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MILITARY STANDARD

WORK BREAKDOWN STRUCTURES FOR DEFENSE MATERIEL ITEMS

FSC MISC

DEPARTMENT OF DEFENSE

Washington D. C. 20301

Work Breakdown Structures for Defense Materiel Items

MIL-STD-881A

1. This Military Standard is mandatory for use by all Departments and Agencies of the Department of Defense.

a. Mandatory. This standard is applicable to each of the following types of projects:

(1) All defense materiel items (or major modifications) being established as an integral program element of the 5-year defense program (FYDP)

(2) All defense materiel items (or major modifications) being established as a project within an aggregated program element where the project is estimated to exceed $10 million in RDT&E financing, and

(3) All production follow-on of (1) and (2) above.

b. Otherwise designated. A work breakdown structure (WBS) may be employed in whole or in part for other defense materiel items at the discretion of the DOD component, or when directed by the Director of Defense Research and Engineering.

2. Recommended corrections, additions, or deletions should be addressed to:

Headquarters, Air Force Systems Command
Directorate of Cost Analysis
Cost Information and Management Systems Division (ACCI)
Andrews Air Force Base, Washington, D.C. 20334

FOREWORD

1. This Military Standard is based on the cooperative efforts of the military services with assistance from various industrial associations.

2. The practices and procedures contained in this standard are applicable to systems, equipment, and other designated materiel items which are referred to as defense materiel items. Work breakdown structures (WBS) provide a consistent and visible framework that facilitates:

a. A more effective management and technical base for planning and assigning management and technical responsibilities by operations within those government offices responsible for the acquisition of defense materiel items and those contractors furnishing the items.

b. More consistent control over and reporting of the progress and status of engineering and other contractor efforts, resource allocations, cost estimates, expenditures, and procurement actions throughout the acquisition of defense materiel items.

c. Consideration of total life cycle effects, including development, production, activation, operational use and phase-out, when making system development and acquisition decisions.

3. The uniformity in definitions and approach for developing the upper three levels of the WBS established by this standard is expected to assure compatibility of multiple-data requirements. The benefits expected from increased uniformity in the generation of work breakdown structures and their application to management practices will be realized by the improved interpretation and reconciliation of all reports prepared to this uniform framework throughout acquisition of a defense materiel item.

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MILITARY STANDARD

WORK BREAKDOWN STRUCTURES FOR DEFENSE MATERIEL ITEMS

1. SCOPE

1.1 Purpose. This standard establishes criteria governing the preparation and employment of work breakdown structures for use during the acquisition of designated defense materiel items.

1.2 Application

1.2.1 The work breakdown structure requirements established by this standard apply to all defense materiel items (or major modifications) (a) established as an integral program element of the 5-year defense program (FYDP); (b) where a project within an aggregated program element is estimated to exceed $10 million in RDT&E financing; (c) otherwise designated by the DOD component or Director of Defense Research and Engineering; and (d) all production follow-on of (a), (b), and (c).

1.2.2 This standard is to be used by both contractors and DOD components (government activities) in the development of work breakdown structures for defense materiel items.

2. REFERENCED DOCUMENTS

2.1 The documents referenced in appendices A through G of this standard apply as stated therein.

3. DEFINITIONS

3.1 General. Terms shall be as defined herein and in the appendices of this document.

3.2 Program element. A program element is the basic building block of the 5-year defense program; i.e., a description of the mission to be undertaken and a collection of the organizational entities identified to perform the mission assignment. A program element may consist of forces, manpower, materiel (both real and personal property), services, and associated costs, as applicable.

3.3 Defense materiel item. Defense materiel item is a term used within the DOD to identify a system or item that is usually established as an integral program element or is identified as a project within an aggregated program element.

3.4 Work breakdown structure (WBS). A work breakdown structure is a product-oriented family tree composed of hardware, services and data which result from project engineering efforts during the development and production of a defense materiel item, and which completely defines the project/program. A WBS displays and defines the product(s) to be developed or produced and relates the elements of work to be accomplished to each other and to the end product.

3.5 Summary work breakdown structure (Summary WBS). A summary work breakdown structure consists of the upper three levels of a WBS prescribed by this standard and having uniform element terminology, definition, and placement in the family-tree structure. The upper three levels of a summary WBS have been organized within the following categories of defense materiel items:

a. Aircraft systems
b. Electronics systems
c. Missile systems
d. Ordnance systems
e. Ship systems
f. Space systems
g. Surface vehicle systems

3.5.1 Level identification. The three levels specified in 3.5 are defined as follows:

Level 1. Level 1 is the entire defense materiel item; for example, the Minuteman ICBM System, the LHA Ship System, or the M-109A1 Self-Propelled Howitzer System. Level 1 is usually directly identified in the DOD programming/budget system either as an integral program element or as a project within an aggregated program element.

Level 2. Level 2 elements are major elements of the defense materiel item; for example, a ship, an air vehicle, a tracked vehicle, or aggregations of services, (e.g., systems test and evaluation); and data.

Level 3. Level 3 elements are elements subordinate to level 2 major elements; for example, an electric plant, an airframe, the power package/drive train, or type of service, (e.g., development test and evaluation); or item of data (e.g., technical publications).

3.6 Project summary work breakdown structure (Project summary WBS). A project summary work breakdown structure is a summary WBS tailored to a specific defense materiel item.

3.7 Contract work breakdown structure (Contract WBS). Contract work breakdown structure is defined as the complete WBS for a contract, developed and used by a contractor in accordance with this standard and the contract work statement.

3.8 Project work breakdown structure (Project WBS). Project work breakdown structure is defined as the complete WBS for the project, containing all WBS elements, related to the developments and/or production of the defense materiel item.

3.9 Work breakdown structure element. A work breakdown structure element is a discrete portion of a work breakdown structure. A WBS element may be either an identifiable item of hardware, set of data, or a service.

3.10 Configuration item (CI). An aggregation of hardware/computer programs or any of its discrete portions, which satisfies an end-use function and is designated by the government for configuration management. CIs may vary widely in complexity, size and type, from an aircraft, electronic or ship system to a test meter or round of ammunition. During development and manufacture of the initial (prototype) production configuration, CIs are those specification items whose functions and performance parameters must be defined (specified) and controlled to achieve the overall end-use function and performance. Any item required for logistic support and designated for separate procurement is a configuration item.

3.11 Systems engineering. Systems engineering is the application of scientific and engineering effort to:

a. Transform an operational need into a description of system performance parameters and a system configuration through the use of an iterative process; e.g., definition, syntheses, analysis, design, test and evaluation, etc.

b. Integrate related technical parameters and assure compatibility of all physical, functional, and program interfaces in a manner which optimizes the total system definition and design, and

c. Integrate reliability, maintainability, safety, human, and other such factors into the total engineering effort.

3.12 Logistics engineering. Logistics engineering is the application of support planning and analysis techniques to:

a. Define, optimize and integrate the logistics support considerations into the mainstream engineering effort.

b. Determine the optimal logistics posture to be established for support of a weapon system/program.

c. Perform logistic support analysis and other synthesis, modeling or evaluation necessary to establish optimal logistics support requirements for the activation or operational phases of a program.

3.13 Integrated logistics support. Integrated logistics support is a composite of all the support considerations necessary to assure the effective and economical support of a system for its life cycle. It is an integral part of all other aspects of system acquisition. Integrated logistic support is characterized by harmony and coherence among all the logistic elements.

3.14 Acquisition. Acquisition is a term used within the DOD to denote the aggregation of efforts to develop, produce and provide a weapon system to the user. It commences in the conceptual phase and is completed at such time as the last production unit is provided to the user. It excludes all operational activities associated with the mission application of the acquired weapon system.

3.15 Integration and assembly. Integration and assembly are defined as the technical and functional activities associated with combining all other level 3 hardware elements into a prime, level 2 mission equipment. (This does not preclude contractor use of the term Integration and Assembly for WBS elements at lower levels of a contractor extended WBS, reference 5.5.1.3).

4. GENERAL REQUIREMENTS

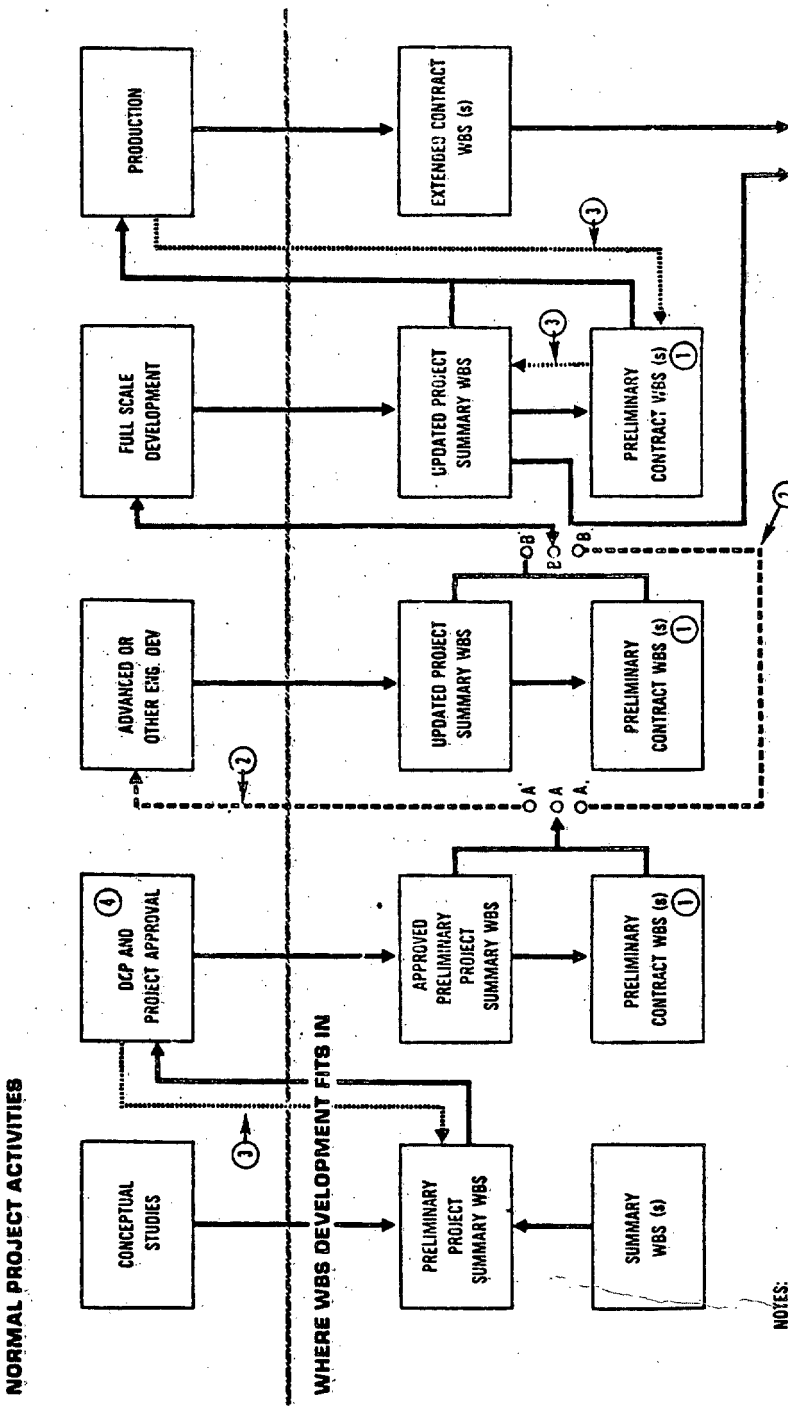
4.1 Work breakdown structure (WBS). The DOD component will structure a project summary WBS for defense materiel items by selecting elements from one or more of the category summary WBS(s) set forth in appendices A through G of this standard that are applicable to the project. From this project summary WBS, individual contract WBS(s) (one for each procurement action) will then be developed by the DOD component and negotiated with the contractor(s). The negotiated contract WBS(s) shall then be extended to lower levels by the contractor(s) to define the complete extended contract WBS(s). When aggregated with the project summary WBS, the extended contract WBS(s) shall form a project WBS. Figure 1 depicts the development and relationship of WBS(s).

4.2 Project management. The project summary WBS will be established early in the program. This summary structure and its derivatives will be used throughout acquisition of defense materiel items as a framework for technical and management activities. Project management (of the DOD component) will employ the project summary WBS and its derivatives as a coordinating medium in planning for further systems engineering, resource allocation, cost estimates, contract actions, and work execution. The reporting of progress, performance, and engineering evaluations as well as financial data, shall be based on the project WBS.

4.3 Solicitation and proposal action. The solicitation will identify the preliminary contract WBS to prospective contractors. The preliminary contract WBS (CWBS) will be structured by selecting appropriate elements from the approved project summary WBS. The contract line items, configuration items, contract work statement tasks, the contract specification, and contractor responses will be expressed in terms of the preliminary CWBS. During negotiations contractors may propose changes to the preliminary contract work breakdown structure to enhance its effectiveness in satisfying the objectives of the particular acquisition. A preordained structure shall not be imposed without the benefit of system engineering.

4.4 Configuration management. Configuration items will be identified as WBS elements in the project and contract WBS(s). However, not all WBS elements will necessarily be subjected to configuration management.

4.5 Specifications and drawings. The family of specifications and drawings resulting from the progressive steps of systems engineering shall conform to the evolved project WBS.



NOTES:
(1) THE TERM "CONTRACT" INCLUDES EQUIVALENT DOD IN-HOUSE EFFORT.
(2) THE DASHED LINES INDICATE ALTERNATIVES.
(3) THE DOTTED LINES INDICATE CHANGES (IF ANY).
(4) DEVELOPMENT CONCEPT PAPER (DCP).

FIGURE 1 DEVELOPMENT AND RELATIONSHIP OF WBS (s) DURING ACQUISITON

4.6 Management control system. The contract WBS shall serve as the framework for the contractor's management control system which will provide auditable or otherwise traceable summarizations of internal data generated by his performance measurement procedures.

4.7 Integrated logistics support (ILS). The element of ILS shall be accommodated as indicated in the summary levels of WBS in appendices A through G. Aggregations of WBS elements for logistics support management and reporting shall be accomplished by summation of relatable ILS elements of the project summary WBS.

4.8 Programming and budgeting. Where a project summary WBS has been established, it will be used in any necessary subdividing of a program element for purposes of programming and budgeting.

4.9 Procurement. In contracts using WBS(s), the following shall be relatable to elements of the project summary WBS:

a. The structure of work statements
b. The contract WBS(s)
c. The contract line items
d. Configuration items
e. Technical and management reports
f. Government-furnished equipment

4.10 Reporting. All reporting requirements for the project shall be consistent with the project/contract WBS. The organization of reporting requirements shall not be construed by either the DOD component or the contractor as determining the manner in which the defense materiel item is to be designed or produced.

5. DETAILED REQUIREMENTS

5.1 Summary work breakdown structures. The appropriate category or categories of summary WBS (s) and related definitions prescribed herein will be used in the preparation of the project summary WBS for the defense materiel item under consideration.

5.1.1 Aircraft system. The summary work breakdown structure and definitions for an aircraft system will be as specified in appendix A.

5.1.2 Electronics system. The summary work breakdown structure and definitions for an electronics system will be as specified in appendix B.

5.1.3 Missile system. The summary work breakdown structure and definitions for a missile system will be as specified in appendix C.

5.1.4 Ordnance system. The summary work breakdown structure and definitions for an ordnance system will be as specified in appendix D.

5.1.5 Ship system. The summary work breakdown structure and definitions for a ship system will be as specified in appendix E.

5.1.6 Space system. The summary work breakdown structure and definitions for a space system will be as specified in appendix F.

5.1.7 Surface vehicle system. The summary work breakdown structure and definitions for a surface vehicle system will be as specified in appendix G.

5.2 Project summary work breakdown structure

5.2.1 Preparation. The project summary WBS will be prepared by the DOD component for a specific defense materiel item by selecting, through systems engineering and management planning processes, applicable elements from one or more of the summary WBS(s). While the categories and elements specified in appendices A through G normally will provide the basis for constructing project summary WBS(s), deviations are permitted when they result from unique project needs determined through the systems engineering process. (See figure 1 depicting the progression from concept formulation through the various phases of WBS development in arriving at the approved project summary WBS.)

5.2.1.1 The preparation of a preliminary project summary WBS will normally be accomplished by the DOD component as a result of systems engineering conducted during concept formulation or its equivalent. This systems engineering effort identifies the category of defense materiel items and summary WBS elements considered to be most suitable to satisfy the operational needs. The project summary WBS will be tailored to the project objectives. Therefore, in preparing a project summary WBS for any specific defense materiel item, a selection of the level 2 and level 3 elements from one or more of the summary WBS(s) for the appropriate

category will be made. While it is not necessary to include every element in the summary WBS for a specific defense materiel item's project summary WBS, those elements of the summary WBS(s) utilized will be identified with the uniform nomenclature, definition and structural placement specified for the summary WBS, unless deviation is required. Figure 2, WBS Matrix, depicts a format for developing and documenting a project summary WBS. Although the project summary WBS is normally limited to the upper three levels, additional elements to lower levels may be specified if determined according to previously conducted systems engineering.

5.2.1.2 When deviation from the prescribed elements and definitions are required (because of an items' unique configuration, activities or other requirements or when additional WBS element selection is needed or desired beyond the summary WBS) additional or substitute elements, properly defined, in level 2 or level 3 of the project summary may be used.

5.2.1.3 The preliminary project summary WBS is not intended to be constraining. During advanced development or equivalent development efforts, changes may be proposed to this preliminary project summary WBS. Contractors may propose alternatives when warranted and exercise initiative and creativity intended to provide an improved final product. Such alternatives will be evaluated by the DOD project manager, in terms of the benefits offered, in context with the overall objectives of the project/program. The changes adopted at the end of the advanced development or equivalent effort will be reflected in the approved project summary WBS and the appropriate elements of the approved structure will be included in the negotiated CWBS(s) and work statements for follow-on development effort.

5.3 Contract work breakdown structure.

5.3.1 Preparation. Only one preliminary CWBS will be used in each request for a proposal and ensuing contract WBS. The DOD component will structure a preliminary contract WBS by selecting those elements of the approved project summary WBS which apply to that contract and organizing them into a framework which supports the approved project summary WBS and the objectives of the development.

5.3.1.1 Figure 2, WBS Matrix, depicts a format suitable for documenting the subdivision of a project summary WBS into preliminary contract WBSs for each contractor/source. Identifying the hardware (subsystem) with a horizontal line and extending the required generic element's vertical line downward to the point of intersection (identify with a dot) provides a graphic display of the project WBS and each individual source CWBS.

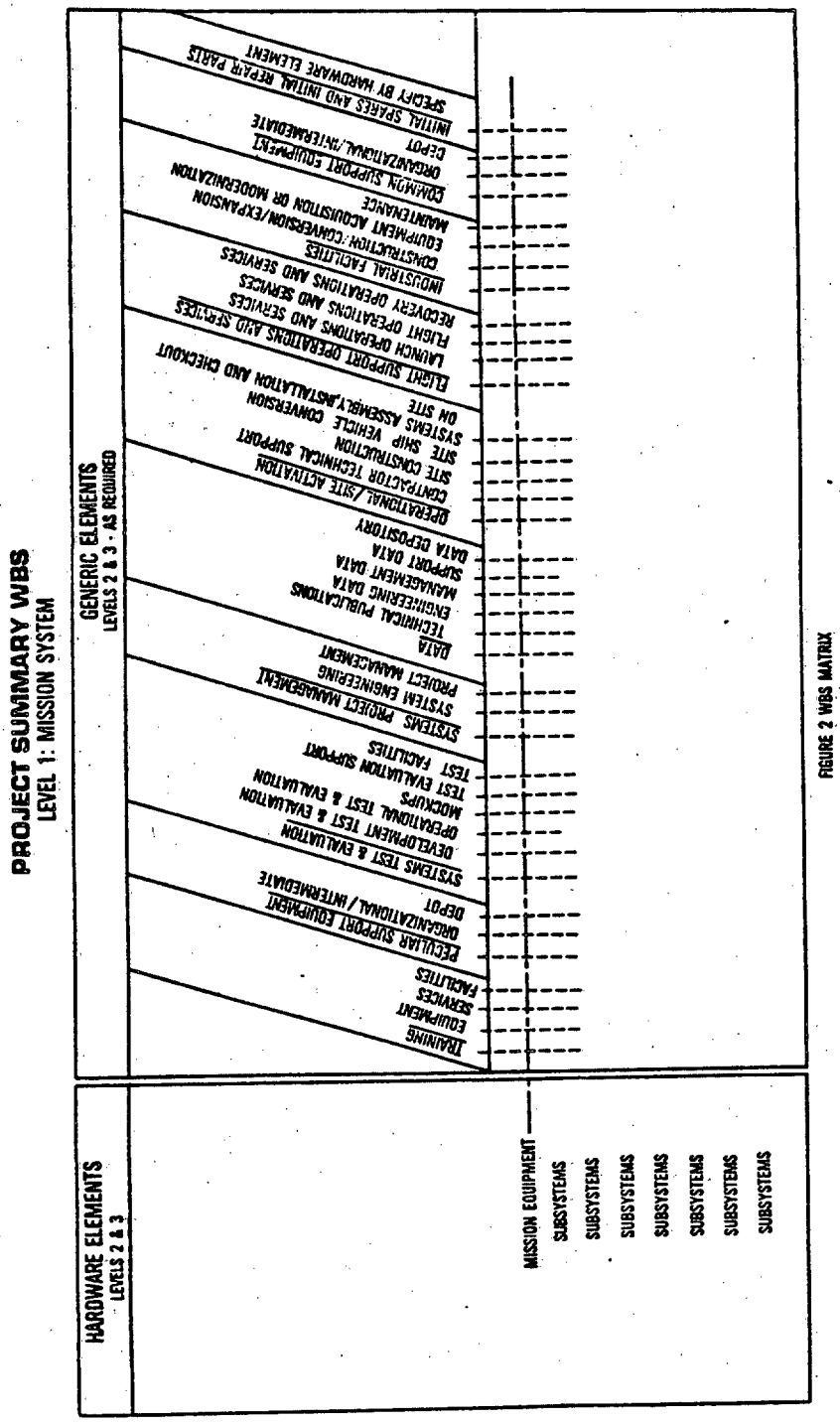


FIGURE 2 WBS MATRIX

5.3.1.2 Individual subsystems/hardware elements may then be extended to the next lower levels to provide management visibility and control.

5.3.1.3 Level commonality between the approved project summary WBS and the individual contract WBS need not be maintained, providing the approved project summary WBS element nomenclature and definitions are not violated. Traceable summarization of individual contract WBS(s) into the approved project summary WBS shall be maintained.

5.3.2 Changes to contract work breakdown structure. During proposal action, contractors may propose alternatives to the selected WBS elements for the proposed contract in order to enhance the effectiveness of the contract WBS in satisfying the objectives of the particular project. Changes proposed by the contractor to the selected project WBS elements of the contract WBS will require approval by the DOD project manager. After necessary adjustment based on contractor's proposals and contract negotiations, the elements selected for the contract shall become the basis for further evolutionary extension by the contractor during the contracted effort.

5.3.3 Contracturally specified levels. The contract WBS shall be constructed in a manner consistent with the levels specified in the contract, and to the extent possible, should be uniform with structures for similar defense materiel items. The contract will indicate the levels of contract WBS at which cost accumulation shall be made for reporting to the government. Traceability of cost accumulations will be required to those extended contract WBS levels which are used by the contractor for his cost control purposes.

5.3.3.1 In the extended contract WBS, consideration shall be given to the specific contractual, technical, and managerial requirements of the defense materiel item. Lower levels may be configuration items, service elements, items of data or meaningful product or management oriented lower indentures of a higher-level element. The contractor has complete flexibility in extending the contract WBS to reflect how his work is to be accomplished. assuming lower elements to be meaningful product-oriented lower indentures of a higher-level element. Particular attention shall be given to insure the correlation of lower levels of the contract WBS to the specification tree, contract line items, configuration items of the contract, data items, and work statement tasks.

5.3.3.2 The lowest level of the extended contract WBS for project planning, control, and support shall be that necessary to reach manageable units of functional tasks and shall reflect the way the work is actually being performed by the contractor or government activity. For configuration management the contract WBS shall be extended sufficiently to identify all configuration items. It is not required by this standard that the CWBS level used for program control also be the level needed for configuration control.

5.3.3.3 Information on the complete contract WBS (preliminary and extensions thereto) content shall be available to the government project manager upon request.

5.4 Preparation of project work breakdown structure. The project WBS (see figure 1) will be constructed by the DOD component by compiling the elements of the extended contract WBS(s) with the project summary WBS. The DOD component will incorporate into the project WBS those levels of the extended contract WBS(s) that it considers necessary for project management and other related requirements. This compilation occurs as development effort identifies the successive extension of the individual contract WBS(s). The project WBS will be completed prior to the initiation of production.

5.5 Other preparation guidance

5.5.1 General

5.5.1.1 The definitions and terminology presented in the appendices to this military standard shall be used as the basis for structuring the specific terminology and definitions for each WBS element. The DOD component will prepare specific terminology and definitions for each preliminary CWBS element. The contractor(s) shall prepare specific terminology and definitions for the contractor extended elements of the contract WBS.

5.5.1.2 Qualification tests, acceptance tests, and system engineering for a particular hardware element shall be included as part of the effort associated with the element, rather than with the level 2 elements of system test and evaluation and system/project management. These level 2 elements pertain to overall systems effort, rather than individual hardware elements comprising the prime mission equipment.

5.5.1.3 In those instances where an integration and assembly element is used (Appendices A through G), it will include all effort of technical and functional activities associated with the design, development, and production of mating surfaces, structures, equipments, parts, and materials required to assembl the other level 3 equipment elements into a level 2 mission equipment as a whole and not directly part of any other individual level 3 element.

5.5.1.3.1 Integration and assembly includes all effort associated with:

a. The development of engineering layouts, determination of overall design characteristics, and determination of requirements of design review

b. The set up, conduct and review of testing assembled components or subsystems prior to installation

c. The detailed production design

d. Inspection activities related to receiving, factory and vendor liaison

e. Design maintenance effort

f. Quality planning and control

g. Tooling (planning, design and fabrication)

h. Administrative engineering

i. The joining or mating and final assembly of level 3 equipment elements to form a complete prime mission equipment when the effort is performed at the manufacturing facility

j. The conduct of production acceptance testing.

5.5.1.3.2 Integration and assembly excludes all system/project management and system test and evaluation which are associated with the overall system.

5.5.1.3.3 When an integration and assembly element is utilized at lower levels of the preliminary CWBS or extended CWBS, it will be summarized into the next higher level hardware WBS element and should never be summarized into the level 3 integration and assembly element of the summary WBS(s) set forth in this standard.

5.5.1.4 Modification and changes such as redesign, rework, retooling, retesting, and refurbishing shall be associated with the WBS element identified in the contract and affected by the change.

5.5.1.5 The level 2 summary WBS elements, system/project management, and system test and evaluation are defined to include any overall systems effort. These elements exclude subsystem or component efforts that can be associated with a hardware element. This definition, however, does not preclude the inclusion of an element entitled System/Project Management or Systems Test and Evaluation in individual contract WBS(s) even though the elements may pertain only to level 3 hardware effort. An element of this nature may be required in the WBS for project management or contractual purposes In this case, the summarization of these elements (which include only level 3 effort) should be made into the level 3 hardware element, rather than the project summary WBS element of system/project management and system test and evaluation.

5.5.2 Application to lesser systems/projects. The WBS practices and procedures of this standard may be applied to lesser systems/projects than the prescribed summary WBSs contained in Appendices A through G. A project summary WBS can be developed for any system/project regardless of size or complexity, by proper application of the product oriented structuring concepts set forth in this standard. Figure 2, WBS Matrix, depicts a format suitable for developing a project summary WBS for less than an entire defense materiel item/program element.

5.5.2.1 For example, given a radar project within an aggregated program element which is to be managed as a system entity, the radar becomes the level 1 mission system, i.e., radar system. Subordinate to this level 1 radar system will be the level 2 (mission) radar equipment and required generic elements to structure the project as a complete system entity. The level 2 radar equipment will logically expand into level 3 subsystem elements., e. g., integration and assembly, transmitter, receiver, antenna, antenna pedestal, etc. The generic elements will be identified at levels 2 and 3 as required for the management and control of all elements necessary to meet the radar system mission requirements in an operational environment.

5.5.2.2 For systems/projects involving two or more contractors, this same technique is appropriate for subdividing a project summary WBS into individual preliminary contract work breakdown structures by contractor/source (see 5.3.1.1).

5.5.3 Acquisition phase. The project summary and contract WBS will be established initially at the award of the development contract and extended during development. A single project WBS, element nomenclature and definition in accordance with the guidelines prescribed herein will be maintained throughout the acquisition process to insure traceability.

5.5.4 Operational phase. While the prescribed summary WBS(s) are not mandatory during the operational phase, elements of the summary WBS will be used to the maximum extent possible when a life cycle project WBS is required. Elements in the operational phase project WBS will be directly relatable to the hardware breakdown used in acquisition.

5.5.5. Placement of multifunction equipment in the project summary work breakdown structure. To accommodate the flexibility required in the systems engineering and design process, latitude in the placement of multifunction equipments in the project summary WBS will be permitted. This latitude will be limited; however, by the following principle: Multifunction equipments will be a part of the WBS element which either includes the equipment in the element's specification or exercises the most critical performance constraint on it. In cases where the application of this rule results in a conflict in the selection of the proper element, the specification relationship will take precedence.

5.5.6 Subcontract work breakdown structures. The prime contractor shall be responsible for traceable summarizations of subcontractor data supporting his prime contract WBS elements. The prime contractor may negotiate any WBS with a subcontractor that permits the prime contractor to fulfill his contract WBS requirements and which provides adequate control of the subcontractor.

6. NOTES

6.1 The preliminary contract WBS will be attached to and be a part of the solicitation documents. The contract WBS, as negotiated, will be attached to the contract.

6.2 The costing of engineering data and management data contract WBS elements need not employ individual cost accumulation and task assignment, but may be represented for financial information by supportable negotiated prices as shown on the DD Form 1423, Contract Data Requirements List.

Custodians:
Army - MI
Navy - NM
Air Force - 10

Preparing activity:
Air Force - 10

Project No. MISC-0885

APPENDIX A

SUMMARY WORK BREAKDOWN STRUCTURE AND DEFINITIONS AIRCRAFT SYSTEM

10. SCOPE

10.1 This appendix covers the summary work breakdown structure and definitions for an aircraft system.

20. REFERENCED DOCUMENTS

20.1 The following documents of the issue in effect on date of invitation for bids or requests for proposal form a part of this standard to the extent specified herein.

PUBLICATION

TD-3 Department of Defense Authorized Data List, Index of Data Item Descriptions

(Application for copies should be addressed to Naval Publications & Printing Service, Eastern Division, 700 Robbins Avenue, Philadelphia, Pa 19111).

30. SUMMARY WORK BREAKDOWN STRUCTURE

30.1 Levels. The following is a summary work breakdown structure for an aircraft system:

Level 1	Level 2 (see 5.2.1.1)	Level 3 (see 5.2.1.1)
Aircraft system		
	Air vehicle	
		Airframe
		Propulsion unit
		Other propulsion
		Communications
		Navigation/guidance
		Fire control
		Penetration aids
		Reconnaissance equipment
		Automatic flight control

Level 1	Level 2(see 5.2.1.1)	Level 3 (see 5.2.1.1)
		Central integrated checkout
		Antisubmarine warfare
		Auxiliary electronics equipment
		Armament
		Weapons delivery equipment
		Auxiliary armament/weapons delivery equipment
	Training	
		Equipment
		Services
		Facilities
	Peculiar support equipment	
		Organizational/intermediate (Including equipment common to depot)
		Depot(Only)
	Systems test and evaluation	
		Development test and evaluation
		Operational test and evaluation
		Mockups
		Test and evaluation support
		Test facilities
	System/project management	
		System engineering
		Project management
	Data	
		Technical publications
		Engineering data
		Management data
		Support data
		Data depository

Level 1	Level 2(see 5.2.1.1)	Level 3 (see 5.2.1.1)
	Operational/site activation	
		Contractor technical support
		Site construction
		Site/ship/vehicle conversion
	Common support equipment	
		Organizational/intermediate (Including equipment common to depot)
		Depot (Only)
	Industrial facilities	
		Construction/conversion/expansion
		Equipment acquisition or modernizatio
		Maintenance
	Initial spares and initial repair parts	
		(Specify by allowance list, grouping, or hardware element)

40. DEFINITIONS

40.1 Aircraft category. Aircraft category is defined as those systems having fixed or movable wing, rotary wing, or compounded wing, manned air vehicles designed for powered or unpowered (glider) guided flight in the atmosphere.

40.2 Aircraft system. The aircraft system element refers to the complex of equipment, data, services, and facilities required to develop and produce the capability of employing those fixed or movable wing, rotary wing, or compound wing, manned air vehicles designed for powered or unpowered (glider)guided flight in the atmosphere. (Represented by A-7, C-5, B-1, UH-1D, AAFSS, XC-142, etc.)

40.2.1 Air vehicle. The air vehicle element refers to the complete flyaway, including airframe, engines, and all other installed equipment. This element includes all effort associated with the design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use). It also includes the installation and checkout of all remaining level 3 elements into the airframe to form the complete air vehicle.

40.2.1.1 Airframe. The airframe element refers to the assembled structural and aerodynamic components of the air vehicle that support subsystems essential to a particular mission. This element includes all effort outlined in 5.5.1.3 as well as the integration and assembly of all other level 3 equipments into the airframe to provide an air vehicle as a whole. It includes; for example, the basic structure (wing, empennage, fuselage, and associated manual flight control system), the air induction system, starters, exhausts, the fuel control system, inlet control system, alighting gear (tires, tubes, wheels, brakes, hydraulics, etc.), secondary power, furnishings (cargo, passenger, troop, etc), engine controls, instruments (flight, navigation, engine, etc.), environmental control, racks, mounts, intersystem cables and distribution boxes, etc., which are inherent to and nonseparable from the assembled structure, dynamic stystems, rotor group, and other equipment homogeneous to the airframe. All efforts directly related to the other level 3 elements are excluded.

40.2.1.2 Propulsion unit. The propulsion unit element refers to that portion of the air vehicle that pertains to installed engines to provide power/thrust to propel the aircraft through all phases of powered flight. This element includes the engine as a propulsion unit within itself, of reciprocating or turbo type with afterburner when appropriate; thrust reverser, thrust vector devices, transmissions, gear boxes, if furnished as in integral part of the propulsion unit; suitable for integration with the airframe. All ancilliary equipments that are not an integral part of the engine required to provide an operational primary power source (i.e., air inlets, instruments, controls, etc.) are excluded.

40-2.1.3 Other propulsion. The other propulsion element refers to that portion of the operational power/thrust source required in addition to the engine to insure the performance requirements of powered flight. This element includes; for example, propellers, booster units, thrust reversers, thrust vector devices, transmissions, and gear boxes, if not furnished as an integral part of the engine. This element excludes instruments, controls, air inlets, exhausts, starters, and other ancilliary items required for operational performance that are included in the airframe.

40.2.1.4 Communications. The communications element refers to those equipments installed in the air vehicle for communication and identification purposes. This element includes; for example, intercom, radio system(s), IFF, data link, and control boxes associated with the specific equipment. When an integrated communication, navigation, and identification package is used, it will be included here.

40.2.1.5 Navigation/guidance. The navigation/guidance element refers to those equipments installed in the air vehicle to perform the navigation/guidance function. This element includes; for example, radar, radio or other essential navigation equipment, radar altimeter, direction finding set, doppler compass, computer, and other equipment homogeneous to the navigation/guidance function. Panel instruments are excluded.

40.2.1.6 Fire control. The fire control element refers to that equipment installed in the air vehicle which provides the intelligence necessary for weapons delivery such as bombing, launching, and firing. This element includes; for example, radars and other sensors necessary for search rendezvous and/or tracking; self-contained navigation and air data system; displays, scopes, or sights; bombing computer and control and safety devices.

40.2.1.7 Penetration aids. The penetration aids element refers to those equipments installed in the air vehicle which assist in penetration for mission accomplishment. This element includes; for example, ferret and search receivers, warning devices and other electronic devices, electronic countermeasures, jamming transmitters, chaff, infrared jammers, terrain-following radar, and other devices homogeneous to this mission function.

40.2.1.8 Reconnaissance equipment. The reconnaissance equipment element refers to those equipments installed in the air vehicle necessary to the reconnaissance mission. This element includes; for example, photographic and electronics, infrared, and other sensors; search receivers, recorders, warning devices, magazines, and data link. Gun cameras are excluded.

40.2.1.9 Automatic flight control. The automatic flight control element refers to equipments installed in the air vehicle to provide the unpiloted automatic modes of flight path control. This element includes; for example, the automatic pilot, flight control mechanisms and connectors, mechanical and electrical parts for the signal transmission and application of power, reference sensors, stability augmentation equipment, and air data computer. Control linkages, control surfaces, or other structural parts of the airframe are excluded.

40.2.1.10 Central integrated checkout. The central integrated checkout element refers to that equipment installed in the air vehicle for malfunction detection and reporting. This element includes; for example, transducers, computer and dry tapes, recorders, displays, and stimuli.

40.2.1.11 Antisubmarine warfare. The antisubmarine warfare element refers to that equipment installed in the air vehicle peculiar to the ASW mission. This element includes, for example, sensors, computer, displays, etc.

40.2.1.12 Auxiliary electronics equipment. The axuiliary electronics equipment element refers to auxiliary or other electronics equipment not allocable to individual electronic element equipments. This element includes peculiar equipments which are not homogeneous to the prescribed electronic elements. It includes; for example, such multi-use equipments as antennae, control boxes, power supplies, environmental control, racks, mountings, etc.

40.2.1.13 Armament. The armament element refers to that equipment installed in the air vehicle to provide the fire-power functions. This element includes; for example, guns, mounts, turrets, weapon direction equipment, ammunition feed and ejection mechanisms, and gun cameras.

40.2.1.14 Weapons delivery equipment. The weapons delivery equipment element refers to that equipment installed in the air vehicle to provide the weapons delivery capability. This element includes; for example, launcher, pods, bomb racks, pylons, integral release mechanism, and other mechanical or electromechanical equipments specifically oriented to the weapons delivery function. This element excludes the bombing/navigation system which is included in fire control (40.2.1.6).

40.2.1.15 Auxiliary armament/weapons delivery equipment. The auxiliary armament/weapons delivery equipment element refers to that equipment required to provide the ancilliary functions to the applicable mission equipments. This element includes flares and ejection mechanisms, ejector cartridges, and other items homogeneous to the mission function that are not identifiable to the armament or weapons delivery elements set forth in 40.2.1.13 and 40.2.1.14.

40.2.2 Training. The training element refers to the training services, devices, accessories, aids, equipment, and parts used to facilitate instruction through which personnel will acquire sufficient concepts, skills, and aptitudes to operate and maintain the system with maximum efficiency. This element includes all effort associated with the design, development, and production of training equipment as well as the execution of training services.

40.2.2.1 Equipment. The equipment element refers to those distinctive end items of training equipment, assigned by either a contractor or military service, required to meet specific training objectives. This element includes; for example, operational trainers (i.e., simulators), maintenance trainers (i.e., MTU's), and other items such as cutaways, mockups, and models.

40.2.2.2 Services. The services element refers to services, devices, accessories, and aids necessary to accomplish the objectives of training. This element includes; for example, training plans, training aids, training course materials, contractor-conducted training including in-plant and service training, etc.

40.2.2.3 Facilities. The facilities element refers to that special construction necessary to accomplish the objectives of training. (Primarily, the brick-and-mortar-type facility constructed solely for the training mission.) The equipment used for the purpose of acquainting the trainee with the system or establishing trainee proficiency is excluded.

40.2.3 Peculiar support equipment. The peculiar support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which have application peculiar to a given defense materiel item. This element includes; for example, vehicles, equipment, tools, etc., used to refuel, service, transport, hoist, repair, overhaul, assemble, disassemble, test, inspect, or otherwise maintain the mission equipment. It also includes all effort associated with the design, development, and production of peculiar support equipment.

40.2.3.1 Organizational/intermediate. The organizational/intermediate element refers to the peculiar support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by air vehicle subsystem (i.e., airframe, propulsion, etc.) or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.).

40.2.3.2 Depot. The depot element refers to the peculiar support equipment required to support only depot maintenance.

40.2.4 Systems test and evaluation. The systems test and evaluation element refers to the use of prototype, production, or specially fabricated hardware to obtain or validate engineering data on the performance of the aircraft system. This element includes the detailed planning, conduct, support, data reduction and reports from such testing, and all hardware items which

are consumed or planned to be consumed in the conduct of such testing. It also includes all effort associated with the design and production of models, specimens, fixtures, and instrumentation in support of the test program. Test articles which are complete units (i.e., functionally configured as required by the aircraft equipment) are excluded. Development component acceptance, etc., testing which can be specifically associated with the hardware element, unless these tests are of special contractual or engineering significance (e.g., associate contractor), are also excluded.

40.2.4.1 Development test and evaluation. The development test and evaluation (DT&E) element refers to that test and evaluation conducted to: (a) demonstrate that the engineering design and development process is complete; (b) demonstrate that the design risks have been minimized; (c) demonstrate that the system will meet specifications; (d) estimate the system's military utility when introduced; (e) determine whether the engineering design is supportable (practical, maintainable, safe, etc.), for operational use, and (f) provide test data with which to examine and evaluate tradeoffs against specification requirements, life cycle cost, and schedule. DT&E is planned, conducted and monitored by the developing agency of the DOD component. It includes; for example, such models and tests as wind tunnel, static, drop, and fatigue; integration ground tests, engine military qualification tests (MQT), preliminary flight rating tests (PFRT), test bed aircraft and associated support; development flight test, test instrumentation, test equipment (including its support equipment), chase aircraft and support thereto, etc.

40.2.4.2 Operational test and evaluation. The operational test and evaluation element refers to that test and evaluation conducted by agencies other than the developing command to assess the prospective systems's military utility, operational effectiveness, operational suitability, logistics supportability (including compatibility, interoperability, reliability, maintainability, logistic requirements, etc.), cost of ownership, and need for any modifications. Initial operational test and evaluation (IOT&E) conducted during the development of a weapon system will be included in this element. This element encompasses such tests as flight tests, sea trials, etc., and support thereto, required to prove the operational capability of the deliverable system. It also includes contractor support (e.g., technical assistance, maintenance, labor, material, etc.) consumed during this phase of testing.

40.2.4.3 Mockups. The mockups element refers to the design engineering and production of system or subsystem mockups which have special contractual or engineering significance, or which are not required solely for the conduct of one of the above elements of testing.

40.2.4.4 Test and evaluation support. The test and evaluation support element refers to all support elements necessary to operate and maintain systems and subsystems during flight test and evaluation which are not consumed during the flight-testing phase and other support requirements that are not allotable to a specific phase of testing. This element includes; for example, reparable spares, repair of reparables, repair parts, contractor technical support, etc., not allocable to preceding test and evaluation elements. Operational and maintenance personnel, consumables, special fixtures, special instrumentation, etc., which are utilized and/or consumed in a single element of testing and which should, therefore, be included under that element of testing are excluded.

40.2.4.5 Test facilities. The test facilities element refers to those special test facilities required for performance of the various developmental tests necessary to prove the design and reliability of the system or subsystem. This element includes; for example, engine test fixtures, white rooms, test chambers, etc. The brick-and-mortar-type facilities allocable to industrial facilities are excluded.

40.2.5 System/project management. The system/project management element refers to the systems engineering and technical control as well as the business management of particular systems/projects. This element encompasses the planning, directing, and controlling the definition, development, and production of a system/project including the functions of logistics and logistics support, maintenance support, facilities, personnel and training, testing, and activation of a system. System/project management effort than can be associated specifically with the hardware element is excluded, unless this management effort is of special contractual or engineering significance (e.g., associate contractor).

40.2.5.1 System engineering. The system engineering element refers to the technical and management efforts of directing and controlling a totally integrated engineering effort of a system program. This element encompasses the system engineering effort to define the system and the integrated planning and control of the technical program efforts of design engineering, logistics engineering, specialty engineering, production engineering, and integrated test planning. This element includes but is not limited to: the system engineering effort to transform an operational need or statement of deficiency into a description of system requirements and a preferred system configuration; the logistics engineering effort to define, optimize and integrate the logistics support considerations into the mainstream engineering effort to insure the development and

production of a supportable and cost effective weapon system; and the technical planning and control effort for planning, monitoring, measuring, evaluating, directing and replanning the management of the technical program. It excludes the actual design engineering, and production engineering directly related to the products or services of a deliverable end item. Examples of system engineering efforts include:

a. System definition, overall system design, design integrity analysis, system optimization, system/cost effectiveness analysis, and intrasystem and intersystem compatibility assurance, etc., the integration and balancing of reliability, maintainability, producibility, safety, and survivability; human factors, personnel and training program requirements, security requirements, configuration identification and control, quality assurance program, value engineering, preparation of equipment and component performance specifications, design of test and demonstration plans;

b. Support synthesis, design impact projections, life cycle cost factors, time factors, tradeoff analysis, logistics design appraisal, use studies, support function requirements identification, repair level determination, task analysis, standardization review, logistics requirements identification, logistics support verification, and the preparation and updating of the logistics support plan, the maintenance plan, facilities planning (operational and maintenance), the transportation and handling plan, etc., and;

c. Preparation of the Systems Engineering Mangement Plan (SEMP), specification tree, program risk analysis, system test planning, decision control process, technical performance measurement, technical reviews, subcontractor/vendor reviews, work authorization, technical documentation control, etc.

40.2.5.2 Project management. The project management element refers to the business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designated to accomplish overall project objectives which are not associated with specific hardware elements and are not included in system engineering. Examples of these activities are logistics management, cost/schedule/performance measurement, contract management, data management, vendor liaison, contract WBS, etc.

40.2.6 Data. The data element refers to all deliverable data required to be listed on a DD Form 1423. The data requirements will be selected from TD-3. This element includes only such effort that can be reduced or will not be incurred if the data item is eliminated. If the data are government peculiar, include the efforts for acquiring, writing, assembling, reproduction, packaging and shipping. It also includes the effort for repreparing into government format with reproduction and shipment if data are identical to that used by the contractor, but in a different format.

40.2.6.1 Technical publications. The technical publications element refers to those formal technical orders/manuals developed, as well as commercial, advance, real property installed equipment, and miscellaneous manuals for the installation, operation, maintenance, overhaul, training and reference of hardware, hardware systems and computer programs; and contractor instructional materials, inspection documentation, and historical type records that may accompany individual items of equipment. This element includes the data item descriptions set forth in functional category M of TD-3.

40.2.6.2 Engineering data. The engineering data element refers to those engineering drawings, associated lists, specifications, and other documentation required by the government in accordance with functional categories E, H, R, S, and T of TD-3. This element includes; for example, all plans, procedures, reports, and documentation pertaining to systems, subsystems, computer programs, component engineering, testing, human factors, analysis, etc.

40.2.6.3 Management data. The management data element refers to those data items necessary for configuration management, cost, schedule, contractual data management, programs management, etc., required by the government in accordance with functional categories A, F, and P of TD-3. This element includes; for example, contractor cost reports, cost performance reports, contractor fund status reports, and schedule, milestone, networks, integrated support plans, etc.

40.2.6.4 Support data. The support data element refers to those data items designed to document the logistics support planning and provisioning process in accordance with functional categories L and V of TD-3. This element includes; for example, supply and general maintenance plans and reports, transportation, handling, packaging information, etc.; and data to support the provisioning process.

40.2.6.5 Data depository. The data depository element refers to a facility designated to act as custodian in establishing and maintaining a master engineering specification and drawing depository service for government-approved documents that are the property of the U.S. Government. As custodian for the government, the contractor is authorized by approved change orders to maintain these master documents at the latest approved revision level. When documentation is called for on a given item of data retained in the depository, the charges (if charged direct) will be to the appropriate data element. This element represents a distinct entity of its own and includes all effort of drafting, clerical, filing, etc., required to provide the service outlined above. All similar efforts for the contractor's internal specification/drawing control system in support of his engineering/production activities are excluded.

40.2.7 Operational/site activation. The operational/site activation element refers to to the real estate, construction, conversion, utilities, and equipment to provide all facilities required to house, service, and launch prime mission equipment at the organizational and intermediate level. This element includes conversion of site, ship, or vehicle; system assembly, checkout, and installation into site facility or ship to achieve operational status. It also includes contractor support in relation to operational/ site activation.

40.2.7.1 Contractor technical support. The contractor technical support element refers to all materials and services provided by the contractor related to activation. This element includes; for example, repair of reparables, standby services, final turnover, etc.

40.2.7.2 Site construction. The site construction element refers to the real estate, site preparation, construction, and other special-purpose facilities necessary to achieve system operational status. This element includes the construction of utilities, roads, and interconnecting cabling.

40.2.7.3 Site/ship/vehicle conversion. The site/ship/vehicle conversion element refers to all materials and services required to provide for the conversion of existing sites or ships to accommodate the mission equipment and selected support equipment directly related to the specific system. This element includes launch, operating, support, and other conversion necessary to achieve system operational status. Where appropriate, specify by site or ship.

40.2.8 Common support equipment. The common support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which are presently in the DOD inventory for support of other systems. This element includes all efforts required to assure the availability of this equipment for support of the particular defense materiel item. It also includes the acquisition of additional quantities of those equipments if caused by the introduction of the defense materiel item into operational service.

40.2.8.1 Organizational/intermediate. The organizational/intermediate element refers to the common support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by air vehicle subsystem (i.e., airframe, propulsion, etc.), or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.).

4.2.8.2 Depot. The depot element refers to the common support equipment required to support only depot maintenance.

40.2.9 Industrial facilities. The industrial facilities element refers to the construction, conversion, or expansion of facilities for production, inventory, and contractor depot maintenance required by one or more suppliers for the specific system. This element includes; for example, equipment acquisition, or modernization, where applicable, and maintenance of the above facilities or equipment.

40.2.9.1 Construction/conversion/expansion. The construction/conversion/expansion element refers to the real estate and preparation of system peculiar facilities for production, inventory, depot maintenance, and other related activities.

40.2.9.2 Equipment acquisition or modernization. The equipment acquisition or modernization element refers to production equipment acquisition, modernization, or transferal of equipment for the particular system. (Pertains primarily to government owned and leased equipment under facilities contract.)

40.2.9.3 Maintenance (industrial facilities). The maintenance (industrial facilities) element refers to the maintenance, preservation, and repair of industrial facilities and equipment.

40.2.10 Initial spares and initial repair parts. The initial spares and initial repair parts element refers to the spare components or assemblies used for replacement purposes in end items of equipment. This element excludes development test spares, and spares provided specifically for use during system installation, assembly, and checkout on site.

APPENDIX B

SUMMARY WORK BREAKDOWN STRUCTURE AND DEFINITIONS

ELECTRONICS SYSTEM

10. SCOPE

10.1 This appendix covers the summary work breakdown structure and definitions for an electronics system.

20. REFERENCED DOCUMENTS

20.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

PUBLICATION

TD-3 Department of Defense Authorized Data List, Index of Data Item Description

(Application for copies should be addressed to Naval Publications & Printing Service, Eastern Division, 700 Robbins Avenue, Philadelphia, Pa 19111).

30. SUMMARY WORK BREAKDOWN STRUCTURE

30.1 Levels. The following is a summary work breakdown structure for an electronics system:

Level 1	Level 2 (See 5.2.1.1)	Level 3 (See 5.2.1.1)
Electronics System		
	Prime Mission Equipment	
		Integration and Assembly
		Sensors
		Communications
		Automatic Data Processing Equipment
		Computer Programs.
		Data Displays
		Auxiliary Equipment

Level 1	Level 2 (See 5.2.1.1)	Level 3 (See 5.2.1.1)
	Training	
		Equipment
		Services
		Facilities
	Peculiar Support Equipment	
		Organizational/Intermediate (Including Equipment Common to Depot)
		Depot (Only)
	Systems Test and Evaluation	
		Development Test and Evaluation
		Operational Test and Evaluation
		Mockups
		Test and Evaluation Support
		Test Facilities
	System/Program Management	
		Systems Engineering
		Project Management
	Data	
		Technical Publications
		Engineering Data
		Management Data
		Support Data
		Data Depository
	Operational/Site Activation	
		Contractor Technical Support
		Site Construction
		Site/Ship/Vehicle Conversion
		System Assembly, Installation and Checkout on Site

Level 1	Level 2 (See 5.2.1.1)	Level 3 (See 5.2.1.1)
	Common Support Equipment	
		Organizational/Intermediate (Including Equipment Common to Depot)
		Depot (Only)
	Industrial Facilities	
		Construction/Conversion/Expansion
		Equipment Acquisition or Modernization
		Maintenance
	Initial Spares and Initial Repair Parts	
		(Specify by allowance list, grouping, or hardware element)

40. DEFINITIONS

40.1 Electronics category. Electronics category is defined as those systems and equipments which are classified as the electronics portion of defense materiel items. The range encompasses command centers/fire control systems, communications systems, sensor systems, navigation/guidance systems, electronic warfare systems, and support systems.

NOTE: The decision rule used to differentiate between electronics and other categories is: When the item is peculiar to or closely identified with a system contained in another category, the item will be included with the prime system in the related category. When the item is unique or used as a building block for several systems, but not accounted for in these systems, it will be included in the electronics category.

40.2 Electronics system. The electronics system element refers to the complex of equipment, data services, and facilities required to develop and produce the capability of electronics systems as represented by Command Centers/Fire Control Systems - 425L, FADAC; Communications- 490L, Tactical Radios; Sensor Systems - SONUS; Navigation/Guidance Systems - ILAAS; Electronic Warfare Systems, AN/QRC-54 Jammer; Support Systems- Multi-System Test Equipment.

40.2.1 Prime mission equipment. The prime mission equipment element refers to the equipments and associated computer programs used to accomplish the prime mission of the defense materiel item. Those support equipments and services vital to the operation and maintenance of the system, but not integral with the prime function of the system, are excluded. When the electronic system is comprised of several prime mission products, each will be listed separately at level 2. This element includes all effort associated with the design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use). It also includes such items as interconnecting cabling and harnesses.

40.2.1.1 Integration and assembly. The integration and assembly element refers to all effort outlined in 5.5.1.3 as well as the interface materials and parts required for the in-plant integration and assembly of other level 3 elements into a prime mission product, within a suppliers' facilities. This element includes all materials and parts or other mating equipments furnished by/to an integrating agency or contractor. It includes; for example, vans, storage and transportation devices; cables, conduits, connectors; and other devices associated with the operational system to provide the complete electronics mission equipment. All effort directly related to other level 3 elements is excluded. It also excludes all effort associated with system assembly, installation and checkout on site.

40.2.1.2 Sensors. The sensors element refers to those equipments which are used to extend man's natural senses; and equipment which detects and indicates terrain configuration, the presence of military targets, and other natural and manmade objects and activities by means of energy emitted or reflected by such targets or objects. The energy may be nuclear, electromagnetic, including the visible and invisible portions of the spectrum; chemical, biological, thermal or mechanical; including sound, blast, and earth violence. This element includes; for example, radome, antenna, structural facilities, transmitter, receiver, information processor, exciter, and power supply.

40.2.1.3 Communications. The communications element refers to those equipments used to receive and transmit messages of data from one person or place to another. This element includes; for example, radome, antennae, transmitter, receiver, terminal equipment, internal facility trunking, modem, cryptographic equipment, power supply, and interface equipment. It also includes internal communications such as public address, intercom, and radio used to transmit and receive the messages within the vehicle structure or complex, and leased-lines used for communication purposes.

40-2.1.4 Automatic data processing equipment. The automatic data processing equipment element refers to a machine or group of interconnected machines consisting of input, storage, computing, control, and output devices which use electronic circuitry in the main computing element to automatically perform arithmetic and/or logical operations by means of internally stored or externally controlled programmed instructions. This element includes; for example, a central processor, large-capacity storage data channels, input/output, and that peripheral equipment in operational support of data processing equipment, and devices that are designed to convey data from its original state to a data-processing media. These equipment can be mechanical, electromechanical, electrical, or optical in nature, and are generally at the terminal ends of data communication lines. (For example; transmission devices, image transmission and reception systems, and data interface equipment.)

40.2.1.5 Computer programs. The computer programs element refers to those programs and routines consisting of a deck of punched cards, magnetic or paper tapes, read-only memory (ROM) units (plug in type), or other physical medium containing a sequence of instructions and data in a form suitable for insertion into the computer and used to direct the computer to perform a desired operation or sequence of operations. These involve among other things, the analysis of the problem, preparation of flow diagrams, preparing details, developing subroutines, allocation of storage locations, specification of input and output formats, testing, and producing the physical medium (i.e., tapes, punched cards, etc.) to provide operational computer programs. This element includes; for example, executive (compiler/source), diagnostic, maintenance (built-in fault isolation, dry tapes, etc.), and operational (object) programs. This element excludes all effort for incorporating (entering) the program into the computer; computer operations, and all system test and evaluation performed during development test and evaluation. It also excludes computer programs used for administrative purposes or not associated with operational systems/equipments and computer programs for use with training or peculiar support equipment.

40.2.1.6 Data displays. The data displays element refers to the visual presentation of processed data by specially designed electronic or electromechanical devices through interconnection (either on or off line) with digital computers or component equipments. This element includes; for example, the project screens, large-screen projectors, data image simulation displays, flat panel displays, small scale individual displays, three dimensional displays, and image data storage and retrieval equipment. Although line printers and punch cards may display data, they are not usually categorized as displays but as output equipments.

40.2.1.7 Auxiliary equipment. The auxiliary equipment element refers to those common or multi-usage equipments used to augment the functional performance of several level 3 elements. This element includes; for example, power generator, power distribution, security system, and other equipments that are not homogeneous to the designated level 3 elements. All items that are an integral part of specific level 3 elements or to the integration assembly/installation and checkout are excluded.

40.2.2 Training. The training element refers to training services, devices, accessories, aids, equipment, and parts used to facilitate instruction through which personnel will acquire sufficient concepts, skills, and aptitudes to operate and maintain the system with maximum efficiency. This element includes all effort associated with the design, development, and production of training equipment as well as the execution of training services.

40.2.2.1 Equipment. The equipment element refers to those distinctive end items of training equipment, assigned by either a contractor or military service, required to meet specific training objectives. This element includes; for example, operational trainers (i.e., simulators), maintenance trainers (i.e., MTU's), and other items such as cutaways, mockups, and models.

40.2.2.2 Services. The services element refers to services, devices, accessories, and aids necessary to accomplish the objectives of training. This element includes; for example, training plans, training aids, training course materials, new equipment training, contractor-conducted training including both in-plant and service training. etc.

40.2.2.3 Facilities. The facilities element refers to that special construction necessary to accomplish the objectives of training. (Primarily, the brick-and-mortar-type facility constructed solely for the training mission.) The equipment used for the purpose of acquainting the trainee with the system or establishing trainee proficiency is excluded.

40.2.3 Peculiar support equipment. The peculiar support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which have application peculiar to a given defense materiel item. This element includes; for example, vehicles, equipment, tools, etc., used to service, transport, hoist, repair, overhaul, assemble, disassemble, test, inspect, or otherwise maintain the mission equipment. It also includes all effort associated with the design, development, and production of peculiar support equipment.

40.2.3.1 Organization/intermediate. The organizational/intermediate element refers to the peculiar support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by equipment subsystem (i.e., sensors, communications, etc.), or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.).

40.2.3.2 Depot. The depot element refers to the peculiar support equipment required to support only depot maintenance.

40.2.4 Systems test and evaluation. The systems test and evaluation element refers to the use of prototype, production, or specially fabricated hardware to obtain or validate engineering data on the performance of the electronics system. This element includes the detailed planning, conduct, support, data reduction and reports from such testing, and all hardware items which are consumed, or planned to be consumed, in the conduct of such testing. It also includes all effort associated with the design and production of models, specimens, fixtures, and instrumentation in support of the test program. Test articles which are complete units (i.e., functionally configured as required by the mission equipment) are excluded. Development, component acceptance, etc., testing which can be specifically associated with the hardware element, unless these tests are of special contractual or engineering significance (e.g., associate contractor), are also excluded.

40.2.4.1 Development test and evaluation. The development test and evaluation (DT&E) element refers to that test and evaluation conducted to: (a) demonstrate that the engineering design and development process is complete; (b) demonstrate that the design risks have been minimized; (c) demonstrate that the system will meet specifications; (d) estimate the system's military utility when introduced; (e) determining whether the engineering design is supportable (practical, maintainable, safe, etc.), for operational use, and (f) providing test data with which to examine and evaluate tradeoffs against specification requirements, life cycle cost, and schedule. DT&E is planned, conducted and monitored, by the developing agency of the DOD component. This element includes; for example, integrated ground tests, environmental tests, engineering tests and evaluation, etc. In those instances where the electronics system will utilize an air vehicle as an operational platform, it will include all system test and evaluation efforts set forth in the appendix A of this standard.

40.2.4.2 Operational test and evaluation. The operational test and evaluation element refers to that test and evaluation conducted by agencies other than the developing command to assess the prospective system's military utility, operational effectiveness, operational suitability, logistics supportability (including compatibility, interoperability, reliability, maintainability, logistic requirements, etc.), cost of ownership, and need for any modifications. Initial operational test and evaluation (IOT&E) conducted during the development of a weapon system will be included in this element. This element includes such tests as integrated systems test, appropriate flight tests, sea trials, mobility demonstrations, and other tests as required to prove the operational capability of the deliverable system. It also includes contract support (e.g., technical assistance, maintenance, labor, material, etc.), consumed during this phase of testing.

40.2.4.3 Mockups. The mockups element refers to the design engineering and production of systems or subsystem mockups which have special contractual or engineering significance, or which are not required solely for the conduct of one of the above elements of testing.

40.2.4.4 Test and evaluation support. The test and evaluation support element refers to all support elements necessary to operate and maintain systems and subsystems during testing and evaluation which are not consumed during a particular element of testing. This element includes; for example, reparable spares, repair of reparables, repair parts, contractor technical support not allotable to a specific phase of testing. Operator and maintenance personnel, consumables, special fixtures, special instrumentation, etc., which are utilized and/or consumed in a single element of testing, and which should; therefore, be included under that element of testing are excluded.

40.2.4.5 Test facilities. The test facilities element refers to those special test facilities required for performance of the various developmental tests necessary to prove the design and reliability of the system or subsystem. This element includes; for example, white rooms, test chambers, etc. The brick-and-mortar-type facilities allocable to industrial facilities are excluded.

40.2.5 System/project management. The system/project management element refers to the systems engineering and technical control as well as the business management of particular systems/ projects. This element encompasses the planning, directing, and controlling the definition,

development, and production of a system/project including the functions of logistics and logistics support, maintenance support, facilities, personnel and training, testing,and activation of a system. System/ project management effort that can be associated specii.cally with the hardware element is excluded, unless this managment effort is of special contractual or engineering significance (e.g., associate contractor).

40.2.5.1 System engineering. The system engineering element refers to the technical and management efforts of directing and controlling a totally integrated engineering effort of a system program. This element encompasses the systems engineering effort to define the system and the integrated planning and control of the technical program efforts of design engineering, logistics engineering, specialty engineering, production engineering, and integrated test planning. This element includes but is not limited to: the system engineering effort to transform an operational need or statement of deficiency into a description of system requirements and a preferred system configuration; the logistics engineering effort to define, optimize and integrate the logistics support considerations into the mainstream engineering effort to insure the development and production of a supportable and cost effective weapon system; and the technical planning and control effort for planning, monitoring, measuring, evaluating, directing and replanning the management of the technical program. It excludes the actual design engineering, and production engineering directly related to the products or services of a deliverable end item. Examples of system engineering efforts include:

a. System definition, overall system design, design integrity analysis, and intrasystem and intersystem compatiblity assurance, etc., the integration and balancing of reliability, maintainability, producibility, safety, and survivability; human factors, personnel and training program requirements, security requirements, configuration identification and control, quality assurance program, value engineering, preparation of equipment and component performance specifications, design of test and demonstration plans;

b. Support synthesis, design impact projections, life cycle cost factors, time factors, tradeoff analysis, logistics design appraisal, use studies, support function requirements identification, repair level determination, task analysis, standardization review, logistics requirements identification, logistics support verification, and the preparation and updating of the logistics support plan, the maintenance plan, facilities planning (operational and maintenance), the transportation and handling plan, etc., and;

c. Preparation of the Systems Engineering Management Plan (SEMP), specification tree, program risk analysis, system test planning, decision control process, technical performance measurement, technical reviews, subcontractor/vendor reviews, work authorization, technical documentation control,etc.

40.2.5.2 Project management. The project management element refers to the business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designated to accomplish overall project objectives which are not associated with specific hardware elements and are not included in system engineering. Examples of these activities are logistics management, cost/schedule/performance management, contract management, data management, vendor liaison, contract WBS, etc.

40.2.6 Data. The data element refers to all deliverable data required to be listed on a DD Form 1423. The data requirements will be selected from the TD-3. This element includes only such effort that can be reduced or will not be incurred if the data item is eliminated. If the data are government peculiar, include the efforts for acquiring, writing, assembling, reproduction, packaging and shipping. It also includes the effort for repreparing into government format with reproduction and shipment if data are identical to that used by the contractor, but in a different format.

40.2.6.1 Technical publications. The technical publications element refers to those formal technical orders/manuals developed, as well as commercial, advance, real property installed equipment, and miscellaneous manuals for the installation, operation, maintenance, overhaul, training and reference of hardware, hardware systems and computer programs; and contractor instructional materials, inspection documentation, and historical type records that may accompany individual items of equipment. This element includes the data item descriptions set forth in functional category M of the TD-3.

40.2.6.2 Engineering data. The engineering data element refers to those engineering drawings, associated lists, specifications and other documentation required by the government in accordance with functional categories E, H, R, S, and T of TD-3. This element includes; for example, all plans, procedures, reports and documentation pertaining to system, subsystems, computer programs, component engineering, testing, human factors, analysis, etc.

40.2.6.3 Management data. The management data element refers to those data items necessary for configuration management, cost, schedule, contractual data management, programs management, etc., required by the government in accordance with functional categories A, F, and P of TD-3. This element includes; for example, contractor cost reports, cost performance reports, contractor funds status reports; and schedule, milestone, networks, integrated support plans, etc.

40.2.6.4 Support data. The support data element refers to those data items designed to document the logistics support planning and provisioning process in accordance with functional categories L and V of TD-3. This element includes; for example, supply and general maintenance plans and reports, transportation, handling, packaging information, etc.; and data to support the provisioning process.

40.2.6.5 Data depository. The data depository element refers to a facility designated to act as custodian in establishing and maintaining a master engineering specification and drawing depository service for government-approved documents that are the property of the US Government. As custodian for the government, the contractor is authorized by approved change orders to maintain these master documents at the latest approved revision level. When documentation is called for on a given item of data retained in the depository, the charges (if charged directly) will be to the appropriate data element. This element represents a distinct entity of its own and includes all efforts of drafting, clerical, filing, etc., required to provide the service outlined above. All similar efforts for the contractor's internal specification/drawing control system, in support of his engineering/production activities, are excluded.

40.2.7 Operational/site activation. The operational/site activation element refers to the real estate, construction, conversion, utilities, and equipment to provide all facilities required to house, service, and launch prime mission equipment at the organizational and intermediate level, except for turnkey operations, wherein real estate and construction are involved as a package procurement. This element includes conversion of site, ship, vehicle; system assembly, checkout, and installation into site facility or ship to achieve operational status. It also includes contractor support in relation to operational/site activation.

40.2.7.1 Contractor technical support. The contractor technical support element refers to all materials and services provided by the contractor related to activation. This element includes; for example, repair of reparables, standby services, final turnover, etc.

40.2.7.2 Site construction. The site construction element refers to the real estate, site preparation, construction, and other special-purpose facilities necessary to achieve system operational status. This element also includes the construction of utilities, roads, and interconnecting cabling.

40.2.7.3 Site/ship/vehicle conversion. The site/ship/vehicle conversion element refers to all materials and services required to provide for the conversion of existing site/ship/vehicle to accommodate the mission equipment and selected support equipment directly related to the specific system. This element includes launch, operating, support, and other conversion necessary to achieve system operational status. Where appropriate, specify by site or ship.

40.2.7.4 System assembly, installation, and checkout on site. The system assembly, installation, and checkout on site element refers to the materials and services involved in the assembly of mission equipment at the site. This element includes; for example, installation of mission and support equipment, operations, or support facilities; and complete system checkout or shakedown to insure achievement of operational status. Where appropriate, specify by site/ship or vehicle.

40.2.8 Common support equipment. The common support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which are presently in the DOD inventory for support of other systems. This element includes all effort required to assure availability of this equipment for support of the particular defense materiel item. It also includes the acquisition of additional quantities of these equipments if caused by the introduction of the defense materiel item into operational service.

40.2.8.1 Organizational/intermediate. The organizational/intermediate element refers to the common support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance; however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by equipment subsystem (i.e., sensors,

communications, etc.), or maintenance function (i.e., electrical maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.).

40.2.8.2 Depot. The depot element refers to the common support equipment required to support only depot maintenance.

40.2.9 Industrial facilities. The industrial facilities element refers to the construction, conversion, or expansion of facilities for production, inventory, and contractor depot maintenance required by one or more suppliers for the specific system. This element includes; for example, equipment acquisition, or modernization, where applicable, and maintenance of the above facilities or equipment.

40.2.9.1 Construction/conversion/expansion. The construction/conversion/expansion element refers to the real estate, and preparation of system peculiar facilities for production, inventory, depot maintenance, and other related activities.

40.2.9.2 Equipment acquisition or modernization. The equipment acquisition or modernization element refers to production equipment acquisition, modernization, or transferal of equipment for the particular system. (Pertains primarily to government owned and leased equipment under facilities contract.)

40.2.9.3 Maintenance (industrial facilities). The maintenance (industrial facilities) element refers to the maintenance, preservation, and repair of industrial facilities and equipment.

40.2.10 Initial spares and initial repair parts. The initial spares and initial repair parts element refers to the spare components or assemblies used for replacement purposes in major end items of equipment. This element excludes development test spares, and spares provided specifically for use during system installation, assembly and checkout on site.

APPENDIX C

SUMMARY WORK BREAKDOWN STRUCTURE AND DEFINITIONS MISSILE SYSTEM

10. SCOPE

10.1 This appendix covers the summary work breakdown structure and definitions for a missile system.

20. REFERENCED DOCUMENTS

20.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

PUBLICATION

TD-3 Department of Defense Authorized Data List, Index of Data Item Description

(Application for copies should be addressed to Naval Publications & Printing Service, Eastern Division, 700 Robbins Avenue, Philadelphia, Pa 19111).

30. SUMMARY WORK BREAKDOWN STRUCTURE

30.1 Levels. The following is a summary work breakdown structure for a missile system:

Level 1	Level 2 (see 5.2.1.1)	Level 3 (see 5.2.1.1)
Missile System	Air Vehicle	Integration and Assembly
		Propulsion (For Single Stage Only)
		Stage I
		Stage II
		Stage III
		Stage IV
		Guidance and Control Equipment
		Launched Payload
		Payload Shroud
		Airborne Test Equipment
		Airborne Training Equipment
		Auxiliary Equipment

Level 1	Level 2 (see 5.2.1.1)	Level 3(see 5.2.1.1)
	Command and Launch Equipment	Integration and Assembly
		Surveillance, Identification, and Tracking Sensors
		Launch and Guidance Control
		Communications
		Data Processing
		Launcher Equipment
		Auxiliary Equipment
	Training	Equipment
		Services
		Facilities
	Peculiar Support Equipment	Organizational/Intermediate (Including Equipment Common to Depot)
		Depot(Only)
	Systems Test and Evaluation	Development Test and Evaluation
		Operational Test and Evaluation
		Mockups
		Test and Evaluation Support
		Test Facilities
	Systems/Project Management	Systems Engineering
		Project Management
	Data	Technical Publications
		Engineering Data
		Management Data
		Support Data
		Data Depository
	Operational/Site Activation	Contractor Technical Support
		Site Construction
		Site/Ship/Vehicle Conversion
		System Assembly, Installation, and Checkout on Site

Level 1	Level 2 (see 5.2.1.1)	Level 3 (see 5.2.1.1)
	Common Support Equipment	Organizational/Intermediate (Including Equipment Common to Deport) Depot (Only)
	Industrial Facilities	Construction/Conversion/ Expansion Equipment Acquisition or Modernization Maintenance
	Initial Spares and Initial Repair Parts	Specify by allowance list, grouping, of hardware element)

40. DEFINITIONS

40.1 Missile category. Missile category is defined as those weapons delivery systems which employ unmanned, self-propelled air/space vehicles to navigate, penetrate, and produce a desired effect on selected targets. The missile category includes systems designed for employment as weapons of air defense, land warfare, strategic bombardment, air and sea combat, and drones.

40.2 Missile system. The missile system element refers to the complex of equipment, data services, and facilities required to develop and produce the capability of employing a missile weapon in an operational environment to produce the desired destructive effect on selected targets. (Represented by Poseidon, Minuteman II, Nike-X, SRA, Phoenix, etc.).

40.2.1 Air vehicle. The air vehicle element refers to the means for delivering the destructive effect to the target, including the capability to generate or receive intelligence to navigate and penetrate to the target area, and to detonate the warhead. This element includes the design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use).

40.2.1.1 Integration and assembly. The integration and assembly element refers to all effort outlined in 5.5.1.3 as well as that portion of the missile vehicle furnished by the integrating contractor to provide interface/mating

surfaces necessary to permit the in-plant integration and assembly of the other level 3 elements into an air vehicle within a contractor's facility. This element includes; for example, external appendages for stable and controllable flight, interstage sections, structure, framework, skirts, umbilical receptacles and cables, umbilical raceways, scoops, covers, self-destruction system, and other miscellaneous items which are homogeneous to the integration effort. All effort directly related to the other level 3 elements of the air vehicle equipments are excluded. It also excludes all effort associated with system assembly, installation and checkout on site.

40.2.1.2 Propulsion. The propulsion element refers to the means for generating propelling forces on single-stage missiles. This element includes; for example, the engine, structure, propellant and fuel, distribution and control of propellant and fuel, starting means, safety devices, and internal environmental control when grouped as a functional entity.

40.2.1.3 Stage I. The stage I element refers to the first separable propulsion section of a multistage propulsion system to propel the aerospace vehicle on its intended flight. This element includes; for example, the structure, engines, tanks, case, case liner, nozzle controls, propellants and fuels, and other equipments homogeneous to the complete stage I element of the aerospace vehicle as an entity within itself.

40.2.1.4 Stage II. The stage II element refers to the second separable section of a multistage propulsion system to propel the aerospace vehicle on its intended flight. This element includes; for example, the structure, engines, tanks, propellant and fuel, case, case liner, nozzles, nozzle controls, and other equipments homogeneous to the completed stage II element of the aerospace vehicle as an entity within itself.

40.2.1.5 Stage III. The stage III element refers to the third separable stage of a multistage propulsion system to propel the aerospace vehicle on its intended flight. This element includes; for example, the structure, engines, tanks, propellant and fuel, case, case liner, nozzles, nozzle controls, and other equipments homogeneous to the completed stage III element of the aerospace vehicle as an entity within itself.

40.2.1.6 Stage IV. The stage IV element refers to the fourth separable stage of a multistage propulsion system to propel the aerospace vehicle on its intended flight. This element includes; for example, the structure, engines, tanks, propellant and fuel, case, case liner, nozzles, nozzle controls, and other equipments homogeneous to the completed stage IV element of the aerospace vehicle as an entity within itself.

40.2.1.7 Guidance and control equipment. The guidance and control equipment element refers to the means for generating or receiving guidance intelligence, conditioning the intelligence to produce signals, and generating appropriate control forces. Controllers may interface with the structure by actuating movable area surfaces or with the propulsion system to produce control movable reaction forces, or may independently produce reaction forces for control. If design is such that electronics are packaged into a single rack or housing as an assembly, this rack or housing will be considered part of the guidance and control system, but the circuit boards and cathode ray tube will be considered as parts of the appropriate subsystems. This element includes; for example, the guidance intelligence system, computer, sensing elements, autopilot, etc.

40.2.1.8 Launched payload. The launched payload element refers to the means employed to produce the destructive effect on the target at the terminal point of flight. This element includes; for example, case/nosecone, warhead and associated devices for safing/arming, and igniting the explosive elements; plus all items deployed or carried along to improve penetration to the target.

40.2.1.9 Payload shroud. The paylod shroud element refers to that equipment constituting a protective enclosure for safeguarding the payload during the severe environments of launch and flight through the earth's atmosphere. This element includes; for example, structure, mounting provisions, access ports, antenna windows, separation and ejection subsystems, and other equipment homogeneous to the shroud. It also includes all design, development, production, and assembly effort to provide this entity. All effort directly related to the remaining level 3 elements and the integration and assembly of this element into an air vehicle is excluded.

40.2.1.10 Airborne test equipment. The airborne test equipment element refers to an exercise warhead that is interchangeable with the live warhead and suitable for developmental firing. This element includes; for example, destruct systems, recovery systems, special instrumentation, telemetry equipment, etc.

40.2.1.11 Airborne training equipment. The airborne training equipment element refers to an exercise warhead that is interchangeable with the live warhead and suitable for training firing. This element includes; for example, destruct systems, recovery systems, special instrumentation, telemetry equipment, etc., associated with the training mission.

40.2.1.12 Auxiliary equipment. The auxiliary equipment element refers to that additional equipment generally excluded from other specific level 3 elements. It includes equipment required to supplement or provide service to other level 3 elements within the air vehicle. This element includes; for example, power supply, power distribution, environmental control, shock alleviation, safety and protective subsystems, destruct system, etc. It also includes equipment of a single purpose and function which is necessary for accomplishing the assigned mission.

40.2.2 Command and launch equipment. The command and launch equipment element refers to the subsystems installed at a launch site or aboard launch vehicles required to store, make ready, and launch the air vehicles of the missile system. This element includes those equipments required to acquire and condition the necessary intelligence of select targets, reach launch decisions, command the launch, and provide guidance and control where such capability is not self contained aboard the air vehicle. This element includes design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification (s), regardless of their end use).

40.2.2.1 Integration and assembly. The integration and assembly element refers to all effort outlined in 5.5.1.3 as well as the interface materials and parts required for the in-plant integration and assembly of the other level 3 equipments/computer programs into an installed, operational system, within a contractor's facilities. This element includes all materials and parts or other mating equipments furnished by/to an integrating agency or contractor. It includes; for example, vans, storage and transportation devices; cables, conduits, connectors; and other devices associated with the operational system. All effort directly related to other level 3 elements of the command and launch equipments is excluded. It also excludes all effort associated with system assembly, installation and checkout on site.

40.2.2.2 Surveillance, identification, and tracking sensors. The surveillance, identification, and tracking sensors element refers to those sensors required to support defensive missile systems by maintaining surveillance against incoming targets and providing the data required for targeting, launch , midcourse guidance, and homing where such capability is not self-contained aboard the missile system air vehicle. For all classes of missile systems, they may include tracking of the missile system air vehicles as required for guidance and control or range safety. (Subsystems involved in safety and destruct or test and training are not included, unless they are required operational items. Otherwise they are included under test and evaluation.) This element may include; for example, sensors of any spectrum whether radar, optical, infrared, etc.

40.2.2.3 Launch and guidance control. The launch and guidance control element refers to the means to enable targeting of missile air vehicles, launch decisions to be made, and to command launch. This element includes; for example, supplementary means for guidance of those missile air vehicles not having self-contained guidance and control and means to command destruct. This element also includes control and checkout consoles, data displays, mission records, etc.

40.2.2.4 Communications. The communications element refers to the means for distribution of intelligence within the missile system. This element includes intercommunication subsystems of launch sites for tactical and administrative message flow and ties between sensor, data processing, and launch and guidance control subsystems. Communications may interface with existing fixed-communications facilities or communications subsystems of launch platforms which are associated systems to the missile system. (Subsystems involved in safety and destruct or test and training are not included, unless they are required operational items. Otherwise they are included under test and evaluation support under systems test and evaluation.)

40.2.2.5 Data processing. The data processing element refers to the means to condition data generated at the launch site or aboard the launch vehicle of those systems employing mobile launch, or data received from associated systems so as to accommodate the needs of launch and guidance control. This element includes the computer and peripheral equipment. Items that are an integral part of launch and guidance control are excluded.

40.2.2.6 Launcher equipment. The launcher equipment element refers to the means to launch the missile air vehicle from stationary sites or mobile launch platforms. This element may include stowage facilities and checkout stations for readiness verification when these are integral to the launcher. It may include safety and protective elements when these are not integral to the launch platform or site facilities. (Subsystems involved in safety and destruct or test and training are not included, unless they are required operational items. Otherwise they are included under test and evaluation support under systems test and evaluation.)

40.2.2.7 Auxiliary equipment. The auxiliary equipment element refers to the general-purpose ground equipment utilized to supplement the various operational equipments of the command-and-launch system. This element includes; for example, power generator, power distribution system, environmental control, cabling, malfunction detection, fire prevention, security systems, and other common-usage equipments.

40.2.3 Training. The training element refers to the training services, devices, accessories, aids, equipment, and parts used to facilitate instruction through which personnel will acquire sufficient concepts, skills, and aptitudes to operate and maintain the system with maximum efficiency. This element includes all effort associated with the design, development, and production of training equipment as well as the execution of training services.

40.2.3.1 Equipment. The equipment element refers to those distinctive end items of training equipment, assigned by either a contractor or military service, to meet specific training objectives. This element includes; for example, operational trainers (i.e., simulators), maintenance trainers (i.e., MTU's) and other items such as cutaways, mockups, and models.

40.2.3.2 Services. The services element refers to services, devices, accessories, and aids necessary to accomplish the objectives of training. This element includes; for example, training plans, training aids, training course materials, contractor-conducted training including inplant and service training, etc.

40.2.3.3 Facilities. The facilities element refers to that special construction necessary to accomplish the objectives of training. (Primarily, the brick-and-mortar-type facility constructed solely for the training mission.) The equipment used for the purpose of acquainting the trainee with the system or establishing trainee proficiency is excluded.

40.2.4 Peculiar support equipment. The peculiar support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which have application peculiar to a given defense materiel item. This element includes; for example, vehicles, equipment, tools, etc., used to fuel, service, transport, hoist, repair, overhaul, assembly, disassemble, test, inspect, or otherwise maintain the mission equipment. It also includes all effort associated with the design, development, and production of peculiar support equipment.

40.2.4.1 Organizational/intermediate. The organizational/intermediate element refers to the peculiar support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance; however, it is characterized by its

requirement at the organizational and intermediate level of maintenance. Further breakdown may be by air vehicle subsystem (i.e., stage I, stage III, etc) or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc); and command and launch subsystem (i.e., launch and guidance control, communications, etc).

40.2.4.2 Depot. The depot element refers to the peculiar support equipment required to support only depot maintenance.

40.2.5 Systems test and evaluation. The systems test and evaluation element refers to the use of prototype, production, or specially fabricated hardware to obtain or validate engineering data on the performance of the missile system. This element includes the detailed planning, conduct, support, data reduction and reports from such testing, and all hardware items which are consumed, or planned to be consumed, in the conduct of such testing. It also includes all effort associated with the design and production of models, specimens, fixtures, and instrumentation in support of the test program. Test articles which are complete units (i.e., functionally configured as required by the mission equipment) are excluded. Development, component acceptance, etc., testing which can be specifically associated with the hardware element, unless these tests are of special contractural or engineering significance (e.g., associate contractor) are also excluded.

40.2.5.1 Development tests and evaluation. The development test and evaluation (DT&E) element refers to that test and evaluation conducted to: (a) demonstrate that the engineering design and development process is complete; (b) demonstrate that the design risks have been minimized: (c) demonstrate that the system will meet specifications; (d) estimate the system's military utility when introduced; (e) determining whether the engineering design is supportable (practical, maintainable, safe, etc.) for operational use and (f) providing test data with which to examine and evaluate tradeoffs against specification requirements, life cycle cost, and schedule. DT&E is planned, conducted and monitored, by the developing agency of the DOD component. It includes; for example, such models and tests as wind tunnel, static, drop, and fatigue; integration ground tests; (a) air vehicle (b) command and launch systems equipments (c) integrated air vehicle and command/launch systems equipment; test bed aircraft and associated support; and development flight test, test instrumentation, and test equipment, including its support equipment; chase aircraft and support thereto.

40.2.5.2 Operational test and evaluation. The operational test and evaluation element refers to that test and evaluation conducted by agencies other than the developing command to assess the prospective system's military utility, operational effectiveness, operational suitability, logistics supportability (including compatibility, interoperability, reliability, maintainability, logistic requirements, etc.), cost of ownership, and need for any modifications. Initial operational test and evaluation (IOT&E) conducted during the development of a weapon system will be included in this element. It encompasses such tests as integrated system tests, flight tests, sea trials, etc., as required to prove the operational capability of the deliverable systems. It also includes contractor support (e. g., technical assistance, maintenance, labor, material, etc.) consumed during this phase of testing.

40.2.5.3 Mockups. The mockups element refers to the design engineering and production of systems or subsystem mockups which have special contractural or engineering significance, or which are not required solely for the conduct of one of the above elements of testing.

40.2.5.4 Test and evaluation support. The test and evaluation support element refers to all support elements necessary to operate and maintain systems and subystems during testing and evaluation which are not consumed during a particular category of testing. This element includes; for example, instrumentation, reparable spares, repair of reparables, test and support equipment, contactor technical support, drones, surveillance aircraft, tracking vessels, etc., not allocable to preceding test and evaluation elements. Operator and maintenance personnel, consumables, special fixtures, special instrumentation, etc., which are utilized and/or consumed in a single element of testing, and which should; therefore, be included under that element, are excluded.

40.2.5.5 Test facilities. The test facilities element refers to those special test facilities, sites, or ships, required for performance of the various developmental tests necessary to prove the design and reliability of the system or subsystem. This element includes; for example, test chambers, white rooms, shakers, etc. The brick-and-mortar-type facilities allocable to industrial facilities are excluded.

40.2.6 System/project management. The system/project management element refers to the systems engineering and technical control as well as the business management of particular systems/projects. This element encompasses the planning, directing, and controlling the definition, development, and production of a system/project including the functions of logistics and logistics support, maintenance support, facilities, personnel and training, testing, and activation of a system. System/project management effort that can be associated specifically with the hardware element is excluded, unless this management effort is of special contractual or engineering significance (e. g., associate contractor).

40.2.6.1 System engineering. The system engineering element refers to the technical and management efforts of directing and controlling a totally integrated engineering effort of a system program. This element encompasses the system engineering effort to define the system and the integrated planning and control of the technical program efforts of design engineering, logistics engineering, specialty engineering, production engineering, and integrated test planning. This element includes but is not limited to: the system engineering effort to transform an operational need or statement of deficiency into a description of system requirements and a preferred system configuration; the logistics engineering effort to define, optimize and integrate the logistics support considerations into the mainstream engineering effort to insure the development and production of a supportable and cost effective weapon system; and the technical planning and control effort for planning, monitoring, measuring, evaluating, directing and replanning the management of the technical program. It excludes the actual design engineering, and production engineering directly related to the products or services of a deliverable end item. Examples of system engineering efforts include:

a. System definition, overall system design, design integrity analysis, system optimization, system/cost effectiveness analysis, and intrasystem and intersystem compatibility assurance, etc.; the integration and balancing of reliability, maintainability, producibility, safety and survivability; human factors, personnel and training program requirements, security requirements, configuration identification and control, quality assurance program, value engineering, preparation of equipment and component performance specifications; design of test and demonstration plans;

b. Support synthesis, design impact projections, life cycle cost factors, time factors, tradeoff analysis, logistics design appraisal, use studies, support function requirements identification, repair level determination, task analysis, standardization review, logistics requirements identification, logistics support verification, and the preparation and updating of the logistics support plan, the maintenance plan, facilities planning (operational and maintenance), the transportation and handling plan, etc., and;

c. Preparation of the Systems Engineering Management Plan (SEMP), specification tree, program risk analysis, system test planning, decision control process, technical performance measurement, technical reviews, subcontractor/vendor reviews, work authorization, technical documentation control, etc.

40.2.6.2 Project management. The project management element refers to the business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designated to accomplish overall project objectives which are not associated with specific hardware elements and are not included in system engineering. Examples of these activities are logistics management, cost/schedule/performance management, contract management, data management, vendor liaison, contract WBS, etc.

40.2.7 Data. The data element refers to all deliverable data required to be listed on a DD Form 1423. The data requirements will be selected from the TD-3. This element includes only such effort that can be reduced or will not be incurred if the data item is eliminated. If the data are government peculiar, include the efforts for acquiring,writing, assembling, reproduction, packaging and shipping. It also includes the effort for repreparing into government format with reproduction and shipment if data are identical to that used by the contractor, but in a different format.

40.2.7.1 Technical publications. The technical publications element refers to those formal technical orders/manuals developed, as well as commercial, advance, real property installed equipment, and miscellaneous manuals for the installation, operation, maintenance, overhaul, training and reference of hardware, hardware systems, and computer programs; and contractor instructional materials, inspection documentation, and historical type records that may accompany individual items of equipment. This element includes the data item descriptions set forth in functional category M of TD-3.

40.2.7.2 Engineering data. The engineering data element refers to those engineering drawings, associated lists, specifications, and other documentation required by the government in accordance with functional categories E, H, R, S, and T of TD-3. This element includes; for example, all plans, procedures, reports, and documentation pertaining to systems, subsystems, computer programs, component engineering, testing, human factors, analysis, etc.

40.2.7.3 Management data. The management data element refers to those data items necessary for configuration management, cost, schedule, contractual data management, programs management, etc., required by the government in accordance with functional categories A, F, and P of TD-3. This element includes; for example, contractor cost reports, cost performance reports, contractor fund status reports, and schedule, milestone, networks, integrated support plans, etc.

40.2.7.4 Support data. The support data element refers to those data items designed to document the logistics support planning and provisioning process in accordance with functional categories L and V of TD-3. This element includes, for example, supply and general maintenance plans and reports, transportation, handling, packaging information, etc.; and data to support the provisioning process.

40.2.7.5 Data depository. The data depository element refers to a facility designated to act as custodian in establishing and maintaining a master engineering specification and drawing depository service for government-approved documents that are the property of the U. S. Government. As custodian for the government, the contractor is authorized by approved change orders to maintain these master documents at the latest approved revision level. When documentation is called for on a given item of data retained in the depository, the charges (if charged direct) will be to the appropriate data element. This element represents a distinct entity of its own and includes all effort of drafting, clerical, filing, etc., required to provide the service outlined above. All similar effort for the contractor's internal specification/drawing control system, in support of his engineering/production activities, is excluded.

40.2.8 Operational/site activation. The operational/site activation element refers to the real estate, construction, conversion, utilities, and equipment to provide all facilities required to house, service, and launch prime mission equipment at the organizational and intermediate level. This element includes conversion of site, ship, vehicle; system assembly, checkout, and installation into site facility or ship to achieve operational status. It also includes contractor support in relation to operational/site activation.

40.2.8.1 Contractor technical support. The contractor technical support element refers to all materials and services provided by the contractor related to activation. This element includes; for example, repair of reparables, standby services, final turnover, etc.

40.2.8.2 Site construction. The site construction element refers to the real estate, site preparation, construction, and other special-purpose facilities necessary to achieve system operational status. This element also includes the construction of utilities, roads, and interconnecting cabling.

40.2.8.3 Site/ship/vehicle conversion. The site/ship/vehicle conversion element refers to the conversion of existing site/ship/vehicle to accommodate the mission equipment and selected support equipment. This element includes operating, support and other special-purpose facilities necessary to achieve system operational status. It also includes all material and services to provide for their conversion, as well as; for example, utilities, roads, etc.

40.2.8.4 System assembly, installation, and checkout on site. The system assembly, installation, and checkout on site element refers to all materials and services involved in the assembly of mission equipment at the site. This element includes; for example, installation of mission and support equipment in the launch, operations, or support facilities; and complete system checkout or shakedown to insure achievement of operational status.

40.2.9 Common support equipment. The common support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which are presently in the DOD inventory for support of other systems. This element includes all effort required to assure the availability of this equipment for support of the particular defense materiel item. It also includes the acquisition of additional quantities of these equipments if caused by the introduction of the defense materiel item into operational service.

40.2.9.1 Organizational/intermediate. The organizational/intermediate element refers to the common support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by air vehicle subsystem (i.e., stage I, stage III, etc.) or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.); and command and launch subsystem (i.e., launch and guidance control, communications, etc.).

40.2.9.2 Depot. The depot element refers to the common support equipment required to support only depot maintenance.

40.2.10 Industrial facilities. The industrial facilities element refers to the construction, conversion, or expansion of facilities for production, inventory, and contractor depot maintenance required by one or more suppliers for the specific system. Ths element includes; for example, equipment acquisition, or modernization, where applicable, and maintenance of the above facilities or equipment.

40.2.10.1 Construction/conversion/expansion. The construction/conversion/expansion element refers to the real estate, and preparation of system peculiar facilities for production, inventory, depot maintenance, and other related activities.

40.2.10.2 Equipment acquisition or modernization. The equipment acquisition or modernization element refers to production equipment acquisition, modernization, or transferal of equipment for the particular system. (Pertains primarily to government owned and leased equipment under facilities contract.)

40.2.10.3 Maintenance (industrial facilities). The maintenance (industrial facilities) element refers to the maintenance, preservation, and repair of industrial facilities and equipment.

40.2.11 Initial spares and initial repair parts. The initial spares and initial repair parts element refers to the spare components or assemblies used for replacement purposes in major end items of equipment. This element excludes development test spares, and spares provided specifically for use during system installation, assembly and checkout on site.

APPENDIX D

SUMMARY WORK BREAKDOWN STRUCTURE AND DEFINITIONS

ORDNANCE SYSTEM

10. SCOPE

10.1 This appendix covers the summary work breakdown structure and definitions for an ordnance system.

20. REFERENCED DOCUMENTS

20.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

PUBLICATION

TD-3 Department of Defense Authorized Data List, Index of Data Item Description

(Application for copies should be addressed to Naval Publications & Printing Service, Eastern Division, 700 Robbins Avenue, Philadelphia, Pa 19111).

30. SUMMARY WORK BREAKDOWN STRUCTURE

30.1 Levels. The following is a summary work breakdown structure for an ordnance system:

Level 1	Level 2 (see 5.2.1.1)	Level 3 (see 5.2.1.1)
Ordnance System		
	Complete Round	
		Integration and Assembly
		Propellant/Propulsion
		Structure
		Warhead
		Fuze
		Safety/Arm
		Guidance and Control

Level 1	Level 2 (see 5.2.1.1)	Level 3(see 5.2.1.1)
	Launch System	
		Integration and Assembly
		Launcher
		Carriage
		Fire Control Equipment
		Ready Magazine
		Adaptor Kits
	Training	
		Equipment
		Services
		Facilities
	Peculiar Support Equipment	
		Organizational/Intermdiate (Including Equipment Common to Depot)
		Depot (Only)
	Systems Test and Evaluation	
		Development Test and Evaluation
		Operational Test and Evaluation
		Mockups
		Test and Evaluation Support
		Test Facilities
	System/Project Management	
		System Engineering
		Project Management
	Data	
		Technical Publications
		Engineering Data
		Management Data
		Support Data
		Data Depository

Level 1	Level 2(see 5.2.1.1)	Level 3 (see 5.2.1.1)
	Operational/Site Activation	Contractor Technical Support Site Construction Site/Ship/Vehicle Conversion System Assembly, Installation and Checkout on Site
	Common Support Equipment	Organizational/Intermediate (Including Equipment Common to Depot) Depot (Only)
	Industrial Facilities	Construction/Conversion/ Expansion Equipment Acquisition or Modernization Maintenance
	Initial Spares and Initial Repair Parts	(Specify by allowance list, grouping, or hardware element)

40. DEFINITIONS

40.1 Ordnance category. Ordnance category is defined as those systems and equipments which are comprised of munitions (including atomic, biological, chemical, psychological, and pyrotechnic) and particular delivery vehicles. The ordnance category includes bombs, rockets, artillery, naval guns, torpedoes, mines, rifles, mortars, and the ammunition associated with these systems. Aerospace guided missiles and land, sea, or air delivery vehicles are excluded.

40.2 Ordnance system. The ordnance system element refers to the complex of equipment, data services, and facilities required to develop and produce the capability for applying munitions (including atomic, biological, chemical, psychological, and pyrotechnic) to a target. This element includes the munitions and the means of launching or firing the munitions, such as MK 48 torpedo system, SNAKEYE bomb, 8-inch Howitzer, .223 caliber ammunition, etc.

40.2.1 Complete round. The complete round element refers to all the components making up the ammunition necessary for firing one shot, such as mines, bombs, rockets, torpedoes; rifle and artillery ammunition. This element includes, for example, structural elements, warhead or payload, fuze, safety/arming devices, guidance equipment, and propulsion equipment or propellant. For artillery ammunition, the complete round consists of the projectile (including structure, warhead, fuze, safety/arming devices, etc.), and the propelling charge. It also includes all efforts associated with the design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use).

40.2.1.1 Integration and assembly. The integration and assembly element refers to the effort outlined in 5.5.1.3 as well as the installation, mating, and associated manfuacturing testing that are performed within the contractor's facility to make the complete round ready for operational use. This element includes; for example, mating projection to cases, installation of fuzes, arming devices, primers, etc. All effort directly related to other level 3 complete round equipment is excluded.

40.2.1.2 Propellant/propulsion. The propellant/propulsion element refers to chemical or mechanical devices which provide the force to transport the warhead from the launch position to the target such as explosive powder charges, rocket motors, torpedo motors, etc. For artillery ammunition, this element includes the cartridge case, if applicable, and primer as well as the explosive charge itself.

40.2.1.3 Structure. The structure element refers to that portion of the round which carries the warhead to the target, such as the basic housing of a bomb or rocket, casing of a projectile, body of a torpedo, etc. This element includes those structural devices which provide stability and control such as fins, parachutes, anchors, etc.

40.2.1.4 Warhead. The warhead element refers to the assembly making up the payload of the round. This element includes high-explosive, chemical, and biological agents, nuclear devices; pyrotechnics; etc. It also includes an exercise head, when applicable. Where the projectile is solid, as in small arms ammunition and inert A/P shells, the warhead will comprise the entire projectile.

40.2.1.5 Fuze. The fuze element refers to the mechanical or electronic device designed to detonate under desired conditions the charge or primer in a bomb, rocket, mine, etc, or to set forces into action to detonate one or the other, such as impact fuzes, proximity fuzes, hydrostatic fuzes, etc.

40.2.1.6 Safety/arm. The safety/arm element refers to the device or combination of devices which control the capability of initiating the explosive sequence. Such devices may be mechanical, hydrostatic, inertial, counters, timers, etc.

40.2.1.7 Guidance and control. The guidance and control element refers to the complex of equipment which, after launch, evaluates and correlates the path of the round with target information, and which performs the necessary functions to enable the round to intercept the target. This element includes; for example, homing devices, communications links, inertial platforms, control systems, and devices controlling parachute and anchor actuations.

40.2.2 Launch system. The launch system element refers to the complex of equipment for controlling and releasing, or sending forth, munitions on a desired course or trajectory; the ordnance system less the complete round. Launch systems are defined as rifles, artillery pieces, naval guns, mortar cannons, and machine guns, as well as that equipment for launching torpedoes and rockets or dropping bombs. This element includes; for example, the launcher, fire control equipment, and the ready magazine. It includes all effort associated with the design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use).

40.2.2.1 Integration and assembly. The integration and assembly element refers to the effort outlined in 5.5.1.3 as well as that portion of the launch system furnished by/to the integrating contractor to provide interface sections or interconnecting material(s) necessary to permit the integration and assembly of the other level 3 launch items that are performed within the contractor's facility. This element includes; for example, adaptors, cables, connectors, and other miscellaneous materials which are homogeneous to the integration effort for providing a launch system. All efforts directly related to other level 3 elements of the launch equipments are excluded.

40.2.2.2 Launcher. The launcher element refers to a structural device designed to support and hold munitions in position for firing or release. This element includes; for example, suspension and release systems, rocket pods, mine racks or dispensers, torpedo tubes; for guns and artillery, it includes tubes, recoil assemblies, breech mechanisms, mounts, rifle stocks, etc.

40.2.2.3 Carriage. The carriage element refers to the primary structure which serves as a platform to accommodate other level 3 elements and provides mobility to the complete launch system. It is not generally considered a self-propelled vehicle. This element includes; for example, T-frame, hull/chassis, wheels, tires, tubes, brakes, scondary power (batteries, generators, etc.), hydraulics, etc., which are an integral part of the carriage itself and not directly a part of other level 3 elements.

40.2.2.4 Fire control equipment. The fire control equipment element refers to equipment for controlling the direction, volume, and time of fire or release of munitions through the use of electrical, electronic, optical, or mechanical system; devices; or aids. For rifles and small arms, this element includes sighting devices and trigger mechanisms. For artillery, naval guns, and heavy mortars, it additionally includes aiming mechanisms in traverseand elevation, radar and other sensors, computers, and other equipment for performing fire control computations. For air-dropped munitions, this element includes gunsights, intervalometers, and other sensor and computational devices for controlling the release of the munition. For torpedoes, it includes sonar and other sensors, computers, control consoles, and devices for presetting torpedo speed and direction.

40.2.2.5 Ready magazine. The ready magazine element refers to a structure or compartment for storing ammunition or exposives in a ready-for-use condition or position. This element includes; for example, part of a gun or firearm which holds the ammunition ready for chambering and feed mechanisms for placing the ammunition in a position ready for chambering.

40.2.2.6 Adaptor kits. The adaptor kits element refers to engineering and hardware for adapting the launch system to particular applications. This element includes; for example, vehicle adaptor kits, kits for adaption to different aircraft models, kits for backpacking, etc.

40.2.3 Training. The training element refers to training services, devices, accessories, aids, equipment, and parts used to facilitate instruction through which personnel will acquire sufficient concepts, skills, and aptitudes to operate and maintain the system with maximum efficiency. This element includes all effort associated with the design, development, and production of training equipment as well as the execution of training services.

40.2.3.1 Equipment. The equipment element refers to those distinctive end items of training equipment, assigned by either a contractor or military service to meet specific training objectives. This element includes; for example, operational trainers (i.e., simulators), maintenance trainers (i.e., MTUs) and other items such as cutaways, mockups, and models.

40.2.3.2 Services. The services element refers to services, devices, accessories, and aids necessary to accomplish the objectives of training. This element includes; for example, training plans, training aids, training course materials, contractor-conducted training including in-plant and service training, etc.

40.2.3.3 Facilities. The facilities element refers to that special construction necessary to accomplish the objectives of training. (Primarily, the brick-and-mortar-type facility constructed solely for the training mission.) The equipment used for the purpose of acquainting the trainee with the system or establishing trainee proficiency is excluded.

40.2.4 Peculiar support equipment. The peculiar support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which have application peculiar to a given defense materiel item. This element includes; for example, vehicles, equipment, tools, etc., used to fuel, service, transport, hoist, repair, overhaul, assemble, disassemble, test, inspect, or otherwise maintain the mission equipment. It includes all effort associated with the design, development, and production of peculiar support equipment.

40.2.4.1 Organizational/intermediate. The organizational/intermediate element refers to the peculiar support equipment required to perform organizational and intermediate (field)maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by equipment subsystem (i.e.,

propulsion, warhead, safety/arm, etc) or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc), and launch equipment (carriage, fire control, etc).

40.2.4.2 Depot. The depot element refers to the peculiar support equipment required to support only depot maintenance.

40.2.5 Systems test and evaluation. The systems test and evaluation element refers to the use of prototype, production, or specially fabricated hardware to obtain or validate engineering data on the performance of the ordnance system. This element includes the detailed planning, conduct, support, data reduction, and reports from such testing, and all hardware items which are consumed, or planned to be consumed, in the conduct of such testing. It also includes all effort associated with the design and production of models, specimens, fixtures, and instrumentation in support of the test program. Test articles which are complete units (i.e., functionally configured as required by the mission equipment) are excluded. Development, component acceptance, etc., testing which can be specifically associated with the hardware element, unless these tests are of special contractual or engineering significance, (e.g., associate contractor) are also excluded.

40.2.5.1 Development test and evaluation. The development test and evaluation (DT&E) element refers to that test and evaluation conducted to; (a) demonstrate that the engineering design and development process is complete; (b) demonstrate that the design risks have been minimized; (c) demonstrate that the system will meet specifications; (d) estimate the system's military utility when introduced; (e) determine whether the engineering design is supportable (practical, maintainable, safe, etc.), for operational use and (f) provide test data with which to examine and evaluate tradeoffs against specification requirements, life cycle cost, and schedule. DT&E is planned, conducted and monitored, by the developing agency of the DOD component. This element includes; for example, integration, ground tests, flight tests, etc.

40.2.5.2 Operational test and evaluation. The operational test and evaluation element refers to that test and evaluation conducted by agencies other than the developing command to assess the prospective system's military utility, operational effectiveness, operational suitability, logistics supportability (including compatibility, interoperability, reliability, maintainability, logistic requirements, etc.), cost of ownership, and need for any modifications. Initial operational test and evaluation (IOT&E) conducted during the development of a weapon system

will be included in this element. This element includes; for example, integrated system tests, flight tests, sea trials, and other tests as required to prove the operational capability of the deliverable system. It also includes contractor support (e.g., technical assistance, maintenance, labor, material, etc) consumed during this phase of testing.

40.2.5.3 Mockups. The mockups element refers to the design engineering and production of system or subsystem mockups which have special contractual or engineering significance, or which are not required solely for the conduct of one of the above elements of testing.

40.2.5.4 Test and evaluation support. The test and evaluation support element refers to all support elements necessary to operate and maintain systems and subsystems during testing and evaluation which are not consumed during a particular element of testing. This element includes; for example, instrumentation, reparable spares, repair of reparables, test and support equipment, contractor technical support, chase aircraft, test bed vehicles, etc., not allocable to preceding test and evaluation elements. Operator and maintenance personnel, consumables, special fixtures, special instrumentation, etc., which are utilized and/or consumed in a single element of testing, and which should; therefore, be included under that element of testing, are excluded.

40.2.5.5 Test facilities. The test facilities element refers to those special test facilities required for performance of the various developmental tests necessary to prove the design and reliability of the system or subsystem. This element includes; for example, engine test fixtures, white rooms, test chambers, etc. The brick-and-mortar-type facilities allocable to industrial facilities are excluded.

40.2.6 System/project management. The system/project management element refers to the systems engineering and technical control as well as the business management of particular systems/projects. This element encompasses the planning, directing, and controlling the definition, development, and production of a system/project including the functions of logistics and logistics support, maintenance support, facilities, personnel and training, testing, and activation of a system. System/project management effort that can be associated specifically with the hardware element is excluded, unless this management effort is of special contractual or engineering significance (e. g., associate contractor).

40.2.6.1 System engineering. The system engineering element refers to the technical and management efforts of directing and controlling a totally integrated engineering effort of a system program. This element encompasses the system engineering effort to define the system and the integrated planning and control of the technical program efforts of design engineering, logistics engineering, specialty engineering, production engineering, and integrated test planning. This element includes but is not limited to: the system engineering effort to transform an operational need or statement of deficiency into a description of system requirements and a preferred system configuration; the logistics engineering effort to define, optimize and integrate the logistics support considerations in the mainstream engineering effort to insure the development and production of a supportable and cost effective weapon system; and the technical planning and control effort for planning, monitoring, measuring, evaluating, directing and replanning the management of the technical program. It excludes the actual design engineering, and production engineering directly related to the products or services of a deliverable end item. Examples of system engineering efforts include:

a. System definition, overall system design, design integrity analysis, system optimization, system/cost effectiveness analysis, and intrasystem and intersystem compatibility assurance, etc.; the integration and balancing of reliability, maintainability, producibility, safety, and survivability; human factors, personnel and training program requirements, security requirements, configuration identification and control, quality assurance program, value engineering, preparation of equipment and component performance specifications, design of test and demonstration plans;

b. Support synthesis, design impact projections, life cycle cost factors, time factors, tradeoff analysis, logistics design appraisal, use studies, support function requirements identification, repair level determination, task analysis, standardization review, logistics requirements identification, logistics support verification, and the preparation and updating of the logistics support plan, the maintenance plan, facilities planning (operational and maintenance), the transportation and handling plan, etc., and;

c. Preparation of the Systems Engineering Management Plan (SEMP), specification tree, program risk analysis, system test planning, decision control process, technical performance measurement technical reviews, subcontractor/ vendor reviews, work authorization, technical documentation control, etc.

40.2.6.2 Project management. The project management element refers to the business and administrative planning, organizing, directing, coordinating, controlling, and approval action designated to accomplish overall project objectives which are not associated with specific hardware elements and are not included in system engineering. Examples of these activities are logistics management, cost/schedule/performance management, contract management, data management, vendor liaison, contract WBS, etc.

40.2.7 Data. The data element refers to all deliverable data required to be listed on a DD Form 1423. The data requirements will be selected from the TD-3. This element includes only such effort that can be reduced or will not be incurred if the data item is eliminated. If the data are government peculiar, include the efforts for acquiring, writing, assembling, reproduction, packaging and shipping. It also includes the effort for repreparing into government format with reproduction and shipment if data are identical to that used by the contractor, but in a different format.

40.2.7.1 Technical publications. The technical publications element refers to those formal technical orders/manuals developed, as well as commercial, advance, real property installed equipment, and miscellaneous manuals for the installation, operation, maintenance, overhaul, training and reference of hardware, hardware systems, and computer programs; and contractor instructional materials, inspection documentation, and historical type records that may accompany individual items of equipment. This element includes the data item descriptions set forth in functional category M of TD-3.

40.2.7.2 Engineering data. The engineering data element refers to those engineering drawings, associated lists, specifications, and other documentation required by the government in accordance with functional categories E, H, R, S, and T of TD-3. This element includes, for example, all plans, procedures, reports, and documentation pertaining to systems, subsystems, computer programs, component engineering, testing, human factors, analysis, etc.

40.2.7.3 Management data. The management data element refers to those data items necessary for configuration management, cost, schedule, contractual data management, programs management, etc., required by the government in accordance with functional categories A, F, and P of TD-3. This element includes, for example, contractor cost reports, cost performance reports, contractor fund status reports, and schedule, milestone, networks, integrated support plans, etc.

40.2.7.4 Support data. The support data element refers to those data items designed to document the logistics support planning and provisioning process in accordance with functional categories L and V of TD-3. This element includes; for example, supply and general maintenance plans and reports, transportation, handling, packaging information, etc.; and data to support the provisioning process.

40.2.7.5 Data depository. The data depository element refers to a facility designated to act as custodian in establishing and maintaining a master engineering specification and drawing depository service for government-approved documents that are the property of the U.S. Government. As custodian for the government, the contractor is authorized by approved change orders to maintain these master documents at the latest approved revision level. When documentation is called for on a given item of data retained in the depository, the charges (if charged direct) will be to the appropriate data element. This element represents a distinct entity of its own and includes all effort of drafting,clerical, filing, etc., required to provide the service outlined above. All similar efforts for the contractor's internal specification/ drawing control system, in support of his engineering/production activities, are excluded.

40.2.8 Operational/site activation. The operational/site activation element refers to the real estate, construction, conversion, utilities, and equipment to provide all facilities required to house, service, and launch prime mission equipment at the organizational and intermediate level. This element includes conversion of site, ship, vehicle; system assembly, checkout, and installation into site facility or ship to achieve operational status. It also includes contractor support in relation to operational/ site activation.

40.2.8.1 Contractor technical support. The contractor technical support element refers to all materials and services provided by the contractor related to activation. This element includes; for example, standby services, final turnover, repair or reparables, etc.

40.2.8.2 Site construction. The site construction element refers to the real estate, site preparation, construction, and other special-purpose facilities necessary to achieve system operational status. This element also includes the construction of utilities, roads, and interconnecting cabling.

40.2.8.3 Site/ship/vehicle conversion. The site/ship/vehicle conversion element refers to the conversion of existing site/ship/vehicle to accommodate the mission equipment and selected support equipment. This element includes operating, support and other special-purpose facilities necessary to achieve system operational status. It also includes all material and services to provide for their conversion, as well as; for example, utilities, roads, etc.

40.2.8.4 System assembly, installation, and checkout on site. The system assembly, installation, and checkout on site element refers to all materials and services involved in the assembly of mission equipment at the site. This element includes; for example, installation of mission and support equipment in the launch, operations, or support facilities; and complete system checkout or shakedown to insure achievement of operational status.

40.2.9 Common support equipment. The common support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which are presently in the DOD inventory for support of other systems. This element includes all effort required to assure the availability of this equipment for support of the particular defense materiel item. It also includes the acquisition of additional quantities of these equipments if caused by the introduction of the defense materiel item into operational service.

40.2.9.1 Organizational/intermediate. The organizational/intermediate element refers to the common support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance; however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by subsystem (i. e., launcher, fire control, guidance and control, etc.) or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.).

40.2.9.2 Depot. The depot element refers to the common support equipment required to support only depot maintenance.

40.2.10 Industrial facilities. The industrial facilities element refers to the construction, conversion, or expansion of facilities for production, inventory, and contractor depot maintenance required by one or more suppliers for the specific system. This element includes; for example, equipment acquisition, or modernization, where applicable, and maintenance, and other related activities.

40.2.10.1 Construction/conversion/expansion. The construction/conversion/expansion element refers to the real estate, and preparation of system peculiar facilities for production, inventory, depot maintenance, and other related activities.

40.2.10.2 Equipment acquisition or modernization. The equipment acquisition or modernization element refers to production equipment acquisition, modernization, or transferal of equipment for the particular system. (Pertains primarily to government owned and leased equipment under facilities contract.)

40.2.10.3 Maintenance (industrial facilities). The maintenance (industrial facilities) element refers to the maintenance, preservation, and repair of industrial facilities and equipment.

40.2.11 Initial spares and initial repair parts. The initial spares and initial repair parts element refers to spare components or assemblies used for replacement purposes in major end items of equipment.

APPENDIX E

SUMMARY WORK BREAKDOWN STRUCTURE AND DEFINTIONS SHIP SYSTEM

10. SCOPE

10.1 This appendix covers the summary work breakdown structure and definitions for a ship system.

20. REFERENCED DOCUMENTS

20.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

PUBLICATION

TD-3 Department of Defense Authorized Data List, Index of Data Item Description

(Application for copies should be addressed to Naval Publications & Printing Service, Eastern Division, 700 Robbins Avenue, Philadelphia, Pa 19111).

30. SUMMARY WORK BREAKDOWN STRUCTURE

30.1 Levels. The following is a summary work breakdown structure for a ship system:

Level 1	Level 2 (see 5.2.1.1)	Level 3 (see 5.2.1.1)
Ship System	Ship	Hull Structure Propulsion Plant Electric Plant Communications and Control Auxiliary Systems Outfit and Furnishings Armament Integration/Engineering Ship Assembly
	Training	Equipment Services Facilities

Level 1	Level 2 (see 5.2.1.1)	Level 3 (see 5.2.1.1)
	Peculiar Support Equipment	Intermediate Depot
	Systems Test and Evaluation	Development Test and Evaluation Operational Test and Evaluation Mockups Test and Evaluation Support Test Facilities
	System/Project Management	Systems Engineering Project Management
	Data	Technical Publications Engineering Data Management Data Support Data Data Depository
	Ship Conversion	(To be specified)
	Common Support Equipment	Intermediate Depot
	Industrial Facilities	Construction/Conversion/Expansion Equipment Acquisition or Modernization Maintenance
	Initial Spares and Initial Repair Parts	(Specify by allowance list, grouping, or hardware element)

40. DEFINTIIONS

40.1 Ship category. Ship category is defined as those ship systems which produce the capability to operate or support the operation of naval weapons, or to perform other naval tasks on and under the surface of the water.

40.2 Ship system. The ship system element refers to the complex of ships, equipment, data services, and facilities required to develop and produce the capability of operating or supporting the operation of naval weapons, or performing other naval tasks at sea.

40.2.1 Ship. The ship element refers to the waterborne vehicle of a ship system. It includes all types of surface and subsurface water vehicles such as combatants, auxiliaries, amphibious, and special-purpose ships. This element includes all material and effort associated with the design, development, production, testing, and delivery of complete ships (prototype and operationally configured ships which satisfy the requirements of their applicable specification(s), regardless of their end use). It also includes spares, repair parts, and support equipment carried onboard the ship.

40.2.1.1 Hull structure. The hull structure element refers to the assembled main hull body with all structural subdivisions. This element includes; for example, shell plating. longitudinal and transverse framing, platforms and decks, superstructure, foundations, structural bulkheads, enclosures and sponsors; castings, forgings and weldments; fixed ballast; doors and closures; kingposts, masts, and service platforms; and sonar domes. It also includes compartment testing.

40.2.1.2 Propulsion plant. The propulsion plant element refers to those major components installed primarily for propulsion and the systems necessary to make these components operable. This element includes; for example, boilers and energy converters, propulsion units, main condensers and air ejectors, shafting, bearings, and propellers, combustion air supply system, uptakes, propulsion control equipment, main stream, feedwater and condensate, circulating and cooling water, fuel oil service and lubricating oil systems, and onboard spares, repair parts, and tools. It also includes nuclear steam generators, reactors, reactor coolant and auxiliary systems, nuclear power plant control, and radiation shielding. (Hardware testing and checkout is included with the specific element involved.)

40.2.1.3 Electric plant. The electric plant element refers to the power generating and distributing system installed primarily for ship service and emergency power and lighting. This element includes; for example, the electric power generation, power distribution switchboards, power distribution system, lighting system, and onboard spares, repair parts, and tools. (Hardware testing and checkout is included with the related element.)

40.2.1.4 Communication and control. The communication and control element refers to all equipments and associated systems installed to receive information from off-ship sources, to transmit to off-ship receivers, and to distribute information throughout the ship. It also includes sensing and data systems required for navigation and weapon fire control. This element includes; for example, navigation equipment, interior communication systems and equipment, gun fire control system, non-electronic countermeasure systems, electronic countermeasure systems (ECM); missile fire control systems, ASW fire control and torpedo fire control systems; radar systems, radio communication systems, electronic navigation systems, space vehicle electronic tracking systems, sonar systems, electronic tactical data systems; onboard spares, repair parts and tools, and related testing and checkout.

40.2.1.5 Auxiliary systems. The auxiliary systems element refers to those systems required for ship control, safety, provisioning, and habitability. It includes the auxiliary machinery and piping systems; the hull mechanical handling systems; and ship control surfaces such as rudders, hydrofoils, and driving planes. This element includes; for example, heating, ventilation air-conditioning systems; refrigerating spaces; plant and equipment; gasoline, JP-5, all liquid cargo piping, oxygen-nitrogen and aviation lubricating oil systems; plumbing installations, salt-water service systems, fire extinguishing systems, drainage, ballast, trimming, heating and stabilizer tank systems; fresh water system, scuppers and deck drains; fuel and diesel oil filling, venting, stowage and transfer systems; tank heating systems, compressed air system, auxiliary steam, exhaust steam and steam drains, buoyancy control system, distilling plant; and steering systems, mooring, towing, anchor and aircraft handling systems, deck machinery, elevators, moving stairways, stores strikedown and stores handling equipment, operating gear for retracting and elevating units, aircraft elevators; aircraft arresting gear, barriers, and barricades; catapults and jet blast deflectors, replenishment at sea and cargo handling systems; onboard spares, repair parts, and tools; and related testing and checkout.

40.2.1.6 Outfit and furnishings. The outfit and furnishings element refers to those outfit equipments and furnishings required for habitability and operability which are not specifically included in other ship elements. This element includes; for example, hull fittings; boats, boat stowage and handling; rigging and canvas; ladders and gratings; nonstructural bulkheads and doors; painting, deck covering, hull insulation; storerooms, stowages and lockers; equipment for utility spaces, workships, laboratories, test areas, galley, pantry, scullery and commissary outfit; furnishings for living spaces, offices, control centers, machinery spaces, medical, dental and pharmaceutical spaces; nonpropulsion space shielding; onboard spares, repair parts and tools; and related testing and checkout.

40.2.1.7 Armament. The armament element refers to the complex of armament and related ammunition handling, stowage, and support facilities; and cargo munition handling, stowage, and support facilities. This element includes; for example, guns and gun mounts; ammunition handling systems and stowage; special weapons handling and storage; rocket and missile launching devices, handling systems, and stowage; torpedo tubes handling and stowage; small arms and pyrotechnic stowage, air launched weapons handling systems and stowage; cargo munition handling and stowage; onboard spares, repair parts, and tools; and related testing and checkout.

40.2.1.8 Integration/engineering. The integration/engineering element refers to that engineering effort and related material associated with the design, development, and rework to provide the ship as a whole exclusive of that included under the systems/project management element. This element includes; for example, construction drawings, engineering calculations, weighing and weight calculations, photographs, models, and shipbuilders information drawings.

40.2.1.9 Ship assembly. The ship assembly element refers to those efforts and material associated with the construction and test of the ship as a whole and which cannot be logically and practicably identified with, or related to, other level 3 elements. This element includes; for example, staging, scaffolding and cribbing; temporary utilities and services; molds, templates, jigs, fixtures, and special production tools, drydocking, inspection, insurance launching, trials, and delivery.

40.2.2 Training. The training element refers to the training services, devices, accessories, aids, equipment, and parts used to facilitate instruction through which personnel will acquire sufficient concepts, skills, and aptitudes to operate and maintain the system with maximum efficiency. Training includes all effort associated with the design, development, and production of training equipment as well as the execution of training services.

40.2.2.1 Equipment. The equipment element refers to those distinctive end items of training equipment, assigned by either a contractor or military service to meet specific training objectives. This element includes; for example, operational trainers (i.e., simulators), maintenance trainers (i.e., MTU s) and other items such as cutaways, mockups, and models.

40.2.2.2 Services. The services elment refers to services, devices, accessories, and aids necessary to accomplish the objectives of training. This element includes; for example, training plans, training aids, training course materials, contractor-conducted training including inplant and service training, etc.

40.2.2.3 Facilities. The facilities element refers to that special construction necessary to accomplish the objectives of training. (Primarily, the brick-and-mortar-type facility constructed solely for the training mission.) The equipment used for the purpose of acquainting the trainee with the system or establishing trainee proficiency is excluded.

40.2.3 Peculiar support equipment. The peculiar support equipment element refers to the tender and shore-based equipment, including tools, required to maintain and care for the system or portion of the system while not directly engaged in the performance of its mission and which have application peculiar to a given defense materiel item. This element includes; for example, vehicles, equipment, and tools used to refuel, service, transport and hoist, repair, overhaul, assemble, disassemble, test, inspect, or otherwise maintain the mission equipment. It includes all effort associated with the design, development, and production of peculiar support equipment.

40.2.3.1 Intermediate. The intermediate element refers to the peculiar support equipment required to perform field maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at intermediate levels of maintenance or maintenance performed by a tender or naval ship repair facility. Further breakdown may be by subsystem (i.e., hull structure, propulsion, etc) or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.).

40.2.3.2 Depot. The depot element refers to the peculiar support equipment required to support only depot maintenance or maintenance performed at a shipyard.

40.2.4 Systems test and evaluation. The systems test and evaluation element refers to the use of prototype, production, or specially fabricated hardware to obtain or validate engineering data on the performance of the ship system in a development program related to a ship project. This element includes the detailed planning, conduct, support,

data reduction and reports from such operations, and all hardware items which are consumed, or planned to be consumed, in the conduct of such operations. It also includes all effort associated with the design and production of models, specimens, fixtures, and instrumentation in support of the test program. Test articles which are complete units (i.e., functionally configured as required by the mission equipment) are excluded. Development, component and acceptance testing, etc, which can be specifically associated with the hardware element, unless these tests are of special contractual or engineering significance (e.g. associate contractor), are also excluded.

40.2.4.1 Development test and evaluation. The development test and evaluation (DT&E) element refers to that test and evaluation conducted to: (a) demonstrate that the engineering design and development process is complete; (b) demonstrate that the design risks have been minimized; (c) demonstrate that the system will meet specifications; (d) estimate the system's military utility when introduced; (e) determining whether the engineering design is supportable (practical, maintainable, safe, etc.), for operational use; and (f) providing test data with which to examine and evaluate tradeoffs against specification requirements, life cycle cost, and schedule. DT&E is planned, conducted and monitored, by the developing agency of the DOD component. This element includes; for example, model basin, hydrostatic, fatigue, shock, integration, and special sea tests or trials.

40.2.4.2 Operational test and evaluation. The operational test and evaluation element refers to that test and evaluation conducted by agencies other than the developing command to assess the prospective system's military utility, operational effectiveness, operational suitability, logistics supportability (including compatibility, interoperability, reliability, maintainability, logistic requirements, etc.), cost of ownership, and need for any modifications. Initial operational test and evaluation (IOT&E) conducted during the development of a weapon system will be included in this element. It encompasses such tests as sea trials and other tests as required to prove the operational capability of the deliverable system. It also includes contractor support (e.g., technical assistance, maintenance, labor material, etc.) consumed during this phase of testing.

40.2.3.4.3 Mockups. The mockups element refers to the design engineering and production of system or subsystem mockups which have special contractual or engineering significance, or which are not required solely for the conduct of one of the above elements of testing.

40.2.4.4 Test and evaluation support. The test and evaluation support element refers to all support elements necessary to operate and maintain systems and subsystems during flight test and evaluation which are not consumed during the flight-testing phase and other support requirements that are not allotable to a specific phase of testing. This element includes; for example, reparable spares, repair of reparable spares, repair parts, warehousing and distribution of spares and repair parts, contractor technical support, etc., not allocable to preceding tests and evaluation elements. Operational amd maintenance personnel, consumables, special fixtures, special instrumentation, etc., which are utilized and/or consumed in a single element of testing and which should; therefore, be included under that element of testing,are excluded.

40.2.4.5 Test facilties. The test facilities element refers to those special test facilities required for performance of the various developmental tests necessary to prove the design and reliability of the system or subsystem. This element includes; for example, test tank test fixtures, white rooms, test chambers, etc. The brick-and-mortar-type facilities allocable to industrial facilities are excluded.

40.2.5 System/project management. The system/project management element refers to the systems engineering and technical control as well as the business management of particular systems/projects. This element encompasses the planning, directing, and controlling the definition, development, and production of a system/project including the functions of logistics and logistics support, maintenance support, facilities, personnel and training, testing, and activation of a system. System/project management effort that can be associated specifically with the hardware element is excluded, unless this management effort is of special contractual or engineering significance (e.g. associate contractor).

40.2.5.1 System engineering. The system, engineering element refers to the technical and management efforts of directing and controlling a totally integrated engineering effort of a system program. This element encompasses the system engineering effort to define the system and the integrated planning and control of the technical program efforts of design engineering, logistics engineering, specialty engineering, production engineering, and integrated test planning. This element includes but is not limited to: the system engineering effort to transform an operational need or statement of deficiency into a description of system requirements and a preferred system configuration; the logistics engineering effort to define, optimize and integrate the logistics support considerations into the mainstream

engineering effort to insure the development and production of a supportable and cost effective weapon system; and the technical planning and control effort for planning, monitoring, measuring, evaluating, directing and replanning the management of the technical program. It excludes the actual design engineering, and production engineering directly related to the products or services of a deliverable end item. Examples of system engineering efforts include:

a. System definition, overall system design, design integrity analysis, system optimization, system/cost effectiveness analysis, and intrasystem and intersystem compatibility assurance, etc. the integration and balancing of reliability, maintainability, producibility, safety, and survivability; human factors, personnel and training program requirements, security requirements, configuration identification and control, quality assurance program, value engineering, preparation of equipment and component performance specifications, design of test and demonstration plans;

b. Support synthesis, design impact projections, life cycle cost factors, time factors, tradeoff analysis, logistics design appraisal, use studies, support function requirements identification, repair level determination, task analysis, standardization review, logistics requirements identification, logistics support verification, and the preparation and updating of the logistics support plan, the maintenance plan, facilities planning (operational and maintenance), the transportation and handling plan, etc., and;

c. Preparation of the Systems Engineering Management Plan (SEMP), specification tree, program risk analysis, system test planning, decision control process, technical performance measurement, technical reviews, subcontractor/vendor reviews, work authorization, technical documentation control, etc.

40.2.5.2 Project management. The project management element refers to the business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designated to accomplish overall project objectives which are not associated with specific hardware elements and are not included in system engineering. Examples of these activities are logistics management, cost/schedule/performance management, contract management, data management, vendor liaison, contract WBS, etc.

40.2.6 Data. The data element refers to all deliverable data required to be listed on a DD Form 1423. The data requirements will be selected from TD-3. This element includes only such effort that can be reduced or will not be incurred if the data item is eliminated. If the data are government peculiar, include the efforts for acquiring, writing, assembling, reproduction, packaging and shipping. It also includes the effort for repreparing into government format with reproduction and shipment if data are identical to that used by the contractor, but in a different format.

40.2.6.1 Technical publications. The technical publications element refers to those formal technical orders/manuals developed, as well as commercial, advance, real property installed equipment, and miscellaneous manuals for the installation, operation, maintenance, overhaul, training and reference of hardware, hardware systems, and computer programs; and contractor' instructional materials, inspection documentation, and historical type records that may accompany individual items of equipment. This element includes the data item descriptions set forth in functional category M of the TD-3.

40.2.6.2 Engineering data. The engineering data element refers to those engineering drawings, associated lists, specifications, and other documentation required by the government in accordance with functional categories E, H, R, S, and T of TD-3. This element includes; for example, all plans, procedures, reports, and documentation pertaining to systems, subsystems, computer programs, component engineering, testing, human factors, analysis, etc.

40.2.6.3 Management data. The management data element refers to those data items necessary for configuration management, cost, schedule, contractual data management, programs management, etc., required by the government in accordance with functional categories A, F, and P of TD-3. This element includes; for example, contractor cost reports, cost performance reports, contractor fund status reports, and schedule, milestone, networks, integrated support plans, etc.

40.2.6.4 Support data. The support data element refers to those data items designed to document the logistics support planning and provisioning process in accordance with functional categories L and v of TD-3. This element includes; for example, supply and general maintenance plans and reports, transportation, handling, packaging information, etc.; and data to support the provisioning process.

40.2.6.5 Data depository. The data depository element refers to a facility designated to act as custodian in establishing and maintaining a master engineering specification and drawing depository service for government-approved documents that are the property of the U. S. Government. As custodian for the government, the contractor is authorized by approved change orders to maintain these master documents at the latest approved revision level. When documentation is called for on a given item of data retained in the depository, the charges (if charged direct) will be to the appropriate data element. This element represents a distinct entity of its own and includes all efforts of drafting, clerical, filing, etc., required to provide the service outlined above. All similar effort for the contractor's internal specification/drawing control system, in support of his engineering/production activities, is excluded.

40.2.7 Ship conversion. The ship conversion element refers to all material and effort required to provide for the conversion of existing ships to perform different missions or to have different characteristics. This element includes those ship elements in level 3 which are applicable.

40.2.8 Common support equipment. The common support equipment element refers to the tender and shore-based equipment, including tools, required to maintain and care for the system or portions of the system while not directly engaged in the performance of its mission, and which are presently in the DOD inventory for support of other systems. This element includes all effort required to assure the availability of this equipment for support of the particular defense materiel item. It also includes the acquisition of additional quantities of these equipments if caused by the introduction of the defense materiel item into operational service.

40.2.8.1 Intermediate. The intermediate element refers to the common support equipment required to perform field maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at the intermediate level of maintenance, or maintenance performed by a tender or naval ship repair facility. Further breakdown may be by subsystem (i.e., hull structure, propulsion, etc.) or maintenance funtion (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.).

40.2.8.2 Depot. The depot element refers to the common support equipment required to support only depot maintenance or maintenance performed at a shipyard.

40.2.9 Industrial facilities. The industrial facilities element refers to the construction, conversion, or expansion of facilities for production, inventory, and contractor depot maintenance required by one or more suppliers for the specific system. This element includes; for example, equipment acquisition, or modernization, where applicable, and maintenance, of the above facilities or equipment.

40.2.9.1 Construction/conversion/expansion. The construction/conversion/expansion element refers to the real estate, and preparation of system peculiar facilities for production, inventory, depot maintenance, and other related activities.

40.2.9.2 Equipment acquisition or modernization. The equipment acquisition or modernization element refers to production equipment acquisition, modernization, or transferal of equipment for the particular system. (Pertains primarily to government owned and leased equipment under facilities contract.)

40.2.9.3 Maintenance (industrial facilities). The maintenance (industrial facilities) element refers to the maintenance, preservation, and repair of industrial facilities and equipment.

40.2.10 Initial spares and initial repair parts. The initial spares and initial repair parts element refers to spare components or assemblies used for replacement purposes in major end items of equipment. Repair parts are those bits-and-pieces (e.g., individual parts or nonreparable assemblies required for the repair of spares and end items. This element includes the procurement of initial stocks of spares and repair parts not carried onboard ship, but stocked on tenders and ashore.

APPENDIX F

SUMMARY WORK BREAKDOWN STRUCTURE AND DEFINITIONS SPACE SYSTEM

10. SCOPE

10.1 This appendix covers the summary work breakdown structure and definitions for a space system.

20. REFERENCED DOCUMENTS

20.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

PUBLICATION

TD-3 Department of Defense Authorized Data List, Index of Data Item Description

(Application for copies should be addressed to Naval Publications & Printing Service, Eastern Division, 700 Robbins Avenue, Philadelphia, Pa 19111).

30. SUMMARY WORK BREAKDOWN STRUCTURE

30.1 Levels. The following is a summary work breakdown structure for a space system:

Level 1	Level 2 (See 5.2.1.1)	Level 3 (see 5.2.1.1)
Space System		
	Launch Vehicle	Integration and Assembly
		Stage I
		Stage II
		Stage III
		Stage IV
		Strap on Units
		Guidance and Control

Level 1	Level 2 (see 5.2.1.1)	Level 3(see 5.2.1.1)
	Stage Vehicle	
		Integration and Assembly
		Propulsion
		Guidance and Control
	Space Vehicle	
		Integration and Assembly
		Spacecraft
		Re-Entry Vehicle
		Payload
		Orbit Injection/Dispenser
		Propulsion Module
		Payload Shroud
	Ground Communications, Command and Contol Equipment (Peculiar)	Surveillance, Identification, and Tracking Sensors
		Command and Control
		Communications
		Data Processing Equipment
		Launch Equipment
		Auxiliary Equipment
	Training	
		Equipment
		Services
		Facilities
	Peculiar Support Equipment	Organizational/Intermediate (Including Equipment Common to Depot)
		Depot (Only)
	Systems Test and Evaluation	Development Test and Evaluation
		Operational Test and Evaluation
		Mockups
		Test and Evaluation Support
		Test Facilities

Level 1	Level 2 (see 5.2.1.1)	Level 3 (see 5.2.1.1)
	System/Project Management	
		Systems Engineering
		Project Management
	Data	
		Technical Publications
		Engineering Data
		Management Data
		Support Data
		Data Depository
	Operational/Site Activation	
		Contractor Technical Support
		Site Conversion
		System Assembly, Installation, and Checkout on Site
	Flight Support Operations and Services	
		Launch Operations and Services
		Flight Operations and Services
		Recovery Operations and Services
	Common Support Equipment	
		Organizational/Intermediate (Including Equipment Common to Depot)
		Depot (Only)
	Industrial Facilities	
		Construction/Conversion/Expansion
		Equipment Acquisition or Modernization
		Maintenance
	Initial Spares and Initial Repair Parts	
		(Specify by allowance list, grouping, or hardware element)

40. DEFINITIONS

40.1 Space category. Space category is defined as those systems related to the placement, operation, and recovery of systems in space and includes both manned and unmanned systems.

40.2 Space system. The space system element refers to the complex of hardware, data services, and facilities required to develop and produce the capability for the placement, operation, and recovery of manned and unmanned vehicles in space. This element includes launch/stage vehicles, space vehicles, support equipments, and other elements necessary to provide an operational space system. (Represented by Titan III, Program 369-SATCOM, START, AGENA, and MOL.)

40.2.1 Launch vehicle. The launch vehicle element refers to the prime means for providing initial thrust on placing a space vehicle into its operational evnironment. The launch vehicle is the prime propulsion portion of the complete flyaway, for launch purposes (no payload). This element includes; for example, the structure, propulsion, guidance and control, and all other installed equipment integral to the launch vehicle as an entity within itself. It also includes the design, development, and production of complete units (prototype or operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use).

40.2.1.1 Integration and assembly. The integration and assembly element refers to the integration and assembly of level 3 hardware/computer program elements into a launch vehicle as a whole. It includes all effort outlined in 5.5.1.3 as well as those material items of the launch vehicle furnished by the integrating contractor and/or other sources, to provide interface or mating sections necessary to permit the in-plant integration and assembly of the level 3 items into the launch vehicle within a contractor's facility. This element includes; for example, structure/airframe as appropriate, control surfaces, adapters, power supply; umbilical raceways, covers, cables and connectors; case liner, and other installed equipment integral to the integration and assembly of the remaining level 3 elements to provide the launch vehicle. All effort directly related to the other level 3 elements of the launch vehicle equipment is excluded.

40.2.1.2 Stage I. The stage I element refers to the initial launch vehicle stage which provides the lift-off propulsive thrust for the complete flyaway for placing a space vehicle into its operational environment. This element includes; for example, the structure, propulsion, controls, instrumentation, interfaces, separation subsystems, and all other installed equipment integral to the stage as an entity within itself. It also includes the design, development, production, and assembly of complete units. All efforts directly related to the remaining level 3 elements and the integration and assembly of this element into a launch vehicle is excluded.

40.2.1.3 Stage II. The stage II element refers to the second launch vehicle stage which provides continuing boost propulsive thrust, following separation of the first stage, for placing a space vehicle into its operational environment. This element includes; for example, the structure, propulsion, controls, instrumentation, interfaces, separation subsystems, and all other installed equipment integral to the stage as an entity within itself. It also includes the design, development, production, and assembly of complete units. All effort directly related to the remaining level 3 elements and the integration and assembly of this element into a launch vehicle is excluded.

40.2.1.4 Stage III. The stage III element refers to the third launch vehicle stage which provides continuing boost propulsive thrust, following separation of the second stage, for placing a space vehicle into its operational environment. This element includes; for example, the structure, propulsion, controls, instrumentation, interfaces, separation subsystems, and all other installed equipment integral to the stage as an entity within itself. It also includes the design, development, production, and assembly of complete units. All effort directly related to the remaining level 3 elements and the integration and assembly of this element into a launch vehicle is excluded.

40.2.1.5 Stage IV. The stage IV element refers to the fourth launch vehicle stage which provides continuing boost propulsive thrust, following separation of the third stage, for placing a space vehicle into its operational environment. This element includes; for example, the structure, propulsion, controls, instrumentation, interfaces, separation subsystems, and all other installed equipment integral to the stage as an entity within itself. It also includes the design, development, production, and assembly of complete units. All effort directly related to the remaining level 3 elements and the integration and assembly of this element into a launch vehicle is excluded.

40.2.1.6 Strap-on unit. The strap-on unit element refers to the solid or liquid propulsion assemblies that provide additional thrust to assist the main propulsion thrust during initial launch of the aerospace vehicle. This element includes; for example, case, propellant/fuel nozzle, ignition, mounting structure, etc. It also includes the design, development, production and assembly of complete units. All effort directly related to the remaining level 3 elements and the integration and assembly of this element into a launch vehicle is excluded.

40.2.1.7 Guidance and control. The guidance and control element refers to the means for generating or receiving guidance intelligence, conditioning the intelligence to produce control signals, and generating appropriate control forces. Controllers may interface with the structure by actuating movable aero surfaces or with the propulsion system to produce control reaction forces or may independently produce reaction forces for control. If design is such that electronics are packaged into a single rack or housing as an assembly, this rack or housing will be considered part of the guidance and control system. This element includes; for example, the guidance intelligence system, computer, sensing elements, etc.

40.2.2 Stage vehicle. The stage vehicle element refers to the next stage of energy-producing means, following launch vehicle separation, for placing the space vehicles in their operational environment. The stage vehicle is the post-launch propulsion portion of the complete flyaway for boost purposes (no payload), and may be of single-stage or multiple-stage configuration. This element includes; for example, the structure, propulsion, guidance and control, and all other installed equipment integral to the stage vehicle as an entity within itself. It also includes the design, development, and production of complete units (prototype or operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use).

40.2.2.1 Integration and assembly. The integration and assembly element refers to the integration and assembly of level 3 hardware and computer program elements into a stage vehicle as a whole. It includes all effort outlined in 5.5.1.3 as well as those material items of the stage vehicle furnished by the integration contractor and/or other sources, to provide interface or mating sections necessary to permit the in-plant integration and assembly of the level 3 items into a stage vehicle within a contractor's facility. This element includes; for example, structure/airframe as appropriate, control surfaces, adapters, power supply, umbilical raceways, covers, cables,and connectors, case liner, and other installed equipment integral to the integration and assembly of the remaining level 3 elements to provide the stage vehicle. All effort directly related to the other level 3 elements of the stage vehicle is excluded.

40.2.2.2 Propulsion. The propulsion element refers to the means for generation of propelling forces for the stage vehicle. It may consist of single-stage or multiple-stage configuration. This element includes; for example, the structure, engine, propellant and fuel, distribution and control of propellant and fuel, starting means, safety devices,and environmental control when grouped as a functional entity.

40.2.2.3 Guidance and control. The guidance and control element refers to the means for generating or receiving guidance intelligence, conditioning the intelligence to produce control signals, and generating appropriate control forces. Controllers may interface with the structure by actuating movable aero surfaces or with the propulsion system to produce control reaction forces or may independently produce reaction forces for control. If design is such that electronics are packaged into a single rack or housing as an assembly, this rack or housing will be considered part of the guidance and control system. This element includes; for example, the guidance intelligence system, computer, sensing elements, autopilot, etc.

40.2.3 Space vehicle. The space vehicle element refers to a complete vehicle or group of vehicles placed in space. It includes the design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification(s) regardless of their end use). This element includes; for example, spacecraft and/or re-entry vehicle (as appropriate), payload, payload shroud, propulsion module, and orbit injection/dispenser.

40.2.3.1 Integration and assembly. The integration and assembly element refers to the integration and assembly of level 3 hardware elements into a space vehicle as a whole. It includes all effort outlined in 5.5.1.3 as well as those material items of the space vehicle furnished by the integrating contractor and/or other sources, to provide interface or mating sections necessary to permit the in-plant integration and assembly of the remaining level 3 items into a space vehicle wihtin a contractor's facility. This element includes; for example, mountings, brackets, fasteners, interconnecting cables, self-destruct system (if appropriate), adapter (if required), and other items homogeneous to the integration and assembly effort. All effort directly related to other level 3 elements of space vehicle equipments is excluded.

40.2.3.2 Spacecraft. The spacecraft element refers to the principal operating space vehicle which serves as a housing or platform for carrying a payload and other mission-oriented equipments into space. This element includes; for example, the structure/spaceframe, electrical power and distribution, attitude controls, command and control, and other equipments homogeneous to the spacecraft. It also includes all design, development, production, and assembly effort to provide the spacecraft as a basic structure for integration of other level 3 hardware elements. All effort directly related to the remaining level 3 elements and the integration and assembly of these elements into a space vehicle is excluded.

40.2.3.3 Re-entry vehicle. The re-entry vehicle element refers to the principal operating space vehicle specifically designed to safely re-enter the atmosphere in order to land a payload (experimental equipment or crew). This element includes; for example, navigation and guidance, power supply, command and control, attitude control, environmental control, propulsion, and other equipments homogeneous to the re-entry vehicle. It also includes all design, development, production, and assembly efforts to provide the re-entry vehicle as a basic structure for integration of other level 3 hardware elements. All effort directly related to the remaining level 3 elements and the integration and assembly of these elements into a space vehicle is excluded.

40.2.3.4 Payload. The payload element refers to that equipment provided for special purposes in addition to the normal equipment integral to the spacecraft or re-entry vehicle. This element includes; for example, experimental equipment placed onboard the vehicle, flight crew equipment (space suits, life support, and safety equipment), communications, displays and instrumentation, telemetry equipment and other equipments that are specifically mission-oriented to collecting data for future planning and projection purposes. It also includes all design, development, and production and assembly effort to provide the payload equipments as discrete entities for integration with other level 3 hardware elements. All effort directly related to the remaining level 3 elements and the integration and assembly of this element with/into a space vehicle is excluded.

40.2.3.5 Orbit injection/dispenser. The orbit injection/dispenser element refers to that equipment which performs the function of placing orbiting objects in the planned orbital path. This element includes; for example, the structure, propulsion, instrumentation and stage interface, separation subsystem, and other equipment necessary to provide the orbit injection/dispenser as an entity within itself for integration with other level 3 elements. It also includes all design, development, and production and assembly effort to provide this entity. All effort directly related to the remaining level 3 elements and the integration and assembly of this element into a space vehicle is excluded.

40.2.3.6 Propulsion module. The propulsion module refers to that equipment which provides in-space propulsive thrust to the spacecraft and/or re-entry vehicle and its payload to meet mission requirements for changes of direction and velocity. This element includes; for example, the structure, propulsion, instrumentation, stage interface, attitude control, separation subsystems, and other equipment homogeneous to the propulsion module. It also includes all design, development, and production and assembly effort to provide this

entity. All effort directly related to the remaining level 3 elements and the integration and assembly of this element into a space vehicle is excluded.

40.2.3.7 Payload shroud. The payload shroud element refers to that equipment constituting a protective enclosure for safeguarding the payload and/or spacecraft during the severe environments of launch and flight through the earth's atmosphere. This element includes; for example, the structure, mounting provisions, access ports, antenna windows, separation and ejection subsystems, and other equipments homogeneous to the shroud. It also includes all design, development, production and assembly effort to provide this entity. All effort directly related to the remaining level 3 elements and the integration and assembly of this element into a space vehicle is excluded.

40.2.4 Ground communications, command and control equipment (peculiar). The ground communications, command and control equipment (peculiar) element refers to those ground-based operating equipments essential to the performance of space vehicles. This element includes communications between control and tracking facilities, and the spacecraft major equipments and computer programs installed in control and tracking facilities such as sensors, special antennae, EDP, displays, personnel accommodations, and special launch platform equipment or modifications. It also includes the design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use).

40.2.4.1 Surveillance, identification and tracking sensors. The surveillance, identification, and tracking sensors element refers to those sensors required to support space systems by maintaining surveillance and providing the data required for targeting, launch, guidance, and homing where such means are not entirely self-contained aboard the space system. Space systems may include tracking of the space vehicle as required for guidance and control or range safety. This element includes; for example, sensors of any spectrum whether radar, optical, infrared, etc.

40.2.4.2 Command and control. The command and control element refers to the means to enable launch decisions to be made and to command launch of the aerospace vehicle. This element includes; for example, supplementary means for guidance of those aerospace vehicles not having completely self-contained guidance and control and means to command destruct. It also includes control and checkout consoles, data displays, and mission records.

40.2.4.3 Communications. The communications element refers to the means for distribution of intelligence within the space system. This element includes intercommunication subsystems of launch sites for tactical and administrative message flow and ties between sensor, data processing, and launch and guidance control subsystems. Communications may interface with existing fixed-communications facilities or communications subsystems of launch platforms which are associated systems to the space system.

40.2.4.4 Data processsing equipment. The data processing equipment element refers to the means to condition data generated at the launch site or aboard the space vehicle, or data received from associated systems so as to accommodate the needs of command and control. This element includes; for example, computer, peripheral equipment, and programs.

40.2.4.5 Launch equipment. The launch equipment element refers to the means to launch the aerospace vehicle from stationary sites. This element may include stowage facilties and checkout stations for readiness verification when these are integral to the launcher. It may also include safety and protective elements when these are not integral to the launch platform or site facilities.

40.2.4.6 Auxiliary equipment. The auxiliary equipment element refers to the general purpose/multi-usage ground equipment utilized to support the various operational capabilities of the command and launch equipments. This element includes; for example, power generators, power distribution systems, environmental control, cabling, malfunction detection, fire prevention, security systems, and other common-usage items not applicable to specific elements of the ground-based equipment.

40.2.5 Training. The training element refers to the training services, devices, accessories, aids, equipment, and parts used to facilitate instruction through which personnel will acquire sufficient concepts, skills, and aptitudes to operate and maintain the system with maximum efficiency. Training includes all effort associated with the design, development, and production of training equipment as well as the execution of training services.

40.2.5.1 Equipment. The equipment element refers to those distinctive end items of training equipment, assigned by either a contractor or military service, to meet specific training objectives. This element includes; for example, operational trainers (i.e., simulators), maintenance trainers (i.e., MTUs), and other items such as cutaways, mockups, and models.

40.2.5.2 Services. The services element refers to services, devices, accessories, and aids necessary to accomplish the objectives of training. This element includes; for example, training plans, training aids, training course materials, contractor-conducted training including in-plant and service training, etc.

40.2.5.3 Facilities. The facilities element refers to that special construction necessary to accomplish the objectives of training. (Primarily, the brick-and-mortar-type facility constructed solely for the training mission.) The equipment used for the purpose of acquainting the trainee with the system or establishing trainee proficiency is excluded.

40.2.6 Peculiar support equipment. The peculiar support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which have application peculiar to a given defense materiel item. This element includes; for example, vehicles, equipment, tools, etc., used to fuel, service, transport and hoist, repair, overhaul, assemble, disassemble, test, inspect, or otherwise maintain the mission equipment. It also includes all effort associated with the design, development, and production of peculiar support equipment.

40.2.6.1 Organizational/intermediate. The organizational/intermediate element refers to the peculiar support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by space vehicle subsystem (i.e., spacecraft, re-entry vehicle, payload, etc.), ground communications, and command and control equipment.

40.2.6.2 Depot. The depot element refers to the peculiar support equipment required to support only depot maintenance.

40.2.7 System test and evaluation. The system test and evaluation element refers to the use of prototype, production, or specially fabricated hardware to obtain or validate engineering data on the performance of the space system or individual level 2 elements. This element includes the detailed planning, conduct, support, data reduction and reports from such operations, and all hardware items which are consumed, or planned to be consumed, in the conduct of such operations. It also includes all effort associated with the design and production of models, specimens, fixtures and instrumentation in support of the test program. Test articles

which are complete units (i.e., functionally configured as required by the mission equipment) are excluded. Development, component acceptance, etc., testing which can be specifically associated with the hardware element, unless these tests are of special contractual or engineering significance, (e.g., associate contractor) are also excluded.

40.2.7.1 Development test and evaluation. The development test and evaluation (DT&E) element refers to that test and evaluation conducted to: (a) demonstrate that the engineering design and development process is complete; (b) demonstrate that the design risks have been minimized; (c) demonstrate that the system will meet specifications; (d) estimate the system's military utility when introduced: (e) determining whether the engineering design is supportable (practical, maintainable, safe, etc.), for operational use, and (f) providing test data with which to examine and evaluate tradeoffs against specification requirements, life cycle cost, and schedule. DT&E is planned, conducted and monitored by the developing agency of the DOD component. This element includes; for example, such tests as integration, flight and ground tests. It also includes such models and tests as wind tunnel, hydrostatic, fatigue, etc.

40.2.7.2 Operational test and evaluation. The operational test and evaluation element refers to that test and evaluation conducted by agencies other than the developing command to assess the prospective system's military utility, operational effectiveness, operational suitability, logistics supportability (including compatibility, interoperability, reliability, maintainability, logistic requirements, etc.), cost of ownership, and need for any modifications. Initial operational test and evaluation (IOT&E) conducted during the development of a weapon system will be included in this element. This element includes; for example, flight tests, on-orbit tests, spin demonstration, stability tests, etc. It also includes contractor support (e.g., technical assistance, maintenance, labor, material, etc.), consumed during this phase of testing.

40.2.7.3 Mockups. The mockups element refers to the design engineering and production of system or subsystem mockups which have special contractual or engineering significance, or which are not required solely for the conduct of one of the above elements of testing.

40.2.7.4 Test and evaluation support. The test and evaluation support element refers to all support elements necessary to operate and maintain systems and subsystems during testing and evaluation which are not consumed during a particular category of testing. This element includes; for example, instrumentation, reparable spares, repair of reparables, test and support equipment, contractor technical support, surveillance

aircraft and tracking vessels, etc., not allocable to preceding test and evaluation elements. Operator and maintenance personnel, consumables, special fixtures, special instrumentation, etc., which are utilized and/or consumed in a single element of testing, and which should; therefore, be included under that element, are excluded.

40.2.7.5 Test facilities. The test facilities element refers to those special test facilities or sites required for performance of the various developmental tests necessary to prove the design and reliability of the system or subsystem. This element includes; for example, propulsion test fixtures, white rooms, test chambers, etc. The brick-and-mortar-type facilities allocable to industrial facilities are excluded.

40.2.8 System/project management. The system/project management element refers to the systems engineering and technical control as well as the business management of particular systems/projects. This element encompasses the planning, directing, and controlling the definition, development, and production of a system/project including the functions of logistics and logistics support, maintenance support, facilities, personnel and training, testing, and activation of a system. System/project management effort that can be associated specifically with the hardware element is excluded, unless this management effort is of special contractual or engineering significance (e.g. , associate contractor).

40.2.8.1 System engineering. The system engineering element refers to the technical and management efforts of directing and controlling a totally integrated engineering effort of a system program. This element encompasses the system engineering effort to define the system and the integrated planning and control of the technical program efforts of design engineering, logistics engineering, specialty engineering, production engineering, and integrated test planning. This element includes but is not limited to: the system engineering effort to transform an operational need or statement of deficiency into a description of system requirements and a preferred system configuration; the logistics engineering effort to define, optimize and integrate the logistics support considerations into the mainstream engineering effort to insure the development and production of a supportable and cost effective weapon system; and the technical planning and control effort for planning, monitoring, measuring, evaluating, directing and replanning the management of the technical program. It excludes the actual design engineering, and production engineering directly related to the products or services of a deliverable end item. Examples of system engineering efforts include: a. System definition, overall system design, design integrity analysis, system optimization, system/cost effectiveness analysis, and

intrasystem and intersystem compatibility assurance, etc.; the integration and balancing of reliability, maintainability, producibility, safety, and survivability; human factors, personnel and training program requirements, security requirements, configuration identification and control, quality assurance program, value engineering, preparation of equipment and component performance specifications, design of test and demonstration plans;

b. Support synthesis, design impact projections, life cycle cost factors, time factors, tradeoff analysis, logistics design appraisal, use studies, support function requirements identification, repair level determination, task analysis, standardization review, logistics requirements identification, logistics support verification, and the preparation and updating of the logistics support plan, the maintenance plan, facilities planning (operational and maintenance), the transportation and handling plan, etc., and;

c. Preparation of the Systems Engineering Management Plan (SEMP), specification tree, program risk analysis, system test planning, decision control process, technical performance measurement, technical reviews, subcontractor/vendor reviews, work authorization, technical documentation control, etc.

40.2.8.2 Project management. The project management element refers to the business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designated to accomplish overall project objectives which are not associated with specific hardware elements and are not included in system engineering. Examples of these activities are logistics management, cost/schedule/performance management, contract management, data management, vendor liaison, contract WBS, etc.

40.2.9 Data. The data element refers to all deliverable data required to be listed on a DD Form 1423. The data requirements will be selected from the TD-3. This element includes only such effort than can be reduced or will not be incurred if the data item is eliminated. If the data are government peculiar, include the efforts for acquiring, writing, assembling, reproduction, packaging and shipping. It also includes the effort for repreparing into government format with reproduction and shipment if data are identical to that used by the contractor, but in a different format.

40.2.9.1 Technical publications. The technical publications element refers to those formal technical orders/manuals developed, as well as commercial, advance, real property installed equipment, and miscellaneous manuals for the installation, operation, maintenance, overhaul, training and reference of hardware, hardware systems, and computer programs; and contractor instructional materials, inspection documentation, and

historical type records that may accompany individual items of equipment. This element includes the data item descriptions set forth in functional category M of the TD-3.

40.2.9.2 Engineering data. The engineering data element refers to those engineering drawings, associated lists, specifications, and other documentation required by the government in accordance with functional categories E, H, R, S, and T of TD-3. This element includes, for example, all plans, procedures, reports, and documentation pertaining to systems, subsystems, computer programs, component engineering, testing, human factors, analysis, etc.

40.2.9.3 Management data. The management data element refers to those data items necessary for configuration management, cost, schedule, contractual data management, programs management, etc., required by the government in accordance with functional categories A, F, and P of TD-3. This element includes; for example, contractor cost reports, cost performance reports, contractor funds status reports, and schedule, milestone, networks, integrated support plans, etc.

40.2.9.4 Support data. The support data element refers to those data items designed to document the logistics support planning and provisioning process in accordance with functional categories L and V of TD-3. This element includes; for example, supply and general maintenance plans and reports, transportation, handling, packaging information, etc.; and data to support the provisioning process.

40.2.9.5 Data depository. The data depository element refers to a facility designated to act as custodian in establishing and maintaining a master engineering specification and drawing depository service for government-approved documents that are the property of the U. S. Government. As custodian for the government, the contractor is authorized by approved change orders to maintain these master documents at the latest approved revision level. When documentation is called for on a given item of data retained in the depository, the charges (if charged direct) will be to the appropriate data element. This element represents a distinct entity of its own and includes all effort of drafting, clerical, filing, etc., required to provide the service outlined above. All similar effort for the contractor's internal specification/drawing control system, in support of his engineering/production activities, is excluded.

40.2.10 Operational/site activation. The operational/site activation element refers to the conversion of site, utilities, and equipment to provide all facilities required to house, service, and launch prime mission equipment at the operational level. This element includes; for example, system assembly, checkout, and installation into site facility of permanently installed peculiar ground communications, command and control equipment, and system support equipment, together with other effort and material necessary in the conduct of the launch, flight, and recovery tasks of a mission. It also includes contractor support in relation to operational/site activation.

40.2.10.1 Contractor technical support. The contractor technical support element refers to all materials and services provided by the contractor related to activation, but not allocable to discrete activation elements. This element includes; for example, repair of reparables, standby services, final turnover, etc.

40.2.10.2 Site conversion. The site conversion element refers to the conversion of launch, operating, support, and other special-purpose facilities necessary to achieve system operational status. This element includes; for example, utilities, roads, and interconnecting cabling. Where appropriate, specify by site.

40.2.10.3 System assembly, installation, and checkout on site. The system assembly, installation, and checkout on site element refers to the installation, assembly, and checkout of permanently installed ground communication, command, and control equipment peculiar to the specific program as well as the peculiar system support equipment required to provide maintenance, etc., to the entire space system (ground and airborne) at the site. This element includes; for example, wire, conduit, cables, distribution panels, and connectors, together with other miscellaneous items and all services required to interface the various installed equipments. The effort related to acquiring the equipments to be installed is excluded.

40.2.11 Flight support operations and services. The flight support operations and services element refers to the operations and services required to perform launching, flight tracking, and control and recovery in relation to completing a space mission. This element includes launch, flight, and recovery operations; airborne system assembly and checkout; and associated activities directly related to the mission. The effort of providing the operational equipments is excluded.

40.2.11.1 Launch operations and services. The launch operations and services element refers to all contractor effort and materials to conduct equipment receiving and checkout at the launch site, preflight assembly and checkout, transportation of equipments on the test range, logistics support for launch operations, pre/post flight data reduction and analysis, the actual countdown and launch operations,and launch pad refurbishment. These services and materials should be specified by hardware item (i.e., spacecraft, launch vehicle, etc.), where appropriate.

40.2.11.2 Flight operations and services. The flight operations and services element refers to all contractor effort and material required to perform ground command, control, tracking, and communications with the space vehicle(s). This element includes; for example, flight control, telemetry, communications, data processing, data analysis, and logistics support for ground equipment.

40.2.11.3 Recovery operations and services. The recovery operations and services element refers to all contractor effort and material necessary to effect recovery of space vehicles or other mission equipment. This element includes; for example, the launch site recovery forces, re-entry site recovery forces, logistics support to the recovery operations, communications, and transportation of recovered equipment to assigned facilities.

40.2.12 Common support equipment. The common support equipment element refers to the equipment, including tools, required to maintain and care for the system or portions of the system while not directly engaged in the performance of its mission, and which are presently in the DOD inventory for support of other systems. This element inlcudes all effort required to assure the availability of this equipment for support of the particular defense materiel item. It also includes acquisition of additional quantities of these equipments if caused by the introduction of the defense materiel item into operational service.

40.2.12.1 Organizational/intermediate. The organizational/intermediate element refers to the common support equipment required to perform organizational/intermediate (field) maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by space vehicle subsystem (i.e., spacecraft, re-entry vehicle, payload, etc.), ground communications and command and control equipment.

40.2.12.2 Depot. The depot element refers to the common support equipment required to support only depot maintenance.

40.2.13 Industrial facilities. The industrial facilities element refers to the construction, conversion, or expansion of facilities for production, inventory, and contractor depot maintenance required by one or more suppliers for the specific system. This element includes; for example, equipment acquisition, or modernization, where applicable, and maintenance of the above facilities or equipment.

40.2.13.1 Construction/conversion/expansion. The construction/conversion/expansion element refers to the real estate, and preparation of system peculiar facilities for production, inventory, depot maintenance, and other related activities.

40.2.13.2 Equipment acquisition or modernization. The equipment acquisition or modernization element refers to production equipment acquisition, modernization, or transferal of equipment for the particular system. (Pertains primarily to government owned and leased equipment under facilities contract.)

40.2.13.3 Maintenance (industrial facilities). The maintenance (industrial facilities) element refers to the maintenance, preservation, and repair of industrial facilities and equipment.

40.2.14 Initial spares and intial repair parts. The initial spares and initial repair parts element refers to the spare components or assemblies used for replacement purposes in major end items of equipment.

APPENDIX G

SUMMARY WORK BREAKDOWN STRUCTURE AND DEFINITIONS SURFACE VEHICLE SYSTEM

10. SCOPE

10.1 This appendix covers the summary work breakdown structure and definitions for a surface vehicle system.

20. REFERENCED DOCUMENTS

20.1 The following documents of the issue in effect on date of invitation for bids or requests for proposal form a part of this standard to the extent specified herein.

PUBLICATION

TD-3 Department of Defense Authorized Data List, Index of Data Item Description

(Application for copies should be addressed to Naval Publications & Printing Service, Eastern Division, 700 Robbins Avenue, Philadelphia, Pa 19111).

30. SUMMARY WORK BREAKDOWN STRUCTURE

30.1 Levels. The following is a summary work breakdown structure for a surface vehicle system:

Level 1	Level 2 (see 5.2.1.1)	Level 3 (see 5.2.1.1)
Surface Vehicle System		
	Primary Vehicle	Integration and Assembly
		Hull/Frame
		Suspension/Steering
		Power Package/Drive Train
		Auxiliary Automotive Systems
		Turret Assembly
		Fire Control
		Armament
		Body/Cab
		Special Equipment
		Communications and Navigation Equipment

Level 1	Level 2(see 5.2.1.1)	Level 3 (see 5.2.1.1)
	Secondary Vehicle	
		Integration and Assembly
		Hull/Frame
		Suspension/Steering
		Power Package/Drive Train
		Auxiliary Automotive Systems
		Turret Assembly
		Fire Control
		Armament
		Body/Cab
		Special Equipment
		Communications and Navigation Equipment
	Training	
		Equipment
		Services
		Facilities
	Peculiar Support Equipment	
		Organizational/Intermediate (Including Equipment Common to Depot)
		Depot (Only)
	Systems Test and Evaluation	
		Development Test and Evaluation
		Operational Test and Evaluation
		Mockups
		Test and Evaluation Support
		Test Facilities
	System/Project Management	
		Systems Engineering Management/ System Engineering
		Supporting Project Management Activities

Level 1	Level 2 (see 5.2.1.1)	Level 3 (see 5.2.1.1)
	Data	
		Technical Publications
		Engineering Data
		Management Data
		Support Data
		Data Depository
	Operational/Site Activation	
		Contractor Technical Support
		Site/Ship/Conversion
	Common Support Equipment	
		Organizational/Intermediate (Including Equipment Common to Depot)
		Depot (Only)
	Industrial Facilities	
		Construction/Conversion/Expansion
		Equipment Acquisition or Modernization
		Maintenance
	Initial Spares and Initial Repair Parts	
		(Specify by allowance list, grouping, or hardware element)

40 DEFINITIONS

40.1 Surface vehicle category. Surface vehicle category is defined as those systems characterized by a capability to navigate over or in close proximity to the surface. Surface vehicle category includes vehicles primarily intended for general-purpose applications and those intended for mating with specialized payloads.

40.2 Surface vehicle system. The surface vehicle system element refers to the complex of equipment, data services, and facilities required to develop and produce a vehicle system with the capability to navigate over the surface. This element includes cargo and logistics vehicles, mobile work units, and combat vehicles. It also includes combat vehicles serving as armor, weapons platforms, reconnaissance vehicles, and amphibians. (Represented by Main Battle Tank, M34, XM-656, LVTPX12, PACV, etc.)

40.2.1 Primary vehicle. The primary vehicle element refers to the mobile element of the system embodying means for performing operational missions. This element includes means of propulsion and structure for adaption of mission equipment or accommodations for disposable loads. It also includes all effort associated with the design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use).

40.2.1.1 Integration and assembly. The integration and assembly element refers to all effort outlined in 5.5.1.3 as well as that portion of the surface vehicle system furnished by the integration contractor to provide interface sections/materials necessary to permit the integration and assembly of the other level 3 equipments, to provide a complete surface vehicle. All effort directly related to other level 3 elements of the primary vehicle equipments is excluded.

40.2.1.2 Hull/frame. The hull/frame element refers to the vehicle primary structure which provides resistance to all operational loading conditions and accommodates other subsystems. It may consist of monolithic cast or built-up hull, or vehicle frame. It includes all structural subassemblies and appendages which attach directly to the primary structure. This element includes; for example, towing and lifting fittings, bumpers, hatches, and grilles. It also includes provision to accommodate other subsystems such as mountings for suspension, weapons, turret, truck body, cab, special equipment loads, etc.

40.2.1.3 Suspension/steering. The suspension/steering element refers to the means for generating tractive effort, thrust, lift, and steering forces generally at or in proximity to the earth's surface and adapting the vehicle to the irregularities of the surface. This element includes; for example, wheels, tracks, brakes, and steering gears for traction and control functions; and rudder thrust devices and trim vanes for amphibians. It also includes springs, shock absorbers, skirts, and other suspension members.

40.2.1.4 Power package/drive train. The power package/drive train element refers to the means for generating power and delivering power in the required quantities and driving rates to the driving member. This element includes; for example, engine-mounted auxiliaries such as air ducting and manifolds, controls and instrumentation, exhaust systems, and cooling means. It also includes such power transport components as clutches, transmission, shafting assemblies, torque converters, differentials, final drives, and power takeoffs. It may include brakes and steering when these are integral to power transmissions rather than in the suspension/steering element.

40.2.1.5 Auxiliary automotive systems. The auxiliary automotive systems element refers to the group of subsystems which provide services to the primary automotive subsystems, as distinguished from the special equipment subsystems, and which outfit the chassis. This element includes; for example, the vehicle electrical system, fire extinguisher system and controls; chassis-mounted accessories such as the winch and power takeoff, tools and equipment; and on-vehicle materials. When otherwise not provided for, it includes crew accommodations.

40.2.1.6 Turret assembly. The turret assembly element refers to the structure and equipment installations required to provide the fighting-compartment element of combatant vehicles. This element includes; for example, armor and radiological shielding; attachments and appendages such as hatches and cupolas; the turret electrical system; and accommodations for personnel, weapons, and command and control. Excludes fire control-stabilization system.

40.2.1.7 Fire control. The fire control element refers to that equipment installed in the vehicles which provide intelligence necessary for weapons delivery such as launching and firing. This element includes; for example, radars and other sensors necessary for search, rendezvous and/or tracking, displays, sights or scopes, computer, computer programs, etc.

40.2.1.8 Armament. The armament element refers to the means for combatant vehicles to deliver fire on hostile targets and for logistics, and other vehicles to exercise self-defense. This element includes; for example, the main gun, launchers, and secondary armament. Fire control systems are excluded.

40.2.1.9 Body/cab. The body/cab element refers to the major component to be mated to a chassis to provide a complete vehicle having a defined mission capability. This element includes accommodations for personnel, cargo and such subsystems as need to be placed in proximity to operators.

40.2.1.10 Special equipment. The special equipment element refers to that special equipment to be mated to a chassis or a chassis/body/cab assembly to enable the achievement of a specific mission capability. It includes all items required to convert basic vehicle configurations to special-purpose configurations. This element includes; for example, blades, booms, winches, etc., to equip wreckers, recovery vehicles, and other field work units. It also includes the furnishings and equipment for command, shop, medical, and other special-purpose vehicles.

40.2.1.11 Communications and navigation equipment. The communications and navigation equipment element refers to the means provided within the system for implementation of command and control. This element includes radio receivers and transmitters for the command function and intercom and external phone systems. It also includes supplementary communication means such as visual signaling devices. It may include navigation system and data displays when these are not integral with the equipment of crew stations of the turret assembly or the driver's automotive display of a cab.

40.2.2 Secondary vehicle. The secondary vehicle element refers to those vehicles required to supplement, expand, or otherwise contribute to the capabilities of primary vehicles to provide the vehicle system with the required operational characteristics. Secondary vehicles are not necessarily self-contained operational units capable of operating outside the system. This element includes; for example, cargo and tank trailers of truck-trailer and tractor-trailers systems, carriers and tanker units of articulated train-type systems, and transporters as employed in systems when the primary vehicle has limited roadability. It also includes all effort associated with design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of their applicable specification(s), regardless of their end use). The breakdown structure and definitions for secondary vehicle will be the same as specified for primary vehicle.

40.2.3 Training. The training element refers to the training services, devices, accessories, aids, equipment, and parts used to facilitate instruction through which personnel will acquire sufficient concepts, skills, and aptitudes to operate and maintain the system with maximum efficiency. Training includes all effort associated with the design, development, and production of training equipment as well as the execution of training services.

40.2.3.1 Equipment. The equipment element refers to those distinctive end items of training equipment, assigned by either a contractor or military service, to meet specific training objectives. This element includes; for example, operational trainers (i.e., simulators), maintenance trainers (i.e., MTUs), and other items such as cutaways, mockups, and models.

40.2.3.2 Services. The services element refers to services, devices, accessories, and aids necessary to accomplish the objectives of training. This element includes; for example, training plans, training aids, training course materials, contractor-conducted training including in-plant and service training, etc.

40.2.3.3 Facilities. The facilities element refers to that special construction necessary to accomplish the objectives of training. (Primarily, the brick-and-mortar-type facility constructed solely for the training mission.) The equipment used for the purpose of acquainting the trainee with the system or establishing trainee proficiency is excluded.

40.2.4 Peculiar support equipment. The peculiar support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which have application peculiar to a given defense materi l item. This element includes; for example, vehicles, equipment, tools, etc., used to refuel, service, transport and hoist, repair, overhaul, assemble, disassemble, test, inspect, or otherwise maintain the mission equipment. It includes all effort associated with the design, development, and production of peculiar support equipment.

40.2.4.1 Organizational/intermediate. The organizational/intermediate element refers to the peculiar support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance, however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by vehicle subsystem (i.e., hull/ frame, suspension/steering, etc.) or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.).

40.2.4.2 Depot. The depot element refers to the peculiar support euqipment required to support only depot maintenance.

40.2.5 Systems test and evaluation. The systems test and evaluation element refers to the use of prototype production or specially fabricated hardware to obtain or validate engineering data on the performance of the surface vehicle system. This element includes the detailed planning, conduct, support, data reduction and reports from such operations, and all hardware items which are consumed, or planned to be consumed, in the conduct of such operations. It also includes all effort associated with the design and production of models, specimens, fixtures, and instrumentation in support of the test program. Test articles which are complete units (i.e., functionally configured as required by the mission equipment) are excluded. Development, component acceptance, etc., testing which can be specifically associated with the hardware element, unless these tests are of special contractual or engineering significance (e.g., associate contractor) are also excluded.

40.2.5.1 Development test and evaluation. The development test and evaluation (DT&E) element refers to that test and evaluation conducted to: (a) demonstrate that the engineering design and devlopment process is complete; (b) demonstrate that the design risks have been minimized; (c) demonstrate that the system will meet specifications; (d) estimate the system's military utility when introduced; (e) determine whether the engineering design is supportable (practical, maintainable, safe, etc.), for operational use; and (f) provide test data with which to examine and evaluate tradeoffs against specification requirements, life cycle cost, and schedule. DT&E is planned, conducted and monitored, by the developing agency of the DOD component. This element includes such tests as scale model, radiological, ballistics, integration tests, environmental tests, range and accuracy demonstrations, etc., as well as testing facility operations.

40.2.5.2 Operational test and evaluation. The operational test and evaluation element refers to that test and evaluation conducted by agencies other than the developing command to assess the prospective system's military utility, operational effectiveness, operational suitability, logistics supportability (including compatibility, interoperability, reliability, maintainability, logistic requirements, etc.), cost of ownership, and need for any modifications. Initial operational test and evaluation (IOT&D) conducted during the development of a weapon system will be included in this element. This element includes such tests as system demonstration, etc. It also includes contractor support (e.g., technical assistance, maintenance, labor, materials, etc.) consumed during this phase of testing.

40.2.5.3 Mockups. The mockups element refers to the design engineering and production of system or subsystem mockups which have special contractual or engineering significance, or which are not required solely for the conduct of one of the above elements of testing.

40.2.5.4 Test and evaluation support. The test and evaluation support element refers to all support elements necessary to operate and maintain systems and subsystems during testing and evaluation which are not consumed during a particular element of testing. This element includes; for example, instrumentation, facilities, reparable spares, test and support equipment, contractor technical support, test bed vehicles, repair of reparables, etc., not allocable to preceding test and evaluation elements. Operator and maintenance personnel, consumables, special fixtures, special instrumentation, etc., which are utilized and/or consumed in a single element of testing and which should; therefore, be included under that element of testing are excluded.

40.2.5.5 Test facilities. The test facilities element refers to those special test facilities or sites required for performance of the various developmental tests required to prove the design and reliability of the system or subsystem. This element includes; for example, engine test fixtures, white rooms, test chambers, etc. The brick-and-mortar-type facilities allocable to industrial facilities are excluded.

40.2.6 System/project management. The system/project management element refers to the systems engineering and technical control as well as the business management of particular systems/projects. This element encompasses the planning, directing, and controlling the definition, development, and production of a system/project including the functions of logistics and logistics support, maintenance support, facilities, personnel and training, testing, and activation of a system. System/project management effort than can be associated specifically with the hardware element is excluded, unless this management effort is of special contractual or engineering significance (e.g., associate contractor).

40.2.6.1 System engineering. The system engineering element refers to the technical and management efforts of directing and controlling a totally integrated engineering effort of a system program. This element encompasses the system engineering effort to define the system and the integrated planning and control of the technical program efforts of design engineering, logistics engineering, specialty engineering, production engineering, and integrated test planning. This element includes but is not limited to: the system engineering effort to transform an operational need or statement of deficiency into a description of system requirements and a preferred system configuration; the logistics engineering effort to define, optimize and integrate the logistics support considerations into the mainstream engineering effort to insure the development and production of a supportable and cost effective weapon system; and the technical planning and control effort for planning, monitoring, measuring, evaluating, directing and replanning the management of the technical program. It excludes the actual design engineering, and production engineering directly related to the products or services of a deliverable end item. Examples of system engineering efforts include:

a. System definition, overall system design, design integrity analysis, system optimization, system/cost effectiveness analysis, and intrasystem and intersystem compatibility assurance, etc.; the integration and balancing of reliability, maintainability, producibility, safety, and survivability; human factors, personnel and training program requirements, security requirements, configuration identification and control; quality assurance program, value engineering, preparation of equipment and component performance specifications, design of test and demonstration plans;

b. Support synthesis, design impact projections, life cycle cost factors, time factors, tradeoff analysis, logistics design appraisal, use studies, support function requirements identification, repair level determination, task analysis, standardization review, logistics requirements identification, logistics support verification, and the preparation and updating of the logistics support plan, the maintenance plan, facilities planning (operational and maintenance), the transportation and handling plan, etc.,

c. Preparation of the System Engineering Management Plan (SEMP), specification tree, program risk analysis, system test planning, decision control process, technical performance measurement, technical reviews, subcontractor/vendor reviews, work authorization, technical documentation control, etc.

40.2.6.2 Project management. The project management element refers to the business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designated to accomplish overall project objectives which are not associated with specific hardware elements and are not included in system engineering. Examples of these activities are logistics management, cost/schedule/performance management, contract management, data management, vendor liaison, contract WBS, etc.

40.2.7 Data. The data element refers to all deliverable data required to be listed on a DD Form 1423. The data requirements will be selected from the TD-3. This element includes only such effort that can be reduced or will not be incurred if the data item is eliminated. If the data are government peculiar, include the efforts for acquiring, writing, assemblying, reproduction, packaging and shipping. It also includes the effort for repreparing into government format with reproduction and shipment if data are identical to that used by the contractor, but in a differenct format.

40.2.7.1 Technical publications. The technical publications element refers to those formal technical orders/manuals developed, as well as commercial, advance, real property installed equipment, and miscellaneous manuals for the installation, operation, maintenance, overhaul, training and reference of hardware, hardware systems, and computer programs; and contractor instructional materials, inspection documentation, and historical type records that may accompany individual items of equipment. This element includes the data item descriptions set forth in functional category M of the TD-3.

40.2.7.2 Engineering data. The engineering data element refers to those engineering drawings, associated lists, specifications, and other documentation required by the government in accordance with functional categories E, H, R, S, and T of TD-3. This element includes; for example, all plans, procedures, reports, and documentation pertaining to systems, subsystems, computer programs, component engineering, testing, human factors, analysis, etc.

40.2.7.3 Management data. The management data element refers to those data items necessary for configuration management, cost, schedule, contractual data management, programs management, etc., required by the government in accordance with functional categories A, F, and P of TD-3. This element includes, for example, contractor cost reports, cost performance reports, contractor funds status reports, and schedule, milestone, networks, integrated support plans, etc.

40.2.7.4 Support data. The support data element refers to those data items designed to document the logistics support planning and provisioning process in accordance with functional categories L and V of TD-3. This element includes; for example, supply and general maintenance plans and reports, transportation, handling, packaging information, etc.; and data to support the provisioning process.

40.2.7.5 Data depository. The data depository element refers to a facility designated to act as custodian in establishing and maintaining a master engineering specification and drawing depository service for government-approved documents that are the property of the U. S. Government. As custodian for the government, the contractor is authorized by approved change orders to maintain these master documents at the latest approved revision level. When documentation is called for on a given item of data retained in the depository, the charges (if charged direct) will be to the appropriate data element. This element represents a distinct entity of its own and includes all effort of drafting, clerical, filing, etc., required to provide the service outlined above. All similar efforts for the contractor's internal specification/drawing control system, in support of his engineering/production activities, are excluded.

40.2.8 Operational/site activation. The operational/site activation element refers to the conversion of utilities and equipment to provide all facilities required to house and service prime mission equipment at the organizational and intermediate level. This element includes the conversion of the site or ship; system assembly, checkout, and installation into the site facility or ship to achieve operational status. It also includes contract support in relation to operational/site activation.

40.2.8.1 Contractor technical support. The contractor technical support element refers to all materials and services provided by the contractor related to activation. This element includes; for example, repair of reparables, standby services, final turnover, etc.

40.2.8.2 Site/ship conversion. The site/ship conversion element refers to materials and services to provide the conversion of existing sites or ships to accommodate the mission equipment and selected support equipment. Where appropriate, specify by site of ship.

40.2.9 Common support equipment. The common support equipment element refers to those items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, aand which are presently in the DOD inventory for support of other systems. This element includes all effort to assure availability of this equipment for support of the particular defense materiel item. It also includes the acquisition of addtional quantities of these equipments if caused by the introduction of the defense materiel item into operational service.

40.2.9.1 Organizational/intermediate. The organizational/intermediate element refers to the common support equipment required to perform organizational and intermediate (field) maintenance. This equipment may also be required to perform depot maintenance; however, it is characterized by its requirement at the organizational and intermediate level of maintenance. Further breakdown may be by subsystem (i.e., hull/frame, suspension/steering, etc.) or maintenance function (i.e., electrical maintenance and test equipment, hydraulic maintenance and test equipment, power supply equipment, handling and transportation equipment, etc.).

40.2.9.2 Depot. The depot element refers to the common support equipment required to support only depot maintenance.

40.2.10 Industrial facilities. The industrial facilities element refers to the construction, conversion, or expansion of facilities for production, inventory, and contractor depot maintenance required by one or more suppliers for the specific system. This element includes; for example, equipment acquisition, or modernization, where applicable, and maintenance of the above facilities or equipment.

40.2.10.1 Construction/conversion/expansion. The construction/conversion/expansion element refers to the real estate, and preparation of system peculiar facilities for production, inventory, depot maintenance, and other related activities.

40.2.10.2 Equipment acquisition or modernization. The equipment acquisition or modernization element refers to production equipment acquisition, modernization, or transferal of equipment for the particular system. (Pertains primarily to government owned and leased equipment under facilities contract.)

40.2.10.3 Maintenance (industrial facilities). The maintenance (industrial facilities) element refers to the maintenance, preservation, and repair of industrial facilities and equipment.

40.2.11 Initial spares and initial repair parts. The initial spares and initial repair parts element refers to the spare components or assemblies for replacement purposes in major end items of equipment.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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