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Environmental Conditions and Test Procedures for Airborne Equipment

RTCA DO-160G
Supersedes DO-160F
December 8, 2010

Prepared by SC-135
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Foreword

This document was prepared by Special Committee 135 (SC-135) and approved by the RTCA Program Management Committee (PMC) on December 8, 2010. It supersedes RTCA DO-160F dated December 6, 2007.

RTCA, Incorporated is a not-for-profit corporation formed to advance the art and science of aviation and aviation electronic systems for the benefit of the public. The organization functions as a Federal Advisory Committee and develops consensus based recommendations on contemporary aviation issues. RTCA's objectives include but are not limited to:

- coalescing aviation system user and provider technical requirements in a manner that helps government and industry meet their mutual objectives and responsibilities;
- analyzing and recommending solutions to the system technical issues that aviation faces as it continues to pursue increased safety, system capacity and efficiency;
- developing consensus on the application of pertinent technology to fulfill user and provider requirements, including development of minimum operational performance standards for electronic systems and equipment that support aviation; and
- assisting in developing the appropriate technical material upon which positions for the International Civil Aviation Organization and the International Telecommunications Union and other appropriate international organizations can be based.

The organization's recommendations are often used as the basis for government and private sector decisions as well as the foundation for many Federal Aviation Administration technical Standard Orders.

Since RTCA is not an official agency of the United States Government, its recommendations may not be regarded as statements of official government policy unless so enunciated by the U.S. government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

These standards were coordinated by RTCA SC-135 with the European Organisation for Civil Aviation Equipment (EUROCAE). EUROCAE concurs with RTCA on the environmental conditions and test procedures set forth herein. When approved by EUROCAE, this document will be identified jointly as RTCA DO-160G/EUROCAE ED-14G.

Table of Contents

Foreword i
Table of Contents iii

Section 1.0	Purpose and Applicability
Section 2.0	Definitions of Terms - General
Section 3.0	Conditions of Tests
Section 4.0	Temperature and Altitude
Section 5.0	Temperature Variation
Section 6.0	Humidity
Section 7.0	Operational Shocks and Crash Safety
Section 8.0	Vibration
Section 9.0	Explosion Proofness
Section 10.0	Waterproofness
Section 11.0	Fluids Susceptibility
Section 12.0	Sand and Dust
Section 13.0	Fungus Resistance
Section 14.0	Salt Spray
Section 15.0	Magnetic Effect
Section 16.0	Power Input
Section 17.0	Voltage Spike
Section 18.0	Audio Frequency Conducted Susceptibility - Power Inputs
Section 19.0	Induced Signal Susceptibility
Section 20.0	Radio Frequency Susceptibility (Radiated and Conducted)
Section 21.0	Emission of Radio Frequency Energy
Section 22.0	Lightning Induced Transient Susceptibility
Section 23.0	Lightning Direct Effects
Section 24.0	Icing
Section 25.0	Electrostatic Discharge
Section 26.0	Fire, Flammability

Appendix A	Environmental Test Identification
Appendix B	Membership
Appendix C	Change Coordinators

Note: Detailed Tables of Contents appear on the inside of most sections.

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RTCA/DO-160G

Environmental Conditions and Test Procedures for Airborne Equipment

Section 1

Purpose and Applicability

Section 2

Definitions of Terms

Section 3

Conditions of Tests

Important Notice

Information contained in these sections is pertinent to all test procedures described in the other sections of this document. Further, Appendix A is applicable for identifying environmental tests performed.

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Table of Contents

Paragraph **Page**

1 Purpose and Applicability 1-1
1.1 Historical Note, and General Guidance to Users 1-2
1.2 DO-160 User Guides 1-3
2 Definitions of Terms, General 2-1
2.1 Equipment Temperature Stabilization 2-1
2.2 Maximum Duty Cycle 2-1
2.3 Not Operating 2-1
2.4 Controlled or Partially Controlled Temperature Locations 2-1
2.5 Total Excursion 2-2
2.6 Equipment 2-2
2.7 Altitude 2-2
2.8 Category of Tests and Declarations 2-2
2.9 Applicability of Test Results 2-3
3 Conditions of Tests 3-1
3.1 Connection and Orientation of Equipment 3-1
3.2 Order of Tests, Multiple Test Articles 3-1
3.3 Combining Tests 3-1
3.4 Measurement of Air Temperature in the Test Chamber 3-2
3.5 Ambient Conditions 3-2
3.6 Environmental Test Condition Tolerances 3-3
3.7 Test Equipment 3-3
3.8 Multiple Unit Equipment 3-3
3.9 EUT Configuration for Susceptibility Tests 3-3

1 Purpose and Applicability

This document defines a series of minimum standard environmental test conditions (categories) and applicable test procedures for airborne equipment. The purpose of these tests is to provide a laboratory means of determining the performance characteristics of airborne equipment in environmental conditions representative of those which may be encountered in airborne operation of the equipment.

The standard environmental test conditions and test procedures contained herein may be used in conjunction with applicable equipment performance standards as a minimum specification under environmental conditions, which can ensure a sufficient degree of confidence in performance during operations.

Note: In each of the test procedures contained herein, the following phrase will be seen several times:

DETERMINE COMPLIANCE WITH APPLICABLE EQUIPMENT PERFORMANCE STANDARDS.

The "applicable equipment performance standards" referred to are either:

a. EUROCAE Minimum Operational Performance Specifications (formerly Requirements) (MOPS/MOPR).

b. RTCA Minimum Performance Standards (MPS) and/or RTCA Minimum Operational Performance Standards (MOPS).

c. The manufacturers equipment specification(s), where applicable.

Some of the environmental conditions and test procedures contained in this document are not necessarily applicable to all airborne equipment. The selection of the appropriate and/or additional environmental conditions and test procedures is the responsibility of the writers (authors) of the performance standards for the specific airborne equipment.

Notes:

1. There are several additional environmental conditions (categories), that specific airborne equipment may need to be evaluated against, that have not been included in this document. These include, but are not limited to: hail, acceleration and acoustic vibration.

2. The procedures for testing airborne equipment for special environmental conditions that are usually uniquely related to that specific type of airborne equipment, should be the responsibility of the writer (author) of the performance standard for that specific equipment.

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3. The International System of Units (SI) is usually used throughout this document as the primary values. In certain instances, however, when the primary values were derived in US units, these units are used as the primary values.

4. Subject to the provisions of Subsection 3.2, it is permissible to use more than one test article.

The words airborne equipment, as used within this document, have direct applicability to most airborne equipment. It is the responsibility of those who wish to apply the test conditions and procedures contained in this document to determine the applicability of these test conditions and procedures to a specific equipment intended for installation on, or within, a specific or general class or type of aircraft.

Minimum operational performance standards (MOPS) prepared by RTCA, Inc. for airborne equipment contain requirements that the equipment must meet to ensure reliable operation in actual aeronautical installations. These equipment requirements must be verified in ambient and stressed environmental conditions. The MOPS typically contain recommended bench test procedures for ambient conditions**,** and refer to RTCA Document DO-160, "Environmental Conditions and Test Procedures for Airborne Equipment," for the stressed environmental testing. The test categories defined in DO-160 are intended to encompass the full spectrum of environmental conditions that airborne equipment may experience – from benign to very hostile.

The environmental conditions and test procedures defined herein are intended to determine only the performance of the airborne equipment under these environmental conditions and are not intended to be used as a measure of service life of the airborne equipment subjected to these tests.

Any regulatory application of this document is the sole responsibility of appropriate governmental (regulatory) agencies.

1.1 Historical Note, and General Guidance to Users

DO-160 (or its precursor, DO-138) has been used as a standard for environmental qualification testing since 1958. It has been referenced in Minimum Operational Performance Specifications (MOPS) for specific equipment designs, and is referenced in FAA Advisory Circulars as a means of environmental qualification for TSO authorization. It has been subject to a continuous process of upgrade and revision as new needs arose within the aviation community, as improved test techniques have emerged, and as the realities of equipment operation of under actual environmental conditions has become better understood.

Environmental stresses can result from natural forces or man made effects, and may be mitigated by details of the equipment installation. The categories that have been

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