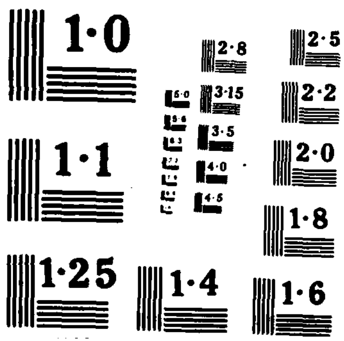
AD-A170 075 NOSC (NAVAL OCEAN SYSTEMS CENTER) PROGRAM MANAGER'S HANDBOOK(U) NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA JUL 86 NOSC/TD-880 1/5

UNCLASSIFIED F/G 5/1 NL


1·0
2·8
2·5
3·15
2·2
3·5
2·0
4·0
4·5
1·1
1·8
1·25
1·4
1·6

NOSC TD 880

(12)

NOSC TD 880

NOSC

NAVAL OCEAN SYSTEMS CENTER San Diego, California 92152-5000

AD-A170 075

Technical Document 880
July 1986

NOSC Program Managers' Handbook

DTIC
ELECTE
JUL 29 1986
B

DEPARTMENT OF THE NAVY
NAVAL OCEAN SYSTEMS CENTER

DTIC FILE COPY

86 7 28 151

(12)

Technical Document 880

NOSC Program Managers' Handbook

July 1986

NAVAL OCEAN SYSTEMS CENTER

San Diego, California 92152-5000

F. M. PESTORIUS, 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

R.M. Hillyer

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

AD-A170075

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 unlimited.
2b DECLASSIFICATION DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S) NOSC TD 880	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: in-house PROJECT NO: TASK NO: WORK UNIT NO:

11 TITLE (include Security Classification)
NOSC PROGRAM MANAGER'S 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 ____	July 1986	413

16 SUPPLEMENTARY NOTATION

17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

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

Handbook to accompany NOSC program managers course.

20 DISTRIBUTION/AVAILABILITY OF ABSTRACT	21 ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	UNCLASSIFIED

22a NAME OF RESPONSIBLE INDIVIDUAL	22b TELEPHONE (include Area Code)	22c OFFICE SYMBOL
R. Watts	(619) 225-2447	Code 942

DD FORM 1473, 84 JAN

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

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

This workbook was designed to accompany the Naval Ocean Systems Center (NOSC) program managers course.

CONTENTS

EXECUTIVE SUMMARY 1

CONTENTS

SECTION 1
EXECUTIVE SUMMARY
R. Watts, Code 942

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, i.e. 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. Computer Tools for Program Managers
Section 7. Planning, Scheduling, and Assessment

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

Section 8. Systems Engineering
Section 9. Major Systems Acquisition
Section 10. Technical Information Support
Section 11. Hardware Product Assurance
Section 12. Test and Evaluation
Section 13. Computer-Aided Logistics
Section 14. Software Product Assurance
Section 15. Contracting
Section 16. Budget and Financial Management
Section 17. Design Review
Section 18. Follow-on Training
Section 19. Human Factors.

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, and it has three subsections: references, outline, and summary. 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 any contributor wishes to revise and extend his remarks, he is 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
D. Washburn, Code 7403

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 847
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 Outline

Introduction
- References
- Outline
- Summary

General

2.1.3 Summary

See below.

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 utility 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 utility 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 utility 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 instructions, directives, and notes kept current by the various offices responsible. Keeping current on all 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 847, is a single page, poster-size schedule summary for R&D planning guidance. The title is *NOSC Planning Calendar*, and it will be 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
SECNAV INST. 5000.1
OPNAV INST 5000.42.

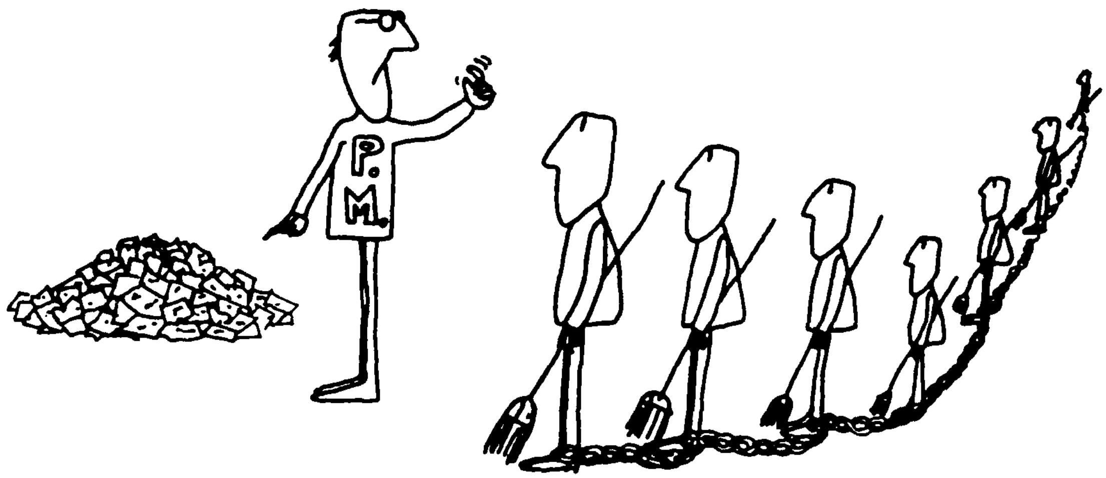
These are drafted addressing major programs, for which the Secretary of Defense chooses to act as program decision authority (PDA), but each applies to all lesser programs in principle, when tailored to the nature and cost of each.

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.

PROGRAM MANAGEMENT FUNCTIONS AND RESPONSIBILITIES —RELATIONSHIPS TO LINE MANAGEMENT

3



CONTENTS

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

D. Washburn, Code 7403

3.1 INTRODUCTION

3.1.1 References

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

3.1.2 Outline

Program Establishment Steps at NOSC
Program Manager Charter and Plan
Lab Center Functions in RDT&E
Acquisition Improvement Initiatives
External Influences
Organizational Effectiveness Review
R&D Productivity
Ethics

3.1.3 Summary

See 3.2 below.

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 his obligations successfully.

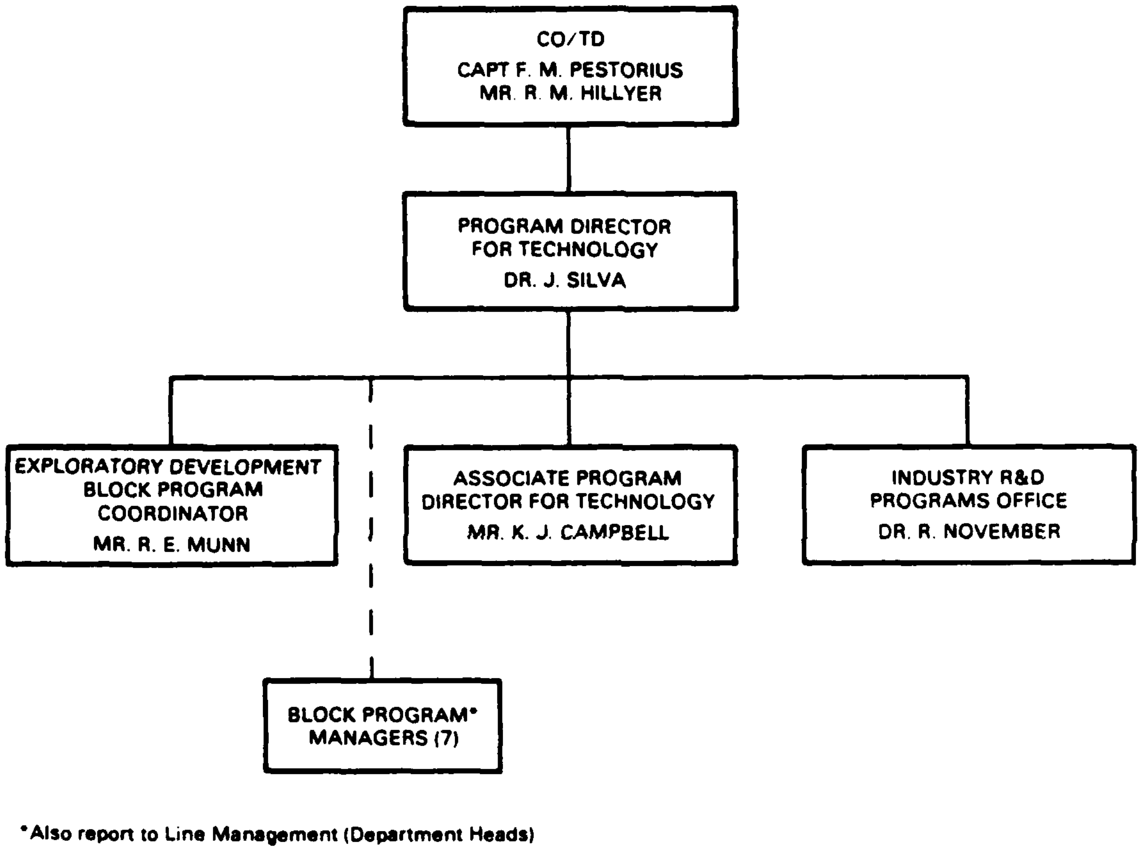


Figure 3.1. IED and technical base management organization.

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.

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.

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 produceability from initial design onward.
24. Insist that logistic support standards will not be compromised.

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 above 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.

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.

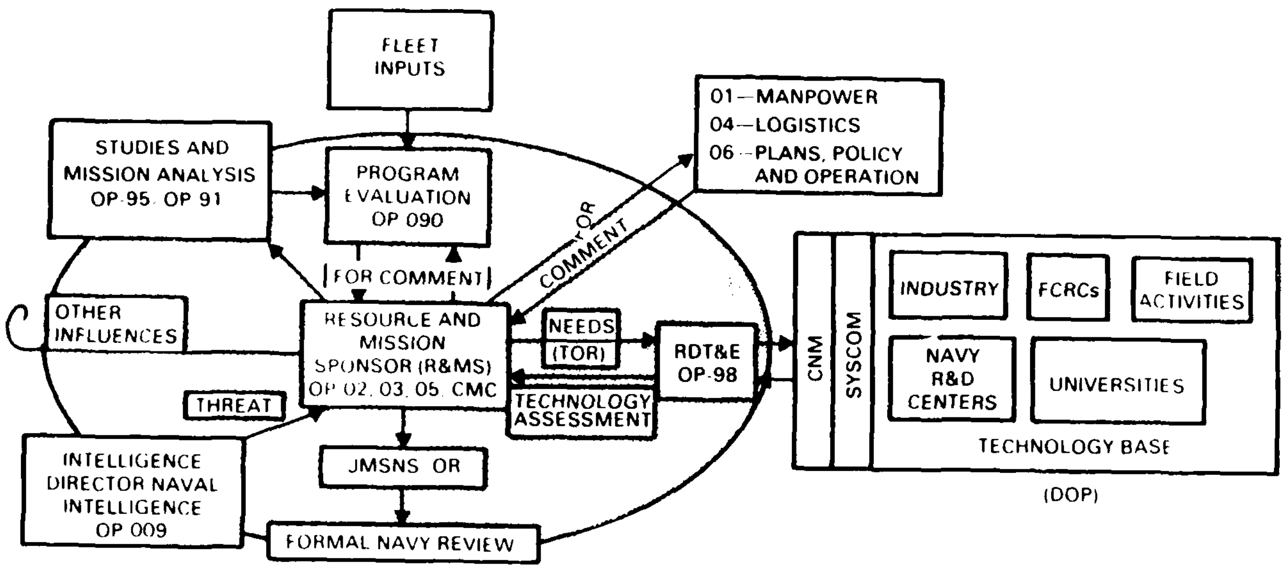
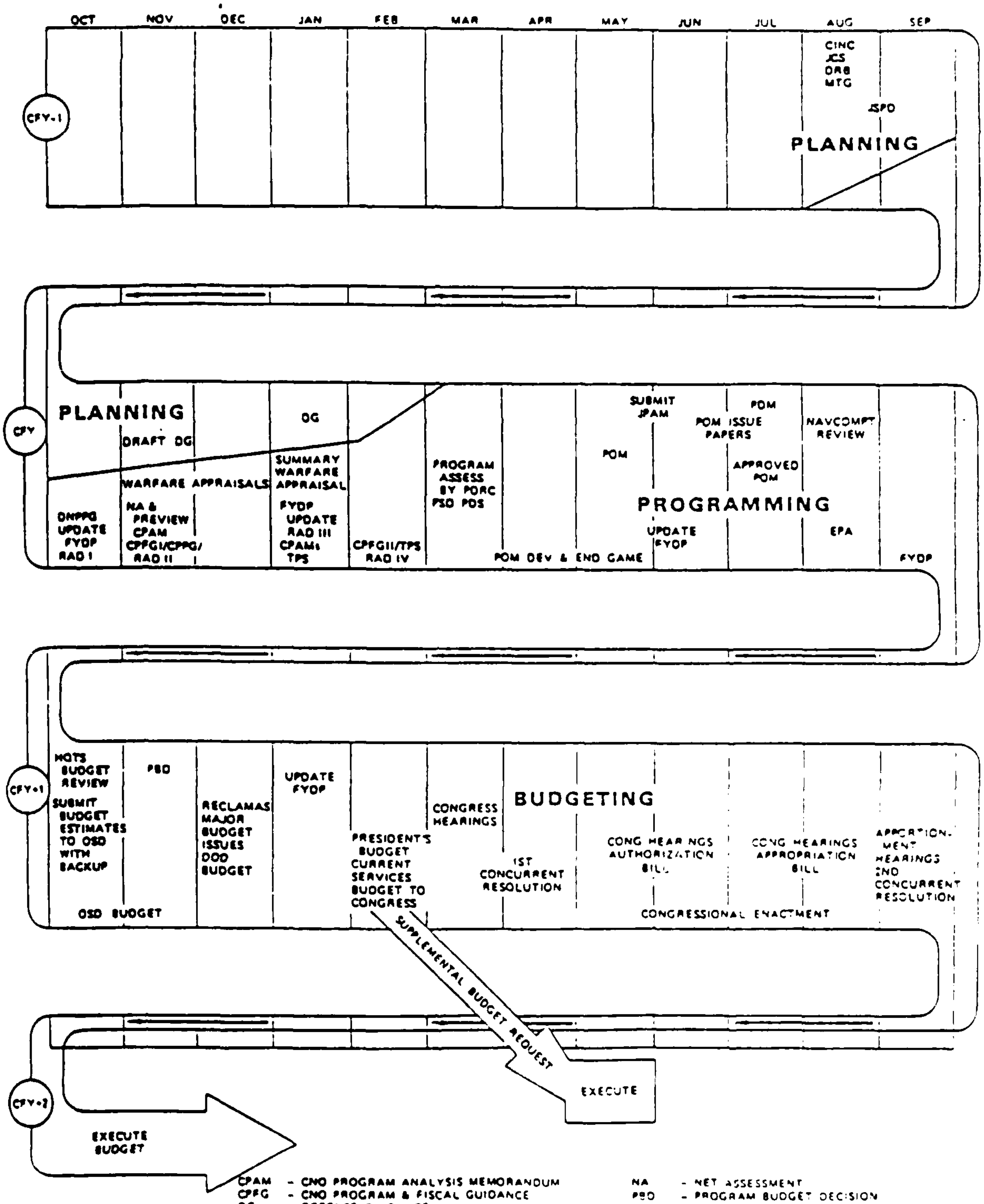


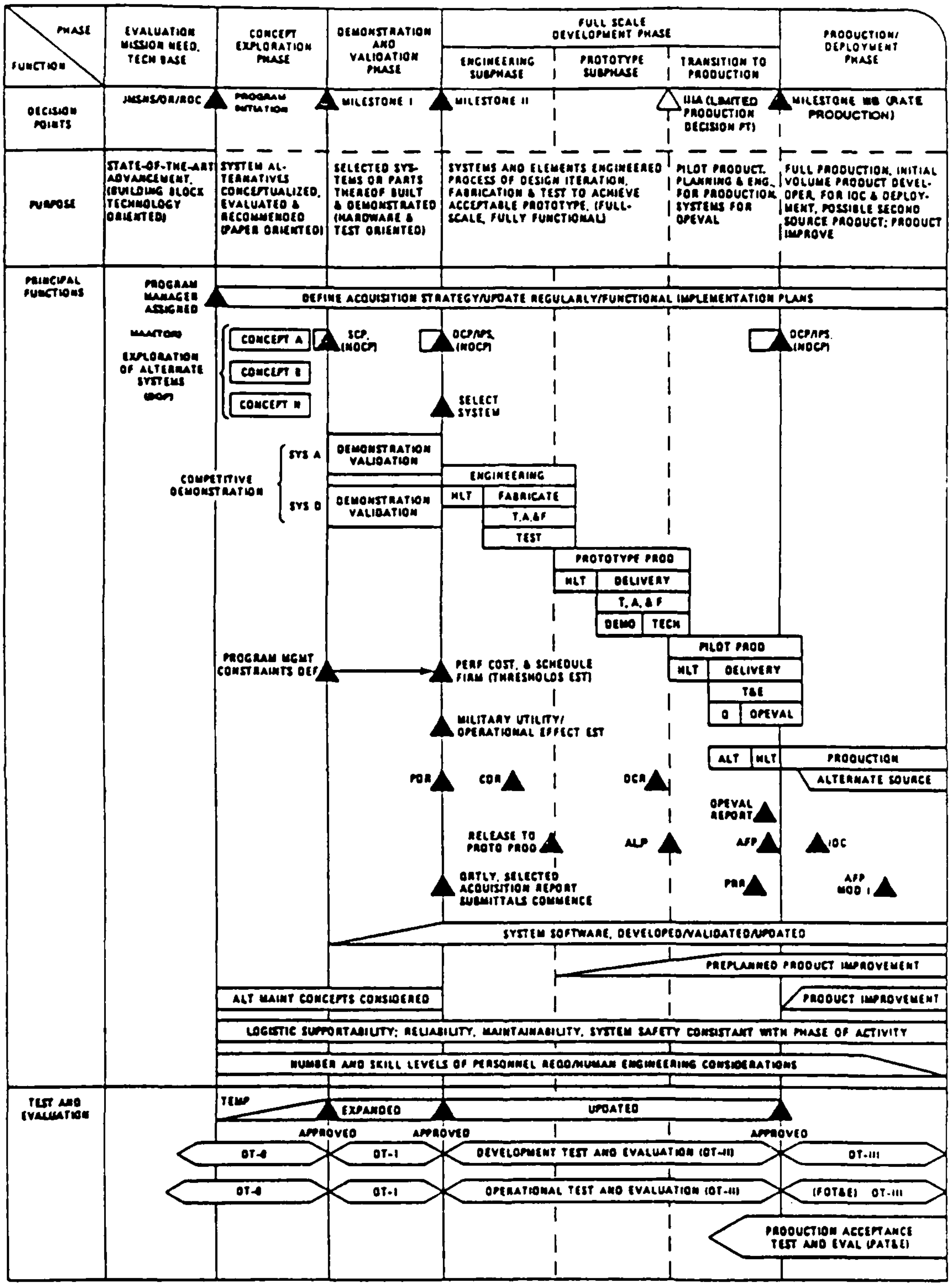
Figure 3.2. Development of the needs document within OPNAV.



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

Figure 3.4. Summary overview of the acquisition process.

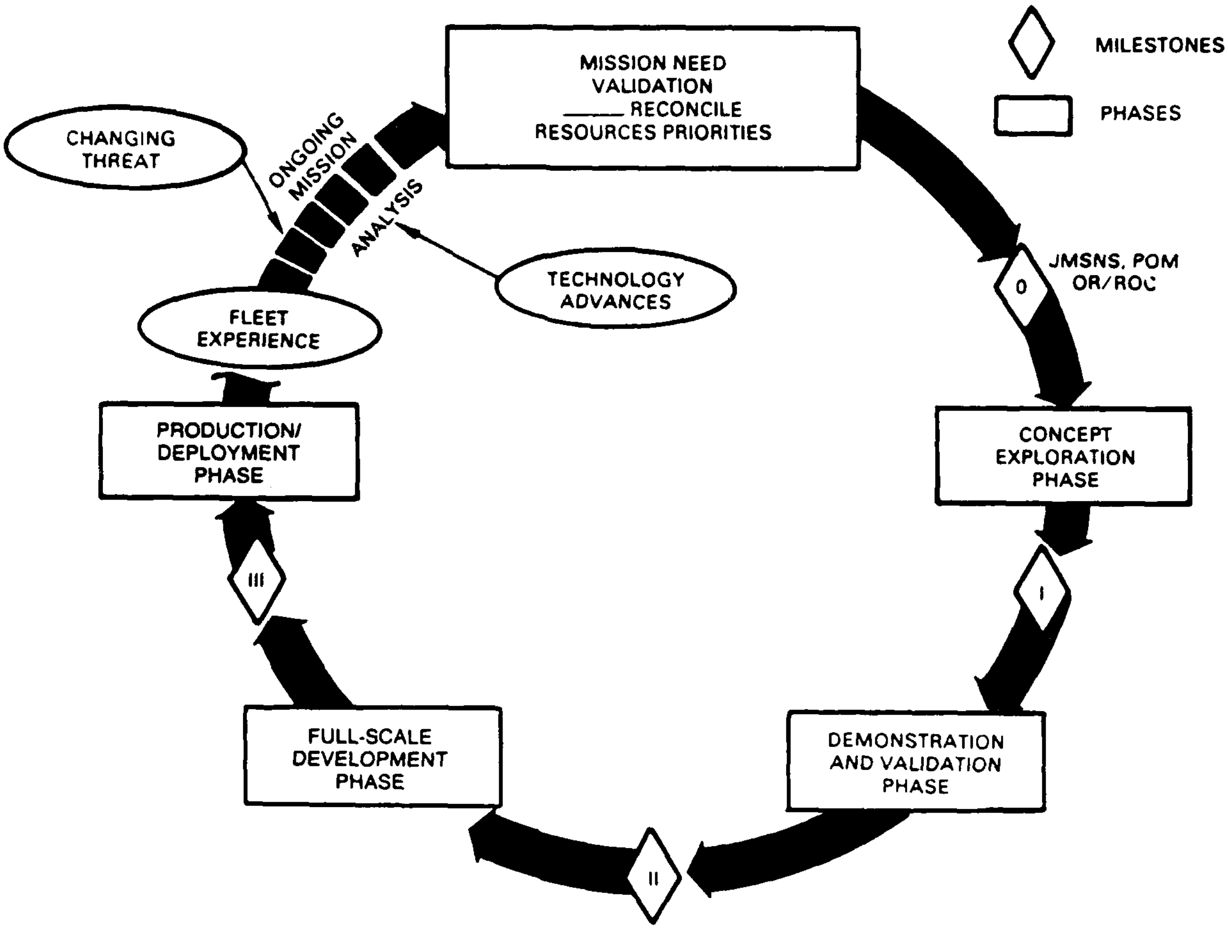


Figure 3.5. Acquisition phases milestones.

	INTERFACES \ ACQUISITION EVENTS OR DOCUMENTS	TOR/DOP/MENS/OR/ROC	CHARTER PROGRAM MANAGER	ACQUISITION STRATEGY	PRINCIPAL DEVELOPMENT ACT., LEAD FIELD ACTIVITY	RAM/O&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
	DAE/DSARC	*		*																	*
	OSD/OJCS	* / ○										■ /									*
	SECNAV	[2]							□												[2]
	NAE					■															*
	CNO	[3]										□									[4]
	OPNAV	●										*				■				*	[5]
MANAGEMENT	OPTEVFOR/FLT	/ ○									* /	● /	△ /	▲ /		* /	* /	* /	* /		△ /
	CNM	[7]	■	■								*									[6]
	MAT 08, ACQ	*	*	*	*	*	*					*							▲		□
	MAT 06, R&M	*		*		*	*					*						▲	△		*
	MAT 04, LOG	*					*					*			■	*	*	*	*		*
	MAT 02, CONTRACTS	*	●	*			■	■	*	■		*									*
	MAT 01, FIN	*					*					*								*	*
EXECUTION	SYSCOMS	△	*		○	△	△		△	■	*				*	▲	△	△	△		△
	PM/PMO	△	○	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●
	NAVY RDT&E CTR	△		△	▲	△	△		△		▲	△	▲	△	△	△	△	△	△		△
	CONTRACTORS												▲		△	△	△		△		

■ REVIEWS/APPROVALS
□ PRIOR REVIEW/APPROVAL
* REVIEWS

● PREPARES ISSUES
○ MAY PREPARE
▲ PERFORMS

△ ASSISTS

OSD / OJCS
OPTEVFOR / FLT

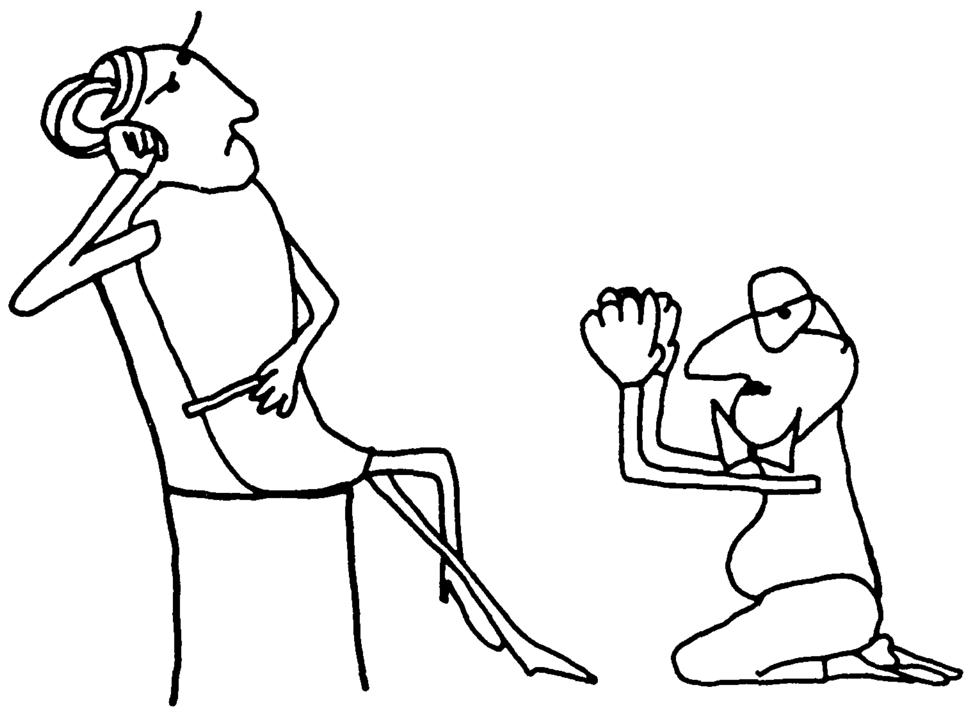
1 – MND & MILESTONE I, II & III * DECISION FOR ACAT I
2 – MND & MILESTONE I, II & III DECISION FOR ACAT IIS
3 – MND DECISION FOR ACATs IIC, III & IV
4 – MILESTONE I, II & III DECISION FOR ACAT IIC
5 – MILESTONE I, II & III DECISION FOR ACAT III
6 – MILESTONE I, II & III DECISION FOR ACAT IV (NORMALLY 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.

PROPOSAL DEVELOPMENT AND MARKETING

4



CONTENTS

SECTION 4
PROPOSAL DEVELOPMENT AND MARKETING
E. Towson

4.1 INTRODUCTION

4.1.1 References

Navy Program Managers Guide
Navy RDT&E Information, Navy POM-87, FY 1987-91, May 1985 (SECRET)
Program Objective Memorandum, Volume Five: Extended Planning Annex (EPA), FY 1987-1991 (POM-67) (SECRET)
NAVSEA Technology Needs Guidance, Volume 1, prepared by Research and Technology Office, Naval Sea Systems Command (SECRET WORKING PAPERS)
Joint Strategic Planning Document (JSPD), The Joint Chiefs of Staff, 4 September 1984 (SECRET)
Surface Ship Combat System Master Plan (U), Volume 1, published by direction of Commander, Naval Sea Systems Command, October 1985 (SECRET — NOFORN)
Navy Command and Control Plan (U), Chief of Naval Operations (SECRET)
NOSC Olympus Updates, prepared by Earl Towson, January 1986 (SECRET)
Laboratory Program Summary (1498s)*
NOSC TD 799, Windows of Opportunity for Naval Systems

*This is THE source document

4.1.2 Outline

Introduction
- References
- Outline
- Summary

Finding a Sponsor
Market Research
The System Acquisition Process
Developing Proposal
New Marketing Strategies

4.1.3 Summary

In summary, you as the good program manager, when involved in proposal development and marketing, should take the following steps:

a. Conduct market research yourself. Ask yourself the relevant questions. What kind of business am I in? What is my product area? Product line? What am I good at? Where am I weak? How do I use the team conception to overcome the weakness? How can I take full advantage of my strengths. These questions can be addressed in a number of ways. First, do your homework. Second, conduct interviews (this is a key element). Third, use the help available in local offices (Code 163, the Technical Library, NARDIC (Pasadena), etc.). Finally, develop client/advisor relationships.

b. Pick your targets carefully. You should match your strengths and put together a team to fill the voids.

c. Know the planning, programming, and budgeting system (PPBS) and the system acquisition process. Besides knowing the system and the process, you should also know the players and when to play (and when to hold, fold, and run!)

d. Develop winning proposals. You should make strong presentations (do *not* depend on the strength of your idea or design). Also it is necessary to be aware of the calendar: feed the "paper tiger" on time, get documents, reports, and forms in on time. In addition, watch the competition, be aware of what is going on in your area of interest.

And finally some advice for future winners:

a. Sell! Sell! Sell!

b. *Don't play* the game unless you can *win*.

c. *Don't slug it out* over objects of questionable value; however, if something is wrong say so.

d. Don't stay with a loser — this is the cardinal sin.

e. Don't juggle too many balls at once, too many programs at once.

f. Anticipate OSD, OMB, etc. *issues* and help service *reclamas*.

g. Conduct institutional advertising (e.g. why Navy labs? why more defense dollars?)

h. Maintain an awareness of the competition. Know what they are doing and what they are planning to do.

i. Promote the corporate image as well as the product.

4.2 FINDING A SPONSOR

Do your homework. Review and study the appropriate referenced documents. There are many very helpful documents that are seldom used. There are budget, guidance, and planning documents available. For example, Code 16 is collecting documentation in these areas; Table 4.1 lists *some* of the major planning documents that are available. So study the basic documents that have to do with your area of interest. Keep in mind the following questions. What does the Navy need? Where is the threat going? How much money is flowing in my business? Who is buying? Selling? You should know

Table 4.1. Major planning documents.

ASW Master Plan	Special Warfare Master Plan
Attack Sub Warfare Plan	Combat Systems Master Plan
EW Master Plan	Surface Warfare Plan
Extended Planning Annex	USMC C2 Master Plan
USMC Mid-Range Objectives Plan	NORAD Master Plan (USAF)
Master Navigation Plan	Ocean Surveillance Master Plan
Master Plan for Embedded Computers	Space Master Plan
Mine Warfare Master Plan	Avionics Planning Baseline (USAF)
Avionics Master Plan	Strategic Defense Arch 2000 (USAF)
Naval Aviation Plan	AF SDF C2 Arch
Naval C2 Plan	Etc., etc., etc.

the documents that apply to your area of interest as well as your sponsor or prospective sponsor, because you are coming to him as the expert who is going to solve his problems. Thus, he is going to judge you and your credibility as an expert on how well you use the language of the discipline under consideration and on the depth of your awareness and understanding of his problems.

In some cases you will have a solution and will need to find a sponsor. Be on the lookout for sponsors. Take advantage of conferences (this is especially important for NOSC because we cannot go out and market like industry does). Use your opportunity at conferences to question the key players in your area of interest. Also, refer to the conference when asking for appointments in the future.

What you face when approaching a prospective sponsor is a series of concerns he may have about you:

I don't know who you are.
I don't know your company.
I don't know your company's product.
I don't know what your company stands for.
I don't know your company's customers.
I don't know your company's record.
I don't know your company's reputation.
Now — what was it you wanted to sell me?

Your task then, when you meet the prospective sponsor, is that you must first sell yourself, then your idea, and finally your organization.

4.3 MARKET RESEARCH

NOSC TD 799, *Windows of Opportunity for Naval Systems*, illustrates one method for discovering an opportunity. Figure 4.1 shows windows of opportunity as related to initial operational capability (IOC) dates for various representative systems. Examine the systems in your area of interest and the necessary questions. When was the system bought? When will it wear out? What happened with past systems? What is the status of current systems? What systems are being considered for the future? When will the window of opportunity open for my system?

Another method for predicting a possible opportunity involves affordability forecasting (Figure 4.2). In this approach you examine an area of interest such as ocean surveillance (OS), anti-submarine warfare (ASW), command and control (CC), etc. in the light of the funding history. In other words you are asking, when does the cash flow in my business? You then attempt to budget your system for the time of optimum cash flow in your area of interest.

In subsection 4.2 it was noted that when you approach a prospective sponsor, you must first sell yourself, then your idea (project), and finally your organization. What follows are suggestions for a successful interview with a prospective sponsor:

a. Have "objective" market analysts do the interview. (This interview is done for information, not sales, so you want to hear what the sponsor actually says, not what you want to hear. You want to find out what this prospective sponsor thinks.)

b. Call him personally. Tell him what you *really* want (again don't give him a sales job if you want an interview).

c. Do your homework. For instance, read the publications authored by that office.

d. Make sure your clearance gets to the proper locations.

e. Compile a questionnaire ahead of time. It also helps to establish priority among the questions in case the time for the interview is cut short. Start with the yes/no questions first 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 with your staff at the office. Do *not* take a tape recorder to the interview; your subject will talk more freely if he does not feel he has to shape each sentence just so. If you want to retain certain specific information during the interview, take notes. Later, after the interview is over and you have left the interview location, you may tape your impressions so they are not lost to time.

f. Develop and use interviewing skills. (This item could be called "interviewing tricks or how to loosen a sponsor up.") Keep these points in mind. If the prospective sponsor is not doing 90 percent of the talking, you are losing out. Conduct the interview in the sponsor's office (his home territory). Show the sponsor a hard copy of a viewgraph that summarizes his publications, issues, etc. (this is one way to indicate to him that you have done your homework and that you are familiar with his situation). Leave him something like a data plot, photographs, or charts. Establish him as the expert. Remember lunches are good for establishing rapport, but are not the place for hard data and ideas. Finally, as you leave, ask him about other people to see and what other material should be read.

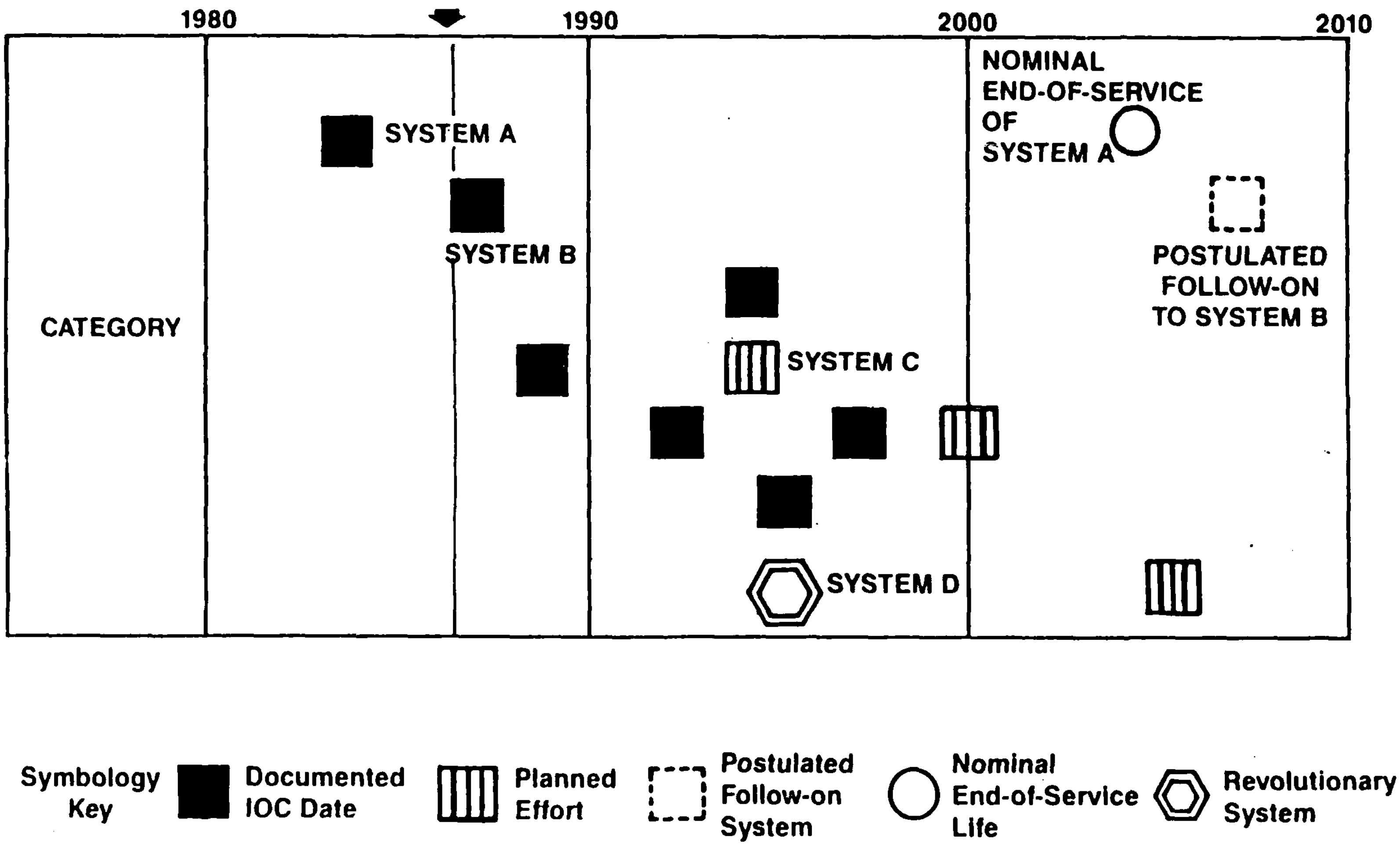


Figure 4.1. Windows of opportunity.

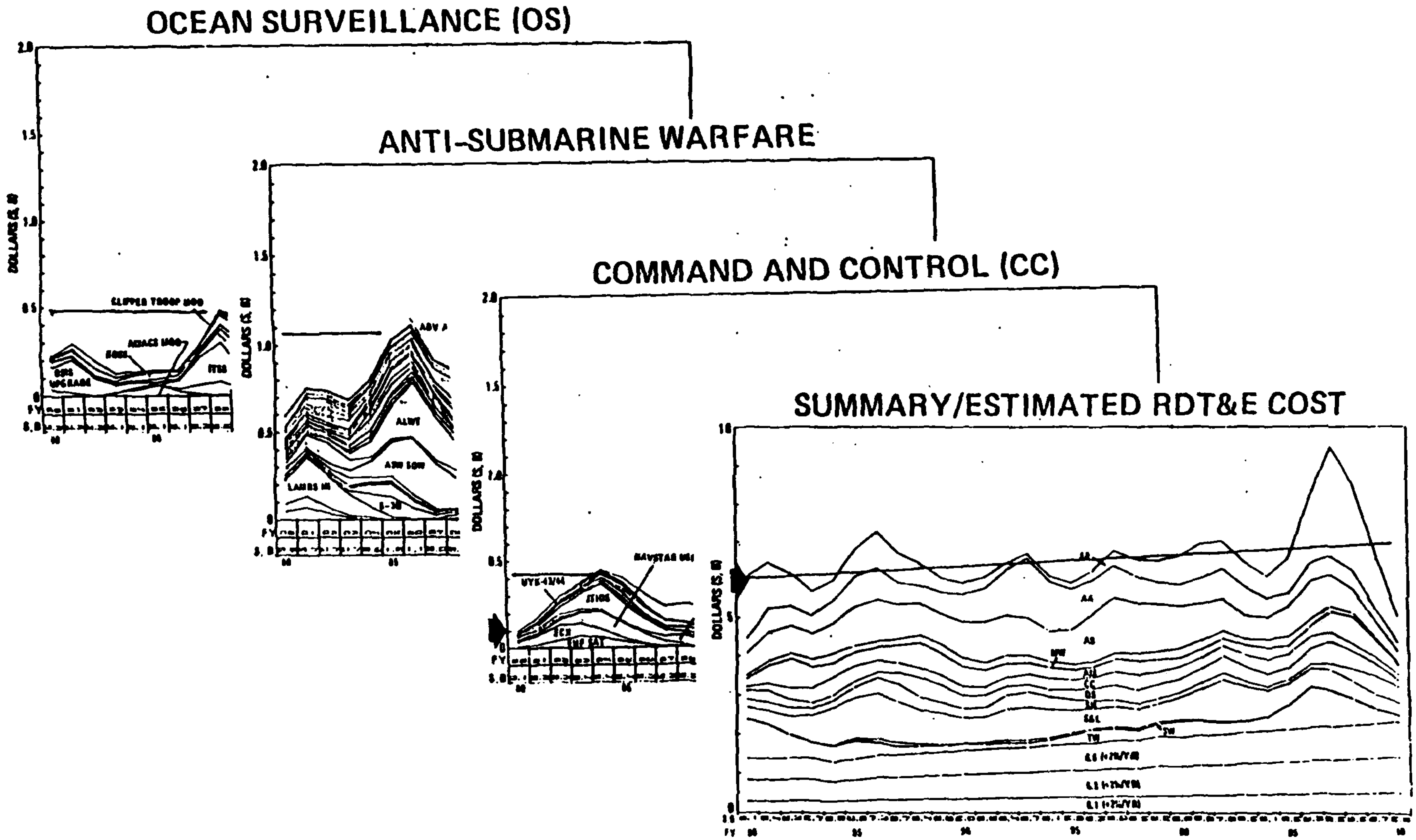


Figure 4.2. Affordability forecasting — when does cash flow in my business?

The following are suggested strategies for winning:

a. Identify new "targets" early. *You cannot get enough customer contact*, and when you do make contact communicate in the customer's language and to his biases.

b. Select the targets that match your strengths.

c. Identify your weaknesses and start correcting them by training, reading, hiring, and teaming.

d. Know your customer's requirement/goals better than he does.

e. Determine if customer considers you a "front runner".

f. Obtain management's commitment and devote ample resources to staff a good proposal team (red team).

4.4 THE SYSTEM ACQUISITION PROCESS

The system acquisition process is presented in Figure 4.3. The process is discussed in terms of DoD's research and development categories: research (6.1), exploratory development (6.2), and advanced development (6.3). The last mentioned category also includes advanced technology demonstrations (6.3A). Helpful definitions are included as Table 4.2, while Table 4.3 lists useful acronyms. Figure 4.4 presents a matrix of definitions and responsibilities for acquisition categories (ACAT).

Figure 4.5 gives an overview of the Navy acquisition/decision process in three steps. Figure 4.6 and Tables 4.4 and 4.5 show the people involved in the process: overall under SECNAV, the resource sponsors, and claimants. Finally, Figure 4.7 illustrates just how long and involved the process can be.

4.5 DEVELOPING PROPOSALS

Figures 4.8 through 4.10 present flowcharts to help in proposal planning, preparation, and presentation, respectively.

The method of proposal development recommended in this section comprises the development of an informal proposal followed by the preparation of a formal proposal. It should be noted that a good proposal by itself is insufficient; a bad one is "lethal."

Be aware that the submission of an *informal proposal* is a tacit offer to commit NOSC resources; also do not oversell or exaggerate (it is counterproductive). 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). 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.

b. Develop a *point paper* or *self-narrated brief*. It must skim well. Keep it short and profusely illustrated (the illustrations should pass the 10-second rule and have instructive captions). It should appeal to experts as well as laymen.

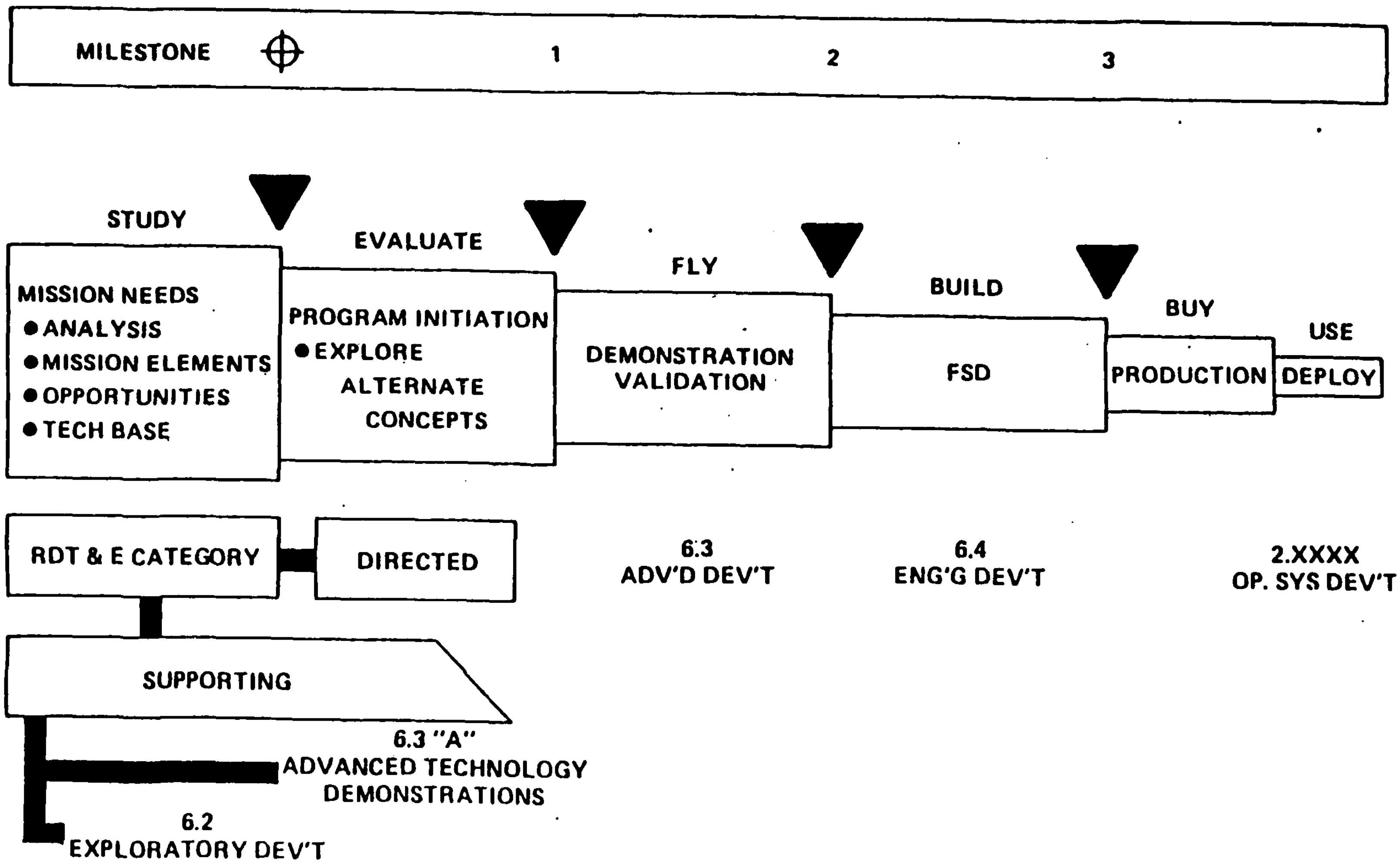


Figure 4.3. System acquisition process.

Table 4.2. Definitions.

Initiate:	Prepares first draft of document and generally manages review/comment on draft revisions.
Submit:	Authorizes insertion of smooth document into final review and approval process.
Chop:	An indication of concurrence by initialing in an indicated place. Not used in smooth document processing.
Review:	An indication of concurrence by signing the cover sheet in the indicated place. *Failure to sign "as reviewed" stops the process.*
Approve:	Signature making the document an official paper for its intended use.
Promulgate:	Process of ensuring record keeping and distribution of the document in an orderly and centralized manner.

Table 4.3. Acronyms.

TOR	Tentative operational requirement
DOP	Development options paper
JMSNS	Justification of major system new start
OR	Operational requirement
DCP	Decision coordination paper
SCP	System concept paper
NDCP	Navy decision coordinating paper
TEMP	Test and evaluation master plan

Acquisition Categories (ACAT)	Criteria	Decision	Documentation Requirements
I	Major Programs: • 200M RDT&E 1B prod • National urgency • As directed	SECDEF DEPSECDEF	SCP DCP and TEMP
II S -------- IIC	Less-Than Major: • 100M RDT&E 500M prod	SECNAV -------- CNO	NDCP & TEMP
III	• Significant impact on military characteristics	OPNAV Sponsor	TEMP
IV T	• All other acquisitions • OPEVAL required	SYSCOM CMDR	TEMP
IV M	All others	SYSCOM CMDR	TEMP

Figure 4.4. Definitions and responsibilities for acquisition categories (ACAT).

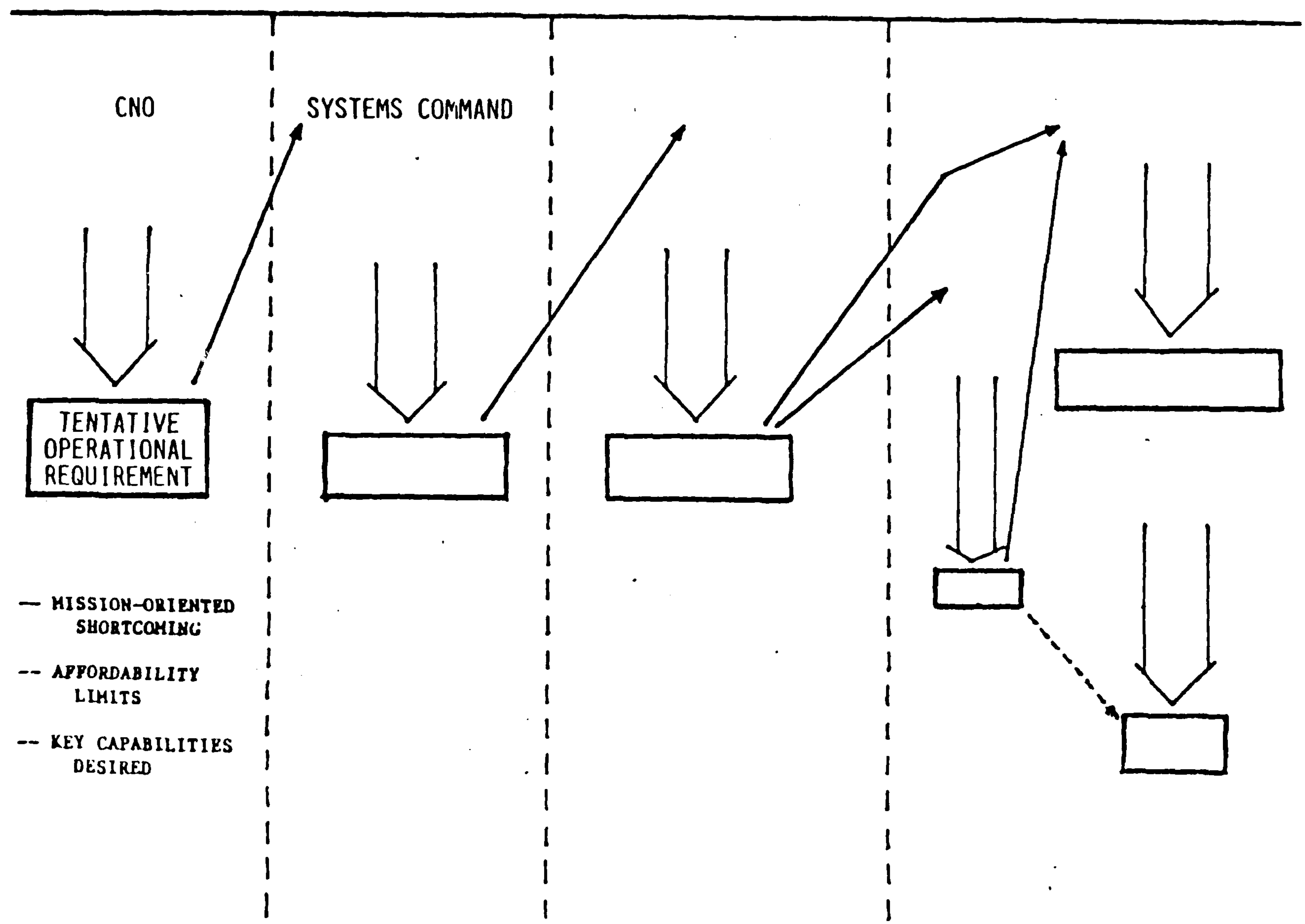


Figure 4.5. Process overview (1 of 3).

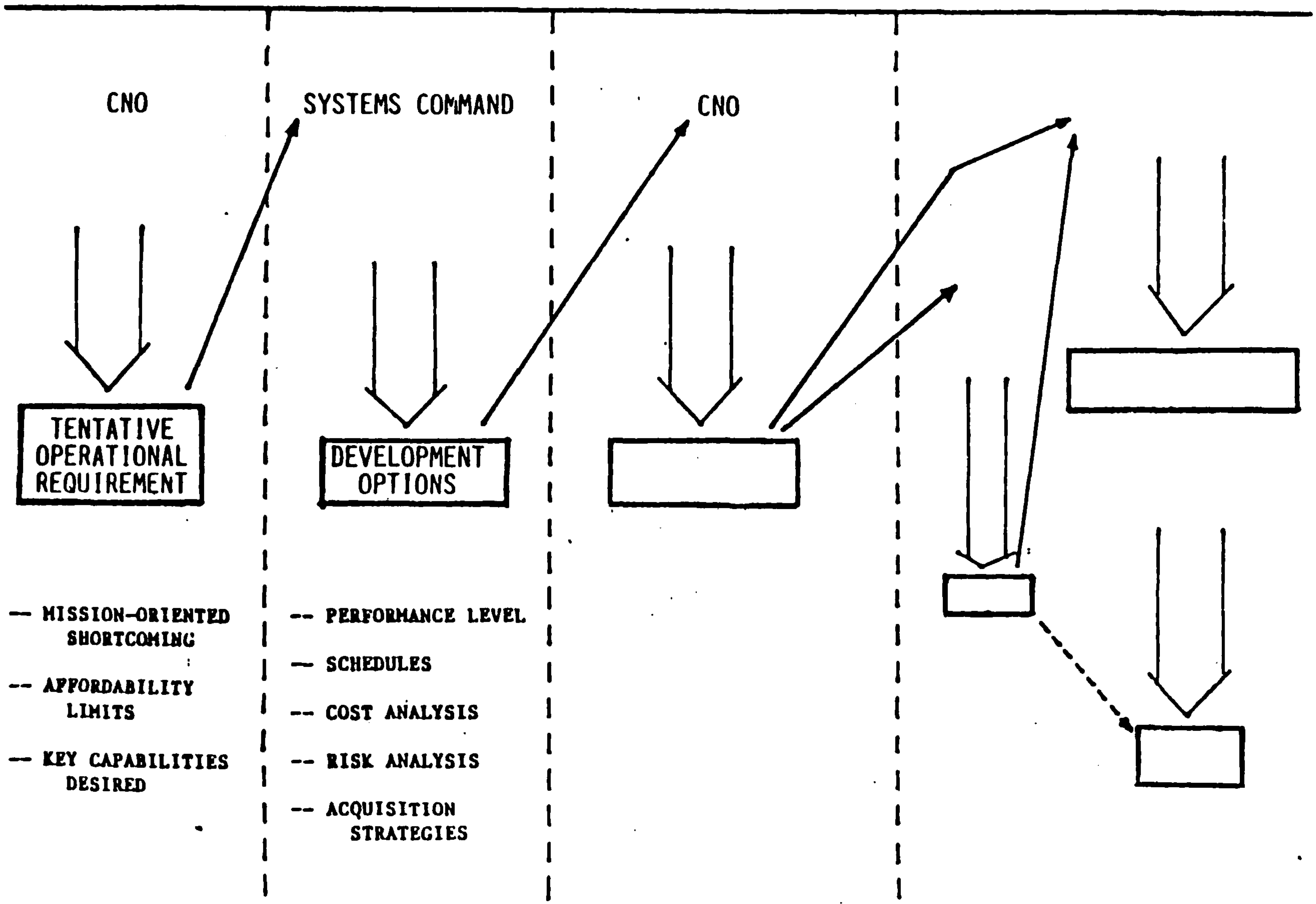


Figure 4.5. Process overview (2 of 3).

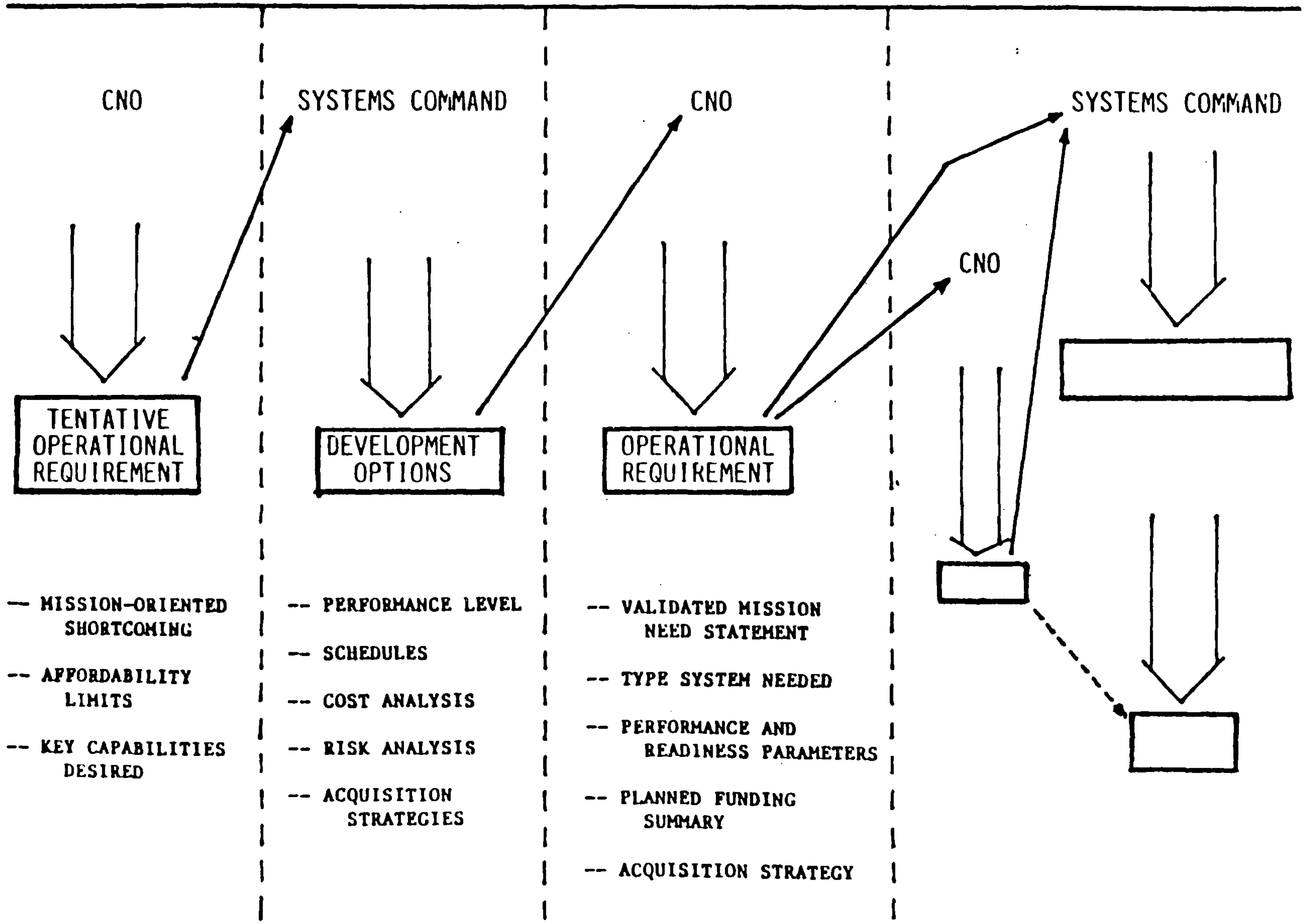


Figure 4.5. Process overview (3 of 3).

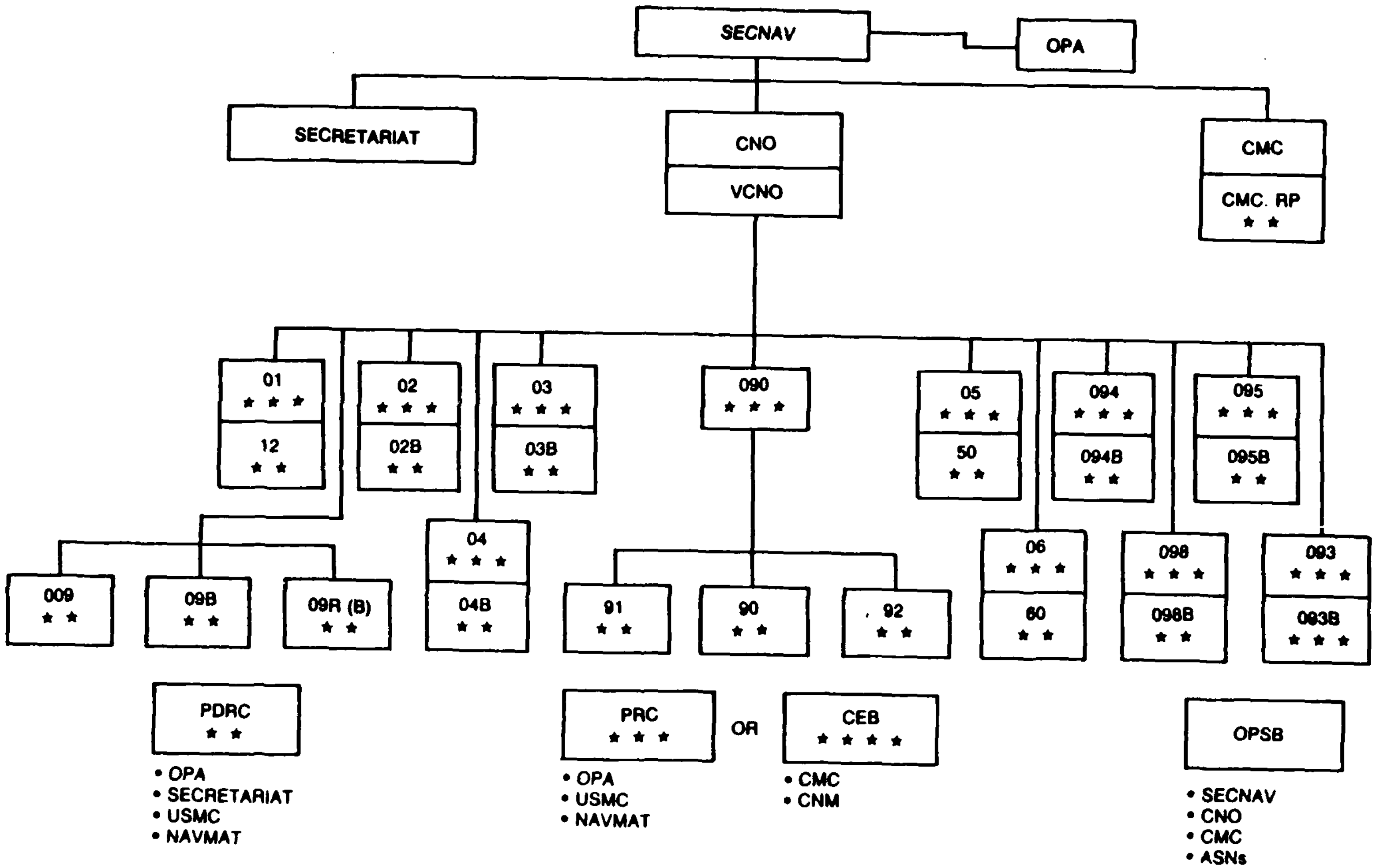


Figure 4.6. People in the decision process.

Table 4.4. Resource sponsors and tasks

Platform Sponsors

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

Support Sponsors

Manpower, personnel, training	OP-01	R&D	OP-098
Logistics	OP-04	C^3	OP-094
Undersea surveillance/oceanography	OP-095	Command/administration	OP-098
Medical	OP-093	Military assistance	OP-08
Intelligence	OP-009	Plans, policy, operations	OP-06

Tasks

Develop programs
Participate in appraisals/CPAMs
Update data base

Table 4.5. Claimants

Have primary responsibility for program execution

Submit suggested programs to sponsors
- NAVMAT/SYSCOMs provide pricing estimates

Review and comment on proposed program
- CINCs strategy review
- RAD II (Oct FYDP) and RAD IV (Jan FYDP) scrub
- Break down (to UIC level) appropriation totals for Oct/Jan internal Navy five-year plans
- Optional claimant input to identify issues
- SPPs written by resource sponsors to define program changes in response to claimant input

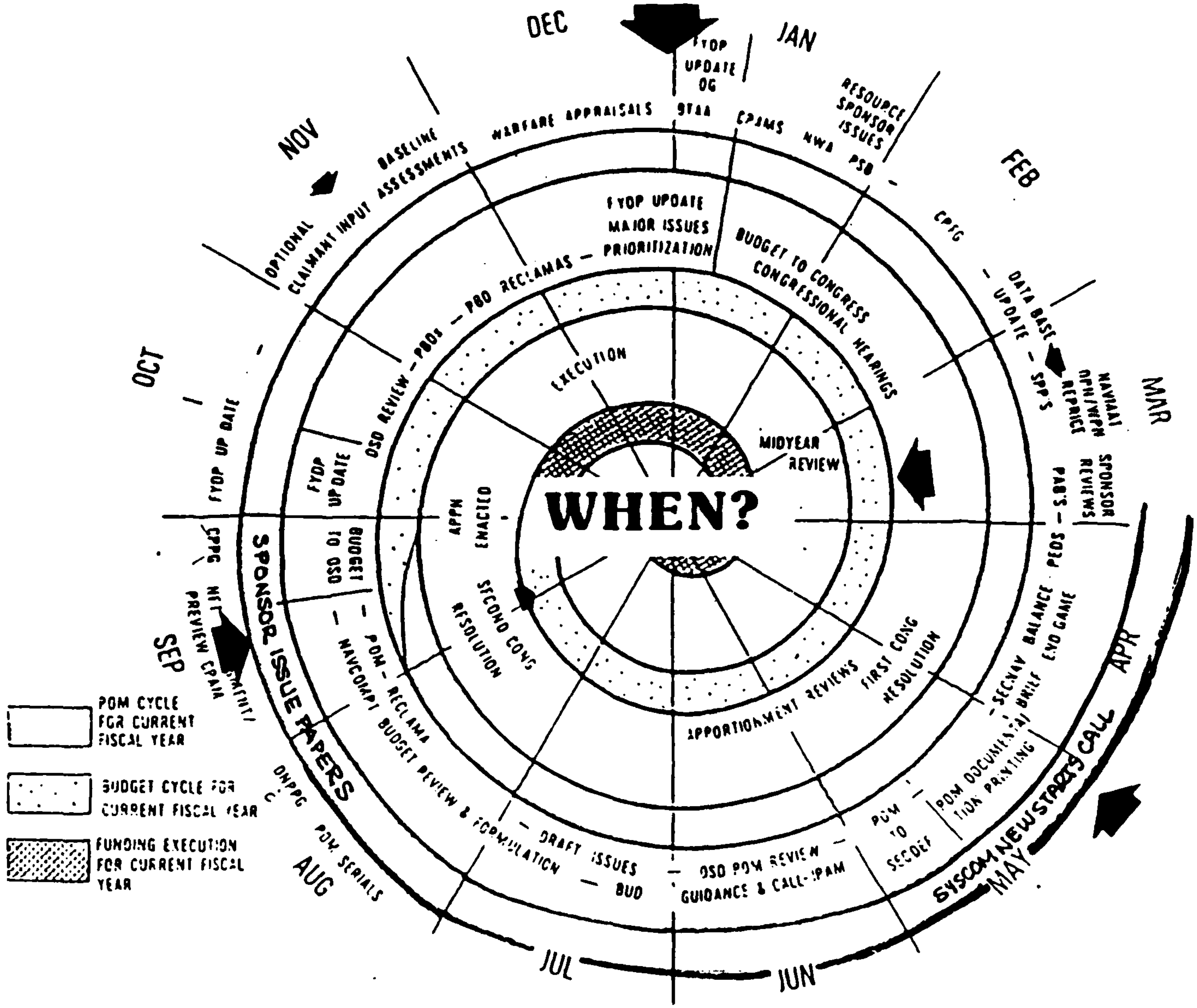


Figure 4.7. The planning, programming, and budgeting system (PPBS) schedule of events.

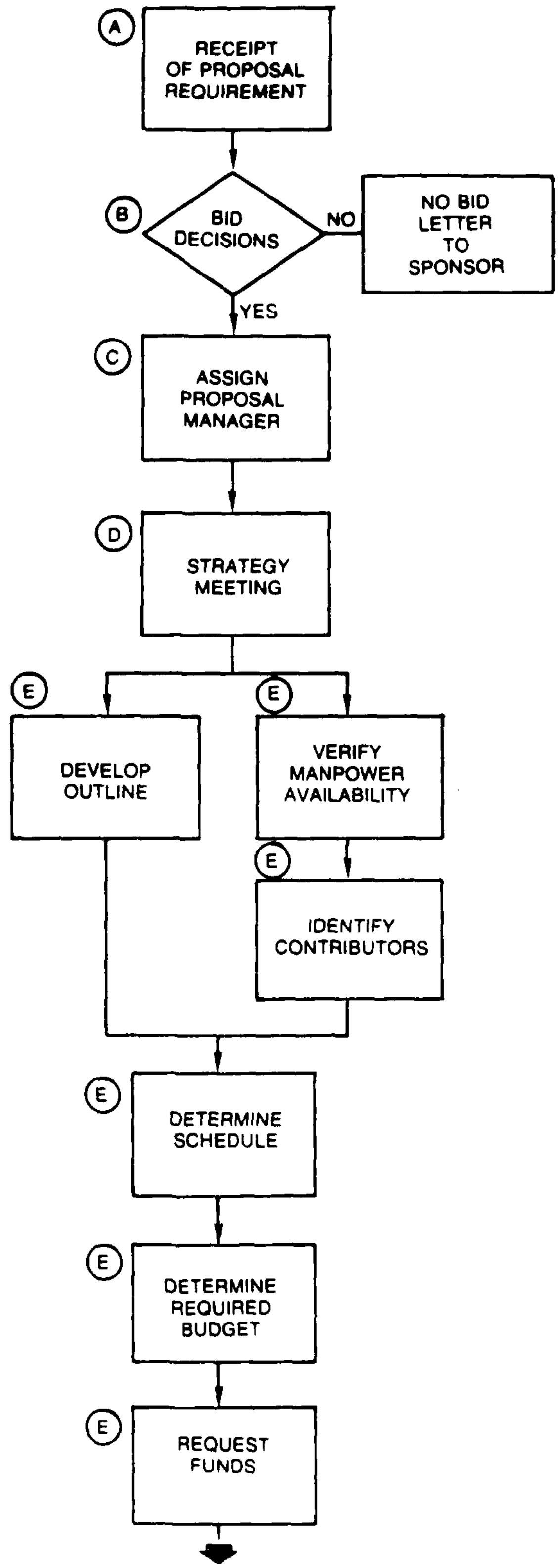


Figure 4.8. Proposal planning.

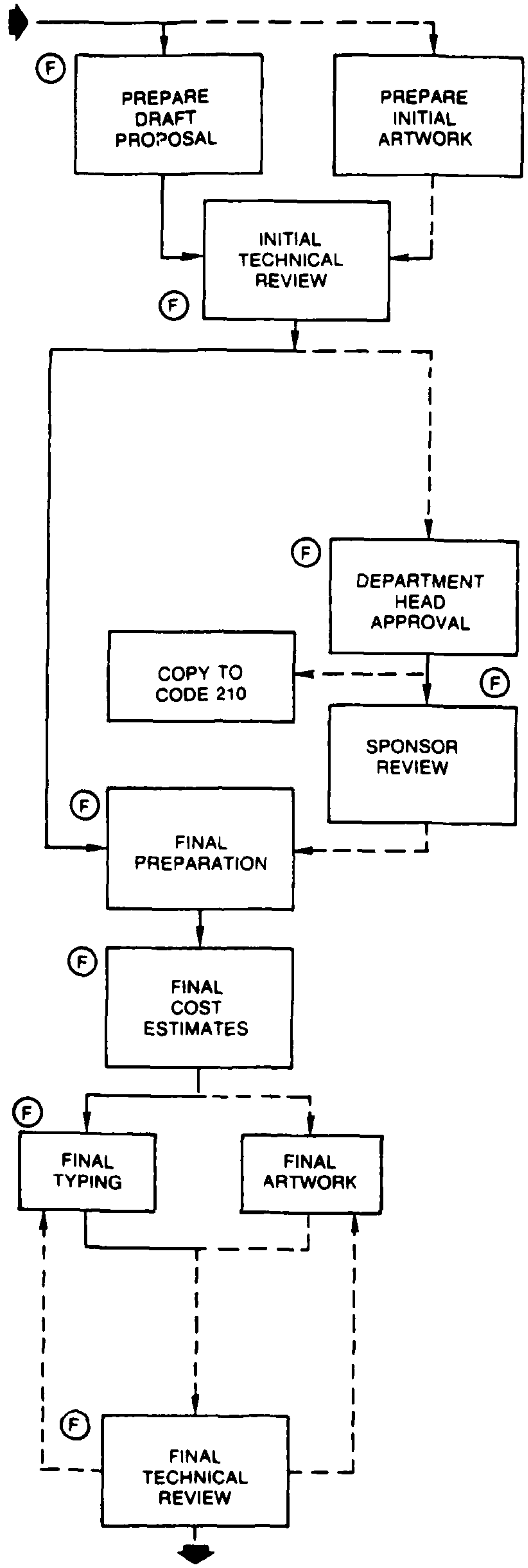


Figure 4.9. Proposal preparation.

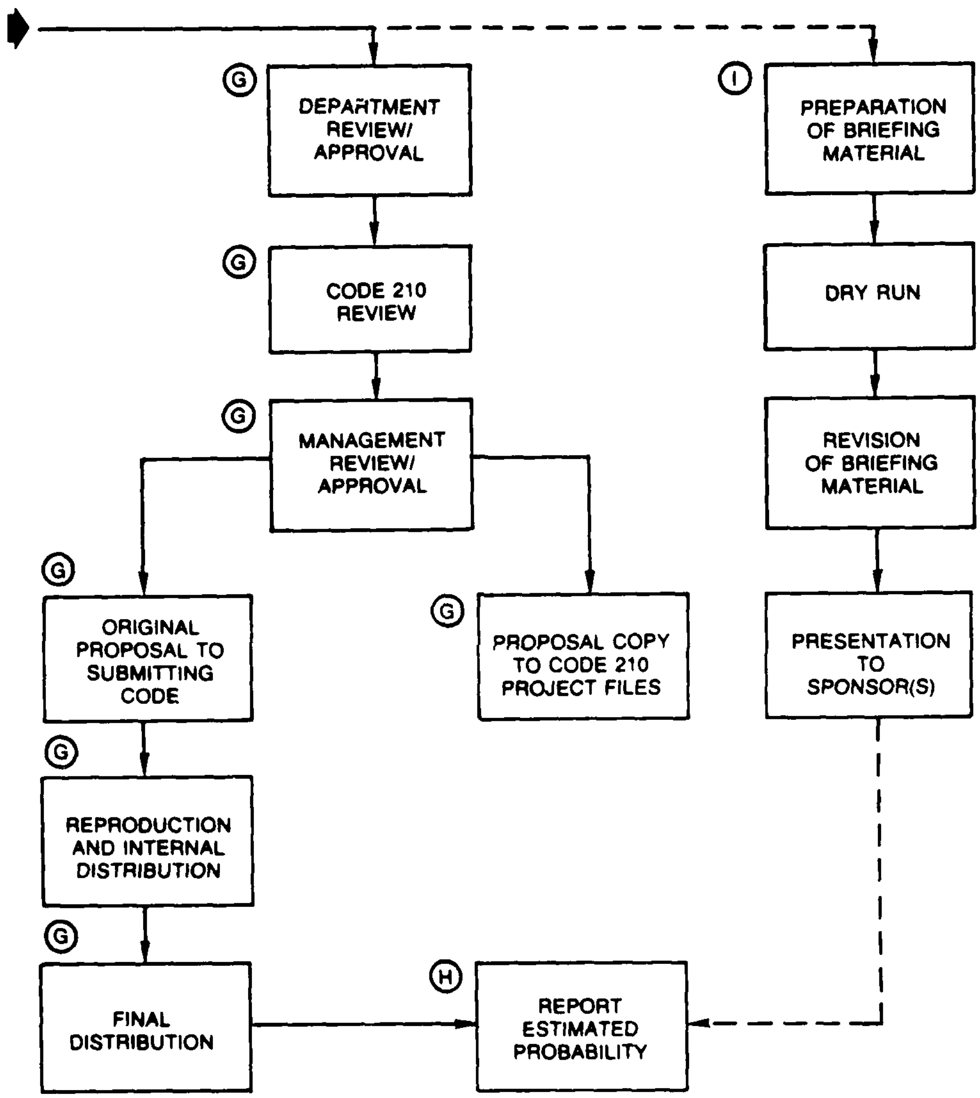


Figure 4.10. Proposal presentation.

c. Remember that the proposal *teaches* what it's all about. It establishes or creates the need, and then proposes the solution and points out the opportunity. It establishes your theme by addressing the superiority of approach; "doability"; credibility (why us?); risk, timing and costs, and management commitment; the deliverable (your defined product); and the early program involvement.

d. Develop your 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. So prepare a first-class briefing designed for dialogue with the customer (you want to incorporate and address his concerns). Your speaker should be "quick on his feet" and be accompanied by those who have the expertise to field difficult questions. In this presentation you want to avoid sales soliloquies.

e. Bring, if possible, any of the following items (they are listed in order of priority):
   Hardware
   Mockups
   Photos
   Engineering type drawings
   Artist sketches
   Reports.

f. Sell your theme emphasizing "we are further along."

g. Detect/create a need/solution your customer did not know he had and is not getting from the competition.

h. *Offer something* he cannot get from the competition (experience, Fleet/intel access, DARPA contracting authority, staff support, etc.). Items g and h both emphasize the fact you should know your competition. Know who they are, their strengths, weaknesses, tactics, and pricing information.

i. Know the *leverage points* (i.e. critical thresholds, costs, etc.).

j. Cultivate a *champion* at headquarters.

k. Dry-run/murder-board proposal.

l. Offer to assist the sponsor (ghostwrite a TDR, etc.).

Past experience has demonstrated several things to keep in mind. Prior experience is less important than the best proposal. At this stage time spent on a *good presentation* pays off more than additional analysis. Our biggest *mistake* is to try and do it all (all of us are *not* Thomas Edisons).

That brings us to formal proposal preparation. The following observations are intended to provide some help in approaching the formal proposal.

a. Currently NOSC does *not* have an *instruction/manual*.

b. *NELCINST 5000.2A* is out of date (but not bad).

c. Most NOSC proposals will use *DD form 1498* (LPS).
   See department administration officer.
   Seek Code 121 help (COMSTOCK).

d. It is important to *involve* affected codes.
   Verify manpower availability.
   Verify costs/schedule.
   Obtain necessary signatures.

e. *Cover letter* most helpful (signed out as high as possible).

f. *Large programs* will be done via by letters of agreement: assignments of responsibility (e.g., deputy PM, lead lab, etc.).

Figure 4.11 presents the types of statements of work (SOWs) and their associated contract documents.

4.6 NEW MARKETING STRATEGIES

The new marketing strategies for NOSC include consideration of the following items:

a. Submit requirement via CINCs (support your local NSAP office).

b. Showcase system in *war games*.

c. Participate in *high level* studies, appraisals, strategies, master plans.

d. Support your sponsor (*NSTEP* = agent in place).

e. Go *black* ... (jumps over many wickets).

f. *End-runs* = *caution*: very high risk for Center/CO & TD (safer: DSB/NRAC/etc.).

g. *Bailing out* troubled programs.

h. Advanced *tech demos* (OP-98).

i. Avoid *joint* programs.

j. Top-level warfare requirements (TLWR)/battle force integration management (BFIM) & SPAWARS???

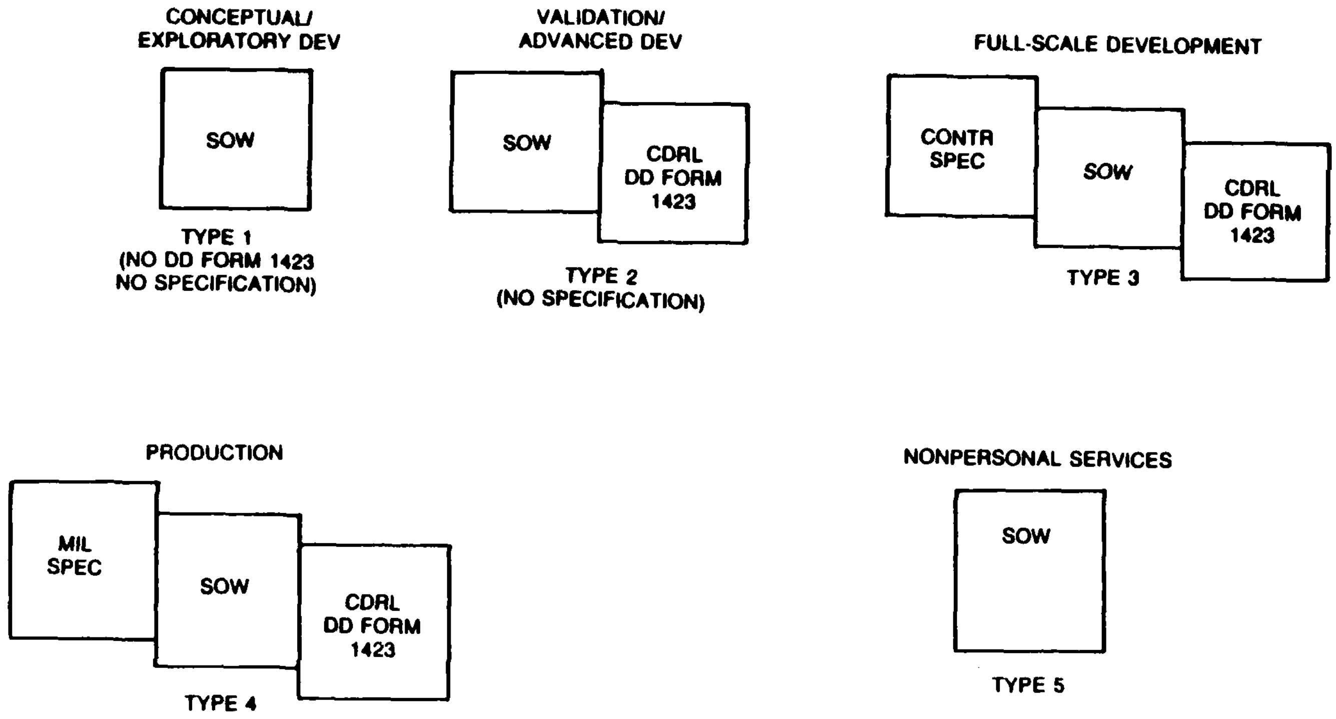
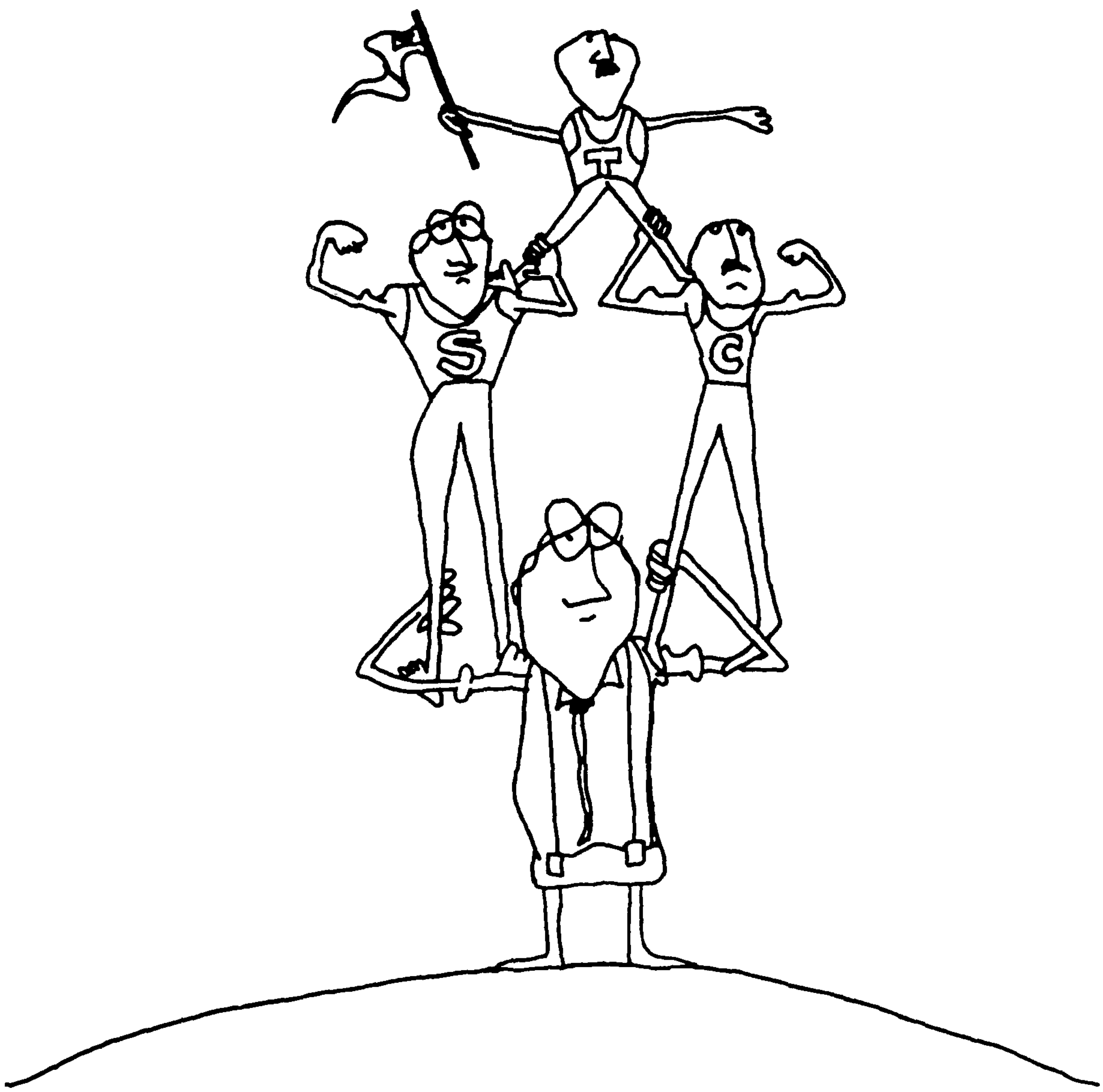


Figure 4.11. SOW types and associated contract documents.

STAFFING, TEAM BUILDING, AND COMMUNICATION

5



CONTENTS

SECTION 5
STAFFING, TEAM BUILDING, AND COMMUNICATION
F. Gordon, Code 60

5.1 INTRODUCTION

5.1.1 References

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

5.1.2 Outline

Introduction
- References
- Outline
- Summary

Staffing, Team Building, and Communication
- Staffing
- Team Building
- Communication

Implementation/Execution

5.1.3 Summary

See below.

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 its 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 Decisionmaking 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 decisionmaking 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.

- 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.

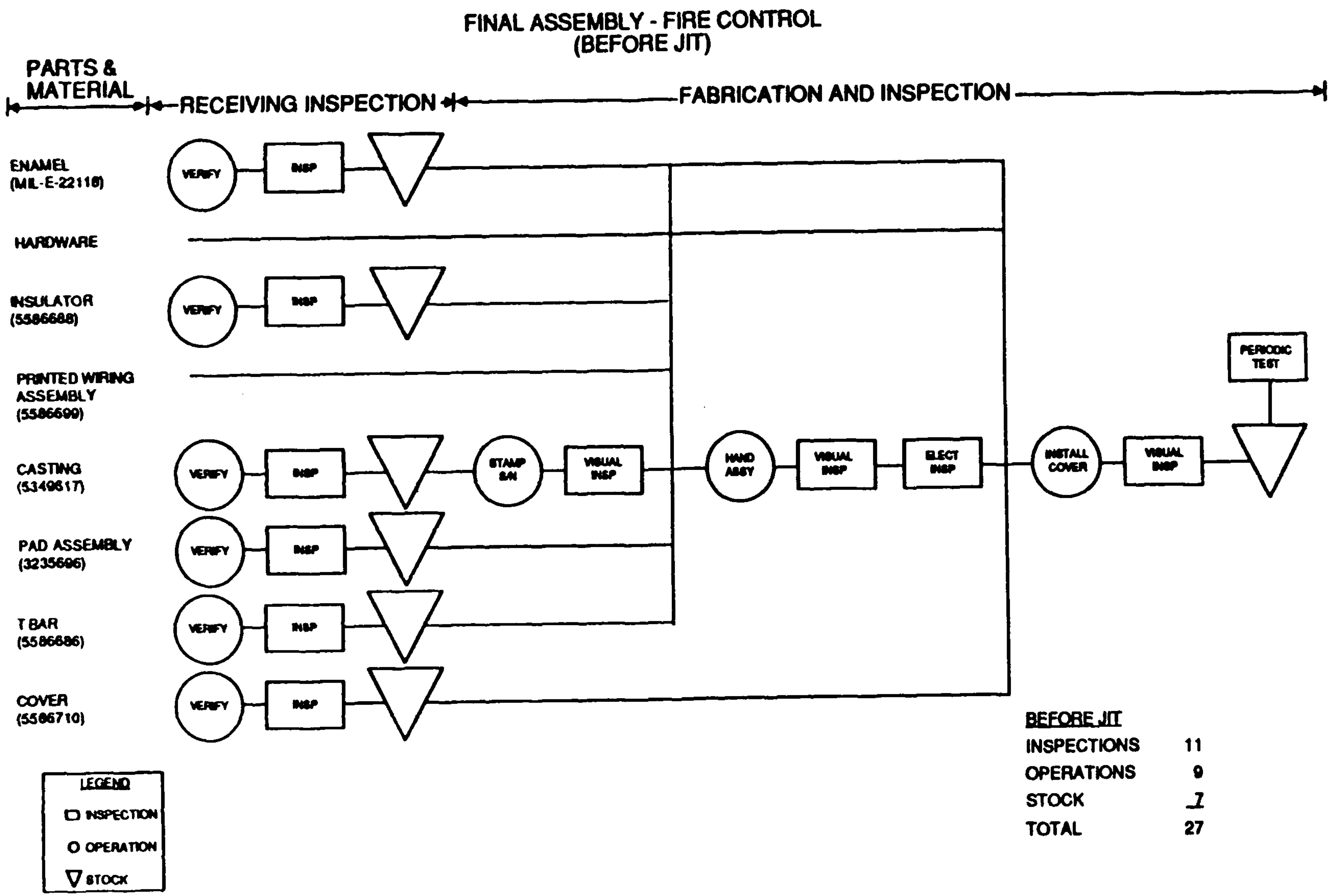


Figure 5.2. Process flow diagram.

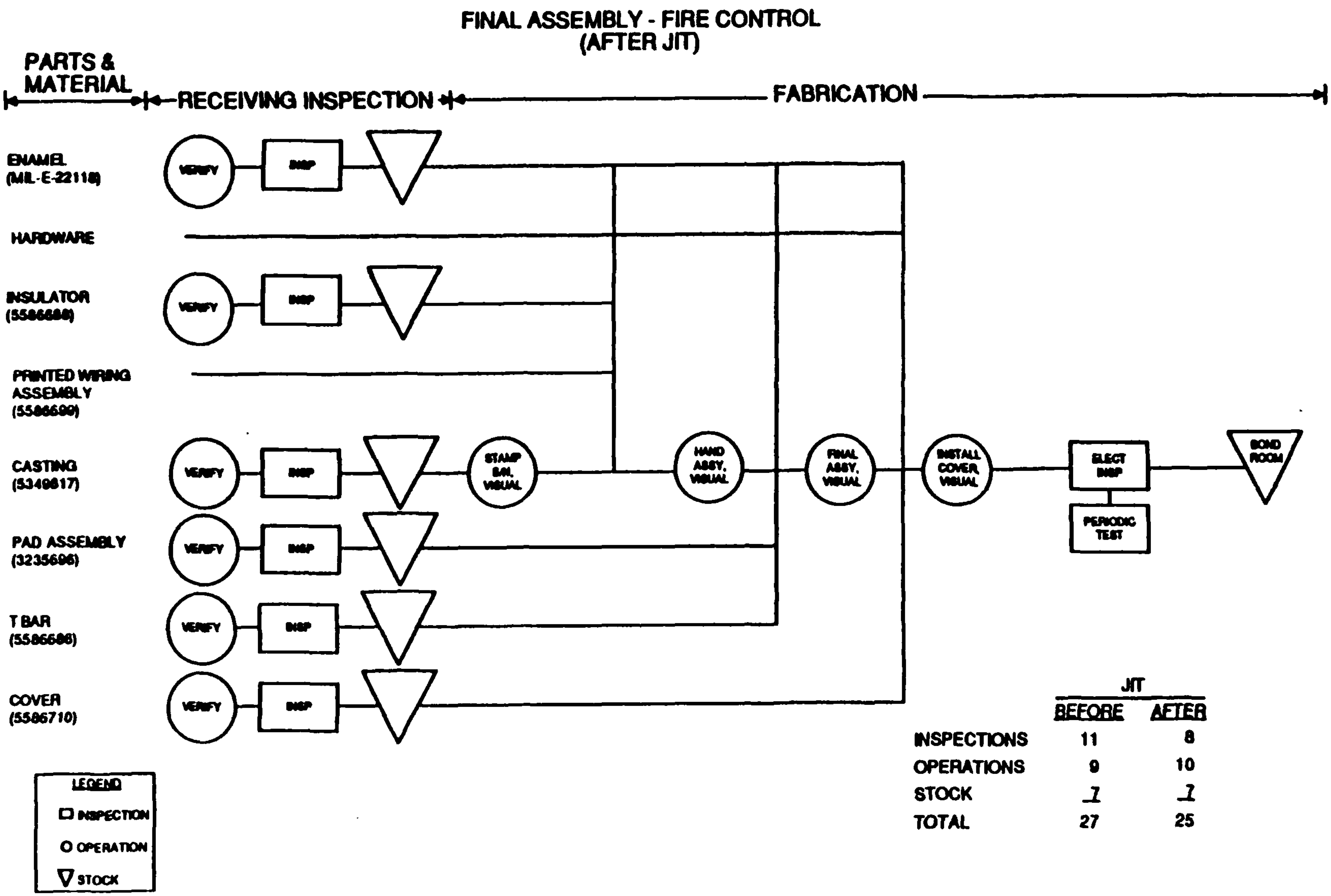


Figure 5.3. JIT process flow diagram.

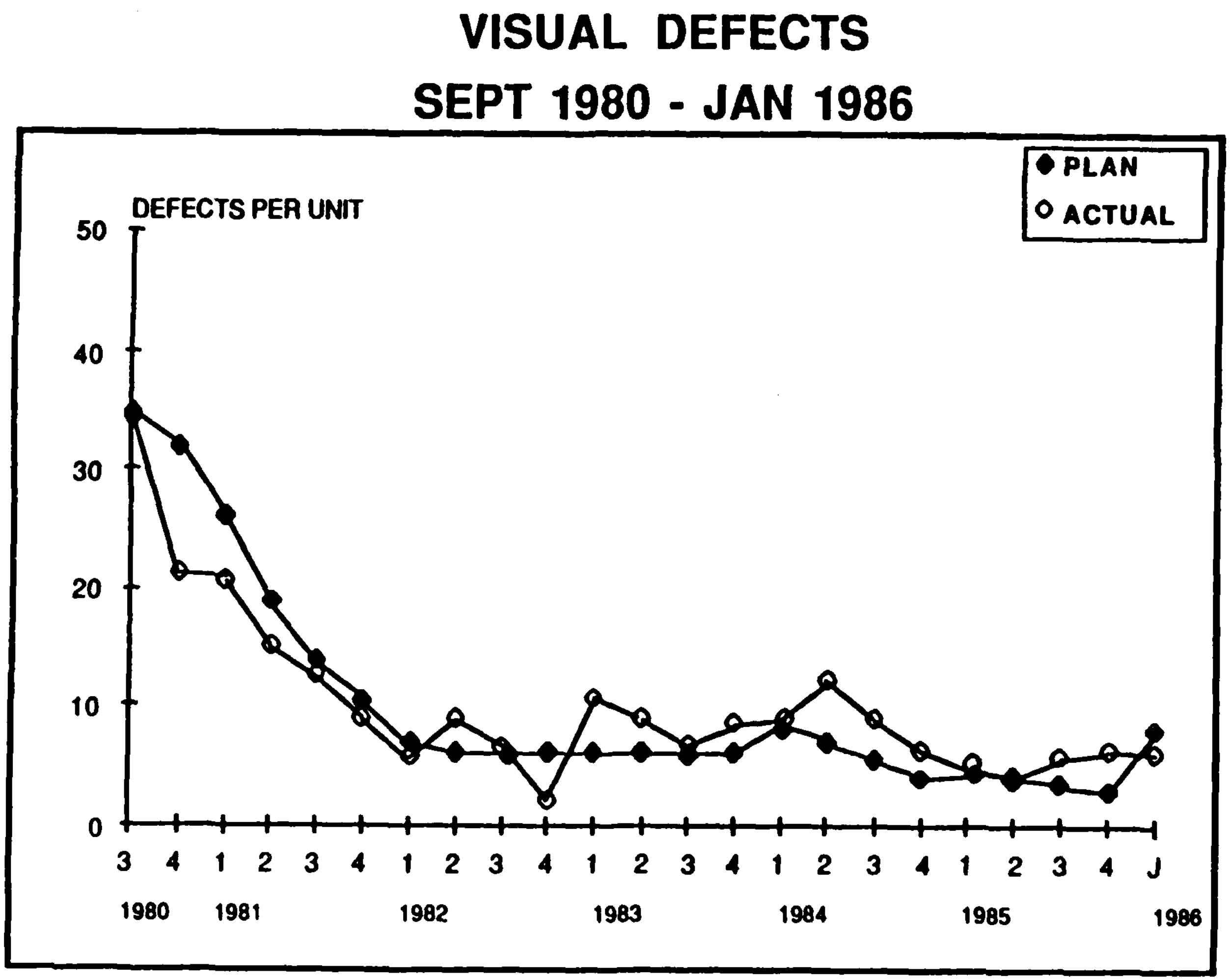


Figure 5.4. MK 46 quality trends.

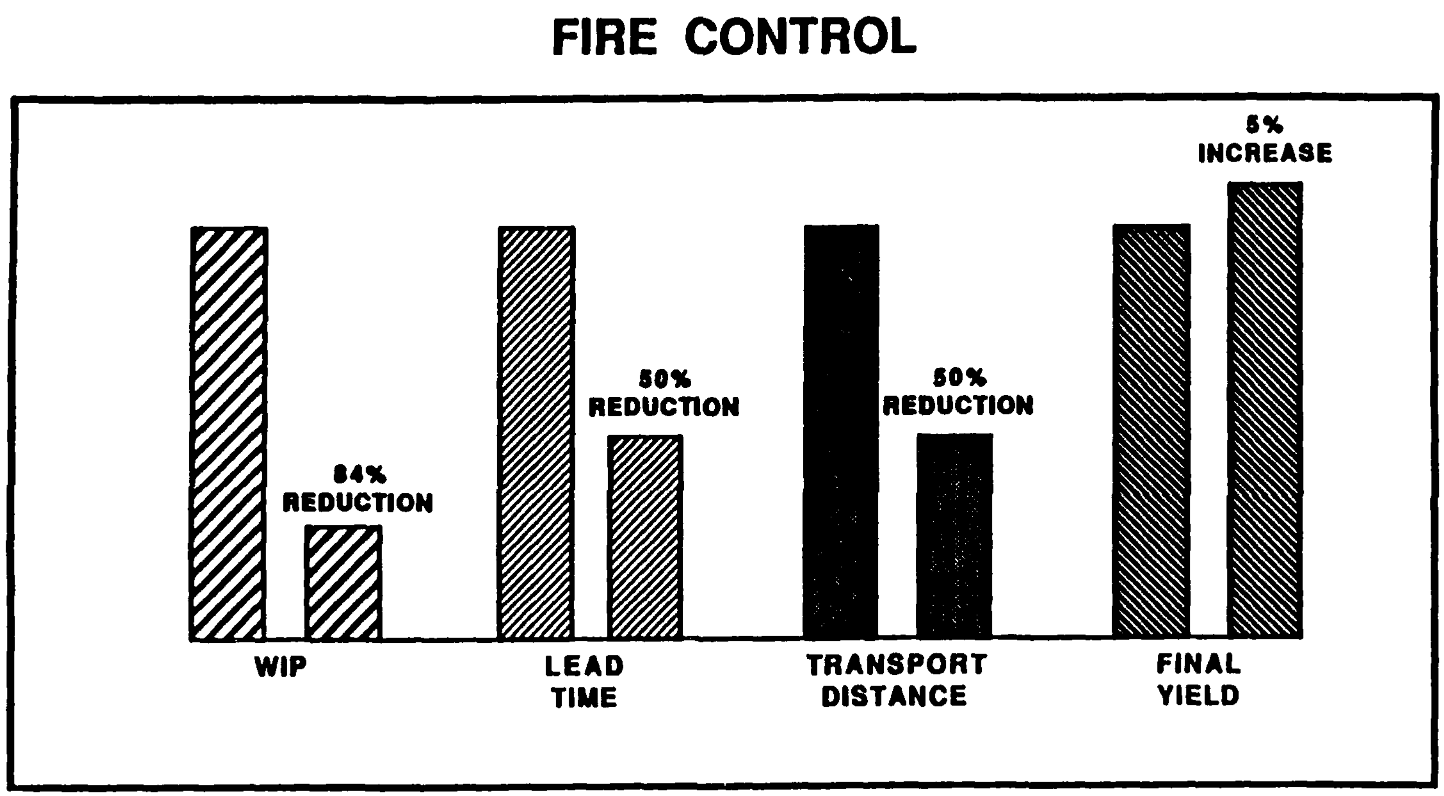


Figure 5.5. Benefits of JIT.

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*

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.

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.

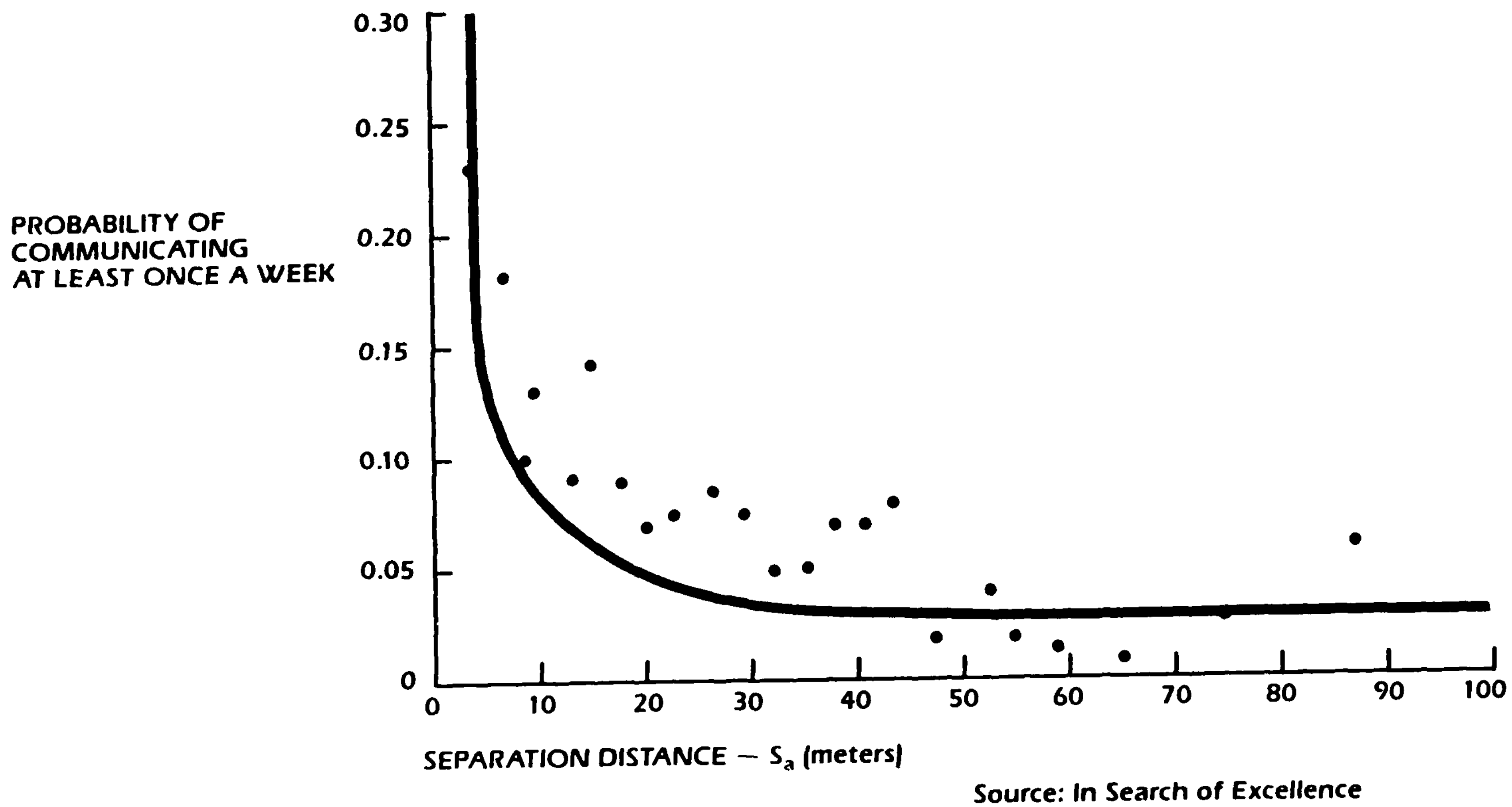
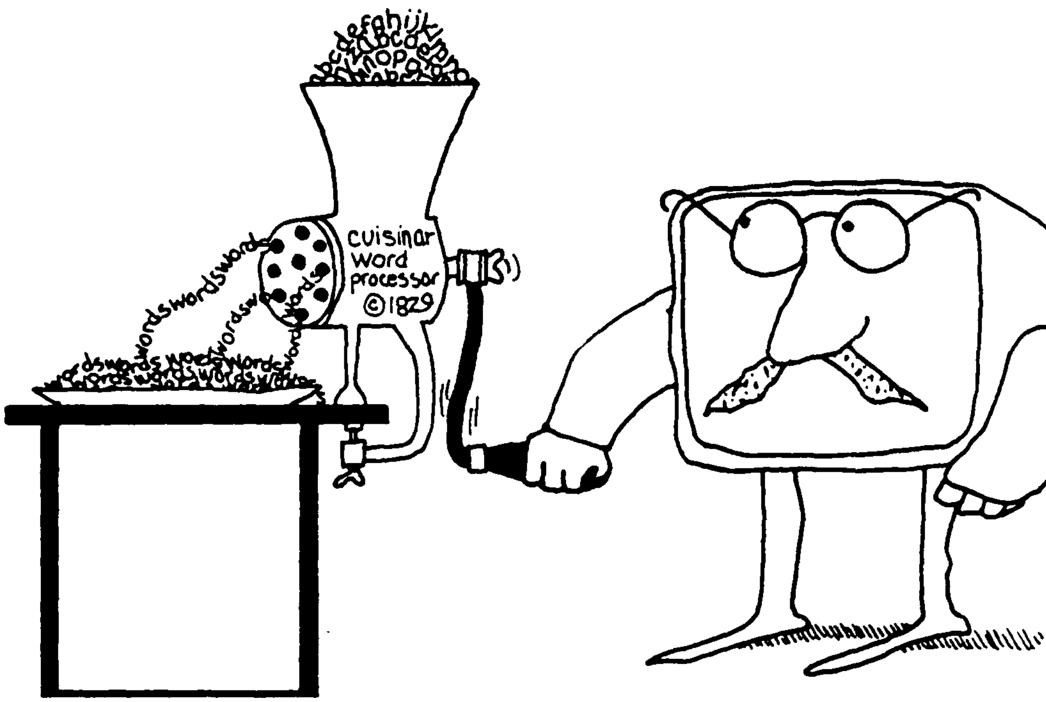


Figure 5.6 Effect of location on communications in R & D and engineering labs.

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

COMPUTERIZED ASSISTANCE 6



CONTENTS

SECTION 6
COMPUTERIZED ASSISTANCE
T. Keil, Code 9101

6.1 INTRODUCTION

6.1.1 References

None.

6.1.2 Outline

Introduction
References
  Outline
  Summary
What Computer Assistance is Available
PCs and Minicomputers
Effective Use of Electronic Mail
User Assistance—What Help is There?
Future Developments

6.1.3 Summary

There is a great explosion in the number of inexpensive desktop computers being used at NOSC. By the end of this year there will be approximately one personal computer (PC) per employee. It is very difficult even for those in the field to maintain an awareness of the advances in hardware and software. We are all faced with the associated problems: these include what to buy, how to use it, how to use it on the GCB (our local NOSC network), and so forth.

Therefore, this presentation has a dual purpose. First, it will make you aware that computerized tools are available to the project manager. Second, it will identify the sources that will help you determine exactly what tools are available and that will help you use these tools effectively.

6.2 WHAT COMPUTERIZED ASSISTANCE IS AVAILABLE?

Computer resources at NOSC fall into two categories:

a. Centralized (the computer center, administrative and STAFS, and the centerwide office automation network (COAN)
b. Division and project computers (minicomputers running UNIX and VMS and microcomputers (PCs)).

With the explosion in microcomputers the traditional role of a centralized computer center is changing from being a computing resource to being a database and routing resource with the micros becoming the workhorses.

What I will discuss is how the micro (PC) can be used effectively with the database and routing resources (minicomputers) we have here at NOSC:

a. Accessing minis from a PC
b. How to use electronic mail
c. Where to go for help and instruction
d. What changes are coming in the future to make work easier.

6.2.1 PCs and Minicomputers

NOSC has in most buildings a generalized communication backbone (GCB) which allows communication between computers. With this network it is possible to connect directly to a minicomputer and work on the minicomputer or to transfer files (data and information) between the microcomputer and the minicomputer. We will discuss PC-mini communication and the GCB.

6.2.2 Effective Use of Electronic Mail

Electronic mail has become one of the most popular uses of computer networks (connecting computers). We will discuss the following:

a. How electronic mail can be used effectively
b. What networks are available to users (to send information to sponsors for instance)
c. How you access NOSC computers while on travel.

6.2.3 The Project Management Support System (PMSS)

The PMSS, administered by NOSC Code 11, is designed to provide NOSC program managers and support personnel with an easy-to-use approach for accessing project information. Among its offerings are software, hardware, documentation, training, and one-to-one consultation. PMSS currently provides the following capabilities:

Access to an online database containing financial data
Access to commercial software tools
Electronic mail.

PMSS was developed to support both the novice and the more experienced computer user. PMSS guides each user with a series of choices, or menus. When you enter PMSS, you see a list of options on the menu. Based on your selection, you may see your present menu replaced by another menu, or you may be asked for specific information, such as a job order number. You can select online help or exit PMSS from every menu.

6.2.4 User Assistance—What Help is There?

User assistance is available for both hardware and software problems: "test driving" the hardware and software, help in purchasing it, installing it, repairing it, getting training on how to use it, and obtaining assistance in doing small programming tasks so the software can be used more effectively. The assistance available and contacts will be discussed.

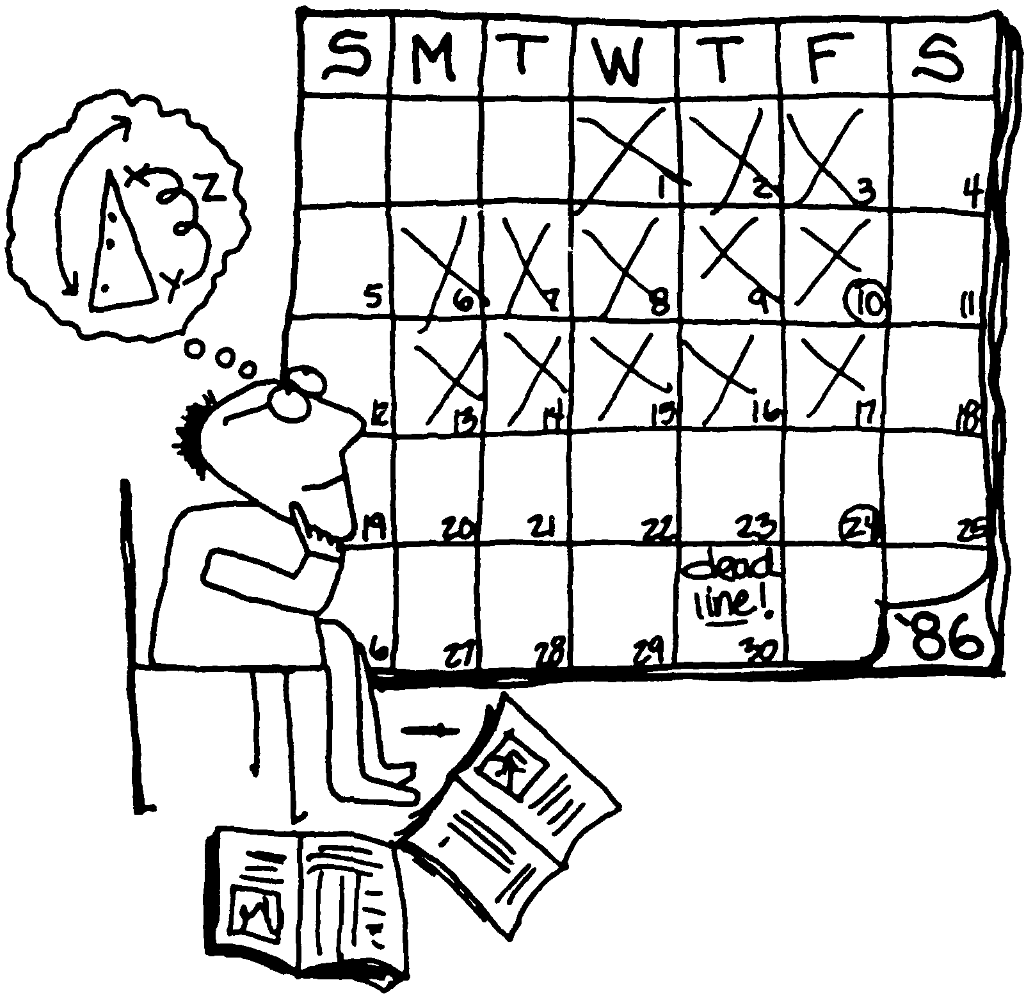
6.2.5 Future Developments

There are several projects underway that will enable personnel to use PCs and minis together more effectively. We will discuss several of these:

a. Development of a simple micro mail and file transfer capability for the micro-only user
b. An integrated NOSC mail system where everyone has a mail name
c. Development of electronic paperwork tools to allow many paperwork functions to be done electronically—stubs for instance
d. Development of a reliable electronic signature system which will guarantee that the person whose name appears did in fact "sign" the document.

PLANNING, SCHEDULING, AND ASSESSMENT

7



CONTENTS

SECTION 7
PLANNING, SCHEDULING, AND ASSESSMENT
R. Nees, Code 805

7.1 INTRODUCTION

7.1.1 References

There is a multitude of 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)

7.1.2 Outline

- Introduction
  - References
  - Outline
  - Summary
- General
- Planning as a Tool
- Project Management Plan
- Integrated Planning
- Milestones
- Technical Sequence and Flow—Networks
- Work Breakdown Structure

7.1.3 Summary

See below.

7.2 GENERAL

Project management is performed at NAVOCEANSYSCEN 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 its size. 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 his requirements to the needs of the specific project. Large projects, however, should use the guidelines as delineated in this section.

The project manager and personnel assigned under his cognizance 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 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

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 herein 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 documentation must be clearly specified in advance so that its cost can be 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 the comparing of 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 may be defined as the direction of 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 specify an 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 consist of leading personnel through all disciplines related to the project are necessary during project initiation, development, test and evaluation, and acceptance. Planning sessions that generate networking of activities and events, establish technical sequence and flow constraints, and identify critical paths provide the basis for allocating resources and planning realistic time frames 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 for 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.

Milestone dates are established from significant events that must occur to complete the project successfully. 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 milestones 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 procurement

g. Start system software development

h. Start fabrication

i. Contractor delivers hardware

j. Fabrication complete

k. Start assembly of system

l. System software complete

m. System installation complete

n. Start test and evaluation

o. Test and evaluation complete

p. Start operations evaluation

q. Operations evaluation complete

r. Deliver to Fleet

s. 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 impact, 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 include 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.

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

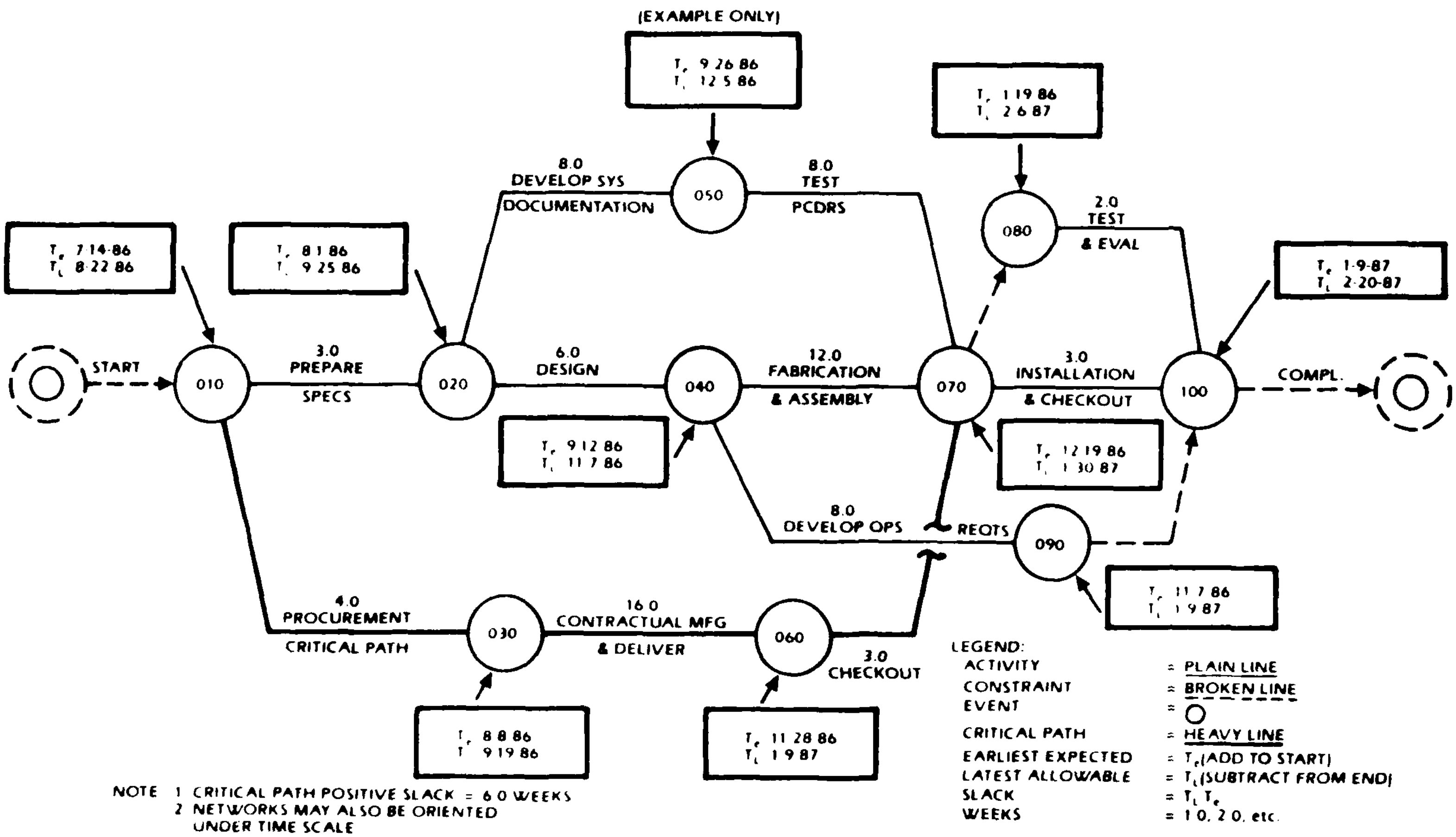


Figure 7.1. Technical sequence and flow network activity oriented.

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. After proper input procedures have been followed, both figures may be obtained through the automated WBS system. 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.

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.

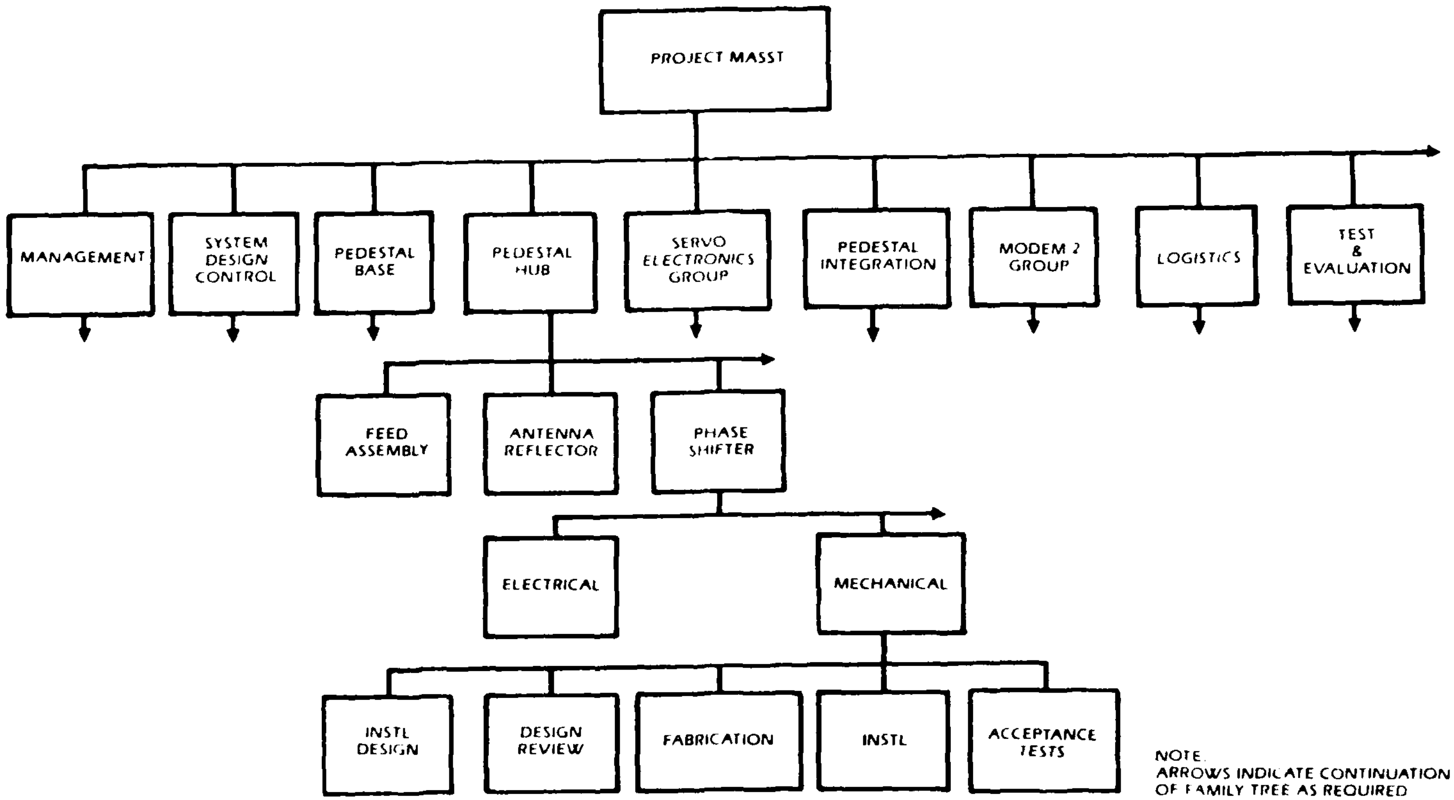


Figure 7.2. Work breakdown structure (graphic example).

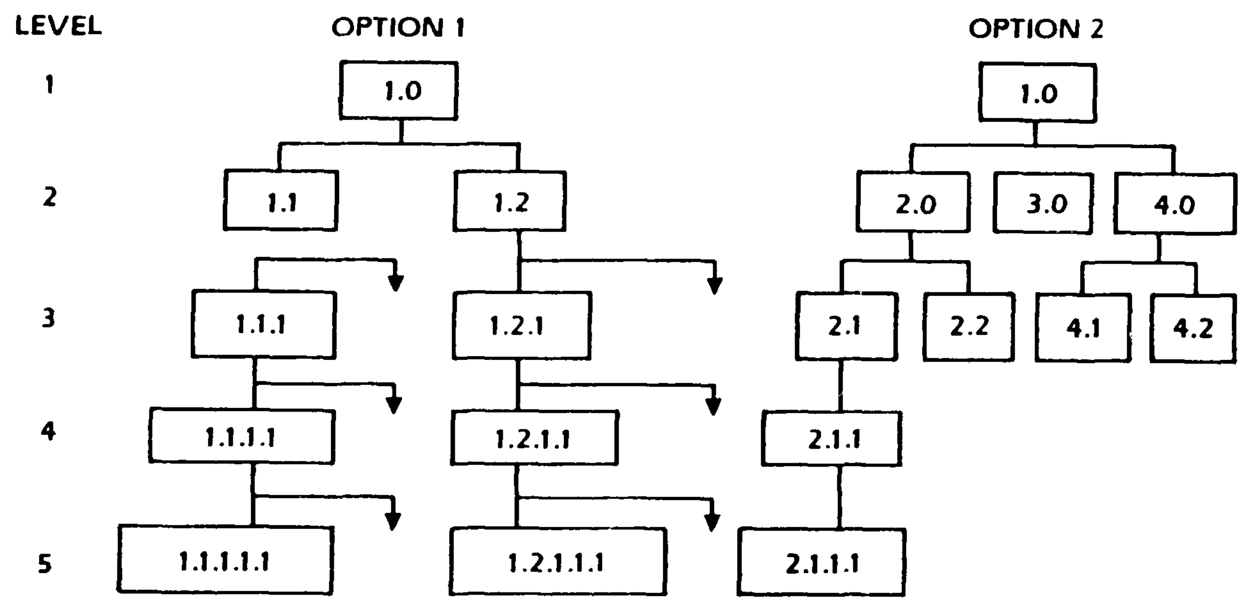


Figure 7.3. Work breakdown structure element numbering system.

7.8.2 WBS Element Description Record

In conjunction with the WBS, a WBS Element Description Record as formatted in Appendix 7H will be filled out for each element to a practical level in the WBS. Instructions for preparing this document are also included. These records will 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 which require consideration during the project development phase. The questionnaire covers such subjects as project authorizations, project management, project documentation, procurements, systems engineering, data management integrated logistics support, 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 will also be 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 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.

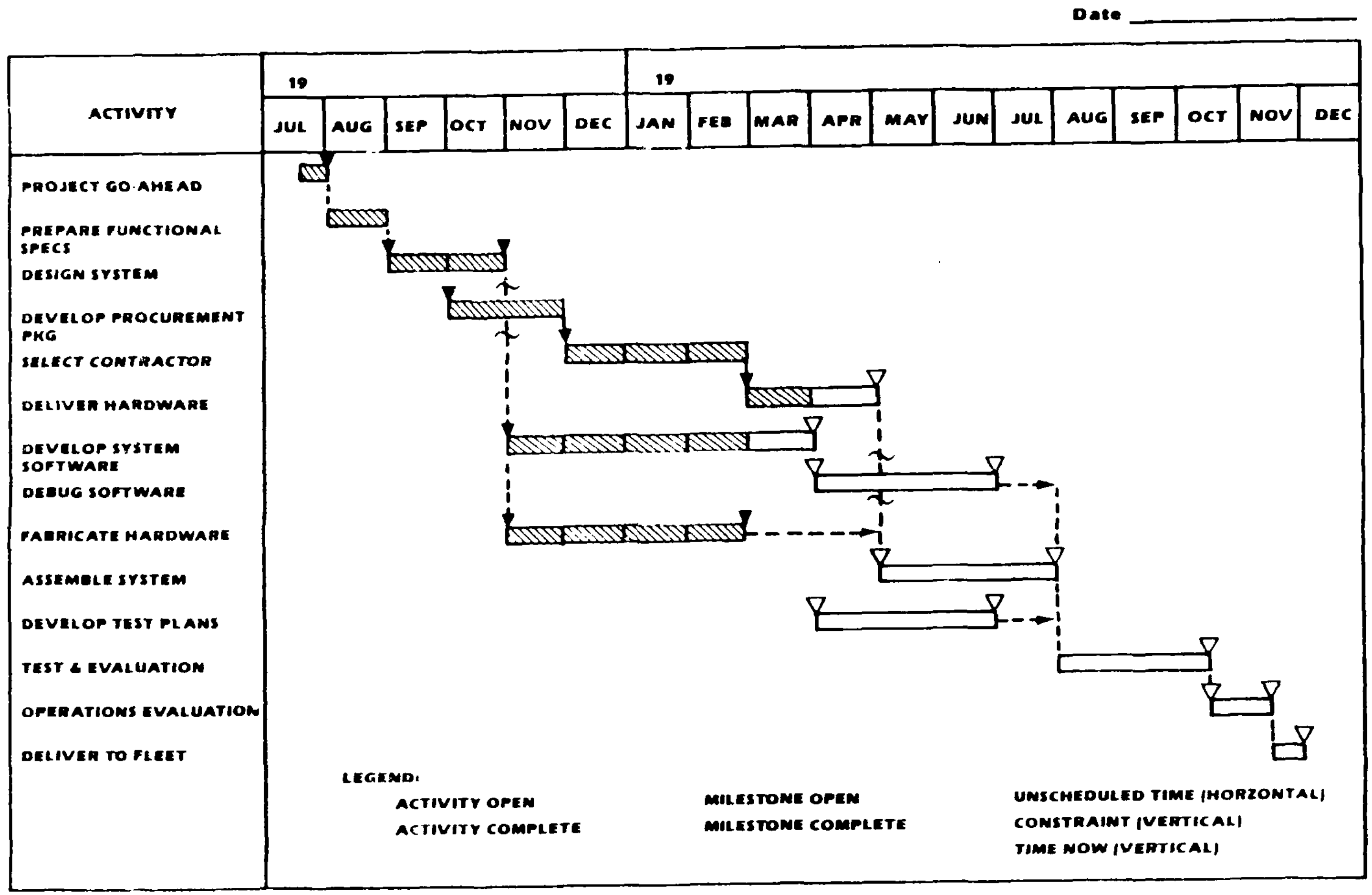


Figure 7.4. Master schedule (Gantt chart example).

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.

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, Code 21, 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. Code 211, the Purchase Branch, is responsible for processing authorized procurements up to $5,000. The contract branches have authority for processing procurements for $5,000 or more.

The planning of procurements is interrelated with early requirement definition accomplished during the exploratory and advanced development stages of system development. Determination of the 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 systems specifications.

The schedule impact of long lead time major procurements is of primary concern to the project manager. To this end, project managers should ensure an in-depth study of the approaches and requirements for acquisition plans (APs).

Acquisition planning is necessary for all procurements at the project level. The process 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.

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 Plan Requirements

The AP is a formal document that is prepared for the purpose of defining major procurement programs during the life cycle of systems development. FAR, Part 7, addresses acquisition plans. The document in part states:

a. "Navy contracting activities shall perform coordinated planning as prescribed by FAR, Subpart 7.1, for those acquisitions which meet the criteria and thresholds in FAR 7.103(a)(1). The acquisition plan required by FAR, Part 7, will be the principle document for in-depth program review and oversight by the Navy acquisition executives who are: (1) ASN (RE&S) for R&D, (2) ASN (FM) for ADP, and (3) ASN (S&L) for other procurements (the R&D funded portions of ship design and/or construction procurements are under the joint cognizance of ASN (RE&S) and ASN (S&L))."

b. A program endorsement memorandum (PEM) must be obtained from the cognizant Navy acquisition executive for the following APs (when DFARS/NARSUP 7.103(c)(2) requires that a written AP be prepared):

   (1) "Development acquisitions (see FAR 35.001), other than those funded under program element 6.2, whose total contractual cost is estimated as greater than $5 million for NAVAIR

and NAVSEA and $2 million for all others."

(2) "All shipbuilding programs."

(3) "All production programs, regardless of type of funds to be utilized or DON contracting activity performing the procurement, having a single contract value whose value (including options) is estimated to equal or exceed $50 million."

FAR 7.103-90 provides for the acquisition plan format. Every topic may not be applicable to every acquisition; however, the format can serve as a checklist of material to be included in the AP. Cross references have been made to FAR, DFARS, and MARSUP requirements for acquisition plan content. Appendix 7K provides an outline of the plan (plus a list of required tables) to project management for ready reference. Acquisition plans for many projects may have been prepared by the sponsoring activity or at the applicable SYSCON level. Procurement requirements that may require a NOSC-initiated acquisition plan should be coordinated through the Supply Department to ensure that the necessity for an acquisition plan exists and to ensure that proper procedures are being followed.

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

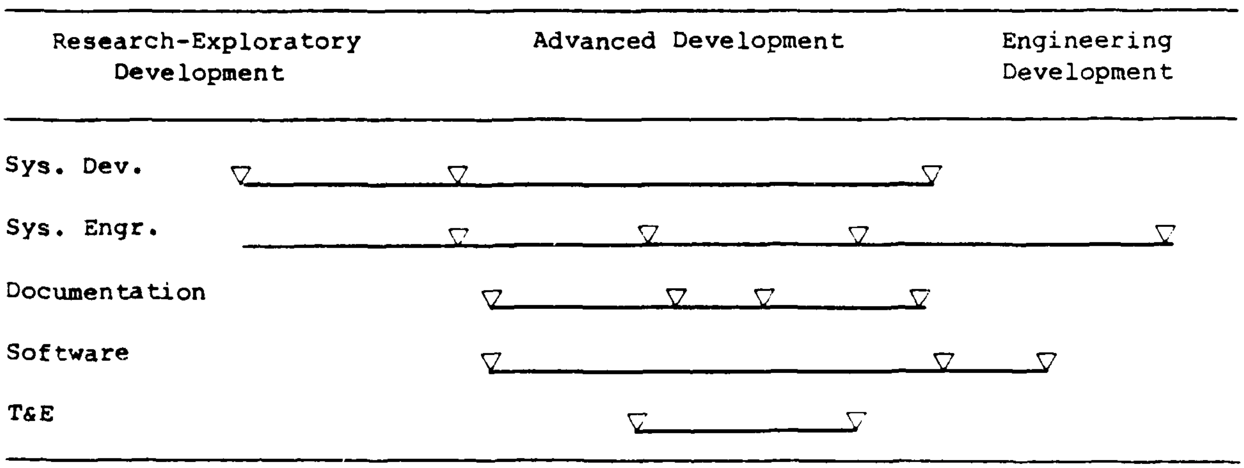
APPROACH

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

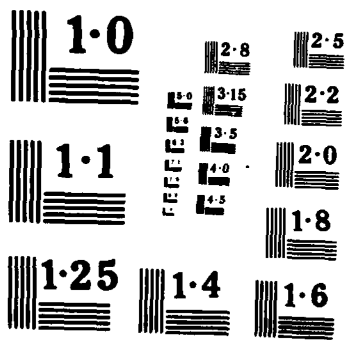
Management controls will be exercised by the (project) over task assignments, manpower expenditures, cost, and scheduling. These controls will be keyed to specific elements of a Work Breakdown Structure (WBS) constituting the bases for task identification and baseline configuration identification. The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

AD-A170 075 NOSC (NAVAL OCEAN SYSTEMS CENTER) PROGRAM MANAGER'S HANDBOOK(U) NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA JUL 86 NOSC/TD-880 2/5

UNCLASSIFIED F/G 5/1 NL


1·0
2·8
2·5
3·15
2·2
1·1
3·5
2·0
4·0
4·5
1·8
1·25
1·4
1·6

EXAMPLE: only show cognizant codes and tasks.

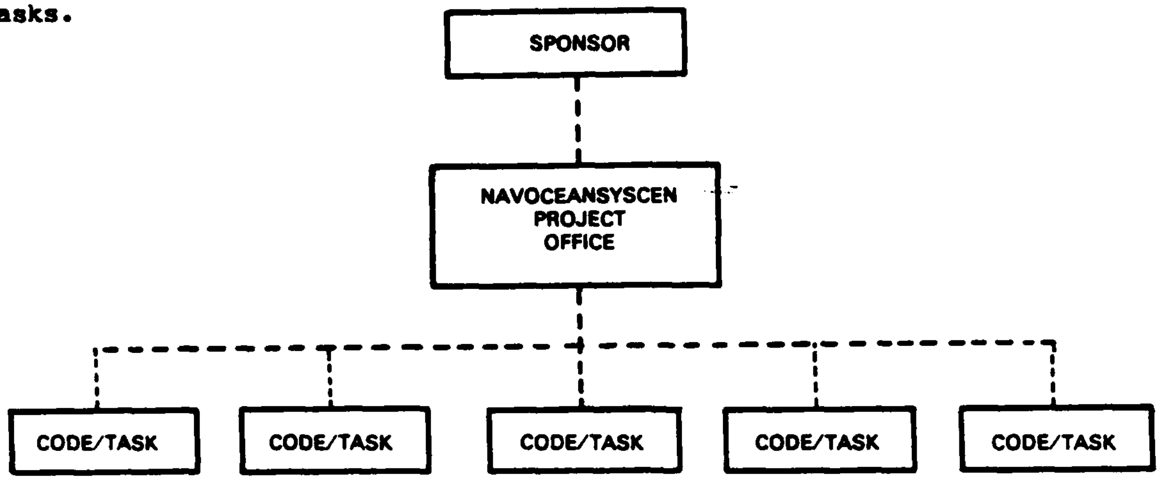


Figure 3-1
Organizational Chart

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

3.3.2 Cost Control

The plannned 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.

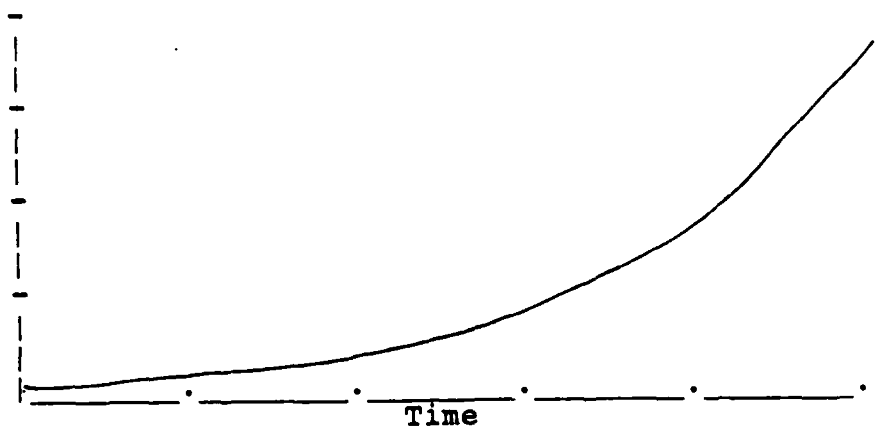


Figure 3-3 Expenditure Profile

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

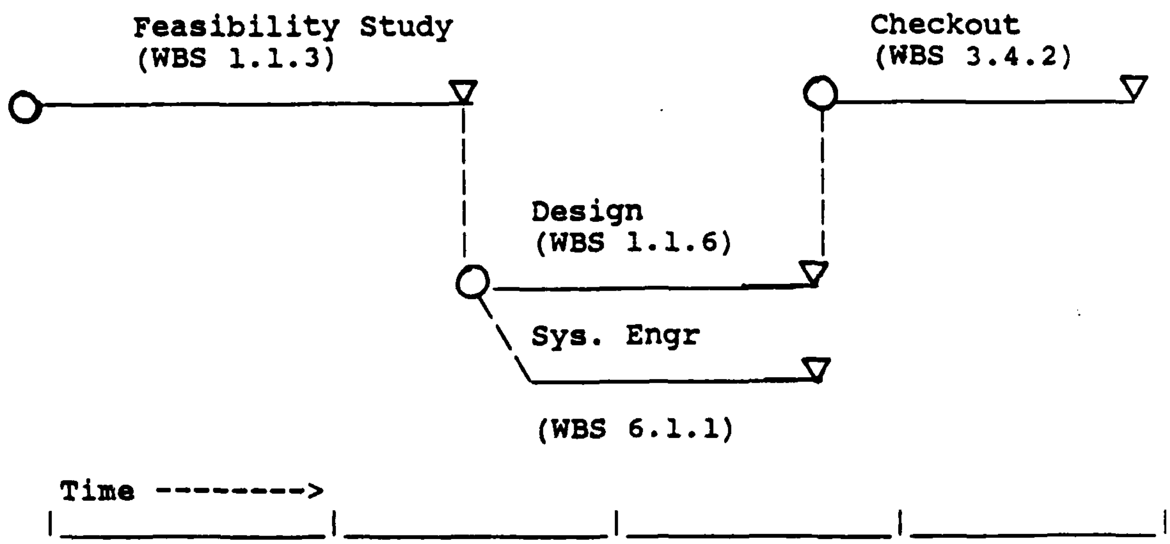
4.1 GENERAL

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	
5.5.1	Installation Plan	Final	
6.1.2-			
7.3	Program Plan (Updated)	Final	
7.2.5	System Engineering Test Report	Final	
7.2.6	FDM 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	TRAVEL	TOTAL		
NOSC	NRL	NUSC				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

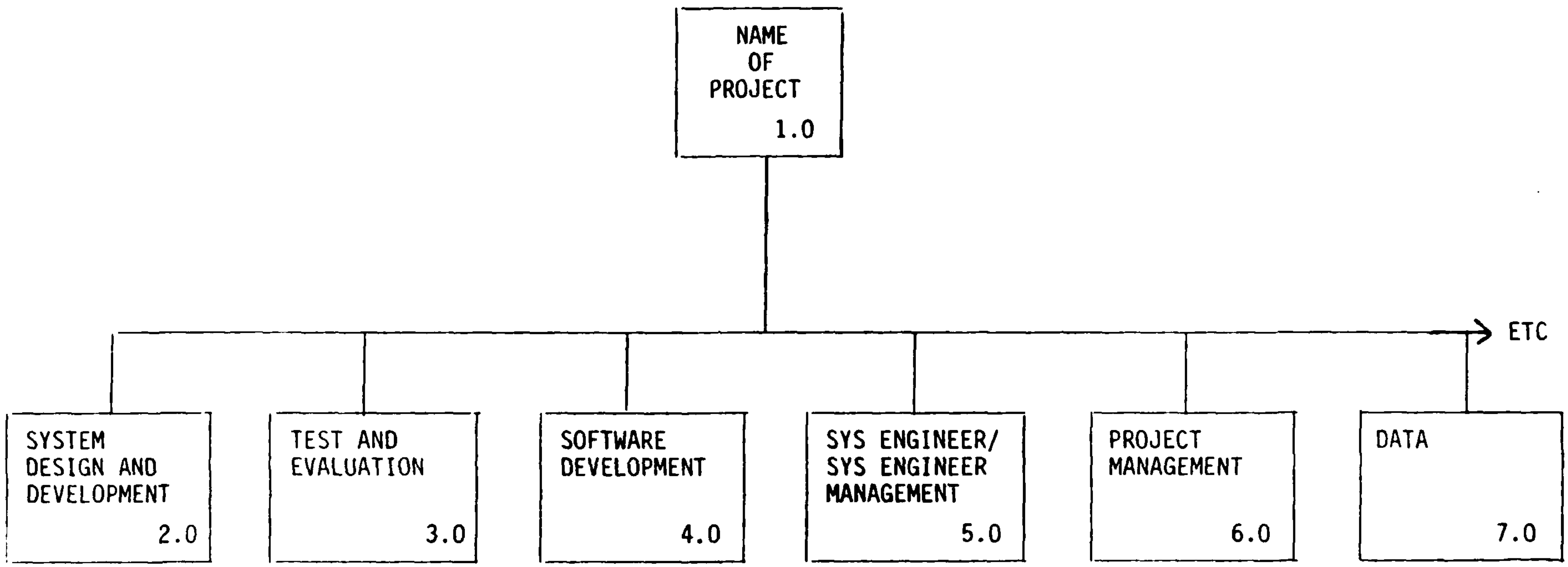
WORK BREAKDOWN STRUCTURE

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
EXAMPLE			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

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

MILESTONE REPORT – DETAIL

WEEK ENDING 3/	
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 15/	DATE 16/

MILESTONE REPORT

SUMMARY

FROM: CODE: 17/

TO: CODE: 18/

WEEK ENDING
19/

PROJECT	PROJECT NAME	CUMULATIVE MISSIONS			CURRENT WEEK		
		SCHED	MADE	MISSED	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	DATE
28/	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 tne 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 uring 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. J851-1
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	E L E M E N T T I T L E	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	6,195,000
				YTD CHARGES	12,099	682,051	2,889,960	0	54,441	53,543	3,678,995
				MTD CHARGES	3,227	183,984	1,431,322-	0	5,281	8,496-	1,250,533-
				BALANCE	5,710	288,949	2,212,040	0	13,441-	21,457	2,506,005
	1.1	PROJECT MANAGEMENT	2	ESTIMATES	1,440	161,000	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	350	31,495	5,526	0	2,253	8,211	48,087
				BALANCE	570-	26,228	7,813	0	6,542-	11,724-	15,775
CC54315T11	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	363	22,011	0	0	1,436	0	23,427
				BALANCE	766-	12,283	0	0	7,243-	0	5,040
CC54615T12	1.1.2	BUSINESS MANAGEMENT	3	ESTIMATES	440	27,000	0	0	0	0	27,000
				YTD CHARGES	373	20,287	3,536	0	508	22,464	46,795
				MTD CHARGES	69	4,351	1,944-	0	508	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	18,769	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
CC54315T1A	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
CC54315T14	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 12/23/85

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
				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	480	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	308	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	460	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	69	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	8,651-	0	2,000	8,687	2,036

REPORT NO. WBS1-3 JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM PAGE 1
PERIOD ENDING 12/24/85 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	61,000	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
	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	163,776
				MTD COSTS	550	31,498	2,170	0	2,252	8,802	44,722
				ENCUMBRANCE	0	0	13,017	0	0	638	13,655
				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
				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	16
				BALANCE	69	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	3,687	2,036

Appendix 7D

Report WBS1 Recap

(See subsection 7.8.1

REPORT NO. WBS1-1
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 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. W551-2
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

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	185,984	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 12/26/85

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
				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	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
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	60	4,351	1,944-	0	505	4,464	7,376
				BALANCE	107	6,713	3,536-	0	505-	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	7,473	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
				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
	1.4	SYSTEM TEST AND EVALUATION	2	ESTIMATES	8,023	382,000	4,626,000	0	15,000	18,000	5,038,000
				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

REPORT NO. .BS2-2 JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM PAGE 1
PERIOD ENDING 12/28/85 JTIDS PROJECT OFFICE NOSC CODE 814 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	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	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
				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

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-	21,457	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	508	2,919	8,563
				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)

REPORT NO. .353
PERIOD ENDING 12/28/85

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JTIDS PROJECT OFFICE NOSC CODE 814

ELEMENT NUMBER	LEVEL 1 2 3 4 5 6 7 8	TOTAL ESTIMATES
1.0	JTIDS SUMMARY WORK BREAKDOWN STRUCTURE - NOSC 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	178.000
1.2.1	PRIME MISSION EQUIPMENT ENGINEERING	178.000
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 TRMNL 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/DSW 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

ELEMENT NUMBER	LEVEL 1	2	3	4	5	6	7	8	TOTAL ESTIMATES
1.4.2.1.2.2						INCR I SPPT - MBIU/NIAU - ADS			45,000
1.4.2.1.2.3						JDES SUPPORT - SDSUF			12,000
1.4.2.1.2.4						INCR I SPPT - E-2C/F18 - SDC			21,000
1.4.2.1.2.5						INCR I MODS - DAS/CFS - SAI			60,000
1.4.2.1.2.6						INCR I MOODS - NIAU - ADS			70,000
1.4.2.1.2.7						SLOW MOVER VAN - INTERMETRICS			75,000
1.4.2.1.2.8						JDES SUPPORT HARDWARE			3,000
1.4.2.2				INCR II DEVEL/MAINT - BOEING					3,500,000
1.4.2.3				INSTALLATION/LAB MODIFICATIONS					84,000
1.4.2.3.1					JDES INSTALLATION MGT				20,000
1.4.2.3.2					JDES INSTALLATION - CONTR SPPT				64,000
1.4.2.3.2.1						INSTL/MODS RACK ENCL - TRACOR			40,000
1.4.2.3.2.2						INSTL/MODS MINI RANGER - SEI			24,000
1.4.2.4				CONFIGURATION MGT SPPT F/JDES CONTRACT					24,000
1.4.2.4.1					CM SPPT IN-HOUSE				3,000
1.4.2.4.2					CM SPPT - CONTRACTOR				21,000
1.4.2.4.2.1						CM DRAWING SPPT - SEI			21,000
1.4.3			QUALITY ASSURANCE CERTIFICATION						233,000
1.4.3.1				QA CERTIFICATION IN-HOUSE					17,000
1.4.3.2				QA CERTIFICATION CONTRACTOR SPPT					216,000
1.4.3.2.1					INCREMENT I TESTING - SAI				130,000
1.4.3.2.2					INCREMENT II QA TEST - SAI				50,000
1.4.3.2.3					OT-II TEST SPPT FSD - SAI				36,000
1.5		SITE/PLATFORM INTEGRATION							740,000
1.5.3			SHIP INTEGRATION						740,000
1.5.3.1				JTIDS ANTENNA/EM ENVIRONMENT ANAL,MEASUREMENT&TEST					197,000
1.5.3.1.1					IN-HOUSE SUPPORT				145,000
1.5.3.1.1.1						ANTENNA & EM ANAL & TST			92,000
1.5.3.1.1.2						EMC ENGR CONSULT/ANAL			31,000
1.5.3.1.1.3						EM MEASUREMENT/TEST SPPT			14,000
1.5.3.1.1.4						EM/ANTENNA ENGR SPPT			8,000
1.5.3.1.2					CONTRACT SUPPORT				52,000
1.5.3.1.2.1						EM STUDIES - ECAC			50,000
1.5.3.1.2.2						TACAN CERTIFICATION - NESEC VJO			2,000
1.5.3.2				INTEGRATION ENGRG					163,000
1.5.3.2.1					IN-HOUSE SUPPORT				73,000
1.5.3.2.1.1						INTEGRATION ENGR MGT			14,500
1.5.3.2.1.2						INTEGRATION ENGR SPPT (CODE 814)			26,500
1.5.3.2.1.3						INTEGRATION ENGR SPPT (LA)			5,000
1.5.3.2.1.4						INTEGRATION ENGR NTP RVW			12,000
1.5.3.2.1.5						SHIP INTEGRATION MATERIAL			15,000
1.5.3.2.2					CONTRACT SUPPORT				90,000
1.5.3.2.2.1						HIGH RISK ANAL - INTERMETRICS			25,000
1.5.3.2.2.2						INTGR ENGR SPPT - INTERMETRICS			50,000
1.5.3.2.2.3						SHIP INTGR SPPT - NESEC VJO			15,000
1.5.3.3				INSTALLATION ENGINEERING					380,000
1.5.3.3.1					IN-HOUSE SUPPORT				80,000
1.5.3.3.1.1						SHIP INSTL ENGR MGT			14,500
1.5.3.3.1.2						SHIP INSTALLATION ENGR SPPT			50,500
1.5.3.3.1.3						SHIP INSTALLATION MATERIAL			15,000

REPORT NO. W253 JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM PAGE 3
PERIOD ENDING 12/28/85 JTIDS PROJECT OFFICE NOSC CODE 814 RUN C06 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			PROJECT TITLE
17	18 WBS NO 23	24	73
1	1/		3/
2	2/		4/

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

ELEMENT NUMBER 1 … 17	LEVEL NO 18 19	ELEMENT TITLE 20 … 69	JOB ORDER NO 70 … 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 4/ OF
WBS ELEMENT NO. 5/	WBS ELEMENT TITLE 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. FUNDING

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)

page 1 of 10

Reference	Topic	Questions
NAVMAT P-9494 NAVSO P-2457		2. Are relevant project records 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

Reference	Topic	Questions
	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

page 2 of 10

		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

V. PROCUREMENT

FAR NOSC SUPPLY FAR/DFARS 7.105	Contract Service	1. Have contractual services been requested from Code 21? 2. Has complete procurement package data been compiled? 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?

		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?

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-624-6010 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?

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/

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/

2 of 3

PROJECT PROGRESS REPORT

24/

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/				

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 colunm.
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.

Appendix 7K

Acquisition Plan Outline

(See subsection 7.12.2)

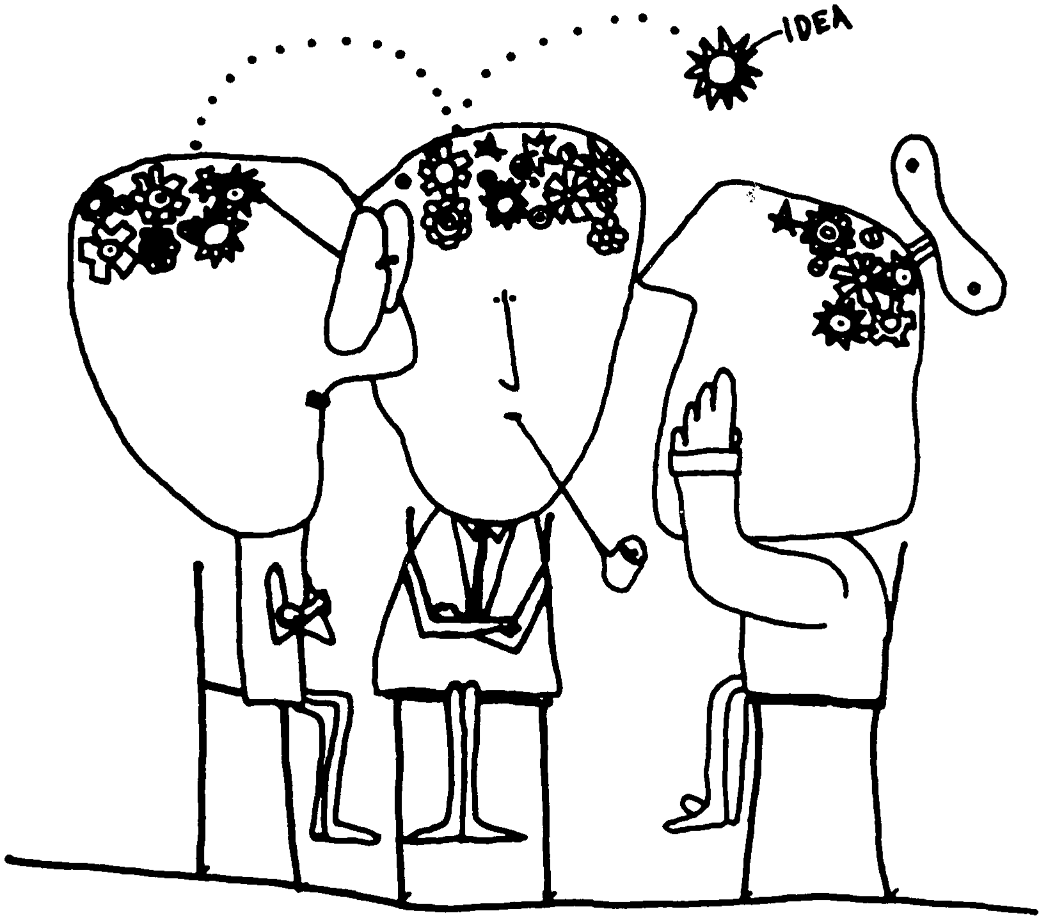
Acquisition Plan Outline

Para.	Title
	LIST OF TABLES
1.0	Description of Program/System Commodity, etc.
2.0	Section A - Acquisition Background and Objective (FAR 7.105(a))
2.1	Statement of Need (FAR/NARSUP 7.105(a)(1))
2.2	Applicable Conditions (FAR 7.105(a)(2))
2.3	Cost (FAR 7.105(a)(3))
2.4	Capability of Performance (FAR 7.104(a)(4))
2.5	Delivery or Performance Period Requirement (FAR 7.105(a)(5))
2.6	Trade-offs (FAR 7.105(a)(6))
2.7	Risks (FAR/DFARS/NARSUP (7.105(a)(7))
2.8	Applicability of DCP, DSARC and/or Internal Service Review (DFARS/NARSUP 7.105(a)(10))
2.9	Approval for Operational Use (DFARS 7.105(a)(71))
2.10	Miestone Chart (DFARS/NARSUP 7.105(a)(721))
2.11	Milestones for Updating the Acquisition Plan (DFARS 7.105(a)(73))
2.12	Background and Acquisition History
3.0	Section B - Plan of Action (FAR 7.105(b))
3.1	Sources (FAR 7.105(b)(1))
3.2	Competition
3.3	Source Selection Procedures
3.4	Contracting Considerations/Contract Type

Para.	Title
3.5	Budgeting and Funding (FAR/NARSUP 7.105(b)(5))
3.6	Product Description (FAR 7.105(b)(6))
3.7	Priorities, Allocations and Allotments (FAR 7.105(b)(7))
3.8	Contractor vs Government Performance (FAR 7.105(b)(8))
3.9	Management Information Requirements (FAR/NARSUP 7.105(b)(9))
3.10	Make a Buy (FAR 7.105(b))
3.11	Test and Evaluation (FAR 7.105(b)(11))
3.12	Logistics Considerations: Support, R&M, QA, data, standardization. (FAR/DFAR/NARSUP 7.105(b)(12))
3.13	Government Furnished Property (FAR 7.105(b)(13))
3.14	Government Furnished Information (FAR 7.105(b)(14))
3.15	Environmental Considerations (FAR 7.105(b)(15))
3.16	Security Considerations (FAR 7.105(b)(16))
3.17	Other Considerations (FAR/NARSUP 7.105(b)(17))
3.18	Milestones for the Acquisition Cycle
3.19	Identification of Participants in AP Preparation
3.20	Acquisition Approach for Each Proposed Contract - Ref subitems "a" through"m" (DFARS 7.105(b)(70))

Table	Title
I	Projected Funding (Ref para 2.3 Cost)
II	Personnel Requirements (Ref para 2.4 Capability of Performance)
III	Milestone Chart (Ref para 2.10 Milestone Chart)
IV	Contracts in Excess of $5.0M (Ref para 2.12 Background and History)
V	Source Selection List (Ref para 3.1 Sources)
VI	Budgeting and Funding (Ref para 3.5 Budget and Funding)

SYSTEMS ENGINEERING 8



CONTENTS

SECTION 8
SYSTEMS ENGINEERING
J. Townsend, Code 934

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 Outline

Introduction
- References
- Outline
- Summary

Definitions
Systems Engineering
Action Items
The Pattern of Success
The Project Manager

8.1.3 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 commonly 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. Figure 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 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.

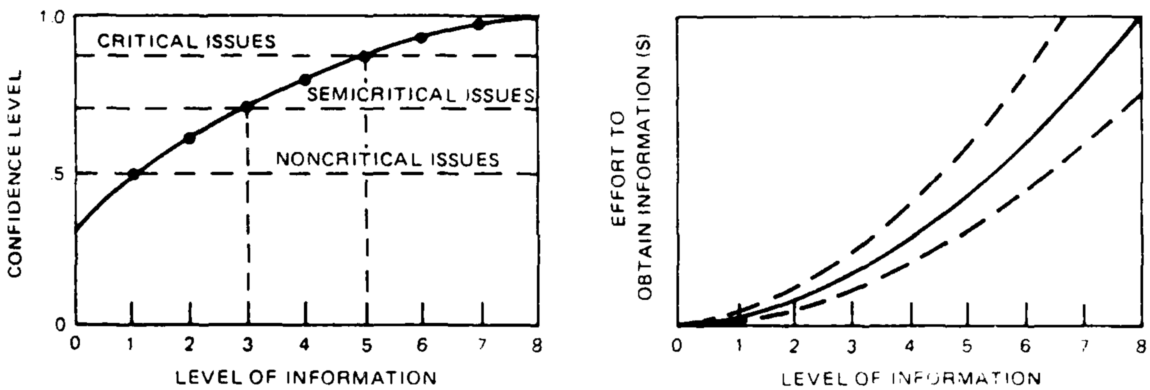
Systems engineering includes extensive costing disciplines. These range from techniques of more accurately estimating and projecting project task costs to techniques of establishing and tracking design-to-cost targets and life-cycle cost targets. These disciplines are very important to the successful 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 very well defined procedures. Projects employing risk management are not, of course, guaranteed success, but project managers who manage risks well are very 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

LEVELS OF INFORMATION FOR DECISION MAKING

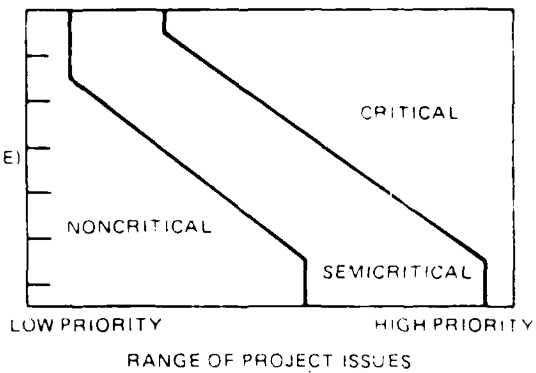
0. Noneducated guess 1. Educated guess by a nonexpert 2. Educated guess by an expert	guesses
3. Expert advice 4. Research and analysis	information developed from experience
5. Analysis and simulation 6. Diagnosis of prior experience 7. Partial testing in use (such as a Fleet Research Investigation or Development Assist) 8. Full-scale testing in use (such as an Operational Assist or OPEVAL)	validated information



Level of information vs confidence and effort to obtain

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	
IV B	> 300k	> 1M	(SMALL)
IV C	> 100k	> 300k	
IV D	EVERYTHING ELSE		(VERY SMALL)



Project size vs range of project issues

Figure 8.2. Project size versus range of project issues.

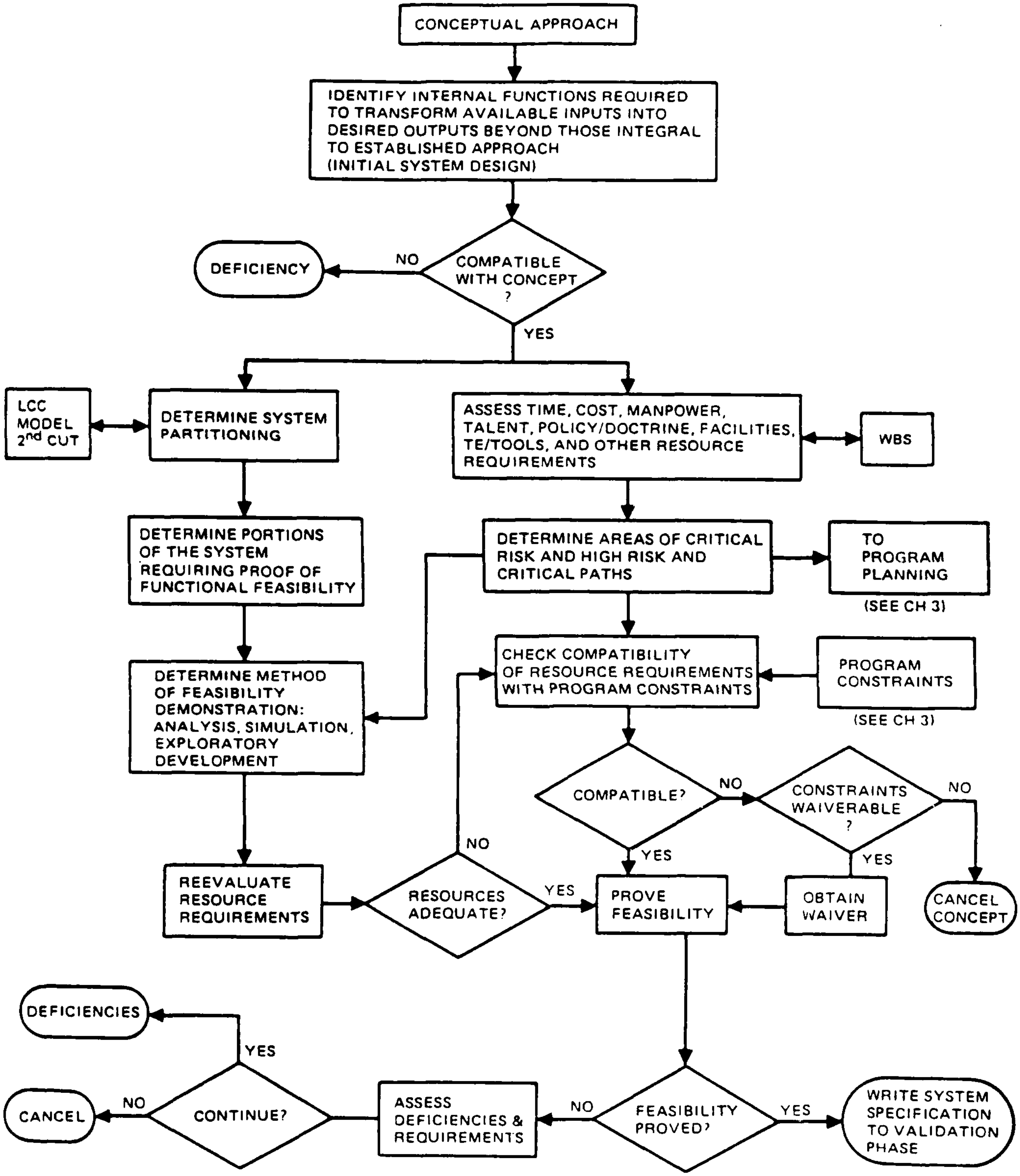


Figure 8.3. Concept formulation.

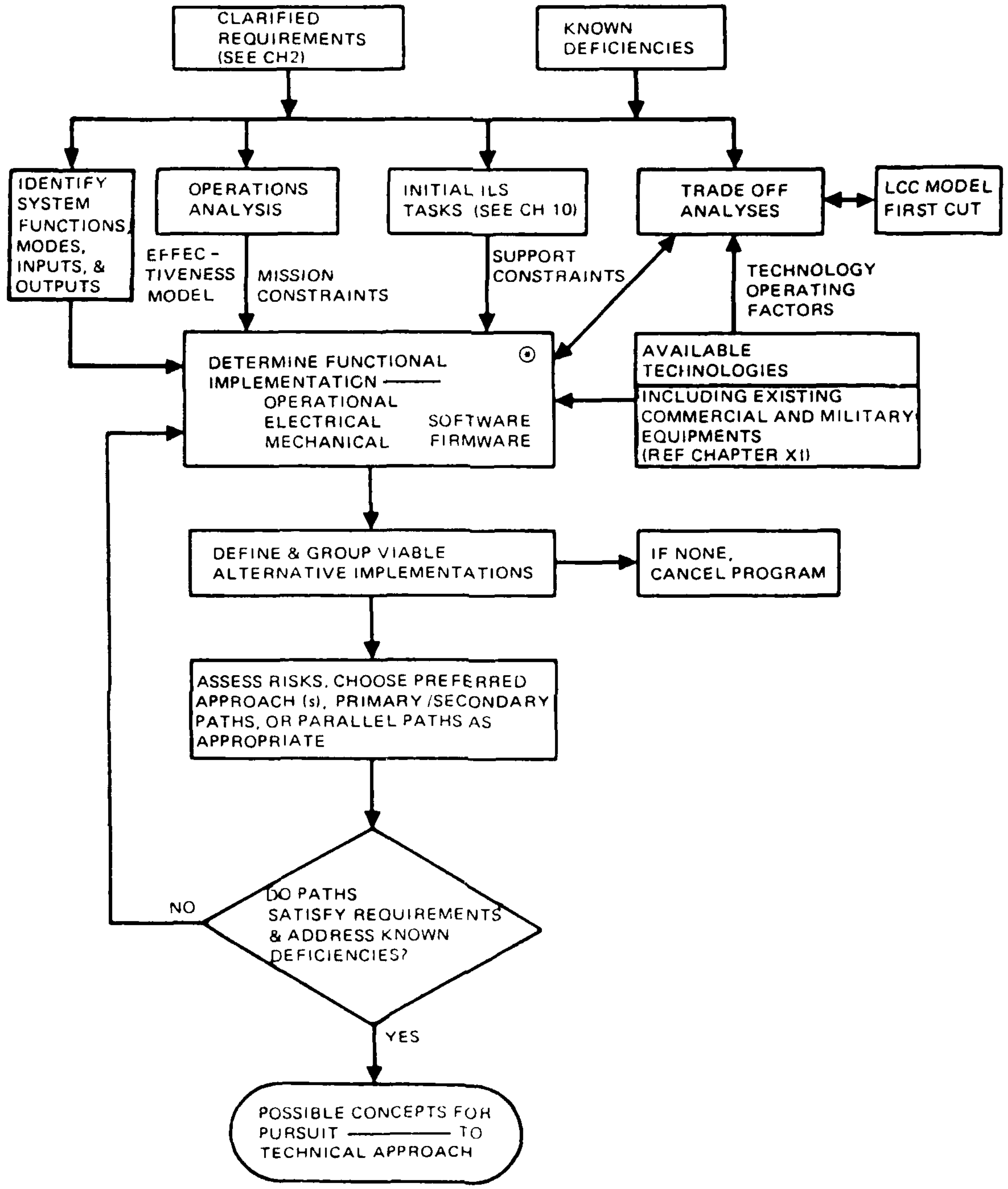
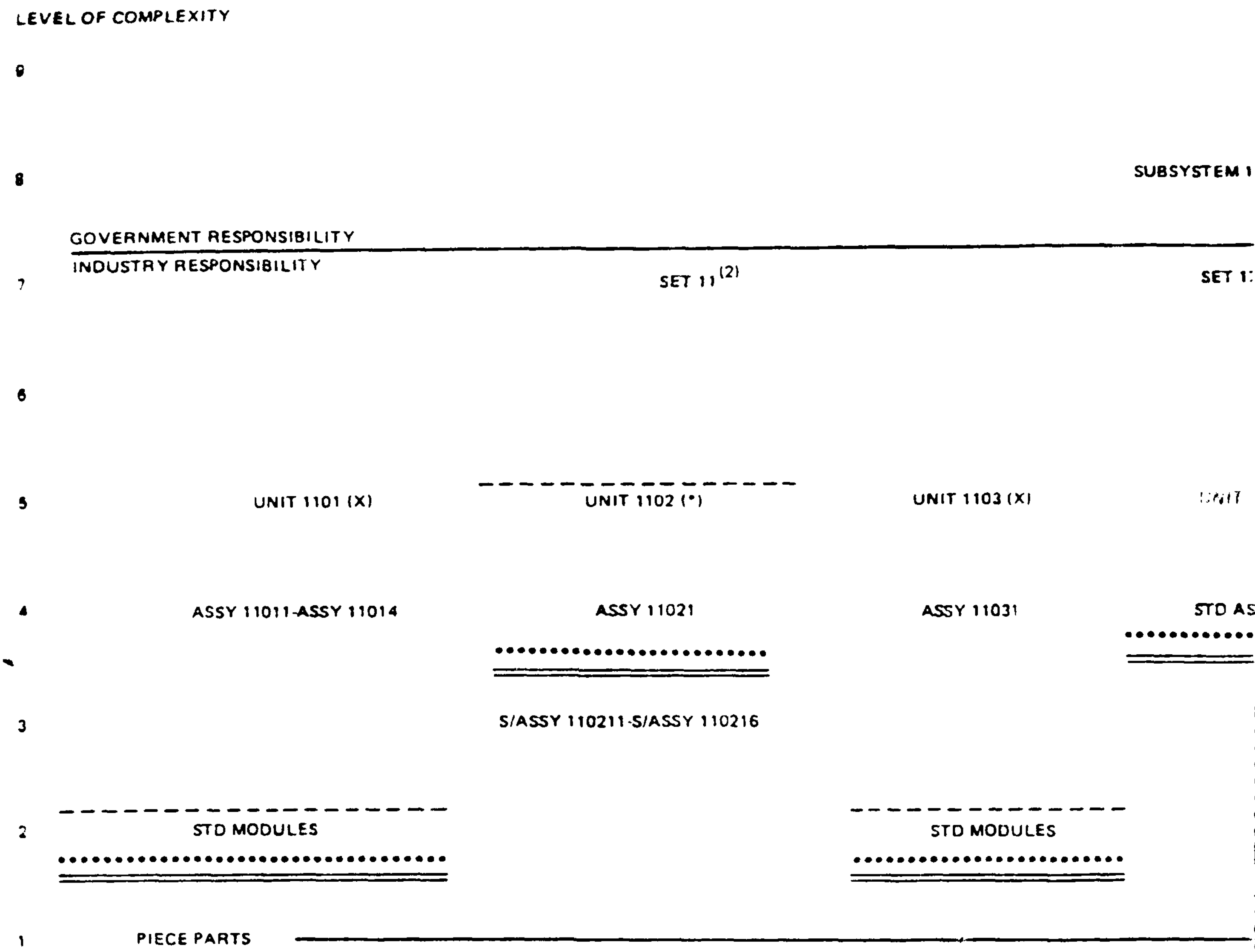
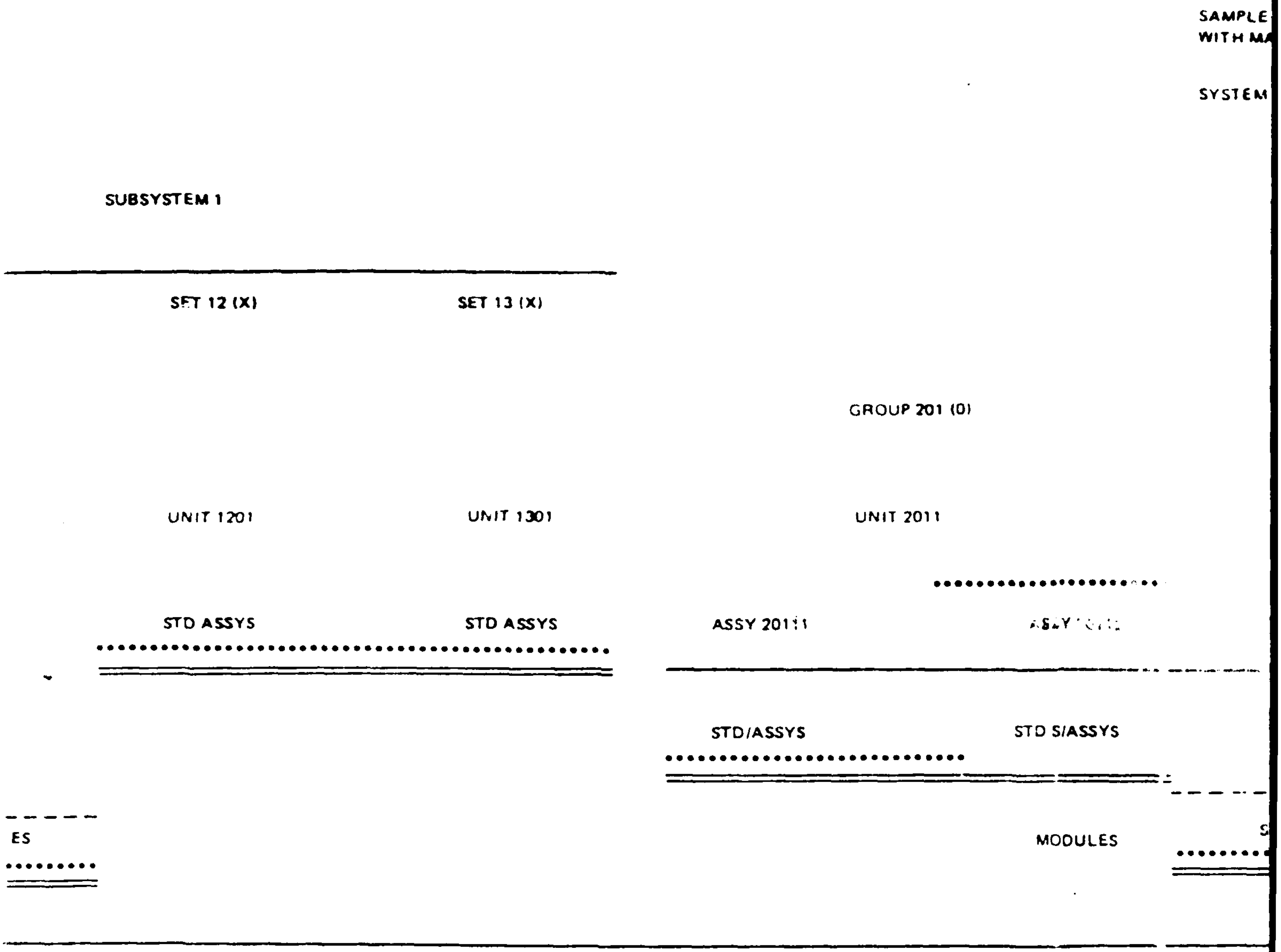
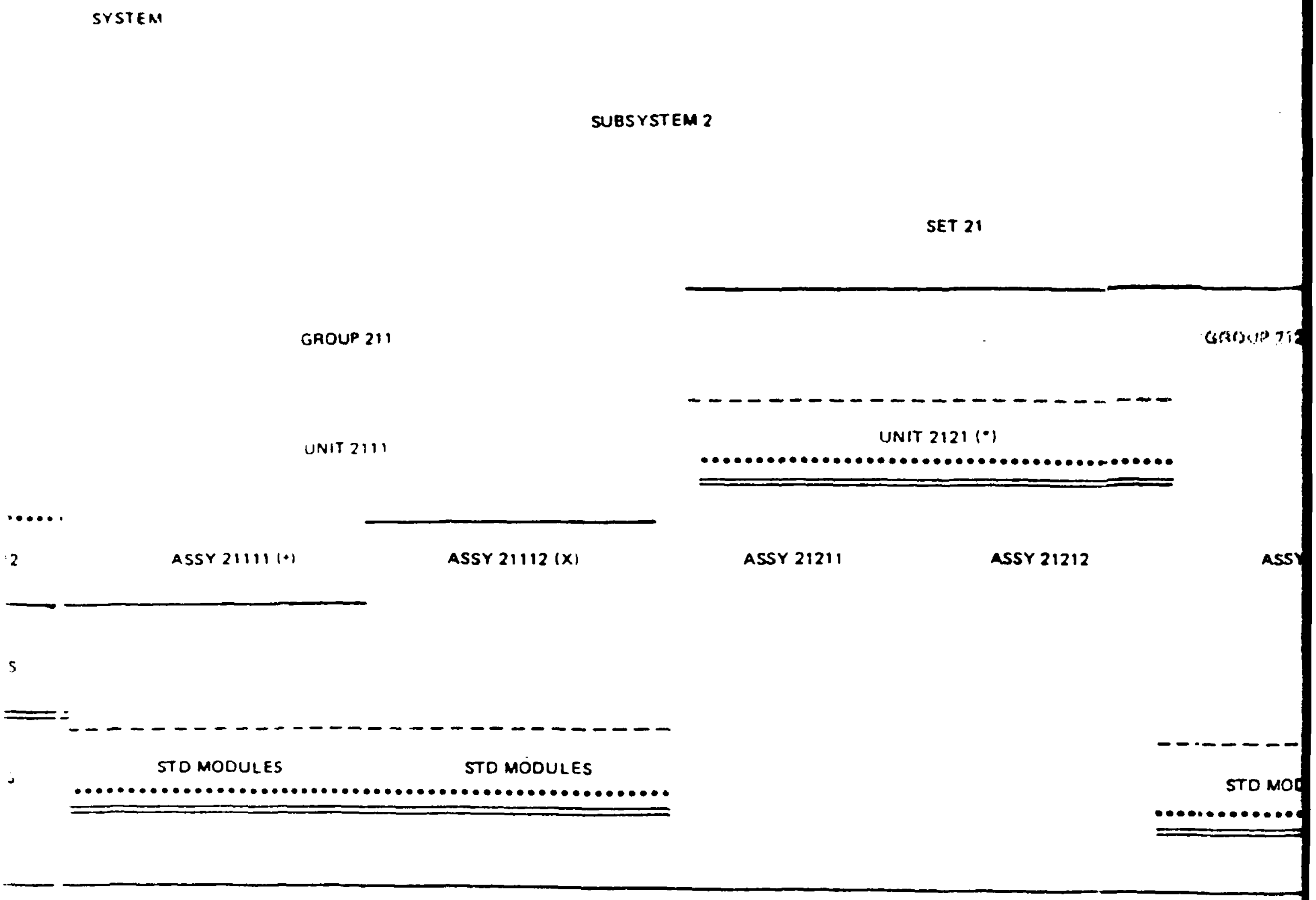


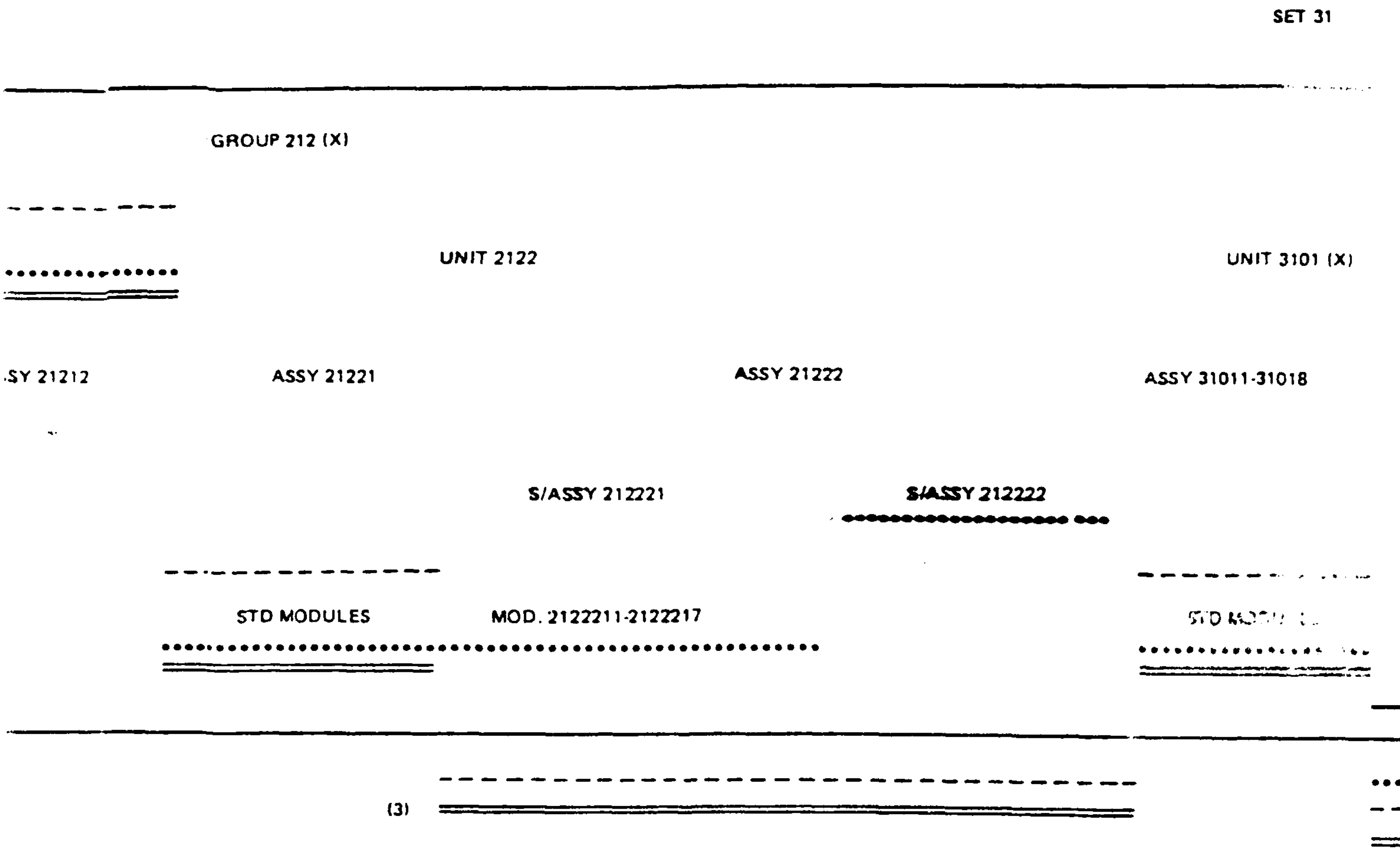
Figure 8.4. Technical approach (for each possible concept).

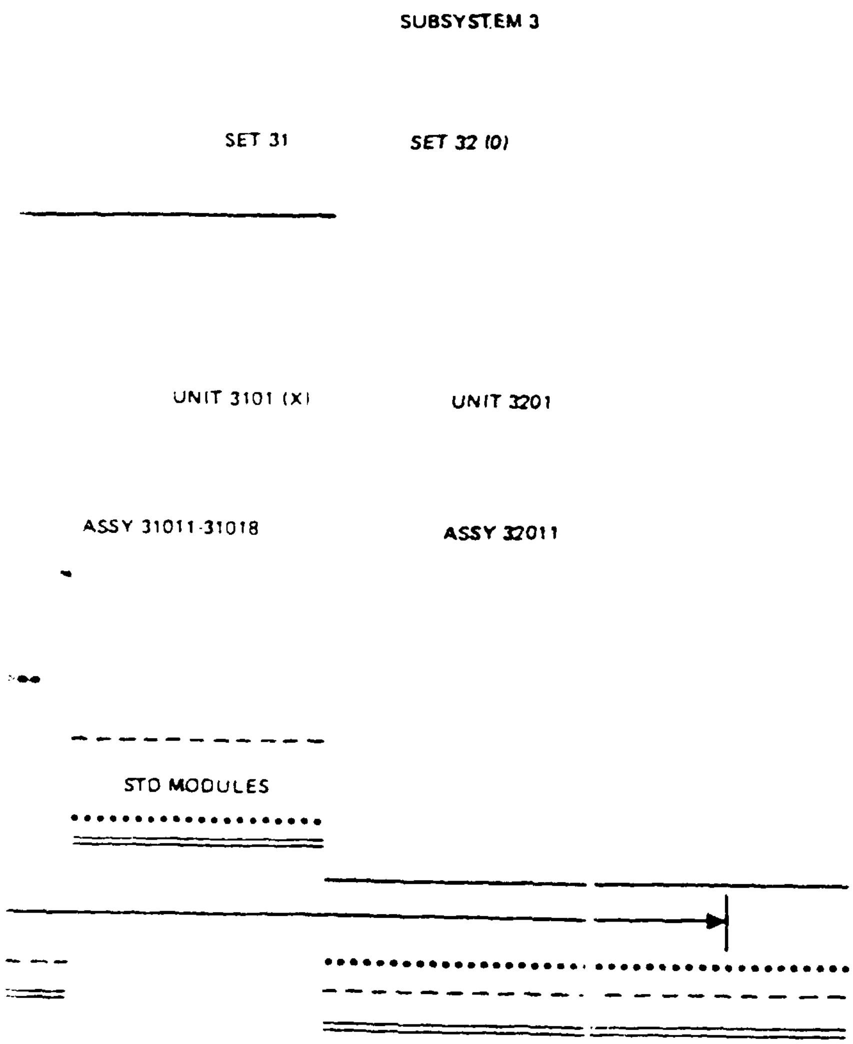

LEVEL OF COMPLEXITY
9
8
SUBSYSTEM 1
GOVERNMENT RESPONSIBILITY
INDUSTRY RESPONSIBILITY
7
SET 11(2)
SET 1
6
5
UNIT 1101 (X)
UNIT 1102 (*)
UNIT 1103 (X)
4
ASSY 11011-ASSY 11014
ASSY 11021
ASSY 11031
STD AS
3
S/ASSY 110211-S/ASSY 110216
2
STD MODULES
STD MODULES
1
PIECE PARTS


SAMPLE
SYSTEM
SUBSYSTEM 1
SET 12 (X)
SET 13 (X)
GROUP 201 (0)
UNIT 1201
UNIT 1301
UNIT 2011
STD ASSYS
STD ASSYS
ASSY 201
STD/ASSYS
STD S/ASSYS
MODULES

SAMPLE SYSTEM PARTITIONING
WITH MAJOR ISSUES RESOLVED




SET 31
GROUP 212 (X)
UNIT 2122
UNIT 3101 (X)
SY 21212
ASSY 21221
ASSY 21222
ASSY 31011-31018
S/ASSY 212221
S/ASSY 212222
STD MODULES
MOD. 2122211-2122217
(3)



NOTES: (1) THE LEVEL OF DESIGN OWNERSHIP DET
EVERY DESIGN CHARACTERISTIC ABOVE TH
AND FUNCTIONALLY DESCRIBES THE ITEMS

(2) THE TWO COMMERCIAL UNITS ARE PRO
BY A CONTRACTOR AND INTEGRATED INTO
ITEM WITHIN THE CONTRACTOR'S TASKED
RESPONSIBILITY. IF UNIT 1102 WERE SUPPL
THE GOVERNMENT WOULD ASSUME INTEG
RESPONSIBILITIES FOR SET 11.

(3) THIS PORTION OF
NUMBER OF SYSTEM
REQUIRE CLOSE CONFIGURATION

(4) THE LEVEL OF STANDARDIZATION IS SE
CONFORM TO THE LOWEST OF LOR OR LOD
EACH PARTITION ABOVE THIS LEVEL IS
CONTROLLED BY A FUNCTIONAL SPECIFICA
FOR STANDARDIZATION PURPOSES.

——— GOVERNMENT/INDUSTRY
INTEGRATION

- - - - - 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 ma

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

(O) IN-HOUSE DEVELOPED

Figure 8.5 Sample system partitioning with major issues resolved 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 which the test director and the systems engineer resolve together.

8.4 ACTION ITEMS

a. Select and involve a chief systems engineer in the proposal stage and carry his 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

*Excerpted and adapted from NOSC TD 108.

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.

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 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

[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

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 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 his tasks, the project manager will draw on expert assistance from many functional areas and will establish lines of organization control which will allow him to manage efficiently. In general, he has 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.

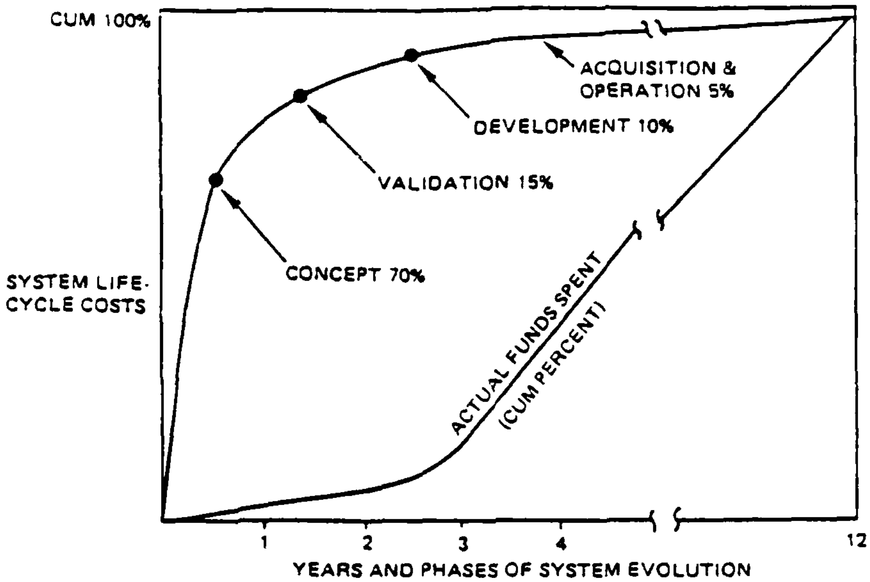


Figure 8.6. Systems funds committed by initial planning decisions.

The project organziation 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 manager should assume that he is fully responsible for meeting his project goals and he should assume all the authority that he is allowed by law and by his supervision to meet his reponsibilities. Within the project organization, he will clearly assign responsibilities, delegate appropriate authority, and hold accountable each responsible individual. The key to his success will often be his authority and his ability to exercise and delegate it. Outside the project, the manager should elicit the cooperation of those who have authority above him, to ensure that he is backed up by keeping his chain of command informed truthfully, concisely, and 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 the manager knows what he 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 a manager has a problem, he has basically two methods available to solve it; the important thing is that the decision be made.

PROBLEM SOLVING

Classical Method	Scientific Method
1. What is the problem?	1. Define the problem
2. What are the alternatives?	2. State objectives
3. What is the best alternative?	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.

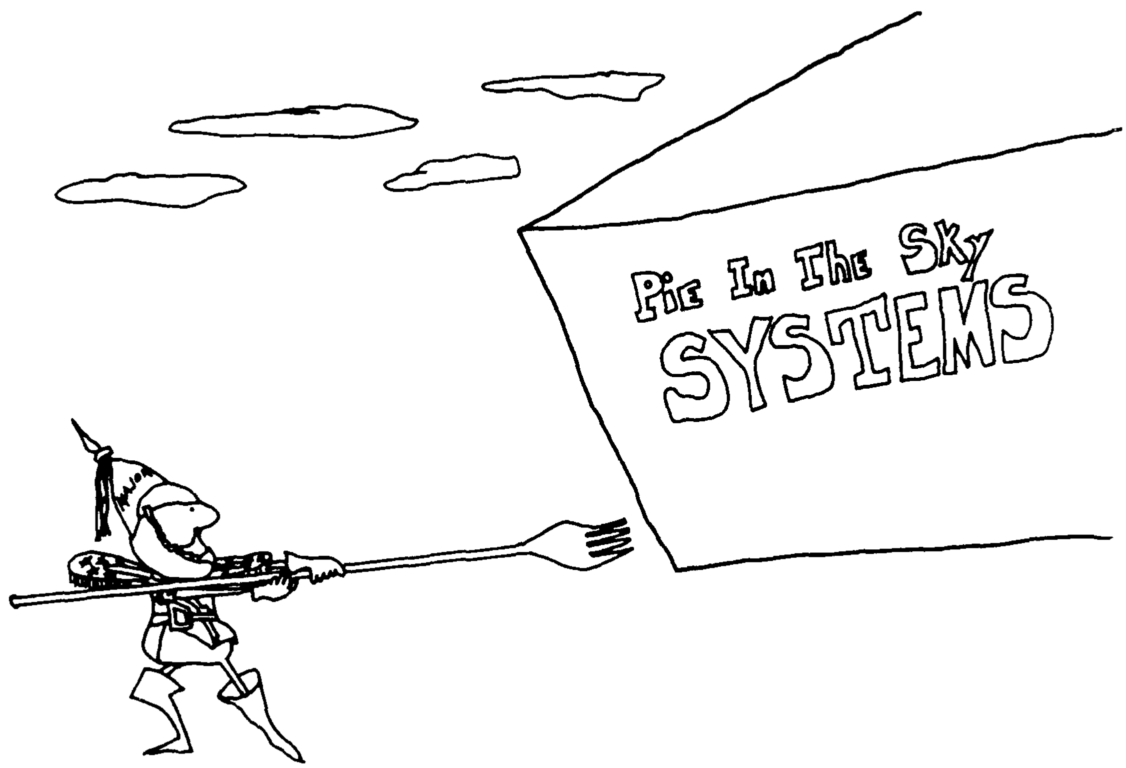
The solution should be kept in perspective by asking, "Is it adequate?" and "Is it too elaborate?"

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 his 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 his own project and also related projects. In knowing his own project, the manager can confidently relate accurate information to his 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 men 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 the manager as he weaves his project's course through instructions, budgets, specifications, and the like to a successful implementation in the Fleet.

MAJOR SYSTEMS ACQUISITION 9



CONTENTS

SECTION 9
MAJOR SYSTEMS ACQUISITION

Dr. Julius Hein*

9.1 INTRODUCTION

9.1.1 References

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

9.1.2 Outline

- Introduction
  - References
  - Outline
  - Summary
- The World of Program Management
  - The Role of the Program Manager
  - Service Responsibility
  - Judgment and Flexibility
  - Functional Support
  - Engagement and Disengagement
  - The Soft Sell
- Defense Communique on Defense Acquisition Management
  - Management Philosophy
  - Funding Distinctions
  - Organization of DoD Acquisition Management
  - Oversight
  - DSARC
  - Other Management Issues
  - Joint Requirements and Management Board
- The Department of Defense Organizational Structure
  - Introduction
    - Department of Defense
    - Office of the Secretary of Defense
    - Military Departments
    - Joint Chiefs of Staff
    - Armed Forces Policy Council
    - Unified and Specified Commands
    - Inspector General of the Department of Defense
    - Defense Agencies
    - OSD Field Activities
    - Uniformed Services University of the Health Sciences

*Defense Systems Management College, St. Louis, Missouri.

Organizations and Functions—Office of the Secretary of Defense
Immediate Offices of Secretary and Deputy
Secretary of Defense
Under Secretary of Defense (Policy)
Under Secretary of Defense (Research and Engineering)
Assistant Secretary of Defense (Controller)
Assistant Secretary of Defense (Manpower, Installations, and Logistics)
Director of Operational Test and Evaluation
Director, Program Analysis and Evaluation
Appendix 9A Navy Acquisition Process

9.1.3 Summary

See below.

9.2 THE WORLD OF PROGRAM MANAGEMENT

9.2.1 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 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. He has the vantage of a large perspective of the program and the interrelationships among its elements. He 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. He does one thing at one time and another thing at another time—whatever is most needed at the moment to achieve his objectives. A general manager is not a "doer" of any job—there are other managers charged with the doing. But the general manager sees to it that what he wants is done, and what he wants is a harmony of things done so that his 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.

9.2.2 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 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 shal 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.

9.2.3 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 the program manager is the agent of the Service, he should operate in an environment in which he selects and tailors to the specific needs of his program those management systems and formal techniques that will help his program. He should operate in an environment conducive to the exercise of judgment. There is no pet formula a program manager can adopt. He must decide for himself what methods, techniques, and systems he will use. If the program manager is responsible for planning, directing, and controlling a program, he 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 his program. In turn, he has a right to expect that those in the Services who are going to approve his management plans and techniques will exercise their power of approval properly. That is to say, his plans and techniques will be accepted as satisfactory if they comply with basic policy directives. He has a right to expect that his plan 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 the program manager has a right to expect and what in fact he 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 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.

9.2.4 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 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, the program manager finds less responsiveness than he desires from the functional elements. His situation is made even more difficult because the functional elements were there long before his program started and they plan to be there long after his 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 his influence, force his 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 his resources at a greater rate than he would otherwise. The program manager's role is to balance this risk over all portions of the project. Therefore, he must have authority to move quickly to balance his 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 assurance he needs, he should relax his control and concede to his contractors a measure of freedom to exercise judgment and flexibility similar to that which he seeks for himself.

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.

9.2.5 Engagement and Disengagement

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

Much has been written about the role of industry and the relationship that should obtain between the defense program manager and his 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. The program manager cannot disengage in any literal sense. He must manage contracted work in just the same sense as he manages all the other parts of

* 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.

his program. More precisely, in this case he manages contractor management of his program. It is not a question of whether he manages; it is only a question of how he manages—or mismanages.

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.*

9.2.6 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.

The program manager who has done his homework and has kept key people informed about his system's programs and progress will improve the odds that funds for his program will not be reduced. We are not suggesting that a program manager affect a hard-sell stance or that he 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.

The program manager must keep in touch with what is going on above him. He has to be aware of what is expected of him by higher authority—both in his Service and at the OSD level. He should know the typical questions being asked at major program review points, and he 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 manager has this rapport with his superiors, he 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.

9.3 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.)

9.3.1 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 manhours 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.

9.3.2 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.

9.3.3 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.

9.3.4 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.

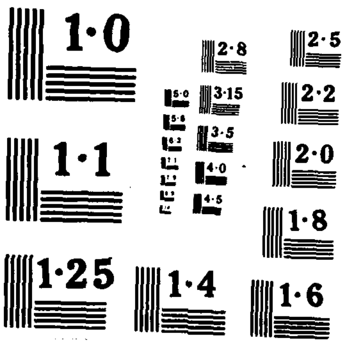
The members of this committee are doubtless aware of many of the important strides we have made in implementing various initiatives of the [Acquisition Improvement Programs (AIP)]. I won't review in detail the progress we have made through the good efforts of Ms. Gilleece and many others, but let me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

9.3.5 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.

AD-A170 075 NOSC (NAVAL OCEAN SYSTEMS CENTER) PROGRAM MANAGER'S HANDBOOK(U) NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA JUL 86 NOSC/TD-880 3/5

UNCLASSIFIED F/G 5/1 NL


1·0
2·8
2·5
3·15
2·2
3·5
1·1
4·0
2·0
4·5
1·8
1·25
1·4
1·6

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 has 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.

9.3.6 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.

9.3.7 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 each 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 micro solutions to problems which are truly macro in nature.

[Figures 9.1 and 9.2 present the life cycle of typical major system acquisitions and life-cycle costing for those acquisitions.]

9.4 THE DEPARTMENT OF DEFENSE ORGANIZATIONAL STRUCTURE

9.4.1 Introduction

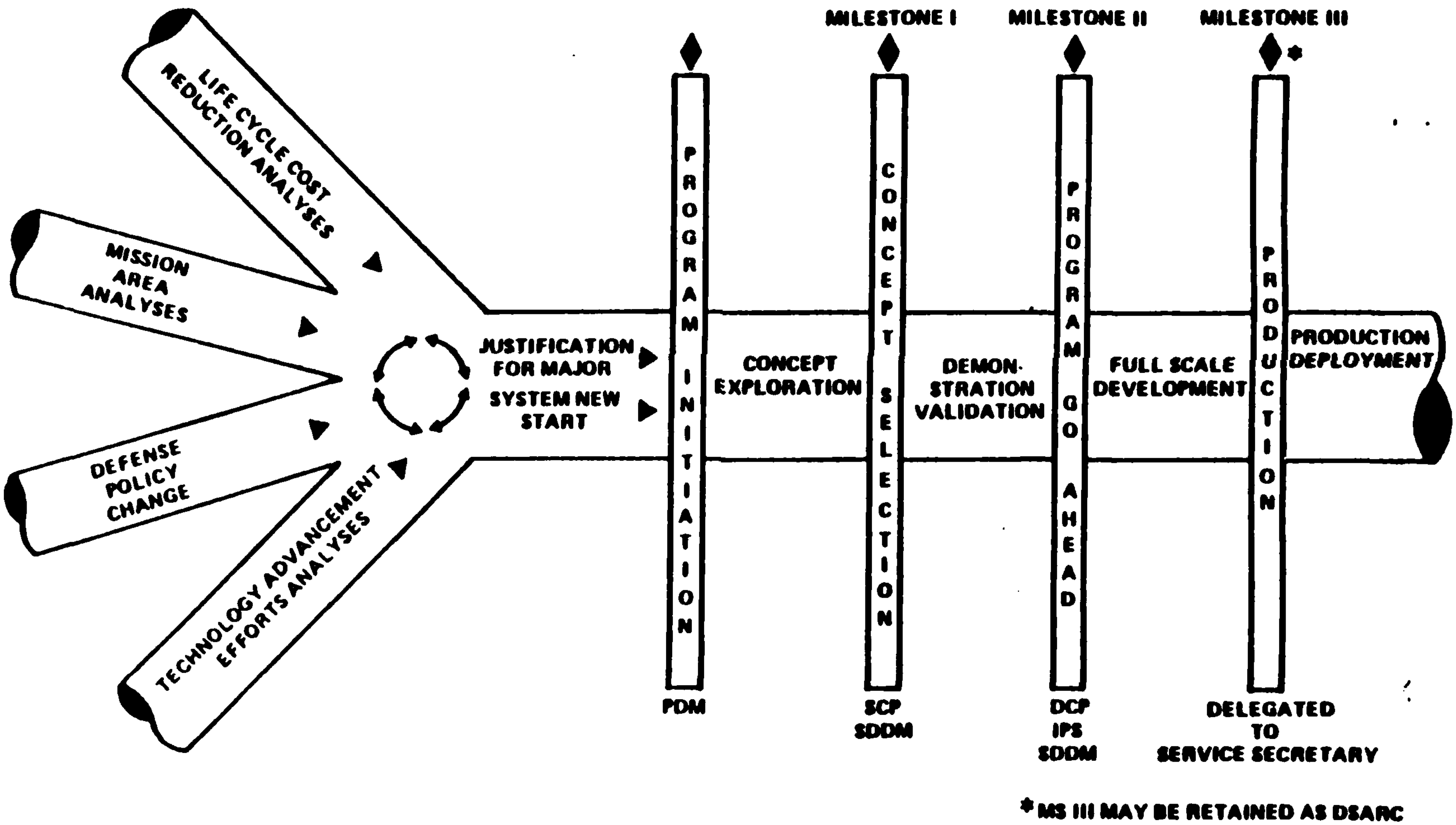


Figure 9.1. The life cycle of major system acquisitions.

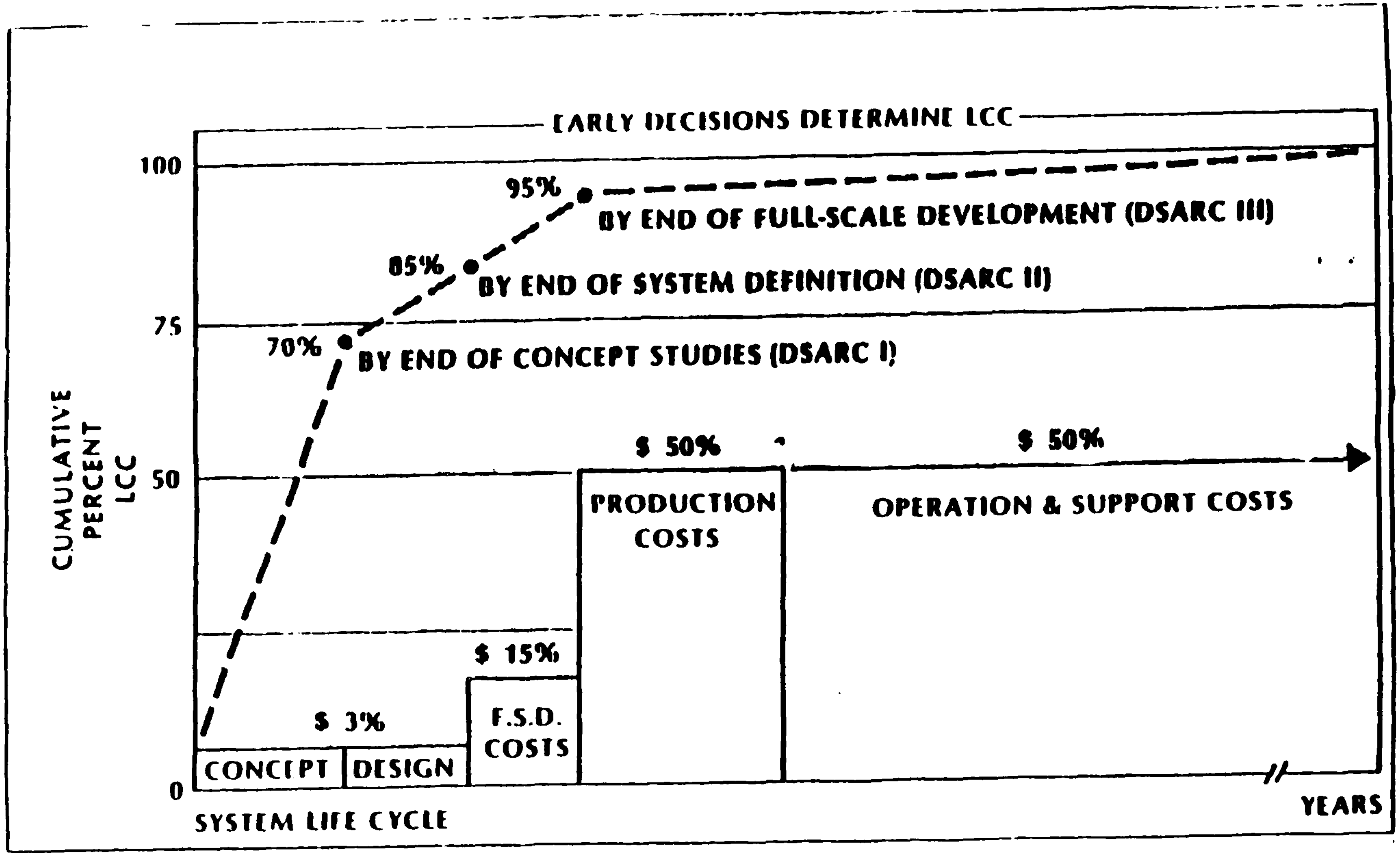


Figure 9.2. Life-cycle costing in system acquisition.

9.4.1.1 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 9.3).

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 9.1.

9.4.1.2 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 9.4). 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.

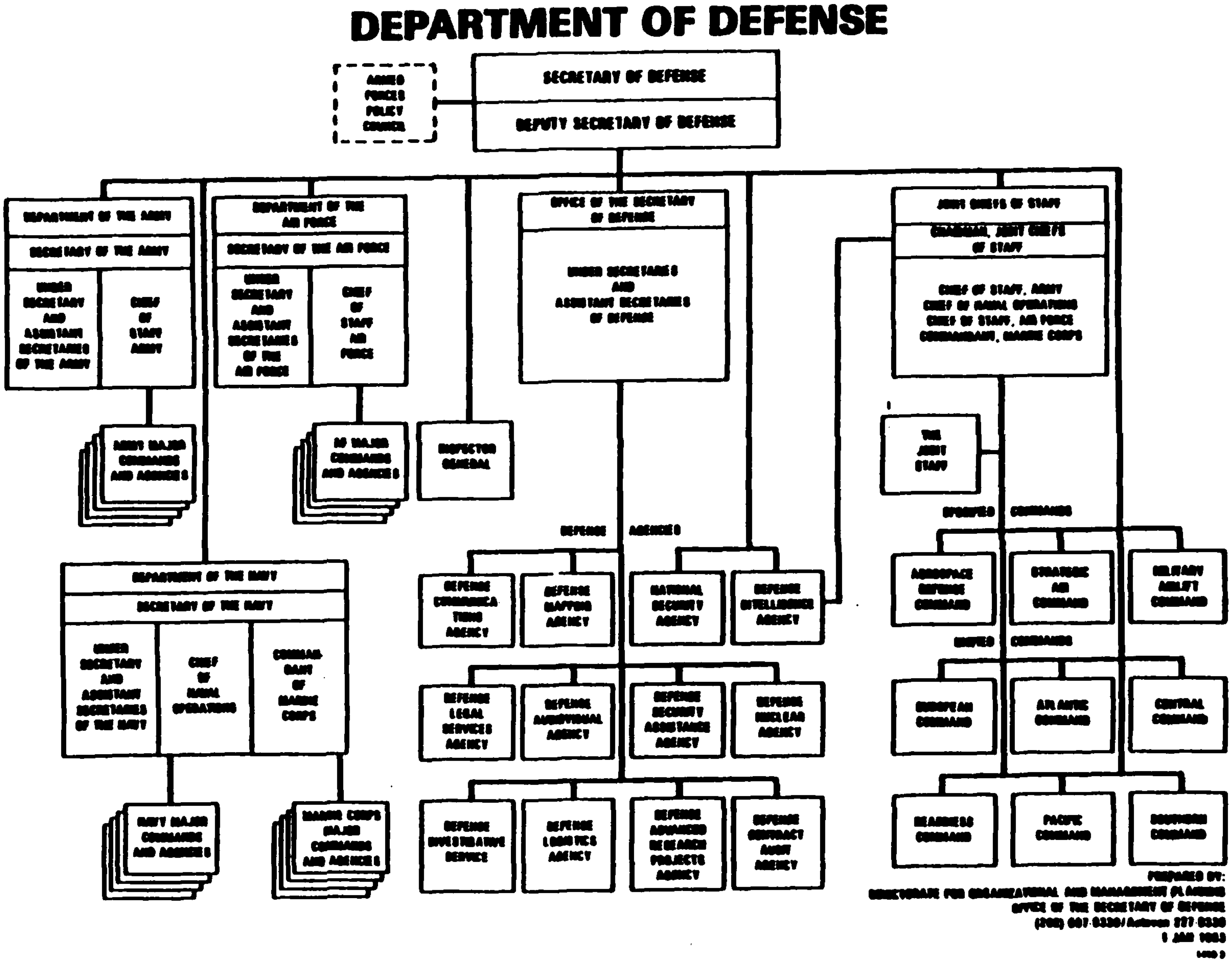


Figure 9.3. The Department of Defense.

Table 9.1 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 C2	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

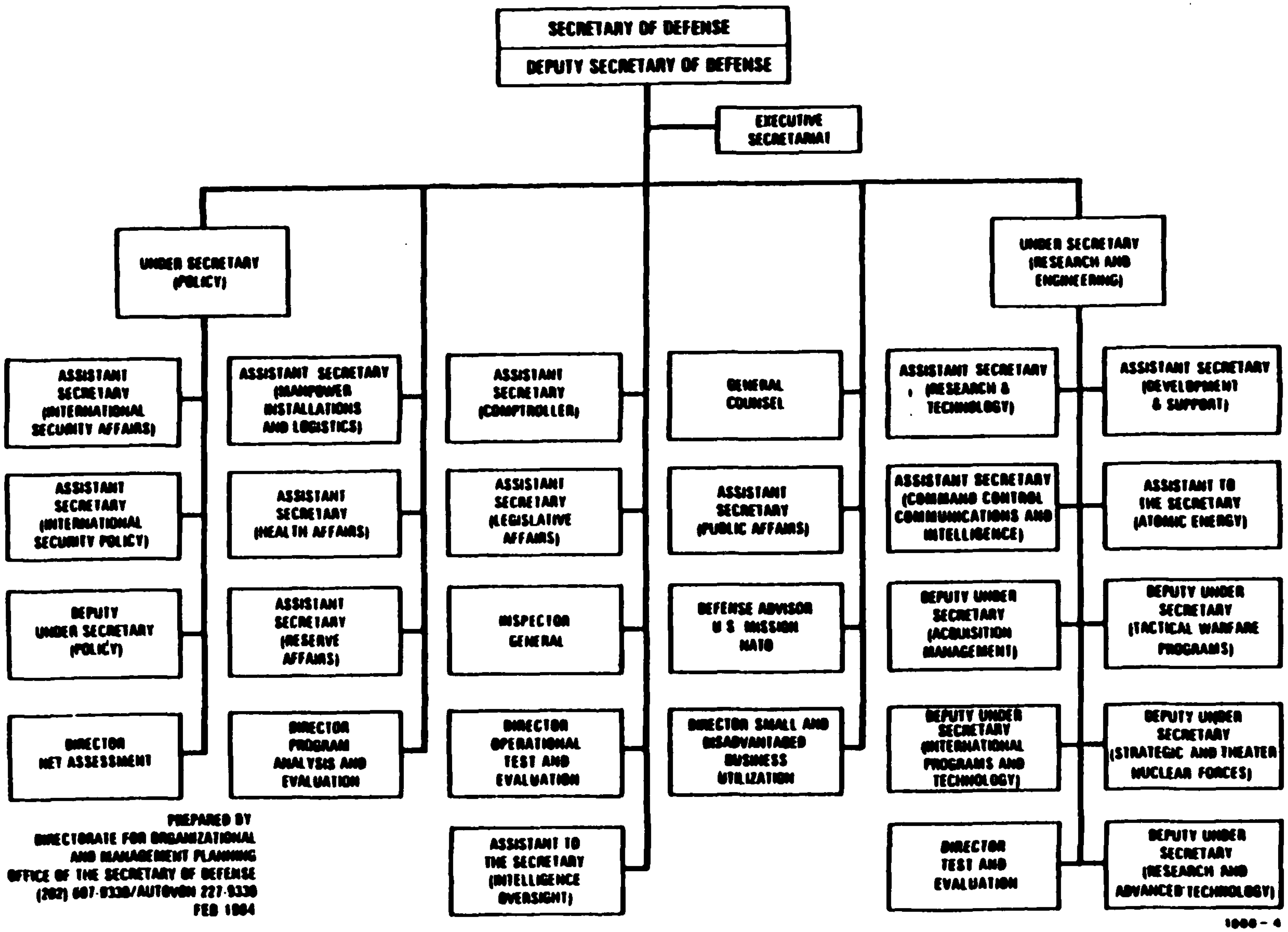


Figure 9.4. Office of the Secretary of Defense.

The organizational struture of USDRE is presented in Figures 9.5 and 9.6. 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).

9.4.1.3 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).

9.4.1.4 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.

9.4.1.5 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 below:

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.

9.4.1.6 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.

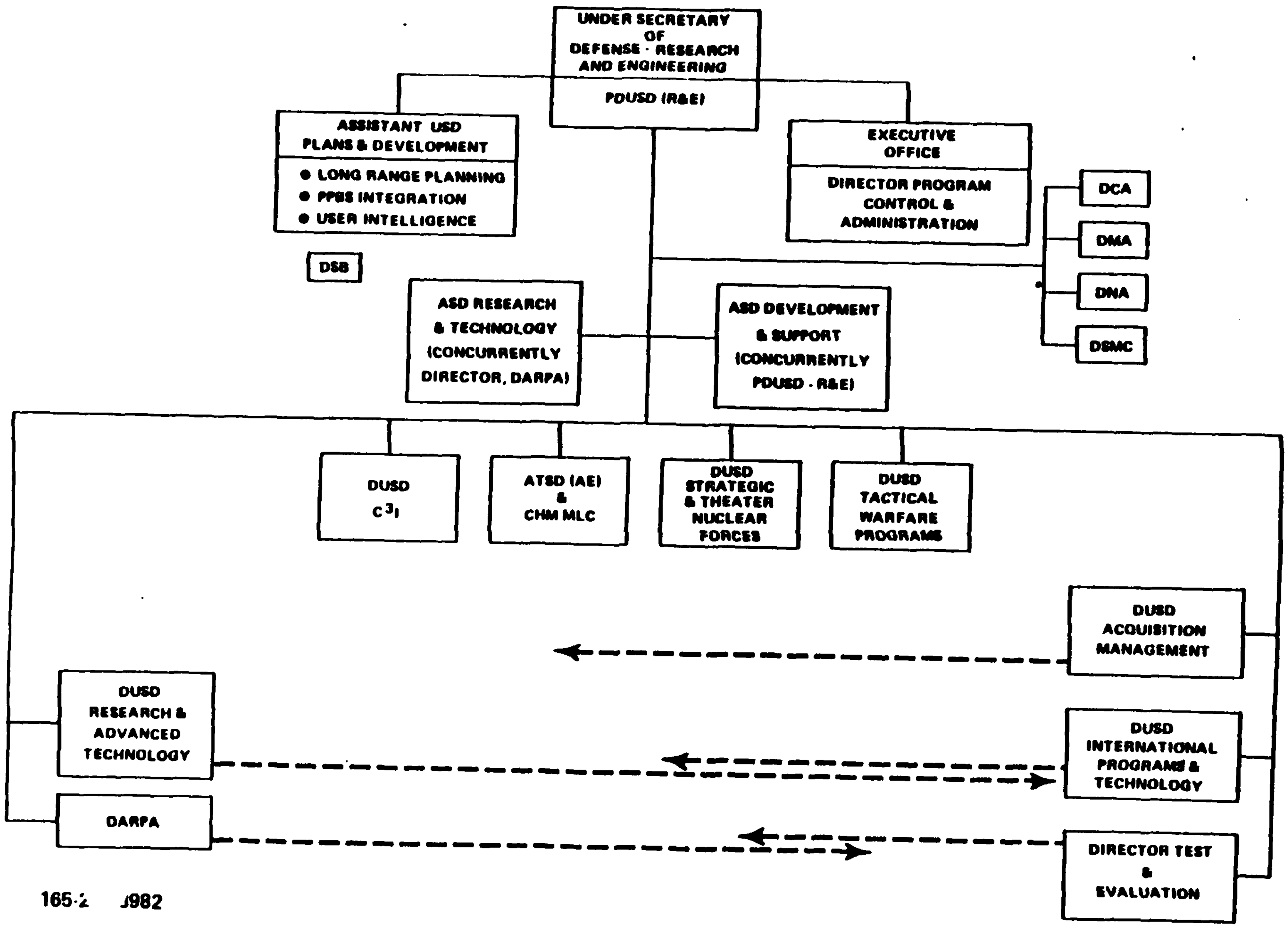


Figure 9.5. Office of the Under Secretary of Defense for Research and Engineering.

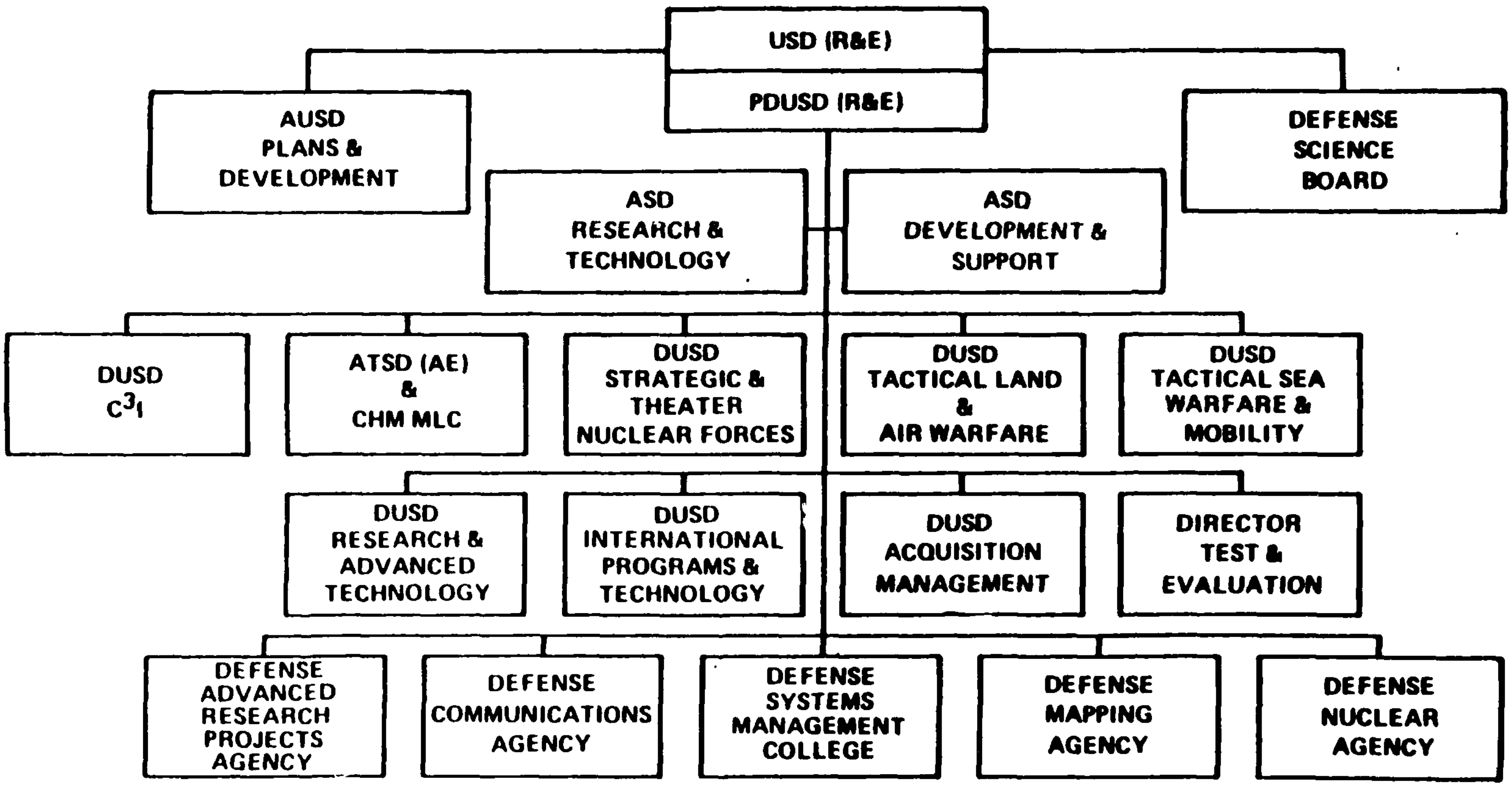


Figure 9.6. Under Secretary of Defense — Research & Engineering.

9.4.1.7 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.

9.4.1.8 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.

9.4.1.9 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.

9.4.1.10 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.

9.4.2 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.

9.4.2.1 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.

9.4.2.2 **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.

The above 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.

9.4.2.3 Under Secretary of Defense (Research and Engineering) (USDRE) (DoD Directive 5129.1). 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 the following:

Defense Advanced Research Projects Agency

Defense Communications Agency

Defense Mapping Agency

Defense Nuclear Agency.

9.4.2.4 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 the following:

Defense Contract Audit Agency

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

9.4.2.5 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 the following:

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.

9.4.2.6 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.

9.4.2.7 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 9A

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)

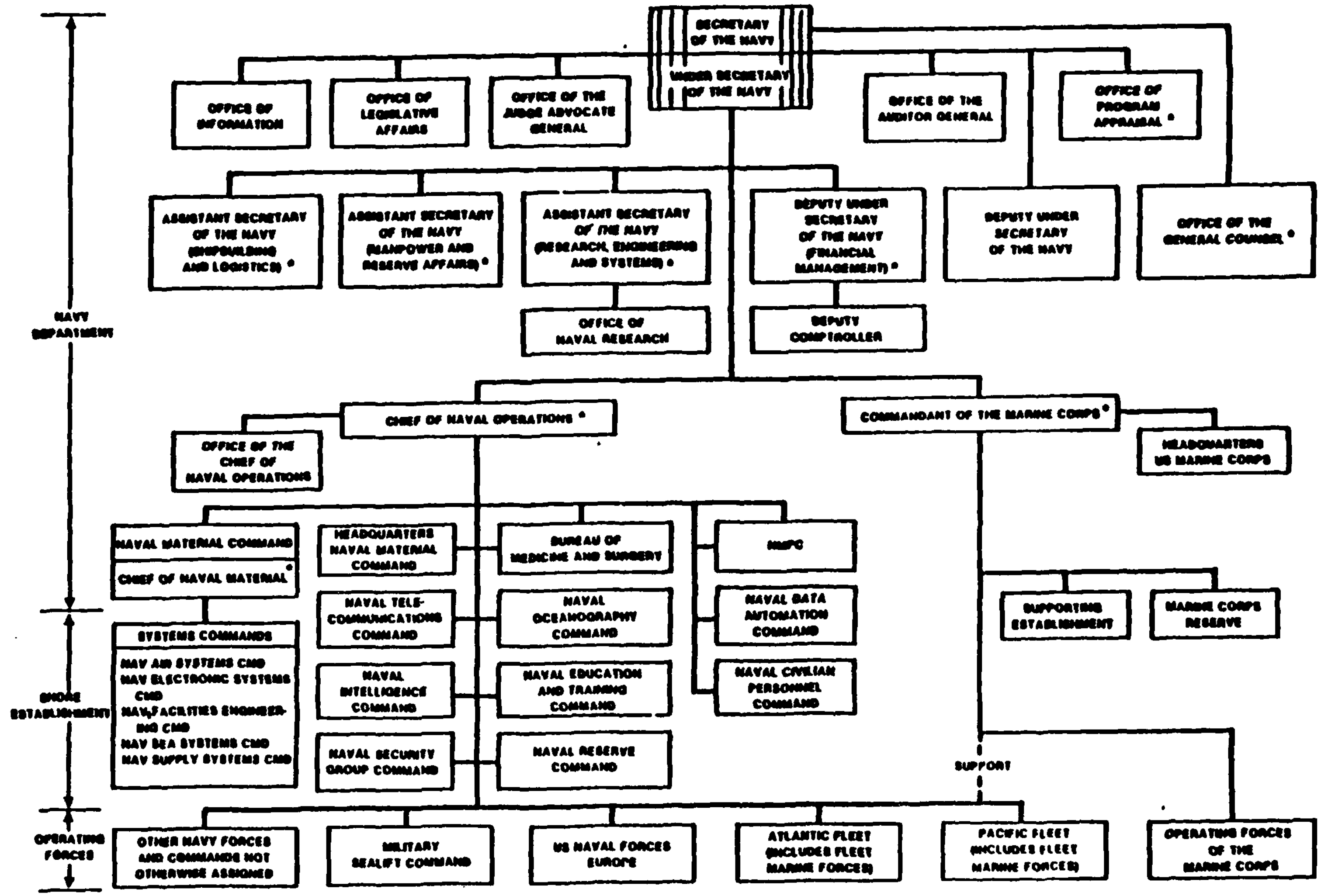
NAVY ACQUISITION PROCESS

	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



138.127 '7

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*

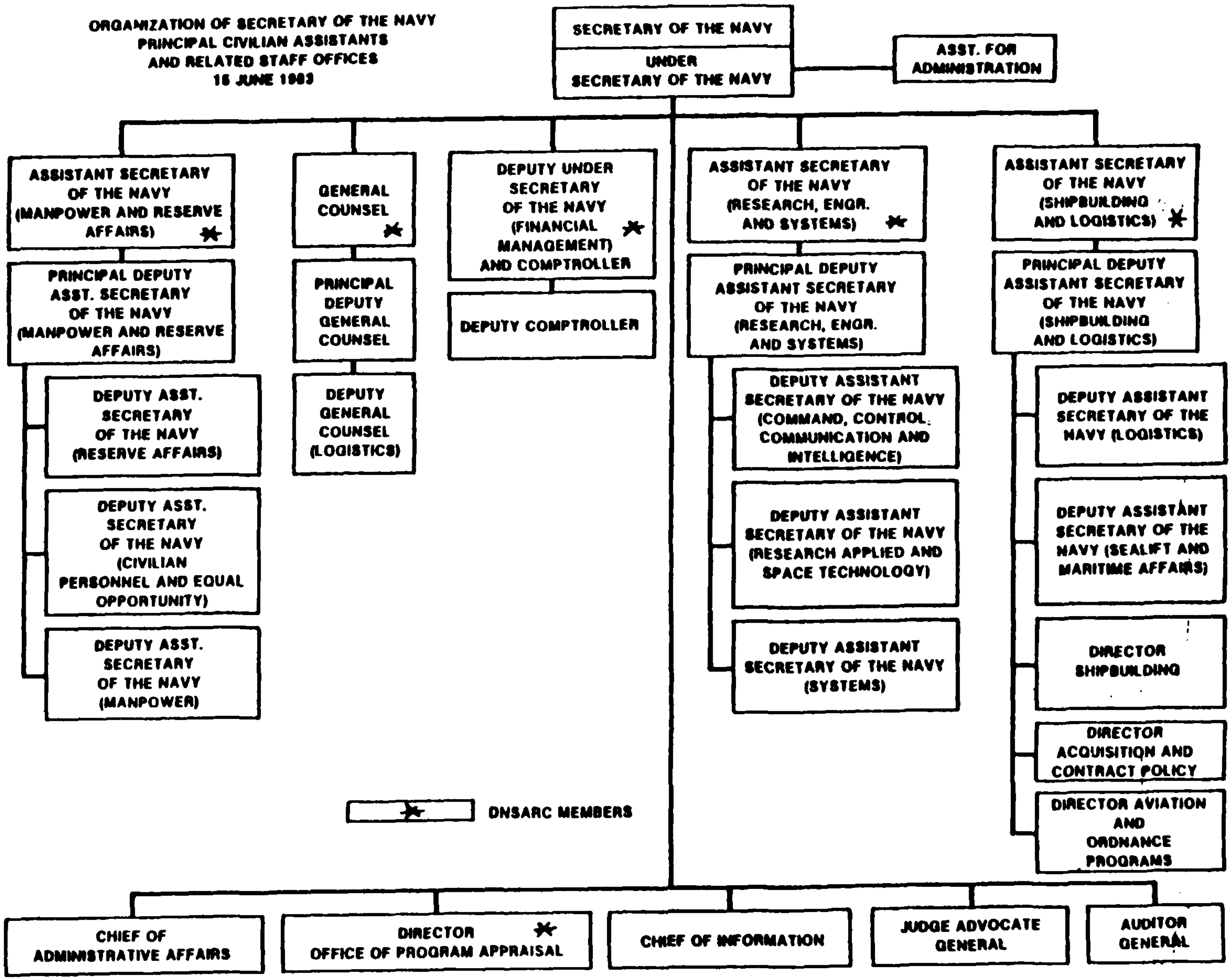
Membership:

- 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.

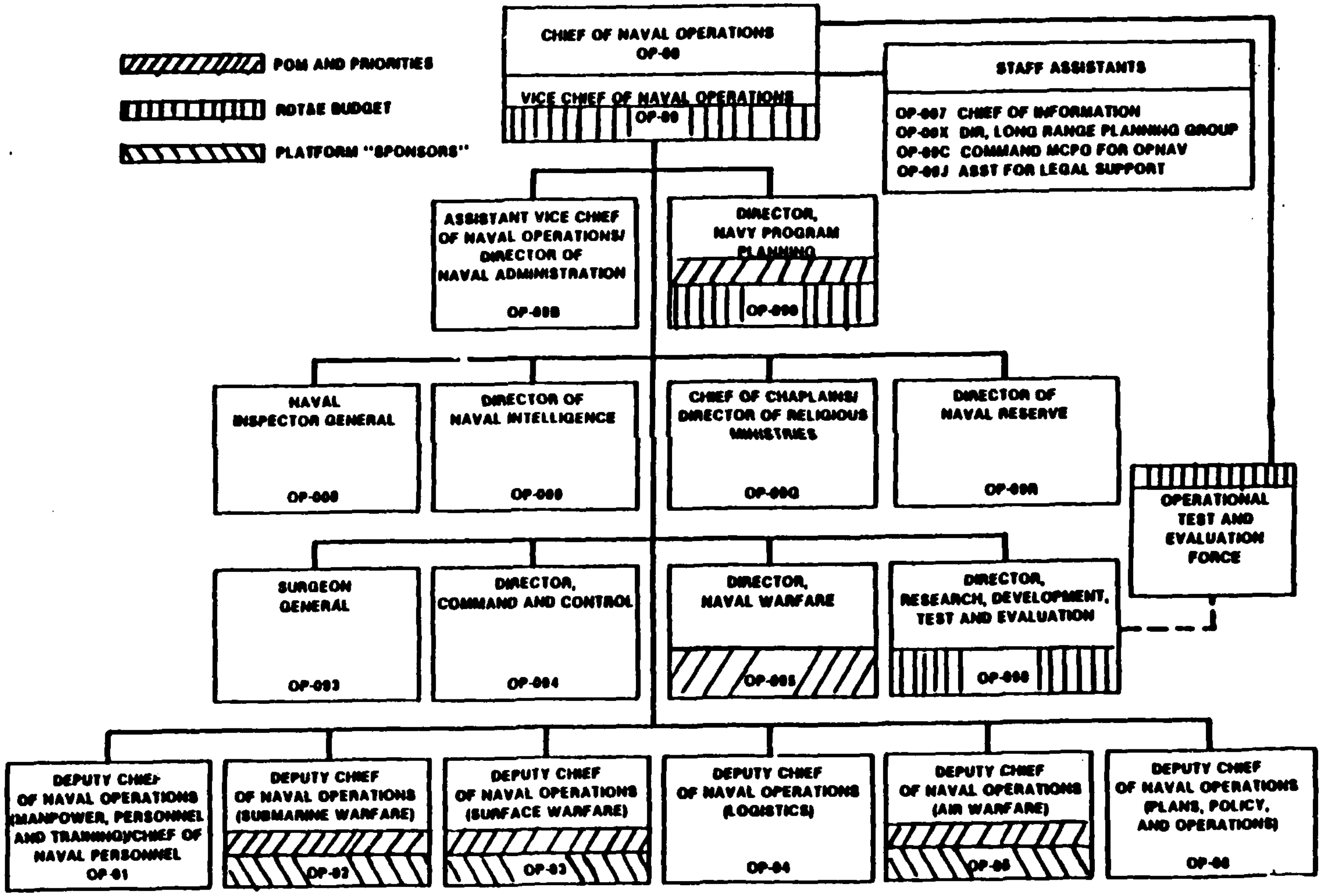
138.1251.5680

ORGANIZATION OF SECRETARY OF THE NAVY
PRINCIPAL CIVILIAN ASSISTANTS
AND RELATED STAFF OFFICES
15 JUNE 1983



130.1258.5907

OFFICE OF THE CHIEF OF NAVAL OPERATIONS



138.126

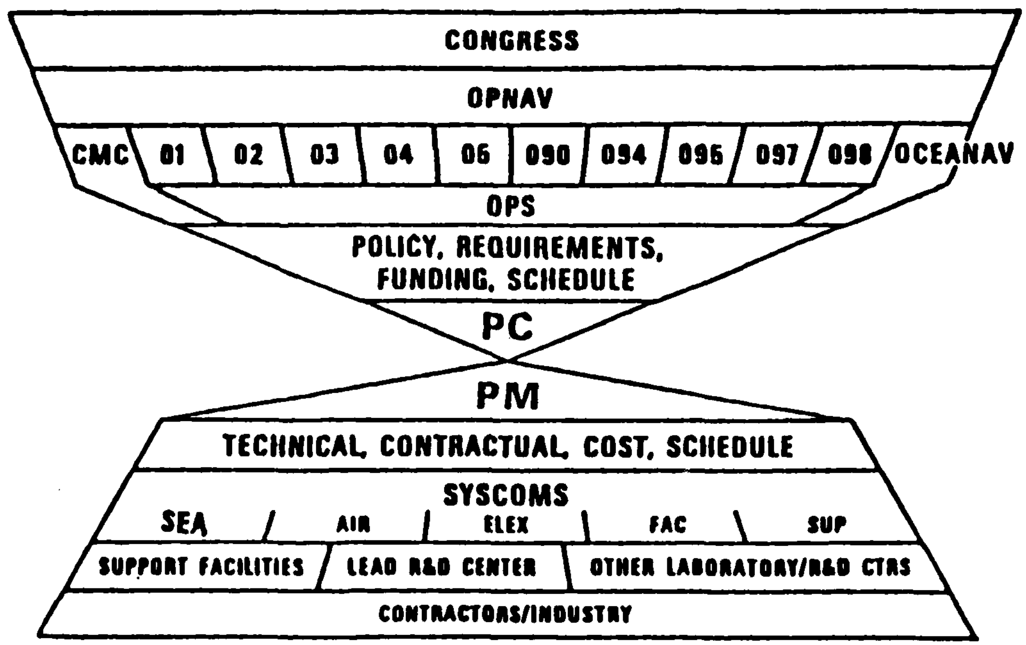
PROGRAM COORDINATOR

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

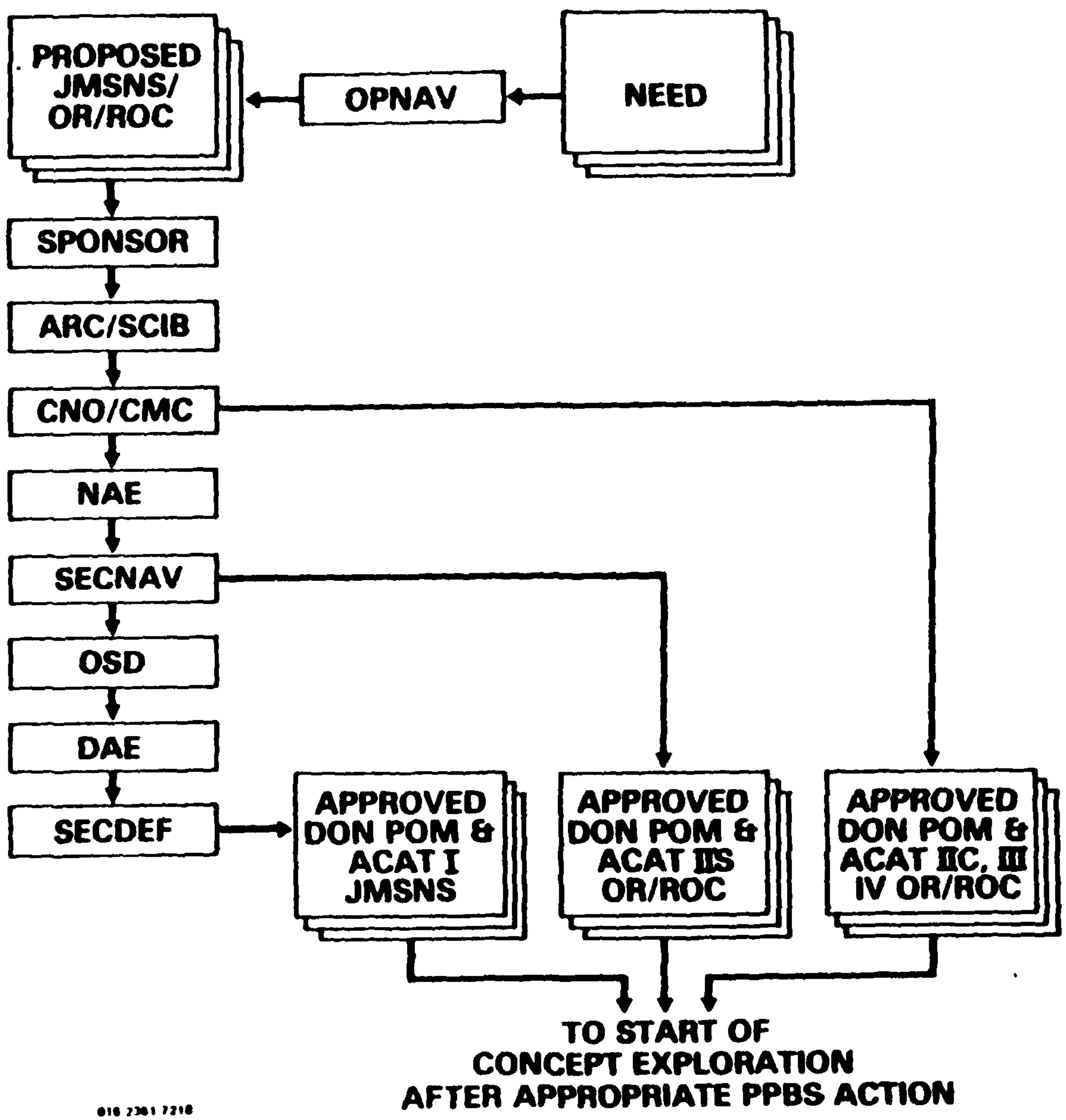
* KNOW YOUR PC

* KEEP HIM/HER INFORMED

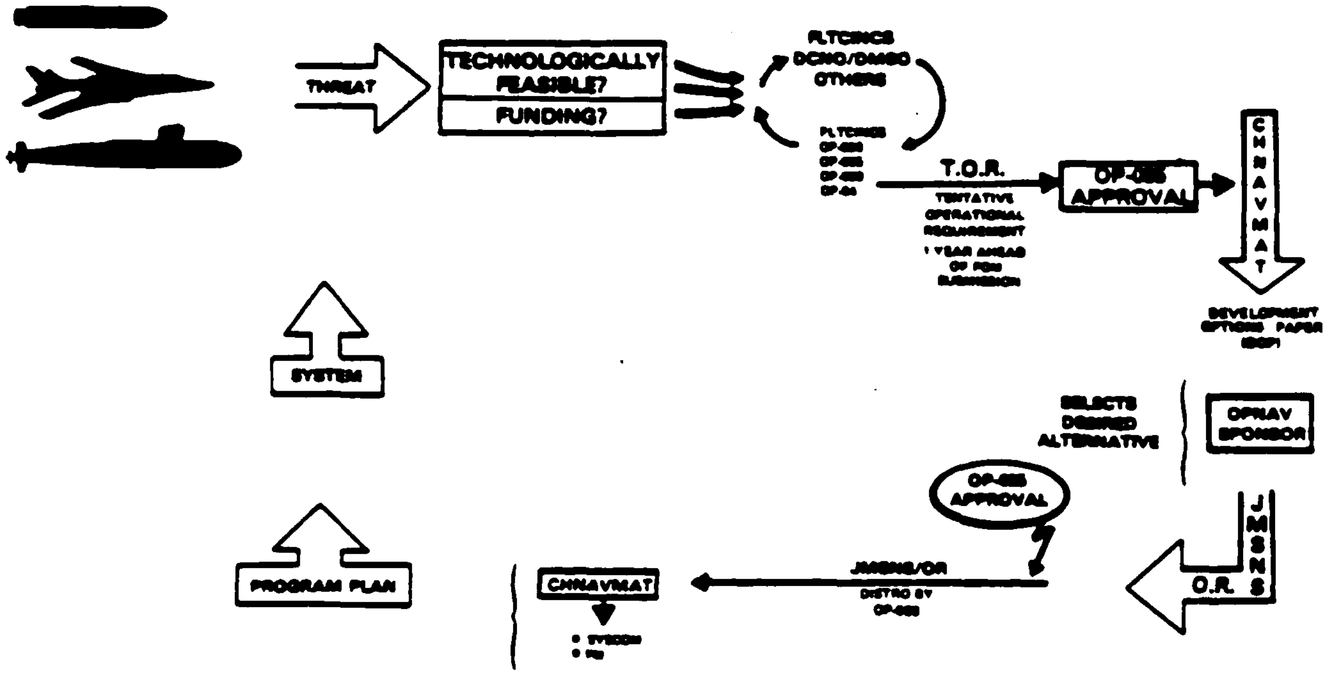
THE PROGRAM COORDINATOR/PROJECT MANAGER INTERFACE



NAVY MISSION NEED REVIEW AND APPROVAL



NAVY PROGRAM INITIATION PROCEDURES (OPNAVINST 5000.42)



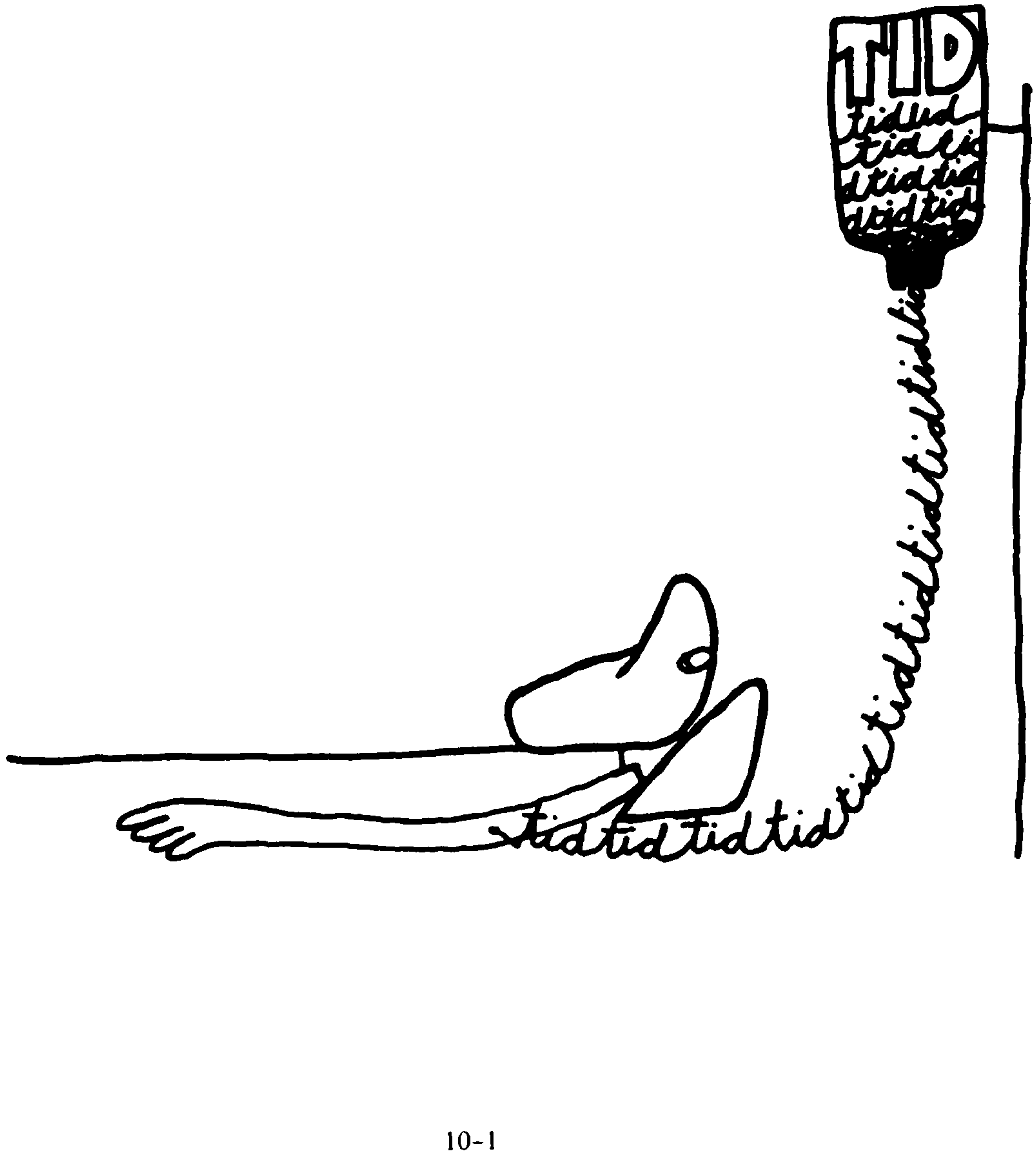
245.1648.6580

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

TECHNICAL INFORMATION SUPPORT 10



CONTENTS

SECTION 10
TECHNICAL INFORMATION SUPPORT
H. Blanchard, Code 96

10.1 INTRODUCTION

10.1.1 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 3150.1, Photographic Operations and Material Control

NOSCINST 3150.2, Photographic Operations and Material Control

NOSCINST 3150.3, AV Equipment Pool

NOSCINST 3158.1A, Presentation Aids

NOSCINST 5290.1, Photographic, Video and Audiovisual Operations and Material Control (will supersede the above 3150 series)

OPNAVINST 5290.1, Navy Audiovisual Management and Operations Manual

NOSC TD.220, A Guide for NOSC Presentation Graphics

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

10.1.2 Outline

Introduction
  References
  Outline
  Summary
Publication Requirements
  Documentation Requirements
    Research and Engineering
    Technical Manuals
  Distribution Requirements
    Distribution Statements
    Research and Engineering
    Technical Manuals
  Planning for Publications
    Research and Engineering
    Technical Manuals
  Contract Requirements
    Research and Engineering
    Technical Manuals
Audiovisual Support
  Visual Media Definitions
  Visual Documentation
  Visual Media Products and Services
  Guidelines for Viewgraphs
  Planning Considerations for Visual Media
  Contacts for Assistance
Technical Library Services
  Library Collections
  Acquisitions Policy
  Library Access
  Reference/Literature Search Services
  Library Publications
  Special Projects and Services
Effective Presentations

10.1.3 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.

10.2 PUBLICATION REQUIREMENTS

10.2.1 Documentation Requirements

10.2.1.1 Research and Engineering. DoD's Scientific Technical Information Program (STIP) requires that all significant results derived from DoD endeavors, including those generated under contract, be recorded as technical documents. These documents are to be made available to the DoD research and engineering community through supporting technical libraries and the Defense Technical Information Center (DTIC). STIP also requires that these documents be prepared and distributed without undue delay and according to established standards for format, security markings, and reproducibility.

NOSC instructions reiterate these requirements and establish the following procedures for their implementation:

All NOSC publications intended for external distribution must carry a NOSC publication number assigned by the Publications Branch. (The NOSC publication series includes technical reports, technical documents, technical notes, contractor reports, and technical manuals.)

The routing cycle for these publications includes branch and division heads, security, and, if unclassified, public affairs.

Primary and secondary distribution of these documents is the responsibility of Code 961.

Code 961 has sole authority at NOSC for sending publications to DTIC.

These procedures and a discussion of the Center's different publication series can be found in NOSC TD 178.

10.2.1.2 Technical Manuals. Requirements concerning technical manuals are based on the DoD concept that they are a part of the integrated logistic support (ILS) process. They contain the logistic data necessary to install, operate, maintain, repair, and otherwise support Navy equipment and systems.

They are required when systems or equipment are being built or equipment is integrated into a system, and they must be prepared according to specifications that control their content and format.

In addition to reiterating these requirements, NOSC instructions also specify the following:

Technical manuals developed for NOSC systems and equipment must be accurate, comprehensible, economically produced, and available to meet user requirements throughout the life cycle of the equipment.

The cost of technical manuals must be considered as part of the overall cost for delivery of an operational system or piece of equipment.

Technical manuals must be included either as a contract line item number and contract exhibit or as a data item description in the acquisition phase.

Technical manual specifications must be tailored in the contractual requirements to provide for factors such as user profile, maintenance plan, and training requirements.

All technical manual efforts must be coordinated through the NOSC Publications Branch. Included are such items as logistics planning, in-process reviews, acquisitions, validation, verification, and changes.

In addition, NOSC instructions specify that Code 961 has sole authority at the Center to assign technical manual identification numbers, including those required by system commands. These numbers are assigned only if the NOSC and DoD requirements for technical manuals are met.

Requirements of the sponsoring systems command must also be met. For example, NAVSEA requires the following:

An approved Technical Manual Contract Requirements (TMCR) or Technical Manual SEATASK Requirements (TMSR) must be used as the specifications-tailoring document. Without this TMCR or TMSR, NAVSEA will not issue a technical manual identification number.

A Technical Manual Quality Assurance (TMQA) Program, which includes validation and verification, must be budgeted for and implemented in all technical manual procurements.

10.2.2 Distribution Requirements

10.2.2.1 Distribution Statements. NOSC requires that all publications with a NOSC publication number carry a formal distribution statement. The purpose of this statement is to control the secondary distribution of the publication. Distribution statements are assigned by security and public affairs after the publication has been reviewed for technical adequacy by branch and division heads. NOSC forms 5605 and 5720 are used for this purpose.

10.2.2.2 Research and Engineering. Research and engineering publications—whether research, software, or engineering—must be provided to DTIC. If the information is so sensitive that a copy of the publication cannot be given to DTIC, DTIC must be provided with a bibliographic citation. At NOSC, Code 961 does this by means of the DD Form 1473. Information up to and including secret is sent to DTIC.

Those publications which 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 and DTIC.)

10.2.2.3 Technical Manuals. NOSC-numbered technical manuals can be provided to sponsors, but cannot be sent to the Navy Publications and Form Center (NPFC) or used on shipboard except during the experimental phase of the project.

Those manuals which carry system command numbers are sent to NPFC for distribution to Fleet users. Distribution is controlled by the distribution statement that appears on the manual.

Technical manuals are not sent to DTIC or information analysis centers.

10.2.3 Planning for Publications

10.2.3.1 Research and Engineering. Planning for this type of publication must begin at the conceptual phase of a project and continue throughout its entire life cycle. Information to be reported includes the following:

a. Research. 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.

b. Development. Information that involves the extension of theoretical, practical, and useful application of basic designs, ideas, and scientific concepts or pieces of equipment. The dominant characteristic of these efforts is that they are pointed to specific military problem areas with a view to developing feasibility and practicality of proposed solutions and determining usage, applications, and effectiveness parameters.

c. Test. Information that documents the procedures and results of subjecting items, systems, materials, personnel, or techniques to simulated or actual operational conditions to determine characteristics, suitability, and compliance with specific requirements.

d. Evaluation. Information that provides values, appraisals, or results relevant to strengths, weaknesses, feasibility, potential, and military worth of efforts, concepts, or hardware.

The important thing to remember is that the information must be pertinent and timely to subjects designated in DoD budget reports. Relevancy of subject contents to ongoing RDT&E activities is essential.

Approximately 5 percent of project funding should be allocated to prepare these publications.

10.2.3.2 Technical Manuals. Planning for technical manuals must also occur at the beginning of the project. Development of technical manuals for new systems or equipment must be initiated either concurrently with performance requirements or at the earliest possible time in the conceptual phase. Technical manuals for commercially available equipment must be developed during the procurement phase.

The cost of technical manuals, depending upon the type required and their intended purpose, ranges from $300 to $1,000 per page. Specific costs for a project can be obtained when Code 961 reviews the project's requirements.

The time required for logistics certification, as well as the time required for writing and production, must be included during the program and acquisition phases.

Plans must also be made to tailor the applicable specifications to meet system requirements. This tailoring will vary for each project and will depend upon factors such as system command requirements, users, and planned maintenance.

10.2.4 Contract Requirements

10.2.4.1 Research and Engineering. The contractor must provide publications that are suitable for entry into DTIC. This means that the information must be complete, legible, reproducible, technically accurate, and sufficiently detailed to permit use of the publication.

The best data item descriptions (DIDs) to use for ordering your publications are those that specify the military standard or specification that applies to the subject matter being reported. For example, UDI-A-26199A and DI-S-4057 are excellent for technical reports.

All publications ordered should be subject to a preliminary government review before final delivery of the data deliverable. During this review, subject matter experts outside the project should be asked to review the data. For example, Code 961 can review research reports or final reports before the final acceptance is made. This allows any problems to be identified and then rectified by the contractor.

10.2.4.2 Technical Manuals. The ordering of technical manuals can involve outlines, manuscripts, preliminary manuals, and camera-ready copy. The items ordered depend upon the specific project.

Current policy dictates that technical manuals be ordered as data on the DD form 1423 (CDRL). Typical data item descriptions (DIDs) are DI-M-2041, Technical Manual Outline/Bookplan; DI-M-2042, Technical Manual Manuscript Copy; DI-M-2043A, Manual, Technical, Preliminary; DI-M-2044A, Manual, Technical, Standard; and DI-M-2046, Technical Manual Permanent Change Pages.

In the near future, the method for ordering technical manuals will change and the CDRL will no longer be used for this purpose. Requirements for manuals are to be contract line items and contract exhibits, the exact forms of which are yet to be determined.

Supporting technical manual data items are and will be ordered via the CDRL. Possible data items include: DI-M-2040A, Technical Manual Organization Plan; DI-M-2194, Technical Manual Quality Assurance Program Plan; DI-M-2195, Validation Plan; and DI-M-2196, Validation Certification.

For NAVSEA requirements, an approved TMCR or TMSR is mandatory for use in all procurements of (NAVSEA) technical manuals, permanent changes, or revisions.

10.3 Audiovisual Support

The intent of this subsection is to outline the visual media services available and how you may obtain them for your project support.

10.3.1 Visual Media Definitions

The following definitions are extracted from OPNAVINST 5290.1, Navy Audiovisual Management and Operations Manual, and apply to all local instructions as well.

10.3.1.1 Official Navy Photography. This includes 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.

10.3.1.2 Technical Documentation. This includes audiovisual resources dedicated to documentation of technical subjects for the purpose of supporting the RDT&E mission. It also includes resources defined above 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.

10.3.1.3 Audiovisual (AV)/Visual Media. This involves the use of sound or visual imagery or both to communicate information. It includes the 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.)

10.3.1.4 Audiovisual Activity. This is 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. AV activities include those that expose and process original photography; record, distribute, or broadcast electronically (video and audio); reproduce still and motion picture photography; duplicate electronic recordings; produce AV products; provide AV services; distribute or preserve AV products; prepare graphic artwork; fabricate AV training aids, models, and displays; provide presentation services; or manage any of these activities.

10.3.1.5 Audiovisual Product. This includes audiovisual media elements such as still photography, graphic arts, still projections (overhead transparencies, slides, and film strips), 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.

10.3.1.6 Audiovisual Production. An AV production is a unified presentation which 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."

10.3.1.7 Optical Instrumentation. This involves the 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. It may include the recording of data to correlate optical images to time, space positions, or other engineering data.

10.3.1.8 Official Photographer. This is 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.

10.3.1.9 Authorized Photographer/Recorder. This is an employee who occasionally needs to use a camera, video, or sound recorder. The Camera/Video/Recording Equipment Pass (form NOSC-SD 5512/21) is issued to these persons for a period not to exceed 12 months.

10.3.1.10 Audiovisual Equipment. The AV equipment can fall into two categories:

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.

10.3.1.11 Dedicated AV Support Activity (DAVSA). This is 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.

10.3.1.12 Graphic Arts. This relates to the design, creation, and preparation of two- and three-dimensional visual aid products. It includes charts; graphs, posters; visual materials for television, motion pictures, and publications; displays and presentations; and exhibits prepared manually, by machine, or by computer.

10.3.1.13 Computer-Generated Graphics System. This is 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.

10.3.1.14 Major Claimant. This is an organization directly subordinate to, established by authority of, and specifically designated by the Secretary of the Navy. (For NOSC, it is the Office of Space and Naval Warfare Systems Command, Code 512.)

10.3.1.15 Technical Report. This is an AV report, an assemblage of film or video clips, or an assembly of technical documentation to report on a single, mission-related event.

10.3.2 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, the above outline cites several areas to consider. The value of visual records to RDT&E programs has been demonstrated countless times.

10.3.3 Visual Media Products and Services

The following visual media products and services are available through Code 962, Technical Information Division

10.3.3.1 Graphics. Illustrations, architectural renderings, and film art are available for use in motion pictures and video, brochures, programs and flyers, signs, exhibits and displays, computer graphics, and special design applications.

10.3.3.2 Still Photography. This covers color and black & white processes, printing, special large/oversize black & white technical and engineering documentation, underwater applications, and optical instrumentation.

10.3.3.3 Motion Pictures and Television. This includes color and black & white motion photography, motion analyses, television technical, engineering and documentation underwater, and one-time set-ups for experiments and tests. Full postproduction services are offered including editing, sound recording, special effects, and other electronic features. Script writing from concepts to final narrative.

10.3.3.4 Archives/Library. Original test material is either on hand or can be secured from the U.S. Navy Photo Center. We have still photo, motion picture, and video records of previous and current programs and projects.

10.3.3.5 Exhibits, Displays and Special Projects. Any special display can be created from sketches or ideas. These can be two or three dimensional.

10.3.3.6 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.

10.3.3.7 Audiovisual Equipment Loan Pool. The 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.

10.3.4 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 Audiovisual 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.

10.3.4.1 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 10.1 through 10.4 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.

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:

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.

10.3.4.2 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 fix 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 10.1. Viewgraph sample 1.

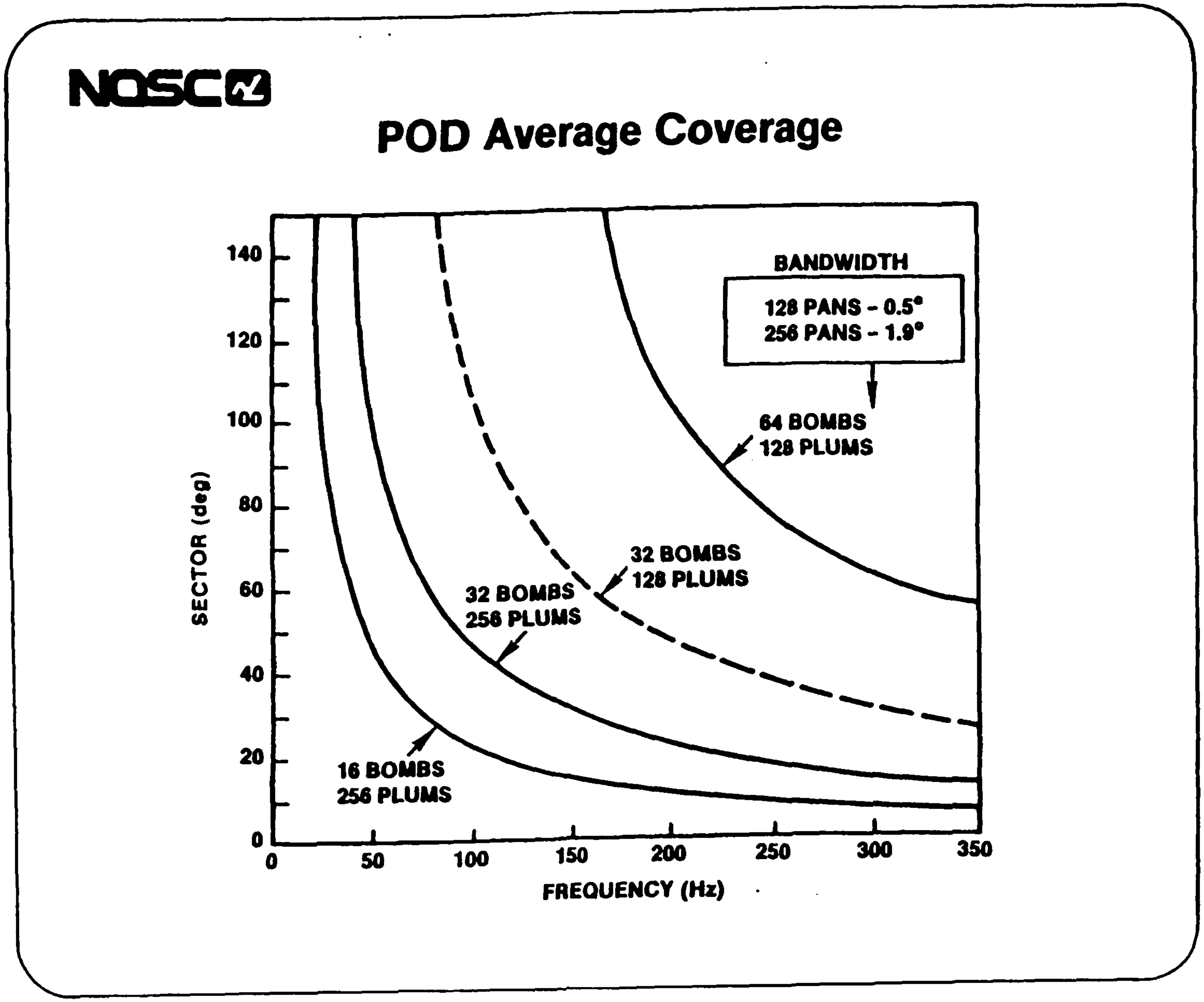


Figure 10.2. Viewgraph sample 2.

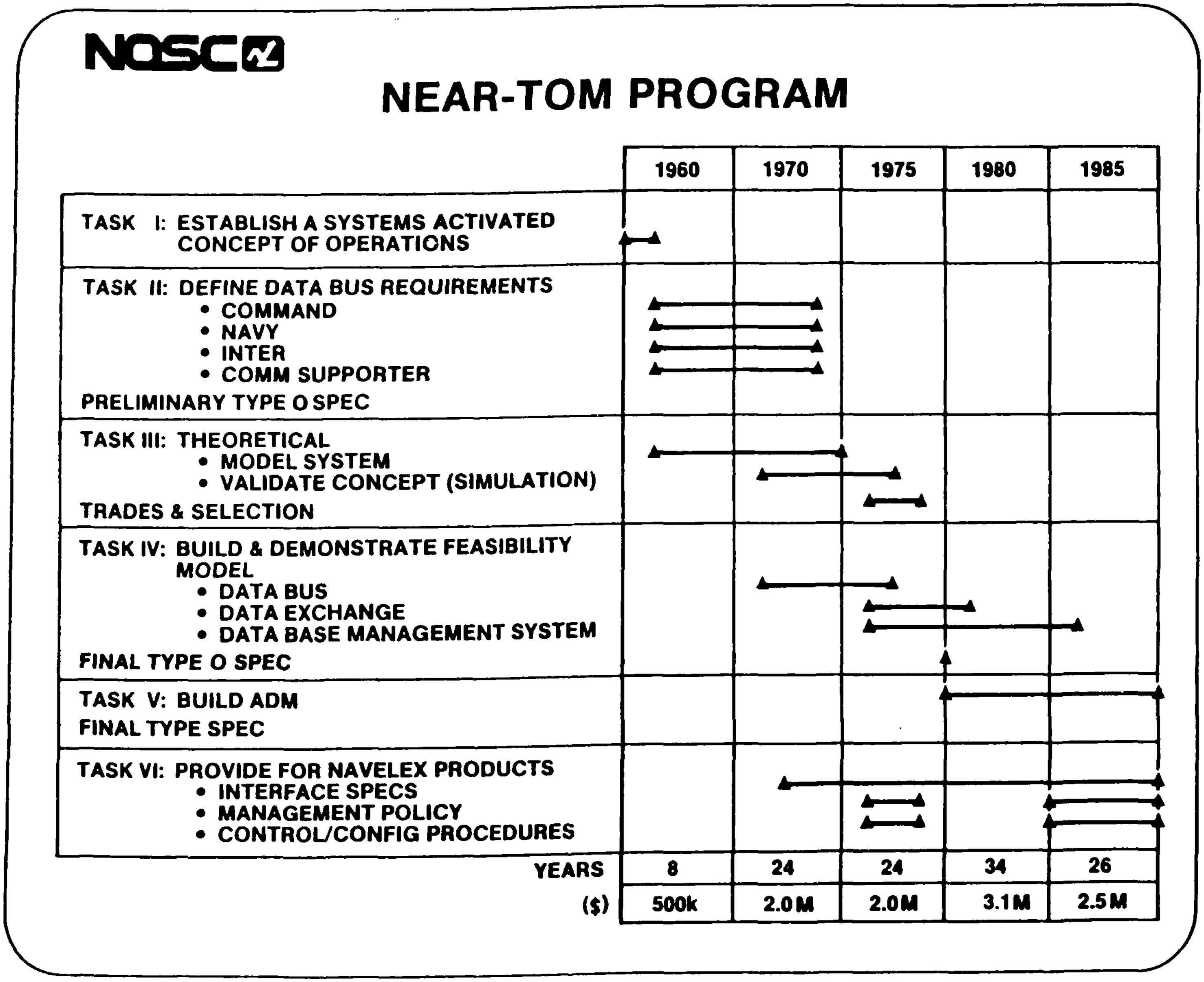


Figure 10.3. Viewgraph sample 3.

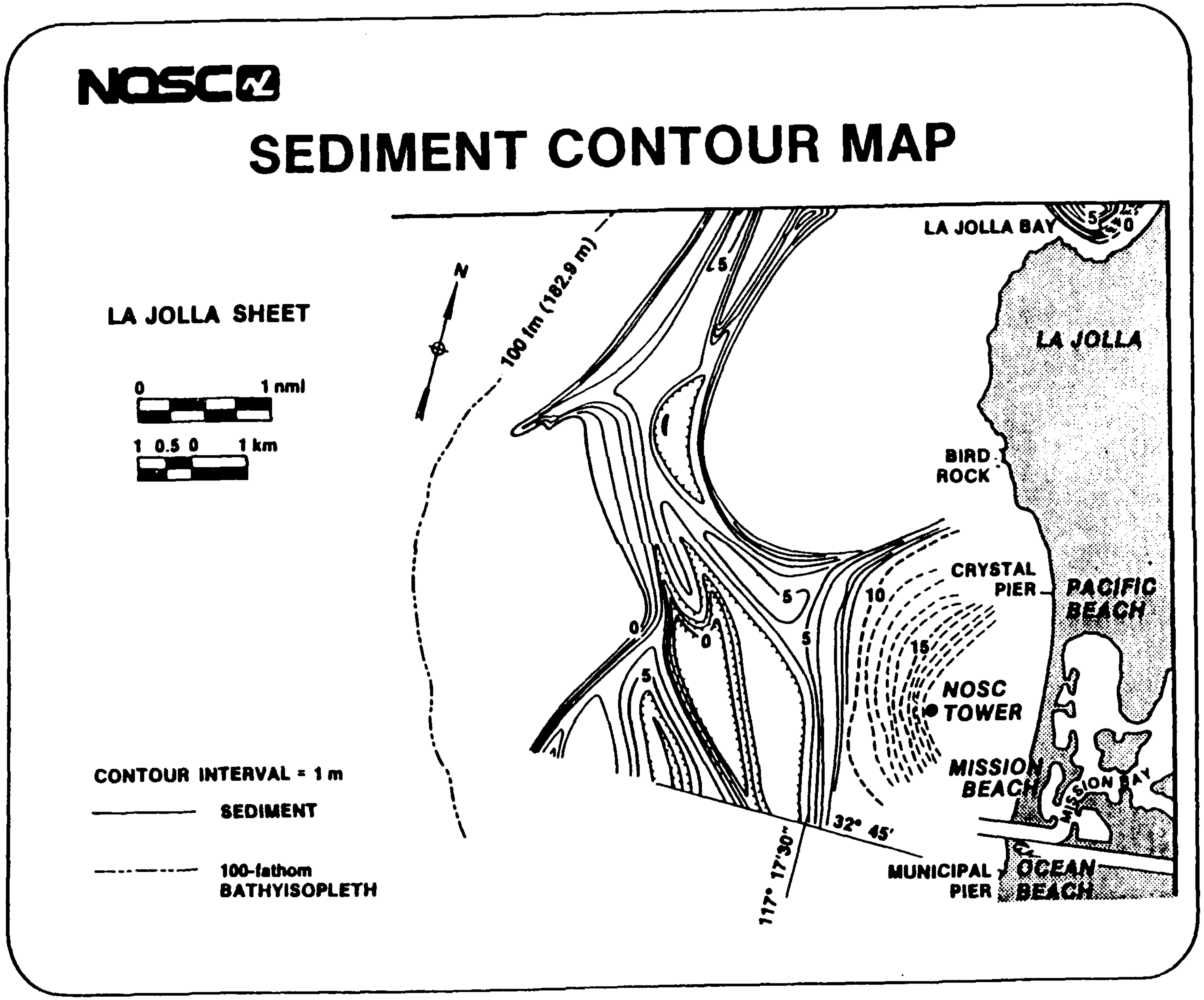


Figure 10.4. Viewgraph sample 4.

10.3.5 Planning Considerations for Visual Media

Just as time itself is transient and cannot be recaptured, so is the chance for visual documentation. Time passes by and so does the historical record unless it is preserved 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 (10.3.2) 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 adequate coverage is included formally in your project documentation.

Contact the applicable visual media staff person or section for assistance on all proposals.

10.3.6 Contacts for Assistance

Management	Ken Callahan	x7817
Visual Info Consultants	Al Woerner, Jim Sundell	x2577, x2041
Graphics	George Galaich	x6438, 39
Still Photo	Lutz Winkler	x6214
Motion Picture/ Television	Stan Follis	x7741
Photo Officer (Code 96)	Roy George	x2041, 2577
AV Equipment	Ernie Santos	x6885

10.4 TECHNICAL LIBRARY SERVICES

10.4.1 Library Collections

The NOSC Technical Library is the largest technical library in the San Diego region, excluding the libraries at UCSD and San Diego State. Materials collected are in those disciplines and subject areas pertinent to the current NOSC mission. Materials are located in the bayside and topside libraries according to the number of scientists and engineers working in particular 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. The bayside, topside, and Hawaii libraries each house a complete and current collection of all military and federal specifications, standards, handbooks, and drawings.

10.4.2 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 sometimes requested from users for unusually expensive or very specialized titles, and also 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, specification, subscriptions, 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 requesting project office.

Publications that are not available for purchase may usually be borrowed from other libraries or photocopied. The NOSC library borrows from not only local libraries, but also from Department of Defense, corporate, public, and university libraries throughout the United States and Great Britain.

10.4.3 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.

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.

10.4.4 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.

10.4.5 Library Publications

The library disseminates a list of its periodical holdings, a monthly 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.

10.4.6 Special Projects and Services

Installation of the Library's new automated system which will provide online access to the library's catalogs is well underway. Included is a NOSC Database of Databases which identifies libraries and databases at NOSC that are outside the NOSC Technical Library. Program managers are requested to register brief descriptive information about their project databases with the technical library. In addition, program managers are requested to consult with the NOSC librarian before establishing new databases and libraries.

Program managers may request library support for contractor review of documentation.

The library offers a presentation on library services, and also one specifically on its literature search services. These presentations are geared toward the specific subject interests of each group.

Finally, Tables 10.1 through 10.4 present further specific information on library contacts, VSMF holdings, accessible retrieval systems, and SDI services. The NOSC library request for literature search form is shown in Figure 10.5.

10.5 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.

The following 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.

Table 10.1. Whom to contact at the NOSC libraries

TOPSIDE LIBRARY		
Reference/Literature Searches/Ordering	Jo Walsh	x6623
	Marcia Whipple	x6623
Circulation	Linda Kerr	x6621
	Bernice Kuntz	x6622
Maps, Charts, Specs, and Standards	Val Danesh	x6623
Periodicals	Jeanie Casto	x6625
BAYSIDE LIBRARY		
Reference/Literature Searches/Translations/Ordering/ Current Awareness	Kathy Wright	x6171
	Diane Soblick	x6171
	Helen Cook	x6171
Circulation	Jan Rutledge	x2357
Interlibrary Loan	Yoli Kerr	x6155
NOSC DATABASE OF DATABASES	Kathy Wright	x6171
LIBRARY CONSULTING SERVICE FOR DATABASES	Kathy Wright	x6171
VISITING LIBRARY SERVICE	Kathy Wright	x6171
ELECTRONIC MAIL		
Bayside Library	BAYLIB	
Topside Library	TOPLIB	

OCTOBER 1985

Table 10.2. NOSC Technical Library

VSMF holdings

TOPSIDE LIBRARY

Military & Federal Specifications & Standards

Military Standardization Package
Navy International Standardization Documents

Industry Standards

ANSI
- Electrical & Electronic
- Information Systems
- Mechanical

ASME Standards
EIA Standards

Vendor Catalog Data

Design Engineering Service
Documentation Service
Integrated Circuit Parameter Retrieval
Semiconductor Parameter Retrieval

Procurement

Defense/Federal Acquisition Regulations

Telecommunications

CCITT. International Telegraph & Telephone Consultative Committee Recommendations

BAYSIDE LIBRARY

Military & Federal Specifications & Standards

Military Standardization Package

Industry Standards

ANSI
- Electrical & Electronic

ASTM Standards
AWS Standards
EIA Standards
NAS (AIA)
SAE—Aerospace Material Specifications

Vendor Catalog Data

Design Engineering Service
Documentation Service/High Tech
Integrated Circuit Parameter Retrieval
Marine Engineering Service
Metric Design Service
Semiconductor Parameter Retrieval

May 1985

Table 10.3. Online information retrieval systems accessible by the NOSC Technical Library

DTIC DROLS. The Defense Research On-Line System (DROLS), maintained 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.

LMARS. The NOSC Library Management and Retrieval System (LMARS) is an automated retrieval system developed inhouse to provide bibliographic control of the library's technical reports collection. LMARS generates a microfiche catalog of the library s holdings. The catalog consists of seven indexes: corporate author, personal author, title, report number, contract number, accession number, and subject. The LMARS also generates the library's list of new publications, recall notices, custom bibliographies, and Current Alert notices of new acquisitions in specific subject areas.

NASA RECON. Provides access to over 2 million technical reports, journal articles, books, conference proceedings, and other publications in the areas of aerospace and related technologies.

DIALOG. Provides access to over 250 databases in all fields, many of which correspond to printed equivalents. Some of those most frequently searched are COMPENDEX (*Engineering Index*), OCEANIC ABSTRACTS, CHEMICAL ABSTRACTS, SCISEARCH (*Science Citation Index*), DEPARTMENT OF ENERGY DATABASE, DISSERTATION ABSTRACTS, and INSPEC (*Physics Abstracts, Electrical and Electronics Abstracts, Computer and Control Abstracts,* and *IT Focus*).

ORBIT. Provides access to over 70 databases, including COLD, a database of technical reports, papers, articles and books compiled and maintained by the Army Cold Regions Research and Engineering Laboratory and the Library of Congress.

BRS. Provides access to more than 70 databases, including RBOT, a database for bibliographic citations on robotics; and TECHDATA, an online index to specifications, standards, and manufacturing catalog information.

WILSONLINE. Provides access to indexes such as *Applied Science & Technology Index, Business Periodicals Index*, and *Readers' Guide to Periodical Literature.*

VU/TEXT. Provides access to information in newspapers such as *The Washington Post, Philadelphia Inquirer,* and *Chicago Tribune.*

QL SEARCH. Provides access to the Arctic Science and Technology Information System produced by the Arctic Institute of North America at the University of Calgary, Alberta.

OCLC. An online union catalog of approximately 12 million records for books, serials, and maps, owned by 3,600 member libraries.

Table 10.4. SDI services offered by the NOSC Technical Library

SDI: Selective dissemination of information: periodic announcement of new publications in specific subject areas

INHOUSE	
-CURRENT ALERT	new technical reports received in the libraries
-CURRENT AWARENESS	bibliographies of new publications in: applied mathematics the arctic artificial intelligence command and control communication satellites communication systems and equipment communication theory data communications display systems feedback and control theory fiber optics image processing matrix materials microelectronics microprocessors numerical analysis oceanography optical communications optics radar radio noise reliability robotics semiconductors and transistors software engineering software quality, reliability and documentation VHSIC
EXTERNAL	
-DTIC -DIALOG -BRS -ORBIT -NASA	Individually tailored SDI searches may be established with any of these external services.

October 1985

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: ______________

DATA BASES TO BE SEARCHED

__________ NOSC Library Holdings

DTIC:

__________ Technical Reports

__________ Work Units (1498s)

__________ Industrial IR&D

__________ Program Planning

Periodical/open literature:

__________ DIALOG

__________ BRS

__________ ORBIT

__________ NASA

__________ Other (please specify)

Figure 10.5. Request for NOSC library literature search form.

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 10.5. 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 10.6. 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 10.7. Audience analysis

How much do they know about the subject?

Are they at the decisionmaking 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 10.8. 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 10.8. The presentation outline (2 of 2)

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 10.9. 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 10.10. 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 10.11. 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 10.12. **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

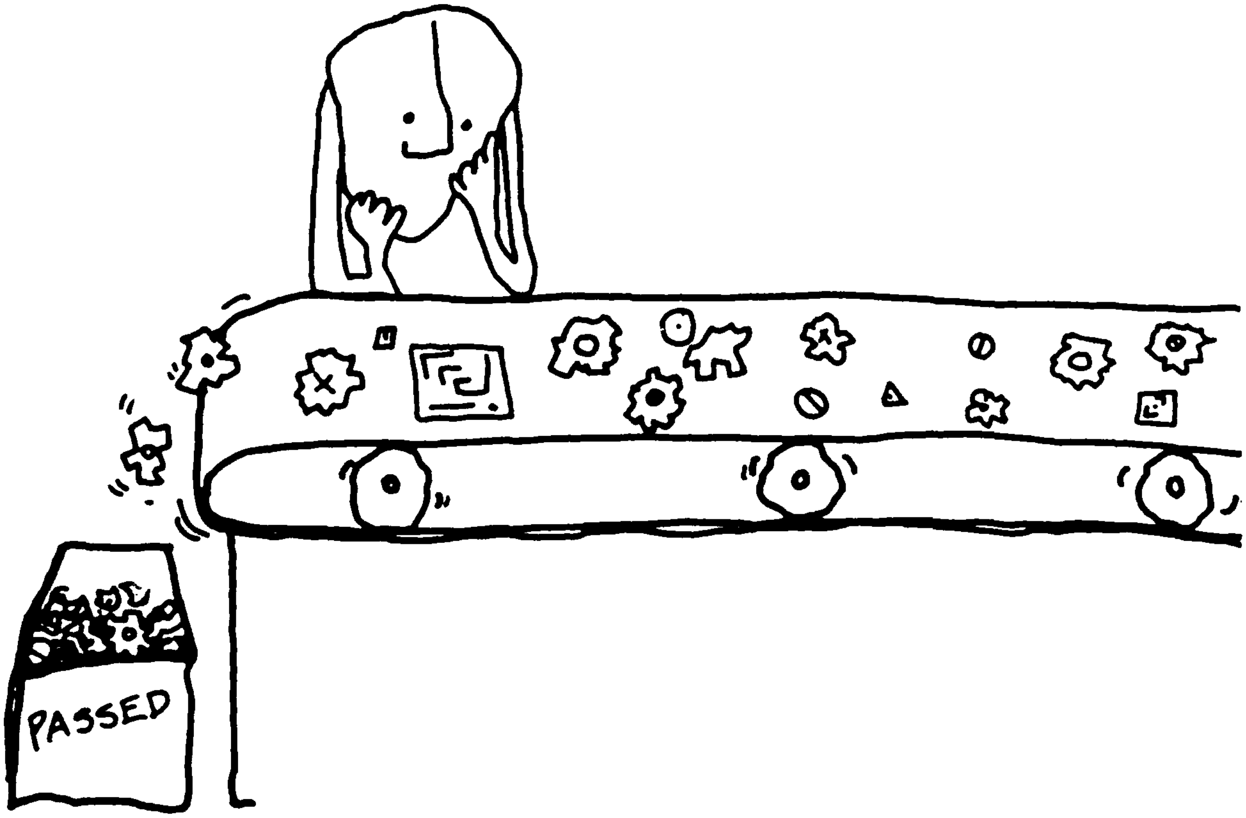
AUDIENCE RETENTION

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 you're ahead, anticipate the end, close with summary statement

HARDWARE PRODUCT ASSURANCE 11



CONTENTS

SECTION 11
HARDWARE PRODUCT ASSURANCE
G. Thirkill, Code 9202

11.1 INTRODUCT ON

11.1.1 References

See subsection 11.10.

11.1.2 Outline

Introduction
  References
  Outline
  Summary
Hardware Product Assurance Overview
Reliability/Maintainability Assurance
  Definitions
  Reliability Program Policy
  Maintainability Program Policy
  Reliability Assurance Program Elements
  Maintainability Assurance Program Elements
System Safety Assurance
  Definitions
  System Safety Program Policy
  System Safety Assurance Program Elements
Human Factors
  Definitions
  Human Factors Policy
  Human Engineering Program Elements
Quality Assurance
  Definitions
  Quality Assurance Program Policy
  Quality Assurance Program Elements
  Why Inspect at the Piece Part Level?
Configuration Management
  Definitions
  Configuration Management Policy
  Configuration Management Program Elements
Design Assurance
  Definition
  Design Assurance Policy
  Design Assurance Program Elements
Integrated Logistic Support
  Definition

Integrated Logistic Support Program Policy
Integrated Logistic Support Program Elements
DoD/Navy/NOSC Product Assurance Policy Overview
Reliability and Maintainability Policy Directives
System Safety Policy Directives
Human Factors Policy Directives
Quality Assurance Policy Directives
Configuration Management Policy Directives
Design Review Policy Directives
Design Documentation Policy Directives
Integrated Logistic Support Policy Directives

11.1.3 Summary

See below.

11.2 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 11.1 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 which are fabricated in production conform to the engineering drawings and specifications and are of high overall quality

Assurance that those systems/equipment items which are introduced into the Fleet are fully supported throughout their life cycle.

The specific concerns of hardware product assurance, therefore, are the following:

Reliability
Maintainability
Availability
System safety
Human compatibility
Quality
    of design, design documentation, and produced products
Configuration integrity
Producibility
Spares reprocurability
Logistic supportability.

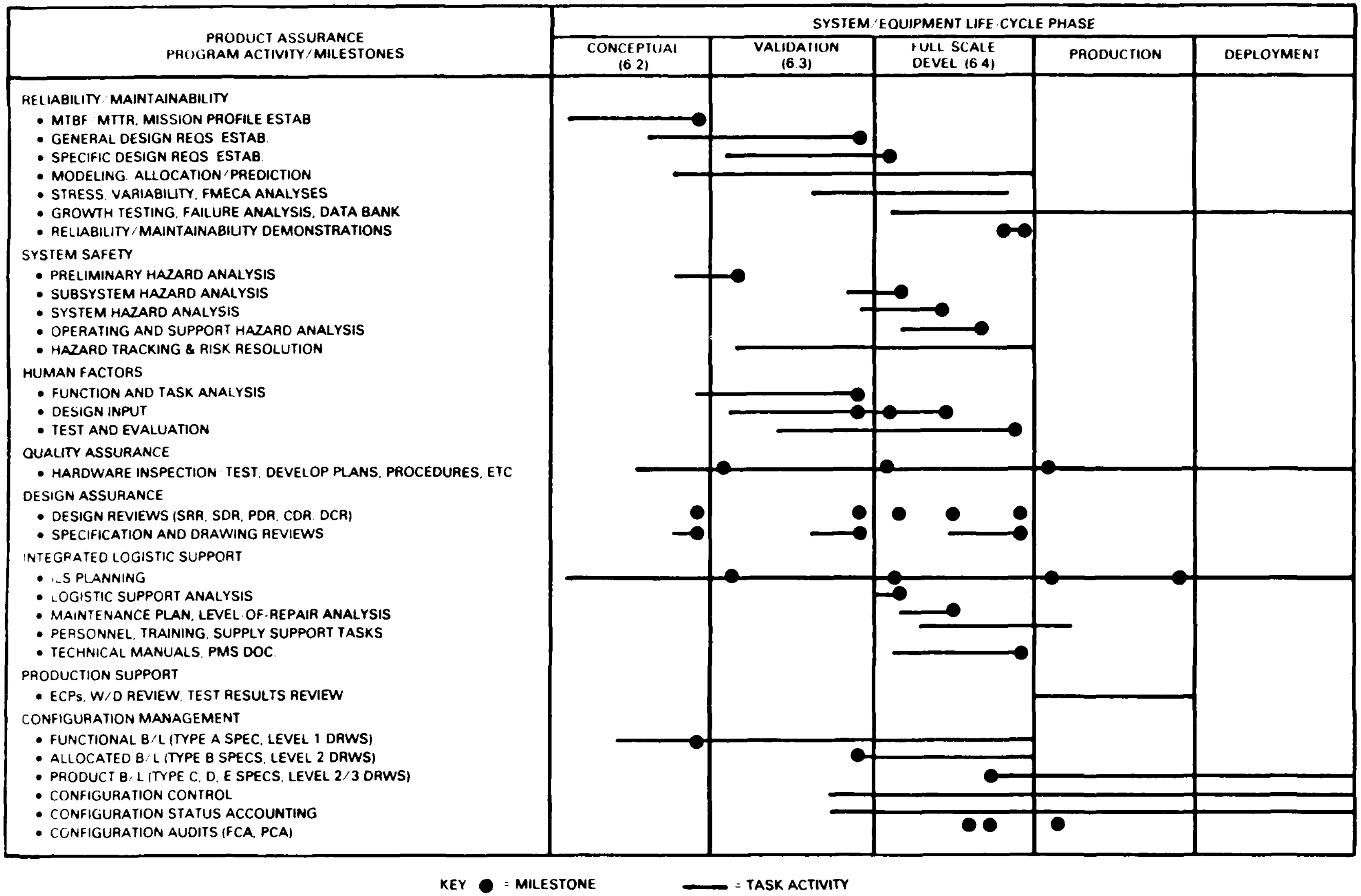


Figure 11.1. Product assurance activity during various life-cycle phases.

These concerns have been ordered in a set of engineering and technical management disciplines which 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.

The above disciplines will be outlined in detail in subsections 11.3 through 11.9. 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 which 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. 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 which may be used in contract statements-of-work.

Subsection 11.10 provides an overview and brief description of the major policy directives which influence product assurance. TD 432 provides a more complete list of product assurance directives.

11.3 RELIABILITY/MAINTAINABILITY ASSURANCE

11.3.1 Definitions

11.3.1.1 Reliability/Maintainability Assurance. 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.

11.3.1.2 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 item's for which operating time is undefinable (e.g., explosive devices, rockets, and torpedoes).

11.3.1.3 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 (MITR), 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.

11.3.1.4 Supportability. This is the ability to satisfy material and administrative requirements associated with restoring the operation of a failed system/equipment.

11.3.1.5 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 which 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.

$$Ai = \frac{MTBF}{MTBF + MITR}.$$

b. Operational availability (Ao) represents the expected percentage of time that a system/equipment will be ready to perform satisfactorily in an operating environment.

$$Ao = \frac{UPTIME}{UPTIME + DOWNTIME} \text{ (basic expression);}$$

$$Ao = \frac{MTBF}{MTBF + MDT}.$$

MDT = mean downtime (includes both maintainability and supportability factors).

NAVMATINST 3000.2 establishes Ao as the primary measure of Navy system/equipment readiness. NAVSEA requires that Ao be reported relating to the mission profile.

11.3.2 Reliability Program Policy (NAVMATINST 3000.1A)

11.3.2.1 Objectives An objective accomplishes the following:

a. Reaffirms the close relationship between good, conservative design and product reliability

b. Redirects reliability program emphasis towards the engineering and manufacturing specifications, disciplines, and controls by which reliable systems/equipment are designed and produced.

11.3.2.2 Policy The following are policy considerations.

a. Reliability is as important as functional performance.

b. DSARC I (release to validation phase development): the DCP to address reliability requirements

c. DSARC II (release to full-scale development): the DCP to state that reliability will be *by design*, not just left to chance: 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.

11.3.2.3 Technical Requirements The technical requirements are noted below.

a. Specific engineering (i.e. 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-16400, Electronic Interior Communication 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 uncertainty 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

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).

11.3.3 Maintainability Program Policy

11.3.3.1 NAVSEAINST 3900.2 This instruction sets out the following relationships and requirements.

a. Reaffirms the inseparable relationship between material design and reliability and maintainability (R&M)

b. Directs 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 (MITR) 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 MITR 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. QAP 200 (superseded by OD 46574B) to be invoked in engineering agent tasking documents.

11.3.3.2 NAVELEXINST 4858.3 This instruction sets out the following requirements.

a. Realistic qualitative and quantitative (MITR) maintainability design requirements are to be specified which strike an optimum balance between logistic support capability, potential life-cycle costs, and a fully maintainable system.

b. Maintainability requirements are to be included in all planning and procurement documents.

c. 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.

11.3.3.3 NAVARINST 13070.2B This instruction sets out the following objectives and requirements.

a. Define mission and environmental profiles.

b. Establish quantitative maintainability performance objectives.

c. Establish maintainability program incorporating requirements of MIL-STD-470 as applicable to the project phase. Full-scale development phase would include:

    Program plan
    Design criteria
    Subcontractor control
    Program reviews
    Data collection, analysis, and corrective action
    Modeling/Allocations/Predictions
    FMEA (maintainability)
    Inputs to LSA
    Demonstration.

d. Ensure maintainability requirements are met.

11.3.4 Reliability Assurance Program Elements

11.3.4.1 Program Planning, Monitoring, and Control. These elements are discussed below:

a. Program planning — Definition of the reliability program (MIL-STD-785) in a plan which 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.

11.3.4.2 Design, Analysis, and Evaluation. These elements are discussed below:

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/Availability 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 for the failure mode, and effects and criticality of the failure using MIL-STD-1629

j. Reliability data bank — Collection of reliability data, i.e., 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.

11.3.4.3 Test and demonstration. These elements are discussed below:

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 meets its specified reliability requirements, using MIL-STD-781 or other equivalent plans

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.

11.3.4.4 Documentation. The documentation elements are discussed below:

a. Procurement documentation — Ensuring that engineering drawings and specifications for production of functional modules and for designated organizational and intermediate level spare parts include well-defined functional and quality assurance requirements

b. Reliability program reporting — Provision for periodic reports on the status of each reliability program element.

11.3.4.5 Why Not Depend on Reliability Demonstration Testing? Something more than definition is needed:

a. In order to demonstrate a 5,000-hour mean-time-between-failure (MTBF) with 90 percent confidence under optimum conditions (0 failures), it would take over 11,000 hours of test time or 458 24-hour days.

b. Conclusions:

For high reliability equipment, generally it is not practical to demonstrate reliability statistically by test prior to committing the design to production.

Contractors won't pay attention to requirements they don't have to demonstrate.

Depend on proven design disciplines first, then demonstrations.

11.3.4.6 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.

11.3.4.7 Component Derating. Component derating is discussed below:

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. NAVSEA TE000-AB-6TP-010, Parts Application and Reliability Information Manual for Navy Electronic Equipment, provides derating guidelines for

   Microcircuits
   Semiconductors
   Resistors
   Capacitors
   Connectors
   Switches
   Relays
   Transformers, inductors, and coils.

e. Derating provides added protection from part variances, decreased part degradation rate, and increased expected life.

11.3.4.8 Component Quality Levels. The quality levels for components are listed below:

a. The use of properly screened and qualified components which are conservatively derated in their circuit application *is the best assurance of reliable electronic hardware.*

b. Component quality levels

   Active and passive electrical components (e.g., relays, coils, connectors, resistors, capacitors); established reliability (ER) failure rates

ER failure rate "L"	=	2.0%	per 1,000 hrs
ER failure rate "M"	=	1.0%	per 1,000 hrs
*ER failure rate "P"	=	0.1%	per 1,000 hrs
ER failure rate "R"	=	0.01%	per 1,000 hrs
ER failure rate "S"	=	0.001%	per 1,000 hrs
ER failure rate "T"	=	0.0001%	per 1,000 hrs

   Discrete semiconductors (e.g. MIL-S-19500 transistors, diodes); failure rates compared to equivalent commercial devices

JAN	Failure rate	=	0.2
*JANTX	Failure rate	=	0.04
JANTXV	Failure rate	=	0.02
JANS	Failure rate	=	0.005.

   Where JANTX devices are unavailable, approved substitutes to be screened to MIL-STD-750 JANTX requirements.

   Microcircuits (MIL-M-38510); failure rates compared to equivalent commercial devices

Class C Failure Rate	=	0.1
*Class B Failure Rate	=	0.01
Class S Failure Rate	=	0.006

Where class "B" devices are unavailable, approved substitutes to be screened to MIL-STD-883, Method 5004, class "B" requirements.

*NAVSEASYSCOM design requirement (specified level or better)

c. The case for using quality components has two main points:

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 percent and the equipment cost is increased by 25 percent. However, the predicted equipment *MTBF is increased 14 to 20 times* over that of equipment constructed with commercial grade components!

11.3.4.9 Environmental Stress Screening (ESS). ESS is discussed in the items below.

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

Wherever possible, power applied to modules, etc. During heating portion of cycle

Performance measurements on modules, etc. to be made at 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 phase development and during production (based on process results).

ESS requirements, when fully mature, should be included on engineering drawings for units, modules, and assemblies which may be reprocured as spares.

Destructive physical analysis recommended in conjunction with component lot acceptance inspection.

Refer to NAVMAT P-9492, NAVEA Notice 3900, IES guidelines, and proposed NAVSPAWAR and RADC MIL-STDs for additional ESS guidance.

11.3.5 Maintainability Assurance Program Elements

11.3.5.1 Program Planning, Monitoring, and Control. These elements are discussed below:

a. Program planning — Definition of the maintainability program (MIL-STD-470) in a plan which 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.

11.3.5.2 Design, Analysis, and Evaluation. These elements are discussed below:

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 (MITR) 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 (MITR) 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.

11.4 SYSTEM SAFETY ASSURANCE

11.4.1 Definitions

11.4.1.1 System Safety Assurance. 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.

11.4.1.2 Safety. This is freedom from conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property.

11.4.1.3 System Safety. This is the application of engineering and management techniques to optimize safety within the constraints of operational effectiveness, time, and cost throughout all life-cycle phases.

11.4.1.4 Mishap. This is an unplanned event or series of events that results in death, injury, occupational illness, or damage to or loss of equipment or property

11.4.1.5 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

11.4.2 System Safety Program Policy (NAVMATINST 5100.6A)

11.4.2.1 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.

11.4.2.2 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.

11.4.3 System Safety Assurance Program Elements

11.4.3.1 Program Planning and Control. These elements are discussed below:

a. Program planning — Definition of the system safety program (MIL-STD-882) in a plan which 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.

11.4.3.2 **Analysis and Evaluation.** These elements are discussed below:

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.

11.5 HUMAN FACTORS

11.5.1 Definitions

Human factors engineering (i.e. human engineering) is the planned integration of people and equipment into an effective operating system

11.5.2 Human Factors Policy (NAVMATINST 3900.9)

11.5.2.1 Objectives. The human factors objectives are as follows:

a. To ensure the development of optimum man-machine systems

b. To ensure that human tasks designed into systems are consistent with manpower capabilities

c. To ensure that training programs and equipment are developed

d. To reduce manpower life-cycle costs by reducing manpower, skill level, and training requirements

e. To ensure that the physiological environment of a system is consistent with its performance goals.

11.5.2.2 Policy. The human elements of systems are to undergo the same development, test, and evaluation as equipment elements.

11.5.2.3 Technical requirements. Requirements of MIL-H-46855, Human Engineering Requirements for Military Systems, Equipment and Facilities, are to apply during system development, test, and evaluation.

11.5.3 Human Engineering Program Elements

11.5.3.1 Analysis. This element is discussed below:

a. Definition and analysis of the functions to be performed by the man-machine system in order to specify the performance requirements for system operation, maintenance, and control and to allocate system functions to automatic operation/maintenance, manual operation/maintenance, or a combination

b. Application of human engineering principles and criteria in the identification and selection of equipment to be operated/maintained by personnel. The requirements of MIL-STD-1472, Human Engineering Design Criteria for Military Systems, Equipment and Facilities, apply.

c. Analysis of tasks to identify information, decisionmaking, activity, facilities, etc. are required.

11.5.3.2 Equipment/Facilities Design Input. This input is discussed below:

a. Conducting experiments, tests, and studies to resolve human engineering and life support problems

b. Human engineering input, based on analyses conducted, to detail equipment design features as reflected by the engineering drawings

c. Human engineering input, based on analyses conducted, to the work environment, operator/crew stations, and facilities designs.

11.5.3.3 Test and Evaluation. These elements are discussed below:

a. Planning of tests to verify that the system/equipment can be operated, maintained, supported, and controlled by user personnel in the intended environment

b. Conducting of tests and identification of discrepancies

c. Analysis of failures and identification of solutions.

11.5.3.4 Coordination. This is coordination of human engineering activity with reliability, maintainability, system safety, survivability/vulnerability, and integrated logistic support functions.

11.6 QUALITY ASSURANCE

11.6.1 Definitions

11.6.1.1 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 which will satisfy the user's requirements.

11.6.1.2 Quality. This is the composite of all the attributes or characteristics, including performance, of a product.

11.6.1.3 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.

11.6.1.4 Manufacturing Quality. This is the conformance of a manufactured product to its required drawings and specifications.

11.6.1.5 Achieved Quality. The ability of a manufactured product to satisfy the user's requirements, i.e. overall product quality.

Achieved Quality = Inherent Quality + Manufacturing Quality
or
Overall Product Quality = Design Quality + Manufacturing Quality.

11.6.2 Quality Assurance Program Policy (NAVMATINST 4855.1)

11.6.2.1 Policy. The policy is discussed below:

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.

11.6.2.2 Program Requirements. The requirements are discussed below:

a. Quality requirements to be included in contracts and consideration given to quality during source selection

b. Contractors' quality programs to be evaluated and audited

c. Engineering specifications to include quality assurance provisions

d. Quality requirements to be based on operating environment

e. Contractor developed test and inspection equipment programs to be assessed

f. Quality assurance requirements to be established in connection with packaging, handling, shipment, and storage

g. Quality assurance requirements to be established in connection with maintenance operations

h. Quality concepts to be included in MIL-STDs, MIL-SPECS, and QPLs.

11.6.3 Quality Assurance Program Elements

11.6.3.1 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

11.6.3.2 Hardware Quality Assurance Program Provisions. These elements are discussed below:

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—Ensures all measuring and test equipment used for material acceptance or evaluation purposes is calibrated 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 supplies.

11.6.4 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

11.7 CONFIGURATION MANAGEMENT

11.7.1 Definitions

11.7.1.1 Configuration Management. This is the technical and administrative direction and surveillance of the functional and physical characteristics of system/equipment hardware or computer software.

11.7.1.2 Configuration Identification. This is the identification and documentation of the functional and physical characteristics of hardware/software with engineering drawings, parts lists, specifications, etc.

11.7.1.3 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.

11.7.1.4 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.

11.7.1.5 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.

11.7.1.6 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.

11.7.1.7 Deviation. This is a specific written authorization, granted prior to the manufacture of an item, to depart from a particular design or performance requirement.

11.7.1.8 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.

11.7.2 Configuration Management Policy (NAVMATINST 4130.1)

The requirements of NAVMATINST 4130.1 are described by paragraph 3, following.

11.7.3 Configuration Management Program Elements (NAVMATINST 4130.1)

11.7.3.1 Configuration Identification. These elements are discussed below:

a. Functional baseline (basis for validation phase)
   Type "A" system specification
   Level 1 system/equipment drawings

b. Allocated baseline (basis for full-scale development)
   Type "A" system specification
   Type "B" development specifications
   Level ½ system drawings
   Interface control drawings

c. Product baseline (basis for production)
   Type "C" product, type "D" process, type "E" material specifications
   Level ⅔ system/equipment drawings
   Level 3 spare parts drawings
   Installation control drawings.

11.7.3.2 Configuration Control (DOD-STD-480 describes). These elements are discussed below:

Engineering change proposals (Class I, II ECPs)

Deviations (critical, major, minor)
Waivers (critical, major, minor)
Material review board actions.

11.7.3.3 Configuration Status Accounting (MIL-STD-482 describes). These elements are discussed below:

Baseline status
ECP, deviation, waiver approval status
ECP, deviation, waiver contract implementation status
"As built" configuration records
Fleet system/equipment configuration records.

11.7.3.4 Configuration Audits (MIL-STD-1521 provides guidelines). These elements are discussed below:

Functional configuration audit (FCA).
Physical configuration audit (PCA).

11.8 DESIGN ASSURANCE

11.8.1 Definition

Design assurance is the technical direction and monitoring of the system/equipment design process to assure that the design appears to be reliable, maintainable, safe, and producible, and that the engineering drawings and specifications are complete in their disclosure of the design and contain appropriate product assurance requirements.

11.8.2 Design Assurance Policy

Other than that policy dealing with design reviews there is no Navy policy dealing with the subject of design assurance, although the DSARC/NSARC reviews include that concern.

11.8.3 Design Assurance Program Elements

11.8.3.1 Development Specifications (For full-scale development). These specifications are discussed below:

a. System/equipment full-scale phase development must not begin until the following are defined in a MIL-S-83490 type "A" system specification:

   System/equipment performance requirements
   Detailed mission profile
   Environmental requirements
   Qualitative and quantitative reliability and maintainability requirements.

b. Type "B" development specifications appropriate for large/complex system development

11.8.3.2 Design Documentation Requirements (for full-scale development). System/equipment full-scale phase development must not begin until the design documentation requirements, based on the anticipated production procurement and logistic support plans, are established. These requirements should include the following:

DoD-D-1000, level 3 drawings are required for competitively awarded production and all spare parts. Level 2 drawings appropriate for one-time-only production by original developer.

MIL-S-83490 type "C" product, type "D" process, and type "E" material specifications, as appropriate

Functional test requirements for testable subassemblies intended to be reprocured as spare parts

Documentation of special (i.e., not covered by military or other recognized standards) functional components

Schematics and wiring diagrams

Documentation of interconnect harnesses and cables using grids

Printed wiring boards and flexible circuits designed to MIL-STD-275, designed to be producible to MIL-P-55110 and solderable to WS-6536

Prohibiting use of company material and process standards

Use of specification, altered, and selected item control drawings. Use of source control drawings should require specific government approval

Parts and index lists. Computer generation of lists

Use of mono- and multi-detail drawings

Component identification

Use of fractions to be avoided

Use of metrics

Use of Navy drawing formats, numbers, and FSCMs

Use of DoD-STD-100 and ANSI Y14.5

Soldering requirements (WS-6536 applies) to be included on drawings

Workmanship requirements (MIL-STD-454, Req 9 applies) to be included on drawings

Classification of characteristics (DoD-STD-2101 applies) for items to be reprocured as spares

Use of computer-aided design techniques

Use of proprietary components, designs, and data to require advance, written approval.

11.8.3.3 Design Reviews. Design reviews, conducted following the guidelines of MIL-STD-1521, to be performed:

a. System requirements review (SRR)—Evaluates system engineering activity and output regarding mission and requirements analysis, system/cost effectiveness, hardware/computer software trade-off analyses, reliability/maintainability trade-off analyses, integrated logistic support analysis, etc. Conducted near end of conceptual phase or early in validation phase.

b. System design review (SDR)—Evaluates the adequacy of the total system requirements, including the Type A system specification, for suitability for proceeding into full-scale development. Conducted near the end of the validation phase or as an initial step in the full-scale development phase.

c. Preliminary design review (PDR)—Evaluates the basic design approach, including trade-off studies, preliminary mechanical/electrical design, reliability/maintainability apportionment, producibility, use of off-the-shelf designs/equipment, safety and human factors analyses, logistic supportability, etc. Conducted early in full-scale development phase prior to initiating detail design effort.

d. Critical design review (CDR)—Evaluates the detail design solutions to satisfy the performance, mission profile, environmental, reliability, maintainability, safety, human factors, and logistic supportability requirements. Conducted during the full-scale development phase prior to release of the detailed design to fabrication.

11.8.3.4 Design Documentation Review. Prior to release of the engineering drawings and specifications to production, at the completion of full-scale development, an independent review must be conducted to verify:

a. Detailed design approach appears to be reasonable, reliable, and maintainable

b. Mil-Spec components and materials selected where available. Special components adequately documented by control drawings

c. Proprietary designs or data not used except where specifically authorized

d. Design details are completely disclosed (DoD-D-1000, level 3 drawings) and are fully specified with dimensions and tolerances. Geometric dimensioning and tolerancing used to describe replaceable unit interfaces.

e. Design appears to be producible on a competitive, industrial basis

f. Components and assemblies anticipated to be reprocured as spare parts are physically and functionally interchangeable. Documentation to have classified characteristics (DoD-STD-2101) and corresponding inspection requirements.

g. Printed circuit boards and flexible circuitry designed to MIL-STD-275 and designed to be producible to MIL-P-55110 using WS-6536

h. Documentation describing functional subassemblies (e.g. PWB assemblies) and units; assemblies include performance requirements

i. Documentation includes appropriate quality assurance (i.e. inspection and test) requirements.

j. Documentation includes appropriate process control (e.g. WS-6536) and workmanship (e.g. MIL-STD-454, Req 9) requirements.

k. Documentation meets military standards and specifications (i.e. DoD-D-1000, DoD-STD-100, ANSI-Y14.5, MIL-S-83490, MIL-STD-490).

11.9 INTEGRATED LOGISTIC SUPPORT

11.9.1 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.

11.9.2 Integrated Logistic Support Program Policy (NAVMATINST 4000.20)

The requirements of NAVMATINST 4000.20, ILS Planning Policy, are described by paragraph 3, following.

11.9.3 Integrated Logistic Support Program Elements

11.9.3.1 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 which 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).

11.9.3.2 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.

11.9.3.3 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).

11.9.3.4 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.

11.9.3.5 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.

11.9.3.6 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.

11.9.3.7 Computer Resources Support. This includes requirements for all computer equipment and computer software and the requirements for their support.

11.9.3.8 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.

11.9.3.9 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.

11.10 DOD/NAVY NOSC PRODUCT ASSURANCE POLICY OVERVIEW

The following provides an overview of the more significant product assurance policy directives affecting the elements discussed in the following sections. For a more complete list, it is recommended that the reader refer to TD 432.

11.10.1 Reliability and Maintainability Policy Directives

a. DoD Directive 5000.50, Reliability and Maintainability

   Establishes DoD policies and responsibilities for the reliability and maintainability of defense systems, subsystems, and equipment

b. NAVMATINST 3000.1, Reliability of Naval Material

   Establishes Navy policy for the acquisition and deployment of reliable material. Key technical requirements imposed on the design agent include invocation of engineering and manufacturing disciplines and controls; integrated test program; reliability test program; continous reliability assessment; reporting, analysis, and correction of failures; contractor control

c. NAVMATINST 3000.2, Operational Availability of Weapon Systems and Equipments; definitions and policy

   Establishes operational availability (A_O) as the primary measure of material readiness for Navy weapons systems and equipment

d. NAVSEAINST 3900.2, Reliability and Maintainability Program of the Naval Sea Systems Command for Design, Development and Acquisition (Non-Nuclear)

   Implements NAVMATINST 3000.1 policy, with further expansion of certain requirements, for NAVSEA programs. Includes maintainability requirements in consonance with those for reliability

e. NAVSEA OD 46574B Weapons and Combat Systems Quality Assurance Requirements for Shore Stations and Engineering Agents

   Establishes overall product assurance program requirements, including reliability and maintainability, for NAVSEA's weapons and combat systems development, production, and in-service support activities

f. NAVELEXINST 4858.2, Naval Electronics Systems Command Reliability Program

Implements NAVMATINST 3000.1 and prescribes basic policy for development and implementing NAVSPAWAR's reliability program requirements and provides guidance and specific direction

g. NAVELEXINST 4858.3, Naval Electronic Systems Command Maintainability Program

Delineates the basic policies, specific directions, and designation of responsibilities in developing and implementing NAVSPAWAR's maintainability program requirements

h. NAVAIRINST 13070.2, Policy for Reliability and Maintainability (R&M) of Naval Aeronautical Systems and Equipment

Implements NAVMATINST 3000.1 and promulgates NAVAIR's policy governing reliability and maintainability (R&M) programs and delineates responsibilities

i. NOSCINST 4855.1, NOSC Product Assurance Program

Requires department heads to ensure that the following actions are accomplished:

NOSC TD 432, Product Assurance Requirements Guide for Naval Ocean Systems Center Projects, used when planning requirements, including reliability and maintainability

Adherence to NAVMAT/SYSCOM policy requirements to be verified by periodic internal program reviews

Formal design reviews (PDR, CDR, DCR) conducted

Records of internal program reviews and design reviews maintained

Product assurance program critique during DRC review.

j. NOSC TD 870, Product Assurance Program Requirements Manual for Naval Ocean Systems Center Projects

Establishes product assurance program content requirements for hardware (including reliability and maintainability) and computer software aspects of NOSC projects in all phases of engineering development, production, or in-service operation; applies to all NOSC Fleet systems/equipment projects; implements NAVSEA OD46574B.

11.10.2 System Safety Policy Directives

a. DoD Directive 5000.36, System Safety Engineering and Management

Establishes policy for the Department of Defense system safety engineering and management programs

b. NAVMATINST 5100.6, System Safety Program; implementation of

Provides Navy policy and guidance for the incorporation of safety programs in the process of acquiring systems and equipment. Requires the SYSCOMs to ensure that system safety programs, based on MIL-STD-882 (System Safety Program Requirements) are incorporated into all system acquisitions

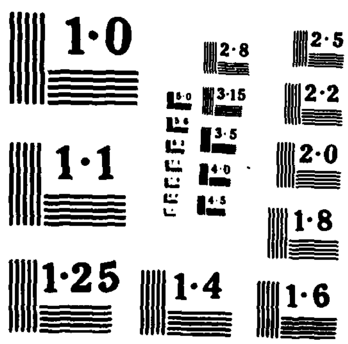
c. NAVSEAINST 5100.6, Safety Program; command policy and responsibilities concerning

Defines NAVSEA policy for the conduct of system safety and establishes program responsibilities and provisions; Weapons Systems Explosive Safety Review Board; hazards of electromagnetic radiation to ordnance responsibility

d. NAVSEAINST 5100.12, System Safety Program for Ships, Ship-borne Systems and Subsystems and Equipment

AD-A170 075 NOSC (NAVAL OCEAN SYSTEMS CENTER) PROGRAM MANAGER'S HANDBOOK(U) NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA JUL 86 NOSC/TD-880 4/5

UNCLASSIFIED F/G 5/1 NL


1·0
2·8
2·5
3·15
2·2
3·5
1·1
4·0
2·0
4·5
1·8
1·25
1·4
1·6

Establishes and promulgates NAVSEA policy for the implementation of MIL-STD-882 for ship system safety programs

e. NAVALEXINST 5100.5, System Safety Program; implementation of

   Establishes NAVSPAWAR's policy for implementation of NAVMATINST 5100.6 and MIL-STD-882. Defines responsibilities for system safety program approval and monitoring

f. NAVAIRINST 5100.3, System Safety Policies, Objectives and Responsibilities

   Implements NAVMATINST 5100.6 and establishes policies, objectives, and responsibilities for incorporating system safety into NAVAIR systems/equipment acquisitions

g. NOSCINST 4855.1, NOSC Product Assurance Program

   Requires that NOSC TD 432 be used when planning product assurance program requirements, including system safety

h. NOSC TD 870, Product Assurance Program Requirements Manual for Naval Ocean Systems Center Projects

   Establishes product assurance program content requirements, including system safety, for NOSC projects

i. NOSCINST 5100.3, System Safety Program; implementation of

   States NOSC's policy for implementation of system safety into the development and acquisition of Navy systems and equipment.

11.10.3 Human Factors Policy Directives

a. NAVMATINST 3900.3, Human Factors

   Establishes Navy policy and requirements to ensure adequate development of the human factors aspects of systems/equipment. Invokes the requirements of MIL-H-46855

b. NOSCINST 4855.1, NOSC Product Assurance Program

   Requires that NOSC TD 432 be used when planning product assurance program requirements, including human factors

c. NOSC TD 870, Product Assurance Program Requirements Manual for Naval Ocean Systems Center Projects

   Establishes product assurance program content requirements, including human factors, for NOSC projects.

11.10.4 Quality Assurance Policy Directives

a. DoD Directive 4155.1, Quality Program

   Establishes DoD quality program policies for products and services and assigns responsibilities

b. SECNAV Instruction 4855.1, Quality Assurance Program

   Implements DoD Directive 4155.1, assigns basic responsibilities for administration of quality assurance, and designates a central management focal point within the Department of the Navy

c. NAVMATINST 4855.1, Quality Assurance Policy for the Naval Material Command

Establishes Navy policies, principles, and responsibilities for implementation and monitoring weapon/support systems and equipment quality assurance programs

d. NAVELEXINST 4855.2, Naval Electronic Systems Command Quality Assurance Program

Implements NAVMATINST 4855.1 and NAVSPAWAR's systems effectiveness program policies in the quality assurance area. Key elements of the program include effective quality assurance actions applied; actions coordinated under quality assurance program; planning and control exercised

e. NAVSEAINST 4855.5, Quality Assurance Program of the Naval Sea Systems Command

Implements DoD and Navy policies regarding quality assurance. Key elements of NAVSEA policy include quality assurance program planning throughout life cycle; continuous program assessment; programs required for engineering agent activities; quality requirements for IFBs, RFPs, contracts; contractors responsible for quality of products; program for ensuring quality of technical data

f. NAVAIRINST 5400.23, Quality Assurance Program of the Naval Air Systems Command

Implements DoD, SECNAV, and NAVMAT policies and establishes NAVAIR program responsibilities and requirements, including:

Quality assurance requirements for all material, data, services—conformance to requirements to be ensured

User dissatisfaction, mission ineffectiveness to be prevented

g. NOSCINST 4734.1, Repair/Calibration of Center Test, Measuring, and Diagnostic Equipment

Requires all meteorology and test, measuring and diagnostic equipment used for quantitative measurements to be calibrated in accordance with the stated policy

h. NOSCINST 4855.1, NOSC Product Assurance Program

Requires that NOSC TD 432 be used when planning product assurance program requirements, including quality assurance

i. NOSC TD 870, Product Assurance Program Requirements Manual for Naval Ocean Systems Center Projects

Establishes product assurance program content requirements, including quality assurance, for NOSC projects.

11.10.5 Configuration Management Policy Directives

a. DoD Directive 5010.19, Configuration Management

Establishes Department of Defense policies governing the configuration management of systems/equipment and other designated material items

b. NAVMATINST 4130.1, Joint DoD Services/Agency Regulation—Configuration Management

A joint regulation endorsed by all DoD components (Army, Navy, Air Force), the Defense Supply Agency, the National Security Agency, the Defense Communications Agency, and the Defense Nuclear Agency. Establishes following requirements:

Configuration management programs required

Configuration identification
Configuration control
Configuration status accounting
Configuration audits (FCA, PCA)
Functional, allocated, product baselines required
Engineering change proposals, deviations, waivers described
Configuration control board operation described

c. NAVSEAINST 4130.10, Configuration Control Board Operations for Systems and Equipments; establishment of

Establishes configuration control board (CCB) operation and procedures for the review and processing of engineering changes

d. NOSCINST 4855.1, NOSC Product Assurance Program

Requires that NOSC TD 432 be used when planning product assurance program requirements, including configuration management

e. NOSC TD 870, Product Assurance Program Requirements Manual for Naval Ocean Systems Center Projects

Establishes product assurance program content requirements, including configuration management, for NOSC projects.

11.10.6 Design Review Policy Directives

a. NAVMATINST 3000.1, Reliability of Naval Material

Establishes Navy policy for the acquisiton and deployment of reliable material. Includes requirements for design reviews to be held in connection with contractor development programs, e.g.

Preliminary design review
Critical design review
Design certification review

b. NAVSEAINST 9070.5A, Design Reviews of Naval Sea Systems Command Acquisition Programs; Policy and Procedures for

Establishes requirement that all systems/equipment acquisition programs to include design reviews, as follows:

Major system/equipment acquisitions
 System design review
 Preliminary design review
 Critical design review
Additional reviews which may be required
 Special purpose design review
 Preproduction design review

c. NOSCINST 3912.1B, Design Review Committee; Establishment of

Establishes the NOSC design review committee (DRC) which provides advice to the technical director regarding the development and readiness for production of NOSC-developed systems/equipment. Requires the following reviews during the full-scale development phase:

Preliminary design review

Critical design review
Design certification review

d. NOSCINST 4855.1, NOSC Product Assurance Program

Requires that preliminary, critical, and design certification reviews be conducted

e. NOSC TD 870, Product Assurance Program Requirements Manual for Naval Ocean Systems Center Projects

Requires that formal design reviews be conducted, to include:

System requirements review (conceptual phase)
System design review (validation phase)
Preliminary design review (full-scale development phase)
Critical design review (full-scale development phase)
Design certification review (full-scale development phase).

11.10.7 Design Documentation Policy Directives

NOSC TD 870, Product Assurance Program Requirements Manual for Naval Ocean Systems Center Projects

Establishes product assurance program content requirements, including design documentation provisions, NOSC projects. Provides application guidance for DoD-D-1000 levels 1, 2, and 3 drawings and establishes requirements for each level. Establishes requirements for specifications. Establishes requirements for classification of characteristics.

11.10.8 Integrated Logistic Support Policy Directives

a. DoD Directive 5000.39, Acquisition and Mangement of Integrated Logistic Support for Systems and Equipment

Establishes DoD policy and assigns responsibility for integrated logistic support (ILS) including the acquisition of ILS as an integral part of the systems and equipment acquisition process

b. SECNAVINST 5000.39, Acquisition and Management of Integrated Logistic Support (ILS) for Systems and Equipment

Implements DoD Directive 5000.39 and establishes Navy policy and assigns responsibility for ILS within the Navy

c. NAVMATINST 4000.20, ILS Planning Policy

Establishes Navy policies and principles for the life-cycle support of systems/equipment. Identifies the principal elements of ILS including:

Maintenance planning
Support and test equipment
Supply support
Transportation and handling
Technical data
Facilities
Personnel and training
Logistic support resource funds
Logistic support management information

d. NAVSEAINST 4105.1, Integrated Logistic Support (ILS); policy, responsibilities and planning

Establishes NAVSEA ILS policy in accordance with NAVMATINST 4000.20, assigns responsibility for ILS actions and products, and establishes standard, detailed requirements for preparation and modification of ILS planning documents. Identifies the particular ILS program requirements for each of the life-cycle phases

e. NAVAIRINST 4000.2, ILS Planning Procedures

Establishes policy and responsibilities for the application of ILS program requirements and related management procedures within NAVAIR. Implements NAVMATINST 4000.20 as the guiding document for NAVAIR ILS planning and implementation

f. NAVELEXINST 4000.6, Integrated Logistic Support (ILS); policy and responsibilities

Establishes NAVSPAWAR's ILS policy in accordance with NAVMATINST 4000.20, assigns responsibilities for ILS actions and products, and establishes standard ILS certification requirements for material

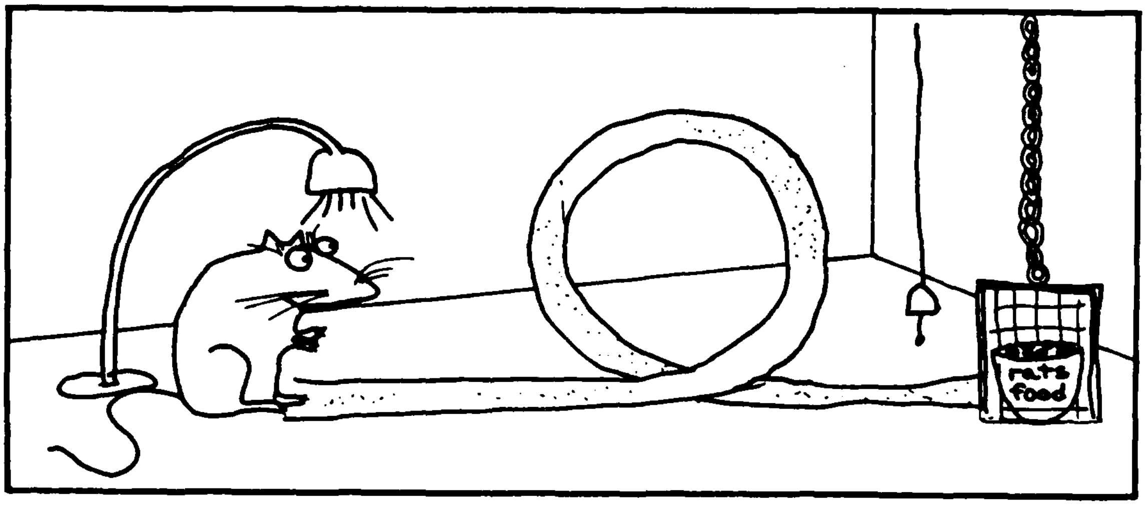
g. NOSCINST 4855.1, NOSC Product Assurance Program

Requires that NOSC TD 432 be used when planning product assurance program requirements, including ILS

h. NOSC TD 870, Product Assurance Program Requirements Manual for Naval Ocean Systems Center Projects

Establishes product assurance program content requirements, including ILS, for NOSC projects.

TEST AND EVALUATION 12



CONTENTS

SECTION 12
TEST AND EVALUATION
F. Heid, Code 954

12.1 INTRODUCTION

12.1.1 References

System Acquisition T&E Handbook, NAVSEA
T&E Handbook, 3rd edition, NAVSPAWAR

12.1.2 Outline

- Introduction
  - References
  - Outline
  - Summary
- Definitions
- T&E During the Acquisition Process
  - Milestone I
  - Milestone II
  - Milestone III
    - TECHEVAL
    - OPEVAL
- Critical T&E Documents
- Test Planning
  - Test and Evaluation Master Plan
  - Test Plans
  - Site Selection
- Conducting the Tests
  - Test Team Selection
  - Conduct
  - Reporting
  - Environmental Testing
  - NOSC Capabilities
- Project Examples
  - SCIACT (Secure Communication Integration of the AN/GSC-40 Command Post Terminal)
  - TRIDENT Integrated Radio Room
  - Message Processing and Distribution System (MPDS)

12.1.3 Summary

Successful test and evaluation (T&E) is the major determining factor in program acquisition milestone decisions. This is also probably true at any time, but certainly during the acquisition process. It is not the intention of this presentation to make test directors of each of you, but rather to present and review pertinent T&E information for you as program managers so you can conduct successful programs. 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 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.

12.2 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

12.3 T&E DURING THE ACQUISITION PROCESS

There are four phases (O, I, II, and III) during the acquisition process which you have probably heard many times by now. The decision to proceed from one phase to the next is considered a milestone (MS), and are numbered by the phase you are deciding to enter. The results of T&E are the major factors in determining program milestone decisions.

12.3.1 Milestone 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.

12.3.2 Milestone II

MS-II is based upon the DT-1 and OT-1 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 (ADM) and require appropriate test documentation.

12.3.3 Milestone 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 and eliminate some of the first article tests. You will notice I have mentioned units—multiple test units, or parts of a unit, are required as several tests are conducted in parallel (i.e., environmental, performance, reliability, etc.), and some tests are destructive (shock, salt spray, fungus, etc.). The size of the system (program product), costs, and schedule will all have a bearing upon the quantity of test units planned.

12.3.3.1 TECHEVAL. The last test of DT-II is usually a TECHEVAL for which you must develop specific documentation. The purpose of a TECHEVAL is to accomplish the following:

Verify that the system meets the technical performance requirements

Verify compatibility with other systems and environment

Verify that the system is operationally satisfactory and ready for OPEVAL.

12.3.3.2 OPEVAL. OT-II consists of an operational test conducted by an independent agency, OPTEVFOR, using military operators of quantity and rate, as those planned for the Fleet. This Navy crew will have been trained by the curriculum developed for this program. The OPEVAL readiness criteria include the following:

TEMP current and approved

DT-II completed and reports published

All DT&E objectives and performance thresholds met

Engineering complete and "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

Space parts available for OPTEVFOR

Navy training plan approved and provided OPTEVFOR

OPEVAL crew consists of numbers and rates planned for Fleet, and have completed training

All OPEVAL resources listed in the TEMP available

The safety program satisfactorily completed.

12.4 CRITICAL T&E DOCUMENTS

The test and evaluation master plan (TEMP) is probably the most important program T&E document, followed by the performance specification. Specifications may be considered T&E documents as they contain test requirements. Most of the test requirements are identified in the TEMP and/or system specification. A T&E management plan may be required, depending upon the size of the program. For smaller projects, information (T&E responsibilities) is contained in the Navy test plan along with integration and performance test plans.

Environmental test plans and procedures are required to verify the requirements identified in the quality section of the specifications. A test requirement document may be required, again, depending upon the size of the program and the number of official specifications. For the larger programs, a tests 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 get a handle on the test requirements and to be sure that none of them fall 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. Of course all of these tests require reports documenting the results. Test reports provide the supporting data to keep a project moving from phase to phase at the various milestones.

12.5 TEST PLANNING

12.5.1 Test and Evaluation Master Plan

One of the first test plans to be developed is the TEMP. This should be completed by MS-I, or early in the D/V phase. The purposes of a TEMP include the following:

Define and control adequate T&E
Identify and reserve special resources
Document major agreements between the SYSCOM and OPTEVFOR.

The TEMP consists of the following items:

Cover Page
- TEMP number
- Title
- ACAT number
- Submittal date
- Review and approval signature lines

Part I
- Major points of contact
- System description
- What it does for the Fleet
- Financial summary
- T&E critical issues, cross-referenced to tests in parts II and IV
- Specific performance requirements for OT&E and DT&E, acceptable criteria and failure definitions.

Part II

Program structure, showing DT and OT periods, milestones, test articles, and deliveries

Part III

DT&E outline, describing each major DT period, DT&E to date, and future DT&E related to critical issues

Part IV

OT&E outline, describing OT, and identification of DT&E results to be used for OT&E

Part V

Production acceptance and evaluation

Part VI

T&E resource summary.

12.5.2 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 check list for any plan:

Introduction-objectives
Scope
Test support
Installation and checkout (I&C)
Test conditions and criteria
Test methods
Test schedule
Test documentation, procedures, and reports.

12.5.3 Site Selection

The selection of a test site is dependent upon the type of tests required to be performed. It 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
Knowledgable test team available and provides training for ship crews
Allows stressing the system
OPTEVFOR involvement (upon PA request)
Validation of I&C procedures.

12.6 CONDUCTING THE TESTS

The testing periods are usually just prior to the milestone decisions. There is very little, if any, testing before MS-I. This is usually a study and analysis phase. If there is a new technology or questionable state-of-the-art process being used, some testing may be required at this time. Again 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 for OPEVAL.

12.6.1 Test Team Selection

When selecting a test team, maintain a continuity of personnel. That is, use some of the people that developed the test requirements document and the test plans. Also, get support from the developer. Test team members should have some previous experience, at least the key personnel. Include some equipment specialists, and invite OPTEVFOR to participate or observe.

12.6.2 Conduct

When conducting the tests know what data is required to verify performance. Be familiar with the procedures; they should be dry run prior to the official test run. Provide data sheets, and use them! Maintain an operating log of all actions.

12.6.3 Reporting

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.

12.6.4 Environmental Testing

This consists of testing the system under the various conditions it would encounter in actual operation. Environmental tests cover the following.

Low temperature	High temperature
Humidity	Salt fog
Sunshine	Fungus
Wind velocity	Icing
Hydrostatic pressure	Altitude
Dust	Rain
Thermal shock	Transportability
Shock	Vibration

12.6.5 NOSC Capabilities

The Electronic and Environmental Test Branch, Code 951, has the capability to conduct first article acceptance and performance testing for almost any radio receiver or transmitter, and for much other electronic equipment.

Four shielded enclosures are available to enable testing without external interference. Two enclosures are ducted together to enable the test stimulus or equipment to be shielded and shielded from the test unit. The largest enclosure is 20 by 24 by 15 feet.

Three vibration machines for electronic equipment testing are available with loads up to 620 pounds and frequencies from 5 to 2,500 Hz.

Two mechanical vibration machines are available, primarily for mechanical shipboard vibration testing. They have load capacity up to 10,000 pounds, and frequencies from 5 to 40 Hz.

Shock machines are capable of loads up to 5,600 pounds and up to 2,000 g's.

Five climatic chambers are available to simulate environments of temperature, humidity, altitude, and sea pressure.

The Systems Test and Evaluation Branch, Code 954, provides the following services:

Develop quality sections of specifications
Draft TEMPs
Develop test plans and procedures
Conduct tests
Develop test reports
Test consultation
Review of procurement packages (T&E aspect).

12.7 PROJECT EXAMPLES

12.7.1 SCIACT (Secure Communication Integration of the AN/GSC-40 Command Post Terminal)

The SCIACT program developed a T&E management plan. This identified the tests, test schedule, test organization and responsibilities, test personnel, and test facilities. It listed these tests:

Environmental
EMI
EMP
Tempest
System integration
System acceptance.

A specific test plan and procedure were 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, good test coordinator, and sufficient funding to do the task.

12.7.2 TRIDENT Integrated Radio Room

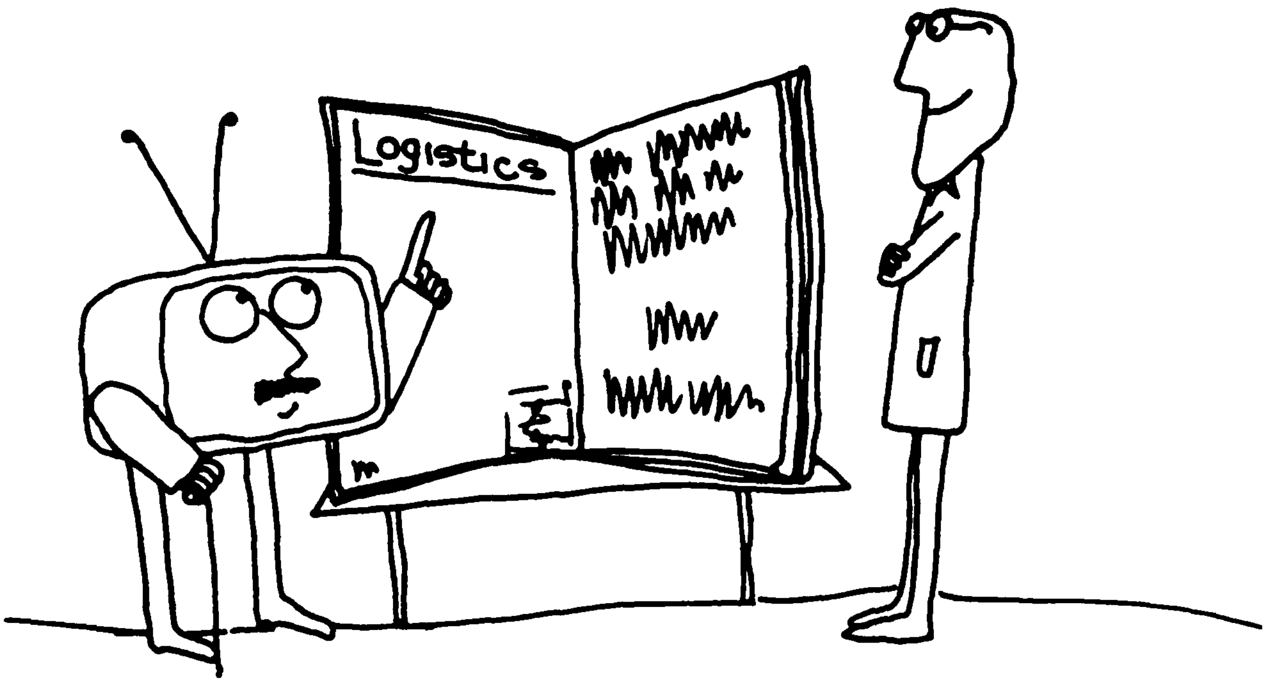
The integrated radio room (IRR) is another project that developed a good T&E program. This was a dual development FSP program from which a production contractor was to be selected after Navy independent testing. Due to overruns and schedule slippage the dual independent Navy tests were not conducted. The Navy tested each system (neither was completed) simultaneously at each contractor's facility with the help of the particular developing contractors. The results of their tests, plus their proposals to complete the system were evaluated and one contractor was selected for a limited production.

The first delivered unit underwent a complete independent Navy acceptance and TECHEVAL. These tests caused numerous hardware and software changes to be made to the system, and the schedule slipped more than a year. It did result in an operational system delivered to the first TRIDENT submarine. Also much of the schedule slip was due to the hull delivery.

12.7.3 Message Processing and Distribution System (MPDS)

This project rushed the hardware—the T&E program, primarily test procedures. The terminals were advanced breadboards that were rushed into production. Likewise, the data acquisition and distribution unit laboratory model was integrated into a deliverable system. The reliability and MTBF was very poor—of course we are talking about the late 1960s and early 1970s when T&E was primarily a production acceptance test. The poor reliability created a lot of user dissatisfaction.

COMPUTER-AIDED LOGISTICS 13



CONTENTS

SECTION 13
COMPUTER-AIDED LOGISTICS

A. Knight, Code 936

13.1 INTRODUCTION

13.1.1 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
DoD Directive 5000.39, Acquisition and Management of Integrated Logistic Support for Systems and Equipment

13.1.2 Outline

Introduction
- References
- Outline
- Summary

Requirements
Important Facts
What is the Technical Life Cycle?
Changing Scope of Logistic Requirements and Perceptions
Basic Guidance
What are the Logistics Elements?
Logistic Support Analysis (LSA)
LSA Task 103
Detecting Trends
What Do I Do?
What Help is Available?

13.1.3 Summary

See below.

13.2 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*.

13.3 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*, 85 cents 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.

13.4 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

13.5 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 13.1, 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 13.1 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 data base.

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.

13.6 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.

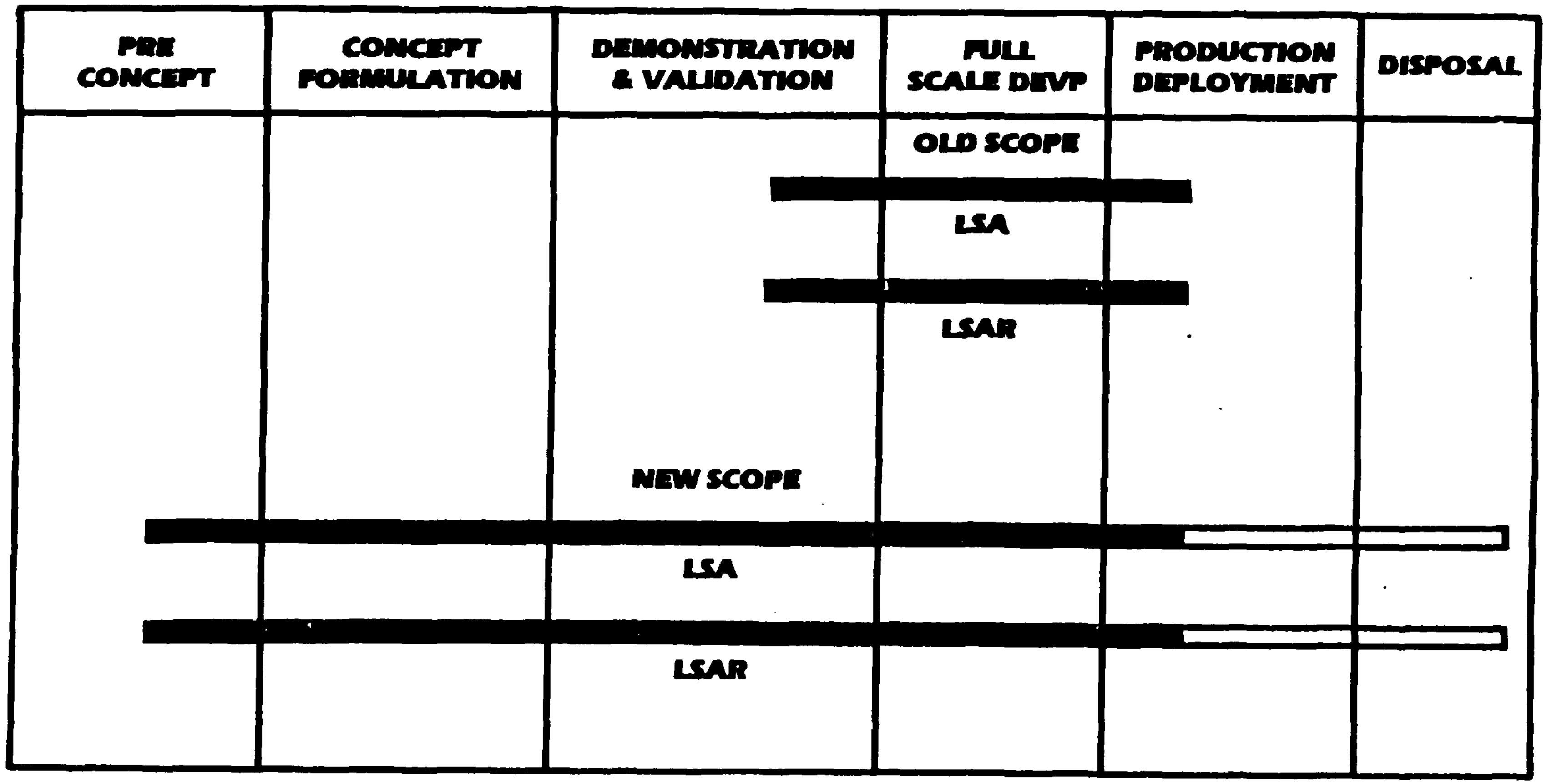


Figure 13.1 Change in logistic requirements and perceptions.

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.

There will be a section in the course which will give specific guidance.

13.7 WHAT ARE THE LOGISTICS ELEMENTS?

There are many different definitions as to the organization of the specific elements of logistics. The list provided below is one that all of the services generally agree with. When logisticians work across service boundaries, i.e., joint service acquisitions, it is the one they normally use. The sequence in which the elements are listed should not be interpreted as establishing a priority.

a. Design influence and integration to include logistic-related reliability and maintainability

b. Maintenance concept and plan

c. Supply support

d. Support equipment and test, measurement, and diagnostic equipment

e. Training and training devices

f. Manpower and personnel

g. Computer resources support

h. Packaging, handling, and storage

i. Technical data

j. Transportation and transportability

h. Facilities

i. Standardization and interoperability

13.8 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

13.9 LSA TASK 103

From the list above 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

13.10 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 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 which can't be held or spent?

It is for situations like this that very close coordination by the logistician is required for elements outside of the main stream of design and conventional systems engineering.

13.11 WHAT DO I DO?

Figure 13.2, LSA activities in the acquisition cycle, provides very specific guidance as to the type of activities which are normally required.

It will be noted 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 within the realm of possibility that a Navy laboratory will be called upon to assist in this function.

The bottom line of Figure 13.2 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 it will be, what will it look like, are architectural drawings required, site surveys, impact studies, can the requirements be combined with the potential sites other plans, and what special requirements are needed. These questions are only a few of those which 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.

13.12 WHAT HELP IS AVAILABLE?

Code 936 (Computer Integrated Engineering), Naval Ocean Systems Center, has developed a computer program that should be of major advantage to program management. The program is called computer-aided logistic support analysis (CALSA). A brief discussion of the program follows.

CALSA

a. Government-owned computer program developed by the NAVOCEANSYSCEN

b. User friendly

c. Easily tailorable to meet program requirements

d. Real time

e. Designed to be a LIFE-CYCLE program

f. Being used by the Navy on one program at the Center and the Air Force at several locations.

g. Has DoD, OPNAV, NAVAIR, NAVSEA, NAVSUP, Air Force Systems Acquisition Logistics Command, Air Force Electronics Command, Army Air Defense Artillery, Army Training and Doctrine Command, Defense

SYSTEM ACQUISITION PHASE	PRE-PROGRAM 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 Contraints -Technical Advancements -Operational Requirements -Existing Support Structure • Identify Historical Lessons Learned • Include Constraints in Requirements/Needs Documents • Perform Intended Use Analysis • 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 P³I 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 Post-Deployment 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 Estimated 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 Post-Production Support • Test Adequacy of Planned ILS Resources • Continue Repair Level Analysis • Satisfy International Logistics Considerations	• Produce and Deploy ILS Elements • Implement ILS/Development Mater Plan • Initiate Work Arounds for Identified Shortfalls • Update Post-Production Support Plan • Obtain and Assess Operational Feedback • Update LSA Record	• Manage Post Production Support • Manage Program Changes -Prioritization -Block Change Concept -LCC Implications of Proposed Changes -Implement Corrective Action Systems (Item/Activity/System) • Institute P³I

TYPES OF FUNDS AND WHEN OBLIGATED

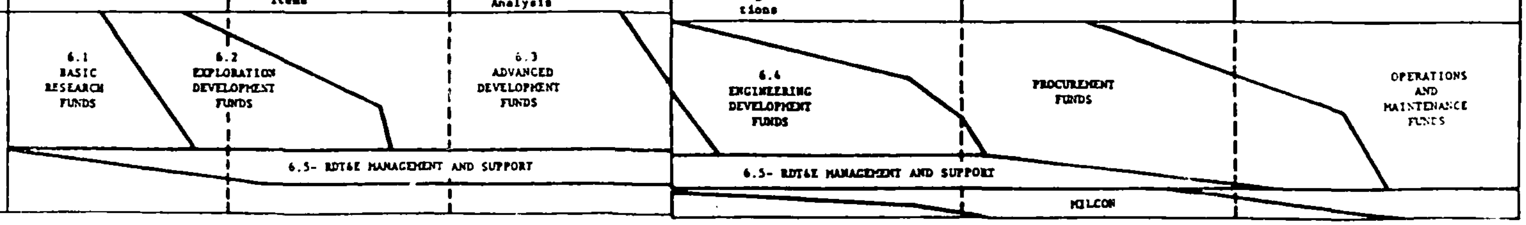


Figure 13.2 LSA activities in the acquisition cycle.

h. Systems Management College, and Army Logistics Management Center level interest.

i. Is under evaluation for validation by the Army

j. Is a planned testbed system for the joint logistics Commander's reliability and maintainability in computer-aided design demonstrations.

Already several testbed elements have been applied interactively to CALSA and will be widely available shortly.

Hardware and manpower analysis (HARDMAN) (Navy testbed project)

Navy timely spares provisioning (TSP) (Navy testbed project)

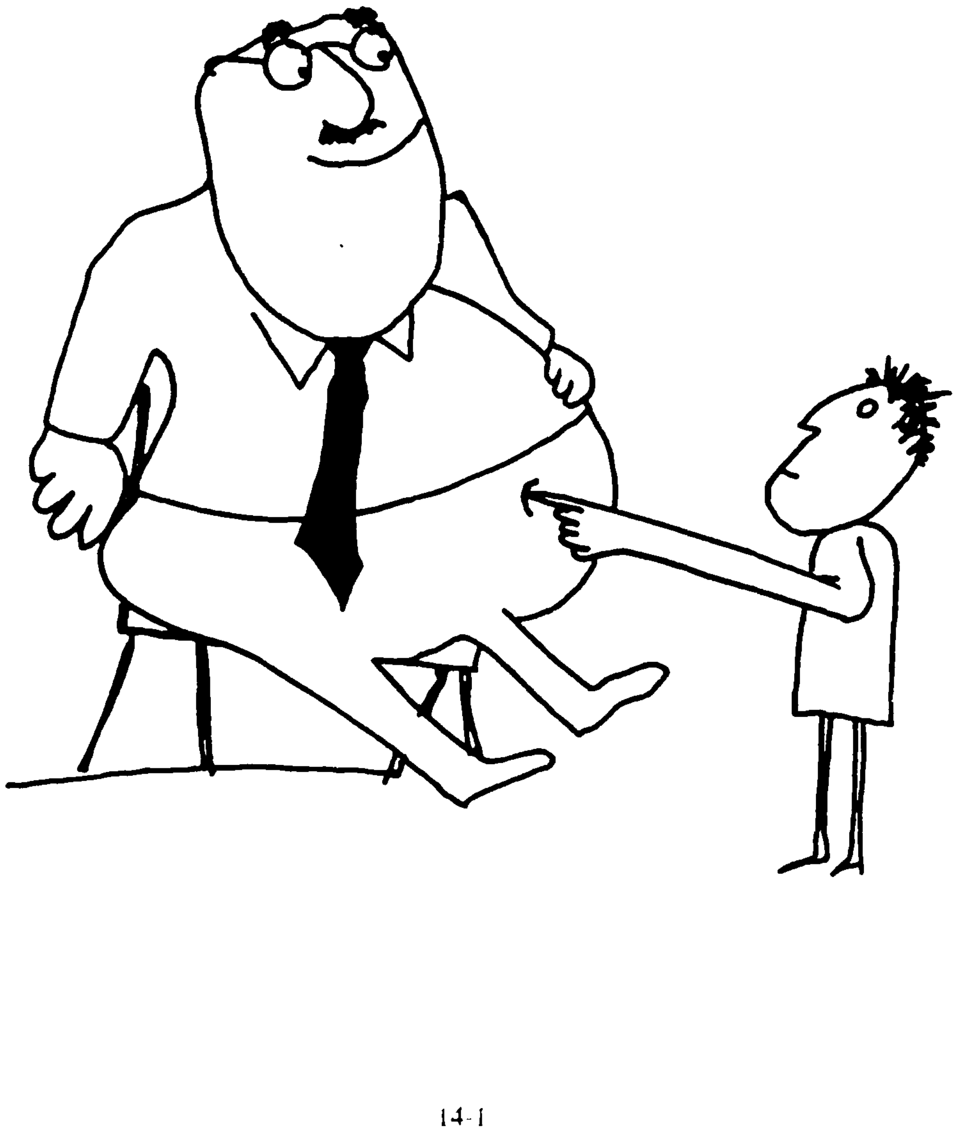
DoD replenishment parts breakout program (FARS Supplement 6) (Testbed project)

Interactive wholesale and retail supply systems analysis models and algorithms under development in conjunction with NAVSUPSYSCOM and Ships Parts Control Center (testbed project)

Planned onsite availability of various interactive computer-aided engineering and logistics tools

The reader should be aware that computer-aided engineering and logistics support is available from Code 936, Computer Integrated Engineering. If we cannot assist you, we can direct you to someone who can.

SOFTWARE PRODUCT ASSURANCE 14



CONTENTS

SECTION 14
SOFTWARE PRODUCT ASSURANCE
C. Gladson, Code 9201

14.1 INTRODUCTION

14.1.1 References

See subsection 14.2.2.1.

14.1.2 Outline

- Introduction
  - References
  - Outline
  - Summary
- Project Management
  - Scope
  - Government Documents
- Definitions
  - Allocated Baseline
  - Authentication
  - Baseline
  - Certification
  - Computer Data Definition
  - Computer Software (or Software)
  - Computer Software Components (CSC)
  - Computer Software Configuration Item (CSCI)
  - Computer Software Documentation
  - Computer Software Quality (or Software Quality)
  - Configuration Identification
  - Configuration Item
  - Developmental Configuration
  - Firmware
  - Format Test
  - Functional Baseline
  - Hardware Configuration Item (HWCI)
  - Informal Test
  - Modular
  - Product Baseline
  - Software Development Library (SDL)
  - Top-down
  - Unit
- General Requirements
  - Computer Software Organization

Software Quality
Subcontractor Control
Nondeliverable Software, Firmware, and Hardware
Firmware
Development Process
Concept Exploration Phase
Demonstration and Validation Phase
Software Requirements Phase
Preliminary Design Phase
Detailed Design Phase
Coding and Unit Test Phase
Computer Software Components (CSC) Integration and Testing Phase
CSCI Testing Phase
Software Quality Evaluation
Purpose
Internal Reviews
Internal Review—Software Requirements Analysis
Internal Review—Preliminary Design
Internal Review—Detailed Design
Internal Review—Code and Unit Testing
Internal Review—CSC Integration and Testing
Internal Review—CSCI Testing
Evaluation
Software Project Planning and Control

14.1.3 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

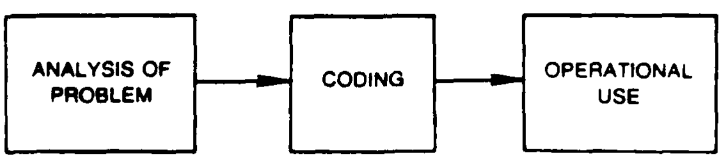


Figure 14.1 The three-phase software development process

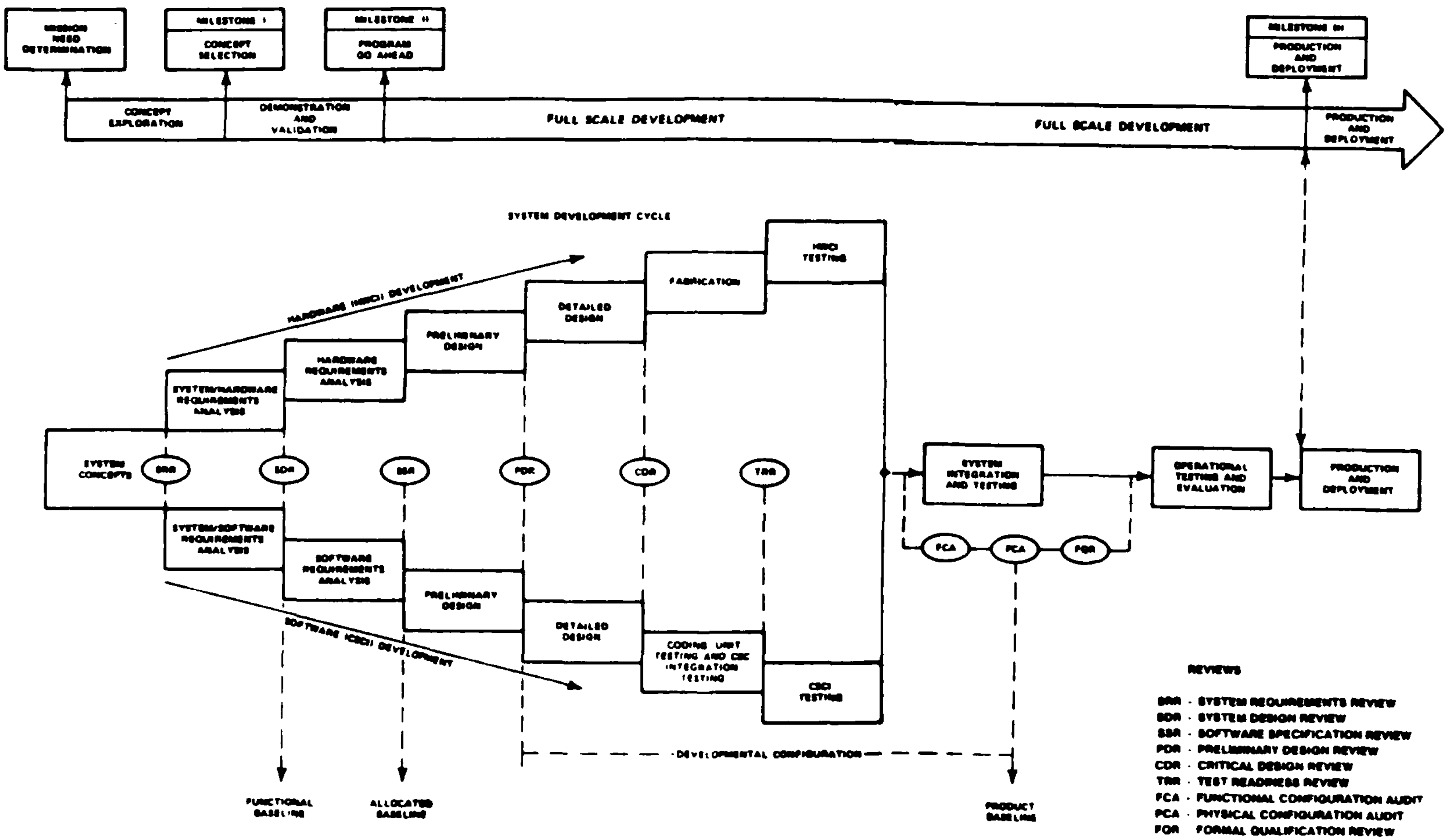


Figure 14.2 System development cycle within the system life cycle.

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.

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 O of DoD-STD-2167.

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 is noted below:

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 SDA, SSPM, SCMP, or SQEP.

14.5.8 CSCI Testing Phase

14.5.8.1 Purpose. The objective of this phase is to show 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.

CONTRACTING 15

CONTENTS

SECTION 15
CONTRACTING
D. Lumpkins, Code 217

15.1 INTRODUCTION

15.1.1 References (listed by topics)

Acquisition Planning and APs	FAR Part 7 DFARS Part 7 NARSUP Part 7 NOSCNOTE 4200 PM 19-86/Code 217
ADPE Acquisition	SECNAVINST 5231.1B SECNAVINST 5236.1B SECNAVINST 5236.2A SECNAVINST 5237.1 SECNAVINST 5238.1B NAVSUPINST 4284.3 NOSCINST 5230.1C
Competition Requirements	FAR Part 6 DFARS Part 6 NARSUP Part 6 FAR 15.5 NOSCINST 4200.6A NOSINST 3900.1C NOSINST 4200.6S PM 13-85/Code 217 CICA
Contracted Advisory and Assistance Services	SECNAVINST 4200.31A
Contracting Officer's Technical Representative	NOSCINST 4330.1 NAVSUPINST 4330.6B NOSCINST 4235.1
Data	DFARS 53.303-70 NAVMATINST 4000.15A DoDINST 5010.12 NOSCISNT 4000.1D
Incremental Funding	NOSCINST 7300.3A
Major Systems Acquisition	DoDINST 5000.1(D) DoDINST 5000.2

Multiple Funding & Funding Plan	NOSCINST 7300.7
Nonpersonal Services Determination	NOSCINST 4200.4B
Patent Rights	FAR 27.3 NOSCINST 4430.4C
Proprietary Material	NOSCINST 3900.6b
Security Classification Specification	FAR 53.204-1(a) NOSC TD 490A
Service Contracts	NAVSUPINST 4300.6B NOSCINST 4330.1
Signature Authority & Priority Designator	NOSCINST 4614.1B
Small Business	FAR 19.6
Small Purchase Procedures	FAR Part 10 FAR Part 13 DFARS Part 13 NARSUP Part 13 SUPARS P-560 OPNAVINST 4614.1F PM 13-86/Code 217 PM 14-86/Code 217 PM 15-86/Code 217
Source Selection Planning/Tech Eval	FAR Part 15
Specifications	FAR part 10 MIL-STD-490
Statement of Work	MIL-HDBK-245B MIL-S-83490 MIL-STD-490 DoD-D-1000
Stub Requisition	FAR 53.301-4 FAR 13.5 PM/Code 217
Supply Department Organization	NOSCNOTE 5400
Unauthorized Commitment of Appropriated Funds	NOSCINST 4235.1
Unsolicited Contractor Proposals	NOSCINST 3900.1C

NOTE: PM stands for procurement memoranda; available from Code 217 (Policy and Planning Branch), x7141. Instructions and Notices are available from Alma Savage, Code 132, x6553.

15.1.2 Outline

Introduction
- References
- Outline
- Summary

- Glossary of Acquisition Terms
- Contracting Conditions and Environment
  - Legislation Affecting Acquisition
  - Deputy for Small Business
  - Data Management Office
  - Contracting Officer's Technical Representative's Duties and Responsibilities
  - Unauthorized Commitments
- Advance Acquisition Planning and APs
  - Background
  - Benefits of Contract Planning
  - Timing Considerations
  - Acquisition Plans
- Further Presolicitation Preparation
  - Statement of Work
  - Specifications
  - Technical Evaluation Plan
- Other Than Full and Open Competition
  - Sole Source Justification and Justification and Authorization
  - Brand Name or Equal
- Contract Types
  - References
  - Service Contracts
  - Indefinite Delivery Contracts
  - CPFF Contracts (Completion versus Term)
- Solicitation Phase
- Administration Phase
- Special Considerations
  - ADP Acquisitions
  - Small Purchase Procedures
    - Sole Source
    - Purchase Descriptions
    - Buy American Act
    - Suggested Sources
    - Technical Evaluation
    - Offsite Repairs
    - Onsite Repairs
    - Stubs Status
    - Patents
  - Unsolicited Contractor Proposals
- Appendix 15A Contents of Acquisition Requirements Package (ARP)
  - 15B The NOSC Stub Requisition Form and Instructions for Its Use
  - 15C Internal Approval Control Points for Commodities/Documentation at NOSC

15.1.3 Summary

This section is devoted to the topic of contracting. It is intended to be an abstract of a subject so massive and so fluid that a full discussion of it would be impractical. We approached the writing of this section aware that the contracting process cannot be fully defined because there is constant revision and change. Therefore, we seek to provide the program manager with the fundamental concepts of the acquisition process (the language, the references, and the names of knowledgeable individuals in each subject area) rather than a detailed discussion on each topic. The references cited herein will provide program management with the information required to gain a more complete understanding of individual aspects of the acquisition cycle.

NOSCINST 4200.5 "Procurement Requirements Package Handbook" (30 August 1978) has been cancelled and is being rewritten. Its successor, the *Acquisition Requirements Package Handbook*, will become the comprehensive local instruction on the subject of contracting, providing detailed instructions for preparing the acquisition requirements package.

Be advised that many important changes in DoD acquisition have taken place. Do not rely on any information currently in print or on previous experience to guide you. Until the new handbook is issued, contact your Contracts Branch for specific guidance. Do not rely on any information currently in print or on previous experience to guide you. Figures 15.1 and 15.2 show the organization charts for NOSC's Supply Department and Contracts Division, respectively.

This section is ordered in a roughly chronological fashion. First come the glossary (15.2), which introduces you to the language of contracting, and subsection 15.3, which sketches the environment, conditions, and responsibilities involved in the contracting process. After acquisition planning documents are reviewed (15.4), the specific presolicitation preparations that include the statement of work, specifications, and the technical evaluation plan are presented (15.5). Approaches other than full and open competition are considered in subsection 15.6; these include sole source justification and the brandname — or — equal requirement. Subsection 15.7 reviews the types of contracts. Then the solicitation and administration phases are briefly discussed (15.8 and 15.9). The section concludes with special contracting considerations (15.10) and the appendixes.

15.2 GLOSSARY OF ACQUISITION TERMS

Acquisition	Buying, leasing, renting, or otherwise obtaining supplies or services to meet needs of the government.
Administrative Change	Contract modification signed only by the Contracting Officer; it has no effect on price, performance, or delivery.
Administrative Contracting Officer (ACO)	A government contracting officer, often at an installation other than the one which made the contract, who handles the business administration of the contract. For the larger primes, the ACO is commonly resident at the prime's facility.
ADP/ADPE	Automatic data processing/equipment
Allocate	To assign an item of cost, or a group of items of cost, to one or more cost objectives. This term includes both direct assignment of cost and the reassignment of a share from an indirect cost pool.
AP	Acquisition plan
ARP	Acquisition requirements package (aka: procurement requirements package (PRP)).
AR/DRRB	Acquisition requirements/Data Requirements Review Board (same as DRRB)

ASN(S&L)	Assistant Secretary of the Navy (Shipbuilding & Logistics)
Bid	A prospective contractor's (bidder's) offer in reply to a sealed bid solicitation document "Invitation for Bid." Needs only government acceptance to constitute a binding contract.
Bidders (Mailing) List (Master Bidders List)	List of sources maintained by the contracting office from which bids or proposals or quotations can be solicited.
Blanket Purchase Agreement (BPA)	A negotiated contractual agreement issued by Code 211 between a contractor and the government under which individual calls not exceeding $10,000, except for subsistence, may be placed during a specified period of time and within a stipulated aggregate amount, if any. This simplified purchase method is designed to fill anticipated repetitive needs for small quantities of supplies or services, which are generally ordered by placing calls orally, thereby eliminating the need for issuing individual purchase documents; as a result, administrative costs are reduced.
Buy American Act	Federal statute imposing restrictions on placing contracts with manufacturers who would deliver items not substantially produced in the United States.
CAS	Cost accounting standards
CDRL	Contract data requirements list — DD form 1423
CFE	Contractor-furnished equipment
Change Order	Contract modification signed only by the contracting officer directing the contractor to take certain action within the scope of the contract. Usually affects price, performance, and/or delivery.
Commerce Business Daily (CBD)	Daily publication by Department of Commerce synopsizing all (except classified purchases and certain other specifically excepted actions) government solicitations in excess of $25,000 and awards exceeding $100,000.
Competition Advocate	At NOSC, Commanding Officer.
Competition Advocate Review Board (CARB)	Committee assembled to review non-competitive requirements over $100,000.
Contract	Simply an agreement between the government and contractor expressing terms and conditions affecting price, performance, and delivery.
Contract Modification	Written action on standard form 30 changing some part of a contract. A formal revision of the terms of a contract, either within or outside the scope of the agreement. Includes change orders. See also *Supplemental Agreement*.
Contract Type:	Refers to specific pricing arrangements between the government (buyer) and the performing contractor(s) (sellers) for payment for work performed under contracts. The compensation arrangements include firm fixed-price, fixed-price incentive, cost-plus-fixed-fee,

cost-plus-incentive-fee, and several others. Among special arrangements that use fixed-price or cost-reimbursement pricing provisions are contract types called indefinite delivery contracts, basic ordering agreements, letter contracts, and others.

a. Basic Ordering Agreement (BOA) — A written instrument of understanding (not a legally enforceable contract per se) between a contractor(s) and the government. Sets forth the contract clauses applicable to future procurements entered into between the parties during the term of the basic agreement. Used to eliminate extensive and costly negotiation when a substantial number of separate-contracts may be entered into with a contractor over a definite period of time.

b. Cost-Reimbursement Contracts — In general, category of contracts whose use is based on payment by the government to a contractor of allowable costs as prescribed by the contract. Normally only "best efforts" of the contractors are involved. This category includes cost, cost sharing, cost-plus-fixed-fee, cost-plus-incentive-fee contracts, and cost-plus-award-fee. A cost-reimbursement contract establishes an estimate of total cost for the purpose of obligation which the contractor may not exceed, except at his own risk, without prior approval or subsequent ratification of the contracting officer.

c. Fixed-Price Contracts — In general, a category of contracts whose use is based on the establishment of a firm price to complete the required work. This category includes firm fixed-price, fixed-price with escalation, fixed-price redeterminable, and fixed-price with incentive provisions contracts.

d. Indefinite Delivery Type Contracts (IDTC) — Used when the precise quantity of items or specific time of delivery desired is not known. Usually will specify a maximum and/or minimum quantity. Such procurement is effected via a definite quantity contract, a requirements contract, or an indefinite quantity contract. May be either negotiated or sealed bid.

e. Letter Contract — An interim type of contractual agreement, sometimes called a "Letter of Intent," authorizing the commencement of manufacture of supplies or performance of services. Used in negotiated procurements only when a definite fixed-price or cost-reimbursement contract cannot be written until a later date.

f. Special Purpose — In general, a category of contracts designed to facilitate a procurement for which one of the fixed-price or cost-reimbursement-type contracts is considered inappropriate. This category includes basic agreements, indefinite delivery type contracts, letter contracts, and time and materials/labor hour contracts.

g. Term or Completion — A CPFF contract may take one of two basic forms: completion or term. Completion describes the scope of work by stating a definite goal or target and specifying an end product. Normally requires the contractor to complete and deliver the specified end product within estimated cost as a condition for payment of entire fixed fee. Term describes the scope of work in general terms and obligates the contractor to devote a specified level of effort for a stated time period.

h. Time and Materials	Negotiated contracts based on specified fixed hourly rates to complete a given task. Used only in situations where it is not possible at the outset to estimate the extent or duration of the work involved or to anticipate cost with any substantial accuracy.
Contracting Officer	Government official who by position or appointment is authorized to bind the government in contracts as an agent for the government.
Contracting Officer's Technical Representative (COTR)	An individual appointed in writing by the commanding officer of the requiring activity, or the contracting officer, with duties assigned by the contracting officer, who functions as the technical representative of the contracting officer in the administration of a specific contract or delivery order. The COTRs general duties include providing technical direction as necessary and authorized with respect to the specifications or statement of work and monitoring the progress and quality of contractor performance.
Contractor	Private, nongovernment party who enters into a contract with the government. Vendor is a term also used to denote contractor.
Cost Overrun	The amount by which a contractor exceeds the estimated cost and/or the final limitation (ceiling) of his contract.
DARPA	Defense Advanced Research Projects Agency
Data	All recorded information to be delivered under a contract. "Technical data" excludes management and financial data.
DCAA	Defense Contract Audit Agency
Defense Contract Administration Service (DCAS)	An agency, under direction of Director of DSA, to provide unified contract administration services to DoD components and NASA for all contracts, except those specifically exempted.
a. DCASMA	Defense Contract Administration Services Management Area
b. DCASPRO	Defense Contract Administration Services Plant Representative Office
c. DCASR	Defense Contract Administration Services Region
DCP	Development concept paper; decision coordination paper
DDRE	See ODDR&E
Delivery Order	A contractual document on DD form 1155 issued by a contracting or ordering officer under an existing contract. A delivery order automatically incorporates all the terms and conditions in the basic contract.
Deputy for Small Business	At NOSC, Code 202; previously the small and disadvantaged business utilization specialist (SADBUS)

Determination and Findings (D&F)	A special form of written approval by an authorized official that is required by statute or regulation as a prerequisite to taking certain contracting actions. The determination is a conclusion or decision supported by the findings. Examples are making advance payments in negotiated acquisitions and determining the type of contract to use.
DFARS	DoD FAR supplement
DID	Data item description (DD 1664)
DIPEC	Defense Industrial Plant Equipment Center
Direct Cost	Any cost which is identified specifically with a particular final cost objective. Not limited to items which are incorporated in the end product as material or labor.
DLA	Defense Logistics Agency
DNFYP	Department of the Navy Five-Year Plan
DNL	Director of Navy Laboratories
DNSARC	Department of the Navy Systems Acquisition Review Council
DPA	Delegation of procurement authority
DRRB	Data Requirements Review Board
DSARC	Defense Systems Acquisition Review Council
DTC	Design to cost
ECP	Engineering change proposal
Expressly Unallowable Cost	Particular item or type of cost which, under the express provisions of an applicable law, regulation, or contract, is specifically named and stated to be unallowable.
Federal Acquisition Regulation (FAR)	The basic regulation for the conduct of government acquisition. Further implemented by departmental acquisition instructions.
Fee	An amount, in addition to allowable costs, paid to contractors having cost-plus-fixed-fee or cost-plus-incentive-fee contracts. In cost-plus-fixed-fee contracts the fee is fixed as a percentage (stated in a dollar amount) of the initially estimated cost of the acquisition. In cost-plus-incentive-fee contracts the fee is expressed in a maximum and minimum amount, along with a fee adjustment formula that provides the incentive for a reduction in cost to the government. Statutory limitations are prescribed for the maximum setting of fees.
F/AD	Force/activity designator
FMA	Financial management advisor
FOB	Free-on-board or freight-on-board
FSC	Federal supply class

FYDP	Five-year defense program
Full & Open Competition	All responsible sources are permitted to compete.
General Accounting Office (GAO)	An agency of the legislative branch, responsible solely to the Congress, which functions to audit all negotiated government contracts and investigate all matters relating to the receipt, disbursement, and application of public funds. Determines whether public funds are expended in accordance with appropriations and law.
General and Administrative (G&A)	Any management, financial, and other expense which is incurred by or allocated to a business unit and which is for the general management and administration of the business unit as a whole. Does not include those management expenses whose beneficial or causal relationship to cost objectives can be more directly measured by a base other than a cost input base representing the total activity of a business unit during a cost accounting period.
General Provisions	The mandatory and applicable (by law or regulation) clauses for all DoD contracts for the type of acquisition involved — sometimes called "boiler plate." The clauses devised particularly for the acquisition are called the special provisions.
Government-Finished Property (GFP)	Government-owned property furnished to a contractor for the performance of a contract. Defined as industrial facilities, material, special tooling, special test equipment, military property. Also designated government-furnished material (GFM), government-furnished equipment (GFE), government-furnished information (GFI), and government-furnished facility (GFF).
GSA	General Services Administration
HCA	Head of contracting agency
IGCE	Independent government cost estimate
ILS	Integrated logistic support
Indirect Cost	Any cost not directly identified with a single final cost objective, but identified with two or more final cost objectives or with at least one intermediate cost objective.
IPD	Issue priority designator
IPE	Industrial plant equipment (See DIPEC)
IR&D	Independent research and development
IR/IED	Independent research/independent exploratory development
Invitation for Bids (IFB)	The solicitation form used in sealed bid acquisitions and in step two of two-step advertising (see below). All sealed bid acquisitions must be on invitation for bids.
K	Contract
KO	Contracting officer (see also CO)

KR	Contractor
LCC	Life-cycle costing
LSA	Labor surplus area
Master (Delivery Order) Contract	A type of agreement describing the total desired area of contractor performance and breaking this down into a number of broadly defined tasks. The contractor is obligated to perform delivery orders subsequently issued by the government under the terms and conditions in the master contract.
MIC	Management Information Center
MIPR	Military indepartmental procurement request
MYP	Multiyear procurement
NARSUP	Navy Acquisition Regulation Supplement
NAVSUP	Naval Supply Systems Command
NICRAD	Navy/Industry Cooperative R&D Program
NRCC	Naval Regional Contracting Center
NSN	National stock number
ODDR&E	Office of the Director, Defense Research and Engineering
Offer/Proposal/Quotation	A prospective contractor's response to the solicitation form (RFP/RFQ/IFB).
Option	A contractual clause permitting an increase in the quantity of supplies beyond that originally stipulated or an extension in the time for which services on a time basis may be required.
Ordering Officer	An individual appointed by the Commanding Officer of NOSC and authorized by warrant to issue delivery orders.
Preaward Survey (Facility Capability Review — FCR)	Study of a prospective contractor's financial, organizational, and operational status made prior to contract award to determine his responsibility and eligibility for government procurement.
Preproposal Conference	A meeting held with potential contractors a few days after requests for proposals/quotes or invitation for bids have been sent out, to promote uniform interpretation of work statements and specifications by all prospective contractors.
Presolicitation Conference	A meeting held with potential contractors prior to a formal solicitation, to discuss technical and other problems connected with a proposed procurement. The conference is also used to elicit the interest of prospective contractors in pursuing the task.
Price and Fee	
a. Ceiling Price	The monetary limit in a fixed-price type contract that the government is obligated to pay. Costs incurred beyond this point must be absorbed by the contractor.

b. Target Price	The estimate of price — in a fixed-price redeterminable or incentive contract — that the government expects to pay for supplies procured under the contract.
Procurement Request (PR)	Document which describes the required supplies or services so that a procurement can be initiated. Some procuring activities actually refer to the document by this title, others use different titles, such as procurement directive, and so forth. At NOSC, it is termed the stub requisition or acquisition requirements package (ARP).
Procuring Contracting Officer (PCO)	The government contracting officer directing and administering the procurement through the award of the contract and the signing of the actual contractual documents. Administration of the contract after award may be delegated to an ACO, as prescribed above.
Purchase Order (PO)	A contractual procurement document used primarily to procure supplies and nonpersonal services when the aggregate amount involved in any one transaction is relatively small (for example, not exceeding $25,000). (DD form 1155.)
QA	Quality assurance
QC	Quality control
QRC	Quick-reaction capability
Qualified Products List (QPL)	A list of products which are pretested in advance of actual procurement to determine which suppliers can comply properly with specification requirements. This is most usually done because of the length of time required for test and evaluation.
RDC	Rapid development capability
R&D	Research and development
RD&E	Research, development, and engineering
RDT&E	Research, development, test, and evaluation
Request for Contractual Procurement (RCP)	Document which describes the required supplies or services so that an acquisition can be initiated. Some contracting activities actually refer to the document by this title, others use different titles, such as acquisition, directive, and so forth.
Request for Proposal (RFP)	The solicitation form used when the government reserves the right to award without further oral or written negotiation. Only the acceptance of the government is required for award. Requests for proposal are for negotiated acquisitions.
Request for Quotation (RFQ)	The solicitation form used to obtain price, cost, delivery, and other information from prospective suppliers. This procedure, utilizing SF-18 [Request for Quotation], is authorized in both formal contracting and informal contracting; however, its use is generally

	reserved for acquisitions estimated not to exceed $25,000. The procedure is also used for solicitation of information for planning purposes.
Request for Technical Proposal (RFTP)	The solicitation form used to request proposals. Does not include a cost proposal in the first step of a "two-step sealed bid" acquisition.
Responsive and Responsible Bidder	A bidder is responsive if his bid/proposal conforms to the requirements of the IFB/RFP/RFQ, and is responsible if he has the capacity and facilities to produce the supplies or render the services being procured.
Sealed Bid	For government acquisition of supplies and services. After public opening of sealed competitive bids, award is made to the lowest responsive and responsible bidder, price and other factors considered, in accordance with FAR part 14.
Small Purchases	Open-market buy of $25,000 or less; simplified purchases. This category includes blanket purchase agreement (BPA) calls, purchase orders, imprest fund purchases (cash), and standard form 44 purchases.
Sole Source	Contract entered into after soliciting and negotiating with only one source.
SPAWARS	Space and Wareface Systems
Specifications	Description of technical requirements for a material, product, or service that includes criteria for determining whether these requirements are met. Specifications shall state only the government's minimum needs.
SSA	Source Selection authority
SSEB	Source Selection Evaluation Board
Subcontractor	Private party who enters into a subcontract with the government's contractor. Generally, government is not "privy" to a contractor-subcontractor relationship.
SUPARS	Supply Acquisition Regulation Supplement (also known as NAVSUP Manual P-560).
Supplemental Agreement	Bilateral written amendment to a contract by which the government and the contractor settle price and/or performance adjustments or alter any of the terms and conditions of the basic contract. See also *Change Order and Modifications*.
Target Price	The estimate of price — in a fixed-price redeterminable or incentive contract — that the government expects to pay for supplies procured under the contract. Adjustment of the target price, also referred to as price ceiling, is made upon the occurrence of a stated event or contingency or by operation of a contract clause or provision.

Termination	The canceling of all or a part of the prime or subcontract prior to its completion through performance. May be for either default or convenience.
TCO	Termination Contracting Officer
TEMS	Technical Equipment Management System
T for C	Termination for convenience
T for D	Termination for default
Two-Step Sealed Bidding	Technical proposals (see RFTP under Sealed Bid) from contractors are solicited in the first step; after selection of acceptable proposals, each offeror submits a separate bid (second step), pricing his own technical proposal. Contract is awarded to lowest bidder in second step. The resultant contract must be a firm fixed-price or fixed-price with economic price adjustment.
Unauthorized Commitment	A change or request to perform by a government official which a contractor believes to have apparent authority, but which is not legally binding because the government official is not authorized to commit the Federal government.
UMMIPS	Uniform Material Movement and Issue Priority System
UND	Urgency need designator (aka: priority designator).
Work Breakdown Structure (WBS)	A framework that provides uniform approach to structuring the program throughout the acquisition life-cycle phases. The WBS permits a logical arrangement of the elements of the statement of work (SOW) and a tracing of work effort expended under each of the elements. (MIL-STD-881 defines the WBS used for system acquisitions.)
ZBB	Zero base budgeting

15.3 CONTRACTING CONDITIONS AND ENVIRONMENT

15.3.1 Legislation Affecting Acquisition

Three recent laws passed by the 98th Congress have had a profound effect upon the federal contracting process:

The Competition in Contracting Act (CICA) of 1984, P.L. 98-369 (Title VII), effective 1 April 1985

The Small Business and Federal Procurement Competition Enhancement Act of 1984, P.L. 98-577, enacted 30 October 1984

The Defense Procurement Reform Act of 1984, P.L. 98-525, enacted 19 October 1984.

Because of the great significance of this legislation, every person involved in the federal contracting process must have a working knowledge of the contents of these laws. This applies not only to contracting specialists but also to program managers, executives, and other decision makers.

The statutory emphasis has shifted from the method of procurement to the use of sources. No longer is *how* you procure the principal matter of the law; rather it is from *whom* you procure that is the foremost concern. In the past the law stated preference for the "formal advertising" method over the "negotiated" method. Law now emphasizes competitive acquisition from among multiple sources over acquisition from single sources. In other words, the key consideration confronting contracts managers today is not "Is there authority to negotiate?" but "Can this acquisition be made on a competitive basis?"

Prior to the passage of CICA, all federal acquisitions were formally advertised unless it was determined that one of 17 exceptions permitting negotiation applied. Despite this preference for "formal advertising," over "negotiation," the reality was that most federal contracts were negotiated — often noncompetitively.

CICA did away with the statutory emphasis on formal advertising by recognizing "sealed bidding" and "negotiation" as equivalent competitive procedures. CICA provides for only seven circumstances in which "other than full and open competition" is permitted. Congress sought to change the emphasis from formal advertising versus negotiated to "full and open competition" versus "other than full and open competition."

The seven circumstances allowing other than full and open competition are as follows:

a. The property or service is available from only one source and no alternative product or service will meet the government's need

b. An unusual and compelling urgency exists

c. Procurement from a specified source is essential to maintain a source of supply in case of national emergency, or to establish or maintain essential R&D capability

d. The procurement is made under the terms of an international agreement

e. The procurement is from a source or agency required by statute

f. Disclosure of the procurement would compromise national security

g. The head of an agency determines in writing that using other than competitive procedures is "necessary" and "in the public interest."

The Small Business and Federal Procurement Enhancement Act of 1984 is intended to eliminate acquisition procedures and practices that inhibit free and open competition and to foster opportunities for small business to participate in competitive acquisition.

Finally, the Defense Procurement Reform Act of 1984 is an amalgamation of congressional initiatives to improve the effectiveness of Department of Defense acquisition. The many provisions of this act further control management of the government's acquisition function from specifying the amount of overhead a contractor may properly allocate to supplies to how long a DoD program manager must be kept in his position.

Actually, these three laws contain far more than the brief descriptions offered above. Without doubt, the "hidden" administrative cost of implementing these laws will be significant, and these laws will continually influence the course of federal acquisition.

15.3.2 Deputy for Small Business

The mission of the federal contracting process is to buy the goods and services that the government needs to operate. The acquisition process, because of its size and impact on the nation's economy, is also used by the government to carry out its socioeconomic goals as well. One of these goals is to foster the growth and development of small business.

At the Naval Ocean Systems Center, the Deputy for Small Business (Code 202, x2707) is charged with ensuring small business participation in our acquisitions. Early coordination with the NOSC Deputy for Small Business will permit effective small business planning and prevent potential delays in the processing of the contract requirement.

The government primarily uses the small business set-aside to help it accomplish small business assistance objectives. All small purchases of $10,000 or less are set-aside for small business by law and are known as "small business-small purchase set-asides." Small businesses may furnish any domestically produced or manufactured product under a small business-small purchase set-aside. When it is essential that a large business be solicited directly, a brief justification is required to dissolve the set-aside and to document the file.

Requirements estimated to exceed $10,000, including both small purchase and contract requirements, are individually screened by the buyer or negotiator and the Deputy for Small Business for potential small business set-aside. Small business set-asides in excess of $10,000 differ from small business small purchase set-asides in that the products must also be manufactured by small business. Requirements not set-aside for small business must be justified. The justifications are subject to review by the Small Business Administration (SBA).

Other preferential programs for small business include increased opportunities for subcontracting a special program for disadvantaged firms. The prime contractor of a contract over $10,000 must agree that small business concerns and small disadvantaged business concerns shall have the maximum practicable opportunity to participate in contract performance. Each solicitation for a contract expected to exceed $500,000 that has subcontracting possibilities must require the offeror to submit an acceptable subcontracting plan. Under Section 8(a) of the Small Business Act disadvantaged firms certified by the Small Business Administration for entry into the 8(a) program are eligible for noncompetitive contracts for federal contracting activities. Section 8(a) firms can provide a valuable resource for project managers.

Small business programs are expected to continue throughout the remainder of the decade although the procedures for the programs may undergo some changes.

15.3.3 Data Management Office

The Data Management Office (DMO), Code 9211, serves as the data management central focal point and advises and assists in carrying out NOSCINST 4000.1 and related directives.

All NOSC acquisitions for which data is required, and all NOSC acquisitions of $10,000 or more shall be reviewed by the DMO.

All acquisition requirements packages (ARPs) with an estimated cost of $1 million or more, or ARPs where the cost of data is estimated at $100,000 or more shall be reviewed by a Data Requirements Review Board (DRRB). The DMO shall convene and chair the DRRB.

Any specific questions should be directed to the Data Management Office (Code 9211), x5817/7038.

15.3.4 Contracting Officer's Technical Representative Duties and Responsibilities

As a Contracting Officer's Technical Representative (COTR) at NOSC you are charged with an incredible responsibility: to act as technical liaison between the contractor and the NOSC Contracts Division without compromising the government's contractual integrity. It is important, however, to recognize that the acquisition process requires a team effort. Close coordination and cooperation among the various team members is very critical to the success of the acquisition. The designated COTR provides a key role for much of the effort. He or she is responsible for principal tasks in each of the three phases of the acquisition process as follows:

a. Planning the technical requirements and providing much of the documentation to form the acquisition request package (ARP)

b. Usually serving as chair of the evaluation team which reviews the technical proposals to determine technical acceptability

c. Managing the resultant contract by scrutinizing technical performance, progress, incurred costs, and inspection and acceptance of contract deliverables.

Only an individual who has received formal COTR training and possesses the requisite technical skills and experience to monitor the service contracts effectively can be appointed as a COTR. NOSCINST 4330.1 provides detailed information on training, qualifications, appointment, duties, and responsibilities.

15.3.5 Unauthorized Commitments

An informal or unauthorized commitment is an action by employees other than duly designated procuring contracting officers (PCO) or purchasing agents that would cause a supplier to deliver material or service in expectation that the service and/or materials will be paid for from appropriated funds.

At NOSC, criminal and administrative penalties are provided for such unauthorized actions. This type of informal or unauthorized conduct does not in fact obligate the government; however, it may obligate the individual committing the act.

A constructive change is an unauthorized commitment for which a contractual vehicle exists under which a PCO may be able to "ratify" the commitment, thereby obligating the government rather than the individual.

15.4 ADVANCE ACQUISITION PLANNING AND ACQUISITION PLANS (APs)

15.4.1 Background

The presolicitation phase is the basis for the entire contracting process. It includes planning the contract and consolidating and refining these plans into the necessary documentation and the approvals that make up the acquisition requirements package (ARP). (Appendix 15A lists the items necessary for inclusion in the ARP. Appendixes 15B (concerning the stub requisition form and its use) and 15C (addressing NOSC's internal approval control points for commodities and documentation) further define and explain the stub requisition requirement in the ARP.)

15.4.2 Benefits of Contract Planning

Contract planning encompasses a wide range of considerations that affect the entire acquisition cycle. Nothing is more critical to the success of the program than the informed, reasonable planning of it. Planning ensures the best use of funds, personnel, networks, and other resources to achieve timely delivery of quality supplies and services.

The importance of planning cannot be stated too strongly. During the entire contracting process, adequate planning lessens problems and delays. It will prove to be very important to technical personnel who will be monitoring the resultant contract. The contract scope and terms and conditions that are determined at this stage define the contractual rights and duties of the contractor and the government. These terms and conditions may be difficult to change later if some contractual aspects were overlooked and potential problems had not been anticipated.

Contract planning includes careful consideration of the technical, scheduling, and cost aspects of the contract. Technical aspects involve defining the scope or the technical boundaries within which the tangible products (deliverable items) will be provided by the contractor. Scheduling aspects include incorporating control points into the contracted effort by which progress can be measured and costs can be evaluated. The data to be delivered by the contractor should relate to these control or decision points. Cost aspects include preparation of a government estimate for the effort to be performed. This enhances the government's ability to select a contractor whose price is realistic and appropriate. It lessens the chances of subsequent overrun situations and of a contractor's "buying in" to place himself in an advantaged or sole source position for future work.

Other planning considerations include selecting the most appropriate type of contract, screening potential contractors through a sources-sought synopsis, determining the need for government-furnished resources, and making necessary arrangements for the timely provision of these resources. If the contract will involve automated data processing (ADP) services, appropriate documentation must be developed, reviewed, and approved.

Sound planning includes the delegation of contracting tasks and the determination of definitive courses of action to be taken and deadlines for their completion. Much contract planning is accomplished through informal meetings. Information gathered during these meetings is consolidated and refined in the SOW and additional planning documentation is often unnecessary. If the contract is unusually complex, has a large dollar value, or covers an extended period of performance, more formal planning, such as PERT charges and work breakdown structures, may be desirable. To help set the proper course for the contract, contractual requirements should be discussed at an early stage with the contracts branch.

15.4.3 *Timing Considerations*

Timing is a vital part of good planning. After determining the date the contracted effort is to be completed and the time necessary for the contractor to perform the effort, it should be possible to ascertain the necessary contract award date. Then, by considering the average procurement administrative lead time (PALT) required to process the contract, the date that the acquisition requirements package must be submitted to the contracts branch can be calculated.

The importance of beginning contractual actions at the proper time cannot be overemphasized. Allowing adequate time will ensure that contractual services will be available when needed. The acquisition requirements package must be submitted to the contracts branch well in advance of the necessary award data to provide time to process the contract.

15.4.4 Acquisition Plans

Acquisition planning is the process by which all personnel responsible for an acquisition coordinate and integrate a comprehensive plan for fulfilling the identified program need promptly and reasonably, including the development of an overall strategy for managing the acquisition.

The acquisition plan (AP), on the other hand, is a formal narrative description which transmits acquisition planning information in a prescribed format to the Assistant Secretary of the Navy (Shipbuilding and Logistic) for his approval. No contracting action (including synopsizing) is authorized until the AP has been approved.

An AP shall be prepared for development acquisition whose total in-house and contractual cost (including options) is estimated at $2 million or more, and for production and service acquisitions whose contractual cost is estimated to be in excess of $5 million.

Such significant elements as dollar thresholds, exemptions, review cycles, and format requirements are subject to change. Therefore, the contracts branch which serves your code should be consulted for an analysis of your requirement and, based on the most current directives, the branch will determine whether an AP is required.

If ultimately required, an AP will be your first step in the formal acquisition process. As APs may cover what is to be acquired under one or more contracts, it is desirable that you begin preparation as soon as the program/acquisition requirements can be identified. At present, the average approval time for APs is 100 days. A conservative estimate for drafting an AP is 60 to 90 days. Generally, an AP should be under review by the Director, ASN(S&L), at least 6 months prior to the targeted solicitation release. Remember, only after the AP is approved and returned to NOSC can the contracts branch initiate any actions on your acquisition requirements package (ARP). To prevent a return of your AP for revision, seek the advice and use the expertise of the contracts branch personnel who can provide clarification and guidance as you prepare the AP.

Due to recent scrutiny of the government's acquisition process, APs will be an absolute requirement for the foreseeable future. Presently, the AP is the principal document for program review and oversight. You must develop, in the prescribed format, a succinct and cogent overview of your program plan. Provide evidence to demonstrate a cohesive strategy for acquiring and managing the supplies or services, and justify their necessity and impact throughout the life cycle of the plan. In summary, the AP is your best effort to define and explain your requirement and to demonstrate the thoughtful planning that went into it.

Once the AP is approved, it must be reviewed for changes at least once a year or at milestones specified in the AP or whenever significant changes occur. Revisions shall be submitted to the contracts branch for approval by ASN(S&L).

As the AP contains acquisition sensitive information, each page shall be marked "For Official Use Only," and everyone associated with the requirement shall be counseled that information contained in the AP is not to be disclosed.

To conclude, specific guidance and detailed information concerning preparation, routing, and format of your AP can be obtained from the contracts branch. Coordinate with them early to prevent costly delays which may jeopardize your requirement.

15.5 FURTHER PRESOLICITATION PREPARATION

15.5.1 Statement of Work

A clear statement of contract requirement is a prerequisite for defining and achieving program goals. The statement of work (SOW) provides the basic framework for this effort. As such, the SOW must be carefully constructed to specify basic responsibilities and minimum program requirements. The SOW is a dynamic document established to tailor cost drivers based upon the needs and limitations of each acquisition. The SOW writer must ensure that the technical requirements are equated to those minimal needs.

Care and skill exercised in the preparation of the SOW can be of great significance by establishing a conclusive baseline upon which proposal evaluation criteria can be constructed. Furthermore, benefits resulting from a definitive SOW should result in conclusive proposals and reduce the time for evaluation.

In the actual proposal evaluation and contractor selection, the SOW plays a significant role. Failure to describe the scope of work adequately will result in needless delays and extra administrative effort during the source selection process. The ability to define the desired end work products clearly and in an exacting manner generally will spell the difference in the type of procurement approach that will be taken and the type contract awarded.

The role of the SOW is to define those work tasks which cannot be contained in a specification and must never be included in the Contract Data Requirements List (CDRL) or Data Item Description (DID). When properly written, the SOW establishes nonspecification tasks and identifies the work effort to be performed expressed as minimal needs. As the contractor performs the effort and completes the tasks, information that may be required for retention will be inherently developed with the work performed. The CDRL is used only to list and order the contract data required, while the DID is used to describe the data and prescribe the preparation instructions in terms of format and arrangement.

The SOW must not be used to amend the equipment/system acquisition contract specification, and it *does not*

Order data

Describe data

Discuss data

Invoke, cite, or discuss a DID

Discuss a CDRL

Specify design control parameters or the performance of hardware

Specify technical proposal criteria or evaluation factors

Establish a delivery schedule but may include, for clarity, significant milestones

Invoke military standards or specifications unless all facets are required to meet minimal needs

Invoke in-house management, DoD, or departmental instructions

Use data words or identify the deliverable data to describe the works to be accomplished

However, the optimum statement of work

Defines clearly all nonspecification requirements and task efforts where conclusive design or performance limitations may be expressed for needs beyond the objectives and goals

Employs work words to describe explicitly and in exacting terms what tasks shall be accomplished

Provides a priceable or cost estimatable set of tasks to fulfill the government's minimum

States clearly and fully what is required to satisfy the contract, but it does NOT over specify nor does it tell the offeror exactly how to do it.

15.5.2 Specifications

Depending upon the nature of the acquisition, specifications may be required. Specification means a description of the technical requirements for a material, product, or service that includes the criteria for determining whether these requirements are met. Specifications shall state only the government's actual minimum needs in a manner to encourage maximum practicable competition.

Items to be acquired shall be described by citing the applicable specifications and standards or by a description containing the necessary requirements. Specifications and standards shall be selectively applied and tailored in their application. "Selective application" is the process of reviewing and selecting from available specifications, standards, and related documents those particulars which have application to a specific acquisition. "Tailoring" is the process by which individual sections, paragraphs, or sentences of the selected specifications, standards, and related documents are reviewed and modified so that each one selected states only the government's minimum requirements.

Unless otherwise authorized by law or by accepted deviation (see FAR, Part 10.007), specifications and standards listed in the Index of Federal Specifications and Standards are mandatory for use by all agencies acquiring supplies or services covered by such specifications and standards. The other principal document covering this subject is the Department of Defense Index of Specifications and Standards (DoDISS). (Both the aforementioned documents may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.)

The number and title format for preparing a specification is prescribed as follows:

1. SCOPE
2. APPLICABLE DOCUMENTS
3. REQUIREMENTS
4. QUALITY ASSURANCE PROVISIONS
5. PREPARATION FOR DELIVERY
6. NOTES
10. APPENDIX

Subject matter shall be kept within the scope of the sections so that the same kind of requirement for information will always appear in the same section of every specification. Except for appendixes, if there is no information pertinent to a section, the following shall appear below the section heading:

"This section is not applicable to this specification."

The paramount consideration in a specification is its technical essence, and this should be presented in language free of vague and ambiguous terms. Using the simplest words and phases will convey the intended meaning. Inclusion of essential information shall be complete, whether by direct statements or reference to other documents. Sentences shall be as short and concise as possible. See MIL-STD-490 for an elaboration of this subject.

15.5.3 Technical Evaluation Plan

The process of evaluating offers is unique to the negotiated method of acquisition. This method allows award based on price and other factors. In sharp contrast, sealed bidding requires an agency to award the contract to the lowest responsible, responsive bidder.

As stated in FAR 15.605, evaluation criteria should be individually tailored to each solicitation and should reflect the requirements minimum needs, yet not be so restrictive as to limit competition. When evaluation criteria are properly selected and weighted, the evaluation process is simplified.

The purpose of the evaluation is to select the source(s) whose proposal has the highest degree of realism and credibility, and whose performance is expected to meet the government objectives best at an affordable cost. The evaluation is to be accomplished in a manner which assures an impartial, equitable, and comprehensive evaluation of each offeror's proposal and related capabilities and which minimizes the complexity of the solicitation while maximizing the efficiency of the evaluation/selection decision.

The evaluation process includes the actual evaluation, negotiations to clarify details, and source selection. The evaluation plan itself is formulated prior to the solicitation and serves the following purposes:

To ensure that all efforts are directed toward a common goal

To collect, organize, and display the performance, schedule, and cost requirements by emphasizing pertinent evaluation criteria

To provide a structure for organizing the evaluation group and scheduling its activities

To provide a structure for the preparation of the RFP

To establish a format for discussion at preproposal conferences, if held, and later offeror or contractor discussions

To serve as a guide for the contracting authority in source selection

To provide procedures and methodology for evaluation purposes

To provide guidelines for making trade-offs among and within the various factors to the performance of the equipment and to the management of the project in relationship to the development, production, operating and support costs, the delivery schedule and quantity, and the qualitative requirements of the procurement.

The actual evaluation is based upon the scoring of each proposal against the preestablished evaluation criteria ranked in order of importance and weighted accordingly. Specific factors and rankings will vary with each procurement, but the cost proposal will always be evaluated separately from the other part.

The government evaluates each proposal against its own previous estimates to assess the realism of cost, schedule, risk assessment, and technical approach and against established standards for management, accounting practices, and the like. Proposals which are unrealistically low in cost or price can be rejected on the grounds that the offeror fails to comprehend the complexities and risks of the contract requirements or else has made an improvident proposal. Only proposals which are evaluated as acceptable (by preestablished criteria) will be passed for final source selection.

The final source selection is an integrated decision based on a consideration of technical approach, capability, management, design-to-cost, historical performance, price/cost, and other pertinent factors. The selected source(s) should the one(s) who is expected to do the best overall job for the government. The selected offeror's proposal (technical, management, and cost) must satisfy the government's minimum requirement.

15.6 OTHER THAN FULL AND OPEN COMPETITION

15.6.1 Sole Source Justification and Justification and Authorization

Both the sole source justification (SSJ) (NOSC-SD 4200/5) and the justification and authorization (J&A) shall be prepared for acquisitions for other than full and open competition. The J&A shall be prepared by the contracts branch and the SSJ by the requester.

Written justification is not required for acquisitions under $1,000; however, when the requiring code has knowledge that competition exists, this information shall be included in the request.

All requests for sole source acquisitions of $1,000 or more will be accompanied by the SSJ, Stub (NOSC-SD 4235/4), SOW/specifications, and all other pertinent information including appropriate approvals within the department. In all cases, SSJs will be signed by the originator, reviewed, and approved by the cognizant division head up to $50,000 (the threshold will be raised to $100,000 soon) and approved by the appropriate department head (who must be SES level) if $50,000 ($100,000 soon) or over.

Sole source acquisition can be defined as follows: A contract for the purchase of supplies or services that is entered into or proposed to be entered into by an agency after soliciting and negotiating with only one source. This definition applies to new requirements as well as an increase in the scope and/or level of effort of existing contracts.

For sole source acquisitions over the aforementioned threshold of $50,000 (soon to be $100,000), the Competition Advocate Review Board (CARB) meets (on Tuesday of each week) to discuss and approve or disapprove the sole source requests. The original and twelve copies must be submitted to Code 217 by the end of the work week for distribution to the CARB members by the following Monday.

Sole source acquisitions approved by CARB will be forwarded to the contracts division. Those cases rejected by the CARB will be returned to the originator for action with a brief rationale for disapproval.

Department heads and project managers shall ensure attainment of maximum competition through the establishment of initiatives which address the following areas:

a. Advance planning of proposed acquisitions to determine what is available to satisfy Center needs, i.e., to permit time for analysis of the marketplace

b. Maximization of statements reflecting functionally stated performance requirements which foster competition

c. Minimization of statements containing features, designs, or manufacturing processes which unduly restrict competition

d. Discounting the existence of patents or other proprietary rights if there are competitive alternatives

e. Elimination of unreasonable qualification or experience requirements which limit sources.

Legal counsel shall review all J&As for legal sufficiency and sign; the cognizant contracting officer shall certify all J&As; the cognizant contract negotiator/administrator shall sign all J&As. The cognizant technical code personnel must secure the signatures required for the "Technical and Requirements Certification;" the negotiator is responsible for obtaining all other approvals. Following the approvals, the J&A will be forwarded to Code 217 for review and then to Code 21 for approval. If the proposed action exceeds $100,000, but is less than $1 million, it will be necessary to obtain further approvals from Code 20 and 00. If the proposed action exceeds $1 million, the J&A must be submitted to NAVSUP or Assistant Secretary of the Navy (Shipbuilding and Logistics).

15.6.2 Brand Name or Equal

Occasionally, a requirement will be of such nature that it can be met by one of several commercial products. When this situation exists, it is frequently possible to make the acquisition on a "brand name or equal" basis. Brand name does not require a full statement of work, but does oblige the requiring code to specify all the technical characteristics which are necessary to fulfill the requirement. These characteristics become the specification against which "equal" products can be measured.

Because of the increased emphasis on competition, we have seen a growing number of purchase requests (PRs) which cite "brand name or equal" requirements. In "brand name or equal" solicitations, the overriding consideration in determining the equality of an offered product is whether it can function to produce the desired results. Citing "brand name or equal" is intended to be descriptive but not restrictive, and is meant to indicate the quality and characteristics of products that will be satisfactory. Care must be taken to protect the government from protest from other vendors for restrictive specifications; therefore, the NOSC policy concerning hardware, ADPE or similar acquisitions will be as follows:

Brand Name or Equal: If the responses to the RFQ/RFP result in only the specified brand name being offered or the alternates being rejected as unacceptable, the acquisition will be considered a de facto sole source requirement. The requirement will be returned to the originator for resubmission with an approved sole source.

Salient Characteristics: If the response to the RFQ/RFP reveals that the salient characteristics are restrictive, and, in fact, the characteristics of a single manufacturer, the acquisition will be considered a de facto sole source requirement and the aforementioned procedure implemented.

15.7 CONTRACT TYPES

15.7.1 References

For a full discussion of the contract types listed below see the Federal Acquisition Regulation (FAR) noted in the right column.

Firm Fixed-Price	FAR 16.2
Other Fixed-Price	
Fixed-Price with Economic Price Adjustment	FAR 16.203
Fixed-Price Incentive	FAR 16.204, FAR 16.403
Fixed-Price Redeterminable	FAR 16.205
Fixed-Price Level-of-Effort	FAR 16.207
Fixed-Price with Award Fee	
Cost Reimbursement	FAR 16.3
Cost Plus Fixed-Fee (CPFF)	FAR 16.306
Other Cost Reimbursement	
Cost Contract	FAR 16.302
Cost Sharing	FAR 16.303
Cost Plus Incentive Fee	FAR 16.304
Cost Plus Award Fee	FAR 16.305
Indefinite Delivery	
Indefinite Quantity	FAR 16.5
Requirements	
Agreements	FAR 16.7
Cost and Price Principles	FAR 31
Cost versus Price	Part 15
Allowable Costs	
Multiyear Contracting	FAR 17.1

15.7.2 Service Contracts

The distinguishing characteristic of service contracts is that contractors perform identifiable tasks (or provide advice) rather than furnish end items of supply. Services can require professional or nonprofessional skills or combinations of the two.

The Service Contract Act (1965) was designed to ensure that contractors providing services to the government did not engage in "wage busting" and similar practices in order to win federal contracts. The act requires that, with certain exceptions, every federal contract over $2,500 for which the principal purpose is to furnish services must include a clause requiring payment to service employees of at least minimum wage determined to be applicable.

Contracted advisory and assistance services (CAAS) (formerly contractor support services (CSS)) are those services acquired from nongovernmental sources to support or improve agency policy development or decisionmaking, the management of organizations, or the operation of hardware systems. CAAS consists of the following four categories:

Individual experts and consultants (IEC)

Studies, analyses, and evaluations (SAE)

Management support services (MSS)

Engineering and technical services (ETS).

A forthcoming Contracts Division (Code 21) instruction will provide a complete discussion of this subject. In the interim, guidance is contained in SECNAVINST 4200.31A, Contracted Advisory and Assistance Services (CAAS).

All proposed contracts shall be screened to determine whether the required effort is CAAS and therefore subject to the provisions of SECNAVINST 4200.31A. Written justification for use of CAAS will be rigorously reviewed by the PCO and the financial manager authorizing the funds prior to initiating the contract action. CAAS statements of work shall describe fully and explicitly the work to be performed, the item(s) to be delivered, and shall specify a fixed period of performance.

SECNAVINST 4200.27A provides a full discussion of experts and consultants, and personal versus nonpersonal services contracts. However, the following definitions apply:

"Nonpersonal services contract" means a contract under which the personnel rendering the services are not subject to the supervision and control usually prevailing between the government and its employees, either by the contract terms or by the manner of its administration.

"Personal services contract" means a contract that, by its express terms or as administered, makes the contractor personnel appear, in effect, government employees.

15.7.3 Indefinite Delivery Contracts

There are three types of indefinite delivery contracts:

Indefinite Quantity — Precise quantities unknown beyond a specified minimum

Definite Quantity — Quantity known, delivery period specified

Requirements — Precise needs and time period not initially known.

All have the advantage of maintaining government inventory at minimum levels, while indefinite quantity and requirements allow flexibility in ordering as requirements arise. The titles of the contracts generally describe their uses; funding, however, does differ. The requirements and indefinite delivery contracts are obligated by delivery order rather than by the contract itself. All contracts should contain a ceiling (not to exceed amount) and, in some instances, a floor.

Federal Acquisition Regulation 16.504(b) requires that indefinite delivery order contracts include a minimum obligation amount applicable to the government and that the minimum amount be funded at the time of contract award. The general view is that the minimum should not be less than 10 percent of the estimated contract ceiling.

At the time the basic IDTC contract is to be initiated, Code 21 personnel will instruct the requesting code to issue a 7300 citing a job order set aside for delivery order contract minimum; following approval by Code 122, the basic contract will be issued citing ACRN ZZ. To reiterate, Departments will prepare 7300 citing delivery order contract minimum, have it signed by approval officials, route to Code 122 immediately, and absorb into their overhead any contract costs incurred as a result of the Center not placing orders for the contract minimum.

15.7.4 CPFF Contracts (Completion versus Term)

A CPFF contract may take one of two basic forms: completion or term.

The completion form describes the scope of work by stating a definite goal or target and specifying an end product. This form of contract normally requires the contractor to complete and deliver the specified end product within the estimated cost as a condition for payment of the entire fixed fee.

The term form describes the scope of work in general terms and obligates the contractor to devote a specified level of effort for a stated time period.

15.8 SOLICITATION PHASE

During the solicitation phase of the acquisition cycle, the contracts branch has the primary responsibility for the acquisition requirements package (ARP). The requiring code's involvement during this stage is limited. Therefore, a full discussion of the subject is not presented. However, the contracting officer may be consulted if you have specific questions. When source selection and analysis of contractor proposals is required, you will be contacted by the contracts branch. Please note that an acquisition schedule plan (completed by the contracts branch) is prepared for each ARP. The acquisition schedule plan establishes acquisition milestones and the estimated date for contract award. The contracting officer will inform you if any deviations in the schedule are expected to occur. Once the source selection process is completed, the contract is awarded.

15.9 ADMINISTRATION PHASE

The contract administration phase requires close cooperation among the team members to monitor contractor performance effectively. The chief areas of concern which require effective interface are:

Contract Modifications

Preparation of Delivery Orders & Evaluation of Contractor Proposals

Inspection and Acceptance

Government Property

Invoicing and Progress Reports

End of Contract or Delivery Order Report Evaluation of Contractor Performance.

While only the contracting officer is empowered to change the terms of the contract and to issue delivery orders, the requesting code plays a critical role in the contract administration phase. COTRs, for example, are required to scrutinize labor and other direct costs on vouchers and to certify that such costs are reasonable and accurately reflect the work accomplished by the contractor. Technical review of contractor progress reports provides the most complete assessment of contract performance — only the requester is in a position to gauge the timeliness and quality of work being performed. The contract personnel rely upon your feedback in identifying and resolving any schedule or performance problems. Government property is another area in which contract personnel require your input. The disposition of GFP is often critical to the contract schedule. If the Government fails to provide GFP, contract performance may be delayed. The inspection and acceptance terms are set forth in the contract.

However, if inspection and acceptance is to be performed at destination, the requester MUST either accept or reject the deliverable in many cases within 15 calendar days, or acceptance may be implied. It is a *very* important function which cannot be delegated and which must be performed in a timely manner. Regulations require an end-of-contract report to achieve administrative close-out. Keep in mind that as the requester, your responsibilities do not end with delivery of the final product or service. Evaluation of contractor performance and assessment of how the supply or service will benefit your program need to be stated in the end of contract report sent to you by the contracting officer.

15.10 SPECIAL CONSIDERATIONS

15.10.1 ADP Acquisitions

Beginning in 1965 with the Brooks Act, which stripped contracting authority for ADP/IRM from Federal agencies and gave the authority to GSA, Congress changed the way in which agencies acquire ADP resources. Because Congress has decided that we need to control ADP purchases, separate and additional approvals are required to procure any ADP-related item which increases computing capability. At present, all approval memos must be signed by Code 9103, the NOSC ADP Focal Point Office.

A standard operating procedure (SOP) is being developed by the Contracts Division which interprets current policy and legislation regarding the acquisition of ADPE. Until the SOP is issued, specific guidance is available from either Code 213 or Code 9103. The following general guidance is offered (please bear in mind that the following is not comprehensive, and is subject to change):

The following thresholds and approval levels presently apply:

a. An order in excess of $50,000 (purchase value for ADPE, annual charge for software or maintenance) must be synopsized in the Commerce Business Daily (CBD); items available under GSA ADP multiple schedules are considered competitive.

b. The Naval Ocean Systems Center has ADP procurement authority up to $1 million; everything over $1 million goes to the Naval Supply Center, San Diego.

c. Acquisition is locally approved if purchase price of items covered by GSA schedule does not exceed $300,000 (usual limit) or the contract maximum order limit (MOL).

d. For software and maintenance, the order may not exceed the contract MOL.

e. Code 9103 has local authority to approve competitive acquisitions up to $10 million; however, procurements over $300,000 require a delegation of procurement authority (DPA) from GSA.

f. Sole source over $50,000 must go to SECNAV for approval.

The primary instructions influencing NOSC ADPE acquisition procedures are the following:

SECNAVINST 5231.1B of 08 March 1985

SECNAVINST 5236.1B of 15 October 1980

SECNAVINST 5236.2A of 07 July 1980

SECNAVINST 5237.1 of 07 July 1975

SECNAVINST 5238.1B of 12 June 1980

NAVSUPINST 4284.3 of December 1985 — ADP Desk Guide.

15.10.2 Small Purchase Procedures

15.10.2.1 Sole Source. As distinguished from large purchase procedures, the sole source justification (SSJ) form (NOSC-SD 4200/5 contained in NOSCINST 4200.6A) is to be prepared for purchase requests from over $1,000 to $25,000. The stub, SSJ, and attendant material with appropriate division head signature should be submitted to the Small Purchase Branch (Code 211) which will route the purchase request and SSJ for supply approvals.

15.10.2.2. Purchase Descriptions. Purchase descriptions shall not be written so as to specify a product or a particular feature of a product peculiar to one manufacturer, thereby precluding consideration of a product manufactured by another company. See "Brand Name or Equal" for a discussion of this issue. An adequate purchase description should set forth the essential physical and functional characteristics of the materials or services required. As many of the following characteristics as are necessary to express the government's minimum requirements should be used in preparing purchase descriptions:

a. Common nomenclature

b. Kind of material (type, grade, alternatives, etc.)

c. Electrical data, if any

d. Dimensions, size, or capacity

e. Principles of operation

f. Restrictive environmental conditions

g. Intended use, including location within an assembly and essential operating condition

h. Equipment with which the item is to be used

i. Other pertinent information that further describes the item, material, or service required

j. Purchase descriptions of services should outline to the greatest degree practicable the specific services the contractor is expected to perform.

More information concerning specifications and standards is available in subsection 15.5.

15.10.2.3 Buy American Act. The Buy American Act requires that only domestic end products may be acquired for public use, except articles, materials, and supplies

a. For use outside the United States

b. For which the cost would be unreasonable

c. For which the agency 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 U.S. in sufficient and reasonably available commercial quantities, of a satisfactory quality, or

e. Purchased specifically for commissary resale.

Presently, we can acquire items from the following countries without using the exception to the Buy American Act Form:

Germany	Italy	United Kingdom of Great Britain
Northern Ireland	Norway	Belgium
Netherlands	Portugal	Canada
Denmark	France	Turkey
Luxembourg	Spain	

The exception to the Buy American Act Form requires a signature from the requesting code, and Codes 211 and 21.

15.10.2.4 Suggested Sources. Suggested sources should be attached to your purchase request. However, everything under $10,000 shall be set aside for small business as prescribed by law. In addition, sources are often predetermined by mandatory GSA schedules.

15.10.2.5 Technical Evaluation. At the request of 211, you may be required to prepare technical evaluations from vendors responding to the request for quotations (RFQ). No specific format for furnishing your criteria is required; a memorandum is sufficient. Keep in mind that in order for a contractor to be considered for an award, the product must meet or exceed your specifications. Contact Code 211 for further guidance.

15.10.2.6 Offsite Repairs. To improve repair time on equipment other than office machines, codes having equipment that is to be repaired by an outside activity or firm are requested to follow the procedures outlined below.

a. A stub is filled out stating the equipment nomenclature, serial number, quantity, original cost of the equipment, and repair required.

b. The equipment is turned into the Traffic Branch, Code 223.

c. A shipment request number is received from the Traffic Branch and written on the stub.

d. The stub is "walked through" the Accounting Division (Code 122), Customer Services (Code 224), and turned in at the Purchase Branch (Code 211).

15.10.2.7 Onsite Repairs. Each time a vendor is required to come on board NOSC, a new stub must be issued (except for contracted annual maintenance). This is due, in part, because labor is normally not covered on a warranty and authorizing repeat "calls" constitutes an unauthorized commitment if not covered by a stub requisition.

15.10.2.8 Stub Status. To find out the status of your stub requisition you can call x2819 or x7160, or, with the assistance of the Consultant of the Day, you can access the RIMS information system. The individual buyer assigned to your purchase order should be contacted if there is a change in specifications and the like. However, once an order number and delivery date have been assigned, contact Receipt Control for follow-up. Damaged goods and other problems with delivery should be directed to Adele Puzon, Receipt Control.

Remember, if a purchase order number appears on the RIMS system, it does not necessarily indicate that the order has been phoned into the vendor. Many vendors will not accept phone orders and require a signed purchase order before placing the order which inevitably lengthens the delivery time.

15.10.2.9 Patents. All acquisitions, regardless of dollar value, which contain patent requirements must be processed by the Contracts Division.

15.10.3 Unsolicited Contractor Proposals

All unsolicited proposals submitted to this Center, regardless of dollar value or form of receipt, i.e., handcarried, personal mail, or by official mail, must be delivered immediately to the Mailroom. The proposal will then be reviewed by the Supply Department and finally the cognizant department. Department heads will ensure that prompt and thorough reviews are made of all proposals forwarded by the Supply Department. The cognizant department shall initiate a proposal evaluation reply within 30 days and forward it to the Supply Department.

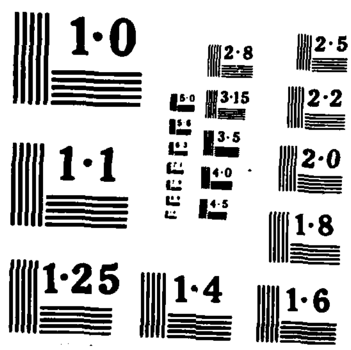
Specific guidance concerning this subject is provided in NOSCINST 3900.1C, Procedures for Handling Unsolicited Contractor Proposals.

Appendix 15A
Contents of Acquisition Requirements Package (ARP)

AD-A170 075 NOSC (NAVAL OCEAN SYSTEMS CENTER) PROGRAM MANAGER'S HANDBOOK(U) NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA JUL 86 NOSC/TD-880

5/5

UNCLASSIFIED F/G 5/1 NL


1·0
2·8
2·5
3·15
2·2
3·5
2·0
1·1
4·0
4·5
1·8
1·25
1·4
1·6

CONTENTS OF ACQUISITION REQUIREMENTS PACKAGE

(Prepared by Tech Code)

Procurement Package Checklist (Code 9211) (NOSC-SD 4280/6)

Stub Requisition Form (NOSC-SD 4235/4)

Statement of Work/Performance or Design Specifications
- Minimum personnel qualifications
- Purchase description
- Salient characteristics for brand name or equal

Contract Data Requirements List (DD 1423)
- Unique data item descriptions (DIDs)

Data Requirements Review Board (DRRB)
- DRRB minutes for over $1 million
- DMO review route sheet over $10,000

Delivery Schedule, Performance Period, Options

Level of Effort (LOE)
- Place of performance (percentage NOSC, SD facility, DC facility, other)
- Labor categories & estimated hours for each category
- Minimum educational & experience qualifications for each category

Detailed Independent Government Cost Estimate includes
- Material
- Travel
- Computer

- Funding Plan
- Type (RDT&E, O&MN, OPN, etc.)
- Accounting data
- Availability schedule

Bidder's List Suggestions (Optional)
- Suggested sources

Proposal Evaluation
- Source selection plan
- Proposal evaluation criteria and weights

Government-Furnished Property (GFP)/Equipment (GFE) to Contractor
- What?
- When?
- How many?
- What is unit value?

Government-Furnished Facility (GFF)/Information (GFI):
- Exact location
- Exact title

Place of Inspection and Acceptance

Notes to the Negotiator

Presolicitation Patent Rights Documentation
    Mandatory over $10,000

Security Classification Specification (DD Form 254)
    If classified information is involved

Services Contract Questionnaire (NOSCINST 4200.4B)
    If services are to be required

Sole Source Justification (SSJ) (NOSC-SD 4200/S)
    If noncompetitive acquisition is contemplated

Competition Advocate Review Board (CARB) Approval
    If sole source

Urgency Statement
    If requirement is urgent, written justification is required

Conflict of Interest Provision
    If applicable

Overtime Justification
    If known in advance that overtime wages are contemplated for contractor's employees under a resultant contract

Acquisition Plan
    Required for R&D over $2 million
    Required for Production & Services over $5 million

ADPE Approvals
    Required when any item enhancing the computing capability is to be acquired under a resultant contract

Buy American Act Exemption
    When applicable

Appendix 15B
The NOSC Stub Requisition Form and
Instructions For Its Use

INSTRUCTIONS FOR PREPARING A STUB REQUISITION
(NOSC-SD 4235/4-REV 11-83)

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 money value of all the items on the requisition
3	From: Requestor's Name	Name of person requesting material
4	Extension	Phone number of requester
5	Other than NOSC	For tenants: NPRDC, NHRC, and Public Works
6–9	Job order	Assign accounting data applicable to your code
10	GFE/GFM authorized	Government-furnished equipment/material to be provided
11	Sole Source	Sole source acquisition documentation provided IAW NOSCINST 4200.6A
12	Accept Substitute	Choose NO or YES
13	Date Material Required	Enter MO/DAY/YEAR material is required
14	Priority	Enter appropriate priority designator
15	Deliver to	Enter name of person to whom material is to be delivered
16–20	Extension/Code/Location	Enter phone extension, Code and location where material is to be DELIVERED
21–22	Requester Signature, Date	Sign and date
24–23	Approval Signature, Date	Authorizing signature and date NOTE: MUST NOT BE SAME INDIVIDUAL CITED IN BLOCK 3 OR 21
25–27	Internal Approval Signature, Code and Date	Signature of individual authorized to approve acquisition of certain commodities requiring internal approval (see Appendix 15C) — must be signed prior to submitting stub to Supply
28	Appropriation	TENANT ACTIVITIES: enter precisely as headings indicate
29	Description	Enter full description, unit of issue, estimated unit price, quantity, and suggested sources
30–32	NOT APPLICABLE	SUPPLY ACTION

Appendix 15C
Internal Approval Control Points
For Commodities/Documentation
at NOSC

INTERNAL APPROVAL CONTROL POINTS
FOR NAVAL OCEAN SYSTEMS CENTER

COMMODITIES REQUIRING APPROVALS	APPROVALS/SIGNATURES REQUIRED
ADP (Automatic Data Processing) hardware, software and supplies (purchase, lease, maint. or repair)	ADP Focal Point Office Code 9103/x2361
Air conditioning equipment; purchase, maint., repair	Support Branch Code 0066/x6447
Audio/visual equipment	Audiovisual Branch Code 962/x2041
Automotive equipment	Support Branch Code 0066/x6447
Blowers, exhaust	Support Branch Code 0066/x6447
Boats, engines and accessories	Service Craft Operations Div. Code 31/x6445
Books, subscriptions, pamphlets	Technical Libraries Code 964/x6623
Building improvements	Support Branch Code 0066/x6447
Cameras: copy, still, motion picture	Audiovisual Branch Code 962/x2041
Carpet	Occupational Safety & Health Grp. Code 155/x6857
Chemicals	Occupational Safety & Health Grp. Code 155/x6857
Communication equipment	Communications & Field Eng. Sect. Code 0068/x7655
Copy machines	NPPS Bldg A38/x7806
Crystals for radio communication equipment	Communications & Field Eng. Sect. Code 0068/x7655
Diving equipment (civilian) (SD)	Civilian Diving Officer, S.D. Code 321/x6628
Diving equipment (civilian) (Hawaii)	Civilian Diving Officer, Hawaii Code 322/Hawaii x359
Drafting services/equipment	Design & Development Div. Code 93/x2214

Drapes	Occupational Safety & Health Grp. Code 155/x6857
Electrical distribution equipment	Support Branch Code 0066/x6447
Electronic test equipment	Test Equipment Calibration Grp. Code 953/x7234
Energy consuming equipment (heaters, fans, exhaust blowers)	Support Branch Code 0066/x6447
Excess equipment (if required for NOSC)	Management Resources Grp. Code 132/x2017
Excess equipment (leaving NOSC)	Storage & Disposal Branch Code 221/x6573
Facilities	Support Branch Code 0066/x6447
Fans	Support Branch Code 0066/x6447
Filing equipment (anything that holds paper)	Management Resources Grp. Code 132/x2017
Fire extinguishers	Occupational Safety & Health Grp. Code 155/x6857
Forms, printing of	Directives & Forms Grp. Code 132/x5972
Furniture, office	Management Resources Grp. Code 132/x2017
Furniture, rehab	Storage & Disposal Branch Code 221/x6573
Gases, (all)	Occupational Safety & Health Grp. Code 155/x6857
Graphic arts; vugraphs, slides	Audiovisual Branch Code 962/x7817
Hazardous materials and containers (chemicals, poisons, nuclear)	Occupational Safety & Health Grp. Code 155/x6857
Heaters	Support Branch Code 0066/x6447
Locks	Physical Security & Loss Prevention Group Code 154/x6228
Material handling equipment; dollies, hand trucks, carts, etc.	Customer Services & Material Div. Code 22/x2511
Nuclear materials	Occupational Safety & Health Grp. Code 155/x6857

Padlocks	Physical Security & Loss Prevention Group Code 154/x6228
Photographic equipment	Audiovisual Branch Code 962/x2041
Plaques	Commanding Officer or Comptroller. (Stub will state "The expenditure of appropriated funds for this purchase is authorized under applicable laws and regulations").
Printing & reproduction (photographic)	Audiovisual Code 962/x2041
Projection equipment (video and photographic)	Audiovisual Code 962/x2041
Publications	Technical Libraries Code 964/x6623
Radiac equipment (handles radioactive materials)	Occupational Safety & Health Grp. Code 155/x6857
Radio equipment	Communications & Field Eng. Sect. Code 0068/x7655
Sales, office	Management Resources Group Code 112/x2017 *and* Physical Security & Loss Prevention Group Code 154/x6228
Safety equipment	Occupational Safety & Health Grp. Code 155/x6857
Safety glasses	Occupational Safety & Health Grp. Code 155/x6857
Saws, power (bench or hand held)	Occupational Safety & Health Grp. Code 155/x6857
Security containers (safes, file cabinets)	Physical Security & Loss Prevention Group Code 154/x6228
Shredders	Information Security Group Code 152/x6842
Signs	Support Branch Code 0066/x6447
Sonobuoys	Air Systems Program Code 021/x6377
Subscriptions	Technical Libraries Code 964/x6623
Telephone equipment	Telecommunications Group Code 0062/x6616

Teletype equipment (*when used w/ADP*)	ADP Focal Point Office Code 9103/x2361
Trade-in equipment (plant accounted)	Property & Stub Control Code 12223/x7025
Trailers, (purchase or rental)	Management Resources Branch Code 112/x2017
Trailers, (repair)	Support Branch Code 0066/x6447
Training courses	Employee Development Office Code 142/x7186
Transportation equipment	Support Branch Code 0066/x6447
Video equipment	Audiovisual Branch Code 962/x2041
Word processing equipment	Technical Information Division Code 96/x6418

NOTE: Office machines and typewriters no longer require internal approvals.

DOCUMENTATION REQUIRING APPROVALS	**APPROVAL/SIGNATURES REQUIRED**
DD Form 254 Contract Security Classification Specification (Needed when contractor will have access to classified materials)	Information Security Group Code 152/x6842
DD Form 1423 Contract Data Requirements List (When data will be a deliverable)	Data Management Office Code 9203/x5817
Patent documentation (if patent clauses are involved, Code 211 does not handle; stub goes to Contracts)	Patent Office Code 291/x6121
Sole Source Justifications:	
$25K and under (signed by requestor and division head)	Policy & Planning Branch Code 217/x7141 Code 211/x2819
Over $25K to $50K (signed by requestor and division head)	Contracts Branch Head and Level Higher, Policy & Planning Branch Code 217/x7141
$50K and above (signed by requestor, division head, department head and SES level official)	Competition Review Board and Policy & Planning Branch Code 217/x7141

Justification and Approval (J&A) (for other than full and open competition)	Refer to Procurement Memorandum No. 13-85, dated 31 July 1985 and Change 1 of 31 October 1985 [Available from Code 217/x7141]
Acquisition Plan	Refer to Part 7 of FAR, DFAR & NARSUP
Contract Plan	Refer to Contract Plan form
Business Clearance Memorandum (BCM)	Refer to NARSUP Part 1.690

BUDGET AND FINANCIAL MANAGEMENT 16

CONTENTS

SECTION 16
BUDGET AND FINANCIAL MANAGEMENT
S. Ryland, Code 1211

16.1 INTRODUCTION

16.1.1 References

NOSCINST 7300.5 of 27 August 1982

NOSCINST 7300 of 5 October 1981

NOSCINST 7300.3A of 25 June 1982

NOSCINST 7300.2A CH-1 of 10 December 1982

16.1.2 Outline

- Introduction
  - References
  - Outline
  - Summary
- Goals and Objectives
- The Navy Industrial Fund (NIF): What is it?
- Stabilized Rates
- Overhead/Rates/Surcharges
  - Funded Rates (NOSC Costs)
  - Unfunded Rates (Navy Costs)
  - Surcharges
- Project Management Requirements
- Acceptance of Funds
  - Funds Required Prior to Start of Work
    - Commander's Order
    - Letter of Intent
  - Types of Funding Documents
    - Reimbursable Orders
    - Direct Cite Orders
  - Center Acceptance Procedures
  - Comparison of Appropriations
  - Navy RDT&E Incremental Funding Policy

Spending/Control of Funds
  NOSC Project Numbering Structure
    Project Number
    Customer Order Number
    Job Order Number
  Multiple-Funded Customer Orders
  Overhead/Service Center Number Structure
    Type of Expense
    Organizational Code
    Function
    Serial
  Commitment/Obligation/Cost
  Overruns

16.1.3 Summary

See below.

16.2 GOALS AND OBJECTIVES

Figure 16.1 introduces the Programs and Budget Branch, Code 121, 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.

16.3 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 16.2).

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

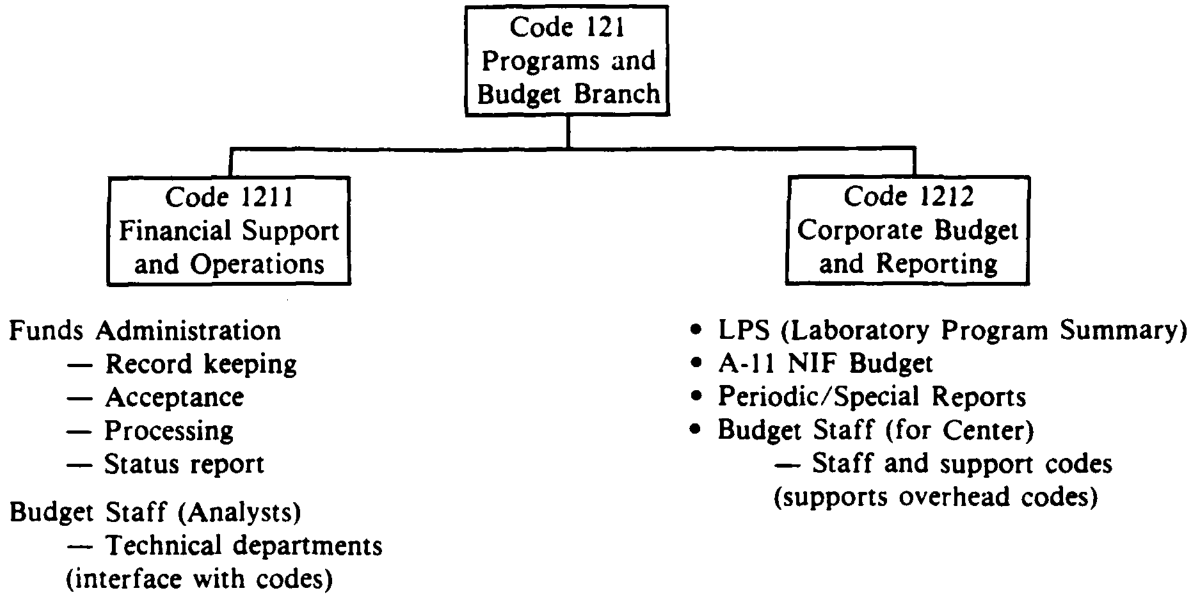


Figure 16.1. The Programs and Budget Branch, Code 121.

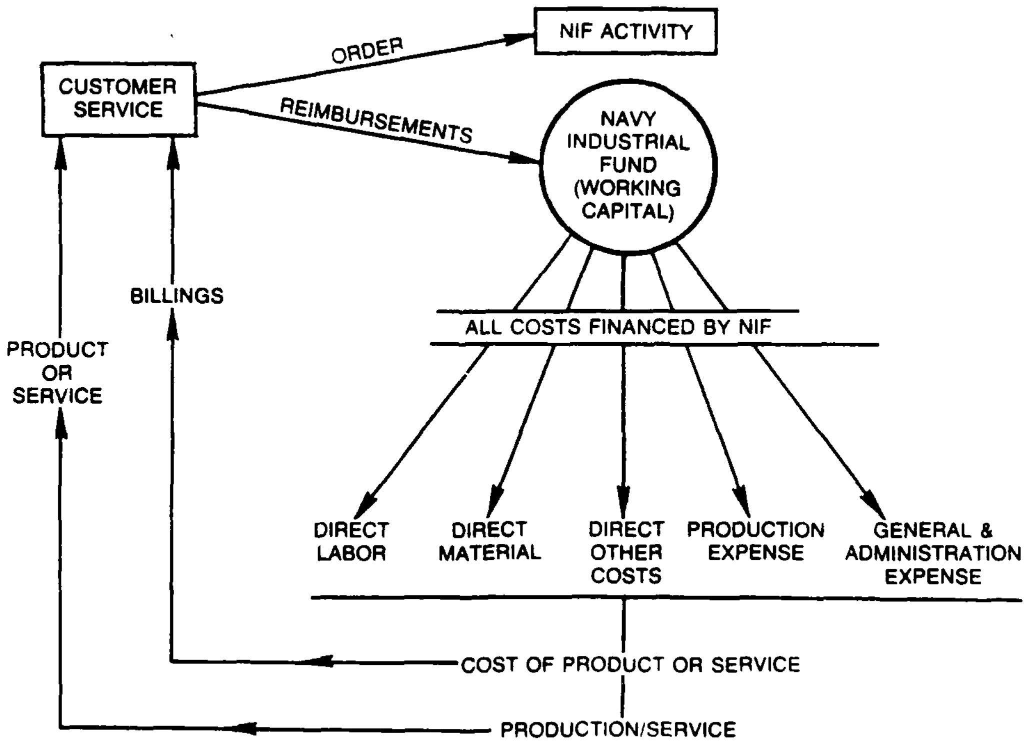


Figure 16.2. The cycle of operations under Navy industrial fund (NIF) financing.

16.4 STABILIZED RATES

a. History

b. Make up of rate

c. How it is applied and to whom

16.5 OVERHEAD/RATES/SURCHARGES

16.5.1 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, i.e., personnel, supply, comptroller, public works, etc.

c. Productive — Costs within direct cost center which cannot be related to a project. Sometimes called indirect overhead.

16.5.2 Unfunded Rates (Navy Costs)

a. General — Statistical cost of military in general cost centers.

b. Production — Statistical cost of military in direct cost center not working on project.

16.5.3 Surcharges

a. Civilian retirement

b. Interest on investment

c. Administrative surcharge

d. Packing

e. Transportation

16.6 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.

16.7 ACCEPTANCE OF FUNDS

16.7.1 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.

16.7.1.1 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 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.

16.7.1.2 Letter of Intent. The Letter of Intent is characterized by the following.

a. It may be issued by 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 7300.5 of 27 August 1982.

16.7.2 Types of Funding Documents (Reference NOSCINST 7300 of 5 October 1981)

Various order forms are used by the Navy and other agencies. Regardless of the form used, the following 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.

16.7.2.1 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 7300.3A).

b. 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.

c. 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.

d. 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.

e. 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.

f. 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.

16.7.2.2 Direct Cite Orders. Documents which are to be direct cited such as requests for contractual procurement (RCPs) or "direct cite" military interdepartment 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 CNM 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.

16.7.3 Center Acceptance Procedures

All funding documents received on Center are forwarded to Code 1211. After internal review and acceptance by the project manager, Code 1211 accepts the document and returns it to the sponsor.

An accepted reimbursable order becomes an obligation on the sponsor's books. Figure 16.3 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 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?

16.7.4 Comparison of Appropriations

Figure 16.4 and Table 6.1 take a look at appropriations from an expense/investment point of view, while Table 16.2 presents the types of funding appropriations. Table 16.3 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, development, 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)

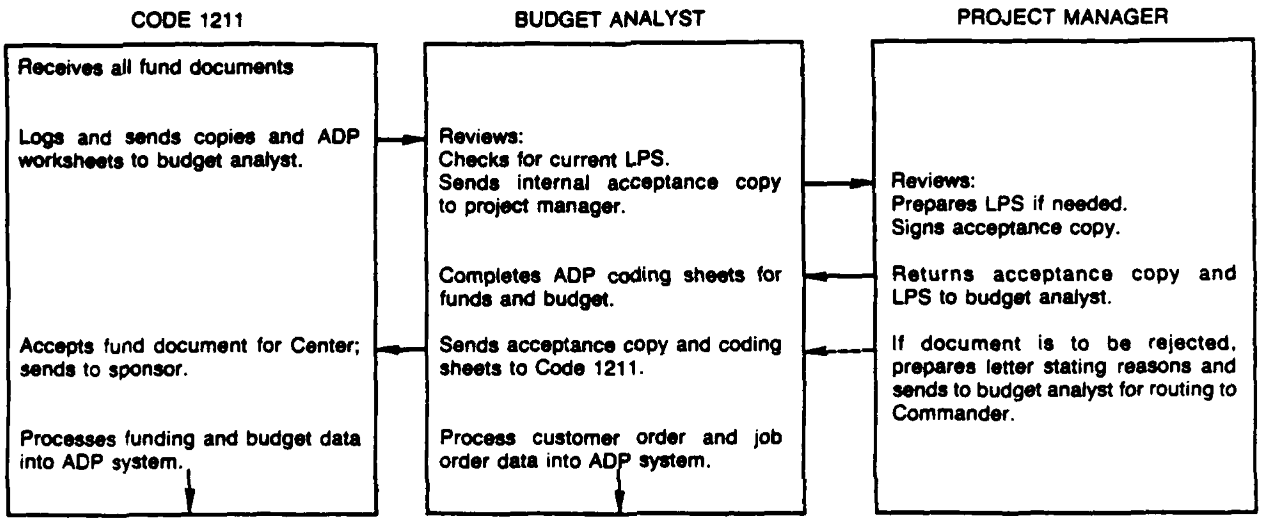


Figure 16.3. Fund acceptance procedure for reimbursable orders.

	Expense	Investment
RDT&E	●	●
Operators and Maintenance	●	
Procurement		
Aircraft (APN)		●
Weapons (WPN)		●
Ships (SCN)		●
Other (OPN)		●
Other		
FMS		
Other Agencies		
Special Deposits		

Figure 16.4. Appropriations.

Table 16.1. Investment/Expense

(specific definitions are contained in NAVCOMPT manual vol. 7, paragraph 075001)

Investment	**Expense**
Equipment costing $3,000 or more (including software)	Equipment costing less than $3,000.
Labor used in assembly, production, or construction of investment item and for direct support costs.	Labor used for operations, maintenance, and services.
Spare assemblies and parts centrally managed.	Spare assemblies and parts not centrally managed.
Modification kits and assemblies.	Nonrepairable spare parts.
APA material	Consumable material and supplies.
Facility construction and direct support costs, design engineering.	Movable furnishings, furniture, and galley equipment (some exceptions).
Initial outfitting of major end item of equipment.	Services
Ammunition and explosives	Rental and leases (some exceptions)
Procurement/production direct support Production testing Quality assurance Product engineering Equipment assembly	General motion picture procurement or development 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 16.2. 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 16.3. 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.

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 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 $3,000

16.7.5 Navy RDT&E Incremental Funding Policy

a. Specific guidance is contained in NOSCINST 7300.3A of 25 June 1982.

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 16.5)

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 first 12-month increment, where award was delayed because of contractual or technical problems.

Service contracts award 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 fiscal year.

Fully funded short term contracts (18 months or less) may be issued where it is not feasible to increment.

When budgets are prepared for RDT&E funded projects, managers should take into account these incremental funding requirements.

	Formulation	Execution	BY (CY) ONDJFMAMJJAS	BY+1 (BY) ONDJFMAMJJAS	BY+2 (BY+1) ONDJFMAMJJAS	COMMENT
Short-Term Contract						
Example 1	X		12 mos.			Coincident with the FY (objective).
Example 2	X		12 mos.			Not coincident with the FY.
Example 3	X		7 mos.			All effort within part of the FY.
Example 4	X			18 mos.		Award made late in FY, maximum permitted duration is 18 months.
Example 5		X			18 mos	Award made in second year of availability, maximum permitted duration is 18 months. Budget cannot be based on this type of funding plan
Multiyear Contract						
Example 6	X		12 mos.	12 mos.	12 mos.	Coincident with the FY (objective).
Example 7	X		7 mos.	12 mos.	12 mos.	First increment made to coincide with end of FY.
Example 8	X		12 mos.	7 mos.	12 mos	Exception: SECNAV approval is required if this pattern is used in budget formulation where the first increment extends beyond the end of the first year and the second increment is made to coincide with the end of the second year. Difficulties in execution may require this patern.
Example 9	X			9 mos, 12 mos.	12 mos.	Exception: SECNAV approval is required if this pattern is used in budget formulation, where the increments are not coincidental with the fiscal year. Difficulties in execution may require this pattern.
Example 10.....		X		9 mos.	6 mos, 6 mos	Award made in second year of availability, funding pattern as shown in example 6 restored by end of next succeeding F.. Budget cannot be based on this type of funding plan
Research Contracts-Educational Institutions						
Example 11	X			36 mos.		Maximum duration of initial increment is 36 months from date of award.
Example 12	X			18 mos.	12 mos.	Maximum duration of any increment after the initial increment is 12 months from date of renewal.
Government Installation						
Example 13	X		12 mos.	12 mos.	12 mos.	Institutional funding.
Example 14	X		9 mos.	12 mos.	12 mos.	Reimbursable orders, planned increment may extend up to 3 months into the following FY.
Example 15		X		10 mos.	6 mos, 6 mos	Reimbursable order issued in second year of availability, second increment funded in second year of availability, maximum duration is 6 months of the following FY. Budget cannot be based on this type of funding plan

Figure 16.5. RDT&E incremental funding.

16.8 SPENDING/CONTROL OF FUNDS

16.8.1 NOSC Project Numbering Structure

The NOSC numbering structure integrates a project number with customer order and job order numbers. This provides for identification of different areas of work at the project number level, funds control at the customer order level, and cost accounting by job order. A complete explanation of this structure is shown in Figure 16.6.

Example: CC54831A01

Project No. *CC54*

Customer Order *CC54831A*

Job Order *CC54831A01*

16.8.1.1 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 16.4.

16.8.1.2 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 16.8.2 for the ground rules).

16.8.1.3 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.

16.8.2 Multiple-Funded Customer Orders (from NOSCINST 7300.3A of 25 June 1982)

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. Funds 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.

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 16.6. The 10-character NOSC job order number explained.

Table 16.4. Mission area indicators in the NOSC project numbering system (1 of 2).

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	NAVMAT 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

- XX: Serial number identifying specific project.
- X (second): Letter code identifying sub-category of mission area.
- X (first): Letter code identifying major mission area.

Sample:

NEARTIP — WT01

ALWT — WT02

Table 16.4. Mission area indicators in the NOSC project numbering system (2 1 2).

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)

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.

16.8.3 Overhead/Service Center Number Structure

A 10-digit "job order" structure is used to account for overhead and service center expense. It 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. The NOSC expense account numbering structure is shown in Figure 16.7.

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 16.7. The 10-digit NOSC expense account numbering structure.

16.8.3.1 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.).

16.8.3.2 Organizational Code. A four-digit code identifies the cognizant organization at the section level.

16.8.3.3 Function. A three-digit code identifies the function where such breakout is required (for example, training, maintaining of building, etc.) or identifies the element of expense (for example, gas, telephone service, etc.). A representative listing of the expense element/function codes is presented in Table 16.5.

Table 16.5. The expense element/function code structure.

10	Salaries
13	Administrative salaries
14	Salaries and wages (other)
20	Material
23	Operating supplies
30	Contracts
31	Major contractual services (>10K)
32	Minor contractual services (<10K)
33	EAM/ADP rentals
35	Transportation
38	Technical information
39	Computer
40	Miscellaneous
41	Training
42	Travel
43	Printing, reproduction, blueprinting
45	Telephone
50	Utilities (PW only)
60	Repair and maintenance
61	Buildings
80	Adjustments
90	Transfers

16.8.3.4 Serial. A two-digit code which can be used as necessary to categorize expenses for special purposes.

16.8.4 Commitment/Obligation/Cost

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

c. Types of transactions

The types of transactions are charted in Figure 16.8.

	Commitment	*Obligation*	*Cost*
Labor and Overhead			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 16.8. Types of transactions.

16.8.5 Overruns (Reference NOSCINST 7300.2A CH-1 of 10 December 1982)

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 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 121.

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

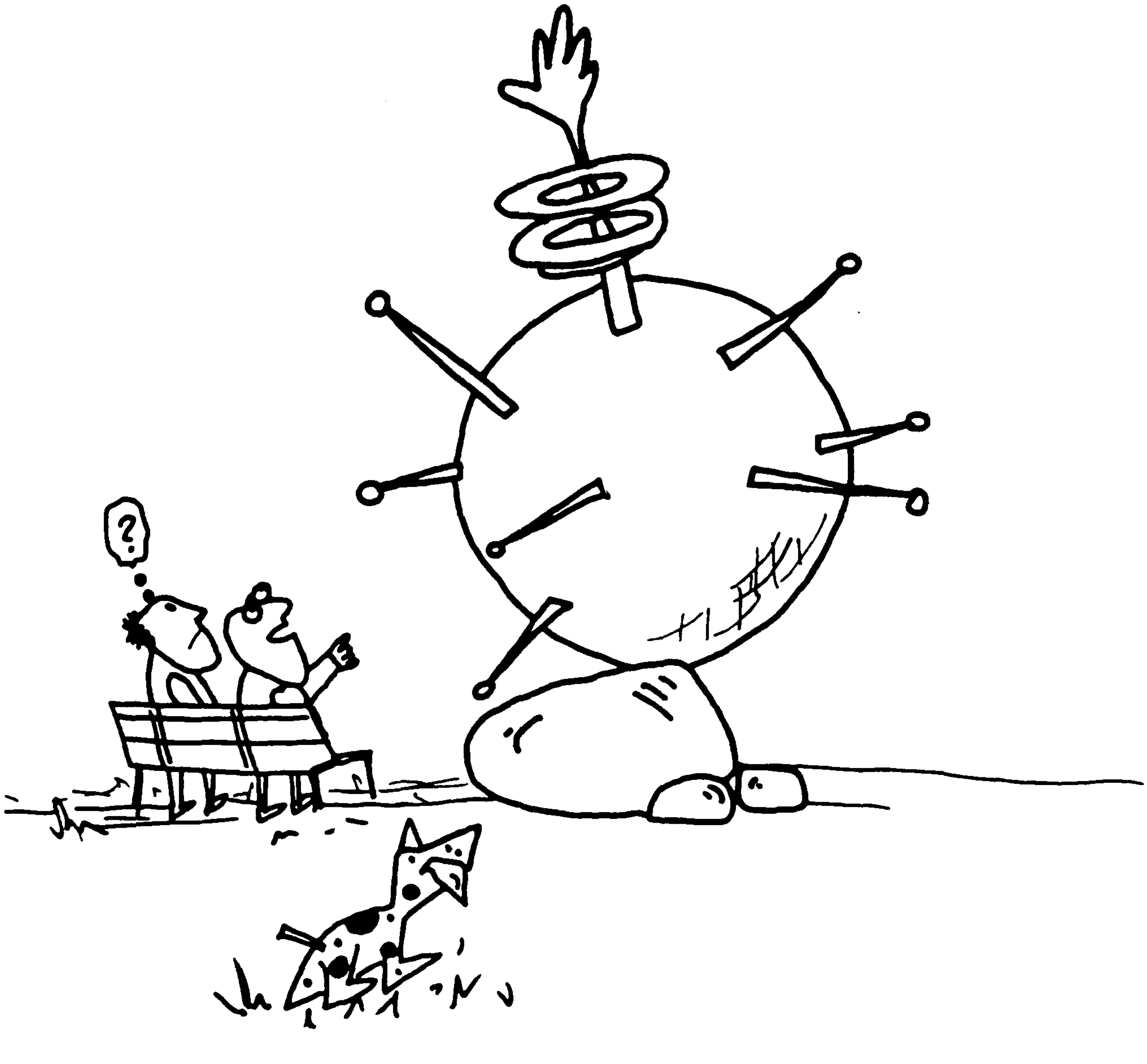
Jeopardy

Stop work

Overrun notification

Overruns outstanding

DESIGN REVIEW 17



CONTENTS

SECTION 17
DESIGN REVIEW
J. Rasmussen, Code 902

17.1 INTRODUCTION

17.1.1 References

NOSCINST 4855.1, NOSC Product Assurance Program
NAVMATINST 3000.1A, Reliability of Naval Material

17.1.2 Outline

17.1.3 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.

17.2 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 shall 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 shall 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 17.1 offers a sample outline for a major system presentation.

17.3 PRODUCT ASSURANCE

Guidance and reference material related to the NOSC product assurance program are provided in NOSCINST 4855.1.

17.4 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 parts of the system development process, the design reviews in concert with these scheduled reviews. Figure 17.2 indicates timing of reviews within the major systems acquisition cycle.

17.4.1 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.

17.4.2 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 (e.g., AUSS (Advanced Undersea Search System), SLC (Submarine Laser Communication) system, etc.).

Reviews are also negotiable for nondeliverable demonstration testbeds.

SAMPLE MAJOR SYSTEM PRESENTATION OUTLINE

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 17.1. Sample major system presentation outline (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 17.1. Sample major system presentation outline (2 of 2).

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 17.2. Major defense systems acquisition cycle

17.4.3 Reviews Not Required

Test instrumentation

Nondeliverable test hardware

Nondeliverable experimental devices

Minor support equipment

17.5 RESPONSIBILITIES

17.5.1 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 which must undergo design review.

17.5.2 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 Office, 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 which recommends release to production and states any limitations or compromises.

17.5.3 Organization of the Design Review Committee

The committee membership is as follows:

*Chairman**: The chairman is the cognizant department head of the subject program.

*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.

Assistant to the Chairman: A person selected by the chairman to assist the chairman 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 Head, Engineering and Computer Sciences Department, Code 90, assures that the review process is followed and that recommendations are complete and rational.

Permanent Recorder: Design Review Office, Code 902, defines design review requirements, assists in selection of review committee members with the assistant to the chairman, maintains files of Center experts, maintains archives of program reviews, and records completion of outstanding action items as forwarded by the assistant to the chairman.

Review Team Members: The team members are selected from across the Center by the chairman and Code 90, and invited to participate by the assistant to the chairman via channels. These members ought to include:

Another technical department head

NOSC technical officer(s) having appropriate technical or Fleet backgrounds.

Independent technical experts from the scientific and engineering departments, individually selected by the chairman with line management approval, to meet the particular needs of each design review.

Ex-Officio Advisory Members: These include additional technical experts, as required.

*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.

FOLLOW-ON TRAINING 18

CONTENTS

SECTION 18
FOLLOW-ON TRAINING
J. Barhoum, Code 142

18.1 INTRODUCTION

18.1.1 References

None.

18.1.2 Outline

18.1.3 Summary

See below.

18.2 TECHNICAL MANAGER DEVELOPMENT

This Center is committed to the development of successful and competent program/project managers. Previous sections of this handbook detail the different areas in which a technical manager must be knowledgeable and highly skilled. In this section, a road map of training and developmental information is presented to assist you in acquiring the necessary skills and abilities to become a competent technical manager.

18.3 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 Assistance
NOSC policies and procedures	Contracting
DoD and Navy acquisition processes	Design review
Project formation	Test and evaluation
Planning and control	Integrated logistics support
Budgeting and accounting	Risk assessment
Marketing	Warranty
Systems engineering	Documentation
Safety	Negotiation techniques
Team building	Presentation skills
Conflict resolution	Writing skills

18.4 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.

18.4.1 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.

18.4.2 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 Extension Program
   - UCLA Engineering Management

18.4.3 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.

18.5 PLANNING FOR PROGRAM MANAGER DEVELOPMENT

Figure 18.1 is a planning guide to help individuals and supervisors be assured that the full complement of program management knowledge and skills is addressed. It is recommended that this guide be filled in as training is accomplished and, when it 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.

18.6 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 which 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 Employee 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. NOSC 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	✓				

1 Check (✓) if required in position

2 Enter "C" (Completely), "P" (Partially), or "M" (Minimally)

3 Indicate assignment, formal training, or position

Figure 18.1. 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)					
o. Warranty	✓				
p. Safety	✓				
q. Documentation	✓				
2. Skills in					
a. Making presentations	✓				
b. Technical Writing	✓				
c. Team building	✓				
d. Interpersonal communication	✓				
e. Negotiating	✓				
f. Conflict resolution	✓				
g.					
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 18.1. Program management development guide (2 of 2).

HUMAN FACTORS 19

CONTENTS

SECTION 19
HUMAN FACTORS
C. M. Dean, Code 441

19.1 INTRODUCTION

19.1.1 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

19.1.2 Outline

19.1.3 Summary

See below. Also consider the words of Albert Einstein, "Concern for man himself and his fate must always form the chief interest of all technological endeavors."

19.2 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 which 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.

19.2.1 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.

19.2.2 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 which 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.

19.3 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 which 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 left hand and the new design required right hand operation.

The Hawthorne effect is named after some studies which 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.

19.4 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.

19.5 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 which 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.

19.6 HFE METHODOLOGICAL TOOLS AND DESIGN AIDS

In addition to the human perception, reaction, tolerance, and anthropometric data bases which human factors experts have compiled over the years, there are other specific methodological tools which 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 which 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 which 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.

19.7 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 discussed above. 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 tables included at the end of this article compare and contrast human and machine capabilities and limitations and should be used to help decide who ultimately does what.

19.8 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 below.

19.8.1 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 which are hard to change

g. Can be "suspicious" of the system

h. Sometimes fear that they will break the system

19.8.2 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!).

19.8.3 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.

19.8.4 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.

19.8.5 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 19A

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 overlooked by too many students, then 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, then 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, i.e. 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, i.e. 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)

END
DTIC
8-86