

RTCA, Incorporated  
1828 L Street, NW, Suite 805  
Washington, DC 20036-5133, USA

# **Environmental Conditions and Test Procedures for Airborne Equipment**

RTCA DO-160E  
Supersedes DO-160D  
December 9, 2004

Prepared by SC-135  
© 2004, RTCA, Inc.

Copies of this document may be obtained from

RTCA, Inc,  
1828 L Street, NW, Suite 805  
Washington, DC 20036-5133, USA

Telephone: 202-833-9339  
Facsimile: 202-833-9434  
Internet: [www.rtca.org](http://www.rtca.org)

Please call RTCA for price and ordering information.

## Foreword

This document was prepared by Special Committee 135 (SC-135) and approved by the RTCA Program Management Committee (PMC) on December 9, 2004. It supersedes RTCA DO-160D dated July 29, 1997; Change 1 dated December 14, 2000; Change 2 dated June 21, 2001; and Change 3 dated December 5, 2002.

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) Working Groups (WGs) 14 and 31. 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-160E/EUROCAE ED-14E.

This Page Intentionally Left Blank.

## Table of Contents

Forward .....	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 covers of most sections.

This Page Intentionally Left Blank

**RTCA, Inc.**

1828 L Street, NW, Suite 805

Washington, DC 20036

**RTCA/DO-160E**

**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.

Date of Issue:  
December 9, 2004

Supersedes: RTCA/DO-160D  
Prepared by: SC-135

	Page
1 Purpose and Applicability .....	1-1
1.1 Historical Note, and General Guidance to Users.....	1-2
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
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

## 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 be subjected to, 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*