

# Deviation Request ETSO-C142a#3 for an ETSO approval for CS-ETSO applicable to NON-RECHARGEABLE LITHIUM CELLS and BATTERIES (ETSO-C142a)

## Consultation Paper

### 1 Introductory Note

The hereby presented deviation requests shall be subject to public consultation, in accordance with EASA Management Board Decision No 7-2004 as amended by EASA Management Board [Decision No 12-2007](#) products certification procedure dated 11th September 2007, Article 3 (2.) of which states:

“2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency.”

### 2 ETSO-C142a#3 NON-RECHARGEABLE LITHIUM CELLS and BATTERIES

#### 2.1 Summary of Deviation

Deviates from ETSO-C142a by using RTCA DO-227A with a corrected sequence for the end-item testing instead of DO-227 modified by Appendix 1 of ETSO-C142a.

#### 2.2 Original Requirement

##### ETSO-C142a

##### **3.1.1 - Minimum Performance Standard**

RTCA DO-227 “Minimum Operational Performance Standard for Lithium Batteries” from June 1995 unless otherwise specified by Appendix 1 of this ETSO

##### **3.1.2 - Environmental Standard**

Non-Rechargeable Lithium Cells and Batteries must be tested according to RTCA DO-227 Section 2.3 unless otherwise specified by Appendix 1 of this ETSO

#### **4.2. – Specific**

Each lithium cell or battery must be marked in accordance with RTCA DO-227, Section 1.4.6.



## **DO-227A**

### 2.4.3 End Item Test Procedures and criteria

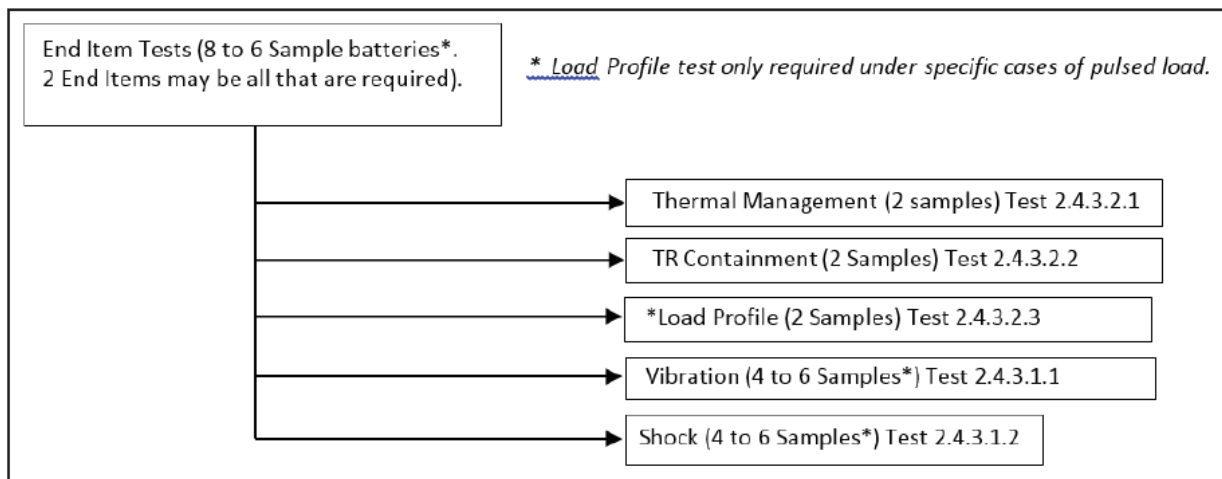
(...) Testing shall be accomplished in the order indicated in Figure 2-27.

(...)

All actual batteries used in the End Item safety tests will have previously passed the End Item vibration and shock tests.

### 2.4.4 Test Samples and Test Sequences

(...)



**Figure 2-27: End Item Tests are independent, and do not follow a sequence**

## 2.3 Industry

EASA advertised their intent to recognize the use of RTCA DO-227A in place of the current RTCA DO-227, which should be the MPS for the future ETSO-C142b. Until ETSO-C142b is published, the industry needs to get batteries and end-items approved in accordance with DO-227A. EASA is granting credit for this new version of DO-227A to show compliance to the applicable special conditions at installation level. FAA is following the same approach.

However, DO-227A sections 2.4.3 and 2.4.4 contain contradictory indications regarding the sequence of end-item tests<sup>1</sup>. This deviation intends to provide an acceptable interpretation.

<sup>1</sup> DO-227A requires three stages of tests: tests on the cell (2.4.1), tests on the battery containing the cells (2.4.2) and tests on the end-item containing the battery (2.4.3).



Section 2.4.3 requires that all actual batteries used in the End Item safety tests<sup>2</sup> have previously passed the End Item vibration and shock tests. Section 2.4.3 also refers to the figure 2-27 for the order of tests.

But the title of the figure 2-27, which is contained in section 2.4.4, states that 'End Item Tests are independent, and do not follow a sequence'. The figure 2-27 reflects this absence of order, opposite to the figures 2-25 for the cell test sequence and 2-26 for the battery test sequence are clearly indicating an order.

The end item safety tests, particularly the thermal runaway containment test, require a modification of the battery, such as the addition of a heating device. This modification modifies the article response to the shock and vibration tests and may not be able to sustain the shock and vibration levels. Hence, it is inappropriate to require that the actual batteries used in the End Item safety tests have previously passed the End Item vibration and shock tests. These batteries are however modified for the purpose of the test from new batteries of the same design that met the criteria for the battery tests.

Furthermore, it is noted that no thermal stress, such as a temperature cycling test, is required at the end-item level. It is therefore understood that the objective of the end item functional tests (DO-227A §2.4.3.1 containing the vibration and shock tests) is not to condition the battery pack but to verify that the installation of battery pack in the end-item does not result in a more stringent environment than the one exercised during the battery tests.

In conclusion, the end-item tests do not have to follow a specific sequence, as rightfully described in figure 2-27.

It should also be noted that the ETSO-C142a and DO-227 only requested a so-called fire test at end-item level, without shock or vibration testing.

## 2.4 Equivalent Level of Safety

An equivalent level of safety is provided by the more stringent testing requirements imposed by DO-227A compared to the requirements of the DO-227 as amended by the appendix 1 of ETSO-C142a, while correcting the inconsistencies in the definition of the sequence of end-item tests.

## 2.5 EASA position

We accept the deviation.

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<sup>2</sup> The End Item safety tests are those of section 2.4.3.2 End Item Safety Tests, and encompass the End Item Thermal Management Test (2.4.3.2.1), the End Item Thermal Runaway Containment Test (2.4.3.2.2) and the the End Item Load Profile Test (2.4.3.2.3).