Aircraft Installed
Battery Industry
Working Group
Updates

International Aircraft Systems Fire
Protection Working Group
Cologne, Germany
May 10 – 11, 2017

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Federal Aviation Administration
Fire Safety Branch
http://www.fire.tc.faa.gov
Industry Working Groups

• RTCA SC-225 – Rechargeable Lithium Batteries and Battery Systems

• RTCA SC-235 – Non-Rechargeable Lithium Batteries
RTCA SC-225: Rechargeable Lithium Battery & Battery Systems

Committee formed 3/2011 to provide certification guidance for rechargeable lithium batteries and battery systems that are permanently installed in aircraft

Points of Contact:
- Chair: Richard Nguyen (Boeing)
- Secretary: Stephen Diehl (Boeing)
- DFO: Norm Pereira (FAA)
RTCA SC-225 (Rechargeable)

• Committee submitted DO-311A to the PMC in June, 2015
  – Integrates coverage for all sizes of batteries.
  – Incorporates the latest understanding of lithium battery technology, battery testing and installation guidance including special condition, means of compliance issue papers and safety recommendations from NTSB.

• PMC rejected initial document for use as a minimum operational performance standard for a TSO, citing format/editorial issues and requesting a review of the categorization of batteries and the incorporation of design requirements
RTCA SC-225 (Rechargeable)

• Group has addressed these issues and document has completed Final Review and Comment (FRAC)

• However several dissenting opinions were received by members with regards to a full battery thermal runaway test that is included in the document.

• Work is ongoing to reach an agreement which will address the dissenting opinions and the group hopes to submit the revised final document to PMC in June 2017.
RTCA SC-225 (Rechargeable)

- Batteries are now separated into four different size categories
- Additionally, batteries are categorized by venting methodology
- Tests are categorized as performance or safety tests.
  - All battery size categories must perform safety related tests.
  - Performance based tests are conducted based on category type
  - Pass/Fail criteria is dependent on venting type
- Single Cell TR Containment test requires both overheating and overcharging as the initiation method
- Battery TR Containment test allows for either overheating or overcharging as the initiation method
RTCA SC-225 (Rechargeable)

Determine Battery Size Category:
- Cat I: <2Wh
- Cat II: 2 ≤ Wh < 20
- Cat III: 20 ≤ Wh < 200
- Cat IV: Wh ≥ 200

Is Battery Size Cat I?
- Yes
- No

Battery Passed UL 1642, 2054 or IEC 62133 with test report provided?
- Yes
- No

Determine Battery Venting Category:
- A: No emissions allowed to escape
- B: Emissions allowed to escape from designed venting provisions
- C: Emissions allowed to escape; no designed venting provisions

Treat as Size Cat II

Determine Required Tests based on Cat II, III or IV

Determine Pass/Fail Criteria for Tests based on Venting Cat A, B or C

Battery is exempt from DO-311A

Yes

Yes

No

No
RTCA SC-235: Non-Rechargeable Lithium Batteries & Battery Systems

Committee formed 06/2015 to revise RTCA DO-227, to provide guidance for non-rechargeable lithium batteries that are permanently installed in aircraft.

Points of Contact:
Chair: John Trela (Boeing)
Secretary: Jeff Densmore (Radiant Power)
DFO: Norm Pereira (FAA)
RTCA SC-235 (Non-Rechargeable)

• Document has been completed and is currently going through the FRAC process.
• Final meeting is planned for May 10, 2017
• Similarities exist with many of the SC-225 test procedures (heating rate for TR test, etc), however there are some significant differences as well.
RTCA SC-235 (Non-Rechargeable)

• Overheating is provided as the primary TR initiation method
  – If TR does not occur, then other methods can be employed
    • Overcharge
    • Polarity reversal

• Regardless of initiation method, objective evidence of TR must be provided per the provided definition
RTCA SC-235 (Non-Rechargeable)

• **Current SC-235 thermal runaway definition:**
  – A thermal runaway results from the initiation of an irreversible exothermic chemical reaction within the cell causing an uncontrollable release of internal electrical and chemical energy resulting in a rapid and accelerating temperature rise to a peak, with an accompanying collapse of cell voltage, and the chemical decomposition oxidation of metallic lithium by combination with active cathode materials.
As part of the reporting requirements of the TR containment test volume, rate of release and temperature of gasses emitted from the unit must be measured and reported.

Fractional composition of gasses (per ASTM E800) must also be reported:

- $\text{CO}_2$
- CO
- HF
- HCL
- NOx
- SOx
- HCN
- Additional critical gasses based on cell chemistry
Questions?

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