

# SAE G27 Committee Update

Presented to International Aircraft Systems Fire Protection Forum  
October 18, 2023  
Doug Ferguson: co-chair of G27 committee

# SAE G27 Committee Update

**SAE G-27 Committee formed in March, 2016 at ICAO ANC request to create a performance-based package standard (AS6413) for the safe transport of lithium batteries as cargo by air.**

**Co-chaired by Doug Ferguson (Boeing) and Claude Chanson (Recharge)**

~ 200 individuals on G-27 Committee

Includes international organizations, airframe manufacturers, regulators, cell manufacturers, battery manufacturers, battery users, operators, package manufacturers, test facilities

~ 40 Voting members,

~ 75 individuals consistently, actively engaged

Monthly Webex teleconference calls

Average of 3 in-person multi-day meetings per year

Next in-person meeting will be in Dallas in November, 2023

# SAE G27 Committee Update

**This standard provides a test method to demonstrate and document the control of the potential hazards from Lithium metal batteries (UN3090) and Lithium ion batteries (UN3480) when transported as cargo on aircraft.**

**It addresses the need to control the hazards which might arise from a failure of an individual cell by containing the hazards within the package.**

**Controlling the consequences of a failure within the package is intended to prevent uncontrolled fire and pressure pulses that may compromise current fire suppression systems within the cargo compartment.**

**The intent of this test is to severely abuse a single cell such that it is most likely to enter thermal runaway with the presumption that a single cell may enter thermal runaway during transport.**

# SAE G27 Committee Update

## AS6413 Draft

Intention is to address the safety of the cell/battery and packaging material (box, etc) together. Can allow for less protection from the package if the cell is less hazardous.

1. Initiate a thermal runaway (TR) in a cell within the package by heating at 5 to 20 C per minute.
2. Remove heater power when cell has entered TR and monitor for 5 hours.
3. If no confirmation of cell TR after cell reaches 200 C, maintain at that temperature for one hour and then remove heater power and monitor for 5 hours.
  - a. If no TR, verify cell TR would have happened if at 100% State of Charge (SOC)
  - b. If no TR with cell at 100%, rerun full test until cell TR or cell reaches 375 C.
  - c. If still no TR, note in report and on test summary sheet.

# SAE G27 Committee Update

AS6413 Draft

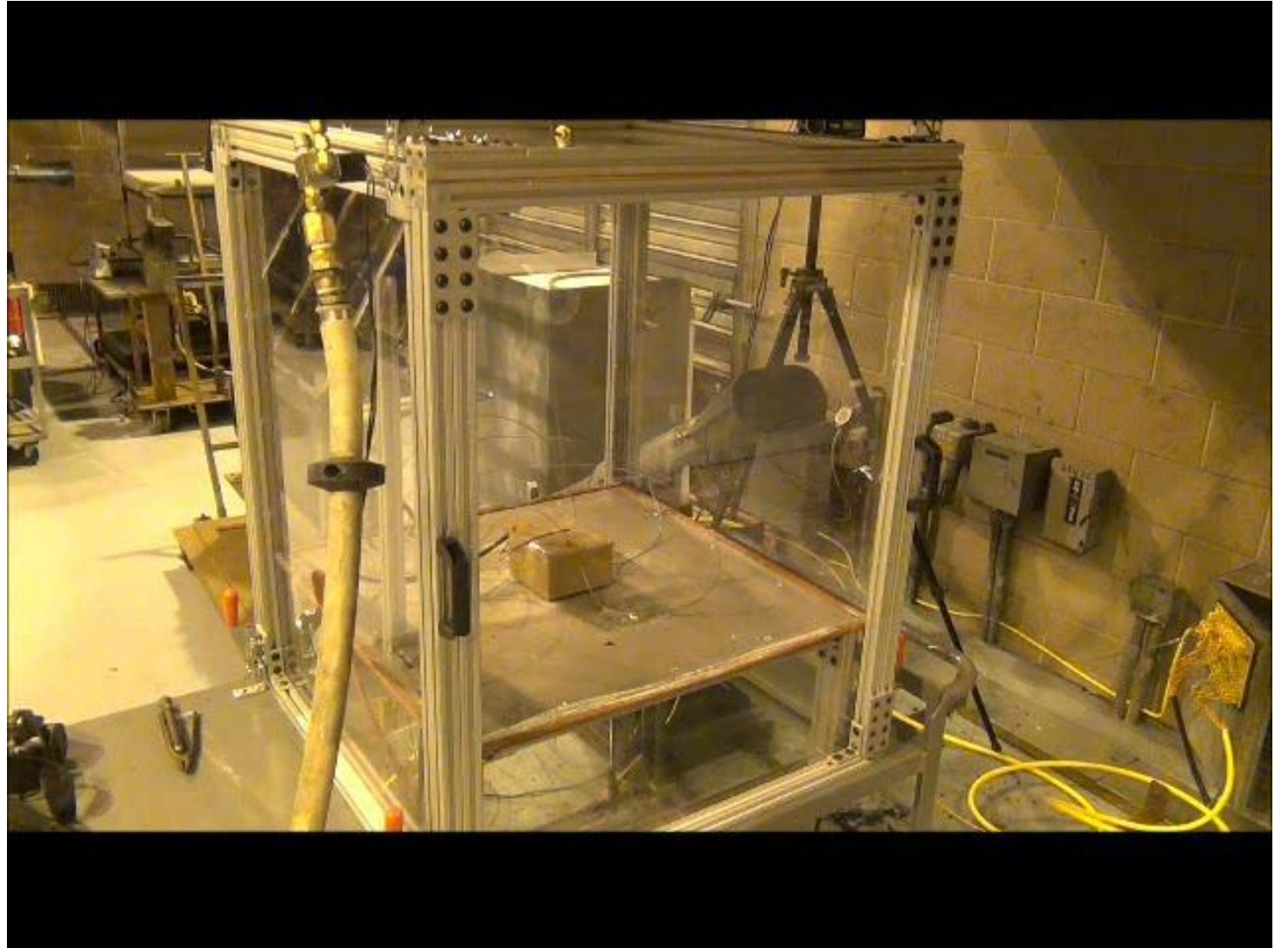
**Verification of “non-hazardous flame” and “non hazardous particle”  
achieved visually or with witness panels**

**Surface of package shall not be sufficient to ignite adjacent materials.**

**Non-hazardous quantity of flammable vapor released outside  
package**

# SAE G27 Committee Update

G27 Background Test  
From FAA Systems Presentation  
[“G27 Packaging Tests”](#), Tom  
Maloney, May 2017



# SAE G27 Committee Update

**Baseline test method has been validated in multiple labs with small (18650) cylindrical lithium ion cells.**

Some lab data for additional configurations, such as pouch cells, fewer cells in package than expected for shipment, surrogate cells, larger cells.

Multiple labs conducting a validation test series in Oct/Nov for reduced cell quantity in package.

**Many additional “variations” or alternatives still require validation, including cells in batteries.**

Pouch and prismatic types

Lithium metal

Benign @SOC

Oversize package

Generic package

# SAE G27 Committee Update

1. Incorporate responses to latest ballot comments, including results of Oct/Nov reduced cell quantity/surrogate cell testing and ballot again before end of year to release “narrow scope” standard only applicable to small cylindrical lithium ion cells.

**Not expected to be incorporated into regulations until later revisions. Most likely to be referenced in existing “approval process”**

**Facilitate discussions outside the G27 committee between operators, shippers, test labs, and authorities**

- **How is standard expected to be incorporated into regulations?**
- **How will audit/oversight of entities be accomplished?**

**Use the released standard to conduct a true “round-robin” review of the ability of the test standard to provide consistent results from multiple labs unfamiliar with the standard**

2. Incorporate responses to latest ballot comments and release Aerospace Information Report (AIR) with appropriate intended use, rationales for various parameters

3. The AIR and AS will be released at the same time.



# SAE G27 Committee Update

## Recent

September 2022 –AIR 6840

March 2023 –AS6413

August 2023 –AS6413

## Upcoming

~ November 2023 –AIR 6840

~ December 2023 –AS6413

~ First or Second Quarter 2024 –AS6413/1 and AS6413/2

# SAE G27 Committee Update

## AS6413/1 - Elevated Temperature Test (Oven Test)

3 hours at 205 C

### Material Test:

- Package made from materials to be in final product
- Simulated 18650 cell with thermocouple in center
- Thermocouple does not exceed [100 C]

Or

### Package with Cells test:

- No thermal runaway
- Any venting does not result in hazardous quantity of flammable gas (not defined)

# SAE G27 Committee Update

## AS6413/2 - Direct Flame Test

FAA Oil burner horizontal test 5 minutes

Material Test:

- Package made from materials to be in final product
- Simulated 18650 cell with thermocouple in center
- Thermocouple does not exceed [100 C]
- No burn-through

Or

Package with Cells test:

- No thermal runaway
- Any venting does not result in hazardous quantity of flammable gas (not defined)
- No burn-through