MIL-STD-2093(AS)
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MILITARY STANDARD

RELIABILITY PROCEDURES FOR PRODUCTION OF GUIDANCE AND CONTROL SECTION FOR GUIDED MISSILE AIM/RIM-7M

FSC 1430

DEPARTMENT OF DEFENSE
Washington, DC 20301

Reliability Procedures for Production of Guidance and Control Section for Guided Missile AIM/RIM-7M

MIL-STD-2093(AS)

1. This standard is approved for use by the Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Engineering Specifications and Standards Department (ESSD), Code 93, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

This standard has been prepared to define contractor reliability program requirements and specific contractor tasks to be performed during production of the AIM/RIM-7M guidance and control sections, and associated interconnecting cabling. This standard is developed specifically for the AIM/RIM-7M and incorporates the production requirements of MIL-STD-785.

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TABLES

APPENDIX

1. SCOPE

1.1 Scope. This standard defines contractor reliability program requirements and specific contractor tasks to be performed during production of the AIM/RIM-7M guidance and control section, hereafter referred to as the guidance and control section (GCS).

1.2 Changes. Contractors engaged in production of the GCS will inform the Naval Air Systems Command of any change in the reliability procedures and tests that would, in the opinion of the contractor, improve the reliability of the AIM/RIM-7M.

2. REFERENCE DOCUMENTS

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

SPECIFICATIONS

MILITARY

MIL-E-8189	-	Electronic Equipment, Missiles, Boosters and Allied Vehicles, General Specification for.
MIL-T-18303	-	Test Procedures, Preproduction, Acceptance, and Life for Aircraft Electronic Equipment, Format for.
MIL-S-19500	-	Semiconductor Devices, General Specification for.
MIL-M-38510	-	Microcircuits, General Specification for.
MIL-G-85142	-	Guidance and Control Sections for Guided Missile AIM/RIM-7M.

STANDARDS

MILITARY

MIL-STD-280	-	Definitions of Item Levels, Item Exchangeability, Models, and Related Terms.

MIL-STD-721	-	Definition of Effectiveness Terms for Reliability, Maintainability, Human Factors, and Safety.
MIL-STD-750	-	Test Methods for Semiconductor Devices.
MIL-STD-756	-	Reliability Prediction.
MIL-STD-785	-	Reliability Program for Systems and Equipment Development and Production.
MIL-STD-831	-	Test Reports, Preparation of.
MIL-STD-883	-	Test Methods and Procedures for Microelectronics.
MIL-STD-965	-	Parts Control Program.

PUBLICATIONS

NAVAL AIR SYSTEMS COMMAND
(Code Ident 30003)

AD-583	-	Procedures for Preparation of a Program to Provide Traceability of Parts and Materials.
AS-4613	-	Application and Derating Requirements for Electronic Components.

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

2.2 Other publications. The following document forms a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

RAYTHEON COMPANY
(Code Ident 49956)

BR-10977	-	Reliability Prediction Report for AIM/RIM-7M Guidance and Control Set.

(Application for copies should be addressed to the Raytheon Company, P.O. Box 740, Lowell, MA 01853.)

3. DEFINITIONS

3.1 Established reliability (ER). ER refers to the series of part specifications which require demonstration of specific maximum failure rate levels as one condition of first article approval.

3.2 Abbreviations. The abbreviations used herein are defined as follows:

a. AS/QVPL. Approved source/quality verified parts list.

b. AT. Acceptance test.

c. CEI. Contract end item.

d. GIDEP. Government/Industry Data Exchange Program.

e. QPL. Qualified parts list.

f. SSLO. Solid-state local oscillator.

g. TE. Test equipment.

4. GENERAL STATEMENT OF REQUIREMENTS

4.1 Reliability program. The contractor shall establish, staff, and implement an effective production reliability program in accordance with, but not limited to, the provisions delineated herein. The phrase "effective production reliability program" is to be understood to signify the implementation of production procedures, practices, and parts quality to ensure the maintenance of program design requirements during the production effort. If, in the opinion of the procuring activity, the use of specific parts, parts quality, or production practices jeopardizes this achievement, the program shall be considered noneffective, and contractor corrective action shall be required.

4.2 Reliability program plan. When specified in the contract or purchase order (APPENDIX), a reliability program plan shall be prepared by the contractor for procuring activity approval. The plan shall delineate the techniques, responsibilities, and authority for the execution of the reliability program. Signature approval is required of responsible contractor reliability and program management. The reliability program plan, when approved by the procuring activity, shall be the contractual document governing the production reliability program.

4.2.1 Reliability organization. The reliability program plan shall identify the organization and key personnel responsible for the management and implementation of the overall program, as well as the relationship between reliability and other groups participating in the program implementation. A definition of the responsibilities and authority of those personnel directly associated with establishing reliability policies and implementation techniques shall be included. The authority delegated to the reliability organization to enforce its policies, and the relationships between line, service, staff, and policy functions shall be stipulated.

4.2.2 Management and controls. The reliability program plan shall include the following as a minimum:

a. A description of specific tasks and procedures necessary to implement and control these tasks.

b. Identification of the organizational units with the authority and responsibility for executing each task.

c. The method of management control to be used to ensure execution of each task as planned.

d. A schedule of start and completion dates for each task.

e. Scheduled management reviews of the total reliability program.

4.3 Reliability program progress reporting. When specified in the contract or purchase order (APPENDIX), a reliability program progress report shall be prepared. This report may be combined with other program progress documentation, provided all reliability information is contained or summarized in a separate section and supporting information is adequately cross-referenced and readily available. Such reports or report sections shall include the following specific information as a minimum:

a. Changes, if any, to the baseline reliability prediction furnished to the contractor.

b. Status of reliability production acceptance tests.

c. Status of lot environmental testing.

d. Status of nonstandard part qualification.

e. Status of vendor activities during the month.

f. Changes, if any, to the AS/QVPL.

g. A description of the major problem areas with a summary of the corrective actions which have been taken, are in process, and are planned.

Terms used in the preparation of these reports shall be in accordance with MIL-STD-280 and MIL-STD-721.

5. DETAILED STATEMENT OF REQUIREMENTS

5.1 Numerical reliability requirements.

5.1.1 Mission reliability requirements. Numerical reliability requirements for each mission to be encountered by the GCS after initial factory acceptance are presented in production baseline reliability prediction report BR-10977, dated February 1979.

5.1.2 Reliability prediction and update. When specified in the contract or purchase order (APPENDIX), the contractor shall prepare or update a reliability prediction report presenting the current numerical reliability estimate for the GCS, as defined by drawings and specifications listed on applicable contract addenda, for each mission reliability requirement. The reliability prediction report shall be in accordance with MIL-STD-756 and shall be maintained and updated through reliability program progress reports (see 4.3) which reference the applicable documentation which necessitates the subject update (engineering change proposals (ECPs) test data, field reports, etc.). In the event cumulative updates occur, resulting in a change of 0.005 or more to the previously published reliability data, the contractor shall prepare a completely revised reliability prediction report for procuring activity approval.

5.2 Part/material/assembly selection and control.

5.2.1 Selection of parts and materials. Standard parts/materials shall be used in the program to the fullest extent practical. Standard parts/materials are defined as those items for which all functional and physical details are covered in federal, military, or industry specifications adopted by the Department of Defense.

5.2.1.1 Standard part/material selection. Standard part/material selection shall be from ER, MIL-S-19500, JANTX or JANTXV, MIL-M-38510, Class B, and specifications listed in MIL-E-8189, Appendix A. Standard semiconductors not having a protective overlay on the metallization (see MIL-S-19500) shall be subjected to radiographic inspection in accordance with MIL-STD-750, Method 2076. Standard microcircuits that are not glassivated (see MIL-M-38510) shall be subjected to radiographic inspection in accordance with MIL-STD-883, Method 2012.

5.2.2 Part/material control. The contractor shall establish appropriate controls on parts and materials to ensure that the reliability requirements of the program are met. Controls shall include, but shall not be limited to, the following.

5.2.2.1 Nonstandard parts/materials. Acceptable part/material quality levels and the basis for selecting standard parts/materials are defined in 5.2.1. When particular part/material applications cannot be satisfied utilizing standard items, nonstandard part/material usage shall be investigated. The following controls shall apply to nonstandard part/material usage.

5.2.2.1.1 Nonstandard part/material usage. The basic procedure for nonstandard part/material usage shall be as follows:

a. The contractor shall review the nonstandard part/material application and conduct investigations to evaluate its merits. Investigations shall encompass physical/performance parameters (electrical, environmental, etc.) and cost, such that the validity of the request can be established. An evaluation shall be made of performance and end life characteristics based on vendor/industry test data inputs, current usage life experience on other military programs, and GIDEP or similar documented information to establish part/material reliability and integrity.

b. When specified in the contract or purchase order (APPENDIX), the following documentation shall be generated if the nonstandard part/material is determined acceptable for use:

(1) A nonstandard part/material approval request prepared in accordance with MIL-STD-965, Procedure I.

(2) A drawing for the nonstandard part/material (see 5.2.2.2).

(3) A first article test procedure (see 5.2.2.3.1) or substantiating data to justify a recommendation for not performing first article tests.

The above documents shall be prepared for procuring activity approval and authorization to proceed with the part/material approval and vendor suitability verification efforts.

5.2.2.2 Drawings for nonstandard parts/materials. Drawings for nonstandard parts and materials shall delineate electrical, mechanical, environmental, reliability/quality assurance and inspection/test requirements as applicable. The requirements delineated shall specify the appropriate screening and preconditioning. Semiconductor devices shall be screened and preconditioned in accordance with the JANTXV requirements of MIL-S-19500. All semiconductors not having a protective overlay on the metallization (see MIL-S-19500) shall be subjected to radiographic inspection in accordance with MIL-STD-750, Method 2076. Microcircuits shall be screened in accordance with MIL-STD-883, Method 5004, Class B. All unglassivated microcircuits (see MIL-M-38510) shall be subjected to radiographic inspection in accordance with MIL-STD-883, Method 2012. Passive devices shall be screened and preconditioned in accordance with similar ER military specifications.

5.2.2.3 Nonstandard part/material first article testing. Source approval is required when a new or otherwise unqualified part/material is proposed for use in the system. Nonstandard part/material source approval requirements shall be satisfied as follows:

a. By first article test reports (see 5.2.2.3.2) generated on previous first article test programs for the same or like parts/materials from the same source, or usage history from sources such as GIDEP or other similar programs.

b. By performance of formal first article testing.

5.2.2.3.1 First article test procedure. When specified in the contract or purchase order (APPENDIX), a detailed first article test procedure, utilizing MIL-T-18303 as a guide for procedure format, shall be prepared for procuring activity approval. Once approved, the first article test procedure shall be the governing document of the test program.

5.2.2.3.2 First article testing. The contractor is responsible for conducting the first article test program in accordance with the approved first article test procedure. Upon satisfactory completion of the first article test program, a first article test report (APPENDIX) shall be prepared in accordance with format provisions of MIL-STD-831 for procuring activity approval. The procuring activity reserves the right to have its representatives witness any (or all) portions of the first article test program.

5.2.3 Assembly control. When specified in the contract or purchase order, (APPENDIX) assemblies, such as modules and trays, which are detailed on assembly drawings containing first article requirements, shall be subjected to first article testing for verification of performance as specified in 5.2.2.3.1 and 5.2.2.3.2.

5.2.4 Source approval (vendor suitability). The contractor is responsible for ascertaining that each proposed source for parts/materials maintains a quality control program to ensure consistent delivery of products conforming to applicable requirements. When parts/materials are fabricated by the contractor, the area used for that purpose shall be considered as belonging to an outside vendor insofar as source approval is concerned. Source approvals by the contractor are to be granted upon acceptable evidence of any of the following:

a. Formal on-site survey of the vendor's manufacturing facilities. When an on-site survey is conducted, the vendor survey form, 11ND-NOTS-4855/16 or equivalent (Figure 1, sheets 1 through 8), shall be used to report the results (APPENDIX). The on-site survey may be repeated and monitored by representatives of the procuring activity. (Vendor scoring is not mandatory if the contractor has a qualitative system which identifies areas requiring improvement.)

b. The source has been previously approved, and evidence is available to confirm that acceptable product quality has been maintained. (The source is not to have been out of production for a period in excess of 18 months on the part or material.)

c. Other evidence of acceptable product quality is available.

5.2.4.1 Vendor suitability report. When specified in the contract or purchase order (APPENDIX), the contractor shall prepare a vendor suitability report which presents all evidence by which the contractor has established the suitability of the vendor manufacturing nonstandard parts, materials, and assemblies. This evidence is subject to approval by the procuring activity.

5.2.5 AS/QVPL. When specified in the contract or purchase order (APPENDIX), an AS/QVPL shall be established by the contractor for all parts/materials/assemblies used in GCS production for which a first article sample requirement is specified on the applicable drawing or specification, and for the sources from which these parts/materials/assemblies are to be procured prior to delivery of the first production lot. The AS/QVPL is a listing of products and sources which have demonstrated an ability to meet the applicable requirements of this standard. All entires on the AS/QVPL shall be fully substantiated by data to satisfy the requirements of source approval and part/material/assembly first article testing herein. The contractor may solicit from the procuring activity information regarding the status of quality verified parts/materials and approved sources which have been previously developed. The AS/QVPL shall contain, as a minimum,

the information shown on Figure 2, which represents an acceptable format for the reporting of necessary information concerning approved sources and quality verified parts. This listing does not supplant or modify the applicable documentation or other Government QPL. This listing supplants MIL-STD-965, Procedure I, requirements for parts listing.

5.2.5.1 Changes to the AS/QVPL. The contractor may develop alternate sources for any part/material/assembly subject to the provisions herein. Proposals by the contractor for substitution or changes to the AS/QVPL shall include objective evidence that the proposed substitute part/material/assembly meets the requirements of 5.2.

5.2.5.2 Removal from the AS/QVPL. Suspension or removal of a source of part/material/assembly from the AS/QVPL shall be at the option of the contractor or the procuring activity. Cause for suspension or removal shall include, but shall not be limited to, the following:

a. Modification of the part/material/assembly by a change in design, materials, manufacturing processes, or manufacturing facilities.

b. Evidence that the quality of the part/material/assembly has not been maintained.

c. Nonproduction of the item by the source for a period of 18 months or more (in which case the item is subject to requalification/recertification).

5.2.6 Construction analysis. Each lot of nonstandard microcircuits and semiconductors shall be subjected to construction analysis. This analysis shall be performed by an activity independent of the device manufacturer.

5.2.6.1 Initial sample. Two acceptable devices of each type shall be selected from the first lot. The devices shall be analyzed and prepared as models to show construction, materials, and workmanship of representative acceptable devices. The construction model devices shall be retained to form a construction model analysis sample for comparison with samples from future lots.

5.2.6.2 Lot samples. Lots containing device types having a different date code (or codes) from those delivered in previously tested lots shall have two devices selected as samples. The samples shall be analyzed and the construction and materials compared with the initial reference sample using a 40 ±10 power microscope. Changes in nonstandard part construction or materials, without prior approval, shall be cause for rejection of the lot.

5.2.6.3 Extent of analysis. The construction analysis shall be conducted in sufficient detail and depth to completely identify all pertinent features of the device design and fabrication.

5.2.6.3.1 Die topography and interconnection pattern. A photograph of sufficient magnification to show clearly the entire die topography and top layer interconnection pattern shall be prepared and made available to the procuring activity for review.

5.2.6.3.2 Additional information. Additional information, such as workmanship and processing anomalies, and conformance to the visual precap criteria of MIL-STD-883 or MIL-STD-750, as applicable, shall be recorded and maintained by the contractor and made available to the procuring activity for review. For lot conformance samples, any differences between the lot samples and the initial sample shall be described in detail.

5.3 Design change review. All proposed changes, deviations, or waivers shall be reviewed by appropriate reliability personnel prior to approval. The review shall include, but shall not be limited to, the following:

a. Any potential product problem areas that may affect reliability as a result of the change.

b. Determination of the effects of the change upon the reliability prediction for each operational mode.

c. Review of test data to verify that electrical stress levels on parts involved in the proposed change meet the requirements of AS-4613 and that environmental or mechanical stresses are acceptable.

d. Review of proposed changes for compliance with part/material/assembly selection and standardization criteria.

5.4 Manufacturing/test controls and monitoring. Adequate procedures shall be invoked by the contractor through the planned, controlled, and scheduled system of control and monitoring to ensure that the reliability achieved in design is maintained during production. The contractor reliability organization shall ensure, either directly or through its interfaces with quality assurance and other contractor organizations, that the following are implemented.

5.4.1 Reliability monitor ıg of vendors. Reliability programs in accordance with the applicable requirements of MIL-STD-785, including failure reporting (see 5.5.1), shall be defined and implemented by vendors and subcontractors who supply critical items.

5.4.1.1 Vendor reliability programs. Vendors requiring reliability programs shall be selected and categorized in accordance with the following characteristics of the item they deliver:

a. The item process requirements are critical or difficult, requiring a reliability/quality system for adequate process control and corrective action implementation.

b. The physical properties of the particular item are stability-sensitive, requiring tight process control.

c. The items are of high complexity, with electrical or design parameters approaching the state of the art.

d. The item is destroyed upon being activated (a one-shot device).

e. The item operation approaches its design limits.

f. Past experience and reliability/quality history warrant tight controls during manufacture of the particular item.

g. Sole-source or long-lead items may also be classified as critical.

5.4.1.2 Vendor reliability program plan. Unless otherwise specified in the contract or purchase order (APPENDIX), a vendor reliability program plan shall be generated and approved by a responsible official within the vendor's management organization and shall be specifically developed for the items listed in the purchase order. The plan shall accomplish the following (as applicable):

a. Delineate the reliability organization or the organization responsible for the reliability function.

b. Document the process flow and identify all test and inspection points. All processes considered critical shall also be identified.

c. List all test/inspection procedures and specifications by number and revision.

d. Describe the failure reporting, analysis, and feedback system for failures experienced within the facility. Provisions shall be made for recording quantities tested and rejected.

e. Define the mechanism for corrective action both in-house and for piece-part contractors.

f. Describe the system and format for failure reporting to the contractor.

5.4.1.3 Critical item list. A list of critical items (as a minimum) is presented in Table I. The contractor shall, as system performance or requirements dictate, revise the critical item list to be consistent with reliability program controls.

5.4.1.4 Surveillance. When warranted by poor performance of vendor or subcontractor items on the production line, the contractor shall perform on-site surveillance of subcontractor/vendor production lines, procedures and quality/reliability systems to identify and isolate the cause of poor performance and ensure its correction. Results of the surveillance and corrective actions shall be reported in the reliability program progress reports (see 4.3).

5.4.2 Manufacturing process controls. The contractor's reliability and quality assurance organizations shall jointly ensure that inherent product reliability is not compromised or degraded during manufacturing operations. The quality assurance controls and control techniques delineated in the AIM/RIM-7M Quality Assurance Program Plan shall be reviewed by the contractor's reliability organization for adequacy and completeness. Specific additional reliability controls shall be defined and exercised during the manufacturing program where deemed necessary.

5.4.3 Test monitoring. Five levels of test are defined for the AIM/RIM-7M test program (see Table II). The contractor's reliability organization shall monitor all test levels, as necessary, to provide a closed-loop data feedback for problem identification and correction. Accept/reject criteria for each test level are derived as follows:

a.	Levels I and II	In accordance with the approved acceptance test procedure.
b.	Level II screening and preconditioning	As defined in MIL-G-85142.
c.	Levels III and IV	From existing drawings and their referenced test specifications.
d.	Level V	From quality assurance procedures peculiar to the specific component under test.

TABLE I. Critical item list.

Part number	Part nomenclature	Part selection criteria 1/						
		a	b	c	d	e	f	g
917AS8148	Accumulator	X					X	X
381MR155	Regulator valve							X
917AS157	Gyroscope, rate, snap start	X					X	X
917AS166	Accelerometer assembly	X					X	X
917AS223	Explosive actuator				X		X	X
917AS726	Radome assembly	X					X	X
917AS6013	Battery	X			X			X
917AS6151	Valve assembly, wing	X					X	X
917AS6176	Voltage-controlled crystal oscillator	X					X	X
917AS6929	Filter, RF, 3-channel	X	X	X		X	X	X
917AS6192	Filter crystal	X					X	X
917AS6405	Torque motor, lower						X	X
917AS6406	Torque motor, yaw						X	X
917AS6411	Torque motor, upper						X	X
917AS6433	Filter bandpass	X					X	X
917AS6434	Filter bandpass	X					X	X
917AS6435	Filter bandpass	X					X	X
917AS6436	Amplifier set gain, switchable	X					X	X
917AS8544	Antenna flat plate			X			X	X
917AS8723	SSLO			X			X	X
917AS6603	Filter, RF	X	X	X		X	X	X
917AS6606	X-band crystal osc.	X					X	X
917AS6607	Filter, RF, 1-channel	X	X	X		X	X	X
917AS6613	Crystal oscillator						X	X
917AS6704	RF assembly	X					X	X

TABLE I. Critical item list. (Continued)

Part number	Part nomenclature	Part selection criteria 1/						
		a	b	c	d	e	f	g
448027	Accelerometer assembly	X					X	X
402008	Gyro, rate, snap-start	X					X	X
917AS8725	Gyro, head	X					X	X
917AS8135	Side antenna	X						X
917AS3110	Fuze triggering device	X		X		X		X
479499	Follow-up potentiometer	X					X	

1/ See 5.4.1.1 for definitions of categories a through g.

TABLE II. AIM/RIM-7M test level, failure reporting, and analysis requirements.

Test level	Hardware level	Inspection/test	Failure reporting, analysis, and corrective action requirements
I	System	Lot acceptance test, reliability production acceptance test	100% on individual basis
II	System	Individual acceptance test; GCS level vibration and preconditioning; may be performed at test level III (subsystem)	100% on individual basis
III	Subsystem	Control section and guidance section acceptance tests	Summary analysis in accordance with 5.5.3
IV	Assembly/ subassembly	Module level test, tray level test	Summary analysis in accordance with 5.5.3
V	Component	Instrument assembly test, purchased-part level tests	Internal contractor reporting

5.5 Failure recurrence control. The contractor shall establish, implement, and maintain a closed-loop failure reporting, analysis, and corrective action program. Test failures shall be categorized according to cause category, such as:

a. Operator error

b. Test equipment error

c. Not yet determined

d. Unable to determine

e. Unknown

f. No failure

g. Workmanship

h. Mishandling

i. Design deficiency

j. Process

k. Part failure-vendor

l. Secondary failure.

Table II summarizes the reporting and analysis requirements for each test level.

5.5.1 Individual failure reporting. When specified in the contract or purchase order (APPENDIX), individual test failure reports shall be prepared for all level I and II test failures. These reports shall summarize all cause category faults and shall consist of the following, as a minimum:

a. A copy of the failure report (in contractor format) containing the following information as a minimum:

(1) Contract designation.

(2) Unique number identifying each failure report.

(3) Test procedure and paragraph numbers covering the test during which the original failure occurred.

(4) Test level and assembly or part number applicable to the level at which the failure occurred.

(5) Serial number of highest level of assembly.

(6) Date of failure.

(7) Description of failure.

(8) Description of repair, including part number and reference designator of replacement parts.

(9) Manufacturer's name or code of replaced part.

b. A copy of the completed failure analysis report. The failure analysis shall select the most effective failure cause isolation processes in light of the failure symptom history described in the failure report. The techniques to be employed shall include, as necessary: circuit analysis, test equipment analysis, environmental test, microprobing, dissection, and X-ray. The reliability organization shall take whatever action is necessary (such as withdrawing parts of the same date code from stores, removing like parts from units in process, etc.) to obtain sufficient analysis samples to isolate and verify the failure cause.

c. A corrective action recommendation to ensure that problems which have been identified through data and laboratory analysis are acted upon rapidly and in a manner which most effectively precludes their recurrence.

d. In addition, level I (sample lot acceptance test and reliability production acceptance test) failures shall be reported to the Government by means of a written advance failure report.

e. The status of all open individual failure reports shall be reported in the reliability program progress report (APPENDIX).

5.5.2 Summary failure reporting. When specified in the contract or purchase order (APPENDIX) a summary of all level III and IV test failures shall be prepared. This summary report may be included as a portion of the reliability program progress report and shall consist of the following, as a minimum:

a. A ranking by test level and by circuit symbol of all failures occuring during the reporting period, and identification of those parts requiring failure analysis according to 5.5.3.

b. The status of analysis and corrective action of all open failure analyses.

5.5.3 Failure analysis. The contractor's reliability program plan shall delineate the rationale to be used for determining when detailed failure analysis for test level III and IV failures shall be conducted. The analysis shall include the physics of failure for parts and materials; the drawing, specification, and procedure review for test equipment; workmanship; human error anomalies; or any other approach deemed necessary to identify causes and effect corrective action to preclude recurrence of identified anomalies. A complete failure analysis shall be conducted for all test level I and II failures.

5.5.4 Level V reporting. Level V failures detected during incoming inspection of purchased parts or instrument assembly (or similar item) tests shall be documented and reports disseminated internally within the contractor's facility. Such data shall be retained for 3 years and shall be made available to the Government upon request.

5.5.5 Corrective action. Implementation and follow-up of approved corrective action shall be the responsibility of the contractor reliability organization. If, during the subsequent reporting period after corrective action has been implemented, the failure mode is not identified as requiring further analysis, the corrective action shall be considered effective and the failure report/analysis shall be considered closed.

5.6 Traceability. The contractor shall establish and implement a traceability program in accordance with AD-583. The traceability program shall be documented in a traceability program plan to be included as part of the reliability program plan (see 4.2), which defines the procedures to be utilized to provide traceability of parts from incoming inspection through CEI acceptance including in-line and AT data. This plan shall include maintenance of configuration data during assembly rework and material review action from the module, gyro, accelerometer, servovalve, and equivalent levels of serialized assemblies up through the CEI. When specified in the contract or purchase order (APPENDIX), the specialized configuration of each CEI shall be documented by way of a serial number configuration list. In-line and AT data shall be identifiable to the appropriate serialized traceable items and shall be kept on file by the contractor for a period of 5 years.

Preparing activity:
Navy - AS

(Project 1430-N-124)

VENDOR SURVEY
AND QUALITY ASSURANCE EVALUATION

SUPPLIER'S NAME

SUPPLIER'S ADDRESS

TYPE OF PRODUCT FOR CONSIDERATION

REFERENCE PART NUMBERS

SURVEY DATE	LEVEL REQUIRED THIS EVALUATION

SURVEYED BY

PERSONS CONTACTED	TITLE	DEPARTMENT

SURVEY RESULT

☐ APPROVAL RECOMMENDED ☐ DISAPPROVAL RECOMMENDED

QC INFORMATION SCORE

HIGHEST SCORE SATISFIED BY THIS VENDOR'S QC SYSTEM

RELIABILITY INFORMATION SCORE

REMARKS

SIGNATURE

DATE

11ND-NOTS-4855/16 (4-64)

FIGURE 1. Vendor survey form (sheet 1 of 8).

VENDOR CLASSIFICATION

Level 1 Approval

Level 1 approval is minimum classification requirement for suppliers of:

a) standard mechanical items; nuts, bolts, clamps, rivets, etc.
b) standard seals and similar items; O rings, gaskets, etc.
c) simple non-standard mechanical items; brackets, forgings, etc.
d) mechanical stock; sheet metal, bar stock, etc.
e) chemical stock; paints, varnishes, resins, plastics, potting compounds, etc.

Level 2 Approval

Level 2 approval is minimum classification requirement for suppliers of:

a) electronic parts; resistors, capacitors, semiconductors, transformers, etc.
b) electro-mechanical devices; relays, valves, solenoids, servos, switches, etc.
c) electronic hardware; connectors, plugs, printed circuit boards, terminal strips, wire, etc.
d) precision mechanical items; pressure fittings, and plates, etc.
e) structural elements; braces. levers, housings, and other elements peculiar to a given vehicle

Level 3 Approval

Level 3 approval is minimum classification requirement for suppliers of:

a) any device item subject to lot by lot acceptance testing including environmental and destructive tests
b) complex electronic or electro-mechanical items; gyros, pre-packaged electronics, thermal batteries, etc.

Level 4 Approval

Level 4 approval is an approval category reserved for items requiring a formal reliability effort by the vendor. Specific vendor requirements typically will be defined by the customer for individual cases. The reliability information section of the survey questionnaire may be used as a screening device for selecting potentially qualified vendors, but should not be used as sole approval data.

FIGURE 1. Vendor survey form (sheet 2 of 8).

DESCRIPTIVE DATA

FACILITIES

SIZE SQ. FT.	☐ OWN ☐ LEASE	AUX POWER?	PLAN FOR EXPAN.	FIRE PROTECTION SYSTEM

	ENVIRONMENTAL TEST LAB.		CALIBRATION LABORATORY		CHEMICAL LABORATORY
	AIR CONDITIONING		DUST CONTROL		HUMIDITY CONTROL

NUMBER OF PERSONNEL

QC	RELIABILITY	PRODUCTION	DEGREED ENGINEERS	TOTAL

EMPLOYEE RELATIONS

UNION	DATE OF CONTRACT EXPIRATION	PROFIT SHARING PLAN OR OTHER INCENTIVE

GOVERNMENT ASSOCIATION

INSPECTION AGENCY

☐ RESIDENT ☐ ITINERANT

CLEARANCE LEVEL	BY WHOM?	MIL-Q-9858A GOVERNMENT APPROVAL

PROJECTION

PRESENT PRODUCTION VOLUME EQUALS _____ PERCENT OF MAXIMUM VOLUME.

SUBCONTRACTED SERVICES

REMARKS

11ND-NOTS-4855/16 (4-64)

FIGURE 1. Vendor survey form (sheet 3 of 8).

INSTRUCTIONS TO SURVEYOR

Definitions

Recommended Level 1 approval means that all of the L-1 survey questions are answered affirmatively, and the total survey score is at least 30.

Recommended Level 2 approval means that all of the L-1 and L-2 survey questions are answered affirmatively, and the total score is at least 55.

Recommended Level 3 approval means that all of the L-1, L-2 and L-3 survey questions are answered affirmatively, and the total score is at least 70.

Recommended Level 4 approval means that all of the L-1, L-2, and L-3 survey questions are answered affirmatively and the total survey score is a minimum established for individual cases.

Recommended disapproval means that the vendor facilities do not meet the minimum requirements defined for the level at which the survey was conducted.

Basic survey questions are those questions which must be answered affirmatively for a given recommended approval level.

Supplementary (S) survey questions are questions designed to measure the supplementary "strength" of the quality system.

Procedures

1. Before the survey, determine the approval level at which the survey is to be conducted. Use the vendor classification section of this survey form as a guide.

2. During the survey, obtain data for the Descriptive Data Section of the questionnaire, and determine and record answers to the basic questions for the applicable survey level.

3. During or immediately after the survey, record answers to the remaining survey questions. Include responses to reliability questions.

4. If the answer to a given survey question is affirmative, enter the assigned weighting number in the applicable box. If the answer is negative, enter a zero. If the answer is "Not Applicable", enter a zero.

5. Determine the survey score by totaling the boxed scores. Determine a separate score for the reliability questions.

6. Prepare a summary report defining the strengths and weaknesses of the vendor's QC system and manufacturing techniques. Make recommendations for vendor improvement and/or corrective action necessary to satisfy the approval criteria. If emergency interim purchases from a disapproved vendor appear necessary, also make recommendations to assure quality of these interim purchases.

FIGURE 1. Vendor survey form (sheet 4 of 8).

QUALITY CONTROL ORGANIZATION AND POLICY

1.	Is there a Quality Control System in effect?	1☐	L-1
2.	Does Quality Control exist as a separate organizational unit, distinct from sales, engineering and production? (Ask for organization chart).	2☐	L-2
3.	Does Quality Control have the authority to accept and reject manufactured or purchased products?	2☐	L-2
4.	Does a company Quality Control Manual exist? (Ask to see it).	2☐	L-3
5.	Does Quality Control prepare Quality Effectiveness Reports for management review? (Quality audit, product yields, $\bar{X}$ charts, etc.)	2☐	S
6.	Is there a Quality Control corrective action system in effect?	3☐	S

PROCUREMENT CONTROL

7.	Is an "Approved Vendor List" maintained by Purchasing?	2☐	L-3
8.	Does Quality Control approve vendors?	2☐	L-3
9.	Does Quality Control review purchase orders?	1☐	S
10.	Does a formal program for vendor survey and evaluation exist?	3☐	S
11.	Is Receiving Inspection data used to generate a quantitative Vendor Quality rating?	2☐	S
12.	Are purchase orders identifiable to a specific revision of applicable specifications and drawings?	2☐	S
		SUBTOTAL ☐	

FIGURE 1. Vendor survey form (sheet 5 of 8).

EQUIPMENT AND CALIBRATION

25.	Is inspection and test equipment maintained under calibration and cycle control?	2 ☐	L-1
26.	Is applicable manufacturing equipment maintained under calibration and cycle control?	2 ☐	L-1
27.	Are calibration standards traceable to the National Bureau of Standards?	1 ☐	L-1
28.	Are environmental controls exercised for measurements of precision products?	2 ☐	L-2
29.	Are applicable jigs and gauge blocks maintained under calibration and cycle control?	2 ☐	L-3
30.	Are written calibration procedures maintained?	3 ☐	S
31.	Do personally owned tools show evidence of calibration?	1 ☐	S
32.	Is there a formal system to assure compatibility between test equipment accuracies and measurement requirements?	3 ☐	S

PRODUCT AND PROCESS CONTROL

33.	Are outgoing shipments of the company product checked for conformance to specific revisions of customer specifications?	1 ☐	L-1
34.	Is in-process inspection performed?	2 ☐	L-2
35.	Are Quality Control inspection stamps used?	2 ☐	L-2
36.	Are inspection records maintained as quality history data?	1 ☐	L-2

SUBTOTAL ☐

PREVIOUS SUBTOTAL ☐

NEW SUBTOTAL ☐

FIGURE 1. Vendor survey form (sheet 6 of 8).

RECEIVING INSPECTION AND STOCK CONTROL

13.	Does a formal system exist for control of "limited storage life" items?	2 ☐	L-1
14.	Does the stock control system prevent mixing of "look alike" items?	1 ☐	L-1
15.	Is sampling inspection (when used) performed in accordance with applicable Military Specifications and Standards?	1 ☐	L-1
16.	Do Receiving Inspection records reflect Quality History of procurement sources?	2 ☐	L-2
17.	Are copies of raw material purchase orders and applicable specifications and drawings supplied to receiving inspection?	3 ☐	L-3
18.	Is acceptance criteria for purchased products formalized by written test procedures?	3 ☐	S
19.	Are "first in, first out" procedures maintained for stock control?	2 ☐	S

DRAWING AND SPECIFICATION CONTROL

20.	Is the company product(s) defined by detailed engineering drawings?	1 ☐	L-1
21.	Does a "change" control system exist?	2 ☐	L-2
22.	Is the change control system monitored to assure recall of obsolete specifications?	2 ☐	L-3
23.	Do written specifications exist defining the manufacturing and assembly procedures?	3 ☐	L-3
24.	Does Quality Control sign off drawings and specifications?	2 ☐	S

SUBTOTAL ☐

PREVIOUS SUBTOTAL ☐

NEW SUBTOTAL ☐

FIGURE 1. Vendor survey form (sheet 7 of 8).

37.	Are manufacturing parts and materials identified in a positive manner?	2 ☐	L-2
38.	Do work orders, route sheets, or process cards accompany materials and/or parts during fabrication and assembly operations?	3 ☐	L-2
39.	Does a formal Material Review Board exist?	2 ☐	L-2
40.	Is acceptance criteria for in-process and final inspection formalized by written test specifications?	3 ☐	L-3
41.	Are there fixed inspection stations in the manufacturing area?	1 ☐	L-3
42.	Are Quality Control inspectors formally trained for their assigned tasks?	3 ☐	S
43.	Have solderers and welders completed certified training courses?	2 ☐	S
44.	Is there a company training program for production personnel?	1 ☐	S
45.	Are Quality Control stamps traceable to individual personnel?	1 ☐	S
46.	Do written operation instructions exist at assembly stations?	2 ☐	S
47.	Do written instructions exist for the operation of inspection test equipment?	2 ☐	S
48.	Is there a formal system to detect and prevent repetitive process discrepancies?	3 ☐	S
49.	Is analysis performed and recorded on customer rejections?	2 ☐	S
50.	Do positive segregation controls exist for commercial and Government items?	1 ☐	S
		SUBTOTAL	☐
		PREVIOUS SUBTOTAL	☐
		GRAND TOTAL	☐

FIGURE 1. Vendor survey form (sheet 8 of 8).

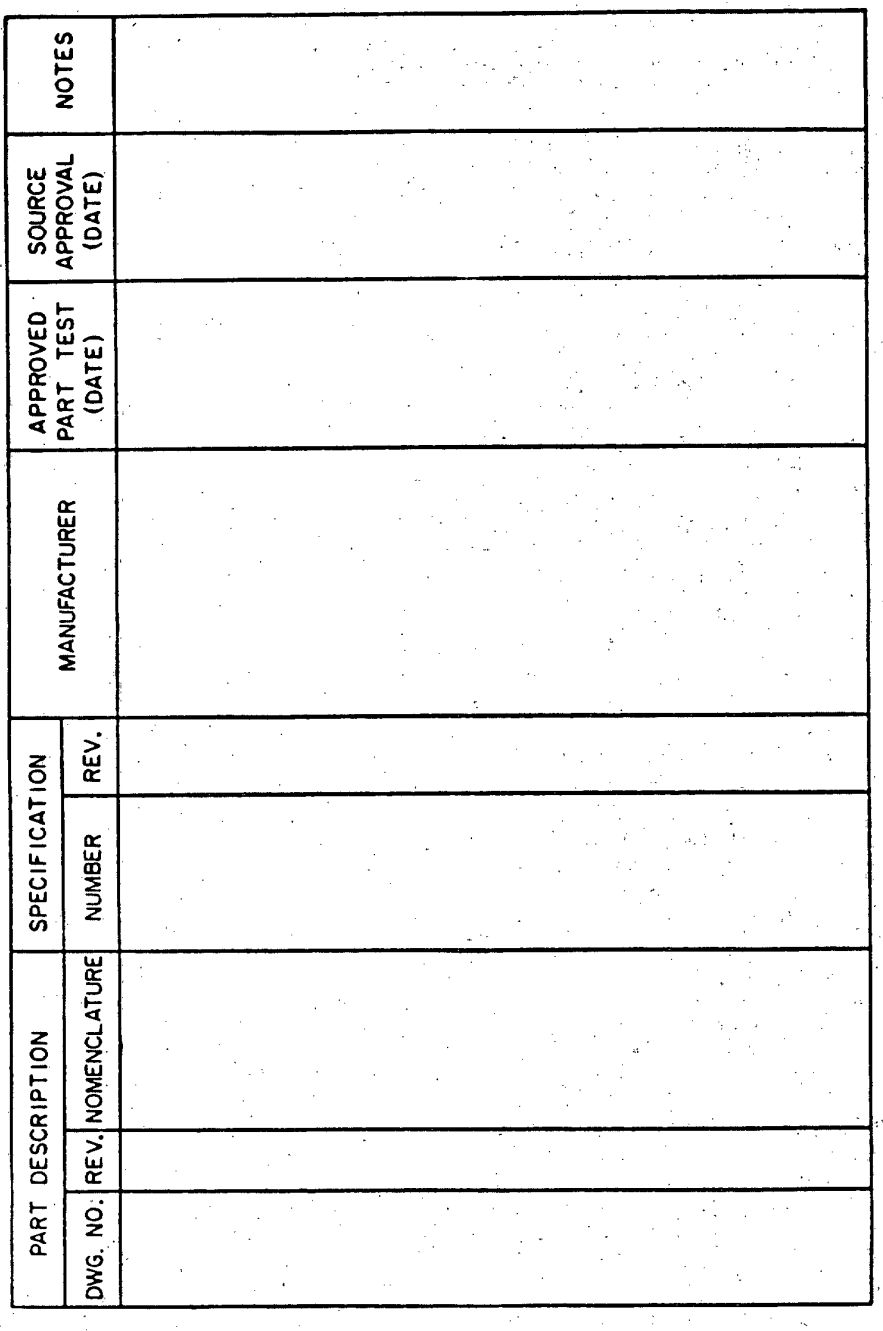

FIGURE 2. AIM/RIM-7M missile guidance and control section AS/QVPL.

APPENDIX

10. GENERAL

10.1 Scope. The information outlined in this section is intended to be explanatory and does not represent direct requirements of the standard.

20.0 Ordering data.

20.1 Procurement requirements. Procurement documents should specify the following:

a. Title, number, and date of this standard.

b. Reliability program (see 4.2).

c. Reliability prediction updates (see 5.1.2).

d. First article testing requirements (see 5.2.3).

e. Vendor reliability program plan (see 5.4.1.2).

20.2 Data requirements. When this standard is used in a procurement which incorporates a Contract Data Requirements List (DD Form 1423) and invokes the provisions of 7-104(n) of the Defense Acquisition Regulations (DAR), the data requirements identified below will be developed as specified by an approved Data Item Description (DID) (DD Form 1664) and delivered in accordance with the approved DD Form 1423 incorporated into the contract. When the provisions of DAR 7-104.9(n) are not invoked, the data specified below will be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this standard is cited in the following paragraphs:

Paragraph	Data Requirement	Applicable DID
4.2	Reliability program plan	UDI-R-21131
4.3, 5.1.2	Reliability program progress report	UDI-R-21137
5.1.1	Reliability prediction report	DI-R-7095
5.2.2.1.1	Nonstandard part or material drawing	DI-E-7031
5.2.2.1.1	Nonstandard part or material approval request	UDI-E-21278

Paragraph	Data Requirement	Applicable DID
5.2.2.1.1, 5.2.2.3.1	First article test procedures	DI-T-5204
5.2.2.3.2	First article test report	DI-5-5329
5.2.4, 5.2.4.1	Vendor suitability report, vendor survey form	UDI-R-21284
5.2.5	Approved source/ quality verified parts lists	UDI-E-21246A
5.5.1	Individual reports of failure, analysis, and corrective action	UDI-R-21141
5.2.2, 5.5.5	Failure summary	UDI-R-21139
5.6	Serial number configuration list	UDI-E-21227A

(Copies of data item descriptions required by the contractor in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS: This form is provided to solicit beneficial comments which may improve this document and enhance its use. DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity. A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed.
NOTE: This form shall not be used to submit requests for 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.

DOCUMENT IDENTIFIER *(Number)* AND TITLE: MIL-STD-2093(AS) RELIABILITY PROCEDURES FOR PRODUCTION OF GUIDANCE AND CONTROL SECTION

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

1. ☐ HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? ☐ IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDED WORDING CHANGE

C. REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

SUBMITTED BY *(Printed or typed name and address — Optional)*

TELEPHONE NO.

DATE

DD FORM 1 OCT 76 1426 EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.