

**Summary of the 14th Plenary
Special Committee 235 - Non-Rechargeable Lithium Batteries
Active Monitor Status Meeting**

Meeting Summary:

The 14th Plenary Meeting of Special Committee 235 (SC-235) was held on 22 February 2021. 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.
Rodolfo Duran	Astronics DME
Leire SeguraMartinez de Ilarduya	Airbus
Nazih Khaouly	Federal Aviation Administration
Larry Masters	Gulfstream Aerospace Corporation
Thomas Pack	ACR Electronics
Paul Pfeifer	Textron
Fernando Menendez Rodriguez	European Aviation Safety Agency
Jim Russell	The Boeing Company
Adrian Sfetcu	Bell Helicopter Textron
Clayton Vondrasek	Garmin
Charlie Wright	Astronics DME

Opening Plenary

- The 14th Plenary meeting of SC-235 was convened on 22 February 2021 at 11:00pm EST 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 #13 was reviewed and approved.
- All documents and presentation material reviewed during Plenary #13 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=9721

Plenary #13 Action Item Review

There were four (4) action items assigned during Plenary #13. The status of each are reviewed below:

- (1) EASA to request Deviation ETSO.Dev.C142a#5 applicant to provide OCV Variation Summary test data to support continued discussion of the requested OCV Variation change
Assigned to: Fernando Menendez Rodriguez
Status: **CLOSED**

EASA provided the OCV variation data provided by the applicant requesting the subject deviation. This data indicated that both cell level and battery level OCV variation exceeded the 2% threshold for the Temperature Variation testing. EASA also provided data from another application revealing similar results. Additionally, Radiant Power shared results from their testing. All of these tests indicate that the LiFeS₂ chemistry is unable to meet the OCV variation requirement within DO-227A. Copies of this data is provided in the workspace folder noted above.

- (2) Propose revised wording to End Item Vibration Test to address allowable alterations for review during Plenary #14.
Assigned to: Jeff Densmore
Status: **CLOSED**

Proposed revisions to the text within 2.4.3.1.1. (End Item Vibration Test) was reviewed and accepted during the Plenary. The revised wording has been uploaded into the Workspace folder listed above.

- (3) Update Table 2-4 to correct entry errors for Battery Drop and Battery Impact tests. Also include note to define "-". Updates to be during Plenary #14.
Assigned to: Jeff Densmore
Status: **CLOSED**

Proposed revisions to Table 2-3 (Cell Test Evaluation Criteria), Table 2-4 (Battery Test Evaluation Criteria), and Table 2-5 (End Item Test Evaluation Criteria) was reviewed and accepted during the Plenary. The revised wording has been uploaded into the Workspace folder listed above.

- (4) Update Table 2-3 to correct entry errors for the Cell Drop test. Also include note to define "-". Updates to be during Plenary #14.

Assigned to: Jeff Densmore

Status: **CLOSED**

See Action Item (3) discussion above.

DO-227A Comment Review

The committee reviewed the comments to DO-227A compiled in the “Monitor Comments” spreadsheet located in the SC-235 Workspace folder. Below is a summary of this review.

Table 2-3 and 2-4: OCV Variation Requirement during Thermal Variation Testing

As discussed above, test data for LiFeS₂ cells and batteries were presented during the meeting. This data was collected by three different parties and all demonstrated that this battery chemistry is unable to meet the $\pm 2\%$ OCV variation requirement during Thermal Variation testing. The committee agreed that this requirement is too restrictive for these chemistries but could not determine how to proceed. It was concluded that the document could not be changed at this point and that any deviations to this requirement should be addressed on a case-by-case basis. Long term, this discussion will be tabled and not addressed unless or until DO-227A is opened for updated by the PMC.

End Item Vibration

As discussed above, the proposed changes were reviewed and accepted. It was agreed that this change was considered a clarification and not a requirement change.

Table 2-4: Battery Test Evaluation Criteria for Battery Drop and Battery Impact tests

As discussed above, the proposed changes were reviewed and accepted. It was agreed that this change was considered a clarification and not a requirement change.

Table 2-3: Cell Test Evaluation Criteria for Cell Drop tests

As discussed above, the proposed changes were reviewed and accepted. It was agreed that this change was considered a clarification and not a requirement change.

Table 2-3: Cell Test Evaluation for Cell Discharge Current and Cell Polarity Reversal tests

During the meeting, the cell test evaluation criteria for the Cell Discharge Current and Cell Polarity Reversal tests was discussed. It was pointed out that the criteria allowed for Leak and Vent failures to be mitigated

at either the Battery or End Item level. However, Fire or Rupture failures were not allowed this same ability to mitigate at the next level. It was suggested that this allowance to mitigate at the Battery or End Item level be considered. After discussing, it was agreed that this was a requirement change and the topic should be tabled and not addressed unless or until DO-227A is opened for updated by the PMC. These comments were captured in the ‘Monitor Comments’ tracking spreadsheet.

Figure 2-27 and Paragraph 2.4.3: End Item Test Sequence

This topic was discussed in detail during Plenary 12, but tabled due to lack of consensus. The committee returned to this discussion during this meeting. There is an ambiguity between the text in Paragraph 2.4.3 and Figure 2-27. The paragraph includes a statement that *the End Item safety tests will have previously passed the End Item vibration and shock tests*. However, Figure 2-27 shows that all tests are performed in a non-sequential (parallel) order. It was suggested that the committee review the FRAC comments and resolutions to help resolve this issue. From the FRAC comments, it was clear that these requirements were discussed. There were changes made at that time to reflect a non-sequential (parallel) path for performing the End-Item tests. It appears that the changes made during FRAC were incomplete, leading to the present ambiguities. It should be noted that some committee members continue to dissent to performing these tests in a non-sequential order. It was eventually agreed that any changes to correct the document would be a requirement change. Therefore, it was decided that this issue remain tabled and the document remain as is. This issue will be resolved if DO227A is opened for update by the PMC.

Paragraph 2.4.2.1.1: Pre-Test Battery Capacity Test

NOTE: During Plenary #13, this topic was discussed, but not captured in the previous Meeting Summary. It is included here for completeness.

The procedure for this test requires that the capacity be measured using a constant current discharge. However, in the requirement (2.2.2.1.1), it states that capacity should be measured in accordance with the manufacturer’s recommendation. In some cases, manufacturers specify capacity using constant resistance measurement (or even other methods). It was suggested that the test Procedure be changed to allow for other methods of testing capacity if the manufacturer’s recommended method differs from constant current discharge method. The committee agreed with this recommendation and concurred that this change is a editorial clarification and not a requirements change.

Next Steps

All comments to DO-227A have now been reviewed and dispositioned by the committee. They are summarized in the following table. All accepted comments were deemed editorial in nature and not a requirement change. Those items tabled were deemed a change in requirements.

Committee Disposition of Comments	Quantity
Accepted	8
Rejected	1
Tabled	7
Total Comments	16

The committee agreed to request PMC approval for an updated SC-235 Terms of Reference (TOR) to open up DO-227A for revision with a delivery due date of March 2022. This will be presented to the PMC at their 18 March 2021 meeting.



Action Item Summary

All previous action items have now been closed and there were no actions assigned during this Plenary.

Next Plenary

Plenary #15 has been scheduled as a Virtual Meeting on 29 March 2021. 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