

**Summary of the 11th Plenary
Special Committee 235 - Non-Rechargeable Lithium Batteries
Active Monitor Status Meeting**

Meeting Summary:

The 11th Plenary Meeting of Special Committee 235 (SC-235) was held on October 8, 2020. The meeting was conducted as a Virtual Meeting with the following attendees participating via WebEx:

John Trela (Chairman)	The Boeing Company
Norman Pereira (Government Authorized Representative)	Federal Aviation Administration
Jeff Densmore (Secretary)	Radiant Power Corporation
Karan Hofmann (Program Director)	RTCA, Inc.
Antonio Chiesa	Transport Canada
James Christo	NASA
Claude Cresp	ELTA
Samuel Davenel	Orolia
Nazih Khaouly	Federal Aviation Administration
Thomas Maloney	Federal Aviation Administration
Larry Masters	Gulfstream Aerospace Corporation
Fredric Menard	Orolia
Fernando Menendez Rodriguez	European Aviation Safety Agency
Thomas Pack	ACR Electronics
Paul Pfeifer	Textron
Sergio Roberto	ANAC-Brazil
Jim Russell	The Boeing Company
Luis Samico	Mitsubishi
Leire SeguraMartinez de Ilarduya	Airbus
Adrian Sfetcu	Bell Helicopter Textron
Clayton Vondrasek	Garmin

Opening Plenary

- The 11th Plenary meeting of SC-235 was convened on October 8, 2020 at 12:00pm EDT by Chair John Trela (Boeing). Jeff Densmore (Radiant Power) was the SC-235 Recording Secretary.
- Norman Pereira was introduced as the Government Authorized Representative.
- An RTCA overview, including RTCA's Proprietary References Policy was read by Karan Hofmann, the Program Director.
- Welcoming remarks were made by John Trela. Each person in attendance was invited to introduce themselves.
- The meeting agenda was reviewed.
- The Meeting Summary for SC-235 Plenary #10 was reviewed and approved with one minor change. After discussing, it was agreed that the "Deviation Request ETSO-C142a#3" discussion should be amended to add the following statement "...Changes to DO-227A must still be defined by the committee during subsequent meetings. The committee will need to address questions regarding usage of the End Item Test Articles throughout the test sequence...". The meeting summary has been amended accordingly and posted on the RTCA Workspace.
- All documents and presentation material reviewed during Plenary #11 have been uploaded and is available on the RTCA Workspace at the following location:
https://workspace.rtca.org/apps/org/workgroup/sc235_nonrechargeble_lithium_batteries/documents.php?folder_id=9502

Continued Review of Prior EASA Deviation Requests Against ETSO-C142a

The committee reviewed several EASA Deviation Requests that were previously submitted against ETSO-C142a. These requests addressed potential changes and clarifications to DO-227A. Note that these deviation requests are available on the RTCA Workspace.

Deviation Request ETSO-C142a#4

This deviation request addressed paragraph 2.4.1.2.1, Cell Discharge Current Test. This test procedure specifies discharging the cells in step (d) at 3 volts. Elsewhere in the document, test voltages are referenced as the nominal cell voltage. The noted paragraph is an issue for those Lithium Cells that do not have a nominal voltage of 3 volts (e.g. LiFeS₂). The committee concurred that this reference should be changed to a more "generic" terminology used elsewhere in the document that the change would be considered a clarification and not a change in requirement.

Deviation Request ETSO-C142a#5

This deviation request addressed the Open Circuit Voltage (OCV) criteria for the Cell and Battery Temperature Cycling tests. These paragraphs specify a maximum of 2% allowable change in OCV. The request suggested changing 2% to 5% for these tests. Rationale included a discussion regarding the possible cumulative OCV variation throughout the entire test sequence because OCV variation is only specified for each individual test. The committee stated that the OCV variation requirements existed in the original DO-227 document and carried forward into DO-227A. The committee further agreed that the cumulative

variation could be an issue and likely not considered during creation of the original DO-227 requirements. However, the committee concluded that the Pre/Post Capacity tests were more substantive in assessing the cumulative effects of environment on the Cells and Batteries. After much discussion, the committee concluded that they disagreed with the request to change the OCV variation requirement for Temperature Cycling. At the conclusion the discussion, it was requested that committee members that have experience with these tests provide feedback on observed OCV variation (see action items below).

At the conclusion of Plenary #10, committee members were encouraged to submit other discussion items for review at the next Plenary meeting. Radiant Power submitted four additional items for discussion as summarized below:

- 1) For the End Item Vibration tests, DO-227A does not discuss the allowance of alterations to the End Item to allow for instrumentation cabling to monitor the device's internal batteries.

This item ties-in with the extended discussion of Deviation Request ETSO-C142a#3 during the review of the Plenary #10 Meeting Summary. The allowance to alter the End Item to is implied based the requirements to monitor internal battery OCV variation during test. Radiant Power's comment was submitted for the committee to consider removing any possible ambiguity. This item will be included in the more general discussion regarding clarifications and potential changes to the End Item test section.

- 2) For some low-current batteries, the standard discharge current – and sometimes the peak short circuit current, is less than 100 mA. The End Item Thermal Management Test requires the test to continue until the battery current is less than 100 mA. The 100mA threshold is not low enough for these low current cells. Perhaps a end state based on percentage may be better.

The committee discussed this comment and agreed a more “generic” end of test criteria would accommodate low current cells / batteries as suggested. This item will be included in the DO-227A Active Monitor comments spreadsheet for further feedback (see actions below).

- 3) The Battery Impact test is arguably more damaging to the battery than the Battery Drop Test; however, Table 2-4 has an ‘F’ in the OCV column for the Battery Impact Test but is blank for the Battery Drop Test. The ‘F’ in the OCV column for the Impact Test does not have a ‘1’ superscript after it like all of the other tests with an ‘F’ in this column; therefore, there is no defined requirement for what constitutes a failure. It should also be noted that the test procedure does not require OCV data as a reportable. Also again, the Battery Drop Test is the only table entry that is completely blank. It is suggested that both of these OCV table entries (Battery Impact and Battery Drop) should have a dash “-“.

The committee discussed this item and agreed that there was an inconsistency between Table 2-3 (Cell) and 2-4 (Battery) and the textual requirements in 2.4.1.2.4, 2.4.2.2.2, and 2.4.2.2.3. There was an agreement with the changes suggested in the submitted comment. However, there was uncertainty if such a change would be considered Errata, editorial, or a requirement change. This item will be included in the DO-227A Active Monitor comments spreadsheet for further feedback (see actions below).

- 4) The Battery Capacity test specify a constant current discharge profile in 2.4.2.1.1; however, this could contradict the test requirement in 2.2.2.1.1 to perform the check following the manufacturer's recommended procedure. Some manufacturers of low discharge current cells specify a constant-resistance discharge. It is recommended that the spec be changed to eliminate the constant current requirement and refer to the manufacturers recommended procedure instead. This comment applies to both the Pre and Post Battery Capacity tests.

The committee discussed this item and agreed there could be an inconsistency between paragraphs 2.2.2.1.1 and 2.4.2.1.1 if the manufacturer specifies capacity to be measured in a means other than a constant current discharge method. This item will be included in the DO-227A Active Monitor comments spreadsheet for further feedback (see actions below).

Action Item Summary

There were three (3) actions assigned during this Plenary as summarized below:

- (1) Send request to SC-235 members to share test results summarizing OCV variation during temperature cycling. Cell / Battery chemistry tested should also be included.
Assigned to: Jeff Densmore
- (2) Provide a line-numbered PDF of DO-227A only to SC-235 committee members to assist in comment generation and review
Assigned to: Karan Hofmann
- (3) Consolidate discussion items from Plenary #10 and Plenary #11 into a comment spreadsheet for committee review and feedback. Additional comments will be included as received.
Assigned to :Jeff Densmore

Next Plenary

Plenary #12 has been scheduled as a Virtual Meeting on November 10, 2020. A detailed agenda and WebEx meeting information will be issued closer to this meeting date.

-S-
Jeff Densmore
Secretary

CERTIFIED as a true and accurate summary of the meeting.

-S-
John Trela
Chairman