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INTEGRATED LOGISTICS SUPPORT PLANNING GUIDE

FOR DOD SYSTEMS AND EQUIPMENT

Integrated Logistics SUPPORT PLANNING GUIDE

for DoD Systems and Equipment*

October 15, 1968

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*(Ref. DoD Directive 4100.35)

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

October 1968

FORWARDING MEMORANDUM

SUBJECT: Integrated Logistics Support Planning Guide

This document represents a key step towards an emerging improved Systems Engineering process for Defense systems and equipment, which has as its goal the achievement of proper balance between operational, economic, and logistics factors. While in itself not an instrument to be applied to a specific program, the guide provides the basis for Project Managers to tailor their management planning of specific tasks, at the appropriate level of detail, for logistics support planning and integration.

It is the consensus of Defense and industry alike that achievement of integrated logistic support is dependent upon the integration of logistics considerations and logistics planning into the systems engineering and design process. Also, that when logisticians and designers make program decisions based on the full military and economic consequence of their actions, the result will be superior force effectiveness at the lowest total cost.

The contents of the guide are dedicated to this end.

Tom Morris
THOMAS D. MORRIS

Assistant Secretary of Defense
(Installations and Logistics)

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Research & Engineering

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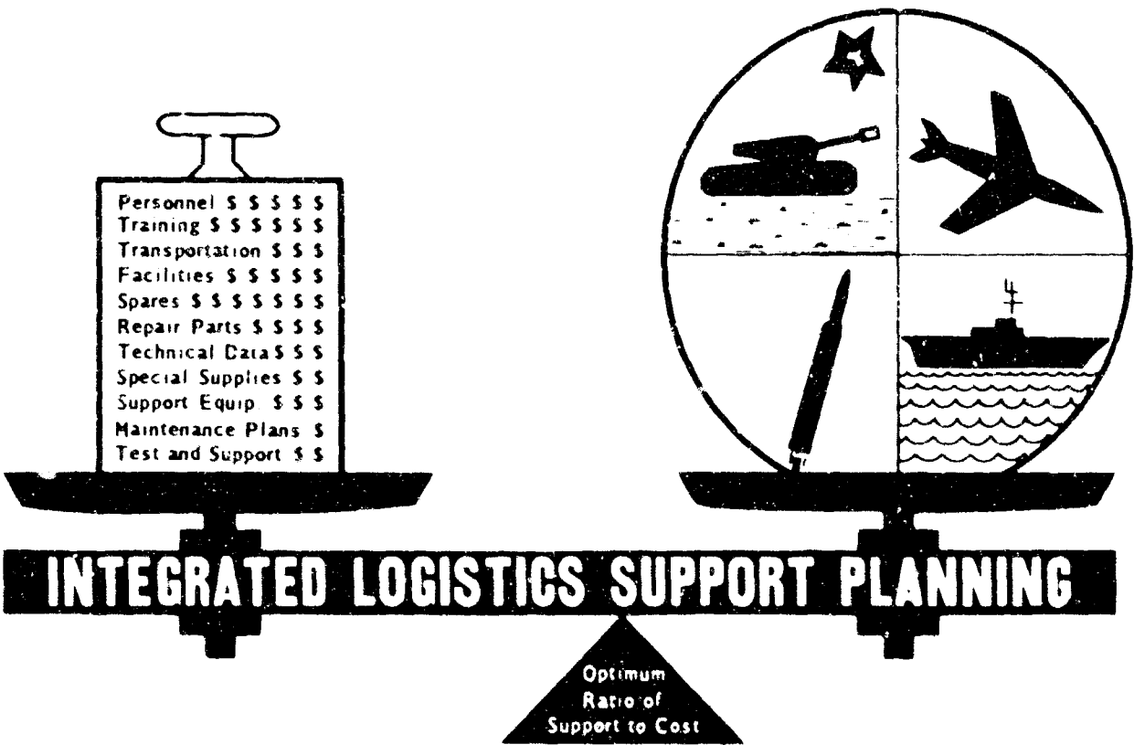
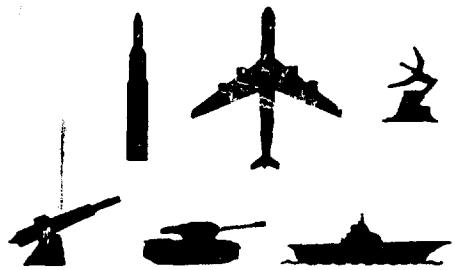


THE ILS MANAGEMENT MISSION IN PERSPECTIVE



– Mission Readiness Through the Timely and Effective Integration of All Support Factors with Credible Efficiency.

MISSION READY UNITS

MISSION COMMANDS

SYSTEM SUPPORT COMMANDS

SEPARATE SERVICES

JOINT CHIEFS

SERVICE SECRETARIES

DEPARTMENT OF DEFENSE

Management Data (Test, Performance, Failure and Use)
Maintainability and Reliability
Maintenance Planning
Supply Support
Facilities
Funding
Technical Data
Personnel and Training
Support and Test Equipment
Transportation and Handling (Includes Packaging and Preservation)

Procurement Policies (Total Package Disengagement, Etc.)
Value Engineering, Cost Reduction, Etc.
Resource Management Systems
Life Cycle Costing
Configuration Management
Requirements Status Reporting
Quality Assurance Plans and Inspection
Systems Engineering and integrated Logistics Support

SUPPORT ELEMENTS ARE "Things to Manage"	ORGANIZATIONS TELL "Who Manages"	SYSTEMS, DISCIPLINES, AND TECHNIQUES ARE "Ways to Manage"

SUPPORTING CONTRACTORS AND INDUSTRIAL BASE

Figure 1

1

Introduction

Although defense components and industry have contributed to the development of Integrated Logistic Support (ILS) concepts expressed in DoD Directive 4100.35, differences in the interpretation and implementation of its broad objectives exist at all levels. These concepts and objectives call for positive management actions integrating all support elements in order to maximize the availability of equipment and optimize support costs.

This guide presents a systematic management approach to the early integration of support criteria into design activities. It provides a credible technical basis for developing significantly improved life cycle cost estimates within the performance and availability requirements of the mission. It should assist managers within industry and the Services in preparing their own definitive plans for the development and management of support requirements and activities.

The guide also identifies the interrelated elements of logistic support requiring project-type management. It places them in perspective with both mission objectives and such other varied functional management disciplines and techniques as systems engineering, procurement policies, life-cycle costing, configuration management, value engineering, quality assurance, resource management, etc. (see fig. 1). This chart lists as "Ways to Manage" some of the products of such functional management organizations as maintenance, supply, procurement, the comptroller, etc. It is significant to note here that traditionally, these functional managers usually achieve recognition through the conservation of resources.

Figure 1 separately lists some of these same functions as "Support Elements," or "Things to Manage." These, along with other system acquisition activities such as program administration and control, system design, and production are also important interfacing functions of project management during the development and acquisition of new systems and equipment (see fig. 2).

Unlike the functional manager, acquisition project managers usually achieve recognition through the application and expenditure of resources. These different motivations of functional managers and project managers are in fact essential and complementary features of materiel management.

Weapons or Equipment Program

PROJECT MANAGEMENT FUNCTIONS

ADMINISTRATION * AND CONTROL

- Cost and Schedule Programs Control
- Configuration Management
- Technical Administrative Support (i.e. information library, data bank, personnel, security contract negotiations, etc.)
- Housekeeping Administration
- Other Elements

SYSTEM DESIGN *

- Operations Planning
- Design
  - Performance
  - Reliability & Maintainability
  - Producibility
  - Survivability
  - Safety & Other Characteristics
- Installation & Checkout
- Test & Demonstration
- Facilities
- Funding
- Data Requirements

SUPPORT MANAGEMENT

- **MR** Maintainability and Reliability
- **MP** Maintenance Planning
- **SE** Support and Test Equipment
- **SS** Supply Support
- **TH** Transportation and Handling
- **TD** Technical Data
- **FA** Facilities
- **PT** Personnel and Training
- **F** Funding
- **MD** Management Data

PRODUCTION *

- Producibility
- Plans & Controls
  - Configuration
  - Quality Assurance
  - Production Reqmts
  - Cost & Schedule
- Manufacturing
- Inspection & Test
- Equipment & Tools
- Facilities
- Industrial Support
- Personnel & Trng
- Funding
- Control Data

ILS GUIDE COVERAGE

* Examples of Typical Functions

Figure 2

Project management is not restricted to acquisition activities. Commodity management and other management-by-exception techniques such as NORS (not operationally ready, supply), critical item lists, hi-value and weapons system accounts are also forms of project management.

Conflicts between project and functional managers within the logistics disciplines themselves often have been settled for the lowest apparent cost, without consideration of future effects on equipment availability or support costs. Functional management policies should be selected to optimize total operational support costs. It is believed that this can best be accomplished through a systems engineering approach to integrated logistic support planning of the sort presented in this document.

It is the responsibility of top commanders and executives to establish responsive policies, priorities and review procedures which advance these ILS objectives and which will effectively allocate available resources among competing project managers.

Intended as a reference document for use in ILS planning, the Guide provides a road map of key actions in support of a typical major system development. It derives its authority from existing Defense objectives, policies, and directives. Wherever it is not compatible, it will identify an interfacing problem area which requires resolution.

The various contributors to the document soon discovered that their separate Service-oriented terminology was the only impediment to almost unanimous agreement on the technical subject matter. This resulted in the necessity to use common terms. While some terms may be unfamiliar to those who are used to specialized nomenclature, the meanings should nevertheless be clear inasmuch as dictionary definitions are used.

1.1 Definition of Integrated Logistics Support

DoD Directive 4100.35 describes Integrated Logistics Support as:

> ". . . a composite of the elements necessary to assure the effective and economical support of a system or equipment at all levels of maintenance for its programmed life cycle. It is characterized by the harmony and coherence obtained between each of its elements . . ."

What is described is the life cycle task of support management. It includes responsibility for preserving continuity in the systematic planning, development, acquisition, and operation of weapons and equipment in order to maximize readiness and optimize costs.

1.2 Application

ILS planning will provide visibility of the support requirements essential for improved life cycle costing and systems analysis trade-offs. It can also provide a sound baseline for

SUPPORT IMPACT ON SYSTEM DESIGN

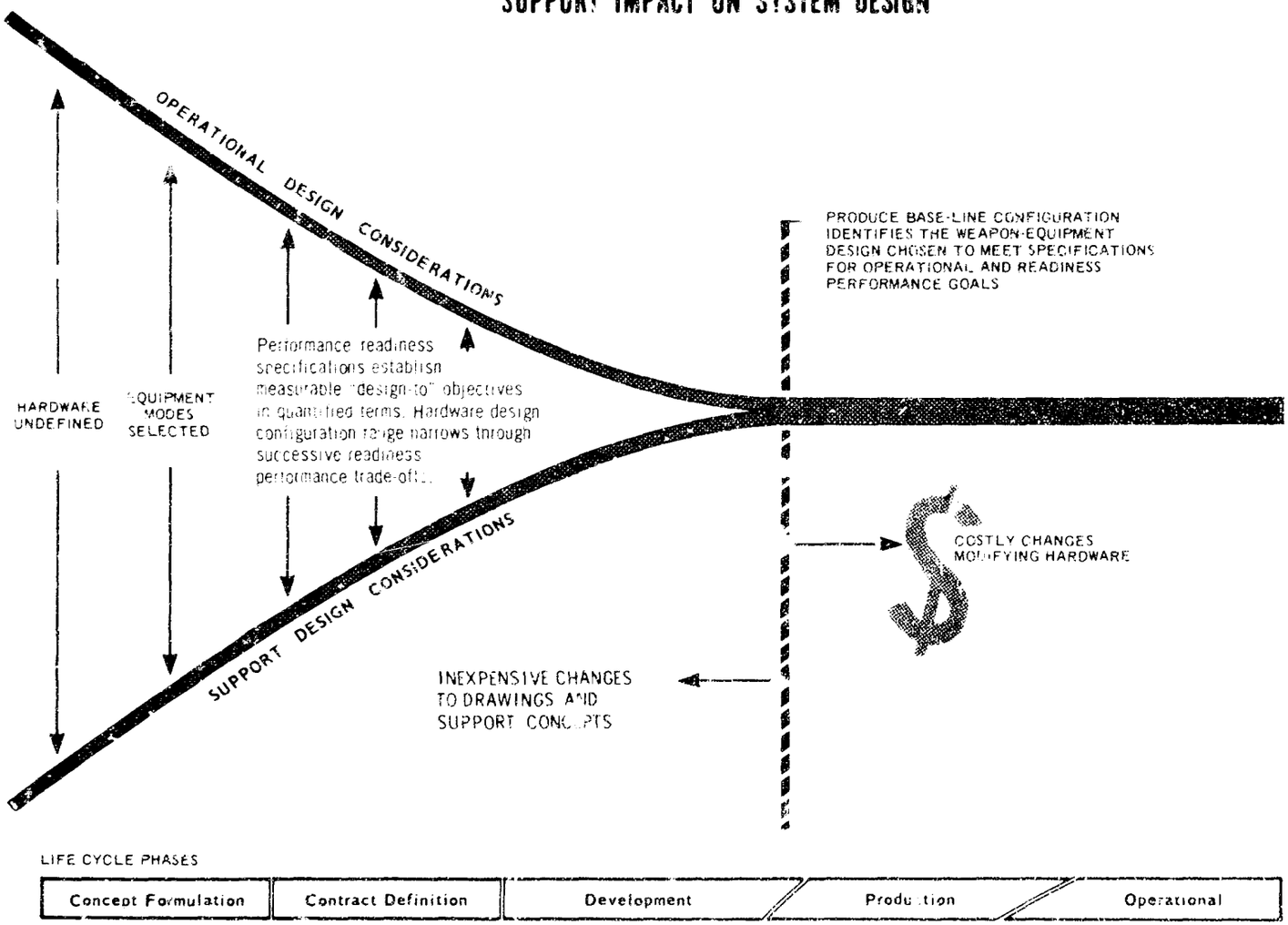


Figure 3

achieving lower costs per unit of equipment use through life cycle costing and total package procurement techniques. Development of meaningful ILS readiness performance and support requirements in contract specifications will permit better control of major support costs, will provide earlier and better performance specifications to the contractor and may provide earlier means of achieving demonstrable life cycle cost comparisons. This specifically requires systematic analyses of the design considerations and support requirements to determine their interdependent impact on each other. This is accomplished during the concept formulation, contract definition and development phases as the logistics input to the systems engineering process of design optimization. These procedures are designed to minimize later costly changes to production hardware and the expensive modifications of operational equipment (see fig. 3).

The guide describes discreet management actions which might be performed by contractor or Service program managers. Program plans and contracts must specify the assignment of responsibility for these actions. Only key program actions and approval points (for systems and equipment of average complexity) have been included in the support management networks. They would demand abbreviation for off-the-shelf or minor equipment procurements and expansion for specialized and complex systems (e.g., insertion of additional events). Further, procurement methods will markedly influence responsibilities and actions. Service project managers and industrial contractors must tailor the events to their particular requirements. Specific procedures and interfacing procurement practices must be designed with clarity and simplicity as the goal.

1.3 Planning Life Cycle Support Management

Integrated logistic support planning during acquisition requires management of the following selected activities or elements:

- Maintainability and Reliability (MR)
- Maintenance Planning (MP)
- Support and Test Equipment (SE)
- Supply Support (SS)
- Transportation and Handling (TH)
- Technical Data (TD)
- Facilities (FA)
- Personnel and Training (PT)
- Funding (F)
- Management Data (MD)

Certain departments and agencies within the Department of Defense may presently, or in the future, classify elements of support differently for purposes of management emphasis. Such differences are of secondary importance as long as two basic requirements are met. The breakdown chosen must include consideration of all required support management activities. The elements chosen must be functionally related to permit their assignment to task-oriented individuals and organizations.

The engineering disciplines of maintainability and reliability are listed as elements from the standpoint of their maintenance preventative roles. These disciplines are also needed to perform trade-offs between support elements, and provide key characteristics inputs from support management to design. It is recognized that they must also remain as functions of design to perform engineering apportionment of performance goals to subsystems and components.

Two separate elements are used to define support data requirements. Experience has shown that much confusion stems from failing to separately consider the management of technical hardware descriptions and related instructional or procedural manuals from the collection and analysis of periodic or transient performance and failure data. Although technical in nature, these latter data measure the results of organizationally combined equipment and people of various skills in various mission environments. While common hardware coding identification should be maintained, the differentiation of these two elements of data as "technical" (for hardware descriptions and procedures) and "management" (for evaluation of equipment and organizational support capabilities) is considered essential.

The fact that such essential management functions as quality assurance, configuration management, value engineering, cost reduction, and others have not been included as ILS elements should in no way be interpreted as detracting from their importance. Some are more properly listed as elements under the project management functions of Administration and Control, System Design, or Production. Others are techniques of management such as cost reduction or contract support that could be applied across the board to any activity (figs. 1 and 2).

There are also numerous technical innovations, such as "numeric controls" for machine tools, which may offer new and significant options in spares provisioning or other areas for management improvement. Many excellent mathematical models and simulation procedures fall into this category. While these kinds of techniques will continue to be of tremendous importance to the support manager or specialist, their ILS application must be left to his expertise and ingenuity due to practical limitations on the scope of this book.

Figure 4 charts a systems engineering approach to integrating the project management functions of support and production with system design (also see fig. 2). Key life-cycle events for each of these project management functions are depicted, and the chart represents a systems engineering approach to their interface with the controlling events of system design.

The charting techniques used in this document necessarily show integration between support and production with system design through their respective functional management event lines. While this is in accord with the alignment of management responsibility, standard management practices permitting the delegation of lateral coordination between elements (with resolution of unsolved problems elevated to the next level) should be understood.

Subsequent chapters of the guide will expand upon the event relationship between

System Design, Support Management, and each of the support elements. A summarization of these activities in each life cycle phase follows:

- *Concept Formulation Phase* support planning activities begin with the definition of top level functions needed to satisfy operational capability, e.g., new mission, weapon system, or equipment. Included in this required operational capability document is an estimate of the current support capability which may satisfy these functions. Current support capability is defined as existing procedures, repair facilities, skills, and equipment which could be used to accommodate a new requirement. Trade-off studies are performed to find different means of satisfying those requirements which cannot effectively be satisfied by existing support capabilities. The best of these support concepts are selected and included in the 5-year Defense Program along with the prime equipment selection. The selected concept(s), along with requirements to be levied on the contractors for contract definition, is included in a logistic support section within the system development plan. Management should plan for inclusion of the cadre of concept formulation support personnel into definition phase activities. This will help assure continuity of support planning. The preservation of technical competence and continuity of experience through all life cycle phases are major factors in avoiding unnecessary support expenditures. Command prerogatives available within each Service to maintain such continuity in equipment support project management include: (1) insuring compatibility between the functional and organizational support relationships, (2) personnel policies which maximize experience through training and reassignments between operational and system/support commands, (3) effective procedures for the timely collection, analysis, and dissemination of management, performance, usage, and historical data, (4) protection of budgeted funds for travel[1] between locations of activities participating in the program, and (5) judicious use of contract technical representatives, contract technicians, consultants, and other contract services as required.
- *Contract Definition Phase* support planning activities are based on the logistics requirements in the system development plan. The technical requirements are combined with management planning criteria providing guidance on the respective planning and support responsibilities of the service and contract program managers for inclusion in the rqeuest for proposal. Proposal evaluation criteria is also documented for subsequent use by source selection board personnel. Contractor proposals should be evaluated for: (1) The degree to which they meet or

[1] "Protection of budgeted funds for travel" is an objective which should be given consideration to enhance integrated logistics support planning.

exceed minimum readiness requirements and other support specifications, (2) comparative credibility of life cycle cost estimates, and (3) demonstrability of specifications goals and requirements. Successive iterations of these proposal activities are often necessary to select an optimum equipment and support approach. These actions result in development of definitive specifications for equipment and its support.

The selected contractor support plan and detailed technical and management criteria for development phase planning are combined in a logistics support plan for inclusion in development phase contracts. Anticipated requirements for maintenance actions, equipment, personnel, training, spares, and data are identified. Development contracts must define equipment readiness (in terms of maintainability and reliability requirements) as well as other support requirements and constraints, schedules and controls, and subsystem and system demonstrations to be conducted for validation of all specification requirements.

- *Development Phase* support planning activities begin with the definition of more detailed logistics support concepts and resource requirements as the system/equipment design progresses. Maintenance actions, times, levels, locations, and the requirements for spares and repair parts, facilities, personnel, training, training equipment, technical data, tools and test equipment are refined. Logistics support personnel participate in design reviews and hardware tests and demonstrations. All resulting changes are evaluated by support element specialists for their impact on support requirements and functions. Design support trade-offs are conducted. Program management approval based on these trade-offs results in establishment of a proposed product baseline configuration and release of initial production contracts. Included within these contracts must be the specifications for and means of demonstrating attainment of operational readiness performance goals.
- *Production Phase* support planning activities start with the completion and release of detailed procurement specifications for hardware and supporting items. Limited quantities of these resources are procured for test. A first article inspection is conducted. It includes the evaluation of support resources and their specifications. Acceptance of these resources to their specifications establishes a firm product baseline for follow-on procurement. Service tests are conducted in a preplanned operational environment to verify user suitability and the achievement of support requirements. Deficiencies, found during test, are corrected by engineering change. The changes are evaluated for their impact on support planning prior to their incorporation into follow-on production

items. The availability of support resources necessary for equipping the first operational organization is verified.

- *Operational Phase* support activities begin prior to delivery of initial production units to the first operating organization for suitability testing. During this test, operational and support plans and resources are evaluated for achievement of their prescribed goals. All deficiencies are identified and evaluated by design/support trade-offs prior to making modification decisions. Modifications incorporated either in new production runs or as minor changes at the operating unit are documented together with the reason for the change. This information, as well as subsequent support management data, is made available to similar support planning efforts.

  Equipment modernization or phase-out for technical reasons is dependent on advancements in the state-of-the-art, revised mission requirements and evaluations of the cost-effectiveness of maintaining existing inventories compared to replacement with better equipment.

1.4 Use of the Guide

Chapter 1 provides an overview of the purpose, application and contents of the guide. Chapter 2 describes the system design and support management relationships necessary to the planning of logistic support. Chapters 3 through 12 describe the life-cycle program events for the selected support elements. Foldouts at the end of each chapter illustrate the required interface between each support element and design management, and support management. These chapters also portray each element's relationship to design, production, test and operations.

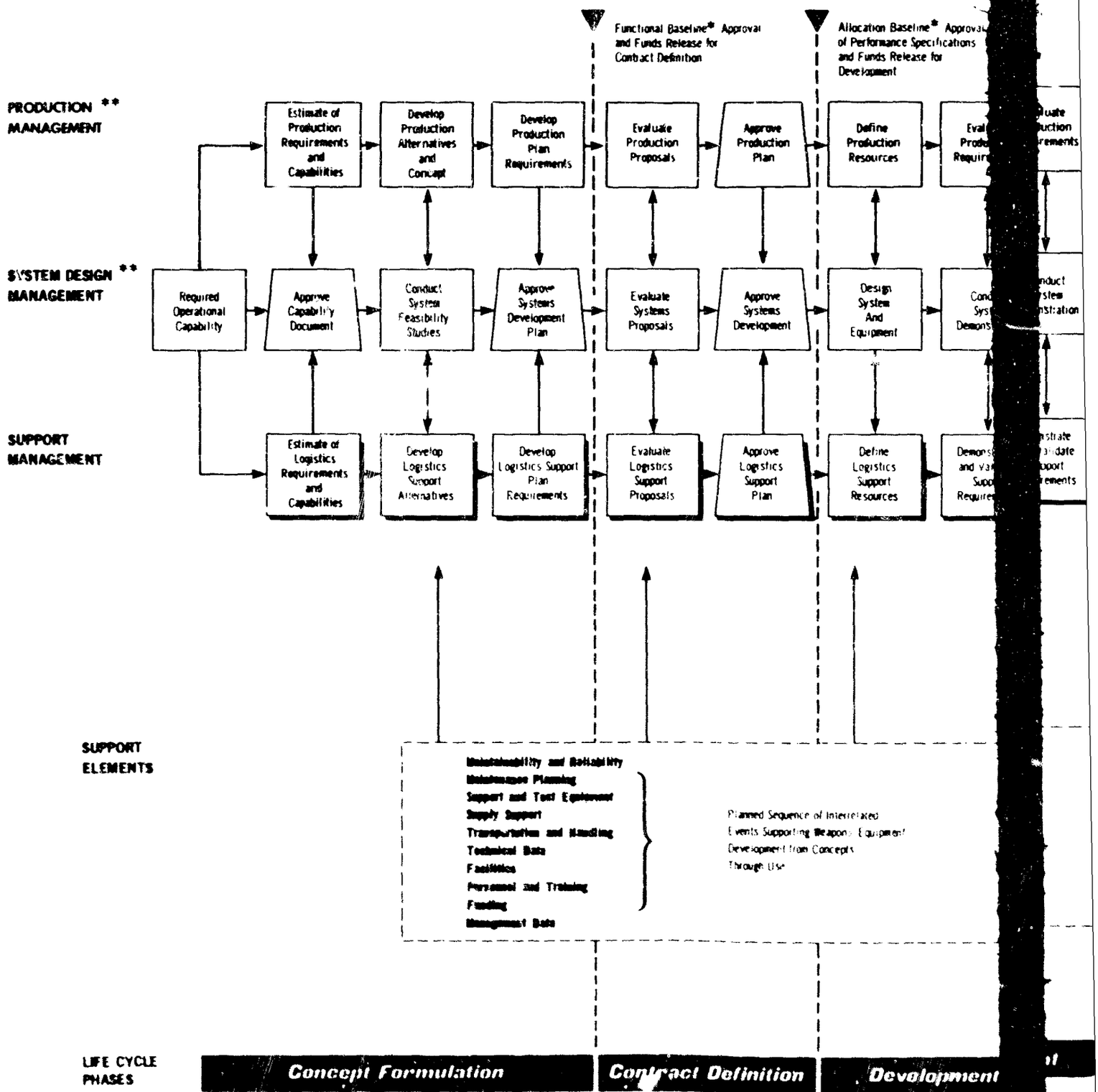
After reading the first chapter and through the introduction to chapter 2, the executive seeking a general understanding of the systems engineering approach to ILS planning can skip to the last foldout chart, figure 16, for an overview of the life-cycle relationship between all support elements in terms of specific support actions. Support managers will find it convenient to follow foldout charts for each chapter while reading consecutive action block descriptions. They should also note their responsibilities for the selective use of technical and administrative tools described in chapters 11 and 12 covering the support management elements of "Funding" and "Data."

In its entirety, the guide provides a "kit of tools" for use by program managers, designers, and logisticians. It is intended as an aid to assist them in tailoring or critiquing logistics plans and actions in support of equipment readiness.

The guide does this by providing examples of logistics actions which might be accomplished during the life cycle of a typical equipment program. It is not an inflexible plan. It is intended to help project managers tailor program milestones to fit their own peculiar

development requirements, as modified by the degree of system complexity, procurement methods, etc.

Although the guide itself is not a contractual document, its basic procedures are workable today within the framework of existing policies and directives of the separate services if project managers and contractors choose to plan their own action sequences and negotiate them into the contracts.


Functional Baseline* Approval and Funds Release for Contract Definition
Allocation Baseline* Approval of Performance Specifications and Funds Release for Development
PRODUCTION MANAGEMENT **
SYSTEM DESIGN MANAGEMENT **
SUPPORT MANAGEMENT
Estimate of Production Requirements and Capabilities
Develop Production Alternatives and Concept
Develop Production Plan Requirements
Evaluate Production Proposals
Approve Production Plan
Define Production Resources
Required Operational Capability
Approve Capability Document
Conduct System Feasibility Studies
Approve Systems Development Plan
Evaluate Systems Proposals
Approve Systems Development
Design System And Equipment
Estimate of Logistics Requirements and Capabilities
Develop Logistics Support Alternatives
Develop Logistics Support Plan Requirements
Evaluate Logistics Support Proposals
Approve Logistics Support Plan
Define Logistics Support Resources
SUPPORT ELEMENTS
Maintainability and Reliability
Maintenance Planning
Support and Test Equipment
Supply Support
Transportation and Handling
Technical Data
Facilities
Personnel and Training
Funding
Management Data
Planned Sequence of Interrelated Events Supporting Weapon Equipment Development from Concepts Through Use
LIFE CYCLE PHASES
Concept Formulation
Contract Definition
Development

KEY SYSTEMS MANAGEMENT EVENTS

A Systems Engineering Approach to the Integration of Logistics Support and Production Planning Events with Weapons Systems and Equipment Design

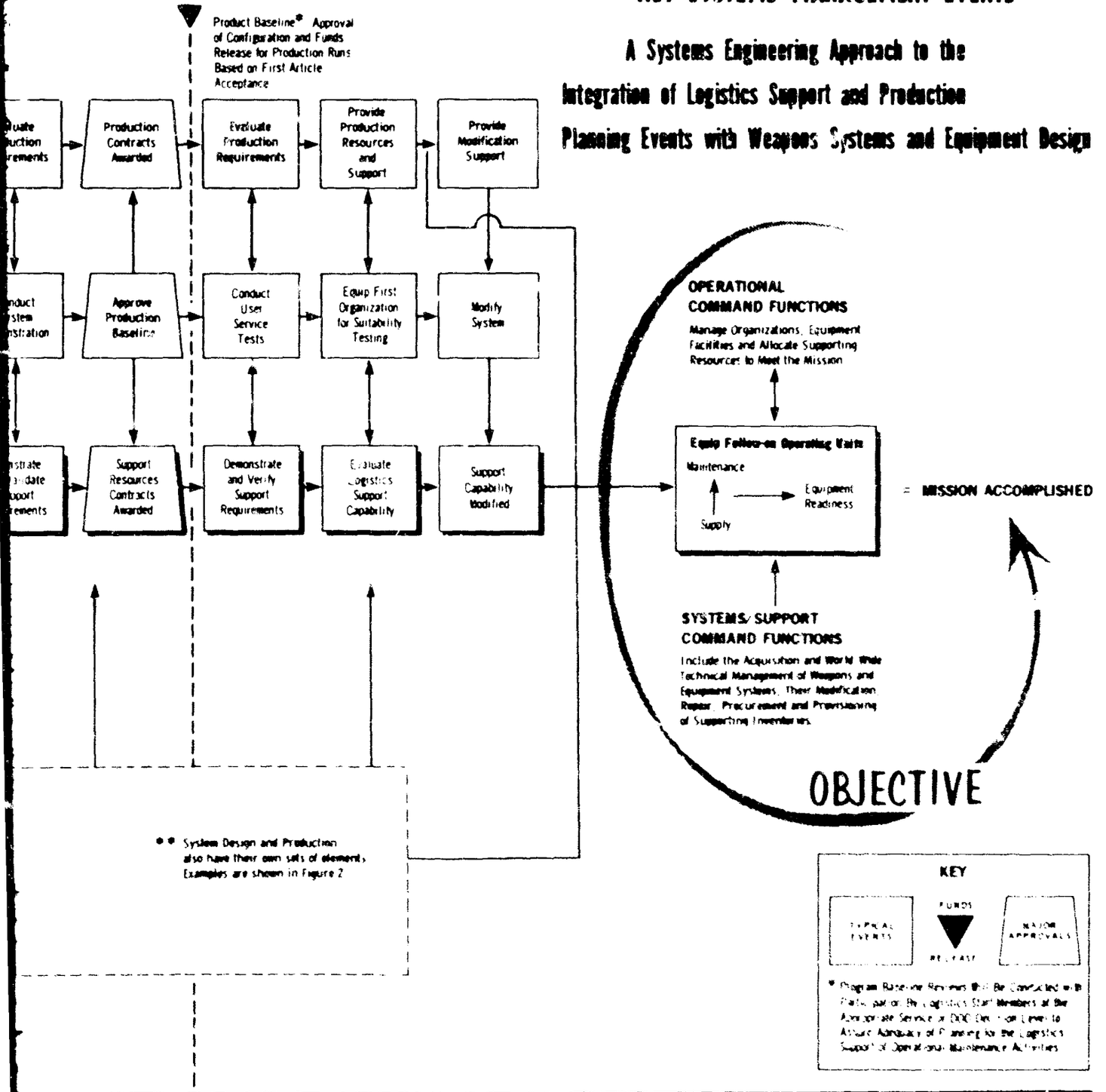
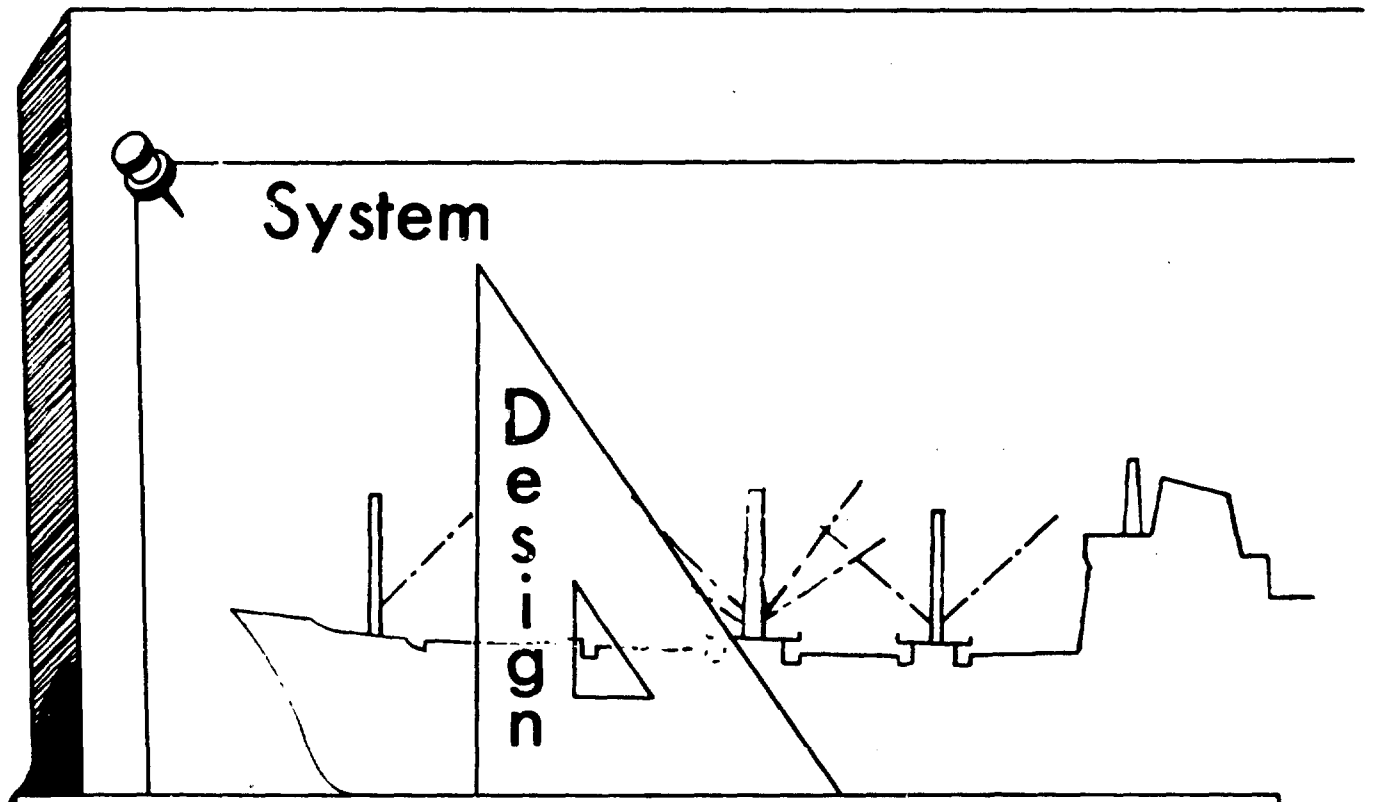


Figure 4



Mission Costs by "Design" – OR CHANCE ?

System Availability	Self Sufficiency	Cross Servicing	Transportation
Maintainability	Commonality	Capability	Rapid Resupply
Reliability	Special Test	Responsibility	Redistribution
Repair	Built-in Test	Standardization	Handling
Replace	Universal Test	State-of-the-Art	Packaging
Fixed Base	Skill Training	Breakthrough	Preservation
Mobility	Fault Isolation	Cyclic Overhaul	ECP's
Deployment	Redundancy	Planned Replacement	Production Change
Bare Base	Modular Replacement	Facilities Mods	Field Modifications
		New Construction	

2

System Design/Support Interface

2.1 Introduction

Support planning requires a close and dynamic working relationship between system design and support management. It involves repeated review and refinement of emerging support requirements and their probable impact on design objectives, including operational and readiness performance characteristics. Quantified operational readiness performance specifications (in the form of maintainability and reliability characteristics and projected support requirements) thus become a yardstick against which design and support can be defined in terms of assigned tasks and needs and evaluated in terms of finite measurements. These requirements, or key characteristics, must be expressed in terms of "numbers" measuring gross system availability, utilization, downtime, turnaround, crew requirements, maintenance man-hours per operating hour, defined constraints, etc., as appropriate to the equipment type and intended use.

The objectives of ILS planning include the elimination of support requirements whenever practical and reduction of remaining support costs to the optimum level consistent with operational readiness requirements. These results will not come about by routine observation of support needs. Their attainment requires systematic evaluation of all design/support characteristics by qualified engineers and support technicians. This involves the continuous assessment of the probable impact design will have on specific performance and support requirements. The effectiveness of such a maintenance engineering analysis is dependent on documentation to record and disseminate changes in developing support requirements, plans, design and specifications for recurrent evaluation by support specialists and design engineers.

Both service and contractor managers must assure that their specialists responsible for the various support elements: (1) Understand the system or equipment mission objectives, (2) define actions and resources required for complete life cycle support, (3) schedule actions and commit resources to support development and future operations, (4) request and utilize

funds in a preplanned sequence to minimize cost overruns and unnecessary program delays, and (5) use performance and management data and standard staff control techniques to maintain an information and experience exchange between program elements.

Figure 5 depicts the step-by-step system design/support interface events typical of a weapons systems or equipment of average complexity. Section 2.2 includes descriptions of the system design management events which will require the coordinated participation of support personnel. These events will result in the systematic identification of required support activities, a prerequisite to the achievement of mission readiness and cost effectiveness in support planning. Section 2.3 includes a description of the support management events which will result in the integration of all logistics support actions.

2.2 System Design Management—Detailed Event Description

SD–1 Required Operational Capability

The system or equipment life cycle begins with the identification of an operational deficiency or the need for a new military capability. This required operational capability is usually defined by the nature of the threat, the anticipated operating environment, variations in basic mission and the constraints of policy, gross schedule requirements, and minimum system operational performance criteria; e.g., speed, range, capacity, firepower, target acquisition, vulnerability, etc. These needs result in a tentative requirement for a new vessel, aircraft, missile, vehicle, communications systems or gear, or for multiple combinations of such hardware. These requirements must undergo screening and approval prior to further concept formulation phase action.

SD–2 Approve Required Operational Capability Document

The desired capabilities and requirements of the system (SD–1), the estimate of logistics support requirements and objectives (SM–1), and the estimated current capability to meet these requirements (SM–2) are all essential inputs to the operational capability document. Review and approval of this document should provide information for mission analyses and preliminary design necessary to develop system concepts, technological approaches, and related cost and schedule information. Whether these studies are performed by contract or by the Government, responsibilities for the development of requirements for schedule, costs, work breakdown structures, etc., must be clearly assigned.

SD–3 Conduct System Feasibility Studies

Based upon the approved operational capability document and feasibility studies, several preliminary system and equipment ideas are developed to explore alternate ways of

achieving mission objectives. Preliminary design is then conducted on the most promising concepts, and system/cost effectiveness tradeoffs are made to determine the optimum choice among the several system and equipment concepts. Logistics support requirements estimates defined during these feasibility studies permit comparison between various life cycle support cost alternatives. These studies may be summarized for program management review and must record selection rationale behind each considered concept. They include tradeoffs involving system and support selection, development cost and schedule estimates, life cycle cost estimates, and preliminary performance specifications.

SD-4A Approve Program Change Request

When a system concept is developed to the point where its technical and economic feasibility can be verified, a Program Change Request (PCR) is prepared to incorporate the selected program into the DoD 5-Year Defense Program. DoD approval is granted by a Program Change Decision (PCD).

SD-4B Approve System Concept Formulation Package

The system concept formulation package assures higher authority that the selected concept is the best way to satisfy the identified operational need and recommends the resources needed to pursue further development. The package contains a description of the proposed system, the costs and schedules, and the rationale supporting the concept selection. It provides for a preliminary program review prior to preparing a system development plan.

SD-5 Approve System Development Plan

The system development plan becomes the functional baseline for further engineering development of performance specifications for the concept selected during the feasibility studies. The plan includes such things as functional and engineering descriptions of operations and support requirements, preliminary systems and equipment configurations, and tradeoffs to be further considered. Emphasis is placed on areas of high technical risk, schedules, and life cycle costs. It also identifies funding requirements so that contract definition and development phase budget allocations can be made. Acceptance of the Development Plan is a "Key Approval Action" requiring review and approval prior to contract and fundings release by Service level or OSD authority (as appropriate to existing policy on weapon technology and dollar thresholds). Program reviews leading to this "Key Approval Action" must insure adequacy of planning for the logistics support of operational maintenance activities. They must be conducted with participation by logistics staff members at the appropriate Service or DoD decision level.

SD–6A Approve Systems Contract Definition

A directive initiating sole source or competitive contract definition for the selected system and support concepts is issued following approval of the development plan. Procurement and budget authorizations are provided to the development command in this management directive.

SD–6B Approve Support Requirements

Support requirements are approved as an integral part of the systems contract definition approval through direct coordination with responsible support managers at all appropriate DoD levels. This approval is the basis for beginning development of the logistics support management plan.

SD–7A Appoint Source Selection Authority

Early contract definition phase effort consists of detailed enginering to define operations and support performance requirements. This effort is aimed toward the preparation and approval of an "allocation" baseline for acquisition of the system and equipment. Contract definition involves competitive proposals by several contractors. A source selection authority is appointed to provide DoD inhouse evaluation of these proposals. Assistance is provided through representative staff elements of the Services. The purpose of this assistance is to help establish the source selection criteria.

SD–7B Provide Support Requirements for Request for Proposal

The logistics support requirements (SM–5) provided as a part of the systems development plan (SD–5) are included in the request for proposals (SD–7C). It is of utmost importance that these requirements thoroughly define operational and readiness performance specification goals and the support management approach to further development and acquisition of support resources.

SD–7C Request for Proposal

The request for proposal is prepared for issuance to competing contractors. It contains results of prior studies and the current system specifications. Included are such key characteristics as readiness performance targets, with criteria for their further development, test, and demonstrations. Required program management criteria include assignment of responsibilities, and selective identification of specific portions of general directives, policies, and procedure guides that are to apply to this procurement. Depending on the complexity and

cost of the system or equipment to be developed, successive iterations of requests for proposal may be required to refine specifications.

Where appropriate, requirements for life cycle cost estimates should be included in final requests for proposals. Here program management must consider and define representative cost elements, time elements, and the simplest appropriate methodology to be followed by competing contractors in developing and updating life cycle cost estimates for (1) program funding and budget control and (2) cost of use (and ownership) comparisons. In simple equipment procurements, product use guarantees alone might satisfy these requirements. Similarly, where the contracts include contractor assumption of support responsibilities and associated costs, major life cycle cost elements may be already included in the cost of acquisition.

SD–8 Evaluate System Proposal

Upon receipt of the system and equipment proposals, the source selection evaluation board reviews and scores each proposal based upon the previously established criteria. Subsequently, selected competing contractors will continue to define the performance requirements of the system elements and their plans for production, operations, logistics and training The resulting system definition is then evaluated. This final evaluation determines the technical soundness of the proposal in meeting performance requirements, degree of identified risk, contractor fulfillment of tasks in the proposal work statements, and his ability to accomplish them, best features of each proposal's design approach, costs and schedules, and comparative impact of proprietary rights.

SD–9A Approve System Development

Development plan specifications and terms (SD–5) constitute a functional baseline which the project manager must use as a negotiations floor. Improved specifications and more definitive terms may be incorporated into the contract as a result of negotiations. The updated plan must now include procurement specifications and detailed demonstration methodology; equipment and support element resource requirements, including government furnished items; cost and price estimates, and any special contract clauses. Review of the updated development plan is prerequisite to "Key Approval Action" by the designated project approval authority. This review endorses the plan as an allocation baseline for the development contract awards. It must include participation by logistics staff members at the appropriate Service or OSD decision level to insure adequacy of support planning for the maintenance and readiness of equipment in the operating environment.

SD–9B Select Contractor(s)

Upon approval of the system development, contractors are selected. The selection is based upon the proposal evaluations (SD–8). Multiple contractors may be chosen, particularly for subsystems development, under the direction of a system project office. High confidence in achievement of the required mission capability must be the first selection consideration. After specified operational and readiness performance requirements are assured, other considerations may then be weighed.

SD–10A Award System Development Contract

Based upon the development approval and contractor selection (SD–9 A and B), the contracts are awarded.

SD–10B Begin Detailed System Design

System and equipment specifications, including operational and readiness performance criteria (design requirements), are the basis for detailed system and equipment design. Maintainability and reliability parameters (MR–9) are included in the design considerations. Continuous coordination with other support elements is required to assure that a proper balance is maintained between design performance and cost versus support requirements and their effect on equipment readiness.

SD–11 Complete Detailed Design of System/Equipment

Because the system and equipment design is a continuing effort throughout the development phase, this event is shown here as a sample iteration of the design loop. Subsequent reviews, tests, and demonstrations create a feedback of engineering changes and new requirements which in turn must be analyzed and programmed into a new design cycle. This typical feedback loop is shown in simple form in figure 5. The support impact of these changes is also evaluated (SM–12B). Any further changes are fed back into the design cycle. The engineering drawings, specifications, and test procedures become the basis for contractual control of each end item to be manufactured and tested.

SD–12 Review and Approve System Design

Review and approval of system and equipment design is conducted at predesignated review points. Included are all aspects of design such as performance, maintainability, packaging, structure limitations, safety, standardization and support requirements which have been generated based upon the design. Changes are incorporated in the engineering documentation and detailed specifications. Design review and approval results in con-

currence of the development command to commit the design to fabrication of prototype models. It is also the basis for provisioning planning and preparing preliminary technical data.

SD–13 Conduct Subsystem Demonstration

As the design and test specifications are being completed, subsystems prototypes are fabricated and tested. Performance to detailed specifications should be demonstrated. To the maximum degree possible, support requirements are verified during demonstration. Results are evaluated and problems resolved.

SD–14 Conduct System Demonstration

Demonstration of the prototype hardware system, followed by corrective action while there is still time to change specifications at minimum cost to the program, is a desired objective. Verification of support requirements (SM–13) is part of the system demonstration. Corrective action results from the change activity (see change loop fig. 5, SD–11 through SD–14, and SM–12B). The Government and contractor joint tests demonstrate: (1) system capabilities and limitations; (2) performance, control, maintainability and reliability; (3) availability and validity of technical data; (4) compatibility of subsystems; and (5) adequacy of logistics support planning.

SD–15 Establish Proposed Product Baseline

Completion of system demonstration and incorporation of the resultant changes establishes the proposed product configuration baseline consisting of all the specifications necessary for initial production and first article testing.

SD–16 Initiate Production

Establishment of the proposed baseline configuration (SD–15) is followed by production of initial units for the first block of user service and operational suitability test items. Further production and subsequent concurrent support commitments are contingent upon formal acceptance of product baseline specifications (SD–17B). Support resources may or may not be acquired under the same production contract, depending on the procurement method selected, the nature of the system and equipment and the contractor capability. One example might be consideration for the use of multi-year procurement. Priorities may be established on line-of-balance type schedules to assure delivery in phase with planned operational objectives. Where appropriate, corollary procurement action must be taken to acquire additional installations and facilities.

SD–17A Complete Detailed Production Specifications

Completing the contract end item specifications involves the preparation of "build-to"[1] specifications and drawings upon which acceptance, testing of the first production article and follow-on production can be based.

SD–17B Conduct First Article Inspection

First article inspection consists of a review of drawings and specifications against the first article of hardware. Review and acceptance of this product baseline configuration is a "Key Approval Point" upon which follow-on production is contingent. This review will include logistics staff participation from the appropriate Service or OSD decision level. It must insure that design producibility has been achieved without compromising system concepts, maintenance supportability specifications, performance and support costs. Changes beyond this point usually result in block modifications which are generally very costly in comparison to the paper and prototype changes made prior to establishing the product baseline. Any changes as a result of the inspection must be made in conformance with current configuration management directives and instructions. Inspection approval denotes formal acceptance of the detailed specifications as audited and approved contractual documents.

SD–18 Conduct User Service Tests

Service tests usually occur at a user test facility in a simulated environment. Resulting system, equipment and support changes are reviewed by the user and developer and incorporated into follow-on production planning by engineering change proposals. Test results include limited performance experience, technical data validation, support and test equipment performance experience, equipment operator evaluation, and servicing and maintenance experience. Requirements for significant changes might result in the immediate initiation of a modification cycle as described in blocks SD–23 through SD–25.

SD–19 Accept System for Operational Testing

Satisfactory completion of the service tests provides program management with the confidence necessary to continue production and acceptance of hardware in those quantities required for initial deployment to operational units. Further tests will establish the degree of achievement of operational readiness performance specifications required by the contract (SD–22).

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[1] The expression, "build-to," signifies the completion of specifications with procurement information and/or any other support information stemming from contractual agreements.

SD-20 Verify Availability of All Required Support Resources

Prior to equipping the first operational organization, availability of all system and support resources according to planned schedules is verified. System/support commands, contractors, and using commands review and evaluate shortages, schedule problems, priorities, delivery plans, inventory distribution, and any other applicable material management considerations for possible correction. Coordination between the operational and system/support commands is necessary to insure complete planning for operations and support. Time-phased activity schedules include the exact need dates and phase-over actions required to furnish equipment, tools and test equipment, spares and repair parts, technical data, trained personnel, training equipment and other system and support resources to the operating units.

SD-21 Equip First Operational Organization (Test)

Equipping the first organization can vary from the complex installation and checkout of a missile system to the delivery of a test box. Similarly, the system activation and support effort covers a broad spectrum. Contract end items of equipment are shipped to the location of the designated test unit. Appropriate phaseover actions are carried out by both development and operational command personnel to assure the rapid and complete accomplishment of this task in accord with preplanned schedules. Installation and checkout includes receipt and acceptance of equipment and support resources, assembly, installation, test, integrated system checkout, and verification of the system and support resource performance as installed. Compatibility of all interfaces is verified.

SD-22 Conduct Operational Suitability Demonstration

A predefined demonstration of a full complement of equipment will be conducted by a typical user organization such as a ship, squadron, company, or regiment during routine training operations for a specified time period.

The demonstration objective is to verify achievement of operational requirements (including readiness performance) through mission accomplishment . . . in a defined environment with measured manpower skills and established equipment and facilities support. See SD-9A through SD-10A on contract specifications development.

The value of the demonstration will be in direct ratio to the realism with which test ground rules were negotiated for personnel selection based on available skills and average manning levels, spare parts provisioning, test mission profile mix, special test data requirements, etc. Management evaluation and control of such an operational test should be directed toward containing the test within these established rules and objectives. Care should be taken to avoid interference with the detailed operations and maintenance management of the test unit.

SD–23 Identify Deficiencies

Figure 5 depicts a typical change or modification cycle that may be initiated by any one of several operational situations such as (1) the inability of the system or equipment to satisfy its current requirements, (2) changes to mission operational and support roles, (3) correction of discrepancies where the forecast operational and support goals were unrealistic or inaccurate, or (4) equipment failures caused by improper design or fabrication. In all cases deficiencies are identified and evaluated. Trade-off studies are performed to determine the effect of these deficiencies upon future operations and support. A decision is made with regard to further program action.

SD–24A Propose Modifications

Based upon the identified system and support deficiencies (SD–23), alternate approaches for modifying the system and support resources and procedures are developed. These alternatives incorporate the best of the field experience recommendations as well as innovations created by advances in technology. Emphasis is placed upon the correction of the deficiencies by procedural or simple workaround changes. For example, new methods of field repair for electronic cards using available tools and test equipment may be better than the risk and effort involved in a functional design change to the electronic system. This is true only if readiness is not jeopardized. The best approaches are proposed in the modification package along with schedules, manpower, and cost estimates. The proposal must comply with the requirements of applicable configuration management directives and instructions.

SD–24B Decision To Modify

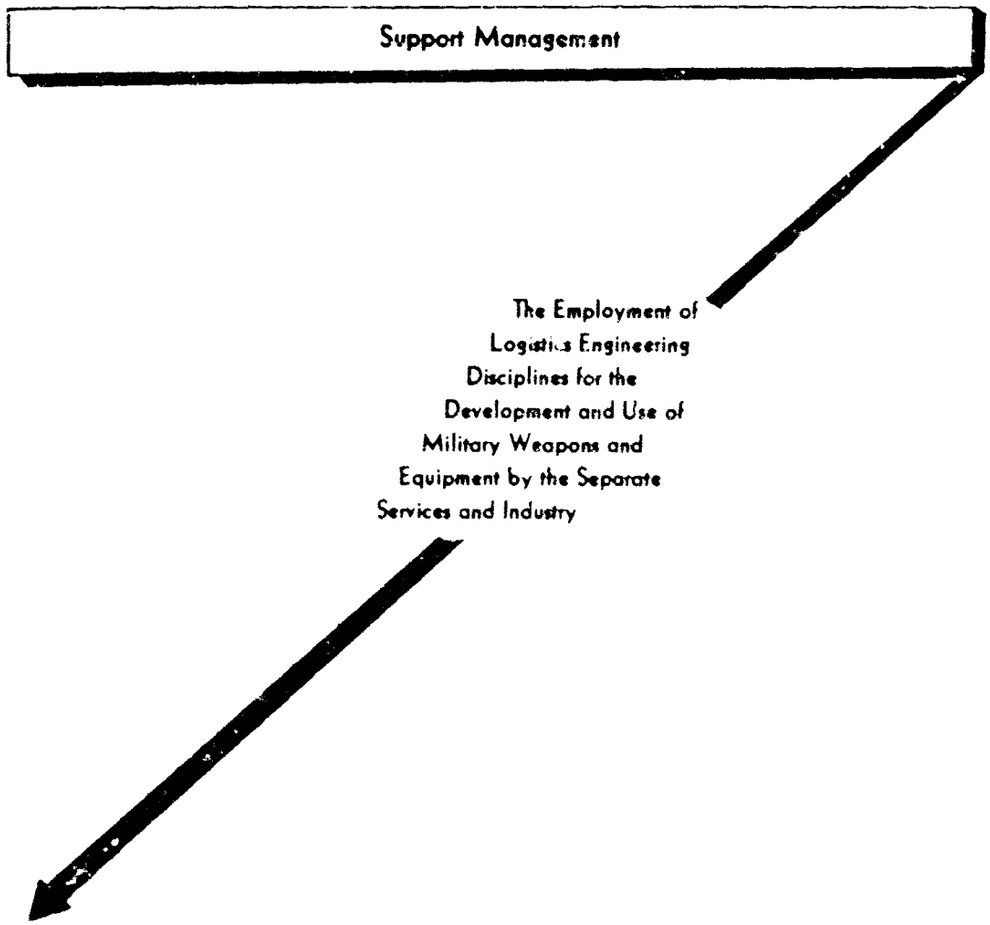
Configuration control board action approving the modification package must be in accord with procedures implementing current configuration management directives and instructions. These procedures, directives, and instructions also establish levels of approval authority. Review and approval action at the appropriate decision level must include logistics staff participation to insure adequacy of planning for the logistic support of operational maintenance activities.

SD–24C Initiate Action To Change Production

Where major system or equipment changes are required, a new production cycle (SD–16 and on) for follow-on operational units is initiated against the new configuration baseline. In such a case, aforementioned modification studies involve planning sequences and actions which are equivalent to the definition and development phase tasks leading to a normal product baseline. The detail for each required action in this testing and analysis sequence may be reduced as appropriate to the modification requirements.

SD–25 Modify Existing System/Equipment

To assure mission success within the time constraints imposed by operational requirements and to satisfy safety, performance, economic, or other factors, it is often necessary to retrofit existing equipment. In this case technical compliance change packages are prepared which specify the change requirements, responsibilities, schedules and funding by which the military organizations or selected contractors are to perform the required modifications. These changes are accomplished at field, depot and contractor facilities as designated by the appropriate system/support authority.



2.3 Support Management Detailed Event Description

SM–1 Define Logistics Support Capability Requirements

Specialists qualified in all areas of support management must be organized to perform a systematic and coordinated analysis of the required operational capability in order to

determine the needed logistic support capability. These capabilities will be stated in terms of (1) quantitative readiness performance criteria (e.g., system availability, utilization, permissible scheduled and unscheduled maintenance downtimes, operator and maintenance requirements in terms of gross skills and manning levels, firing rates, launch rates, etc.), and (2) qualitative readiness requirements (e.g., compatibility with existing replenishment techniques, operational unit self-sufficiency in remote areas, personnel skill level limitations, automated fault isolation techniques, etc.).

Support specialists provide support considerations to the required operational capability document by (1) identifying the needed support capability, (2) proposing modifications to the operational requirements statement which will enhance overall effectiveness, and (3) recommending substitute capabilities or alternate solutions.

SM–2 Estimates of Logistics Support Capabilities

The logistics support capabilities estimate consists of an integrated package of each support elements' forecast ability to satisfy support readiness requirements defined in SM–1. The information developed in follow-on action blocks labeled MR–2, MP–2, SE–2, FA–2, etc., must be analyzed and properly integrated by support management. The results are reflected in the operational capability document. For example, the estimates would include readiness performance experience together with lessons learned on previous similar systems (e.g., utilization, availability, incidence of unscheduled maintenance, causes of maintenance downtime, facility requirements, training requirements, technical data display techniques, fault isolation techniques, the benefits of tracking repair parts usage, the maintainability goals to be considered from similar system and equipment design experience, etc.). Probable support requirements over and above existing support capabilities are identified for further action. Government and contractor responsibility for studies to develop support concepts which satisfy these requirements should be clearly defined.

SM–3 Develop Support Alternatives

The logistics support ideas incorporated in the system feasibility studies (SD–3) consist of an integrated package of support element tradeoff study results (e.g., equipment redundancy or high reliability vs. maintenance upon failure) and selection of the best of each element's approach to overall support. The prime focal point for tying together the design and support tradeoffs is maintainability and reliability (MR–3). The tradeoffs combining system design alternatives with concept inputs from each support element are an integral part of the system feasibility studies. Failure to recognize and consider the combined tradeoff alternatives can result in commitment to a support concept which leads to excesses and shortages, duplicate facilities, and poor utilization of existing capabilities. Simulation techniques

and mathematical model analysis may be used as aids to tradeoff comparisons. Use of these techniques should be based on problem complexity and the need for building a dynamic management data baseline (see ch. 12).

SM–4A Prepare Logistics Support Program Change Request

Subsequent to the development of support concepts, the logistics support section of the Program Change Request is prepared. This section should contain brief statements regarding:

- Readiness performance goals, including maintainability and reliability design performance requirements,
- Maintenance concepts,
- Probable support impact on current or projected organizational capabilities,
- Preliminary estimates of life cycle support cost, and
- Major support development milestones.

SM–4B Prepare Support Concept Formulation Package

The selected support concepts are combined for inclusion in the system concept formulation package (SD–4B). The support package incorporates the selected concepts developed in SM–3, the estimated costs and schedules, the concept selection rationale and the specific funding needs for further development. The package also provides justification to the logistics approval authority for the selected concepts.

SM–5 Develop Support Plan Requirements

Based upon inputs from SM–2, SM–3, and SM–4, the support plan requirements are developed for inclusion as a logistics section of the system development plan (SD–5), and the RFP. These requirements include gross support functions that meet system or equipment requirements, the design and support goals and criteria in terms of readiness and cost to be met during engineering development, support tradeoff criteria to be considered and support program management activities and decision points anticipated during subsequent development events. Specific inputs to the support plan requirements include:

- Maintainability and reliability requirements (MR–5),
- Maintenance support concepts (MP–5),
- Preliminary support equipment estimates and design criteria (SE–5),
- Preliminary supply requirements (SS–4),
- Preliminary facility requirements (FA–5),
- Preliminary personnel and training requirements (PT–5),
- Preliminary funding requirements (F–5),

- Preliminary technical data requirements (TD–5),
- Transportation, handling and packaging requirements (TH–5),
- Life cycle cost methodology, and,
- Support schedule requirements.

These requirements must be clearly defined and quantified for "Key Approval Action" specified in SD–5. They are to be included in the request for proposal package.

SM–7A Develop Logistics Support Management Plan

The logistic support management plan is established to provide an outline of specific organizational responsibilities and functions for further development and acquisition of support resources and monitoring of contract effort. Separate plans for each support element program are included in the support management plan. The plan must identify organizational interfaces, working procedures and personnel responsible for such things as:

- Implementation of the logistics support development program,
- Monitoring of the contractors M & R effort,
- Establishing policy regarding maintenance engineering practices and procedures for all levels of maintenance,
- Development and acquisition of support equipment,
- Development and acquisition of facilities,
- Procurement and distribution of spares and repair parts,
- Implementation of the personnel and training program,
- Procurement and distribution of technical data,
- Implementation of the transportation, packaging and handling program, and,
- Funding and data management.

The management plan also includes related funding and schedule information, relationships and responsibilities between development and support commands and designation of the logistics support manager.

SM–7B Establish Logistics Support Criteria for Proposal Evaluation

The logistics representatives to the source selection board establish criteria for evaluation of proposed support plans. This criteria includes policies for determining how well each proposal meets readiness performance specifications and cost requirements, takes advantage of current resources, minimizes technological risks, and considers life cycle costs for support.

SM–8 Evaluate Logistics Support Proposal(s)

Based upon the support evaluation criteria (SM–7B), the source selection board evaluates the proposed support plans. Performance, schedules, cost and high risk areas are evaluated and scored.

SM–9 Establish Support Development Plan

Subsequent to the proposal evaluations, the logistics support portion of the system development plan is updated to reflect the results of contract definition. The support development plan also includes the updated management plan covering the controls, policies, funding, scheduling, etc., for development, acquisition and distribution of the support resources. The support development plan is an integrated package of time-phased support element plans and requirements (see event 9 in subsequent chapters of this guide). It includes the following:

- M & R requirements and related performance incentives,
- Maintenance concepts,
- Procedures for acquisition and distribution of support and test equipment,
- Procedures for acquisition and distribution of spares and repair parts,
- Procedures for development of facilities,
- Procedures for acquisition, training and distribution of personnel,
- Procedures for acquisition and distribution of training equipment,
- Procedures for acquisition and distribution of government furnished materiel,
- Procedures for acquisition and distribution of technical data,
- Updated funding and management data requirements, and
- Schedules for each support element identified by organizational responsibility.

Approval of the support development plan is a part of the "Key Approval Action" specified in SD–9A.

SM–10 Monitor and Guide Logistics Support Effort (Continued)

Concurrent with development phase design effort, logistics support requirements for all elements are generated by detailed maintenance engineering analyses of equipment designs. These analyses are part of the total systems engineering effort and influence design development as a result of tradeoffs between operational and support requirements. The maintenance analysis also uses design schematics and drawings to define the basic support requirements. Continuous monitoring of and guidance for support requirements development is provided. Support management must assure that each support element's requirements are properly generated, interfaced and programed with established maintainability and

reliability goals. Support management relies upon the maintenance engineering analysis documentation system to support and control this recurring analysis (MD–4 and MD–10).

SM–12A Review and Approve Design Characteristics and Support Element Requirements

Designs are reviewed and approved to assure that established quantitative and qualitative logistics support requirements can be satisfied. Resulting changes and their support impact on requirements are reviewed for compatibility. Support management assures that the requirements of each element have been included and that full consideration has been given to available items in the DoD inventory.

SM–12B Evaluate Impact of Proposed System and/or Logistics Support Changes

As part of the design and support requirements review and approval, support management evaluates the impact of all changes on support. In cases where the design or changes to the design do not meet assigned performance predictions, a tradeoff is made to eliminate the discrepancy by a further change to the design or to the prediction. Coordination of such actions between support management and design engineering is required.

SM–13 Conduct Demonstration and Validation of Support Requirements

During design of systems and equipment and preparation of test specifications, support management assures that all support requirements and criteria, e.g., access provisions, technical data on the equipment, repair time limitations, etc., have been included. In addition, prototype support resources (e.g., test equipment, tools, technical data, handling equipment, etc.), are demonstrated to validate configuration and specification requirements. To the maximum degree possible, these demonstrations are conducted as an integral part of system tests to assure that all support requirements are reviewed prior to production release. Simulation models, laboratory tests, mathematical models and actual field tests are used. Testing and validation is continuous until the total system capability is demonstrated.

SM–15 Update Support Plan

The support plan is updated concurrently with establishment of a proposed product baseline configuration. Due to the need for some long-lead-item release to production and the fact that support resource identification lags the system equipment identification, limited commitment of some support resources may be required. Further commitment of resources to production must be coordinated with all support elements to insure total compatibility of requirements. This action will keep later production and operational changes to a minimum. Inputs to the proposed product baseline include well-defined maintenance performance

and measurement criteria, drawings and specifications for support equipment and facilities, spares and repair parts lists and specifications, technical data by type and format, personnel, training requirements, training equipment funding allocation for production, and management data requirements.

SM–16 Award Support Resouces Contract(s)

The logistic section of the contract is used to buy support resources based upon quantity, schedule and planned utilization of operational equipment. Common resources are normally procured through appropriate DoD commodity inventory managers. Logistics support management must make known their procurement requirements for common material and related technical data in time to support tests and operations. Contractual exhibits and work statements reflecting test, activation and operational support requirements must be negotiated.

SM–17A Complete Support Requirements Specification

Completion of support requirements specifications requires action similar to SD–17A for support equipment and facilities. Support management must assure appropriate inclusion of "build-to"[1] and test requirements in production specifications. Each specification requirement must be reviewed to assure that technical data, personnel and training, and supply support interfaces are compatible with applicable configuration management directives and instructions.

SM–17B Conduct Preliminary Support Evaluation

A preliminary support evaluation of the contracted production units must be accomplished during the first article inspection (SD–17B). It is important that support features which contribute to equipment readiness have been incorporated in the hardware in accordance with specifications. Results of this evaluation are reviewed as part of the "Key Approval Action" specified in SD–17B.

SM–18 Complete Demonstration and Evaluation of Support Requirements

Demonstration and evaluation of initial support resources and procedures are accomplished concurrently with the user service tests and equipment acceptance (SD– 18 and 19). These tests must demonstrate achievement of all operational support readiness specifications. Support management must verify that support resources are utilized as planned or justify

[1] The expression, "build-to," signifies the completion of specifications with procurement information and/or any other support information stemming from contractual agreements.

any changes. Management evaluations and failure analyses are accomplished where support element functions and hardware performance fail to meet specifications and goals. Required changes are processed in accord with applicable configuration management directives and instructions.

SM-21 Update Logistics Support Plan

Subsequent to user tests and during equipping of the first operational organization, the logistics support plan is updated to reflect operational support changes to responsibilities, policies, controls, coordination, communications, schedules, etc. The updated plan is used for equipping and supporting subsequent operational organizations. The plan is the basis for staff actions in all required support areas at successively higher levels of management within DoD.

SM-23 Evaluate Support Capabilities

As part of the operational suitability demonstration (SD-22) and concurrently with the identification of deficiencies (SD-23), the planned support capabilities are evaluated to determine how well they satisfy support goals including readiness performance specifications. Support management reviews all element interfaces to [illegible] that control, communications, coordination and data reporting systems do not impede attainment of the logistics support requirements for readiness and cost. Detailed evaluations include verification of personnel skill levels, training and training equipment; adequacy of technical data; availability of spares and repair parts; adequacy of facilities; capability of support equipment; adequacy of data collection and distribution plans; and assessment of the overall support system capability to meet its readiness requirements.

SM-24 Evaluate Support Impact of Proposed Modification

Support management must see that each of the support element specialists evaluate the impact of any proposed changes to his plan. The combined results of these evaluations are weighed. If a change is required, all resulting support requirement changes are included in the proposed modification package.

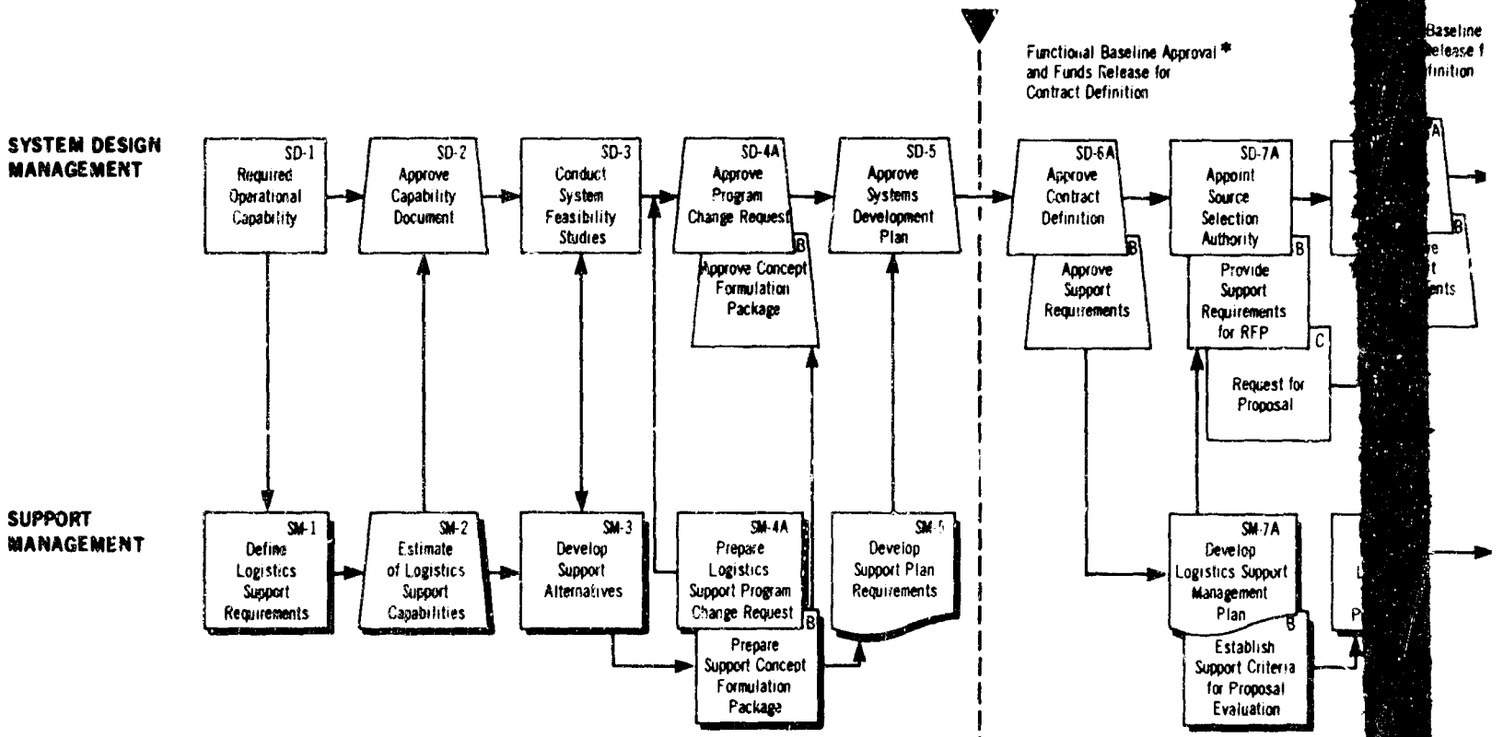
SM-26 Equip Follow-On Operating Units

After satisfactory completion of operational suitability testing, follow-on operating units are equipped. Operational commands direct mission assignments of subordinate organizations and monitor their support performance. Local analysis of "failure data" (summarizing maintenance actions) along with performance data on mission accomplishment and

support responsiveness, will permit unit commanders to separate true hardware deficiencies from those of manning, skills, supply response, organizational management, etc. This evaluated data should be summarized for transmittal to operational commands. Corrective action beyond the capability of unit commanders becomes a requirement for higher command action. Subsequent command analysis involves comparison of operating units for: (1) mission performance, (2) maintenance effectiveness, (3) supply responsiveness, and (4) hardware failure trends. Unit performance for all the above parameters can be weighed against command averages and trends.

Concurrent with operational command management analyses, the system support command will receive raw hardware failure and support data for analysis by the project system support manager (and/or commodity manager). The results of these analyses will be used to update support planning for further procurements, repair, and modification. They also provide experience information to project managers engaged in the planning of new systems and equipment (see MD–22B, ch. 12 and fig. 15).

Reallocation or disposal of operational and support resources is based upon consideration of changes to the required operational capability, technological obsolescence, operations and maintenance costs and the acquisition of new equipment into the inventory. Integrated logistics support planning for future equipment development should include data from operations and support experience as an aid to management.



SUPPORT ELEMENTS (See Figures 6 through 16)

LIFE CYCLE PHASES

Concept Formulation | Contract Defin

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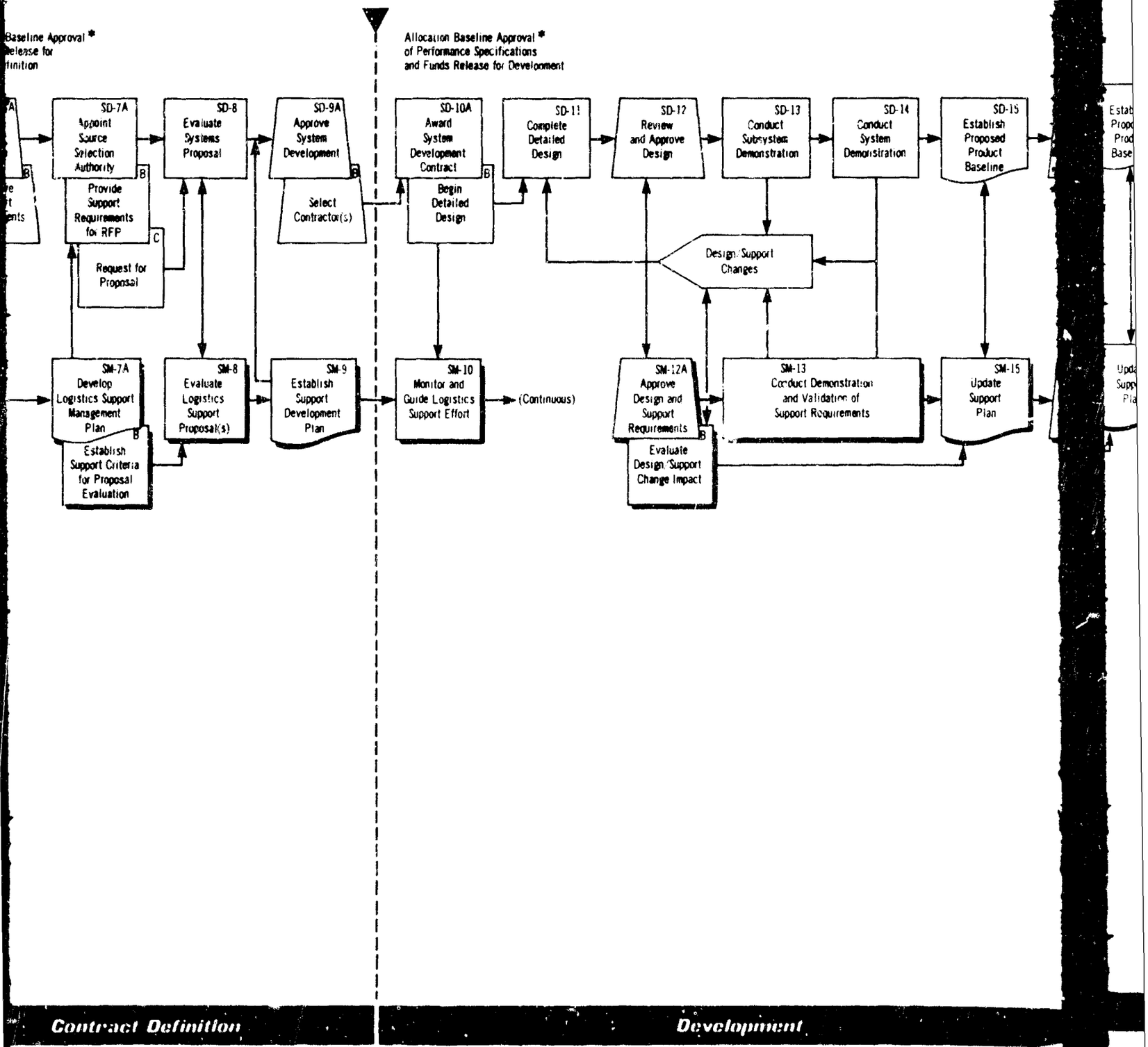
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Requirements
for RFP
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Contractor(s)
Begin
Detailed
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SM-7A
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Logistics Support
Management
Plan
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for Proposal
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SM-8
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Logistics
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SM-9
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SM-10
Monitor and
Guide Logistics
Support Effort
(Continuous)
SM-12A
Approve
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Support
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Evaluate
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SM-13
Conduct Demonstration
and Validation of
Support Requirements
SM-15
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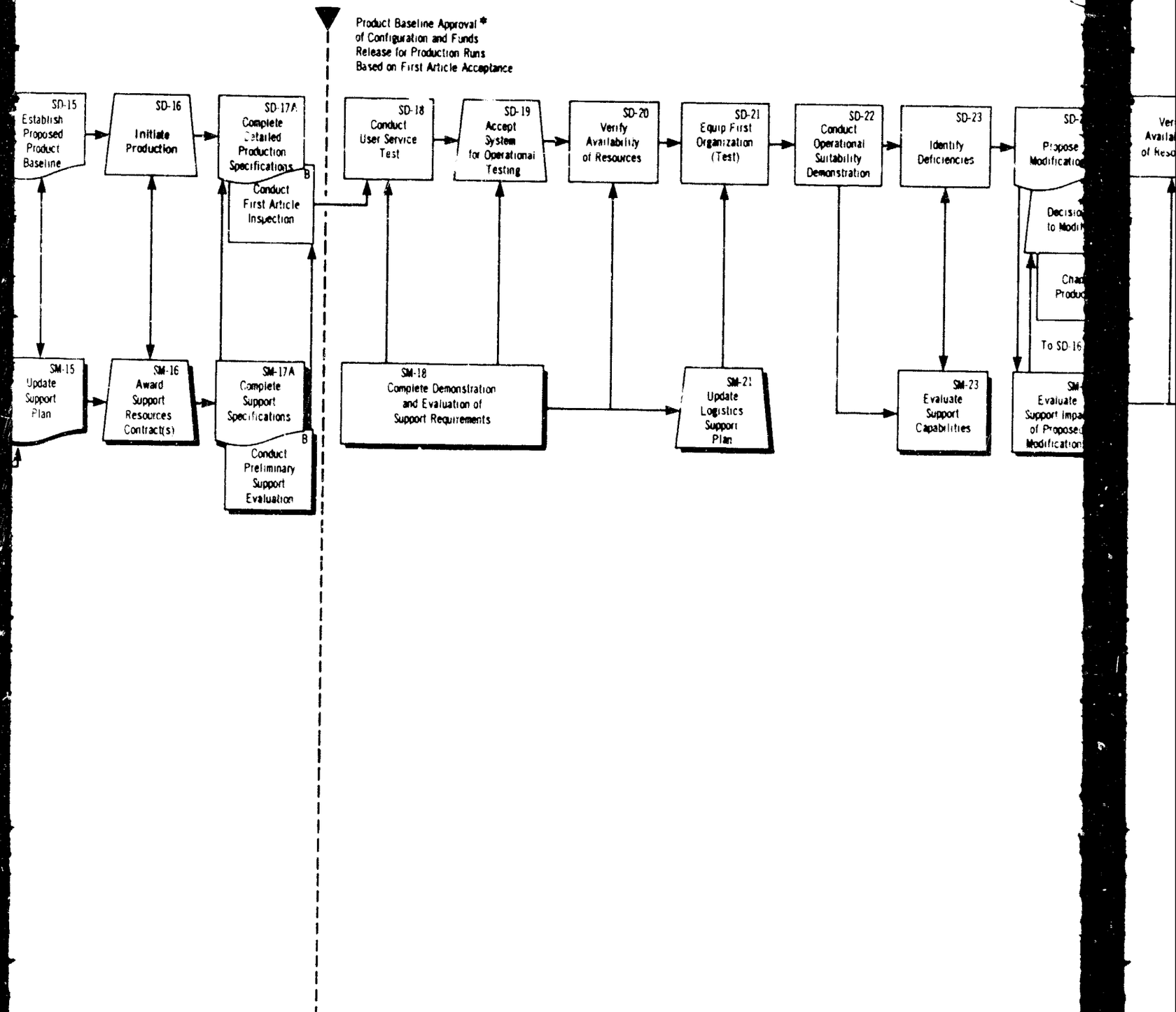
B


Product Baseline Approval *
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Establish
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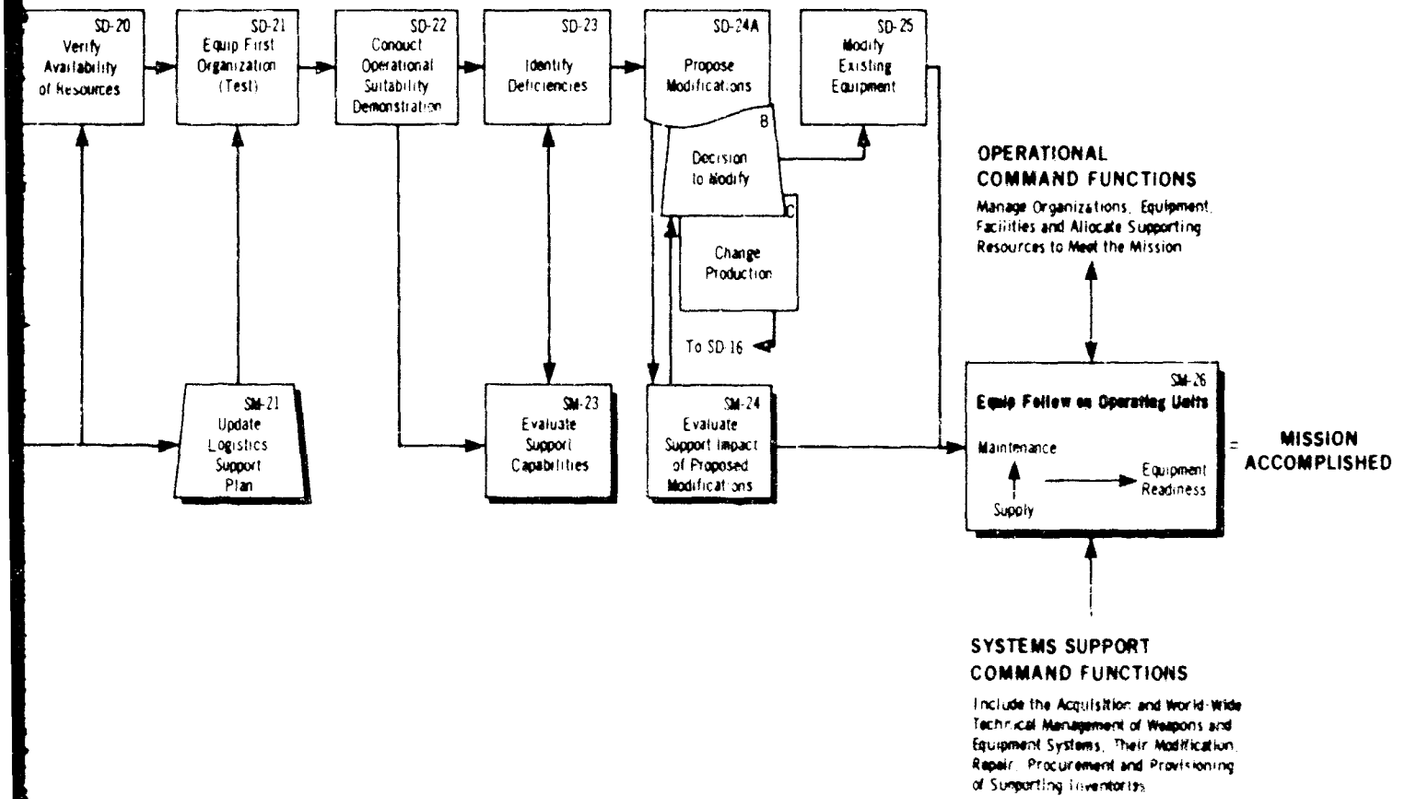
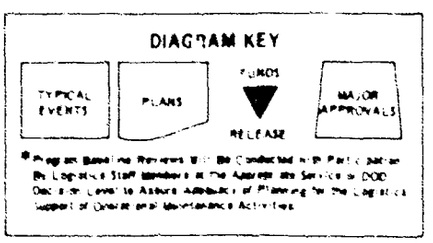
SYSTEM DESIGN/SUPPORT MANAGEMENT INTERFACE (SD & SM)





Operational

Figure 5

MAINTAINABILITY AND RELIABILITY

CHAPTER 3

Interface Responsibilities

- Maintenance Planning for Support.
- Support and Test Equipment Concepts and Design Characteristics.
- Supply Support Concept Data and Mean Time Between Repair Characteristics.
- Transportation and Handling Design Specifications.
- Technical Data Type, Location and Availability.
- Facilities Design Characteristics.
- Personnel Skills Capabilities and Training.
- Funding Requirements, Allocation and Life Cycle Cost Criteria.
- Management Data for Prediction and Design Support Tradeoff

3

Maintainability and Reliability (M and R)

3.1 Introduction

Maintainability is an expression of the probability of equipment being restored to operating status within allowable time limits using available test equipment, facilities, personnel, spare parts and procedures. Reliability is the probability that an equipment will continue to function correctly for a specified period of time without failure under a prescribed condition of use.

Both maintainability and reliability are included as maintenance preventive characteristics in equipment design and support resources requirements. Maintainability and reliability goals must be integrated into the equipment and support system design through requirement and contract specifications. The specification requirements must be stated early in the concept formulation phase. Since these characteristics have a direct influence on operational readiness, they collectively express the optimum end result of equipment readiness performance and cost effectiveness tradeoffs.

Surveillance over changes in both design and support is required to prevent degradation of maintainability and reliability. Demonstrations with the equipment must be conducted to see that requirements are met. The demonstration results are analyzed and tradeoffs conducted to improve system design and support. These early tradeoffs result in a continual narrowing down of configuration ideas until a firm production baseline is established. Because paper and prototype changes are relatively inexpensive, maximum emphasis must be placed on maintainability and reliability prior to establishing this baseline (see fig. 3).

Figures 6 and 16, and the following paragraph descriptions show the direct relationship which must exist between maintainability and reliability, system design, support management, and other support elements.

3.2 Detailed Event Description

MR-2 Prepare M and R Portion of Logistics Support Capabilities Estimate

The maintainability and reliability portion of the capabilities estimate is based upon the operations and support requirements of SD-1 and SM-1. It includes estimates of required systems availability in terms of operating hours to failure, probability of launch, system level mean-time-between-failures (MTBF), maximum times to repair (MTTR), turn around times, maximum fallout rate to be allowed (percent out for unscheduled maintenance after operational sortie), etc. These estimates along with experience data on similar systems (MD-2) are to be included in the overall support inputs (SM-2) to the operational capability document (SD-2).

MR-3 Perform M and R Trade-off Studies

Development of support alternatives (SM-3) for consideration in the system feasibility studies (SD-3) requires that design/support maintainability and reliability tradeoffs be conducted. These tradeoffs are to determine the optimum balance between inherent system reliability and equipment redundancy to establish the most practical reliability and maintainability goals. This action requires other inputs to these tradeoffs including projected failure frequencies, operational readiness experience, current and projected transportation modes, maintenance and supply resource expenditures, alternative use of facilities and technical data applications. Where state-of-the-art, or economic factors prevent achievement of the desired reliability, alternative maintainability approaches are considered. Decisions resulting from the maintainability and reliability tradeoffs become a significant input to the maintenance concept (MP-4) and early design concepts.

MR-5 Establish Gross M and R Plan Requirements

Following selection of a system concept (SD-4B) and the support concept (SM-4B), program specifications for the development of maintainability and reliability requirements are established as part of the logistics support plan and the RFP (SM-5). They include maintainability and reliability goals for system and support development, requirements for the identification and tailoring of specifications, and selection of a way to demonstrate achievement of performance, support and cost goals. Repair accessibility criteria must be defined along with any needs for new test methods, quantitative and qualitative analysis techniques and figures for mean-time-to-repair, maximum repair time, availability, repairability, etc.

Compatibility must be maintained with the other support element inputs to SM-5. Maintainability and reliability requirements which collectively express gross readiness

performance requirements (SM–1) must be subsequently integrated into contract definition work statements and specifications.

MR–7 Establish M and R Evaluation Criteria

Criteria must be established to evaluate contractor maintainability and reliability programs aimed at developing a reliable and supportable design. The criteria should include suitable methods for evaluating maintainability and reliability predictions, approved methods for measuring the adequacy of calculated or estimated quantitative maintainability and reliability factors and methods of evaluating plans for demonstration of maintainability and reliability attainment. Factors which may be included are:

- Mission support profile criteria,
- Planned utilization criteria,
- Failure criteria,
- Acceptable limits of subsystem operation,
- Facilities and manpower limitati
- Turnaround time allowable,
- Unit size and deployment period, and
- Support maintenance concept constraints such as the maintenance level, throwaway level, etc.

MR–8 Perform M and R Evaluation

The contractors maintainability and reliability program proposals are evaluated and scored. A determination is made as to which proposals best fulfill the criteria (MR–7). This becomes a part of the system and support evaluations for proposal selection (SD–8 and SM–8). The contractor's proposed maintainability and reliability plan should contain:

- M and R calculations, predictions and apportionment,
- Demonstration plan for M and R,
- M and R design review and evaluation,
- Procedure for determining impact of design changes on M and R, and
- Performance guarantees and incentives.

MR–9 Define M and R Design Guidelines

Performance and readiness specifications established in contract definition will include operational duration and mission frequency design goals as an aid to measure useful availability. They will also specify manhour criteria to crew, service, and maintain equipment as "ready" within specified reaction times at defined levels of use. These goals and criteria must be translated into complementary rather than contradictory maintainability and

reliability guidelines. Depending upon the type of system/equipment involved, they establish design measurement criteria for such things as:

- Minimum planned utilization (hours or sortie),
- Turnaround time limits,
- In-commission rate,
- Operational fallout rate (percent out after sortie),
- Maintenance MH's per operating hour (or sortie),
- Scheduled preventative maintenance limits,
- Depot repair limits,
- Unscheduled maintenance limits,
- Supply and "other" downtime limits, and
- Maintainability and reliability cost-effectiveness factors.

The design guidelines will also include firm policies related to size, weight and space limitations based on human factors; constraints on the minimum reliability of parts and components; constraints on materials, such as resistance to corrosion or other deterioration; the requirements for use of standard parts; specifications of typical approved fasteners, quick disconnects, etc. Human engineering, configuration management and other such directives and instructions should be specified in total, or in part, depending on their application to the equipment under development.

MR–10 Update M and R Plan Requirements

During design (SD–10B), and maintenance engineering analysis (MP–10) the maintainability and reliability plan must be updated to provide more detailed requirements. These requirements result from analysis of support methods, drawings and specifications, and other systems engineering documentation. The objective is to identify key maintainability and reliability "design to" characteristics of hardware components in order to:

- Reduce maintenance,
- Reduce technical skills,
- Establish the optimum frequency and extent of preventive maintenance,
- Improve maintenance methods,
- Improve diagnostic routines,
- Reduce specialized tools and test equipment,
- Provide data feedback to expedite design and evaluate support.

The above objectives are to be attained by expanding the requirements for more reliable parts and materials, planning and arranging component parts for ready accessibility, using standard parts now available in the supply system, and other maintainability and

reliability design techniques. Where necessary, tradeoffs will be performed and the requirements impact evaluated and justified.

MR-11 Allocate M and R Design Goals

During preparation of preliminary drawings, maintainability and reliability design goals are apportioned to the various sub-items of equipment. Each item is assigned appropriate maintainability and reliability factor limits within the overall system and support performance parameters. Tradeoffs are performed as necessary and include analyses of the effect on equipment design and support plans (SD–10 and SM–10). Serious impairment of either operational or support effectiveness is not permitted. Resultant maintainability and reliability goals are specified as characteristics to be included in further detailed design of subsystems equipment and modules (SD–11).

MR-13 Demonstrate Attainment of M and R Goals

During subsystem and system testing, the attainment of previously allocated maintainability and reliability goals will be demonstrated. Deficiencies found should be evaluated and corrected by engineering changes or changes in the support program. The impact of these deficiencies with relation to other support element plans is considered in SM–13, since reduced reliability or poor maintainability in a designed item will degrade system availability and increase costs. Revised maintainability and reliability demonstration criteria and evaluation information must be included in the updated support plan (SM–15). This information is essential as a basis for the wider goals and specifications in procurement plans and contracts.

MR-16 Adjust M and R Goals

Based on the experience gained in the system demonstration, a firm prediction of subsystem maintainability and reliability requirements for production units will be made. These subsystem requirements more closely support the required system reliability in such terms as failure rates and repair times. Component maintainability factors, such as mean-time-to-repair, mean preventative maintenance downtime, and the frequency of preventative maintenance should be included. These predictions, with associated confidence levels, are necessary for refining calculations of support resource quantities (e.g., numbers of technicians, quantities of repair parts, quantities of consumables, and other items generated by further maintenance engineering analysis). The reallocated goals must be fed into the data collection system (MD–11B) for future program purposes.

MR-17 Evaluate Attainment of M and R in First Article

During the first article inspection, particular attention will be given to the review of maintainability and reliability deficiencies noted in the subsystem and system demonstrations (SD- 13 and 14) to assure that: (1) Corrective action has been taken and (2) that this action has not resulted in new maintainability and reliability problems. The first article is carefully examined to see that maintainability and reliability design policies have been carried out, minimum new spares have been introduced into the supply system, and modifications and engineering changes introduced during production have not degraded reliability nor introduced maintenance or support problems. Analyses of the impact of design changes on maintainability and reliability goals are made a part of the preliminary support evaluation (SM-17B).

MR-18 Demonstrate and Evaluate M and R During Service Test

The service test is primarily intended to prove the system/equipment utility and to further isolate any design deficiencies. During service tests, failures occur and are repaired using the parts, tools, test equipment technical data, etc., established as a result of the operations and maintenance engineering analyses efforts. The number and nature of the failures, the time required for repair, the parts used, and any other support data are recorded and analyzed (MD-11B). From this management data, modifications and corrections to hardware items and procedures are determined. These engineering change proposals must be closely monitored for possible impact on maintainability and reliability goals.

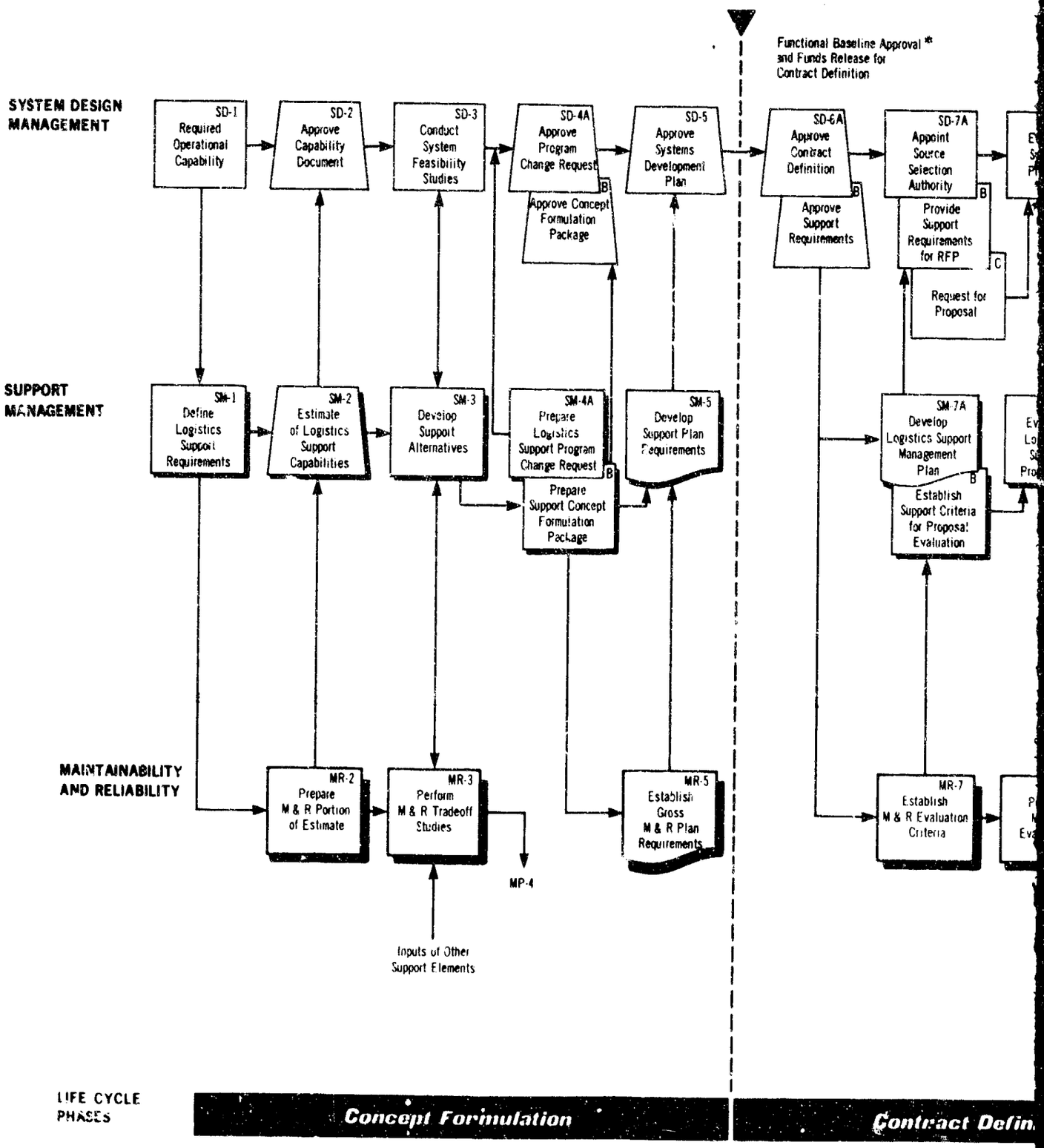
MR-21 Validate/Update M and R Goals for Future Use

Based on experience gained during the user service tests (SD-18) and on data gathered from the operating units after the equipment is issued, maintainability and reliability requirements and goals are updated for use in defining concepts and estimating requirements for future systems. Support experience data is collected and analyzed for comparison to the reliability and maintainability predictions. The results provide valuable information for updating the support plan (SM-21) for use during the remaining life of the equipment.

MR-24 Modify M and R Goals as Required

As a result of operational suitability testing or follow-on operations and support, modifications are required to correct deficiencies or to adapt to mission changes. When such modifications are contemplated it is necessary to assure that previously attained levels of maintainability and reliability are not degraded. Where these modifications bring improvement, it will be necessary to correct established goals so that they reflect the modified

system. Such modified maintainability and reliability goals are essential to the overall support evaluation (SM–24) so that future modifications may be evaluated to the new product baseline.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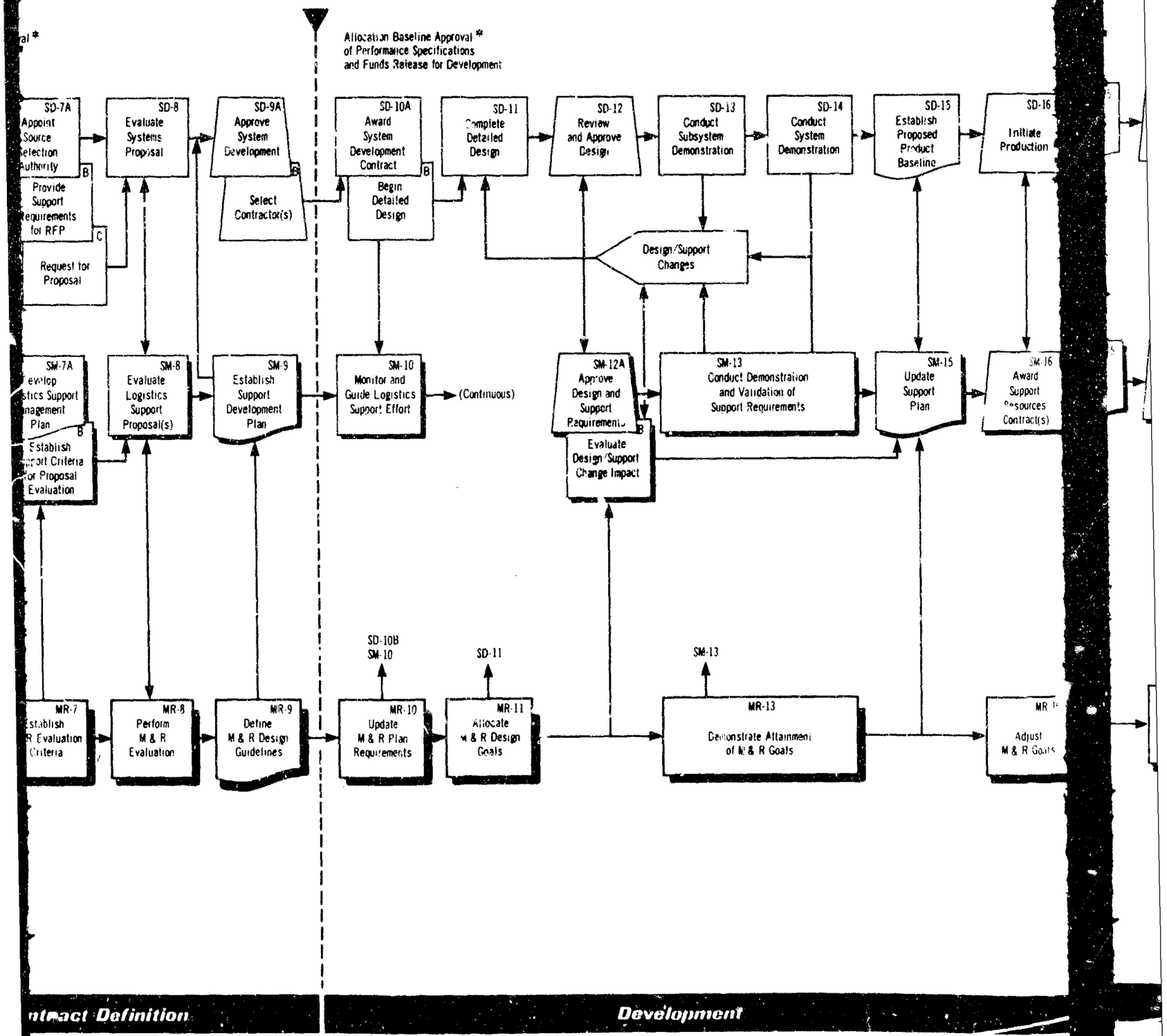
SD-1 Required Operational Capability
SD-2 Approve Capability Document
SD-3 Conduct System Feasibility Studies
SD-4A Approve Program Change Request
B
Approve Concept Formulation Package
SD-5 Approve Systems Development Plan
SD-6A Approve Contract Definition
B
Approve Support Requirements
SD-7A Appoint Source Selection Authority
B
Provide Support Requirements for RFP
C
Request for Proposal
SUPPORT MANAGEMENT
SM-1 Define Logistics Support Requirements
SM-2 Estimate of Logistics Support Capabilities
SM-3 Develop Support Alternatives
SM-4A Prepare Logistics Support Program Change Request
B
Prepare Support Concept Formulation Package
SM-5 Develop Support Plan Requirements
SM-7A Develop Logistics Support Management Plan
B
Establish Support Criteria for Proposal Evaluation
MAINTAINABILITY AND RELIABILITY
MR-2 Prepare M & R Portion of Estimate
MR-3 Perform M & R Tradeoff Studies
MP-4
MR-5 Establish Gross M & R Plan Requirements
MR-7 Establish M & R Evaluation Criteria
Inputs of Other Support Elements
LIFE CYCLE PHASES
Concept Formulation
Contract Defin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SD-8
Evaluate Systems Proposal
SD-9A
Approve System Development
SD-10A
Award System Development Contract
SD-11
Complete Detailed Design
SD-12
Review and Approve Design
SD-13
Conduct Subsystem Demonstration
SD-14
Conduct System Demonstration
SD-15
Establish Proposed Product Baseline
SD-16
Initiate Production
Provide Support Requirements for RFP
Request for Proposal
Select Contractor(s)
Begin Detailed Design
Design/Support Changes
SM-7A
Develop Logistics Support Management Plan
SM-8
Evaluate Logistics Support Proposal(s)
SM-9
Establish Support Development Plan
SM-10
Monitor and Guide Logistics Support Effort
(Continuous)
SM-12A
Approve Design and Support Requirements
SM-13
Conduct Demonstration and Validation of Support Requirements
SM-15
Update Support Plan
SM-16
Award Support Resources Contract(s)
Establish Support Criteria for Proposal Evaluation
Evaluate Design/Support Change Impact
SD-10B
SM-10
SD-11
SM-13
MR-7
Establish M & R Evaluation Criteria
MR-8
Perform M & R Evaluation
MR-9
Define M & R Design Guidelines
MR-10
Update M & R Plan Requirements
MR-11
Allocate M & R Design Goals
MR-13
Demonstrate Attainment of M & R Goals
MR-14
Adjust M & R Goals
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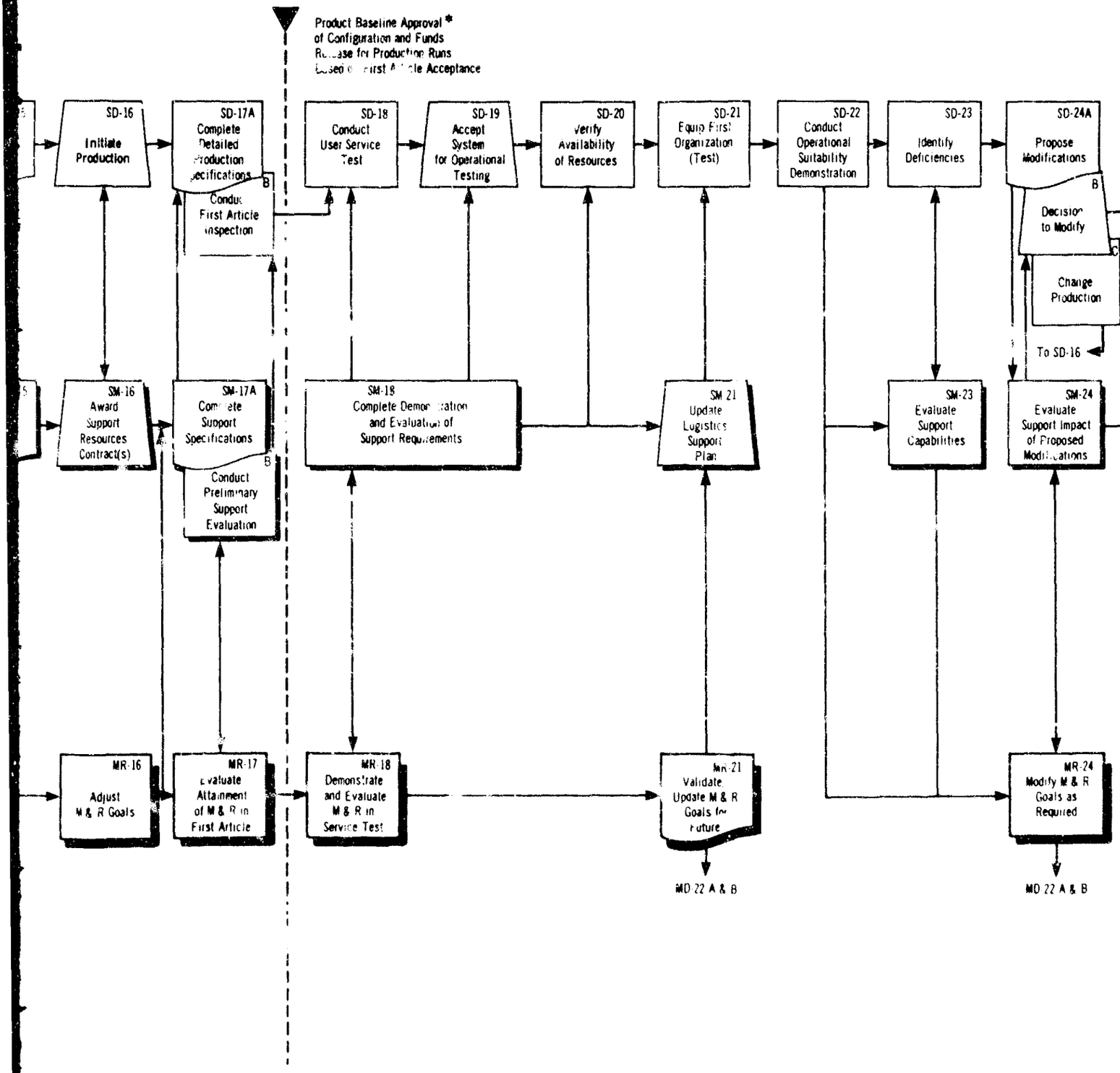
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SD-23
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SM-21
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SM-23
Evaluate Support Capabilities
SM-24
Evaluate Support Impact of Proposed Modifications
MR-16
Adjust M & R Goals
MR-17
Evaluate Attainment of M & R in First Article
MR-18
Demonstrate and Evaluate M & R in Service Test
MR-21
Validate Update M & R Goals for Future
MR-24
Modify M & R Goals as Required
MD 22 A & B
MD 22 A & B

Figur

MAINTAINABILITY AND RELIABILITY (MR)

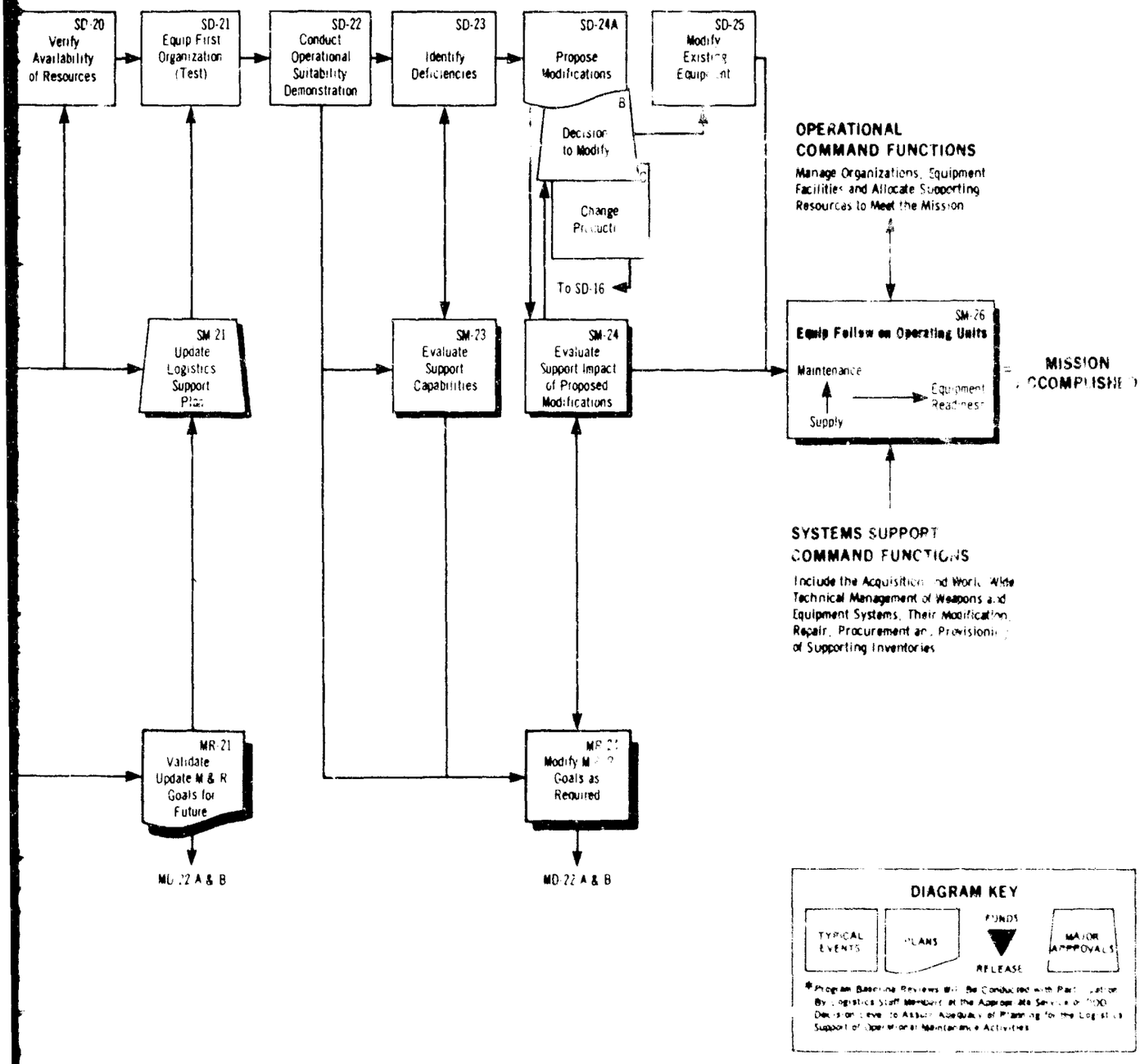


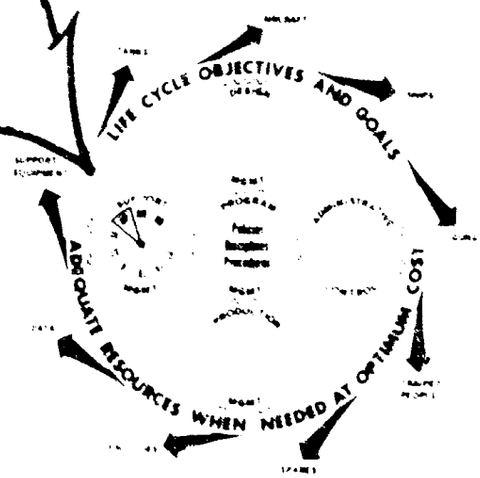
Figure 6

MAINTENANCE PLANNING

CHAPTER 4

Interface Responsibilities

- Maintainability and Reliability Goals and Design Data for Maintenance Planning Concepts.
- Support and Test Equipment Requirements, Specifications, Drawings and Use Plans.
- Supply Support Concepts, Requirements and Use Plans.
- Transportation and Handling Concepts and Requirements (Includes Packaging and Preservation).
- Technical Data Concepts and Requirements for Operations and Maintenance Training.
- Facilities Requirements and Support Plans
- Personnel and Training Manpower and Skill Requirements and Distribution.
- Funding Requirements and Allocations for Maintenance Program.
- Management Data Needs and Use in Maintenance Analyses, Support Tradeoffs, Product Improvement and Management by Exception



4

Maintenance Planning (MP)

Maintenance planning establishes concepts and requirements for each level of equipment maintenance to be performed during its useful life. As such, maintenance planning defines the actions and supporting requirements necessary to maintain the designed system and equipment in its prescribed state of operations. Maintenance functions include checkout, servicing, crew augmentation, status monitoring, inspection, fault isolation, replacement, modification and overhaul. The degree to which these various functions are to be performed by organizational, intermediate, or depot level maintenance must be spelled out. The use of contract maintenance should be considered. The maintenance plan responds first to readiness requirements and next to economies in the commitment of supporting resources.

Maintenance planning evaluates current and projected maintenance capabilities and translates them into criteria and requirements which influence optimum system development. Initially, the capabilities are stated as concepts and philosophies which become definitized specifications as system design progresses. Specific maintenance actions to be performed at various levels of maintenance and the resource requirements needed to support those actions, are identified by systematic and detailed maintenance engineering analysis. This analysis is conducted concurrently with hardware design and is updated as design changes. Maintenance engineering analysis documentation provides:

- The identification and description of tools and test equipment, facilities, personnel, spares and repair parts and technical data,
- Quantification of most maintenance support needs by time and place,
- Personnel requirements analysis by skill, type and number, and
- Facilities loading to establish adequacy and utilization.

The maintenance planning and analysis effort is tailored in depth to the complexity of the hardware and the program detail required for the specific phase being worked. A block diagram of events that make up the maintenance planning program is shown on figure 7.

4.2 Detailed Event Description

MP-2 Prepare Maintenance Planning Portion of Logistics Support Capabilities Estimate

The total current and projected maintenance capabilities of the operating forces must be analyzed for application to the support requirements (SM-1). Tradeoffs are made in recognition of the various operations and support restrictions which may be imposed through use of these capabilities. As gross system specifications are being defined, resulting operational requirements are analyzed to determine the impact of their introduction to the operating forces and supporting maintenance activities. Findings are included in the operational capabilities document (SM-2). This early planning and analysis provides a realistic assessment of the maintenance capabilities of the operating forces to support the new mission, and to identify any new requirements.

MP-3 Evaluate Possible Maintenance Concepts

In conjunction with developing support alternatives for the different system approaches (SD-3), various maintenance concepts are analyzed. Varied combinations of performance requirements and maintenance capabilities are traded off to determine the optimum maintenance approaches. These analyses are supported by the maintainability and reliability tradeoff studies (MR-3). Preliminary support requirements are estimated early in the program to allow the comparison of optional support alternatives for selection of the best. Factors to be considered in maintenance capability estimates include:

- Qualitative and quantitative personnel requirements (PT-3),
- Support and test equipment (SE-3),
- Supply Considerations (SS-3),
- Facilities (FA-3),
- Economic Factors (F-2),
- Deployment periods and locations, and
- Support safety factors.

MP-4 Establish Maintenance Concepts

Maintenance support concepts for the system are established as a result of prior feasibility studies and maintainability and reliability tradeoffs between support elements (MR-3). These concepts will provide guidance for the definition of support requirements. Depending on the depth of system definition required, overall maintenance concepts should include:

- Projected levels and locations of maintenance,
- Fault isolation and system testing approach,
- Equipment overhaul approach,
- Components repair by maintenance level and location,

- Scheduled maintenance requirements and location, and
- Maintenance demonstration and verification tests.

MP–5 Develop Maintenance Plan Requirements

Maintenance plan requirements must be developed for inclusion in the development plan and the RFP (SM–5). The requirements also become the criteria for development of the maintenance plan during contract definition. These criteria must identify both program manager and contractor responsibilities for planning and supporting actions. In support of previously developed maintenance concepts (MP–4), these requirements may include but are not restricted to:

- Definition of maintenance practices to be considered in the proposals,
- Maintenance planning milestone interface with hardware design schedules,
- Preliminary "plan for use" criteria outlining,
  - Deployment of the system—where, when and how,
  - Operational life of the system,
  - Maintenance responsibilities by level and location,
  - Operational use (e. g., frequency, duration).
- Guidelines and specifications for maintenance demonstration and test.
- Maintenance management and analytical techniques to be used with limitations specified to suit the program,
- Government furnished equipment planning criteria, and
- Specifications for maintenance engineering analysis documentation and other detailed and summary data requirements.

MP–7 Establish Maintenance Evaluation Criteria

Contractor-proposed maintenance plans should be evaluated for responsiveness to all maintenance requirements previously defined, as well as:

- Compatibility of the plan with readiness performance specifications and goals,
- Comparison of relative support costs in terms of maintenance man-hours and investments in special test and support equipment,
- Impact of planned overhaul requirements on operational availability,
- Readiness and cost impacts of tradeoffs (e.g., organizational, intermediate, and depot repair mix, etc.).

MP–8 Evaluate Proposed Maintenance Plan

Maintenance plans are evaluated in accordance with criteria in MP–7. The best elements of proposals from various contractors may be considered for inclusion in the final maintenance plan

MP-9 Approve Maintenance Plan

An updated maintenance plan is approved for use and further definition during the development phase of the life cycle.

MP-10 Conduct Maintenance Engineering Analysis

As sketches or drawings of subsystems and components become available, a maintenance engineering analysis will be conducted to determine specific maintenance support actions by frequency, time, and location. Maintenance engineering analysis documentation interacts with system design documentation to identify and control requirements for further changes to either design or support. Properly controlled, it will prevent reengineering or repurchase of available data. This documentation also identifies requirements such as personnel skills, spares provisioning, supply support, servicing, support and test equipment, tech data, shop space, and associated facilities. Analysis techniques are in accord with instructions of the separate Services.

MP-13 and MP-14 Evaluate Maintenance Demonstration of Prototype

A preliminary maintenance support demonstration is conducted during contractor subsystem and system demonstration (SD-13 and SD-14) in accordance with the approved maintenance plan (MP-9). This demonstration and evaluation validates the adequacy of the planned maintenance program to satisfy mission performance requirements as defined by the contract. The maintenance support demonstration is part of the logistic support demonstration and verification program (SM-13). Should the demonstration uncover inadequacies, recommendation for improvements are made at this time.

During this demonstration, selected maintenance requirements are verified and tasks are performed to determine the adequacy of:

- Support and test equipment (SE-13),
- Tech data (TD-14),
- Spares and repair parts (SS-12 A and B),
- Facilities (FA-12),
- Personnel skill levels (PT-9 and PT-11), and
- Management data plan (MD-10).

As a result of the preliminary demonstration, the maintenance support plan is updated as required and translated into requirements for contractor performance during the production phase.

MP-17 Update Maintenance Plan

After detailed design is completed and a product baseline established, the maintenance support plan is again updated to provide current maintenance requirements for support resources and procedures. All design change recommendations are analyzed to determine if they affect system maintenance (e.g., adding a component to the system, etc.). The analysis may also show that a change is not operationally desirable or cost-effective for the system. The impact of design changes on the maintenance plan should be considered during the logistics support evaluation (SM-17B).

MP-18 Conduct Maintenance Support Demonstration and Evaluation

A demonstration is performed to evaluate achievement of objectives outlined in the maintenance support plan (MP-17). The system may be tested in an actual or simulated operational environment for the purpose of demonstrating that:

- Maintenance functions can be performed at the assigned maintenance levels,
- Maintenance tasks can be accomplished by the skill levels specified in the allotted time,
- Support and test equipment can support the maintenance function as planned,
- Technical data correctly describes maintenance tasks to be performed,
- The supply support planning, including distribution and range of spares, repair parts and special supplies, is correct,
- Safety factors have been satisfactorily considered,
- Facilities will satisfy intended functions, and
- System design for maintainability has been accomplished as specified in the contract.

MP-19 Present Maintenance Plan to User

The maintenance plan is again updated as a result of support demonstration and verification. It becomes part of the logistics plan (SM-21) for use by the operational organizations receiving the equipment for Service use. The plan provides maintenance staff members and commanders with an understanding of the planning upon which preparations for operational support have been predicated.

MP-23 Identify and Analyze Support Deficiencies

Monitoring of support effectiveness during the operational suitability demonstrations (SD-22) is required to determine the dependability of the equipment and support resources

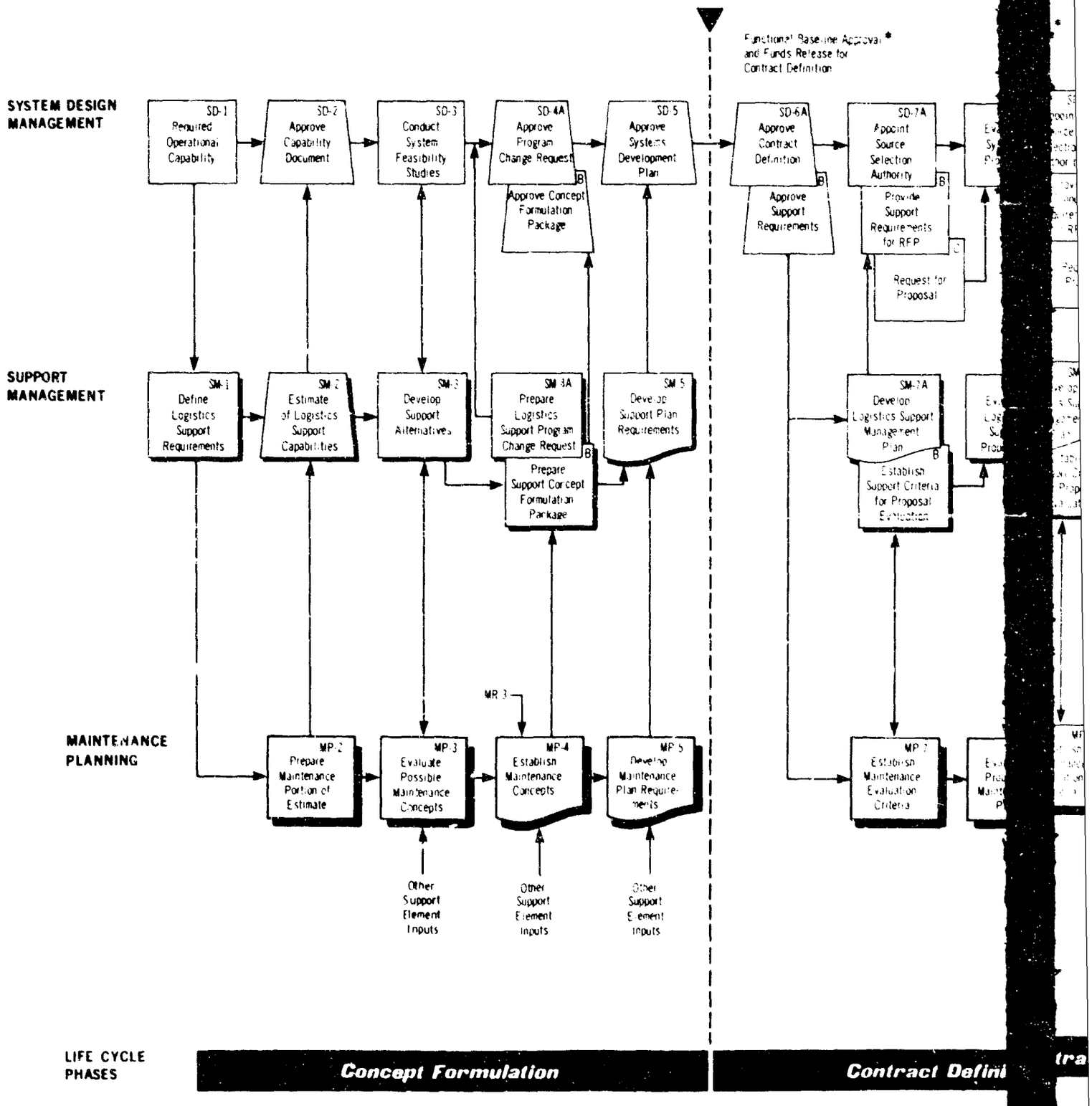
to achieve readiness performance within contractually agreed upon test parameters. Specific maintenance demonstration requirements should include such things as:

- Measured achievement of specified maintainability and reliability goals,
- Verification of maintenance support procedures in technical data,
- Verifying the adequacy of personnel training to the specified skill requirements,
- Assessing the availability of personnel, spares, repair parts, special supplies, facilities, support and test equipment,
- Verification of the range, location and specified use of spares, repair parts, special supplies, support equipment, etc., which are required for operations and maintenance, and
- Assurance that maintainability, reliability, safety and human engineering characteristics have been considered in both equipment design and support planning.

Support deficiencies will be identified and analyzed, using test data (MD-22B) collected to satisfy maintenance demonstration requirements. The results of these analyses become part of the logistics support evaluations (SM-23). The plan for the operational suitability demonsfration must specify personnel as test conductors who are experienced in operational maintenance of similar equipment and assigned as evaluators (umpires, not technicians). The team will include contractor and Service participants under project manager direction.

MP-24 Update Maintenance Plan

Proposed modifications to hardware and support resulting from evaluations (SD-24 and SM-24) are analyzed for changes to the maintenance plan. Recommendations are made for hardware design changes where tradeoff studies justify them as effective improvements. These actions are conducted in accordance with applicable configuration management directives and instructions. The revised maintenance plan is used by follow-on operating units and their appropriate commands (SM-26)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SD-6B Approve Support Requirements
SD-7A Appoint Source Selection Authority
SD-7B Provide Support Requirements for RFP
SD-7C Request for Proposal
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SM-1 Define Logistics Support Requirements
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SM-3 Develop Support Alternatives
SM-3A Prepare Logistics Support Program Change Request
SM-3B Prepare Support Concept Formulation Package
SM-5 Develop Support Plan Requirements
SM-7A Develop Logistics Support Management Plan
SM-7B Establish Support Criteria for Proposal Evaluation
MAINTENANCE PLANNING
MP-2 Prepare Maintenance Portion of Estimate
MP-3 Evaluate Possible Maintenance Concepts
MP-4 Establish Maintenance Concepts
MP-5 Develop Maintenance Plan Requirements
MP-7 Establish Maintenance Evaluation Criteria
MR-3
Other Support Element Inputs
Other Support Element Inputs
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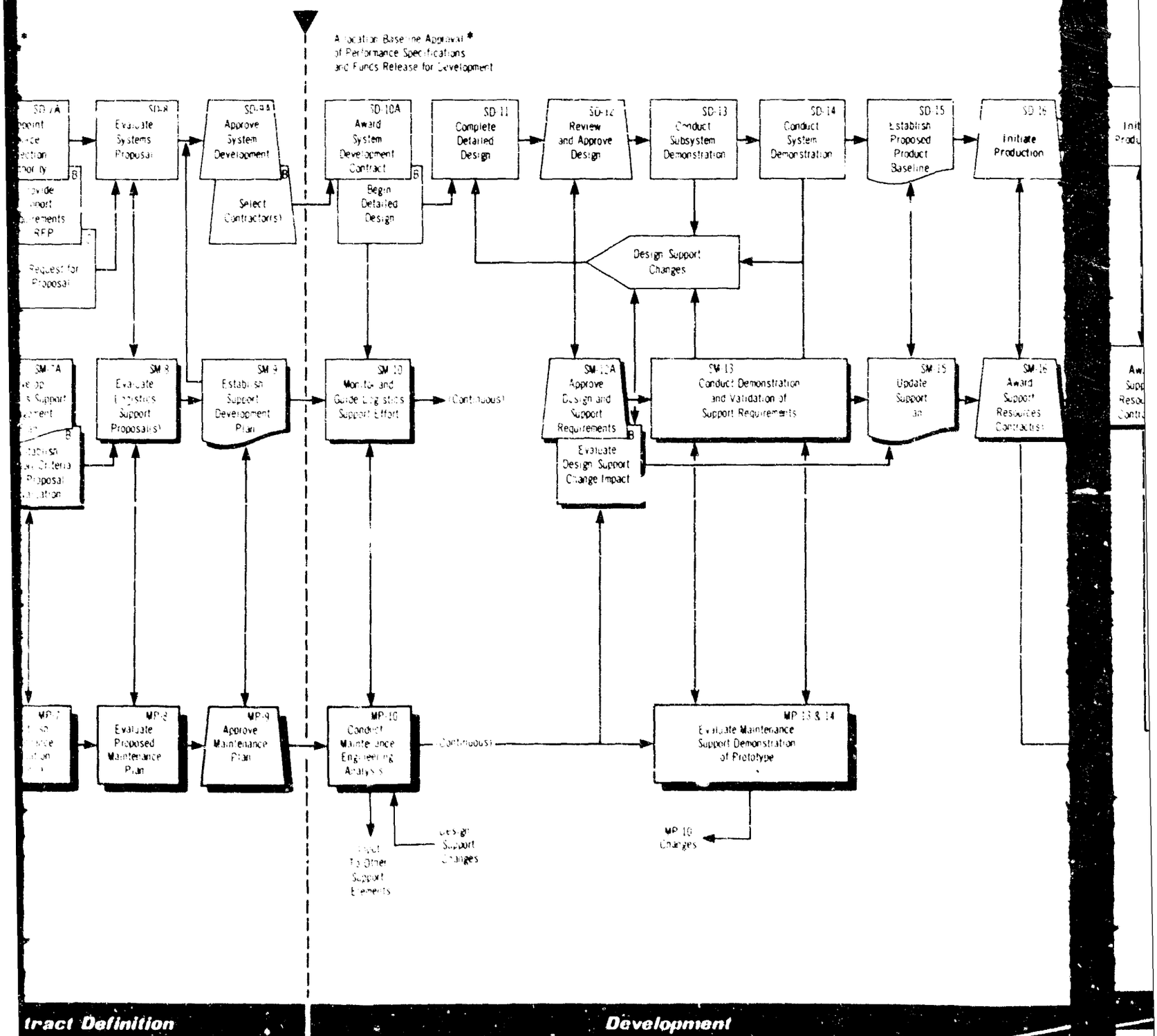
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SD-14
Conduct System Demonstration
SD-15
Establish Proposed Product Baseline
SD-16
Initiate Production
Request for Proposal
Design Support Changes
SM-8
Evaluate Logistics Support Proposal(s)
SM-9
Establish Support Development Plan
SM-10
Monitor and Guide Logistics Support Effort
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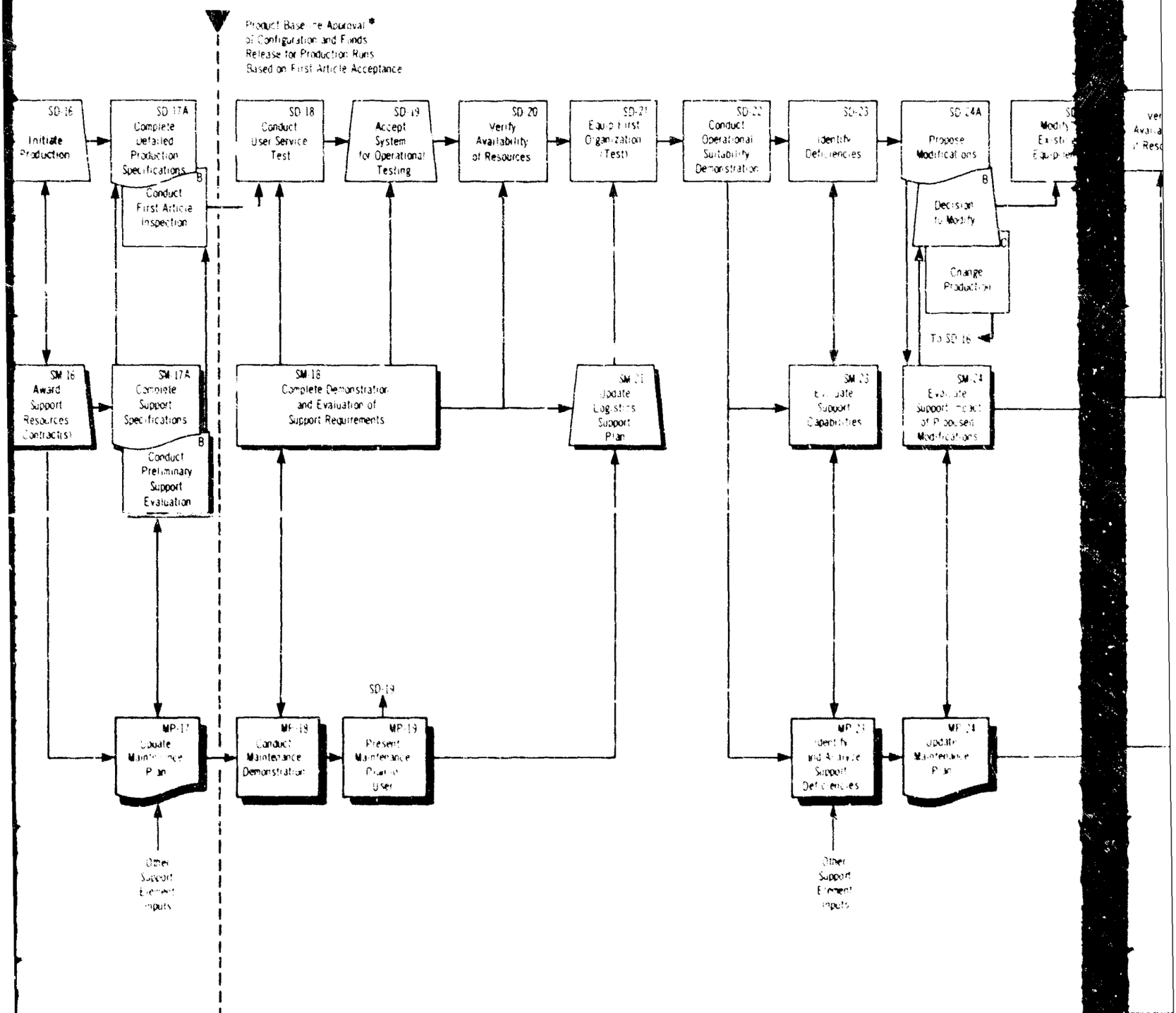
SM-12A
Approve Design and Support Requirements
Evaluate Design Support Change Impact
SM-13
Conduct Demonstration and Validation of Support Requirements
SM-15
Update Support Plan
SM-16
Award Support Resources Contract(s)
MP-8
Evaluate Proposed Maintenance Plan
MP-9
Approve Maintenance Plan
MP-10
Conduct Maintenance Engineering Analysis
(Continuous)
MP-13 & 14
Evaluate Maintenance Support Demonstration of Prototype
MP-10 Changes
Design Support Changes
Contract Definition
Development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SD-24A
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SM-17A
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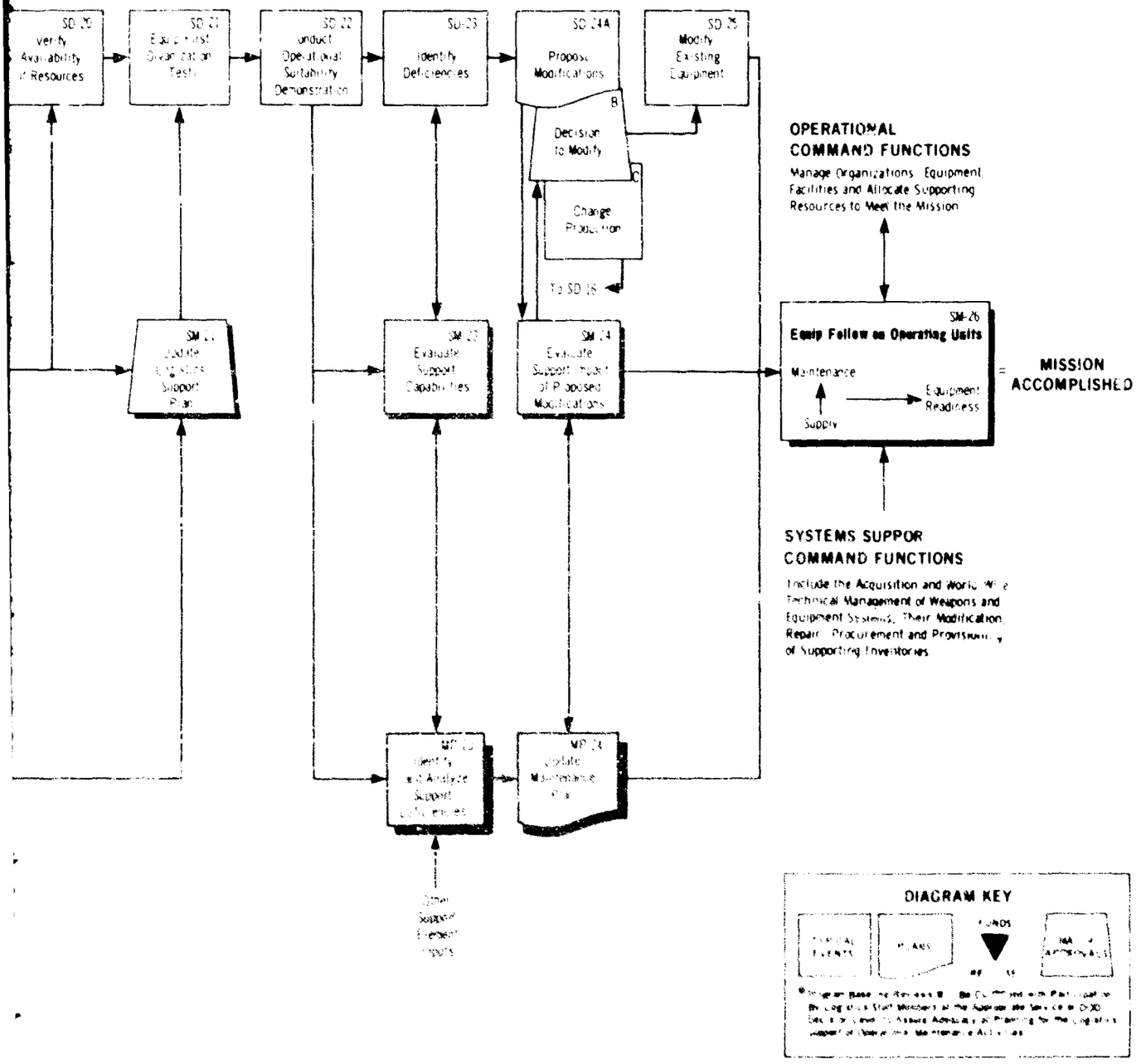
Conduct Preliminary Support Evaluation
SM-18
Complete Demonstration and Evaluation of Support Requirements
SM-21
Update Logistics Support Plan
SM-23
Evaluate Support Capabilities
SM-24
Evaluate Support Impact of Proposed Modifications
SD-19
MP-17
Update Maintenance Plan
MP-18
Conduct Maintenance Demonstration
MP-19
Present Maintenance Plan to User
MP-23
Identify and Analyze Support Deficiencies
MP-24
Update Maintenance Plan
Other Support Element Inputs
Other Support Element Inputs

Figure 7

MAINTENANCE PLANNING (MP)



Operational

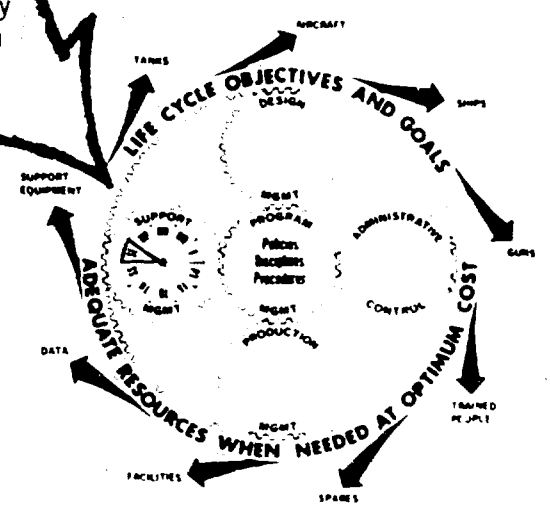
Figure 7

SUPPORT AND TEST EQUIPMENT

CHAPTER 5

Interface Responsibilities

- Maintainability and Reliability Characteristics in Design and Performance Goals
- Maintenance Planning Concepts, Actions, Requirements and Equipment Analysis
- Supply Support Concepts and Provisioning for Spares, Repair Parts and Special Supplies
- Transportation and Handling Design Characteristics for Equipment Requirements
- Technical Data Requirements, Characteristics and Procedures
- Facilities Design Characteristics, Plans and Siting
- Personnel and Training Requirements and Human Interface Evaluations
- Funding Requirements and Allocations Information for Equipment Program
- Management Data Needs and Use for Evaluation of Equipment Performance, Product Improvement and Management by Exception



5

Support and Test Equipment (SE)

5.1 Introduction

The purpose of the support and test equipment program is to assure that the required support and test equipment is available to the operating forces and supporting maintenance activities in a timely manner. The ability to perform the required unscheduled and scheduled maintenance depends on the adequacy of the support and test equipment identified or developed concurrently with the prime system and equipment. Support and test equipment consists of tools, metrology and calibration equipment, monitoring and checkout equipment, maintenance stands and handling devices which are categorized into special (peculiar to the system under development) and common (commercially available or currently in the defense inventory).

The support and test equipment program encompasses all life cycle phases. The development of support and test equipment requires application of tailored ILS planning techniques for the same reasons they should be applied to prime equipment projects. The program events and their sequence relationship to the system design and support management are shown in figure 8.

5.2 Detailed Event Description

SE-2 Prepare Support Equipment Portion of Logistics Support Capabilities Estimate

Based on the required operational capability, an analysis is made of the projected maintenance capabilities of the operating forces and supporting maintenance activities (MR-2 and MP-2). An integral part of this analysis effort is the assessment of support and test equipment used to maintain similar systems at various maintenance levels. This action is based on available operations/readiness performance requirement data, gross system configuration, and the preliminary maintenance and maintainability assessments of support

needs for the projected operations and support modes. The resultant estimates should define both existing support equipment that may be utilized and those requirements needing further exploratory study or development.

SE–3 Perform Support and Test Equipment Trade-off

Support and test equipment trade-off studies are conducted to satisfy the alternative support concepts being considered (SM–3). As part of the maintainability and reliability trade-offs (MR-3), these studies consider currently available support and test equipment, experience of the operating forces and supporting maintenance activities with such equipment, support and test equipment under development, and the analysis of the technical feasibility, cost and desirability of developing new equipment.

SE–4 Establish Support Equipment Concept

Support and test equipment concepts are selected on the basis of performance, maintainability and reliability and cost trade-offs (MR-3) and in accord with the maintenance concept (MP–4). These concepts are documented as gross support and test equipment functions needed to support operations and maintenance. They are the basis for the initial requirements (SE–5) needed to satisfy the selected system and support concepts (SD–4 and SM–4).

SE–5 Determine Preliminary Support Equipment Plan Requirements

As part of the logistics support plan and RFP requirement (SM–5), support and test equipment requirements are developed as planning criteria for:

- Special or general purpose automated/manual system testing and fault isolation system or equipment,
- Special or general purpose support and test equipment,
- Special or general purpose handling equipment,
- Funding requirements for new or additional common support and test equipment and related spares, repair parts and manuals,
- Development and acquisition plan for new support and test equipment,
- Metrology and calibration equipment, and
- Acquisition plan for additional quantities of general purpose government furnished support and test equipment.

SE–7 Establish Support Equipment Plan Evaluation Criteria

Evaluation criteria must be developed for determining the competing contractors relative responsiveness to the support equipment plan requirements (SE–5). Procedures,

schedules, funding and responsibility requirements for development of new support and test equipment (or identification of additional quantities of existing support and test equipment) become part of the management plan to which contract definition request for proposals can be prepared (see SM-7B and SD-7C).

SE-8 Evaluate Support Equipment Proposal(s)

Comparison of contractor support equipment proposals require evaluations of the:

- Adequacy and responsiveness of the contractors support equipment program,
- Identification of and justification for each proposed item of special support and test equipment,
- Adequacy of support and test equipment to accomplish maintenance functions, and
- Cost to design, develop, procure and support recommended support and test equipment.

The results of the evaluation are included in SM-8 for overall logistics support proposal scanning.

SE-9 Approve Support Equipment Plan

An updated support equipment plan is approved for use and further definition during the development phase. Together with the maintenance plan MP-9, it becomes part of the support plan (SM-9) for inclusion in development contracts (SD-10A). As such, it authorizes the contractor to proceed with concurrent development of items of support and test equipment in the quantities required for the development phase test and demonstration. Based upon procurement lead time, action is initiated for special support and test equipment in the quantities estimated to be required for the development phase. Procurement action for other special and common items of support or test equipment not being developed by the contractor is progressively initiated to fit test and demonstration need dates.

SE-10 Update Support Equipment Requirements

The support and test equipment requirements and plans are modified and updated continually, based on changes which occur as a result of continuing system and maintenance engineering analysis effort (SD-10B and MP-10).

SE-11 Design Support Equipment

Concurrent with system design, items of support and test equipment are identified, designed and developed or acquired in accordance with contract specifications. Suitable

items in the Defense inventory will be acquired as GFE. As a part of the support and test equipment design, special attention should be given to the determination of calibration requirements. These calibration requirements should then be compared to existing capabilities and if additional calibration capability is required, the appropriate supporting agency must be notified so that necessary development and/or procurement action can be accomplished.

SE-13 Verify Availability of Support Equipment

In conjunction with the demonstration and verification of support requirements (SM-13), the end items of support and test equipment will be evaluated for preliminary acceptance. Support and test equipment availability for the subsystem and system demonstration (SD-13 and SD-14) is verified. Design form, fit and function changes to the support and test equipment made as a result of the preliminary acceptance tests are reflected in an updated support equipment plan.

SE-16 Award Support Equipment Contract

Contracts (SM-16) for required items of support and test equipment are also released or included as part of the system production contract (SD-16) as appropriate.

SE-17 Update Support Equipment Requirements

During detail design and to establish a product baseline, design/support changes may require updating of the support equipment plan. These changes must include the results of the first article review of the specifications to the support and test equipment (SD-17B). They must be made in accordance with applicable configuration management directives and instructions and as part of the preliminary support evaluation (SM-17B).

SE-18 Accomplish Service Test of Support Equipment

Final review and acceptance of support and test equipment hardware prior to delivery is accomplished in conjunction with the complete demonstration and evaluation of support requirements (SM-18). The demonstration must show, for example, that:

- The equipment performs the maintenance functions to the prescribed maintainability goals,
- It interfaces properly with the complete system and does not duplicate functions,
- The item is acceptable with regard to service use (accessibility, durability, repairability, ease of operation, etc.), and
- Performance requirements established in the development contract can be met.

SE-19 Verify Availability of Support Equipment

Prior to deployment of the system for operational suitability test, the availability of all required support and test equipment must be verified. Status of changes made as a result of the service test (SD–18) are reported. This assures that all support and test equipment is ready for delivery, and that updated support equipment program plans are available for use.

SE-21A Issue Support Equipment To First Operational Organization

Delivery of all required support and test equipment to the first operating unit is accomplished in accordance with planned schedules. Interface actions between the contractor, storage locations and operating units must be complete to assure adherence to delivery schedules.

SE-21B Validate/Update Support Equipment Requirements

Discrepancies found during delivery acceptance, installation and/or preliminary operations are submitted as changes for updating the support equipment plan and specification.

SE-23 Identify Support Equipment Deficiencies

Deficiencies in support and test equipment resulting from operational suitability testing are identified for corrective action. These deficiencies will be identified as part of the support evaluation (SM–23), and in accord with the maintenance evaluation criteria (MP–23).

SE-24A Initiate Action To Modify Support Equipment

Proposed modifications to the system (SD–24A) must be reviewed with regard to their impact on support and test equipment. Action to modify support and test equipment and change their follow-on requirements is initiated concurrently with the decision to modify the system (SD–24B). Interaction of all changes between prime and support equipment must be in accord with current configuration management directives and instructions. The impact of these modifications must be considered in the support evaluation (SM–24).

SE-24B Procure Additional Support Equipment

Based upon the modification schedules and the complexity of the changes, reprocurement action is taken for supplying support equipment to follow-on operating units. Successive reprocurements based on progressive changes to the equipment may be necessary. Advanced planning for these reprocurements becomes part of the support equipment plan updating

through all life cycle phases and should be based on the best estimates possible using previous experience with similar system changes.

SE-25A Modify Support Equipment

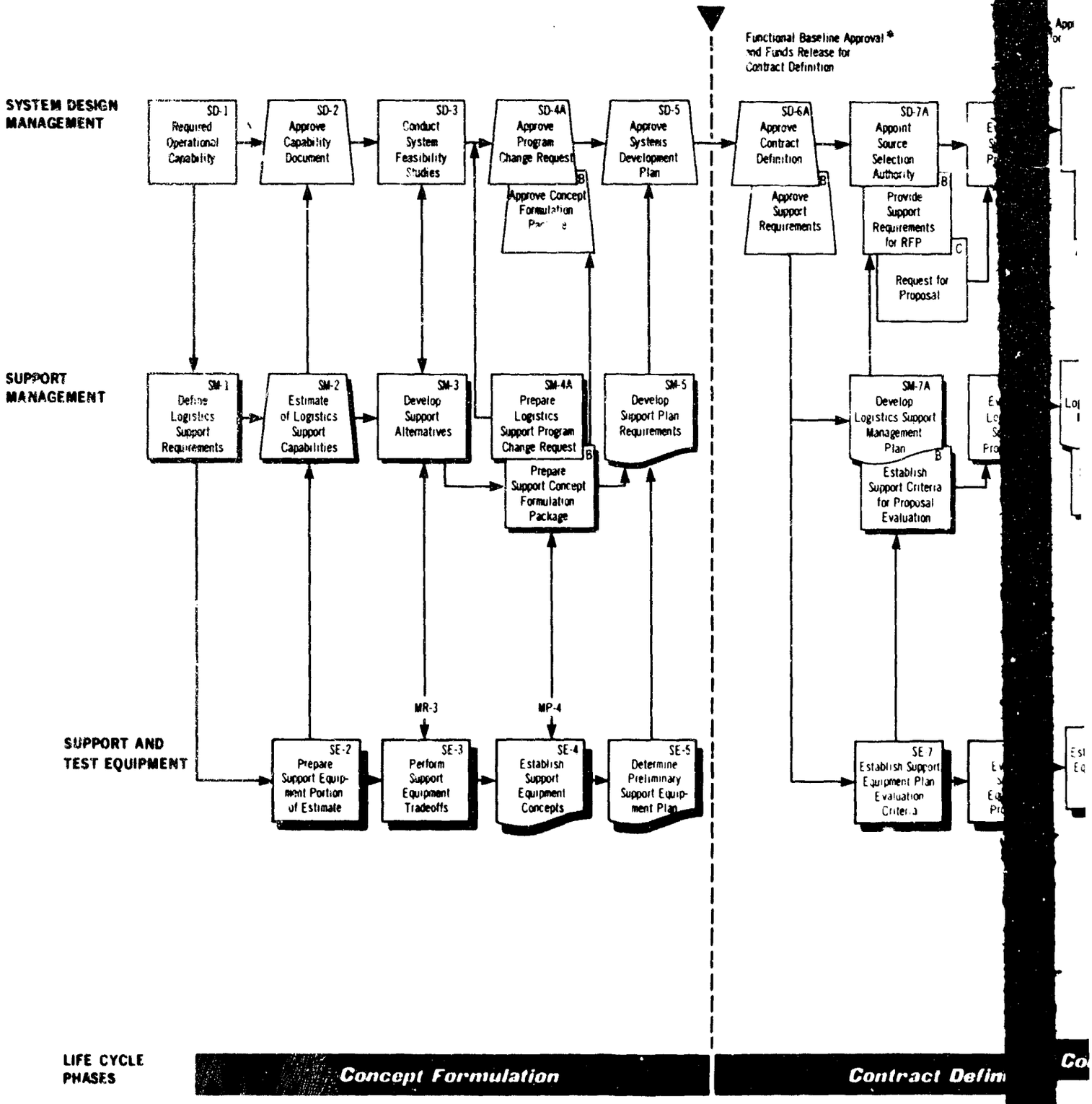
As a result of the decision to modify equipment (SD-25), changes to the support and test equipment are made, as required. Where the proposed modifications affect the use of the equipment on other Service systems, appropriate interface action on the change must be accomplished through use of current configuration management directives and instructions.

SE-25B Issue New Support Equipment

The allocations of support and test equipment for follow-on operating units are made. Continuous monitoring of the status and effectiveness of this equipment is accomplished to:

- Continuously update and improve the equipment provided to the operating forces and their maintenance activities, and
- Provide product improvement information for follow-on replacement systems.

Management receipt of user data, on-site visits and the feedback of management data system reports (MD-22B), provide the means to continuously evaluate support equipment throughout the operational phases.


Functional Baseline Approval* and Funds Release for Contract Definition
SYSTEM DESIGN MANAGEMENT
SD-1 Required Operational Capability
SD-2 Approve Capability Document
SD-3 Conduct System Feasibility Studies
SD-4A Approve Program Change Request
Approve Concept Formulation Package
SD-5 Approve Systems Development Plan
SD-6A Approve Contract Definition
Approve Support Requirements
SD-7A Appoint Source Selection Authority
Provide Support Requirements for RFP
Request for Proposal
SUPPORT MANAGEMENT
SM-1 Define Logistics Support Requirements
SM-2 Estimate of Logistics Support Capabilities
SM-3 Develop Support Alternatives
SM-4A Prepare Logistics Support Program Change Request
Prepare Support Concept Formulation Package
SM-5 Develop Support Plan Requirements
SM-7A Develop Logistics Support Management Plan
Establish Support Criteria for Proposal Evaluation
MR-3
MP-4
SUPPORT AND TEST EQUIPMENT
SE-2 Prepare Support Equipment Portion of Estimate
SE-3 Perform Support Equipment Tradeoffs
SE-4 Establish Support Equipment Concepts
SE-5 Determine Preliminary Support Equipment Plan
SE-7 Establish Support Equipment Plan Evaluation Criteria
LIFE CYCLE PHASES
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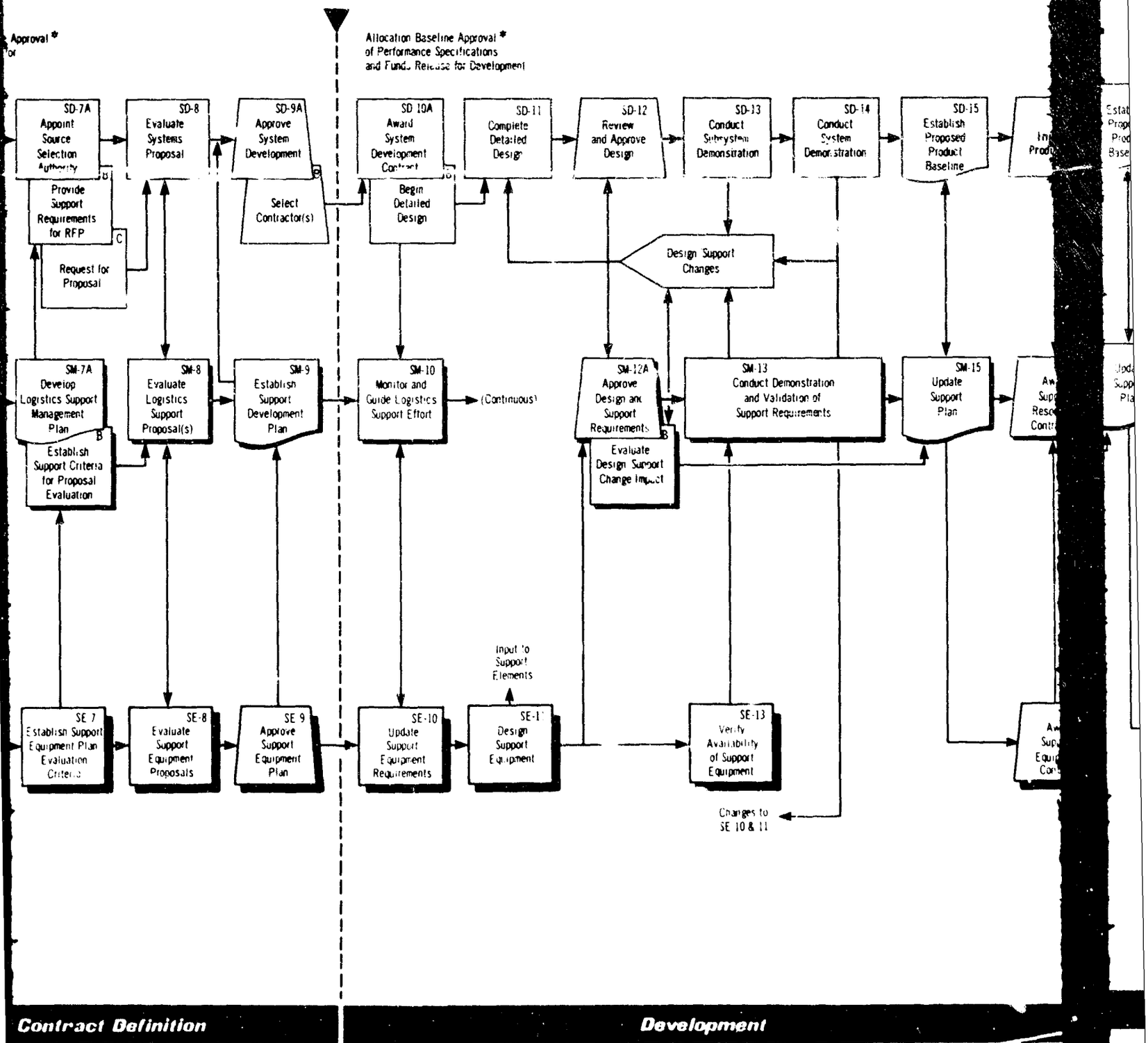
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Award
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Development
SD-11
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Detailed
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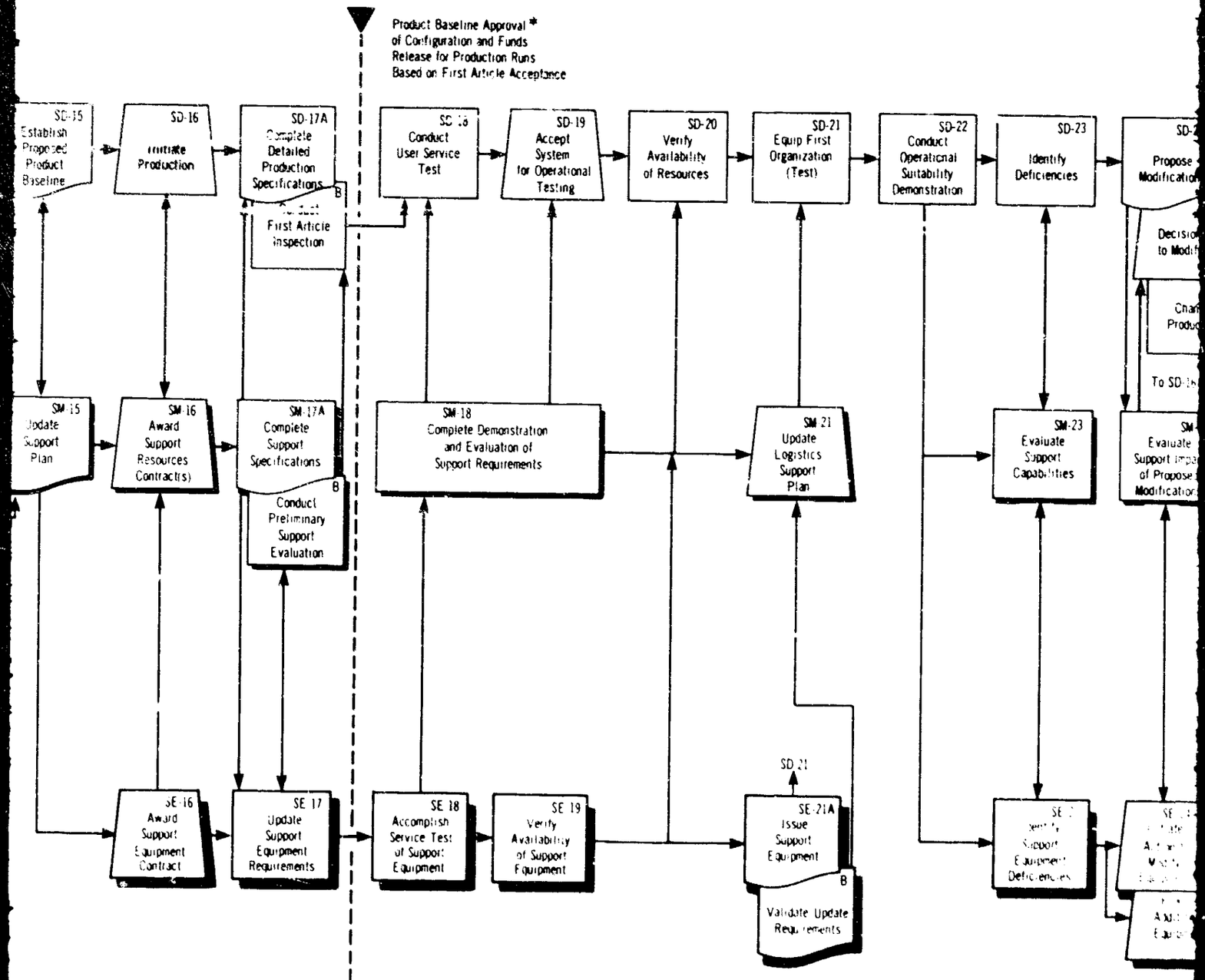
SD-12
Review
and Approve
Design
SD-13
Conduct
Subsystem
Demonstration
SD-14
Conduct
System
Demonstration
SD-15
Establish
Proposed
Product
Baseline
Provide
Support
Requirements
for RFP
Request for
Proposal
Select
Contractor(s)
Begin
Detailed
Design
Design Support
Changes
SM-7A
Develop
Logistics Support
Management
Plan
SM-8
Evaluate
Logistics
Support
Proposal(s)
SM-9
Establish
Support
Development
Plan
SM-10
Monitor and
Guide Logistics
Support Effort
(Continuous)
SM-12A
Approve
Design and
Support
Requirements
SM-13
Conduct Demonstration
and Validation of
Support Requirements
SM-15
Update
Support
Plan
Establish
Support Criteria
for Proposal
Evaluation
Evaluate
Design Support
Change Impact
Input to
Support
Elements
SE 7
Establish Support
Equipment Plan
Evaluation
Criteria
SE-8
Evaluate
Support
Equipment
Proposals
SE 9
Approve
Support
Equipment
Plan
SE-10
Update
Support
Equipment
Requirements
SE-11
Design
Support
Equipment
SE-13
Verify
Availability
of Support
Equipment
Changes to
SE 10 & 11
Contract Definition
Development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Release for Production Runs
Based on First Article Acceptance
SD-15
Establish Proposed Product Baseline
SD-16
Initiate Production
SD-17A
Complete Detailed Production Specifications
B
First Article Inspection
SD-18
Conduct User Service Test
SD-19
Accept System for Operational Testing
SD-20
Verify Availability of Resources
SD-21
Equip First Organization (Test)
SD-22
Conduct Operational Suitability Demonstration
SD-23
Identify Deficiencies
SM-15
Update Support Plan
SM-16
Award Support Resources Contract(s)
SM-17A
Complete Support Specifications
B
Conduct Preliminary Support Evaluation
SM-18
Complete Demonstration and Evaluation of Support Requirements
SM-21
Update Logistics Support Plan
SM-23
Evaluate Support Capabilities
SE-16
Award Support Equipment Contract
SE-17
Update Support Equipment Requirements
SE-18
Accomplish Service Test of Support Equipment
SE-19
Verify Availability of Support Equipment
SD-21
SE-21A
Issue Support Equipment
B
Validate Update Requirements

SUPPORT AND TEST EQUIPMENT (SE)

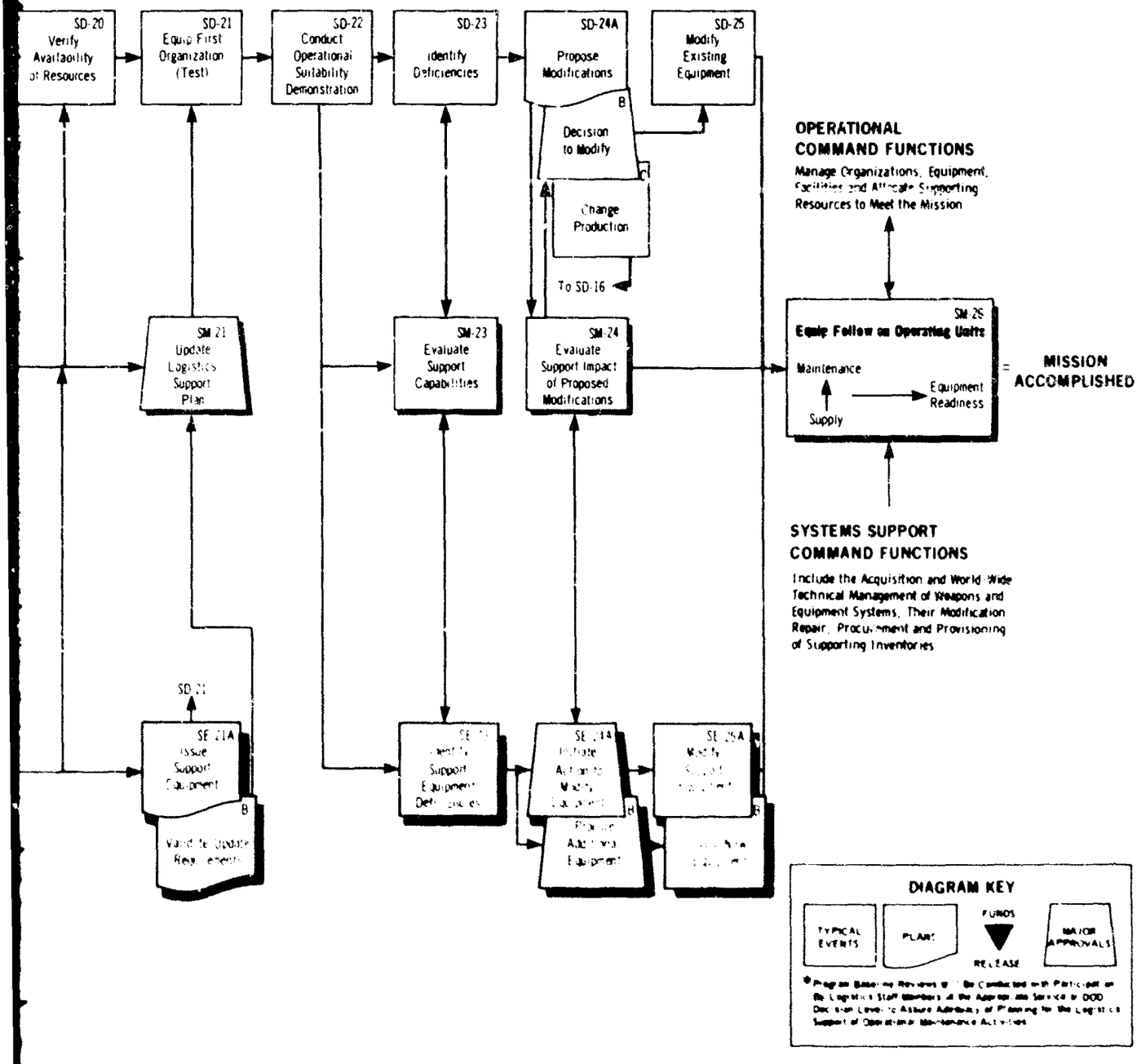


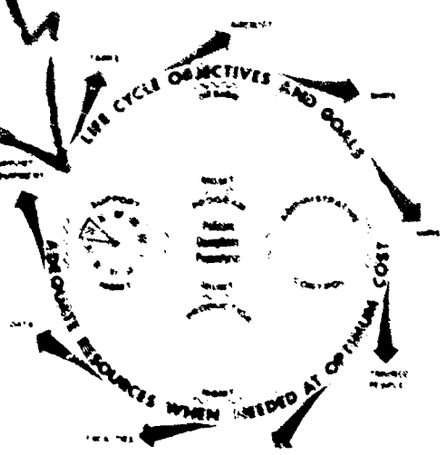
Figure 8

SUPPLY SUPPORT

CHAPTER 6

Interface Responsibilities

- Maintainability and Reliability Data for Spares and Repair Parts Selection.
- Maintenance Planning Requirements for Repair, Overhaul and Resupply.
- Support and Test Equipment Requirements for Spares, Repair Parts and Special Supplies
- Transportation and Handling Requirements for Receipt, Storage, Issue and Shipment
- Technical Data Requirements and Procedures for Parts Breakdown, Age Controls, Special Storage and Selective Commodity Management.
- Facilities Requirements by Space, Location, Support Level and Function.
- Personnel and Training Requirements for Supply Support Personnel.
- Funding Requirements and Allocations for Supply Support Program.
- Management Data Collection and Analysis of Supply Effectiveness at the Operating Level.



6

Supply Support

6.1 Introduction

Maintaining operational readiness under diverse conditions of military use depends directly on the availability of the right supplies at the time and place they are needed. Supply support is an essential element of the logistics integration effort and is responsible for the timely provisioning, distribution and inventory replenishment of spares, repair parts, and special supplies.

Supply planning for spares and repair parts must be based upon technical inputs from maintenance planners and engineers (e.g., system/equipment utilization rate, operating hours, failure rates, required field repair rates, locations, and selected maintenance items critical to safety and mission accomplishment). Considered are such supply inventory management factors as the agency responsible for support, the planned management method (e.g., item control by project manager, inventory manager, or gross commodity class), item criticality, item priorities, distribution, repair cycles, attrition rate, and replacement lead time. This process requires support management attention through all phases of the equipment life cycle. Inventory management control depends upon current and complete knowledge of item status by configuration and location so that support management decisions can be made on a responsive basis.

Planning support for new equipment also includes the responsibility of alerting indirect back-up and housekeeping activities to these interfacing supply support responsibilities in such areas as facilities, installed property, POL, and munitions.

A block diagram of the events that make up the supply support program and their relationship to system design and support management is shown on figure 9.

6.2 Detailed Event Description

SS-2 Prepare Supply Support Portion of Logistics Support Estimate

Based on projected logistics support requirements for equipment proposals (SM-1), an analysis is conducted to assess the capability of the supply system. A preliminary estimate is made of the supply support workload and the type of storage and distribution techniques that might be employed to support the operational and training mission (SP-1), the maintenance capabilities (MP-2), personnel requirements (PT-5), and planned facilities (FA-5). Early identification of the criteria needed to plan long lead time resource procurement, such as tooling, equipment, technical data, etc., is desirable to permit later definition of the requirements for provisioning and acquisition of spares, repair parts, special supplies, munitions, POL, subsistence and housekeeping supplies on a time phased basis.

SS-3 Perform Supply Support Trade-offs

Supply support considerations (modes, methods, and constraints), to be applied during system feasibility studies (SD-3) and evaluate during trade-off studies (MR-3) are identified. These studies may be conducted by government or by selected contractors. They are based on operational requirements, maintenance concepts and alternative supply support concepts and techniques for provisioning, requirements determinations, inventory control, supply locations, distances, mode of transport, use of facilities, etc.

SS-4 Establish Supply Support Concepts

A preliminary determination is made to select the basic ground rules under which supply support is to be provided. The materiel management system best able to support the operational requirements is determined. Factors are developed for estimating spares and repair parts, special supplies, munitions, POL, subsistence and housekeeping supply costs for the system life cycle. The proposed plans, milestone charts, techniques and concepts developed during in-house or contractor studies are thoroughly reviewed. Logistic support concepts for spares, repair parts, and equipment provisioning objectives are established.

SS-5 Develop Supply Plan Requirements

A supply plan requirements package is prepared for inclusion in the support plan requirements and the RFP (SM-5), for submittal to those contractors participating in contract definition. The plan includes:

- Supply support concepts, techniques and related assumptions,
- Supply program milestones, and

- Provisions to assure direct participation with other program support elements to assure life cycle continuity of logistic support management.

SS–7 Establish Provisioning Requirements Criteria

Provisioning and supply management requirements and evaluation criteria are furnished for inclusion with other support criteria in the logistic support management plan (SM–7A). The contractor must be given management data requirements (MD–4 through MD–7) and other specific procedural controls or constraints for consideration in his support planning. This package should call for contractor discussion of the concepts, techniques, and procedures proposed for both the provisioning function and supply item requirements determination, distribution, and control.

SS–8 Evaluate Provisioning and Support Proposals

Contractors are evaluated for their capability to provide concurrent and responsive production of spare parts, the ratio of standard stock listed spare parts and equipment to new parts and equipment, delivery schedules, emergency requirements and rapid delivery. Their proposal to provide materiel support to testing and training programs is also evaluated.

Evaluation of supply support proposals is accomplished by specialists in each area of logistics. The final supply support plan must reflect the "best mix" solution of all support element inputs. Support management assures a transfusion of the best ideas from the contractors' proposed plans into a support program that is both responsive to operational requirements and in harmony with defense supply constraints and objectives.

SS–9 Approve Provisioning Plan

Final approval of the provisioning plan, as part of the logistics support development plan (SM–9), is accomplished. This approval follows verification that the supply plan is a product of the latest and best information, and that the plan has been thoroughly coordinated and integrated with all other planning efforts. This results in assurance that all plans having common requirements are using the same values and have compatible objectives.

SS–10 Prepare Provisioning Documents for Test

Incremental preparation of provisioning documentation for spares, repair parts and special supplies needed to support testing is begun concurrently with the start of detailed design (SD–10B) and maintenance engineering analysis (MP–10). Special supplies, such as lubricants, epoxies, etc., are included in provisioning documents as they can be defined through maintenance engineering analysis efforts. Quantitative determinations are based on

these analyses, contractors' experience and design and procurement parameters. Contractors' recommendations are incrementally received by subsystem/end item for approval or adjustment. These recommendations include the range of items established by the maintenance engineering analysis, their locations and quantity together with an explanation of the ground rules and methods of calculation employed. They should cover the requirements for all test and training activities prior to equipping the first operational organization (SD–21) and, be compatible with operational provisioning criteria.

SS–11 Approve Items Provisioned for Test

Review, approval, or readjustment of contractors' recommended spares, repair parts and special supplies for test must be accomplished within scheduled milestones. It is done in response to the maintenance plan and in consideration of past experience on like equipment.

As a follow-on to test provisioning document approval, contractor engineering computations for spares, repair parts, and special supplies are begun for initial operational phase quantities. Formal action on provisioning documentation is accomplished concurrently with SM–16. Usage data, factored reliability test data, current engineering changes, residual assets from the test program, and initial lay-in quantities are considered in the progressive development of initial production quantities. Distribution programming and delivery schedules are developed in accordance with established milestones and program requirements. Progressive preparation of allowance listings includes item nomenclature, federal stock number, part number, unit of allowance and quantity, price and standard support codes (MD–11A).

SS–12 A and B Procure Spares, Repair Parts, and Special Supplies for Testing and Training

Based upon the definitive order for spares, repair parts and special supplies (SS–11) and applicable system/support command specifications, procurement is initiated in accordance with the approved test and training provisioning documents.

SS–16 Procure Spares, Repair Parts and Special Supplies To Support Operations

Upon formal completion and approval of the allowance and distribution plan begun in SS–11, additional quantities are incrementally procured or produced for issue to service test and initial operating units, based upon progressively improved usage data.

SS–18 Verify Suitability of Spares and Repair Parts

As part of the demonstration and evaluation of support requirements (SM–18), suitability of the spares and repair parts to satisfy operational and maintenance requirements

is verified. For selected items critical to operational readiness, a determination is made regarding:

- The validity of the item selection based upon justified maintenance requirements,
- Effectiveness of the supply system with regard to item location and time to deliver,
- The acceptability of the item as regards packaging, storage and other service use, and
- Other specified performance requirements.

SS-19 Deliver Spares and Repair Parts to User

At a predetermined date prior to equipment operations, the using organizations requisition required spares, repair parts and special supplies from item managers in support of their operational activities. Automatic initial issue may initiate supply support in some cases. Inventory control is initiated with usage records and stock replenishment procedures.

SS-21 Validate/Update Provisioning Plan

The provisioning plan (SS-9) is updated to reflect changes resulting from test findings (SS-18). Support management reviews the revised plan to insure compatibility with plan revisions of all other support elements. The revised plans are included in the updated support management plan (SM-21).

SS-23 Identify Supply Support Deficiencies

As a part of the overall support evaluation (SM-23), supply deficiencies are identified during operational suitability demonstrations and initial operations. These deficiencies are included in the support capability evaluations (SM-24) as a basis for the decision to modify (SD-24). They may encompass any or all supply parameters described in previous events.

SS-24A Update Provisioning Plan

During typical modification cycles, the provisioning plan (SS-21) is updated to reflect the impact on supply support. The updated plan becomes the basis for supporting modification kits and follow-on operational procurements.

SS-24B Procure Spares and Repair Parts

Where the decision to modify results in site modification action, procurement of supply items to support modified equipment is initiated. Appropriate hardware change identification and status reporting is required to document and control configuration changes in accordance

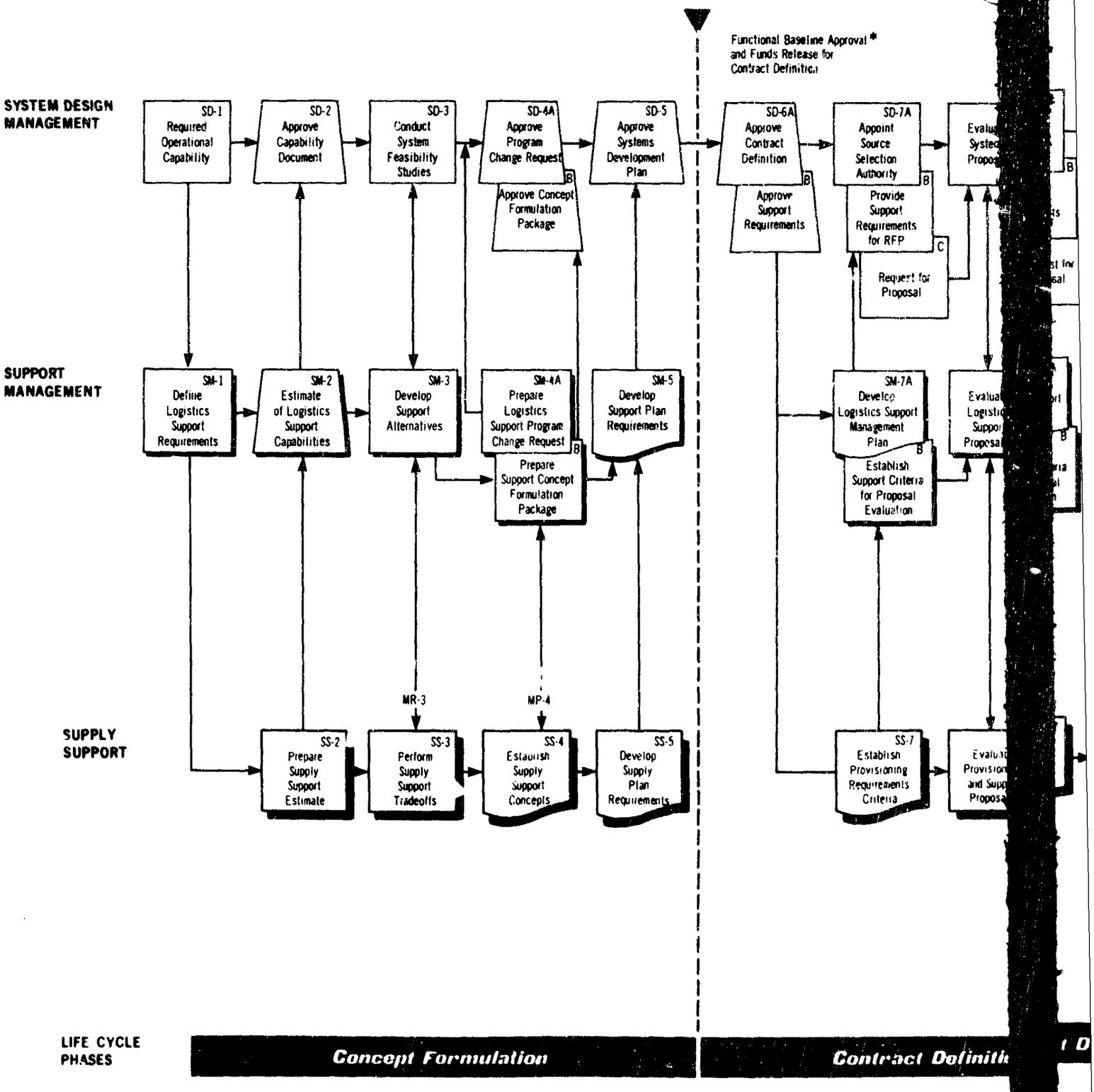
with current directives and instructions. This procurement becomes part of the action taken under SD–24B.

SS–25 Update Allowance and Distribution Plan

As a result of revisions to the provisioning plan (SS–24A) and other recommendations by initial operating units, the allowance and distribution plan is updated to reflect:

- Supply support assets utilization to date,
- Change in distribution of assets and future procured items,
- Adjustments in allowances for follow-on operating units, and
- Inventory control changes with respect to records, reporting, and reorder.

Monitoring supply requirements is a continuing task from the first provisioning action throughout the life of the program. This will insure adequate and timely response to mission support needs. The follow-on monitoring of supply support effectiveness is done through analysis of usage information and reports of maintenance actions required throughout the operational phase of the program (see MD–22B).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Establish Support Criteria for Proposal Evaluation
MR-3
MP-4
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SS-2 Prepare Supply Support Estimate
SS-3 Perform Supply Support Tradeoffs
SS-4 Establish Supply Support Concepts
SS-5 Develop Supply Plan Requirements
SS-7 Establish Provisioning Requirements Criteria
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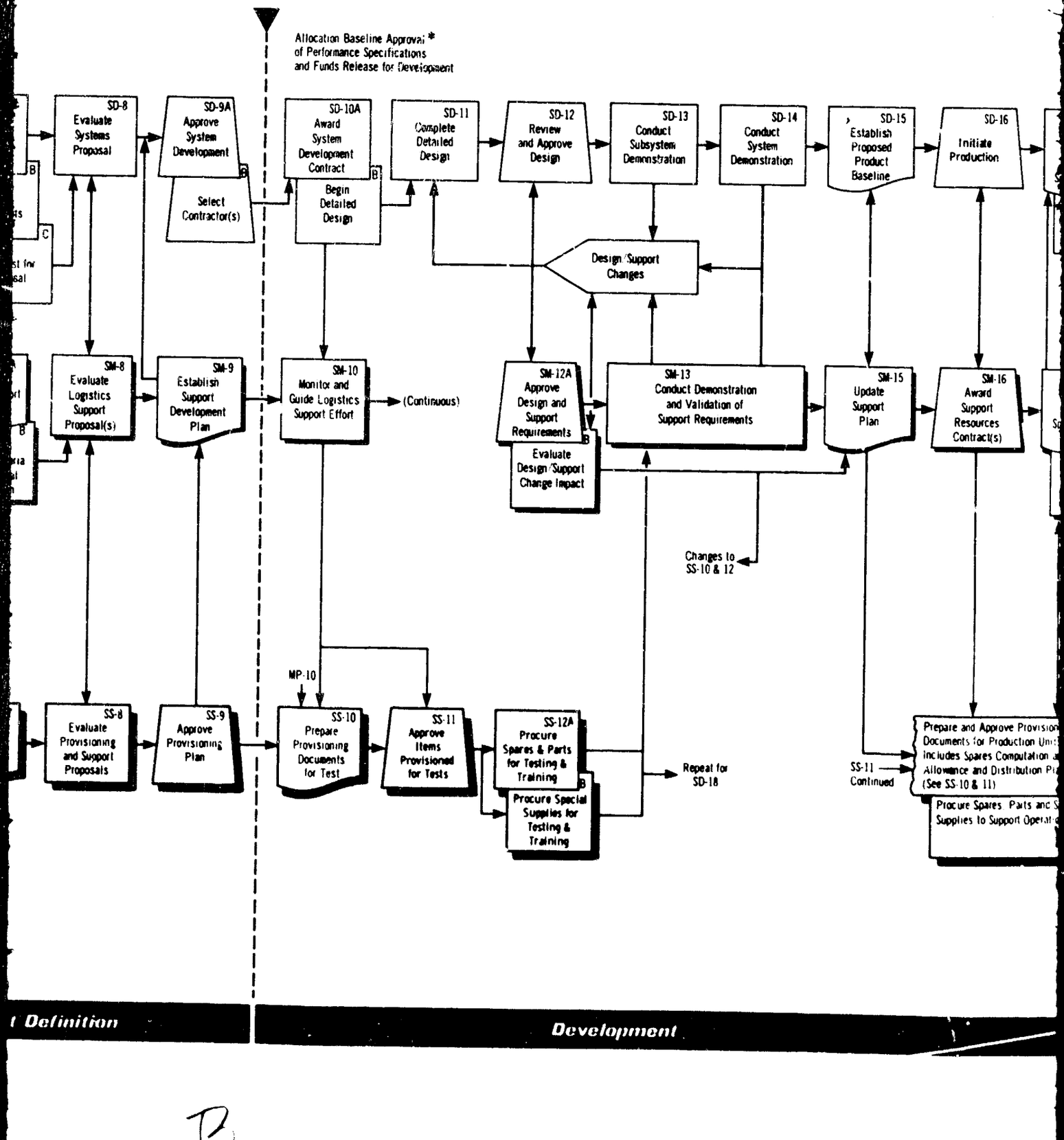
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SD-8
Evaluate Systems Proposal
SD-9A
Approve System Development
Select Contractor(s)
SD-10A
Award System Development Contract
Begin Detailed Design
SD-11
Complete Detailed Design
SD-12
Review and Approve Design
SD-13
Conduct Subsystem Demonstration
SD-14
Conduct System Demonstration
SD-15
Establish Proposed Product Baseline
SD-16
Initiate Production
Design/Support Changes
SM-8
Evaluate Logistics Support Proposal(s)
SM-9
Establish Support Development Plan
SM-10
Monitor and Guide Logistics Support Effort
(Continuous)
SM-12A
Approve Design and Support Requirements
Evaluate Design/Support Change Impact
SM-13
Conduct Demonstration and Validation of Support Requirements
SM-15
Update Support Plan
SM-16
Award Support Resources Contract(s)
Changes to SS-10 & 12
MP-10
SS-8
Evaluate Provisioning and Support Proposals
SS-9
Approve Provisioning Plan
SS-10
Prepare Provisioning Documents for Test
SS-11
Approve Items Provisioned for Tests
SS-12A
Procure Spares & Parts for Testing & Training
Procure Special Supplies for Testing & Training
Repeat for SD-18
SS-11 Continued
Prepare and Approve Provision
Documents for Production Un
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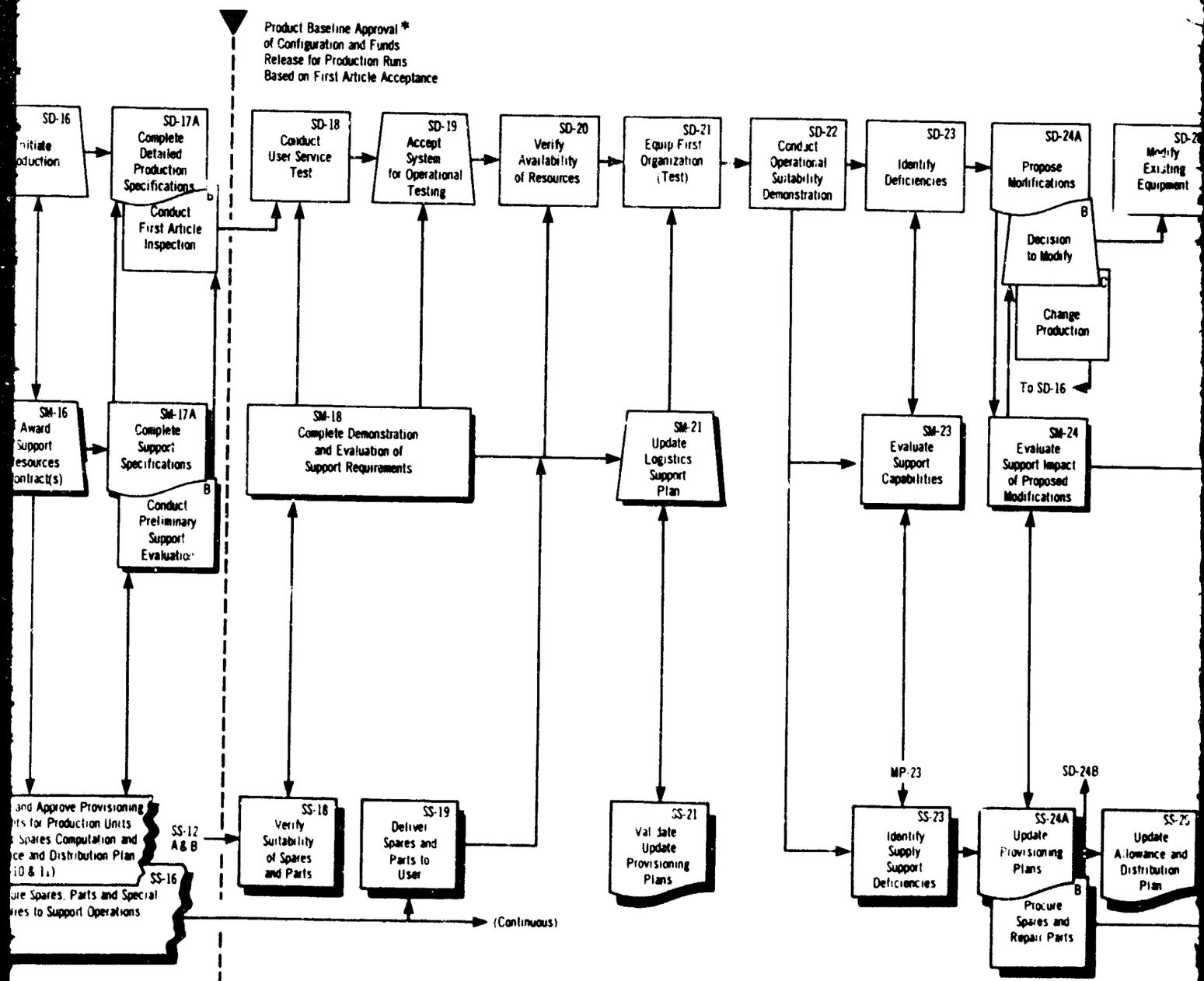
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Test
SD-19
Accept
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Verify
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SD-22
Conduct
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SD-23
Identify
Deficiencies
SD-24A
Propose
Modifications
Decision
to Modify
Change
Production
To SD-16
SM-16
Award
Support
SM-17A
Complete
Support
Specifications
Conduct
Preliminary
Support
Evaluation
SM-18
Complete Demonstration
and Evaluation of
Support Requirements
SM-21
Update
Logistics
Support
Plan
SM-23
Evaluate
Support
Capabilities
SM-24
Evaluate
Support Impact
of Proposed
Modifications
MP-23
SD-24B
SS-12
A & B
SS-16
SS-18
Verify
Suitability
of Spares
and Parts
SS-19
Deliver
Spares and
Parts to
User
SS-21
Validate
Update
Provisioning
Plans
SS-23
Identify
Supply
Support
Deficiencies
SS-24A
Update
Provisioning
Plans
Procure
Spares and
Repair Parts
SS-25
Update
Allowance and
Distribution
Plan
(Continuous)

Figure 9

SUPPLY SUPPORT (SS)

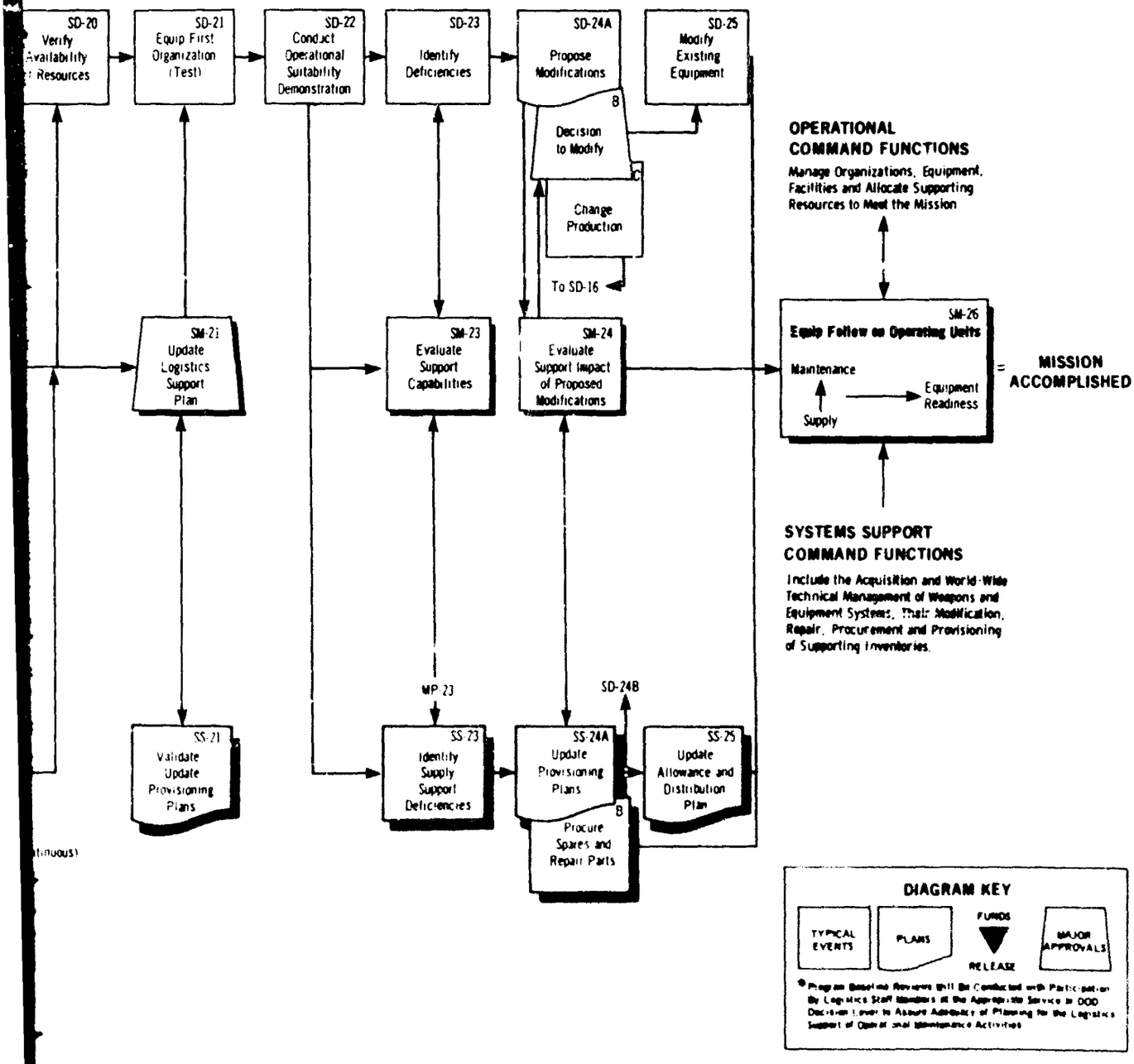


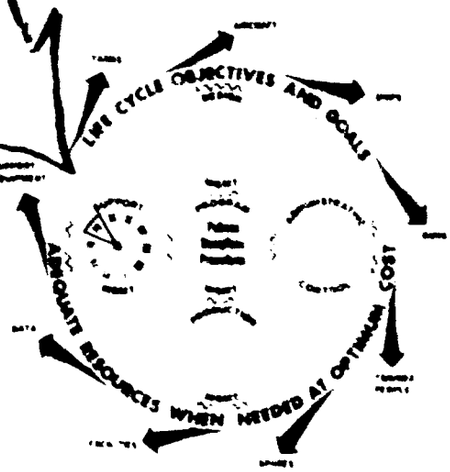
Figure 9

TRANSPORTATION AND HANDLING

CHAPTER 7

Interface Responsibilities

- Maintainability and Reliability Goals for and Impact on Packaging, Preservation and Transportability
- Maintenance Planning for Deployments, Repair, Recycle and Special Handling
- Support and Test Equipment Transportability in Design, Packaging and Preservation
- Supply Support Systems and Locations for Transport, Packaging and Preservation
- Technical Data Instructions for Transportation, Handling, Packaging and Preservation
- Facilities Requirements for Shipping and Receiving Terminals
- Personnel and Training Requirements for all Modes of Transportation, Handling, Packaging and Preservation
- Funding Requirements and Allocations for Special Supporting Transport and Packaging Programs
- Management Data Analysis Quantifying Transportation Delays and Handling Loss



7

Transportation and Handling

7.1 Introduction

The transportation and handling element includes the characteristics, actions and requirements necessary to insure the capability to transport, preserve, package and handle all equipment and support items. The functional requirements and actions are developed from operations and maintenance analyses, equipment design drawings, specifications and other documentation defining transportability criteria, handling equipment and procedures, and packaging and preservation needs. Requirements to be considered include:

- Transportability and packaging criteria such as time, locations, duration, frequency, volume, safety, security and fragility;
- Desired locations for transportation equipment and facilities;
- Planned availability of existing system capabilities by quantity, volume and location;
- Additional or special transportation and handling procurement requirements; and
- Interfaces with other system design and support management functions.

These considerations require support management attention through all phases of the life cycle. Block diagrams of activities in the transportation and handling program and their integration with other design and support program events are shown on figure 10.

7.2 Detailed Event Description

TH-2 Prepare Transportation and Handling Portion of Logistics Support Capability Estimate

Transportation, handling and packaging capabilities to support the proposed logistic requirements (SM-1) are evaluated for input into the logistics support capability estimate (SM-2). This evaluation includes broad considerations of:

- Initial transportation, packaging and materials handling considerations of designated and backup modes, transportation and handling equipment requirements, and packaging requirements for movement or deployment of equipment, munitions and supplies.
- Rationale to be used in requirements identification,
- Requirements constraints (SM-1) on transportation and handling capabilities,
- Operations and support modes (e.g., deployments, frequencies, durations, environments, support concepts, etc.),
- Current capabilities to satisfy requirements, and
- Data on similar equipment (MD-2).

TH-3 Evaluate Effect of Support Alternatives on Transportation and Handling

Government or contractor transportation, packaging and handling trade-off studies are conducted for selection of optimum modes, and procedures. All alternatives are rated for the most favorable combination of options to be further defined, including those involving other support elements. Forecast information regarding cost, technical feasibility and high risk areas is prepared. The results of this effort are included in the maintainability and reliability studies (MR-3) and system feasibility studies (SD-3).

TH-4 Establish Transportation and Handling Concepts

Transportation, handling, packaging and preservation concepts and requirements are established in consonance with maintainability and reliability tradeoffs (MR-3), results of feasibility studies (SD-3) and maintenance and other support concepts. These concepts and requirements take the form of initial gross specifications to be included in the system and support concept formulation packages (SD-4B and SM-4B). They describe selected system equipment modes under consideration for detailed specifications development.

TH-5 Provide Transportation and Handling Input To Support Plan Requirements

As a result of system concept approval (SD-4B), logistics support plan requirements (SM-5) are prepared for inclusion in the system development plan (SD-5). These inputs are in the form of contract terminology for inclusion in both the logistics support management plan (SM-7A) and the request for proposal. They include such things as:

- Concept information (TH-4),
- Scope of contractor and government transportation and handling development efforts and milestones,
- Technical interfaces,
- Existing transportation, handling and packaging systems to be considered, and
- Initial functional transportation models.

TH-7 Establish Transportation and Handling Evaluation Criteria

Criteria for evaluating the transportation, handling, packaging, and preservation portions of contractor proposals must be developed for inclusion with that of other support elements (SM-7B). Measurement and evaluation methods must be specified to assess the adequacy of contractor proposed programs to identify transportability and handling requirements.

Evaluation of the contractor response to approved support requirements (SD-6B) should include consideration of accessibility, availability, dependability, delivery response time, survivability, security, safety, human factors, cost, etc. The contractor should also be evaluated for the logic of his proposed use of existing transportation and handling capabilities and his justification for additional special support

TH-8 Evaluate Transportation and Handling Proposals

Evaluation of transportability, transportation, handling, packaging, and preservation proposals are performed as part of the overall logistic support evaluations (SM-8).

TH-9 Approve Transportation and Handling Plan

The transportation and handling plan is coordinated and reviewed for compatability with operational and support planning. It is approved as part of the logistics support development plan.

TH-10A Update Transportation and Handling Requirements

Approval of the support development plan (SM-9 and SD-9A) signals the start of detailed design and the beginning of a continuing maintenance engineering analysis effort (SD-10B and MP-10). All transportation and handling requirement inputs, including design-support characteristics, must be continuously updated throughout all life cycle events until establishment of the proposed product baseline (SD-15). Results include incremental acceptance of design support decisions and detailed specifications criteria for newly identified requirements.

TH-10B Input Transportation and Handling Specifications to System Support Plans

Updated transportation and handling requirements provide the basis for developing detailed specifications for design and development of systems and support equipment. Concurrent evaluation of transportation and handling support elements must be accomplished as part of subsystem and system demonstrations (SD-13 and 14).

TH-16 Award Special Transportation and Handling Contracts and Agreements

Contracts for transportation and handling are included as part of the production contract (SD–16) as appropriate. Concurrently, host-tenant or interdepartmental agreements are initiated to insure follow-on transportation and handling support.

TH-13 Evaluate Transportation and Handling of Hardware

As part of the demonstration and verification of support requirements (SM–18), the transportation and handling evaluation includes:

- Evaluation of the transportation system, transportation and handling equipment, and packaging capabilities to achieve all operational and support objectives,
- Review of adequacy of host-tenant and interdepartment agreements,
- Providing acceptance and contract change inputs to effect correction of transportation packaging and handling deficiencies, and
- Providing active support for testing.

TH-21 Update Transportation and Handling Requirements

In preparation for equipping the first operating unit, the transportation and handling portion of the logistics support management plan is updated to assure:

- Transportation and handling guidance for operational support activities,
- Identification of critical potential problem areas for specialized equipment, modes, routing, etc.,
- Identification of all items of special equipment and facilities required for receipt, on-site handling, storage and reshipment of system and support resources, and
- Identification of specialized packaging and preservation actions, including instructions and controls, for items which require reuse of packaging at production sites.

TH-23 Identify Deficiencies in Transportation and Handling

During operational suitability testing, all transportation, packaging and handling technical and management deficiencies which compromise timely and economical support are identified. These deficiencies are evaluated along with all other system and support deficiencies (SM–23) to determine the overall impact of a proposed modification (SM–24) prior to the decision to modify (SD–24B).

TH-24 Update Transportation and Handling Specifications

Following the decision to modify, transportation, packaging and handling specifications (TH–10B) in the various plans and documents are updated to reflect the latest modification

requirements. These specifications may call for new or changed transportation and handling resources or they may be simple changes to procedures. Typical operational modifications result in either a modification recycle (SD–23 through SD–25) or a continuation of operations. In either case, all operating unit, operational command and system support command documentation is updated to reflect the change. Experience gained in developing and implementing project plans for transportation, handling and packaging should be summarized for use in planning future systems.

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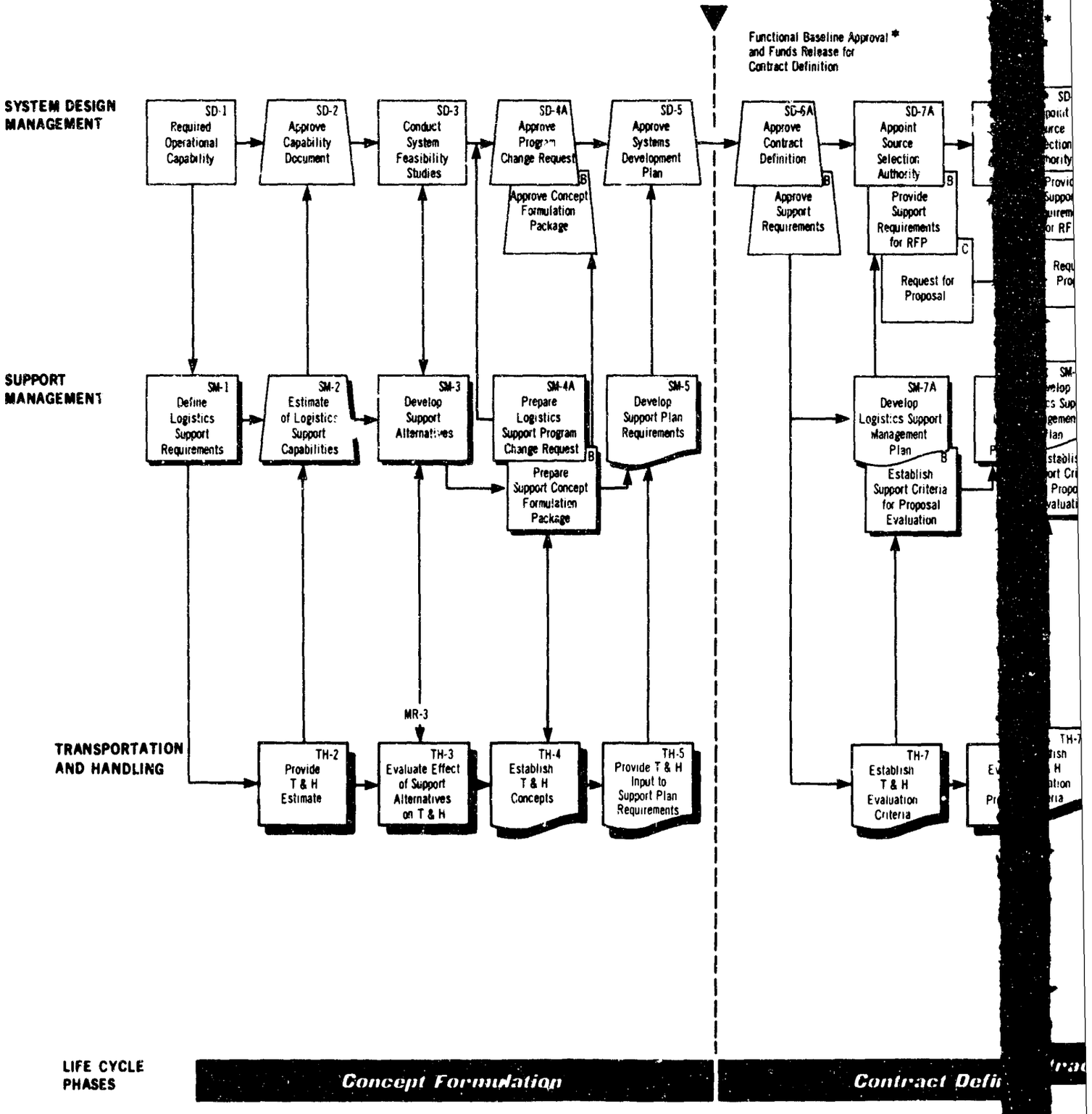
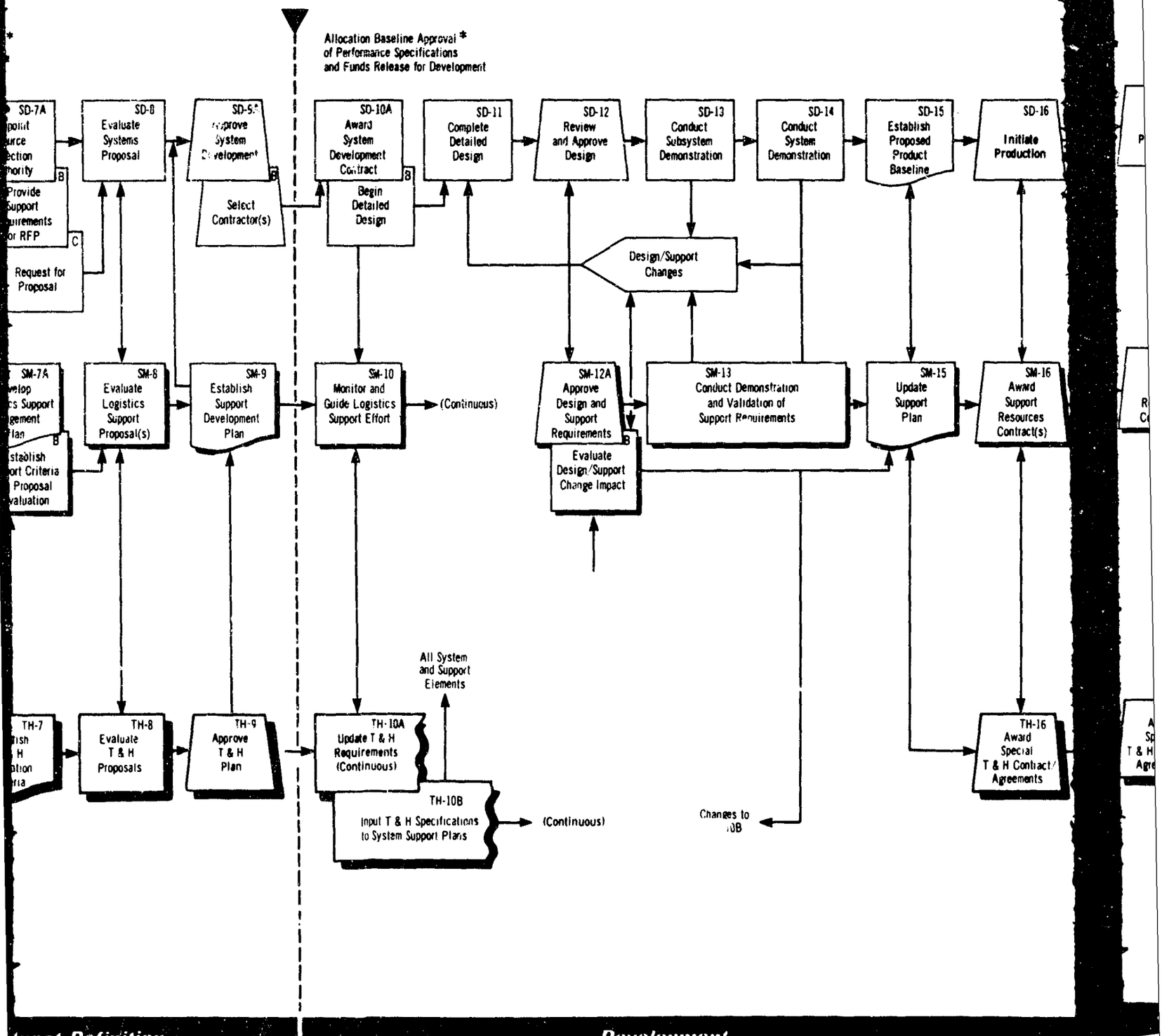

Functional Baseline Approval *
and Funds Release for
Contract Definition
SYSTEM DESIGN MANAGEMENT
SD-1 Required Operational Capability
SD-2 Approve Capability Document
SD-3 Conduct System Feasibility Studies
SD-4A Approve Program Change Request
B
Approve Concept Formulation Package
SD-5 Approve Systems Development Plan
SD-6A Approve Contract Definition
B
Approve Support Requirements
SD-7A Appoint Source Selection Authority
B
Provide Support Requirements for RFP
C
Request for Proposal
SUPPORT MANAGEMENT
SM-1 Define Logistics Support Requirements
SM-2 Estimate of Logistics Support Capabilities
SM-3 Develop Support Alternatives
SM-4A Prepare Logistics Support Program Change Request
B
Prepare Support Concept Formulation Package
SM-5 Develop Support Plan Requirements
SM-7A Develop Logistics Support Management Plan
B
Establish Support Criteria for Proposal Evaluation
MR-3
TRANSPORTATION AND HANDLING
TH-2 Provide T & H Estimate
TH-3 Evaluate Effect of Support Alternatives on T & H
TH-4 Establish T & H Concepts
TH-5 Provide T & H Input to Support Plan Requirements
TH-7 Establish T & H Evaluation Criteria
LIFE CYCLE PHASES
Concept Formulation
Contract Defi


Allocation Baseline Approval *
of Performance Specifications
and Funds Release for Development
SD-7A
SD-8
Evaluate Systems Proposal
SD-5*
Select Contractor(s)
SD-10A
Award System Development Contract
Begin Detailed Design
SD-11
Complete Detailed Design
SD-12
Review and Approve Design
SD-13
Conduct Subsystem Demonstration
SD-14
Conduct System Demonstration
SD-15
Establish Proposed Product Baseline
SD-16
Initiate Production
Provide Support
Request for Proposal
Design/Support Changes
SM-7A
SM-8
Evaluate Logistics Support Proposal(s)
SM-9
Establish Support Development Plan
SM-10
Monitor and Guide Logistics Support Effort
(Continuous)
SM-12A
Approve Design and Support Requirements
Evaluate Design/Support Change Impact
SM-13
Conduct Demonstration and Validation of Support Requirements
SM-15
Update Support Plan
SM-16
Award Support Resources Contract(s)
All System and Support Elements
TH-7
TH-8
Evaluate T & H Proposals
TH-9
Approve T & H Plan
TH-10A
Update T & H Requirements (Continuous)
TH-10B
Input T & H Specifications to System Support Plans
(Continuous)
Changes to 10B
TH-16
Award Special T & H Contract/ Agreements
Contract Definition
Development

B

TRANSPORTATION AND

(INCLUDES PACKAGING AN

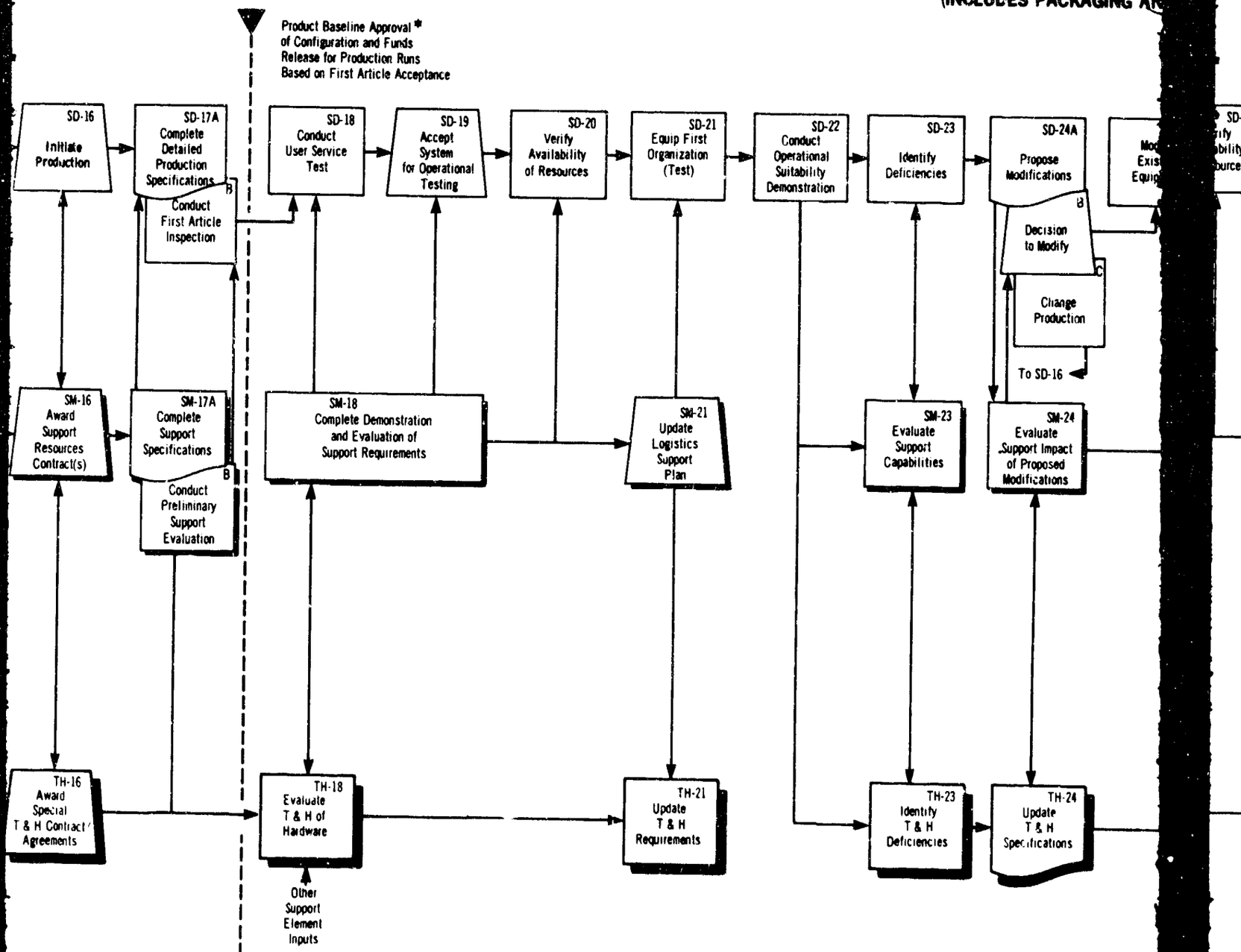


Figure 10-

TRANSPORTATION AND HANDLING (TH)

(INCLUDES PACKAGING AND PRESERVATION)

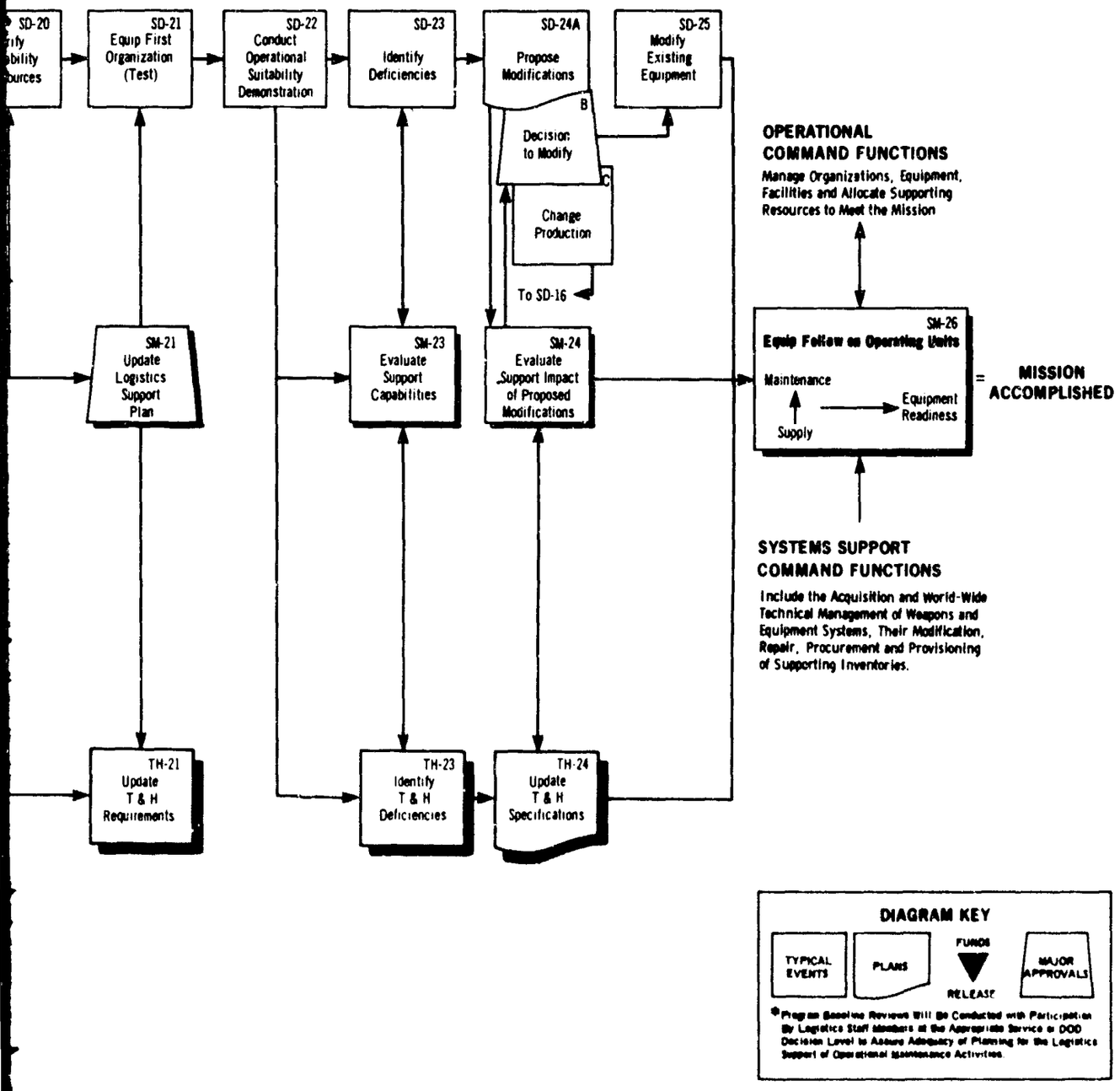


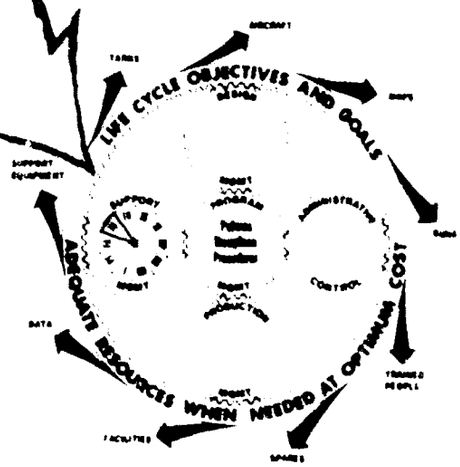
Figure 10

TECHNICAL DATA

CHAPTER 8

Interface Responsibilities

- Maintainability and Reliability Goals and Criteria for Accurate and Instructive Technical Data Coverage
- Maintenance Planning of Technical Data Concepts and Techniques with Human Factors Included
- Support and Test Equipment Drawings, Specifications, Instructions, Constraints, Procurement, Test and Use Inputs
- Supply Support Concepts, Policies, Provisioning, Item Listings, Illustrated Parts, Inventory Record and Control, Locations, Repair and Use Information
- Transportation and Handling Concepts, Drawings, Specifications, Instructions, Acquisition, Test and Use Inputs
- Facilities Drawings, Specifications, Instructions, Acquisition, Test and Use Inputs
- Personnel and Training Concepts, Skills, Courses, Audio-Visual Equipment, Test, Evaluation and Use Inputs
- Funding Requirements and Allocations for Technical Data Development Program
- Management Data Analysis of Application and Effectiveness of Instruction Material



8

Technical Data

8.1 Introduction

The purpose of the technical data program is to provide for the timely development and distribution of technical data necessary to conduct operations, training maintenance, supply, modification, repair and overhaul of the systems and equipment. Technical data provides the link between personnel and equipment. It includes drawings; operating, maintenance and modification instructions; provisioning and facilities information; specifications; inspection, test and calibration procedures; instruction cards and equipment placards; special purpose computer programs and other forms of audio/visual presentation required to guide people performing operations and support tasks.

Technical data planning must be based upon information from equipment operations and maintenance planners (e.g., system/equipment use, design characteristics, operations and maintenance methods and personnel tasks, frequency and time to repair, supply provisioning and inventory items and procedures, etc.). Technical data considerations are involved in design and support trade-offs, tests, demonstrations, production, operations and maintenance. The life cycle events of the technical data program and their relationship to system design and support management are shown on figure 11.

8.2 Detailed Event Description

TD-2 Prepare Technical Data Portion of Logistics Support Capabilities Estimate

Based on projected support capability requirements (SM-1), analysis is conducted to evaluate the applicability of current technical data methods and programs. A preliminary estimate of the technical data capability is made for inclusion in SM-2. The estimate includes such things as the requirement for new data display techniques, data preparation

techniques currently in the inventory, availability for use of commercial data, new processes in development which might reduce data costs, deficiencies of current data systems, and technical data areas needing trade study analyses.

TD–3 Perform Technical Data Trade-offs

Technical data considerations are identified for application to system feasibility studies (SD–3) and trade-off studies (MR–3). These studies, conducted in-house or by selected contractors, are essential for selection of a technical data concept (TD–4). They are based on operational readiness requirements and goals and must be in consonance with alternative concepts being examined for other support elements.

TD–4 Establish Technical Data Concept

A preliminary determination is made of the technical data concept which best satisfies the selected system and support program (SD–4B and SM–4B). This concept defines the preliminary technical data plans, procedures and requirements. It may include recommendations for study of preparation and distribution methods needed to support the technical data program, including the concept of deferred ordering of data. Information justifying new technical data requirements, including their relationship with other support requirements, is provided for management approval. To the maximum extent possible, existing technical data available in the form of current microcards, microfilm, and manuals should be used.

TD–5 Provide Technical Data Plan Requirements

A technical data requirements package, defining the gross specifications for further development of the concept established in TD–4, is prepared for inclusion in the support plan requirements and the RFP (SM–5). The package may include preliminary technical data requirements by type and location, specifications for use of existing data, specifications for development of new data, constraints upon data development and use and program milestones.

TD–7 Establish Technical Data Program Evaluation Criteria

Technical data evaluation criteria are furnished for inclusion with other support criteria in the logistics support management plan (SM–7A). The criteria should include means to evaluate contractor responsiveness to specification requirements, his logic for use of existing technical data presentation methods versus development of new methods, the validity of his program costs, and his proposed methods for demonstrating the use of technical data to support operations, training and maintenance.

TD–8 Evaluate Technical Data Proposals

Technical data proposals are evaluated by specialists in fields requiring use of the data. The resultant technical data plan should reflect the "best mix" solution from all support specialist evaluations. Support management is responsible for the development of ideas and proposals into a technical data program meeting the needs of both the operating units and system/support commands.

TD–9 Approve Technical Data Plan

The technical data plan is coordinated and reviewed for compatibility with operational, training and maintenance planning (SD–9A and MD–9). It is approved as part of the logistics support development plan (SM–9).

TD–10 Begin Preparation of Preliminary Technical Data

Concurrently with detailed equipment design (SD–10B) and maintenance engineering analysis (MP–10), preliminary technical data are prepared for use in early engineering tests and demonstrations. Beginning with drawings and specifications, preliminary data may be prepared in such forms as draft manuals, commercial data, microfilm for storage and visual retrieval or required computer program inputs. This preliminary data could cover orientation information, operations and maintenance, structural repair, illustrated parts breakdown and lists, inspection requirements, test procedures, engineered diagnostic procedures for unscheduled maintenance, transportation and handling, installation and checkout, etc. Design and support changes require technical data updating on a continuing basis. Preliminary data should be prepared in a format which can later be expanded and formalized for use in the production and operational phases of the life cycle.

TD–14 Verify Suitability of Preliminary Technical Data

Technical data, prepared in accord with the approved plan (TD–9), are provided for validation during subsystem and system demonstration (SD–13 and SD–14). Preliminary engineering evaluation must confirm that data type, format and application match the current design configuration and satisfy support requirements and goals established by previous analyses. Compatibility of technical data with equipment configuration is prerequisite to the establishment of the proposed product baseline (SD–15). These concurrent actions precede award of the production contract (SD–16).

TD–16 Procure Formal Technical Data

Based on the proposed product baseline and approval to award support resources contracts (SM–16), procurement or preparation of formal technical data is begun. These data

are made available for provisioning and procurement of initial support requirements and for evaluation with the initial equipment at first article inspection (SD–17B).

TD–18 Verify Suitability of Technical Data

The formal technical data needed to support production and operations are updated to agree with final requirements specifications resulting from first article inspection evaluations (SM–17B). Demonstration during user service tests must verify that the technical data will satisfactorily provide personnel with the information necessary to conduct operations and maintenance in support of established performance goals. Verification actions must also test the technical data for handling durability, accuracy and completeness of information, clarity appropriate for use at the intended skill levels, ease of access and updating.

TD–19 Distribute Technical Data to User

Technical data distribution schedules must be coordinated with test schedules, installation time tables, and equipment activation data for operational units. On receipt, each unit participates in a preliminary information acceptance review of the technical data.

TD–21 Verify/Update Technical Data Plan

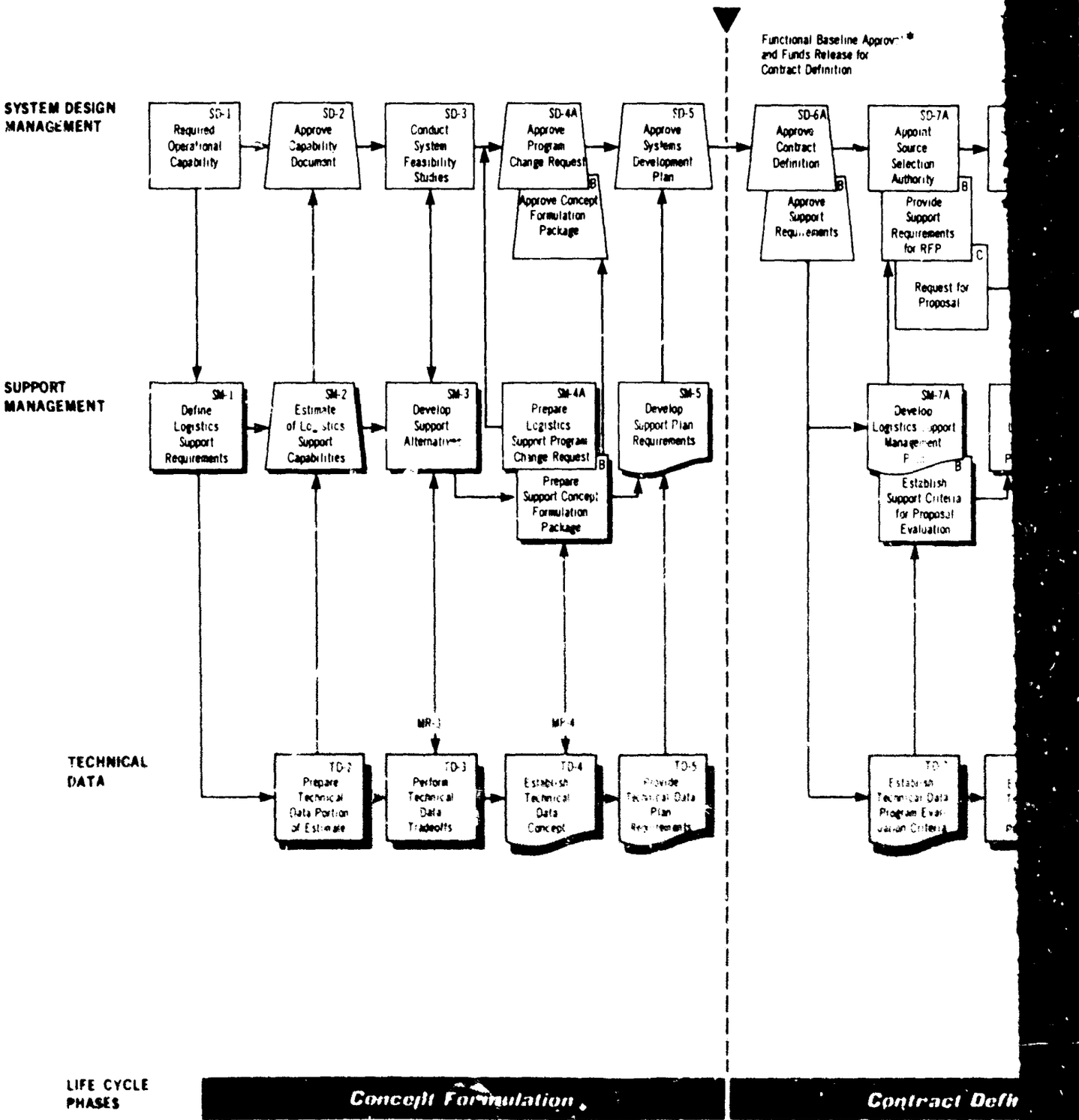
Based upon changes resulting from user service tests (TD–18) and preliminary acceptance reviews, the technical data plan is updated for follow-on procurement. Support management reviews all revisions to insure their compatibility with other support element plans. The technical data plan is then included in the updated support management plan (SM–21)

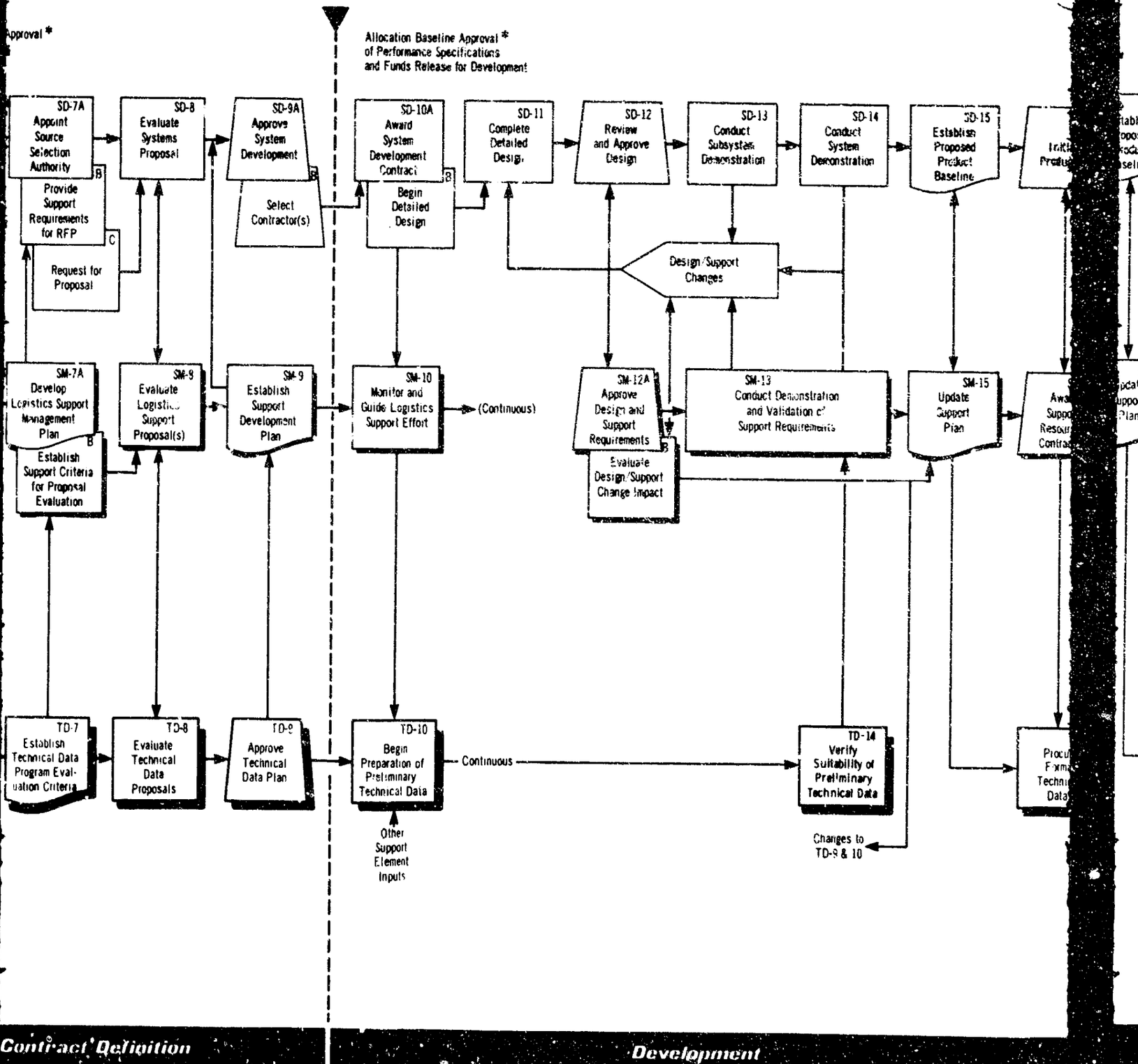
TD–23 Identify Technical Data Deficiencies

During the operational suitability demonstration technical data deficiencies are identified and reported in the overall support evaluation (SM–23). Evaluation criteria similar to that described in TD–18 and MP–23 is the basis for verifying technical data in the operating unit environment.

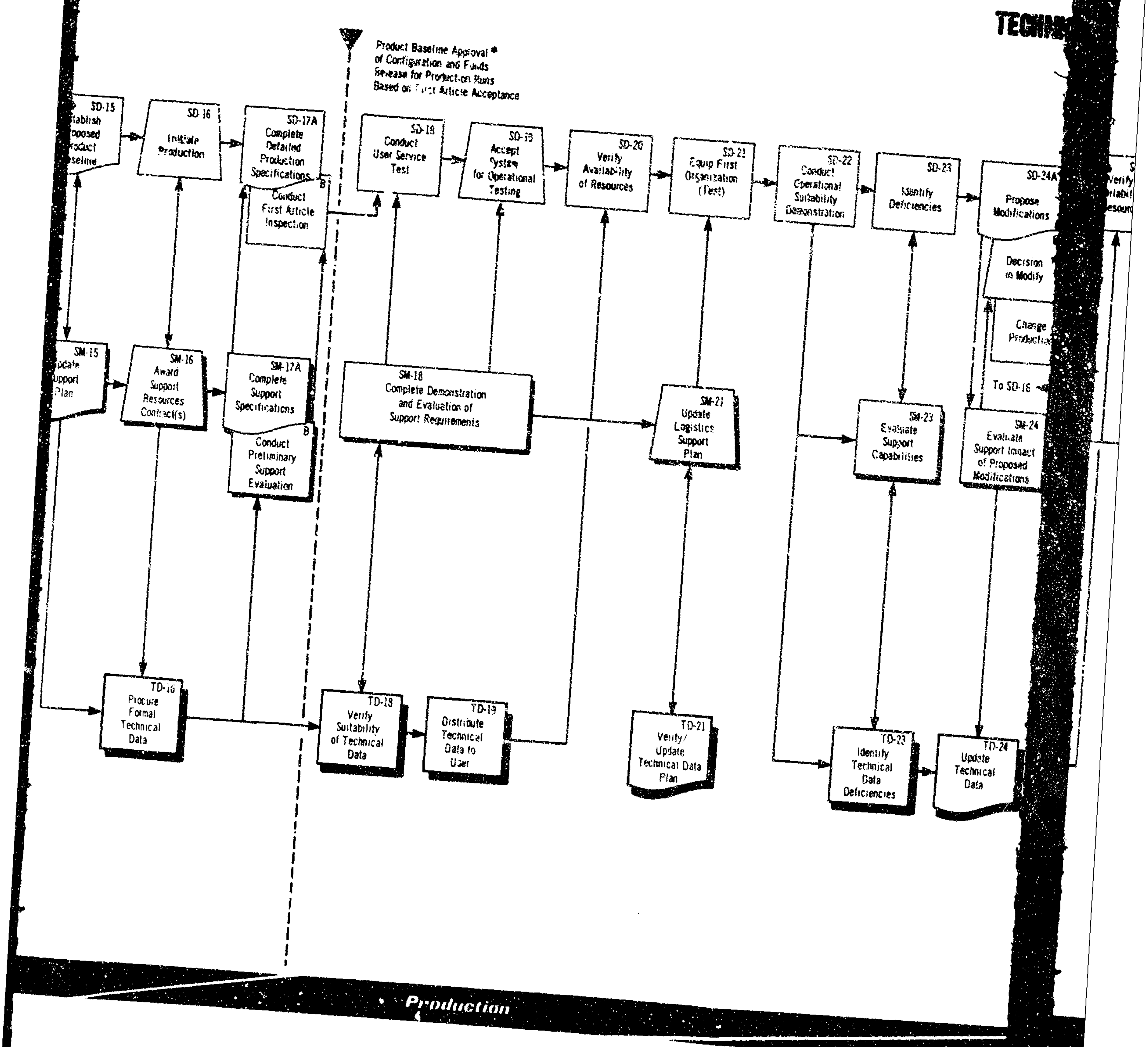
TD–24 Update Technical Data

Technical data must be updated to reflect all changes in equipment or support configuration which result from modification decisions, or deficiencies identified during the operational suitability demonstration.


Functional Baseline Approval and Funds Release for Contract Definition
SYSTEM DESIGN MANAGEMENT
SD-1 Required Operational Capability
SD-2 Approve Capability Document
SD-3 Conduct System Feasibility Studies
SD-4A Approve Program Change Request
B
Approve Concept Formulation Package
SD-5 Approve Systems Development Plan
SD-6A Approve Contract Definition
B
Approve Support Requirements
SD-7A Appoint Source Selection Authority
B
Provide Support Requirements for RFP
C
Request for Proposal
SUPPORT MANAGEMENT
SM-1 Define Logistics Support Requirements
SM-2 Estimate of Logistics Support Capabilities
SM-3 Develop Support Alternatives
SM-4A Prepare Logistics Support Program Change Request
B
Prepare Support Concept Formulation Package
SM-5 Develop Support Plan Requirements
SM-7A Develop Logistics Support Management
B
Establish Support Criteria for Proposal Evaluation
MR-3
MR-4
TECHNICAL DATA
TD-2 Prepare Technical Data Portion of Estimate
TD-3 Perform Technical Data Tradeoffs
TD-4 Establish Technical Data Concept
TD-5 Provide Technical Data Plan
Establish Technical Data Program Evaluation Criteria
LIFE CYCLE PHASES
Concept Formulation
Contract Defn


Approval *
Allocation Baseline Approval *
of Performance Specifications
and Funds Release for Development
SD-7A
Appoint
Source
Selection
Authority
SD-8
Evaluate
Systems
Proposal
SD-9A
Approve
System
Development
SD-10A
Award
System
Development
Contract
SD-11
Complete
Detailed
Design
SD-12
Review
and Approve
Design
SD-13
Conduct
Subsystem
Demonstration
SD-14
Conduct
System
Demonstration
SD-15
Establish
Proposed
Product
Baseline
Provide
Support
Requirements
for RFP
Request for
Proposal
Select
Contractor(s)
Begin
Detailed
Design
Design/Support
Changes
SM-7A
Develop
Logistics Support
Management
Plan
Establish
Support Criteria
for Proposal
Evaluation
SM-8
Evaluate
Logistics
Support
Proposal(s)
SM-9
Establish
Support
Development
Plan
SM-10
Monitor and
Guide Logistics
Support Effort
(Continuous)
SM-12A
Approve
Design and
Support
Requirements
Evaluate
Design/Support
Change Impact
SM-13
Conduct Demonstration
and Validation of
Support Requirements
SM-15
Update
Support
Plan
TD-7
Establish
Technical Data
Program Evaluation
Criteria
TD-8
Evaluate
Technical
Data
Proposals
TD-9
Approve
Technical
Data Plan
TD-10
Begin
Preparation of
Preliminary
Technical Data
Continuous
Other
Support
Element
Inputs
TD-14
Verify
Suitability of
Preliminary
Technical Data
Changes to
TD-9 & 10
Contract Definition
Development

B



Product Baseline Approval * of Configuration and Funds Release for Production Runs Based on First Article Acceptance
SD-15 stablish roposed roduct aseline
SD-16 Initiate Production
SD-17A Complete Detailed Production Specifications
B Conduct First Article Inspection
SD-18 Conduct User Service Test
SD-19 Accept System for Operational Testing
SD-20 Verify Availability of Resources
SD-21 Equip First Organization (Test)
SD-22 Conduct Operational Suitability Demonstration
SD-23 Identify Deficiencies
SD-24A Propose Modifications
Decision to Modify
Change Productio
To SD-16
Verify vailabil esour
SM-15 pdate upport Plan
SM-16 Award Support Resources Contract(s)
SM-17A Complete Support Specifications
B Conduct Preliminary Support Evaluation
SM-18 Complete Demonstration and Evaluation of Support Requirements
SM-21 Update Logistics Support Plan
SM-23 Evaluate Support Capabilities
SM-24 Evaluate Support Impact of Proposed Modifications
TD-16 Procure Formal Technical Data
TD-18 Verify Suitability of Technical Data
TD-19 Distribute Technical Data to User
TD-21 Verify/ Update Technical Data Plan
TD-23 Identify Technical Data Deficiencies
TD-24 Update Technical Data
Production

TECHNICAL DATA (TD)

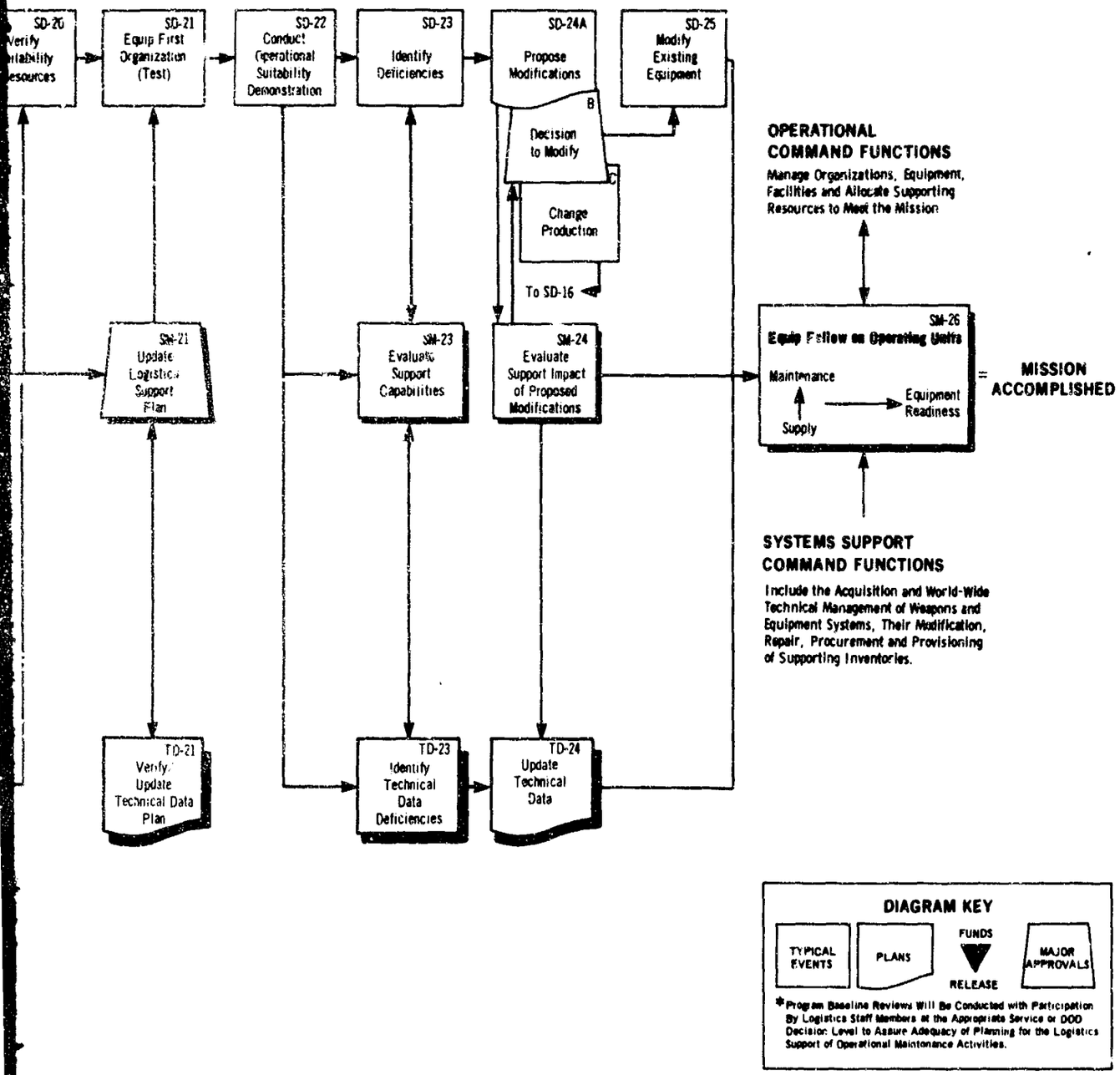


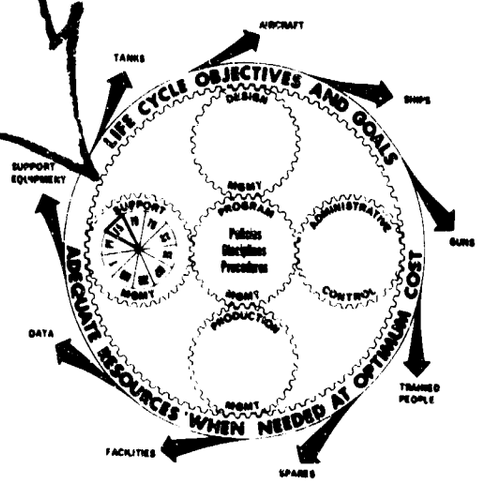
Figure 11

FACILITIES

CHAPTER 9

Interface Responsibilities

- Maintainability and Reliability Design Characteristics, Performance Goals Facilities Evaluation Criteria.
- Maintenance Planning Concepts, Actions, Requirements and Facilities Evaluations.
- Support and Test Equipment Design Characteristics, Plans and Utilities Requirements.
- Supply Support Concepts, Plans and Warehouse Requirements.
- Transportation and Handling Equipment Requirements for Real Property.
- Technical Data Criteria, Procedures and Facilities Design and Performance Information.
- Personnel and Training Concepts, Plans and Human Interface Evaluation.
- Funding Requirements and Allocations for Facilities Program.
- Management Data for Evaluation of Facilities Performance and Use.



9
Facilities

9.1 Introduction

The purpose of the facilities program is to assure that all required facilities are available to the operating forces and supporting activities in a timely manner. The ability to perform the mission could depend on the adequacy of facilities provided concurrently with the prime system or equipment. Facilities planning is based on operations and maintenance analyses, equipment design drawings, specifications and other documentation necessary for defining types of facilities, locations, space needs, environment, duration and frequency of use, personnel interfaces, installation activities, training requirements, test functions and existing facility applications. Development schedules must consider construction delay experience on similar programs due to seasonal weather and other regional considerations such as labor, soil conditions, etc. Facilities planning requires support management attention through all phases of the life cycle to provide positive coordination with other program elements, particularly with regard to dates of need and construction program lead times. The facilities program events and their relationship to system design and support management are shown on figure 12.

9.2 Detailed Event Description

FA–2 Evaluate Requirements and Define Facilities Support Capability

Based on the required operational capability (SD–1) and the gross support requirement (SM–1), an analysis is made to determine what facility capabilities are needed. An integral part of this analysis is an assessment of facilities used to maintain similar systems and equipment. This action is based on available operational readiness performance experience data (MD–2), gross system configuration and preliminary maintenance and maintainability assessments of support needs (MP–2 and MR–2). The resultant estimates should define

both existing facilities that may be utilized and those requirements needing further exploratory study. Study contract and in-house project task information is prepared for inclusion in SM–2. Criteria considered in these evaluations include:

- Initial facilities trade-offs needed to define basing, movement, deployment, durations and frequency, etc.,
- Ground rules for facility selection (e.g., considerations of required material resources by type, quantity and location as well as construction force needs in terms of skills, numbers and availability),
- Constraints to be considered (e.g., security, easements, ownership, etc.), and
- Operations and support interfaces to be examined (tenancy concepts, deployment variations, combat contingencies, duration differences, and primary launch, test or operating base complexes along with support shops, personnel, storage and administrative requirements).

FA–3 Perform Facility Trade-offs

System feasibility studies and support element trade-offs are evaluated for their impact on current facilities. Facility trade-off studies are conducted in-house, or by contract, to satisfy new requirements. The best approaches are selected for review and consideration in the maintainability and reliability trade-off studies (MR–3). For example, the trade-off studies may include consideration of alternative basing modes (e.g., hardened vs. dispersed, mobile vs. fixed, land vs. water), existing vs. new facilities, different materials to be considered and portable vs. fixed power sources.

The several support alternatives are evaluated and the most favorable facility concepts selected for further study. Cost information, technical feasibility problems and high risk areas are identified.

FA–4 Establish Facilities Concept

A facilities concept is selected on the basis of maintainability and reliability trade-offs (MR–3) and system feasibility studies (SD–3). This concept is reviewed for compatibility with the maintenance concept (MP–4) and is included in the support concept formulation package (SM–4B) as guidance for the facility plan requirements to be identified in FA–5.

FA–5 Provide Facilities Plan Requirements

Facilities plan requirements are prepared for inclusion in the logistics support plan requirements and the RFP (SM–5). They include criteria for further development of:

- Real estate and construction specifications,

- Primary facilities such as materials, power and communications, water, access roads and critical real property,
- Support facilities for ships, personnel, training, storage, transportation, and administrative use,
- Critical research and test needs,
- Facility life cycle cost and budget estimates for the funding schedule (F–5), and
- Host-tenant agreements for support requirements.

FA–7A Select Facility Architect-Engineer and Begin Design

Because of the lead time involved in the procurement and construction of prototype facilities such as test stands, silos, checkout docks and shipboard facilities, project action is taken to initiate development of peculiar design specifications. This design or architect engineering task may be accomplished by government or by contract in accordance with current Service instructions and procedures.

FA–7B Establish Facility Plan Evaluation Criteria

Technical and management evaluation criteria and interface control methods must be developed for determining the contractors' responsiveness to the general facility plan requirements (FA–5) and engineering design specifications (FA–7A). As part of the overall support criteria (SM–7B), they include evaluation of:

- Functional performance characteristics of supporting facilities (e.g., installed equipments' reliability, maintainability, useful life, environmental design and transportability),
- Both general and definitive design and construction specifications, standards, and constraints,
- Detailed facilities concepts for nontechnical support (e.g., functional requirements, support policies, survival requirements and policies, etc.), siting and layout (e.g., area plans and site plans such as access, paving and drainage, contours, quantity-distance criteria, etc.), and civil, architectural, structural, mechanical and electrical requirements, and
- Funding, schedule, technical and management control for those items requiring prototype construction and testing (e.g., critical installed equipment and environmental control, electrical, power, missile launch suspension and other similar systems).

FA-8 Evaluate Proposals for Facilities Prototype Construction

Contractor proposed facilities plans should be evaluated for:

- Adequacy and responsiveness to defined requirements and criteria,
- Identification of and justification for new facility specifications and requirements, and
- Cost to design, develop, and acquire proposed facilities.

The evaluation ratings, recommended changes to requirements and schedules, allowable deviations and recommended contract revisions should be included in the logistics support evaluation report. (SM-8).

FA-9A Approve Prototype Construction

Concurrent with system development approval, prototype construction is approved and funds allocated. Prototype design is completed and construction bids are solicited for the planned facilities.

FA-9B Initiate Military Construction Programming Action

In accord with development plan requirements for construction or acquisition of operational and support facilities, programming action is initiated to request funds authorization. Action must also be taken to initiate installation of facilities outside the scope of the military construction program such as shipboard facilities, vans, etc.

FA-10 Begin Facility Construction (Prototype)

With the beginning of prototype facility construction, continuous surveillance of the development of all system and support requirements is performed to see that design and support changes are not made without consideration of their impact on facilities. Changes require reevaluation of funds and schedules.

FA-12 Verify Availability of Prototype Test Facility

Prior to subsystem and system demonstration, the prototype test facility is evaluated for compatibility with requirements. Progressive reviews of the installations' adaptability to system and support requirements must be performed to verify facility acceptability. Change requirements identified during installation, checkout or test are evaluated and corrective action initiated (SM-12B).

FA-13 Obtain Approval for Military Construction

Approval is received for the required military construction of operational support facilities (FA-9B). System and support changes found during prototype evaluation are incorporated into the facility drawings and other documentation.

FA-16 Complete Final Design and Award Facility Construction Contracts

Concurrent with the initiation of equipment production, facility specifications and contract documents are prepared and advertised for bid (see SD-16). Bid proposals and construction schedule milestones must be consistent with the schedules of all other program elements. The bid proposals are reviewed and construction contracts awarded. For other than military construction facilities, final design and installation is verified.

FA-17 Complete Facility Construction

Inspection and acceptance of the initial facility is progressively accomplished throughout facilities construction, system and equipment installation, checkout and service test.

FA-18 Activate Operational Support Facilities

Operational and support facilities are activated for service test. Facility design and equipment interfaces are tested and verified during the equipment and support demonstrations. Deficiencies are documented and evaluations conducted. Changes are processed in accord with applicable configuration management directives and instructions.

FA-21 Validate/Update Facilities Plan

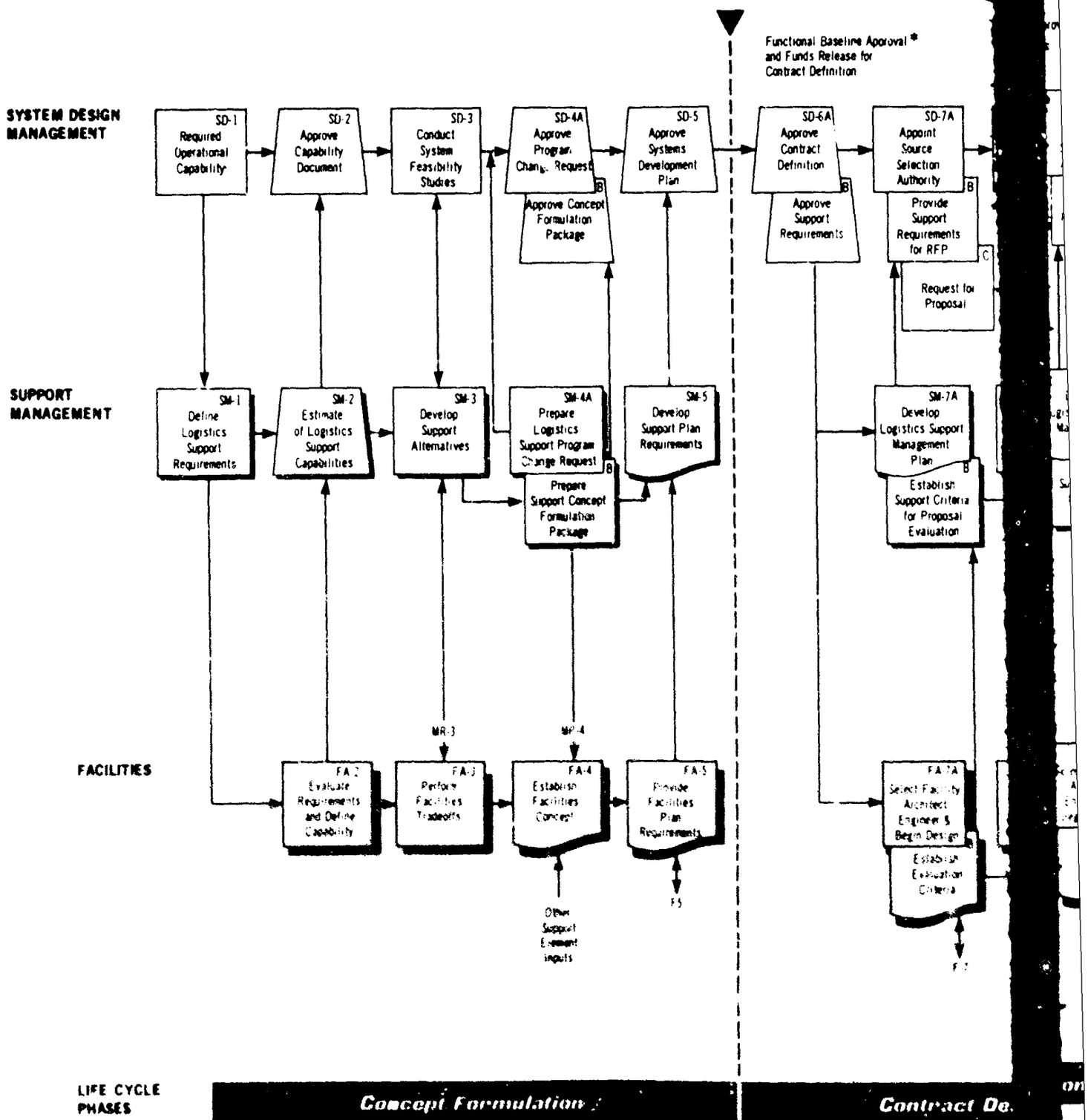
Based on the changes identified during service test and initial operational installation, the facilities plan is updated to provide guidance for follow-on support activities, identification of critical problem areas, identification of special transportability and operability criteria, and awareness of special requirements for survivability, security, etc. Facilities schedule and funding requirements are reevaluated based on overall program changes and constraints.

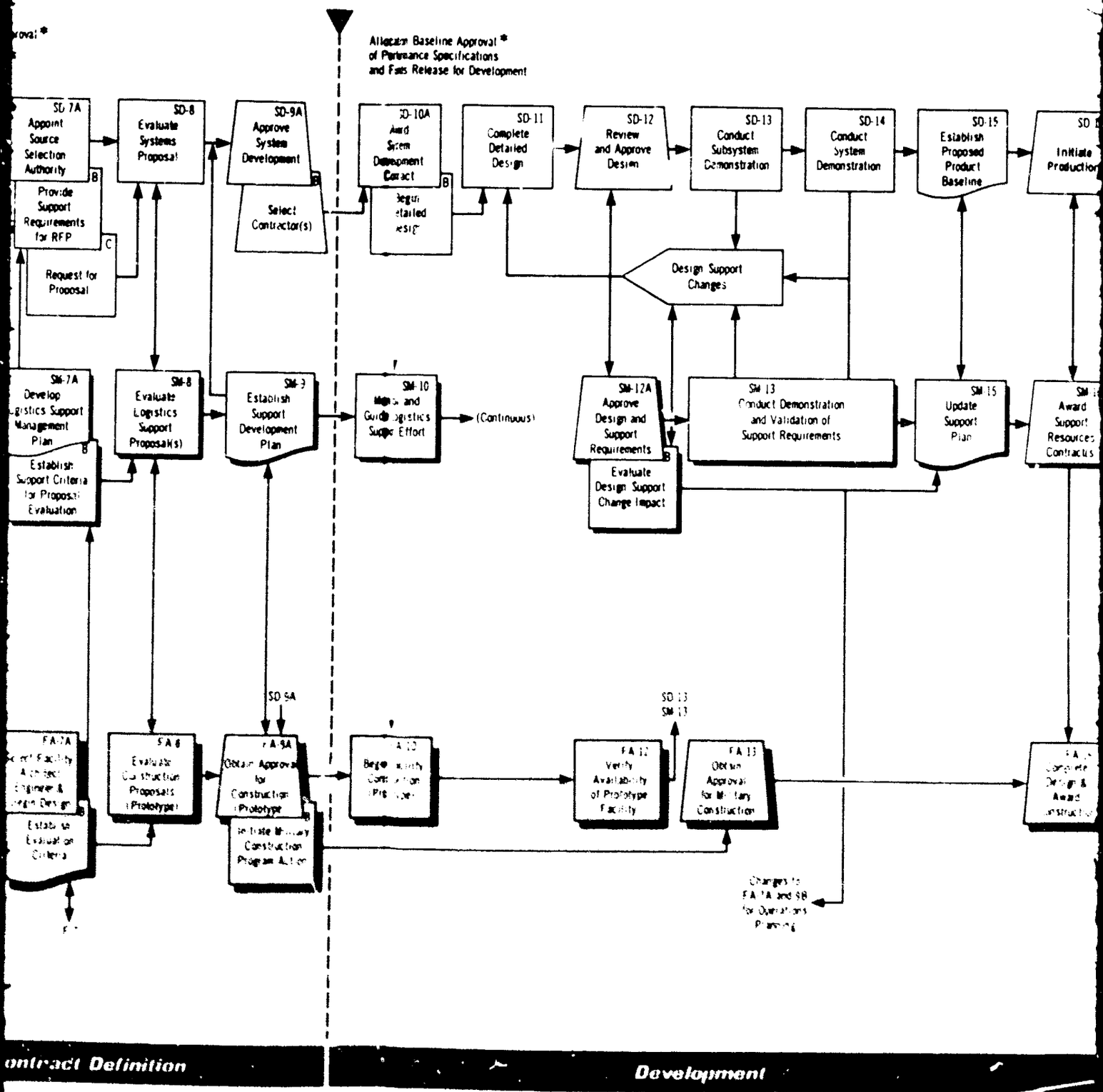
FA-23 Identify Facilities Deficiencies

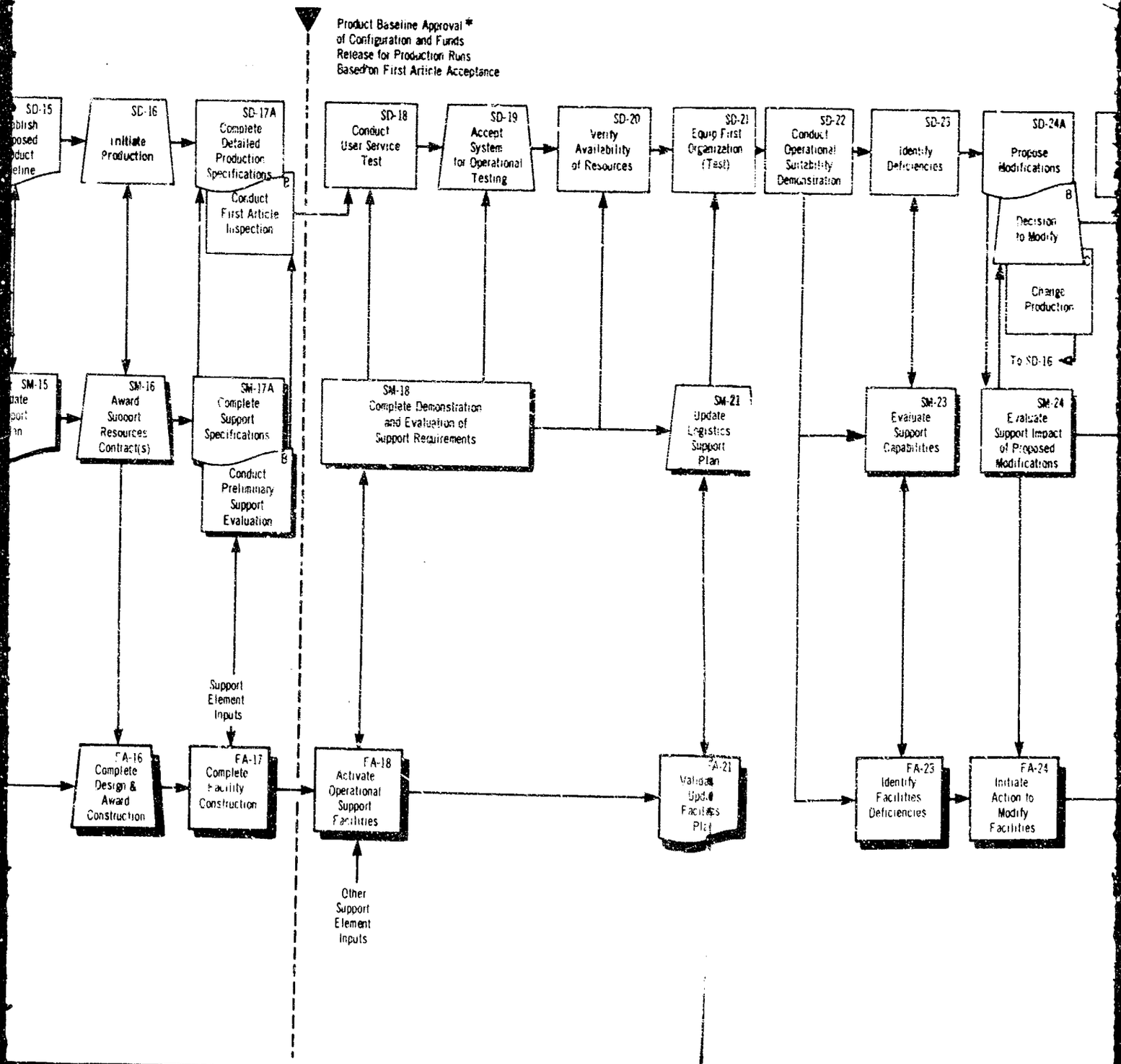
During operational testing all facility deficiencies are identified. These deficiencies are evaluated along with all other logistics support deficiencies (SM-23) to determine the possible impact of required modifications (SM-24) prior to any decision to modify (SD-24B).

FA–24 Initiate Action To Modify Facilities

Action to modify facilities is initiated concurrently with the decision to modify interfacing equipment (SD–24B). Plans are updated to agree with all changes. Specifications for any changes must be in accord with configuration management directives and instructions. Whether modifications require a major facility improvement or only minor changes to the operational facility, all documentation should reflect the changes. They should also be recorded as experience data for future planning (MD–22B).


Functional Baseline Approval *
and Funds Release for
Contract Definition
SYSTEM DESIGN MANAGEMENT
SD-1 Required Operational Capability
SD-2 Approve Capability Document
SD-3 Conduct System Feasibility Studies
SD-4A Approve Program Change Request
SD-5 Approve Systems Development Plan
SD-6A Approve Contract Definition
SD-7A Appoint Source Selection Authority
Approve Concept Formulation Package
Approve Support Requirements
Provide Support Requirements for RFP
Request for Proposal
SUPPORT MANAGEMENT
SM-1 Define Logistics Support Requirements
SM-2 Estimate of Logistics Support Capabilities
SM-3 Develop Support Alternatives
SM-4A Prepare Logistics Support Program Change Request
SM-5 Develop Support Plan Requirements
SM-7A Develop Logistics Support Management Plan
Prepare Support Concept Formulation Package
Establish Support Criteria for Proposal Evaluation
MR-3
MR-4
FACILITIES
FA-2 Evaluate Requirements and Define Capability
FA-3 Perform Facilities Tradeoffs
FA-4 Establish Facilities Concept
FA-5 Provide Facilities Plan Requirements
FA-7A Select Facility Architect Engineer & Begin Design
Establish Evaluation Criteria
Other Support Element Inputs
F5
F7
LIFE CYCLE PHASES
Concept Formulation
Contract De


Allocated Baseline Approval * of Performance Specifications and Fists Release for Development
SD-7A Appoint Source Selection Authority
SD-8 Evaluate Systems Proposal
SD-9A Approve System Development
SD-10A Award System Development Contract
SD-11 Complete Detailed Design
SD-12 Review and Approve Design
SD-13 Conduct Subsystem Demonstration
SD-14 Conduct System Demonstration
SD-15 Establish Proposed Product Baseline
Provide Support Requirements for RFP
Request for Proposal
Select Contractor(s)
Design Support Changes
SM-7A Develop Logistics Support Management Plan
SM-8 Evaluate Logistics Support Proposal(s)
SM-9 Establish Support Development Plan
SM-10 (Continuous)
SM-12A Approve Design and Support Requirements
SM-13 Conduct Demonstration and Validation of Support Requirements
SM-15 Update Support Plan
Establish Support Criteria for Proposal Evaluation
Evaluate Design Support Change Impact
SD-9A
SD-13 SM-13
FA-7A
FA-8
FA-9A Obtain Approval for Construction (Prototype)
FA-12
FA-12 Verify Availability of Prototype Facility
FA-13 Obtain Approval for Military Construction
Establish Evaluation Criteria
Changes to FA-7A and 9B for Operations
Contract Definition
Development


Product Baseline Approval * of Configuration and Funds Release for Production Runs Based on First Article Acceptance
SD-15
SD-16 Initiate Production
SD-17A Complete Detailed Production Specifications
Conduct First Article Inspection
SD-18 Conduct User Service Test
SD-19 Accept System for Operational Testing
SD-20 Verify Availability of Resources
SD-21 Equip First Organization (Test)
SD-22 Conduct Operational Suitability Demonstration
SD-23 Identify Deficiencies
SD-24A Propose Modifications
Decision to Modify
Change Production
To SD-16
SM-15
SM-16 Award Support Resources Contract(s)
SM-17A Complete Support Specifications
Conduct Preliminary Support Evaluation
SM-18 Complete Demonstration and Evaluation of Support Requirements
SM-21 Update Logistics Support Plan
SM-23 Evaluate Support Capabilities
SM-24 Evaluate Support Impact of Proposed Modifications
Support Element Inputs
FA-16 Complete Design & Award Construction
FA-17 Complete Facility Construction
FA-18 Activate Operational Support Facilities
FA-21 Validate Update Facilities Plan
FA-23 Identify Facilities Deficiencies
FA-24 Initiate Action to Modify Facilities
Other Support Element Inputs

Figure

FACILITIES (FA)

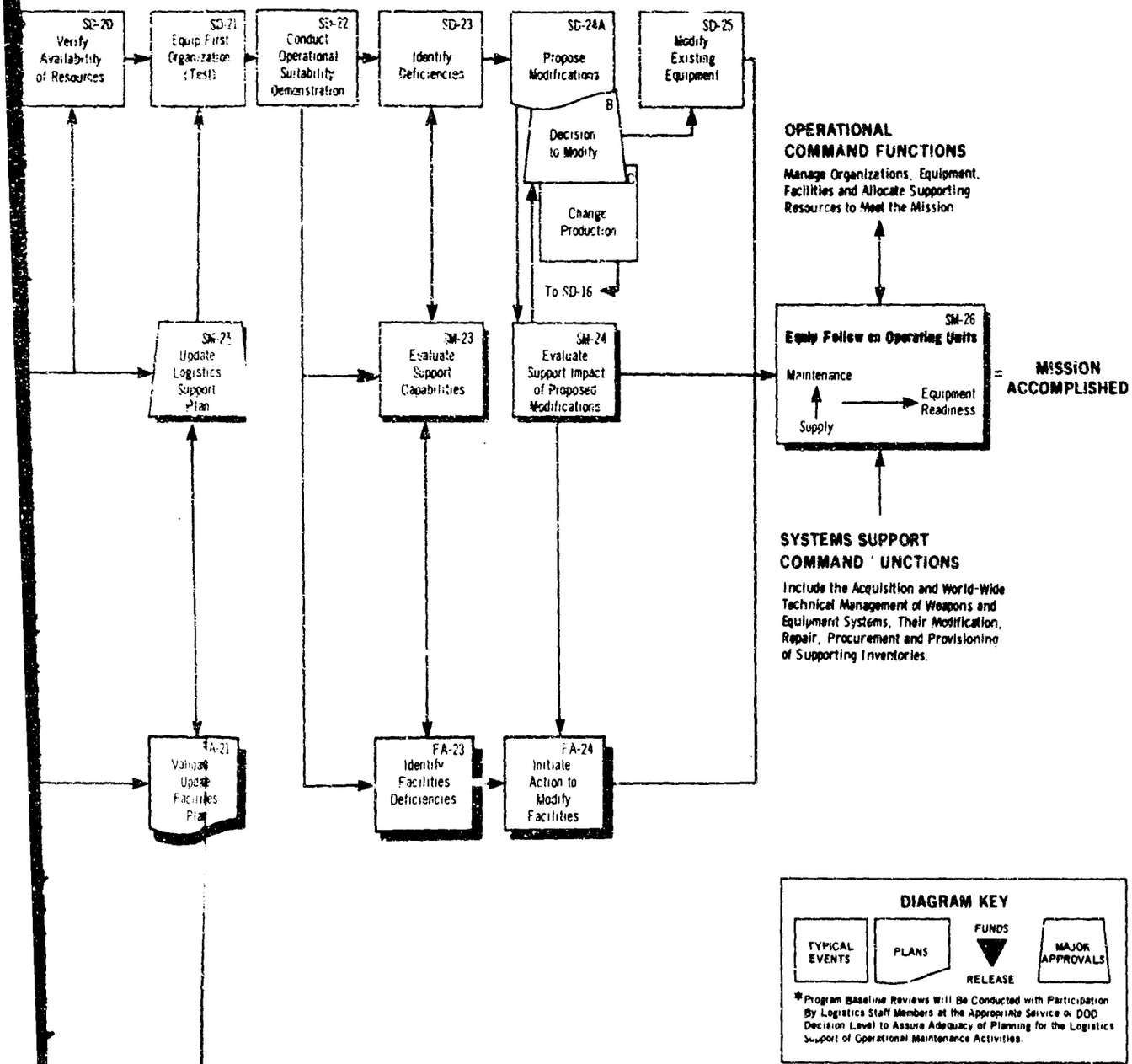


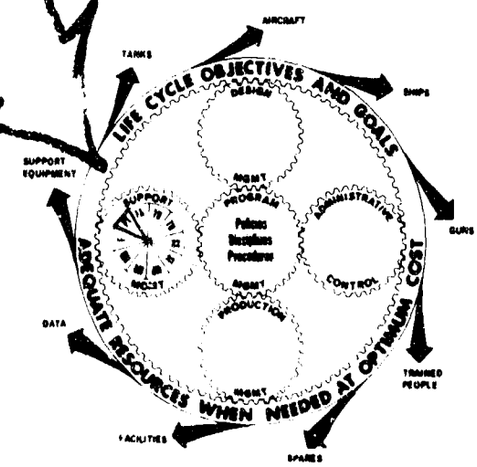
Figure 12

PERSONNEL AND TRAINING

CHAPTER 10

Interface Responsibilities

- Maintainability and Reliability Goals, Test and Human Performance Demonstration Criteria.
- Maintenance Planning Concepts, Policies, Tasks, Times and Demonstration.
- Support and Test Equipment Drawings, Specifications and Plans. Training Equipment Design, Test and Use.
- Supply Support Concepts, Policies and Use Information for Unit Support Personnel.
- Transportation and Handling Concepts and Procedures Applied to Personnel Skills and Disciplines.
- Technical Data Display, Locations, Procedures and Human Response.
- Facilities Requirements for Special Operations, Training, Administration and Housing.
- Funding Requirements and Allocations for Personnel and Training Programs.
- Management Data Analysis of Maintenance Manhour Costs Per Operating Hour or Cycle and by Maintenance Level.



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10

Personnel and Training

10.1 Introduction

The personnel and training program defines the requirements for trained operations and maintenance personnel and training devices needed to support the program through all life cycle phases. A realistic estimate of current manning capabilities, in terms of both numbers and skills, must be made against the probable quantitative and qualitative manning demands of the system or equipment concepts under study. As hardware concepts are developed, design and support decisions must be made with due consideration for their impact on manpower and training requirements. These requirements are translated into specific manning plans in terms of numbers and military skill classifications. Projections of training requirements must reflect attrition experience. Special requirements for trainers and training aids must be developed along with training curricula. These requirements must complement maintenance concepts and technical data methods.

Personnel and training planners must progressively identify manning requirements for test and demonstration, operations and maintenance in the use environment. They must consider task categories and resulting optimum skill mixes needed to achieve or exceed readiness performance goals. Personnel requirements for operations and maintenance must be balanced against manpower availability. All deficits must be covered by firm training actions and timely manpower commitments. A block diagram of events that make up the personnel and training program is shown on figure 13.

10.2 Detailed Event Description

PT-2 Prepare Personnel and Training Portion of Logistics Support Capabilities Estimate

Current and projected personnel capabilities of the operating forces must be evaluated for their potential application against the personnel requirements described in SM-1. Knowledge of projected personnel capabilities and restraints must be acquired for development

of support alternatives (see MR–3 and SM–3). This information should be realistically based on past and current manpower availability at operating levels and applicable readiness performance data.

PT–3 Make Preliminary Estimate of Skill Requirements

Gross estimates of personnel requirements by skills and quantities are made to support maintainability and reliability trade-off studies (MR–3). Consideration must be given to tasks to be performed, identification of required skills, manpower availability (PT–2), special training needs, availability of training facilities and the impact of these estimates on the requirements of each support element.

PT–4 Establish Personnel and Training Concept

Personnel and training concepts are established as a result of prior maintainability and reliability trade-offs (MR–3). These concepts must be in accord with plans for equipment use, maintenance and support. They include tentative identification of quantative and qualitative personnel requirements including any not currently in the skills inventory, assessing the impact of possible changes to existing personnel use patterns, and making preliminary lists of training equipment and facility needs.

These personnel and training concepts become an integral part of the logistics support concept package (SM–4B), which becomes part of the concept formulation package.

PT–5 Develop Personnel and Training Plan Requirements

Personnel and training plan requirements must be developed for input into the support plan and the RFP (SM–5). These requirements include criteria for contractor development of proposed personnel and training programs during contract definition. In support of previously established personnel and training concepts (PT–4), these requirements may include, but are not restricted to criteria necessary for:

- Clarification of project manning policies and priorities,
- Determination of and justification for personnel needed (including instructors),
- Means to utilize existing personnel and training resources,
- New training courses required by type, location and time,
- Training material preparation, and
- Training equipment design, procurement, fabrication, use and support.

PT–7 Establish Personnel and Training Program Evaluation Criteria

Criteria must be established to evaluate the responsiveness of contractor personnel and training program proposals. As part of the Logistics Support Management Plan (SM–7A), these criteria provide a means for assessing how well a proposal meets the requirements of PT–5. For example, is it compatible with operational, reliability and maintainability goals? Does it consider use of available skills before adding new requirements? What are the management methods and relative costs proposed for implementing the personnel and training program (e.g., use of service technical schools, factory training, civilian institutions, special field courses, on-the-job training, etc.)?

PT–8 Evaluate Proposed Personnel and Training Requirements

Personnel and training plans evaluated as part of the overall logistics support proposal evaluation must include comparison and scoring of the various proposals to the requirements and evaluation criteria described in PT–5 and PT–7.

PT–9 Approve Personnel and Training Plans

Personnel and training plans are approved for use and further definition of requirements during the development phase of the life cycle. As part of the logistics support plan (SM–9), they include selected contractor proposals for personnel training and equipment programs along with development and user agency plans for scheduling, funding and controlling development of training requirements.

PT–11A Determine Personnel Availability (Continuous)

During system analyses and design (SD–10B) and maintenance engineering analysis (MP–10), identified personnel requirements are continuously reviewed and compared to available personnel skills and quantities. New personnel skill requirements resulting from these reviews are analyzed for possible training needs. Manpower acquisition plans and controls are continuously updated to reflect new requirements.

PT–11B Prepare Training Package

Based on new personnel requirements (PT–11A), a training package is prepared to record operations and maintenance personnel tasks, correlate those tasks to manpower specialty classifications, establish personnel learning levels and performance standards, define cross-training requirements and identify the training courses, aids and equipment needed. Included in the training package are the methods for demonstrating training effec-

tiveness, package updating during follow-on test and operations, and plans for the progressive transition of training responsibilities to the using command.

PT-12 Begin Instructor Training

Training is initiated to satisfy needs of the scheduled test and demonstration programs and familiarize advanced cadre personnel with the hardware in preparation for later tests, operations and maintenance. Selection of instructors and preparation of their training curricula is accomplished in accord with the requirements of the training package (PT-11B).

PT-13 Begin Operations and Maintenance Personnel Training (Continuous)

This training is initiated to satisfy scheduled needs of contractors, operating units and logistics support activities in performing equipment demonstrations (SD- 13 and 14), service tests (SD-18), operational suitability demonstrations (SD-22) and actual operations/support (SM-26). Training lead times must be sufficient to assure that personnel can be trained to perform assigned tasks in support of specified readiness goals.

PT-17 Update Personnel and Training Requirements

Changes to personnel and training requirements are generated by deficiencies found during training demonstration and personnel performance evaluation. Corrective action is initiated in accord with other design/support changes and documented by revision of the personnel lists and training packages.

PT-18 Verify Required Skill Levels

Preliminary verification of personnel skill levels and adequacy of the classroom training is determined during the logistics support demonstration (SM-18). Task performance standards are evaluated and revised based on the appropriateness of skill level to task assignments, time needed to perform the task, and the adequacy of the equipment and support design in meeting specifications. Where appropriate, corrective actions resulting from the evaluations are documented in the training packge (PT-11B) and service command manpower listings.

PT-19 Verify Availability of Trained Personnel for Operations and Maintenance

Current and projected assets of trained operational and support personnel are evaluated. Availability of these personnel for the planned operating units is verified.

PT-21 Update Personnel and Training Plan

Personnel and training plans, procedures, schedules, quotas and other requirements are updated as a result of the service tests and evaluations. These updated plans are furnished to the first operating units and their commands as part of the logistics support plan (SD-21).

PT-23 Identify personnel and Training Deficiencies

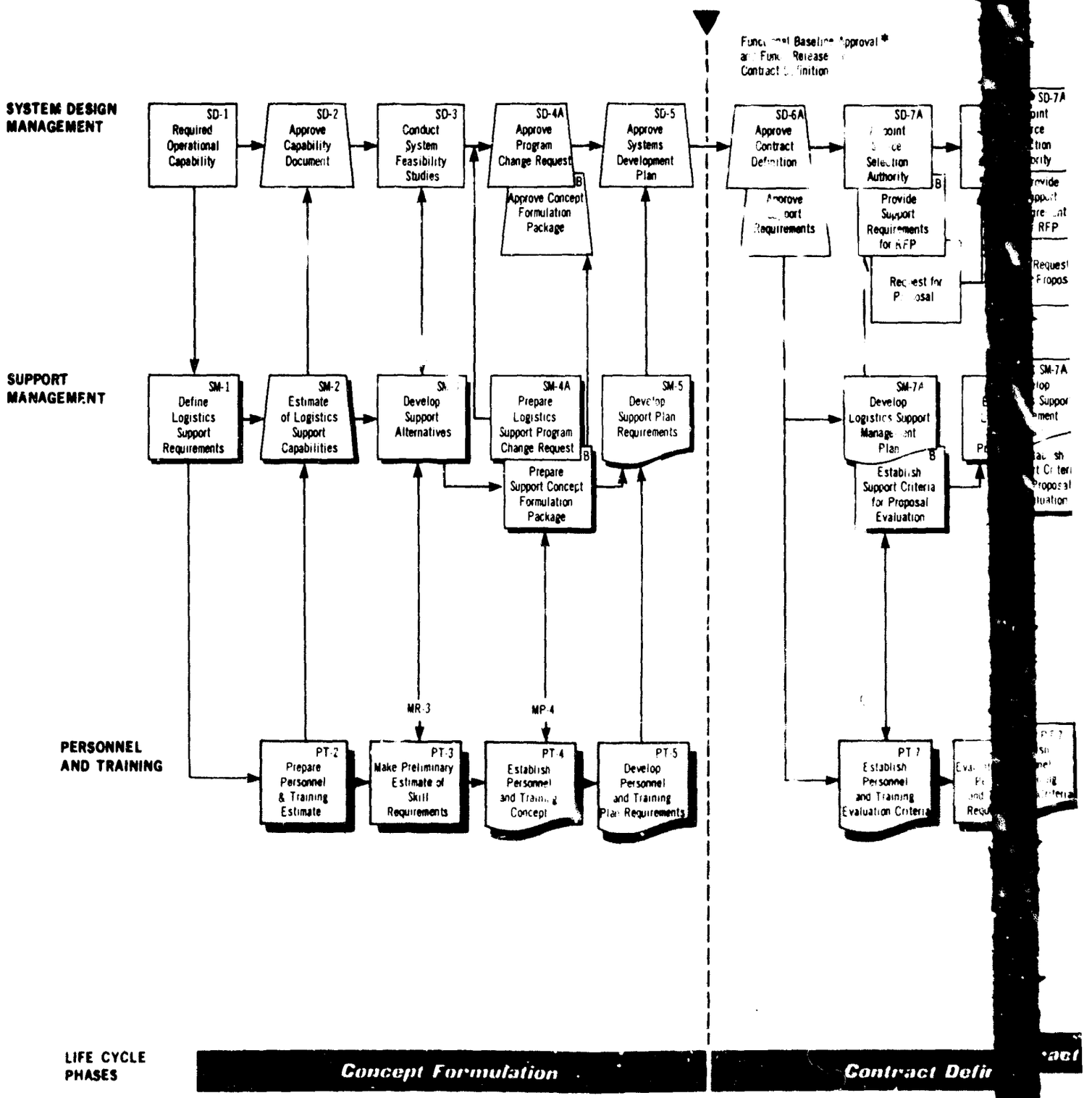
Deficiencies resulting from operational suitability demonstrations are identified for inclusion in the overall support evaluations (SM-23). Evaluations similar to that of MP-18 and PT-18 are used for determination of the deficiencies.

PT-24 Update Training Package

The training package is updated to include new requirements resulting from the equipment and support modifications (SD-24 and SM-24). Consideration must be given to all other support element modifications during this action. Changes are incorporated under applicable configuration management directives and instructions.

PT-25 Conduct Additional Operations and Maintenance Training

Based on the revised training package (PT-24), follow-on training for operating and support unit personnel is accomplished. Gross changes to key equipment design and support characteristics could require a new training development cycle (PT-12 and on). Minor changes are handled through training adjustments by operating unit personnel. All changes should be documented and made available to future planning (MD-22B).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Contract Definition
SYSTEM DESIGN MANAGEMENT
SD-1 Required Operational Capability
SD-2 Approve Capability Document
SD-3 Conduct System Feasibility Studies
SD-4A Approve Program Change Request
Approve Concept Formulation Package
SD-5 Approve Systems Development Plan
SD-6A Approve Contract Definition
SD-7A Selection Authority
Provide Support Requirements for RFP
Request for Proposal
SUPPORT MANAGEMENT
SM-1 Define Logistics Support Requirements
SM-2 Estimate of Logistics Support Capabilities
SM-3 Develop Support Alternatives
SM-4A Prepare Logistics Support Program Change Request
Prepare Support Concept Formulation Package
SM-5 Develop Support Plan Requirements
SM-7A Develop Logistics Support Management Plan
Establish Support Criteria for Proposal Evaluation
MR-3
MP-4
PERSONNEL AND TRAINING
PT-2 Prepare Personnel & Training Estimate
PT-3 Make Preliminary Estimate of Skill Requirements
PT-4 Establish Personnel and Training Concept
PT-5 Develop Personnel and Training Plan Requirements
PT-7 Establish Personnel and Training Evaluation Criteria
LIFE CYCLE PHASES
Concept Formulation
Contract Defin

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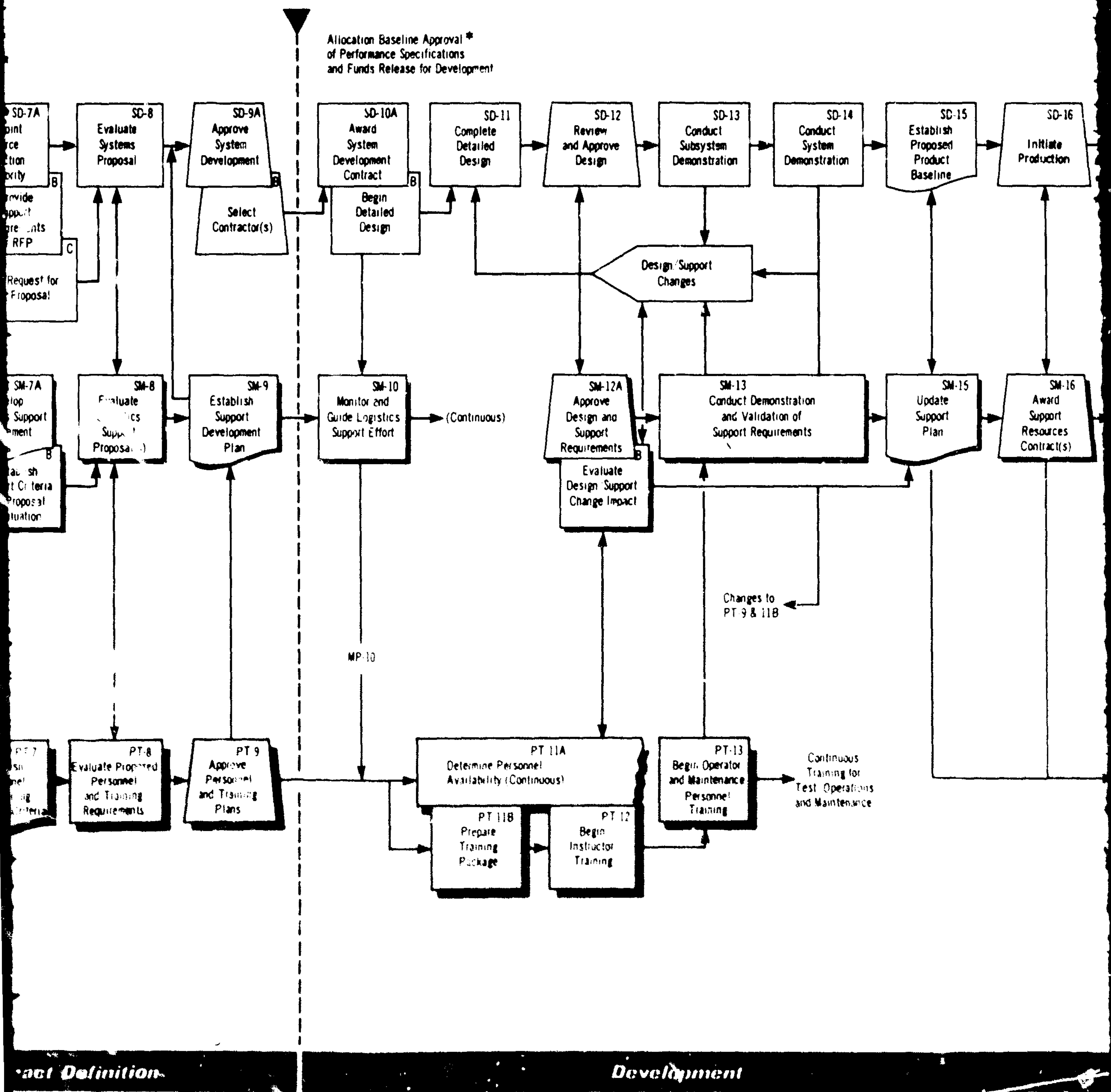
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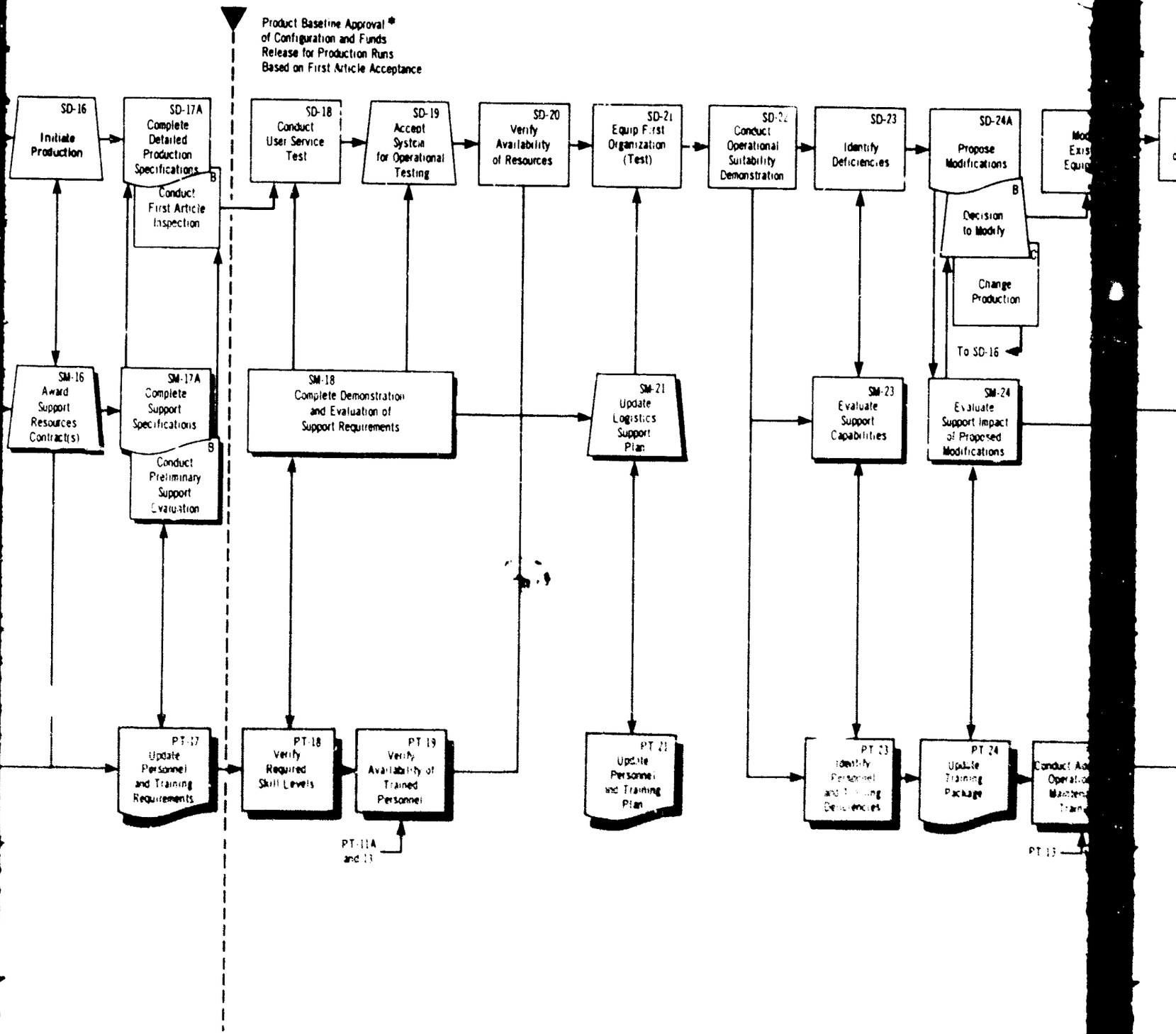
and Funds Release for Development
SD-7A
SD-8 Evaluate Systems Proposal
SD-9A Approve System Development
Select Contractor(s)
SD-10A Award System Development Contract
Begin Detailed Design
SD-11 Complete Detailed Design
SD-12 Review and Approve Design
SD-13 Conduct Subsystem Demonstration
SD-14 Conduct System Demonstration
SD-15 Establish Proposed Product Baseline
SD-16 Initiate Production
Request for Proposal
Design/Support Changes
SM-7A
SM-8
SM-9 Establish Support Development Plan
SM-10 Monitor and Guide Logistics Support Effort
(Continuous)
SM-12A Approve Design and Support Requirements
Evaluate Design/Support Change Impact
SM-13 Conduct Demonstration and Validation of Support Requirements
SM-15 Update Support Plan
SM-16 Award Support Resources Contract(s)
Changes to PT-9 & 11B
MP-10
PT-8 Evaluate Proposed Personnel and Training Requirements
PT-9 Approve Personnel and Training Plans
PT-11A Determine Personnel Availability (Continuous)
PT-11B Prepare Training Package
PT-12 Begin Instructor Training
PT-13 Begin Operator and Maintenance Personnel Training
Continuous Training for Test Operations and Maintenance
Development


Product Baseline Approval *
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SM-21
Update Logistics Support Plan
SM-23
Evaluate Support Capabilities
SM-24
Evaluate Support Impact of Proposed Modifications
PT-17
Update Personnel and Training Requirements
PT-18
Verify Required Skill Levels
PT-19
Verify Availability of Trained Personnel
PT-11A and 13
PT-21
Update Personnel and Training Plan
PT-23
Identify Personnel and Training Deficiencies
PT-24
Update Training Package
PT-13

Figure 1

PERSONNEL AND TRAINING (PT)

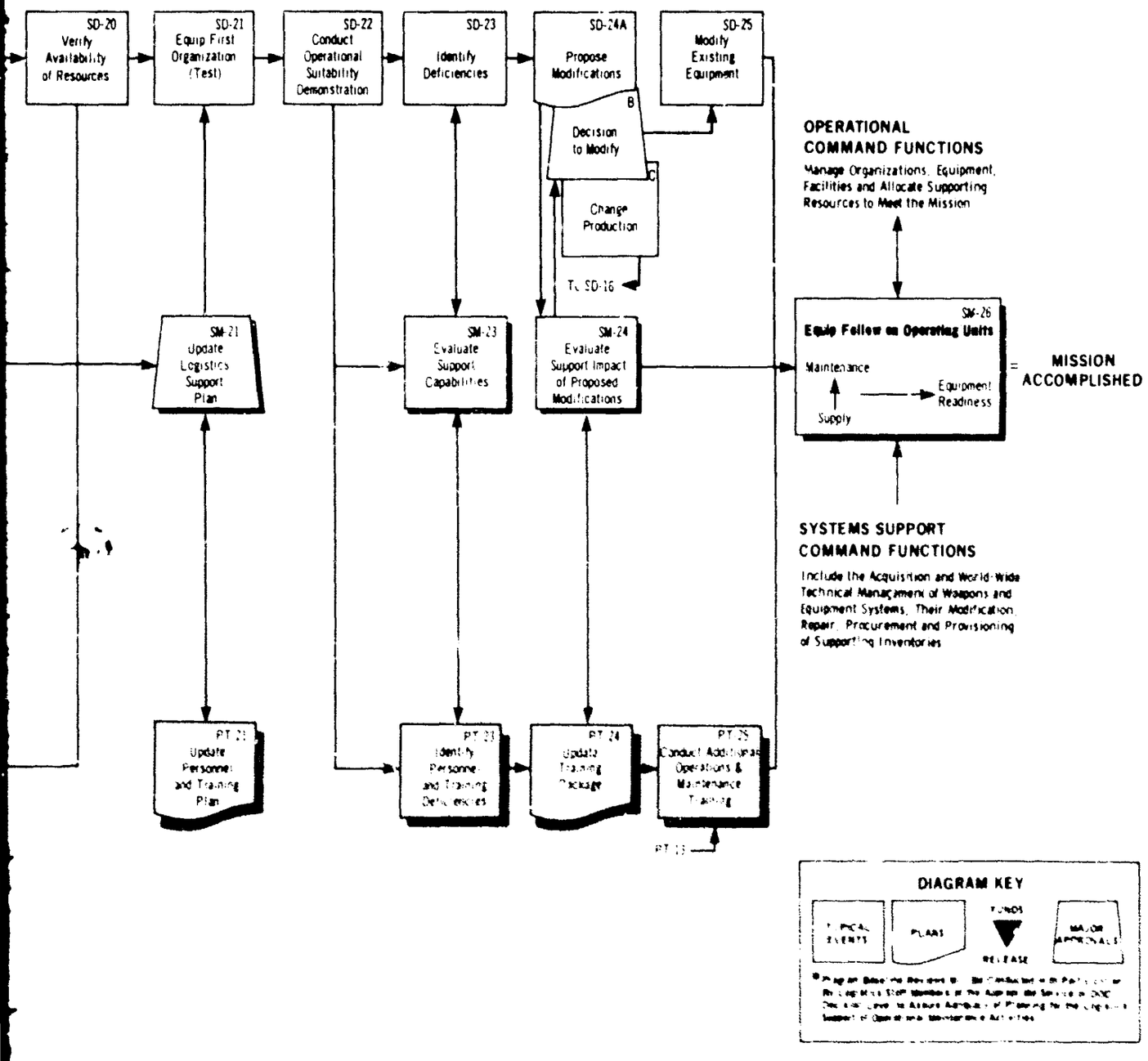


Figure 13

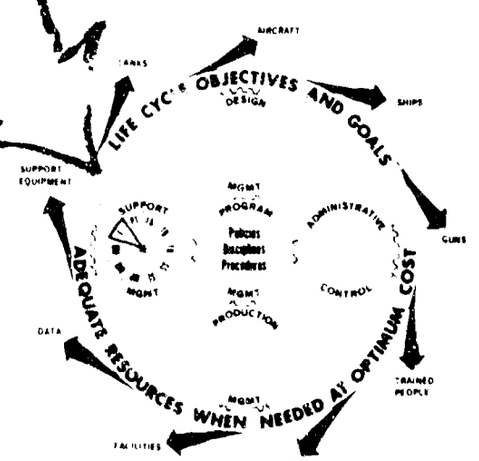
FUNDING

CHAPTER 11

Interface Responsibilities

Allocations and Expenditures by Life Cycle Phase for:

- Maintainability and Reliability.
- Maintenance Planning
- Support and Test Equipment.
- Supply Support.
- Transportation and Handling.
- Technical Data.
- Facilities.
- Personnel and Training.
- Management Data.



11

Funding

(BUDGETING AND FINANCING)

11.1 Introduction

Successful ILS planning during all phases of the equipment life cycle requires management attention to the interface between the support element needs and defense budgeting and financing procedures. Because of their importance to implementing logistics support, budgeting and financing activities are included as a prime element of support management. Budgeting and financing activities should include the:

- Early determination of logistics support funding requirements, which, together with experience factors from similar equipment programs, allow accurate forecasting of life cycle costs,
- Accurate updating of forecasts for timely fiscal planning and apportionment of required research and development, investment and operating funds,
- Allocation of available program funds to each logistics support element based upon its justified need, with emphasis given to program schedule and task priorities, and
- Accurate accounting of funds expenditures using work breakdown structure and measurement [illegible] to insure proper funds utilization and redistribution.

Typical budgeting and financing events for the funding element are shown in figure 14.

11.2 Detailed Event Description

F-2 Prepare Funding Portion of Logistics Support Estimate

Preliminary funding estimates for the concept formulation effort are made. They are based on the effort needed to establish concepts and requirements for logistics support capabilities not currently available to the program (SM- 1 and 2). The preliminary estimates include funding for all support studies, exploratory development of support items requiring

state-of-the-art advancement, preparation of logistics support plan requirements, etc. Based on experience data, preliminary life cycle cost estimates are made and program funding criteria established. Allocation of concept formulation fund requirements should be made without delay.

F–4 Provide Financial Estimates

The financial input for the logistics support Program Change Request (SM–4A) is prepared, which together with manpower requirements (PT–4) provides an estimate of the support resources required for the logistics support for the current fiscal year, the base fiscal year plus four succeeding fiscal years.

F–5 Develop Funding Schedule Requirements

Funding schedule requirements are developed for inclusion with logistics support plan requirements (SM–5). These requirements are based upon the selected concept (SM–4) and an estimate of each support element's budgeting and financing requirements for definition, development, production and operational phases. Definitive estimates of the funding requirements for definition phase support activities are made. Work breakdown structures with line item cost estimates for each element are required. Due consideration is given to appropriate fiscal budget cycles and schedules. These requirements, as part of SM–5, are essential to "Key Approval Action" (SD–5).

F–6 Allocate Funds for Definition Phase

Support element funds for the definition phase effort are allocated in accord with the approved development plan and support requirements (SD–6 A and B) and the funding schedule requirements (F–5).

F–7 Prepare Financial Plan for Support

Based upon allocated funds (F–6), support element funding plans must be prepared at all levels of management. These plans delineate the distribution of funds for all task efforts. Consideration is given to both DoD "in-house" and contract costs, with separate categories for each as required. Support management reviews and approves this plan for incorporation into the equipment program financial plan.

F–8A Update Financial Plan for Support

New support requirements resulting from evaluation of the proposals (SM–8) are the basis for updating the financial plan. Estimated funding needs are evaluated and previous

budgets are refined to more accurately reflect future demands. Procedures are to be established which will provide for the continuous review of manpower and financial requirements and for the routine updating of the support portion of the Five Year Defense Plan (F–4) in accordance with current instructions.

F–8B Confirm Availability of Funds

The financial plan for support (F–8A) is compared to actual fund authorizations for their adequacy to to support the program. Funding deficiencies must be identified. Expected program risks due to insufficient funding are documented. The deficiencies, their cause and resulting risk areas are coordinated for project management review prior to submitting the support development plan (SM–9) for "Key Approval Action" (SD–9A).

F–9 Allocate Funds for Development Phase

System development approval and contractor selection (SD–9 A and B) require allocation of logistics support funding for the development phase. This allocation should be in accord with funding decisions resolving previously identified problems (F–8B).

F–10 Revise Plan Based on Development Contract

Funding changes resulting from development contract awards must be reflected in the financial plan. The revised plan is then a baseline for future budgeting and financing activity.

F–12A Update Plan Based on Design Reviews

The financial plan for support is updated to reflect any new requirements stemming from design and support changes resulting from reviews (SM–12B). This action depends on [illegible] type, specific funding limits, and the type of change (e.g., contractor or government initiated).

F–12B Confirm Availability of Funds for Production

The updated plan (F–12A) must be reviewed to determine the adequacy of funds authorized for program support. Expected program risks due to insufficient funding are documented. Deficiencies and risk areas are coordinated for review and resolution prior to allocation of production funds (F–14).

F-14 Allocate Funds for Initial Production

Successful test and demonstration of system and equipment prototypes (SD-13 and 14) and verification that all support requirements have been identified (SM-13) normally must be accomplished prior to authorization of funds for initial production of support resources.

F-17 Allocate Funds for Follow-on Production

Compatibility of specifications for all equipment and supporting resources with the first production article must be assured prior to allocation of funds for follow-on production. This action is part of the support evaluation (SM-17B) and essential to "Key Approval Action" (SD-17B).

F-18 Continue Fiscal Funding Cycle

Support management monitors fund requirements and allocations to see that each support element receives and accounts for its share of the funds. Shortages or overages are recorded and adjustments made to the fiscal funding requests or to the program requiring those funds.

F-21 Revise Plan Based on Service Test

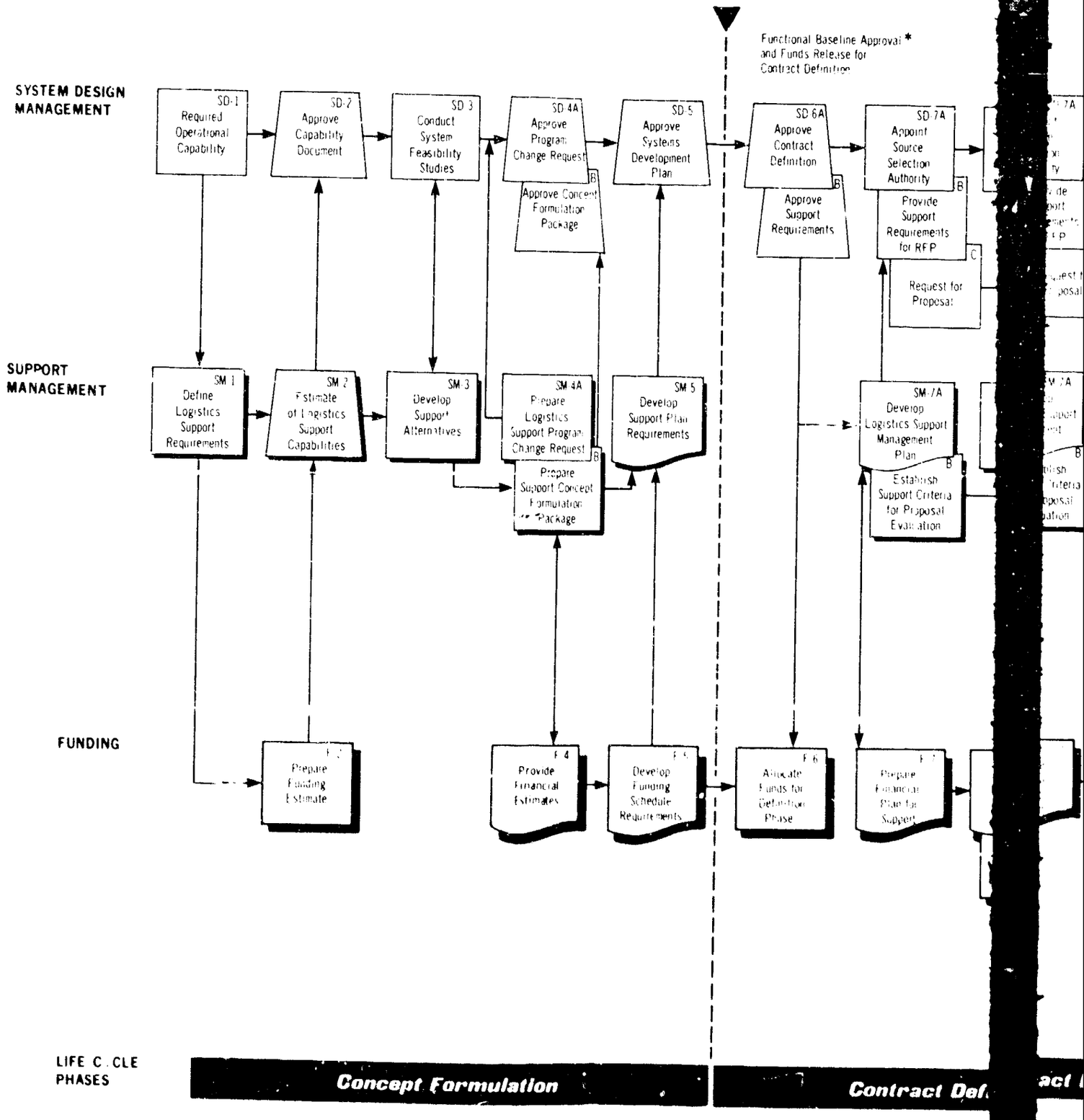
Based upon support changes resulting from service testing and feed-back from the first operating unit, the financial plan for support is updated to denote any new or changed requirements. Adjustments in fiscal funding allocations are made based on these approved changes.

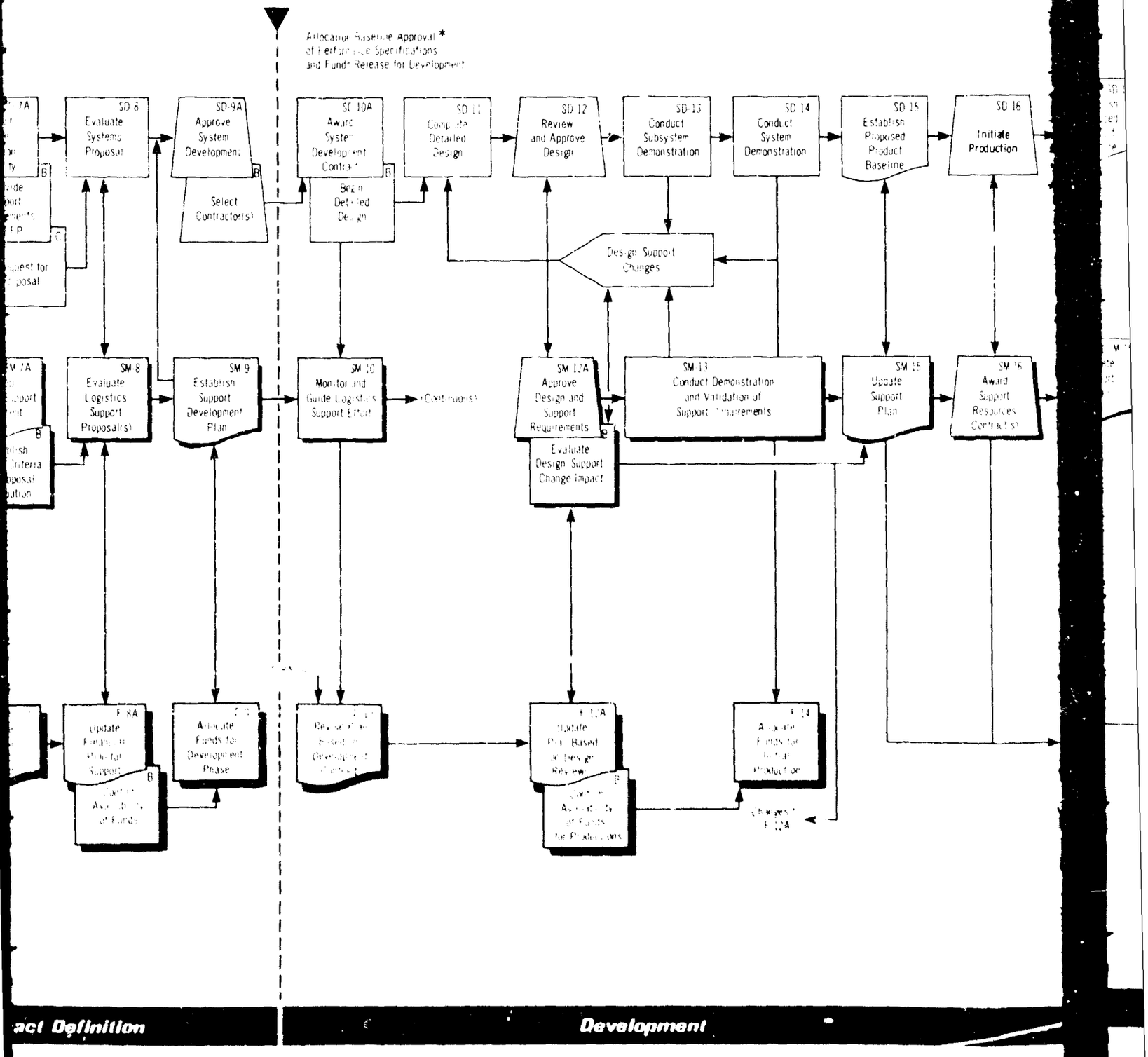
F-24A Update Plan for Modifications

Modification cycles may result from deficiencies found during suitability testing or subsequent operations (SD-22 to SM-26). Depending on the deficiency, new design or redesign of the equipment may require new production contracts. Preliminary funding estimates for projected equipment and support modifications should have been part of the early development phase forecasts. These estimates, based on experience with similar systems, should reflect past funding expenditure patterns including times of need during the life cycle. The plan is updated to provide more accurate estimates of the funds now required for support modifications.

F-24B Verify Availability of Funds

Modification of the support resources requires that forecasted funds be weighed against the revised plan requirements (F-24A). As in F-12B, the identified deficiencies, justification, and risk areas are coordinated and reviewed with appropriate command support management. These reviews include trade-offs between all budgeted program elements for resolution of these deficiencies within available funding limits. Funding experience is furnished to the advanced planning areas for incorporation into future support modification estimate criteria (F-2).


Functional Baseline Approval *
and Funds Release for
Contract Definition
SYSTEM DESIGN MANAGEMENT
SD-1 Required Operational Capability
SD-2 Approve Capability Document
SD-3 Conduct System Feasibility Studies
SD-4A Approve Program Change Request
B
Approve Concept Formulation Package
SD-5 Approve Systems Development Plan
SD-6A Approve Contract Definition
B
Approve Support Requirements
SD-7A Appoint Source Selection Authority
B
Provide Support Requirements for RFP
C
Request for Proposal
SUPPORT MANAGEMENT
SM-1 Define Logistics Support Requirements
SM-2 Estimate of Logistics Support Capabilities
SM-3 Develop Support Alternatives
SM-4A Prepare Logistics Support Program Change Request
B
Prepare Support Concept Formulation Package
SM-5 Develop Support Plan Requirements
SM-7A Develop Logistics Support Management Plan
B
Establish Support Criteria for Proposal Evaluation
FUNDING
F-3 Prepare Funding Estimate
F-4 Provide Financial Estimates
F-5 Develop Funding Schedule Requirements
F-6 Allocate Funds for Definition Phase
F-7 Prepare Financial Plan for Support
LIFE CYCLE PHASES
Concept Formulation
Contract Def


Allocation Baseline Approval *
of Performance Specifications
and Fund Release for Development
SD-6
Evaluate Systems Proposal
SD-9A
Approve System Development
Select Contractor(s)
SD-10A
Award System Development Contract
Begin Detailed Design
SD-11
Complete Detailed Design
SD-12
Review and Approve Design
SD-13
Conduct Subsystem Demonstration
SD-14
Conduct System Demonstration
SD-15
Establish Proposed Product Baseline
SD-16
Initiate Production
Design Support Changes
SM-8
Evaluate Logistics Support Proposal(s)
SM-9
Establish Support Development Plan
SM-10
Monitor and Guide Logistics Support Effort
SM-12A
Approve Design and Support Requirements
Evaluate Design Support Change Impact
SM-13
Conduct Demonstration and Validation of Support Requirements
SM-15
Update Support Plan
SM-16
Award Support Resources Contract(s)
F-8A
Update Funding for Support
F-9
Allocate Funds for Development Phase
F-12A
Update Plan Based on Design Review
F-14
Allocate Funds for Initial Production
Concept Definition
Development

FUN

BUDGETING

SD 14A
Propose
Modification

Decision
to Modify

Changes
Required

To SD 16

SW 14
Evaluate
Support Impact
of Proposed
Modification

SD 13
Identify
Operational Changes

SW 13
Evaluate
Support
Capabilities

SD 12
Conduct
Operational
Suitability
Demonstration

SD 11
Evaluate
Operational
Test

SW 11

SD 10
Verify
Availability
of Resources

SD 9
Update
Operational
Test

SD 8
Update
Operational
Software

SW 8
Complete Detailed Specification
and Evaluation of
Support Requirements

Formal Release Approval *
Of Flight and Flight Support Units
Release for Production Units
Based on Formal Article Acceptance

SD 17A
Complete
Detailed
Production
Specifications

B
Conduct
First Article
Configuration

SW 17A
Complete
Support
Specifications

B
Conduct
Preliminary
Support
Evaluation

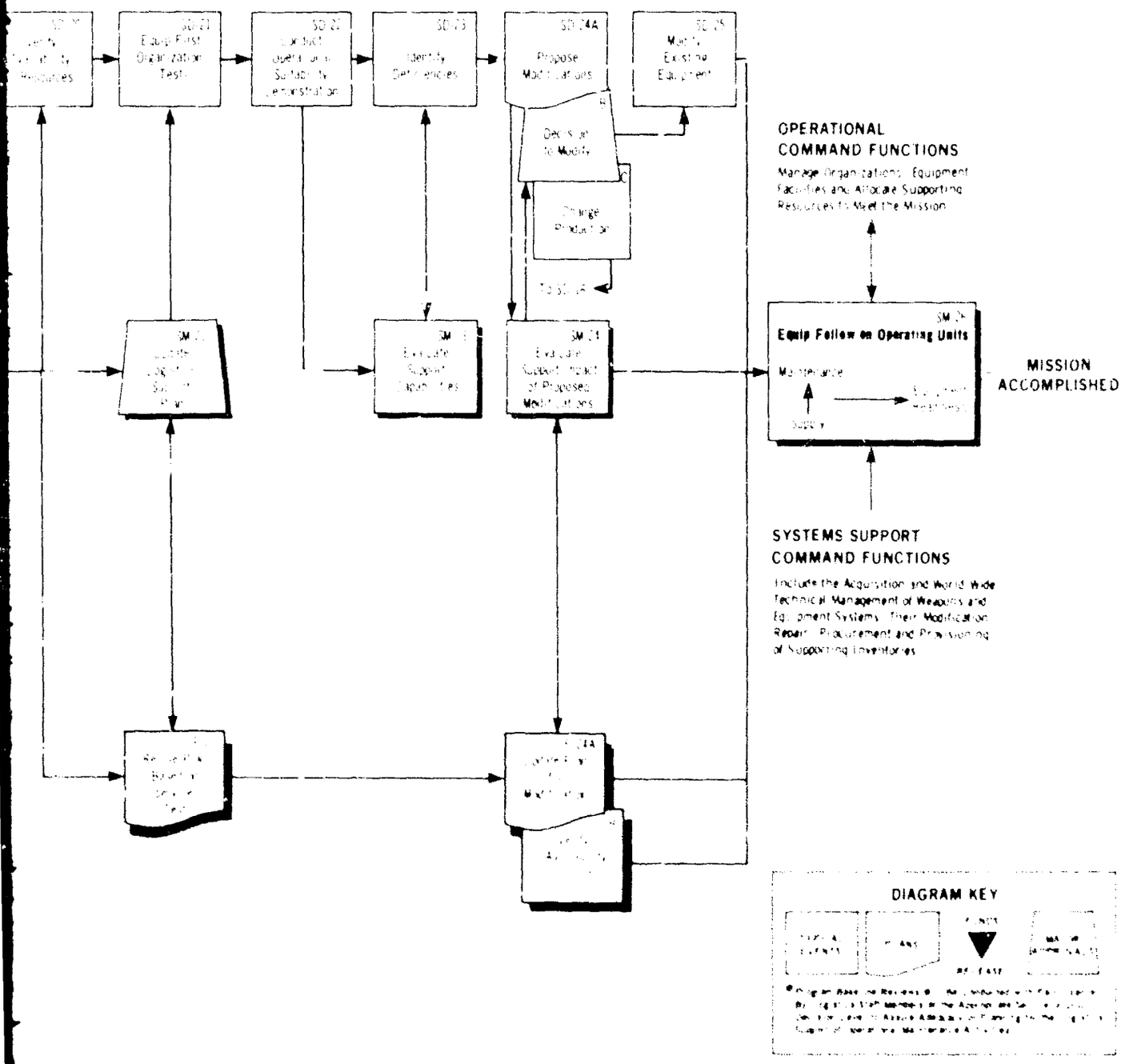
SD 16
Initiate
Production

SW 16
Award
Support
Resources
Contract(s)

Production

FUNDING (F)

(BUDGETING AND FINANCING)



Operational

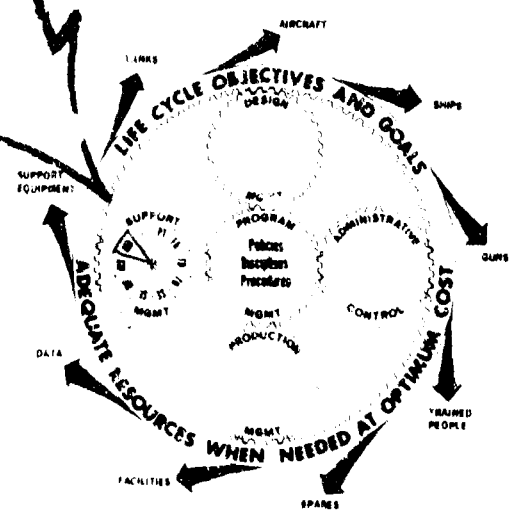
Figure 14

MANAGEMENT DATA

CHAPTER 12

Interface Responsibilities

- Maintainability and Reliability Test Data.
- Maintenance Planning Analysis, Test and Demonstration Data and Readiness Performance Experience.
- Support and Test Equipment Use and Failure Data.
- Supply Support Effectiveness Data.
- Transportation and Handling Use and Failure Data.
- Technical Data Use and Historical Information.
- Facilities Use and Historical Data
- Personnel and Training Skills Analyses, Manning Demonstrations and Historical Data.
- Fund Requirements, Allocations, Expenditures and Historical Cost Data.



12

Management Data (MD)

12.1 Introduction

Defense activities use and support many information systems to meet separate technical management needs of organizations with differing development, support and operational missions. These data systems are defined in equally diverse directives at various echelons within DoD and the separate Services.

Information and control systems interfacing with support management include: maintenance engineering and analysis control documentation; engineering test and demonstration records; program schedule and cost controls, such as pert or critical path; maintenance management and failure data; miscellaneous requirements forecasts, e.g., personnel, equipment, supplies, and facilities; configuration management; operational readiness support status, and supply management effectiveness reporting systems. This chapter addresses these support management data requirements.

Early in the development phase of the acquisition life cycle, Support Management selectively identifies the extent to which the above information systems will be required during the item's life cycle, when they will be required and how and by whom the requirements will be met. These requirements are compatible with current directives from the applicable Service. They are tailored to the level of detail appropriate to the type, complexity, or cost of the item being developed. Simple off-the-shelf procurements might only require already digested and analyzed information. In that case the appropriate "data system" is a simple information gathering and editing activity.

Data become useful information only when they are assembled into manageable aggregates for purposeful evaluation. When this can be easily done manually, time and costs can be reduced. When sampling or summary techniques can provide needed information on a one-time or periodic basis, redundant report processing is eliminated.

At the other extreme, the acquisition and operation of new and complex equipment may justify electronic data processing support. Here, standardization of data codes, use of

available software, and new generation computer capabilities combine to make data-bank concepts attractive. This approach satisfies all the information requirements of the formal systems and also permits selective reporting of current data to functional support managers on an as-required basis.

Information search, acquisition, collation for library storage, selective retrieval, reporting and dissemination (to user-defined specifications) are all technical administrative data support functions that may sometimes be more economically performed under centralized control.

While inclusion of the data events shown on Figure 15 as a management element, recognizes these economies, a word of caution is in order. These data systems are oriented to the use of data to "manage," rather than to the "management of data." It is necessary that the functional support managers recognize both the limitations and capabilities of information collection and data processing. At best, only part of the managers total information requirements can be coded for electronic processing. Managers initiate data/information requirements by close liaison with system analysts and programmers. They must perform continuing validation and analysis of data products. These responsibilities should not be usurped by or defaulted to data services organizations which are primarily a management support function.

12.2 Detailed Event Description

MD-2 Input Readiness Performance Experience

Readiness performance data attained on similar inservice equipment must be quantified in terms such as:

- *Useful availability*—minimum operating hours, sortie rates or operational on-station time per month, or cyclic use rates such as equipment "alerts" and firing frequencies,
- *Maintainability/reliability*—in terms of turn around time, incidence of unscheduled maintenance, elapsed time to replace major components, etc.,
- *Man-hours expended per operating hour*—to service and maintain equipment at defined use-levels during organizational and intermediate maintenance.

These measurements of present or past support capability provide a firm point of departure on which to forecast capabilities in support of newly defined operational requirements. Maintenance man-hour expenditures have a proportionate relation to the consumption of replacement spares, parts, and consumables. As such they may provide a useful index of relative supply support costs. This readiness performance data provides inputs to SM-2 and SM-3 as the first step in a series of data requirements which become more detailed as

system/support development progresses. Simulation techniques can provide a basis for optimizing operational and support effectiveness.

MD–3 Input Usage Experience Into Supply Model

Simulation techniques provide a basis for gross cost estimates for provisioning, follow-on spares replenishment and supply support under various replacement or maintenance-level repair alternatives. The appropriate Service's Systems/Support Command should be able to provide model inputs of historical usage data on comparable systems of an earlier generation. These inputs require careful evaluation of differences in doctrine, tactics, environment or maintenance concepts which may influence support of the proposed development item. The management use of electronic data processing techniques requires the application of judgment based on collateral knowledge from the Services or industry (SS–3).

MD–4 Establish Support Data Requirements

The support manager identifies management data requirements for:

(1) Maintenance engineering analysis control documentation and support engineering test and demonstration reports,

(2) Tracking support program schedules and cost controls,

(3) Developing standard system/equipment support codes and item identification procedures in support of maintenance management and failure data systems and maintenance engineering analysis control documentation,

(4) Identification of each functional support element's specific data needs and preparation of necessary supporting data outputs,

(5) Directed configuration management accounting and control procedures to support engineering design, maintenance, and supply actions,

(6) Acquiring and evaluating support status reports listing Operational Readiness (OR) rates, Not Operationally Ready Maintenance (NORM) rates, Not Operationally Ready Supply (NORS) rates, Cannibalization rates, and

(7) Supply management effectiveness reporting systems which reflect current operating level demand and usage data; e.g., fill rates, fill times, and the per cent on-hand of currently critical quantified line items. The on-hand percentage report of critical line items depends upon coordinated inventory status inputs from supply and maintenance. A "currently critical line item" requiring this support management attention is one which has either been cannibalized or gone NORS within the last normal replenishment cycle, and which is still below established stockage minimums.

MD–5 Prepare Data Collection, Analysis and Control Requirements

Based on specific data requirements in the support concept formulation package (SM–4B), prepare requirements identifying specific responsibilities of Service and contractor program management to:

- Collect and report raw data,
- Collate data for analysis,
- Research relevant collateral information,
- Disseminate data and reports,
- Evaluate and analyze reported data in light of collateral knowledge,
- Selectively report hardware performance and decision back-up data for necessary feedback and historical use.

The purpose is not to generate a demand for additional requirements, but to selectively identify data needs by time, place, and support specialist responsibility for inclusion in the support plan and the RFP.

MD–7 Specify Data Requirements for the Bid Package

Break-out and define specific contractor responsibilities for the collection, dissemination, evaluation, and use of required maintenance and support management data/information. Define Service furnished data to be made available to the support contractor and applicable communications, proprietary and security considerations. Define other special data sources and considerations as applicable.

MD–8 Evaluate Data Collection and Analysis Proposals

Rate contractor proposals in response to the data portion of the bid package for adequacy, currency, simplicity, and validity.

MD–9 Update Data Specifications

A joint contractor/project management review and sign-off of individual and interfacing data responsibilities is required. This insures a clear understanding of terms, conditions, and definitions. It is a part of negotiations preliminary to award of the development contract. A method for future retrieval and feedback of data information into block MD–4 of follow-on systems should be considered.

MD–10 Update Data Collection, Analysis and Control Plan

Both Service and contract support managers now update their respective data plans in the form of control directives to provide required information and data services to project

development activities. These directives identify who is responsible for collection, report collation, dissemination, storage, retrieval, and analysis activities for each information/data system. They clarify the manager's continuing responsibility to validate data system logic, his interface with supporting data processing services, run priorities, security needs, reporting schedules, and any special data preservation, retention, and replacement requirement.

MD–11A Develop Standard System/Equipment Support Codes

As soon as designs are sufficiently definitized, a set of common codes describing hardware subsystems and components in terms of work unit elements are assigned to support:

- Tests and demonstrations,
- Maintenance management and failure data systems, and
- Maintenance engineering analysis control systems.

Codes are developed in accordance with DoD methods and standards to assure appropriate commonality in terms of hardware reference.

MD–11B through 19 Perform Collection and Analysis of Test Feedback Data

System and subsystem test and demonstration measurements and performance results are fed back to the separate functional support elements for evaluation of attainment of assigned design objectives. Each change triggers a new evaluation cycle to define impacts and trade-off choices between design and support (SM–12B).

In complex development projects, data services support for maintenance engineering analysis documentation can provide the support manager with a mechanized system to control and record these iterations. In simpler procurements, this documentation control can be done manually.

MD–21 Update Data Collection and Analysis Plan

Review test objective revisions for their effect on elements of required data systems (e.g., data collection, processing, evaluation, and analysis procedures). Performance reporting methodology for demonstrating attainment of contract specifications must be clearly spelled out prior to the start of operational testing.

MD–22A Collect and Disseminate Demonstration Test Data

Test results are compared with design performance objectives. System readiness performance below or significantly above design objectives, as well as support changes, are reported to support management through a system of control documentation. This documentation records hardware and support deficiencies as well as tradeoff alternatives which back up change proposals.

MD–22B Transition to Maintenance Management, Failure Data and Supply Management Effectiveness Systems

After turnover of equipment to operational units, continuous evaluation of its performance in the use environment may be desirable. While test data (MD–22A) can provide controlled hardware performance information during development, complete evaluation of system performance requires consideration of the effectiveness of all supporting elements, including command/support management. Collection of test data is phased out as compliance with the appropriate Service's maintenance management and failure data system starts. Concurrently, the senior materiel officer should provide his operational organization commander with current operational readiness/support status and accompanying cumulative supply management effectiveness reports (subpar. 6 and 7 of MD–4). These and other supporting logistic reports, summarized as appropriate for the command or support echelons involved, continue for the balance of the equipment's life cycle.

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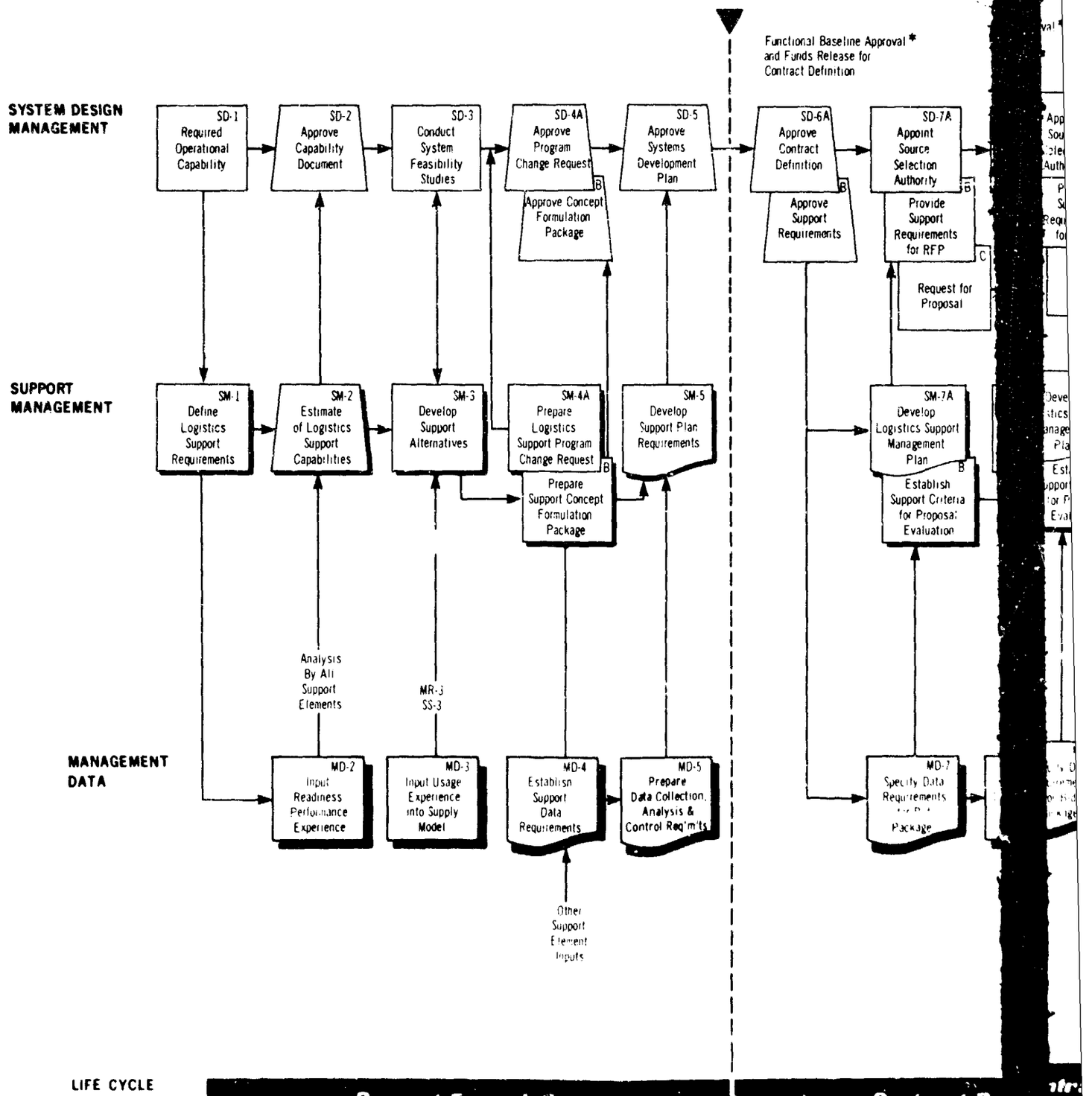
Functional Baseline Approval *
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Contract Definition
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SD-1 Required Operational Capability
SD-2 Approve Capability Document
SD-3 Conduct System Feasibility Studies
SD-4A Approve Program Change Request
Approve Concept Formulation Package
SD-5 Approve Systems Development Plan
SD-6A Approve Contract Definition
Approve Support Requirements
SD-7A Appoint Source Selection Authority
Provide Support Requirements for RFP
Request for Proposal
SUPPORT MANAGEMENT
SM-1 Define Logistics Support Requirements
SM-2 Estimate of Logistics Support Capabilities
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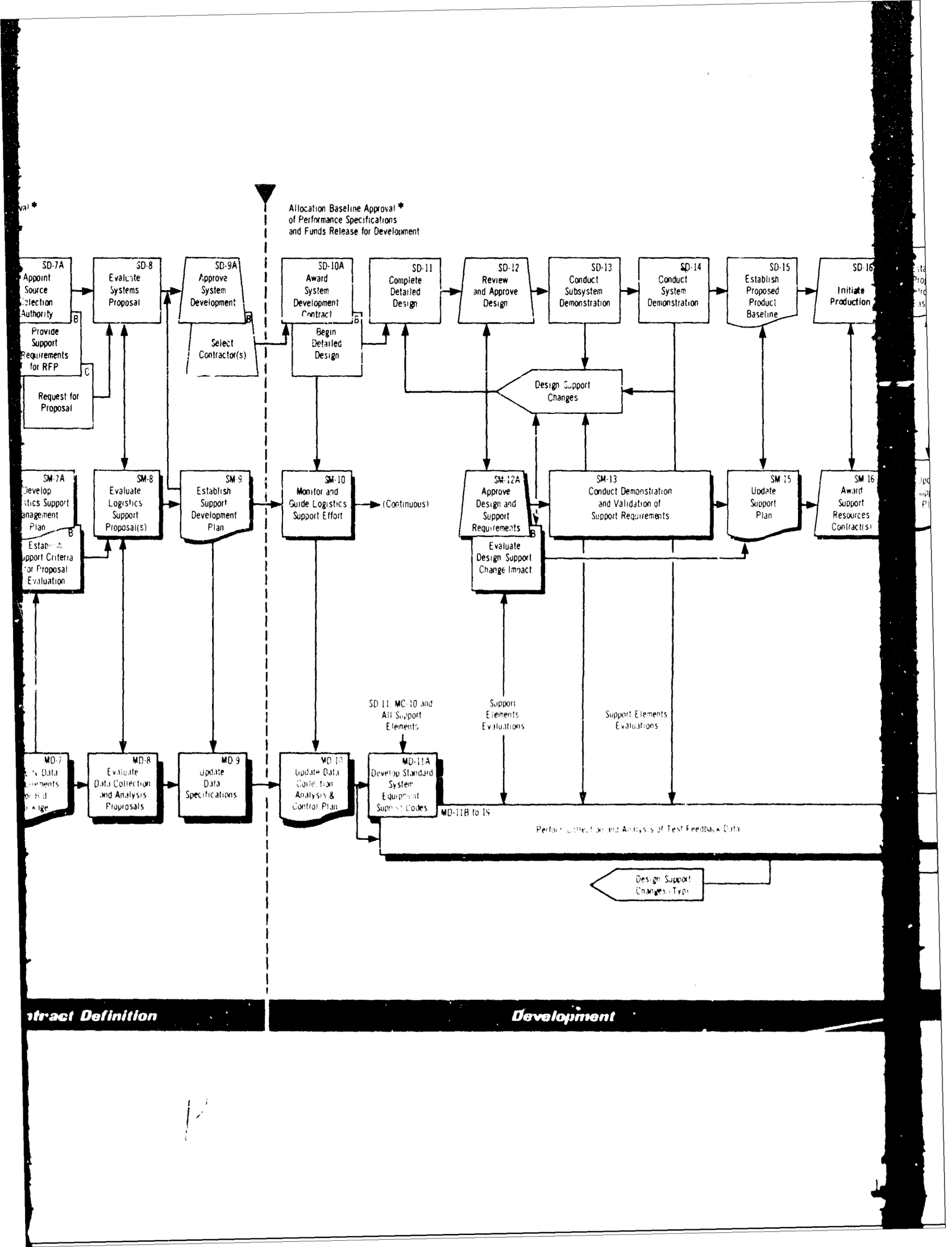
SM-4A Prepare Logistics Support Program Change Request
Prepare Support Concept Formulation Package
SM-5 Develop Support Plan Requirements
SM-7A Develop Logistics Support Management Plan
Establish Support Criteria for Proposal Evaluation
Analysis By All Support Elements
MR-3 SS-3
MANAGEMENT DATA
MD-2 Input Readiness Performance Experience
MD-3 Input Usage Experience into Supply Model
MD-4 Establish Support Data Requirements
MD-5 Prepare Data Collection, Analysis & Control Req'mts
MD-7 Specify Data Requirements
Package
Other Support Element Inputs
LIFE CYCLE PHASES
Concept Formulation
Contract De


Allocation Baseline Approval *
of Performance Specifications
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SD-7A
Appoint Source Selection Authority
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SD-10A
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SD-14
Conduct System Demonstration
SD-15
Establish Proposed Product Baseline
SD-16
Initiate Production
Provide Support Requirements for RFP
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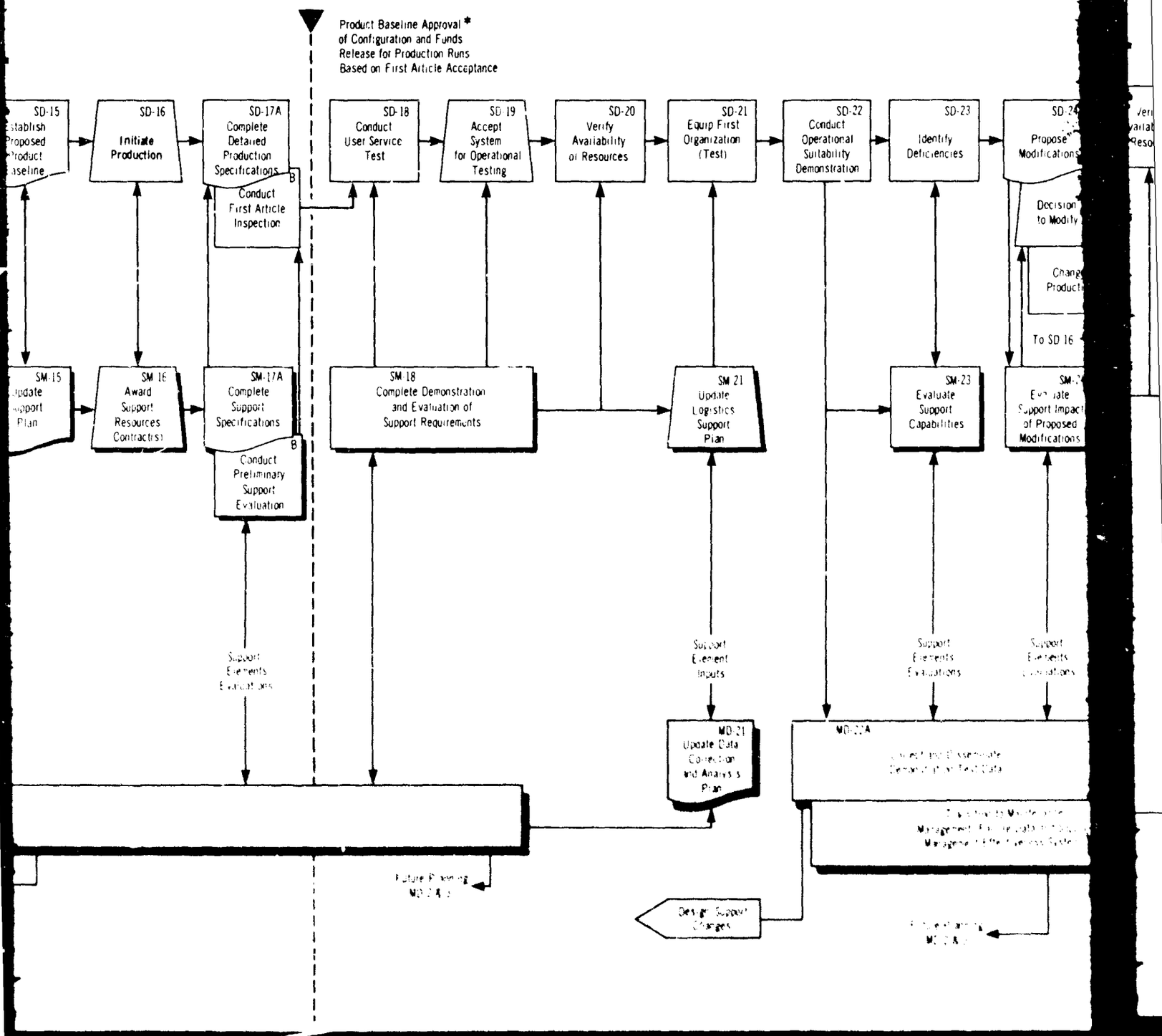
Select Contractor(s)
Begin Detailed Design
Design Support Changes
SM-7A
Develop Logistics Support Management Plan
Establish Support Criteria for Proposal Evaluation
SM-8
Evaluate Logistics Support Proposal(s)
SM-9
Establish Support Development Plan
SM-10
Monitor and Guide Logistics Support Effort
(Continuous)
SM-12A
Approve Design and Support Requirements
Evaluate Design Support Change Impact
SM-13
Conduct Demonstration and Validation of Support Requirements
SM-15
Update Support Plan
SM-16
Award Support Resources Contract(s)
SD-11, MC-10 and All Support Elements
Support Elements Evaluations
Support Elements Evaluations
MD-7
MD-8
Evaluate Data Collection and Analysis Proposals
MD-9
Update Data Specifications
MD-10
Update Data Collection Analysis & Control Plan
MD-11A
Develop Standard System Equipment Support Codes
MD-11B to 19
Perform Collection and Analysis of Test Feedback Data
Design Support Changes (Typ)
Contract Definition
Development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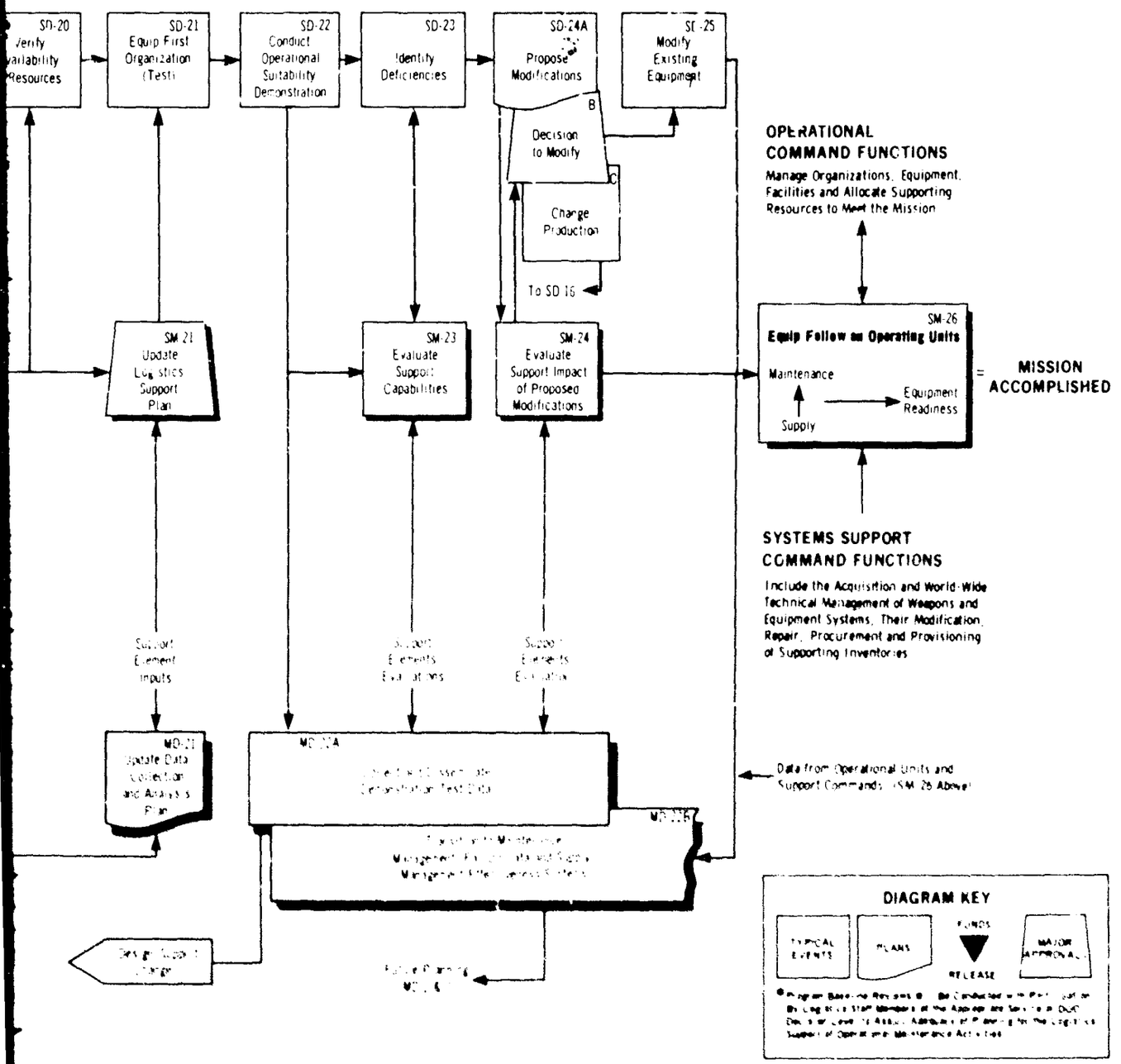
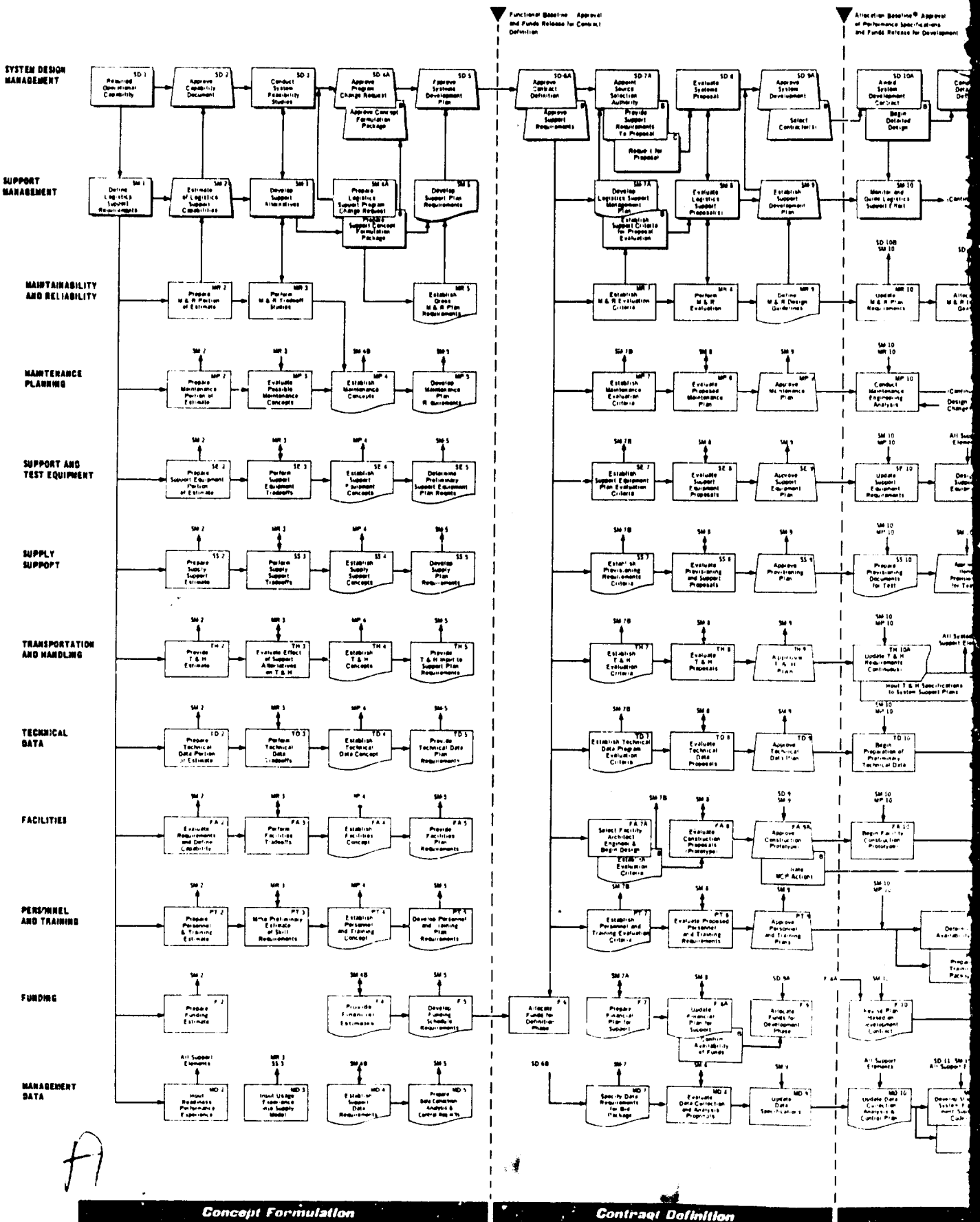
Release for Production Runs
Based on First Article Acceptance
SD-15
Establish Proposed Product Baseline
SD-16
Initiate Production
SD-17A
Complete Detailed Production Specifications
B
Conduct First Article Inspection
SD-18
Conduct User Service Test
SD-19
Accept System for Operational Testing
SD-20
Verify Availability of Resources
SD-21
Equip First Organization (Test)
SD-22
Conduct Operational Suitability Demonstration
SD-23
Identify Deficiencies
SD-24
Propose Modifications
Decision to Modify
To SD 16
SM-15
Award Support Resources Contract(s)
SM-17A
Complete Support Specifications
B
Conduct Preliminary Support Evaluation
SM-18
Complete Demonstration and Evaluation of Support Requirements
SM 21
Update Logistics Support Plan
SM-23
Evaluate Support Capabilities
Support Elements Evaluations
Support Element Inputs
MD-21
Update Data Collection and Analysis Plan
Design Support Changes

MANAGEMENT DATA (MD)



Operational

Figure 15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Allocation Baseline Approval of Performance Specifications and Funds Release for Development
SYSTEM DESIGN MANAGEMENT
SUPPORT MANAGEMENT
MAINTAINABILITY AND RELIABILITY
MAINTENANCE PLANNING
SUPPORT AND TEST EQUIPMENT
SUPPLY SUPPORT
TRANSPORTATION AND HANDLING
TECHNICAL DATA
FACILITIES
PERSONNEL AND TRAINING
FUNDING
MANAGEMENT DATA
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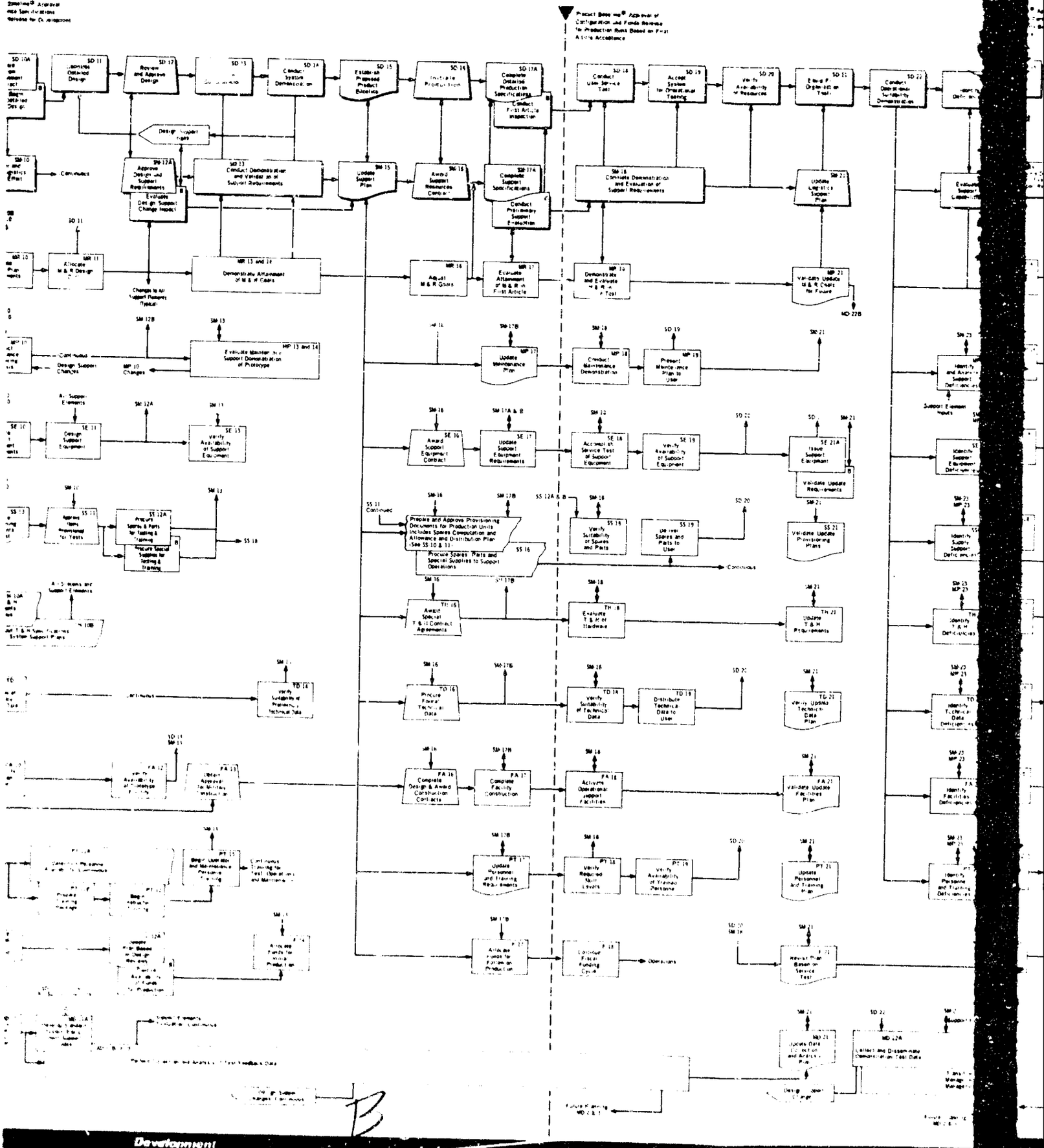
Contract Definition


Development
Production

MANAGEMENT MATRIX
INTEGRATING LOGISTICS SUPPORT PLANNING EVENTS

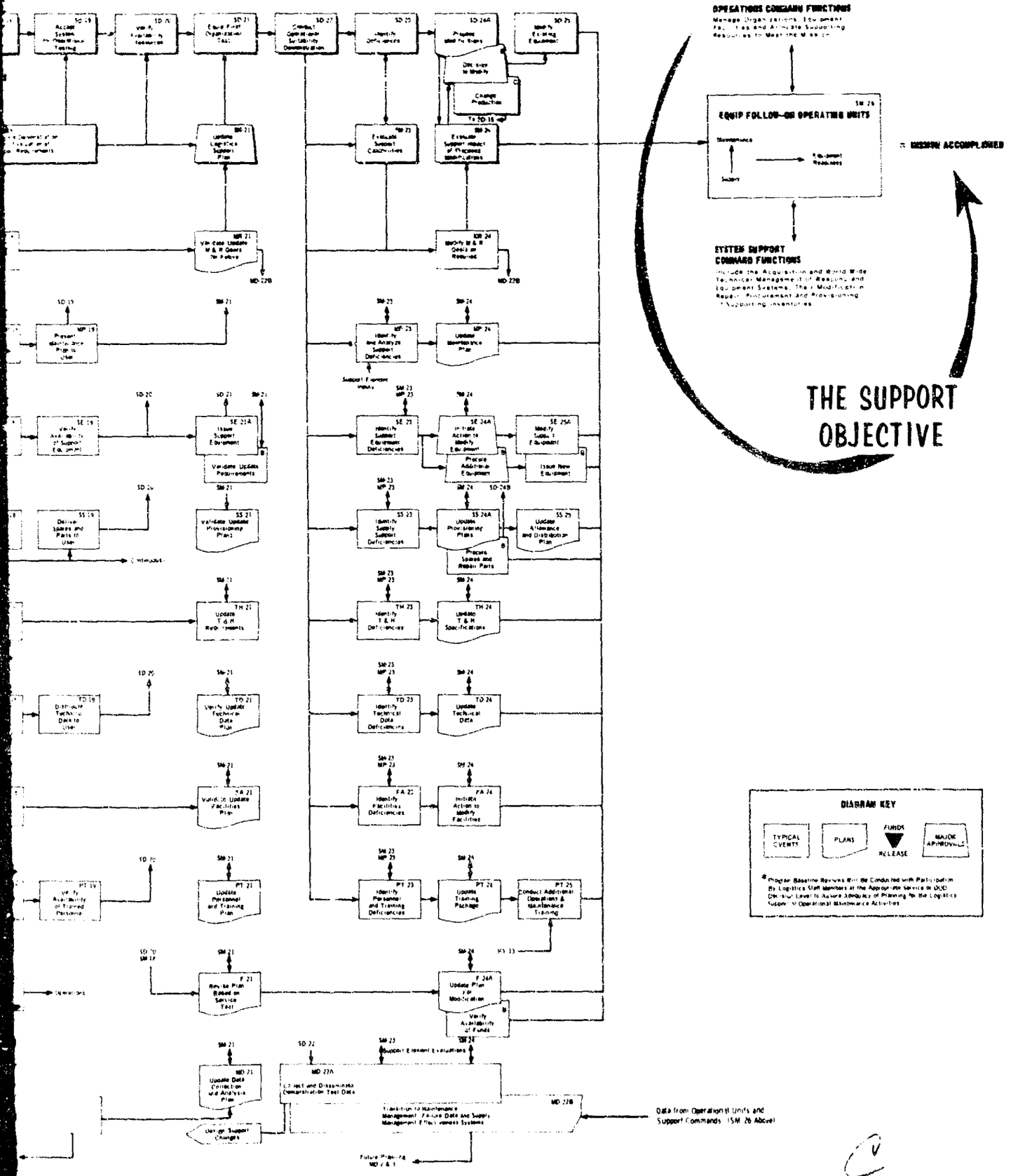


Figure 16