Aircraft Installed
Battery Industry
Working Group
Updates

International Aircraft Systems Fire
Protection Working Group
Atlantic City, NJ
November 1 – 2, 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 (Retired)
– 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)

• July, 2017, WG approved the document for submission to the September, 2017 PMC

• PMC had some comments to the document and formed a 3-member Ad-Hoc committee to review and provide recommendations by October 30.
RTCA SC-225 (Rechargeable)

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

Is Battery Size Cat I?

Yes

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

Determine Required Tests based on Cat II, III or IV

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

No

Battery Passed UL 1642, 2054 or IEC 62133 with test report provided?

Yes

Battery is exempt from DO-311A

No

Treat as Size Cat II

Is Battery Size Cat I?

Yes

Battery is exempt from DO-311A

No

Treat as Size Cat II
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, approved by PMC, and was published on September 21, 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)

- Thermal runaway test must be performed at worst-case cell location (determined by engineering analysis)
- In lieu of engineering analysis, entire battery can be heated until multiple cells enter TR.
- 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)

• Final 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 rise of temperature and pressure rise to a peak, with an accompanying collapse of cell voltage, and the chemical oxidation of metallic lithium. by combination with active cathode materials.
RTCA SC-235 (Non-Rechargeable)

• 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:
  • CO₂
  • CO
  • HF
  • HCL
  • NOx
  • SOx
  • HCN
  • Additional critical gasses based on cell chemistry
Questions?

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