

## Summary of the 20<sup>th</sup> Plenary Special Committee 235 - Non-Rechargeable Lithium Batteries

### Meeting Summary:

The 20<sup>th</sup> Plenary Meeting of Special Committee 235 (SC-235) was held on March 7, 2022. The meeting was conducted as a Virtual Meeting with the following attendees participating via WebEx:

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|---|---------------------------------|
| 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.                      |
| James Bond  | EaglePicher Technologies        |
| Camilo Camargo  | ECA Aerospace                   |
| Antonio Chiesa  | Transport Canada                |
| James Christo   | NOAA                            |
| Brian Conlee  | Saft America, Inc               |
| Bryan Easterwood                                      | Federal Aviation Administration |
| Olivier Holin   | ECA Aerospace                   |
| Nazih Khaouly   | Federal Aviation Administration |
| Thomas Maloney  | Federal Aviation Administration |
| Keith McKnight  | Federal Express Corporation     |
| Frederic Menard                                       | Orolia                          |
| Fernando Menendez Rodriguez                           | EASA                            |
| John Neilson  | Ultralife                       |
| Paul Pfeifer  | Textron                         |
| Ray Rodriguez   | U.S. Air Force                  |
| Jim Russell   | The Boeing Company (retired)    |
| Leire Segura Martinez de Ilarduya                     | Airbus                          |
| Adrian Sfetcu   | Bell Helicopter Textron         |
| Greg Smith  | U.S. Air Force                  |
| Clayton Vondrasek                                     | Garmin                          |
| Joseph Wells  | EaglePicher Technologies        |

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## Opening Plenary

- The 20<sup>th</sup> Plenary meeting of SC-235 was convened on March 7, 2022 at 10:00am 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 #19 was reviewed and approved as written. It was pointed out that the meeting's start time was incorrectly stated as 11:00pm versus 11:00am. This typographical error was corrected and minutes reissued on AeroOpus.
- All documents and presentation material reviewed during Plenary #20 have been uploaded and are available on in the RTCA AeroOpus documents folder.

## Plenary #19 Action Item Review

There were no action items assigned during Plenary #19.

## SC-235 Schedule Review

John Trela discussed the committee's progress towards updating and releasing DO-227B. He revisited the schedule discussed during Plenary #18 and indicated that additional schedule changes may be needed. He presented the following updated timeline representing achievable milestones:

- Upcoming RTCA PMC Meetings: Mar 17, 2022, Jun 23, 2022, Sep 15, 2022, and Dec 15, 2022
- Plenary #19: January 18<sup>th</sup> (Completed)
- Plenary #20: March 7<sup>th</sup> (Completed)
- Plenary #21: April 19<sup>th</sup> and 20<sup>th</sup> (Committee Review of Draft DO-227B)
- Plenary #22: May 23<sup>rd</sup> (Open FRAC)
- FRAC Process:
  - Submit Draft DO-227B to RTCA for FRAC May 31<sup>st</sup>
  - FRAC Start June 7<sup>th</sup>
  - FRAC comments due July 7<sup>th</sup>

- Plenary #23: End of August
- Plenary #24: End September / Early October (for SC 235 approval)
- Release Process:
  - Document to RTCA November 1<sup>st</sup>
  - Target RTCA PMC Approval December 15<sup>th</sup>

The committee discussed this timeline and agreed this schedule was achievable.

### **Single Cell Pass / Fail Criteria for performance / non-safety tests**

The committee once again revisited the Cell Open Circuit Voltage (OCV) Pass / Fail criteria. This continued and protracted discussion on this requirement clearing indicates that the Committee is nowhere near consensus on this existing requirement. The competing viewpoints can be summarized as follows:

- Regulatory Agencies are hesitant to change this long-standing requirement as it dates back to the original DO-227 document released in 1995. Additionally, there are safety concerns to loosening this requirement (in the negative direction, e.g., < 98%) based on inputs from some of the cell (Saft and Ultralife) manufacturers.
- End-Item Manufacturers and Airframe Manufacturers would like to either have a wider Pass / Fail criteria or a means to mitigate OCV failures at next higher levels.

The committee has yet to identify a means to navigate this issue as it continues to be discussed during Plenary and Working Group meetings.

Discussions during this Plenary included the following topics:

- Jim Russell introduced the idea of using a Pulsed Load test in place of or in addition to an OCV test for cells exposed to the required environmental conditions. Jim shared some test data collected by Jeff Densmore for numerous cell chemistries and sizes that were subjected to three successive 1 second, 1C pulsed loads. Subsequent discussions recognized the potential value in such tests, but the concerns presented included a lack of a clear Pass / Fail criteria for such a test. This data is available on AerOpus
- Brian Conlee presented OCV test data for LiMnO<sub>2</sub>, SOCl<sub>2</sub>, and SO<sub>2</sub> chemistries subjected to UN38.3 tests. This data showed that SO<sub>2</sub> Cells come very close to 2% variation after temperature cycling while the other two chemistries performed better. Brian also shared that internal factory Pass / Fail criteria for OCV variation of production cells exceeds 2% (as high as 2.75%). This document is available on AerOpus.
- John Neilson discussed the benefits of Closed-Circuit Voltage (CCV) in assessing cells. He stated that Ultralife uses both OCV and CCV tests to determine if production cells are acceptable for shipment. John showed examples of failure modes that could PASS an OCV test, but FAIL a CCV test.
- John Trela and Jeff Densmore also reminded the committee that AA and AAA Li-FeS<sub>2</sub> cannot comply with the 2% OCV requirement and have been subject to earlier EASA TSO Deviation Requests.

The committee agreed to table this issue once again to allow time to review the proposed “Best Practices” appendix to be included in DO-227B.



## **Best Practices for Thermal Runaway Testing.**

Jim Russell presented the current draft of the Best Practices appendix for inclusion into DO-227B. Due to the lengthy discussion on OCV above, there was only limited time to review this document. Jim quickly navigated through the compiled “best practices” and encouraged everyone to review and provide comments.

## **Action Item Summary**

The following actions were generated during Plenary #20:

- (1) EaglePicher to review their internal OCV test data and share observations with the committee.  
Assigned to: Joseph Wells
- (2) Propose an amended OCV requirement to capture how to proceed with cells that exceed the OCV 2% requirement. Suggest an alternate way to demonstrate safety. Action identified, but not assigned  
Assigned to: Action identified, but not assigned

## **Working Group Meetings**

Weekly Working Group meetings will continue on Monday’s at 10am (EDT) for 1 hour to continue to draft DO-227B and on Wednesday’s at 10am (EDT) to continue to draft the “Best Practices” appendix

## **Next Plenary**

Plenary #21 has been scheduled as a Virtual Meeting on 19-20 April 2022. 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