Summary of the 27th Plenary
Special Committee 235 - Non-Rechargeable Lithium Batteries

Meeting Summary:

The 27th Plenary Meeting of Special Committee 235 (SC-235) was held on March 7-9, 2023. The meeting was held "in-person" at Radiant Power's facilities in Sarasota, FL. The meeting was also conducted as a Virtual Meeting with many 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
Carlos Javier Munoz Garcia (*)	EASA
Nazih Khaouly (*)	Federal Aviation Administration
Christopher Kusak (*)	U.S. Air Force
Thomas Maloney	Federal Aviation Administration
Frederic Menard	Orolia
Kathryn Mulhollen	U.S. Air Force
John Nielsen (*)	Ultralife
Richard Olson (*)	Textron
Paul Pfeifer (*)	Textron
Ray Rodriguez (*)	U.S. Air Force
Jim Russell (*)	The Boeing Company (retired)
Leire Segura (*)	Airbus
Adrian Sfetcu (*)	Bell Helicopter Textron, Inc
Greg Smith	U.S. Air Force

(*) Attended Virtually

Opening Plenary

- The 27th Plenary meeting of SC-235 was convened on March 7, 2023 at 9:00am 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 #26 was reviewed and approved as written.

- All documents and presentation material reviewed during Plenary #27 have been uploaded and are available in the RTCA AerOpus documents folder for this meeting.

Plenary #26 Action Item Review

There were three Action Items assigned during Plenary #26, with status as follows:

Draft the Executive Summary for the Release of DO-227B
    Assigned to: Nazih Khaouly
    Status: OPEN

Create the Change Log from DO-227A to DO-227B
    Assigned to: Jeff Densmore and John Trela
    Status: OPEN. Note that this log cannot be generated until the changes are to DO-227B are finalized. This action will be worked once the FRAC process is completed and the document approved.

Develop a Plan to Resolve FRAC Comments Regarding Orientation During Thermal Runaway and Disabling Cell and Battery Protective Devices
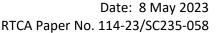   **Assigned to**: Working Group
    Status: OPEN. These topics remain an open discussion topic during working group meetings.

DO-227B Comment Resolution

There were 561 total comments received during FRAC against DO-227B. Beginning in October 2022, the SC-235 Working Group began the comment resolution process focusing on Editorial Comments and other items that could be addressed based on those in attendance. The comments are categorized as shown below, with a summary of those remaining unresolved.

Type	Total	Unresolved	% Unresolved
Non-Concur	2	0	0%
High	59	8	14%
Medium	225	81	36%
Low	124	23	19%
Editorial	151	5	3%
Total	561	117	21%

The objectives of Plenary #27 were to resolve comments with the following priorities:
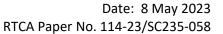
- Thermal Runaway / Orientation Related Comments
- Comments Generated by EASA (during the Wednesday session).
- Distortion Related Comments
- All other comments, time permitting.

Note that the "DO-227B FRAC Comment List Plenary 26_2023-03-03.xlsx" spreadsheet was used for tracking comments for this Plenary Meeting. A copy of this file has been uploaded in AerOpus for reference. All comments referenced herein are identified by the comment "Line Number" in this spreadsheet.

Also note that comment resolution occurring during this Plenary Meeting have been tracked in the "DO-227B FRAC Comment List Plenary 27.xlsx". As an aide, the "Line Number" column was color coded to indicate which day each comment was discussed: (1) Orange on 7Mar, (2) Blue on 8Mar, and (3) Purple on 9Mar.

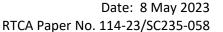### *Thermal Runaway Comments Resolution Summary*

Line	Category	Resolution	Disposition
1150	Medium	This is important if the full cell test is not present.	Partially Accepted
2300	Medium	Reword to avoid using the word conformity	Accepted
2311	Medium	Change to: […] in which case an alternate method for achieving thermal runaway (see Appendix B) shall selected.	Accepted
2319	Medium	Align requirements	Partially Accepted
2319	Low	Delete the word "engineering" before test.	Accepted
2322	Medium	...the worst-case cell location (trigger cell) may consist of testing at 55°C, modeling…..	Accepted
2322	Low	Expand to include cell testing and development hardware testing.	Superseded
2335	Medium	Merge / re-write steps e and g and fully integrate appendix alternative trigger method language.	Accepted
2342	Low	Wires for heating, voltage, and temperature monitoring shall be passed through the End Item housing. Any added penetration of the End Item shall (or should?) be sealed to retain internal pressure. Suitable sealant may be high temperature RTV silicone rubber or equivalent.	Partially Accepted
2347	Medium	Remove "shall" for mixing fan capability or define how is this shown.	Partially accepted
2350	Low	included wording that the reader may be required to conduct FOUR test events.	Partially Accepted
2354	Low	Add a note that this would be an additional third tes	Superseded
2383	Low	Add timing guidance of when to turn on mixing fan	Accepted

EASA Comments Resolution Summary

Line	Category	Resolution	Disposition
917	Low	The reporting of documented evidence of examination details should be relocated to the section Reportable Items. The parameters in the highlighted text are already included in Table 2-5 (the evaluation criteria) on page 6. Therefore, the requirement should be limited to: *The end item shall successfully meet the test evaluation criteria when tested per section 2.4.3.1.2.*	Accepted
976	Medium	make it a requirement that the test has to be conducted before compliance to a) and b) is determined.	Superseded
1107	Medium	make the 45 cells a requirement and move then the requirement that 45 cells have to be tested, to 2.2.1.1.2	Rejected
1366	Medium	Make this statement related to Max continuous current coherent with the rest of the document.	Rejected
2034	Medium	Complete figure 2-20 with parallel configuration.	Accepted
2904	Medium	Provide also a drawing how the case X parallel strings of X serial cells is to be covered. Disconnection strategy to be suggested in the document.	Superseded
2945	Medium	Figure B2 to be completed with more configuration possibilities including information about disconnection strategy.	Partially Accepted
3059	Low	replace "product" with a more consistent word in line with Part 21	Accepted
1244	Medium	To be discussed in the group and confirm approach is adequate.	Superseded
3385	Medium	Cosmetic definition to be included in appendix D	Accepted
579	Medium	clarify meaning	Rejected
1	Medium	Harmonize definitions and usage of the wording.	Rejected
862	High	To check and propose a consistent approach about disabling protection for all paragraph affected along the document.	Accepted
1	Low	Replace safety devices with protective devices (9 instances) and replace protection device with protective device (6 instances)	Partially Accepted

Distortion Related Comments Resolution Summary

Line	Category	Resolution	Disposition
Medium	Medium	If it is required, add an inspection / teardown step in the test procedure. If it's not a requirement, then delete this reportable.	Accepted
Low	Low	1) Part of the content of the text highlighted in yellow is vague and does not specify what should be inspected (signs of failure, other indications of adverse reaction). The remaining part should be added to Table 2-5 by creating new sub column C (Cell) under Distort (Distortion) and Rupture, which are manifestations of mechanical damage, and assigning code F for Vibration and dashes for the other rows. 2) The text highlighted in green is not evaluation criteria but a reportable item and should be relocated to the correct section.	Partially Accepted
Medium	Medium	Add note to allow this examination to be deferred until after shock	Superseded
Medium	Medium	Add new reportable item and add a note that says the inspection can take place after shock test if they are run back-to-back	Superseded
Medium	Medium	Add observation time if there is no justification for its absence.	Superseded
Medium	Medium	Change pass/fail for Battery Drop under the Distort check to Allowable.	Partially Accepted

At the conclusion of the Plenary, the committee was able to review and resolve 33 Comments. The status of all comments at the close of the meeting is summarized below:

Type	Total	Unresolved	% Unresolved
Non-Concur	2	0	0%
High	59	6	10%
Medium	225	56	25%
Low	124	14	11%
Editorial	151	5	3%
Total	561	81	14%

FRAC comment resolution will continue through the working group meetings, with a goal of completion by the next Plenary Meeting.

Action Item Summary

There were two new actions generated during Plenary #27:

(1) Perform an Engineering tests of JUST battery cells interconnected with TABs in a parallel / series combination to assess proposed Short Circuit with Protections Disabled requirements
        Assigned to: Jeff Densmore and Tom Maloney

(2) Create a Proposed Figure for Illustrating the Various End Item Orientations
        Assigned to: Jeff Densmore

Working Group Meetings
It was agreed that Monday and Wednesday Working Group meetings will continue in an effort to continue resolution of FRAC comments. Karan will schedule these through the next Plenary Meeting.

Next Plenary
Plenary #28 has been scheduled as a Virtual Meeting on 16-18 May 2023.

-S-
Jeff Densmore
Secretary

CERTIFIED as a true and accurate summary of the meeting.

-S-
John Trela
Chairman