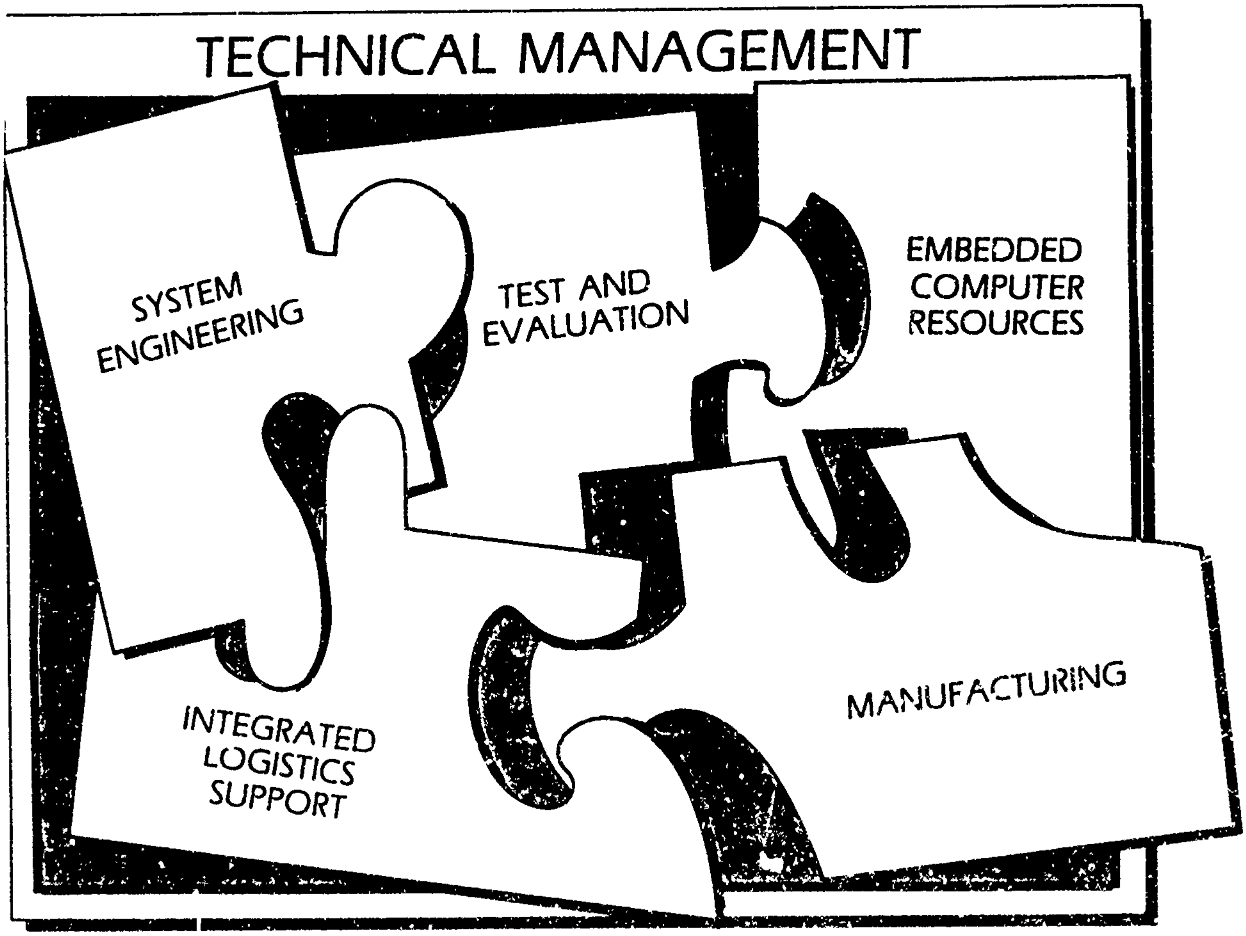
DEFENSE SYSTEMS MANAGEMENT COLLEGE

2

INTEGRATED LOGISTICS SUPPORT GUIDE



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DEPARTMENT OF DEFENSE
DEFENSE SYSTEMS MANAGEMENT COLLEGE
FORT BELVOIR, VIRGINIA 22060-5426

May 1986

DEFENSE SYSTEMS MANAGEMENT COLLEGE

INTEGRATED LOGISTICS SUPPORT GUIDE

FIRST EDITION

Execution of a sound Integrated Logistics Support (ILS) Program is no accident. It requires hours of research, planning, and understanding of the critical issues and acquisition risks inherent in any acquisition undertaking.

This ILS educational guide is designed to acquaint the newcomer with ILS concepts and techniques, identify specific directives and references, and assist in the understanding of the overall acquisition system. It is not directive in nature and cannot be cited as authority for official actions. The concepts in this guide, when combined with common sense and technical expertise, will constitute the basis of a sound ILS program.

This first edition reflects feedback resulting from the circulation of an October 1985 draft. Recognizing that ILS is an extremely dynamic discipline, this book is planned for periodic updating. Ongoing research and experience may identify areas where addition, modification, or deletion might enhance the usefulness of the guide. Your comments and recommendations are solicited. Please use the tear-out sheet provided at the end of the book or address your comments to:

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FOREWORD

This document is one of a family of educational guides written from a Department of Defense perspective; i.e., non-service peculiar. These books are intended primarily for use in the courses at the Defense Systems Management College (DSMC) and secondarily as a desk reference for program and project management personnel. The books are written for current and potential Department of Defense (DoD) Acquisition Managers, who have some familiarity with the basic terms and definitions employed in program offices. They are designed to assist both Government and industry personnel in executing their management responsibilities relative to the acquisition and support of Defense systems. This family includes:

- o Integrated Logistics Support Guide; First Edition: May 1986
- o Embedded Computer Resource (ECR) Guide; estimated publication date: 1986.
- o Systems Engineering Management Guide; October 3, 1983. Update in process - estimated publication date of second edition: 1986.
- o Test & Evaluation (T&E) Guide; estimated publication date: 1987.
- o Department of Defense Manufacturing Management Handbook for Program Managers; Second Edition; July 1984. Estimated publication date of Third Edition: 1988.

This family of books is especially needed at this time. We all desire capable, producible, supportable, testable systems delivered within cost and schedule. However, the increasing cost and technical complexity of Defense systems has forced greater specialization of functions and the rise of many specific (and very often vocal) disciplines. Public attention to the Defense Acquisition Process has also intensified. A key element to a successful program is intelligent integration and balance among the many disciplines that constitute a modern system. This is achieved through a process that begins with communication and continues with a careful trade-off process throughout the system life cycle.

Each of the books will have a common foreword designed to assist managers in sharpening their judgement and focusing their thinking. These books are not to be used as an all inclusive checklist or model of the single correct approach to system acquisition management because all programs are unique and must be executed with professional judgement and common sense.

This book was developed by Information Spectrum, Incorporated under contract MDA 903-84-C-0369, directed by DSMC. Special thanks are due members of the DSMC faculty, students, alumni, and members of the acquisition community at large, whose comments, suggestions, and materials were helpful in completing this project. The DSMC is the controlling agency for this guide. Comments and recommendations for improvement are solicited. You are encouraged to place them on one of the pre-addressed tear sheets located at the back of the book and mail them to us.

This foreword offers a system perspective for technical management over the system life cycle. Subsequent material in this book provides information on managing a specific discipline within this broad scope of technical activities. The past several decades have seen the rise of large, highly interactive Defense systems that are often on the forward edge of technology. These systems have a natural process of evolution, or life cycle, in which actions taken or avoided in the very early stages can mean the difference between success and failure downstream.

The system life cycle consists of the interval from program initiation to system disposal. All activity in the acquisition process centers around the system. Thus, the state of definition of the system configuration at any time in the system life cycle is an area of common interest among all disciplines.

Phases in a Defense system's life cycle are Concept Exploration, Demonstration/Validation, Full Scale Development, Production, and Operation and Support.

The division of technical activities into functional areas of design, test, manufacturing, and logistic support is convenient and usually results in a corresponding division of labor in a program office. As can be seen from Figure F-1, each of these functional areas is active in the earliest phase of the life cycle and continues through most of the program. The general trust of technical management goes like this:

- o Define what it takes to support, produce, and test the system utilizing analyses. Then see if we can afford it.

- o Influence the design through producibility engineering, logistics analysis, testability design, and design to cost. Develop specifications and translate requirements to contract language.

- o Prepare to execute by arranging for the test facilities, acquiring and setting up the production line, and designing and acquiring the logistic support.

- o Execute by testing, manufacturing, and supporting.

Figure F-1 is a rigorous endeavor to show all the technical management activities that should be accomplished and integrated in the various program phases.

- Phases are shown with nominal times, purpose, decision points, and general contract flow.

- Systems engineering and related interdisciplinary integration tie together the progress of product definition through the phases--system level configuration item level, detailed level, deficiency correction, and modifications/product improvements.

- Manufacturing and integrated logistics support influence the design and then proceed in a disciplined fashion to implement selected strategies.

- Test results provide feedback for analysis of performance progress.

Acquisition of a system is a process that begins with the identification of a need. The goal of a system acquisition is to deploy (in a timely manner) and sustain an effective system that satisfies the need at an affordable cost.

Thus, the effort involved in the acquisition process can be modeled as an input, process, and output. The output is the system. The input is the need and other appropriate constraints. The process consists of managing the technical activities by establishing and maintaining a balance among cost (the resources required to acquire, produce, operate and support, and dispose of a system), system effectiveness (the degree to which a system can be expected to achieve a set or specific mission requirements), and schedule. Much of the criticism leveled at Defense programs results from a perception of imbalance among these factors.

To summarize, management of the acquisition process can be defined as the logical and systematic conduct of the effort required to transform a military need into an operational system.

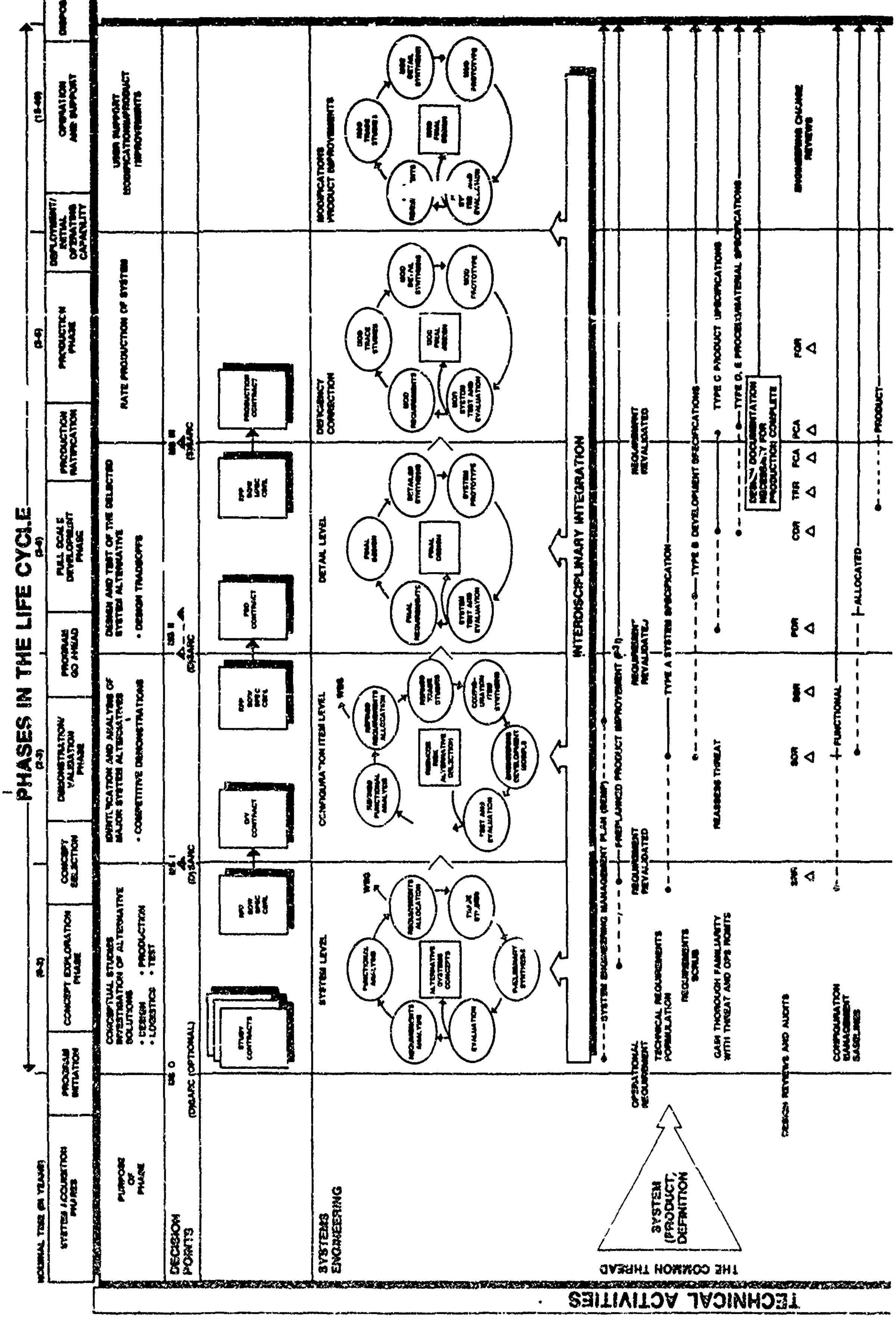
A system life cycle can span 30 years or more, as is the case with examples like the M-60 tank, USS NEW JERSEY, or B-52 aircraft. Technical activities over the life cycle are not discrete events. Each activity is present in some form throughout a system's life cycle.

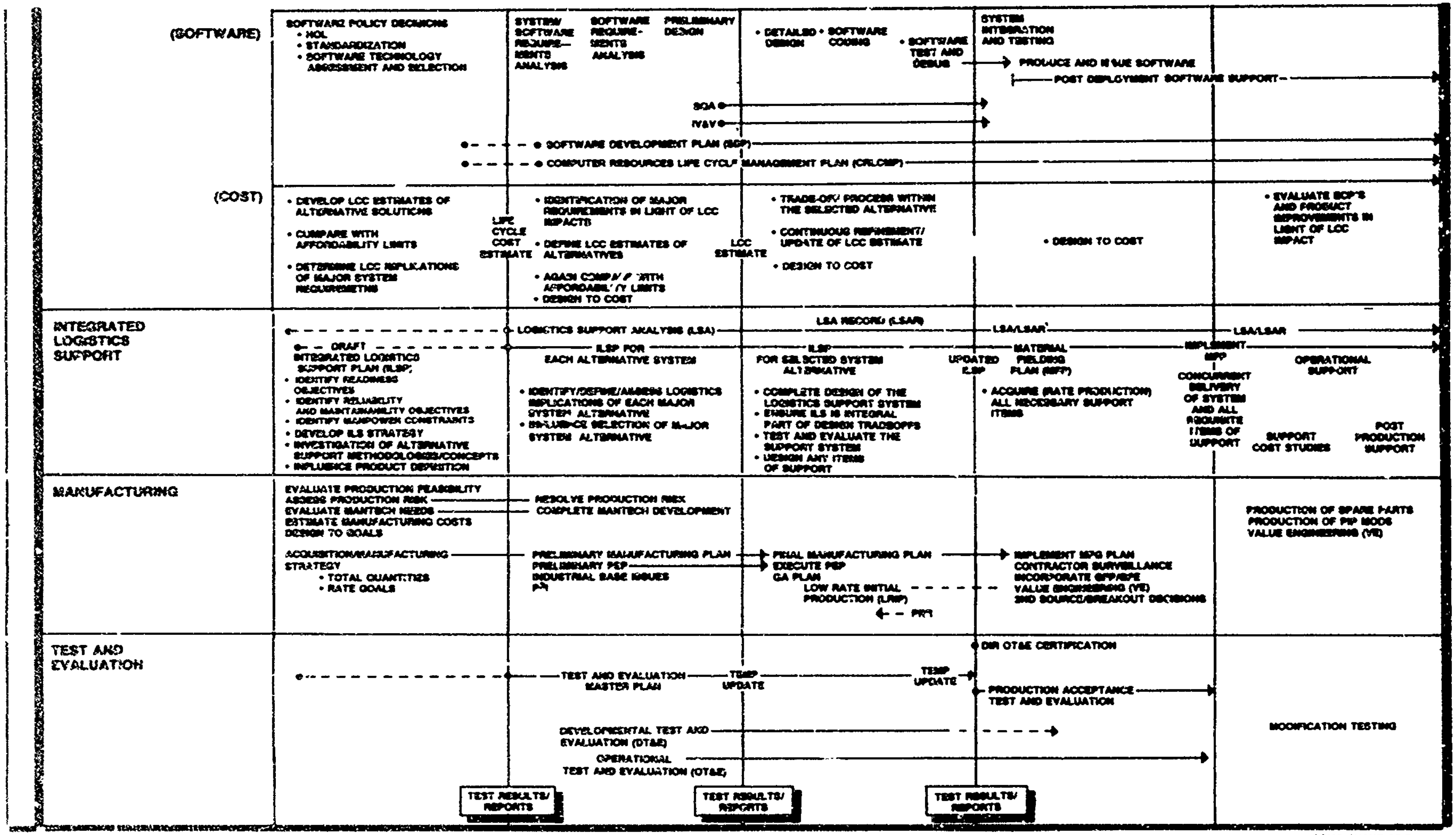
Successful acquisition and support of a system require a cooperative effort on the part of Government and industry, since the capability of the industrial base to economically produce Defense systems on a timely basis is a key element of the acquisition process.

The System Life Cycle Technical Activities Chart (Figure F-1) provides a detailed description of activites. This is the common framework which we will use as a point of departure. Delving into the details of Figure F-1 will soon confirm that hard work at the beginning will pay off later. Early technical decisions have a profound effect on total system cost and schedule, but there are continuing requirements for important technical activities and integration.

Whenever in the publication, "man", or "men", or their related pronouns appear, either as words or parts of words (other than with obvious reference to named male individuals), they have been used for literary purposes and are meant in their generic sense.

SYSTEM LIFE CYCLE TECHNICAL ACTIVITIES





ALL INQUIRIES AND COMMENTS ON THIS CHART SHOULD BE ADDRESSED TO THE TECHNICAL MANAGEMENT DEPARTMENT, DEFENSE SYSTEMS MANAGEMENT COLLEGE, FORT BELVOIR, VIRGINIA 22060-5426

Figure F-1 System Life Cycle Technical Activities

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MODULE I

INTRODUCTION TO ILS

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All acquisition programs require an ILS effort that begins prior to formal program initiation and continues for the life of the system. This module introduces the ILS process and its objectives, ILS planning requirements, and development of readiness and supportability objectives and design parameters. Subsequent modules will describe the development of an ILS program, funding and contracting, testing and evaluating, and providing the support. Finally, ILS requirements for international, joint, and non-major programs are discussed.

CONTENTS

CHAPTER 1

ILS FUNDAMENTALS

1.1 INTRODUCTION

1.1.1 Purpose

To provide an introductory overview of Integrated Logistic Support (ILS), including its historical background, conceptual basis, guidelines for application, and elements.

1.1.2 Definition

DoDD 5000.39, "Acquisition and Management of Integrated Logistic Support for Systems and Equipment", defines ILS as a "disciplined, unified, and iterative approach to the management and technical activities necessary to:

- o Integrate support considerations into system and equipment design.
- o Develop support requirements that are related consistently to readiness objectives, to design, and to each other.
- o Acquire the required support.
- o Provide the required support during the operational phase at minimum cost."

These can be more simply expressed in chronological order as:

- o Define the support
- o Design for support
- o Acquire the support
- o Provide the support

1.2 BACKGROUND

The 1980s have brought about an increased emphasis on readiness. The Defense Acquisition Improvement Program initiated in 1981, requires readiness improvement measures, including:

- o Establishment of readiness objectives for each materiel development program.
- o Enhanced visibility of logistics and support resources by mandating identification of resources by materiel system in each Service's Program Objectives Memorandum (POM).
- o Design incorporation of reliability and maintainability objectives.
- o Development of contractor incentives for reliability and support enhancement.

ILS policy initially emphasized the integrated development of a total logistic support structure in lieu of developing individual ILS elements in isolation. While this aspect remains important, the current thrust is on the introduction of readiness implications in the "front end" of system development as a prime objective of the acquisition process. The Program Manager is assigned responsibility to establish and manage an adequately funded ILS program. The early identification of Readiness and Supportability (R&S) objectives and their translation into explicit supportability design parameters are necessary mechanisms to achieve system readiness objectives at an affordable Life Cycle Cost (LCC).

1.3 GUIDELINES

Major guidelines for the development of R&S objectives are listed in Figure 1-1 and discussed in the following paragraphs.

1.3.1 Mission Need

The need for a new or modified system and its specific operational requirements derive from continuing analyses of mission areas (Figure 1-2) conducted prior to program initiation. R&S objectives for the

- DEVELOP R&S OBJECTIVES TO SUPPORT MISSION NEED
- INTEGRATE R&S ENGINEERING ACTIVITIES WITH DESIGN EFFORT
- DOCUMENT SUPPORTABILITY DESIGN OBJECTIVES EXPLICITLY IN STATEMENTS OF WORK AND SPECIFICATIONS
- RELATE R&S ACTIVITIES TO THE BUDGET
- DEVELOP AND UPDATE COMPREHENSIVE PLANNING OF ILS ACTIVITIES
- STRUCTURE THE LSA PROGRAM TO REQUIREMENTS AND OBJECTIVES
- ASSURE EARLY "FRONT END" DEVELOPMENT OF R&S OBJECTIVES

Figure 1-1 Readiness and Supportability Guidelines

system must be established to support the operational requirements. The R&S objectives in turn determine or influence the manner in which the system will be designed and supported in its operational role. This then leads to establishment of supportability parameters for use in the system design process. Refer to Chapter 3.

1.3.2 Integration with Design Effort

The establishment of supportability parameters is an engineering design activity. It must be integrated with all other design development performed in a system engineering process using compatible design techniques. Refer to Chapter 4.

1.3.3 Specification of Supportability Objectives

System designers are guided by and held accountable to requirements in design sections of Statements of Work (SOW) and in formal configuration baseline specifications. Logistic Support Analysis (LSA) provides a means for determining supportability objectives but, by itself, does not direct design activity. Supportability related design parameters, such as operational reliability and maintainability, must be specified in design-related terms that can be unambiguously interpreted, designed to, and demonstrated. Refer to Chapters 3 and 9.

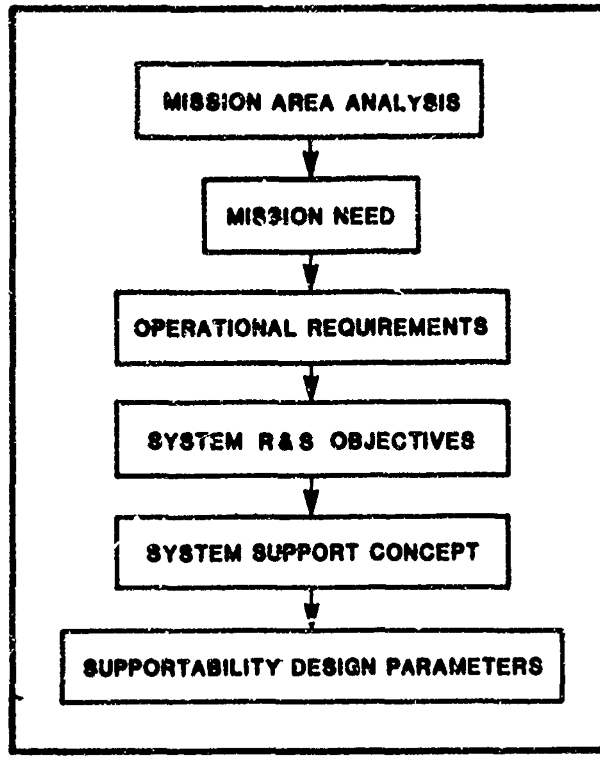


Figure 1-2 Relationship of ILS Objectives to Mission Need

1.3.4 Relation to the Budget

R&S objectives have two basic relationships to Defense budgets. First, effective implementation will be possible only when logistic support resource requirements and supportability-related tasks receive adequate funding. Second, R&S objectives are links to the determination of LCC and particularly Operation and Support (O&S) costs which generally account for about 60 percent of the total system LCC. These relationships must be continuously evaluated for the impact of system design decisions. Refer to Chapters 6 and 8.

1.3.5 Comprehensive ILS Planning

Early development (during Concept Exploration) and continued updating of ILS planning is critical to the attainment of R&S objectives throughout the system's life cycle. A comprehensive and current ILS Plan provides essential direction to the multi-disciplinary ILS activities required to satisfy evolving requirements. The ILS program and LSA activities must remain responsive to these requirements. Refer to Chapter 2.

1.3.6 Structuring the LSA Program

The general attributes of a well-structured ILS program, offering needed emphasis on R&S objectives, can be explicitly identified from LSA tasks outlined in MIL-STD-1388-1A, "Logistics Support Analysis". The total analysis effort must be structured to achieve R&S objectives with tailoring of tasks to obtain cost-effective implementation. Refer to Chapters 2, 5, and 7.

1.3.7 Early Development of R&S Objectives

Experience has repeatedly demonstrated that emphasis on readiness and supportability in a materiel system must start with the earliest activities that establish the general characteristics of the system; i.e., in the "front-end" of the program. During these activities, the program requirements are defined and system performance characteristics and objectives are established. Readiness and supportability are inextricably bound to these early activities. Prior to program initiation, cost drivers and supportability problems of existing systems operating in the mission area provide the basis for continuing Logistics R&D and the focus for improved performance in the new system. Refer to Chapter 3.

1.4 ILS ELEMENTS

The ten ILS elements (Figure 1-3) listed below are specified in DoDD 5000.39. All the elements, except Maintenance Planning and Design Interface, comprise the total of logistic support resources that contribute to system operation and the attainment of readiness objectives in the system's operational role. Maintenance Planning and Design Interface are part of the LSA process. During early development phases, the Design Interface develops the supportability influence starting at the system level and proceeding down the system indenture levels (Figure 1-4). This transitions in later phases to detailed Maintenance Planning and a detailed bottom-up identification of total logistic resources.

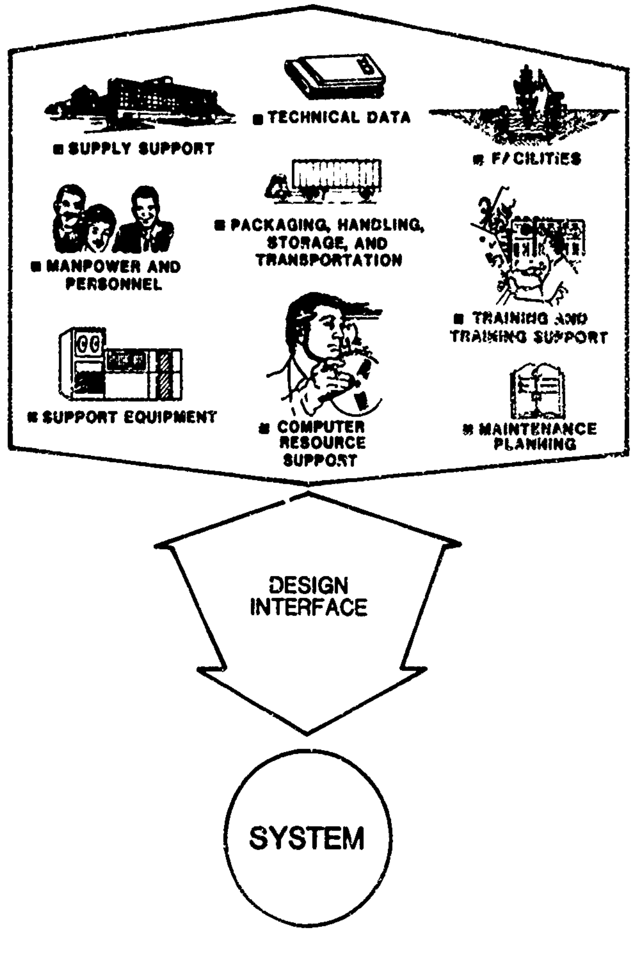


Figure 1-3 The ILS Elements

- o <u>Maintenance Planning</u> - The process conducted to evolve and establish maintenance concepts and requirements for the lifetime of a materiel system.

- o <u>Manpower and Personnel</u> - The identification and acquisition of military and civilian personnel with the skills and grades required to operate and support a materiel system over its lifetime at peacetime and wartime rates.

- o <u>Supply Support</u> - All management actions, procedures, and techniques used to determine requirements to acquire, catalog, receive, store, transfer, issue, and dispose of

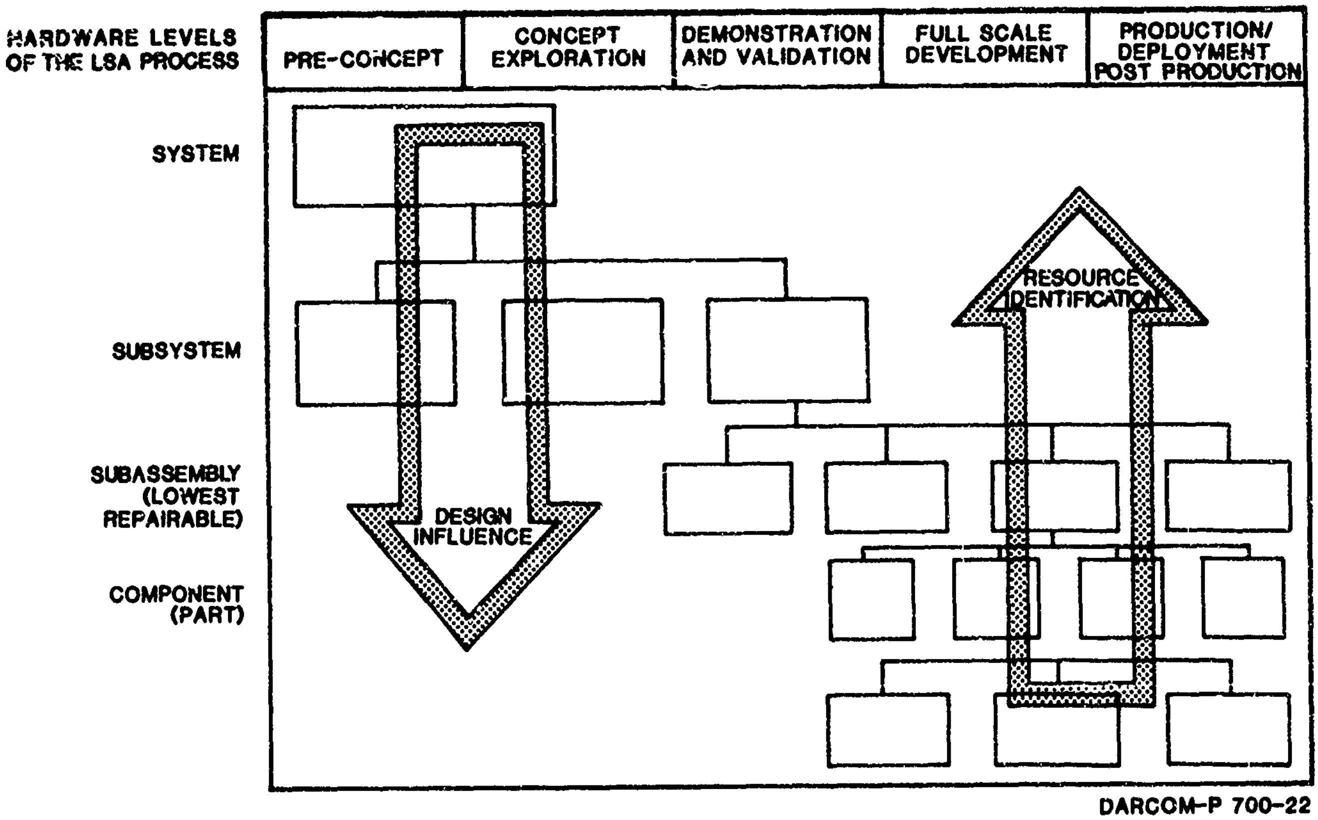


Figure 1-4 LSA Activity Emphasis During the Acquisition Cycle

secondary items. This includes provisioning for initial support as well as replenishment supply support.

- Support Equipment - All equipment (mobile or fixed) required to support the operation and maintenance of a materiel system. This includes associated multi-use end items, ground-handling and maintenance equipment, tools, metrology and calibration equipment, and test and automatic test equipment. It includes the acquisition of logistics support for the support and test equipment itself.

- Technical Data - Recorded information regardless of form or character (such as manuals and drawings) of a scientific or technical nature. Computer programs and related software are not technical data; documentation of computer programs and related software are. Also excluded are financial data or other information related to contract administration.

- Training and Training Support - The processes, procedures, techniques, training devices, and equipment used to train civilian and active duty and reserve military personnel to operate and support a materiel system. This includes individual and crew training; new equipment training; initial, formal, and on-the-job training; and logistic support planning for training equipment and training device acquisitions and installations.

- Computer Resources Support - The facilities, hardware, software, documentation, manpower, and personnel needed to operate and support embedded computer systems.

- Facilities - The permanent or semipermanent real property assets required to support the materiel system. Facilities management includes conducting studies to define types of facilities or facility improvements, locations, space needs, environmental requirements, and equipment.

- o <u>Packaging, Handling, Storage, and Transportation</u> - The resources, processes, procedures, design considerations, and methods to ensure that all system, equipment, and support items are preserved, packaged, handled, and transported properly. This includes environmental considerations and equipment preservation requirements for short and long term storage and transportability.

- o <u>Design Interface</u> - The relationship of logistics-related design parameters, such as R&M, to readiness and support resource requirements. These logistics-related design parameters are expressed in operational terms rather than as inherent values and specifically relate to system readiness objectives and support costs of the materiel system.

1.5 REFERENCES

1. DoDD 5000.1, Major System Acquisitions.

2. DoDI 5000.2, Major System Acquisition Procedures.

3. DoDD 5000.39, Acquisition and Management of ILS for Systems and Equipment.

4. DoDD 5000.40, Reliability and Maintainability.

5. DoD Long Range Logistics Plan, OASD (MRA&L).

6. AR 700-127, Integrated Logistics Support.

7. AR 1000-1, Basic Policies for Systems Acquisition.

8. HQO P4105.1, USMC ILS Planning Manual.

9. SECNAVINST 5000.39, USN Acquisition and Management of ILS for Systems and Equipment (Draft).

10. SECNAVINST 5000.1B, System Acquisition.

11. OPNAVINST 5000.49, ILS in the Acquisition Process.

12. AFR 800-2, Acquisition Program Management.

13. AFR 800-8, Integrated Logistics Support (ILS) Program.

14. AFLC/AFSCR 800-24, DARCOM-R 700-97, NAVMATINST 4000-38, Standard Integrated Support Management System.

15. AMCR 700-15, Integrated Logistic Support.

CONTENTS

CHAPTER 2

ILS PLANNING

2.1 HIGHLIGHTS

- o Acquisition Program/ILS Planning Relationships
- o Integrated Logistics Support Management Team
- o Integrated Logistics Support Plan
- o Integrated Support Plan

2.2 INTRODUCTION

2.2.1 Purpose

To provide a managerial overview of the requirements and responsibilities for planning the ILS effort. Relates ILS planning to overall acquisition program planning requirements and describes the principal ILS planning documents.

2.2.2 Objective

ILS plans provide the details of the ILS program and their relationship with overall program management and ensure coordination of logistics issues among all members of the Government/contractor management teams.

2.3 MANAGEMENT ISSUES

2.3.1 Background

The materiel system acquisition process requires that an extensive set of plans be prepared. Nearly all of these plans require an ILS input. Upon approval, they provide guidance and direction to the ILS effort. The preparation, coordination, use, and revision of ILS related plans is a major and significant task for the ILS Manager.

2.3.2 Integrated Logistics Support Management Team (ILSMT)

DoDD 5000.39, "Acquisition and Management of Integrated Logistic Support for Systems and Equipment" requires that a continuing interface between the program management office and the manpower and other logistic communities be maintained throughout the acquisition process. Therefore, each Service requires that all major systems constitute an ILSMT. The team is formed prior to contractor selection so it may help with the planning effort and specifically, with the request for proposal, source selection, and the Program Management Plan. It is composed of Government and industry program management office members and personnel from the using command and commands and activities concerned with logistics, training, testing, and other acquisition functions. If applicable, membership may also include personnel from other Services.

The ILSMT functions to advise and assist the ILS Manager with planning; coordinating; monitoring of schedules and contractor performance; ensuring the accuracy and timeliness of Government inputs; and contractor compliance with applicable requirements, regulations, specifications, standards, and guidelines. The Government and contractor ILS Managers generally co-chair the ILSMT. Meetings are often scheduled in conjunction with key program events. Their frequency depends on the intensity of ILS planning activity.

2.3.3 Acquisition Program Planning

Acquisition planning involves the preparation of many specific plans. All of these are required for the management of the program, however, some are specifically prepared to support decision makers at milestone review times. Detailed plans are generally derived from the more general program management plans. Both the Army and the Air Force require a Program Management Plan (PMP). The Navy requires a series of Functional Implementation Plans (FIP) that implement the programs acquisition strategy. The PMP or FIP depicts how the requirements documents will be satisfied through the materiel acquisition process. It should be first assembled prior to Milestone I.

Detailed plans support entry into each acquisition phase and are refined and updated between milestones. Figure 2-1 lists examples of detailed plans. Figure 2-2 lists the plans specifically required for milestone reviews.

The System Concept Paper (SCP) is required for all major programs and is used up to Milestone I to describe the acquisition strategy and document the results of the Concept Exploration (CE) Phase. It may not exceed 12 pages. The Decision Coordinating Paper (DCP) is also required for all major programs. It summarizes, in not more than 18 pages (excluding annexes), the program status at Milestone II and III. The Integrated Program Summary (IPS) is required only when the decision authority requires more information than that presented in the DCP.

2.3.4 ILS Planning

The Government and/or contractor ILS Managers prepare or provide input to key plans. Key ILS plans include the Integrated Logistics Support Plan (ILSP), the Integrated Support Plan (ISP), and the Deployment Plan.

2.3.4.1 ILSP. The ILSP describes and documents the ILS program. It is the principal logistics document for an acquisition program and serves as a source document for summary and consolidated information required in other program management documents. It is summarized in the SCP, DCP, and IPS. Therefore, it must be prepared, coordinated, and approved in time to allow for development and incorporation of summary level data with the decision documents. In summary, the purpose of the ILSP is to:

- o Provide a complete plan for support of the fielded system.

- o Provide details of the ILS program and its relationship with overall program management.

- o Provide decision making bodies with necessary information on ILS aspects necessary for sound decisions on further development/production of the basic system.

- o Provide the basis for preparation of ILS sections of the procurement package, e.g., Statement of Work, Specification, and Source Selection and Evaluation Criteria.

The ILSP describes the overall ILS program including requirements, tasks, and milestones for the immediate acquisition phase and plans for succeeding phases. The plan is tailored to the specific needs of each program and will address the total materiel system including the end item, training devices, and support equipment. When approved, the ILSP becomes the implementation plan for all participating activities and is treated as an integral part of the total program planning process. Effective implementation of the ILSP is a major management challenge due to the multitude of logistics support interfaces.

A. ILSP Time Phasing. The Government Program office normally prepares, coordinates, and promulgates the initial ILSP during the CE phase. It provides the basis for other Government and contractor planning during this phase and for ILS planning in follow-on phases. By Milestone I, the ILSP should include specific tasks to be accomplished during the Demonstration and Validation (DVAL) Phase, identify the responsible Service agencies and activities, and establish the schedule for task completion. The ILSP should also project requirements, tasks and milestones for future acquisition phases.

During the DVAL and following phases, the ILS Manager may obtain contractor assistance to review and update the ILSP. The plan will become progressively more detailed as the program design activity progresses. Prior to entering the Full Scale Development (FSD) phase, the update of the full scope ILSP will be completed by the Government ILS Manager. The update will reflect the results of the demonstrations and validations, include pertinent details from the contractor-prepared ISP, and describe the plan for the FSD phase.

Configuration Management Plan	Integrated Logistics Support Plan
Training Plan	Test and Evaluation Master Plan
Post Production Support Plan	Fielding Plan
Systems Engineering Management Plan	Manufacturing Plan

Figure 2-1 Examples of Detailed Plans

System Concept Paper (SCP)
Decision Coordinating Paper (DCP)
Integrated Program Summary (IPS)

Figure 2-2 Program Decision Documents

During FSD and in subsequent phases, the ILSP will have continuous Government and contractor involvement in reviewing, refining, expanding, and updating the plan. The ILSP will be updated:

- When new program direction is received.
- When there are changes that involve personnel, training, facilities, or any other ILS elements.
- Before milestone decision reviews.
- When there are system configuration changes.

The responsibility of the Government is to ensure that all milestones are listed, that the timing is correct, and coordination actions have been completed. The contractor should provide inputs as appropriate for ILSP updates.

B. ILSP Contents. The content of the ILSP must reflect the needs of the specific system. The Army and the Air Force prescribe a three part plan (Section I. General; Section II. Plans, Goals and Strategy; and Section III. ILS Milestone Schedules). The Navy provides a more detailed list of contents that are also tailored to the four acquisition categories of Navy programs. The following are guidelines adapted from the service regulations.

(1) General. This normally includes: (a) a system description including Government Furnished Equipment (GFE) and associated support equipment; (b) program management organization and responsibilities, associated

Services, agencies and working groups; and (c) applicable documents involving requirements, guidance and evaluation criteria.

(2) Concepts, Goals and Strategy. The main body of the ILSP covers the following topics:

- o Operational and organizational concept involving mission requirements, operational environment and other required Logistic Support Analysis (LSA) input parameters.

- o Maintenance Concept.

- o System readiness objectives for both peacetime and wartime situations.

- o A logistics acquisition strategy involving contractual approaches and incentives for Life Cycle Cost, reliability and maintainability, and supportability goals.

- o Logistics Support Analysis Plan which, due to its importance in realizing program and ILS objectives, may be included as a separate document. This plan describes in detail the scope of LSA tasks.

- o Supportability test and evaluation concepts involving identification of specific test issues related to overall ILS objectives and to each ILS element.

- o ILS elements will be addressed as to the objectives, concepts, trade-off factors, goals, thresholds, special requirements, responsibilities, and validation and verification requirements for each element. The manner in which the elements of ILS are to be progressively specified, designed, tested and/or acquired and then integrated with the other elements will be documented.

- o Planning for deployment and the transfer of logistic responsibility will describe the procedures for the changeover from contractor to Government support addressing each of the applicable elements. This may be later broken out as a separate document.

- o Support resource funds involving ILS-related life cycle funding requirements (funded and unfunded) will be identified by ILS element, program function and appropriation category.

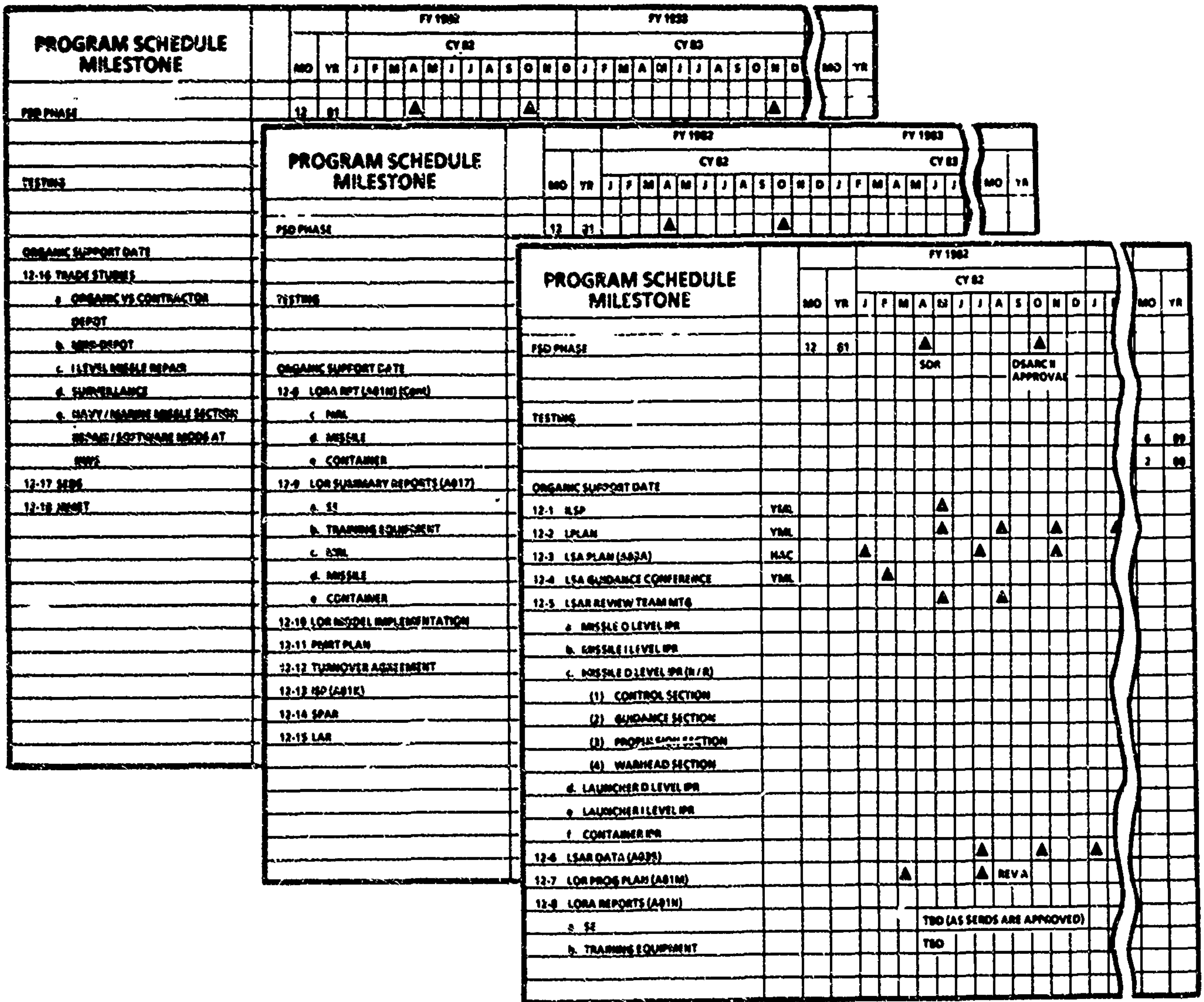
- o Post fielding assessments involve plans for analyzing and assessing field data feedback related to materiel support and support system performance. The plans will address assessment methodology, identify milestones and responsibilities, and describe the strategies for improvements.

C. ILS Milestone Schedules. The ILSP also provides system program schedule charts showing the interrelationship of logistic tasks and events to the overall program milestones and to each other. These charts focus on such elements as management, training, testing, maintenance, and supply support. They will identify assignments, responsibilities, and events. Figure 2-3 is an example of a management information chart developed for the AMRAAM ISP. ILS milestone schedules are the baselines for ILS planning in the materiel acquisition process, therefore:

- o System program schedule charts used by program management should depict the most essential support program milestones; these are the milestones which relate critical support capabilities to overall program success.

- o Milestone data should include all supporting Government agency participation as well as contractor and Government agency responsibilities.

- o Milestone schedule charts should include a system program schedule and a summary ILS program schedule. The program and ILS schedules highlight the relationships between key events on the two charts.



Source: AMRAAM ISP

Figure 2-3 Logistics Support Management Information

- o Individual support element program plans shoud include a program schedule showing key program milestone achievements for that particular element.

- o The integrated network schedules should show dependency relationships between support elements. Some of the features and benefits of the integrated network are:

  - Computer generated critical path methodology (such as PERT and CPM) to define logistic critical paths and slack times.

  - Clear visualization for management of interfaces.

  - Integration with the program management information system concept.

  - Illustration of the dependency relationship between individual LSA results and the various ILS elements to facilitate the identification of support equipment acquisition events, procurement lead times, etc.

- Compliance with the requirement of DoD Directive 5000.39, "Acquisition and Management of ILS for Systems and Equipment" to establish an ILS management information system.

- Potential to combine the ILS management information system with cost and manpower reporting for total ILS management control.

2.3.4.2. Integrated Support Plan (ISP). Solicitation documents and contracts with industry and other performing activities may include a requirement to develop an ISP which sets forth the contractor's plan to accomplish his projected ILS efforts. ISP activities may also be used to structure ILS studies and other deliverables for follow-on logistic effort. Pertinent portions of the ISP are usually incorporated into updates of the Government prepared ILSP. The ISP is an iterative document that must be accepted and approved by the Government. Data Item L-6138 provides preparation instructions. The contents of the contractor's ISP include:

- o Organization
- o Responsibilities
- o Schedules
- o Major Tasks
- o Sub-plans (e.g., LSA, training, provisioning)
- o Interrelationships among logistic elements
- o External Constraints
- o Other Pertinent Factors.

2.3.4.3 Deployment Planning. The ILS Manager is responsible for the preparation of a plan for deployment (or fielding) outlining the schedules, procedures, and actions necessary to successfully deploy a new materiel system. Deployment planning is discussed in Chapter 13, Deployment.

2.4 SUMMARY

There are several keys to a successful logistics program. They include:

- o Logistics involvement in all program planning, beginning in the CE Phase.
- o Effective use of LSA in support of tasks to achieve readiness and supportability objectives.
- o Effective use of the ILSMT in the planning process.
- o Preparation of an ILS plan tailored to the system prior to Milestone I.
- o Implementation of the ILS plan as a current and integral part of the overall program.

2.5 REFERENCES

1. AR 700-127, Integrated Logistics Support.
2. AFR 800-8, integrated Logistics Support Program.
3. SECNAVINST 5000.39, Integrated Logistics Support in the Acquisition Process (Draft).
4. DI-L-6138, Integrated Support Plan (ISP).
5. DI-P-7119, Post Production Support Plan.
6. DI-S-7120, Supportability Assessment Plan.
7. DI-L-7017A, Logistics Support Analysis Plan.

CONTENTS

CHAPTER 3

READINESS AND SUPPORTABILITY

3.1 HIGHLIGHTS

- o ILS Issues in Mission Area Analyses
- o Establishing Support Resource Constraints
- o Use of Logistic Support Analysis (LSA) to Establish Readiness and Supportability (R&S) Objectives
- o Establishing Supportability Design Requirements

3.2 INTRODUCTION

3.2.1 Purpose

To provide a managerial overview of the procedures and responsibilities for establishing readiness and supportability objectives for a new materiel system and translating objectives into system supportability design factors and logistic support parameters.

3.2.2 Objective

The overall objective for any new materiel system is to provide a needed military capability at an affordable cost. Achievement of peacetime and wartime readiness objectives is essential to attainment of military capability. Supportability objectives and supportability design factors are formulated to attain the specified readiness levels within life cycle cost (LCC) targets and in compliance with logistic constraints.

3.3 MANAGEMENT ISSUES

3.3.1 Background

In order to influence rapidly evolving system design, R&S objectives, thresholds, and design requirements must be established prior to Milestone II (transition to Full Scale Development (FSD)). Program requirements to establish the measures are stated in DoDD 5000.39 "Acquisition and Management of ILS for Systems and Equipment" and summarized in Figure 3-1. Figure 3-1 also identifies corresponding LSA tasks as documented in MIL-STD-1388-1A, "Logistic Support Analysis". These requirements and tasks provide the framework for discussion in this chapter.

3.3.1.1 Readiness. Readiness of a materiel system is a future oriented attribute. It represents the system's ability to deliver the output for which it was designed (e.g., move and shoot, observe and record, communicate) during peacetime and at the outset of hostilities. The system readiness objectives are the criteria used in assessing the ability of a system to undertake and sustain a specified set of missions at planned peacetime and wartime utilization rates. There is no universal measure of readiness that is applicable to all materiel systems. Expressions of readiness assume forms that are dependent upon the system, its design, and the conditions of its use. Figure 3-2 lists some top-level examples of readiness measures currently employed by the Services. Note that these top-level readiness measures must be broken down into clearly definable terms. The Program Manager (PM) must choose a means of defining system readiness that is:

- o Quantifiable
- o Measurable
- o Precisely defined by readiness criteria
- o Related to the projected peacetime and wartime utilization rates and conditions of use
- o Compatible with the Service's readiness reporting system.

3.3.1.2 Supportability. Ultimately, supportability is the degree to which system design characteristics and planned logistics resources, including manpower, meet system peacetime readiness and wartime utilization requirements. Early program activity by the ILS Manager should:

ACQUISITION PHASE	PROGRAM REQUIREMENTS (DoDD 5000.39)	LOGISTIC SUPPORT ANALYSIS TASKS (MIL-STD-1388-1A)
PRE-CONCEPT	• Identify support resource constraints (mission area analysis)	• Perform mission area analyses • Analyze intended use; identify supportability factors <u>Use Study (LSA Task 201)</u> • Select and analyze baseline comparison system <u>Comparative Analysis (LSA Task 203)</u>
CONCEPT EXPLORATION	• Define baseline operational scenarios for system alternatives	• Identify peacetime and wartime employment <u>Use Study (LSA Task 201)</u>
	• Identify support cost drivers and targets for improvement	• Develop a baseline comparison system; determine supportability, cost and readiness drivers <u>Comparative Analysis (LSA Task 203)</u>
	• Identify and estimate achievable values of logistics and R&M parameters	• Identify design opportunities for improved supportability <u>Technological Opportunities (LSA Task 204)</u> • Define supportability related design constraints <u>Mission Hardware, Software, and Support System Standardization (LSA Task 202)</u> • Update Manpower, Personnel, and Training (MPT) constraints <u>(Comparative Analysis (LSA Task 203)</u>
	• Establish system readiness objectives and tentative thresholds	• Establish R&S objectives <u>(LSA Task 205.2.2)</u>
DEMONSTRATION AND VALIDATION	• Establish a consistent set of objectives for readiness, R&M, and logistic parameters	• Establish supportability characteristics and supportability related design factors <u>(LSA Task 205)</u>
	• Conduct trade-offs among design, support concepts, and support resource requirements	• Perform evaluations of alternatives and trade-off analyses <u>(LSA Task 303)</u>

Figure 3-1. Development of R&S Objectives and Supportability Design Factors

MATERIAL CATEGORY	TYPICAL READINESS MEASURES
Aircraft	Mission Capable Rate Operational Availability Sortie Rate
Ground-Based Missile	Mission Capable Rate Operational Availability
Air-Launched Missiles	Asset Readiness (Qty)
Combat Vehicles	Mission Capable Rate Operational Availability
Ships	Operational Availability - applies to equipment and weapon system assigned to ships

Figure 3-2 Examples of Readiness Measures

- o Define supportability objectives that are optimally related to system design and to each other.
- o Cause supportability objectives to be an integral part of system requirements and the resulting design.

Supportability objectives prescribe conditions and constraints guiding the development of system design and logistics support. These objectives are related to the planned operational role and utilization rates of the system and the overall support capability of the military Service. The following are examples of supportability issues upon which specific objectives can be based.

- o Maintenance manpower or manhour constraints.
- o Personnel skill level constraints.
- o Operation and Support (O&S) cost constraints.
- o Target percentages of system failures (downing events) correctable at each maintenance level.
- o Mean down time in the operational environment.
- o Turn-around time in the operational environment.
- o Standardization and interoperability requirements.

3.3.2 Mission Area Analysis

Requirements for new or modified materiel systems generally evolve from continuing analyses of the mission areas assigned to the military Services. The purpose of these analyses is to identify deficiencies or to determine more effective means of performing assigned tasks.

Logisticians must play a substantial role in these analyses. Their assessment of current systems in the mission area should focus on deficiencies in their supportability performance (e.g., failure rates, maintenance times, fault detection, and isolation capability) and on the adequacy of logistic support provided the system. Targets for improvement in both areas should provide the input for each Service's Logistic Research and Development Program. In addition, the mission area analysis should establish realistic bounds on the support resources that can be provided to a proposed new system. Support resource constraints must be identified in the Justification for Major System New Start (refer to DoDI 5000.2, "Major System Acquisition Procedures"). The Use Study (paragraph 3.3.3.1, below) and Comparative Analysis (paragraph 3.3.3.2, below) are conducted as part of the mission area analysis.

3.3.3 Readiness and Supportability Objectives

The development of wartime and peacetime R&S objectives must be accomplished by Milestone (DVAL). The procedure employed requires evaluation in the areas of system mission requirements, deficiencies of current systems employed in the mission area, technological opportunities, and logistics constraints and limitations. Figure 3-3 presents representative factors (not intended to be exhaustive or in any order of priority) that should be considered in each of the areas. During the Concept Exploration (CE) Phase, studies based on mission area and materiel system analyses are employed to quantify relationships among the conceptual hardware, mission, and supportability parameters. The following paragraphs describe studies and analyses leading to the development of R&S objectives. LSA in general is described in Chapter 5.

3.3.3.1 Use Study (LSA Task 201). The Use Study is described in MIL-STD-1388-1A as "the prerequisite task to all others in the LSA program". This study develops a comprehensive analysis of how the new system will be used and supported in its mission area in both peacetime and wartime. The Use Study should identify operating requirements (e.g., mission frequency and duration, miles driven, operating hours, rounds fired), number of systems per support unit, environmental factors, and other descriptions of operation and support characteristics. The study will be based initially upon an evaluation of an existing system or systems performing similar functions in the mission area with all values adjusted to the mission need of the new system.

3.3.3.2 Comparative Analysis (LSA Task 203). This task develops a Baseline Comparison System (BCS). The BCS represents the initial characteristics of the new system for the purpose of:

- Projecting supportability related design factors.
- Determining supportability, cost, and readiness drivers.
- Identifying targets for improvement in the new system and in the supporting logistic support system.

Characteristics and performance parameters assigned the BCS should be derived from an existing system or a composite of existing systems performing similar operational roles in the mission area. Different BCSs may be developed to represent the performance of design alternatives as designers attempt to maximize cost effectiveness. Projections of support costs and resource requirements for the BCSs should be based upon usage scenarios developed in the Use Study.

3.3.3.3 Technological Opportunities (LSA Task 204). This task identifies and evaluates available technological opportunities to improve supportability related design of the new system and to improve performance of the logistic support system. Sources of these opportunities include new hardware or software technology developed or being developed via:

- On-going research, exploratory development, and advanced development programs.
- Other system development programs.
- Commercial R&D programs.

Technological improvements for materiel systems generally result from development of improved components; e.g., improved propulsion subsystems, and improved fire control components. The ILS Manager should ensure that sufficient direction and incentives are provided for contractors to adapt and develop technological improvements that have the potential to reduce logistic support resource requirements and to enhance readiness. The ILS Manager should also ensure that technological opportunities for supportability are included with pre-planned product improvements in accordance with the acquisition strategy.

Technological capabilities identified as attainable in the system development program should be incorporated into the BCS. Pro-

SYSTEM MISSION REQUIREMENTS

Operational Concept

Operational Environment

Service Support Concept

Performance Requirements

Threat

Mission

Measures of Effectiveness

Manpower

•

•

•

DEFICIENCIES OF CURRENT SYSTEM

Quantitative and Qualitative Manpower Requirements

Reliability & Maintainability (R&M)

Performance O&S

Support Equipment Requirements

•

•

•

TECHNOLOGICAL OPPORTUNITIES

Materials

Data Processing

Computer Capabilities

Manufacturing Technology

Training Devices/Simulation

BIT & BITE

•

•

•

LOGISTIC CONSTRAINTS & LIMITATIONS

Support Funding

Existing Support Structure

Affordability

Manpower, Personnel, and Training

Standardization and Interoperability

•

•

•

Figure 3-3 Considerations in the Development of Readiness and Supportability Objectives ceeding in this manner, the BCS evolves as a composite of current and projected enhanced components and approaches the supportability performance that the development program is capable of achieving. As discussed in paragraph 3.3.4.2 below, this approach is useful in establishing target supportability design values for the new system.

3.3.3.4 Mission Hardware, Software, and Support System Standardization LSA Task 202). From the earliest planning efforts, the PM must recognize the advantages, as well as the constraints, placed on his program by the emphasis on standardization. Standardization of parts and equipment across systems and military Services can be a major cost saving factor. In order to be effective however, policy and direction must be firmly established so that the proper constraints can be included in system requirements documents. Standardization impacts the selection of program peripherals such as support equipment; major subsystems such as engines, radios, navigation, electronic countermeasure suites; and basic building blocks such as fasteners and connectors. Standardization should result in a reduction of parts stockage, design risk, and the proliferation of new or unique support items in the Government supply system. Standardization should also be considered in the design of new subsystems and support equipment to develop them for use with more than one system. The Airborne Self Protection Jammer (ASPJ), an electronic warfare system designed for a wide variety of Air Force and Navy aircraft, is a case in point. Disadvantages can include restriction on the designer's ability to use advanced technology or innovative techniques in developing the system. Directed standardization could force the new system to use support equipment which may not be as effective or economical as that designed specifically for the system. The impact on measures of effectiveness will be a consideration in each case.

NATO interoperability requirements also impose constraints on system design. When required, the PM must ensure that the materiel system and its subsystems are capable of being operated with or supported by NATO common ammunition, lubricants, and other NATO logistics pipeline assets.

Initial standardization studies are performed during the CE phase and provide program direction in two related areas:

(1) Constraints are placed upon development of the prime system to incorporate compatibility with selected standard components, software, and support equipment;

(2) Components, software, and support equipment requiring development for unique application to the prime system are identified.

3.3.3.5 Update of Manpower, Personnel, and Training (MPT) Constraints - Comparative Analysis (LSA Task 203). System readiness is bounded by the availability and capabilities (quantity and quality) of personnel who must operate and maintain the system in its operational role. MPT resource constraints established prior to program initiation are updated as system characteristics are progressively defined during the CE and following phases. Human factors engineering applications seek a compatible man-machine interface. However, constraints placed on design to achieve this compatibility must not preclude the introduction of vitally needed technology enhancement. An effective working relationship among design, logistics, human engineering, and training personnel can produce the appropriate design, maintenance concept, and training programs required to support new technologies. The introduction of solid state and integrated circuit components is one example. The integrated approach commonly employed includes:

- o Modular system design.
- o Automatic fault detection and isolation - built-in or off-line (automatic test equipment).
- o Replace-only corrective maintenance at organizational and forward intermediate levels.
- o Repair of printed circuit boards at rear intermediate and depot levels.
- o Training tailored to the skills required at each maintenance level.

3.3.3.6 Establishing R&S Objectives (LSA Task 205.2.2). Mission requirements and supportability constraints developed in LSA Tasks 201 through 204 must be synthesized to form a compatible set of R&S objectives.

Computer models capable of simulating force level (e.g., division or fleet size) engagements and logistic support in an operational environment may be employed to assist the ILS Manager in this decision process. The input to the simulations may include tentative values of system reliability and maintainability and maintenance turn around times or mean downtime. Alternate support concepts can be tested. These variables can then be used as inputs to the simulations which are applied to an operational scenario of specific duration. Outputs may include sorties completed, a count of spares demand, maintenance delays, and sorties or missions not achieved. Simulations can be repeated to test the sensitivity of the system to R&S decisions and to determine the validity of R&S objectives.

3.3.4 Supportability and Supportability Related Design Factors (LSA Task 205)

3.3.4.1 Measures of Performance. R&S objectives must be translated into:

- o Explicit supportability related design factors that govern design of the materiel system and each of its components.
- o Logistic support parameters that govern design of the logistic support system.

Figure 3-4 displays examples of these measures.

3.3.4.2 Development of Measure of Performance. An initial estimate of system supportability design factors may be derived from the performance parameters of a composite baseline comparison system which incorporates projected technology enhancements (refer to paragraph 3.3.3.3). This approach has been employed with naval aircraft. The steps are summarized in Figure 3-. and described as follows.

Reliability and maintainability or other appropriate operational parameters are assigned to each of the level 3 components of the new system; e.g., airframe, propulsion unit, fire control, etc. (The level 1, 2, and 3 breakdown for aircraft systems is identified in MIL-STD-881A, "Work Breakdown Structures for Defense Materiel Items".) Each parameter is an engineering estimate of the value that technology is capable of achieving in the ensuing system development program.

System level supportability design factors are derived by mathematically combining the operational parameters assigned to the components. Appropriate techniques are described in DoD 3235.1-H, "Test and Evaluation of System Reliability Availability and Maintainability, a Primer".

The projected capability of the logistic system can be estimated by evaluating ongoing studies to improve performance of the current logistic system. For example, these might include improvements in data processing, automated warehousing, and transportation methods.

The adequacy of the above technological projections in achieving system readiness objectives should be evaluated by computer simulation techniques (refer to paragraph 10.3.4). It is likely that the procedure described above will need to be performed iteratively to establish a consistent set of objectives for readiness, R&M, and logistic parameters as required by DoDD 5000.39 and LSA Task 205.

3.3.5 Evaluation of Alternatives and Trade-Off Analysis (LSA Task 303)

The purpose of this task is to determine the best balance among hardware characteristics (design), support concepts, and support resource requirements. The following discussion addresses examples of trade-offs that significantly impact system design.

3.3.5.1 Repair Level Analyses. Repair level analyses, including repair versus discard, determine whether components should be repaired and, if so, at what maintenance level. Analytic techniques and computer models available to support these decisions determine economic trade-offs among investment costs (e.g. equipment and documentation), component procurement costs, and operating and support costs (repair, transportation, etc.) The decisions provide input to both maintenance planning and maintainability design. Ease of removal

Supportability Design Factors (Materiel Systems)	System Reliab.lity (Mean Time Between Failures) System Maintainability (Mean Time To Repair) Maintenance Burden (Maintenance Manhours Per Operating Hour) Built-In Fault Detection Capability (Percent Successful Detection) Built-In Fault Isolation Capability (Percent Successful Isolation) Transportability Requirements (Identification of Conveyances On Which Transportable)
Logistic Support Parameters (Logistic System)	Provisioning Objective e.g., Spare To Availability Target Supply Support Objectives e.g., Fill Rates, Order and Ship Times

Figure 3-4 Examples of Supportability-Related Design Factors and Logistic Support Parameters

and disassembly must be designed into the system when required to support repair operations. When repair is not required or is deferred to higher level maintenance, design techniques can be employed that reduce production costs and extend component life. For this reason, repair level analysis decisions should be made selectively starting in the CE phase with major components and continuing through FSD (and beyond for design changes).

3.3.5.2 Diagnostic Trade-Offs. Diagnostic capabilities inherent in design of the materiel system or support equipment may be traded with manpower and personnel skill requirements and changes in maintenance concepts. The development of Very High Speed Integrated Circuits (VHSIC) and associated architecture may be used as one example. This developing technology has the potential to enable development of built-in fault isolation to the printed circuit board level. Development of this degree of built-in fault isolation would reduce manpower and skill requirements at the organizational level and possibly eliminate the need for intermediate maintenance. These trade-offs must be evaluated by design and logistics personnel starting in the CE Phase.

3.3.5.3 Survivability Trade Offs. Decreased vulnerability to the effects of battle damage can enable more rapid restoration of force levels and increased sustainability of combat operations. However, the benefits of improved survivability can be realized fully only when the logistic system can restore the damaged but recoverable, items to operating condition close to the battle area. An effective battle damage assessment and repair program requires:

- o Combat scenario modeling to determine lethal and reparable equipment casualties.

- o Estimate technologically attainable operational parameters for level 3 components.
- o Combine component parameters to derive system level supportability design factors.
- o Estimate technologically attainable parameters of logistic support.
- o Perform simulations to determine attainment of the readiness objective.
- o Repeat the steps above to obtain consistent readiness, R&M, and logistic parameters.

Figure 3-5 Development of Supportability Related Design Factors and Logistic Support Factors

- o Attack mode and materiel system modeling to provide estimates of combat damage to the system.
- o Historical analyses of combat damage and repair techniques.
- o Development of assessment and expedient repair procedures and their incorporation in technical manuals and training programs.
- o Determination of additional personnel required to perform wartime battle damage assessment and repair.
- o Computation of supply support stockage levels based upon combat damage estimates and wartime utilization rates.
- o Determination of additional transportation requirements for battlefield recovery.

System engineers should trade-off alternative survivability designs and logistic support capabilities in the CE Phase and refine the design in the follow-on development phases.

3.4 SUMMARY

- o Initial LSA activities during program initiation and the CE Phase should be performed as part of a mission area analysis.
- o Early R&S analysis should be based on:
  - System mission requirements
  - Deficiencies of current systems
  - Technological opportunities
  - Logistic constraints and limitations.
- o Development of R&S objectives can be performed within a tailored but structured analysis process that includes:
  - Mission area analysis and identification of support resource constraints
  - Use studies
  - Comparative analyses
  - Technological opportunities
  - Mission hardware, software and support system standardization
  - Updating manpower, personnel, and training (MPT) constraints.
- o Supportability design factors may be developed by an iterative process of projecting technological improvements for major components into system level factors and the performance of readiness simulations.

3.5 REFERENCES

1. DoDD 5000.1, Major System Acquisition.
2. DoDI 5000.2, Major System Acquisition Procedures.
3. DoDD 5000.39, Acquisition and Management of ILS for System and Equipment.
4. MIL-STD-1388-1A, Logistic Support Analysis.

MODULE II

DEVELOPING THE ILS PROGRAM

Design and support decisions have the greatest impact on system performance, life cycle cost, and readiness and supportability characteristics when accomplished early and through the systems engineering process. This module describes the ILS impact on design and logistics support requirements; the integration of readiness, supportability and life cycle cost into the ILS process; and the Logistics Support Analysis/Logistics Support Analysis Record process/documentation.

CONTENTS

CHAPTER 4

ILS IN THE SYSTEM ENGINEERING PROCESS

4.1 HIGHLIGHTS

- o Integration of Support Requirements in the Design Process
- o System Engineering and the Reliability and Maintainability (R&M) Interface
- o Achieving Support "Design-To" Parameters

4.2 INTRODUCTION

4.2.1 Purpose

To provide a managerial overview of the Program Manager's (PM's) responsibility to employ the system engineering process to formulate logistic support "design-to" parameters consistent with established readiness objectives.

4.2.2 Objective

The objective of interfacing ILS with system engineering is to ensure that the disciplines of the design process and R&M engineering are employed in developing "design-to" support parameters for the materiel system. This objective is part of the overall program management initiative involved in:

- o Accomplishing readiness objectives that are challenging but attainable.
- o Accomplishing realistic R&M requirements to achieve these objectives.
- o Identifying support and manpower drivers.
- o Assigning appropriate priority to ILS element requirements in system design trade-offs.

4.3 MANAGEMENT ISSUES

4.3.1 Background

System readiness is a primary objective of the acquisition process. As noted in earlier chapters, DoD policy requires that resources to achieve readiness receive the same emphasis as those required to achieve schedule and performance objectives (DoD Directive 5000.1, "Major System Acquisition"). These resources shall include those necessary to design desirable support characteristics into materiel systems as well as those to plan, develop, acquire, and evaluate the support.

DoD Directive 5000.39, "Acquisition and Management of ILS for Systems and Equipment" emphasizes early identification of supportability design requirements such as R&M and contractor incentives so that they can be integrated into the engineering effort. To make this happen, a real time iterative relationship between the ILS process and the product definition (design) process is necessary. ILS program success hinges on how the readiness and supportability characteristics are designed into the system during early development (Concept Exploration [CE] and Demonstration/Validation [DVAL]). The system engineering process provides a framework for a DoD materiel system to acquire the desired supportability characteristics. System engineering, when done properly, integrates the effects of logistic disciplines such as survivability, reliability, and maintainability within the system design.

4.3.2 System Engineering

System engineering is, by definition, the application of scientific and engineering efforts to: (1) transform an operational need into a description of a system configuration which best satisfies the operational need according to the measures of effectiveness; (2) integrate related technical parameters and assure compatibility of all physical, functional, and technical program interfaces in a manner which optimizes the total system definition and design; and (3) integrate the efforts of all engineering disciplines and specialties into the total engineering effort.

4.3.2.1 Integration of the ILS into the System Engineering Process. Figure 4-1 illustrates the analytical and decision making process involved in the application of system engineering to acquisition management. The process is shown for the CE and DVAL phases. Within the framework of this process, the Government operational needs are analyzed; the various design concepts are synthesized, evaluated, and optimized in trade-off studies; and the best design is defined in the detail specification. Support "design-to" parameters should flow from this process.

The upper portion of Figure 4-1 portrays those efforts and activities that define the requirements for prime equipment and associated software. The lower portion of Figure 4-1 contains efforts and activities that define the related logistic support requirements. Attainable supportability characteristics are developed throughout the design process using design trade-off efforts involving all product design disciplines, including survivability/vulnerability, reliability, and maintainability.

To achieve the necessary integration of ILS into the system engineering process, the contractor defines trade-off decision criteria subject to modifications as the design evolves. In addition to their participation in defining the support criteria, the contractor and Government ILS Managers should influence and monitor the incorporation of support features into design concepts.

4.3.2.2 Management Linkages. Throughout the development process, the balanced integration of multiple technical design needs with ILS management functions is critical to the success of logistics support activity. Figure 4-2 has been derived from a diagram of functional linkages used by General Dynamics/Fort Worth for an aircraft program. Terminology has been modified to that in current usage. This figure shows a broad array of functional disciplines in organizational cells on the left side of the linkage diagram. This illustrates the complexity of integrating support into the design process of large programs. The system engineering management challenge is to ensure that the support is integrated; the ILS Manager's role must recognize and accept this challenge. Successful integration requires that the ILS Manager take a strong leadership role in both the system engineering and ILS processes and their management linkages.

Figure 4-2 highlights the linkages which incorporate ILS into the system engineering process. The ILS Manager's role in relationship to these interactions, which are performed iteratively and extensively over the acquisition life cycle, is discussed in the following subparagraphs:

- "System Engineering Supportability Characteristics Outputs" are developed under the direction of the ILS Manager by ILS, R&M, Life Cycle Cost (LCC), safety, and other discipline specialists participating in system engineering support criteria studies prior to Full Scale Development (FSD).

- "Functional and Allocated Baselines" are developed during CE and DVAL respectively. At this design baseline setting stage, the success achieved by the ILS Manager in influencing design is demonstrated by the inclusion or absence of effective supportability characteristics and requirements in System Specifications (Type A) and Development Specifications (Type B). This program phasing relationship stresses the importance of early CE phase analyses and inputs from the Government and contractor ILS and R&M supportability specialists. Figure 4-3 displays the phasing of the functional, allocated, and product baseline linkage events and their related specifications with respect to other system acquisition

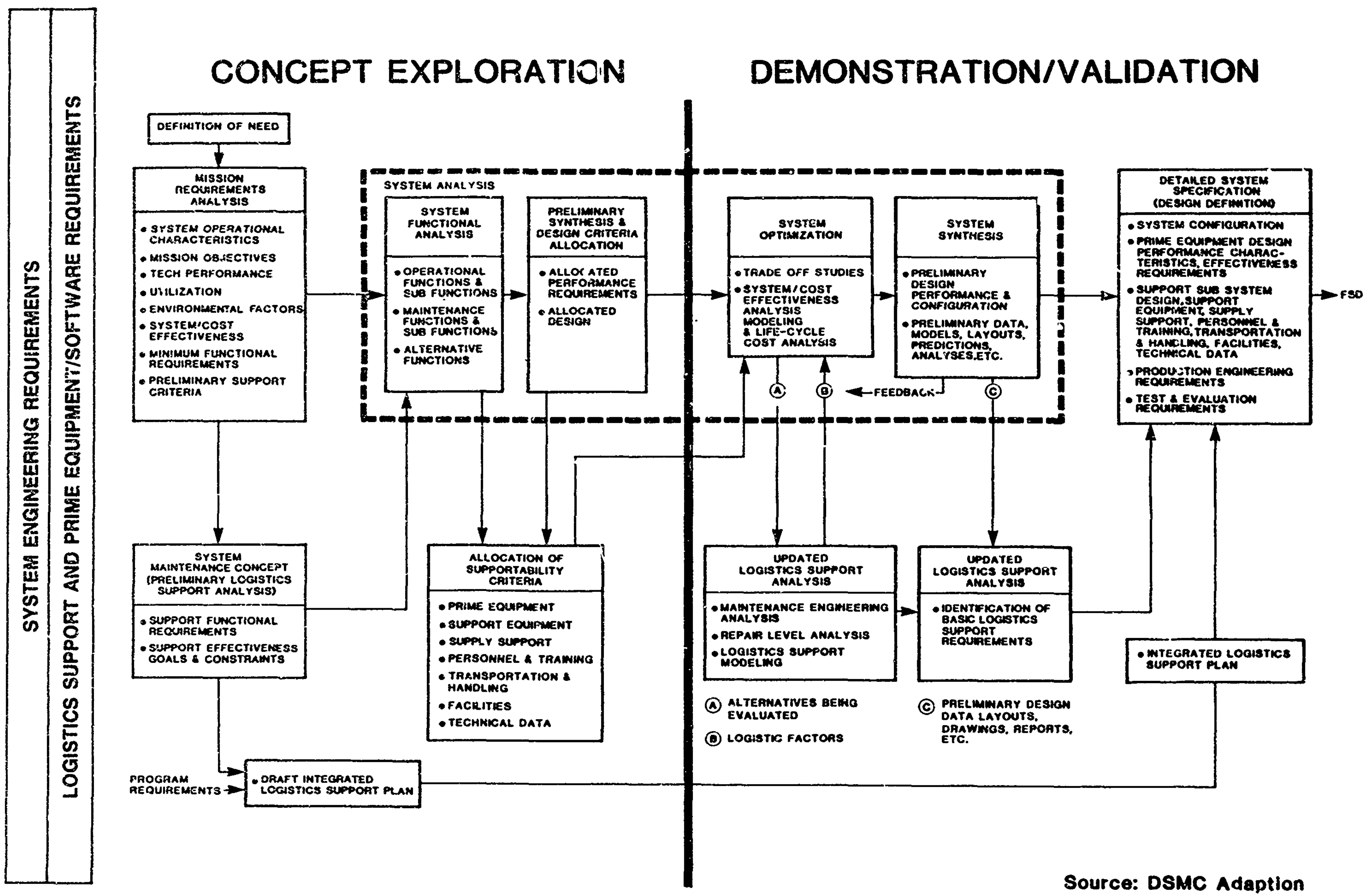


Figure 4-1 ILS and the System Engineering Process

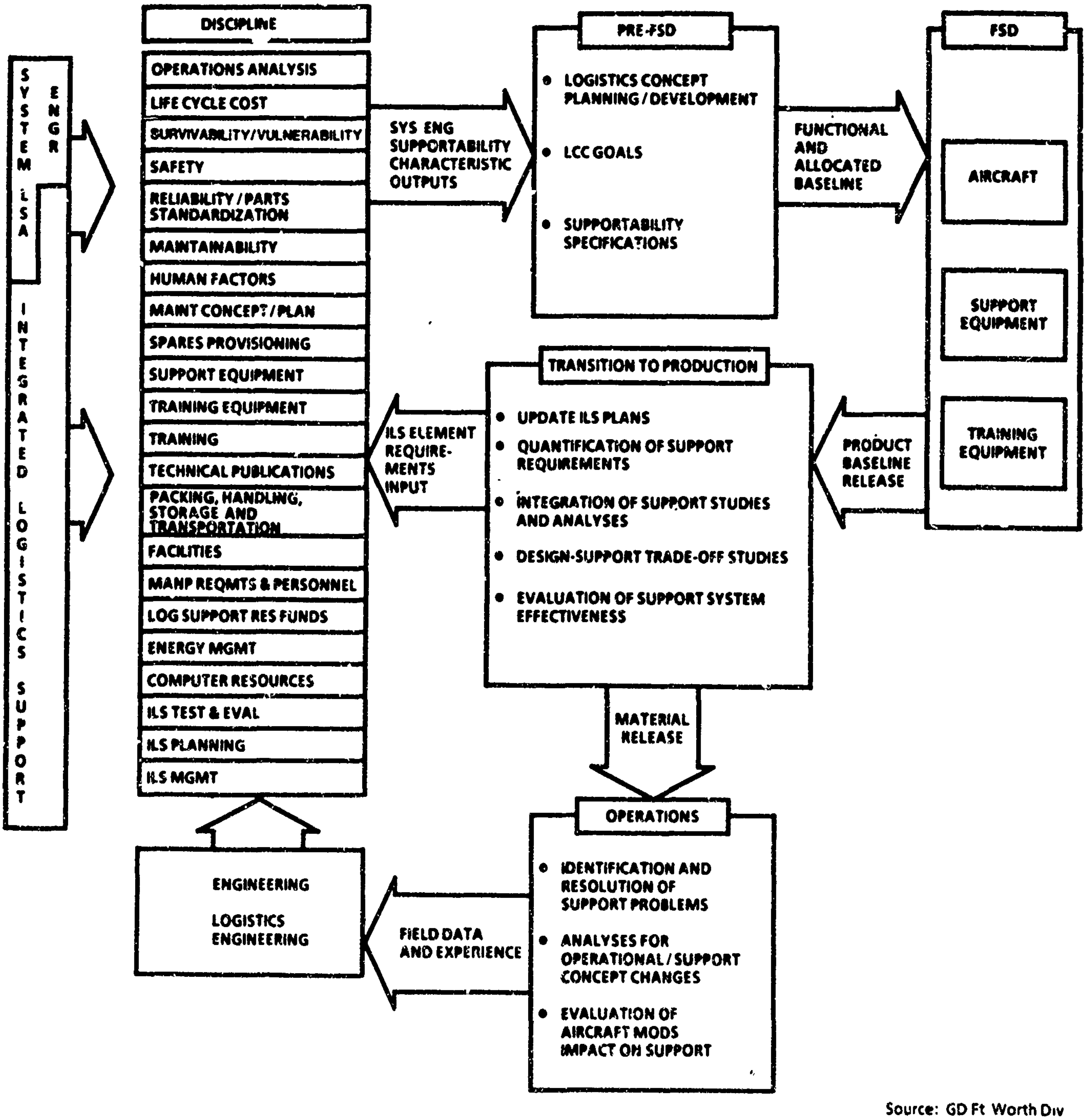
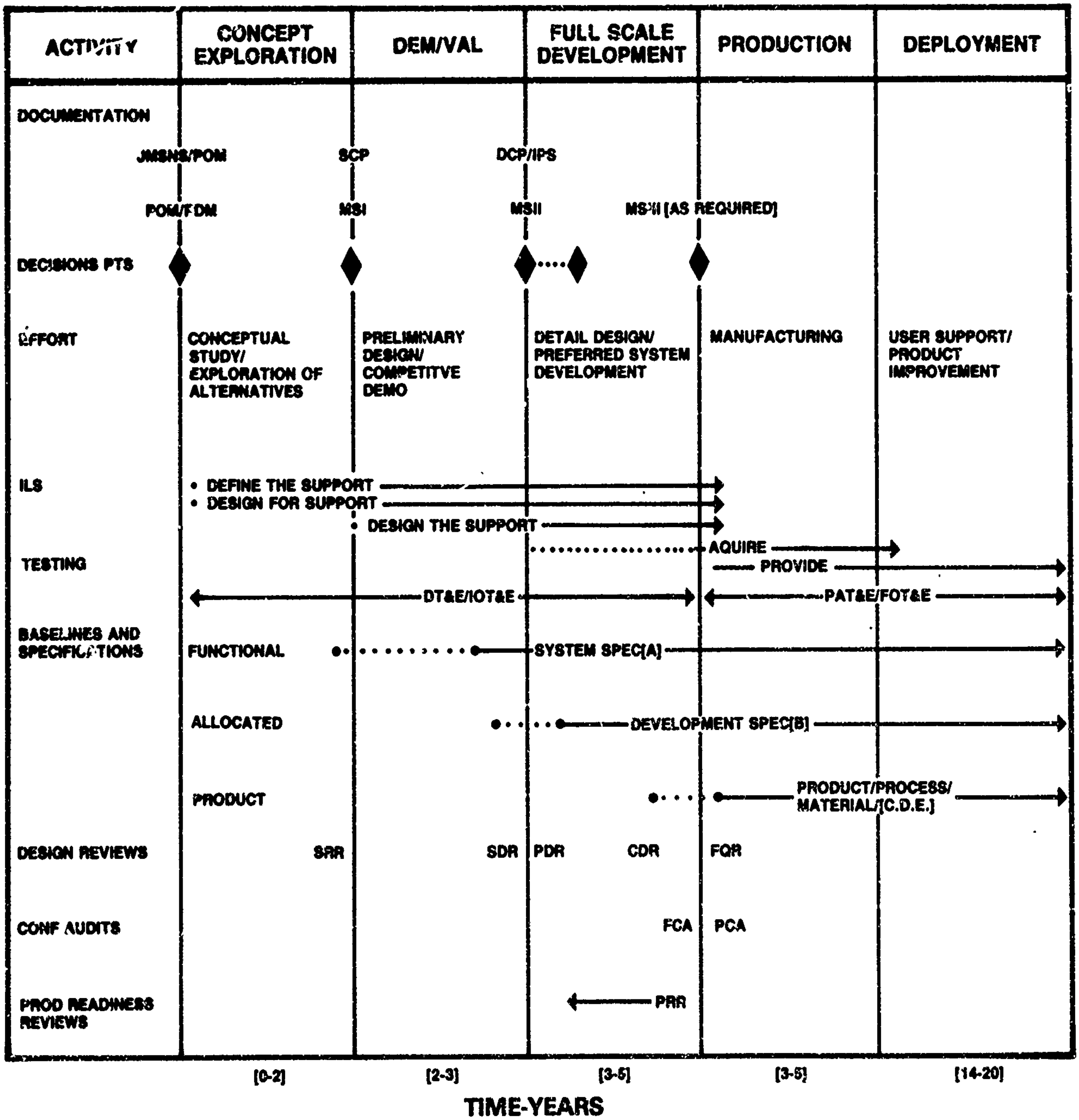


Figure 4-2

Typical Contractor System Engineering Linkages with Logistic Support Elements



CDR.....Critical Design Review
FCA.....Functional Configuration Audit
FQR.....Formal Qualification Audit
PCA.....Physical Configuration Audit
PDR.....Preliminary Design Review
PRR.....Production Readiness Review
SDR.....System Design Review
SRR.....System Requirements Review

SOURCE: DSMC SYSTEM ENGINEERING MGMT. GUIDE

Figure 4-3 System Acquisition Management

management milestones. The dotted lines in Figure 4-3 portray the period of documentation review while the solid lines portray continued use under Government configuration management. The format of the Type A specification has provisions for identification of supportability characteristics (R&M) and logistics concept requirements (maintenance, supply, and facilities). Requirements of the Type A system specification flow down to Type B specification on major end items, components, and software. These specifications (A and B) are the requirements that control the engineering design activities (upper right in Figure 4-2) during FSD. The ILS Manager must ensure that achievable supportability and readiness requirements are initially established prior to Milestone I and then incorporated in the baseline specifications at this point.

o The "Product Baseline Release" provides detailed design documentation for the transition to production. The timing of the various "ILS Element Requirement Inputs" is also of critical interest to the ILS Manager. Timely release of the major end items and their support and training equipment designs is required for scheduling logistic activities such as preparation of final technical manuals, preparation and processing of provisioning documentation, and development of packaging requirements.

o "Materiel Release" in Figure 4-2 refers to the decision to proceed with deployment of the first system in its military role. The ILS Manager must participate in scheduling this event to ensure that all support has been acquired and can be provided concurrent with or prior to this initial deployment. This topic is discussed in greater detail in Chapter 13.

o "Field Data and Experience" provides the means for assessing supportability related performance and attained readiness, instituting required improvements, and updating the ILS elements. The ILS Manager must ensure adequate planning for and utilization of this feedback.

A new DoD initiative on acquisition streamlining places a restriction on the call-out of military specifications and standards prior to FSD. A 3 June 1985 memorandum from Deputy Secretary of Defense William A. Taft IV provides policy guidance in this area pending formal publication of DoD Directive 4120.21. The 3 June 1985 memorandum states in part that "It is DoD policy to avoid the premature application of military specifications and standards and to limit the inadvertent establishment of contract requirements through indirect referencing". It further encourages contractors to provide recommendations for application and tailoring of contract requirements. The ILS Manager must be aware of the restrictions in developing and specifying logistics requirements, particularly as they affect design.

4.3.2.3 System Engineering Linkage to LSA. MIL-STD-1388-1A, "Logistic Support Analysis," defines LSA as part of the system engineering and design process. As previously noted, Figure 4-2 displays an iterative process and includes LSA as one of the many disciplines that are integrated into the system engineering and the logistic activities conducted in development. The system engineering activity is both comprehensive and structured such that any one analysis or design output will include some factors that contribute inputs to a subsequent detailed support study. Figure 4-4 identifies several system engineering activities that relate directly to LSA tasks. As an example, the LSA maintenance planning and the system engineering maintainability data are mutually supporting.

4.3.3 Reliability and Maintainability

As noted in Chapter 3, R&M parameters are the ILS Manager's most effective tools for influencing and interacting with the system engineering process. Establishment of effective R&M objectives for

SYSTEM ENGINEERING ACTIVITY	RELATED LSA TASKS
Design and Configuration Management	Identification of Components, Maintenance Planning, Task Analysis, Cataloging (For Supply Support)
Reliability Data e.g., Component MTBF	Design Interface, Maintenance Planning (Repair Level Analysis, Maintenance Man-Hour Requirements), Supply Support (Provisioning Studies)
Maintainability Data e.g., Component MTTR	Design Interface, Maintenance Planning (Repair Level Analysis/Maintenance Man-Hour Requirements)
Failure Modes Effects and Criticality Analysis	Design Interface, Reliability Centered Maintenance (RCM) - Development of Scheduled Maintenance Services
	Development of System Troubleshooting Instruction
Life Cycle Cost	Logistic Trade-off Analyses, Maintenance Planning (Repair Level Analyses), Supply Support (Provisioning studies)
Human Factors Engineering	Design Interface, Personnel Skill Requirements, Training and Training Device Requirements
Safety Engineering	Design Interface, Maintenance Procedures

Figure 4-4 System Engineering Activity Supporting LSA

the total system and their allocation to lower level components are a vital influence on "design-to" mission success and operation and support (O&S) cost results. Throughout the development process, measured progress toward achieving R&M values for the system and its components should result in reducing logistic support requirements and attaining system readiness objectives. Various forms and uses of R&M parameters listed in DoD 5000.40, "Reliability and Maintainability" are summarized in Figure 4-5 and commented on below:

- o Mission success is greatly influenced by mission reliability (mean time between critical failures that impact the mission) and mission maintainability (mean time to restore functions during the mission).

- o Readiness is partially determined by mean time between downing events and mean time to restore the system.

OBJECTIVE	R PARAMETER	M PARAMETER
Mission Success	Mission Time Between Critical Failures	Mission Time to Restore Functions
Readiness	Mean Time Between Downing Events	Mean Time To Restore Systems
Maintenance Manpower and Costs	Mean Time Between Maintenance Actions	Direct Manhours per Maintenance Action
Logistics Support Cost	Mean Time Between Removals	Total Parts Cost Per Removal

Figure 4-5 System R&M Parameters

- Maintenance manpower requirements and costs are affected by the interval between and the manhours to perform maintenance actions.

- Logistic support costs related to parts are determined by the mean time between removal of reparables and consumables and the total of all costs to remove, replace, transport, and repair components at all levels of maintenance.

The ILS Manager must ensure that the R&M parameters can be related to planned peacetime and wartime operational environments, scenarios, and the support that will be provided under these conditions. Failure to fully account for the effects of item design, quality, operation, maintenance, and repair can lead to a substantial shortfall in operational performance and an unprogrammed overrun of logistic support costs. Further, reliability is not a static parameter. Reliability growth is programmed during development by application of reliability development/growth testing (also called Test, Analyze, and Fix). Figure 4-6 illustrates the planned reliability growth program for the AMRAAM missile during the development program. The anticipated maturity growth is portrayed against the minimum Joint Service Operational Requirement (JSOR) threshold and the greater contract goal.

4.3.4 ILS Management Techniques In System Engineering

The identification and application of management techniques which will contribute to system engineering goals in areas of logistic support have the potential for enhancing the system development process and ensuring the timely influence of support requirements on design. The DoD and industry challenge to use Computer Aided Logistics (CAL) in coordination with Computer Aided Design (CAD) presents interesting challenges and innovation opportunities, particularly when these methods are integrated with simulation and modeling tools early in the acquisition process.

4.3.4.1 Analysis and Trade-off Studies. Much of the logistic oriented system engineering activity in early development

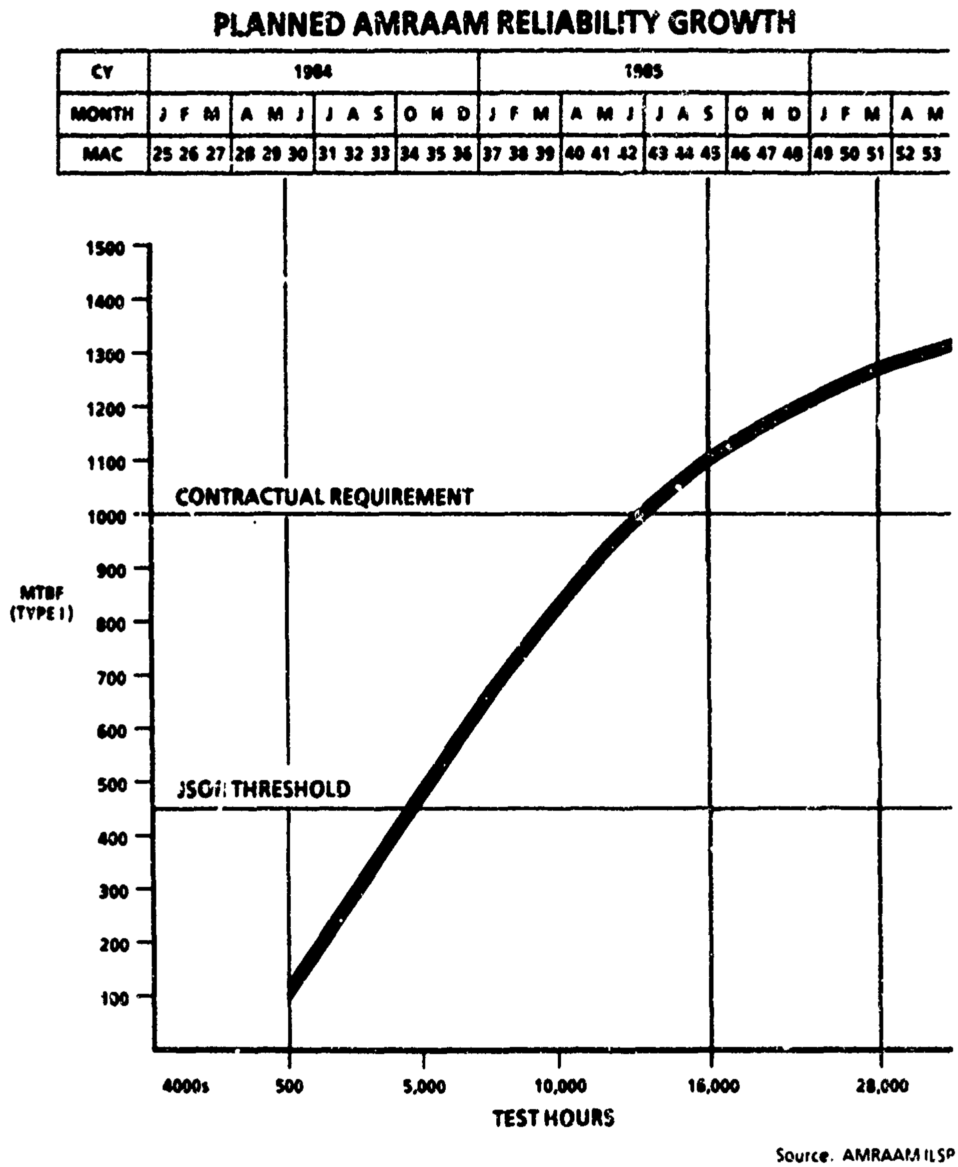


Figure 4-6 Typical Reliability Growth Curve

consists or structured studies. Tradeoff analysis continues throughout development as the quality of data is enhanced based on the progress of testing activity. The ILS Manager and supporting ILS element specialists should participate in system analysis and trade-off studies throughout the system's life cycle. The ILS Manager should:

- Become actively involved in the mission need and use studies (Chapter 3) by providing support element experience factors, challenges, and objectives to be used in the design synthesis consideration of all system engineering input elements. System engineering identifies and defines the functional characteristics of system hardware, software, facilities, and personnel through an interactive process of analysis, design synthesis, evaluation, and selection of a proposed system description, as reflected in system performance and end item specifications.

- Establish a visible and documented ILS management control system which effectively uses the LSA outputs to provide supportability inputs to the decision making and engineering process.

- o Implement a procedure for timely analysis and feedback of logistic support options. One approach would be through effective use of available CAE tools integrated with CAD systems.

4.3.4.2 Support System Design. The support system design functions usually include the design of automatic and non-automatic test and support equipment, simulators, training equipment, mobile maintenance trainers, analysis of maintenance and repair facility requirements, and packaging and transportation studies. Using LSA and standard study techniques, the ILS manager should:

- o Integrate system performance and support requirements using the system engineering techniques and reflect test values and other support parameters in system specifications.

- o Identify "design-to" requirements early and refine them throughout the life cycle.

- o Analyze Government Furnished Equipment (GFE) support system items (new or existing) and integrate these items into the total system design.

- o Emphasize hardware, firmware, and software interface design considerations and specifications to provide early identification and resolution of problems.

- o Include support system design items in the System Configuration Management Program to provide total system consideration of proposed changes.

4.3.4.3 Software. Software design and support considerations are of vital concern to the ILS Manager. The ILS Manager should:

- o Develop a software management system which parallels the traditional hardware system. This will provide a controlled and structured development process involving appropriate design specifications, design reviews, milestones, documentation, configuration control and identification, and validation and verification.

- o Develop a control system to identify and provide the status of hardware, firmware and software design, and support interface specifications.

- o Develop a software support plan for user programmable firmware and software which highlights documentation, training, support equipment, and facility requirements.

Because of the increasing role of software and firmware in materiel system and support system designs, the PM and ILS Manager must make special efforts to (1) fund design efforts that identify and evaluate software maintenance requirements prior to hardware and software design, (2) update these requirement projections in successive phases, and (3) plan for the needed software maintenance and support hardware and services lead-time-away from the appropriate funding inputs and decision points.

4.4 RISK MANAGEMENT

4.4.1 Delayed Definition of Logistics Criteria

4.4.1.1 Risk Area. Delayed decisions on reliability and supportability requirements result in less than optimum support. Once the design is committed, the options become limited. Many early fighter aircraft suffered from having design optimized for performance without comparable attention to support aspects such as maintenance accessibility and spare parts reliability. As a result turn around times and O&S costs were excessive and manpower requirements for some aircraft models approached 100 MMH/FH.

4.4.1.2 Risk Handling. System level logistic requirements (such as basing constraints, use of existing test facilities, sortie turn-around-time, etc.) must be fully addressed in original concept documents and be required program inputs to the formal specification generation and configuration management processes. Initial supportability requirements and logistic concepts can be refined during the development of detailed designs but the desired results will not be obtained if they are not inserted until late in the CE Phase.

4.4.2 Impact of Engineering Changes

4.4.2.1 Risk Area. A high number of design changes made during the development program can overwhelm ILS planning and create an inability to fully reflect ILS and O&S cost considerations in engineering change decisions.

4.4.2.2 Risk Handling. System developers have utilized a number of modeling techniques to cope with rapid changes. An F-16 system simulation model has been used to determine the impact of proposed engineering changes on requirements for logistic support items. The F-16 LCC model provided O&S cost estimates for design alternatives. Similar model development is recommended for new programs and funding for initiation and maintenance should be budgeted. LCC models provide the capability to assure that every design decision is made with full awareness of ILS impacts. Integration of CAD models with CAL models are also useful in the assessment of changes on logistics support elements.

4.4.3 Late Establishment of Readiness and Supportability Objectives

4.4.3.1 Risk Area. The system engineering process is a key factor in identifying and attaining realistic readiness and supportability objectives. If a well organized process is not started at the program inception and continued throughout the development phases then the program risks:

- o Increased design, development, and O&S costs.
- o Schedule delays.
- o Degraded readiness factors.

4.4.3.2 Risk Handling. Accuracy and completeness of the early system engineering effort is essential for realizing readiness and supportability objectives. The previously noted System Engineering Management Guide, published by the Defense Systems Management College, provides a working familiarity with system engineering management from program inception to operational deployment and use. The system engineering process when applied to ILS will greatly improve the probability of achieving ILS objectives through an iterative process of definition, synthesis, tradeoff, test, and evaluation.

4.4.4 Unrealistic R&M Requirements

4.4.4.1 Risk Area. The establishment of unrealistic R&M requirements (as part of the Pre-Program Initiation or CE phases) can lead to increased design and development costs incurred as a result of excessive design iterations. This in turn can cause program delays and costly program support system restructuring in later phases.

4.4.4.2 Risk Handling. The ILS Manager should insist that realism in testing requirements be applied to R&M goals. This can be accomplished in the CE Phase by simulation of R&M goals using prior system achievements as a comparative baseline and estimating the impact of the technological enhancements and unique applications on these prior system base lines.

4.4.5 Acquisition Streamlining

4.4.5.1 Risk Area. The new DoD initiative on acquisition streamlining may impose restrictions on the ILS Manager as well as the designer in early definition of requirements. Although intended to decrease cost and improve efficiency, casual application of such guidance could result in a loss of standardization with attendant cost increase and loss of documented lessons learned experience.

4.4.5.2 Risk Handling. The ILS Manager must work closely with the designer to ensure that the supportability design requirements are called out in the contract. In keeping with the intent of the 3 June 1985 memorandum the contractor should be advised during the development phases which specifications and standards are being considered for the FSD and production contracts. The contractor should also be encouraged to recommend appropriate tailoring.

4.5 SUMMARY

- o The system engineering process produces a balanced design that will reflect the impact of various R&M options and other specialty engineering analyses dealing with readiness objectives and O&S costs.
- o Integration of the LSA process into the system engineering and design process and "intended use" and operational scenario studies simplifies the implementation of ILS management objectives.
- o Unrealistic R&M requirements can be avoided by analyzing the achievements of prior systems and the impact of the technological enhancements incorporated in the new system.
- o An ever expanding ability to simulate, analyze, and design-in supportability can result in obtaining a better real time "balance" between design, operational performance, supportability, and ownership costs.

4.6 REFERENCES

1. DoD Directive 5000.40, Reliability and Maintainability.
2. MIL-STD-499A, Engineering Management.
3. MIL-STD-756B, Reliability Modeling and Prediction.
4. MIL-HDBK-472, Maintainability Prediction.
5. System Engineering Management Guide, Published by the DSMC.
6. AR 702-3, Army Materiel Systems Reliability, Availability, and Maintainability.
7. FM 770-78 System Engineering Practices.
8. AFR 800-18, Air Force R&M Program.
9. MIL-STD-785B, Reliability Program for Systems and Equipment.
10. MIL-STD-470A, Maintainability Program for Systems and Equipment.
11. MIL-STD-471B, Maintainability Demonstration/Evaluation.
12. MIL-HDBK-189, Reliability Growth Management.
13. DoD Directive 5000.19 Configuration Management.
14. MIL-STD-483 Configuration Management Practices for Systems, Equipment, Munitions and Computer Programs.

CONTENTS

CHAPTER 5

LOGISTICS SUPPORT ANALYSIS

5.1 HIGHLIGHTS

- o Managing the Logistic Support Analysis (LSA) process
- o Government and Contractor Responsibilities
- o LSA Task Requirements
- o LSA Documentation
- o Data Verification
- o Tailoring LSA and Logistic Support Analysis Record (LSAR)

5.2 INTRODUCTION

5.2.1 Purpose

To provide an overview of the performance of LSA.

5.2.2 Objective

LSA is an analytical effort for influencing the design of a system and defining support system requirements and criteria. The objective of LSA is to ensure that a systematic and comprehensive analysis is conducted on a repetitive basis through all phases of the system life cycle in order to satisfy readiness and supportability objectives. The selection, level of detail, and timing of the analyses are to be structured and tailored to each system and program phase. The LSAR is designed to be a standardized medium for systematically recording, processing, storing, and reporting data. The LSA data is the basis for determining and budgeting for the logistic support resources (maintenance manpower, training requirements, supply support, etc.) required to attain peacetime and wartime system readiness objectives.

5.3 MANAGEMENT ISSUES

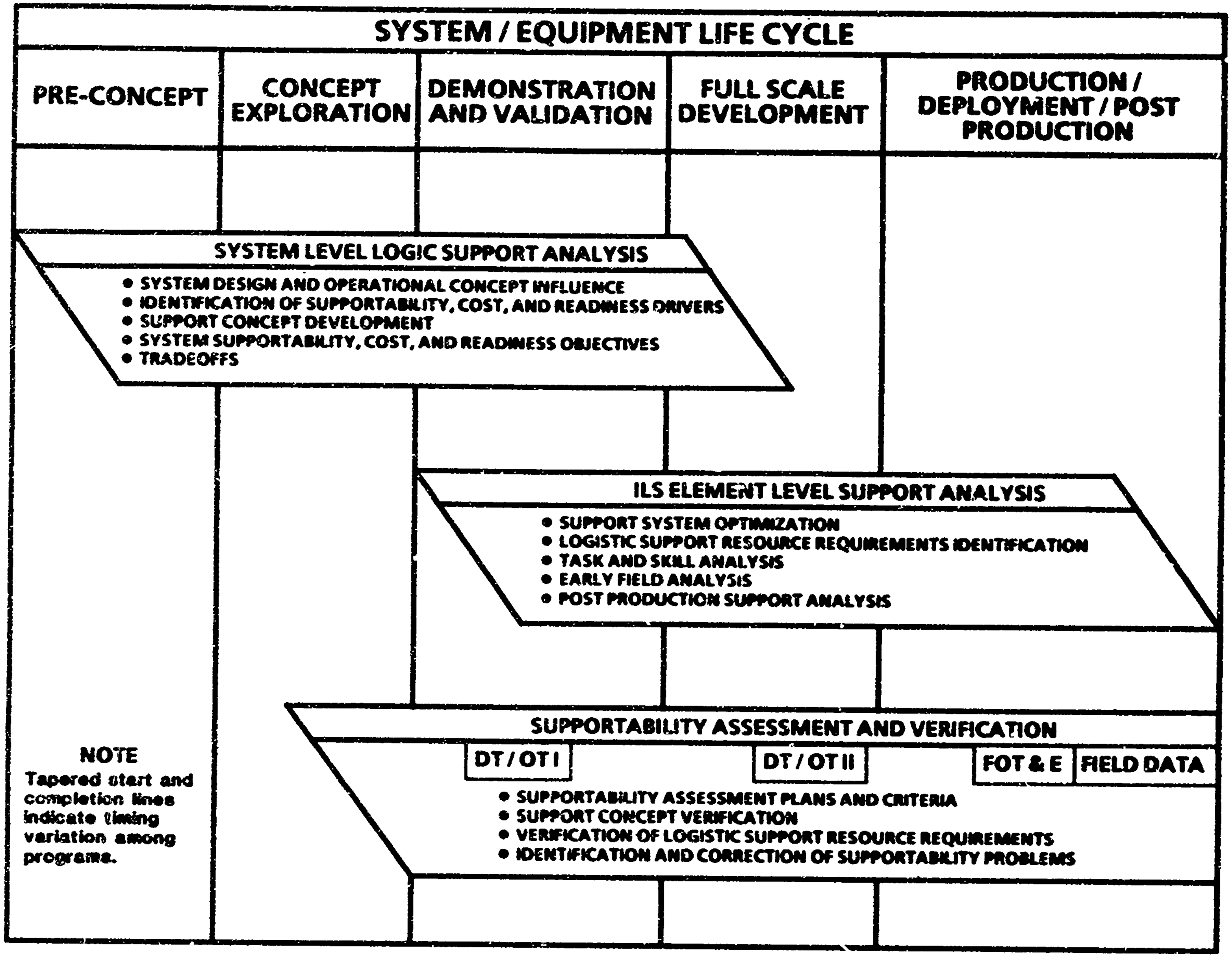
5.3.1 Guidance

Guidelines and requirements for LSA are established by DoDD 5000.39, "Acquisition and Management of Integrated Logistic Support for Systems and Equipment." The guidance for LSA is in MIL-STD-1388-1A "Logistic Support Analysis," and the guidance for LSAR is in MIL-STD-1388-2A, "DoD Requirements for a Logistic Support Analysis Record."

These two MIL-STDs have expanded significantly upon information previously provided in the earlier version of the 1388 series. Specifically, MIL-STD-1388-1A provides for definitive analysis requirements; program front-end analysis requirements are clearly defined; LSA task inputs are identified to include what the Government must provide to the contractor; the expected outputs from each LSA task are specified; Data Item Descriptions (DIDs) are referenced; and instructions for tailoring analysis requirements are provided. These are significant requirements that need to be understood by the ILS Managers and utilized in the planning and execution of the LSA process. MIL-STD-1388-2A contains added LSAR input data records and associated Automated Data Processing (ADP) routines that provide ILS Managers throughout DoD and the Defense industry with a standardized means of handling the logistics data.

5.3.2 LSA Requirements

The LSA process is structured to provide early ILS design influence to obtain a ready and supportable system at an affordable Life Cycle Cost (LCC). The LSA process comprises a planned series of tasks performed under the



Source: MIL-STD-1388-1A

Figure 5-1 Logistic Support Analysis Process Objective by Program Phase direction of the ILS Manager. These include examination of all elements of a system to determine the logistics support required to make and keep that system usable for its intended purpose (refer to Figure 1-4).

5.3.2.1 Government and Contractor Roles. There are unique and joint roles for the Government (requiring authority) and contractor (peforming activity or prime contractor to vendor) and their specialists involved in the LSA tasks. Time phasing of these tasks is discussed in relation to the program acquisition phases. Figure 5-1 supplements the following time-phasing discussions.

Government management of the LSA process begins in the pre-concept phase before the program is formally initiated and continues throughout the life of the system. The pre-concept tasks help define initial support criteria and influence efforts of the potential performing activities (competing contractors) through Concept Exploration (CE), Demonstration and Validation (DVAL) and into Full Scale Development (FSD). These tasks are performed to (a) influence system design and operational concepts; (b) estimate gross logistics requirements of alternate concepts; and (c) relate design, operation and support characteristics to system readiness objectives. The results of the early analytical tasks allow (a) consideration of support in the system engineering definition of system hardware and software; (b) evaluation of alternative designs; and (c) identification of gross resource requirements. The Government's verification tasks begin early in the process using simulation models and baseline comparison systems. Verification tasks continue in conjunction with the contractor throughout the life cycle.

The contractor's LSA tasks are initiated as part of the pre-proposal effort in preparation for a competitive CE proposal. The contractor's competitive proposal will respond to the specific and tailored Request for Proposal (RFP) requirements for LSA and will identify the planned approach, key issues to be addressed, and task scope. Therefore, the burden is on the Government to accurately describe which ILS issues are to be addressed by LSA. The Government must also understand the cost, time, and workload requirements generated by LSA. The Integrated Logistic Support Plan (ILSP) is the Government's description of the desired logistics program and anticipated maintenance concept, and forms the basis, or "seed", from which the contractor's Integrated Support Plan (ISP) is developed. The ISP may include the contractor's LSA Plan. Refer to Chapter 2 for additional discussion of the ILSP and the ISP.

Following CE contract award, the contractor and the Government logistic management specialists will pursue the LSA tasks on a joint effort basis. The analytical tasks started during the pre-concept and CE phases will continue and progressively increase in detail as the acquisition program moves into its successive phases in the transition to production and deployment.

The validity of the analysis and the attendant data products must be successfully demonstrated. Results of formal test and evaluation programs and post-deployment assessments are analyzed by both the contractor and the Government, and corrective actions are implemented as necessary. The process of testing, evaluating, and correcting deficiencies in both the materiel system and its logistic support continues throughout the life cycle.

The Government ILS Manager's supervision of the contractor's LSA role involves the following tasks:

- o Provide guidance.
- o Assess compliance with contractual requirements.
- o Provide models and input parameters (e.g., LCC, stockage levels, and level of repair).
- o Conduct periodic reviews.
- o Provide Government data and/or factors for use studies.
- o Provide the Government-developed Joint Service LSAR ADP System or approve an alternative contractor proposed program.

5.3.2.2 Logistic Inputs for Trade-off Analysis. LSA conducted prior to program iniation identifies constraints and targets for improvement. This early effort provides supportability inputs into system engineering trade-offs conducted during the CE phase. Unless timely evaluation of supportability factors is available, the design process will proceed to solidify without logistic input.

5.3.2.3 LSA Task Requirements. LSA requirements are detailed in MIL-STD-1388-1A and consist of five general task sections involving 15 tasks and 77 sub-tasks. The following paragraphs summarize the five task sections; the MILSTD should be consulted for details. The time phasing of the total process is shown in Figure 5-1, and an overview of the time phasing and repetitive nature of the individual tasks is provided in Figure 5-2.

Task Section 100 - Program Planning and Control

Management of the LSA effort requires the development of a proposed LSA strategy, tailoring, decisions, requirements for the LSA plan, and design reviews, procedures and schedules. This front end analysis to include LSA planning and management is the responsibility of the Program Manager.

Task Section 200 - Mission and Support System Definition

The tasks contained in this section identify the operational role and intended use of the new system and establish support resource constraints, readiness and supportability objectives, supportability design requirements, and measures of logistic support. During the early phases of an acquisition program this analytical task provides the greatest opportunity for the Government ILS Manager to influence the design of the system and its support (refer to Chapter 3).

Task Section 300 - Preparation and Evaluation of Alternatives

The tasks contained in this section are highly repetitive in nature and are applicable to successive phases of the preproduction part of the life cycle and to production design changes. The tasks are generally performed in sequence and the process is then repeated at increasingly lower levels of the system's work breakdown structure as further information is provided by the system engineering process.

Task Section 400 - Determination of Logistics Support Resource Requirements

This portion of the LSA defines requirements for the ILS elements. The tasks can be general to scope requirements or very detailed and produce extensive procedural and parts listing documentation (refer to Chapter 7).

Task Section 500 - Supportability Assessment

The supportability test and evaluation program serves three objectives throughout a program's life cycle: (a) develop logistic test and evaluation requirements as inputs to system test and evaluation plans; (b) demonstrate contractual compliance with design requirements; and (c) expose supportability problems for corrective action (refer to Chapters 10 and 11).

5.3.3 LSA Documentation

LSAR data requirements are detailed in MIL-STD-1388-2A. LSAR data is a subset of the LSA documentation and is generated as a result of performing the LSA tasks specified in MIL-STD-1388-1A. MIL-STD-1388-2A is structured to accommodate the maximum range of data potentially required by all Services in all ILS element functional areas for all types of materiel systems, and throughout the entire acquisition life cycle. This approach permits standardization of formats and data definitions for Government-required LSA data. Tailoring of these data requirements is a vital part of the ILS Manager's role. There are 14 LSA standard data records. Figure 5-3 identifies these 14 records and relates them to the applicable LSA tasks and system engineering specialities. Other LSA tasks may be recorded through documents such as the contractor's LSA Plan (Task 102), Alternative Support Systems (Task 302) and Early Fielding Analysis (Task 402). If task results are to be

LSA TASK SECTIONS AND TASKS	Pre-Concept	CE	DVAL	FSD	Production, Deployment, Post Prod.	Design Changes
Task 100: PROGRAM PLANNING AND CONTROL						
Early LSA Strategy (101)	X	X	X			
LSA Plan (102)		X	X	X	X	X
Program & Design Reviews (103)		X	X	X	X	X
Task 200: MISSION AND SUPPORT SYSTEM DEFINITION						
Use Study (201)	X	X	X	X		
System Standardization (202)		X	X	X		X
Comparative Analysis (203)	X	X	X	X		
Technological Opportunities (204)		X	X			
Supportability Factors (205)		X	X	X		X
Task 300: PREPARATION AND EVALUATION OF ALTERNATIVES						
Functional Requirements Ident. (301)		X	X	X		X
Support System Alternatives (302)		X	X	X		
Evaluation of Alterations & Trade-offs (303)		X	X	X		X
Task 400: DETERMINATION OF LOGISTIC SUPPORT RESOURCE REQUIREMENTS						
Task Analysis (401)			X	X		X
Early Fielding Analysis (402)				X		X
Post Production Support (403)					X	X
Task 500: SUPPORTABILITY ASSESSMENT						
Supportability Assessment (Test, Evaluation and Verification) (501)		X	X	X	X	X

Figure 5-2 Acquisition Phase Timing of LSA Sub-tasks

performed by the contractor for the Government, the LSA program statement of work must establish the requirement. Standard or specially created DIDs may be used to specify report format with delivery instruction detailed on the Contract Data Requirements List (CDRL), DD Form 1423. ILS Managers should be aware of the amount of documentation they may be generating. Only the LSAR data that are required should be ordered by the Government. The ILS Manager needs to determine what data is needed and when. From this determination, he can identify the output reports, the LSA, data records, and tasks required to meet the program needs. He should also ensure that sufficient qualified personnel are available to effectively apply the LSAR data output.

5.3.4 Joint Service LSAR ADP System

LSAR data may be prepared and maintained manually using the required MIL-STD-1388-2A format. It may also be maintained automatically through use of computer technology or by combining manual and automatic techniques although the preferred method is use of automated systems developed by the contractor. The Joint Service LSAR ADP system is a standard automated data system developed by the Services for use by contractors, if they do not have a validated system of their own. The U.S. Army Materiel Readiness Support Activity (MRSA) in Lexington, Kentucky is the lead activity in the application of the standard system.

MRSA will provide the software and instructions for the ADP system on request and is available to assist in setting it up at a contractor's facility. MRSA will also validate a contractor-developed system for use on DoD contracts to ensure that these systems meet the requirements of MIL-STD-1388-2A. This support is normally provided during early FSD and is provided without charge to DoD contractors.

5.3.5 Data Verification

5.3.5.1 LSA Input Data. Figure 4-4 identifies principal system engineering data sources employed in the performance of LSA. LSA is generally performed by a separate ILS group within a contractor's program office or by a supporting activity, and not by the same system engineering personnel that perform the design, R&M, etc. In view of these typical arrangements, the responsibility of ensuring the timely use of appropriate system engineering input for all analyses falls upon the contractor and Government ILS Managers. Key personnel in the contractor's ILS activity must be conversant with the language of the associated system engineering disciplines in order to ensure an effective linkage. The Government ILS Manager must possess this same capability. All aspects of system engineering are dynamic and iterative. For example, component reliability values progress from allocations to predictions to measurements to projections of mature values (reliability growth).

- o Verify that input data is updated in a timely manner by the managers of the associated system engineering disciplines.
- o Verify that the system engineering data is expressed in a format compatible with LSA input requirements - or can be readily converted to the required format.
- o Verify that the input data is compatible with the time frame that the LSA is addressing. For example, a repair level analysis to support maintenance planning for the operational phase requires: (1) projections of repair task frequencies (derived from reliability data); (2) projections of repair task durations and manpower burden (derived from maintainability data); (3) projections of component prices (from LCC studies); (4) identification of support equipment requirements (from system design studies); and (5) estimates of other logistic support costs (training, publications, transportation, etc.).

5.3.5.2 LSAR Data Quality Assurance. As illustrated in Figure 7-3, LSAR data is employed to define and quantify logistic support resource requirements. The assurance of qualitative and quantitative validity of these records is required to preclude misidentification and under or over procurement of support resources (supply support, support equipment, etc.).

Data Record	Record Title	Related LSA Task No.	Specialty
A	Operation and Maintenance Requirements	205	R&M
B	Item Reliability and Maintainability Characteristics	205, 301, 401, 501	R&M, Safety
B1	FMECA	301	R&M, Safety
B2	Criticality and Maintainability Analysis	301	R&M, Safety
C	Operation and Maintenance Task Summary	301, 401, 501	R & Safety
D	Operation and Maintenance Task Analysis	301, 401, 501	R&M, Safety
D1	Personnel and Support Requirements	301, 401, 501	R&M, Safety
E	Support Equipment or Training Material Description and Justification	401, 501	M
E1	Unit Under Test (UUT) and Automatic Program(s)	401, 501	M
F	Facility Description and Justification	401, 501	M
G	Skill Evaluation and Justification	401, 501	M
H	Support Items Identification	401, 501	R, Prov.,
H1	Support Items Identification (Application Related)	401, 501	R and Prov.
J	Transportability Engineering Characteristics	401, 501	Transport.

Figure 5-3 LSA/LSAR Relationships

LSA/LSAR is a conversion process. The LSA input data is converted to detailed LSA records. Some conversions require application of complex models, e.g., repair level analysis and Reliability Centered Maintenance (RCM). Others follow detailed procedures prescribed in MIL-STD-388-2A e.g., conversion of reliability estimates of mean time between maintenance actions for spares and repair parts, to estimates of maintenance replacement rates (employed in provisioning computations).

An LSAR Quality Assurance procedure must validate the process employed by the logistic support personnel. Suggested procedures are listed in Figure 5-4.

5.3.6 Tailoring LSA/LSAR

5.3.6.1 Tailoring LSA. The key to a productive and cost effective LSA program is proper tailoring of the LSA subtasks so that the available resources are concentrated on the tasks which will most benefit the program. Limitations on acquisition funding require that the LSA effort be applied selectively in order to improve hardware design and support concepts, not merely to collect data. The Government ILS Manager plays a significant role in the tailoring process. Appendix A to MIL-STD-1388-1A provides excellent guidance in tailoring LSA requirements to fit the needs of a specific program. Programs are tailored in several ways. First, they are tailored by task and subtask and by the depth of the analysis (how much of the task). This aspect of LSA tailoring involves consideration of:

- o Amount of new design freedom involved.
- o Amount of funds available for investment in tasks.
- o Estimated return on investment.
- o Schedule constraints (such as "fast track" programs).
- o Data and analyses availability and relevancy.

Programs are also tailored in terms of acquisition phase timing and required updating. Figure 5-2 shows the normal program time phasing for various LSA tasks. In addition, tailoring can dictate which activity will perform the task or subtask.

5.3.6.2 Tailoring LSAR. Tailoring LSAR data is mandatory for Government Program and ILS Managers. The tailoring decisions should be based on (a) the LSA tailoring process described in the preceding paragraph, (b) related engineering and ILS element analysis efforts which result in LSAR data and (c) deliverable logistic products specified by DID's. In addition, LSAR data records may be tailored to different degrees by hardware level depending upon program requirements. Appendix E to MIL-STD-1388-2A provides detailed guidance for tailoring the LSAR.

A basic approach to the tailoring of LSAR requirements is to start with the output or end uses of the data and backward plan as follows:

- o The ILS Manager, supported by functional specialists (manpower, publications, etc.) determines exactly what logistic resource data are required and when they are needed in the acquisition life cycle of the specific materiel system.
- o The ILS Manager must then determine which of these requirements can be supported by LSAR data and whether they require the depth of detail that LSAR provides, as opposed to less detailed parametric estimates.
- o The input records (LSAR) needed to obtain the selected output requirements and the timeframe are then identified. Selected input-output relationships are identified in Figure 7-4 of this handbook. Detailed input/output relationships for all LSA records are illustrated in Figure 90 (Appendix E) of MIL-STD-1388-2A.

5.3.7 LSA/LSAR Relationship Summary

Figure 5-5 summarizes the relationships among the ILS requirements, LSA tasks,

Contractor	Government
o Develop detailed LSA/LSAR procedures - selection, adaptation, and augmentation of MIL-STD-1388-1A and 2A	o Establish an LSA management team o Review and approve contractor procedures
o Develop self-check procedures	o Review and approve
o Train and certify logistic support personnel to perform the procedures	o Monitor/evaluate
o Establish, schedule, and implement multi-disciplinary audit reviews	o Establish, schedule, and implement independent (Government) audit reviews
o Identify problems and implement corrections	o Identify problems o Approve corrections
o Repeat audits	o Repeat audits

Figure 5-4 LSAR Quality Assurance Procedures

LSA documentation, ILSP, and the acquisition life cycle phases.

5.4 RISK MANAGEMENT

5.4.1 Failure to Apply LSA during Concept Exploration

5.4.1.1 Risk Area. Failure to participate in the definition of system concepts can produce a system design in follow-on phases that does not meet supportability objectives and requires excessive or unattainable operation and support (O&S) costs and manpower to meet the readiness objectives.

5.4.1.2 Risk Handling. As stated in Chapter 4, LSA must be integral to the system engineering program in order to achieve an effective design for supportability. The LSA activity during the CE phase also provides the basis and planning for the ILS program in DVAL and later acquisition phases.

5.4.2 Invalid Application of Component R&M Data

5.4.2.1 Risk Area. Design and manufacture determine the mean life and failure rate of components when viewed in isolation. When the parent materiel system is engaged in its military operational role, these same components should be expected to exhibit replacement rates substantially higher than their handbook value or inherent reliability alone would indicate. The consequences of improperly computed material replacement rates are invalid manpower requirements, incorrect supply support stockage lists, and invalid repair level analyses.

5.4.2.1 Risk Handling. Differences between operational and inherent failure rates are attributable to:

- o Environmental factors.
- o Failures induced by interacting components.
- o Personnel related failures.
- o No-defect removals.

MIL-STD-1388-2A contains explicit mechanisms to convert inherent failure rates to their expected operational values. Estimates of the effects of factors listed

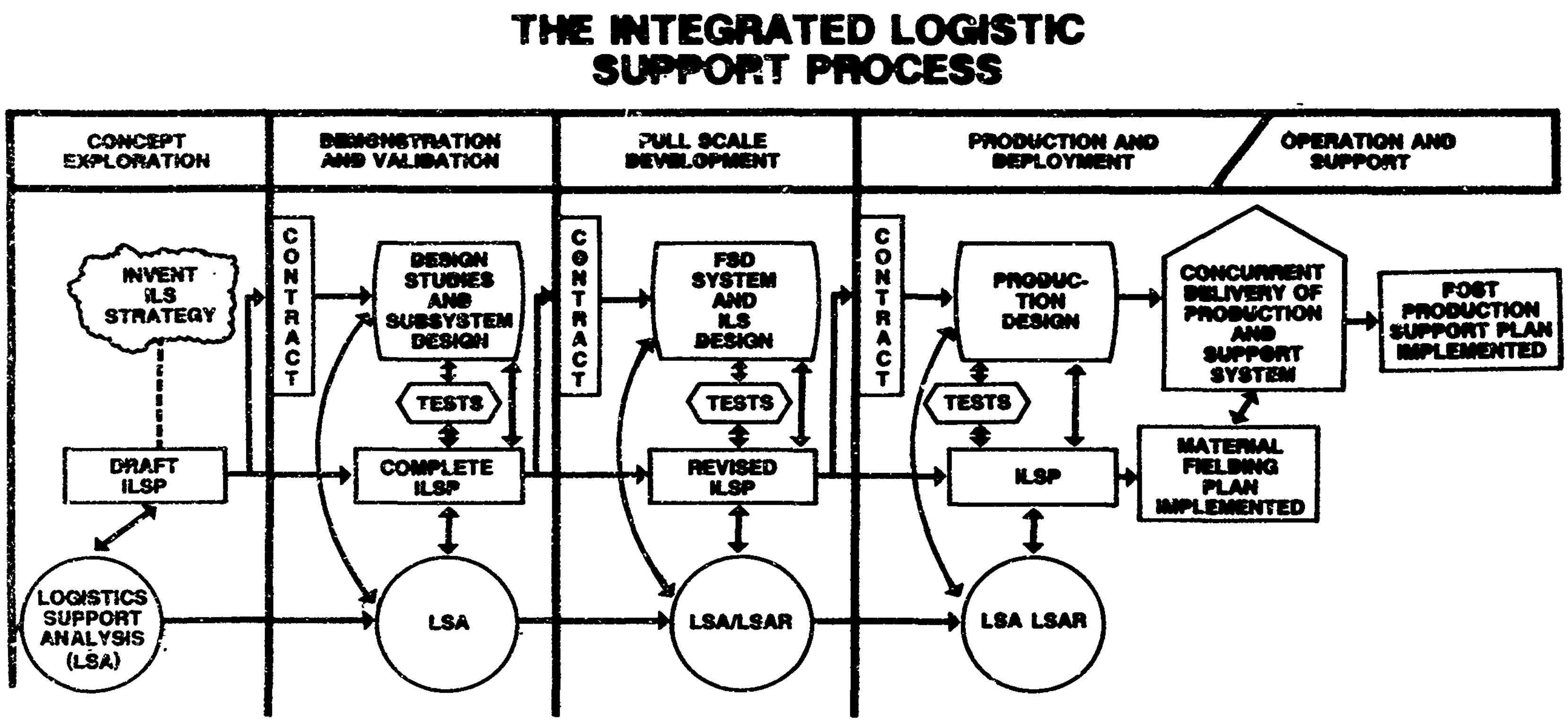


Figure 5-5 The Integrated Logistic Support Process

above may be derived from field data on similar components. In addition, computed material replacement rates should be updated directly when the parent materiel system undergoes operational test and later field deployment.

5.4.3 Failure to Structure/Tailor LSA/LSAR Requirements

5.4.3.1 Risk Area. Failure to establish an LSA plan that is specifically designed to meet the needs of the materiel system can result in: excessive costs; the performance of unwanted analysis while failing to complete needed studies; and the development of excessive documentation while overlooking critical information needs. ILS lessons learned reports and discussions with ILS Managers have provided numerous examples of these deficiencies.

5.4.3.2 Risk Handling. The ILS Manager's LSA/LSAR objective should be to obtain only what he needs and use what he gets. The process discussed in this chapter, of fitting the activity to the need, is an essential aspect of tailoring.

5.5 SUMMARY

- Application of LSA is mandatory for all materiel systems.
- Their applications must be tailored to the requirements of each acquisition to ensure cost-effective implementation.
- LSA programs for major systems are relatively costly. These costs are most warranted when LSA is used as the integrated source and record for development of ILS planning and definition of ILS products.
- The program that provides front-end funding for LSA and other ILS activities is more likely to be successful.

5.6 REFERENCES

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2. MIL-STD-1388-2A, DoD Requirements for a Logistic Support Analysis Record.

CONTENTS

CHAPTER 6

LIFE CYCLE COST AND SYSTEM READINESS

6.1 HIGHLIGHTS

- o Achieving LCC Objectives
- o Importance of Front-End LCC Analysis
- o Cost Estimating Methods
- o Responsibilities for Cost Analysis
- o Relationship of LCC to System Readiness
- o Time Phasing of DoD LCC Policies
- o Influencing System Design and Logistics Choices
- o Trade Studies and Design-to-Cost

6.2 INTRODUCTION

6.2.1 Purpose

To relate the Life Cycle Cost (LCC) concept to Integrated Logistic Support (ILS) and system readiness.

6.2.2 Objective

DoD policy is to acquire systems that meet performance and readiness objectives at an affordable LCC (DoDD 5000.1, "Major System Acquisitions"). This policy requires the Program Manager (PM) to ensure that LCC influences the system design and the logistics engineering process at all acquisition stages. In accomplishing this goal, the PM requires a comprehensive, accurate, and current LCC estimate to support each cost significant management decision. An LCC estimate is comprehensive when it covers all costs to the Government during the system's life cycle. Research and development, production, operation and support, and disposal costs are included in LCC.

An LCC estimate should have sufficient accuracy to permit comparison of relative costs of design and acquisition alternatives under consideration by management. In addition, the LCC estimate must demonstrate whether a system meets affordability goals; i.e., that it can be procured, operated and supported efficiently and effectively for the programmed and budgeted resources in the years required. The uses of LCC estimates are shown in Figure 6-1.

6.3 MANAGEMENT ISSUES

6.3.1 Background

There are few decisions made during a program's life cycle that do not affect LCC. Programmatic and design choices can cause a wide LCC variation and have a significant effect on the system's readiness.

The use of LCC is most effective during the early phases of the acquisition cycle. By Milestone II, roughly 85 percent of the system's LCC has been committed by design and logistics choices made prior to this point (see Figure 6-2). Clearly, the decisions with the greatest chance of affecting LCC and identifying savings are those decisions impacting acquisition and Operating and Support (O&S) costs undertaken in the preconcept, Concept Exploration (CE), and Demonstration/Validation (DVAL) phases. (See Figure 6-3).

The goals of LCC analysis are to (1) identify the total cost of alternative means of countering a threat, achieving production schedules, and attaining system performance and readiness objectives; and (2) estimate the cost impact of the various design and support options. To achieve this goal, DoD policy establishes cost as a parameter equal in importance to technical and supportability requirements and schedules (DoDD 4245.3, "Design to Cost").

The acquisition management technique which pursues this policy is called the Design to Cost (DTC) concept. The relationship between LCC and DTC is that LCC analysis forms the foundation for the selection and allocation of DTC goals and

I. INPUT TO ACQUISITION DECISIONS AMONG COMPETING MAJOR SYSTEM ALTERNATIVES

II. INPUT IN REQUIREMENTS DETERMINATION

III. WITHIN A SELECTED SYSTEM ALTERNATIVE,

   A. PROVIDE IDENTIFICATION OF COST DRIVERS

   B. PROVIDE AN INDEX OF MERIT FOR TRADEOFF EVALUATIONS:

      1. DESIGN
      2. LOGISTIC
      3. MANUFACTURING

IV. BASIS FOR OVERALL COST CONTROL

DSMC

Figure 6-1 Uses of Life Cycle Cost

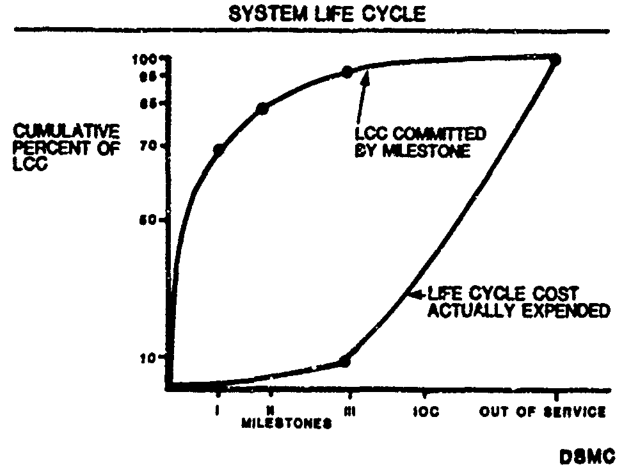

Figure 6-2 Typical System Life Cycle Cost Commitment

the cost tracking activities. Initial DTC activity in CE should focus on cost and performance tradeoffs early in the development cycle to define an affordable system that meets required performance levels and schedule. As development continues, at increasingly more detailed levels of design, DTC efforts evolve toward identifying and resolving areas requiring attention because of excessive costs (DoDD 4245.3). The DTC goals and thresholds should be established by Milestone II. DTC goals must be set for both acquisition cost and O&S parameters. The O&S parameters should be selected from the cost drivers identified in the LCC analysis. Typically, these will include manpower, fuel, ammunition, and spares and repair parts. There is a tradeoff in acquisition and O&S costs, which will be explained below in sections 6.3.5.2 and 6.3.5.3.

If the PM determines that system level DTC thresholds will be breached, he must inform the Defense Acquisition Executive (DAE) and Service officials. The PM's recommended alternative courses of action shall include a zero cost growth alternative which will show performance and readiness impacts. The PM should allocate DTC goals and thresholds through contracts to design managers in accordance with the program work breakdown structure. This process is especially useful to motivate design tradeoffs. By the end of DVAL, the PM must identify - through the interface of LCC analysis with design - the high-risk or high-cost components with the greatest opportunity for design tradeoffs. Program management should also consider the use of product performance agreements or other contract incentives to meet selected DTC goals (DoDD 4245.3).

DTC parameters must include a focus on O&S cost parameters to ensure that the acquisition process yields effective, durable, and reliable systems that can be maintained within available resources. A system with low acquisition cost that is too costly to operate and support is as unsatisfactory as one that is less costly to maintain but is too expensive to acquire in the required quantity.

6.3.2 LCC Estimation Methods

The LCC estimation method chosen should be based on the objectives of the analysis, the level of detail in the available data, the level of system definition, and the acquisition phase of the program. Analysts are encouraged to employ alternative cost estimating methods concurrently to expose hidden factors such as design and schedule risk areas and to reinforce the estimates derived. An LCC estimate should be as accurate as the data and applicable methodology will allow.

In the preconcept, CE and early DVAL phases, cost estimates generally are made on the system level reflecting the lack of detail design available. In the late DVAL, Full Scale Development (FSD), Production, and Operation and Support phases, cost estimates generally reflect engineering

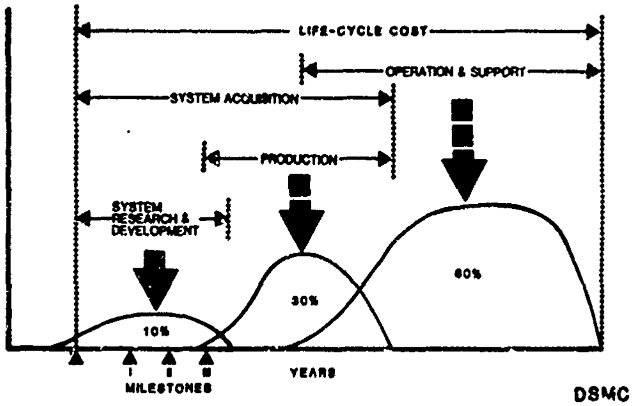

Figure 6-3 Typical System Life Cycle Cost Distribution

detail design; the materiel system LCC is the sum of the cost estimates for each system component. Data in these phases is derived from the design engineering and LSA/Logistic Support Analysis Record (LSAR) processes and adjusted to reflect experience data as appropriate. Initially, LSAR data consists of engineering estimates which are updated with test results in the FSD and Production phases, and with field experience in the Operation and Support Phase.

6.3.2.1 Parametric Costs. A statistical parametric cost estimate for a new system is developed from Cost Estimating Relationships (CERs) statistically derived from data which shows a relationship between a particular cost and cost driving variable(s) for existing systems. CERs require engineering and physical characteristics data from a group of comparable existing systems. Parametric cost estimates generally are made on a system level in the preconcept, CE, and DVAL phases. The system level estimates typically have high uncertainty based upon the limited system design completed during these early phases.

An example of a CER can be an expression that estimates the cost of a new sonar based on a statistical analysis of related data for a group of 20 existing sonars. The CER may express the cost of the new sonar as a function of its expected weight, target detection range, and reliability.

6.3.2.2 Analogies. The cost analogy technique relates the cost of a new system to a similar existing system through analysis which develops a cost complexity factor that explicitly adjusts for differences in technological, operational, or logistical variables between the two systems. Generally, system cost estimates based on analogies are made in the CE and DVAL phases and are moderately uncertain reflecting preliminary system design definition.

An example of a cost analogy is the estimation of the cost of a new fire control system based upon an existing fire control system. The analysis may identify technology changes in the systems's computer. The cost estimate for the new computer may be derived by applying a complexity factor to the cost of the existing computer. The overall cost for the new fire control system may then be determined by applying the same or similar techniques to all other components of the fire control system.

6.3.2.3 Engineering Cost Estimates. The engineering cost estimating technique (also known as the "bottoms-up" cost estimating technique) uses known or estimated costs of lower level items (such as level four items on a work breakdown structure) and aggregates them into the total costs of a higher level, taking into consideration the costs of associated and interconnecting equipment. Engineering type estimates generally are made in the late DVAL, FSD, Production, and Operation and Support phases. The engineering cost estimating technique typically has low uncertainty reflecting detailed system design.

The cost of each lower level item can be estimated by a different method (parametric, analogy, or actual) to achieve the greatest cost accuracy possible for that item. For example, the cost of a new anti-submarine warfare aircraft can include the previously mentioned parametric estimate of the new development sonar, the previously mentioned analogous estimate of the fire control system, plus the known costs (actuals) of standard components incorporated in the design.

6.3.2.4 Updated Cost Estimates Based on Actuals. LCC estimates can be updated based on system characteristics, as well as actual costs that the contractor and Government incurred for earlier versions, production runs, or operations. Sources of actuals are characteristic charts, Government ledgers, contracts, usage reports, manpower documents, and maintenance facility records. Actual costs generally are incorporated into the analysis in the late FSD, Production, and Operation and Support phases.

6.3.3 Cost Analysis Roles

Each program office should develop its own LCC estimate for the materiel system. This program office cost estimate can assist program management in several ways.

- o First, when developed during preconcept from a structured set of program design, support and other characteristics, the LCC serves as the baseline cost estimate and provides a standard with which to measure the cost changes of the system throughout its acquisition cycle.

- o Second, it provides the program office a detailed set of Government cost estimates and assumptions which are reconciled with the contractor's cost estimates and assumptions at various times. Such a detailed comparison is important in contract negotiations to help the Government seek realistic contract target costs, DTC goals, and the conditions which impact the achievement of these goals.

- o Third, the program office cost estimate can be used to monitor the contractor's trade study effort during the design process to ensure that low-cost design alternatives are consistently considered and selected.

- o Fourth, the updated program office cost estimate typically is required at program review milestones, in Selected Acquisition Reports (SARs), to determine Congressional (Nunn-McCurdy) unit cost report requirements, in POMs, and to develop budgets.

- o Fifth, the program office cost estimate can be used to conduct Government-sponsored planning and programming trade studies of service-wide design and logistics issues.

An independent cost estimate must be developed for milestone reviews (DoDD 5000.4, "OSD Cost Analysis Improvement Group"). This estimate must be prepared by analysts not under the control of the program office responsible for the acquisition of the particular materiel system. These analysts typically are located in independent costing organizations which have been formally established in each Service.

For major systems, the OSD Cost Analysis Improvement Group (CAIG) will review the program office and independent cost estimates. Frequently, the CAIG will then provide the Defense System Acquisition Review council (DSARC) with its independently generated cost assessment. A prudent program office will base its cost estimates on a detailed, tailored version of its parent Service's approved cost element breakdown structure. The PM periodically will communicate his intended cost estimation methods to his parent Command and other reviewing organizations including the OSD CAIG. The feedback from these organizations will help the PM review his estimates, methods, and cost factors to ensure their reasonableness.

6.3.4 Relationship of LCC to System Readiness

The primary goal of the ILS program is to achieve system readiness objectives at an affordable LCC (DoDD 5000.39, "Acquisition and Management of Integrated Logistic Support for Systems and Equipment"). The resources needed to achieve the readiness objective must receive equal emphasis with the resources required to achieve schedule or performance objectives (DoDD 5000.1). LCC analysis helps to achieve these objectives by evaluating the cost implications of various design and logistic support alternatives.

Early in the acquisition cycle, the LCC analysis concentrates on quantifying the cost implications of selected design alternatives which provide the desired level of performance. ILS activities at this stage focus on designing supportability characteristics into the system and evaluating the cost of ownership and support requirements. Frequently, these tasks require the expenditure of higher development and acquisition costs in return for lower O&S costs.

In later stages of the acquisition cycle, evaluations are oriented toward identifying lower cost means of support to achieve readiness objectives. In particular, support elements such as manpower and spares are evaluated to identify cost effective alternatives by which required readiness levels can be achieved and sustained during actual operations.

Figure 6-4 illustrates how the cost analysis process helps to achieve readiness at an affordable cost by allowing comparisons between various logistics support and design alternatives. Each curve represents all designs which meet a constant value for a specific program performance parameter such as operating range, weight, "kill" probability, ordnance delivered, or velocity. Through analysis, the cost and readiness associated with each design are estimated. The detailed logistic support considerations of readiness analysis are discussed in Chapter 7. Cost and readiness goals can be graphically represented, and the most preferred design choice is one that meets the performance objectives (the particular curve); is affordable (less than or equal to the cost goal); and meets the readiness objective (greater than or equal to the readiness goal).

Comparisons of design alternatives can be made which can result in the tradeoff of design, logistics, LCC and/or readiness requirements in attempting to design the system to fulfill the user's need. The range of design, performance, and logistics options depicted as Alternative A does not meet either the cost or readiness goals. Alternative B can meet the cost goal by sacrificing readiness or it can meet the readiness goal by exceeding the cost goal. Alternative C can meet both cost and readiness goals. However, care must be taken to ensure that the performance level represented by Alternative C effectively counters the threat for which the program is intended.

6.3.5 Time Phasing of DoD LCC Policies

Figure 6-5 summarizes the major LCC activities which can occur in each phase. These activities are detailed in the relevant DoD Directives, particularly DoDD 5000.1, 5000.4, 5000.39, and 4245.3.

6.3.5.1 Pre-Concept Phase. Cost analysis in this phase is typically concerned with making initial estimates of total system costs including the alternatives to new system acquisition: modification of existing equipment, use of existing or commercial systems, and changes in doctrine. (See Figure 6-5).

The objective in this phase is to make an estimate of all elements of LCC for use in comparisons of system alternatives. Therefore these cost estimates must reflect analyses of pertinent supportability factors for the alternatives proposed, with adequate attention placed on cost impacts associated with the risks or uncertainties of each alternative. The results of this analysis should show the order of magnitude of the cost impacts of the alternatives in comparison with system modifications and the use of other existing equipment. Cost estimates based on detailed engineering design generally are not necessary at this time, and may not be possible.

By the program initiation point, the Service staff must develop specific plans to analyze support costs and readiness drivers of current fielded systems and identify readiness and support cost targets for improvement in the new system based on the analysis. Careful planning must be directed to development and analysis of data for the current fielded baseline equipment. In some cases, an existing data base can provide the information, while the data may have to be developed through other means for other systems. Generally

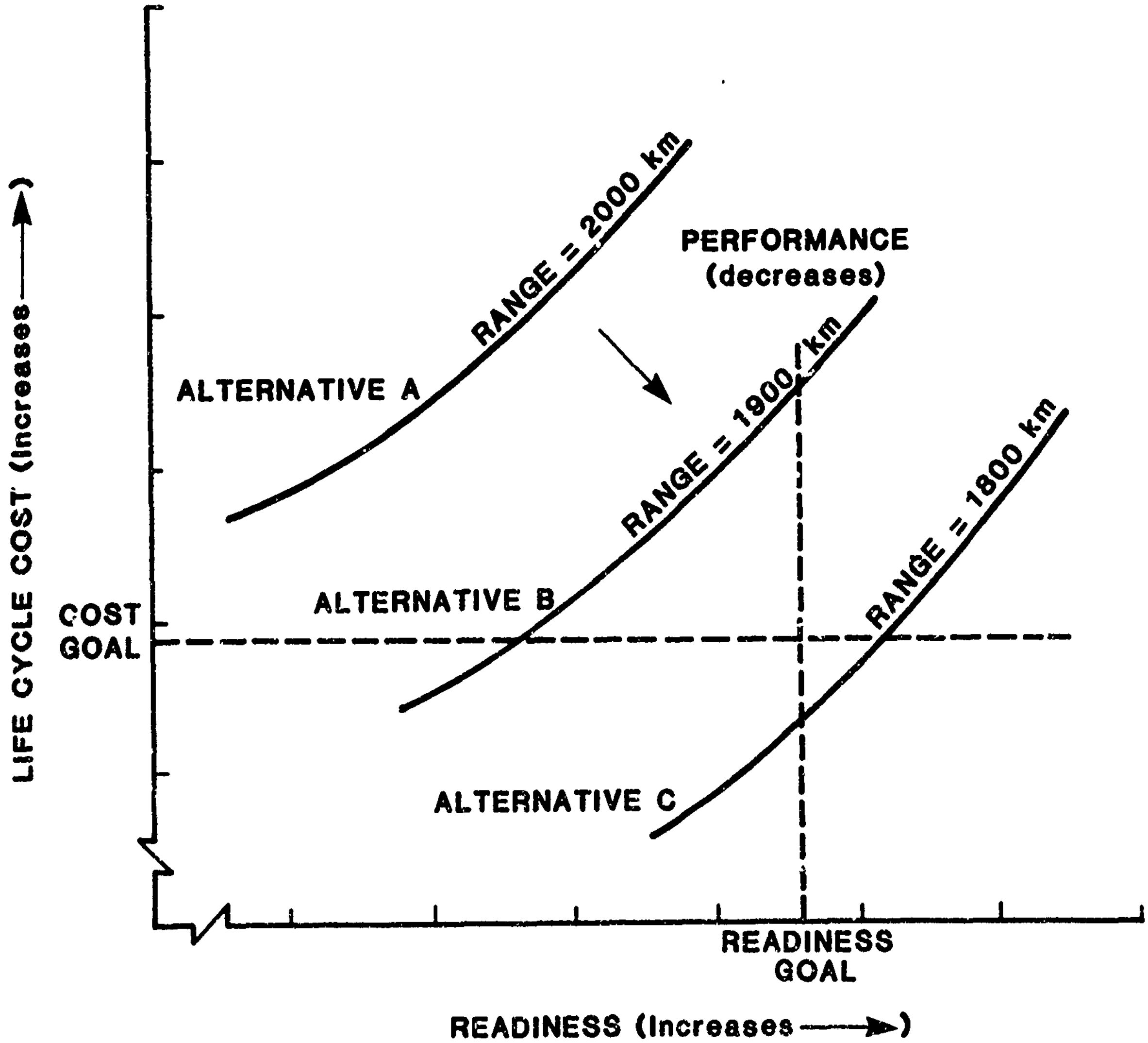

Figure 6-4 Readiness/Cost Tradeoff

however, the cost analyst must recognize that the data drawn from various systems may not be consistent and could require some adjustment before being utilized in comparative studies.

6.3.5.2 Concept Exploration Phase. The LCC objectives in this phase concern developing cost estimates for each alternative concept, demonstration of affordability, and identification of cost drivers. Many Logistics Support Analysis (LSA) tasks will support LCC activities. The cost analyst should participate in the structuring and tailoring of LSA/LSAR requirements in order to obtain sufficient data for later LCC analyses. Explicit plans must be written to assure that tradeoff studies are performed which are designed to set firm goals and thresholds for selected parameters by Milestone II. (See Figure 6-5). Both the plans and administrative responsibility must be made a prominent part of the System Engineering Management Plan to assure effective use.

DTC activity in CE focuses on cost and performance tradeoffs to define the characteristics of an affordable system that meet or exceed required performance levels. As CE continues, the DTC program and supporting cost analysis seek to identify areas requiring additional design action because of unacceptable estimated cost levels. Throughout the acquisition cycle, cost reduction alternatives (derived from

PRECONCEPT	CONCEPT EXPLORATION	DEMONSTRATION/ VALIDATION	FULL SCALE DEVELOPMENT	PRODUCTION	OPERATION AND SUPPORT
Estimate LCC For Each Alternative	Establish Baseline LCC for Selected Alternative	Set DTC Goals and Thresholds	Update LCC Based On Logistics Plans, Design and Test Results	Estimate LCC Impact of Product Improvement Plans	Estimate LCC Impact of Product Improvement Plans
Identify Affordability Constraints	Determine Design to Cost (DTC) Objectives with Tradeoff Analyses	Conduct Tradeoff Analyses	Demonstrate Support Resources are Adequate to Meet Readiness Objectives	Conduct Should Cost Analysis	Monitor Cost Performance in Field
Plan Analysis of Support Cost and Readiness	Identify Logistics Parameters that Drive Readiness and Support Costs	Identify Cost Risks/ Cost Drivers	Reduce Cost Drivers and Resolve Cost Risks at Subsystem Level	Insure Contractor Utilizes Value Engineering to Reduce Total Cost	
Develop Cost Driver Identification Plan	Demonstrate Affordability	Update LCC Based on Logistics Plans, Design and ILS Test Results	Demonstrate Affordability	Use LCC to Monitor Contractor	
	Participate in Tailoring of LSA/LSAR Tasks to Support LCC Activities in Later Phases	Develop Contractor Cost Reporting Plan	Conduct Tradeoff Analyses		
		Demonstrate Affordability			
		Review LSAR Requirements			

*Derived from relevant DoD and service regulations, especially DoDD 5000.1, 5000.4, 5000.39, and 4245.3

Figure 6-5 Time Phasing of DoD LCC Activities value engineering, producibility engineering, alternative operations and maintenance concepts, increased use of commercial equipment, and industrial modernization incentives) are considered to keep costs at or below stated goals (DoDD 4245.3). These activities must be incorporated in the cost analysis program to provide the engineers and logisticians with the cost implications of their alternative design and support concepts. Cost reduction alternatives must be considered as early as possible in the CE phase because this acquisition stage offers the greatest opportunity to reduce LCC.

6.3.5.3 Demonstration/Validation Phase. The system risk areas should be identified in the DVAL phase. The cost analysis tasks will include tradeoff studies which were planned and outlined in the CE phase, as well as additional studies identified as design activities progress. The cost analyst must also develop a schedule for cost analysis to be performed during FSD, and develop a plan for the contractor to submit Cost/Schedule Control System Criteria (C/SCSC) reports. (See Figure 6-5).

The cost analyses performed in this phase must provide credible estimates of the relationships of acquisition vs. O&S cost for changes in logistics support as well as design alternatives. The results of these cost tradeoff analyses are most useful when the estimate provides sensitivity data that includes the cost range or exposes the cost risk areas associated with the engineering or support alternatives.

By Milestone II, DTC goals should be established for acquisition cost. The acquisition DTC goals should be in terms of unit production cost, based on total planned quantity at defined production rates and for procurements planned for the first three years following FSD. DTC parameters for O&S costs should be in terms of design-controllable factors (such as specific fuel consumption or field reliability) which are measurable during test and evaluation, as well as deployment. The PM must plan to develop O&S costs based on a model of the system operational scenario which is derived from consultations with the user community.

In the DTC process, there is usually a tradeoff of acquisition vs. O&S cost, such as illustrated in Figure 6-6. The graph indicates that, for a particular component, improved reliability results in increased acquisition cost but decreased O&S cost. Since the ILS objective (DoDD 5000.39) is to achieve system objectives for an economical LCC, the reliability that is sought by design activity is in the range of minimum LCC. There is an economic and a technical limit in designing reliability improvements, but theoretically the PM development strategy will result in the balance of acquisition and O&S cost that produces minimum LCC. By determining the minimum LCC, the PM also identifies the supporting Design to Unit Production Cost (DTUPC) and O&S cost goals for design trade off studies.

6.3.5.4 Full Scale Development Phase. By this stage, sufficient LSAR data is becoming available to support cost analyses at the subsystem and even the component level. LSAR data is particularly helpful in estimating two of the largest O&S costs: spares and manpower. The LSA records contain estimates of maintenance manhours, repair parts consumption rates, and requirements for support equipment, training devices, and facilities. Management of LCC also requires that explicit plans be developed for cost analysis updates during the subsequent Production and Operating and Support phases. (See Figure 6-5).

LCC for each piece of equipment may be estimated discretely, with the system LCC being an aggregation of all of these equipment estimates. During FSD, the LCC analysis must address the risks uncovered during the previous phase by quantifying their potential cost impacts and ultimately demonstrating their affordable resolution. The cost estimates during FSD should be relatively more accurate because they typically address more detailed issues and in particular may become a significant factor in the production decision.

6.3.5.5 Production Phase. In the Production Phase, LCC shifts toward contract monitoring, cost analysis of product improvement proposals and "should cost" analysis

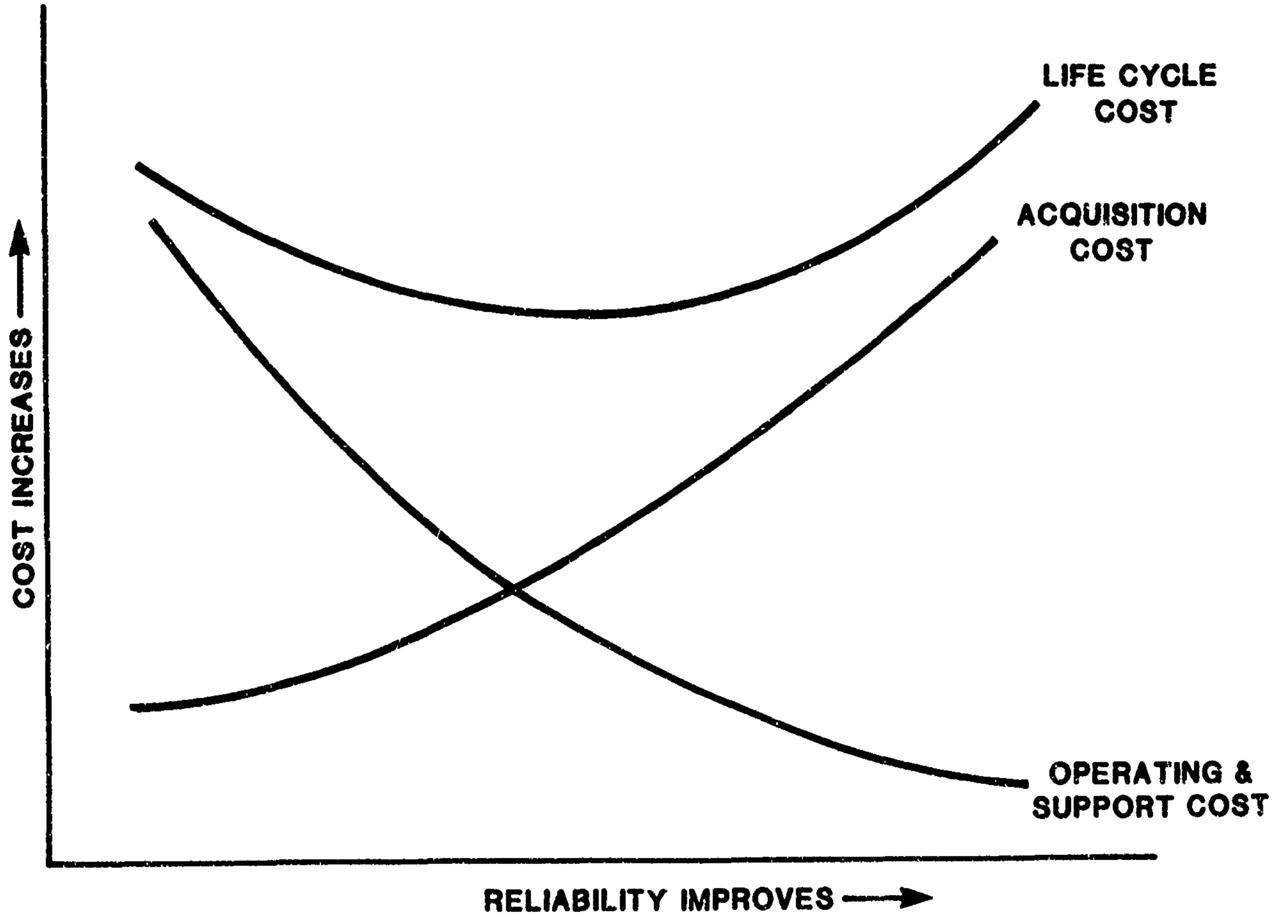

Figure 6-6 Life Cycle Cost and Reliability Tradecff

(See Figure 6-5). Cost analyses of design changes and major modifications is in many ways the most technically complex task for the analyst. The analyst must obtain sufficient definition of the proposed change to establish a credible estimate of LCC impact in time to influence the Engineering Change Proposal (ECP) approval process.

The "should cost" analysis is a contract pricing method that is intended to challenge a contractor's cost proposal, supporting data, and rationale, as well as establish the Government's negotiating objectives. "Should cost" analysis, when used, incorporates a comprehensive audit and assessment, including pricing, engineering, and management analysis of the contractor's system engineering, manufacturing, program management, and subcontracting operations. The negotiating objectives are based on the "should cost" projection derived from the in-depth review of the contractor's method of operation; thus, reflecting what an item "ought to cost" based on achi :ab'e efficiencies, economies, and reasonable overall management of contract performance.

6.3.5.6 Operation and Support Phase. The LCC activities for the Operation and Support phase utilize the maintenance data collection and cost data bases to monitor the cost and performance of the deployed system, and to develop cost baselines for product improvements or proposed new systems (see Figure 6-5).

6.4 RISK MANAGEMENT

6.4.1 Lack of LCC Impact on Design and Logistics Support Process

6.4.1.1 Risk Area. LCC analysis is m st effective when it is integrated into the engineering and management process that makes design and logistics engineering choices. This integration must start with program initiation. Once the ability to influence design is lost, it is very difficult and always more costly to re-establish. Most performance and schedule risks have cost impacts. Performance risks result from requirements which are very costly, or from engineering requirements beyond forseeable technical capabilities for hardware development. The result can be increased cost from design, development, and test of a replacement item; contract termination costs; increased program buy; and increased O&S costs. Schedule changes can increase costs whether they are shortened or lengthened.

6.4.1.2 Risk Handling. The following strategies can maximize LCC influence on the design and logistics engineering choices and minimize the cost consequences of performance and schedule risks.

- o PM must require Government engineers, cost analysts and logisticians to work together to prepare joint management recommendations such as:
  - Source selection criteria
  - Contract incentives and award fees
  - Design to Cost program
  - Cost and engineering deliverables
  - System Requirements for Statement of Work (SOW) in Request for Proposal (RFP)
  - Requirements for Logistics Support Analysis and Logistics Support Analysis Records.
- o PM must encourage contractor designers, logisticians, and cost analysts to work together by requiring a DTC program with deliverables scheduled starting in the CE phase.
- o The Government and the contractor must identify cost drivers early and challenge system requirements that are cost drivers.
- o PM must establish broad performance requirements in the RFP SOW to allow maximum design tradeoff opportunities.
- o PM must require early LCC analyses as deliverables from system contractors. Require the cost studies to have design engineering participation and system engineering approval.
- o PM must set realistic DTC goals for both acquisition and O&S cost drivers, and assign these goals to design managers.
- o PM must determine readiness and cost drivers to influence the design to reduce O&S costs and balance O&S with development and acquisition costs.
- o PM must require trade-off studies to find low risk alternatives among cost, schedule, and performance considerations.

6.5 SUMMARY

- o Objective of ILS program is to achieve the system readiness objective at affordable LCC.
- o By Milestone II, about 85% of LCC is effectively established because of early design and logistics choices.
- o Largest LCC contributions are acquisition and O&S costs.
- o LCC cost estimates can influence design and logistics choices through tradeoff studies and the Design-to-Cost Program.
- o Early identification of cost and readiness drivers must influence design to control O&S costs.
- o Cost analysis program must be carefully planned and managed to provide timely support to the PM.

- o Many specific PM actions can be taken to enhance the effectiveness of LCC contributions to achievement of system goals.

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10. AFR 173-11, Independent Cost Analysis.
11. AFR 600-11, Life Cycle Cost Management Program.

CONTENTS

CHAPTER 7

LOGISTICS SUPPORT RESOURCE REQUIREMENTS

7.1 HIGHLIGHTS

- Use of Logistic Support Analysis (LSA) to Define ILS Resource Requirements.
- Determining Quantitative Logistics Requirements to Attain Readiness Objectives.
- Data Inputs, Unique LSA, Time Phasing Issues, and ADP Output Reports Associated with each ILS Element.
- Managing Logistic Support Resources for Accelerated Acquisitions.

7.2 INTRODUCTION

7.2.1 Purpose

To provide a managerial overview of methods to determine the logistic support resources (i.e., the ILS elements) required to achieve system readiness objectives.

7.2.2 Objective

The primary objective of any new materiel system is to provide a needed military capability at an affordable life cycle cost. Readiness is one of the principle determinants of military capability. The objective of the activities described in this chapter is to define the logistics resources needed to support system operational performance and to achieve peacetime and wartime readiness objectives.

7.3 MANAGEMENT ISSUES

7.3.1 Support of Operational Performance

Logistic support resource requirements are driven by the system operational reliability and maintainability (R&M) characteristics and the readiness and supportability objectives established early in the Concept Exploration (CE) Phase. As shown in Figure 7-1, the system operational R&M characteristics are determined by the design characteristics of the system, the projected operational role, and the operational support the system will receive in its operating environment. The operational support consists of the trained manpower, spares and support equipment, technical manuals, embedded computer systems, facilities and budgeted resources that directly support the operational performance of the system.

7.3.2 Attainment of Readiness Objectives

Readiness & supportability objectives take explicit account of the effect of system design R&M, the characteristics and performance of the support system, and the quantity and location of support resources. Figure 7-1 depicts these relationships.

Attainment of readiness objectives requires the application of logistic support to restore materiel systems to ready status when failures occur. The ILS elements are partly unique to the materiel system and partly a characteristic of the overall support structure for all materiel systems. The unique elements (maintenance manpower, spares and repair parts stockage, special support equipment, and additional quantities of common equipment) can be designed or selected to achieve a specified system readiness level. The effectiveness of common support elements can be quantified using parameters such as order and ship time and fill rate. These parameters should be based upon the demonstrated and projected performance of the common support structure. Given target or measured values of operational reliability and maintainability and the parameters describing the effectiveness of logistics support, computer simulations may be used to model the attainability of a readiness objective (refer to paragraph 10.3.4).

Sustaining wartime readiness adds the dimensions of combat exposure and duration to the peacetime measure of readiness. Wartime readiness objectives usually take

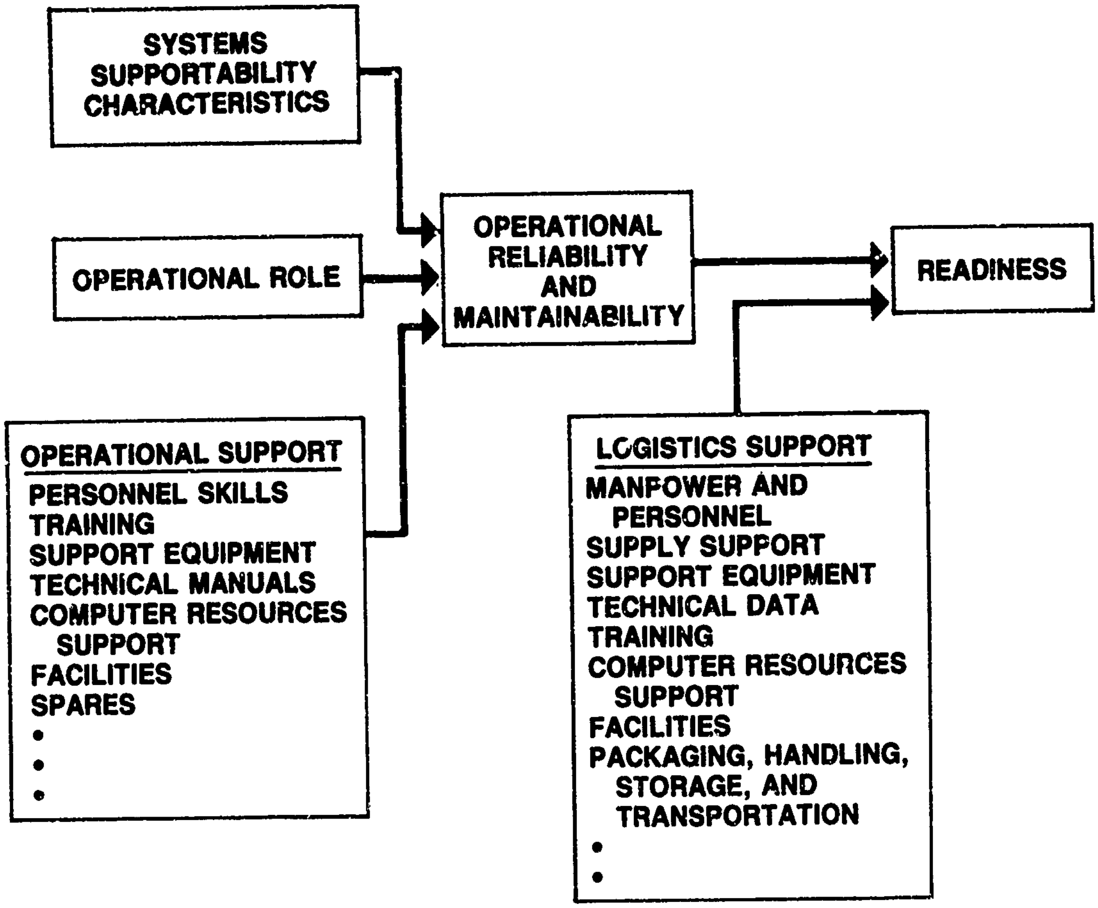


Figure 7-1 ILS R&M Readiness Relationships

the form of a specified level of operational availability over a postulated duration and intensity of combat. Clearly, wartime requirements for manpower, supply support, and transportation are substantially greater than peacetime requirements due to higher utilization rates and exposure to combat damage. For example, an M-1 Abrams tank which might fire twenty training rounds per year in peacetime, could fire three times that amount in a single day of high intensity combat. Additional considerations for combat sustainability are listed in Figure 7-2.

7.3.3 Analytical Techniques

LSA employs a number of analytical techniques. Those techniques which apply to the determination of resource requirements for two or more ILS elements are Failure Modes Effects and Criticality Analysis (FMECA); Repair Level Analysis (RLA); Reliability Centered Maintenance (RCM) Analysis; Maintenance Task Analysis; and Survivability Analysis. These five topics are addressed below:

7.3.3.1 Failure Modes Effects and Criticality Analysis. The FMECA is an essential function in the design process that provides input to the identification of functional requirements (LSA Task 301). The principal purpose of FMECA is to identify potential design weaknesses through systematic consideration of: the likely modes in which a component or equipment can fail; causes for each mode of failure; and the effects of each failure (MIL-STD-785B, "Reliability Program for Systems and Equipment, Development and Production" and MIL-STD-1629A, "Procedures for Performing a Failure Mode, Effects and Criticality Analysis"). The FMECA should be initiated during the CE Phase as soon as preliminary design information is available at the higher system levels and should be extended to lower levels in later acquisition phases as

ILS ELEMENT	SUSTAINABILITY CONSIDERATIONS
Maintenance Planning	o Evaluate impact of battle damage assessment and repair on logistic support
Manpower & Personnel	o Assess impact of higher wartime system utilization and requirements for battle damage assessment and repair, and the impact of personnel casualties
Supply Support	o Compute wartime consumption rates (parts, POL, ammunition); develop war reserves and combat supply support stockage; assess industrial preparedness; address cannibalization of parts from battle damaged systems
Technical Manuals	o Incorporate instructions for battle damage assessment and repair
Training	o Develop training requirements for battle damage assessment and repair and support increased need for replacement of trained personnel
Transportation	o Evaluate inter-theatre, intra-theatre, and battlefield recovery and transportation requirements

Figure 7-2 Sustaining Wartime Readiness

more information becomes available. Its first purpose is the early identification of catastrophic and critical failure possibilities so that they can be eliminated or minimized through design correction.

The results of the FMECA also provide input to:

- o Identification of requirements for corrective maintenance.
- o Performance of Reliability Centered Maintenance (see below).
- o The development of troubleshooting procedures in technical manuals/orders.

7.3.3.2 Repair Level Analysis. RLA is a technique which establishes whether an item should be repaired and at what level of maintenance. RLA is addressed in Paragraph 3.3.5.1

7.3.3.3 Reliability Centered Maintenance. The purpose of an RCM analysis is to identify the essential preventive maintenance tasks required to retain the safety and reliability inherent in system design. The requirement to perform RCM is contained in DoDD 4151.16, "DoD Equipment Maintenance Program". Each Service has developed procedures for its application. General application guidelines have been developed by United Airlines under contract to the Department of Defense ("Reliability-Centered Maintenance", F. Stanley Nowlan and Howard F. Heap, 29 December 1978). In addition, MIL-STD-1388-2A contains provisions for recording the results of RCM analyses.

FMECA (discussed above) provides an essential input to RCM analysis. Failure modes that impact safety or mission performance or which require costly repair are identified as candidates for preventive maintenance tasks. Task selections include crew monitoring procedures, scheduled inspection procedures, and (when justified by a demonstrated statistical relationship between failure probability and accrued usage) a scheduled replacement or repair procedure. The application of RCM results in:

- o Identification of failure modes requiring additional design evaluation.
- o Establishment of scheduled preventive maintenance tasks for inclusion in technical manuals/orders.
- o Establishment of overhaul selection procedures for end items and components.

7.3.3.4 Maintenance Task Analysis. Maintenance task analysis consists of a detailed analysis of the operation and maintenance tasks required for a new system. The specific objectives of this analytical activity are to:

- o Identify logistic support resource requirements for each task.
- o Identify new or critical logistic support resource requirements.
- o Identify transportability requirements.
- o Identify support requirements which exceed established goals, thresholds, or constraints.
- o Provide data to support the development of design alternatives to reduce O&S costs, optimize logistic support resource requirements, or enhance readiness.
- o Provide source data for preparation of required ILS documents (technical manuals, training programs, etc.).

Task analysis breaks each maintenance task into specific subtasks in order to identify skill requirements, elasped time, task frequency, personnel required at each maintenance level, and character of the repair action (adjustment/alignment, inspection, overhaul, trouble-shoot, etc.). The Government should require the contractor to perform selected high pay-off task analyses during the Demonstration and Validation (DVAL) Phase. All task analyses should be completed during Full Scale Development (FSD). Task analyses of proposed design changes will be required during all phases.

LSA Task 401 "Task Analysis" addresses the specific inputs, analytical requirements, and outputs of maintenance task analysis. In addition, "Logistics Engineering and Management", by B. Blanchard has an excellent discussion of maintenance task analysis.

7.3.3.5 Survivability Analysis. Survivability characteristics of a system directly impact its wartime sustainability. Survivability analysis serves to influence system and component design and to identify the additional logistic support resources required to achieve the wartime readiness objectives. The frequency and severity of combat damage occurences are estimated through combat simulations and tests. Additional manpower, supply support, transportation, and skills associated with restoring a battle damaged system to ready status are then computed (refer to paragraph 3.3.5.3).

7.3.4 Developing ILS Elements

LSA is an integral part of Systems Engineering which defines, quantifies, schedules, and documents required levels of logistics support. This section provides a broad overview of the development of the ten ILS elements (DoDD 5000.39, "Acquisition and Management of Integrated Logistic Support for Systems and Equipment") with a focus on the linkage of basic source data to LSA (MIL-STD-1388-1A); to Logistic Support Analysis Records (LSAR)

(MIL-STD-1388-2A); to LSAR Output reports (Joint Service LSAR ADP System); and where applicable, to models and other studies (as displayed in Figure 7-3).

LSA data, generated by the system developer's performance of LSA, are documented in specific formats. Data records related to individual ILS elements are identified in Figure 7-3. The Government-developed Joint Service LSA ADP system is capable of extracting data recorded in automated format and producing LSA output reports to support development or selection of ILS elements (refer to Chapter 5).

7.3.4.1 Maintenance Planning. This is the process conducted by the Government and contractor to explore alternatives and to develop the maintenance concepts and maintenance requirements for the life of the materiel system. Maintenance planning is the lead analytical activity and provides input to the development of all of the remaining logistic support elements.

DoDD 5000.39 requires the development of a baseline support concept during the CE Phase and a maintenance concept and supporting analyses during DVAL. Detailed operation and maintenance tasks are identified during DVAL and FSD. Maintenance planning identifies the level of maintenance at which each task (e.g., remove, disassemble, fault locate) is performed, and where tools and equipment are required, as well as task times and frequencies.

As indicated in Figure 7-3, source data includes current characteristics of the standard maintenance system employed by the Service to support similar items in the mission area, organizational and operational concepts, and the evolving design of the system. Analytical techniques to assist in the performance of maintenance planning are described in paragraph 7.3.3 above.

The results of the analyses are documented on the LSA records identified in Figure 7-3. When employed, LSA ADP reports provide a convenient display of maintenance planning as a guide for the identification of other logistic support resource requirements. LSA-003, "Maintenance Summary", compares maintainability parameters achieved by system design to the required values. LSA-004, "Maintenance Allocation Summary", lists maintenance task allocation by such functions as test, service and replace. LSA-016, "Preliminary Maintenance Allocation Chart", provides preliminary descriptions of task allocation as analyses are performed. Finally, LSA024, "Maintenance Plan" can provide maintenance and support equipment requirements for specified components.

7.3.4.2 Manpower and Personnel. This element encompasses the identification and acquisition of military personnel with the skills and grades required to operate and support a materiel system over its lifetime at peacetime and wartime rates.

DoDD 5000.39 requires identification of manpower contraints prior to program initiation and an initial estimate of manpower requirements during the CE Phase. Initial estimates are based upon analysis of a baseline comparison system derived from a similar system or systems in the mission area (refer to paragraph 3.3.3.2). Several models are available for employment in an LSA process. For example, HARDMAN is an analytical tool which predicts quantitative manpower and personnel requirements in different skill specialty code categories.

As the system design is completed during FSD, data becomes available to enable the development of more precise manpower estimates based upon detailed task analyses. The source data identified in Figures 7-3 and 7-4 are used to identify the estimated frequency and duration of individual tasks based upon predictions, simulations, test and field data, and historical data on like and similar components. LSA techniques are described in paragraph 7.3.3 above.

Maintenance manpower requirements are recorded on the MIL-STD 1388-2A data records identified in Figures 7-3 and 7-4. The LSA ADP system is capable of displaying the recorded data in formats convenient for use in manpower computation models. LSA-001, "Direct Annual Maintenance Manhours" lists the direct

ILS ELEMENT	BASIC SOURCES	LSA	LSAR	LSA ADP REPORTS	OTHER STUDIES	COMPUTATIONAL MODEL
Maintenance Planning	o Service maintenance system o Organizational and operational concepts o Test Field and historical data o R&M Predictions	o Repair level analyses o FMECA o RCM o Task o analyses o Survivability analyses o Analysis of existing Manpower sources	A B B1 B2 C D	LSA-003 Maintenance Summary LSA-004 Maintenance Allocation Summary LSA-016 Preliminary Maintenance Allocation Chart LSA-024 Maintenance Plan		Maintenance simulation models
Manpower and Personnel Maintenance Requirements	o R&M predictions and modeling o Test data o Field data o Historical data	o Task analyses o Survivability analyses	A C D G	LSA-001 Direct Annual Maintenance Man-Hours LSA-002 Personnel and Skill Summary	o Available manhours o Indirect productive time o Battle damage simulations o COEA	Manpower models
Supply Support	o Reliability predictions and modeling o Test data o Field data o Historical data	o FMECA o RLA o Task analyses o Survivability analyses	B C D H	LSA-036 Provisioning Requirements	o Battle damage simulations o Cannibalization policy	"Spare to availability" models Sortie generation models
Support Equipment	o Lists of standard support and test equipment o GSA/DLA tool specifications	o Task analyses	B C D	LSA ADP REPORTS LSA-005 Support Equipment Utilization Summary LSA-007 Support Equipment Requirements LSA-020 Tools and Test Equipment Requirements		

Technical Data	o System functional requirements o Production documentation o Technical Manual standards and specifications o Descriptions of personnel capabilities (Target Audience)	o FMECA o RCM RLA o Task analyses o Survivability analyses	B C D H E1	LSA-015 Sequential Task Description LSA-020 Tool and Test Equipment Requirements LSA-029 Repair Parts List LSA-030 Special Tool List LSA-040 Components of End Item List LSA-041 Basic Issue Items List LSA-042 Additional Authorization List LSA-043 Expendable/Durable Supplies & Materials list LSA-050 Reliability Centered Maintenance Summary LSA-055 Failure Mode Detection Summary
Training and Training Support	o Existing personnel skills capabilities, and programs of instruction o Training devices available	o Task analyses	C D E G	LSA-01 Requirements for Special Training Device LSA-014 Training Tasks List
Computer Resources Support	o System functional requirements o Test reports o Field reports	o Post production support analysis		
Facilities	o Facilities available o Funding Constraints o Organizational and Operational Maintenance Concept	Task analyses	C D	LSA-012 Requirements for Facility
Packaging, Handling, Storage, and Transportation	Existing transportation system and capabilities	Task analyses	H J	LSA-025 Packaging Requirements Data LSA-026 Packaging Developmental Data

Figure 7-3 Development of ILS Elements

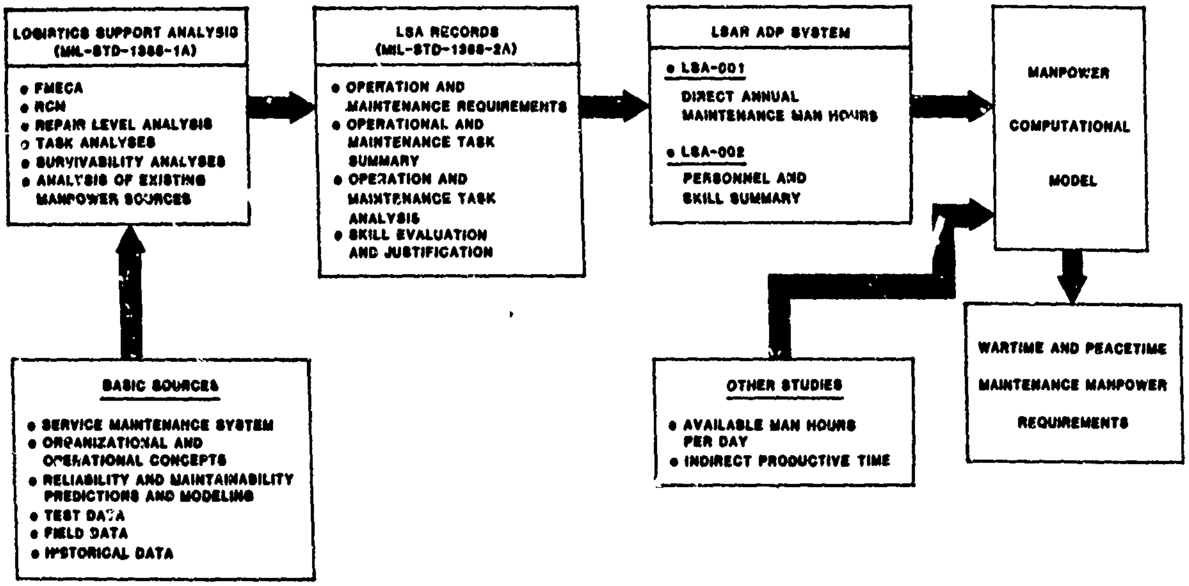


Figure 7-4 Development of Maintenance Manpower Requirements

annual maintenance manhours of each required Skill Speciality Code (SSC) at each level of maintenance. LSA 002, "Personnel and Skill Summary" is capable of identifying man-hours, time, and the required number of personnel by task, work unit code, or technical manual functional group code.

Each Service has its own procedures, manpower standards, and manpower models for converting direct annual manhours to quantitative and qualitative manpower requirements. Although the Program Manager (PM) determines the skills, tasks, and knowledge required to operate and support the new system and the time required to maintain it at each maintenance level, the manpower personnel and training communities convert these into the quantitative manpower requirements. PMs and their staffs should be familiar with and assign individual responsibilities for participating in their Service's manpower computation procedures.

7.3.4.3 <u>Supply Support</u>. Supply support encompasses all actions required to identify and obtain the spares and repair parts needed to support peacetime and wartime readiness objectives. The input data listed in Figure 7-3 are used to determine the anticipated interval between replacement of the items based upon initial predictions, simulations, test and field data, and historical data on like and similar components. The LSA tasks identify the mission criticality of parts (FMECA), stock levels (RLA), peacetime and wartime replacement rates and provisioning technical documentation (task analysis), and estimates of part failures due to battle damage (survivability analysis). Data elements in MIL-STD-1388-2A can support all required provisioning actions. The current edition of MIL-STD-1388-2A has superseded MIL-STD-1552A, "Provisioning Technical Documentation, Uniform DoD Requirements For". LSA ADP Report LSA-036 "Provisioning Requirements" can provide all provisioning list deliverables cited in MIL-STD-1561, "Uniform DoD Provisioning Requirements". Replacement rates related to battle damage may be included in LSA/LSAR procedures or developed by separate battle damage simulations.

"Sparing to availability" is the term generally applied to models that compute stockage levels (items and quantities) required to support peacetime and wartime readiness levels. For example, the Army employs the Selected Essential-Items Stockage for Availability Method (SESAME) model to compute the stockage of spares and repair parts needed to achieve an established system availability target. The

ILS Manager should understand the computational methodology and assume direct responsibility for supply, maintenance, transportation, and procurement performance parameters employed in the model. "Sparing to availability" models simulate multi-echelon supply support from wholesale stockage points (e.g., Defense Logistic Agency supply centers, Service depots, contractor warehouses) to the ultimate user. The ultimate user may be a high priority operational unit in a distant country or at sea location. The ILS Manager must ensure that order and ship time, fill rates, maintenance turn around times and other parameters employed in the model realistically portray the impact and interaction of the supply, transportation, maintenance, and procurement systems.

Selected supply support LSA studies are performed starting in the DVAL Phase. All required studies and documentation should be completed during FSD. Computation and total provisioning requirements should be completed based on a stable design prior to the transition to production. Updates to reflect design changes and field experience will be required in all phases.

7.3.4.4 Support Equipment. The support equipment element encompasses all equipment required to support operation and maintenance of the materiel system. This includes ground handling equipment, tools, metrology and calibration equipment, test equipment, and logistic support for the support equipment.

Support equipment standardization studies and the determination of developmental requirements for new support equipment are performed during the CE Phase (refer to paragraph 3.3.3.4). The input for the standardization studies are lists of existing equipment employed in the mission area and broader lists of standard support equipment and tools maintained by the Services, the Defense Logistics Agency, and the General Services Administration (Figure 7-3).

By the beginning of FSD, special and standard support equipment should have been identified by prior trade-off studies. At this point, detailed task analyses and documentation are performed to identify the specific equipment requirements for every operating and maintenance task. The LSA ADP reports identified in Figure 7-3 support determination of quantitative requirements for the selected items.

Development and support of Automatic Test Equipment (ATE) has become a major cost area for each of the military Services. Substantial progress has been made in recent years in limiting the proliferation of ATE for developmental material systems. Each Service has developed standard or preferred ATE or a family of ATE and has established a central office to critically review requests for waivers. The responsible central activities are PM, Test Measurement and Diagnostic, U.S. Army Communications-Electronics Command; HQ, Air Force System Command, DCS for Product Assurance and Acquisition Logistics; and the U.S. Navy Space and Naval Warfare System Command, Attn: Code OAT.

Standardization of the software employed to automate test procedures offers additional opportunities for cost reduction. The Office of the Under Secretary of Defense Research and Engineering, working with the Services and industry, has established C-Atlas 716 as the standard programming language for ATE test programs. Each of the Services has established capabilities to manage contractor software development and to update and maintain programs employing this standard language.

7.3.4.5 Technical Data. Technical data encompasses all recorded information of a scientific or technical nature related to a program. Technical data are written instructions such as drawings; operating and maintenance manuals; specifications, inspection, test and calibration procedures; and computer programs which guide personnel performing operations and support tasks.

System functional requirements and design and production documentation are sources of technical data. Technical manual standards and specifications describe format, content, and style requirements. Training activities within the Services identify skills and reading comprehension levels of the target audiences. Technical instructions are developed by performance of logistic support analyses listed in Figure 7-3 and recorded on the data records identified. FMECA identifies corrective maintenance actions and troubleshooting guidance. RCM determines scheduled maintenance tasks. Task analyses identify specific procedures and skill requirements. Survivability analyses help identify battle damage assessment and repair procedures. The data provided by each of these analyses is utilized in technical manual development.

The LSA ADP system is capable of displaying extensive data to support preparation of technical manuals. Some output reports (LSA-029 "Repair Parts List", for example) are produced directly in the military standard format for technical manuals.

Scheduling the delivery of technical data is a critical PM challenge. Preliminary technical manuals must be available by late DVAL to support operational test and evaluation and training activities. A formal validation and verification procedure must be scheduled and executed to ensure the quality of technical manuals. This is often conducted as part of the OT&E program and must be included in the Test and Evaluation Master Plan.

7.3.4.6 Training and Training Support. This element encompasses all of the processes, procedures, techniques, training devices and equipment used to train personnel to operate and support a materiel system. Examples include individual and crew training; new equipment training; initial, formal and on-the-job training; and logistic support planning for training equipment.

Inputs to planning for training requirements include constraints imposed by the present logistic system. Compatibility with existing personnel skills, programs of instruction, and training equipment can minimize training costs. DoDD 5000.39 specifies that detailed descriptions of current and projected skill and training resources will be developed during the CE Phase.

The LSA process, through task analysis, serves to identify training and equipment requirements at the task level during DVAL and FSD. The system developer or Service test organization is responsible for the training of operating and maintenance personnel that participate in OT&E during FSD. These initial training procedures and equipment should be representative of that which will be employed during the operational phase.

The outputs of the ADP system include LSA-01, which lists requirements for special training devices and LSA-014, which details training tasks. These in turn are used to guide budget development and technical and training manual development, respectively.

7.3.4.7 Computer Resources Support. Computer resources support are defined as all computer equipment, software, associated documentation, contractual services, personnel, and supplies needed to operate and support an embedded computer system.

The increasing complexity, expanding use, and high life cycle costs of embedded computer software demand management attention to configuration control and status accounting of the software. Standardization policies adopted by DoD, such as the mandated utilization of ADA as the standard embedded computer higher order language, are intended to help control life cycle costs. Areas of special concern for the ILS Manager include: (a) fault-detection and fault-isolation capabilities of embedded diagnostic systems (b) ability of maintenance personnel to differentiate between hardware and software deficiencies, and (c) management of software modification during the operational phase of the materiel system. The ILS Manager should ensure that diagnostic programs are fully evaluated during OT&E and deficiencies corrected prior to deployment. Support of embedded computers should also be addressed in the Post Production Support Plan.

7.3.4.8 Facilities. Facilities encompass those real property assets required to support the materiel system, and the studies which define types of facilities or facility improvements, locations, space needs, etc. The objective of ILS facilities planning is to assure that the required facilities are available to the Government test organizations, operating forces, and supporting activities at the time they are needed. Facility planning requires support management attention throughout the acquisition process. A minimum of five years is normally required from initiation of the POM process until the usable facility is in place. In the case of NATO facility acquisition, the lead time can be even greater. Because of this long acquisition cycle, the need for new facilities must be recognized early in the system life cycle. During the CE Phase, space and equipment demands are analyzed to determine gross facility requirements. Where existing facilities are deemed inadequate, new facility requirements are developed. A particularly difficult scheduling problem is the approval , design, and construction of any new facilities required to support testing activity. These facilities must be defined early in the CE Phase if they are to be available when required.

Inputs to facility requirements planning include existing facility data, projected space availability, facility funding constraints, and projected operational and maintenance concepts. Existing facility data includes information on other Service depot facilities. The Depot Maintenance Interservicing Program, under the authority of the Joint Logistics Commanders, requires a joint service review of facility requirements for new systems and major changes to facilities for existing systems. The objective of this review is to determine if support can be provided on a more cost effective basis by existing capabilities within any of the Services (DoDD 4151.1, "Use of Contractor and DoD Resources for Maintenance of Materiel"). The only justification that can be used to reject other Service capabilities is that retention of Service support is absolutely critical to that Service's mission.

LSA data record F is used to document the description and justification of new facilities. These are summarized in the LSA-012 report, "Requirements for Facility".

7.3.4.9 Packaging, Handling, Storage and Transportation (PHS&T). This element includes the characteristics, action and requirements necessary to insure the capability to transport, preserve, package, and handle all equipment and support items.

Inputs to the PHS&T planning process are support system transportability constraints, existing packaging standards and containers, and the capability of current handling and storage facilities and equipment. Initial system transportability constraints are specified in the CE Phase, in accordance with DoD Directive 3224.1 "Engineering for Transportability", and are assessed against the capabilities of existing transportation assets. Transportability trade-offs are performed as part of LSA Task 303.2.12, to optimize the transportation concept under the identified constraints. These requirements must be approved by the appropriate military Service transportation agents. During DVAL, specific end item transportability characteristics are identified through transportability analyses conducted as part of LSA Task 401, "Task Analysis". These characteristics are then recorded in Data Record J, "Transportability Engineering Characteristics".

In the CE Phase applicable packaging and handling standards should be specified; design constraints should be established to maximize compatibility with the projected support system. Packaging design engineers should be included in the design review and approval cycle for released engineering documents. During DVAL, component design is reviewed to assure resistance to damage, compatibility with existing packaging assets and to determine unique protection and handling requirements. Dimensional, special handling, storage, and shelf life data are recorded in LSAR data record H. A special handling list can be developed and distributed to facilitate correct handling of special items.

Outputs of the process include LSA-025 "Packaging Requirements Data" and LSA026 "Packaging Development Data".

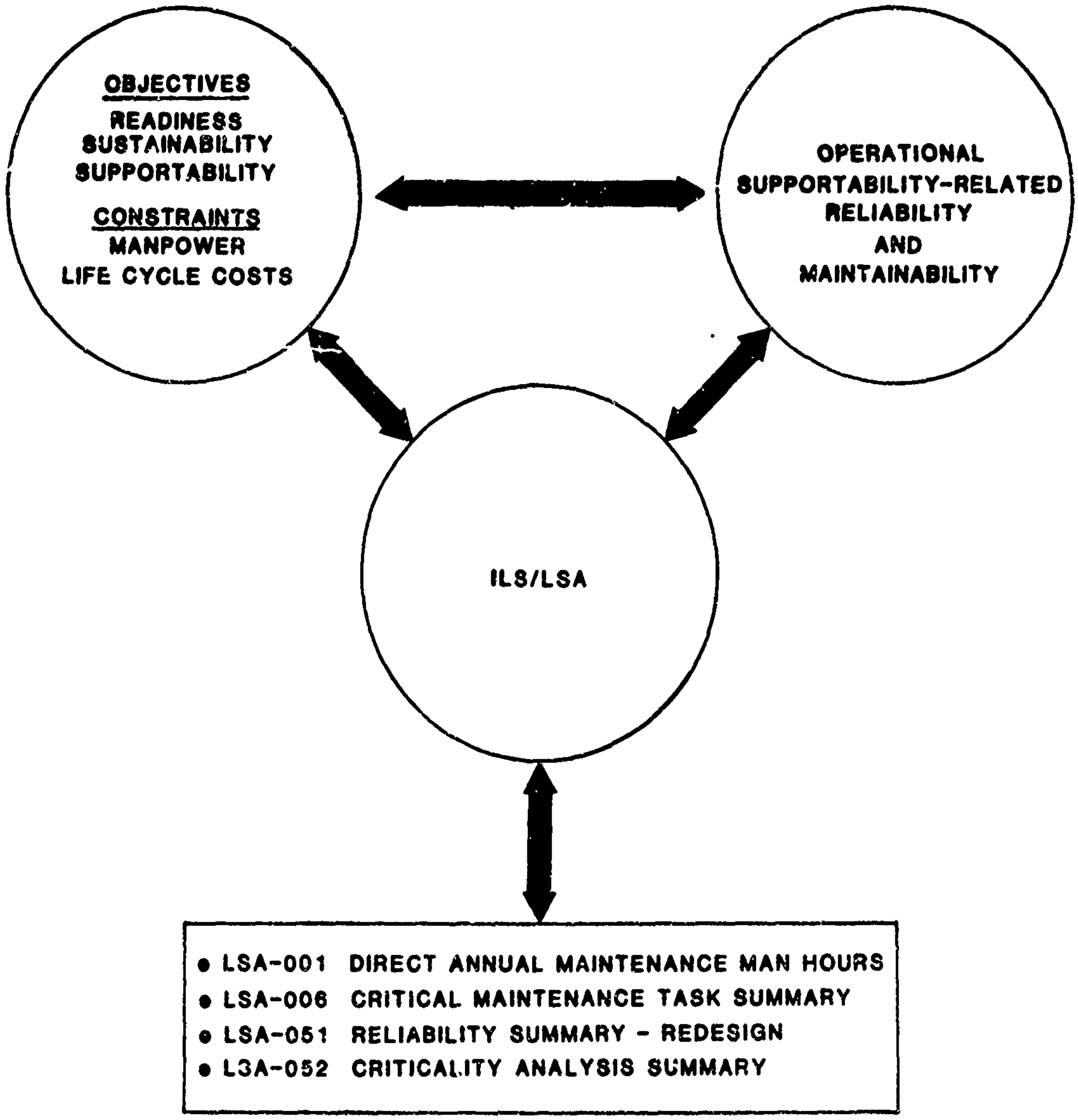


Figure 7-5 ILS System Design Relationship

7.3.4.10 Design Interface. Design interface is the relationship of logistics-related design parameters, such as R&M, to readiness and logistic support resource requirements. As portrayed in Figure 7-5, this is an interactive relationship. System readiness objectives and logistic constraints established during CE drive the design. While ILS exerts the greatest influence during this early phase, there are also opportunities in later phases. Application of LSA assists in identifying design-related shortfalls and targets for subsequent design study. This is achieved through analysis, specific LSA effort, and logistic reviews as the materiel system progresses through the acquisition cycle. The four LSA ADP reports listed in Figure 7-5 are compiled from LSAR data documented during FSD. The reports identify the need and opportunities for design changes to improve readiness and reduce operation and support costs.

- "Direct Annual Maintenance Man-hours" (LSA-001) measures the achievement of a maintenance man-hour per operating hour or similar constraint established prior to program initiation or during the CE Phase.

- "Critical Maintenance Task Summary" (LSA-006) lists maintenance tasks that exceed a specified threshold such as frequency, elasped time or annual maintenance manhours. This enables a focus on cost drivers.

- "Reliability Summary-Redesign" (LSA-051) is a compilation of problem areas annotated on LSA records during task analyses.

- "Criticality Analysis Summary" (LSA-052) lists failure modes that have the greatest impact upon system reliability and safety.

The constant review of the design interfaces assures the identification of opportunities to reduce logistic support costs and/or enhance readiness. Any design change which results from this review process must be assessed for impact on logistic support resource requirements.

7.4 RISK MANAGEMENT

7.4.1 Accelerated Programs

7.4.1.1 Risk Area. An accelerated system development program may be required to overcome a critical deficiency in an existing military capability. This "streamlining" can pose the risk of delaying design maturation with frequent configuration changes occurring in late development and possibly continuing during initial production and deployment. The added time required to modify LSA Records and update ILS elements can lead to an initial period of decreased system readiness.

7.4.1.2 Risk Handling. DoD Directive 5000.39 states ILS policies related to accelerated development programs as follows:

- ILS risks shall be fully considered in reviewing alternate acquisition strategies.

- Accelerated strategies shall place additional emphasis on supportability design requirements (such as R&M) and shall provide additional front-end funding to achieve readiness objectives within the shortened development cycle.

- When deemed necessary, interim contractor support shall be planned to avoid compressing support delivery schedules.

- Transition to Government support normally shall be scheduled to occur after the system design is stable, the capability to support the system has been demonstrated, and the planned ILS resources for the mature system can be delivered.

The objective during the initial deployment period is to use contractor resources to replace delayed ILS elements in a manner that attains peacetime and wartime readiness objectives. For many combat-related systems, this requires a combination of full, organic military capability within the combat zone and contractor support outside this zone. Life-of-System contractor support is often employed for training devices and administrative vehicles that are not direct participants in combat operations. Planning for contractor support should be performed concurrent with development of an accelerated acquisition strategy and documented in the Integrated Logistics Support Plan.

Reliability Improvement Warranties (RIW) can also be used in combination with contractor repair. RIW creates a contractor incentive to improve reliability while relieving government activities of the burden of the design changes. This approach was applied successfully during the first three years of production of the T700 turbine engine used in BLACK HAWK helicopters. During this period, all engines removed at unit level were returned to the General Electric Company which maintained responsibility for configuration control (design improvements) and all repair. During the RIW period, the Army established an organic depot overhaul capability and the durability performance of the engine (mean time to overhaul) improved so that it exceeded specification requirements.

7.5 SUMMARY

- o System readiness and supportability objectives established in CE are the determinants of system reliability and maintainability and the elements of ILS.

- o LSA and LSAR provide the data required to define and select ILS elements. LSAR automation facilitates compilation of the required data; However, accuracy of the data is totally dependent upon the precision of the input analysis performed by multiple technical and logistics skills.

- o Accelerated system development strategies require concurrent logistics planning. Properly designed interim contractor support is an acceptable means of handling the risks of delayed design maturation.

7.6 REFERENCES

1. Blanchard, B., Logistics Engineering and Management. Englewood Cliffs, Prentice Hall, 1981

2. DoD Directive 4151.1, Use of Contractor and DoD Resources for Maintenance of Materiel.

3. DoD Directive 3224.1, Engineering for Transportability.

4. DoD 3235.1-H, Test and Evaluation of System Reliability, Availability, and Maintainability, A Primer.

5. Mil-STD 1561, Uniform DoD Provisioning Requirements.

6. Nowlan, S. and Heap, H., Reliability-Centered Maintenance, OASD (MRA&L), 29 December 1978.

MODULE III

PROGRAMMING, BUDGETING AND CONTRACTING FOR ILS

Specific ILS programming and budgeting actions are required in order that studies and analyses can be conducted in time to influence the system design and to design and acquire the system support. Contracting for ILS activities requires special skills. This module covers the ILS Manager's programming, budgeting and contracting options and responsibilities.

CONTENTS

CHAPTER 8

PROGRAMMING AND BUDGETING

8.1 HIGHLIGHTS

- Visibility of ILS Funds
- Need for Continuing Interface between Program Management and Logistics Community
- Advance Planning for ILS Program Funding
- ILS Funding in the Program Objective Memorandum (POM) and Budget Submissions
- Minimizing Risk by Realistic Planning and Budgeting

8.2 INTRODUCTION

8.2.1 Purpose

To address the Program Manager's (PM's) responsibilities to program and budget within the Planning, Programming, and Budgeting System (PPBS) for support essential to the development and acquisition of a materiel system. In addition, to address responsibilities to minimize future Operating and Support (O&S) costs consistent with operational needs and readiness goals.

8.2.2 Objective

The objective of ILS programming and budgeting is to determine support funding requirements for the materiel system, to work within the PPBS to acquire those funds, and to execute the budget consistent with readiness and supportability goals. ILS requirements and funds tracking are to be integrated into the materiel system's annual POM/budget submission.

8.3 MANAGEMENT ISSUES

8.3.1 Background/Responsibilities

The PM is responsible for the identification of financial resources for the system's logistic support. This chapter, without becoming Service specific, will provide the "how" in achieving this goal. A brief review of the PM's responsibilities to manage support funding can be extracted from portions of two key DoD directives and Acquisition Improvement Program (AIP) documents. The first is DoDD 5000.1, "Major Systems Acquisitions", which includes the procedural steps leading to formal program approval and the first opportunity to program/budget funds in support of a specific materiel system. Second is DoDD 5000.39, "Acquisition and Management of ILS for Systems and Equipment", which establishes resource priorities to achieve readiness goals. And last is the the requirement for ILS exhibits to be part of the POM/budget submissions in accordance with the AIP and outlined in a 28 August 1984 DEPSECDEF memo to the Service Secretaries (subject: Management of Integrated Logistic Support Funding).

DoDD 5000.1, paragraph E. 4. a. states:

"Mission Need Determination. The mission need determination is accomplished in the PPBS process based on a Component's Justification of Major System New Starts (JMSNS) which is to be submitted with the Program Objectives Memorandum (POM) in which funds for the budget year of the POM are requested. The Secretary of Defense will provide appropriate program guidance in the Program Decision Memorandum (PDM). This action provides official sanction for a new program start and authorizes the Military Service, when funds are available, to initiate the next acquisition phase."

DoDD 5000.39, paragraph D. states:

"Policy. System readiness is a primary objective of the acquisition process. It is DoD policy to ensure that resources to achieve readiness receive the same emphasis as those required to achieve schedule and performance objectives

(DoD Directive 5000.1, reference (b)). These resources shall include those necessary to design desirable support characteristics into systems and equipment as well as those to plan, develop, acquire, and evaluate the support."

DEPSECDEF memo of 28 Aug, 1984, states:

"A key initiative in our Acquisition Improvement Program (AIP) has been to provide visibility in the PPBS of support funding for new weapons systems (Acquisition Initiative 30, "Management of Initial Support Funding"). Continued progress in this area will enable the DoD to assess the extent to which essential weapon system support needs are met within the Defense program. I regard this initiative as one of the most important advances in our capability to manage the readiness and sustainability of the new systems we are fielding.

I would like you to define further steps for improving our corporate ability to validate weapon system support requirements, track the associated funding explicitly in the PPBS, and manage support funding changes with full appreciation of the effects on deployment schedules and readiness objectives."

Thus, the DoD directives referenced above and the AIP, provide guidance to the PM as to "what" he must accomplish and can be summarized as:

- Identify, prior to program initiation, appropriate support resources.
- Estimate and budget realistically, and fund adequately.
- Achieve a cost effective balance between program elements.
- Address affordability, while understanding a program normally shall not proceed into concept exploration or demonstration and validation unless sufficient resources are or can be programmed for those phases.

8.3.2 Methods: Planning, Programming, and Budgeting System (PPBS)

The PPBS is the framework in which the PM must function in acquiring support resources. DoDD 7045.14, "The Planning, Programming and Budgeting System (PPBS)" describes the policy, procedures and responsibilities relating to programming and budgeting. The PM should review this document along with the annual Defense Guidance, annual Service Guidance, and standing Service procedures. In addition, the PM should thoroughly understand the annual Service programming/budgeting procedures which are likely to include events, dates, level of detail, and review group responsibilities essential to structuring the Service POM and later the Service budget.

The following brief definitions apply to the PPBS:

Planning. In this phase, the military role and posture of the United States and the DoD in the world environment shall be examined by the Joint Chiefs of Staff, considering enduring national security objectives and the need for efficient management of resources. A comprehensive annual review of all issues will culminate in the issuance of the Defense Guidance.

Programming. In this phase, the DoD Components develop proposed programs, i.e., their POMs, consistent with the Defense Guidance. These programs shall reflect systematic analysis of missions and objectives to be achieved, alternative methods of accomplishing them, and the effective allocation of the resources. A review of the Service POMs will be conducted by the Office of the Secretary of Defense (OSD) and the results issued in Program Decision Memoranda (PDM).

Budgeting. In the budgeting phase, the DoD Components develop detailed budget estimates for the budget years of the programs approved during the programming phase. A joint Office of Management and Budget (OMB)/DoD budget review is conducted; and the results are issued in Program Budget Decisions (PBDs).

Five Year Defense Program (FYDP). The decisions associated with the three phases of the PPBS are reflected in the FYDP which is updated three times a year (President's budget, POM, budget). Figure 8-1 displays PPBS phases and the overlapping cycles.

At first glance, the PPBS can appear to be difficult to understand and employ. However, several helpful hints can aid the PM in programming and budgeting adequate funds for the logistic elements of his program.

- o Work with Service Headquarters focal point.
- o Talk to other PMs about previous year POM/budget activities in your Service.
- o Determine those personnel who have leadership and decision making roles in your organization and Service's POM/budget process and understand their impact on the process.
- o Understand the content of POM/budget material being prepared by others which may impact your materiel system in any fashion.
- o Have current knowledge of all dates and formats for the submission of POM/budget data and scrupulously meet these requirements.
- o Actively interact with the personnel noted above by discussing your program's requirements and being continually aware of anything that can directly or indirectly impact program funds.

8.3.3 Logistic Activities and Funds

The many requirements contained in this handbook, when tailored to the specific needs of a particular program, represent the scope of logistic functions to be coordinated and supervised by the PM. Figure 8-2 is an abbreviated listing of those logistic functions. Although Figure 8-2 shows where these ILS functions receive emphasis, most functions actually overlap the block in which they have been displayed both in terms of timing and type of activity.

8.3.3.1 Logistic Deliverables. At the risk of oversimplification, all activities (deliverables) noted in Figure 8-2 can be classified as either materiel or services. Many times a single deliverable consists of both materiel and services e.g., the development and manufacturing of support equipment and accompanying user instructions. Taking the definitions of deliverables a step further, materiel deliverables are composed of raw materials and labor. Services are the purchase of labor hours and the use of equipment. These labor hours may produce a deliverable engineering study, a cost analysis, a plan, or software, etc. The sources of deliverables are primarily Government and industry. Therefore, through the use of administrative arrangements and task orders in the case of Government agencies, and contracting in the case of industry, the items noted in Figure 8-2 are "ordered" by the PM. The timely programming and budgeting of funds provides the means for the PM to acquire the needed logistic materiel and services listed in Figure 8-2. In addition to paying for contractual obligations with industry, these funds pay for the travel of all Government personnel on the project and the labor rates for industrially funded Government employees working in support of the PM. The following general rules apply to the PM's need to program and budget based on the category and source of the deliverable:

- o Materiel (spares, support equipment, facilities, etc.).
  - Government Furnished Equipment (GFE) (may or may not require programming and budgeting by PM for items used by his materiel system; command and program unique procedures will determine answer).
  - Contractor Furnished Equipment (CFE) (materiel items delivered as part of or in support of the

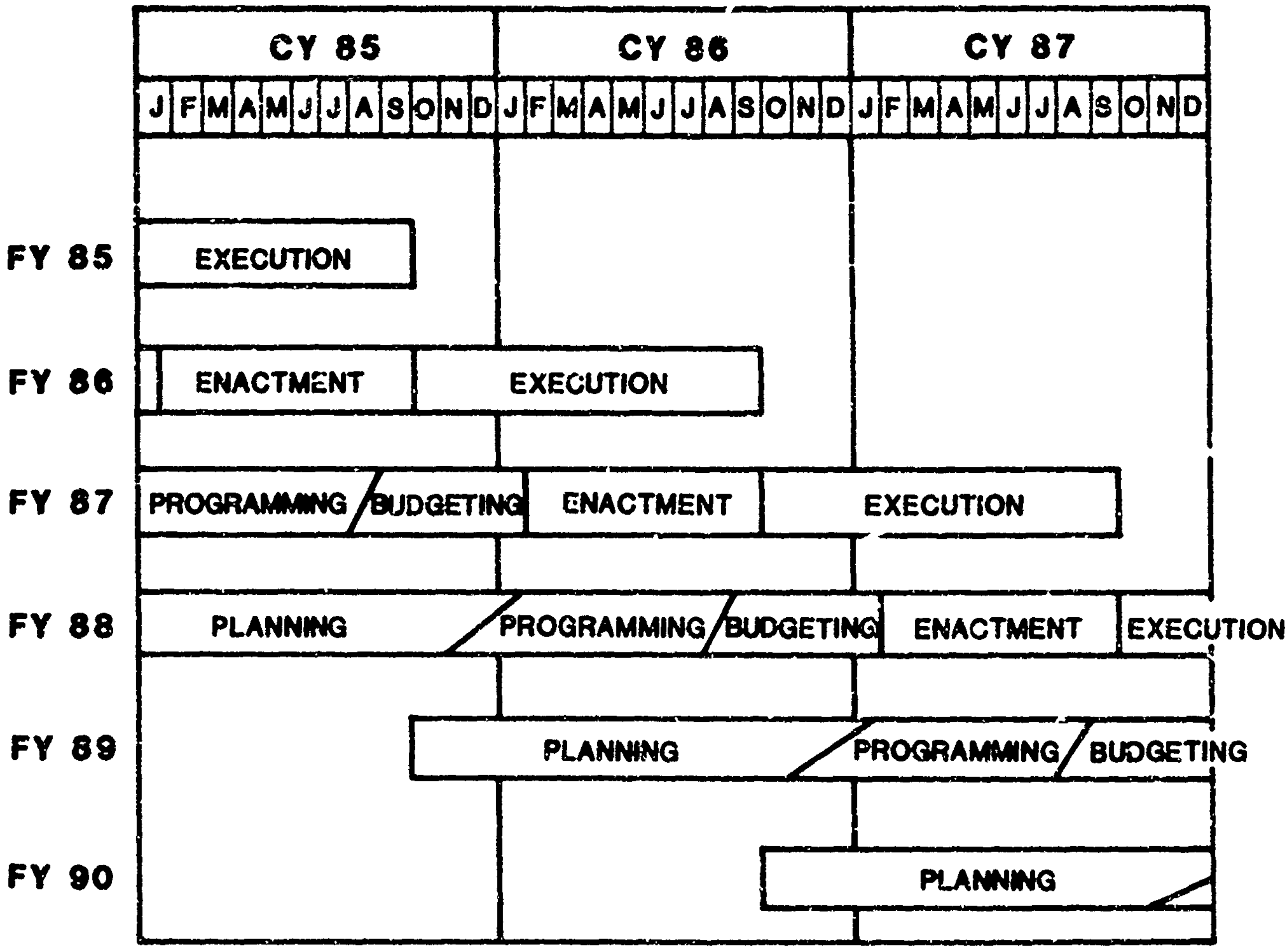


Figure 8-1 Cycle Overlap for Single Year Funds

materiel system require programming and budgeting by the PM).

- o Services (studies, plans analyses, cost estimates, etc.).

  - Government Sources:

    - o Industrially funded activities (services provided by these activities will require programming and budgeting by PM).

    - o Non-Industrially funded activities (labor hours provided by Federal Government employees will not require programming and budgeting by PM).

    - o Federal Contract Research Centers (Rand, CNA, etc., probably will not require PM programming and budgeting).

  - Industry Sources:

    - o Any non-Government source (services provided by the private sector to the Government will require PM programming and budgeting).

Figure 8-2 also displays generic appropriation information applicable to obligations planned for the various phases of a program. The lead time for programming and budgeting these funds and the obligational periods (single or multi-year appropriation) will be addressed by OSD and Service guidance.

8.3.4 Logistics, Funding, and a New Start

As previously noted, the requirement for the start of a major new acquisition program is an approved JMSNS, or other Service documents for less than major systems. By performing the analysis called for prior to program initiation in DoDD 5000.39, Enclosure 3, the PM should be prepared to make a meaningful contribution to the logistic issues that must be addressed in the JMSNS. The format for the JMSNS is contained in Enclosure 3 of DoDI 5000.2, "Major System Acquisition Procedures". However, prior to the actual preparation of the JMSNS, a lengthy process must be completed to coordinate Service sponsors, OSD interest, JCS interest, industry interest, NATO interest, issue papers, and reviews by Service leadership, all of which will require logistic support inputs from the PM. The PM may perform these analyses himself, employ his staff, or use the labor (services) sources listed in paragraph 8.3.3.1. Where funding is needed to pay for initial logistic studies, the PM should employ his 6.3A RDT&E funds if a line item has been established in the FYDP for concept analysis of the new system, an appropriate existing service program element, or perhaps 6.2 RDT&E funds if a line item has not been established.

Similar analysis is required to justify the logistic costs that will be included as part of the line item for the new materiel system in the Service POM. The PM must work closely with his Service cost estimating organizations, logistic offices, and program sponsors to ensure that the logistic area of the POM has adequate funds to perform those logistic functions essential to the early stages of a program. The POM, accompanied by the JMSNS, is submitted via Service channels to the Secretary of Defense (SECDEF). Receipt of an approved PDM constitutes permission to move ahead into the Concept Exploration (CE) Phase.

The PM should be aware of the fact that the initial problem of obtaining adequate funding during the CE Phase can be reduced by advanced planning at the Materiel Command (USA); System Command (USN); or Product Division (USAF) level. This will include programming advanced development or exploratory development funds into the mission areas that will directly support an anticipated new start.

8.3.5 Interfacing with PPBS

As noted in the Navy Program Manager's Guide, 1985 edition, the acquisition process proceeds in phases, each of which may require only a part of a budget cycle or several full cycles. Gearing the phases to the particular business and technical aspects of the program ensures that adequate in-depth reviews are conducted prior to significant commitment of resources. By contrast, the PPBS runs on a tightly structured schedule (a single cycle from start of programming through Congressional enactment) and start of actual budget execution requires about 21 months depending on the start of Service programming. It should be noted that the initial planning phase starts much earlier than shown in Figure 8-1; and that completion of the enactment process has been delayed for as long as three months beyond what is shown in Figure 8-1. However, PPBS decisions, rather than being oriented to the needs of a specific program, are keyed to the larger problem of balancing all of the programs within an individual service, DoD, OMB, and Congressional financial limits established for a particular fiscal year or the FYDP.

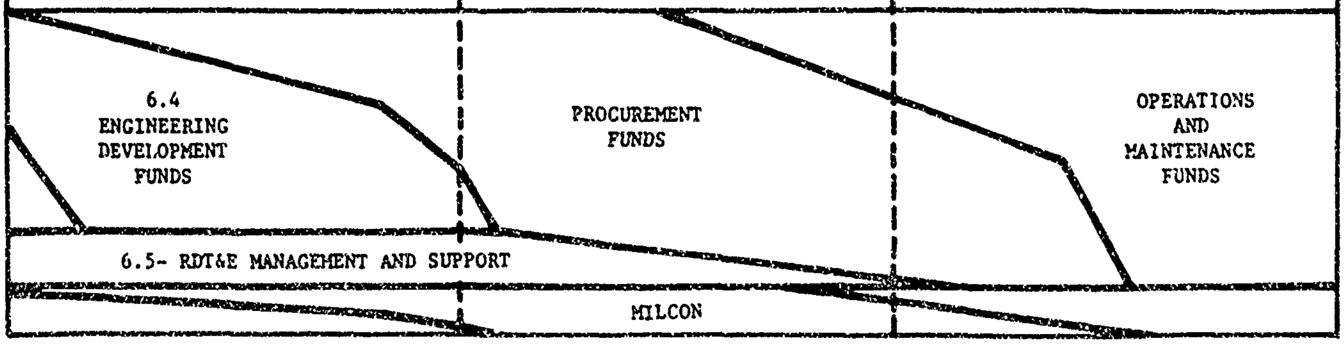
Decisions made through the acquisition process need to be reflected in the FYDP. This is accomplished either during the POM/Issue Paper/PDM process, or during the budgeting process depending on when the milestone decision is made. The PM must follow these processes carefully because his support funding is in jeopardy at each step of the programming/budgeting process. Successfully passing a milestone decision is no guarantee of full funding, and in the POM/PDM/budget process the program's logistic funding may be dropped below threshold. This tracking of a program's status is accomplished by the PM maintaining communication with the personnel noted in paragraph 8.3.2. Figure 8-3 depicts the time phasing of key PPBS events.

Top level DoD review of the POM/PDM and budget is the responsibility of the

SYSTEM ACQUISITION PHASE	PRE-PROGRAM INITIATION	CONCEPT EXPLORATION	DEMONSTRATION/ VALIDATION
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/Supportabilty Objectives • Integrate Preliminary Support Concept into System Design Criteria • Quantify Risks • Initiate P^3I Planning • Identify R&D Efforts to Reduce Support Drivers • Prepare and Document Cost and Readiness Improvement Targets • Describe Standardization Approach • Identify Logistics & R&M Parameters • Establish Baseline Support Concept to Influence Detailed Design	• Establish Firm Readiness and Support Objectives • Conduct Parallel Subsystem Testing for Supportability • Conduct Trade-off Analyses of System Design Characteristics Support Concepts • Establish Firm System Thresholds for R&M • Establish Manpower and Logistics Design Objectives
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
TYPES OF FUNDS AND WHEN OBLIGATED	6.1 BASIC RESEARCH FUNDS	6.2 EXPLORATION DEVELOPMENT FUNDS	6.3 ADVANCED DEVELOPMENT FUNDS
	6.5- RDT&E MANAGEMENT AND SUPPORT		

Figure 8-2 ILS PPBS Activities in the Acquisition Cycle

FULL-SCALE DEVELOPMENT	PRODUCTION/DEPLOYMENT	OPERATION AND SUPPORT
• Conduct Supportability T&E on Adequacy of ILS Porgram 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
• 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 P^3I



Source: This figure is based in part on the "Defense System Acquisition Process" prepared by Sanders Associates, Inc., 1984.

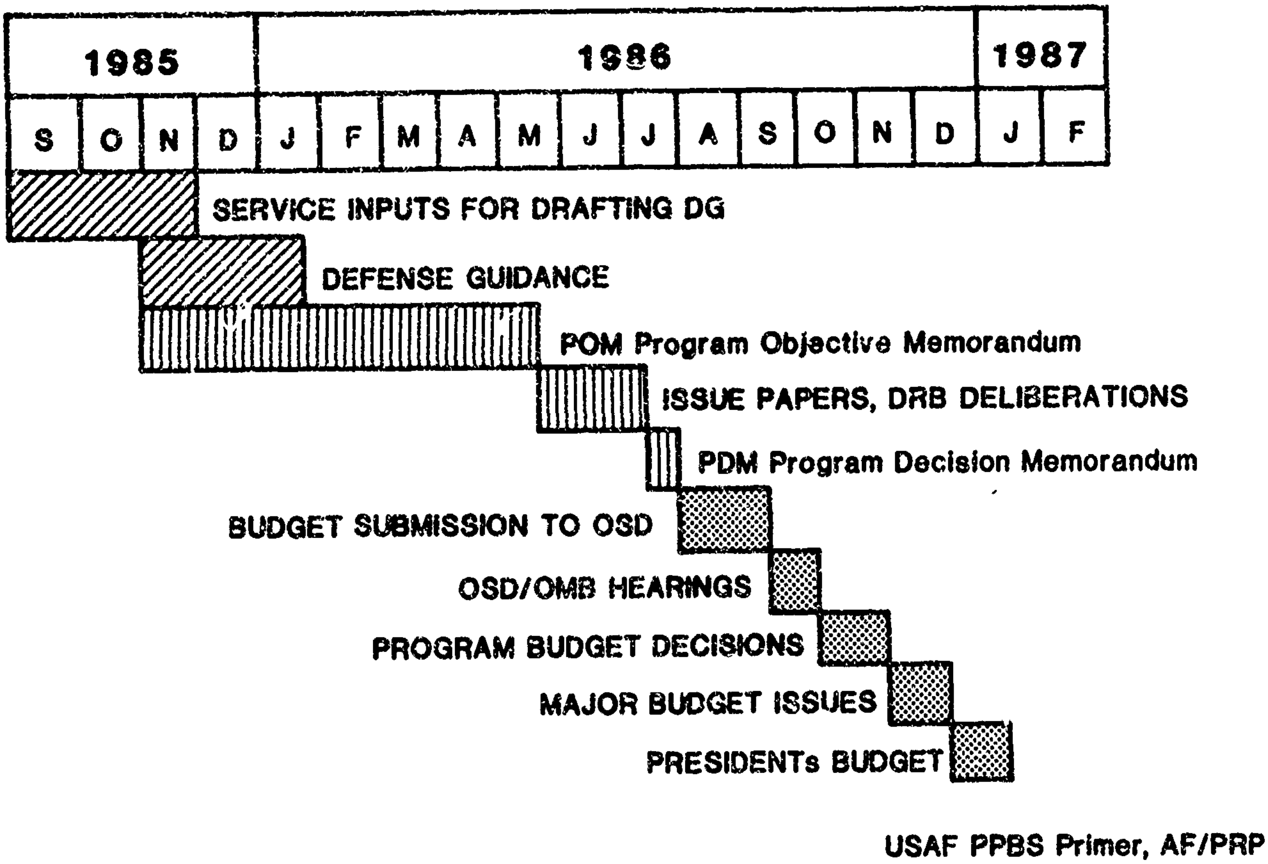


Figure 8-3 Planning, Programming, and Budgeting

Defense Resources Board (DRB). The makeup of the DRB is very similar to that of the DSARC, although the purposes of the two groups are different. The DRB review can severely impact the budgeting of major systems acquisition. The DSARC deals with a single system at a time, basing decisions on the technical progress, acquisition strategy, implementation plans, and accuracy of cost projections. By contrast, the DRB's responsibility is to advise SECDEF on the overall DoD budget. In this arena, each program must compete with all other programs (including those of other Services) for dollars. The DRB recommends a priority and ranking of programs to SECDEF.

In the event a POM or budget submittal to OSD deviates significantly from a previously approved milestone decision, this fact and the cost, schedule, and performance impact on the program are to be noted and explained in the POM or budget submittal. This includes O&S cost. For example, if the PM were to determine that future depot costs were likely to exceed original cost estimates and cause a significant increase in Life Cycle Cost (LCC), such information must be included in the next POM and budget. In addition, the PM should communicate these conclusions to his superiors and others as early as possible. However, this type of problem can be minimized or avoided if the PM will insist on, and budg t for, quality cost analysis and timely/comprehensive logistic reviews. His funding documentation must be explicit relative to lead time requirements, location of support, deployment concepts and requirements, and an assessment of the effect of any shortfalls on support schedules and readiness objectives. The POM/budget back-up documentation should be no less complete than that required in Enclosure 4 (System Concept Paper or Decision Coordinating Paper) of DoDI 5000.2, and preferably in the detail outlined by the OSD Cost Analysis Improvement Group (CAIG) guides. The analysis and documentation should support the program through the review chain up to and including Congressional hearings, and should be in sufficient detail that it can be used for decision making when decrements have been imposed by higher authority.

Since the PPBS is an annual event, and there is continuing competition by many programs for the limited funds, the PM must maintain an awareness of the status of the POM and budgeting process. He must also be prepared at any time to support his Service sponsor and program coordinator in defense of his project's funding. When responding to questions or writing reclamas, the PM and his logistic personnel must work as a unified team. Materiel Command/Logistic Research Organization and contractor support may also be helpful. Sensitivity to the perspective of the questioner is vital.

As the process moves through the POM phase, the PM should anticipate budgeting problems. He must know the probable opposition and, with the Service headquarters program coordinator, maintain a forceful dialogue with important constituencies, particularly within the respective comptroller organizations.

8.3.6 Logistics Support Funding Management

The PM's management responsibilities include budget execution, the validation of support requirements, and the tracking of support funding.

8.3.6.1 Budget Execution. The timely and efficient execution of the budget is as important as the planning, programming, and budget formulation. The PM, in coordination with each logistics element manager, must ensure that funds are obligated within the authorized time period and that they are supporting the planned logistic goals.

A primary tool in the achievement of these budget execution goals is some form of Contractor Performance Measurement (CPM). This can range from monthly one page status reports of hours and funds planned and expended by a small contractor performing studies, to a highly structured reporting system as outlined in DoDI 7000.10, "Contractor Cost Performance, Funds Status and Cost/Schedule Status Reports" and be applicable to large materiel contracts. The reports linked to DoDI 7000.10 can be costly to the Government and must be tailored to specific needs. Budget execution also requires the PM to be in regular contact with his staff, other Government offices, and his contractors to the degree that he is fully aware of current accomplishments and problems impacting logistic support activities and established program goals. He should be aware, well in advance, of any problem that will surface in the next month's CPM report.

Figure 8-4 is a generic display of the financial expenditure process within the Services. The PM enters this process with an approved Purchase Request (PR) which will allow for the assignment of a funding citation. The PM must then monitor the status of a subsequent contract, CPM reports, and the status of his obligated funds as reported to his command by vouchers flowing in the system.

8.3.6.2 Support Requirements Validation and Fund Tracking. The validation of support requirements and the tracking of associated funds through the acquisition process and annual PPBS events has always been a PM responsibility. However, a Deputy Secretary of Defense (DEPSECDEF) memo of 28 August 1984 (Management of Integrated Logistic Support Funding) addressed to the Secretaries of the Military Departments, has added renewed emphasis to the AIP and ILS validation and tracking responsibilities. The objective and scope of this memo is to:

- o Validate support requirements and track support funding for major weapon systems using procedures that will make maximum use of existing or modified Service review processes, acquisition documents, and information systems.
- o Include within three years, all major weapon systems for which Selected Acquisition Reports (SARs) are required.
- o Address seven of the ILS elements defined in DoDD 5000.39, which include the key support investment

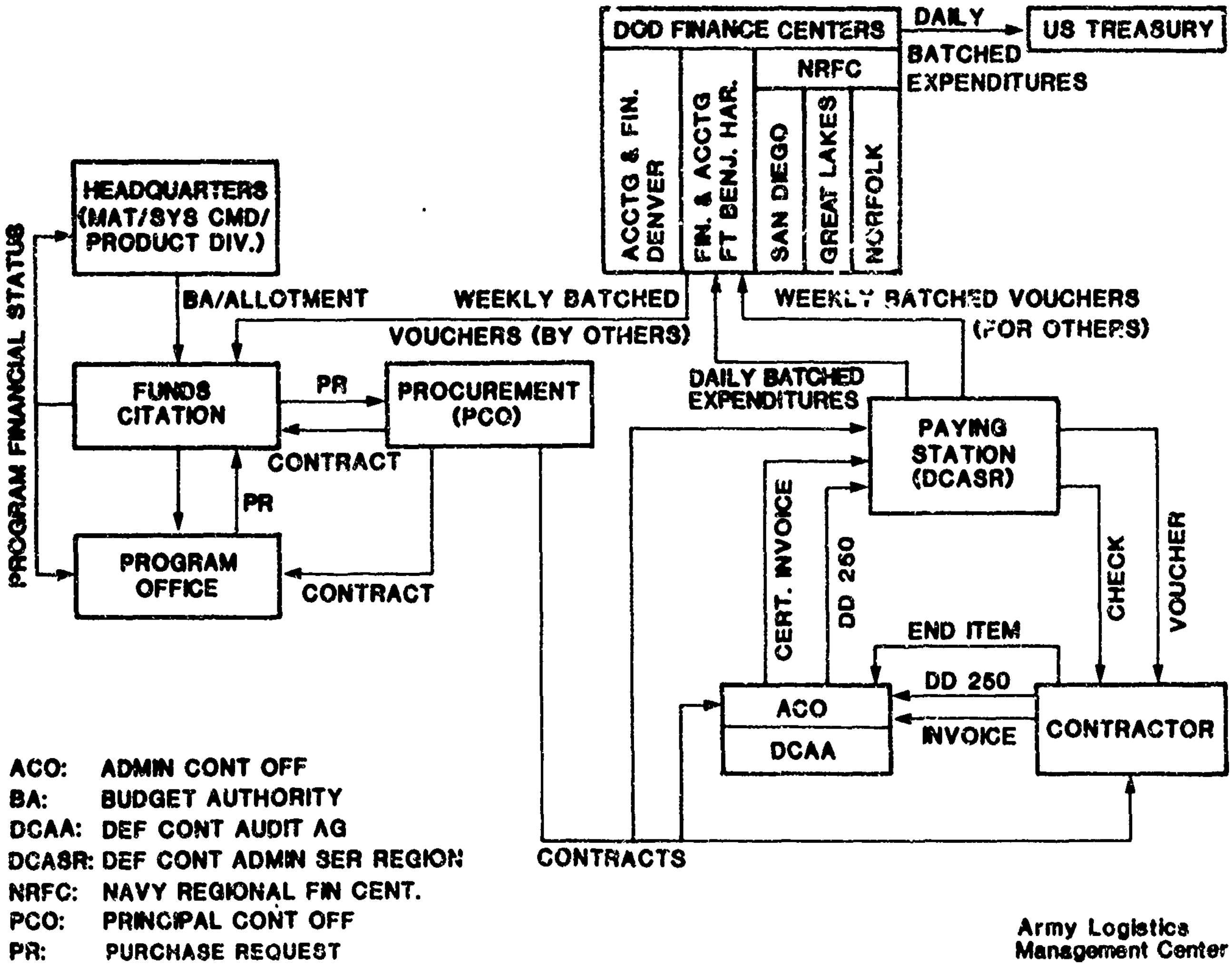


Figure 8-4 Financial Expenditure Process

and recurring support cost elements that affect weapon system deployment schedules and readiness objectives (see list below).

The memo gives recognition to the constraints in current Service programming and budgeting processes for common support accounts such as replenishment spares, depot maintenance, and common support equipment. The ability to track all essential funding in these areas by major weapon system is currently limited, but the memo notes this "is expected to evolve". The validation and tracking actions apply to POM and budget submissions, plus DSARC Milestones II and III. Service specific implementing directives should be available for review by the PM.

Validation calls for an independent Service review of the ILS resource requirements. The two essential components of this independent assessment are (1) validation of the support plans and assumptions and (2) validation of the estimated cost to carry out the support plans. If the PM participates in this effort, he should use existing or modified Service acquisition document(s) to validate support resource requirements and the key factors that drive them, and should summarize programmed funding in a format directly traceable to that used for reporting weapon support resources in POM and budget submissions, including the budget year and five program years. The methodology used to estimate requirements should be documented in appropriate backup materials.

Tracking calls for displaying funding requirements in the POM and budget, and using the seven support elements derived from DoDD 5000.39 and listed below. The PM must show that the POM and budget funding requirements are directly traceable to the validated ILS resource requirements document. The POM submittal should assess the impact of any funding shortfalls. Thus, the PM should ensure that his logistic staff work and studies always include sensitivity analyses on the impact of shortfalls and possible alternatives or work-arounds.

The support category definitions applicable to the DEPSECDEF memo and the AIP are:

1. Supply Support - Includes all initial, replenishment and war reserve spares and repair parts (both GFE and CFE) for the weapon system and its associated support equipment and training devices.

2. Support Equipment - Includes development and procurement of peculiar support and test equipment (including test program sets) and major items of common support equipment (automated test stations, handling equipment, etc.) for all echelons of maintenance.

3. Training and Training Devices - Includes development and procurement of both operator and maintainer training courses and materials, simulators and other training devices, and initial factory training.

4. Publications/Technical Data - Includes development and procurement of operator technical manuals, maintenance technical manuals for each echelon of maintenance, and other technical data (drawings, engineering and reprocurement data, etc.).

5. Maintenance and Maintenance Support - Includes the recurring cost of organic support at the depot level (labor, material and overhead), contractor support at all levels of maintenance, and maintenance support programs (e.g., Contractor Engineering Technical Services).

6. Facilities - Includes all MILCON-funded new construction and facilities modifications identified as support requirements for the new system (except production facilities).

7. Other System-Peculiar Support Requirements - May include ILS management, development/revision of support plans, Logistic Support Analysis (LSA), analysis of test and early field data, development and procurement of support-related engineering change orders and product improvements, packaging, handling, storage, and transportation, and computer resources support not included in other categories. Items to be reported will be defined for each individual weapon system, as required.

8.4 RISK MANAGEMENT

8.4.1 Funding Uncertainty

8.4.1.1 Risk Area. This subject has received top level attention and definition within DoD. The DEPSECDEF memo on "Improving the Acquisition Process" of 30 April 1981, addressed budgets and risks in what would become AIP Initiative No. 11. This memo stated in part:

> "Materiel development and early production programs are subject to uncertainties. Program Managers who explicitly request funds to address these uncertainties usually find these funds deleted either in the DoD PPBS process, by OMB, or by Congress. Then when such uncertainties occur, undesirable funding adjustments are required or the program must be delayed until the formal funding process can respond with additional dollars".

Three years later, the issue was still not completely resolved. In his AIP memo of 6 June 1984, with regard to the discussion of realistic budgeting, DEPSECDEF stated in part:

> "... the difficult problem of budgeting for risk remains unresolved".

The memo goes on to state:

> "Efforts have been made to identify and report to the Defense Resources Board (DRB) the level of funding included for

risk, whether technological, production, or other, in the Services' development and procurement budgets and program submissions. The Services, however, are unwilling to reveal management reserves for fear of Congressional reductions. While it is important that internal efforts should be made to budget for risk on a systematic, analytical basis, the Services' views of the problem seem well advised. Budget adjustments to meet requirements for risk are best accomplished internally during the OSD program budget review."

8.4.1.2 Risk Handing. The internal efforts of the Services and OSD to manage risks (as noted above) can be enhanced by the PM in advance of formal POM and budget submission dates. These risk-reducing actions should:

- o Provide organization and structure to program logistic funds by overlaying them with a Work Breakdown Structure (WBS). An accountability WBS is suggested in which the various levels of program detail are placed on one axis (fan, compressor, and turbine), and functional program structure along the other axis (manufacturing, and engineering, test).

- o Ensure all funding requirements have written justification and that cost sensitivities are understood. Data to support these items will flow from normal logistic studies initiated by the PM plus LSA activity.

- o Thoroughly understand the PPBS and rigorously comply with the requirements.

- o Stay in regular communication with the appropriate PPBS authorities/administrators within your Service. During critical periods this may mean contact several times a day with such offices.

- o Apply the methods presented in the DSMC, July 1983, edition of Risk Assessment Techniques.

8.5 SUMMARY

- o DoD policy calls for financial resources to be identified prior to the formal establishment of a program and that logistic support resources have the same priority as performance and schedule resources in the acquisition process.

- o Logistic personnel must be fully informed on the PPBS and actively participate in the process in order to satisfactorily compete for funds.

- o Logistic products are either in the form of materiels or services and logistic personnel must program/budget funds to acquire deliverables of these items from Government and industry in support of system readiness goals.

- o The logistics aspects of a new program must be integrated into the JMSNS and special efforts may be required to acquire funding to support pre-concept and concept studies.

- o Changes in the logistic program that will impact O&S cost must be immediately identified and entered into the next cycle of the PPBS.

- o Special DoD procedures have been initiated to cover logistic requirements validation and fund tracking as a part of Service POM and budget submissions.

8.6 REFERENCES

1. DoDI 5000.33, Uniform Budget/Cost Terms and Definitions.

2. DoDI 7000.3, Selected Acquisition Reports.

3. DoDD 7045.14, The Planning Programming, and Budgeting System (PPBS).

4. DoDD 7045.7, Implementation of the Planning, Programming and Budgeting System.

5. DoDD 7045.8, Procedures for Updating the Five Year Defense Program Data.

6. DoDD 7110.1, DoD Budget Guidance.

7. AR-1 Planning, Programming and Budgeting within the Department of Army.

8. AFM-172-1, USAF Budget Manual.

9. NAVCOMPTINST 7100.45A, Five Year Defense Plan.

10. DoDD 7200.4, Full Funding of DoD Procurement Programs.

11. The Planning, Programming, and Budgeting System (PPBS), A Primer, Dec. 1983, 4th Edition, USAF, AF/PRP.

CONTENTS

CHAPTER 9

CONTRACTING FOR SUPPORT

9.1 HIGHLIGHTS

- o ILS Manager's Role in the Contracting for Support Process
- o Logistics Inputs to the Procurement Package
- o Controlling Deliverable Data
- o Contract Types for Logistics Support

9.2 INTRODUCTION

9.2.1 Purpose

To provide a managerial overview of the process and techniques in contracting for logistics support.

9.2.2 Objectives

Contracting for support provides for industry resources to implement the Government's ILS strategy within the framework of contract laws and regulations. Contracting is used to acquire many or all of the following logistic deliverables from commercial sources during system acquisition: (1) ILS documentation, such as analyses, plans, designs, and reports. (2) support materials such as spares and repair parts, support equipment and software; and (3) logistics services such as training, component repair and "turn-key" support of selected equipment (e.g., training simulators) or of the materiel system under procurement (see Figure 9-1). Some of these deliverables may be the subject of a separate ILS contract; others may be part of an overall program contract. In either case, the Government's objectives are to satisfy its logistics support needs at a fair price within its legal and regulatory boundaries. Figure 9-2 identifies general Government responsibilities in acquisition program contracting. The contract itself will provide specific responsibilities for both parties.

9.3 BACKGROUND

9.3.1 Acquisition Policy, Law and Regulations

U.S. Government policy calls for heavy reliance on private commercial sources for supplies and services (OMB Circular No. A-76, "Performance of Commercial Activities"). The Federal Acquisition Regulation (FAR) and other procurement directives set forth rules and procedures for implementing this policy. These documents reflect both the basic procurement law, the Armed Services Procurement Act, and revisions enacted during the annual authorization and appropriation process. The DoD implements and expands on the FAR with the Defense Federal Acquisition Regulation Supplement (DFARS) and Service supplements.

9.3.2 Contracting Authority, Responsibility and Participation

Authority and responsibility to contract for authorized supplies and services is vested in the agency head and delegated to contracting officers. In turn, the contracting officer is responsible for ensuring that all requirements of the law, executive orders, regulations and procedures have been met prior to exercising this authority. Although contracting officers are allowed wide latitude in exercising business judgment, they must ensure that contractors receive impartial and equitable treatment, and they must request and consider the advice of specialists in program management, engineering, logistics, and other fields as appropriate (FAR 1.602-2).

The requirement which specifies that specialists, such as ILS Managers, must be involved in the contract process includes major contract events, e.g., source selection. Major contract activities such as developing the acquisition strategy for ILS are primarily the responsibility of the ILS Manager. In sum, the ILS Manager must be

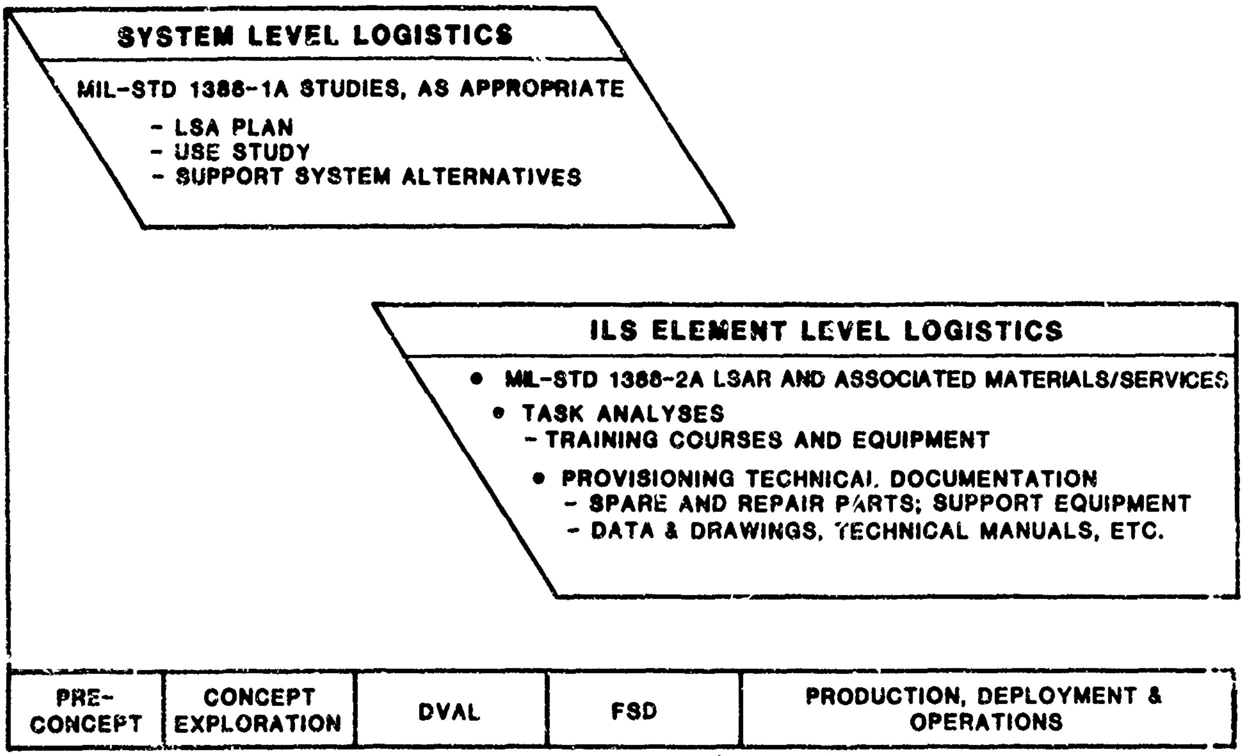


Figure 9-1 Logistics Deliverables during System Acquisition

involved in the entire contracting process from preparation of the procurement package to monitoring contractor performance.

9.3.3 The Contract Process

The primary contracting activities in which the ILS Manager may be involved include: developing the contracting strategy, planning the acquisition, recommending contract method and type, preparing the procurement package, evaluating proposals, and monitoring contract performance. These are discussed in FAR 7, 34, 35, and 37. With reference to Figure 9-2, the solicitation and negotiation/award processes are the responsibility of the contracting officer, with assistance as required from specialists such as the ILS Manager. The ILS Manager should become familiar with his responsibilities for these contract events as they relate to contracting for support. Figure 9-3 and 9-4 display a generic chronology of contract events. These time frames are current representative contract lead times under the Competition in Contracting Act of 1984.

9.3.3.1 Acquisition Strategy. The ILS Manager's acquisition strategy should permit pre-priced competitive contracts where practicable. Other strategy considerations include appropriate implementation of warranties, breakout, and the consolidation of spare parts requirements (initial, follow-on, and replenishment). The ILS contract strategy must be compatible with the overall program acquisition strategy.

9.3.3.2 Acquisition Planning. In planning the acquisition of logistics data, materials or services, the ILS Manager should work with (or support) the Government team of personnel who are responsible for significant aspects of the acquisition, such as contracting, financial, and technical, for the purpose of creating an acquisition plan (FAR 7.105). A wide selection of contract types are available which provide flexibility in acquiring the needed logistics resources. These contracts vary according to (1) the degree and timing of responsibility (risk) assumed by the contractor for cost and performance, and (2) the amount and nature

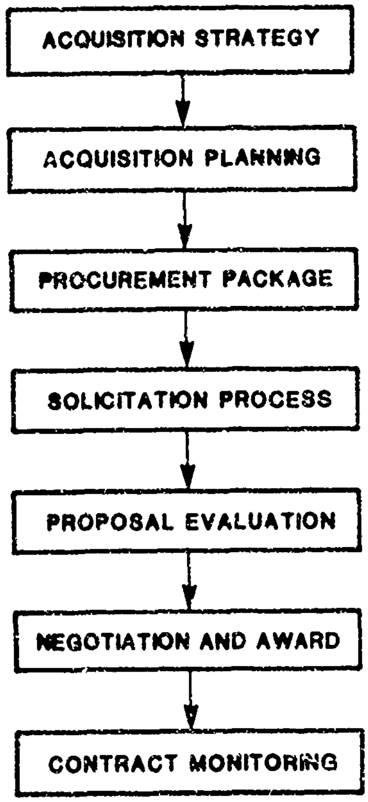


Figure 9-2 Government Contracting Responsibilities

of profit incentive. Contract types are grouped into two broad categories: fixed-price contracts and cost-reimbursement contracts. Specific contract types range from firm-fixed-price, where the contractor is fully responsible for performance, cost and profit (or loss); to cost-plus-fixed-fee, in which the contractor has minimal responsibilities for performance and cost but receives a negotiated fee (FAR 16).

9.3.3.3 The Procurement Package. The Procurement Package encompasses most of the information the contracting officer needs to prepare a solicitation as given in "Part I - the Schedule" of the uniform contract format (FAR 14.201-2). It provides technical and management information including the range and depth of data, materials, and services to be acquired. A timely and comprehensive statement is required for each acquisition involving equipment or processes needing future support materials, services, or data. MIL-HDBK-245B, "Preparation of the SOW", provides specific guidance on identifying and presenting information on logistic deliverables in specification format that is consistent with life cycle phase requirements. The ILS Manager should be concerned with each part of the Procurement Package as logistics requirements may be located throughout the document.

Care should be taken in selecting and describing related deliverables. Plans, drawings, specifications, standards, and purchase descriptions should be selectively applied and tailored to the particular application in the SOW. For example, many Military Standards provide useful guidance and requirements related to logistics. After reviewing the available Standards bearing on a given topic, select the fewest number of Standards which encompass the desired range and depth of logistics tasking in such areas as planning, supply, manpower, personnel, and training. Specific applications should be tailored to meet program needs by selecting or modifying standard Data Item Descriptions (DIDs) and confining data element generation to those defined in MIL-STD-1388-2A,"DoD Requirements for a Logistic Support Analysis Record". The Procurement Package should include:

o Guidance to the contractor about the Government's baseline thinking on ILS — objectives, requirements, importance relative to other program objectives, concepts, assumptions, constraints, and priorities.

o Specific ILS tasks to be performed by the contractor, such as ILS analyses, logistics alternatives evaluations, preparation of plans and concepts, training courses, spares and repair parts, technical publications and data, etc.

o Incentives aimed at achieving the desired balance between technical capabilities and ILS.

The terms used must be understood and consistent with standard contractual clauses. "Buzz Words", terms with multiple meanings, conflicting or unclear terms and symbols must be avoided.

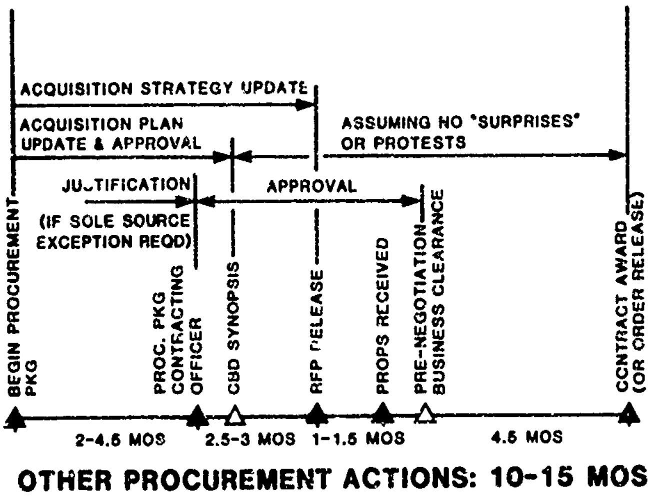


Figure 9-3 Support Contract Cycle

9.3.3.4 Evaluating Proposals. The ILS Manager identifies and defines what logistics considerations should be addressed in the bidder(s) proposals (i.e., the proposal data requirements). He also helps to determine the relative importance (weight) of evaluation factors such as understanding of the problem, technical approach, "other technical factors", experience, and cost. Other technical factors should provide measurable and meaningful criteria related to the specific logistics support requirements of the proposed system. These logistics considerations are also incorporated in the overall Source Selection Plan (SSP) which contains the evaluation factors and weights for each factor which must be on record with the Contracting Officer prior to RFP release. Prior to evaluation working group meetings the ILS manager should independently evaluate all technical and price proposal items related to logistics in order to provide a position of informed leadership in the discussions leading to source selection.

9.3.3.5 Contract Monitoring. A comprehensive contract file, including all procurement contract modifications, is a useful management tool. Data in the contract file directly relate actual performance to actual cost and, when automated, do so in a timely manner. During the performance period, this data should be used to rapidly identify, focus, examine, and resolve logistics problems that arise.

9.3.4 Contracting Methods

The Competition in Contracting Act of 1984 requires agencies that are conducting procurements for goods and services to obtain "full and open competition" through the maximum use of "competitive procedures". This means that all responsible sources are encouraged to submit sealed bids or competitive proposals, depending on what is required by the solicitation. There are two primary differences between the competitive procedures known as sealed bids and competitive proposals. One difference relates to award factors; the second relates to the use of bargaining to arrive at the contract which consummates the procurement. When sealed bids are used, price and price-related factors are clearly the dominant factor on which the award will be based. In contrast, competitive proposals permit consideration of other factors, such as technical merit, that go beyond cost in meeting the Government's need. The second difference involves the permissibility of negotiations to arrive at the business deal. With sealed bids, discussions are not permitted, other than for purposes of minor clarifications. Competitive proposals, however, do permit bargaining, and usually afford the offerors an opportunity to revise their offers during the negotiation period. In context, "bargaining" refers to discussion, persuasion, alteration of initial assumptions and positions, and the give-and-take may apply to price, schedule, technical requirements, and other terms of the proposed contracts.

The use of "other than competitive procedures", i.e., sole source negotiations is not authorized unless the circumstances of the acquisition meet the criteria of one of the seven identified exceptions (FAR 6).

9.4 MANAGEMENT ISSUES

9.4.1 Data Processing Resources

The acquisition process is cumbersome due to the volume of requirements and procurement data which must be organized, stored, retrieved, and compared to make decisions. Large quantities of data in the acquisition process are handled manually.

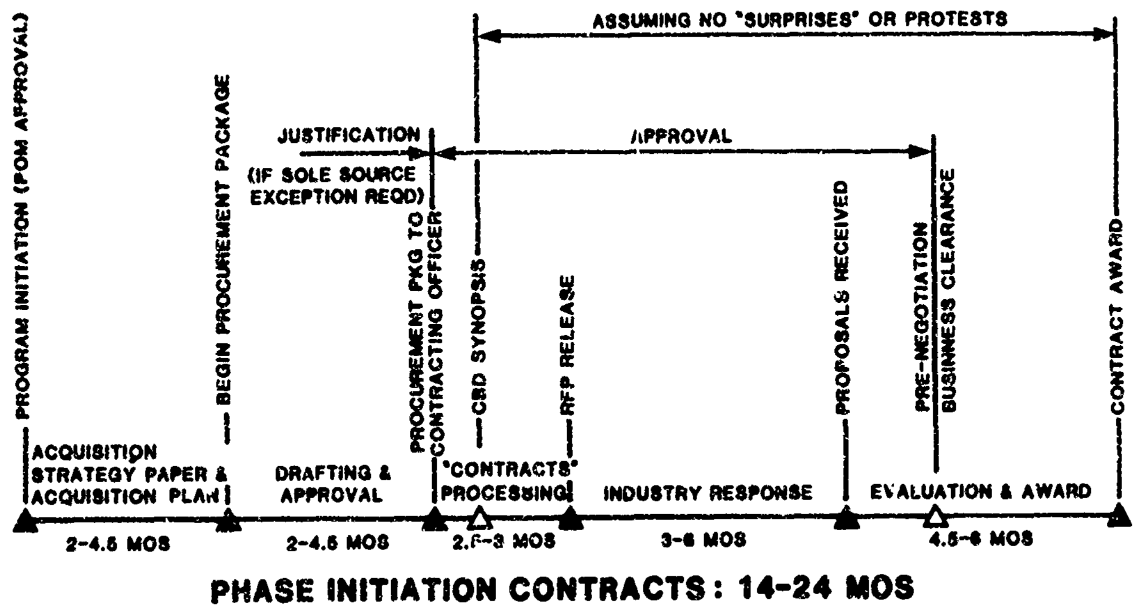


Figure 9-4 Procurement Action Cycles

While each component has some automated data processing capability, it is antiquated and cannot rapidly retrieve and process large quantities of data at one time. Data processing systems at most Inventory Control Points were originally designed in the 1960s. Data is stored in an off-line mode and retrieved sequentially from remote storage mediums, such as magnetic tape. Data requests are usually input in a batch processing mode. Information requests can take hours, days, or even weeks, depending on the overall workload at any given time. This makes the computer virtually unavailable to do detailed logistics analyses. As a consequence, detailed analyses are seldom done because they are so labor-intensive. This results in logistics managers and contracting personnel doing limited computer-assisted analyses. Thus, the functions of the item manager and contracting officer become more clerical in nature and less analytical. Timely and effective analyses are not feasible with outmoded equipment. Until the major system upgrades can be completed, ILS Managers should use microcomputer technology to provide data processing support for acquisition analyses.

9.4.2 Data

A major data problem in the past has been the identification of complete data requirements and lack of emphasis on inspection and acceptance procedures which address legibility, completeness, and correct drawing practices. Remedies include working with a data review board to ensure the correct requirements are incorporated into the contracts initially and then enforcing those requirements in accordance with the following guidelines:

- Determine the level of specificity required for procurement purposes.
- Ensure that the parts descriptions and drawings are available so that other participants in the acquisition understand what is being bought.
- Establish prices and options for data delivery only when the design is stable enough to make it useful.
- Obtain technical data on a phased schedule to permit breakout of vendor components for future competitive acquisitions.
- Inspect and validate the completeness, accuracy and adequacy of data promptly after its receipt.
- Consult with the Contracting Officer to ensure that the current regulations concerning data rights and data restrictions (FAR 27) are incorporated in the solicitation.

9.4.3 Spares and Breakout

Decisions affecting spares must be made very early in the life cycle of a materiel system; i.e., establishing parts standardization guidance. As the program evolves, the ILS Manager must issue provisioning technical documentation guidance via the contract including milestones and feedback reporting to ensure that program unique materials are promptly ordered. The ILS Manager must also ensure that follow-on spares and repair parts are obtained in a cost-effective manner. Relying on the original prime contractor for follow-on support material entails risks in the areas of cost and availability of needed spares and repair parts. The ILS Manager should consider obtaining technical data, drawings, tooling, etc., to enable the Service to compete for follow-on logistics support. The cost of obtaining this capability must be weighed against the potential benefits of competition, particularly during an extended post-production period. FAR, Part 7 requires the inclusion of detailed component breakout plans in the acquisition plan.

In sum, in order to develop and deliver an effective spares package to future users, the ILS Manager should:

- o Ensure the timely and accurate assignment of procurement source codes (e.g., prime contractor, vendor, field manufacture, etc.) and challenge data rights and restrictive markings.
- o Require contractors to identify actual manufacturers.
- o Screen contractor-recommended parts lists to make full use of DoD and General Services Administration (GSA) supply systems.
- o Make sure parts already available in DoD and GSA supply systems are not bought from system contractors.
- o Order optimum quantities where significant savings can be obtained.
- o Base estimated unit prices on anticipated buy quantities rather than a single item. No provisioning price, no matter how it is derived, should be used as the basis for determining the reasonableness of the price of future buys. Procurement history records should identify (e.g., by asterisk) provisioning prices as such.
- o Plan for Spares Acquisition Integrated with Production (SAIP) where the Government combines spare parts orders with planned production.
- o Encourage multi-year procurement of replenishment spares which are sensitive to quantity and front-end investment costs.
- o Ensure that all spare parts requirements (initial or replenishment) are combined to the maximum extent possible to achieve the savings of larger quantities. Buying offices should alert users when frequent purchases of the same part are causing higher costs.
- o Ensure realistic breakout and competition goals, taking into consideration savings potential and the availability of procurement specialists to conduct the competitions and breakout actions.
- o Be sure that tradeoffs are made between inventory carrying costs and marketplace quantity discounts.

9.4.4 Contracts and Pricing

A Program Manager (PM) often regards logistics contract considerations, such as identifying logistics deliverables and creating the ILS inputs to the SOW, as long-term issues that are less important than the immediate problems. As a result, logistics concerns are often deferred for later resolution. A common example is the acquisition of data needed for future logistics support. Understandably, the PM with a funding shortfall is more likely to cut the long-term data requirement from the contract than items with immediate impact.

An OMB review found that a large number of unpriced orders are backlogged at many DoD activities. The time required for audit, cost or price analysis and negotiation of a contractor's proposal may relate to the number of cost elements to be negotiated. Solutions have included reducing the number of cost elements to be analyzed, as well as avoiding the use of Basic Ordering Agreements (BOAs) and the ordering (provisioning) clause for the large amounts of data and spares that can be firm-fixed-priced at the time the order is placed. Another solution is the use of forward pricing arrangements. Forward pricing arrangements provide for advance negotiation of indirect cost factors that can then be used for a mutually agreed time. The prenegotiated ILS cost factors facilitate efficient pricing of a contractor's proposal by providing more time to analyze direct costs. These factors can be routinely used by less experienced buyers and are easily adapted to a computerized system. Increased emphasis on negotiating forward pricing arrangements should result in a decrease in the number of outstanding unpriced orders. Goals should be set and monitored for the control of unpriced orders.

9.4.5 Government Furnished Property and Other Promises

The Government's failure to provide promised Government Furnished Material (GFM) in a timely manner and suitable condition may create a Government liability for subsequent costs and schedule increases (FAR 52.245-2). Therefore, the ILS Manager should only identify GFM that are within the resources of the Government to provide in a timely manner and condition suitable for use. If appropriate, the Contracting Office may allow the contractor to utilize MIL-STRIP procedures in obtaining the required GFM (FAR51).

9.4.6 Imposing Unrealistic Delivery or Performance Schedules

The Government is capable of creating pressure in ILS negotiated contracts so that the contractor may feel obligated to agree to items he cannot deliver. Subsequently, the contractor may seek and receive relief from unreasonable requirements. Therefore, ILS Managers should avoid issuing requirements on an urgent basis or with unrealistic delivery or performance schedules, since it generally restricts competition and increases costs.

9.4.7 Incentives

Incentive mechanisms in contracts are used to motivate contractors to exceed predetermined goals such as delivery schedules and Reliability and Maintainability (R&M) thresholds. Incentives provide this motivation by establishing a relationship between the amount of fee payable and the actual performance of the delivered item. When predetermined formula type incentives on delivery or technical performance are included, fee increases are provided for achievement that exceeds the targets, and reductions in fee are provided to the extent that such targets are not met. Incentive contracts are addressed in FAR 16.4 and in a joint DoD/NASA Incentive Contracting Guide.

Logistics incentives should be designed to address one or more of the following conditions: (1) designs that tend to minimize logistics costs during the operational phase of life cycle; i.e., maximizing the use of standard components, minimizing trouble-shooting time, etc.; (2) accelerated delivery of the logistics system (all elements) commensurate with accelerated program delivery; (3) realism of R&M targets; (4) attaining R&M objectives and (5) exceeding realistic R&M targets.

9.4.8 Warranties

With reference to FAR 46.7 and DFARS 246.7, warranties provisions must be imposed on most new materiel systems to ensure that the deliverables: (1) conform to the design and manufacturing requirements; (2) are free from all defects in materials and workmanship at the time of acceptance or delivery; and (3) conform to the essential performance requirements. In effect, the warranty is an obligation of the contractor to repair or replace equipment found defective during the course of the warranty period. FAR/DFARS also provide policies and procedures for tailoring the required warranties to the circumstances of a particular procurement and for obtaining waivers when needed. For supplies and services which do not meet the definition of a weapon system such as spares and data, warranties are elective provided they meet or exceed the foregoing requirements and are advantageous to the Government. A warranty of technical data (extended liability) should be included in the solicitation and evaluated on its merits during source selection. Consideration should be given to whether non-conforming data should be replaced or subject to a price adjustment. In designing the contract warranty clause, the ILS Manager should consider the following guidelines:

- o Provide a realistic mechanism for administering the warranty.

- o Maximize the Government's ability to use the warranty - considering transportation and storage factors.

9.5 RISK MANAGEMENT

9.5.1 Improper Contracting for Support

9.5.1.1 Risk Area. The major risk area in ILS contracting, in terms of impact and the probability of its occurrence, is the failure to properly contract for data, materials, and services. Included are failures involving contractual promises by the Government to furnish material and services and the imposition of unrealistic delivery or performance schedules. Impacts may include degraded support and readiness, cost growth and, when repeatedly exposed by the media, loss of the taxpayers' good will and confidence.

Contracting for support entails many areas of risk which the PM must control. A recent, highly publicized problem is the procurement of spares. In its June 1984 report to the Congress on DoD procurement of spare parts and related program elements, Office of Federal Procurement Policy (OFPP) summarized the problem as a set of facts that have created a public perception of a problem completely out of control. These stories serve as a warning that additional management attention is needed. A key finding was that the same or similar problems have existed (and similar reforms have been proposed) for nearly 25 years. The report observes:

> "At a minimum, this look-back underscores the fact that permanent solutions to these problems are elusive unless management attention is sustained at all levels. Without such attention, we will only repeat the mistakes of the past - a flurry of activity, amounting to overkill, dying out without producing meaningful or lasting improvements."

9.5.1.2 Risk Handling. Toward the goal of improving logistics procurement practices, the report offers more than 100 recommendations and suggestions aimed at avoiding well known risk areas. Those most applicable to executive and working level ILS Managers are included in the guidance given at paragraph 9.4, Management Issues. They may be used as a checklist either to guide hands-on managerial efforts, or to review the work of matrix personnel to ensure the price-consciousness of their efforts.

9.6 SUMMARY

- o Participation in the contracting process is part of the ILS Manager's job.

- o Contract knowledge, initiative, and determination are essential in managing ILS programs.

- o ILS program success is a direct reflection of contract success.

9.7 REFERENCES

1. The Federal Acquisition Regulations.

2. Office of Federal Procurement Policy. "Review of the Spare Parts Procurement Practices of the Department of Defense", June 1984.

3. MIL-HDBK-245B, Preparation of Statement of Work (SOW).

4. DoDD 4105.62, Selection of Contractual Sources for Major Defense Systems (USDRE).

5. Defense Federal Acquisition Regulations Supplement.

6. DARCOM Pamphlet 700-21, Integrated Logistics Support Contracting Guide.

7. DoD/NASA Incentive Contracting Guide October 1969, Army Field Manual 38-34, NAVMATP 4283, AF 70-1-5.

MODULE IV

TEST AND EVALUATION

Test and evaluation of materiel systems and their support is one of the more difficult tasks facing the program management team. This module discusses the planning for, and the conduct of logistics tests and evaluations.

CONTENTS

CHAPTER 10

PLANNING LOGISTICS TEST AND EVALUATION

10.1 HIGHLIGHTS

- o Objectives of ILS-Related Tests and Evaluations
- o Requirements for Statistical Validity
- o Planning Documentation
- o Planning Guidelines for the ILS Manager

10.2 INTRODUCTION

10.2.1 Purpose

To provide an overview of the planning required to test and evaluate a materiel system's operational suitability and to determine the adequacy of the logistic support developed to attain system readiness objectives.

10.2.2 Objectives

The overall objectives of logistics test and evaluation are:

- o To provide assurance of system supportability under anticipated wartime conditions.
- o To verify that the logistic support developed for the system is capable of achieving established system readiness levels.
- o To demonstrate that system readiness objectives are attained at peacetime and wartime utilization rates during operational use.

10.3 MANAGEMENT ISSUES

10.3.1 Test and Evaluation Programs

Logistics test and evaluation extends over the entire materiel acquisition cycle. The following paragraphs describe ILS-related objectives of Development Test & Evaluation (DT&E) and Operational Test & Evaluation (OT&E) and the additional objectives of supportability assessments. The ILS Manager must be a participant in the planning of DT&E and OT&E and is responsible for the planning of post-deployment supportability assessments.

10.3.1.1 Development and Evaluation (DT&E). DT&E is part of the engineering design and development process. It verifies the attainment of technical performance specifications and objectives. Figure 10-1 identifies the objectives of major interest to the ILS Manager. The tests are generally conducted by the prime contractor and/or developing agency under conditions not fully representative of field operation.

10.3.1.2 Operational Test and Evaluation (OT&E). OT&E is conducted to assess a system's operational effectiveness and suitability and the adequacy of the systems's logistic support (Figure 10-1). The tests are managed and independently evaluated by a field agency separate from the developer and user. The tests are performed in an environment as operationally realistic as possible.

A complete evaluation of the system's supportability design parameters (e.g., operational R&M) and the ILS elements should be conducted during Full Scale Development (FSD), employing a prototype of the materiel system. This evaluation may continue into the Production and Deployment Phase with pilot production items. All ILS elements must be provided in a condition or configuration which is close to or identical with that which will be provided during the Operational Phase. The test environment should include:

- o Representative military operations and maintenance personnel.
- o Personnel trained through a prototype of the planned formal training program.

ACQUISITION PHASE / TEST TYPE	CONCEPT EXPLORATION	DEMONSTRATION/VALIDATION	FULL SCALE DEVELOPMENT	PRODUCTION/DEPLOYMENT	OPERATIONAL SUPPORT
DEVELOPMENT T&E	• Select Preferred System and Support Concepts	• Identify Preferred Technical Approach, Logistic Risks, and Preferred Solutions	• Identify Design Problems and Solutions in re: - Survivability - Compatibility - Transportation - R&M - Safety - Human Factors	• Assure Production Items Meet Design Requirements and Specifications	• Assure Adequacy of System Design Changes
OPERATIONAL T&E AND SUPPORTABILITY ASSESSMENT	• Assess Operational Impact of Candidate Technical Approaches • Assist in Selecting Preferred System and Support Concepts • Estimate Operational Compatibility and Suitability	• Examine Operational Aspects of Alternative Technical Approaches • Estimate Potential Operational Suitability of Candidate Systems	• Assess Operational Suitability - Operational R&M - Built-in Diagnostic Capability - Transportability • Evaluate Logistics Supportability - Effectiveness of Maintenance Planning - Appropriate Personnel Skills/Grades - Appropriate Spares, Repair Parts, Bulk Supplies - Adequate Support Equipment, including effective ATE and Software - Accurate and Effective Technical Data; Validation/Verification of Technical Manuals - Adequate Facilities (Space, Environmental Systems, Storage) - Effective Packaging, Lifting Devices, Tie-Down Points, Transporation Instructions	• Assure Production Items Meet Operational Suitability Requirements	• Demonstrate Attainment of System Readiness Objectives • Update O&S Cost Estimates • Evaluate Operational Suitability and Supportability of Design Changes • Identify Improvement Required in Supportability Parameters • Provide Data Required to Adjust ILS Elements

Figure 10-1 ILS Objectives in the T&E Program

- Draft technical manuals in MIL STD format.

- Support equipment selected for operational use.

10.3.1.3 Product Assurance Test and Evaluation (PAT&E). PAT&E is conducted to demonstrate that items procured fulfill the requirements and specifications of the procuring contract or agreements.

10.3.1.4 Supportability Assessment. A supportability assessment (LSA task 500) is performed in two general areas: (1) assessment as part of the formal DT&E and OT&E programs and (2) assessment performed after deployment through analysis of operational, maintenance, and supply data on the system in its operational environment.

The ILS Manager participates with the project office test planner in the planning of DT&E and OT&E programs. He develops detailed ILS T&E objectives for each acquisition phase and incorporates these objectives within the formal test programs. Assessments of some ILS elements may require additional or separate tests. Two common examples are validating the accuracy of technical manuals and logistic demonstrations to evaluate maintenance planning. These are generally initiated prior to the formal test programs in order to reduce delays during these tests. The evaluation of ILS elements is discussed in paragraph 10.3.1.5 below.

The ILS Manager is responsible for the planning of post-deployment supportability assessments (LSA Task 501.2.5). General objectives are listed in Figure 10-1. The planning should identify:

- Objectives and specific planned uses of the assessment analyses and reports.

- Specific parameters to be estimated (e.g., operational availability, O&S costs, maintenance replacement rates for spares and repair parts, and operational reliability and maintainability).

- Data sources and method of collection.

- Statistical validity required.

- Duration of data collection.

- Data analysis methods and reports.

10.3.1.5 Evaluation of ILS Elements. Each ILS element should be evaluated to determine its impact on system readiness, manpower, provisioning, and Operating and Support (O&S) costs. A brief listing of the main evaluation factors for the listed ILS elements is presented below. A check-off list for each element is provided in Department of Army Pamphlet 700-50, "Integrated Logistic Support: Development Supportability Test and Evaluation Guide", from which much of the information in this paragraph is drawn.

- Maintenance Planning is evaluated to verify proper assignment of maintenance tasks to maintenance levels and the appropriate selection of support equipment and personnel to perform maintenance tasks. A structured logistic demonstration is an effective evaluation mechanism; as a minimum, the demonstration should include all organizational and selected intermediate level tasks.

- Manpower and Personnel, Training, and Training Support are tested and evaluated to:

  - Insure that personnel are identified in the numbers and skills necessary to support a materiel system in its operational environment.

  - Assess the effectiveness of the training program for Government personnel, as reflected in their ability to operate, support, and maintain the materiel system under test.

  - Insure that training devices are provided in the proper quantities and functional areas.

  - Identify potential training and training equipment problems in order to initiate any required revisions to ensure compatibility with weapon system hardware, operational, and maintenance procedures.

- o <u>Supply Support</u> is evaluated to verify that the quantities and types of items and supplies designed to maintain the materiel system in its prescribed state of operational readiness are adequate.

- o <u>Support Equipment</u> is evaluated to determine its effectiveness, the validity of the planned requirements, and the progress achieved toward meeting those requirements. Test and evaluation should verify that all items specified are required and that no requirement exists for items not listed.

- o <u>Technical Data/Equipment Publications</u> are tested and evaluated to assure that they are accurate, understandable, and complete, as well as able to satisfy maintenance requirements at projected skill levels. The evaluation must also assure that any changes made on the end item system or the support system are reflected in the technical literature which is provided with the complete document package.

- o <u>Computer Resources Support</u> provides support for both embedded computer systems as well as automatic test equipment which will provide support for the end item. In general this area of support addresses the evaluation of the adequacy of the hardware and of the accuracy, documentation, and maintenance of computer software routines. Built-in test routines programmed into the software of a complex device such as a computerized aircraft fire control system, would be covered in this area of the evaluation.

- o <u>Facilities</u> are evaluated to determine whether:

  - Facilities requirements in terms of space, volume, capital equipment, and utilities necessary for system operation and maintenance have been defined and satisfied.

  - Environmental system requirements (for example, humidity, dust control, and site locations for radiating end-items, such as lasers and radars) associated with operational, maintenance, and storage facilities have been identified and the requirements met.

- o <u>Packaging, Handling, Storage, and Transportability</u> evaluations will determine:

  - The adequacy of all transportability instructions provided.

  - Whether the system can be handled by conventional types of lifting, loading, and handling equipment.

  - Whether lifting and tie-down points conform to MIL-STD-209F "Slinging and Tie Down Provisions for Lifting and Tying Down Military Equipment" with regard to size, strength, and markings.

  - The adaptability of the system to prescribed forms of transport (surface and air as applicable).

  - The suitability of the system for moving equipment and personnel from ships to shore assembly points in logistic-over-the-shore operations.

10.3.2 Statistical Validity

There is a trade-off among the numbers of test hours which can be expended, the failure rates experienced during the testing, and the degree of precision which statistics permit us to glean from those tests. In

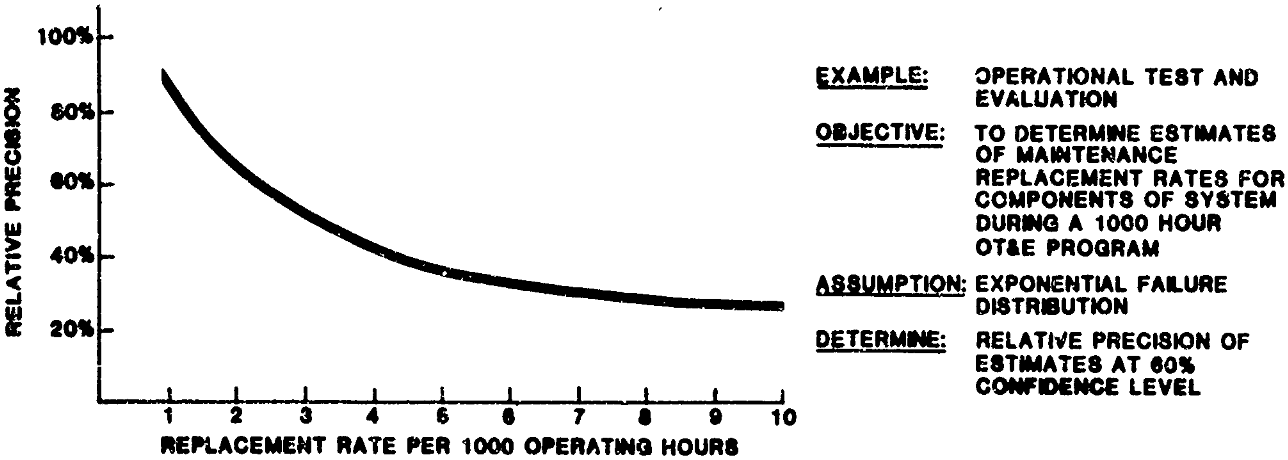


Figure 10-2 Variation of Relative Precision with Replacement Rate

practice, test hours are limited not only by funds available for testing but also by the numbers of items available for test and by the way in which failures occur. While it might be possible to exercise some control over funding, failure rates and their distribution among the various components and systems are inherent in the system design and operational utilization. Therefore, careful attention to statistical design limitations is an integral part of the logistics aspects of both development and operational testing.

This relationship is illustrated in Figure 10-2. In this example, the system will be operated a total of 1000 operating hours. The ILS Manager desires to determine the maintenance replacement rate for components of the system. Two statistical terms are used - relative precision and confidence level. To state that an estimate has a relative precision of 30 percent at a 60 percent confidence level means that there is a 60 percent likelihood that the true value lies within plus or minus 30 percent of the estimate. As shown, greater precision will be obtained for components that exhibit higher replacement rates. A system test of the limited duration illustrated will generate insufficient data on high cost or high maintenance burden components that are replaced at low to moderate rates. These should be identified as candidates for separate subsystem evaluations.

Post-deployment assessments are not as constrained as development and operational tests; they can extend over a lengthy period of operational use and encompass a large number of operationally deployed systems. Greater relative precision and confidence levels can be obtained by increasing the durations and number of systems monitored and evaluated with corresponding increases in the cost of data collection and analysis. The relationships of relative precision, confidence level, and required operating hours (total for all systems) are illustrated in Figure 10-3 using an example of an estimate of a maintenance replacement rate for a single component.

Each military Service has qualified test planners who can assist in the development of valid and attainable statistical objectives for each assessment.

10.3.3 Technical Performance Measurement (TPM)

TPM is a design assessment that predicts, through engineering analysis or test measurements, the values of essential system level performance parameters. The ILS Manager should participate in the establishment of the TPM program during the Demonstration/Validation (DVAL) phase to ensure that critical support and supportability-related design factors are tracked in this formal assessment program. Parameters

REQUIRED SYSTEM OPERATIONAL HOURS (THOUSANDS)

RELATIVE PRECISION	60%	80%	95%
20%	1.7	4.1	9.6
10%	7.1	16.4	38.4
5%	28.2	65.5	154

CONFIDENCE LEVEL

EXAMPLE: POST DEPLOYMENT ASSESSMENT

OBJECTIVE: TO DETERMINE A COMPONENT'S MAINTENANCE REPLACEMENT RATE, GIVEN A DESIRED LEVEL OF CONFIDENCE AND PRECISION

PRELIMINARY ESTIMATE: TEN REPLACEMENTS PER 1000 ANNUAL OPERATING HOURS

ASSUMPTION: EXPONENTIAL FAILURE DISTRIBUTION

PROCEDURE: DETERMINE TOTAL OPERATING HOURS REQUIRED FROM RANDOMLY SELECTED SYSTEMS TO OBTAIN THE SELECTED LEVEL OF CONFIDENCE AND PRECISION

Figure 10-3 Examples of Operating Hours Required to Meet Statistical Objectives

selected should be directly measurable and follow a predictable time-phased improvement pattern. Appropriate supportability-related parameters may include operational reliability and maintainability, built-in fault detection and fault isolation capabilities, and a measure of readiness (e.g., operational availability). Refer to Chapter 13 of the System Engineering Management Guide for additional information on this subject.

10.3.4 Planning Documentation

10.3.4.1 The Supportability Assessment Plan. The Supportability Assessment Plan is prepared directly by the ILS Manager or by the contractor (Data Item Description DI-5-7120) and approved by the Government. The plan identifies the approach and criteria for achievement of supportability related design requirements and the adequacy of the logistic support resources for a materiel system. The plan documents the ILS Manager's input into the Test and Evaluation Master Plan (paragraph 10.3.4.2) and should also be used to plan the assessment of the system's supportability after deployment in its operational environment.

The Supportability Assessment Plan is developed initially during Concept Exploration (CE) and is updated during each succeeding phase to concentrate on plans for testing conducted in the following acquisition phase.

10.3.4.2 Test and Evaluation Master Plan (TEMP). The TEMP is the primary document used in the OSD review and decision process to assess the adequacy of the planned tests and evaluations. Requirements and format for the plan are prescribed in DoDD 5000.3, "Test and Evaluation". It is initially prepared during the CE Phase and updated periodically. The Program Manager is responsible for developing the TEMP and assuring proper coordination among the developing activity, test activities, and the user, and for obtaining OSD approval.

The TEMP contains a program description, a program summary, outlines of the DT&E, OT&E, and PAT&E programs, and a brief resource summary. The resource summary identifies the items to be tested, including key subsystems to be tested individually, and unique items required to support the test.

10.3.5 Planning Guidelines for Logistics Test and Evaluation

- o Establish detailed ILS-related objectives for each life cycle phase.
- o Develop a test strategy to implement each objective.
- o Employ the Integrated Logistic Support Management Team (ILSMT) to assist in developing objectives and strategies. (Refer to paragraph 2.3.2)
- o Coordinate with the program test planner to incorporate ILS testing requirements into the formal DT&E and OT&E program to the extent feasible.
- o Identify ILS tests and evaluations that will be performed apart from DT&E and OT&E during development and production phases.
- o Participate with the program test planner to identify all resources required for the formal DT&E and OT&E programs and the separate ILS testing. This will include the identification of all test articles (items to be tested and evaluated) and special support requirements (e.g., facilities, supply support, calibration support). Identify the total requirements in the TEMP.
- o Participate with the program test planner and the Service test activity to develop the operational testing "environment". Establishment of an environment as operationally realistic as possible should be a special concern of the ILS Manager. The following steps apply:
  - Select representative personnel in the appropriate skill specialty codes to operate and maintain the system. Military units supporting the system being replaced (if one exists) are a valid source of representative personnel. If the system requires new skill specialty codes, select personnel representative of the population that will be trained to operate and maintain the system during its operational phase.
  - Train the selected personnel using prototypes of the training courses and training devices that will be employed in the operational phase.
  - Support test operations with preliminary draft technical manuals or technical orders prepared to MIL STD format and with prototypes and/or selected items of the support equipment that will be employed in the operational phase.
- o Ensure that OT&E planning will provide sufficient data on "high cost" and "high maintenance burden" items to identify items requiring design improvement and to enable updating of O&S cost and maintenance manpower projections. Based upon Pareto's principle, identify the 15-20 percent of the critical spares that generally account for about 80 percent of total spares replacement costs. Utilize the results of early testing to reevaluate the selection of critical spares.
- o With the assistance of a qualified test planner or systems analyst, establish appropriate measures of statistical validity for each individual case and the test parameters required to achieve these measures.
- o Identify subsystems that require off-system evaluations.
- o Ensure that OT&E planning encompasses all ILS elements.
- o Establish a methodology to assess the capability of the planned logistic support to attain system readiness objectives. Three examples of logistics/readiness models that have been used for this purpose are the Naval Air Systems

Command Comprehensive Aircraft Support Effectiveness Evaluation (CASEE) model; the Army Logistics Analysis Model (LOGAM); and the Air Force/Logistics Management Institute Aircraft Availability model. The methodology should employ operational performance data (e.g., operational R&M) that is validated during OT&E.

- Determine the adequacy of standard data systems to satisfy the objectives of the post-deployment supportability assessment. If required, develop plans for supplementary data collection during the operational phase.

- Identify specific planned uses of post-deployment assessments and ensure that all planned users participate in the development of the Supportability Assessment Plan.

10.4 RISK MANAGEMENT

10.4.1 Delay d or Inadequate Logistics T&E Planning

10.4.1.1 Risk Area. The main thrust of the formal DT&E and OT&E programs is to evaluate system level performance. Logistics test and evaluation has an additional focus on component evaluation and on the adequacy of the ILS elements that comprise the logistic support structure. Failure by the ILS Manager to participate effectively in the initial development of the TEMP during the CE Phase risks the exclusion of critical logistics T&E and the omission of the ILS test funds required in program and budget documents.

10.4.1.2 Risk Handling. The Supportability Assessment Plan (paragraph 10.3.4.1) should be developed prior to preparation of the TEMP. The prior identification of objectives, test articles, and resource requirements will enable the ILS Manager to participate effectively in developing total T&E planning and total resource requirements.

10.4.2 Poorly Stated ILS Objectives

10.4.2.1 Risk rea. Vaguely or incompletely stated objectives will translate into vague and inadequately defined resource requirements. The ILS Manager will be placed in a poor position to justify additional resources for logistics test and evaluation.

10.4.2.2 Risk Handling. Clearly stated objectives are vital first steps in effective planning. General objectives are listed in Figure 10-1. These must be converted into detailed qualitative and quantitative requirements for each acquisition phase and for each test and evaluation and assessment program. Objectives should be established for all acquisition phases during initial preparation of the Supportability Assessment Plan (during the CE Phase) and updated during each succeeding phase.

10.4.3 Inadequate Planning for Data Utilization

10.4.3.1 Risk Area. Collecting data without detailed planning for its use can lead to:

- A mismatch of data collection and information requirements

- Failure to accomplish the intended purpose of the assessment (such as the update of supply support and manpower requirements and the identification and correction of design deficiencies).

10.4.3.2 Risk Handling. Intended users should be principal participants in the planning of the assessment program including data collection and analysis. The ILS Manager should identify organizational responsibilities and the analyses and follow-up activities to be performed by each organizational element. Organizations and requirements change; therefore, the ILS Manager and all participants should review and update the planning as required through the period of implementation.

10.5 SUMMARY

- Preparation of a comprehensive Supportability Assessment Plan during the CE Phase is an essential initial step in total ILS-related T&E planning.
- Qualitative and quantitative assessment objectives should be established for each acquisition phase.
- Effective OT&E requires establishment of an environment as operationally realistic as possible. The ILS Manager should play a major role in the establishment of this environment.
- The ILSMT should assist in the development of detailed T&E planning.
- The Supportability Assessment Plan should identify the planned utilization of all data collected during the assessments.

10.6. REFERENCES

1. DoDD 5000.3, Test and Evaluation.
2. DoDD 5000.40, Reliability and Maintainability.
3. DOD 3235.1-H, Test and Evaluation of System Reliability Availability and Maintainability, A Primer.
4. Army Materiel Systems Analysis Activity Interim Note No. 85, Statistical Guide for Sample Data Collection (SDC) Planning.
5. System Engineering Management Guide. (Defense Systems Management College)
6. Department of the Army Pamphlet 700-50, Integrated Logistic Support: Developmental Supportability Test and Evaluation Guide.

CONTENTS

CHAPTER 11

CONDUCTING LOGISTICS TEST AND EVALUATION

11.1 HIGHLIGHTS

- o Evaluation of Objectives
- o Timeliness of Support Package
- o Importance of Timely and Accurate Data
- o Need for Realism

11.2 INTRODUCTION

11.2.1 Purpose

To provide a managerial overview of methods for ensuring complete testing of system design for supportability and ILS system elements, for accurate recording and evaluation of data, and for effective utilization of the results to determine the adequacy of the anticipated logistics support.

11.2.2 Objectives

The overall objectives of conducting supportability Test and Evaluation (T&E) are:

- o To provide timely measurement of system/equipment supportability throughout the acquisition process.
- o To demonstrate that the integrated support system can achieve the planned system readiness objectives.
- o To assess the contractor's performance and progress relative to ILS contractual requirements.
- o To assure that maintenance and support planning and resources accurately reflect the design.
- o To identify cost effective supportability improvements in the system's design as test data becomes available.
- o To assess the planned support system's effectiveness in the operational environment and the readjustment of logistic resources planning as required, based upon actual experience.

These objectives are achieved through the conduct of tests, analyses, audits, and Production/Logistics Readiness Reviews (PRRs/LRRs), which are the primary vehicles for assessing the adequacy of the ILS program to support a materiel system's progress through the acquisition milestones.

11.3 MANAGEMENT ISSUES

11.3.1 Background

The effectiveness of the testing and evaluation of a support system is largely the result of the planning effort. Testing and evaluation are the logistician's tools to measure the ability of the support concept to meet the stated system readiness objectives. Chapter 10 describes the effort required to plan the evaluation and to determine data requirements. This chapter addresses the evaluation process itself which consists of collecting the data as specified in the T&E plan in order to determine the progress of the system in achieving its supportability requirements and to predict its ability to sustain them. In the early stages of a program, there is little opportunity for test and evaluation of system hardware, since the major products are design and planning; the test and evaluation effort typically builds during the Demonstration and Validation Phase (DVAL) and peaks during Full Scale Development (FSD). In conducting supportability tests, special end item equipment tests are seldom established solely for ILS evaluation; ILS data is usually collected in conjunction with performance-oriented tests. Similarly, supportability testing of configuration changes and modifications are usually conducted in conjunction with performance testing.

11.3.2 Scope of ILS Testing and Evaluation

Although some testing and evaluation are conducted during the early acquisition phases, the major evaluation effort commences after the FSD contract is awarded, and the basic configuration of the selected materiel system has been established. Generally, evaluations prior to FSD can only be conducted by reviewing contractors' planning and analyses, by monitoring reliability development tests of major components, and by conducting simulations. The ILS T&E program will consist of a series of ILS demonstrations and assessments, integrated with hardware performance and T&E progress, that will prove the credibility of the predictions of planned support resources, maintenance procedures, and design compatibility with supportability requirements. ILS evaluations can be considered as falling into four phases or areas with different objectives but overlapping time phasing.

11.3.2.1 Design Interface. This first evaluation commences with the initial Concept Exploration (CE) contract go-ahead and continues until the end of FSD. The evaluation consists of a continuous assessment of the contractor's development of design ILS interfaces with corrective action feed-back. This evaluation is designed to ensure that the selected maintenance plan is compatible with design and hardware characteristics. Mock-ups, test installations, and development fixture evaluations are conducted to provide Logistic Support Analysis (LSA) data. Support equipment functional tests, performed during the evaluation, determine compatibility of equipment with related operating and check-out procedures. The LSA projections and the maintenance plan are compared to results of the evaluation and recommendations for corrective action are provided to the ILS Manager.

11.3.2.2 Hardware Verification. This evaluation verifies the acceptability of the hardware and its ability to meet the established supportability objectives. This is accomplished by verifying selected on-site maintenance tasks and related maintenance plans, and demonstrating achievement of fault-isolation, remove and replace requirements, and supportability design characteristics (e.g., mean-time-between failures). New corrected information is entered into the LSA process to coordinate logistic planning changes and to initiate design changes where required. Where changes to previously approved maintenance plans result from information developed in the ILS evaluation, the specific reason for change will be cited when the revised maintenance plan is submitted for approval. Impact of any changes identified through the ILS evaluation on either the design or approved maintenance plans, must be assessed, documented, and resolved prior to the next DSARC review.

11.3.2.3 Verification of Statistical Data. This evaluation verifies statistical ILS data in order to assess the supportability and maintainability characteristics of the system in its operational environment during initial deployment. This will allow visibility of potential opportunities for logistics enhancements early in the life cycle, form the basis for updating the logistics resource planning and budgeting efforts, and verify contractual compliance with the quantitative support system performance requirements and warranties.

11.3.2.4 Post Deployment Assessment. This evaluation consists of a post operational maintenance review. It assesses the availability and adequacy of the programmed logistics resources to support the specific materiel system. This assessment is usually conducted a reasonable time after materiel system introduction, about one year after Initial Operating Capability (IOC). This time allows resolution of early supply support problems, training and familiarization of maintenance and operating personnel, phasing out of supplemental contractor support and the achievement of a relatively stable mode of operations. Post Deployment Assessments consider all ILS elements listed in DoDD 5000.39, "Acquisition and Management of Integrated Logistic Support for Systems and Equipment", which are applicable to the materiel system under evaluation.

11.3.3 Special Support Requirements

In light of the scheduling requirement for testing major systems, such as range availability and support aircraft or ships, it is essential that all special support requirements are available as a test and support package at the test site before the testing is scheduled to begin. This test and support package consists of spares, support equipment, publications, and representative personnel as well as necessary peculiar support requirements. Delays in availability of essential support items can cause a test to experience costly delays, or more significantly, cause it to be conducted without proper evaluation of the planned support system. During early development and operational testing, the ILS Manager must recognize that prototype test equipment will be used as well as, draft technical manuals, contractor assistance, and an artificial supply system. During this period, simulation will be required to T&E the adequacy of logistics support. Testing and evaluation conducted during and subsequent to FSD should be supported by the planned test and support package, using equipment and personnel that are representative of anticipated operational resources. The effect of any shortcomings should be known well in advance and arrangements for work-arounds identified. The test and support package should be fully committed to the test effort until the requirement is completed. During development testing, any commercial support requirements must be covered by an adequately funded contract. Contractor support, however, should not be used . r operational testing except for areas where contractor support is planned for operational use. The relationship between Government and contractor must be well defined in order to ensure a smooth evaluation with no overlaps or gaps in responsibility.

11.3.4 Data Recording

A properly structured, comprehensive data collection plan is essential in any test program. The ILS Manager coordinates this requirement with the testing organization and solicits its assistance to ensure formats and priorities are responsive to the needs of the support program. Other issues will include the method for data storage and extraction. If possible, data should be collected in a format that not only supports test goals and LSA needs but is also compatible with the data collection and extraction systems used by the Service with operational materiel systems. A system which can effectively accomplish these goals must be in place prior to the start of the first series of tests and evaluations. The data collection and extraction process should be as automated as possible, and samples should be of appropriate size to confirm or negate projections made on previous analyses. The information collected should be of a type easily fed into the LSA process for use in updating readiness and supportability projections. The analysis of this data provides the basis for logistics planning for follow on tests by identifying areas needing emphasis or modification. One example is the failure to meet reliability growth projections which could cause an increase in spares or manpower requirements unless the contractor improves the quality or design of the equipment. Another example is the failure to satisfy the self test requirements; this shortcoming is usually software related and unless corrected before deployment could cause a significant change in maintenance philosophy.

11.3.5 Evaluation of Contractor Data

The ILS Manager should expect the contractor to provide early identification of causes and impacts of any shortcomings which could affect supportability. Starting in DVAL and continuing through production, data should be available from the contractor to be integrated into the T&E effort for Service assessment in all ILS areas.

11.3.6 Use of Results

Unless the results of the test evaluation are properly used, the T&E process itself is of little value. T&E provides a level of assurance that the system being evaluated can meet its design and support objectives and identifies potential areas for improvement either through design change or some change in the support concept. These goals can be accomplished by ensuring that the test and evaluation will:

- o Demonstrate how well a system meets its technical and operational requirement.

- o Provide data to assess developmental and operational risks for decision making.

- o Verify that technical, operational and support problems identified in previous testing have been corrected.

- o Ensure that all critical issues to be resolved by testing have been adequately considered.

- o Identify critical design shortcomings that can affect system supportability.

The emphasis on the use of the results of testing changes as the program moves from the CE Phase to post deployment. The ILS Manager must make the Program Manager (PM) aware of the impact on the program of logistical shortcomings which are identified during the T&E process. The PM in turn must ensure that the solutions to any shortcomings are identified and reflected in the revised specifications and that the revised test requirements are included in the updated Test and Evaluation Master Plan (TEMP) as the program proceeds through the various acquisition stages. During early phases of a program, the evaluation results are used primarily to verify analysis and develop future projections. As the program moves into FSD and hardware becomes available, the evaluation addresses design, particularly the reliability and maintainability aspects, training programs, support equipment adequacy, personnel skills and availability, and technical publications.

11.4 RISK MANAGEMENT

11.4.1 Incomplete or Delayed Support Package

11.4.1.1 Risk Area. Without an adequate test support package on site, ready to support the scheduled test, it may be possible to start testing, but the chances are low of continuing on schedule. A support system failure could cause excessive delays, which can incur a schedule slippage and increased test cost due to on-site support personnel being unemployed or for the cost of facilities which are not being properly used.

11.4.1.2 Risk Handling. Proper planning with adequate follow-up will help to ensure that the test support package is on site and on time, that the personnel required are trained and available, that test facilities are scheduled with enough leeway to compensate for normal delays, and any interservice or intraservice support is fully coordinated. To better assure adequate planning and follow-up, some type of network schedule (e.g., Program Evaluation Review Technique) should be employed. This schedule will identify critical test paramaters and annotate the critical path of resources required to meet the test schedule and objectives.

11.4.2 Incomplete or Inaccessible Data

11.4.2.1 Risk Area. Without sufficient data being available from each test, and used properly for planning subsequent tests, it is not possible to evaluate the adequacy of the system to meet all of its readiness requirements. Without accurate failure rates, system and component reliability cannot be determined; without cause of failure established, Failure Modes Effects and Criticality Analysis and Repair of Repairables Analysis cannot be accomplished. Integral to a data management system is the retrieval and reduction of data as well as the collection and storage. Essential to any test program is the ability to document and collect results so that they are readily available to both the engineer and logistition for analysis at completion of the test program. Lacking the necessary data, system design and ILS progress cannot be established, problems cannot be identified, and additional testing may be required.

11.4.2.2 Risk Handling. With the availability of computers, modern programming techniques, and advanced instrumentation and telemetry capabilities, the collection, storage, and retrieval of data are manageable tasks if approached knowledgeably. Most computer programs are flexible enough to allow multiple retrieval functions if the data management system is planned and programmed prior to the start of the test. The ILS Manager must work with the programmers in establishing the data base. He must ensure that the raw data needed is collected and that the output data to meet ILS requirements can be extracted in an automated manner. The ILS Manager must also investigate the computer resources planned to be used by both the contractor and the Government to assure their compatibility with available systems planned for use at the test site. Any incompatibility either for collection, retrieval, or distribution should be identified in the TEMP and resolved before the testing commences.

11.4.3 Unrealistic Scenarios

11.4.3.1 Risk Areas. A subtle risk, particularly during development testing, and one which can have lasting impact on the viability of a program, is testing to an unrealistic scenario. Realism does not necessarily mean that the stresses put on the system under test must duplicate those of actual service, since in most cases this is impractical; it does mean however that the test is planned to simulate the conditions as closely as possible and differences are carefully documented. Perhaps more significant in ILS testing than stresses applied, is the quality and skill level of personnel maintaining and operating equipment. It is expected during development testing, that highly skilled personnel will be operating and maintaining the equipment, since the main purpose of development testing is to evaluate the hardware itself and to see if it demonstrates the required performance. During operational testing, however, the purpose of the test is to see how the system operates under actual conditions and useful data can only be obtained if it is maintained and operated by personnel having the same skill levels and training as the personnel planned to operate and maintain the system when deployed in the field. If operational testing is staffed with military personnel having much more experience and skill than can be expected when deployed, the operational testing will give an unrealistically favorable evaluation, which though favorable to the system, provides misleading information resulting in invalid conclusions.

11.4.3.2 Risk Handling. During development testing the ILS manager must utilize as realistic a testing profile as possible to ensure that laboratory conditions for parts testing as well as full scale supportability testing gives a true picture of the performance capability of the hardware being tested. Selected pertinent criteria such as temperature cycling, water intrusion, high humidity testing, and shock exposure should all be part of the development test. In operational testing the ILS Manager should insist on being able to test the supportability of the system in order to ensure its being able to achieve its readiness objective when deployed. To accomplish this, it is necessary to use representative personnel who have received training through representative maintenance courses and draft technical manuals, not highly skilled technicians. It is also highly desirable to use standard support and test equipment planned to be used with the system, and a spares methodology which can simulate anticipated standard delay times. These restrictions on operational testing should establish a realistic sense of readiness capability, adequate spares provisioning, identification of training and publication deficiencies, and the surfacing of support and test equipment problems.

11.5 SUMMARY

- T&E of ILS measures the ability of the support concept to achieve the readiness objective of a materiel system.
- An adequate test and support package should be available at the start of a test effort to enhance the probability that all ILS issues will be fully addressed and that the test will be completed on schedule and within the programmed budget.
- The ability to collect and manage the test data is critical to a successful test.

- The successful T&E of any system depends on thorough and timely planning being completed well in advance of the test.

11.6 REFERENCES

1. DoDD 5000.3, Test and Evaluation.

2. Dept of Army Pamphlet 700-50, Integrated Logistic Support: Developmental Supportability Test and Evaluation Guide.

MODULE V

PROVIDING THE SUPPORT

The goal of the ILS Manager's efforts is the successful deployment of a materiel system and its support and the achievement of readiness, supportability and life cycle cost objectives. This module focuses on the ILS role in planning for and accomplishing the transition to production and operational and post-production support.

CONTENTS

CHAPTER 12

SUPPORTABILITY ISSUES IN TRANSITION TO PRODUCTION

12.1 HIGHLIGHTS

- o Validation of Reliability and Maintainability Goals With Early Production Hardware During the Transition to Production
- o Interrelationship of Production and Supportability
- o Template Discipline of DoD 4245.7-M.

12.2 INTRODUCTION

12.2.1 Purpose

To provide a managerial overview of the key activities required to achieve an effective transition from development to production in terms of supportability.

12.2.2 Objective

The supportability objective during the transition to production is to assure that earlier predictions and assumptions of support requirements and system performance are verified and validated in the early production articles. Among the evidence that the ILS Manager should insist on are: demonstrated reliability, a producible design, proven repeatability of manufacturing procedures and processes, certified hardware and software, and verified support equipment.

12.3 MANAGEMENT ISSUES

12.3.1 General

In the acqusition process, evidence of materiel system problems usually becomes apparent when a program transitions from Full Scale Development (FSD) into production. This transition is not a discrete event in time; it occurs over months or even years. Some programs may not succeed in production despite the fact that they have passed the required milestone reviews. Reliability and support characteristics that are not "designed-in" cannot be "tested-in" or "produced-in". In the test program, there may be unexpected failures that require design changes. The introduction of these changes can impact quality, producibility, supportability, and can result in program schedule slippage. The ILS Manager must exercise strong change management discipline during this transition period to ensure that the changes incorporated in the materiel system are properly reflected in the support system deliverables.

The transition process is impacted by:

- o Design maturity - a qualitative assessment of the implementation of contractor design policy.
- o Test stability - the absence or near absence of anomalies in the failure data from development testing.
- o Certification of the manufacturing processes - includes both design for production and proof of process. Proof of process occurs during pilot production or low rate initial production or other "proof of concept" methods used prior to rate buildup.

12.3.2 Support Readiness Reviews

Support readiness reviews should be initiated and scheduled by the Program Manager or ILS Manager. The number and topic sequence shall depend on the nature of the program and address all ILS elements listed in DoDD 5000.39, "Acquisition and Management of Integrated Logistic Support for Systems and Equipment" at some time during the transition. Depending on the system under consideration and the phase of the program, some elements will be more critical than others during particular reviews. The emphasis on key program issues will, therefore, have to be tailored accordingly. To be most effective, support readiness reviews should preceed Preliminary Design Reviews (PDR) and Critical

Design Reviews (CDR), wherein the ILS Manager has an active role (see Figure 4.3). Logistics related issues from earlier PDRs and CDRs should be prime considerations during later support readiness reviews. The ILS Manager should maintain and track support related action items. The Integrated Logistic Support Management Team, discused in paragraph 2.3.2 should be employed to conduct these reviews.

12.3.3 Tasks, Activities, and Deliverables

The quality and validity of many of the products of the Logistic Support Analysis (LSA) process surface in the transition to production. Earlier validation of LSA outputs gives confidence in the quality of the analytical side of the process. As the hardware and attendant validation results transition to production, a lengthy list of problems may surface which the ILS Manager must resolve e.g., inadequate support equipment; late ordering of spares; inadequate training; documentation that is not to the latest configuration; unproven facilities; one set of check out equipment needed simultaneously for production testing, quality assurance standards, and deployment, and any attendant procedures and processes.

12.3.3.1 Support Requirements Review During The Transition Phase. The ILS Manager should take stock of the lessons learned from the results of the development program phase by conducting a support requirements review prior to recommending that the program proceed to the production phase. Some of the review considerations are:

- o Have the supportability parameters required to satisfy the operational requirement of readiness, mission duration, turn-around-times and support base interface goals been identified, tracked and verified in the proceeding phases?

- o Have critical supportability design deficiencies identified during Development Test & Evaluation (DT&E) and Operational Test & Evaluation (OT&E) been corrected or have solutions been identified that can be applied prior to deployment?

- o Have ILS elements (support equipment, technical manuals, etc.) been fully evaluated in a representative operational environment? Have deficiencies been corrected or can they be corrected prior to deployment?

- o Have quantitative requirements for ILS elements (e.g., maintenance manpower, and initial provisioning) been determined?

- o Is sufficient funding included in the Program Objectives Memorandum (POM)?

- o Can the manpower required to support the system be satisfied by the Services manpower projections?

- o Will production leadtimes for the ILS elements support the planned production and deployment schedules?

- o Have simulations confirmed the attainability of system readiness thresholds within the target levels for operating and support costs?

- o Have plans for interim contractor support, if applicable, and transition to organic support been prepared?

If these issues have not been resolved, then the ILS Manager should develop a recovery plan and/or recommend further system development.

12.3.3.2 ILS Manager's Priority Tasks During The Transition Phase. The primary purpose of the acquisition process is to field materiel systems that not only perform their intended functions but are ready to perform these functions repeatedly without burdensome maintenance and logistics efforts. The successful deployment of a reliable and supportable system requires that the ILS Manager provide strict watch dog management during the transition phase to ensure that adequate technical engineering, manufacturing disciplines, and management systems are applied to the ILS elements and supportability features of the system. Transition phase ILS priority item are:

- o Providing timely funding for all ILS elements.
- o Involving ILS specialists in the preparation of comprehensive hardware and software specifications and data description.
- o Continuing an active LSA process.
- o Establishing adequate funding for initial spares and support equipment.
- o Ensuring ILS inputs to configuration control and the comprehensive assessment of the impact of changes on all support elements.
- o Establishing a technical management system for tracking support equipment reliability, configuration control, and compatibility with end item hardware/firmware/software.
- o Funding and scheduling of technical manuals and other support documentation.

12.3.4 The Transition Plan

Transition plans, which are detailed accounting of the items and issues to checkoff in "readiness" reviews, are primarily a management tool for ensuring that adequate risk handling measures have been taken. Figure 12-1 provides a list of contents for a transition plan and production readiness review. They must be initiated and tailored to the need of the program by the Program and ILS Managers.

12.3.5 DoD 4245.7-M, "Transition From Development to Production"

This documentation is an aid in structuring technically sound programs during the transition from development to production. The manual includes a series of risk management templates keyed to specific technical issues. The templates in turn provide a program relationship and identify the potential risks and outline risk avoidance techniques. Figure 12-2 illustrates the level of detail of risk management provided in this document. Other templates related to logistic support are included for LSA; manpower and personnel; training; packaging, handling, storage, and transportation; support equipment; and support facilities.

12.3.6 Management of Changes

Even with a good configuration management system, the impact of DT&E/OT&E changes can overwhelm the best logistics support planning in the transition to production unless: (1) the guidance and intent of DoD 4245.7 and 4245.7-M on disciplining the engineering process have been employed, (2) an effective Government/contractor/subcontractor team is implemented to handle the changes on a total systems basis, and (3) the Government is prepared to respond with funding and direction to other Government agencies whose support tasks on the program are affected by the changes.

Figure 12-3 diagrams the traditional approach to ILS management and review. Due to the "reality" of professional specialization and organizational compartmentalization in both Government and industry, each support discipline is considered a specialty unto itself and is often isolated at the expense of coordination and integration (e.g., spares were dealt with in isolation between industry and Government provisioning specialists). Experience has amply demonstrated that the traditional approach results in an inability to obtain optimum support in the field following delivery of a materiel system. Ideally and properly implemented, the systems engineering and LSA processes would cure the lack of adequate integration between design engineering and logistics elements.

An example of an effective contractor team which precludes the "isolation" of specialities described above by forcing in-house coordination is the support integration review team concept shown in Figure 12-4. This team parallels the intent of DoDD 5000.39 and related directives in the integration of ILS with the design effort.

Before the contractor initiates fabrication of production parts, the discipline of identifying program peculiar issues and

TRANSITION PLAN OUTLINE

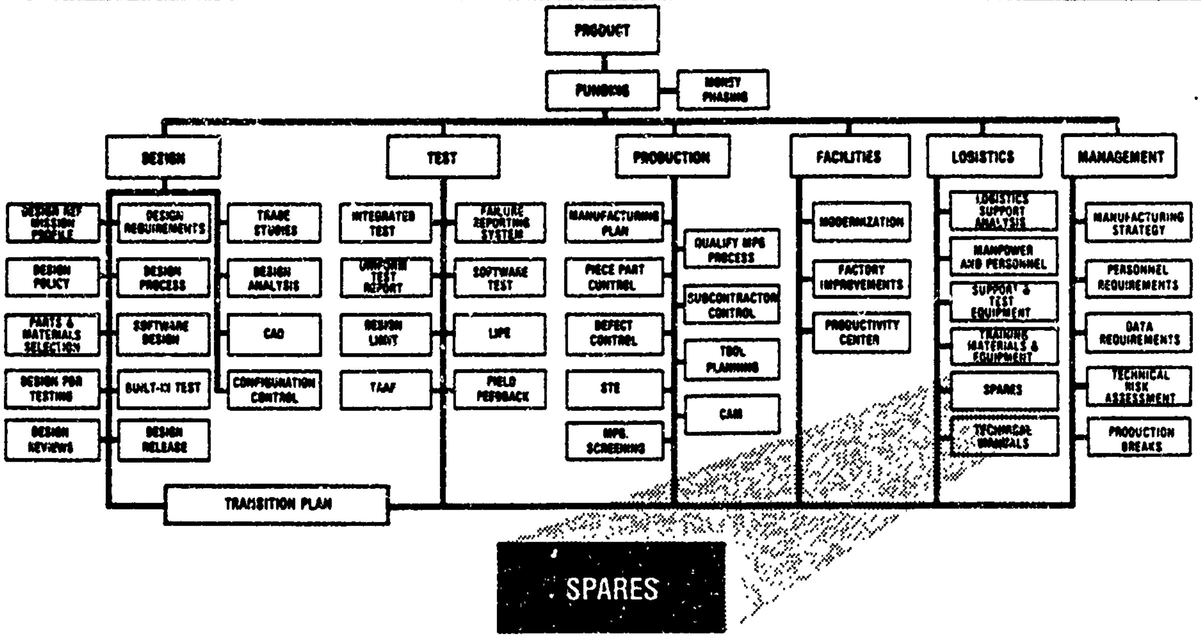
- Purpose of the Transition Plan
- Manufacturing Organization
- Program Schedules
- Make or Buy Decisions
- Producibility Engineering Role & Responsibilities
- Facility Required
- Manufacturing Technology
- Material Procurement
- Assembly Planning
- Methods
- Processing Engineering
- Assembly Tooling
- Packaging Engineering
- Fabrication
- Production Engineering
- Production Control
- Manpower Plan
- Manufacturing Financial Plan
- Product Assurance Plan

PRODUCTION READINESS REVIEW

- Production Management
- Engineering Design
- Production Design
- Production Engineering
- Industrial Resources
- Materials and Purchased Parts
- Make or buy
- Subcontract Management
- Manufacturing Planning
- Quality Assurance
- Cost
- Risk
- Logistics
- Contract Administration

Figure 12-1 Sample Transition Plan and Production Readiness Review Contents

TEMPLATE



AREA OF RISK

Spares are a troublesome area in the production and deployment of weapon systems. Spares and repair parts often do not meet the same quality and reliability levels as the prime hardware. Full spares provisioning too early in the development cycle, when there are large uncertainties in the predicted failure rates and design stability, results in the procurement of unneeded or unusable spares. Inadequate technical and reprocurement data frequently limits competition, acquisition flexibility, and spares manufacturing throughout the life cycle of the prime systems. Spares thus present a major risk of increased acquisition and support costs, and reduced readiness of fielded systems.

OUTLINE FOR REDUCING RISK

- A spares acquisition strategy is developed early in FSD to identify least cost options, including combining spares procurement with production. This strategy addresses spares requirements to meet FSD testing as well as production and deployment.
- The same quality manufacturing standards and risk reduction techniques used for the prime hardware are used in the spares manufacturing and repair process.
- Transition from contractor to government spares support is planned on a phased subsystem by subsystem basis.
- Initial spares demand factors are based on conservative engineering reliability estimates of failure rates (derived from comparability analysis), and sparing to availability analytical models. These factors are checked for reasonableness at the system or major subsystem level against laboratory and field test results and documented in the logistics support analysis data base.

SOURCE: DOD 4245.7-M

Figure 12-2 Sample Logistics Template

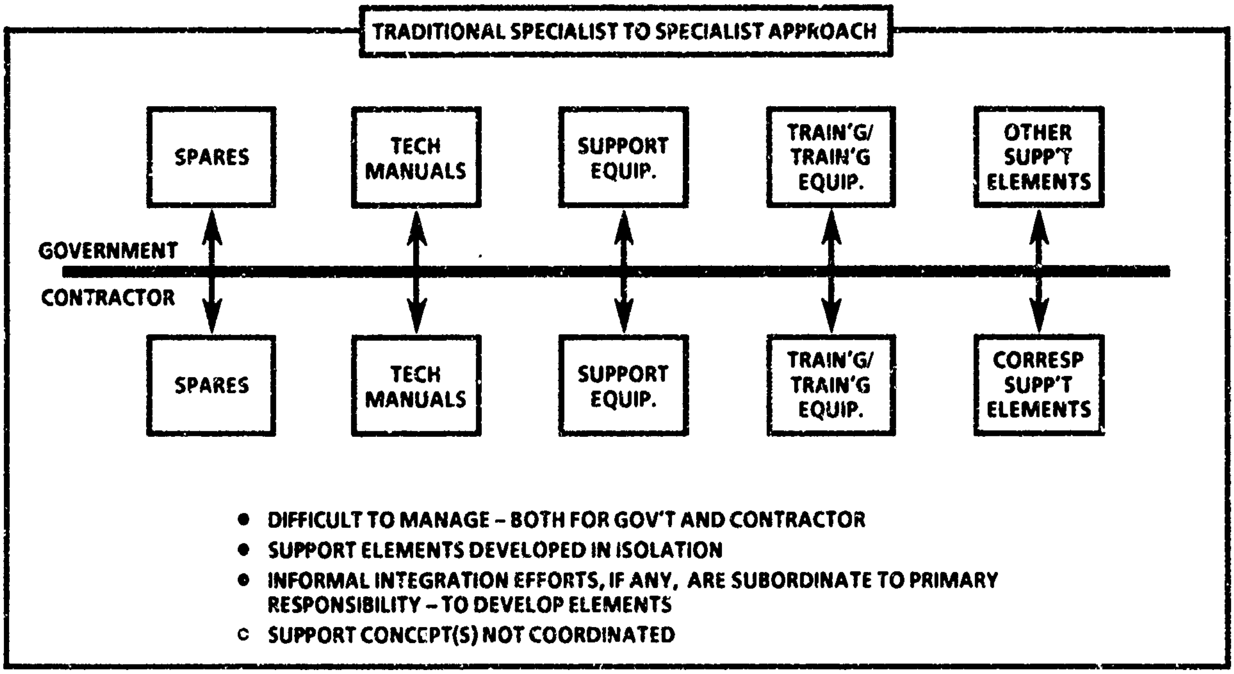


Figure 12-3 Traditional ILS Management and Review Approach

applying appropriate risk management and risk hedges should have been employed to ensure:

- o Design maturity
- o Repeatability of test results
- o Certification of manufacturing processes.

This will minimize the quantity and scope of follow-on changes required to correct or improve the production of end items.

When changes do occur, the ILS Manager's task becomes a vital one to the eventual success of the program in view of the fact that the changes to the materiel system will generally require changes in all or most of the logistic support resources.

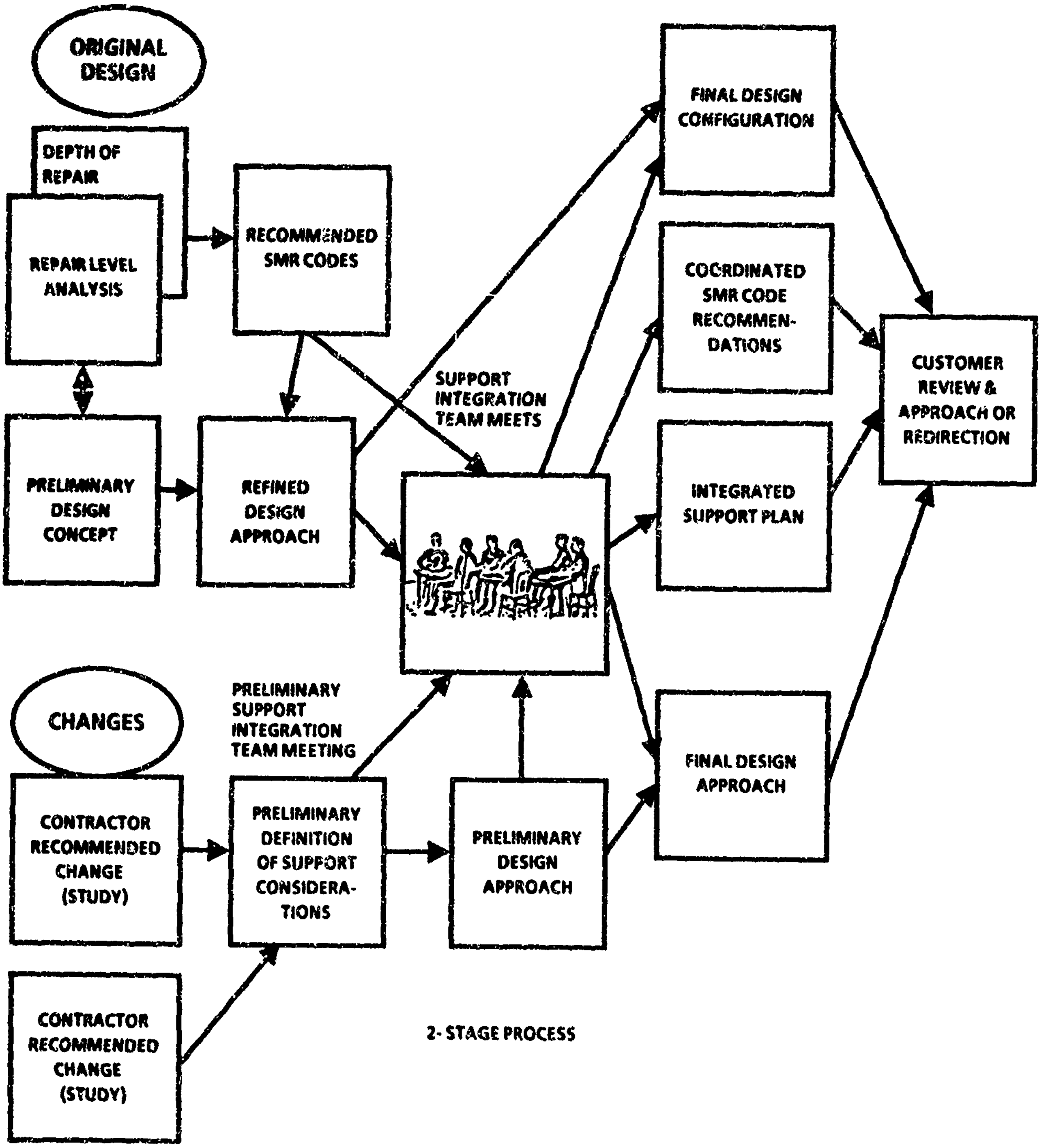
12.3.6.1 Change Proposal Preparation. The starting point in change preparation is recognition of a deficiency and a decision to employ a design solution. As shown in Figure 12-5, the request to change production - and possibly retrofit fielded equipment - may be originated by the Government or the contractor. The top half of Figure 12-5 illustrates one approach to contractor preparation of an Engineering Change Proposal (ECP). The contractor ILS Manager must be actively involved in:

- o Determining the impact of the ECP on affected ILS elements.
- o Developing requirements and schedules for required changes to affected ILS elements.
- o Participating in engineering review board and change review board meetings.

The Government ILS Manager must be involved in the Government review and approval process. He must ensure that:

- o The impact on ILS elements has been fully evaluated.
- o ECPs for associated changes to support equipment and training devices are available for concurrent review and approval.
- o Lead times for changes to ILS elements are compatible with the planned implementation of the ECP on the production line.
- o Changes to ILS elements are funded.

12.3.6.2 Change Implementation. After Government approval, the contractor initiates action to finalize the change for production and or retrofit and the concur-



Source: GD Ft. Worth Div

Figure 12-4 Flow of Contractor Support Integration Team Actions

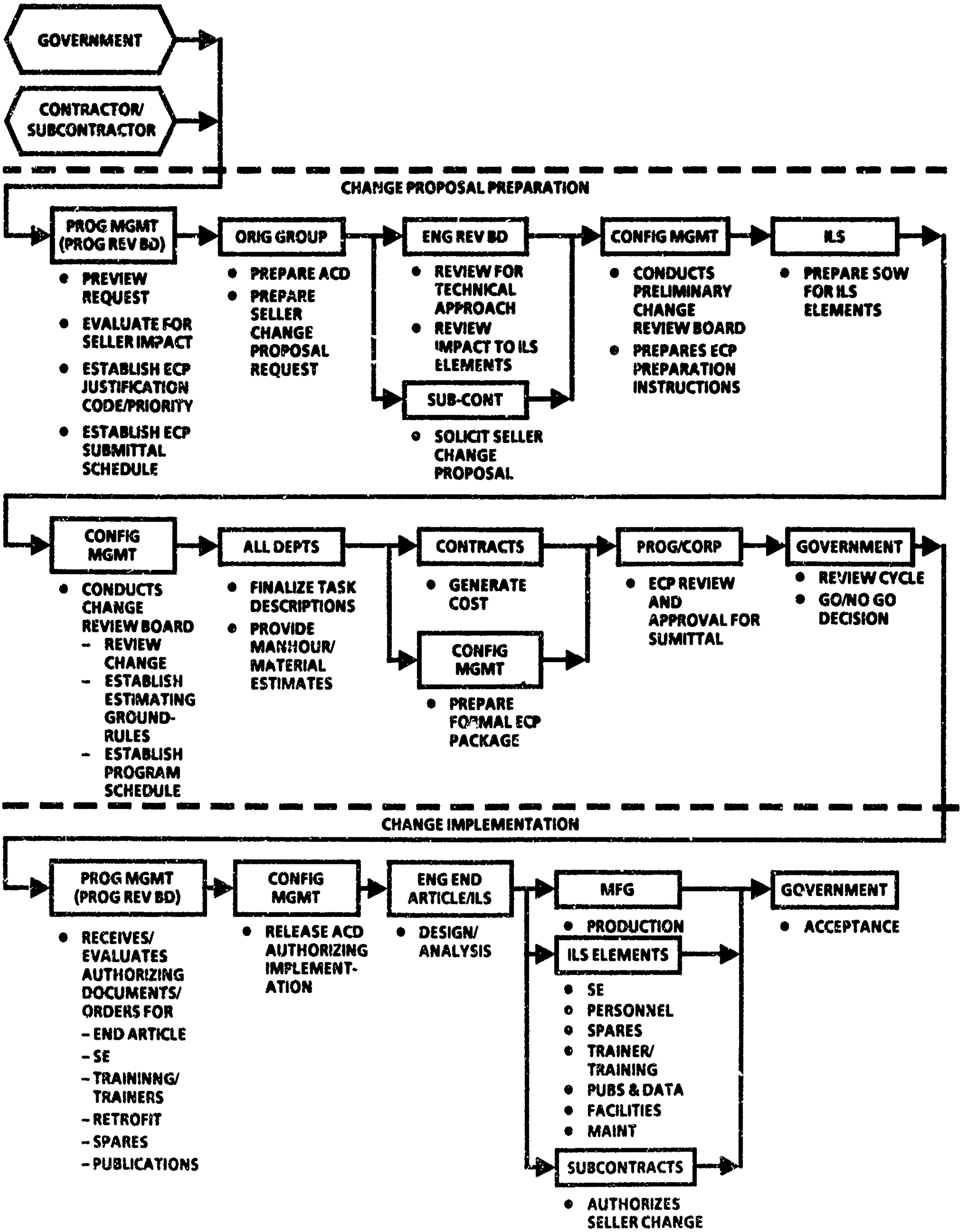


Figure 12-5 One Variation of ECP Preparation/Implementation by a System Contractor

rent modification of the affected ILS elements (bottom half of Figure 12-5). The Government accepts the modified systems. The Government ILS Manager normally is responsible for the application of retrofit kits and must assure that the required changes to logistics support of fielded systems are applied or are available concurrent with the application of retrofit kits to the systems. This latter requirement can be facilitated by grouping retrofit kits into block modifications and applying them to complete production lots.

12.3.7 The Support Management Information System

Support management information systems are common on most major programs and they greatly facilitate the ability to manage changes during the transition period. Integration of Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), and Computer Aided Logistics (CAL) has been implemented on past programs and is a very effective means of managing changes.

12.4 RISK MANAGEMENT

12.4.1 Risk Areas

Prior to entering the FSD phase, the ILS Manager should try to identify unique system/equipment risk areas which might impact a smooth transition from FSD to production and highlight the techniques which might avoid these risks as tasks to be performed during FSD. Some examples of risk areas to be considered are identified in Figure 12-6.

Risk Area	Impact
o Inadequate transition planning.	o FSD phase does not effectively validate support item risk areas; increase in production change traffic; extended contractor support period.
o Extensive engineering change traffic.	o O&S cost thresholds exceeded; configuration of deployed support systems not compatible with fielded system.
o Organic support implementation delayed.	o O&S cost thresholds can be exceeded; this could stem from contractor support tasks being priced in a non-competitive environment.
o Delayed completion of DT&E and OT&E effort.	o Changing product baseline with expensive post delivery retrofit in lieu of production incorporation.
o Product not adequately engineered for producibility.	o High unit manufacturing cost; producibility improvement changes; configuration management problems with delivered support items.

Figure 12-6 Transition Risk Areas

Technique	Risk Handling Techniques
o Assessing transition planning.	o The transition from FSD to production should be documented with a transition plan that includes as a milestone the validation of a system support package covering and integrating all support elements. o This plan should be available prior to the start of FSD and updated and ratified early in the FSD phase.
o Timely and cost effective planning of contractor and affected Government agency support tasks.	o The program and ILS Managers must actively coordinate the development of the transition plan with contractor and other Government agencies and use MIL-STD-480, "Configuration Control Engineering changes, Deviations, and Waivers", as an effective ILS change management tool.
o Timely inclusion of Government organic support considerations in planning.	o Include user and depot representation in the planning process.

Figure 12-7 Transition Risk Handling

12.4.2 Risk Handling

The risk areas identified in Figure 12-6 can all be minimized by following the guidelines for the LSA process discussed in Chapter 5, and the planning and management visibility and control techniques discussed as part of the ILSP in Chapter 2. Some specific techniques applicable to the example risk areas are discussed in Figure 12-7.

12.5 SUMMARY

- o Major ILS management risks in the transition to the production process are:
    - Inadequate planning
    - Extensive changes
    - Delayed organic support
    - Delayed completion of testing phase
    - Inadequate producibility in design
- o Major support problems first become evident when the system is transitioned to production.
- o Transition planning should be completed before entering the initial production phase so that the system support package can be validated prior to the production decision.
- o Intensive ILS management is required to ensure that support items remain compatible with late changes to the materiel system.

12.6 REFERENCES

1. DoD 4245.7, Transition From Development to Production and Companion Manual, DoD 4245.7-M.
2. DoDI 5000.38, Production Readiness Reviews

3. MIL-STD-480, Configuration Control - Engineering Changes, Deviations, and Waivers.

4. MIL-STD-482, Configuration Status Accounting, Data Elements, and Related Features.

CONTENTS

CHAPTER 13

DEPLOYMENT

13.1 HIGHLIGHTS

- Deployment Planning Requirements and Schedules
- Deployment Coordination and Negotiation Requirements
- The Deployment Plan; Agreement and Certification
- Managing the Deployment Process.

13.2 INTRODUCTION

13.2.1 Purpose

To provide a managerial overview of the actions required to successfully deploy a new or modified materiel system. The term deployment includes fielding, turnover, handoff, fleet-introduction, and other terms used by the Services. Included are deployment planning, execution, and follow-up requirements covering the period from Concept Exploration (CE) until the last unit is operational.

13.2.2 Objective

The deployment process is designed to successfully turn over newly acquired or modified systems to users who have been trained and equipped to operate and maintain the equipment. Every element of ILS must be in place at deployment with the exception of those for which interim contractor support is available. Although seemingly a straightforward process, deployment is complex and can be costly if not properly managed. Properly planned and executed deployments can result in high unit readiness, reduced cost, less logistics turmoil, and can establish a favorable reputation for the new system.

13.3 MANAGEMENT ISSUES

13.3.1 Scope

Deployment poses the challenge to the Service logistic organization of being capable of providing adequate support to a materiel system when custody of that system shifts to a user or operating command. The Service logistic capability at that point in time may be augmented for various periods by a range of contractor provided services. First unit Initial Operational Capability (IOC) may range from the first day of custody of the system hardware to some later date when unit training has been completed and a readiness inspection is satisfactorily passed. Initial deployment may range from one or two systems being transitioned to the user over a period of several weeks and then growing significantly in numbers to the staged transition of a single large system, such as an aircraft carrier. Regardless of the deployment schedule, the system must have a comprehensive, coordinated deployment plan containing realistic lead times, supported by adequate funds and staff, and having the potential for rigorous execution. Applicable elements among those identified in Figure 13-1 must be available on schedule or the system will not be operational.

Although a deployment schedule may be established at Milestone I, subsequent adjustments are possible and should be considered, particularly in the early stages of a program when a greater range of flexibility exists. In later stages of the acquisition process, the failure to meet a logistic milestone can translate into a costly deployment delay, or deployment of a system that cannot meet readiness goals; both of which will result in reduced military capability.

13.3.2 Planning

Deployment should not be thought of as simply delivering equipment. There is a need for consideration of manpower, personnel, and training requirements; establishment of facilities; placement of system support; use of contractor support; data collection and feedback; and identification of funds. Planning for deployment begins in the CE

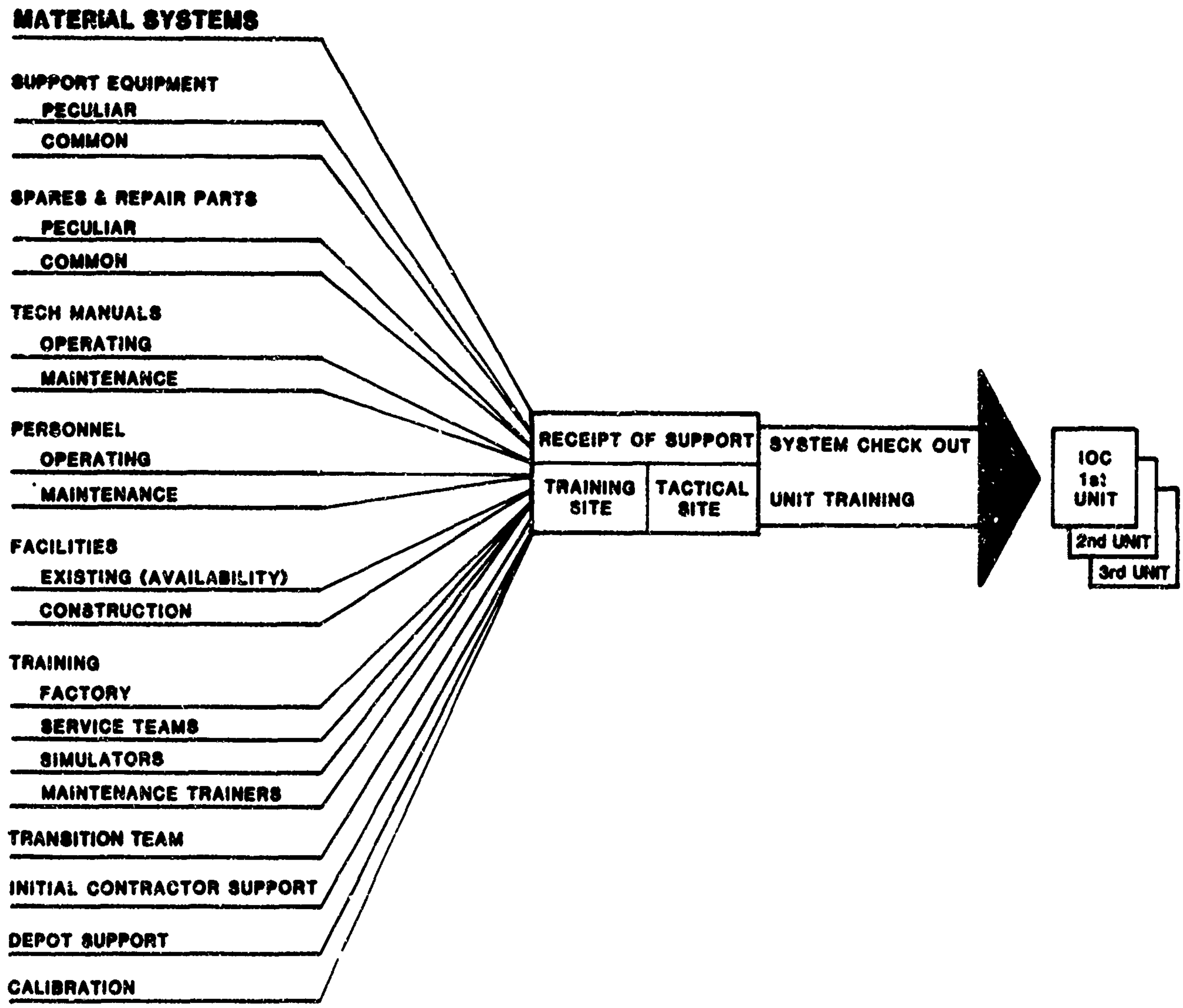


Figure 13-1 Deployment Requirements

Phase. By Milestone I, the draft Integrated Logistics Support Plan (ILSP) must be prepared and address the long term deployment considerations. Deployment planning intensifies through the Demonstration/Validation (DVAL) Phase so that by Full Scale Development (FSD), a detailed plan for deployment can be prepared. This plan must be continually updated and coordinated to reflect program changes and disseminated to all participants.

Coordination (or dissemination) is very important. Each change must be passed on to every organization involved in the deployment process. Changes in almost any aspect of the program can have an impact on deployment. These range from the very obvious, such as production schedule changes, to a less obvious change in unit manning requirements. Figure 13-2 shows the relationship between deployment activities and major ILS activities. Figure 13-3 provides suggested topics for inclusion in the plan. The Integrated Logistics Support Management Team (ILSMT) must be actively involved in deployment planning. See Chapter 2 for additional material on planning.

13.3.2.1 Test and Evaluation. Supportability of a system should be demonstrated before deployment and the ILS manager must ensure that the Test and Evaluation Master

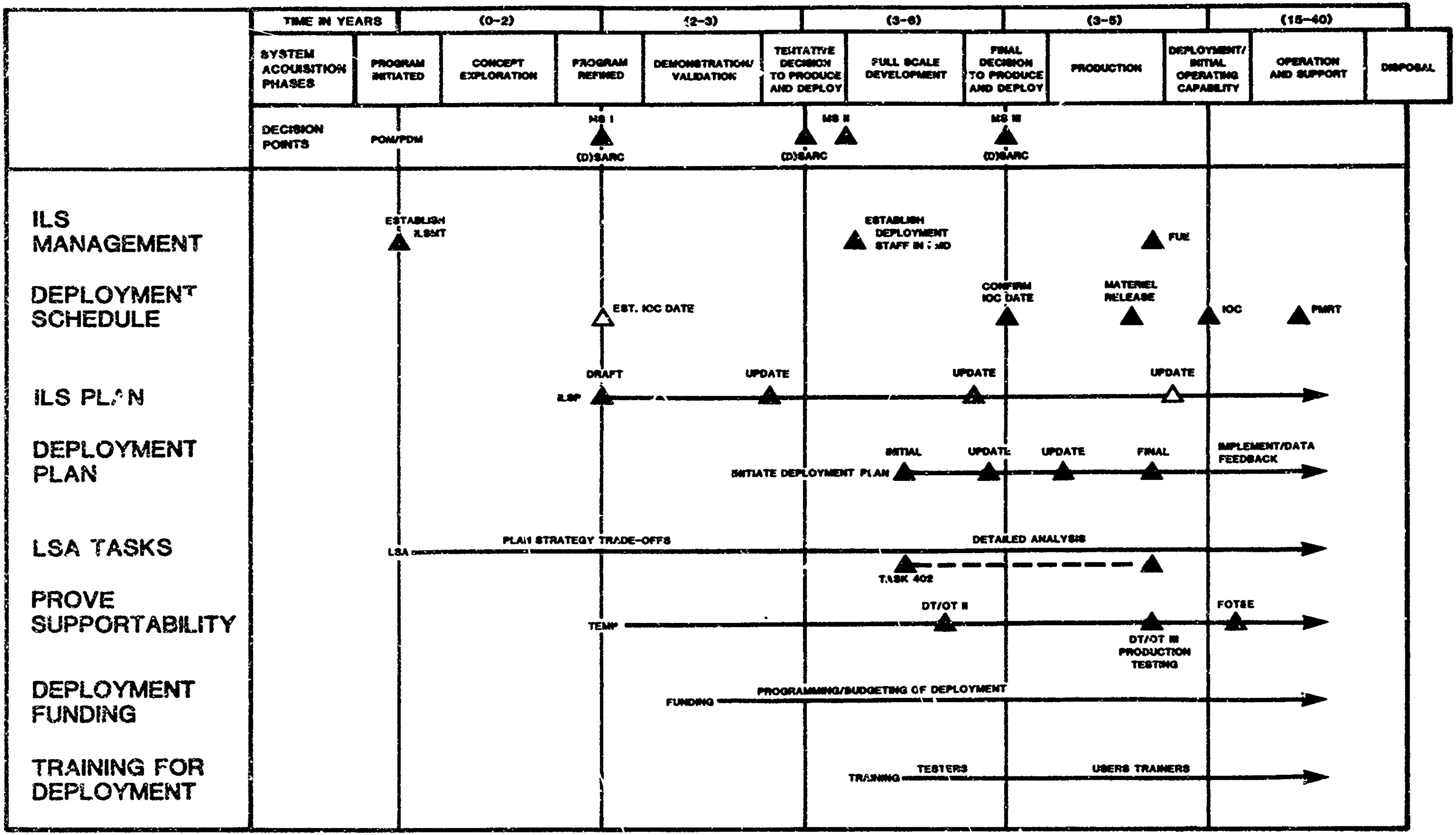


Figure 13-2 ILS Deployment Activities

I. INTRODUCTION

A. Purpose

B. Limitation of Data

C. Logistics Support Concept

D. Deployment Agreement and Certification (LOA, MOU)*

II. SYSTEM/END ITEM DESCRIPTION

A. Functional Configuration

B. Organizational and Operational Concepts

C. Deployment Schedules

III. LOGISTICS SUPPORT AND COMMAND AND CONTROL

A. Command and Control Procedures

B. Logistics Assistance

C. Materiel Defects

D. Coordination

IV. SYSTEM SUPPORT DETAILS

(Discuss each ILS Element)

V. THE PROGRAM MANAGERS COMMITMENT

VI. SUPPORT REQUIRED FROM USING COMMAND

VII. SUMMARY

APPENDIX

A. Key Correspondence

B. Plans and Agreements

C. Developers Checklist

D. User Command Checklist

E. Classified Information

*Letters of Agreement, Memorandum of Understanding

SOURCE: DARCOM CIR 700-9-4

Figure 13-3 Suggested Contents of a Plan for Deployment

Plan (TEMP) includes supportability objectives, issues and criteria. Development and operational testing during FSD provides information for the Milestone III production and deployment decision, and provides input to follow-on testing requirements. These tests should provide assurance that the proposed logistics concepts and planned resources will be sufficient to support the system once deployed. This testing may also suggest changes to planned deployment actions. In addition, the Follow-On Test and Evaluation (FOT&E) may use the first unit equipped as the test unit; therefore, FOT&E planning must be closely coordinated with deployment planning.

13.3.2.2 Logistics Support Analysis (LSA). LSA task results have a significant impact on deployment planning and execution. Early Fielding Analysis (LSA Task 402) should be conducted during FSD. This task should be repeated as input data changes. Typical input data changes result from Evaluation of Alternatives and Tradeoff Analyses (Task 303), changes in deployment quantities and schedules, and changes in manpower and personnel availability or requirements. Early Fielding Analysis provides data to ILS management by assessing many elements including: the impact of the introduction of new systems on existing materiel systems, identification of sources of personnel to meet the requirements of the new systems, determining the impact of a program's failure to obtain the logistic support resources, and determining essential logistic support resource requirements for a combat environment. The final subtask for the Early Fielding Analysis requires the development of plans to alleviate potential fielding problems.

13.3.2.3 Funding. Although ILS funding is discussed in Chapter 8, it is important to reiterate here that specific funding requirements for deployment require early identification in terms of programming and budgeting. Deployment-related funding requirements may include military construction, training, travel, transportation of materiel, contractor support, and can involve both Program Management Office (PMO) and user funds.

13.3.2.4 Warranties. When a warranty is to be used, the user must be involved in the planning and the warranty's impact must be accommodated in the deployment plan. The deployment plan should state which components are under warranty, by whom and for how long, and the starting date or event of the warranty. Generally, it will be necessary to describe warranty provisions by equipment serial numbers. The interface between the user and the contractor should also be explained in the plan. Warranty coverage should normally begin at the time the components are placed in service rather than at initial delivery. This will avoid components remaining in transit and storage during a substantial portion of the warranty period.

13.3.2.5 Management Information System (MIS). The ILS manager should establish a MIS to assist the deployment planning and implementation. The number of logistics elements, the varied disciplines involved in planning for deployment, the numerous funding sources for support, and the multitude of data that are interrelated make the deployment status difficult to track and update unless it is managed systematically. For example, a slippage in parts delivery for a simulator could mean that more training time is needed on the prime system. This would increase demands on maintenance (during a training period), and increase the demand for replenishment spares. This increased demand for spares could impact the availability of components for the production line or the initial support package for following deployments, causing a slippage in the deployment schedule. Slippage in the deployment schedule would increase the demand for support to the system being phased out - all due to slippage in parts for the simulator. Further, failure rates and operating problems could differ significantly from those encountered in the testing environment. These difficulties must be fed back to the ILS manager so that the support deficiencies can be corrected before future deployments are made. As a minimum, on-site data collection, reports of trade-off analyses, status of support activities, and costs and funding reports should be included in this MIS.

13.3.3 Coordination and Negotiation

A deployment working group, which involves the ILSMT, should be established by the Program Manager. The group should, at a minimum, have members from the using and supporting commands. Figure 13-4 lists those staffs, commands and functions that must be included in deployment planning and shows their major responsibilities.

The major negotiation requirement is on the agreement or certification by the Program Manager to deliver the system and its support and by the user to prepare for its receipt. The agreement may be an integral part of the plan for deployment; negotiated between the two principals and coordinated among the many other participants. Negotiations should commence prior to the production decision and should be documented as required by each Service, e.g., in the case of the USAF, the Turnover Agreement is documented in the Program Management Plan (PMP). The coordination may involve on-site meetings prior to deployment which coordinate the details of transfer, site planning and inspection, equipment on-site checkout, and similar activities. Frequently, the initial units to receive a new system find that they are competing for replacement spares with the ongoing production line and the build-up to support subsequent deployments. Depot level component repair also may compete with the production line for resources, (test equipment, bits and pieces, skilled manpower, etc.) These problems are compounded when the fielded reliability does not meet the planned reliability. These potential problems and the priorities established for satisfying requirements during this time of support and production build-up should be included in the agreement.

13.3.4 Organization

As the planning for deployment intensifies, the Program Manager should establish an organization within the PMO to assist the user, interact with the working groups, and resolve problems that arise during deployment. Deployment personnel should be considered for both PMO and on-site assignments. Teams may be required for briefing user commanders and their staffs. System deployment teams at each deployment site can assist in the checkout of equipment, perform the hand-off, train unit personnel, and assure that support capabilities are in place. The assistance of contractor personnel may also be desirable at this time and should be considered in the planning.

13.3.5 Materiel Release Review

The release of the first system to each major user activity follows a period of extensive planning and coordination. The materiel release review is a control mechanism to verify that all materiel and logistics deficiencies identified in Operational Test and Evaluation have been corrected and that all logistics resources required to support the initial deployment will be available concurrent with the release of the system (see Figure 13-1). The materiel release is in essence a certification by the materiel system developing/procuring activity that all conditions required to achieve initial readiness have been met.

13.3.6 Lessons Learned from Previous Deployments

Figure 13-5 summarizes problem areas associated with previous deployments, and suggested corrective actions.

13.4 <u>RISK MANAGEMENT</u>

13.4.1 Accelerated Programs

13.4.1.1 <u>Risk Area</u>. Compressed schedules increase the demand for critical assets during the time of normal asset shortages.

13.4.1.2 <u>Risk Handling</u>. Knowing that the acquisition strategy calls for an accelerated schedule, the ILS manager must assess the risks associated with acceleration, identify support concept alternatives that will minimize the risk, and develop ILS program guidelines and techniques that will assure its proper execution. Interim contractor support is a feasible alternative that should be considered, and if accepted, planning should be initiated as early as possible in the program. The using command, as well as all of the other participants, must be informed and involved in the planning.

COMMAND/STAFF	FUNCTION
PROGRAM MANAGER (MATERIAL DEVELOPMENT OR IMPLEMENTING COMMAND)	o Establishes Working Group
	o Develops Supportability Testing Assessment
	o Provides Input to Training Plans
	o Prepares Deployment Plan
	o Coordinates Plan
	o Prepares Deployment Agreement/Certification
	o Negotiates Agreement/Certification with Using Command(s)
USER (OPERATING) COMMANDS	o Prepares Operational Support Plan
	o Provides Input to Deployment Plan
	o Negotiates Agreement/Certification with Program Manager
TEST & EVALUATION ORGANIZATION	o Performs Operational Test and Evaluation
TRAINING COMMAND	o Provides Input to Deployment Plan
	o Prepares Training Plans/System Training Requirements
SERVICE STAFF	o Provides Deployment Allocations, Manpower Changes, Training Facilities, and Logistics Inputs to the Deployment Plan
	o Reviews Plans and Agreements
CONTRACTOR	o Provides Support/Warranty
	o May Provide Plan for Interim or Life Cycle Maintenance and Supply Support

Figure 13-4 Deployment Planning, Negotiation, and Coordination Requirements

PROBLEM AREA	ACTIONS
Personnel Turnover	Document all plans, agreements and changes Conduct new equipment training close to date unit will be equipped.
Conditional Materiel Release	User must understand and agree to the terms of a conditional materiel release
Training of Operators and Maintenance Personnel	Software training required before ATE delivery so that unit will be better prepared to participate in the acceptance testing. New equipment training plans must include provisions for the maintenance of equipment used in training. Contractor personnel may be considered for this task. Anticipate the need to brief commanders and their staffs prior to deployment. Developer must ensure that all required support equipment is available prior to new equipment training. Personnel should be scheduled for new equipment training. They should have the correct skills, sufficient time remaining in the unit, and meet all other training prerequisites. The use of Video Tapes and other media should be considered for new equipment training teams.
Establishing a PMO Deployment Team (Field Support)	Need experienced fielding personnel, who are logisticians familiar with the system. Have to start looking for these people early-on.
Warranties	Establish simple procedures for returning failed parts to the manufacture for analysis.
Deployment Plan for a Non-Logistics Significant Item	Plan may not be necessary but user must concur with decision to eliminate the plan.
Failure to include contractor in deployment planning	Keep contractors informed of requirements so that they can assess their tasks. Contracts must be negotiated to assure that support items are delivered concurrently with the end item.
Hardware problems during user hand-off period	Establish a staging area (may be at contractor's facility) where maintenance personnel can check out all equipment.

Figure 13-5 Lessons Learned from Previous Deployments

13.4.2 Schedule Slippage

13.4.2.1 Risk Area. Failure to understand how a schedule slippage in one functional element impacts the other elements and milestone events.

13.4.2.2 Risk Handling. The Program Manager should employ a network schedule which identifies all deployment activities and annotates the critical path of those activities which would delay deployment if not accomplished on schedule.

13.4.3 Delayed Facilities Planning

13.4.3.1 Risk Area. Failure to perform timely facility planning can result in substantial deployment delays.

13.4.3.2 Risk Handling. Facility requirements which are included in the Military Construction Program normally have a planning and funding cycle of five years, and up to seven years for NATO requirements. Therefore, early identification of requirements and coordination with the military construction proponent is necessary. A facilities support plan is desirable.

13.4.4 Updating the Deployment Plan

13.4.4.1 Risk Area. Failure to keep the deployment plan updated, complete, and coordinated with all concerned.

13.4.4.2 Risk Handling. The Program Manager should ensure that fielding personnel in his organization recognize the need to promptly update the plan as requirements, schedules, and responsibilities change. In addition, he must also ensure that the plan and its changes are fully coordinated with the user, and that the ILSMT or working group provides the vehicle for its coordination and distribution. Finally, the user should be required to prepare a plan for the receipt of the new system, and should have established policy and procedures regarding the preparations for receipt of new system by its subordinate units.

13.4.5 Managing Problems in the Deployment Process

13.4.5.1 Risk Area. Unreported and uncorrected deployment problems can seriously disrupt the process.

13.4.5.2 Risk Handling. Problems need to be quickly identified, reported, and solved. The deployment plan should provide a process that will lead to the rapid correction of deployment problems and deficiencies. On-site program management and contractor personnel can facilitate the identification and reporting of problems. In addition, for the benefit of future deployments, lessons learned reports based on the problems and their solutions should be submitted as required by each Service.

13.5 SUMMARY

- o Deployment is a key event in the acquisition life cycle. Its success can be evaluated in terms of how quickly and smoothly it is achieved, and how easily the user establishes the ability to meet and sustain the system readiness objective.

- o The success of the process is directly related to how well it is planned, coordinated, negotiated, and executed. Major points are:

  - Deployment planning starts early in the CE Phase. It intensifies during FSD, reaching a peak during the Production Phase as the deployment approaches

  - Deployment is characterized by extensive coordination and negotiation. It deals with many long lead time tasks — facilities, personnel, provisioning, and procurement of training devices, spares and repair parts.

13.6 REFERENCES

1. Military Standard-1388-1A, Logistic Support Analysis.
2. Army Regulation 700-127, Integrated Logistic Support.
3. DARCOM Circular 700-9-4, Instruction for Materiel Fielding.
4. Air Force Regulation 800-8, Integrated Logistic Support (ILS) Program.
5. Air Force Regulation 800-19, System or Equipment Turnover.
6. SECNAVINST 5000.39, Integrated Logistics Support in the Acquisition Process.

CONTENTS

CHAPTER 14

OPERATIONAL AND POST-PRODUCTION SUPPORT

14.1 HIGHLIGHTS

- o Assessing Operational Performance
- o Maintaining Readiness
- o Planning Post-Production Support
- o Funding Engineering and Publications Support

14.2 INTRODUCTION

14.2.1 Purpose

To provide an overview of ILS planning and management activities associated with operational support and post-production support.

14.2.2 Objective

The overall objective of operational and post-production support is to maintain the materiel system in a ready condition throughout its operational phase within the Operating and Support (O&S) cost program levels established in the Program Objectives Memoranda (POM) and Budget. System readiness objectives established early in development constitute the baseline for planning operational and post-production support and supportability assessments during the operational phase.

14.3 MANAGEMENT ISSUES

14.3.1 Background

Figure 14-1 is a notional display of system readiness levels across a system's life. Prior to deployment, success in achieving system readiness objectives is evaluated by modeling or other estimation techniques employing input data obtained in development and operational testing. The first opportunity to directly measure readiness occurs when the system is initially deployed in its operational environment with its planned logistics support structure. Operational support planning and post-production support planning are performed early in the acquisition cycle and serve a two-fold purpose: (1) to ensure that readiness objectives are met and sustained and (2) to provide advance planning for corrective actions if required.

About 60 percent of the total DoD budget is dedicated to support of operational systems, the majority of which are no longer in production. Logistic support problems increase with the age of the system and the rate of obsolescence of the technology employed in its manufacture. While problems may be encountered in a number of support elements (such as retaining manpower skills and replacing support equipment), the loss of production sources for spares and repair parts has presented the greatest difficulties. Each materiel system has unique post-production support problems, and the success of post-production support will depend on the manager's ability to anticipate problems and find cost-effective solutions before they reduce readiness and/or increase support costs.

14.3.2 Maintaining Readiness

14.3.2.1 Assessing Performance. Although adequate development testing and operational testing, with their inherent data feedback, are critical to the success of a materiel system, they do not fully measure the experiences which occur once that system has been fielded. Existing data collection systems, such as VAMOSC, O&SCMIS, 3M, and Maintenance Data Collection (MDC) provide coverage for many general applications; however, their output may not be sufficiently timely or detailed to support the Reliability and Maintainability (R&M) analysis needed while the system is still in production. Supplemental data collection may be necessary and should be considered to provide timely corrections to design and quality assurance deficiencies which would be reflected in high failure rates; poor training which would be reflected in a high false removal rate; or

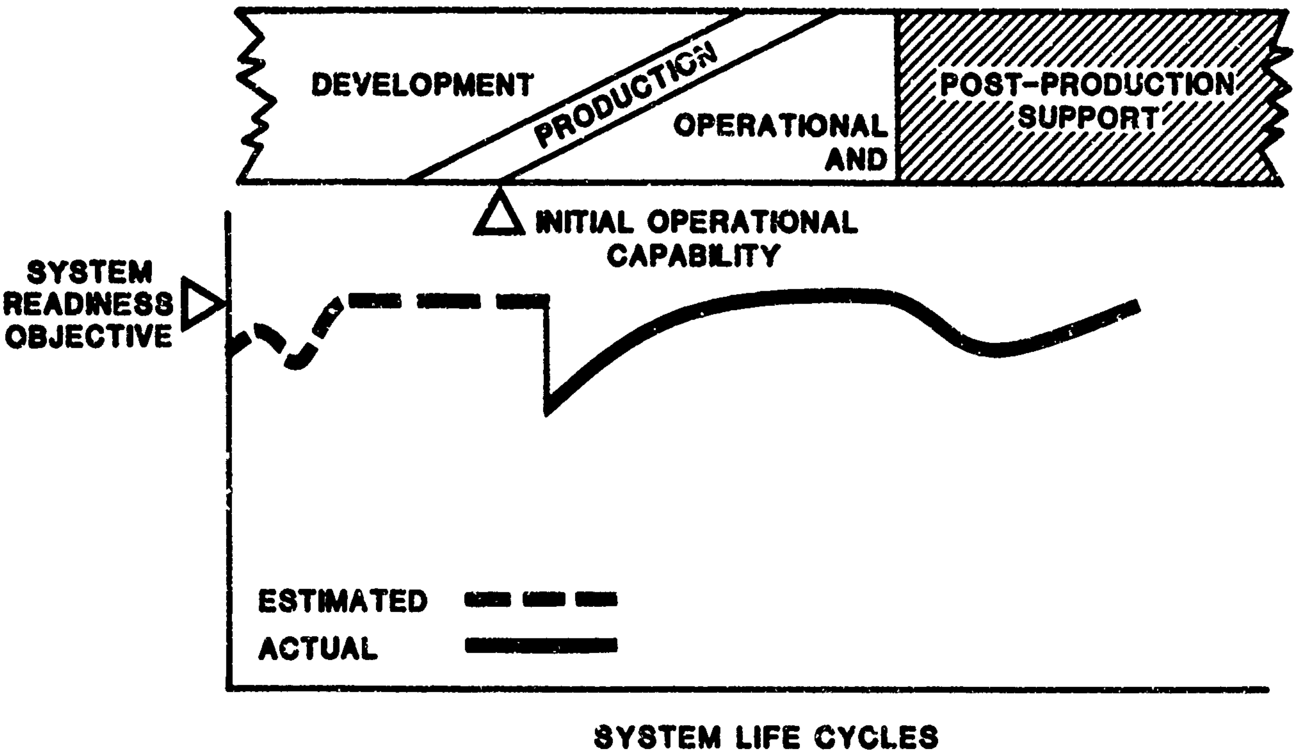


Figure 14-1 Readiness in the Acquisition Life Cycle

poor technical data which would be reflected in a high depot test "OK" rate. The earlier these problems are detected in the operational environment the less costly the retrofit and the more effective the operational system will be.

14.3.2.2 Adjusting the Support. The initial corrective reaction to a readiness shortfall is to draw more extensively on existing logistic support resources. Responsive actions might include accelerating delivery of critical parts, raising stockage levels, modifying training procedures and technical manuals, changing operational or maintenance procedures or concepts, and increasing technical assistance to user personnel.

As stated in Chapter 7, initial estimates of requirements for ILS elements (manpower, supply support, etc.) are based upon anticipated failure rates, maintenance times, and other input factors. Logistic support resources must be recomputed as required based upon updated values of R&M and other parameters measured during the operational phase.

14.3.2.3 Correcting The Design and Specifications. There are two basic reasons to modify the manufacturing drawings of an operational system: (1) to correct performance and operational R&M deficiencies and (2) to improve and maintain the producibility of major components and spares to reflect changes in specifications and standard components that evolve over time. Relative to the first issue, it is important to detect design deficiencies as early as possible while the system is still in production. Procurement and application of field modifications are much more expensive than a production engineering change. Drawing obsolescence, the second issue, occurs primarily in the post-production period and becomes apparent when components can no longer be procured with the outdated drawing. Inability to obtain components incorporated in the original design can also necessitate modifications to the deployed system (e.g., change a bracket to accept a new commercial component).

14.3.2.4 Updating the Software. Electronic circuitry is finding increased use in a variety of commodity groups. This growth has brought with it increased requirements to develop, test, and maintain the software used to control the mission and operation of the materiel system and the software employed with Automatic Test Equipment (ATE) to test replaceable units. Rapid growth and expanding technology have brought two problem areas:

(1) Software programs exhibit a greater tendency for latent defects than hardware design.

(2) System developers have encountered difficulties developing and maintaining ATE software compatible with system design during Full Scale Development (FSD) and Production phases.

Responsibility for initial establishment of a complete and tested software capability remains with the system developer. However, it must also be recognized that there will be a continuing need for software maintenance during the operational phase and the post-production period. ILS Managers and the Services must establish the funding and the organization required to update the software to correct deficiencies and reflect design changes.

14.3.3 Post-Production Support

Sources of post-production problems are displayed in Figure 14-2. Each materiel system will have support problems that are unique to that system and many of these will be unanticipated. The ILS Manager should include post-production support as a line item in the budget to accommodate the resultant changes.

14.3.3.1 Providing The Plan. Task 403, Post-Production Support Analysis, of MIL-STD-1388-1A, "Logistic Support Analysis" should be performed during FSD. The Post-Production Support Plan (PPSP) should be completed prior to Milestone III and updated with the Integrated Logistic Support Plan (ILSP). The PPSP should be maintained current as long as the system is in the active inventory and should focus on issues such as: (1) system and subsystem readiness objectives in the post-production time frame; (2) organizational structures and responsibilities in the post-production time frame; (3) modifications to the ILSP to accommodate the needs of PPS planning; (4) resources and management actions required to meet PPS objectives; (5) assessment of the impact of technological change and obsolescences; (6) evaluation of alternative PPS strategies to accommodate production phase-out (second sourcing, pre-planned product improvement, standardization with existing hardware, engineering level of effort contracts in the postproduction time frame, life-of-type buys, contract logistics support vs. organic support, etc.); (7) consideration of support to the materiel system if the life of the materiel system is extended past the original forecast date; (8) data collection efforts in the early deployment phase to provide the feedback necessary to update logistics and support concepts; (9) potential for Foreign Military Sales (FMS) and its impact on the production run; and (10) provisions for utilization, disposition and storage of Government tools and contractor developed factory test equipment, tools, and dies. Figure 14-5, at the end of the chapter, lists additional issues that should be addressed in post-production support planning.

14.3.3.2 Establishing a Competitive Environment. Relying on a single industrial source for critical support entails risks in the areas of cost and availability of needed spares and repair parts during the operational phase and particularly after termination of end item production. The ILS Manager should consider obtaining technical data, drawings, tooling, etc., to enable the Service to compete follow-on logistics support. The cost of obtaining this capability must be weighed against the potential benefits of competition particularly during an extended post-production period. Federal Acquisition Regulation (FAR), Part 7 requires the inclusion of detailed component breakout plans in the acquisition strategy initially prepared during the Concept Exploration Phase. (Note: History has shown that the Government does a poor job at keeping good configuration control after the loss of production experience, equipment, and drawings. It has purchased inadequate technical documentation to enable the breakout and competition of equipment, spares and repair parts. Good

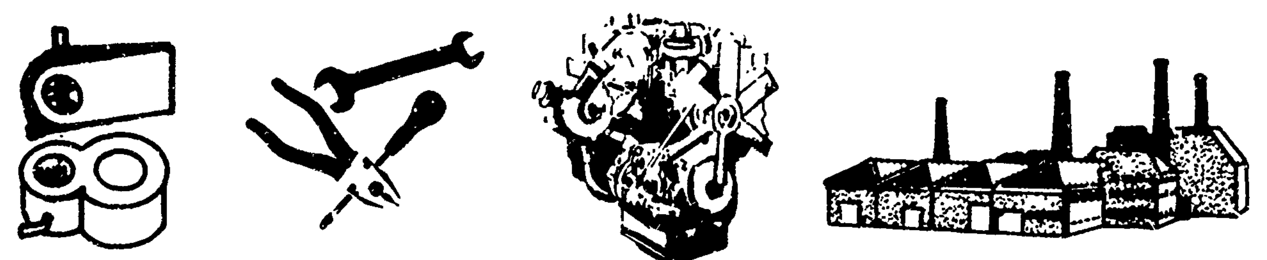


Figure 14-2 Problems of Post-Production Support

documentation and configuration control is essential if the Government is to successfully compete follow on support. It may be advisable to have the major manufacturer continue a level of effort in documentation after the production line closes).

14.3.3.3 Post-Production Support (PPS) Decision Meeting. The Program Manager should conduct a PPS decision meeting prior to the final production order to avoid major non-recurring charges if follow-on production is later required. This meeting should consider the advisability of purchasing major items from the manufacturer, such as, (1) major manufacturing structures (2) forgings and castings, (3) insurance items to cover crash/battle damage or fatigue, (4) proprietary data, and (5) raw material, and updating the PPSP based on the latest data available.

14.3.3.4 Other Remedies. When faced with the imminent loss of production sources for unique spares and repair parts, there are two basic options available to logistic managers: (1) increase the supply or (2) decrease the demand. A combination of actions listed in Figure 14-3 is often the most practical approach. These remedies are generally less effective and more costly than actions taken earlier in the production cycle.

14.3.4 Funding of Engineering and Publications Support

As stated in paragraphs 14.3.2.3 and 14.3.2.4, there is generally a continuing need to correct hardware design, specifications, and software after the completion of system development. Changes to technical manuals/ technical orders are also needed to reflect the system and software changes and to correct other deficiencies reported by operator and maintenance personnel. While the materiel system (end item) is still in production, the procurement appropriation bears the major burden of these costs.

Figure 14-4 is a notional display of the continued funding requirement for the above costs extending into the operational phase. However, an abrupt change in funding responsibility occurs at the beginning of the first post-production fiscal year. While the total requirement for engineering and publication support should decrease as initial problems are detected and corrected, the total burden for such costs shifts to the Operation and Maintenance (O&M) appropriation after the termination of system production. Early recognition of the need for post-production support and the programming and budgeting of O&M funds is required to obtain a continuity of effort.

SPARE AND REPAIR PARTS ACTIONS	
INCREASE SUPPLY	DECREASE DEMAND
o Develop a reprocurement technical data package and alternate production sources o Withdraw from disposal o Procure Life-of-Type Buy o Seek substitute (interchangeable) parts o Redesign system to accept standard component if not interchangeable o Purchase plant equipment; establish an organic depot capability o Subsidize continuing manufacture o Draw (cannibalize) from marginal, low priority systems.	o Restrict the issue to critical applications in support of combat essential items o Phase out less essential systems employing the same parts. o Restrict issue to system applications where no substitute is available. o Accelerate replacement of the system.
NOTE: For additional actions, see DODD 4005.16, Diminishing Manufacturing Sources and Material Shortages Program.	

Figure 14-3 Logistic Actions to Reduce Impact of Loss of Parts Production Sources

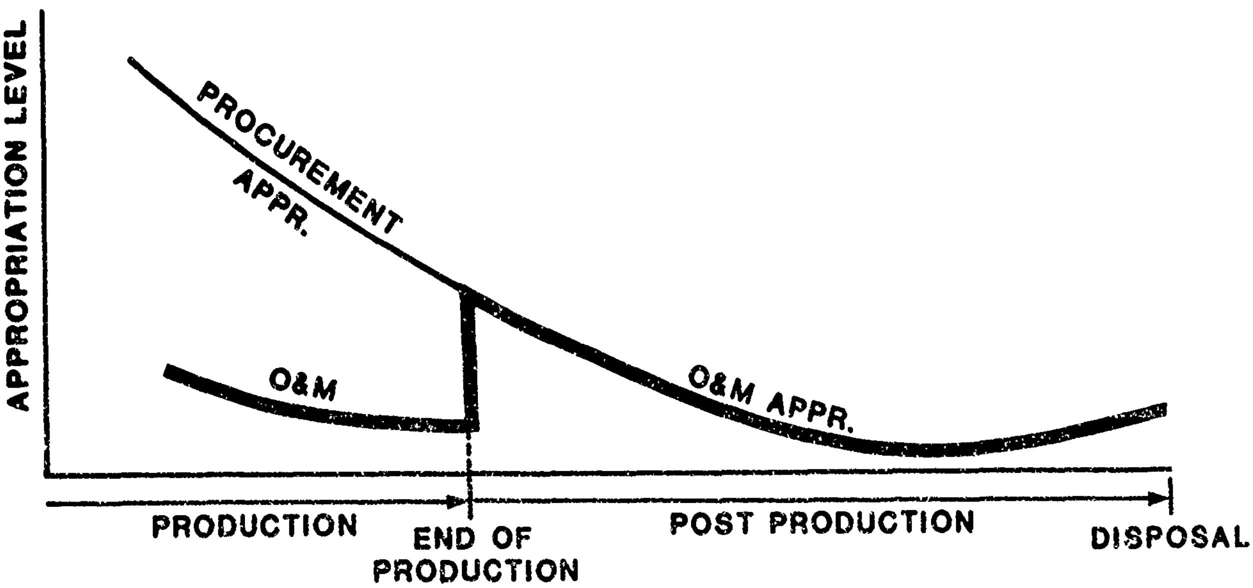


Figure 14-4 Source of Engineering and Publication Funding

The increase in fund requirements shown in the late post-production phase is attributed to growing design obsolescence. The ILS Manager should work directly with his supporting O&M appropriation manager to develop valid requirements estimates - usually derived from experience with prior similar systems - and program/budget accordingly.

14.4 RISK MANAGEMENT

14.4.1 Delayed PPS Planning

14.4.1.1 Risk Area. Continued support of the materiel system by the industrial base existing in the post-production time frame may not be economically feasible.

14.4.1.2 Risk Handling. PPS planning must be performed when acquisition strategy, design, and documentation options are still available for incorporation into an effective PPSP. This includes both engineering and financial issues. The PPSP, if not incorporated in the ILSP, must be maintained and tied to each ILSP update. While the ILSP is essential to establishing the supportability and readiness of the materiel system, the PPSP is just as crucial to maintaining that supportability and readiness throughout the system's life. A deficiency in either will adversely impact system effectiveness and mission readiness.

14.5 SUMMARY

- o The first empirical measure of system readiness occurs when the materiel system is deployed in the operational phase.

- o Readiness and R&M experience during the operational phase is employed to adjust the logistic support resources programmed during the FSD and Production phases (manpower requirements, supply support, etc).

- o Performance and R&M deficiencies must be detected and corrected as early as possible in the Operational Phase of the system.

- o The objective of planning performed during system development is to ensure that readiness objectives are met and sustained through the Operational Phase including the post-production period. Planning deferred until the problems are encountered will be limited in effectiveness.

14.6 REFERENCES

1. DoDD 4005.16, Diminishing Manufacturing Sources and Material Shortages Program.

2. DoDD 4151.1, Use of Contractor and DoD Resources for Maintenance of Material.

3. DoDD 5000.39, Acquisition and Management of ILS for Systems and Equipment.

4. MIL-STD 1388-1A, Logistic Support Analysis.

5. DoDI 4000-XX, Post Production Support (Draft).

1. Supply Support

a. Continued producibility and availability of Components and Parts. (Every peculiar item within the system should be reviewed down to the subcomponent level and national stock number (See DoDD 4005.16)

(1) Is technical data available at a reasonable cost?

(2) Is stability of design a concern?

(3) Is competitive procurement appropriate?

(4) Is the production base adequate?

(5) What proprietary rights, if any, have been declared by the prime, subcontractors?

(6) Are rights in data procurable at a reasonable cost?

(7) What is life-of-type buy potential?

(8) Are repair facilities available?

(9) Is component critical to system performance?

(10) What is the expected life of the system/subsystem?

(11) Is there FMS support potential?

(12) Are workaround alternatives available?

(13) Are quality assurance requirements unique, difficult to duplicate?

(14) Is contract logistics support feasible?

(15) Will failure rates be high enough to sustain organic capability?

(16) Technology obsolescence. Is system replaceable with new technology?

(17) Will potential design changes eliminate the need for the part?

(18) Is engineering level-of-effort contract appropriate to ensure continued supportability?

b. What support equipment is required?

c. Will support of support equipment be available at a reasonable cost?

d. Is there an adequate organization to focus on and resolve post production problems?

Figure 14-5. PPS Checklist

2. Engineering

a. Who has been designated to perform acceptance inspection QA on tech data?

b. Will there be adequate field engineering support, configuration management, and ECP support? Will there be adequate support to update:

(1) Technical Manuals
(2) Production drawings
(3) Technical reports
(4) Logistics support data
(5) Operational and maintenance data
(6) User's manuals
(7) Data requirements

c. Will operational experience be considered in changes to the materiel system?

3. Competitive Procurement

a. Is production rate tooling complex/cost significant; is it readily available or long lead to procure?

b. Are all cost factors associated with a breakout/competitive procurement decision considered? Cost elements should encompass added tooling, special test equipment, qualification testing, quality control considerations, rights in data procurement, etc. If performance specifications are applicable, the following additional costs pertain: cataloging, bin opening, item management, technical data, production and distribution variables, rate and ATP hardware/software augment costs, configuration control and engineering requirement costs, etc.

Figure 14-5 PPS Checklist (Continued)

c. Are all potential customers included in the production requirements computations?

d. Does ship set resource cover installs, spares, rejects repairs, and FMS as applicable?

4. ATE Support

a. Hardware

(1) Will hardware be supportable?

(2) Will mission, ECP changes be compatible?

(3) Will modifications be possible, supportable?

(4) Is system expandable?

b. Software

(1) Will diagnostic software changes be possible?

(2) Will the organizational structure allow for continuing software update?

(3) Will software changes caused by ECP/mission changes be incorporated?

5. Storage and Handling

a. Will shelf life items be replaceable when they expire?

b. Will special shipping containers be replaceable/repairable?

c. Will peculiar manufacturing tools and dies be procured and stored?

6. Technical Data

a. Will manufacturing shop standards and procedures be retained?

b. Will all changes which occur during the production phase be incorporated in the manufacturing shop drawings?

Figure 14-5 PPS Checklist (Continued)

7. **Training**

a. **Will simulators and maintenance trainers be supportable in the out years?**

b. **Will follow-on factory training be required?**

8. **Maintenance**

a. **Will depot overhaul be required in the out-years? Organic - Contract.**

b. **Will provisions be made in the front end to accommodate a service life extension program if required? (Most recent materiel systems have been extended well past their original forecasted disposal date).**

c. **Will components be available to support the depot overhaul program in the out-years?**

d. **Is it realistic to co-mingle manufacturing with repair on a single production line?**

Figure 14-5 PPS Checklist (Continued)

MODULE VI

INTERNATIONAL, NON-MAJOR AND JOINT PROGRAMS

Although the earlier modules in this handbook address the requirements of single-service major programs, all programs require an ILS effort. This module presents the difference in ILS management for international and joint service programs and for non-major systems.

CONTENTS

CHAPTER 15

INTERNATIONAL PROGRAMS

15.1 HIGHLIGHTS

- o Security Assistance Program Management Structure
- o ILS Issues for Security Assistance Programs
- o Integrated Logistic Support Plans (ILSPs) for Security Assistance Programs
- o ILS Issues for Co-production Programs

15.2 INTRODUCTION

15.2.1 Purpose

To provide a managerial overview of ILS issues unique to international programs, with a focus on security assistance and co-production programs.

15.2.2 Objectives

15.2.2.1 Security Assistance. Support objectives in a security assistance program are: (1) assist non-U.S. users of U.S. equipment to achieve readiness objectives, (2) increase standardization and interoperability in a combined military structure (e.g., NATO).

15.2.2.2 Co-production. The support objectives in a co-production program are: (1) increase standardization and interoperability in a combined military structure, (2) increase production and repair sources, (3) interchangeability of spares and repair parts on components manufactured by both co-producing countries.

15.3 MANAGEMENT ISSUES

15.3.1 Background

International logistics is the negotiation, planning, and implementation of supporting logistics arrangements among nations, their forces and agencies. It also relates to the coordination of U.S. logistics systems or procedures with those of foreign countries, and the provisioning and receipt of logistic support among friendly Governments (JCS Pub. 1, "Dictionary of Military and Associated Terms"). Two aspects of international logistics, security assistance and co-production, are the subject of this chapter.

15.3.1.1 Security Assistance. Security assistance concerns the transfer of military and economic assistance through sale, grant, lease, or loan to friendly foreign Governments. The two major laws which apply to Security Assistance programs are the Foreign Assistance Act (FAA) of 1961, as amended, and the Arms Export Control Act (AECA) of 1976, as amended.

Security assistance consists of the following major programs:

- o Programs administered by the Department of State:
  - Economic Support Fund
  - Peacekeeping Operations
  - Commercial Export Sales Licensed Under the Arms Export Control Act
- o Programs administered by the DoD:
  - The International Military Education and Training (IMET) Program:
  - Foreign Military Sales (FMS) Financing

The State Department is responsible for continuous supervision and general direction of the Security Assistance Program. This includes determining whether there will be a program for a particular country or activity and, if so, its size and scope. It also includes the determination of whether a particular sale will be made and when.

DoD administers and manages all transactions that involve the transfer of defense materiel and services and the provision of military training for international students. To the extent practical, security assistance requirements are integrated with other DoD requirements and implemented through the same DoD systems, facilities, and procedures.

The Defense Security Assistance Agency (DSAA) is the DoD focal point for tracking arms transfers, and budgetary, legislative, and other security assistance matters.

The military department logistic organizations manage security assistance as an integral part of their overall mission. They procure and provide Defense articles, services, and training to meet security assistance requirements. They also are responsible for providing information necessary to ensure that proper security assistance planning can be accomplished. In general, Security Assistance procurements are conducted in accordance with the existing Federal Acquisition Regulations (FAR). Additional information on Security Assistance responsibilities is contained in DoD 5105.38-M, "Security Assistance Management Manual".

Security assistance programs have a unique financial management system. DSAA established policy and procedures are contained in DoD 7290.3-M, "FMS Financial Management Manual". A basic principle of FMS financial management, required by the AECA is that the FMS program will result in no cost or profit to the U.S. Government.

The Security Assistance Accounting Center (SAAC) performs FMS accounting and billing, collections, trust fund management, and administrative fee accounting for all security assistance programs. Each department interfaces with the DSAA financial system through an International Logistic Control Office (ILCO). Procedures for interface between SAAC and each Service are unique and require a variety of planning, obligating, and expending procedures that are delineated in Service directives.

An FMS case manager is designated within a DoD component and is responsible for performing case planning and implementing the sales and lease agreements that are documented in the Letter of Offer and Acceptance (LOA), DD-1513. The case manager ensures that the case objectives are established between the foreign country and the U.S. Government and are achieved within applicable laws and regulations. These objectives are: (1) to accomplish the case on schedule, (2) to accomplish the case within cost constraints, and (3) to close the case as planned. In some FMS cases, there may be a separate ILS Manager designated to support the case manager. For the program managed system, this responsibility should be with the ILS Manager of the program office. Specific responsibilities for a case manager can be found in DoD 5105.38-M.

15.3.1.2 Co-production. Co-production of systems, subsystems, and components is the sharing of product manufacture and assembly among the U.S. and foreign producers. ILS issues for the U.S. program office result from foreign production of components for use in U.S. military systems. In these cases, a U.S. source should be capable of producing every part of the system to prevent a situation where the U.S. becomes totally dependent on the foreign source for one or more system components.

A co-production project may be limited to the assembly of a few end items with a small input of local country parts, or it may extend to a major manufacturing effort requiring the buildup of capital industries. Co-production programs are defined in DoDD 2000.9, "International Co-production Projects and Agreements Between the United States and Other Countries or International Organizations".

From a political and military viewpoint, the programs strengthen alliances with other nations through standardization and interoperability of military hardware. From an industrial viewpoint, each nation's industrial technological capability is upgraded and high technology employment is created.

Co-production is a program implemented either by a Government-to-Government arrangement or through specific licensing arrangements by designated commercial firms. Co-production enables an eligible foreign Government, international organization, or designated foreign commercial producer to acquire the "know-how" to manufacture or assemble, repair, maintain, and operate a specific defense item or support system. Co-production programs normally are initiated by a properly authorized DoD component and by authorized representatives of foreign Governments and international organizations.

Offset arrangements are another tool used to promote cooperation in acquisition. (DoDD 2000.9) Offset arrangements provide procedures for the co-producing country to balance trade and expenditures through the seller agreeing to make offsetting purchases from the country. Under current DoD policy, it is not standard procedure to enter into co-production agreements that obligate the DoD and other U.S. Government agencies to place orders for systems or components in foreign countries. DoD policy also does not require U.S. contractors to place subcontracts in foreign countries as a condition for the sale of U.S. defense articles to those countries.

15.3.2 Integrated Logistics Support Issues in Security Assistance Programs

When a foreign country decides to procure a U.S. system, there are a variety of ways in which the U.S. and the customer can interact to support the system over its life cycle. Effective and efficient integration of a materiel system into a foreign Government's military structure may include developing the foreign country's logistics support processes, procedures, and re- quirements for the new system. U.S. support for the system will vary depending upon the nature of the sale (commercial or FMS) and the existing logistic capabilities of the foreign country. A detailed discussion of logistics in Security Assistance programs, and other international logistics issues, is contained in the Joint Logistic Commanders Guide, "Management of Multinational Programs".

Detailed ILS planning must be performed to develop tailored or modified support for the system when this assistance is requested by the purchasing country. In this instance, it is also appropriate to document ILS planning in a special ILS Plan. Joint ILS planning conferences, or in-country site surveys, or both may be used to develop the plan.

15.3.2.1 <u>ILS Planning Conference/In-Country Site Survey.</u> When considering the choice of the ILS planning conference versus the in-country site survey method, the Program Manager (PM) decides which process will provide adequate information to effectively plan logistics. The choice of a planning conference or an in-country survey is influenced by a number of factors, such as:

- o The attitude of the foreign country toward a U.S. team evaluating their capabilities.
- o The technological and logistical competence of the foreign country.
- o The experience of the foreign country in introducing similar systems.
- o The availability of sufficient data.

If the in-country survey is desired, representatives of the foreign country and a team of U.S. personnel work together to conduct the survey. The specific goals of the site survey team generally are:

- o To provide the customer country with an assessment of support requirements.
- o To assist the country in identifying required levels of support and to assessing their capabilities to provide the support.
- o To develop and document a plan for introducing and supporting the system.

Careful planning and preparation are necessary for a successful site survey. As part of the planning process, a pre-site survey may be required to collect preliminary data prior to the formal site survey. The pre-site survey team generally consists of a small group of highly trained experts who lay the groundwork for the full site survey and prepare a preliminary program and support plan. This document should include a plan of action and milestones for the formal site survey.

A logistics planning conference generally is chosen when the foreign country has an existing logistics system that can support the equipment without a survey. If the planning conference option is chosen, the foreign country participants should include representatives of the relevant logistics specialties. They should have the necessary information to complete the planning exercises which are described in the following paragraphs. Consultation between the countries prior to the actual convening of the meeting is helpful to insure that the required information is developed.

A detailed understanding of how the U.S. FMS system works and an appreciation for how their requirements relate to U.S. requirements will help the foreign country make decisions on those items they wish to procure via FMS. The item delivery lead time and FMS processing time will have to be considered when defining system requirements and item need dates. Recommendations will indicate when FMS customers should submit Letters of Request (LOR) for a Letter of Offer and Acceptance (LOA) to activate the U.S. procurement system. The agreement should address the extent of logistics support the U.S. will provide after we stop using the system.

The basic structure for an ILSP for a U.S. system is described in Chapter 2, and can be used as a baseline for the special ILSP. The structure for this ILSP can be tailored to the needs of the foreign country. The schedule and the logistics element sections especially will require modification to reflect support of the foreign country's logistics system.

15.3.2.2 Logistics Support Analysis (LSA). The LSA performed to support U.S. forces is based upon the U.S. operational role, utilization rates, and support concepts. However, there is a core of data within the LSA and LSA records prepared for U.S. forces that is independent of the role, utilization rates and support concepts. This core can be used to derive LSA and LSAR information needed to compute the foreign country's requirements for logistic support resources (maintenance manpower, supply support, provisioning quantities, etc.). If desired by the foreign country, the U.S. military Service can assist the foreign Government with the analysis, documentation, and resource computations or perform these tasks for the foreign country.

15.3.2.3 Maintenance Planning. Maintenance planning may require an in-depth study of the foreign customer's ability to support the system. The results of the examination will assist in tailoring maintenance recommendations to correspond to the customer's current maintenance philosophy and practices. Logistics support will be analyzed and unique requirements will be identified. The analysis should result in recommendations on how best to use the country's maintenance capabilities and how DoD can interface and assist in executing the overall maintenance program.

15.3.2.4. Facilities. The country's existing facilities should be analyzed to determine their capability to support operation and maintenance of the new system. Analysis of the adequacy of structures, property, and permanently installed support equipment should be performed. The analysis should result in recommendations on cost effective methods to adapt existing facilities to support requirements of the new system.

15.3.2.5 Supply Support. The country's supply system should be analyzed to determine how best to integrate supply support of the new system. A basic understanding of how the foreign customer's supply system works, ADP interfaces, and required new methods to support the system should be analyzed and addressed. A Repair of Repairables (ROR) program can be designed and offered using either customer or U.S. sources for repair of repairable items. A working knowledge of the country's industrial capabilities is necessary to properly address ROR programs. If the decision is made to use U.S. maintenance facilities to support ROR, an FMS case will have to be established. This FMS case is separate from the case which covered the sale of the system, because separate organizations are responsible for providing supply support.

15.3.2.6 Support Equipment. An analysis should be performed of the country's ability to satisfy requirements for support equipment with their existing equipment or support equipment producible by the foreign country. The analysis should identify requirements to procure support equipment from the U.S. Government where applicable.

15.3.2.7 Training and Training Support. Operational and maintenance training requirements are normally established by the U.S. and will be the baseline for a foreign training program. The analysis can assess existing training facilities, level of English language proficiency, level of core technical training, level of operational proficiency, and the foreign skill specialty structure. Once an assessment is made in these areas, recommendations on training devices, training courses, required software, and operator and maintenance training requirements can be incorporated into a training plan. The training plan will identify sources for accomplishing the training and purchasing the training devices, available contractor support, and applicable software. Generally, the U.S. military Service supplies a majority of the support in this area.

15.3.2.8 Technical Data. The analysis should establish requirements for the country's technical data, publications and documentation library to support the purchased system. The applicable U.S. Service will have established the documentation required to support U.S. forces and the analysis can compare the customer's documentation needs with this U.S. documentation. As a follow-on, an information exchange agreement between the purchasing country and the U.S. is desirable in order to efficiently transfer data in a mutually agreeable and timely basis. Another requirement for the customer would be to establish a separate FMS case that would provide automatic updates and revisions of publications and documentation.

15.3.2.9 Configuration Management. A method to share the costs of the continuing engineering support should be established. Continued adherence to the U.S. configuration has many advantages, particularly if the customer is going to rely on the U.S. supply system and technical documentation program. If the customer's configuration differs from the U.S. configuration, then supply support, software development, and support equipment development will be costly and adversely affect interoperability and standardization objectives.

15.3.2.10 Contractor Engineering and Technical Services (CETS). CETS can be a vital element in any foreign acquisition of a U.S. materiel system. The technical expertise available to the customer in all phases of the program can assist the customer in performing maintenance, conducting training, purchasing support equipment, test and evaluation, follow-on provisioning, inspections, and essentially all aspects of the program. The customer country can contract through the U.S. military Service using an FMS case separate from the materiel system sale case, or contract directly with a commercial firm for CETS. The requirements for CETS will depend largely on the time it takes the foreign country to attain full operational and maintenance capability.

15.3.2.11 Safety. The analysis will identify potential safety hazards resulting from unique operations and maintenance procedures used by the foreign country. U.S. military instructions, guidance, and reporting procedures are normally used as a basis for this evaluation. If safety hazards do exist, the analysis should result in recommendations for engineering change proposals, revised operation and maintenance procedures, and other corrective actions.

15.3.3 Integrated Logistics Support Issues in Co-production Programs

This section will address ILS issues related to co-production of a U.S.-developed materiel system with logistic support provided to U.S. forces by the co-producing nation. The major issues that must be addressed in the ILS planning are:

- Foreign Industrial Base Survey

- Offset Agreements

o Configuration Management

15.3.3.1 Foreign Industrial Base Survey. An industrial base survey must be conducted by the U.S. military Service, prime contractor, and their foreign counterparts to ensure that the foreign production facilities are contractually required to satisfy U.S. military specifications and quality assurance acceptance standards at a reasonable cost and on an achievable schedule. In particular, the existing tooling must be evaluated and any deficient capability obtained from either the U.S. or abroad. The foreign capacity to produce spares on a surge basis in peacetime and wartime must be addressed because of its readiness implications. To ensure that these logistics requirements are met, a pilot preproduction or low rate initial production program should be undertaken before the final production program commitments are made.

15.3.3.2 Offset Agreements. The PM must also require that offset agreements be analyzed carefully to ensure that logistic support provided by the foreign country contributes to system readiness and is cost effective. The offset agreement should address several issues: willingness to provide the support on a continuing basis, the ability to substitute other equipment or services for those in the agreement because of inability to provide a previously agreed equipment or service, and inclusion of depot maintenance. The cost analysis must seek to define a set of hardware or services to satisfy the offset commitment, which has a reasonably competitive cost compared to domestic production and is feasible for the foreign country to produce. Offset agreements providing for equipment maintenance can have a positive readiness impact by using facilities at locations closer to the operating sites.

15.3.3.3 Configuration Management. Manufacture of any item by a second source generally requires changes to manufacturing drawings to enable production by that source. The need to develop and approve engineering change proposals will be encountered more frequently when the second source is in a foreign nation and uses different manufacturing processes. Configuration control must be exercised by the U.S. configuration manager. The objectives of this control should be to retain interchangeability of line replaceable units with no impact on maintenance procedures performed at the organizational level and minimal impact on maintenance performed at the intermediate and depot levels.

15.4 SUMMARY

- Security assistance and co-production programs are major parts of international logistics.
- The DSAA is the DoD focal point for security assistance.
- Depending on the logistic capabilities of the foreign country, an in-country site survey or a conference can be conducted to plan logistics for the Security Assistance Program.
- Logistic support analyses for the Security Assistance Program should result in recommendations tailored in the areas of: maintenance planning; facilities; supply support; support equipment; training and training support; data; configuration management; contractor engineering and technical services; and safety.
- Planning of co-production programs should address the qualitative and quantitative adequacy of all logistic support to be provided by the foreign country to U.S. forces.
- Effective configuration management is needed in co-production to enable common support of each nation's equipment.

15.5 REFERENCES

1. DoDD 2000.8, Cooperative Logistic Supply Support Arrangements.

2. DoDD 2000.9, International Co-Production Projects and Agreements Between the U.S. and other Countries or International Organizations.

3. DoDD 2010.4, U.S. Participation in Certain NATO Groups Related to Research, Development, Production, and Logistics Support of Military Equipment.

4. DoDD 2010.6, Standardization and Interoperability of Weapon Systems and Equipment Within the North Atlantic Treaty Organization.

5. DoDD 2010.8, Department of Defense Policy for NATO Logistics.

6. DODI 2010.9, Mutual Logistic Support between the U.S. and other NATO Forces.

7. DoDI 2010.10, Mutual Logistic Support between the U.S. and other NATO Forces Financial Policy.

8. DoDD 2040.2, International Transfers of Technology, Goods, Services, and Munitions.

9. DoDD 4005.16, Diminishing Manufacturing Sources and Material Shortages Program.

10. DoD 5105.38M, Security Assistance Management Manual.

11. DoD 5220.22R, Industrial Security Regulations.

12. DoD 7290.3M, Foreign Military Sales Financial Management Manual.

13. Defense Institute of Security Assistance Management, The Management of Security Assistance.

14. Joint Logistic Commanders Guide, Management of Multinational Programs Defense Systems Management College.

15. Federal Acquisition Regulations, 1 April 1984.

16. Public Law 90-629, the Arms Export Control Act, as amended.

17. Under Secretary of Defense (Research and Engineering), "Report of the Defense Science Board Task Force on Industry to Industry International Armaments Cooperation", June 1983.

CONTENTS

CHAPTER 16

NON-MAJOR SYSTEMS

16.1 HIGHLIGHTS

- o Management of Non-Major Systems by the Military Services
- o Integrated Logistic Support of Non-Major Systems
- o ILS Risk Considerations in Non-Major System Acquisition

16.2 INTRODUCTION

16.2.1 Purpose

To provide an overview of the management of ILS for non-major systems by the military Services.

16.2.2 Objective

The objectives of the ILS activities described in this chapter are identical to those applicable to major systems, i.e., deployment of ready and sustainable materiel systems within cost and schedule targets.

16.3 MANAGEMENT ISSUES

16.3.1 Background

DoD Directive 5000.1, "Major System Acquisitions", establishes acquisition management principles and objectives applicable to major and non-major systems. DoD Directive 5000.39, "Acquisition and Management of Integrated Logistic Support for Systems and Equipment", sets general policy for the acquisition and management of ILS for all systems, while delegating responsibility for application of ILS policies for non-major systems to the military Services. Guidelines in DoD Directive 5000.1 for designation as a major system include program cost thresholds ($200 million-RDT&E, $1 billion procurement), risk, urgency of need, joint acquisition (multi-Service and other nation), and Congressional interest. The ultimate criterion is selection by the Secretary of Defense. Systems not designated as major systems are generally single-Service systems, less costly, and by themselves less critical to national defense. However, non-major systems may have a large aggregate impact upon the capabilities of combat units and their logistic burdens.

16.3.2 Service Management Procedures

The military Services have delegated management responsibility for non-major systems "to the lowest levels of the component at which a comprehensive view of the program exists". Materiel systems are assigned to program categories based upon criteria such as combat role and program cost. The decision authority, funding criteria, and examples of programs in each category are listed in Figure 16-1. Non-major systems may also be categorized as developmental or non-developmental.

16.3.2.1 Developmental Systems. Developmental programs for non-major systems range from full development to ruggedization of commercial items prior to deployment, as depicted in Figure 16-2. Specific ILS procedures for influencing the design and defining and acquiring the support parallel those for major systems but are generally characterized by a reduced scope, fewer iterations, fewer personnel, and smaller budgets. The Integrated Logistic Support Plan (ILSP), for example, may be part of the Program Management Plan rather than a separate document. Logistic Support Analysis (LSA) requirements for non-major systems, particularly those requiring only minor development, are often significantly reduced by tailoring.

Non-major systems do not have the intense management and detailed reviews enjoyed by major systems. Managers and their staffs may be assigned several non-major systems and handle a variety of actions covering a wide spectrum of acquisition functions. Less supervision and the requirement to deal with many areas can result in some actions being overlooked.

SERVICE	PROGRAM CATEGORY	FUNDING CRITERIA (RDT&E/PROCUREMENT)	DECISION AUTHORITY	EXAMPLE
ARMY	MAJOR SYSTEM PROGRAM	$200M/$1 BILLION	SECRETARY OF DEFENSE	M-1 ABRAMS TANK
	DESIGNATED ACQUISITION PROGRAM	*	ASST. SECRETARY OF THE ARMY (RESEARCH, DEVELOPMENT AND ACQUISITION)	STINGER/POST MISSILE
	DA IN-PROCESS REVIEW PROGRAM	*	DEPUTY CHIEF OF STAFF (RESEARCH, DEVELOPMENT AND ACQUISTION)	VRC-47 RADIO
	IN-PROCESS REVIEW PROGRAM	*	MATERIEL DEVELOPER (USUALLY AMC)	PRC-77 RADIO
NAVY/MARINE CORPS	ACAT I (MAJOR SYSTEM)	$200M/$1 BILLION	SECRETARY OF DEFENSE	F/A-18 AIRCRAFT
	ACAT IIS	$100M/$500M	SECRETARY OF THE NAVY	AV-8B HARRIER
	ACAT IIC	$100M/$500M	CNO/CMC	AEGIS AREA AIR DEFENSE
	ACAT III	$100M/$500M	DCNO/ASST. CMC	ACOUSTIC SENSOR SYSTEM
	ACAT IVT	*	SYSCOM COMMANDER/ASST. CMC	LIFE SUPPORT EQUIPMENT ENGINEERING DEVELOPMENT
	ACAT IVM	*	SYSCOM COMMANDER/ASST. CMC	LASER EYE PROTECTION SYSTEM
AIR FORCE	MAJOR SYSTEM	$200M/$1 BILLION	SECRETARY OF DEFENSE	F-16 AIRCRAFT
	AF DESIGNATED ACQUISITION	*	SECRETARY OF THE AIR-FORCE	BMEWS MODERNIZATION
	DELEGATED PROGRAM	*	IMPLEMENTING COMMAND (USUALLY AFSC)	"HAVE QUICK" ANTI-JAM COMMUNICATIONS UPGRADE

* NONE. CASE BY CASE DECISION RENDERED BASED UPON FACTORS SUCH AS MISSION CRITICALITY AND CONGRESSIONAL INTEREST.

Figure 16-1 Acquisition Program Categories

	DEVELOPMENTAL SYSTEMS				NON-DEVELOPMENTAL SYSTEMS
DEGREE OF DEVELOPMENT	FULL DEVELOPMENT PROGRAM	DEVELOPMENT W/STANDARD SUBSYSTEMS	MILITARIZATION	RUGGEDIZATION	OFF-THE-SHELF OUT-OF-THE CATALOG
EXAMPLE	FIELD ARTILLERY BATTERY COMPUTER SYSTEM (BCS)	GBU-15 GLIDE BOMB	C-9 MEDICAL TRANSPORT AIRCRAFT	MICROFIX (RUGGEDIZED APPLE COMPUTER)	PORTABLE GENERATOR
DURATION*	4 TO 8 YEARS	2 TO 5 YEARS	1 TO 3 YEARS	1 YEAR	4 MONTHS

* Nominal values, wide variances possible

Figure 16-2 Acquisition Spectrum

Logistics personnel will have to assert themselves to ensure that ILS receives the resources and attention required. In fact, the impetus is on the staff to be sure that the required planning, coordination, and programming are accomplished.

Small programs have a small logistics burden, however; as was pointed out above, they have a large aggregate impact. The Army, for instance, has approximately thirty major systems and in excess of 300 non-major systems currently under development. It is important that ILS is applied as necessary to each non-major system develoment.

16.3.2.2 Non-Developmental Systems. Non-developmental systems (Figure 16-2) include commercial items and materiel developed by another U.S. military Service or Government agency or country. Purchase of non-developmental items offers the benefits of shortened acquisition time and reduced cost. The logistic support challenges of purchasing non-developmental items include:

(a) Design Influence - Design influence is generally limited to the selection process. Source selection criteria should therefore include:

- o Utility of available operation and support manuals
- o Similarity of current and intended use, support environment, and duty cycles
- o Supportability-related design factors
- o Compatibility with current support equipment
- o Compatibility of design with existing manpower skill categories and training programs
- o Availability of supportability data and experience.

(b) ILS Resources - Funds must be programmed and budgeted for the performance of ILS tests and analyses normally conducted during development, and for acquiring the ILS elements (see Chapter 8).

(c) ILS Planning - The planning requirements in Chapter 2 are also applicable to non-developmental systems. ILS plans may be prepared to cover individual items or categories of items (e.g., commercial test equipment). In either case, the contractor's data and field experience will be helpful in structuring the plans.

(d) Maintenance Planning - The choice between contractor and organic support is based on operational constraints, schedules, resources, and the mission of the user. When the non-developmental system is "off the shelf" and commercial/contractor support is chosen, minimal LSA and documentation is required. In fact, use of the contractor's support philosphy and support structure, e.g., skills, facilities, equipment, technical documentation, and training may be a feasible alternative. If not, the support should be tailored to the user's requirements. When organic support is preferred, but lead times are insufficient, interim contractor support may be necessary during the period required to establish an organic support capability.

(e) Supply Support - Non-developmental items pose the problem of securing a long term source of spares and repair parts. Several alternatives are available. One, procure a life-time supply prior to terminating the contract with the source, or two, give selection preference to the commercial product having the greatest likelihood of having a long term supply.

(f) Test and Evaluation - An evaluation of the military suitability and supportability of non-developmental items is required if marketplace testing or other developmental data is inadequate or fails to address the intended military environment.

(g) Technical Manuals - Commercial manuals should be used if feasible and if they satisfy the requirements of the intended user. The alternative is the commitment of considerable time and money to convert the manuals to military specifications. If commercial manuals are used, a management surveillance system is required to make sure that the contractor updates the manuals when the equipment is changed. The decision to use contractor support facilitates the use of commercial manuals.

16.4 RISK MANAGEMENT

16.4.1 Accelerated Acquisitions

16.4.1.1 Risk Area. Lead times for delivery of non-developmental items can be extremely short, particularly for in-stock commercial items. This poses a substantial risk of deployment with incomplete or inadequate logistic support and attendant degraded readiness.

16.4.1.2 Risk Handling. Applicable management approaches include:

- o Perform detailed logistics planning concurrently with development of the acquisition strategy.
- o Determine the need and extent of contractor support required and include appropriate logistic support requirements in the solicitation.
- o Employ existing commercial or other developmental data to compute supply support stockage levels.
- o Consider use of reliability improvement warranties to ennance reliability.
- o Schedule the time and budget the funds required for a supportability evaluation.

16.4.2 Configuration Control of Commercial Items

16.4.2.1 Risk Area. The Government does not control the configuration of items procured from the commercial marketplace. This presents two potential risks:

- o Subsequent competitive reprocurement of the end item may lead to a totally different internal configuration with different support requirements.

- o There is no automatic guarantee that original commercial suppliers will continue to manufacture spares and repair parts to fit the Government's configuration.

16.4.2.2 Risk Handling. These configuration risks may be reduced by the following:

- o Post-production support planning should be performed to determine viable alternatives such as buyouts, modifications, and Government manufacture (refer to Chapter 14 for additional information).

- o Multi-year procurement from the same source at agreed upon prices should be considered in order to decrease the impact of configuration changes in follow-on procurement.

- o Pre-solicitation market surveys should be performed to determine the probable availability of a civilian after-market that will supply components for an extended period. For example, when the Army procured commercial 1 1/4-ton trucks in 1975, surveys indicated that major components would remain available through the useful life projected at that time.

16.5 SUMMARY

- o The military Services employ decentralized acquisition and ILS management procedures for non-major items.

- o Review bodies and decision authorities have been designated for each category of non-major system to insure compliance with DoD acquisition and ILS policies and Service regulations.

- o Procurement of non-developmental items may offer substantial reductions in total program cost and acquisition time; however, the reduction in time requires that logistics planning be performed concurrent with development of the acquisition strategy.

- o Acquisition of non-major developmental items poses special considerations because of the more general management and review procedures employed by the Services. Logistics personnel have less program supervision and broader responsibilities for each system.

- o Viable mechanisms are available to attain readiness objectives for non-developmental items. These include incorporation of supportability issues in the source selection process and use of existing LSA documentation.

16.6 REFERENCES

1. AR 70-1, System Acquisition Policies and Procedures.

2. AR 700-127, Integrated Logistic Support.

3. SECNAV Instruction 5000.1B, System Acquisition.

4. OPNAV Instruction 5000.42B, RDT&E/Acquisition Procedures.

5. AMC/TRADOC Pamphlet 70-7, Non-Development Item Acquisition (Draft).

6. AFR 800-2, Acquisition Program Management.

7. AFR 800-8, Integrated Logistics Support Program.

8. MCO 5000.10, Systems Acquisition Management Manual.

CONTENTS

CHAPTER 17

JOINT SERVICE PROGRAMS

17.1 HIGHLIGHTS

- o Roles of Lead and Participating Services
- o ILS Funding for Joint Programs
- o Performance of Joint Integrated Logistic Support (ILS) Activities
- o Inter-Service Coordination and Communication.

17.2 INTRODUCTION

17.2.1 Purpose

To present an overview of ILS planning and management responsibilities for joint programs.

17.2.2 Objective

Logistics management objectives of joint programs are: to realize economies by joint performance of ILS planning, analysis, and documentation; to satisfy essential logistic support needs of each Service; and to attain established readiness and supportability objectives.

17.3 MANAGEMENT ISSUES

17.3.1 Background

Joint acquisition programs are encouraged by the Office of the Secretary of Defense (OSD) and Congress. They provide opportunities to reduce acquisition and logistic support costs and to improve interoperability of equipment in joint operations. Major joint programs in 1985 include the Airborne Self-Protection Jammer (ASPJ), the Joint Tactical Information Distribution System (JTIDS), the Advanced Medium Range Air-to-Air Missile (AMRAAM), and the Joint Cruise Missile.

ILS management of joint programs is similar to that of single Service programs, with one major exception - joint program management requires the accommodation of each participating Service's unique requirements resulting from differences in equipment deployment, mode of employment, and support concepts.

17.3.2 Joint Management Structure

Although there is no overall single structure for the management of joint programs, the OSD and the Joint Logistics Commanders have identified required management relationships. The Program Manager and military Services must build a detailed structure which responds rapidly to decisions of the Joint Program Manager and ILS Manager and provides a direct information path conveying the requirements of each military Service to the Program Manager. Figure 17-1 identifies the required joint program staff relationships. Typical staffing of a joint program office includes the following considerations:

- o The lead Service establishes a manning document for the program office with positions to be filled by representatives of the participating Services. The manning document also designates key positions for the senior representative of each participating Service.
- o The participating Services assign personnel to fill identified positions in the jointly staffed program office. The senior representative assigned to the program office reports directly to, or has direct access to, the Program Manager, and also functions as the participating Service's representative on all issues pertaining to that Service.
- o Each participating Service designates an ILS Manager to support the Joint Project Manager.

17.3.3 Documentation of Joint Programs

The basic requirements document for a

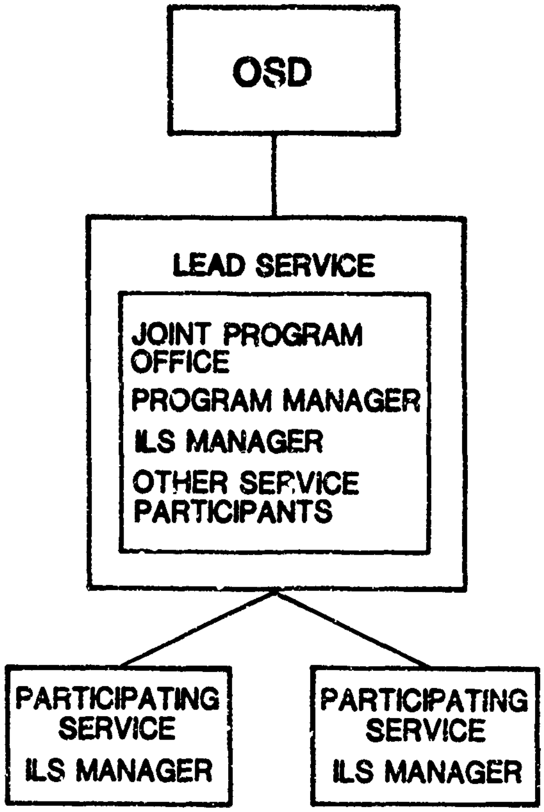


Figure 17-1 Joint Program Chain of Command

major joint acquisition program, the Justification of Major Systems New Starts (JMSNS), identifies specific military deficiencies common to two or more Services. The JMSNS states technical objectives of the program that in turn are translated into system performance goals.

The Joint Integrated Logistics Support Plan (JILSP) parallels the content and purpose of ILSPs of single Service programs. Briefly, the JILSP documents specific ILS tasks to be performed, the activity assigned responsibility for performance, and the task schedule. The Joint Logistics Commanders Guide for the Management of Joint Service Programs provides instructions for preparation of JILSPs.

17.3.4 ILS Funding For Joint Programs

Funding responsibilities for most joint programs are shared among the lead and participating Services, and are defined in a Joint Memorandum of Agreement. The sharing arrangements vary from program to program. A typical arrangement is discussed below for each appropriation category.

a. Research, Development, Test and Evaluation (RDT&E) - The RDT&E funding of requirements common to all participants is either provided entirely by the lead Service or split among participants in accordance with an agreed-upon formula (such as proration by planned procurement densities). Each Service usually funds its own unique ILS activities.

b. Procurement - Each Service funds procurement of ILS assets (support equipment, technical data, etc.) to support its deployed systems.

c. Operation and Maintenance - Each Service provides separate funds for operation and maintenance requirements to support its deployed systems.

d. Military Construction - New or modified facilities may be required to support development testing and operational deployment. Funds for common facilities required during development are either programmed by the lead Service or shared by agreement. Funds for post-deployment operational facilities are provided by each Service to support individual requirements.

Each participating military Service uses its own Service channels to identify program requirements to OSD. However, the Joint Program Manager maintains overall responsibility for identification of total funding requirements and their inclusion in a Joint Program Funding Plan. The Joint Program Manager also consolidates contracting requirements and contract award for the entire development and production program. The participating Services transfer the required obligational authority to the Joint Program Office or that office's supporting command for this purpose.

17.3.5 Unique ILS Requirements

Given identical materiel systems, which is not always the case, the military Services will often operate the systems with differing supply and maintenance support concepts and with unique support equipment. Techniques to accommodate essential

Service-unique requirements within the framework of common approaches are discussed below.

17.3.5.1 Logistic Support Analyses. MIL-STD-1388-1A, "Logistic Support Analysis", provides a common structure, time table, and objectives for a large body of analyses. Some analyses are standard; for example, Failure Modes Effects and Criticality Analysis (FMECA), reliability predictions and modeling, and maintainability predictions and modeling are each documented in joint-use military standards. On the other hand, the services employ different models for Repair Level Analysis (RLA), Reliability Centered Maintenance (RCM), and supply stockage computations. There are also variations employed within the Services. ILS Managers of a Joint Service Program should endeavor to agree on common models for each analytic technique applied to the joint system. Use of common models will reduce the total analytical effort and also reduce differences in the results obtained. Some differences will remain due to service variations in logistic parameters (order and ship time, for example) and maintenance concepts.

17.3.5.2 Logistic Support Analysis Record (LSAR). The developers of MIL-STD-1388—2A, "DoD requirements for a Logistic Support Analysis Record", have incorporated mechanisms to accommodate Service variations in materiel configuration, supply and maintenance concepts, and operational roles. As an example, Service variations in maintenance task levels and replacement rates for the same component can be entered with alternate LSAR cards at the component level of detail. The Joint Service LSAR ADP system will then print separate LSAR output reports for each Service; for example, separate Service summaries of direct annual maintenance man-hours for the total system.

17.3.5.3 Technical Publications. The Services have different requirements for technical orders or technical manuals. As well as the variations in support concept, operational role, and materiel configuration mentioned in the previous paragraph, there can also be differences in the reading comprehension levels of the target audience. The Services generally have been successful in accommodating those differences in joint-use technical orders and technical manuals, especially when the joint approach begins at program initiation. Reading comprehension levels occupy a range rather than a precise point value; the Services seek a single target level that satisfies the needs of each Service. Other differences are covered in the body of the specific publication or in Service supplements.

17.3.5.4 Training. Training requirements vary. The Services employ different skill specialty code systems as well as different maintenance concepts. Single location training for a jointly-used system can still be cost effective and should be considered early in the planning cycle. As one example, Air Force and Army personnel receive common maintenance training on the TSC 94 and TSC 100 satellite terminals at the Army's Ft. Gordon training facility.

17.3.5.5 Depot Maintenance Interservicing (DMI). DMI studies seek to avoid unnecessary duplication of facilities and equipment among the Services. The studies have been performed effectively for both single Service and multi-Service new starts. Interservicing plans for joint programs should be addressed in the JILSP. This approach has been applied very effectively on joint programs. The TRI-TAC Program develops tactical communications systems used by the Army, Navy, Air Force, and Marine Corps. The Program Manager has identified TRI-TAC items to be managed by individual services. The designated Service then provides depot support for all users of that system.

17.4 RISK MANAGEMENT

17.4.1 Inadequate Coordination

17.4.1.1 Risk Area. Logistics planning tasks for joint programs require more coordination than that required for single service programs. No other aspect of joint program management will confront the manager with as many interservice differences as logistics. Differences can occur in all of the ILS elements. The lack of extensive coordination can lead to:

- o Incomplete or inadequate logistic support at the time of initial deployment.

- o A decision by one or more Services to go it alone with ILS planning and development of Service-unique logistics support.

- o Loss of the economies that can be gained by joint ILS performance.

17.4.1.2 Risk Handling. Success in joint program management comes from facilitating and expediting the required coordination, not from eliminating coordination and fragmenting the program. Methods that have been employed include:

a. Early Recognition of Joint Requirements - A vital first step is early recognition during mission area analyses that a joint program is needed. The joint JMSNS may be initiated by OSD, JCS, or two or more services in unison. When this occurs, a joint program structure is recommended in the JMSNS, funding requirements for each Service are identified in each Service's initial Program Objectives Memorandum, and common and unique requirements of the services are documented in the initial JILSP prepared during Concept Exploration.

b. Staffing of the Joint Program Office - Senior representatives and other participating service personnel serve two vital functions. First, they work as part of a team committed to objectives of the joint program. Second, they are conduits for rapid two-way communications and decisions on methods to implement joint planning and satisfy unique needs of each Service.

c. Effective Communication - Implementation of joint ILS planning by the Services requires participation by their subordinate activities. Effective communications must be carried out among the provisioners, maintenance engineers, publications managers, trainers, and other logisticians who support the program within the Services. The lead ILS Manager must ensure that key logistics personnel from each Service are identified and jointly participate in planning and establishing the program. A hierarchy consisting of a high level review team, a joint ILS committee, and functional working groups may be established to provide oversight and rapid decisions that meet each Service's needs. Refer to the Joint Logistics Commanders Guide for the Management of Joint Service Programs for additional information.

17.5 SUMMARY

- o Joint implementation of ILS planning, analyses, and documentation can reduce total logistic support costs and meet essential needs of each Service.

- o As with single-Service programs, effective joint ILS programs require early planning starting prior to program initiation and continuing during Concept Exploration and beyond.

- o Joint ILS planning and implementation are facilitated by DoD military standards on logistic support analysis and continuing development of other joint-use standards and specifications.

- o Jointly staffed program offices and effective inter-Service communication have been major contributors to joint program management.

17.6 REFERENCES

1. MIL-STD-1388-1A, Logistic Support Analysis.

2. MIL-STD-1388-2A, DoD Requirements for a Logistic Support Analysis Record.

3. AFSC/AFLC Regulation 800-2, AMC Regulation 70-59, NAVMATINST 5000.10A, Management of MultiService Systems, Programs, and Projects.

4. AFLC/AFSCR 800-24, DARCOM-R 700-97, NAVMATINST 4000-38, MCO P4110.1A, Acquisition Management, Standard Integrated Support Management System.

5. Joint Logistic Commanders Guide for the Management of Joint Service Programs. (Defense Systems Management College).

APPENDIX A
GLOSSARY

AFFORDABILITY - The demonstration that a system can be procured, operated and supported efficiently and effectively for the programmed and budgeted resources (DoDD 5000.1).

ALLOCATED BASELINE - Development specifications (type B) that define the performance requirements for each configuration item of the system (DSMC).

AVAILABILITY - A measure of the degree to which an item is in an operable and committable state at the start of a mission when the mission is called for at an unknown (random) time (MIL-STD-1388-1A).

BASELINE COMPARISON SYSTEM (BCS) - A current operational system, or a composite of current operational subsystems, which most closely represents the design, operational, and support characteristics of the new system under development (MIL-STD-1388-1A).

COMPARABILITY ANALYSIS - An examination of two or more systems and their relationships to discover resemblances or differences (MIL-STD-1388-1A).

COMPUTER RESOURCES SUPPORT - The facilities, hardware, software, documentation, manpower, and personnel needed to operate and support embedded computer systems (DoDD 5000.39), one of the principal ILS elements.

CONCEPT EXPLORATION (CE) PHASE - The identification and exploration of alternative solutions or solution concepts to satisfy a validated need (MIL-STD-1388-1A).

CONFIGURATION ITEM (CI) - An aggregation of hardware/computer programs or any of its discrete portions which satisfies an end item use function and is designated by the Government for configuration (DSMC).

CONFIGURATION MANAGEMENT (CM) - The process that identifies functional and physical characteristics of an item during its life cycle, controls changes to those characteristics, provides information on status of change actions, and audits the conformance of configuration items to approved configurations (DSMC).

CONSTRAINTS - Restrictions or boundary conditions that impact overall capability, priority, and resources in system acquisition (MIL-STD-1388-1A).

CONTRACT DATA REQUIREMENTS LIST (CDRL), DD Form 1423 - A form used as the sole list of data and information which the contractor will be obligated to deliver under the contract, with the exception of that data specifically required by standard Federal Acquisition Regulation (FAR) clauses (MIL-STD-1388-1A).

COPRODUCTION (INTERNATIONAL) - Method by which items intended for military application are produced and/or assembled under the provisions of a cooperative agreement that requires the transfer of technical information and know how from one nation to another (DoD-5105.38M)

CORRECTIVE MAINTENANCE - All actions performed, as a result of failure, to restore an item to a specified condition. Corrective maintenance can include any or all of the following steps: Localization, Isolation, Disassembly, Interchange, Reassembly, Alignment, and Checkout (MIL-STD-1388-1A).

COST ESTIMATING RELATIONSHIP (CER) - A statistically derived equation which relates Life Cycle Cost or some portions thereof directly to parameters that describe the performance, operating, or logistics environment of system (MIL-STD-1388-1A).

CRITICAL DESIGN REVIEW (CDR) - Determines that the detail design satisfies the performance and engineering specialty requirements of the development program. The CDR is performed late in the prototype subphase when the design detail is essentially complete but prior to drawing release and fabrication of formal test articles (adapted from NAVMATP 9494).

DATA ITEM DESCRIPTION (DID), DD FORM 1664 - A form used to define and describe the data required to be furnished by the contractor. Completed forms are provided to contractors in support of and for identification of each data item listed on the CDRL (MIL-STD-1388-1A).

DEFENSE SYSTEMS ACQUISITION REVIEW COUNCIL (DSARC) - The top level DoD corporate body for system acquisition. Provides advice and assistance to the Secretary of Defense (DODI 5000.2).

DEMONSTRATION AND VALIDATION (DVAL) PHASE - The period when selected candidate solutions are refined through extensive study analyses; hardware development, if appropriate; test, and evaluations (MIL-STD-1388-1A).

DEPLOYMENT - The process of planning, coordinating, and executing the deployment of a materiel system and its support (AR 700-127).

DESIGN INTERFACE - The relationship of logistics-related design parameters, such as R&M, to readiness and support resource requirements. These logistics-related design parameters are expressed in operational terms rather than as inherent values and specifically relate to system readiness objectives and support costs of the materiel system (DoDD 5000.39), one of the principal elements of ILS.

DESIGN PARAMETERS - Qualitative, quantitative, physical, and functional value characteristics that are inputs to the design process, for use in design tradeoffs, risk analyses, and development of a system that is responsive to system requirements (MIL-STD-1388-1A).

DESIGN TO COST (DTC) - An acquisition management technique to achieve Defense system designs that meet stated cost requirements. Cost is addressed on a continuing basis as part of a system's development and production process. The technique embodies early establishment of realistic but rigorous cost objectives, goals and thresholds and a determined effort to achieve them (DoDD 4245.3).

DEVELOPMENT TEST AND EVALUATION (DT&E) - Test and Evaluation conducted to assist the engineering design and development process and to verify attainment of technical performance specifications and objectives (DoDD 5000.3).

END ITEM - A final combination of end products, component parts, and/or materials which is ready for its intended use; e.g., ship, tank, mobile machine shop, aircraft (MIL-STD-1388-1A).

FACILITIES - The permanent or semipermanent real property assets required to support the materiel system, including conducting studies to define types of facilities or facility improvements, locations, space needs, environmental requirements, and equipment (DoDD 5000.39), one of the principal elements of ILS.

FAILURE MODE, EFFECTS, AND CRITICALITY ANALYSIS (FMECA) - An analysis to identify potential design weaknesses through systematic, documented consideration of the following: all likely ways in which a component or equipment can fail; causes for each mode; and the effects of each failure (which may be different for each mission phase) (MIL-STD-1388-1A).

FAST TRACK PROGRAM - An acquisition program in which time constraints require the design, development, production, testing, and support acquisition processes to be compressed or overlapped (MIL-STD-1388-1A).

FIRST UNIT EQUIPPED (FUE) - The scheduled date a system or end item, and its agreed upon support elements, are issued to the designated IOC unit and training specified in the NET Plan has been accomplished. Support elements to be issued with system or end items will be specified in the Materiel Fielding Plan or other gaining command-developer agreement documents (AR 700-127).

FOLLOW-ON TEST AND EVALUATION (FOT&E) - That test and evaluation which is conducted after the production decision to continue and refine the estimates made during previous operational test and evaluation, to evaluate changes, and to evaluate the system to insure that it continues to meet operational needs and retain its effectiveness in a new environment or against a new threat (MIL-STD-1388-1A).

FOREIGN MILITARY SALES (FMS) - That portion of United States security assistance authorized by the Arms Export Control Act (AECA), as amended (Section 21 and 22, AECA).

FULL-SCALE DEVELOPMENT (FSD) PHASE - The period when the system [illegible] the principal items necessary for its support are designed, fabricated, tested, and evaluated (MIL-STD-1388-1A).

FUNCTIONAL BASELINE - The technical portion of the program requirements (type A specifications); provides the basis for contracting and controlling system design (DSMC).

FUNCTIONAL CONFIGURATION AUDIT (FCA) - Verifies that the actual item which represents the production configuration complies with the development specification (DSMC).

FUNCTIONAL SUPPORT REQUIREMENT (FSR) - A function (transport, repair, resupply, recover, calibrate, overhaul, etc.) that the support system must perform for the end item to be maintained in or restored to a satisfactory operational condition in its operational environment (MIL-STD-1388-1A).

GOALS - Values, or a range of values, apportioned to the various design, operational, and support elements of a system which are established to optimize the system requirements (MIL-STD-1388-1A).

GOVERNMENT FURNISHED MATERIAL (GFM) - Material provided by the Government to a contractor or comparable Government production facility to be incorporated in, attached to, used with or in support of an end item to be delivered to the Government or ordering activity, or which may be consumed or expended in the performance of a contract. It includes, but is not limited to, raw and processed materials, parts, components, assemblies, tools and supplies. Material categorized as Government Furnished Equipment (GFE) and Government Furnished Aeronautical Equipment (GFAE) are included (MIL-STD-1388-1A).

ILS ALTERNATIVE/TRADE-OFFS - Supporting dat[illegible] comes from "Lessons Learned" files, comparative analysis, technological opportunities, use studies, field visits, standardization re[illegible]ements, functional and military requirements, constraints, maintenance and operational approaches. This information is used in analyses and assessments of support for the identified alternatives system designs, using established lists of design criteria, utility curves, and criteria weights (DSMC).

INHERENT R&M VALUE - Any measure of reliability or maintainability that includes only the effects of item design and installation, and assumes an ideal operating and support environment (DoDD 5000.40).

INITIAL OPERATIONAL CAPABILITY (IOC) - The initial operational capability is the first attainment of the capability by a unit and its support elements to operate and maintain effectively a production item or system (AR 700-127).

INTEGRATED LOGISTICS SUPPORT (ILS) - A disciplined, unified, and iterative approach to the management and technical activities necessary to: (a) Integrate support considerations into system and equipment design (b) Develop support requirements that are related consistently to readiness objectives, to design, and to each other (c) Acquire the required support, (d) Provide the required support during the operational phase at minimum cost (DoDD 5000.39).

INTEGRATED LOGISTICS SUPPORT MANAGEMENT TEAM (ILSMT) - A team of Government and industry functional and management personnel formed to advise and assist the ILS Manager with planning, coordinating, monitoring schedules and contractor performance, ensuring accuracy and timeliness of Government inputs, and compliance with applicable requirements, regulations, specifications, standards, etc., (Adapted from AR 700-127).

INTEGRATED LOGISTICS SUPPORT PLAN (ILSP) - The formal planning document for logistics support. It is kept current through the program life. It sets forth the plan for operational support, provides a detailed ILS program to fit with the overall program, provides decision-making bodies with necessary ILS information to make sound decisions in system development and production and provides the basis for the ILS portion of procurement packages (DSMC).

INTEGRATED SUPPORT PLAN (ISP) - A comprehensive plan to demonstrate how a contractor intends to manage and execute his ILS program (DI-L-6138).

INTEROPERABILITY - The ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together (MIL-STD-1388-1A).

JUSTIFICATION OF MAJOR SYSTEM NEW STARTS (JMSNS) - The military component's submission upon which the mission need determination is accomplished. The JMSNS is submitted with the Program Objectives Memorandum (POM) in which funds for the budget year of the POM are requested. The Secretary of Defense will provide appropriate program guidance in the Program Decision Memorandum. This action provides official sanction for a new program start and authorizes the Military Service, when funds are available, to initiate Concept Exploration phase (Adapted from DoDD 5000.1).

LIFE CYCLE COST (LCC) - The total cost to the Government of acquisition and ownership of the system over its full life. It includes the cost of development, acquisition, operation, support, and where applicable, disposal (Joint Design to Cost Guide).

LIFE UNITS - A measure of use duration applicable to the item (such as, operating hours, cycles, distance, rounds fired, attempts to operate) (DoDD 5000.40).

LINE REPLACEABLE UNIT (LRU) - An LRU is an essential support item which is removed and replaced at field level to restore the end item to an operationally ready condition (MIL-STD-1388-2A).

LOGISTIC SUPPORT ANALYSIS (LSA) - The selective application of scientific and engineering efforts undertaken during the acquisition process, as part of the systems engineering process, to assist in: (a) Causing support considerations to influence design (b) Defining support requirements that are related optimally to design and to each other (c) Acquiring the required support (d) Providing the required support during the operational phase at minimum cost (DoDD 5000.39).

LOGISTIC SUPPORT ANALYSIS DOCUMENTATION - All data resulting from performance of LSA tasks pertaining to an acquisition program (MIL-STD-1388-1A).

LOGISTIC SUPPORT ANALYSIS RECORD (LSAR) - That portion of LSA documentation consisting of detailed data pertaining to the identification of logistic support resource requirements of a system/equipment. See MIL-STD-1388-2A for LSAR data element definitions (MIL-STD-1388-1A).

LOGISTIC SUPPORTABILITY - The degree to which the planned logistics (including test equipment, spares and repair parts, technical data, support facilities, and training) and manpower meet system availability and wartime usage requirements (DoDD 5000.3).

LOGISTICS R&D - Technology programs funded outside the weapon system development programs that may result in improved subsystem R&M, improved support elements needed in the operation and maintenance of weapon systems, and improved logistics infrastructure elements (DoDD 5000.39).

MAINTAINABILITY - The measure of the ability of an item to be retained in or restored to specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair (MIL-STD-1388-1A).

MAINTENANCE CONCEPT - A narrative description identifying the broad, planned approach to be employed in sustaining the system/equipment at a defined level of readiness or in a specified condition in support of the operational requirement. Provides the basis for the maintenance plan.

MAINTENANCE PLANNING - The process conducted to evolve and establish maintenance concepts and requirements for the lifetime of a materiel system (DoDD 5000.39), one of the principal elements of ILS.

MANPOWER - The total demand, expressed in terms of the number of individuals, associated with a system. Manpower is indexed by manpower requirements, which consist of quantified lists of jobs, slots, or billets that are characterized by the descriptions of the required number of individuals who fill the job, slots, or billets (MIL-STD-1388-1A).

MANPOWER AND PERSONNEL - The identification and acquisition of military and civilian personnel with the skills and grades required to operate and support a materiel system over its lifetime at peacetime and wartime rates (DoDD 5000.39), one of the principal elements of ILS.

MATERIEL FIELDING PLAN (MFP) - The plan to ensure smooth transition of the system from the developer to the user (DSMC).

MATERIEL SYSTEM - A final combination of subsystems, components, parts, and materiels that make up an entity for use in combat or in support thereof, either offensively or defensively, to destroy, injure, defeat, or threaten the enemy. It includes the basic materiel items and all related equipment, supporting facilities, and services required for operating and maintaining the system.

MISSION AREA ANALYSIS - Continuing analyses of assigned mission areas by DoD Components, OSD and OJCS to identify deficiencies or to determine more effective means of performing assigned tasks. From these mission analyses, a deficiency or opportunity may be identified that could lead to initiation of a major system acquisition program (DoDD 5000.1).

MISSION RELIABILITY - The ability of an item to perform its required functions for the duration of a specified mission profile (DoDD 5000.40).

MEAN TIME BETWEEN FAILURES (MTBF) - For a particular interval, the total functional life of a population of an item divided by the total number of failures within the population. The definition holds for time, rounds, miles, events, or other measures of life units (MIL-STD-1388-2A), a basic technical measure of reliability.

MEAN-TIME-TO-REPAIR (MTTR) - The total elapsed time (clock hours) for corrective maintenance divided by the total number of corrective maintenance actions during a given period of time (MIL-STD-1388-2A), a basic technical measure of maintainability.

OBJECTIVES - Qualitative or quantitative values, or range of values, apportioned to the various design, operational, and support elements of a system which represent the desirable levels of performance. Objectives are subject to tradeoffs to optimize system requirements (MIL-STD-1388-1A).

OPERATING AND SUPPORT (O&S) COSTS - The cost of operation, maintenance, and follow-on logistics support of the end item and its associated support systems. This term and "ownership cost" are synonymous (MIL-STD-1388-1A).

OPERATIONAL AVAILABILITY (Ao) - The probability that, when used under stated conditions, a system will operate satisfactorily at any time. A_o includes standby time and administrative and logistic delay time (MIL-STD-1388-2A).

OPERATIONAL R&M VALUE - Any measure of reliability or maintainability that includes the combined effects of item design, quality, installation, environment, operation, maintenance and repair (DoDD 5000.40).

OPERATIONAL REQUIREMENT - An established need justifying the timely allocation of resources to achieve a capability to accomplish military objectives, missions, or tasks (JCS Pub 1).

OPERATIONAL SUITABILITY - The degree to which a system can be satisfactorily placed in field use, with consideration being given to availability, compatability, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistic supportability, and training requirements (DoDD 5000.1).

OPERATIONAL TEST AND EVALUATION (OT&E) - Test and evaluation conducted to estimate a system's operational effectiveness and suitability, identify needed modifications, and provide information on tactics, doctrine, organization, and personnel requirements (DoDD 5000.3).

OPTIMIZATION MODELS - Models which accurately describe a given system and which can be used, through sensitivity analysis, to determine the best operation of the system being modeled (MIL-STD-1388-1A).

PACKAGING, HANDLING, STORAGE, AND TRANSPORTATION (PHS&T) - The resources, processes, procedures, design considerations, and methods to ensure that all system, equipment, and support items are preserved, packaged, handled, and transported properly including: environmental considerations, equipment preservation requirements for short- and long-term storage, and transportability (DoDD 5000.39), one of the principal elements of ILS.

PARAMETRIC ESTIMATING RELATIONSHIP (PER) - A statistical parametric analysis that involves development and application of mathematical expressions commonly called "cost estimating relationships" (CER's). CER's are developed by statistically analyzing past history to correlate cost with significant physical and functional parameters (MIL-STD-1388-1A).

PERSONNEL - The supply of individuals, identified by specialty or classification, skill, skill level, and rate or rank, required to satisfy the manpower demand associated with a system. This supply includes both those individuals who support the system directly (i.e., operate and maintain the system), and those individuals who support the system indirectly by performing those functions necessary to produce and maintain the personnel required to support the system directly. Indirect support functions include recruitment, training, retention, and development (MIL-STD-1388-1A).

PHYSICAL CONFIGURATION AUDIT (PCA) - A technical examination of a designated configuration item to verify that the item "as built" conforms to the technical documentation which defines the item (DSMC).

PLANNING, PROGRAMMING, BUDGETING SYSTEM (PPBS) - An integrated system for the establishment maintenance, and revisioning of the FYDP and the DoD budget (DSMC).

POST-PRODUCTION SUPPORT (PPS) - Systems management and support activities necessary to ensure continued attainment of system readiness objectives with economical logistic support after cessation of production of the end item (weapon system or equipment) (DoDD 5000.39).

PRELIMINARY DESIGN REVIEW (PDR) - Conducted on each configuration item to evaluate the progress, technical adequacy and risk resolution of the selected design approach, determine its compatability with performance and engineering speciality requirements of the development specification and establish the existence and compatability of the physical and functional interfaces among the item and other items of equipment, facilities, computer programs and personnel (DSMC).

PREVENTIVE MAINTENANCE - All actions performed in an attempt to retain an item in specified condition by providing systematic inspection, detection, and prevention of incipient failures (MIL-STD-1388-1A).

PRODUCIBILITY - The relative ease of producing an item or system which is governed by the characteristics and features of a design that enable economical fabrication, assembly, inspection, and testing using available production technology (DSMC).

PRODUCT BASELINE - Specifications (type C) that establish the detailed design documentation for each configuration item. Normally also includes Process Baseline (type D) and Material Baseline (type E) (DSMC).

PRODUCT DEFINITION - The definition of the product (or system) at each stage in the system life cycle. For example: Engineering must know what to design, test and evaluation must know what to test, manufacturing must know what to produce, and logistic support must know what to operate and support at each stage of the system life cycle. Product definition includes the generation of operational requirements, technical requirements, specifications, configurations, etc.

PRODUCTION ACCEPTANCE TEST AND EVALUATION (PAT&E) - Test and evaluation conducted on production items to demonstrate that procured items fulfill the requirements and specifications of the procuring contracts and agreements (DoDD 5000.3).

PRODUCTION AND DEPLOYMENT PHASE - The period from production approval until the last system is delivered and accepted (MIL-STD-1388-1A).

PRODUCTION READINESS REVIEW (PRR) - A formal examination of a program to determine whether the design is ready for production, production engineering problems have been resolved, and the producer has accomplished adequate planning for the production phase (DoDD 4245.6).

PROVISIONING - The process of determining and acquiring the range and quantity (depth) of spares and repair parts, and support and test equipment required to operate and maintain an end item of materiel for an initial period of service (MIL-STD-1388-1A).

READINESS DRIVERS - Those system characteristics which have the largest effect on a system's readiness values. These may be design (hardware or software), support, or operational characteristics (MIL-STD-1388-1A).

RELIABILITY - (a) The duration or probability of failure-free performance under stated conditions (b) The probability that an item can perform its intended function for a specified interval under stated conditions (For nonredundant items this is equivalent to definition (a). For redundant items this is equivalent to mission reliability, (MIL-STD 1388-1A).

RELIABILITY CENTERED MAINTENANCE (RCM) - A systematic approach for identifying preventive maintenance tasks for an end item in accordance with a specified set of procedures and for establishing intervals between maintenance tasks (DoDD 5000.39).

REPAIR LEVEL ANALYSIS (RLA) - The Repair Level Analysis limits the depth of maintenance task analysis in the LSA process by distinguishing between repairable and nonrepairable components and by selecting the most cost-effective repair level. An RLA is normally conducted on all Line Replaceable Units.

REPAIR PARTS - Those support items that are an integral part of the end item or system which are coded as nonrepairable (MIL-STD-1388-1A).

RISK - The opposite of confidence or assurance; the probability that the conclusion reached as to the contents of a lot (number of defects or defective range) is incorrect (MIL-STD-1388-1A).

SCHEDULED MAINTENANCE - Preventive maintenance performed at prescribed points in the item's life (MIL-STD-1388-1A).

SPARES - Those support items that are an integral part of the end item or system which are coded as repairable (MIL-STD-1388-1A).

STANDARDIZATION - The process by which member nations achieve the closest practicable cooperation among forces; the most efficient use of research, development, and production resources; and agree to adopt on the broadest possible basis the use of: (a) common or compatible operational, administrative, and logistics procedures; (b) common or compatible technical procedures and criteria; (c) common, compatible, or interchangeable supplies, components, weapons, or equipment; and (d) common or compatible tactical doctrine with corresponding organizational compatability (MIL-STD-1388-1A).

SUPPLY SUPPORT - All management actions, procedures, and techniques used to determine requirements to acquire, catalog, receive, store, transfer, issue, and dispose of secondary items. This includes provisioning for initial support as well as replenishment supply support (DoDD 5000.39), one to the principal elements of ILS.

SUPPORT CONCEPT - A complete system level description of a support system, consisting of an integrated set of ILS element concepts, which meets the functional support requirements and is in harmony with the design and operational concepts (MIL-STD-1388-1A).

SUPPORT EQUIPMENT - All equipment (mobile or fixed) required to support the operation and maintenance of a materiel system. This includes associated multiuse end items, ground-handling and maintenance equipment, tools, metrology and calibration equipment, test equipment and automatic test equipment. It includes the acquisition of logistics support for the support and test equipment itself (DoDD 5000.39), one of the principal elements of ILS.

SUPPORT RESOURCES - The materiel and personnel elements required to operate and maintain a system to meet readiness and sustainability requirements. New support resources are those which require development. Critical support resources are those which are not new but require special management attention due to schedule requirements, cost implications, known scarcities, or foreign markets (MIL-STD-1388-1A).

SUPPORTABILITY - The degree to which system design characteristics and planned logistics resources, including manpower, meet system peacetime readiness and wartime utilization requirements (DoDD 5000.39).

SUPPORTABILITY ASSESSMENT - An evaluation of how well the composite of support considerations necessary to achieve the effective and economical support of a system for its life cycle meets stated quantitative and qualitative requirements. This includes integrated logistic support and logistic support resource related O&S cost considerations (MIL-STD-1388-1A).

SUPPORTABILITY FACTORS - Qualitative and quantitative indicators of supportability (MIL-STD-1388-1A).

SUPPORTABILITY-RELATED DESIGN FACTORS - Those supportability factors which include only the effects of an item's design. Examples include inherent reliability and maintainability values, testability values, transportability characteristics etc (MIL-STD 1388-1A).

SUSTAINABILITY - The "staying power" of our forces, units, weapon systems, and equipment often measured in numbers of days (JCS Pub 1, subset of Military Capability).

SYSTEM - (See MATERIEL SYSTEM).

SYSTEM DESIGN REVIEW - Reviews the conceptual design of the system and establishes its capability to satisfy requirements (DSMC).

SYSTEM ENGINEERING - System 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 compatability 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 effort to meet cost, schedule, and technical performance objectives (MIL-STD-499).

SYSTEM READINESS OBJECTIVE - A criterion for assessing the ability of a system to undertake and sustain a specified set of missions at planned peacetime and wartime utilization rates. System readiness measures take explicit account of the effects of system design R&M, the characteristics and performance of the support system, and the quantity and location of support resources. Examples of system readiness measures are combat sortie rate over time, peacetime mission capable rate, operational availability, and asset ready rate (DoDD 5000.39).

TAILORING - The process by which the individual requirements (sections, paragraphs, or sentences) of the selected specifications and standards are evaluated to determine the extent to which each requirement is most suitable for a specific materiel acquisition and the modification of these requirements, where necessary, to assure that each tailored document invoked states only the minimum needs of the Government (MIL-STD-1388-1A).

TECHNICAL DATA - Recorded information regardless of form or character (such as manuals, and drawings) of a scientific or technical nature. Computer programs and related software are not technical data; documentation of computer programs and related software are. Also excluded are financial data or other information related to contract administration (DoDD 5000.39), one of the principal elements of ILS.

TEST AND EVALUATION MASTER PLAN (TEMP) - A broad plan that relates test objectives to required system characteristics and critical issues, and integrates objectives, responsibilities, resources, and schedules for all T&E to be accomplished (DoDD 5000.3).

TESTABILITY - A design characteristic which allows the status (operable, inoperable, or degraded) of an item and the location of any faults within the item to be confidently determined in a timely fashion (MIL-STD-1388-1A).

THRESHOLD - A quantitative requirement, documented in the DCP and Secretary of Defense Decision Memorandum, against which acquisition program achievements are measured. Breach of a threshold (actual or projected) requires notification of the Defense Acquisition Executive (DODD 5000.39).

TRADEOFF - The determination of the optimum balance between system characteristics (cost, schedule, performance, and supportability) (MIL-STD-1388-1A).

TRAINING AND TRAINING SUPPORT - The processes, procedures, techniques, training devices, and equipment used to train civilian and active duty and reserve military personnel to operate and support a materiel system. This includes individual and crew training; new equipment training; initial, formal, and on-the-jobtraining; and logistic support planning for training equipment and training device acquisitions and installations (DoDD 5000.39), one of the principle elements of ILS.

TURN-AROUND TIME (TAT) - The time required to return an item to use between missions (MIL-STD-1388-2A).

UNSCHEDULED MAINTENANCE - Corrective maintenance required by item conditions (MIL-STD-1388-1A).

APPENDIX B
LOGISTICS MODELS

A large number of models have been developed to support quantitative determination of requirements for logistics support and related disciplines.

Model Categories

Availability	Maintainability
Budgeting	Manpower
Design Interface	Provisioning
Facilities	Reliability
Life Cycle Cost	Training

Catalogs of Logistics Models

The following documents provide a structured format which summarizes each model with a narrative description, model applications, capabilities, compatible software, custodian, and other useful information which can be used to obtain documentation and conduct a preliminary evaluation for applicability to a particular program need.

Title: Department of Defense Catalog of Logistics Models

Point of Contact: Defense Logistics Studies Information Exchange
U.S. Army Logistics Management Center
Fort Lee, Virginia 23801
AUTOVON 687-4255/4546/3570; Commercial
(804) 734-4255/4546/3570

Title: Logistics Support Analysis Techniques Guide (AMC-P 700-4)

Point of Contact: Headquarters

U.S. Army Materiel Command

Alexandria, Virginia 22333

Attn: AMCSM-PLE

AUTOVON 284-8497; Commercial (202) 274-8497

Title: <u>Selected Logistics Models and Techniques</u>

Contact: HQ AFSC/AL

DCS Acquisition Logistics

Andrews AFB, DC 20334

AUTOVON 858-3915; Commercial (301) 981-3915

APPENDIX C
LOGISTICS COURSES

This appendix contains information on the Government courses currently offered on Integrated Logistics Support (ILS). The courses are arranged by the offering command or school. General information is provided on course content, along with course length and location. The courses listed cover all aspects of ILS. The schools may be contacted directly for information on additional courses that cover specific ILS aspects (such as materiel management).

SCHOOL: Air Force Institute of Technology
LOCATION: Wright-Patterson AFB, Ohio
POINT OF CONTACT: AFIT/LSA, WPAFB Ohio 45433
AUTOVON 785-6335/6336/3532;
Commercial (513) 255-6335/6336/3532

Course: Acquisition Logistics (Integrated Logistics Support)
Length: 2 Weeks
Content: This course helps students recognize the necessary interface between support planning and the systems engineering process, exposes them to some of the tools and techniques available to them, and shows them that acquisition logistics is a multidiscipline management challenge rather than a lockstep process. The course addresses the elements of ILS with the emphasis upon techniques as aids to decision making.

Course: Combat Logistics
Length: 2 Weeks
Content: This course provides an overview of the wartime roles and responsibilities of the logistics manager and provides an introduction to combat logistics planning, strategies, and contingency procedures that will likely be implemented in a wartime scenario. The course is designed to create an understanding of how logistics contributes to the overall war effort and wartime requirement, and serves as an anchor to which subsequent on-the-job training and formal development can be keyed.

Course: Logistics Management
Length: 4 Weeks
Content: This course broadens and enhances the understanding of logistics management at various levels throughout the Air Force and is directed to the critical examination of interrelationships and interdependencies that prevail in strategic, support, and operational logistics. In these contexts, strategic logistics entails the interrelationships of strategy and logistics and the influence they exert upon each other at the national level; support logistics is concerned largely with the acquisition of systems and their contingent supply, equipment, and allied support functions; operational logistics relates to the direct functional support of the Air Force in the operational environment.

The course design enables the students to comprehend the rationale behind the logistics decisions that they may be called upon to make. Heavy emphasis is placed on the applied management techniques used in the acquisition, distribution, and support of weapon systems. Specific attention is given to line and staff management and the forces that drive the logistics systems at all levels. A major share of the course is devoted to direct student involvement in practical exercises, examples, cases, workshops, and simulations. These exercises enable the student to apply the theory given during the lecture and seminar sessions. Management tools and analytical techniques including ADP, simulation, forecasting, and performance measurement evaluation are used by the student in achieving the goals and objectives of the exercises.

Course: Weapon System Logistics Management For Senior System Managers
Length: 2 Weeks
Content: This course provides an overview of the roles and responsibilities of the logistics manager within the complex and dynamic weapon system logistics management environment. The instruction is aimed at senior level system manager personnel as a core course to which subsequent on-the-job training and formal development can be keyed. The course addresses the organization, structure, and functions of the Air Force Logistics Command, the role of the system manager within the organization, including the manager's interaction with maintenance, item management, distribution, contracting, programming and budgeting, financial management and system integration. The course ends with a synthesis of the various logistics disciplines and a cross disciplinary application exercise.

SCHOOL: Army Logistics Management Center
LOCATION: Fort Lee, Virginia 23801
POINT OF CONTACT: Commandant, ALMC, ATTN: AMXMC-A-R, Fort Lee, Virginia 23801

Course: Integrated Logistics Support Executive
Length: 1 Week
Content: This course is designed to provide senior managers of ILS or ILS related disciplines with an opportunity to exchange ideas, viewpoints, problems, and management approaches under strict rules of nonattribution. Policy and procedures updates and concepts are also provided. Policy updates regarding materiel acquisition and ILS, as well as managerial and technical ILS procedures and concepts are presented. Ranking guest speakers address ILS topics of greatest current interest.

Course: Logistics Executive Development (LEDC)
Length: 19 Weeks Resident or 600 Hours Correspondence
Content: This course provides in-depth logistics education for selected managers, prepares them for positions of responsibility in logistics management, and develops their intellectual depth and analytical ability. LEDC serves as the Army's senior logistics course to prepare civilian/military managers for key executive positions with the Army and DoD logistics systems; to broaden the individual's logistics foundation developed by earlier logistics functional courses and personal experience; to provide insights into the multifunctional areas of logistics and their integration into the overall DoD logistics system; to expand and enhance the fundamental management skills of the individual; to provide an understanding of the interface between the Army in the field, the logistics structure, and industry. The course of instruction includes: development of strategy, force structure; equipment and logistical support; acquisition management and ILS; inventory; distribution and maintenance of equipment; logistical support to the Army in the field; organization and personnel management; DoD resource management; managerial economics (Macro); analytical techniques; automated information technology; force modernization, and an electives program.

Course: Logistics Management Development
Length: 4 Weeks Resident, 18 Class Days On Site
Content: The course is designed to develop the managerial skills of selected military and civilian personnel assigned to, or anticipating assignment to, the Army wholesale logistics system by providing a broad knowledge of the Army wholesale logistics system. The instruction enhances understanding of the interrelationships and interdependence among logistics functions and the organizational structure for logistics management, and provides insights into the impact of a functional management decision on other logistics functions and on the logistics system as a whole. The course provides an overview of the

Army logistics system. The life cycle management model is the common thread of the course. It is used to highlight the more significant considerations of RDT&E, procurement, inventory management, maintenance, and disposal of Army materiel. Management skills instruction includes basic statistical and probability techniques, as well as aspects of interpersonal behavior. This instruction is oriented toward improving the decision making abilities of the students by providing knowledge of the techniques and consideration involved in logistics management.

Course: Logistics Support Analysis
Length: 2 Weeks
Content: This course acquaints the student with MIL-STD 1388-1A, Logistics Support Analysis (LSA), and the techniques and tasks necessary to accomplish the LSA process. This course provides the student with an understanding of the purpose and objectives of the LSA process. It provides an overview of MIL-STD 1388-1A and MIL-STD 1388-2A tasks, techniques for accomplishing the tasks, an examination of the use of Logistics Support Analysis Record (LSAR) data records in the generation and recording of logistics support data, the use of the LSA/LSAR as a management tool and as a force to integrate all ILS elements for an item/system. Specific instructional topics included in the course are an overview of the Materiel Acquisition Process; an introduction to ILS and its relationship to LSA/LSAR; requirements generation; trade-offs; supportability testing; developing comparative analysis; identification of manpower, support, cost and readiness drivers; life cycle costing; support modeling and simulation; risk analysis; a discussion of terms needed to describe maintenance tasks; detailed review and explanation of the LSAR data records and output summaries; a discussion of LSAR data utilization; contracting for LSA/LSAR; and review and validation of LSA data.

Course: Associate Logistics Executive Development (ALEDC)
Length: 10 Weeks (5 Phases, 2 Weeks Active Duty Training Each or a Combination of Active Duty and Correspondence)
Content: This course provides, over a period of three years, five phases of advanced broad logistics management education for Reserve Component officers. This course prepares these officers for executive and policy-making mobilization assignments in logistics.

ALEDC serves as the Army's senior logistics course for the Reserve Components (RC) officers, and prepares them for executive and policy-making mobilization assignments. The course provides insights into the multifunctional areas of logistics and their integration within the DoD. Students gain a fuller understanding of the interface between the Army in the field, DoD's logistics structure, and industry. The course expands and enhances fundamental management skills. Course completion qualifies an RC officer for promotion through 0-5. ALEDC consists of five phases:

1. Management Systems: This phase offers specific instruction in the use of human, financial, and mechanical (computer) resources in order that the goal of effective logistics management might be accomplished. It does this through an in-depth study of the various management systems applicable to logistics and identifies their applications, limitations and values in various management situations.

2. The Acquisition Process: This phase provides an insight into the total DoD and Department of the Army logistics systems. It also provides a general knowledge of the management process for the acquisition of Army materiel to include research, development, test, evaluation, and contracting.

3. Materiel Readiness: This phase provides an understanding of requirements, determination for, and management of, major and secondary items and the relationship and significance of maintenance, transportation, distribution, and disposal.

4. Scientific Techniques: This phase provides a general knowledge of the application of mathematics, economics, computer technology, and systems analysis in the formulation and solution of complex logistics problems.

5. Logistics Support Concepts: This phase provides an interface between the logistics base and the Army in the field through application of current doctrine for logistics support. It also serves as a vehicle for recognition, analysis, and solution of logistics support problems within the Army in the field. It includes command and control problems encountered in contingency planning, and combat service support force planning. This phase also includes a familiarization with the Security Assistance Program.

SCHOOL: **Defense Systems Management College**
LOCATION: **Fort Belvoir, Virginia 22060**
POINT OF CONTACT: **Registrar, Defense Systems Management College**
Fort Belvoir, Virginia 22060
AUTOVON 354-2152; Commercial (703) 664-2152

Course: Business Management
Length: 3 Weeks
Contents: This course provides fundamental education and skill building on Business Management aspects of program management. It serves as one of three foundation courses to prepare inexperienced program management personnel for more advanced program office assignments and/or course work at DSMC.

The Business Management Course acquaints system acquisition personnel with business functions of the Government program office as well as that of the contractor. It presents an overview of the systems management function oriented to business issues. Discussion of such Government topics as basic funds management concepts, cost estimating, program budgets, types of contracts and incentive arrangements, preparation of requests for proposals and source selection planning is included. Contractor topics covered include basic financial concepts, annual operating plans, and proposal preparation. Basic cost control functions, including the cost/schedule control systems criteria, from both the Government and contractor perspective, are discussed.

This course includes lectures and discussions associated with the program business functions and responsibilities and is designed to involve student participation.

Course: Management of Acquisition Logistics (MALC)
Length: 1 Week
Content: This course provides program management personnel and other middle managers with an understanding of the nature of logistics in the acquisition process, and how to manage in order to achieve improved logistics support objectives of the defense systems acquisition process.

The MALC provides participants with an understanding of Integrated Logistic Support (ILS) procedures and practices as exercised during the defense systems acquisition life cycle. Logistics elements such as maintenance planning; supply support; manpower and personnel; support and test equipment; computer resources support; packaging, handling, storage, and transportation; training and training devices; facilities; and technical data are integrated into an acquisition support pattern. Students learn the techniques and importance of defining the logistics support needed, influencing the basic system design, designing and acquiring the support for the system, and providing and sustaining logistics support during deployment and operation. Special emphasis is placed on logistics related support techniques - life cycle costing, readiness, reliability and maintainability, logistics support analysis, ILS planning, logistics support resource funding, and post production support planning.

Specific "real-world" examples of DoD programs are presented by both faculty and guest lecturers from within Government and industry. Special experience-based case studies offer the student an opportunity to experience weapons logistics problems and devise both theoretical and pragmatic solutions.

The student learns to appreciate the importance of integrating the functional logistics elements into a support pattern set against a life cycle background in a manner that will maximize the avoidance of logistics related problems. Via this course, each student develops an appreciation and understanding of integrated logistics techniques and tools that can be used in decision making, designing for support, and making ILS an integral part of the systems acquisition process.

The students enhance their ability to analyze logistics situations and problem areas, to develop alternatives, to prepare solutions, and to properly articulate logistics approaches to higher authorities.

Course: Policy and Organization Management (POMC)
Length: 3 Weeks
Contents: The POMC provides an introduction to the concepts, scope, and application of program management practices within DoD. Attending the course: (1) equips the student to function in a program management office, or to effectively interface with the acquisition policies, tasks, problems, and issues confronting the PM; (2) provides an understanding of the roles, activities and integration of functions and relationships of Government and industry organizations that participate in, and affect the acquisition process; and (3) provides an understanding of the importance of interpersonal relations and communication skills in the development of an effective acquisition team. This course allows middle managers to develop sound management abilities and to experience the practices and problems of program management operations. This course emphasizes the principles of program management, defense acquisition policy, human behavior, and effective communications.

Course: Program Managers Workshop (PMW)
Length: 4 Weeks
Content: The PMW provides an educational opportunity for selected program manager designees and deputies to enhance their performance in managing DoD acquisition programs. It focuses on practical, current management issues at the service, OSD, and congressional levels of interest.

The workshop concept includes identifying current management issues, determining management-issue relevancy to each participant's future program, and scheduling each participant to develop a plan to resolve issues relevant to his or her program.

Three offerings per year are ultimately planned to satisfy service assignments-offerings in March and May and one offering in August or September. The course has achieved its desired four week length in 1985.

The PMW begins with an intern phase of two months. The internship consists of service screening and eligibility, and nomination to DSMC for attendance. Once approved, the participant receives selected skills diagnostics to be completed and returned. These diagnostics are used to individually tailor a read-ahead package consisting of selected articles and instructional materials. The participant must also complete a visit to his or her gaining program office and that office's principal support industry or laboratory prior to attending the course. These visits are a prerequisite to the subsequent course phases.

The selected PM designees and deputy program managers then attend the four week residency phase at DSMC. The curriculum is centered around the workshop concept to facilitate the enrichment of acquisition management experiences, to enhance the participant's exposure to multiservice perspectives, and to encourage experimentation with new concepts and ideas on program management. Visiting program managers serve as workshop hosts. Selected workshop modules on cost control, complex problem solving, and long-range planning also are used to achieve these objectives. Special attendance at (S)SARCs and DSARCs, as well as service seminars, round out the participant's exposure and orientation.

Six months after the residency phase on-campus, a three day transition applications workshop is planned. This workshop is based on the participant's need for an opportunity to develop and resolve current issues in their programs.

Course: Technical Management
Length: 3 Weeks
Content: The Technical Management Course (TMC) provides an introduction to the concepts, scope, and application of technical management disciplines (system engineering, integrated logistic support, test and evaluation, production) to the systems acquisition process. Attending the course: (1) enhances the ability of staff or functional managers to interface with program management office technical efforts through development of a better understanding of the technical management process; (2) provides an understanding of the activities and integration of technical disciplines necessary in the acquisition life cycle; and (3) provides an understanding of the roles of Government and industry organizations in the technical management efforts. This course allows junior level managers to develop a sound understanding of the technical management process through emphasis on the technical disciplines of systems engineering, logistics support, test and evaluation, and production.

Course: Technical Managers Advanced Workshop
Length: 1 Week
Content: The Technical Managers Advanced Workshop is designed for senior engineers and technical directors and stresses the more complex and difficult issues associated with the technical management of a defense systems acquisition.

This workshop enhances the ability of technical managers to plan and implement a technical program strategy, and to recognize and structure solutions to management related problems and issues often encountered by the technical manager. The course is founded on examination of a broad set of issues developed by the Technical Management Department of DSMC, then refined and supplemented through feedback from the system acquisition community. These issues are tailored for each class in order to maintain currency, utilize class expertise, and enhance interest. The course configuration offers a forum for facing current issues to improve technical management. Experts discuss background and current observations on critical issues. Participants are provided with an environment for individual and group development of issues and solutions to contribute improvement for the system acquisition process. The output is an attributable report for retention and potential publication.

The goal of the workshop is to sharpen the judgement of technical managers to ensure that the appropriate balance among performance, supportability, testability, and producibility is "designed in" to a cost-effective defense system that will meet a realistic schedule.

SCHOOL: Navy ILS Training Program
LOCATION: Career Development Institute, Anacostia, Building 150, U.S. Naval Station (Anacostia), Washington, D.C.
POINT OF CONTACT: ILS Training Sponsor,
Commander, Naval Air Systems Command
(AIR-400)
Washington, D.C. 20360
AUTOVON 288-3384; Commercial (703) 433-3384

Course: ILS Overview
Length: 1 Week
Content: This course provides the framework for the other courses in this program. It discusses the management tools available to logistics managers and places ILS in perspective in the weapon system acquisition process. This course is a prerequisite for other courses in the program.

ILS Overview covers the following areas:

- o Weapon System Acquisition Process
- o Logistic Support Analysis
- o Reliability Centered Maintenance
- o ILS Elements
- o Configuration Management
- o Program Planning and Control Techniques.

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Logistics Support Analysis	Contracting
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This handbook is designed to provide middle and top level logistics and acquisition managers with a working familiarity of Integrated Logistics Support. It addresses how to manage the ILS process throughout the life cycle from preconcept exploration through post-production support. It provides an organized approach and architecture for integrating support considerations into the requirements definition and design processes; integrating the support elements into a cohesive package; designing and acquiring support elements;

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered) and providing integrated support resources to achieve readiness and support objectives. The handbook's architecture will show the inter-relationships of the major activities in the acquisition process of systems engineering, test, cost, risk, production, contracts, etc. It is designed to bridge the gap between general acquisition and logistics policy contained in DoD Directives 5000.1 and 5000.39 and specific detailed procedures such as those in MIL-STD-1388-1A.

The handbook is divided into six modules:

~~I~~ 1) Introduction to ILS;
~~II~~ 2) Developing the ILS Program,
~~III~~ 3) Programming, Budgeting and Contracting;
~~IV~~ 4) Test and Evaluation,
~~V~~ 5) Providing the Support, and
~~VI~~ 6) International, Non-Major and Joint Programs

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for
Integrated Logistics Support Guide

This guide was prepared as a reference document for program management personnel. Because of ongoing research in the area of integrated logistics support and the dynamic nature of the entire acquisition process, revisions, additions and updates to this book are expected to be necessary. Your comments and suggestions are solicited.

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