimensional visual-aid products. The definition includes charts; graphs, posters; visual materials for television, motion pictures, and publications; displays and presentations; and exhibits prepared manually, by machine, or by computer.

16.3.10 **Major Claimant.** An organization directly subordinate to, established by authority of, and specifically designated by the Secretary of the Navy. (NOSC's major claimant is the Space and Naval Warfare Systems Command, Code 512.)

16.3.1.11 Official Navy Photography. Those functions that are concerned with aerial, surface, and underwater still, motion picture, audio, and video documentation necessary to support the Naval establishment. For this instruction, "Official Navy Photography" includes still, motion picture, photographic instrumentation, and audio and video documentation, along with the film, prints, and tapes produced at Government expense by Government employees or by contract for the Government.

16.3.1.12 Official Photographer. An individual whose sole employment is making official photographs, motion pictures, video recordings, or production of RDT&E products and audiovisual presentations developed from these products. An official Photographer's Pass is issued only to such individuals.

16.3.1.13 Optical Instrumentation. Use of optical systems, coupled with photographs or television recording devices, which may include audio, to record scientific and engineering phenomena for measurement and analysis. The definition may include the recording of data to correlate optical images to time, space positions, or other engineering data.

16.3.1.14 Technical Documentation. Audiovisual resources dedicated to documentation of technical subjects for the purpose of supporting the RDT&E mission. This includes resources defined previously as "Official Navy Photography" as well as film and video reports of a basic nature (recorded narration and approved titles), slide and audio presentations, graphic arts training aids and devices, and audiovisual design subfunctions where the purpose is to record, propose, report, or convey technical data on RDT&E programs. Technical documentation for RDT&E is exempted from the controls established for audiovisual products for training and information purposes.

16.3.1.15 Technical Report. An AV report. An assemblage of film or video clips. An assembly of technical documentation to report on a single, mission-related event.

16.3.2 Visual Documentation

Within a given program or project, virtually every event and milestone that make up the system's life span can benefit from visual documentation. Certain media are more suited for given events or milestones in the RDT&E process depending upon the requirement.

The following outline is an example of milestones and visual media products/documentation that would apply at those designated times.

	Milestone	Purpose	Products
a.	Identify/Define Requirement	Briefing/Proposals	Viewgraphs, Slides Displays, Illustrations
b.	Submit Proposals/ Obtain Funding	Briefing/Presentations	Viewgraphs, Slides
c.	Research	Document/Record Data Use in Reports	Still Photography Viewgraphs, Slides Illustrations
d.	Development	Document/Record Data Use in Reports	Motion Pictures, Still Photos, Videofilm

e.	Testing/Evaluation	Document/Record Data Use in Reports	Motion Pictures, Still Photos, Videofilm
f.	Modifications/ Follow-On OT&E	Document/Record Data Use in Reports	Motion Pictures, Still Photos, Videofilm
g.	Project Completion	Final Report/Historical Report	Videofilm, Viewgraphs Slides

While there are no established criteria for visual documentation, this outline cites several areas to consider. The value of visual records to RDT&E programs has been demonstrated countless times.

16.3.3 Visual Media Products and Services

The following visual media products and services are available through Code 962, the Visual Media Branch, Technical Information Division.

16.3.3.1 Graphics. Illustrations ranging from sketch to 3-D technical, architectural renderings, design, phototypesetting, and computer graphics are available. Uses include motion and still photo, video presentations and briefs, brochures, programs and flyers, signs, exhibits and displays, awards, and special applications.

16.3.3.2 Still Photography. Services include all black and white and color processes, both large and small parts/systems illustrations, oversize black and white copy photography for electromechanical and other high-resolution schematics, technical and engineering underwater applications, optical instrumentation, and portraiture.

16.3.3.3 Television and Motion Pictures. Products and services range from one-time documentation of an event or test to a complete presentation using all visual media elements from script to narration. Color or black and white video or motion photography is available depending upon the requirement. Full postproduction services are offered including a studio, sound recording, editing, special effects, and other electronic features. A classified, Tempest-certified video editing system is also available for confidential and secret materials. Special applications for underwater video and film coverages are also available.

16.3.3.4 Presentations. The Visual Media Branch can create and assemble a media package for presentation by yourself or as a self-contained program for distribution to other activities.

16.3.3.5 Audiovisual Equipment Loan Pool. This service is available to all Center personnel. The loan pool was established as a source for common types of AV equipment and accessories that are needed for short-term loans. Included are slide and motion picture projectors, video recorder playback units, VHS self-contained video camcorders, still picture cameras, and associated accessories.

16.3.4 Guidelines for Viewgraphs

Viewgraphs are the principal media used at NOSC for briefings and presentations. However, 35mm slides can be produced from the same artwork, if required.

The Visual Media and Publications Branches of Technical Information, working in concert, provide complete services from layout and design to editorial review. All viewgraphs are edited, then proofread after completion. TID's responsibility is to ensure all viewgraphs convey the information while representing NOSC in the most favorable way.

16.3.4.1 The Guidelines. The following viewgraph preparation guidelines will help ensure a measure of consistency between various NOSC presentations and, at the same time, give your presentations a more professional look. Figures 16.1 through 16.4 are sample viewgraph formats.

First, *always remember your audience!* The basic requirement for a viewgraph is that it be READABLE by everyone in the audience. To meet this requirement, the message on the screen should be conveyed simply and quickly.

Second, *work toward the fewest and shortest words possible.* The fewer words on your visual the better your idea will be understood. Some ways to get concise, clear visuals are listed here:

a. *Cut all unnecessary qualifiers* (words or phrases that modify, limit, or qualify other words or phrases). Well-done viewgraphs have NO qualifiers—the speaker provides them.

b. *Cut down on connectives* (and, or, for, but, yet, & nor). Instead, commas and ampersands (&) can be used in visuals to cut down on words.

c. *Limit your total word count to 50 or less.* This doesn't include the title. Remember, however, to keep your titles short and meaningful. Long, rambling titles tend to introduce long, rambling messages.

d. *Break your viewgraph into sections.* If your message must exceed 50 words, put each section on a new viewgraph. Two well-done viewgraphs are always more understandable than one that is crowded and verbose.

e. *Limit the number of diagrams or pictures.* If you have a specific diagram or illustration as well as some text or narrative, limit the viewgraph to one picture or diagram. There is a natural tendency at times (to cover the whole story) to place a diagram, a photo, a milestone chart, and narrative all in one viewgraph (essentially, it is four separate viewgraphs in one). This may be fine for a handout, but for a visual on a screen, it causes confusion. (The result is usually worse than a visual with too many words.)

Following the above guidelines will help you present the NOSC story in the most favorable light. In addition to those steps mentioned above, the graphics section uses the following rules when preparing your viewgraphs for Center-approved presentations.

a. All viewgraphs have a red title, black text, and a clear background.

b. Diagrams and graphs use blue lines.

c. The NOSC logo appears in the upper left of the image area.

16.3.4.2 Scheduling. To ensure a quality product, the graphics section needs at least 5 working days from date received in graphics to date delivered back to you. This gives us enough time not only to edit your rough copy, but also to proof the prepared viewgraphs and correct mistakes. Rush jobs are sometimes unavoidable, but editing and proofing are the items we cut when you need a job quickly. Try to plan your presentations with enough lead time to let us give you the best product.

NOSC

HOOD Energy Density

	Plan 1	Plan 2	Plan 3
kWh	180.0	186.3	220.0
Cells	44.0	54.0	54.0
A-h/cell	1200.0	1000.0	1200.0
Volts (nom)	150.0	183.6	183.6
Cell wt	19.0	22.0	19.0
Well W-hr/#	215.0	154.0	215.0
Cell vol (in^3)	222.0	222.0	222.0
Cell W-hr/in^3	18.4	15.3	18.4
Batt wt	887.0	1241.0	1079.0
Batt W-hr/#	203.0	148.0	204.0
Batt vol	12126.0	14585.0	14585.0
Batt W-hr/in^3	14.8	12.6	15.1
System wt	1089.0	1538.0	1376.0

Figure 16.1. Viewgraph sample 1.

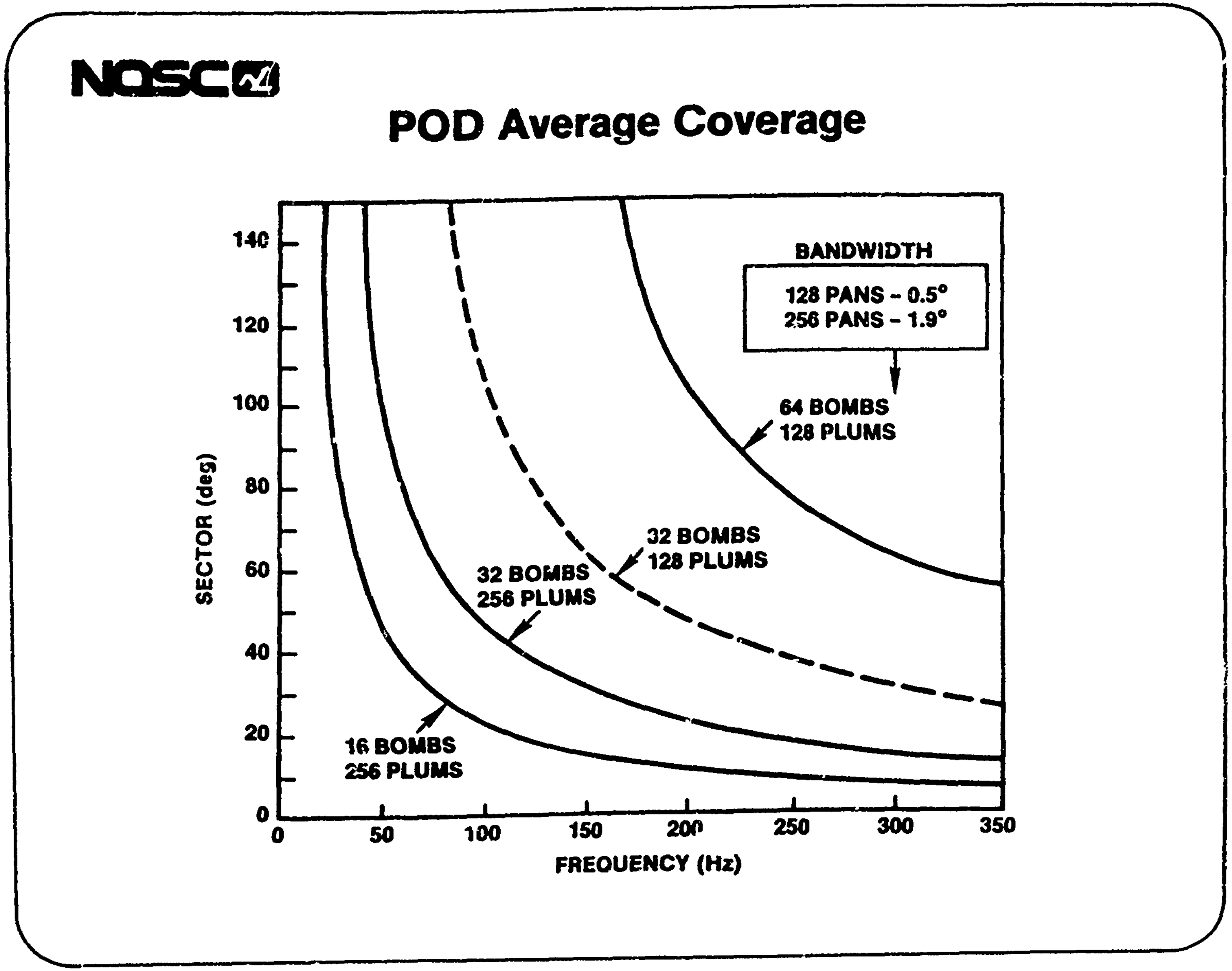


Figure 16.2. Viewgraph sample 2.

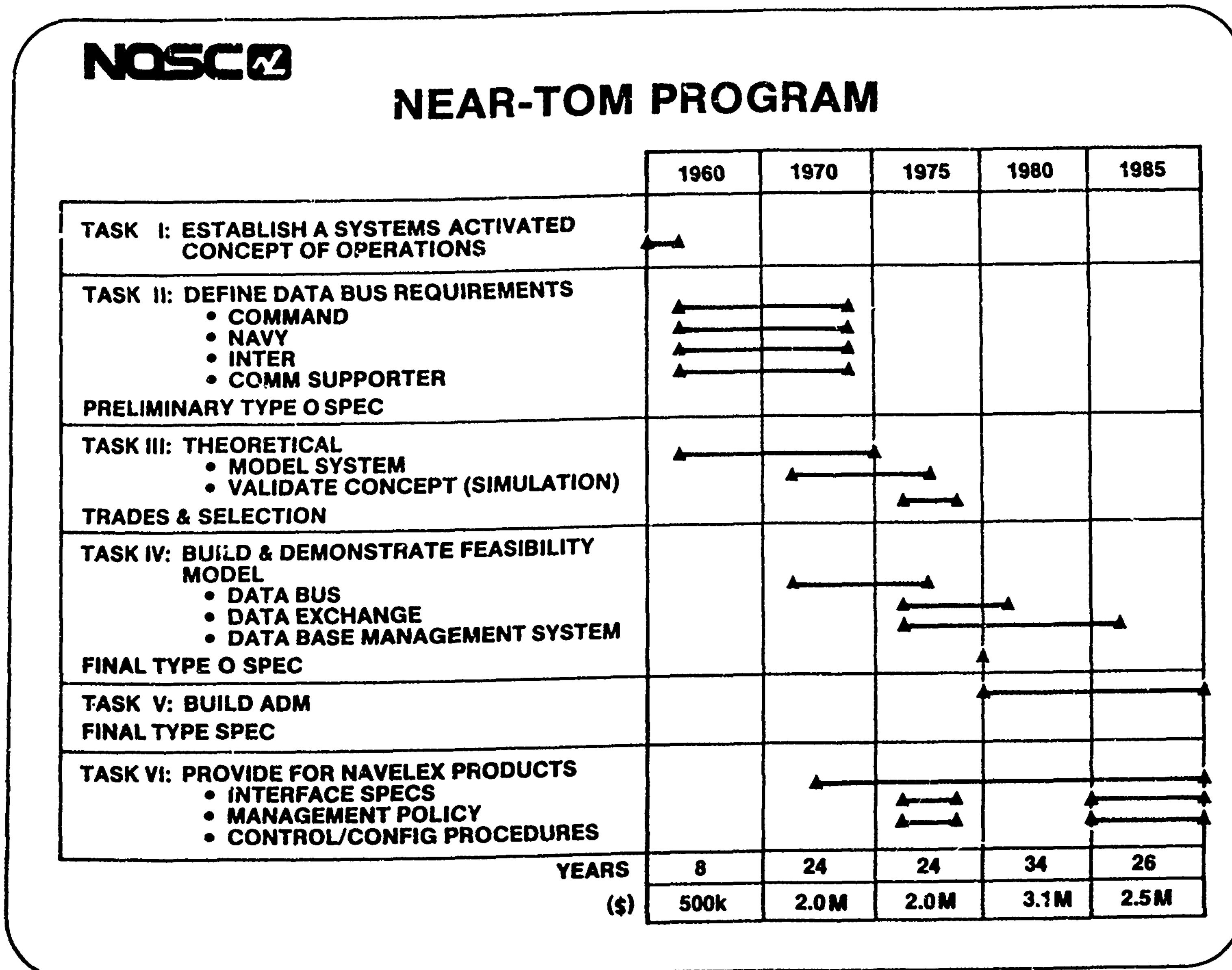


Figure 16.3. Viewgraph sample 3.

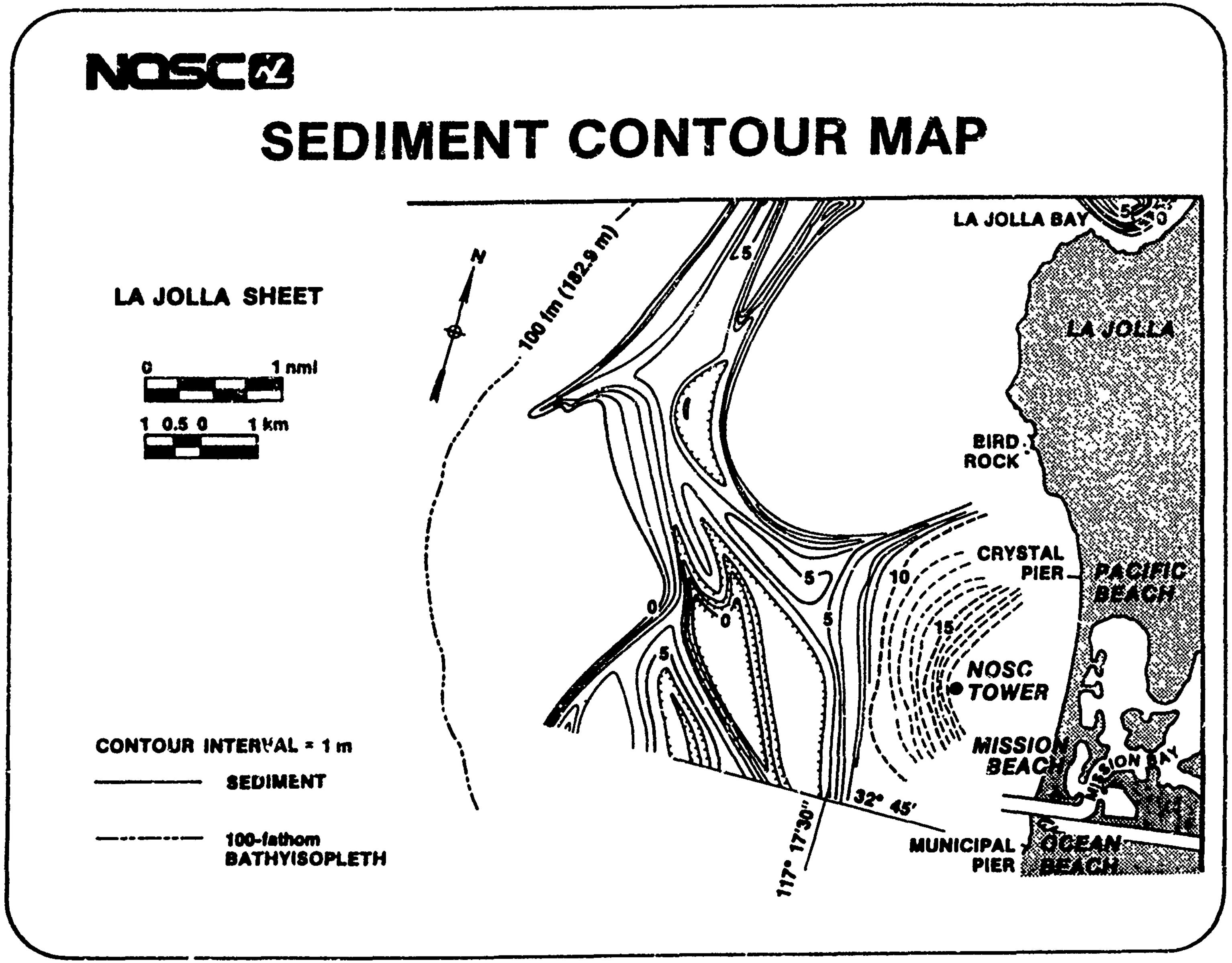


Figure 16.4. Viewgraph sample 4.

16.3.5 Planning Considerations for Visual Media

Just as time itself is transient and cannot be recaptured, so is the chance for visual documentation of a given event. The historical record is lost, unless it is captured on film or video. The visual records of World War II and other modern conflicts have proven the immeasurable value of photographic documentation.

The Technical Information Division (TID) exists to provide products and services to the Center and specifically to program managers. The Visual Media Branch of TID can best serve programs and projects by providing documentation of key events and milestones. The milestone examples listed previously under Visual Documentation (16.3.2) should all be considered when your total requirements for the project are defined.

Bring the visual media staff into the planning process. This will ensure that adequate coverage of significant events is included in your project documentation.

Contact the applicable visual media staff person or section for assistance on all proposals.

16.3.6 Contacts for Assistance

Management	Ken Callahan	x34826
Visual Info Consultants	Al Woerner	x34828
Graphics	George Galaich	x34832
Still Photography	Jim Corbin	x34850
Television/Motion Pictures	Stan Follis	x34869
Photo Officer (Code 9603)	Roy George	x34788
AV Equipment Loan Pool	Ernie Santos	x35233

16.4 TECHNICAL LIBRARY SERVICES

16.4.1 Library Collections

There are three locations of the NOSC Technical Library: Topside, Bayside, and Hawaii. Materials are collected in disciplines and subject areas pertinent to the current NOSC mission. Materials are located in the Bayside and Topside Libraries according to the location of scientists and engineers specifically working in disciplines or subject areas. For example, underwater ordnance, underwater engineering, and marine chemistry materials are found primarily in the Bayside Library, while communications and artificial intelligence materials are in the Topside Library.

The Library holds all major reference works, indexes, and abstracts in the physical sciences, engineering, and life sciences pertinent to the NOSC mission. Special resources include an extensive collection of maps and charts located in the Topside Library and staffed by a professional map librarian, and a collection of technical reports on artificial intelligence from the major universities working in this area, such as MIT, SRI, and others. The Bayside, Topside, and Hawaii Libraries each house a complete and current collection of all military and federal specifications, standards, handbooks, and drawings.

16.4.2 Acquisitions Policy

New titles are selected for purchase by NOSC librarians (frequently in advance of publication) and also by Library users. The Library's overhead funds are used for most book purchases, although funding is requested from users for unusually expensive titles or desk copies. Codes are requested to fund all of their periodical subscription requirements, although the Library will place the orders and provide receipt control.

Program managers should attempt to anticipate their need for both specific publications and subject coverage by consulting with NOSC librarians. Acquisition of publications can be a lengthy process.

The Library is the internal approval control point for all Center purchases of books, publications, maps, specifications, subscriptions, bibliographic retrieval systems, etc. The Library will determine the most expeditious means of acquisition, and in most cases, will handle purchase of publications intended for exclusive use by a project office. Such publications will be cataloged in the Library's system but will also be identified as in use for an indefinite period by the requester.

Publications that are not available for purchase may usually be borrowed from other libraries or photocopied. The NOSC Library borrows not only from local libraries, but also from Department of Defense, corporate, public, and university libraries throughout the United States and Great Britain.

16.4.3 Library Access

The Library is accessible by all NOSC employees and also NOSC contractors. Materials may be borrowed only by NOSC employees. NOSC contractors may use materials on hand; materials in use will not be recalled for them.

Program managers should discuss the technical information requirements of their contractors with the NOSC librarian for the purpose of planning appropriate Library access and services. Contractor access to the Library's technical report collection must be on a need-to-know basis. Procedures are detailed in NOSCINST 5070.1B, paragraph 5.

16.4.4 Reference/Literature Search Services

The Library offers reference service by professional librarians ranging from locating specific handbook-type information to compiling comprehensive subject bibliographies. Online access is maintained to all available commercial and government databases pertinent to NOSC's areas of interest. Librarians search these databases at no charge to Library users.

The Library maintains secure online links to the databases of the Defense Technical Information Center (DTIC). NOSC scientists and engineers are required to request searches of the DTIC databases when beginning new projects (in accordance with DoD, Navy, and NOSC instructions for the purpose of verifying that their projects are not duplicating other efforts).

16.4.5 Library Publications

The Library disseminates a list of its periodical holdings, a periodic (usually every 3 to 4 weeks) list of new publications acquired, and various current awareness listings. Customized current awareness listings may be requested to cover specific project interests at no cost to the requester.

16.4.6 Special Projects and Services

The Library staff is currently in the final stages of implementing an integrated online library system called DATALIB. Eventually all Library holdings will be retrievable from an online catalog. The catalog is now available for use in any of the libraries and will become available via the GCB sometime in 1988. More information about the system is found on the next page.

The Library has established a database of the databases or project libraries located outside the Technical Libraries. This Database of NOSC Databases is included in the Library's online catalog. Employees are requested to register descriptive information about their project databases with the NOSC librarian.

The Library offers a consultation service for project managers with a requirement for starting a new database. The Library will advise on organization, cataloging, and indexing of materials and will also provide guidance in selection of software for storage and retrieval. The Library holds several such software and/or demonstration packages for review by project managers.

Program managers may request Library support for contractor review of documentation. The Library will provide storage, retrieval, and access control of project documents during the proposal period.

Several presentations on Library services are offered. There is a tour of the Library every work Friday at 0900 at the Topside Library; no appointment is necessary. Project managers may request a more formal presentation describing Library services and also a presentation on the Library's various online database resources. Soon to be available is a presentation on map and chart resources.

Finally, Tables 16.1 through 15.5 present further specific information on Library contacts, online retrieval systems, SDI services, the DATALIB system, and map resources. The NOSC Library request for literature search form is shown in Figure 16.5.

DATALIB

DATALIB is the Technical Library's integrated online library system. It has been installed on a VAX-750, formerly the EEL and now renamed the SNOOK. The DATALIB system consists of four functional modules: bibliographic, circulation, acquisitions, and serials control. The Library staff is currently working on implementation of the bibliographic function, which is actually the online catalog of all the Library's holdings and also serves as the master record for the other three modules.

DATALIB is a powerful retrieval system specifically developed for technical libraries. Some of the other users of the system are the General Motors Research Labs., Martin Marietta, RCA, Kerr-McGee, Schlumberger, Texaco, Air Products, Merck, and the Department of Justice. The vendor is Sigma Data Services.

Some major capabilities of DATALIB are

- online catalogs (ours will eventually include all the Library's holdings of books, technical reports, periodicals, papers by NOSC authors, maps, charts, trade catalogs, phone books, patents, standards, audiovisual materials, software, and pamphlets)
- retrieval by either menu or command-level searching using Boolean connectors
- online circulation of Library materials using bar codes
- circulation status displayed for items retrieved (i.e., Is an item on the shelf?)
- online record of items on order and their status
- online check-in and records of periodical issues
- capability for the Library to host multiple databases

Concurrent with implementing the DATALIB bibliographic function is the Library's RECON (or retrospective conversion) project. This entails converting all of our old records to machine readable form and to the DATALIB formats we designed, and also bar coding all materials.

The Library closed its card catalog for books in March 1987. All new titles are in the online catalog. The technical report holdings are also searchable online. The target date for availability of the online catalog on the GCB is February 1988. We anticipate that the circulation module will be fully implemented by June 1988.

Table 16.1. Who to contact in the NOSC Libraries.

HEAD LIBRARIAN	Joan Buntzen	x34879
TOPSIDE LIBRARY		
Reference/Literature Searches/ Ordering	Jo Walsh Marcia Whipple	x34890 x34888
Circulation	Jan Rutledge Janis Anderson	x34894 x34893
Maps/Charts/Specs and Standards	Val Danesh	x34891
Periodicals	Jeanie Casto	x34881
BAYSIDE LIBRARY		
Supervisor	Kathy Wright	x34900
Reference/Literature Searches/ Translations/Ordering	Diane Soblick Helen Cook	x34902 x34902
Circulation	Bernice Kuntz	x34908
Interlibrary Loans	Yoli Kerr	x34904
NOSC DATABASE OF DATABASES	Kathy Wright	x34900
LIBRARY CONSULTING SERVICE FOR DATABASES	Kathy Wright	x34900
HAWAII LIBRARY		
All Services	Pat Kaneshiro	x5247
Technical Library Liaison	Kathy Wright	x34900
SEASIDE LIBRARY SERVICE	Helen Cook	x34902
ELECTRONIC MAIL ADDRESSES		
Topside Library	TOPLIB	
Bayside Library	BAYLIB	
Computer Documents	DOCUMENTS	

Table 16.2. Online information retrieval systems accessible by the NOSC Technical Libraries.

DATALIB

DATALIB is the automated library system that provides online access to the Libraries' catalog of books, technical reports, periodicals, and other publications. Eventually all of the older records will be included in the online catalog and access will be made available to NOSC employees via the GCB.

DTIC DROLS

The Defense RDT&E On-Line System (DROLS), produced by the Defense Technical Information Center, provides classified (through secret) access to past, current, and planned work sponsored by the Department of Defense. DROLS consists of three databases: Technical Reports, Work Units (1498s), and industrial Independent Research and Development Summaries.

NASA/RECON

Provides access to more than 2 million technical reports, journal articles, books, conference proceedings, and other publications in the fields of aerospace and related technologies.

DIALOG

Provides access to more than 250 databases in all subject fields. Many of these databases correspond to printed index equivalents, including COMPENDEX (*Engineering Index*), CA SEARCH (*Chemical Abstracts*), SCISEARCH (*Science Citation Index*), INSPEC (*Physics Abstracts, Electrical and Electronics Abstracts, Computer and Control Abstracts*), and NTIS (*National Technical Information Service*).

ORBIT

Provides access to more than 70 databases, including COLD, a database of technical reports, conference papers, articles, and books compiled and maintained by the Army Cold Regions Research and Engineering Laboratory.

BRS

Provides access to more than 70 databases, including RBOT, a database on robotics, and TECHDATA, an online index to specifications, standards, and manufacturing catalog information.

WILSONLINE

Provides access to general indexes such as *Applied Science & Technology Index, Business Periodicals Index*, and *Readers Guide to Periodical Literature*.

OCLC

An online union catalog of over 14 million books, serials, and maps owned by 3600 member libraries.

USNI MILITARY DATABASE

A database produced by the United States Naval Institute that provides access to unclassified information on the world's armed forces, their organization, orders of battle, and weapons.

CORPTECH

A microcomputer database containing information on developers and manufacturers of high technology products in the United States. (available only at the Topside Library)

Table 16.3. Map resources at the NOSC Technical Libraries.

TYPES OF MAPS/CHARTS AVAILABLE:

- Hydrographic
  - World coverage (DMA Charts)
  - U.S. coastal coverage (NOAA Charts)
- Topographic (USGS Maps)
  - U.S. series — scales 1:1,000,000 and 1:250,000
  - States' series — scales 1:62,500 (15 min.) and 1:24,000 (7.5 min.)
- Bathymetric (NOAA/USGS Maps)
- Aeronautical (DMA/NOAA Charts)
- Road maps (Reference only)
- Political maps (CIA and other sources)
- General world and U.S. maps (DMA and USGS Maps)

NAVIGATIONAL AIDS

- Sailing directions
- Coastal pilots and fleet guides
- Fog and light lists
- Tide tables
- Almanacs
- Booklets on chart/map symbols, abbreviations and terminology

ATLASES

- General
- Specialized: oceanographic, climatological, political, etc.

TO OBTAIN THESE MATERIALS OR FOR FURTHER INFORMATION CONTACT: Val Danesh, Topside Library, Code 9641T, x34891.

Table 16.4. Current awareness services offered by NOSC Technical Libraries.

Publications that provide periodic notification of new publications in the following broad subject areas are available through the NOSC Library. To be placed on the distribution list for any of these topics, contact Jan Rutledge at x34894. To request that a current awareness [illegible]ication be established on a different subject, please contact Joan Buntzen, x34879.

- Acoustics
- Antennas
- Applied Mathematics
- Arctic
- Artificial Intelligence
- Command and Control
- Communication Systems and Equipment
- Communication Theory
- Data Communication
- Display Systems
- Feedback and Control Theory
- Fiber Optics
- Image Processing
- Laser Applications
- Matrix Materials
- Microelectronics
- Numerical Analysis
- Oceanography
- Optics
- Program Management
- Radar
- Radio Noise
- Reliability
- Robotics
- Semiconductors and Transistors
- Signal Processing
- Software Engineering
- Software Quality, Reliability, and Documentation

Individually tailored current awareness searches may be established with any of the online services listed below. Contact Joan Buntzen, x34879, for further information.

- DTIC
- NASA
- BRS
- DIALOG
- ORBIT

REQUEST FOR LITERATURE SEARCH
NOSC TECHNICAL LIBRARY

Name ______________________________

Code ______________________________

Phone __________ ( ) Call me for pickup
( ) Mail search to me

Date __________ Date Required __________

SEARCH TOPIC

Please provide a narrative statement of your topic. Define any terms that may have special meaning in your request. Indicate areas to be excluded. Include significant phrases, synonymous terms, relevant authors, companies, agencies, etc., or pertinent citations. BE AS SPECIFIC AS POSSIBLE.

SEARCH SPECIFICATIONS

Specificity: Exhaustive ________ Specific ________ Few key articles ________

Time coverage: ______________ (no. of years)

Language: All ______ Eng. only ______

Highest classification: ____________

DATABASES TO BE SEARCHED

________ NOSC Library Holdings

DTIC:

________ Technical Reports

________ Work Units (1498's)

________ Industrial IR&D

________ Program Planning

Periodical/open literature:

__________ DIALOG

__________ BRS

__________ ORBIT

__________ NASA

__________ Other (please specify)

Figure 16.5. Request for NOSC library literature search.

16.5 EFFECTIVE PRESENTATIONS

Presentations come with the territory; presentation demands are made on project managers at the Naval Ocean Systems Center. Technical presentations or briefings are often vital to obtaining support, selling your ideas, or defining the scope and requirements of your project. The professional image you portray, how you organize and present material, the visual aids you choose to help you, how you deliver the message, can all mean success or failure in your presentations.

Your oral presentation may be given in-house to your peers or management. When you gain a reputation for giving effective presentations, you'll benefit from a "halo" effect that carries over to other job activities. If your presentation is given to others, the impression you make on your audience will also reflect the image of the Naval Ocean Systems Center. If you're well-organized, sharp, concise, and self-confident, NOSC will be regarded as an efficient and professional organization.

The few minutes of your presentation may reflect years of background, months of study and data accumulation, and days or maybe even weeks of preparation. In many instances, those few minutes can affect management decisions and the expenditure of large sums of money.

As a result, presentation skills are important to you as a project manager and each briefing requires careful and intelligent attention.

The NOSC Presentation Workshop is given periodically for NOSC personnel. It has strong support from upper management. It was designed to not only give you individualized instruction in speaking and presentation techniques, but to familiarize you thoroughly with the audiovisual and graphics support you have available here at the Center.

Two publications are recommended for those preparing presentations:

Effective Business and Technical Presentations, by George L. Morrisey
How to Prepare, Stage, and Deliver Winning Presentations, by Thomas Leech

The tables that follow present a series of ready reference materials that are concise but thorough enough to be of significant help in preparing effective presentations. Use them.

Table 16.5. Criteria for selection of resource material
Table 16.6. How to plan and organize your presentation
Table 16.7. Audience analysis
Table 16.8. The presentation outline
Table 16.9. How to give your presentation
Table 16.10. Preliminary arrangements checklist
Table 16.11. Visual aids
Table 16.12. Odds and ends

Table 16.5. Criteria for selection of resource material.

What is the OBJECT or PURPOSE of the presentation?

What kind of AUDIENCE ACTION or RESPONSE is required?

What MUST be said to reach objectives?

What is the BEST way to say it? What method to use?

What amount of DETAIL is necessary?

What material should be WITHHELD, but available for question/answer period?

Submit all resource materials to the "WHY" test.

Table 16.6. How to plan and organize your presentation.

DETERMINE PURPOSE

State in one concise sentence

ANALYZE YOUR AUDIENCE

Size, attitude, background, relationship

PREPARE PLAN

Main ideas or concepts, supporting material

SELECT RESOURCE MATERIALS

Submit all to the "WHY" test

ORGANIZE WELL

Opening, body, close

PRACTICE

Rehearse, rehearse, rehearse

Table 16.7. Audience analysis.

How much do they know about the subject?
Are they at the decision making level?
What language will they best understand: Technical, business, financial, everyday English, or what?
Are there leaders in the group who could sway the rest?
Should I address myself to the whole group, or only certain ones?
What are their reasons for attending my presentation?
What information or technique is likely to gain their attention?
What information or technique is likely to get negative reactions?
Audience attitude? Friendly, unfriendly, etc.
Will they be in a hurry to conclude?
Is there likely to be opposition, or even debate?
Does anyone's face need to be saved?
Is there likely to be a bias, either pro or con?

Table 16.8. The presentation outline (1 of 2).

Title or Subject: ____________________

Purpose (state in one clear, concise sentence)

____

____

Opening: ____________________

____

____

Main ideas or Concepts

1. ____________________

____

2. ____________________

____

3. ____________________

____

4. ____________________

____

Information necessary to support the main idea:

Idea 1

____

____

____

____

Idea 2

____

____

____

____

Table 16.8. The presentation outline (cont'd.)

Idea 3

____

____

____

____

Idea 4

____

____

____

____

Closing: Summary — The points made:

1. ____________________________________
2. ____________________________________
3. ____________________________________
4. ____________________________________

The recommendation: ______________________________

OR the conclusions: ______________________________

Therefore, the action I want from you ________________________

____

____

Table 16.9. How to give your presentation.

THE TOTAL IMPRESSION

Professional — Confidence, Alertness, Poise

THE LOOK

Appearance — Affects attitudes, answers questions
Affects opinion, reinforces feelings
Dress like occasion demands
Be comfortable
Nothing distracting

LECTERN PRESENCE

Bearing — Posture, movements
Hand gestures — Relax, never make gestures consciously, key is natural, don't play with items you hold
Body gestures — Move with purpose, avoid pacing
Eye contact — Use it
Lectern — Establishes formal relationship

VOICE

Volume, rate, modulation
Pause — Effective means of emphasis
Watch filler words/pet phrases
Be aware — Enunciation/voice drop

DEVELOP STYLE

Personality — warmth/sincerity/enthusiasm
Never imitate
Discover personal strength

MEMORY AIDS

Avoid hazards of memorizing
Visuals keep "on track"
Use notes if more comfortable

Table 16.10. Preliminary arrangements checklist.

GENERAL INFORMATION

Presenter ______________________________
Subject ______________________________
Audience ______________ Number ______________
Date ______________ Time ______________
Security Classification ______________________________

ROOM

- ☐ Room Reserved
- ☐ Arrangement
- ☐ Chairs
- ☐ Tables
- ☐ Lighting
- ☐ Ventilation
- ☐ Distractions
- ☐ Other ______________________________

PRESENTATION MATERIAL

- ☐ Visual Aids
- ☐ Film/Tapes
- ☐ Hardware/Models/Demonstrations
- ☐ Handouts (quantity)
- ☐ Other ______________________________

EQUIPMENT (Test Everything)

- ☐ Placement
- ☐ Accessories (bulb, extension cord, etc.)
- ☐ Sound System
- ☐ Lectern
- ☐ Pointer
- ☐ Marker/Chalk
- ☐ Other ______________________________

SUPPLIES

- ☐ Tablets
- ☐ Pencils
- ☐ Name Cards
- ☐ Other ______________________________

PROVISIONS

- ☐ Refreshments
- ☐ Breaks
- ☐ Other ______________________________

Table 16.11. Visual aids.

WHY VISUALS?

- People are visual-minded
- Retention is increased
- Visualization encourages organization
- Puts you in action
- You and the Audience are side by side
- Misunderstandings are less likely to occur

VISUALS SHOULD

- Illustrate
- Focus attention
- Clarify

GENERAL RULES

- Keep them simple
- Make them readable
- Use key words
- Use consistent style
- No more than 7 items

TYPES OF VISUALS

- Boards
- Pictorials
- Charts
- Objects/Models
- Projections
- Handout Materials
- Auditory Aids

Table 16.12. Odds and ends.

SITUATION

Where given — never ignore details, arrive early, check facilities, check equipment for visuals
Time limit — no excuse for running over
Place on Program — make adjustments accordingly
Handout Material — pass out after talk

ANALYZING AUDIENCE FEEDBACK

Remain objective
Don't continue without audience contact

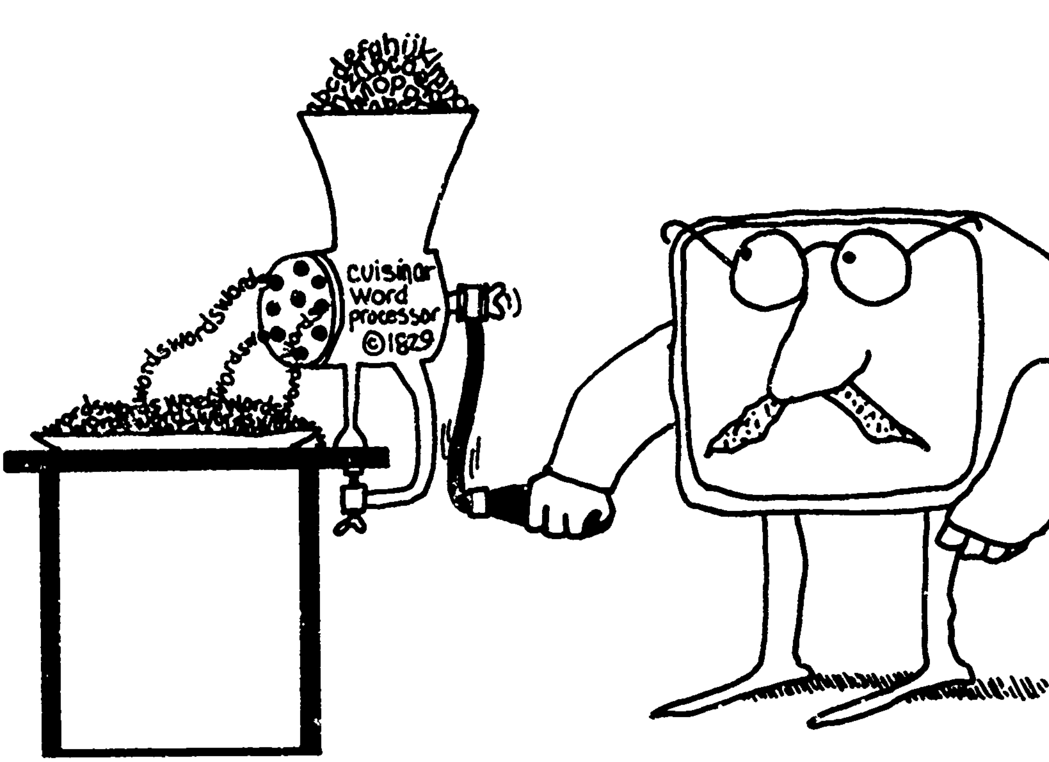
AUDIENCE RETENTION

Strong introduction and conclusion
Need for closing phrases

QUESTION AND ANSWER PERIOD

Advantages — message reinforced, valuable feedback
Planning — allow time, prepare audience, prepare yourself
Handling — getting it started, heard by all, give everyone a chance
Analyzing — spot loaded questions, divide complex questions, accept nonquestions, dismiss irrelevant questions, handling long-winded questions
Answer directly
Stick to your specialty
Keep it moving
Concluding — stop while [illegible] ipate the end, close with summary statement

COMPUTERIZED ASSISTANCE 17



CONTENTS

SECTION 17
COMPUTERIZED ASSISTANCE

17.1 INTRODUCTION

17.1.1 Summary

This presentation serves to introduce you to a variety of computer resources and services available to NOSC project managers. A distinction is made between computer-based tools, which can help you perform project management functions, and the actual performance of the functions of planning, budgeting, or project monitoring. A survey of hardware, software, and support services is provided and includes a number of tools to help you perform most of your work on a personal computer. The presentation concludes with a preview of resources and tools that are in development or are planned.

17.2 WHAT IS A COMPUTER TOOL?

A dictionary defines a tool as "anything used in the performance of an operation; an instrument" and "anything regarded as necessary to the carrying out of one's occupation. . . ." On that basis, a computer tool could be defined as any computer resource, be it hardware, software, or procedure, that can assist in the performance of a task. Remember that use of these tools is not a substitute for planning, budgeting, or project monitoring but can assist in these types of activity.

17.2.1 Some Comparisons of Tools

The following comparisons of computer tools and their noncomputer equivalents illustrate a few possibilities:

Conversation:	Telephone	→	Electronic mail
Writing:	Typewriter	→	Word processing
Distribution:	Guard mail	→	Electronic mail
Document storage:	File Cabinet	→	File system on disk
			Tape archive
Accounting:	Ledger book	→	Spreadsheet
Record Keeping:	3 by 5 cards	→	Database management system

17.2.2 How Can Electronic Mail be Used?

One of the most popular computer tools at the Center is electronic mail. It can be used to exchange messages and reduce "telephone tag." It can also be used to broadcast announcements to project members, line management, and sponsors. It can provide an effective means to distribute drafts of documents for review, to exchange comments or changes, and to submit for final approval.

17.3 WHAT COMPUTER RESOURCES ARE AVAILABLE?

Computer resources at NOSC may be divided into four major categories: project resources, departmental resources, personal computers, and Center services.

17.3.1 Project Resources

There are more than 80 VAX minicomputers throughout the technical and support codes. The majority are run under the VMS operating system. Many are operated as classified processors, and most are restricted to specific projects.

17.3.2 Departmental Resources

A number of departmental resources are available at NOSC. These are independent and complementary to the Center resources. The largest is the Code 80 service center which features a variety of VMS tools, including word processing, a VMS mail gateway to Center email, scientific packages, spreadsheets, graphics utilities, and a project management package.

17.3.3 Personal Computers at NOSC

Personal computers have become the resource of preference for many NOSC personnel, and PC use continues to grow dramatically. By the end of FY86, there were over 3,000 PCs on Center. That number grew to nearly 4,000 by the end of FY87. Of these, about three quarters are IBM PC/XT/AT or IBM compatibles (primarily Zenith Z248s). Another 10 percent are Macintosh. An important consideration for all PC users is the compatibility of the hardware with NOSC's local area network, referred to as the Generalized Communications Backbone (GCB).

17.3.3.1 What Tools are Available for PCs? There are hundreds if not thousands of PC software packages developed annually. A number of these have been evaluated and endorsed by the Centerwide Office Automation Network (COAN) Project. Technical and user support of these programs is available through the Topside and Bayside Computer Resource Centers (CRCs). Examples include

Spreadsheets — Lotus, Supercalc
Database managers — dBase III, Rbase 5000
Word processors — Easy Editor, Wordstar, WordPerfect, WordMARC
Project managers — Time Line
Graphics — Dr. Halo, Chartmaster, Sound Presentation
Calendars/Organizers — Sidekick

Many PCs are used in conjunction with minicomputers, either as terminals or for uploading/downloading of data or text files. Tools are available for these functions including several programs that are free from either CRC. These free products include VT100 terminal emulation (terminal.exe), intercomputer transfers (terminal.exe on PC and mcp on Unix, VMS), and downloading of institutional data (PCLink).

17.3.4 Center Services

A number of computer resources and services are provided Centerwide by the Computer Sciences and Simulation Division, Code 91. These include the GCB, the Defense Data Network (DDN), the General Purpose Computer Center's (GPCC's) VAX network, two Computer Resource Centers, a Computer Training Center, and an applications development service.

17.3.4.1 Generalized Communications Backbone (GCB). The GCB is a broadband communications facility based on cable television technology. It runs between and inside buildings throughout NOSC. Its principal use today is for host-terminal communications. Future emphasis will be for PC-to-PC and intelligent workstation networks. The GCB is capable of supporting video, audio, and RF applications.

17.3.4.2 Defense Data Network (DDN). The DDN provides communication between DoD and non-DoD research centers around the world. The MILNET is the unclassified network component of the DDN. A classified network is planned and partially implemented. The principal local uses are for electronic mail to other activities (e.g., SPAWAR, other laboratories); remote login to host computers at other facilities; and file transfers between computers. When a NOSC employee is on travel, remote access to NOSC's computers is generally possible via the DDN through a local phone call to a Terminal Access Controller (TAC).

17.3.4.3 Code 91 VAX Network. As part of the General Purpose Computer Center (GPCC), Code 912 operates a number of VAXes as timeshared resources. At present there is an 8650 (Manta); three 8600s (Cod, Marlin, Wahoo); a 785 (Trout); and a 750 (Humu, in Hawaii). These are all connected to the GCB and interconnected via Ethernet. The operating system is 4.3 BSD (Berkeley) Unix except for Wahoo, which runs under VMS Version 4. A recent addition to the GPCC's equipment suite is a Convex C1-XP minisupercomputer that also runs under Berkeley Unix.

A number of tools are available on the GPCC VAXes. These include electronic mail (provided free to all NOSC employees); the Project Management Support System (PMSS); and a variety of general purpose resources for editing, word processing, database management, and scientific computation and analysis.

17.3.4.4 Project Management Support System (PMSS). PMSS consists of a collection of locally developed software, hardware, documentation, training, and consultation. PMSS was conceived and designed to provide rapid access to project information electronically. PMSS currently resides on Marlin, Manta, and Humu. It features access to an on-line database containing NOSC financial data. Financial data can be downloaded to Lotus or dBase files on PCs. Data available include job order information; stub status; plant account information; material/service/travel (MST) reports; and employee activity (charges, plant property).

17.4 WHAT ASSISTANCE IS AVAILABLE?

The GPCC staff offers assistance in several ways. Consultation is provided from both CRCs. The consultants serve as a single point of contact for the GPCC. They handle new-user signups and DDN/TAC signups. They also provide technical consultation or referral on a wide variety of computer topics. PC support, including PC maintenance, is available through the CRCs. Customers may contact either CRC location via phone, email, or by visiting in person.

Computer classes are regularly offered in the GPCC's computer training classroom. PC, Unix, and VMS classes are conducted. Schedules are published in the monthly Computing Highlights.

An applications development service is offered whereby small tasks can be handled on a chargeback basis. The initial consultation and scoping of the effort is at no charge. Applications development projects are limited to 80 hours of design and programming effort.

Computer documentation is available from the GPCC. Commercial textbooks on Unix and PC topics may be reviewed and ordered through the CRC or the technical libraries. Most of the titles are stocked and will be delivered within 2 working days. Locally produced documents are also prepared and distributed, including the PC Owners Manual, an email user's guide, a DDN user's guide, and the GPCC Survival Guide.

PC support in addition to the services descibed is available through the CRCs. This support includes hands-on exposure to PC hardware and software, guidance and assistance for PC procurements, assistance for PC installation and check-out, and distribution of public domain and local software. The two CRCs serve as satellite depots for computer-related shopstores stock items, such as printer supplies, diskettes, cables, and software. Recently, complete Z248 PC systems (AT equivalent) were added to the shopstores' catalog, so it is now possible to procure a PC from locally maintained inventory. Finally, PC maintenance by on-site contractor personnel may be arranged by contacting either CRC.

17.5 A NOTE ON COMPUTER SECURITY

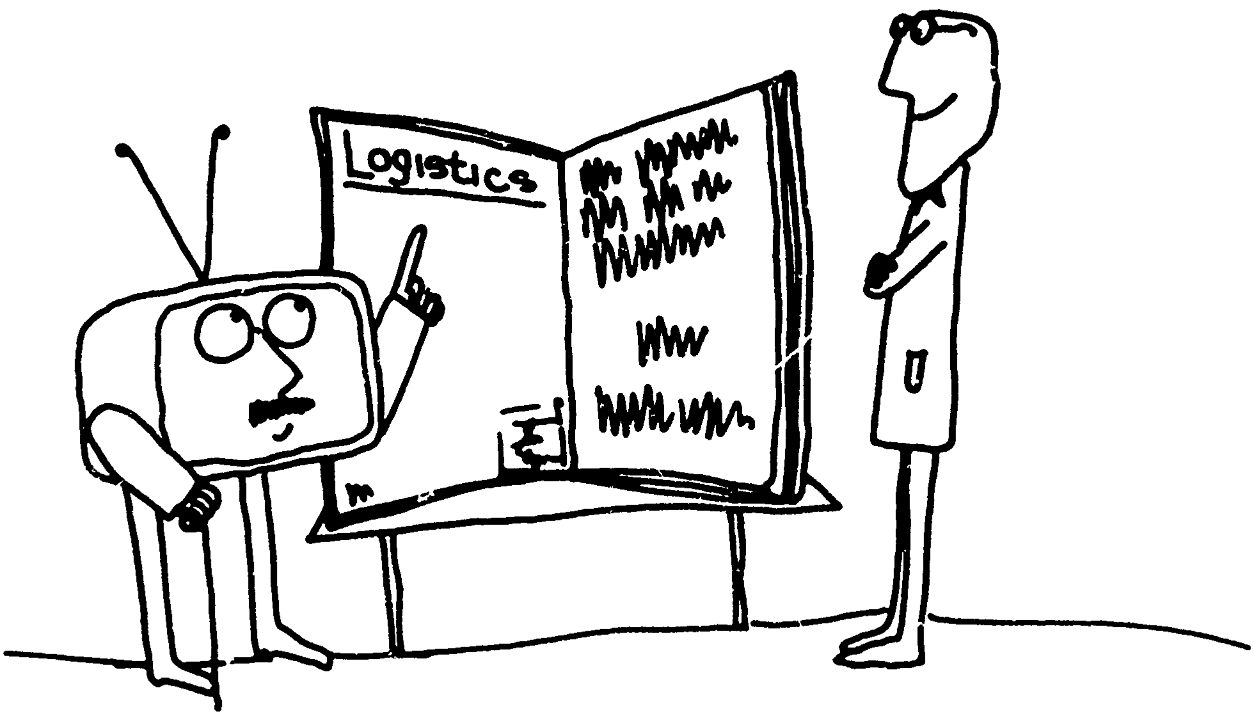
As a reminder that computers at NOSC are often used for classified or sensitive applications, certain security measures may be required when you are acquiring, developing, using, or reconfiguring these resources. Guidance is available from your division ADP System Security Officer (DADPSSO), the ADP Security Office (Code 153), OPNAVINST 5239.1A, and NOSCINST 5500.1A.

17.6 PLANS FOR FUTURE RESOURCES AND TOOLS

There are several efforts in progress which we hope will result in further improvements in how effectively we use PCs and minicomputers at NOSC. These efforts include

- PC-based electronic mail (micromail)
- Integrated email for all NOSC employees
- Electronic paperwork tools (stubs, travel orders, etc.)
- Electronic signature system
- Expanded CRC facilities and services
- More PC, Unix, and VMS training and support

COMPUTER-AIDED LOGISTICS 18



CONTENTS

SECTION 18
COMPUTER-AIDED LOGISTICS

18.1 INTRODUCTION

18.1.1 References

MIL-STD-1388-1A, Logistic Support Analysis (LSA)
MIL-STD-1388-2A, DoD Requirements for a Logistic Support Analysis Record (LSAR)
DoD Instruction 5000.2, Major Systems Acquisition Procedures
SECNAVINST 4130.2, Department of the Navy Configuration Policy
DoD Directive 5000.39, Acquisition and Management of Integrated Logistic Support for Systems and Equipment

18.2 REQUIREMENTS

To understand the objectives of logistics support properly, it is necessary to examine briefly the prime requirements for systems acquisitions. These may be expressed simply as

a. IT MUST DO WHAT IT IS SUPPOSED TO DO WHEN IT IS SUPPOSED TO DO IT. This factor is obviously related to system performance and reliability.

b. IT MUST BE ADEQUATELY DOCUMENTED. *Adequately documented* is a term that needs some degree of logical interpretation. *Adequately* is the key word here. A full level 3 documentation package may not be required on a "one of a kind" system not intended for production. However, a level of documentation suitable for repair, adjustment, operation, special transportation requirements, safety, purchasing repair parts, etc., would certainly be prudent and well advised.

c. IT MUST BE AFFORDABLE. Logistically this term is normally defined in terms of money and resources over the life of the system.

d. IT MUST BE SUPPORTABLE. The term supportable is normally interpreted as logistics functions. Unfortunately, it is not quite so obvious that logistic requirements and data cover the three other areas as well.

The logistics requirements include the need for spare parts. The parts are identified in the configuration management *documentation*. The number of parts required is dependent upon *reliability* and other logistics factors. The cost of the total number of spare parts and the other logistical factors have major impacts on a system's *affordability*.

18.3 IMPORTANT FACTS

a. Out of every $1 that will be spent on a system acquisition over its *LIFE CYCLE*, 75 cents will be "locked in" during the demonstration and validation phase.

b. Out of every $1 that will be spent on a system acquisition over its *LIFE CYCLE*, a total of 85 cents (10 cents additional) will be "locked in" during the full-scale development phase.

c. Approximately 75 percent of all Navy programs undergoing a logistic review group (LRG) audit for logistics certification to proceed to DSARC fail.

d. Approximately 35 percent fail on their SECOND attempt.

18.4 WHAT IS THE TECHNICAL LIFE CYCLE?

LIFE CYCLE OF TECHNICAL ACTIVITIES

System Phase	Time in Years	
Concept exploration	0–2	
Demonstration/validation	2–3	
Full-scale development	3–6	
Technical directions agent (TDA) function	5–11	
		5–11
Production and deployment	3–5	
Operation and support	15–40	
In-service engineering agent (ISEA) function	18–45	
		18–45
Total system life cycle in years		23–56

18.5 CHANGING SCOPE OF LOGISTIC REQUIREMENTS AND PERCEPTIONS

As pointed out in the previous paragraph, the typical system life cycle will range between a quarter to a half century! Reference to Figure 18.1, change in logistic requirements and perceptions, graphically shows what an impact the new requirements impose. Prior to 1983, the application of the logistic support analysis (LSA) with its companion logistic support analysis record (LSAR) was to a large extent optional in the early phases and totally disappeared shortly after deployment. The current directives introduce logistical considerations during the preconcept phase and maintain them into the disposal phase.

Figure 18.1 shows a change in the lines for new scope during the production/deployment phase. This change to an open line represents a reduction of effort in the LSA and LSAR activity. *A key point to remember is that the logistical requirement does not go away over the entire life cycle of the system.* At the end of the TDA function it is transitioned to the ISEA and Program Office with the LSAR database.

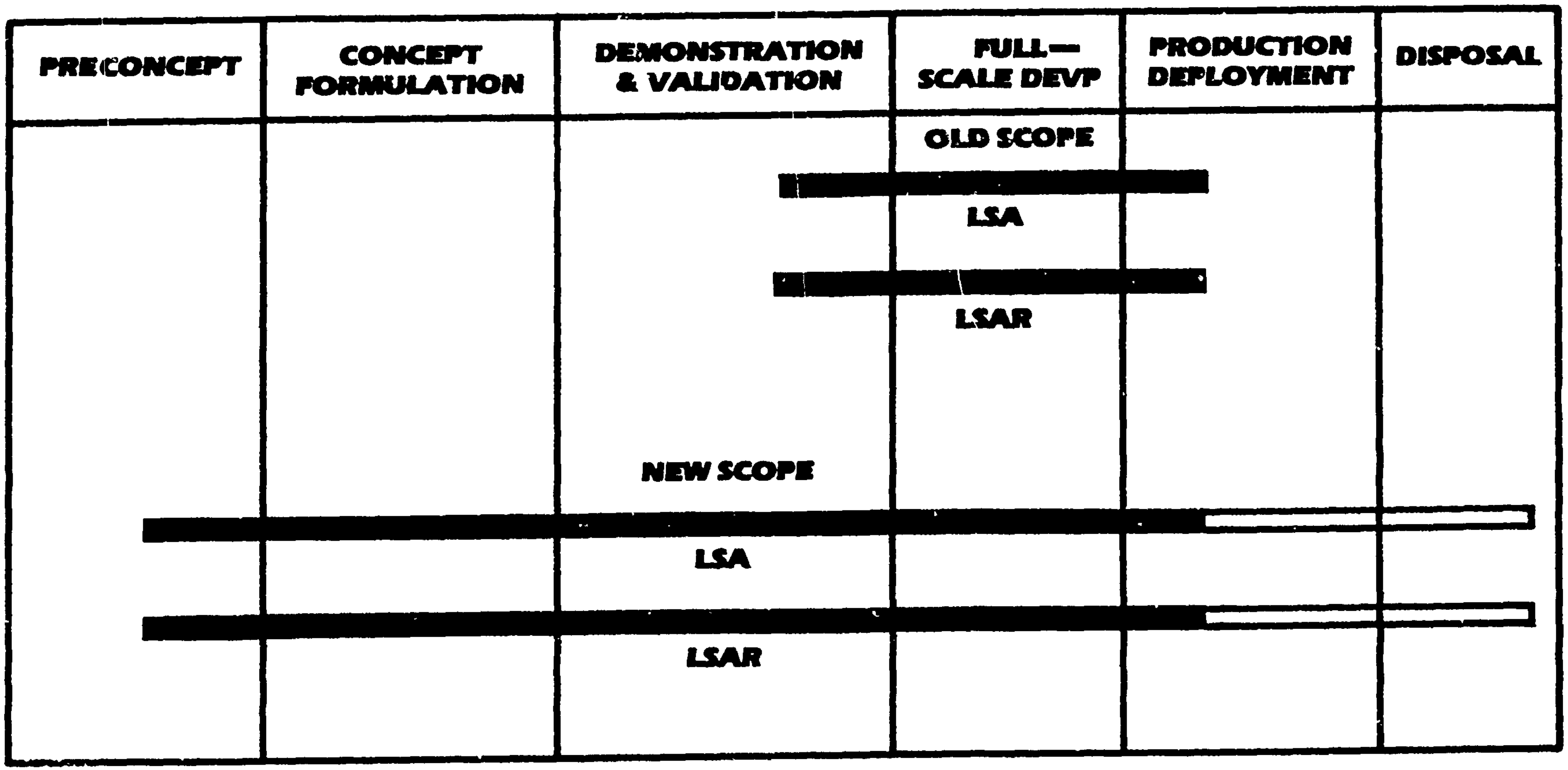


Figure 18.1. Change in logistic requirements and perceptions.

It has frequently been said that logistical planning is the function of the prime hardware contractor. Nothing could be further from the truth. The logistical planning of an acquisition is a government responsibility. True it is accomplished with inputs from many sources including the prime hardware contractor, support from service contractors, other government agencies, etc., but the prime responsibility is that of the acquisition program. This statement normally translates to a TDA function.

18.6 BASIC GUIDANCE

There are approximately 340+ documents within the Navy that are directly involved with the subject of logistics. Fortunately, it is highly unlikely that the majority of them would be applied to a single acquisition.

The easiest approach to defining logistical requirements of an acquisition is covered in two basic documents.

a. MIL-STD-1388-1A, Logistic Support Analysis (LSA)

b. MIL-STD-1388-2A, DoD Requirements for a Logistic Support Analysis Record (LSAR)

These two documents implement the guidelines and requirements established by DoD Instruction 5000.2, Major Systems Acquisition Procedures, and DoD Directive 5000.39, Acquisition and Management of Integrated Logistic Support for Systems and Equipment.

18.7 A MUCH-NEEDED CLARIFICATION

On 11 May 1987, the Assistant Secretary of the Navy, the Honorable Everett Pyatt, implemented SECNAVINST 4130.2, Department of the Navy Configuration Policy. This Navy document specifically identifies what integrated logistic support is and what comprises it for the Navy.

18.7.1 What is Integrated Logistic Support?

Integrated logistic support is a disciplined, unified, and iterative approach to the management and technical activities necessary to

- Integrate support considerations into system and equipment design;
- Develop support requirements that are related consistently to readiness objectives, to design, and to each other;
- Acquire the required support;
- Provide the required support during the Operating and Support phase at minimum cost.

18.7.2 What Comprises Integrated Logistic Support?

Integrated logistic support is comprised of the following elements:

- Maintenance planning
- Manpower and personnel
- Supply support (including initial provisioning)

- Support equipment
- Training and training support
- Technical data
- Computer resources support
- Packaging, handling, storage, and transportation
- Facilities
- Design interface

18.8 A WORD ABOUT TECHNICAL DATA

Technical data is defined by SECNAVINST 4130.2 as

> Recorded information, regardless of form, used to define, produce, test, evaluate, modify, deliver, support, maintain or operate a configuration item. Technical data may be recorded as
>
> - graphic or pictorial delineations in media such as drawings or photographs
> - text bin specifications or related performance or design documents
> - machine forms such as punched cards, magnetic tape, disks, or computer memory printouts
>
> Examples of technical data include engineering drawings and associated lists, specifications, standards, process sheets, commercial item descriptions, manuals, test and evaluation master plans and reports, technical reports, catalog and item identifiers, logic diagrams, flow charts, and minutes of technical reviews and configuration audits. Research and engineering data are included, but financial and administrative data are not.

18.9 A WORD OF CAUTION

Although financial data are not considered logistic technical data, it should be recognized that there is a significant interplay between the financial and logistic considerations.

- Program management should draw upon logistic estimates for Program Objectives Memorandum (POM) funding levels.
  a. The POM cycle establishes acquisition program funding requirements for periods up to 5 years in advance.
  b. A large percentage of funding shortfalls can be traced to mandatory logistic requirements that were totally ignored for funding.
  c. The mandatory nature of the requirement can force the reprogramming of available funds to meet the need. On occasion, this has led to the purchase of fewer numbers of the end item or system.
- Life cycle cost and supportability analyses interact very heavily with the program funding past, present, and future.

- All program personnel should be aware that funding, although not classified as technical data, is an intimate part of supportability planning for future dollars to support the acquisition program.

18.10 WHAT ARE THE PROGRAM MANAGER'S ILS RESPONSIBILITIES?

The following paragraphs are extracted from the DoD Directive 5000.39, "Acquisition and Management of Integrated Logistic Support for Systems and Equipment." While application of the following paragraphs to major systems is mandatory, the directive's use as a guideline for less-than-major systems is highly recommended.

THE PROGRAM MANAGER'S ILS RESPONSIBILITIES

1. The program manager shall address support in determining contract structure, type, and competition. As a normal course of action, source selection criteria and contract performance clauses shall be used to provide contractors incentive to deliver systems that meet the R&M and support objectives. Source selection evaluation criteria for appropriate competitive programs shall include a separate evaluation factor (separate from schedule, cost, and performance) for readiness and support, weighted to ensure a positive effect on contractor selection and contract award. To the maximum extent practical, ILS contract requirements shall be identified under definite contract line items. If extended contractor support is planned, development and production contract requirements shall include delivery of data needed for an effective strategy for the follow-on procurement of support.

2. The program manager shall address manpower, personnel, and training requirements throughout the acquisition phases by

   a. Including in solicitations, requests for design and support approaches to minimize manpower, personnel, and training requirements.

   b. Providing contractors with manpower, personnel, and training data (including data from fielded systems) in sufficient detail for design trade-offs and requirements determination.

   c. Ensuring that manpower, personnel, and training cost factors furnished for design and support trade-off analyses take into account costs to retain or replace experienced personnel as well as billet costs.

   d. Structuring contractor incentives, when appropriate, to reward successful development of training approaches and maintainable designs based on operational demonstrations late in development or early in production.

3. The program manager shall develop an ILS plan by Milestone I and keep it current throughout acquisition. The ILS plan shall integrate logistics aspects of the program. Positive controls shall be established to integrate schedules and to identify interdependencies among the ILS elements, design activities, and deployment plans. The ILS plan shall document readiness and support objectives and demonstrate achievements, operating concepts, and deployment requirements (including transportability), support concepts and plans, ILS element requirements, schedule, funding requirements, and responsibilities for ILS activity planned for each program phase. For multi-DoD Component programs, the ILS plan shall address the support requirements of all participating DoD Components.

4. The program manager shall furnish contractors with appropriate government data, such as a baseline operating scenario and maintenance concepts, system readiness objectives, and support costs on current systems in use as a basis for contractor ILS planning and analysis.

5. The program manager shall maintain current ILS management information (including details of schedule, resource requirements and funding, LSA documentation, and the status of progress toward support-related thresholds) to support ILS planning and management decisions. Standard data elements shall be developed and used to the extent possible. The work breakdown structure established for the program in accordance with DoD Directive 5010.20 and MIL-STD 881A (Work Breakdown Structures for Defense Materiel Items) shall be used as the framework for cost reporting.

6. The program manager shall maintain visibility of all essential resource requirements to assess the extent to which the budgeted and programmed resources are or will be available to meet these requirements and the effect of any shortfalls on support schedules and attainment of readiness objectives. The program shall have an explicit coordinating role in programming, budgeting, and budget execution affecting system readiness. Traceability of changes in support budgets and support-related objectives and thresholds (including changes in definition) shall be maintained in DoD Component management information systems.

7. The program manager shall, by the production decision point, develop plans for follow-on readiness assessment, beginning initial deployment and continuing until the system design and support configuration are mature. These plans shall include milestones, responsibilities, and acquisition strategies for making system design and support resource improvements needed to meet system readiness objectives.

8. By the production decision point, plans shall include resource requirements, milestones, responsibilities and strategies for making software design and support improvements needed to meet system readiness and effectiveness goals following deployment.

9. Plans shall be developed beginning at the production decision point and updated periodically in the production phase to determine the cost-effective means of providing postproduction support. A DoD Components postproduction support review shall be held sufficiently in advance of production phaseout to ensure that plans, resources, and responsibilities are established for effective postproduction support to meet readiness objectives.

18.11 WHY COMPUTER-AIDED LOGISTICS?

The scope of logistics has been previously touched upon. Long-standing major problems exist in the collection, organization, evaluation, retrieval, use, and distribution of logistic data and information.

On 24 September 1985, the Honorable William H. Taft, Deputy Secretary of Defense, established a Steering Group to oversee the implementation of a DoD-level Computer-Aided Logistic Support (CALS) Program. Since that time, the acronym CALS has been changed to mean Computer-Aided Acquisition and Logistic Support. In brief, the major objectives were and still are

- Accelerate the integration of reliability and maintainability (R&M) design tools into contractor computer-aided design and engineering processes.
- Accelerate the automation of contractor processes for generating logistic technical information products.
- Rapidly increase Military Department and Agency capabilities to receive, distribute, and use logistic technical information in digital form to improve weapon system maintenance, training, and spare parts management.

Note that the first two objectives are directed toward industry and the last one toward government.

The bottom line is that government acquisition programs will be expected to have "capabilities to receive, distribute, and use logistic technical information in digital form to improve weapon system maintenance, training, and spare parts management."

The question to be answered is, "Will my acquisition program meet this objective with the resources and capabilities I have available?"

To be useful, data must be processed into information. It is upon the developed information that program management, design, engineering, logistic, and manufacturing decisions are based. Analysis is one of the most common procedures to develop information.

18.12 LOGISTIC SUPPORT ANALYSIS (LSA)

The logistic support analysis is divided into 3 sets, 5 task sections, 15 tasks, and numerous subtasks. Many of the tasks and subtasks will not be new because they have been applied to projects for years. In fact, they are considered normal engineering practice. The major change has been to formalize them to ensure logistic considerations.

Relationship of LSA sets, Task Sections, and Tasks

Manage

- 100 Program Planning and Control
  - 101 Development of an early logistic support analysis strategy
  - 102 Logistic support analysis plan and/or integrated logistic support plan
  - 103 Program and design reviews

Analysis and Synthesis

- 200 Mission and Support Systems Definition
  - 201 Use study
  - 202 Mission hardware, software, and support systems standardization
  - 203 Comparative analysis
  - 204 Technological opportunities
  - 205 Supportability and supportability-related design factors
- 300 Preparation and Evaluation of Alternatives
  - 301 Function requirements definition
  - 302 Support system alternatives
  - 303 Evaluation of alternatives and trade-off analysis
- 400 Determination of Logistic Support Resource Requirements
  - 401 Task analysis
  - 402 Early deployment analysis
  - 403 Postproduction support analysis

Test and Correct

500 Supportability Assessment

501 Supportability test, evaluation, and verification

18.13 LSA TASK 103

From the previous list let's examine MIL-STD-1388-1A LSA Task Number 103 in a little more detail.

LSA TASK 103

Program and Design Reviews

Purpose: This task provides for timely LSA program participation in the official review and control of design information, the scheduling of detailed LSA program reviews, and logistic risk assessments at program reviews. It also ensures that all pertinent aspects of the LSA program are addressed as an integral part of all formal program and design reviews.

Required for: These procedures for the review of design information from a support standpoint within the performing activity provide logisticians a mechanism for accomplishing design influence and tradeoffs. LSA program reviews aid in monitoring the overall progress, quality, and consistency of the LSA effort.

When required: Program and design reviews are generally initiated during the concept exploration phase and are scheduled periodically throughout subsequent phases.

Responsibility: Initially the SYSCOM program office (with assistance from the TDA, if one has been designated) is responsible for Task 103. During the demonstration and validation and subsequent phases, the TDA assumes responsibility for this task.

Associated Subtasks:

Program reviews

- Cost
- Schedule
- Performance
- Documentation
- Supportability risk
- Assessment

Design reviews

- Interfaces
- Specifications
- LSA
- Supportability
- Risk assessment

LSA Reviews

- Task results
- Data exchange
- Test results
- Recommendations

18.14 DETECTING TRENDS

It should be noted that the logistician is not only interested in what is happening, but what may or could happen as well. By detecting trends early enough he/she has time to compensate for changes and, if necessary, make major revision of long-range plans.

Many situations that occur within an acquisition program cause that program to be delayed. It is not uncommon for a Navy initial operating date (IOC) to slip 3 to 5 years beyond the original estimate. The logistician is the individual that should be aware of the impacts of acceleration and slippage to the acquisition and should advise the program management.

For example, if the IOC slips during the full-scale development phase, what is the impact on the funds programmed by NAVSUPSYSCOM and the Ships Parts Control Center for the acquisition of spare parts to support the acquisition via their funding cycle? The magnitude of dollars runs into tens of millions. What courses of action are open to the supply system to handle the sum of money that can't be held or spent?

Situations such as this require very close coordination by the logistician for elements outside of the mainstream of design and conventional systems engineering.

18.15 WHAT DO I DO?

Figure 18.2, LSA activities in the acquisition cycle, provides very specific guidance as to the type of activities normally required.

Note that the logistical activity starts even before the program initiation! During this period, which is normally taken care of by the SYSCOMs, definition of constraints and objectives is established. It is possibile that a Navy laboratory will be called upon to assist in this function.

The bottom line of Figure 18.2 indicates the types of funds and when they are obligated. Note that the typical funding for logistic considerations ranges from 6.1 (Basic Research) to 6.5 (RDT&E Management and Support). Other funds included are procurement, operations and maintenance, military construction (MILCON), training, etc. All of these funds have a 5-year or longer cycle.

Using MILCON funds as an example, it would be prudent to consider facilities as an 8-year requirement. This is to allow the definition as to what is required, where will it be, what will it look like, are architectural drawings required, site surveys, impact studies, can the requirements be combined with the potential site's other plans, and what special requirements are needed. These questions are only a few of those that must be answered prior to the start of the funding cycle.

Assuming that the planning has been accomplished to determine what is required and how much it will cost, consideration must be given to the beneficial occupancy date or that date when the facilities may actually be used by the program. All of these elements must go together.

Failure to consider the time factor can disrupt the entire system. It can lead to facilities requirements not being met when they are required or, if a program has a very high priority, reprogramming of MILCON funds. Reprogramming of funds can eliminate needed MILCON dollars from other programs to meet unplanned requirements. The adequate planning of MILCON requirements is fundamental, yet often overlooked.

SYSTEM ACQUISITION PHASE	PREPROGRAM INITIATION	CONCEPT EXPLORATION	DEMONSTRATION VALIDATION	FULL-SCALE DEVELOPMENT	PRODUCTION DEPLOYMENT	OPERATION AND SUPPORT
SUPPORTABILITY DESIGN INFLUENCE ACTIVITIES	• Input Data – Threat Mission – Environment – Technology – Operational Concept Support Concept Measures of Effectiveness • Identify Constraints Technical Advancements Operational Requirements Existing Support Structure • Identify Historical Lessons Learned • Include Constraints in Requirements Needs Documents • Perform Intended Use Documents • Establish Preliminary Support Concept • Identify Readiness and Support Cost Drivers	• Define Baseline Operational Scenario • Establish System Readiness Supportability Objectives • Integrate Preliminary Support Concept into System Design Criteria • Quantify Risks • Initiate P^3I Planning • Identify R&D Efforts to Reduce Support Drivers • Prepare and Document Cost and Readiness Improvement Targets • Describe Standardization Approach • Identify Logistics & R&M Parameters • Establish Baseline Support Concept to Influence Detailed Design	• Establish Firm Readiness and Support Objectives • Conduct Parallel Subsystem Testing for Supportability • Conduct Trade off Analyses of System Design Characteristics Support Concepts • Establish Firm System Thresholds for R&M • Establish Manpower and Logistics Design Objectives	• Conduct Supportability T&E on Adequacy of ILS Program to meet System Readiness Objectives • Assess Test Results Impact on Readiness and Manpower Objectives • Conduct Parallel Prime System Support Testing • Resolve ILS Element Risks at Subsystem Level of Detail	• Assure Production Items Meet Design and Operational Suitability Requirements	• Conduct Postdeployment Supportability Assessment • Verify Achievement of Readiness Objectives • Establish R&M Objectives for Major System Configuration Changes
INTEGRATED LOGISTICS SUPPORT ACQUISITION ACTIVITIES	• Identify Budget Constraints • Develop Preliminary LCC Estimate of System Alternatives	• Develop Acquisition Logistics Strategy • Tailor ILS Elements • Identify Support Funding Requirements • Prepare and Document Preliminary LCC Estimate • Identify International Logistics Considerations • LSA Planning and Task Identification • Program System Facility Requirements • Identify Test Support Items	• Update LCC Costs • Verify Support Concept • Cost Effectiveness Analysis of Support Alternatives • Identify GFE Elements • Identify Interim Contractor Support Planning • Establish Spares Procurement Concept • Identify Manpower Requirements • Procure Test Support Items • Initiate Facility Buy • Continue Repair Level Analysis	• Identify Detailed ILS Element Requirements • Conduct Detailed Analyses and Tradeoffs of R&M and Logistics Resources • Develop LCC Estimates of Tradeoff Alternatives • Plan for Postproduction Support • Test Adequacy of Planned ILS Resources • Continue Repair Level Analysis • Satisfy International Logistics Considerations	• Produce and Deploy ILS Elements • Implement ILS Development Master Plan • Initiate Work Arounds for Identified Shortfalls • Update Postproduction Support Plan • Obtain and Assess Operational Feedback • Update LSA Record	• Manage Postproduction Support • Manage Program Changes Prioritization Block Change Concept LCC Implications of Proposed Changes Implement Corrective Action Systems (Item Activity/System) • Institute P^3I
TYPES OF FUNDS AND WHEN OBLIGATED	61 BASIC RESEARCH FUNDS	62 EXPLORATION DEVELOPMENT FUNDS 65 RDT&E MANAGEMENT AND SUPPORT	63 ADVANCED DEVELOPMENT FUNDS	64 ENGINEERING DEVELOPMENT FUNDS 65–RDT&E MANAGEMENT AND SUPPORT	PROCUREMENT FUNDS MILCON	OPERATIONS AND MAINTENANCE FUNDS

Figure 18.2. LSA activities in the acquisition cycle.

18.16 WHAT HELP IS AVAILABLE?

The Computer-Aided Logistics element of Code 936, (Computer Integrated Engineering Branch), NOSC, has been developing and applying CALS-type information and programs for several years.

The MK 50 Lightweight Torpedo Program has been used as a testbed for such applications as

- HARDMAN (HARDware and MANpower Analysis) Program
- TSP Program (Navy Timely Spares Provisioning Program)
- Computer-Aided Breakout Program
- CALSA (Computer-Aided Logistic Support Analysis)
- Interactive Navy Supply System Provisioning Models for Wholesale and Retail levels of supply
- Automated DLSC (Defense Logistics Support Center) Screening for acquisition program

There are such computer-aided tools as

- ALP (Automated Logistics Planner) (in accordance with NAVSEANOTE 4105)
- LORA (Level of Repair Analysis) MOD V Version 5

To maintain currency, active roles are being taken in such CALS activities as

- Chairman, Sub-Panel for Reliability and Maintainability in Computer-Aided Design (Joint Logistics Commanders/Joint Policy Coordinating Group)
- Navy representative to the Air Force Unified Life Cycle Engineering (ULCE) Program Steering Group
- Chairman, Navy Test Technology Strategy Team

If assistance is needed with computer-aided logistics, contact Al Knight or Marjorie Rezachek of Code 936. If we can't help you, we know someone who can.

FOLLOW-ON TRAINING 19

CONTENTS

SECTION 19
FOLLOW-ON TRAINING

19.1 INTRODUCTION

19.1.1 Technical Manager Development

This Center is committed to the development of successful and competent program/project managers. Previous sections of this handbook detailed the different areas in which a technical manager must be knowledgeable and highly skilled. This section presents a road map of training and developmental information to help you acquire the necessary skills and abilities to become a competent technical manager.

19.2 KNOWLEDGE AND SKILLS REQUIRED IN PROJECT MANAGEMENT

Potential project management (PM) knowledge is entensive, and skills are many and varied. The technical manager must know the science and engineering used in the development task, the policies of government in acquisition management, the NOSC method of doing the business of engineering management, the tools to ensure that what was envisioned is finally produced within schedule and cost, and personal and social interactions of motivating and rewarding task team members. A listing of these skills and knowledge follows:

PM definition and responsibilities	Product assurance
NOSC policies and procedures	Configuration management
DoD and Navy acquisition processes	Contracting
Project formation	Design review
Planning and control	Test and evaluation
Budgeting and accounting	Integrated logistics support
Marketing	Risk assessment
Systems engineering	Warranty
Human factors engineering	Documentation
Safety	Negotiation techniques
Team building	Presentation skills
Conflict resolution	Writing skills

19.3 METHODS TO DEVELOP PROJECT MANAGEMENT KNOWLEDGE AND SKILLS

There are three primary methods to develop project management skills: on-the-job training, short courses, and long-term academic training. Any one method, by itself, is not the best way to achieve competence as a project manager. A mixture of the three methods planned over a period of several years is much more realistic. An individual who wishes to become a project manager needs to lay out a plan that uses at least the first two methods to acquire the knowledge and skills that are not yet possessed. Let us examine these three methods.

19.3.1 On-The-Job Training

A technical staff member at NOSC usually starts as a member of a small project team and deals with a more senior technical member, branch head, or project leader. As experience grows, larger and more complex tasks are assigned and these frequently lead to becoming a key member of a greater and more complex program management team. The individual watches the technical leader and sees how this person goes about meeting project requirements.

There are additional opportunities offered to technical journeymen to take extended details to Navy Headquarters Program Management Offices to support the project work that is being performed by NOSC and/or by the Navy and industry development organizations. Occasionally, details to Washington Headquarters organizations are formally announced as training opportunities under the Navy Scientist Training and Exchange Program (NSTEP). When the Center receives notification of NSTEP opportunities, these are distributed to the technical departments for interest and response.

19.3.2 Short Courses Available

There is a wide assortment of short courses offered on the knowledge and various skills required of project managers. These range from NOSC-presented training, Navy, and other federally sponsored courses to nongovernment schools, universities, or privately owned training vendors.

a. NOSC In-House Courses
   - Project management course
   - Contracting officer technical representative (COTR) course
   - Presentations and briefings
   - Technical writing
   - Financial management
   - Writing statements of work
   - Toastmasters

b. Government-Sponsored Courses
   - Navy
   - Office of Personnel Management (OPM)
   - Naval Postgraduate School
   - Defense Systems Management College

c. Nongovernment-Sponsored Courses
   - Private vendors
   - UCSD Engineering Management Executive Program
   - UCLA Engineering Management

19.3.3 Long-Term Project Management Training Available

Although these types of opportunities are rarely used, they represent an important resource to consider under special conditions. If a technical department sees a need for trained project managers within a 2-year to 3-year period, they may wish to accelerate the classroom training of a selected staff member by encouraging this person's application for the Center's long-term training support under the academic study program. Several schools have excellent programs. The following programs are recommended in order of relativity to NOSC needs:

Naval Postgraduate School
Defense Systems Management College
USC Systems Management Curricula
UCLA Masters Program in Engineering Management

19.4 PLANNING FOR PROGRAM MANAGER DEVELOPMENT

Figure 19.1 is a planning guide to help individuals and supervisors be assured that the full complement of program management knowledge and skills is addressed. We recommend that this guide be filled in as training is accomplished and, when training is finally completed, that the technical department recognize the achievement of the person in some formal fashion (i.e., performance award recognition, assignment to project leadership role, or a nonmonetary form of recognition).

19.5 ADVICE AND COUNSELING REGARDING DEVELOPMENT OF PROGRAM MANAGERS

The best place to start when asking questions regarding "How do I become a project manager?" is with your line supervisors and program managers. These individuals can point you to the different methods that have been successfully used to develop their experiences. Many will comment that on-the-job training with a project management group is the best way; they will also recommend course work to supplement direct experience.

The NOSC Employment/Development Office advises and counsels individuals on training courses, academic programs, and availability of NSTEP assignments. This office maintains numerous course descriptions and publicizes in-house courses and federal government training opportunities; the staff will strive to meet identified training needs.

NAME		CURRENT POSITION, SERIES, & GRADE			CODE
COMPETENCIES	Required?[1]	Acquired?[2]	IF COMPLETELY OR PARTIALLY ACQUIRED, INDICATE HOW ACQUIRED AND DATES[3]	IF PARTIALLY OR MINIMALLY ACQUIRED, INDICATE HOW WILL BE COMPLETELY ACQUIRED AND DATES	DATE COMPLETED
1. Knowledge of					
a. Program Management Responsibilities	✓				
b. NCSC Policies and Procedures	✓				
c. DoD and Navy Acquisition Systems	✓				
d. Project Formation	✓				
e. Planning and Control	✓				
f. Budgeting and Accounting	✓				
g. Marketing	✓				
h. Systems Engineering	✓				
i. Product Assurance	✓				
j. Contracting	✓				
k. Design Reviews	✓				
l. Test & Evaluation	✓				
m. Integrated Logistics Support	✓				
n. Risk Assessment	✓				
o. Human Factors Engineering	✓				
p. Configuration Management	✓				

1 Check (√) if required in position
2 Enter "C" (Completely), "P" (Partially), or "M" (Minimally)
3 Indicate assignment, formal training, or position

Figure 19.1. Program management development guide (1 of 2).

NAME		CURRENT POSITION, SERIES, & GRADE			CODE
COMPETENCIES	Required?[1]	Acquired?[2]	IF COMPLETELY OR PARTIALLY ACQUIRED, INDICATE HOW ACQUIRED AND DATES[3]	IF PARTIALLY OR MINIMALLY ACQUIRED, INDICATE HOW WILL BE COMPLETELY ACQUIRED AND DATES	DATE COMPLETED
1. Knowledge (contd)					
q. Warranty	✓				
r. Safety	✓				
s. Documentation	✓				
2. Skills in					
a. Making presentations	✓				
b. Technical writing	✓				
c. Team building	✓				
d. Interpersonal communication	✓				
e. Negotiating	✓				
g. Conflict resolution	✓				
3. Other					
a.					
b.					
c.					
d.					

1 Check (✓) if required in position
2 Enter "C" (Completely), "P" (Partially), or "M" (Minimally)
3 Indicate assignment, formal training, or position

Figure 19.1. Program management development guide (contd).