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MILITARY STANDARD

QUALITY PROGRAM REQUIREMENTS
FOR
SPACE AND LAUNCH VEHICLES



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DEPARTMENT OF THE AIR FORCE
Washington, D.C. 20360

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Quality Program Requirements for Space and Launch Vehicles

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FOREWORD

The high reliability required of all space and launch vehicles is achieved by the designs, including the design margins, and by the manufacturing screens and controls imposed at every level of fabrication, assembly, and test. The design and design margins should assure that the equipment is capable of performing in the operational environment, and that all software functions properly. The manufacturing screens and process controls imposed are intended to assure that a known acceptable product is manufactured to meet the design requirements, and that any changes that may be required can be made based on a known product baseline. High risks may result from inadequate designs, manufacturing processes, testing, handling, or storage provisions at any level of assembly. For these reasons, attention to every detail is required by cognizant personnel involved in the development, manufacture, qualification, acceptance, storage, transportation, and preflight testing to ensure successful operation of the space and launch vehicles. The quality program imposed by this standard is intended to ensure that the required attention to detail is achieved. The requirements are a composite of those that have been found to be cost effective on previous space programs.

This standard provides a consistent approach to achieve, in a cost effective way, the high quality required for space and launch vehicles. The standard complements the requirements of MIL-Q-9858 and provides supplemental requirements necessary to establish a basis for the high quality required. Therefore, the planning and implementation of the quality program for space and launch vehicles would be in accordance with both the requirements of MIL-Q-9858 and the additional requirements of this standard. Nevertheless, the cost of imposing each requirement should be evaluated against the benefits that could be realized. Guidance for tailoring is contained in Section 6.

Contractors are encouraged to report to the contracting officer, for program office review and consideration, those specific requirements that seem inappropriate, are believed excessive, or are conflicting with other contract requirements. However, contractors are reminded that any departure from contractually imposed requirements can be granted only by the contracting officer.

For the convenience of the user of this standard, the subsection titles in this standard are the same as the corresponding subsections titles in MIL-Q-9858, wherever that was feasible. A cross reference matrix is included in Section 6 relating the paragraphs in this standard to corresponding paragraphs in MIL-Q-9858 that they supplement.

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SECTION 1

SCOPE

1.1 PURPOSE

The purpose of this standard is to specify special quality program requirements to meet the high standards necessary for space and launch vehicles.

1.2 APPLICATION

This standard is intended primarily for use in acquisition contracts for selected space vehicles, upper stage vehicles, payloads, and launch vehicles. The standard should be cited in the contract schedule, the general provisions, or the statement of work as may be applicable to specify the quality program requirements for the acquisition. Guidance on Government tailoring of this Standard for specific acquisitions is contained in Section 6.

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SECTION 2

REFERENCED DOCUMENTS

The following documents, and the documents referenced in the cited documents (first tier), form a part of this standard to the extent specified herein. All others are for guidance and information only.

2.1 GOVERNMENT DOCUMENTS

Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this standard to the extent specified herein.

SPECIFICATIONS:

MIL-Q-9858 Quality Program Requirements

STANDARDS:

MIL-STD-1520 Corrective Action and Disposition System for
Nonconforming Material

MIL-STD-1535 Supplier Quality Assurance Program

MIL-STD-1543 Reliability Program Requirements for Space
and Missile Systems

DOD-STD-2168 Defense System Software Quality Program

MIL-STD-45662 Calibration Systems Requirements

(Copies of specifications, standards, handbooks, drawings, and publications required by contractors in connection with specified acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 ORDER OF PRECEDENCE

In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence. However, nothing in this standard shall supersede applicable laws and regulations unless a specific exemption has been obtained.

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SECTION 3
DEFINITIONS

The definitions in the referenced documents shall apply to this standard.

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SECTION 4

GENERAL REQUIREMENTS

4.1 GENERAL REQUIREMENTS FOR THE QUALITY PROGRAM

The quality program for space and launch vehicles shall be in accordance with the requirements of MIL-Q-9858 and this standard. Therefore, the planning and implementation of the quality program for space and launch vehicles shall be in accordance with both the requirements of MIL-Q-9858 and the additional requirements of this standard. Normally, for ground equipment or other nonflight elements of an acquisition, only the requirements of MIL-Q-9858 would be imposed by this standard. For the convenience of the user of this standard, the subsection titles in this standard are the same as the corresponding subsections titles in MIL-Q-9858, wherever that was feasible. A cross reference matrix is included in Section 6 relating the paragraphs in this standard with the corresponding paragraphs in MIL-Q-9858 that they supplement.

4.1.1 Quality Program Plans. The contractor shall describe in a Quality Program Plan (Data Item Description, DI-QCIC-80369A) the approach for managing and implementing the quality requirements of the program. The contractor shall also describe in a Software Quality Program Plan (Data Item Description DI-QCIC-80572) the approach for managing and implementing the software quality requirements.

4.1.2 Policies and Procedures. The implementation of the quality program shall be in accordance with written policies and procedures. To assure completeness, a requirements matrix for the quality program shall be prepared which cross-references each paragraph of this standard and of MIL-Q-9858 to the quality requirement paragraphs in the policy or procedure documents. The contractor policies, procedures, and quality program requirements matrix shall be available for review, upon request, by the contracting agency or designated representative.

4.1.3 Management Reviews. Project quality management shall establish and schedule regular reviews for upper project management on the status of the project quality program, including audit results, trend data, problem status, scrap/rework/repair status and costs and quality status for in-plant, intracontractor operations, subcontractors, and major suppliers.

4.1.4 Quality Audits. The contractor shall schedule and conduct audits of personnel, procedures, and operations which implement the quality program. The contractor shall pay special attention to critical subcontracts, and to critical component

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suppliers and vendors. This should include optimum use of no-notice audits. Each audit shall be performed by contractor personnel familiar with written procedures and standards applicable to the operation or work areas being audited, and shall include personnel not having specific line responsibilities in these areas. Each audit shall include examination of selected operations and documentation; evaluation of actual operations as compared with established requirements; recommendations, as appropriate, for remedial and preventive action; and follow-up to assess results of action taken. Audit shall include examination of articles, materials, and products to verify the effectiveness of the contractor's effort and product conformance to technical and contractual requirements.

- a. The audit schedule shall be reviewed and updated annually to assure that optimum consideration is afforded to all areas. The frequency of audits shall be based on criteria derived from the analysis of previous audit results. Audit frequencies may be increased as necessary to assure that the integrity of product quality is maintained. Audit frequencies may be reduced when there are positive results of compliance to procedural and product requirements.
- b. The results of audits in each area shall be documented in a report to contractor higher management with appropriate recommendations for correction of deficiencies. Management action shall be taken to ensure effective correction of the reported deficiencies.

4.1.5 Quality Program at Field Locations. The contractor quality program at field locations shall be guided by written policies and procedures. The responsibility and authority of the contractor quality assurance representatives shall be clearly defined. Controls over work performed at field locations shall be planned and executed with the same level of discipline as work performed in-plant. Policies and procedures shall emanate from or be approved by the parent quality assurance organization. The field quality manager shall only be responsible to field supervision for administrative matters. Technical supervision shall be provided by the parent quality organization.

4.1.6 Software Quality Program. For deliverable computer software the contractor's computer software quality program shall comply with DOD-STD-2168. For contractor developed nondeliverable computer software used to manufacture or test deliverable hardware or software, the contractor shall implement a disciplined management system for the validation and maintenance of such nondeliverable software. The software quality program shall be managed as a part of, and be consistent with, the general requirements for the overall quality program.

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4.2. QUALITY PROGRAM MANAGEMENT

4.2.1 Organization. The contractor shall make functional assignments to implement each element of the quality program. Personnel performing quality program functions shall have well-defined responsibility and authority. Personnel performing quality program shall also have the organizational freedom to assess problems and to recommend and effect solutions. The contractor shall designate one individual responsible for directing and managing the quality function. This quality manager shall report regularly to higher management on the status and adequacy of the overall quality program.

4.2.2 Responsibility. The contractor shall document the assignment of management responsibility and authority for each task of the quality program. Documentation shall include:

- a. Organization charts depicting managerial levels, lines of communications, and personnel assignments.
- b. Identification of the level of management having authority to review the status of the overall quality program and for assuring the adequacy of corrective actions including those between departments and projects.
- c. Narrative statements describing the responsibility of each element of the contractor's organization (e.g., procurement, engineering, reliability, fabrication, test, safety, and quality assurance) which implement the quality program.
- d. The approach to quality management and surveillance of subcontractors and major suppliers.

4.2.3 Initial Quality Planning. Contractor methodology for review of the contract quality assurance tasks and identification of needed quality resources shall be documented in written procedures. Procedures shall describe quality information flow from contract administration personnel to those personnel assigned responsibility for performing contract tasks and requirements included in quality assurance procedures and documentation. Procedures shall also describe methods used for the review and dissemination of quality information contained in contract changes.

4.2.3.1 Skill Requirements. During initial quality planning, the contractor shall identify and provide for the physical requirements and skills needed to accomplish critical processing and manufacturing operations. Requirements for manufacturing and inspection personnel shall include the levels of visual acuity and color perception needed to perform operational functions.

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4.2.3.2 Training. The contractor shall maintain a training program to provide adequate skill levels, including formal and on-the-job training. There shall be sufficient formal training to ensure proficiency of persons performing complex or critical operations. The training program shall include indoctrination regarding reliability and quality requirements of the product. Use of motivational techniques is encouraged to develop personnel commitment toward goals of error-free superior workmanship, including the positive implications and impact on mission performance and the enhancement of productivity.

4.2.3.3 Certification of Personnel. Contractor personnel performing complex or critical operations, and processes requiring a high degree of skill, shall be certified. Certification shall be based upon objective criteria which include work experience, training, and testing. Certified personnel shall be provided evidence of certification, which shall specify the period of effectivity.

4.2.3.4 Recertification. When certification expires, personnel shall be recertified by testing, or review of objective evidence of continued satisfactory performance. The contractor shall also recertify each individual whenever significant changes are made in processes, techniques, or skill parameters, or when physical relocation or interruption of the work period would result in degradation of quality. Whenever inspections, tests, or quality audits identify that individual manufacturing or inspection personnel need additional training, they shall be removed from the operation until provided with additional training, and the required proficiency has been demonstrated.

4.2.3.5 Records. The contractor shall maintain records of the training, testing, and certification status of personnel. The records shall be available for review by government representatives upon request.

4.2.4 Work Instructions

4.2.4.1 Manufacturing and Test Planning. The contractor shall have manufacturing, inspection, and test instructions for all segments of the manufacturing cycle, which shall include flow charts or other effective alternative methods of identifying all inspection and test points. The contractor's quality assurance organization shall participate in the planning and shall review and approve the instructions prior to release. Instructions shall include or reference engineering requirements, such as drawings, material specifications, process specifications, and workmanship standards, to assure that necessary tests and inspections are effectively performed to verify that the product meets technical requirements. Test instructions shall identify the characteristics

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to be measured, the methods of measurement, and the point at which the test is to be performed. The contractor shall address the following in developing the required manufacturing inspection and test instructions.

- a. Sequence of all manufacturing, inspection and test points to assure continuity and effectiveness of all operations.
- b. Inspection and test performance at the optimum item indenture level to minimize repair or rework at higher indenture levels.
- c. Sufficient module level environmental testing and burn-in.
- d. Cleanliness/contamination control.
- e. The adequacy of in-house handling and packaging, including provisions for protection of electrostatic discharge sensitive items.
- f. Availability and utilization of applicable standards.
- g. Clearly defined acceptance or rejection criteria for each inspection or test.
- h. Special attention to monitor and document critical items and their characteristics.
- i. Visual aids for inspection and assembly personnel.
- j. Appropriate selection, application, use, and control of substances, chemicals, shop aids, clothing, and expendable materials specified and used in the manufacturing process (cleaning materials, adhesives, joining material, solvents, rags, and etc.).
- k. Tooling, jigs, fixtures and other fabrication equipment to be utilized.

4.2.4.2 Workmanship. The contractor shall develop methods to assure that the workmanship is adequate and meets contractual requirements.

4.2.4.2.1 Standards. The contractor shall establish workmanship standards. These standards can be part of design specifications, drawings, work instructions or other readily available specifications and standards. The criteria in the

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workmanship standards shall comply with contractual requirements. All standards shall define specific detailed acceptance or rejection criteria.

4.2.4.2.2 Visual Aids. When visual aids are used to support manufacturing or inspections, the contractor shall identify, maintain, and control the samples, graphics, or visual aids that show acceptable workmanship to ensure continued usability and proper configuration.

4.2.5 Records. The contractor shall maintain a system for the collection and analysis of quality records resulting from the procurement, manufacturing, inspection and use of articles and materials. Quality information shall be promptly disseminated to all concerned areas within the contractor's organization and to involved suppliers when problems or deficiencies are detected.

4.2.5.1 Analysis of Records. The contractor shall conduct analysis of quality records for the purpose of:

- a. Identifying quality trends and taking appropriate corrective action.
- b. Establishing confidence levels for products, processes and suppliers by the review of objective evidence of conformance.
- c. Increasing the efficiency of inspection and manufacturing operations by the judicious consolidation of records or operations when it can be demonstrated that such records or operations are of no value to the program or can be combined in a more effective manner.

4.2.5.2 Completed Records

4.2.5.2.1 Identification and Traceability. The contractor shall establish a system for identification, traceability and control of parts, materials, and assemblies from acquisition (purchasing) through manufacturing, assembly and delivery. Flight and critical items shall require individual identification and data retrieval which includes design and manufacturing documentation traceable to their origin. This will provide the capability of tracing backward from fabricated hardware to the records or material from which the item, part and material originated. Identification and retrieval shall be required through all levels of higher assembly. The system shall provide for identification and suitable marking of space flight hardware.

4.2.5.2.2 Recording and Retrieval. Provisions shall be made to record and retrieve information relating to the specific

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test performed, test results, and processes on each lot of parts. When serialization is required, controls shall be established to ensure that identification serial numbers are assigned in a consecutive manner. Records shall indicate applicable part or type numbers and associated detailed information.

4.2.5.2.3 Component Level Data Packages. The contractor shall establish and maintain data packages for all selected components. The packages shall contain the complete chronological history from the beginning of component build through final acceptance of the component. The selection of components requiring data packages shall be based on the criticality of the component to the mission success of the system, single point failure potential, the state-of-the-art of the design or processes, performance levels and other pertinent factors. The term component, as used herein, means an assembly, subassembly, or combination of parts mounted together, normally capable of independent operation and performing a discrete function. Examples are: transmitter; power supply; reaction control unit; which are normally tested as separate units. A part is not a component. A data package is required for each serial number of the flight and qualification items, including spares, and shall include as a minimum the following:

- a. Complete component build history starting at the lowest level of assembly.
- b. Complete build inspection and test records, including physical and functional discrepancies, their resolution, and repair and rework history.
- c. Test history including failures and anomalies during component test, resolution, and retest.
- d. Cumulative operating time or number of cycles when applicable, or specified by another requirement..
- e. Component as-built configuration description.
- f. Records reflecting traceability of parts, materials, and subassemblies installed.
- g. Storage history.
- h. History of the component from the time it is first integrated into a higher assembly, to include; initial installation date; removal date(s); reason for removal; discrepancy and failure history; and traceability references to all inspection, discrepancy, failure, rework, repair and retest paperwork.

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4.2.5.2.4 Vehicle Level Data Packages. The contractor shall establish and maintain a data package for each serial numbered vehicle. The data package shall contain the complete integration and test history starting with subsystem integration and continuing through final acceptance test of the vehicle. Each package shall contain as a minimum the following principal data:

- a. Build Log
- b. Inspection History
- c. Chronological Test History
- d. As-built Configuration Status
- e. A record of failure, anomalies, variations, and deviations identified during vehicle level or system level test (including any retest) and their resolution.
- f. A record of failures, anomalies, variations, and deviations identified by the Material Review Board for vehicle details.
- g. Component/equipment time recording status on time sensitive items.
- h. Modification history including a list and description on any modification approved and scheduled for retrofit.
- i. Installation history of traceable components including removal and replacement history.

4.2.5.2.5 Data Package Review. The contractor shall conduct vehicle and component data package reviews including the review of each critical hardware item and major hardware component of each space and launch vehicle. The reviews shall verify that all hardware, parts, materials, and components, have been manufactured and tested in accordance with current design documentation, test procedures, and related documentation. The review effort shall ensure that:

- a. Discrepancies are documented, and dispositions and corrective actions are evaluated against appropriate criteria and previous history data.
- b. Anomalies noted or observed during review are documented, analyzed, evaluated, and dispositioned.

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- c. Records are progressively reviewed and made part of the overall acceptance criteria.

4.3 FACILITIES AND STANDARDS

4.3.1 Drawings, Documents, and Changes. Product quality shall be a major consideration in the contractor's design and development efforts. The contractor shall ensure that drawings, specifications, and technical documents and changes thereto contain adequate requirements and criteria for determining and controlling the quality of all items purchased or produced by the contractor. A procedure shall be established to identify, analyze, and report engineering documentation errors. Corrective measures shall be initiated when analysis indicates errors are beyond the predetermined acceptable limits.

4.3.2 Design Reviews. The contractor's internal design review program shall include participation of the Quality Assurance, Manufacturing, Engineering Speciality Organizations, and others that are users of design documentation. This should consist of review and approval of all design disclosure technical documentation, and changes thereto, prior to formal document release. The review shall provide for independent evaluation by personnel knowledgeable and experienced in the quality assurance and control aspects of the manufacturing process. As a minimum the following characteristics shall be considered:

- a. Features that enhance the practicability of inspection, measurement, and verification of conformance to design requirements, including acceptance requirements.
- b. Adequacy of provisions to perform testing to verify functional integrity and specified performance.
- c. Allocation of test points for maintainability consideration.
- d. Identification of unnecessary and unrealistic design complexity.
- e. Evaluation of the extent to which single point failure modes and mechanisms have been eliminated, or compensating features included.
- f. Features that enhance ease of manufacturing.
- g. Unique or new tooling requirements.

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- h. Complete, clear, accurate, and unambiguous display of technical requirements in drawings, specifications, other engineering documentation, and process standards.
- i. Specification of nominal useful life, and identification of limited life items, and storage limits.
- j. Necessity and feasibility of special evaluation or inspection methods, including destructive and nondestructive evaluations.

4.3.3 Measuring and Testing Equipment. The contractor shall provide and maintain gages and other measuring and testing devices necessary to assure that supplies conform to technical requirements. These devices shall be calibrated against certified measurement standards which have known valid relationships to national standards at established periods to assure continued accuracy. The objective is to assure that inspection and test equipment is adjusted, replaced or repaired before it becomes inaccurate. The calibration of measuring and testing equipment shall be in conformity with military specification MIL-STD-45662. In addition, the contractor shall insure the use of only such subcontractor and vendor sources that depend upon calibration systems which effectively control the accuracy of measuring and testing equipment.

4.3.4 Production Tooling Used as a Media of Inspection. The contractor shall control production tooling used as a media of inspection to assure continued accuracy between periods of tool proofing.

4.3.4.1 Records. The contractor shall maintain records of tool proofing which provide for each tool the date last proofed, condition found, maintenance performed and date of next proofing.

4.3.4.2 Intervals. The contractor shall analyze the records of tool proofing in order to shorten intervals as required to assure continued accuracy, or to lengthen intervals when the results of previous tool proofing provide definite indications that such action does not adversely affect the accuracy of the tool.

4.4 CONTROL OF PURCHASES

4.4.1 Responsibility. The contractor shall establish a supplier quality program in accordance with MIL-STD-1535.

4.4.1.1 Source Inspection. The contractor shall provide resident or itinerant quality assurance representative(s) at

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subcontractor and vendor facility(s) to provide surveillance of the contractor requirements. The requirement for a resident quality assurance representative shall be based on item design, mission criticality, subcontractor or supplier past performance, and other pertinent factors. The contractor shall have instructions for each resident or itinerant quality assurance representative to delineate their responsibility and authority at the subcontractor or vendor facility.

4.4.1.2 Group I Source Inspection. Group I purchases, as defined in MIL-STD-1535, shall be inspected at the source by the contractor.

4.4.1.3 Intracontractor Work Authorization. All intracontractor work transferred between departments, divisions, or other organizational segments shall be controlled to assure compliance with the technical quality requirements of the contract.

4.4.2 Purchasing Data. The contractor shall develop and maintain a matrix of all the quality assurance requirements imposed by the item specification(s), this standard, and the contract versus the items being procured for the program. The matrix shall be used in the review of procurement documentation to provide a consistent and effective application of quality program requirements.

4.5 MANUFACTURING CONTROL

4.5.1 Production Processing and Fabrication

4.5.1.1 Certification. The contractor shall establish a method to certify the qualification of the machines, equipment, and procedures used in complex, critical operations. Records shall be maintained of the qualifying test performed and the results of such tests. Machines, equipment and procedures shall be recertified as indicated necessary by the results of quality trends or when major process changes are made (i.e., such items as material thickness, design, power source, capacity, voltage, or density).

4.5.1.2 Cleanliness, Contamination and Corrosion Control. The contractor shall review and identify the cleanliness, contamination and corrosion control requirements derived from hardware specifications and ensure that procedures are developed to adequately protect the hardware during manufacturing, storage and transportation. Implementation of controls shall be monitored by quality assurance on a regular basis.

4.5.1.3 Control of Physical Environment. The contractor shall ensure through periodic audit that the physical environment

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(such as temperature, humidity, light, arrangement of work areas, or arrangement of machines and equipment) is controlled to preclude inadvertent damage to hardware and to prevent unsafe conditions in all work and storage areas.

4.5.1.4 Critical Item Quality Control Requirements. The contractor shall establish and maintain appropriate critical item control. Purchase orders for critical items shall specify special transportation, handling, and storage requirements. Manufacturing shall include any special instructions in the appropriate planning shop folders, process plans, log books, and related documents controlling the manufacturing and movement applicable to in-house manufacturing. Components or materials selected for preferential treatment shall be conspicuously marked or tagged to alert personnel of special requirements. These items shall be segregated or have distinctively marked fixtures and locations in all stock rooms, holding and staging areas. Such items shall be regularly and systematically inspected for condition of expired time, cycle, or calendar life. Items with expired time, cycle, or calendar life shall be identified as nonconforming and properly dispositioned. Reviews of selected critical components shall be periodically conducted to verify the adequacy of work instructions and standards being used.

4.5.1.5 Electrostatic Discharge Control Program. Procedures shall be established for the surveillance of the electrostatic discharge control program implementation. This shall include identification of items susceptible to electrostatic discharge and protective features to prevent such damage. As a minimum this should include:

- a. Design criteria
- b. Protected work areas and protective clothing
- c. Process controls and workmanship standards
- d. Handling, packaging, transportation and storage
- e. Training
- f. Marking of documentation and hardware

4.5.1.6 Nondestructive Evaluation. Nondestructive evaluation methods, verification techniques (and attendant equipment and facilities), which are used to perform quantitative measurements, integrity analysis, and nondestructive testing, shall be controlled and integrated into the contractor's qualification, calibration, certification and standards procedures. Nondestructive evaluations for hardware flight

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configurations shall be performed by personnel proficient and certified in the scientific field involved. Nondestructive evaluation methods and techniques shall be encouraged when it can be shown they will enhance productivity, and provide increased assurance of the quality and integrity of flight hardware.

4.5.1.7 Critical Item Verification. For each critical item, beginning at the start of assembly and at progressive levels of assembly and test, the contractor shall verify that the contract, drawing, and specification requirements have been met on all such articles and materials, procured or produced. Significant anomalies, including trends, deviations from expected norms, and marginal conditions shall be identified. Detailed assessment of the quality of these items and their manufacture shall include:

- a. Identification of potential design and layout problems which could cause latent defects or marginal performance.
- b. Verification that current manufacturing test methods and controls are producing repeatable products.
- c. A review of manufacturing problems, if any, which could be alleviated by additional (or revision of) engineering information.
- d. Verification that critical parameters are measured and verified by applicable test procedures.
- e. Decisions, dispositions, corrective actions, or recommendations are evaluated against appropriate criteria and previous history data.
- f. Anomalies noted or observed during review are analyzed, evaluated and dispositioned.
- g. Records are progressively reviewed and made part of the overall acceptance criteria.
- h. Identification and resolution of the differences between as-built and design documentation.
- i. A review of failure and discrepancy reports to identify underlying causes (symptoms or manifestations) and a summary of overstress and induced secondary failures.

4.5.2 Completed Item Inspection and Test. Prior to shipment of a contract end item, the contractor shall review objective evidence generated during manufacturing and test of the

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item to assure that all work sequences have been satisfactorily completed and that all nonconformances have been resolved. The contractor shall maintain records and findings of final review.

4.5.3 Statistical Process Control. The contractor's quality assurance organization shall participate in development of techniques used to control process variability. This should consist of the independent evaluations of design disclosure technical documentation and manufacturing processes by qualified personnel. As a minimum, consider that:

- a. Critical quality characteristics are identified, measured, and verified.
- b. Data is collected from points of measurement.
- c. Control limits and tolerance variations are maintained within product specification limits.
- d. Procedures and methods are established for preventative and corrective actions, and feedback is provided to design and manufacturing.

4.6 NONCONFORMING MATERIAL CONTROL

4.6.1 Responsibility. The contractor is responsible to assure that all items submitted to the Government for acceptance are in compliance with contract technical requirements. Material not conforming shall be segregated and controlled in accordance with MIL-Q-9858, MIL-STD-1520, and this standard.

4.6.2 Nonconforming Material Disposition. The disposition of nonconforming material shall be in accordance with MIL-STD-1520 as supplemented by this standard. The Material Review Board is the only contractor constituted board authorized to determine, or recommend to the Government, disposition of nonconforming material. The rights of the Government regarding acceptance or rejection of nonconforming material apply.

4.6.3 Other Dispositions. Nonconforming material that is determined to be unacceptable for space flight applications shall be clearly marked to identify specific limitations. Precautions shall be initiated to prevent the subsequent use with, or installation in, flight hardware.

4.6.4 Cost of Quality. The "cost of quality" requirements shall include the cost data requirements of MIL-STD-1520. The cost data will be used by management to establish measurement parameters for evaluation of manufacturing planning and manufacturing process in attaining suitable yield and product quality.

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SECTION 5
DETAILED REQUIREMENTS

(not applicable)

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SECTION 6

NOTES

The contents of this Notes section are intended for use by Government Acquisition personnel for guidance and information only.

6.1 INTENDED USE

This standard is intended for use in acquisition contracts for selected space vehicles, upper stage vehicles, payloads, and launch vehicles. The standard would be cited in the contract schedule, the general provisions, or the statement of work as applicable to specify the quality program requirements for the vehicle acquisition. Note that this standard would not normally be used in the acquisition of other types of equipment, such as ground equipment. However, many space and launch vehicle acquisition contracts also include other types of items, such as the associated ground equipment. The wording in this standard states that only the requirements of MIL-Q-9858 would be imposed by this standard for the ground equipment or other elements of the acquisition that are not part of the vehicle. Specific wording in the Statement of Work of the contract is required to achieve any other interpretation.

There may be acquisition contracts for some other type of equipment requiring high reliability where the special quality program requirements for vehicles as stated in this standard should be applied. For those equipments, a statement should be included in the contract or the statement of work that the words "space and launch vehicle" in this standard are to be interpreted as the applicable equipment. Therefore the requirements in the standard for space and launch vehicles would be interpreted as applying to the quality program requirements for the acquisition of the applicable equipment. Specific wording in the Statement of Work or the contract is required to avoid any possible misinterpretation or misapplication.

6.2 TAILORED APPLICATION

The quality program requirements in each contract should be tailored to the needs of that particular acquisition. Military specifications and standards need not be applied in their entirety. Only the minimum requirements needed to provide the basis for achieving the quality standards required should be imposed. The cost of imposing each requirement of this standard should be evaluated by the program office against the benefits that should be realized. However, the risks and potential costs

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of not imposing requirements must also be considered. All tailored applications of this standard shall be clearly identified in the compliance document section of the Statement of Work of the contract.

6.3 DATA ITEM DESCRIPTION

When this standard is used in an acquisition and data are required to be delivered, the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. For those acquisitions that require both a Quality Program Plan and a Software Quality Program Plan, it is recommended that the remarks block of the CDRL be annotated requiring the plans to be combined and submitted as a single plan. When the provisions of DOD FAR Supplement, Part 27, Sub-Part 27.410-6 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this standard is cited in the following paragraphs.

Paragraph No.	Data Requirement Title	Applicable DID No.
4.1.1	Quality Program Plan	DI-QCIC-80369A
4.1.1	Software Quality Program Plan	DI-QCIC-80572

(Data item descriptions related to this standard, and identified in Section 6 will be approved and listed as such in DoD 5010.12-L, Acquisition Management System and Data Requirements Control List (AMSDL). Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.4 SUBJECT TERM (KEY WORD) LISTING

Inspections
Manufacturing
Quality
Quality program
Records
Testing

6.5 CROSS REFERENCE MATRIX TO MIL-Q-9858

The cross reference matrix relating the paragraphs in this standard to the corresponding MIL-Q-9858 paragraphs is shown in Table I.

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TABLE I. CROSS REFERENCE MATRIX TO MIL-Q-9858

Paragraph in this standard	Corresponding MIL-Q-9858 paragraph identification
1. SCOPE.....	1.
1.1 PURPOSE.....	1.2
1.2 APPLICATION.....	1.1
2. REFERENCED DOCUMENTS.....	2.
2.1 GOVERNMENT DOCUMENTS.....	2.1
2.2 ORDER OF PRECEDENCE.....	1.4
3. DEFINITIONS.....	
4. GENERAL REQUIREMENTS FOR THE QUALITY PROGRAM.....	
4.1 GENERAL.....	1.3
4.1.1 Quality Program Plans.....	
4.1.2 Policies and Procedures.....	
4.1.3 Management Reviews.....	
4.1.4 Quality Audits.....	
4.1.5 Quality Program at Field Locations.....	
4.1.6 Software Quality Program.....	
4.2. QUALITY PROGRAM MANAGEMENT.....	3.
4.2.1 Organization.....	3.1
4.2.2 Responsibility.....	3.1
4.2.3 Initial Quality Planning.....	3.2
4.2.3.1 Skill Requirements.....	
4.2.3.2 Training	
4.2.3.3 Certification of Personnel.....	
4.2.3.4 Recertification.....	
4.2.3.5 Records.....	
4.2.4 Work Instructions.....	3.3
4.2.4.1 Manufacturing and Test Planning.....	

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TABLE I. CROSS REFERENCE MATRIX TO MIL-Q-9858 (continued)

Paragraph in this standard	Corresponding MIL-Q-9858 paragraph identification
4.2.4.2	Workmanship.....
4.2.4.2.1	Standards.....
4.2.4.2.2	Visual Aids.....
4.2.5	Records..... 3.4
4.2.5.1	Analysis of Records.....
4.2.5.2	Completed Records.....
4.2.5.2.1	Identification and Traceability.....
4.2.5.2.2	Recording and Retrieval.....
4.2.5.2.3	Component Level Data Packages.....
4.2.5.2.4	Vehicle Level Data Packages.....
4.2.5.2.5	Data Package Review.....
4.3.	FACILITIES AND STANDARDS..... 4.
4.3.1	Drawings, Documents, and Changes..... 4.1
4.3.2	Design Reviews.....
4.3.3	Measuring and Testing Equipment..... 4.2
4.3.4	Production Tooling Used as a Media of Inspection 4.3
4.3.4.1	Records.....
4.3.4.2	Intervals.....
4.4.	CONTROL OF PURCHASES..... 5.
4.4.1	Responsibility..... 5.1
4.4.1.1	Source Inspection.....
4.4.1.2	Group I Source Inspection
4.4.1.3	Intracontractor Work Authorization.....
4.4.2	Purchasing Data..... 5.2
4.5.	MANUFACTURING CONTROLS..... 6.
4.5.1	Production Processing and Fabrication..... 6.2
4.5.1.1	Certification.....
4.5.1.2	Cleanliness, Contamination, and Corrosion Control
4.5.1.3	Control of Physical Environment.....
4.5.1.4	Critical Item Quality Control Requirements.....

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TABLE I. CROSS REFERENCE MATRIX TO MIL-Q-9858 (continued)

Paragraph in this standard	Corresponding MIL-Q-9858 paragraph identification
4.5.1.5 Electrostatic Discharge Control Program.....	
4.5.1.6 Nondestructive Evaluation.....	
4.5.1.7 Critical Item Verification.....	
4.5.2 Completed Item Inspection and Test.....	6.3
4.5.3 Statistical Process Control.....	6.6
4.6. NONCONFORMING MATERIAL CONTROL.....	6.5
4.6.1 Responsibility.....	
4.6.2 Nonconforming Material Disposition.....	
4.6.3 Other Dispositions.....	
4.6.4 Cost of Quality.....	3.6
5. DETAILED REQUIREMENTS.....	
6. NOTES.....	8.
6.1 INTENDED USE	
6.2 TAILORED APPLICATION.....	
6.3 DATA ITEM DESCRIPTION	
(The following subjects in MIL-Q-9858 are not supplemented in this standard)	
- Corrective Action.....	3.5
- Use of Contractor's Inspection Equipment.....	4.4
- Advanced Metrology Requirements.....	4.5
- Materials and Materials Control.....	6.1
- Handling, Storage and Delivery.....	6.4
- Indication of Inspection Status.....	6.7
- Government Inspection at Subcontractor or Vendor..	7.1
- Government Property.....	7.2

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6.6 CHANGES FROM THE PREVIOUS ISSUE.

This issue of MIL-STD-1586 is a revision that incorporates a number of small changes. The location of these changes from the previous issue are indicated by a vertical bar in the margins. This was done as a convenience only and the government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians
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Air Force - 19

(Project No. QCIC-0109)
Document 1965b/Arch 1319b

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NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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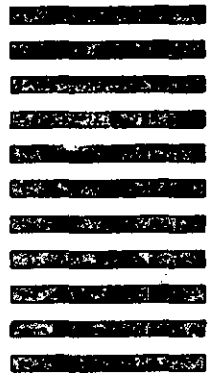
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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-STD-1586A (USAF)		2. DOCUMENT TITLE QUALITY PROGRAM REQUIREMENTS FOR SPACE AND LAUNCH VEHICLES	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> 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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