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MILITARY HANDBOOK

GUIDE FOR APPLICATION AND TAILORING OF REQUIREMENTS FOR DEFENSE MATERIEL ACQUISITIONS



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DEPARTMENT OF DEFENSE
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Guide for Application and Tailoring of Requirements For Defense Materiel Acquisitions.

1. This standardization handbook was developed by the Department of Defense with the assistance of the Naval Air Systems Command in accordance with established procedure.
2. This publication was approved on 15 Oct. 1979 for printing and inclusion in the military standardization handbook series.
3. This document provides guidelines and rationale for engineering and management personnel when tailoring the requirements used in the systems acquisition process.
4. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document, should be addressed to: Commanding Officer, Naval Air Engineering Center, Engineering Specifications and Standards Department (93), Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

DoD-HDBK-248A

FOREWORD

1. This handbook is directed to the attention of program managers, acquisition review boards, and contracting officers, and also the speciality practitioners and technical personnel of the various engineering and effectiveness disciplines who participate in the establishment of materiel and program requirements.

2. Experience has shown that the misapplication, over-application, and under-application of specifications and standards in military procurements results in escalated and unnecessary costs which do not measurably contribute to systems effectiveness or mission performance. DoD Directive 4120.21, "Specifications and Standards Application", establishes policies and procedures governing the application and tailoring of specifications and standards to achieve cost-effective acquisition and life cycle ownership of defense materiel. This handbook provides guidelines for the implementation of the objectives and intent of that directive.

3. The application process is a formalized, systematic method for assuring that appropriate and applicable specifications and standards are cited in the acquisition documentation, that inappropriate or inapplicable specifications and standards are not cited, and that each individual requirement of referenced specifications and standards has been evaluated and "tailored" if necessary for direct applicability to the item of procurement and to the acquisition phase under consideration. The "tailoring" process implicitly includes the conduct of trade-off studies to determine the cost effectiveness of each requirement that is contemplated for inclusion in the acquisition documentation for each procurement of defense materiel or services.

4. The application process must include a degree of caution to assure that the desired balance is achieved between performance and life cycle cost. Equally important is the timing in invoking requirements during the acquisition cycle. A requirement that is invoked prematurely, or lately can incur unnecessary costs, as can a requirement that is not invoked at the appropriate milestone.

DoD-HDBK-248A

CONTENTS

			Page
Section	1.	SCOPE -----	1
Paragraph	1.1	Scope -----	1
	1.2	Purpose -----	1
	2.	REFERENCED DOCUMENTS -----	2
	3.	DEFINITIONS -----	4
Section	4.	GENERAL CONSIDERATIONS -----	8
Paragraph	4.1	Overview -----	8
	4.2	Objectives -----	8
	4.3	Application -----	9
	4.4	Development of tailored systems specifications -----	9
	4.5	Tailoring program management system requirements -----	10
	4.6	High-cost-drivers -----	10
	4.7	Standards invoked by reference -----	11
	4.7.1	Review of content of reference specifications and standards -----	11
	4.7.1.1	Responsibility for tailoring -----	12
	4.7.1.2	Program schedule impact of referenced specifications and standards -----	12
	4.7.1.3	Impact of referenced specifications and standards -----	13
	4.8	Impact of over-application and under- application of specifications and standards in contract requirements---	13
	4.8.1	Over-application -----	13
	4.8.2	Under-application -----	14
Section	5.	DETAIL PROCEDURES -----	15
Paragraph	5.1	Application and tailoring -----	15
	5.1.1	Basic steps for application and tailoring -----	15
	5.1.2	Selecting specifications and stan- dards for application -----	15
	5.1.3	Specifications sheets-----	16

DoD-HDBK-248A

CONTENTS - Continued

		Page
Paragraph	5.1.4	Standard parts and materials list ---- 16
	5.1.5	Exception sheets ----- 16
	5.1.6	Sectionalized format ----- 16
	5.1.7	Extracting requirements ----- 17
	5.1.8	Appendices ----- 17
	5.1.9	Updating requirements ----- 17
	5.1.10	Specifications and standards as guides ----- 18
	5.1.11	Tailoring recommendations submitted by contractor ----- 18
	5.1.12	Use of function specifications ----- 18
	5.2	Application and tailoring by acquisition phases ----- 18
	5.2.1	Program initiation phase ----- 19
	5.2.2	Demonstration and validation phase --- 19
	5.2.3	Full scale engineering development phase ----- 20
	5.2.4	Production/deployment phase ----- 20
	5.3	Acquisition and Distribution of Commercial Products (ADCP)----- 20

FIGURES

Figure	1	Typical distribution of acquisition cost for aircraft-----	22
	2	Typical distribution in-plant aircraft production cost (less avionics)-----	23
	3	Exception sheet for tailoring speci- fications -----	24
	4	The Defense System Acquisition Cycle-----	25

DoD-HDBK-248A

1. SCOPE

1.1 Scope. This handbook outlines a methodology to be used in the application and tailoring of the requirements of specifications and standards contractually imposed during the various phases of defense materiel acquisition.

1.2 Purpose. The purpose of this handbook is to provide acquisition management and engineering personnel with general guidelines and the underlying rationale and philosophy for application and tailoring of the requirements used in the defense materiel acquisition process, and to facilitate implementation of directives requiring that all levels of management take constructive actions to assure more cost-effective utilization of specifications and standards in military materiel acquisitions through the process of application and tailoring.

DoD-HDBK-248A

2. REFERENCED DOCUMENTS

2.1. Issues of documents. The following documents are referred to in various sections of this handbook and are for reference purposes.

STANDARDS

MILITARY

- MIL-STD-109 - Quality Assurance Terms and Definitions
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-454 - Standard General Requirements for Electronic Equipment.
- DoD-STD-480 - Configuration Control - Engineering Changes, Deviations and Waivers.
- MIL-STD-721 - Definitions of Effectiveness Terms for Reliability, Maintainability, Human Factors and Safety
- MIL-STD-785 - Reliability Program for Systems and Equipment Developmental and Production
- MIL-STD-810 - Environmental Test Methods.
- MIL-STD-882 - System Safety Program for Systems and Associated Subsystems and Equipment
- MIL-STD-961 - Outline of Forms and Instructions for the Preparation of Specifications and Associated Documents.
- MIL-STD-962 - Outline of Forms and Instructions for the Preparation of Military Standards and Military Handbooks.

DEPARTMENT OF DEFENSE

- DoD-SD-1 - Standardization Directory

2.2. Other publications.

- DoD Directive 4105.62 - Selection of Contractual Sources for Major Defense Systems.
- DoD Directive 4120.20 - Development and Use of Non-government Specifications and Standards
- DoD Directive 4120.21 - Specifications and Standards Application
- DoD Directive 5000.1 - Acquisition of Major Defense Systems.
- DoD Directive 5000.19 - Policies for the Management and Control of Information Requirements.
- DoD Directive 5010.19 - Configuration Management
- DoD Instruction 5010.12 - Management of Technical Data.

DoD-HDBK-248A

(Copies of specification, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

DoD-HDBK-248A

3. DEFINITIONS

3.1 Definitions used in this handbook. For the purpose of this handbook, the following definitions apply:

3.1.1 Application. The orderly process of reviewing and selecting from the total realm of available specifications and standards those that are considered to have application to the particular materiel acquisition program, and contractually invoking these, wholly or in part, at the most advantageous point in the system acquisition cycle.

3.1.2 Configuration management. Configuration management is a engineering management procedure applying technical and administrative direction and surveillance to (1) identify and document the functional and physical characteristics of a configuration item, (2) control changes to those characteristics, and the identification documents (3) record and report the implementation of changes to the item configuration and its identification documents (4) checking the configuration item for compliance with the configuration identification documents. (DoD Directive 5010.19)

3.1.3 Data (technical data and information). Data requirements define the means for communication of concepts, plans, descriptions, design and performance requirements, and instructions relating to technical projects, materiel, systems, and services. Such data may include specifications, standards, engineering drawings, associated lists, manuals, and reports, including scientific and technical reports. They may be in the form of documents, displays, sound records, punched cards and digital or analog data. (DoD Instruction 5010.12).

3.1.4 Demonstration and validation phase. See DoD Directive 5000.1.

3.1.5 Documentation requirements. Documentation requirements are those specifying types of documents required for design review and approval, manufacture or procurement, testing, inspection, installation, operation, maintenance, logistic support, and configuration management as appropriate.

3.1.6 Environmental requirements. Environmental requirements are those specifying the environmental conditions that the system, subsystem or equipment is expected to experience in shipment, storage, and service use. The following subjects should be considered for coverage: mission environment (rain, temperature, humidity, salt spray, etc.); induced environment (motion, shock, noise, etc.); electromagnetic signal environment; shipboard magnetic environment; and threat environment, that environment composed of enemy caused elements capable of reducing the ability of a weapon system to perform mission-related functions by inflicting damaging effects, forcing undesirable maneuver, or degrading systems effectiveness.

DoD-HDBK-248A

3.1.7 Fabrication (Design) specification. A fabrication specification states a detailed description of the parts and assemblies of the product, usually by prescribing compliance with a set of drawings, and those performance requirements and corresponding tests and inspections necessary to assure proper fabrication, adjustment, and assembly techniques. (DOD-STD-480).

3.1.8 Function (Performance) specification. A function specification states the complete performance requirements of the product for the intended use, and the necessary interface and interchangeability characteristics. It covers form, fit, and function. (DOD-STD-480).

3.1.9 Full scale engineering development phase. See DoD Directive 5000.1.

3.1.10 General specifications (Design). General specifications contain all the requirements that are common to different types, classes, grades or styles of specific items and processes; they avoid repetition of common requirements in each detail item or process specification. Use of general specifications also permits changes to common requirements to be readily effected. General specifications are also used to cover requirements for design of weapons, systems and subsystems.

3.1.11 Human factors. Human factors are scientific facts about human characteristics. The term covers all biomedical and psychosocial considerations. It includes, but is not limited to, principles and applications in the areas of human engineering, personnel selection, training, life support, job performance aids, and human performance evaluation.

3.1.12 Integrated logistics support. Integrated logistic support is a composite of the elements necessary to assure the effective and economical support of a system or equipment at all levels of maintenance of its programmed life cycle. The elements include all resources necessary to maintain and operate an equipment or weapon system, and are categorized as follows: (1) planned maintenance, (2) logistics support personnel, (3) technical logistic data and information, (4) transportation and handling, (5) support equipment, (6) spares and repair parts, (7) facilities, (8) contract maintenance.

3.1.13 Maintainability. Maintainability is a characteristic of design and installation which is expressed as the probability that an item will be retained in, or restored to a specified condition within a given period of time, when the maintenance is performed in accordance with prescribed procedures and resources. Quantitative maintainability requirements should be stated along with the minimum test program to assure that the requirements have been met. (See MIL-STD-721).

3.1.14 Packaging, handling, storage and transportability. Packaging, handling, storage and transportability requirements should provide guidance for the preparation of items for shipment and storage. Included are all the operations and devices required to prepare items for

DoD-HDBK-248A

distribution, such as cleaning, drying, preserving, packing, marking and utilization. Transportability refers to the inherent capability of materiel to be moved by towing, by self-propulsion or by carrier via railways, highways, waterways, pipelines, oceans or airways.

3.1.15 Production and deployment phase. See DoD Directive 5000.1.

3.1.16 Program initiation phase. See DoD Directive 5000.1.

3.1.17 Quality assurance. A planned and systematic pattern of all actions necessary to provide adequate confidence that the item or product conforms to established technical requirements. (See MIL-STD-109).

3.1.18 Product assurance. Those technical management and program execution activities which govern the quality of materiel throughout the materiel life cycle, including materiel reliability, availability and maintainability (RAM), quality engineering, quality control, quality assurance and assessment of product (or system) effectiveness.

3.1.19 Reliability. Reliability is the probability that an item will perform its intended function for a specified interval under stated conditions. Reliability requirements should be stated in quantitative units with confidence levels, and should include the minimum test program to assure that the required reliability has been attained. (see MIL-STD-785)

3.1.20 System acquisition process. A sequence of specified decision events and phases of activity directed toward achievement of established program objectives in the acquisition of defense systems, extending from approval of a mission need through successful deployment of the system or termination of the program. (See DoD Directive 5000.1)

3.1.21 System safety. Safety is freedom from those conditions which can cause injury or death to personnel, damage to or loss of equipment or property. System safety is the optimum degree of safety within the constraints of operational effectiveness, time and cost, attained through specific application of system safety management and engineering principles throughout all phases of a system's life cycle. (See MIL-STD-882).

3.1.22 System specification. A system specification states the technical and mission requirements for a system as an entity, allocates requirements to functional areas and defines the interfaces between or among the functional areas. For the purpose of this handbook, system specifications also include other contractual requirements documents. (See DoD-STD-480).

3.1.23 Tailoring. The process by which the individual requirements (sections, paragraphs, or sentences) of the selected specifications and standards are evaluated to determine the extent to which each requirement is most suitable for a specific materiel acquisition and the modi-

DoD-HDBK-248A

fication of these requirements, where necessary, to assure that each tailored document invoked states only the minimum needs of the Government. (See DoD Directive 4120.21).

3.2 Definition of acronyms used in this handbook. The following acronyms listed in this handbook are defined as follows:

- . ADCP-- Acquisition and Distribution of Commercial Products
- . CI - Configuration Item.
- . CMAN-- Configuration Management
- . DAR - Defense Acquisition Regulation
- . DID - Data Item Description.
- . DoD -- Department of Defense.
- . ECP - Engineering Change Proposal.
- . ENVR - Environmental Requirements and Test Methods
- . FSC - Federal Supply Classification
- . GDRQ - General Design Requirements
- . HFAC - Human Factor
- . MISC - Miscellaneous
- . MNTY - Maintainability
- . OMB - Office of Management Budget
- . OTS -- Off-the-shelf
- . PACK - Packing, Packaging, Preservation, Transport
- . QCIC - Quality Control-Inspection-Calibration
- . RELI - Reliability
- . RFP - Request For Proposal.
- . SAFT - Safety
- . SOW - Statement of Work

DoD-HDBK-248A

4. GENERAL CONSIDERATIONS

4.1 Overview. The requirements contained in many specifications and standards are frequently applied to systems acquisition programs by citing the title and number of such documents in the system specification under the "Applicable Documents" section and text. This method of applying requirements frequently results in unnecessary work by the contractor. The process for proper application of requirements includes deliberate selection of the appropriate specification/standard and the tailoring of the requirements selected from those documents for unique application to the system specification or contract statement of work. The greatest benefit of tailoring can be achieved in the application of non-product specifications and standards such as those identified in the "Standardization Areas" of the DoD Standardization Program. (See Paragraph 4.6). Product specifications and standards such as those identified in the "FSC" classifications in the DoD Standardization Program are not normally subject to tailoring for use in the development and production phase. Misapplication of specifications and standards in acquisition programs is frequently cited as a significant contributor to increased cost and delays in the military-materiel acquisition process. The costly misapplication of specifications and standards has been evident in several forms:

- a. The premature application of military specifications and standards requirements in the early phases of acquisition programs.
- b. The application of military specifications and requirements excessive to the mission functional performance needs.
- c. The inadvertent application of referenced specification and standards.
- d. Total application of referenced specifications and standards which include paragraphs containing obsolete, overlapping, ambiguous or incompatible requirements.
- e. The application of specifications and standards, or certain requirements thereof, not intended for the purpose for which they have been invoked.
- f. Acquisition of nonessential data.
- g. The application of inadequately prepared specifications and standards.

4.2 Objectives. To ensure more cost-effective application of specifications and standards, current DoD policy (DoD Instruction 4120.21) requires that all DoD components increase their efforts toward customized application and tailoring of those specifications and standards which are applied to each program acquisition contract. DoD policy regarding specification tailoring is more fully stated as follows:

- a. Specifications and standards to be used in acquisition programs shall be selected and tailored to impose the minimum essential needs for optimizing the cost effectiveness of the system performance and program management process.

DoD-HDBK-248A

- b. Data requirements to be imposed in acquisition programs shall represent the minimum needs for supporting program management control of schedules, costs and assessment of the compliance with material configuration and performance requirements, to identify and record advancements in the state-of-the-arts that are applicable to future system design and construction.
- c. The blanket contractual imposition of specifications, standards and DID's in acquisition programs shall be controlled and avoided unless the entire specification, standard or DID has been determined to be applicable.
- d. A management review shall be made of all acquisition programs to assure that the requirements of specifications, standards and DID's used have been properly selected, tailored, and applied. This management review shall be adopted as an additional, integral responsibility of existing acquisition and data requirements review boards.
- e. The results of each management review process and the degree of tailoring accomplished shall be made a matter of permanent record, preferably in the contract file.
- f. To the extent permissible by the proposed procurement method, (see DoD Directive 4105.62, ASPR/DAR, Section II, Part 5 and Section III, Part 8), recommendations or comments should be solicited from prospective contractors during the acquisition process to determine whether additional cost-effective tailoring of cited specifications, standards and data items can be accomplished or cost-effective substitutions proposed. During contract performance, contractors should be encouraged to submit proposals for deviations to specification requirements and data item requirements considered to be excessive to the optimized system performance.

4.3 Application. In the selection and tailoring of specifications/standards for application in contract/systems specifications the following should be considered:

- a. Acquisition Phase
- b. Unique Manufacturing Process
- c. Technology
- d. Complexity
- e. Criticality of performance
- f. Quantity/Rate of Production/Price-goals
- g. Logistic Support
- h. Requirements of all using activities

4.4 Development of "tailored" system specifications. At the outset of any new defense system development program, it is not practicable to define and describe all technical requirements down to the level of detail which ultimately will be required for production of the system. The development of the definitive detail into the product specification is a progressive, evolutionary process which continues throughout the

DoD-HDBK-248A

development and production phases of the program. Each stage of evolution is considered a base line or point of departure for the purpose of establishing the contractual requirements. The first base line is the functional base line, usually defined by the system specification which includes the functional requirements and test requirements for the system, and the management system and data reporting requirements for the program. Included are the mission requirements, operational and logistics requirements, and identification of the interface requirements for compatibility with other systems or equipments. The functional base line documents are tailored continuously by the contractor and the government during the validation phase and early development phase. During the full scale development program, the system specification is supplemented by other specifications and drawings to define the total systems in terms of individual configuration items. The final evolution of this process is the product base line. During the entire process, tailoring may be accomplished by changes from the base line. A physical configuration audit is conducted to verify that the "as built" configuration matches the product configuration identification and a functional audit verifies performance. It is extremely important to specify the proper base line identification documents and the point in time at which the base line becomes effective,

4.5 Tailoring program management systems requirements. Tailoring of management system requirements should start at the program manager's level and be structured according to individual program objectives, management control, and reporting needs. Variations among programs will influence the management methods employed. There is a major payoff in the establishment of a management system which is effectively tailored to optimize the management scope and methods for meeting the program objectives. Management plans should be tailored to reflect a degree of management compatible with the type of contract, contract value, acquisition complexity, contractor's inherent management system strengths and weaknesses, and the program life-cycle phase. The system should: (a) provide for time-phased progress plans and flexibility in the plans; (b) provide for assessing and reporting actual achievement against planned objectives; (c) assign appropriate responsibility for identified requirements.

4.6 High-cost-drivers. The specification of requirements in any acquisition program represents a cost driving influence. However, when appropriately applied at the proper time, overall cost effectiveness can be enhanced. As an example, the cost of a defense system after the acquisition phase is 60 to 80% of the total life cycle cost. It follows that applicable logistic specifications should be applied early in the system acquisition phase to provide maximum cost benefits over the system life cycle. The following categories of requirements are typical examples of the kinds of requirements frequently having a high cost impact and should be tailored.

DoD-HDBK-248A

- a. General design specifications requirements
- b. Configuration management requirements
- c. Quality assurance requirements
- d. Reliability and maintainability requirements
- e. Integrated logistic support requirements
- f. Human factors and system safety requirements
- g. Environmental requirements and test methods
- h. Technical data requirements
- i. Packaging, handling, storage and transportability requirements

(Any reference to high-cost-driver specifications, standards or requirements which appears in subsequent paragraphs will be understood to refer to one or more of the high-cost-driver categories listed above or others included in the standardization areas listed in DoD Standardization Directory SD-1.

4.7 Standards invoked by reference. Documents related to the high-cost-driver requirements should be invoked, when applicable, by reference in the contract or statement of work and not in second or third tier reference specifications or in the contract data item descriptions. The standards are intended to provide requirements to the system designers and to control excessive variations in materials, hardware features, software and data formats, engineering and supply management practices and test conditions and procedures. The beneficial purpose of these standards is to promote standardization, commonality, interchangeability, compatibility, reliability, maintainability, system safety, and management control during the development of the system. Although most of the standards do accomplish their beneficial purposes to a greater or lesser degree in system design and management, they all have a cost-driving effect which must be borne by the acquiring activity and, therefore, must be measured judiciously in relation to the benefits to be derived for the particular acquisition under consideration.

4.7.1 Review of contents of reference specifications and standards. Because of compressed schedules and limited resources there is a compelling tendency on the part of the specialty engineers and specification writers, when preparing system specifications, to reference specifications and standards in their entirety without conducting a detailed technical review of the total content of the referenced documents. This review is necessary to ensure that all of the requirements represent current technology; are necessary for, and compatible with, the functional and operational requirements of the system, do not require tailored modifications for increased cost effectiveness; are essential for cost-effective management control during the applicable phase of the system acquisition program; and are devoid of ambiguities. This tendency to omit review of the requirements extends not only to general design requirements but also the other high-cost-driver requirements.

DoD-HDBK-248A

4.7.1.1 Responsibility for tailoring. In industry and government the main depository of "corporate technical memory" is in the compilation of technical information contained in the aggregate of specifications, standards, drawings, handbooks, manuals and test reports. Engineers from one generation to another pass on their lessons learned (from good and bad experiences) through the medium of specifications and standards. Specifications and standards are necessary for successful development of complex systems and they should not be invoked, deleted, or changed without thorough deliberation by qualified persons, or without identification of recognized benefits and risks to the system development program. The task of tailoring must be shared equally by the technology specialist, the component product specialist, and the system integrator. Final responsibility and authority for tailoring rests with the system program manager. Each tailoring operation is unique for each system program.

4.7.1.2 Program schedule impact on use of referenced specifications and standards. Incomplete advance planning, over-optimistic development schedules, and unrealistic expectations of engineering accomplishments contribute to failure to perform adequate tailoring of specifications and standards, prior to release of the RFP and during contract negotiations, subsequent to source selection. Despite these problems, primary attention should be given to tailoring the requirements at the front end of the system acquisition program. Tailoring to the optimum level can ease schedule problems and shorten the validation phase, particularly during the environmental, reliability, and maintainability test and evaluation phase. Optimum tailoring of management system specifications and standards applied in the RFP and during contract negotiation after source selection, will result in the reduction of contractor costs for program management and reporting by permitting optimum compromise between strict compliance with government management and reporting specifications and the contractor's established management system. Front-end tailoring of performance requirements to realistic levels, consistent with both the program cost and schedule objectives as well as operational requirements, should be conducted thoroughly to avoid downstream costs and schedule overruns due to excessive contractor efforts in trying to comply with nonessential performance requirements, which have marginal contribution to the system/equipment performance within the mission operational environment.

4.7.1.3 Impact of referenced specifications and standards. Because of the potential high-cost-driving impact on the system acquisition program, all referenced specifications and standards related to the systems requirements should be reviewed and tailored to the application. Each standardization document invoked by reference in the system specification or statement of work (SOW) in turn may reference 10 or so other standardization documents. This means by referencing fifty of these documents in an acquisition, it would typically require compliance with 500 second tier documents, plus 5,000 third tier documents etc.

DoD-HDBK-248A

Proper tailoring cannot be accomplished without reading the referenced documents, evaluating all the requirements, including the specified requirements of the documents referenced therein, and determining which requirements are applicable and necessary. Figures 1 and 2 present examples of typical distribution of cost for an aircraft weapons system and some of the principle specifications and standards which contribute to such costs and should be selectively applied and tailored.

4.8 Impact of over-application and under-application of specifications and standards in contract requirements. Unawareness of essential information relative to design, technology, operational environments, management organization and techniques, or program cost and schedule goals can often result in over or under-application of specifications and standards. Program managers should insure adequate dissemination of essential information to supporting staff personnel.

4.8.1 Over-application. Over-application relates to invoking requirements which are excessive to the optimized system functional design and performance based on identified mission need or are excessive to the program management needs. Over application is not the fault of the documents but is more typically the product of improper tailoring of the requirements. Some symptoms that have been identified with over application of the standardization documents are:

- a. The "potential high-cost-driver" requirements have not been identified or addressed.
- b. Lack of discrimination in preparing and applying specifications and standards between equipment required to operate in severe environments and equipment that only operates in benign environments. This can result in all equipment being designed to meet the most severe environment which is not, in fact necessary.
- c. Specifications and standards being specified in anticipation of additional need rather than actual identified need. This can be the result, if inadequate attention was given to consider properly the essentiality of the numerous specifications and standards referenced and the applicability of each paragraph or requirement in the documents.
- d. Proper consideration not given to the extensive cross-referencing that exists in specifications. The contractor may be required to apply specifications and standards which were not properly validated as requirements. Specific attention must be devoted to this aspect to assure that unintended requirements are not included by references in lower tier documents.

DoD-HDBK-248A

- e. Tailoring of specifications and standards not evident. The same specifications and standards are applied in identical fashion from contract to contract without appreciation for differing applications. The rigidity of established military specification and standard requirements may exceed the minimum requirements to assure a satisfactory end product for many applications.
- f. Including in the contract requirements or tasks that were accomplished in an earlier phase of the program and are no longer appropriate.
- g. Application on noncritical programs of military specifications which exceed commercial practices. Particularly, the application of "how to" specifications to experienced major contractors may not be cost effective. Military requirements should only be used on selected unique equipment when the commercial practices are inadequate for system requirements.

4.8.2 Under-application. Under-application relates to inadvertent or deliberate omission or easing essential specifications or standard requirements thus permitting reduced level of planned performance with the intent of avoiding cost and compressing schedules. Through under-application of specification requirements, the Government becomes overly dependent on the contractor's interpretation of what would constitute acceptable levels of operational performance, reliability, maintainability, or system safety. Contrary to the intent, under application may result in:

- a. Reduced operation suitability, including reliability or maintainability.
- b. Reduced performance.
- c. Increased life-cycle cost.
- d. Lack of logistic support.
- e. Early obsolescence.

DoD-HDBK-248A

5. DETAILED PROCEDURES

5.1 Application and Tailoring. Application and tailoring, is a progressive, evolutionary process which continues throughout the development and production program and is unique for every acquisition phase. Therefore, it is not feasible to provide detailed instructions for "how to tailor" any one document to make it cost effective for every application. There are, however, some techniques and methods which can be used effectively in selecting, tailoring and applying many different specifications and standards for all applications. Examples of these techniques and methods are described in this section.

5.1.1 Basic steps for application and tailoring. Application of specifications and standards is accomplished by four basic steps:

(1) by deriving specific performance requirements, from interpretation of operational missions profiles and support environments in terms of each discipline (such as functional performance criteria, for testing, evaluation, standardization, reliability, maintainability, survivability, serviceability, safety, etc.) for each subsystem, component and part.

(2) by selecting from the total realm of available management and technical design specifications and standards, or other requirements documents that are suitable for the acquisition program, and invoking only those specifications and standards which contribute to requirements essential for the defined operational performance of the system.

(3) by extracting from the selected specifications and standards only those requirements which are applicable for each phase of the system life cycle,

(4) by tailoring the selected requirements to specify only the minimum, quantified values for system optimization by adding needed requirements not covered by specifications and standards or by deleting non-essential requirements. If performance optimization, practicability and essentiality are the guiding factors in the tailoring process, cost-effectiveness is achieved.

5.1.2 Selecting specifications and standards for application. Because there are numerous specifications and standards having potential application to military systems, an efficient means must be developed in each acquisition agency for aiding the specialty engineer in his review and selection of applicable documents for each acquisition. The responsibility of the cognizant acquisition agency should include a review of the selection and certification actions related to application and tailoring, and also a review of any initiating actions by the specialty engineer for developing new and revised specifications within the specialty group subject matter.

DoD-HDBK-248A

5.1.3 Specification sheets. MIL-STD-961 provides for use of the specification sheet as a supplement to the associated general specification. Only one category (i.e., type, style or model) of an item shall be described by the detailed specification sheet. The detail specification sheet contains "tailored" specific characteristics data and performance requirements needed by the designer and the engineer for the selection of the item for use in assemblies and equipment. Use of the specification sheets in this manner provides a good tool for tailoring the general engineering design specification which is common to all types, classes, provides the means for selecting grades and styles of specified items, materials or processes.

5.1.4 Standard parts and materials lists. The use of "tailored" preferred parts and materials lists, and associated parts and materials selection and control procedures in systems design is an existing, available, technique for accomplishing one of the more tedious tailoring tasks; namely, the selection of parts and materials which will avoid increased costs due to built-in supply problems and increased logistic support during the operational life-cycle. This technique requires the system development contractor to establish and submit for approval a base line preferred parts and materials list intended to maximize cost-effectiveness of the design by increased use of military approved standard parts and materials or qualified products which are already in the military supply system.

5.1.5 Exception sheets. Occasionally, issuance of amendments or revisions to military specifications cannot be accomplished in a timely manner to meet the RFP deadlines. To alleviate this problem, a convenient technique for tailoring the referenced specifications and standards is the use of specification exception sheets (see typical suggested format in Figure 3). The exception sheet can be used for any specification or standard to be cited in the RFP documents. It should be written to tailor the respective referenced paragraphs in the referenced requirements document. This technique is especially useful in adapting cost-effective specification changes encountered in the exceptions granted on prior programs. Records of exceptions on each specification should be distributed for retention by the cognizant specialty engineers for developing the "corporate-technical memory" for preparation of exceptions and revisions of specifications and standards for the next acquisition.

5.1.6 Sectionalized format. Sectionalized format is an efficient and helpful technique which can be used to expedite tailoring of many high-cost-driver standards. Sectionalization (see MIL-STD-962) is the structuring of bookform standards in several sections or parts, each containing separate and distinct group of requirements. The requirements may be grouped and identified in accordance with their intended applicability to one or more of the following or other criteria.

DoD-HDBK-248A

- a. A particular class or kind of system or subsystem
- b. A particular class or type of equipment, component, part or material
- c. A particular range of performance levels and criticality.
- d. A particular engineering design function.
- e. A particular method, class or level of quality testing.
- f. A particular life-cycle phase.
- g. A particular technology or process.

For examples of sectionalization, refer to MIL-STD-202, MIL-STD-454, and MIL-STD-810.

5.1.7 Extracting requirements. Frequently, in the application of lower-tier, referenced military specifications and standards in the system specification or other contract requirements documents, only a few paragraphs of the referenced document will apply. In such instances, the applicable paragraphs should be extracted from the referenced specification and written into the system specification or other document without reference to the lower-tier document. Any necessary tailoring of the extracted paragraph can be incorporated at the same time. This technique can be used to substantially reduce the complexity of the specification tree and related volume of the proposal. It also reduces the data tracking efforts throughout the life of the contract.

5.1.8 Appendices. When referenced specifications and standards require the addition of quantitative criteria or information regarding intended usage for specific applications to the system specification, such criteria or information should be provided in the Exception Form (See Figure 3). The exception forms and any other tailoring recommendations should be attached as an appendix to the RFP and, when approved, included in the specification or other contract requirement documents.

5.1.9 Updating requirements. Contracts usually establish an effectivity date for specifications and standards which are cited therein. Between the time of the RFP closing date and the completion of the development phase, which is usually several years, many specifications and standards undergo upgrading revisions. During the system development phase prior to qualification, the contract should contain language to allow the contractor to substitute later revisions of applicable contractually approved lower-tier specifications and standards, especially

DoD-HDBK-248A

for parts and materials, without prior approval for each individual update change if in all other respects such substitution conforms with the definition of a Class II engineering change in accordance with DoD-STD-480.

5.1.10 Specifications and standards as guides. To permit innovative, cost-effective design approaches by the contractor in the Program Initiation, Demonstration and Validation phases, many military specifications and standards may be referenced as guidance criteria only. For such use proposals should include tailored application of the guidance documents including tailoring quantitative requirements. The critical criteria in lower-tier documents should be extracted and written into the system specification. To the extent feasible, referenced documents in the lower tiers (usually beyond the third or fourth tier) should initially be invoked as "technical guidance" documents only, and later when the production phase is planned, those critical application requirements (from lower-tier "technical guidance" documents) which have been used in the design must be invoked as mandatory requirements for the production system or equipment.

5.1.11 Tailoring recommendations submitted by contractors. During the performance of contracts for major systems, contractors have repeatedly found difficulties in interpreting and complying with some requirements of military specifications and standards. The RFP for the systems proposal should contain language inviting the contractors to submit recommended, tailored substitutes for such requirements which have imposed excessive costs with marginal benefits during performance of prior contracts.

5.1.12 Use of function specification. Use of function specifications in lieu of fabrication specifications (see DOD-STD-480) can be cost effective for many lower-tier components and equipments in the system design. Use of function specifications in conjunction with preferred parts and materials lists during the engineering development phase will tend to reduce logistics problems.

5.2 Application and tailoring by acquisition phase. The acquisition of complex systems for DoD is performed in successive, distinct phases established to facilitate adequate management control by the government over the expenditure of public funds and to ensure timely availability of required defense materiel. To avoid unproductive effort and cost, DoD policy requires that the application of specifications and standards be uniquely selected, tailored and applied to maximize the cost effectiveness of the program effort during each phase. The following subparagraphs provide guidelines for application and tailoring of high-cost-driver specifications and standards for each of the program phases including Program Initiating, Demonstration and Validation, Full-Scale Engineering Development, and Production/Deployment phase. Figure 4 illustrates the sequence and interrelationships between the phases of the system acquisition cycle.

DoD-HDBK-248A

5.2.1 Program initiation phase. During program initiation research efforts are directed toward developing and formalizing sufficient knowledge concerning new technology concepts to permit evaluation of such concepts for practicable application in advancing the state-of-the-art in the design of systems or other military-support material. Usually, no preconceived and defineable technical design approach for hardware is apparent at the onset of research efforts. Therefore, any specifications applied to research efforts should be no more than those minimal, technical objectives (stated as broad limitations on performance and functional purposes) which can be realistically anticipated, by both the contractor and the government, to be achievable within a projected time frame and approximate cost limitation. The specification for the research effort should, with few exceptions, avoid reference to other specifications and standards as requirements. Guideline information available in existing specifications or standards may be referenced but should not be indicated as a mandatory requirement. Following the research endeavor the contractor's efforts are directed toward exploratory development of a physical model of the conceptual-feasibility design of a major component or subsystem embodying adaptations of advanced technologies, derived from prior research efforts, for solving broadly-defined operation and functional problems directly related to a military mission for which no adequate capability currently exists. The technical requirements intended to be applicable to conceptual efforts should be specifically tailored for each contract and should be limited to those broad, basic performance and functional requirements considered by both the Government and the contractor to be achievable by application of existing technologies or advanced technologies developed during prior efforts. As in the research effort, the specifications for exploratory development should include no more than the minimal technical objectives which can be anticipated realistically by both the Government and the contractor to be achievable within a projected time frame and approximate cost limitation. With few exceptions, the contract and specifications should be self-sufficient without reference to other specifications or standards. Any applicable technical information available from existing specifications or standards should be extracted and carefully tailored for the specific purpose related to the technical objectives, without further reference to the specification or standard from which it is derived.

5.2.2 Demonstration and validation phase. The demonstration and validation phase is entered into when sufficient demonstration data has been evaluated to indicate justification for further development of the design and prototype models of test hardware having good potential for application to the solution of one or more of the technical problems relating to military capability requirements. At this point in the development program, both the government and the contractor have more complete knowledge of the technology limitations affecting the extent to which the technical objectives can be achieved. Consequently, in this phase, the specifications should be tailored again to upgrade and more

DoD-HDBK-248A

closely define the technical objectives relating to the design, performance and functional demonstration requirements for prototype test hardware.

5.2.3 Full scale engineering development phase. At this stage in the acquisition cycle, a large-scale commitment of resources must be made by the procuring activity. A commitment to the full scale engineering development phase usually implies a commitment for future procurement for fulfilling an approved military mission. To ensure that the expenditure of such resources will result in cost-effective materiel, the contract must include detailed requirements for obtaining maximum compatibility of the ultimate engineering design with the operational system requirement. The full scale development phase should: (1) revise/update the configuration identification, (2) prepare, revise/update the product/process/materiel specifications and related configuration identification, (3) design, develop and test development model(s) of the configuration item(s), (4) manufacture and test prototype/pilot production configuration item(s), (5) Design, develop and test prototype support equipment, (6) conduct preliminary, critical and in-process reviews, (7) conduct functional and physical audits, (8) initiate tailored configuration status accounting and (9) establish the product base line, prior to entering the production phase. The application of specifications and standards relating to the "cost-driver" requirements should be more specifically defined in the contract.

5.2.4 Production/deployment phase. Usually, the production phase will be entered into only after sufficient design and manufacturing data and documentation developed during the prior engineering development phase have been verified (by contractor and government testing and evaluation) as adequate for producing operational equipments. Proper application of tailored specifications and standards during the prior engineering development effort should preclude necessity for application of additional specifications and standards in the production contract except for refinement of some requirements based on experience gained during prior development phases.

5.3 Acquisition and distribution of commercial products (ADCP). Prior paragraphs have addressed the tailoring and application of Federal and Military specifications and standards. Another method of tailoring requirements for system acquisition is the use of commercial off-the-shelf (OTS) products and industry specification and standards. Therefore, the program managers should encourage the use of commercial, off-the-shelf (OTS) products, when such products will adequately serve the government requirements, provided such products have an established market acceptability. In weighing the acceptability of commercial products, it is necessary that, beyond the form, fit and function requirements, other factors be considered. Such factors vary depending on the nature and complexity of the items, and the environment in which it will be used, e.g. product availability, reliability and maintainability,

DoD-HDBK-248A

human engineering characteristics, guarantees or warranties specified for the item, shelf life, safety features and logistic support. Any decision regarding the use of commercial OTS products should include consideration of those dominant factors that determine the life cycle cost and readiness criteria for that product. Use of commercial specifications, standards, manuals and associated parts lists in lieu of government specifications and standards is encouraged. Every effort should be made to minimize government testing, quality control, special packaging or marking requirements inconsistent with or over and above the best commercial practices with continued emphasis on the adoption and use of industry standards in accordance with DoD Instruction 4120.20 "Development and Use of Non-Government Specifications and Standards and the Office of Management and Budget (OMB) Policies on Acquisition and Distribution of Commercial Products (ADCP).

Custodians:

Navy - AS

Army - MI

Air Force - 11

Preparing activity:

Navy - AS

(Project No. MISC-OC05)

Review

SM

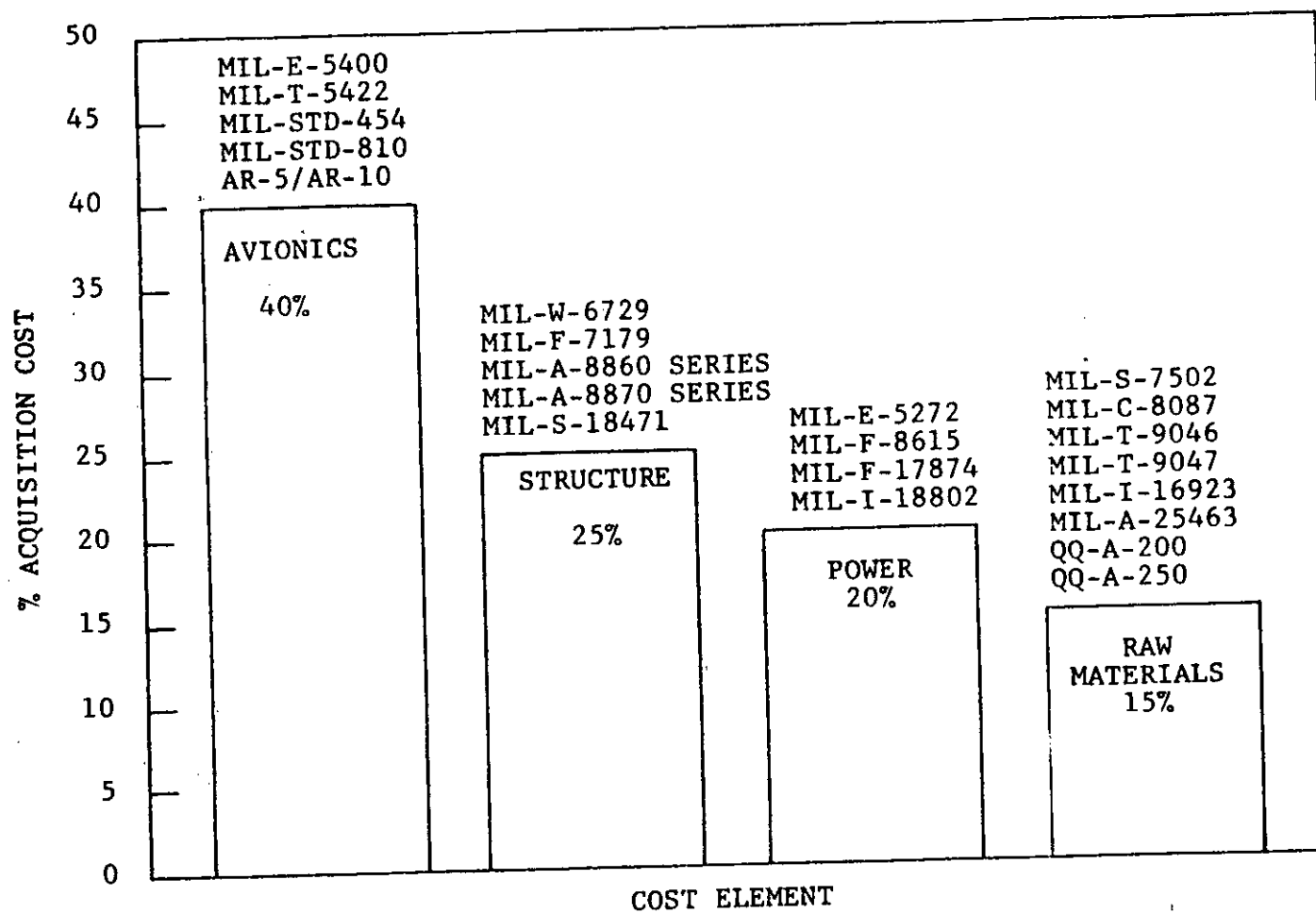


FIGURE 1. TYPICAL DISTRIBUTION OF ACQUISITION COST FOR AIRCRAFT

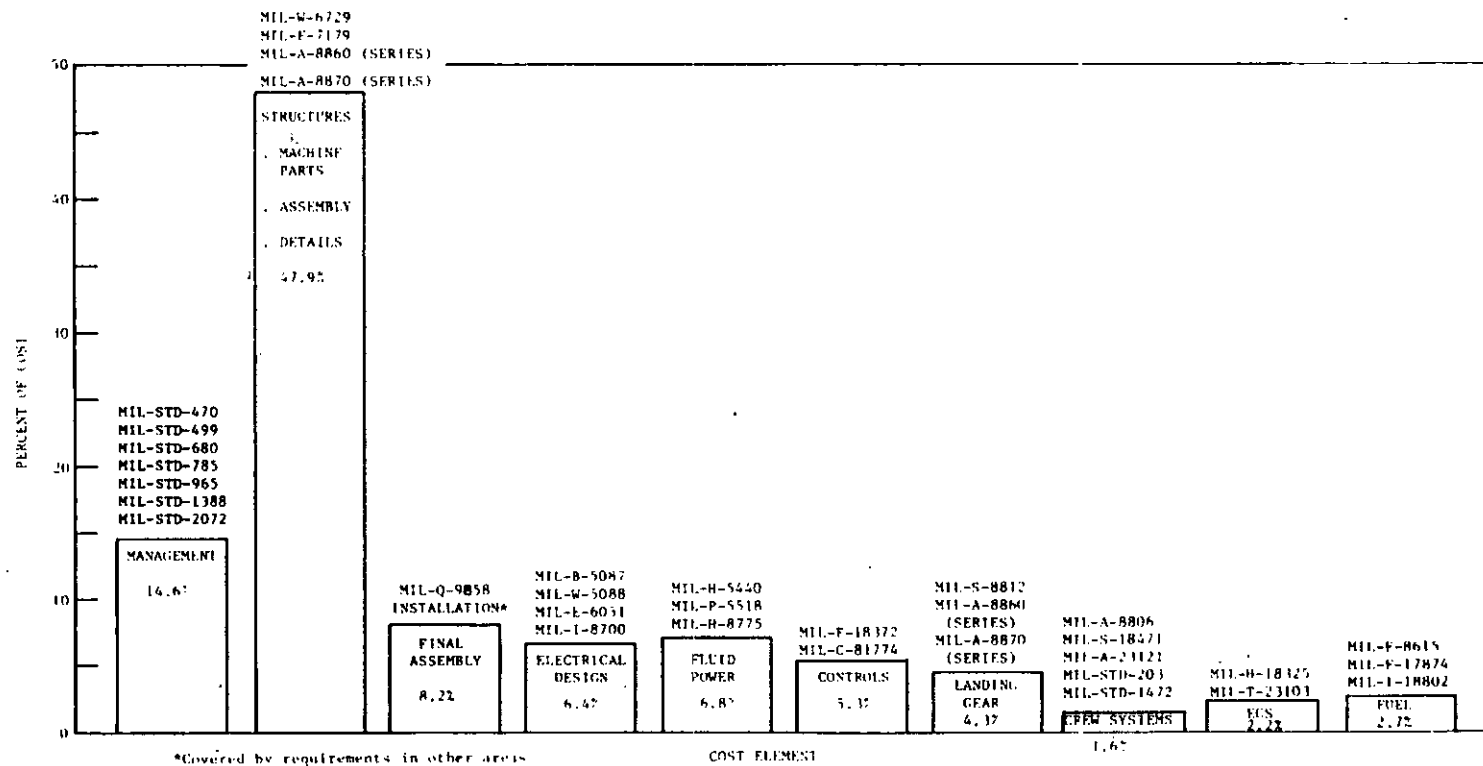


FIGURE 2. TYPICAL DISTRIBUTION IN-PLANT AIRCRAFT PRODUCTION COST (LESS AVIONICS)

EXCEPTION SHEET FOR SPECIFICATIONS AND STANDARDS (Applicable to Systems Specifications)						PREPARED BY: SIGNATURE _____ CODE _____ APPROVED BY _____ REP/CONTRACT NO. _____		SYSTEM SPECIFICATION NO. _____ PRODUCT _____ DATE _____	
SYSTEM	SUBSYSTEM OR AREA	DOCUMENT		CHANGE		JUSTIFICATION	COST SAVINGS		
		NUMBER	PARAGRAPH NUMBER	FROM	TO				

FIGURE 3. EXCEPTION SHEET FOR TAILORING SPECIFICATIONS

RD&E PROGRAM STRUCTURE	6.1 RESEARCH	6.2 EXPLORATORY DEVELOPMENT	6.3 ADVANCED DEVELOPMENT	6.4 FULL-SCALE ENGINEERING DEVELOPMENT	6.5 PRODUCTION/DEPLOYMENT
PROGRAM PHASES DDOINSL 5000.1		PROGRAM INITIATION	DEMONSTRATION AND VALIDATION	FULL-SCALE ENGINEERING DEVELOPMENT	PRODUCTION/DEPLOYMENT
BASIC ACQUISITION ACTIVITIES	<ul style="list-style-type: none"> TECHNOLOGY BASE DEVELOPMENT ANALYSIS OF MISSION RECONCILED WITH OVERALL CAPABILITIES, PRIORITIES, AND RESOURCES 	<ul style="list-style-type: none"> THREAT ANALYSIS OPERATIONAL NEED CONCEPT ANALYSIS TECH/ECONOMIC FEASIBILITY RISK IDENTIFICATION ALTERNATIVES COST ANALYSIS PRELIMINARY DESIGN FACTORS INITIAL CHARACTERIZATIONS/SYSTEM SPECIFICATION 	<ul style="list-style-type: none"> UPDATE OPERATIONAL NEED ADVANCED ANALYSIS TECH/ECONOMIC CONFIDENCE RISK RESOLUTION BEST ALTERNATIVES DEVELOPMENT OF PRELIMINARY LIFE CYCLE COSTS ASSESSMENT DEVELOPMENT PROGRAM PLAN (TECHNICAL, COST, LOGISTICS, SCHEDULE) ADVANCED DESIGNS 	<ul style="list-style-type: none"> UPDATE OPERATIONAL NEED ENGINEERING DEVELOPMENT PROPOSED PRODUCTION CAPABILITY DEVELOPMENT TEST AND EVALUATION OPERATIONAL SUITABILITY LIFE CYCLE COSTS PRODUCTION DELIVERY SCHEDULE PRODUCTION AND LOGISTICS SUPPORT PLAN 	<ul style="list-style-type: none"> PRODUCTION OF OPERATIONAL MATERIAL OPERATIONAL EMPLOYMENT IMPLEMENT LOGISTICS/MAINTENANCE PLANS PRODUCTIVITY/PRODUCT IMPROVEMENTS STOCKPILE MANAGEMENT SURVEILLANCE
OBJECTIVES	TECHNOLOGY RESEARCH	PAPER STUDIES	CRITICAL ISSUES EVALUATED	ENGINEERING EVALUATION DT&E AND OT&E	OPERATIONAL HARDWARE
TWO PROGRAM MILESTONES DDOINSL 5000.1 DDOINSL 5000.2		MILESTONE 0 (MENS) APPROVAL OF MISSION NEED AND PROGRAM INITIATION	MILESTONE 1 (DSARC 1) APPROVAL TO DEMONSTRATE SELECTED ALTERNATIVES	MILESTONE II (DSARC II) APPROVAL FOR FULL-SCALE ENGINEERING DEVELOPMENT AND LIMITED PRODUCTION FOR OT&E	MILESTONE III (DSARC III) PRODUCTION RELEASE APPROVAL FOR SERVICE USE (ASU)

DOD-HDBK-248A

FIGURE 1. THE DEFENSE SYSTEM ACQUISITION CYCLE

