

RTCA/DO-160 Requirements for Testing PMA Parts

Presented by:
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Overview

- ❑ **What is RTCA?**
- ❑ **RTCA/DO-160**
- ❑ **FAA Acceptance - Applicability to Airworthiness Standards**

What is RTCA?

- RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management system issues. www.rtca.org
- Organized in 1935 as the Radio Technical Commission for Aeronautics
- RTCA functions as a Federal Advisory Committee. Its recommendations are used by the FAA as the basis for policy, program, and regulatory decisions.

What is RTCA?

➤ RTCA today includes roughly 400 government, industry and academic organizations from the United States and around the world.

Members include,

- FAA
- ALPA
- ATA
- Boeing
- Stanford University
- Airbus
- UK CAA

What is RTCA?

RTCA products are developed by issue-oriented Special Committees staffed by volunteers.

Special Committee meetings are publicly announced and open to participation by anyone with an interest in the topic under consideration.

Special Committees are often established at the request of the FAA to recommend Minimum Performance Standards (many for TSOs).

Special Committees

- SC-227:** Standards of Navigation Performance
- SC-226:** Audio Systems and Equipment
- SC-225:** Small and Medium Sized Rechargeable Lithium Batteries & Battery Systems
- SC-224:** Airport Security Access Control Systems
- SC-223:** Airport Surface Wireless Communications
- SC-222:** Inmarsat AMS(R)S
- SC-217:** Aeronautical Databases (Joint with EUROCAE WG-44)
- SC-216:** Aeronautical Systems Security
- SC-214:** Standards for Air Traffic Data Communication Services (Joint with EUROCAE WG-78)
- SC-213:** Enhanced Flight Vision Systems/Synthetic Vision Systems, (EFVS/SVS) (Joint with EUROCAE WG-79)
- SC-209:** ATCRBS/Mode S Transponder
- SC-206:** Aeronautical Information Services (AIS) Data Link (Joint with EUROCAE WG 76)
- SC-205:** Software Considerations (Joint with EUROCAE WG-71) [DO-178]
- SC-203:** Unmanned Aircraft Systems
- SC-186:** Automatic Dependent Surveillance – Broadcast
- SC-159:** Global Positioning System
- SC-147:** Traffic Alert & Collision Avoidance System
- SC-135:** Environmental Testing ←

SC-135: Environmental Testing

- **Established: October 1, 1977**
 - **Continues to maintain**
RTCA /DO-160 - *Environmental Conditions and Test Procedures for Airborne Equipment.*
- **DO-160 is the international de facto standard for environmental testing of commercial airborne equipment and provides a laboratory means to determine their performance characteristics.**
- **Next Meeting: March 19-21, 2013**
RTCA Headquarters, Washington DC

RTCA/DO - 160

Environmental Conditions and Test Procedures for Airborne Equipment

- Currently at Revision G (12/8/2010)
- Outlines a set of minimum standard environmental test conditions (categories) and corresponding test procedures for airborne equipment.
- Not all conditions contained in RTCA/DO-160 may be applicable to every installation.
- The applicant is responsible for determining which sections and categories apply.

DO-160 Test Conditions

- 4 - Temperature and Altitude
- 5 - Temperature Variation
- 6 - Humidity
- 7 - Operational Shocks and Crash Safety
- 8 - Vibration
- 9 - Explosion Proofness
- 10 - Waterproofness
- 11 - Fluids Susceptibility
- 12 - Sand and Dust
- 13 - Fungus Resistance
- 14 - Salt Spray
- 15 - Magnetic Effect
- 16 - Power Input
- 17 - Voltage Spike
- 18 - Audio Frequency Conducted Susceptibility - Power Inputs
- 19 - Induced Signal Susceptibility
- 20 - Radio Frequency Susceptibility (Radiated and Conducted)
- 21 - Emission of Radio Frequency Energy
- 22 - Lightning Induced Transient Susceptibility
- 23 - Lightning Direct Effects
- 24 - Icing
- 25 - Electrostatic Discharge
- 26 - Fire, Flammability

DO-160 Equipment Categories

Total of 20 Categories under Section 4: Temperature and Altitude

- **Category A1: Installation in a controlled temperature and pressurized location**
- **Category B1: Installation in a non-pressurized but controlled temperature location**
- **Category F3: Installation in the power plant compartment of an aircraft that is operated at altitudes up to 55,000 ft**

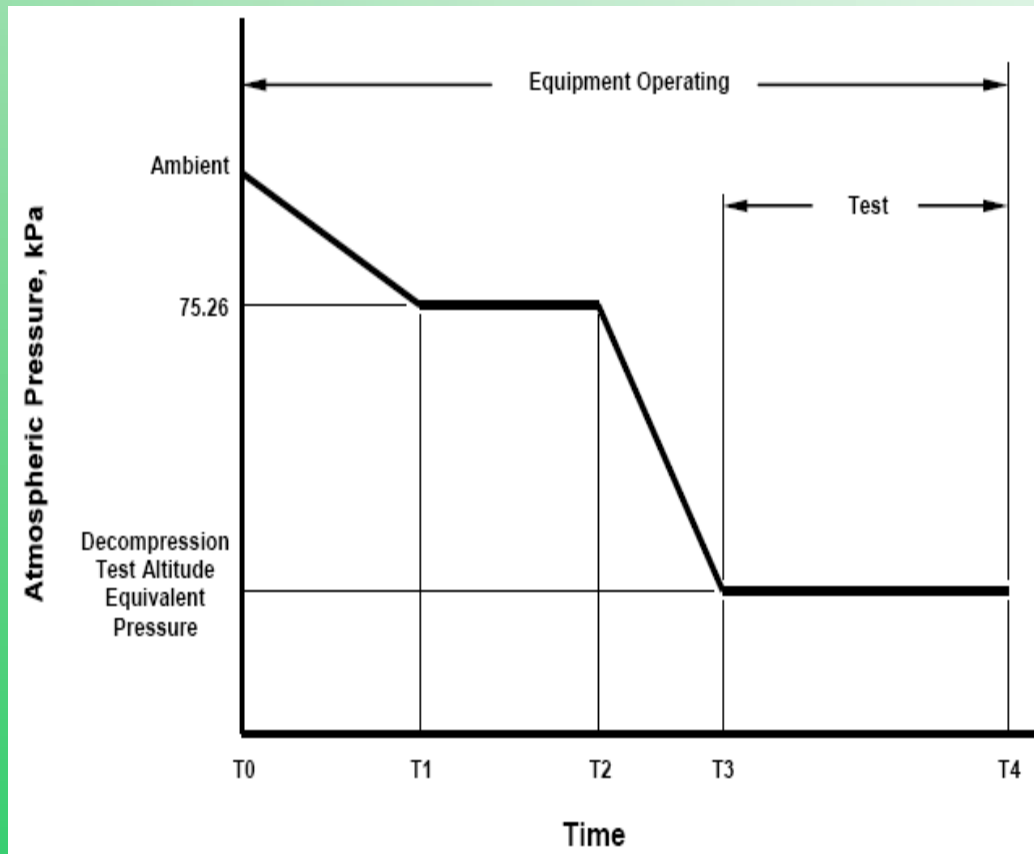
Test Conditions Example

Section 4: Temperature and Altitude

4.5 Temperature Tests

- 4.5.1 Ground Survival Low Temperature Test and Short-Time Operating Low Temperature Test
 - 4.5.2 Operating Low Temperature Test
 - 4.5.3 Ground Survival High Temperature Test and Short-Time Operating High Temperature Test
 - 4.5.4 Operating High Temperature Test
 - 4.5.5 In-Flight Loss of Cooling Test
- ### 4.6 Altitude, Decompression and Overpressure Tests
- 4.6.1 Altitude Test
 - 4.6.2 Decompression Test
 - 4.6.3 Overpressure Test

Test Conditions Example



4.6.2 Decompression Test

Notes:

- 1) *Pressure change rate from T0 to T1 is not specified*
- 2) *T1 to T2 is time for equipment temperature to stabilize*
- 3) *T2 to T3 is 15 seconds, maximum*
- 4) *T3 to T4 is 10 minutes, minimum*

Applicability to Airworthiness Standards

RTCA/DO-160 procedures are listed as acceptable methods of compliance in the following documents.

- **Many Technical Standard Orders (TSOs)**
- **AC 21-16G: RTCA Document DO-160 versions D, E, F, and G** (“The FAA strongly encourages the use of RTCA/DO-160G for new articles”).
- **AC 33.91-1: Engine System and Component Tests**

Related Documents

- **RTCA/DO-138: Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment**
(Predecessor to DO-160)
- **MIL-STD-810: Environmental Engineering Considerations and Laboratory Tests**
- **EUROCAE/ED-14G: Environmental Conditions and Test Procedures for Airborne Equipment** (Identical to DO-160G)
- **ARP4754: Guidelines For Development Of Civil Aircraft and Systems**

Thank You

Questions?

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