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FAILURE CLASSIFICATION FOR
RELIABILITY TESTING



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DEPARTMENT OF DEFENSE
WASHINGTON, DC 20301

Failure Classification For Reliability Testing

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1. This Military 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: Engineering Specifications & Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, N.J. 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document.

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FOREWORD

This Standard contains criteria for classification of failures during reliability testing. Failures are classified as either relevant or nonrelevant. Information on reclassification of failures, failure analysis and failure reports is also provided.

CONTENTS

		<u>Page</u>
Paragraph 1.	SCOPE - - - - -	1
1.1	Principal statement - - - - -	1
2.	REFERENCED DOCUMENTS - - - - -	2
3.	REQUIREMENTS - - - - -	3
3.1	Failures - - - - -	3
3.2	Failure Classification - - - - -	3
3.2.1	Relevant Failures - - - - -	3
3.2.2	Nonrelevant Failures - - - - -	4
3.3	Reclassification - - - - -	5
3.4	Failure Analysis - - - - -	5
3.5	Failure Reports - - - - -	5
6.0	NOTES - - - - -	6
6.1	Definitions - - - - -	6
6.2	Precedence of Documents - - - - -	6
APPENDIX		
10	Data requirements - - - - -	7

1.0 SCOPE

1.1 Principal statement. This standard establishes criteria for classification of failures occurring during reliability tests.

1.2 Applicability. This standard, when made a part of the procurement document or the equipment specification, applies to any reliability test, including, but not limited to, tests performed in accordance with MIL-R-22973, MIL-R-23094, and MIL-STD-781.

2. REFERENCED DOCUMENTS

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

SPECIFICATIONS

MILITARY

- MIL-R-22973 - Reliability Index Determination for Avionic Equipment Models, General Specification For
- MIL-R-23094 - Reliability Assurance For Production Acceptance of Avionic Equipment, General Specification For
NOTE: MIL-R-23094 has been superseded by MIL-STD-781 for all new procurements.

STANDARDS

MILITARY

- MIL-STD-721 - Definitions of Effectiveness Terms for Reliability, Maintainability, Human Factors and Safety
- MIL-STD-781 - Reliability Tests: Exponential Distribution

2.2 Availability of Documents. Copies of applicable specifications standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.

REQUIREMENTS

3.1 Failures. In addition to the definition of failure as given in MIL-STD-721, and any definition given in the applicable reliability test specification or standard, the following criteria for the determination of a failure shall apply:

Whenever any of the performance characteristics are outside of the requirements of the specification at any specified environmental conditions, at least one failure has occurred.

3.2 Failure Classification. All failures occurring during reliability tests, including failures occurring during equipment burn-in under the environmental conditions specified for the reliability test, shall be classified and reported as either relevant or nonrelevant. Only those failures classified relevant shall be used in computing equipment MTBF, or for making an accept/reject decision.

3.2.1 Relevant Failures. All failures are relevant unless determined by the procuring activity (or an authorized representative thereof) to be caused by a condition external to the equipment under test which is not a test requirement. Relevant failures include:

(a) Design/Workmanship Failures: Failures due to design deficiencies or poor workmanship of either the equipment or component parts shall be classified relevant.

(b) Component Part Failures: Failures due to defective component parts shall be classified as relevant failures. In the event that several component parts of the same type fail during the test, each one shall be considered a separate relevant failure, unless it can be shown that one failure caused one or more of the others (see MIL-STD-781, Dependent Failures).

(c) Wearout Parts: Certain parts of known limited life, such as batteries, may have a life stipulated prior to the initiation of testing as approved by the procuring activity. Failures of these parts occurring prior to the end of the stipulated period are relevant. Failures of these parts occurring after the stipulated period are nonrelevant, but any dependent failures caused thereby are relevant.

(d) Multiple Failures: In the event simultaneous part failures occur, each failed part which would independently prevent satisfactory equipment performance shall be counted as a relevant failure except as follows: If the contractor and the procuring activity agree that the failure of one part was entirely responsible for the failure of any other parts, then each such dependent part failure shall not be counted as a relevant failure. At least one equipment relevant failure shall be counted when a dependent failure is claimed.

(e) Intermittent Failures: The first occurrence of an intermittent failure on any one equipment shall be counted as a relevant failure, although subsequent occurrences of the same intermittency on that same unit will be considered nonrelevant. However, no equipment shall be shipped for which an intermittent failure remains unresolved, without specified approval of the government inspector.

(f) Adjustments:

(1) Accessible Controls - Each adjustment of a control which is accessible to the operator during normal use is a relevant failure if the information necessary to restore equipment operation is not available from indicators which are an integral part of the equipment under test.

(2) Inaccessible Controls - Each adjustment of a control which is inaccessible to the operator during normal use is a relevant failure, unless a period of operating (not standby) time has elapsed, since the last adjustment of any inaccessible control on that equipment, which is equal to or greater than the period specified for the equipment "operational stability."

(g) Failures of Built-in Test: Any malfunction (including a false alarm) of the Built-in Test features of the equipment shall be classified as a relevant failure.

3.2.2 Nonrelevant Failures. Although nonrelevant failures are not used for MTBF calculations, all failures shall be recorded and reported. Only those failures listed below may be counted as nonrelevant.

(a) Failures directly attributable to improper installation in the test chamber.

(b) Failures of test instrumentation or monitoring equipment (other than the Built-in Test function).

(c) Failures resulting from test operator error in setting up, or in testing the equipment.

(d) Dependent failures, unless caused by degradation of items of known limited life. (At least one relevant failure shall be counted when a dependent failure is claimed).

(e) Failures attributable to an error in the test procedures.

(f) The second (and any subsequent) occurrences of the same intermittent failure on the same unit.

(g) Failures occurring during burn-in, trouble-shooting, repair verification, or set-up time.

(h) Malfunctions of the Time Totalizing Meters or certain lighting circuit failures, when the approved test procedures specifically designate them as nonrelevant.

(i) Failures clearly attributable to an overstress condition in excess of the design requirements.

(j) Adjustments:

(1) Accessible Controls - Adjustments of controls which are accessible to the operator during normal use shall be counted as nonrelevant failures provided the adjustment is accomplished without reference to test equipment under test.

(2) Inaccessible Controls - Adjustments of controls which are not accessible to the operator during normal use are non-relevant failures provided no such adjustment has been made to the unit under test for a period of operating time at least equal to that specified for the subsystem "operational stability".

(k) Other, as explicitly defined in the approved test procedures.

3.3 Reclassification. A failure, classified as relevant, may be reclassified to nonrelevant provided that all of the following conditions are met:

(a) Corrective action (an equipment design, part, or production process change) has been made in accordance with the applicable reliability test specification or standard on all equipment of the lot from which the reliability test sample was drawn, and;

(b) Sufficient test data has been accumulated to indicate the corrective action is effective in eliminating the failure mode, and;

(c) Approval of the procuring activity (or authorized representative) is obtained for reclassification of the failure.

3.4 Failure Analysis. An analysis of the cause of each failure shall be made in accordance with the applicable reliability test specification or standard.

3.5 Failure Reports. Any and all failures (both relevant and nonrelevant) which occur during equipment burn-in and the reliability tests shall be recorded and reported in accordance with the contract and the applicable reliability test specification. The reports shall include the results of the failure analysis.

4. QUALITY ASSURANCE PROVISIONS: Not applicable.

5. PREPARATION FOR DELIVERY: Not applicable.

NOTES

6.1 Definitions. All definitions are in accordance with MIL-STD-721, and the applicable reliability test specification or standard.

6.2 Precedence of Documents. When the requirements of the contract, this specification or applicable subsidiary specification, are in conflict the following precedence shall apply:

(a) Contract: The contract shall have precedence over any specification.

(b) The Equipment Detail Specification: The equipment detail specification shall have precedence over all applicable subsidiary specifications.

(c) This Specification: This specification shall have precedence over all applicable subsidiary specifications. Any deviation from this specification, or from subsidiary specifications, where applicable, shall be specifically approved in writing by the Naval Air Systems Command.

(d) Reference Specifications: Any referenced specification shall have precedence over all applicable subsidiary specifications referenced therein. All referenced specifications shall apply to the extent specified.

Preparing Activity
NAVY - AS

(Project RELI N009)

APPENDIX A

10. Data requirements: Items of deliverable data required by this standard are cited in the following paragraphs:

<u>Paragraph</u>	<u>Data Requirement</u>	<u>Applicable DID</u>
3.2	Failure classification	*DIR-2115A
3.5	Failure reports	*DIR-2115A

* Such data will be delivered as described on the above approved (numbered) DID's (Data Item Description/DD Form 1664) when specified on DD Form 1423 (Contract Data Requirements List) and incorporated into the contract.

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