

## Summary of the 22<sup>nd</sup> Plenary Special Committee 235 - Non-Rechargeable Lithium Batteries

### Meeting Summary:

The 22<sup>nd</sup> Plenary Meeting of Special Committee 235 (SC-235) was held on May 18-19, 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.
Camilo Camargo	ECA Aerospace
Antonio Chiesa	Transport Canada
Bryan Easterwood	Federal Aviation Administration
Nazih Khaouly	Federal Aviation Administration
Christopher Kusak	U.S. Air Force
Thomas Maloney	Federal Aviation Administration
Frederic Menard	Orolia
Fernando Menendez Rodriguez	EASA
Kathryn Mulhollen	U.S. Air Force
John Neilson	Ultralife
Tom Pack	ACR Electronics
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, Inc
Greg Smith	U.S. Air Force
Stuart Taylor	HR Smith Group
Brandi Teel	RTCA, Inc.
Clayton Vondrasek	Garmin Ltd
Jeremy Zee	NIAR

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## Opening Plenary

- The 22<sup>nd</sup> Plenary meeting of SC-235 was convened on May 18 and May 19, 2022 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 Brandi Teel on behalf of 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 #21 was reviewed. At the request of the committee, the minutes attempted to capture all the changes discussed and incorporated into the Draft DO-227B document during the meeting. This resulted in lengthy, detailed minutes, which made it difficult to review and approve. After much discussion, it was suggested that the change log be moved into a separate document and that the minutes reflect that an action was taken to capture them separately. The committee agreed with this approach and approved the amended minutes provided that the minutes and change log be made available in AerOpus. Jeff Densmore updated the minutes as discussed and uploaded both the approved minutes and draft DO-227B change log into AerOpus
- All documents and presentation material reviewed during Plenary #22 have been uploaded and are available on in the RTCA AerOpus documents folder.

## Plenary #21 Action Item Review

The following action items were carried forward from Plenary #20 and assigned during Plenary #21, with an updated status shown.

- (1) EaglePicher to review their internal OCV test data and share observations with the committee.  
Assigned to: Joseph Wells  
Status: **OPEN**. Joe was unable to attend Plenary #21, so this action will remain open
- (2) Capture all changes incorporated into the Draft DO-227B as discussed and agreed upon during the Plenary #21 meeting.  
Assigned to: Jeff Densmore  
Status: **CLOSED**. These changes have been captured and uploaded into AerOpus
- (3) Propose wording for paragraph 2.b. for small, 5Whr batteries to be consistent with the TSO-C142b  
Assigned to: Norm Pereira  
Status: **CLOSED**. Norm provided suggested wording via email prior to the close of Plenary #22
- (4) Need to Create a Small Working Group to review the Draft DO-227B document for consistency  
Assigned to: Action identified, but not assigned  
Status: **OPEN**. The draft DO-227B continues to be updated in preparation for FRAC
- (5) Clarification requested for comments made regarding the Battery Cell Reversal Test Procedure  
Assigned to: Fernando Menendez Rodriguez  
Status: **CLOSED**. Fernando provided clarification via email to John Trela prior to this Plenary.

## SC-235 Schedule Review

John Trela discussed the committee's progress towards updating and releasing DO-227B. He revisited the schedule discussed during Plenary #21 and identified minor updates since the last Plenary. 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 (Completed)
- Plenary #22: May 18<sup>th</sup> and 19<sup>th</sup> Committee Review of Draft DO-227B
- Plenary #23: Week of June 27<sup>th</sup> (Open FRAC)
- FRAC Process:
  - Submit Draft DO-227B to RTCA for FRAC July 5<sup>th</sup>
  - FRAC Start July 7<sup>th</sup>
  - FRAC comments due August 8<sup>th</sup>
- Plenary #24: Week of Sept 12<sup>th</sup> – In Person (FRAC Resolution)
- Plenary #25: Week of Oct 10<sup>th</sup> – Complete FRAC Resolution and Approve DO-227B to PMC
- 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. However, it was suggested that the typical 30-day FRAC comment period be extended to 45 days due to the summer holiday season. If the comment period is extended, adjustments to the above schedule may be necessary to still meet the December PMC meeting date.

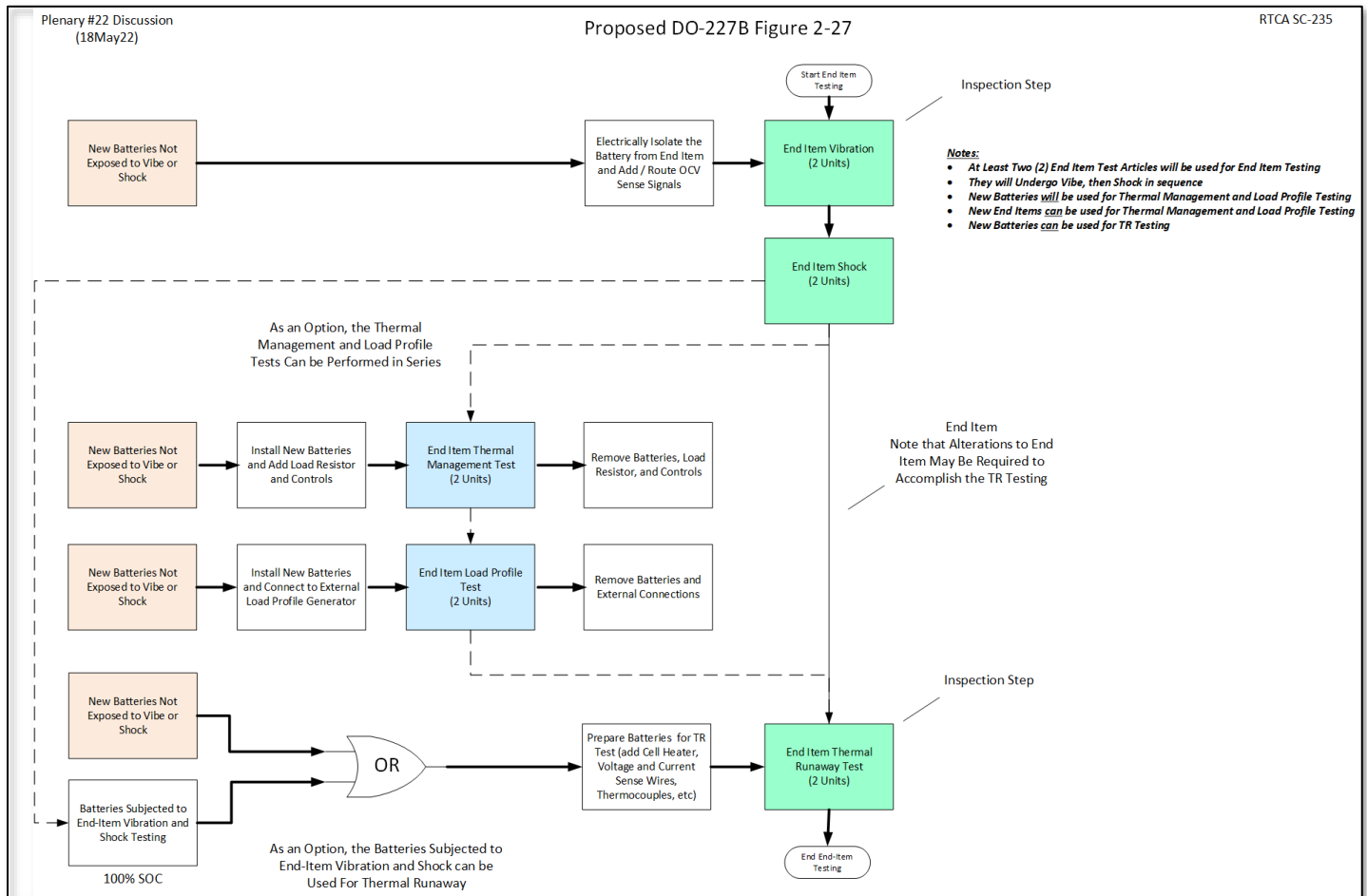
## Draft DO-227B Review

The latest draft copy of DO-227B was uploaded into AerOpus the week prior to Plenary #22 to facilitate the committee's review of the document. For Reference, this document was titled "*DO-227B MOPS with changes May 9 2022.pdf*." The committee spent two full days discussing the proposed changes to the document beginning with the End Item Test Procedures and Criteria (paragraph 2.4.3) and agreeing to further edits. Highlights of these discussions are summarized below.

### *End Item Test Sequence:*

The committee attempted to resolve the long-standing discussion surrounding the End Item Test Sequence requirement. During working group meetings, the committee has begun to converge on a test sequence that included two (2) end items undergoing sequential Vibration and Shock Testing. These end item enclosures would then be used for thermal run away. Meanwhile the Thermal Management and Load Profile testing could be accomplished with new batteries and new end item enclosures. To facilitate the discussion, the following flow diagram was presented to illustrate the proposed test plan. By the end of the discussion, there was consensus on this test sequence, and it was agreed that a more detailed figure similar to that below be included in DO-

227B. At the end of this discussion, the committee paused to recognize and celebrate reaching consensus on this once contentious topic.



### End Item Test Evaluation Criteria:

The committee presented the updated End Item Test Evaluation Criteria (Table 2-5) during the plenary. During working group meetings, it was agreed to expand this table to include both Battery and End Item criteria. The intent of these changes is to provide greater clarity of the expected Pass / Fail criteria to be used for end item testing.

### End Item Thermal Runaway Containment Test Procedure:

Suggested changes to the End Item Thermal Runaway Containment Test procedure were discussed at length. Key items discussed included:

- How to address testing of the end item orientation(s)
- The pros and cons of using a mixing fan within the Thermal Runaway test chamber
- Methods of determining the volume of released / vented gases and measuring gas concentrations.
- Methods of measuring temperatures of released / vented gases

The committee found it difficult to reach consensus on the discussion items above. This is because some of the measured parameters require conflicting methodologies to maximize their accuracy. For example, to achieve an accurate volume calculation of released / vented gases, chamber temperature stabilization is needed. However, some released gases can dissipate quickly requiring sampling to occur quickly after the Thermal Runaway event. The committee requested that the working group continue discuss these issues and present a recommended procedure at the next plenary.

### *Best Practices Appendix*

The committee discussed the best practices appendix that Working Group 2 has been authoring. There was clear agreement that the document contained valuable information and would be helpful to applicants attempting to perform the Thermal Runaway tests. However, the committee expressed concerns about including this document in DO-227B. Rather it was explored if it could be published as a guidance document, white paper, or equivalent. RTCA stated that this was possible, but that it is currently not part of the committee's charter as described in the SC-235 Terms of Reference (TOR). Therefore, if the committee agreed to pursue release of this document separately, then the TOR would need updating and PMC approval obtained. Working Group 2 was asked to identify key items within the Best Practices document that they would recommend for inclusion into the DO-227B test procedure section.

### *DO-227A to DO-227B*

The committee discussed how best to identify changes from DO-227A to DO-227B within the document. Examples of prior RTCA documents, such as DO-160, were presented. It was agreed that it would be beneficial to include a change history within DO-227B to clearly identify changes in a table / matrix format. It was further discussed that a column be added to the table to describe the committee's recommendations to show compliance to DO-227B for items previously qualified to DO-227A. It was further agreed that this information cannot be fully captured until the FRAC process is complete. However, a template will be included into the draft DO-227B for capturing this information.

## **Action Item Summary**

The following actions were generated during Plenary #22:

- (1) Capture in the minutes the request to extend the FRAC comment period from 30 days to 45 days to accommodate the summer holiday season.  
Assigned to: Jeff Densmore
- (2) Review and recommend what, if any, items from the "best practices" document should be included in the DO-227B requirements and/or test procedure sections.  
Assigned to: Working Group 2
- (3) Create a "RevA to RevB" matrix for inclusion into DO-227B as an appendix.  
Assigned to: John Trela and Jeff Densmore



**Working Group Meetings**

Weekly Working Group meetings will continue on Monday's to continue to draft DO-227B and on Wednesday's to identify what items from the "Best Practices" document should be moved into DO-227B.

**Next Plenary**

Plenary #23 has been scheduled as a Virtual Meeting on 28-29 June 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