

Aircraft Installed Battery Industry Working Group Updates

International Aircraft Systems Fire
Protection Working Group
Atlantic City, NJ
November 1 – 2, 2017

Steve Summer
Federal Aviation Administration
Fire Safety Branch
<http://www.fire.tc.faa.gov>



Federal Aviation
Administration



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.**

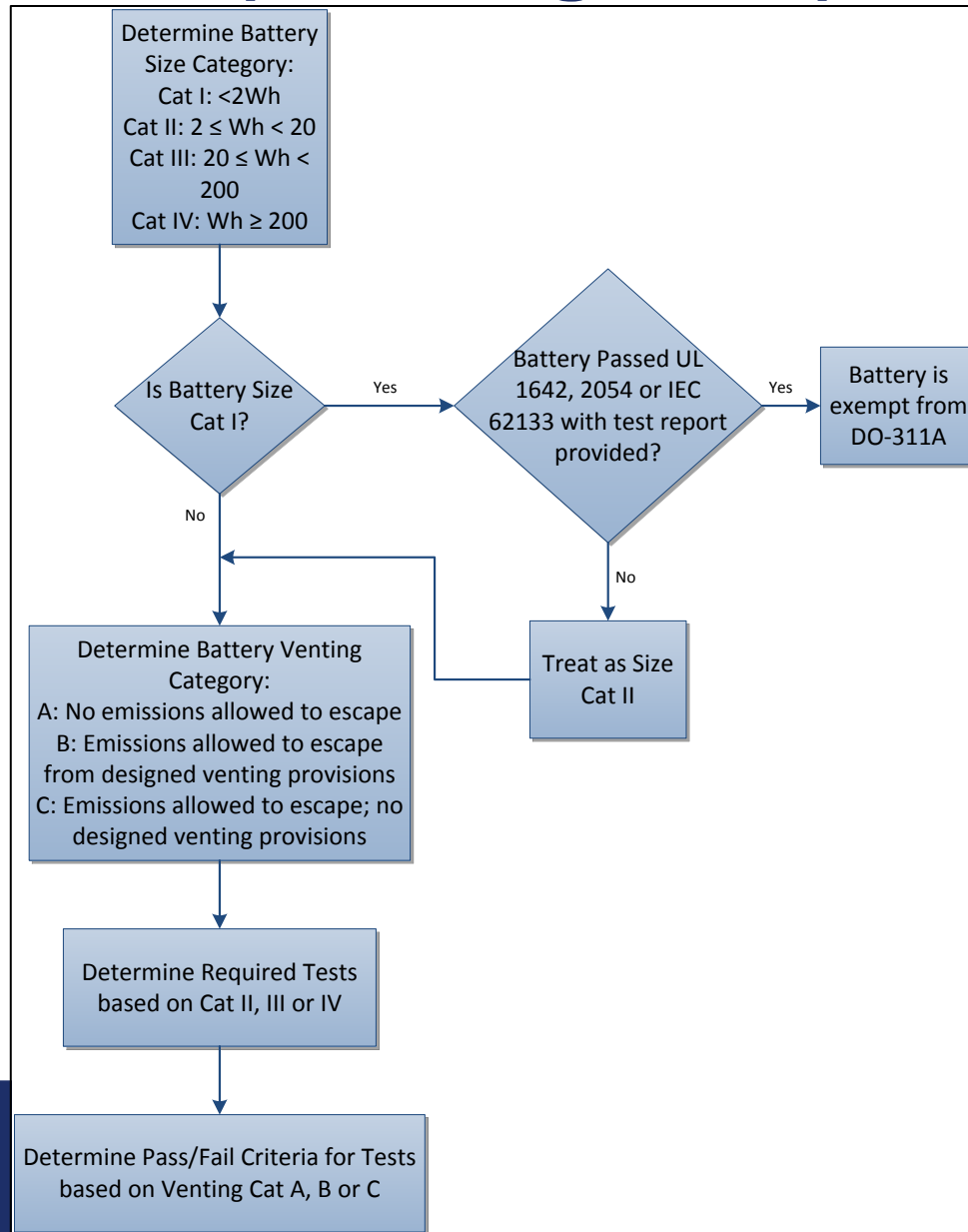


RTCA SC-225 (Rechargeable)

- **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**



RTCA SC-225 (Rechargeable)



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
 - NO_x
 - SO_x
 - HCN
 - Additional critical gasses based on cell chemistry



Questions?

Contact Information:

Steve Summer

609-485-4138

Steven.Summer@faa.gov

