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ESPEC



# AIRCRAFT-RELATED EQUIPMENT

## Large-scale Altitude (Reduced Pressure/Low Temperature) Tests

Testing can be conducted to simulate the reduced pressure and low-temperature environment at altitudes where aircraft operate.

Altitude ..... **Max. 100,000 ft**

Pressure range ..... (Atmospheric pressure) Max. 0.1 kPa

Temperature range ..... -70°C to +180°C (when the above temperature range exceeds 11.6 kPa)

Interior dimensions ..... **W1.5 m × H1.5 m × D1.5 m**

## High-rate Vibration Tests

In addition to a maximum vibration force of 45 kN, a maximum temperature change stress of 5°C/min can be applied.

Temperature range ..... **-70°C to +180°C**

Interior dimensions ..... W1.0 m × H1.0 m × D1.0 m

Maximum vibration force ..... **45 kN**

Frequency range ..... 5 Hz to 2000 Hz

Maximum displacement ..... 76.2 mm (p-p)

## Rapid Temperature Change Tests

Capable of linear temperature change testing at up to 18°C/min. Test sample temperatures can also be controlled.

Altitude ..... -70°C to +180°C

Temperature change rate ..... **18°C/min (+155°C to -45°C)**

Interior dimensions ..... W0.8 m × H0.5 m × D0.4 m

## Medium-scale Temperature Change Tests

Capable of testing capacities up to 1500 L at 5°C/min. Humidity control is also possible.

Temperature range ..... -70°C to +180°C

Temperature change rate ..... 5°C/min (+155°C to -45°C)

Interior dimensions ..... **W1.2 m × H1.0 m × D1.5 m**

## HALT/HASS Tests

Products are subjected to “strong stress” (rapid temperature changes and six-degree-of-freedom random vibration) that exceeds their specifications to find their limitations (weaknesses) at an early stage.

Vibration acceleration ..... **5 Grms to 75 Grms**

Temperature range ..... -100°C to +250°C

Temperature change rate ..... **70°C/min (+85°C to -65°C)**

Table dimensions ..... W0.76 m × D0.76 m

## List of MIL-STD-810G Test Items

| METHOD No. | Test Name               |  | Examples of Compatible Chambers        |                           |                 |                |
|------------|-------------------------|--|--|---------------------------|-----------------|----------------|
|            |                         |  | Chamber Model                          | Test Area Dimensions [mm] |                 |                |
|            |                         |  |  | W                         | H               | D              |
| 500.6      | Low Pressure (Altitude) | Procedure I - Storage/Air Transport  | MZH                                    | 1500                      | 1500            | 1500           |
|            |                         | Procedure II - Operation/Air Carriage  |  |                           |                 |                |
|            |                         | Procedure III - Rapid Decompression  | Temperature chamber + Custom equipment | 300                       | 300             | 300            |
| 501.6      | High Temperature        | Procedure I - Storage  | TCC-150                                | 800                       | 500             | 400            |
|            |                         | Procedure II - Operation   | FD Series                              | 1200                      | 1000            | 1500           |
|            |                         |  | ARS-1100                               | 1000                      | 1000            | 1000           |
|            |                         | Procedure III - Tactical-Standby to Operational                                  | ARSF-800                               | 1000                      | 1000            | 800            |
| 502.6      | Low Temperature         | Procedure I - Storage  | PL-4J                                  | 1000                      | 1000            | 800            |
|            |                         | Procedure II - Operation   | FD Series                              | 1200                      | 1000            | 1500           |
|            |                         |  | ARS-1100                               | 1000                      | 1000            | 1000           |
|            |                         | Procedure III - Operation  | ARSF-800                               | 1000                      | 1000            | 800            |
| 503.6      | Temperature Shock       | Procedure I-A<br>One-way shock(s) from constant extreme temperature              | TSD-101<br><br>TSE-11                  | 1000<br><br>710           | 1000<br><br>345 | 800<br><br>230 |
|            |                         | Procedure I-B<br>Single cycle shock from constant extreme temperature            |  |                           |                 |                |
|            |                         | Procedure I-C<br>Multi-cycle shocks from constant extreme temperature            |  |                           |                 |                |
|            |                         | Procedure I-D<br>Shocks to or from controlled ambient temperature (Fig. 503.6-4) |  |                           |                 |                |
| 504.2      | Contamination by Fluids | Procedure I  |  |                           |                 |                |
|            |                         | Procedure II   |  |                           |                 |                |
| 507.6      | Humidity                |  | PL-4J                                  | 1000                      | 1000            | 800            |
|            |                         |  | FD Series                              | 1200                      | 1000            | 1500           |
|            |                         |  | ARS-1100                               | 1000                      | 1000            | 1000           |
|            |                         |  | ARSF-800                               | 1000                      | 1000            | 800            |
| 512.6      | Immersion               | Procedure I - Immersion  |  |                           |                 |                |
|            |                         | Procedure II - Coatings  |  |                           |                 |                |
| 514.7      | Vibration               | Procedure I - General Vibration  |  |                           |                 |                |
| 516.7      | Shock                   | Procedure I - Functional Shock   | Vibration and shock test device        | 600                       | 600             | 600            |
|            |                         | Procedure II - Materiel to be Packaged   |  | 800                       | 800             | 800            |
| 521.4      | Iceing/Freezing Rain    | Procedure I - Freezing Rain  | EBE-6                                  | 3950                      | 2400            | 2900           |

List of RTCA/DO-160G Test Items

\* Whether or not these tests can be conducted may vary depending on the size of the test sample and any other conditions.

| Section No. | Section Name                            | Sub. Sec. | Test Name  |             | Examples of Compatible Chambers                  |                           |      |      |
|-------------|---|-----------|--|-------------|--|---------------------------|------|------|
|             |   |           |  |             | Chamber Model                                    | Test Area Dimensions [mm] |      |      |
|             |   |           |  |             |  | W                         | H    | D    |
| Section 4   | Temperature Tests                       | 4.5.1     | Ground Survival Low Temperature Test and Short-time Operating Low Temperature Test   |             | TCC-150<br><br>FD Series<br>ARS-1100<br>ARSF-800 | 800                       | 500  | 400  |
|             |   | 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  |             | MZH-32H  | 1500                      | 1500 | 1500 |
|             |   | 4.5.5     | In-flight Loss of Cooling Test   |             |  |                           |      |      |
|             |   | 4.6.1     | Altitude Test  |             |  |                           |      |      |
|             |   | 4.6.2     | Decompression Test   |             |  |                           |      |      |
|             |   | 4.6.3     | Overpressure Test  |             |  |                           |      |      |
| Section 5   | Temperature Variation Tests             | 5.3.1     | If the test is a combined test   |             | TCC-150  | 800                       | 500  | 400  |
|             |   |           |  |             | FD Series  | 1200                      | 1000 | 1500 |
|             |   |           | If the test is not a combined test   |             | ARS-1100   | 1000                      | 1000 | 1000 |
|             |   | 5.3.2     |  | Category S1 | ARSF-800   | 1000                      | 1000 | 800  |
|             |   |           |  |             | TSD-101  | 1000                      | 1000 | 410  |
|             |   |           |  |             | TSE-11   | 710                       | 345  | 230  |
| Section 6   | Temperature and Humidity Tests          | 6.3.1     | Standard Humidity Environment  | Category A  | PL-4J  | 1000                      | 1000 | 800  |
|             |   | 6.3.2     | Severe Humidity Environment  | Category B  | FD Series  | 1200                      | 1000 | 1500 |
|             |   |           |  |             | ARS-1100   | 1000                      | 1000 | 1000 |
|             |   | 6.3.3     | External Humidity Environment  | Category C  | ARSF-800   | 1000                      | 1000 | 800  |
| Section 7   | Operation Shocks and Crash Safety Tests | 7.2.1     | For equipment capable of sustaining vertical shock                                   | Category A  | Vibration and shock test chamber                 | 600                       | 600  | 600  |
|             |   |           |  |             |  | 800                       | 800  | 800  |
|             |   |           |  | Category D  |  |                           |      |      |

| Section No. | Section Name          | Sub. Sec. | Test Name  |          | Examples of Compatible Chambers               |                           |            |            |
|-------------|-----------------------|-----------|--|----------|---|---------------------------|------------|------------|
|             |                       |           |  |          | Chamber Model                                 | Test Area Dimensions [mm] |            |            |
|             |                       |           |  |          |   | W                         | H          | D          |
| Section 8   | Vibration             | 8.5.1     | Standard Sinusoidal Vibration Test                   | S        | Vibration and shock test chamber              | 600<br>800                | 600<br>800 | 600<br>800 |
|             |                       | 8.5.2     | Standard Random Vibration Test                       | S        |   |                           |            |            |
|             |                       | 8.6       | High-level, Short Duration Test                      | H, Z     |   |                           |            |            |
|             |                       | 8.7.1     | Robust Sinusoidal Test                               | R, U, U2 |   |                           |            |            |
|             |                       | 8.7.2     | Robust Random Test                                   | R, U, U2 |   |                           |            |            |
|             |                       | 8.8.1     | Sine-on Random Test - Known Helicopter Frequencies   | R, U, U2 |   |                           |            |            |
|             |                       | 8.8.2     | Sine-on Random Test - Unknown Helicopter Frequencies | U        |   |                           |            |            |
|             |                       | 8.8.3     | Sine-on Random Test - Known Helicopter Frequencies   | U2       |   |                           |            |            |
|             |                       |           |  |          |   |                           |            |            |
|             |                       |           |  |          |   |                           |            |            |
| Section 10  | Water proofness       | 10.3.1    | Condensing Water Proof Test                          |          | Thermal test chamber with humidity (upgraded) | 650                       | 460        | 370        |
|             |                       | 10.3.3    | Spray Proof Test                                     |          |   |                           |            |            |
|             |                       |           |  |          |   |                           |            |            |
|             |                       | 10.3.4    | Continuous Stream Proof Test                         |          |   |                           |            |            |
| Section 11  | Fluids Susceptibility | 11.4.1    | Spray Test   | F        |   |                           |            |            |
|             |                       | 11.4.2.   | Immersion Test                                       |          |   |                           |            |            |
| Section 24  | Icing                 | 24.4.1    | Built-up Icing                                       | A        |   |                           |            |            |
|             |                       |           | In-flight Icing                                      | B        | MZH-32H                                       | 1500                      | 1500       | 1500       |
|             |                       |           |  |          |   |                           |            |            |
|             |                       |           | On-ground Icing                                      | C        | EBE-6   | 3950                      | 2400       | 2900       |

