

# Solid State Battery Tests



Federal Aviation  
Administration



Presented to: Systems Meeting

By: FAA Fire Safety

Date: 11/2017

# Background

- **Solid-State cells**

- Use solid electrolyte instead of liquid electrolyte.
- There are many types of solid electrolyte available but most (maybe all) have issues.
- Are said to be “safer” because of the absence of flammable liquid electrolyte.



# Introduction

- **The FAA conducted a few tests with solid-state lithium ion cells.**
- **Electrolyte composition not specifically disclosed to FAA has similar flammable ingredients as conventional electrolyte but in a solid form.**



# Setup

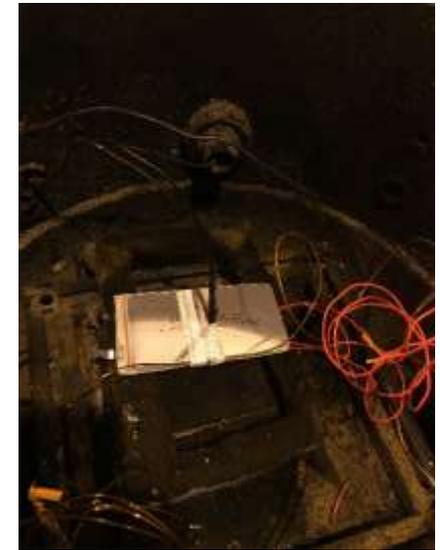
- Test were performed in the 21 liter pressure sphere.
- Flammable gas composition and temperature were measured.
- Solid state cells were 2.6Ah pouch & were compared to regular 2.5Ah LCO pouch cells.



Test Chamber



Solid State Cell



Regular LCO cell

# Results

	Test 1 solid-state	Test 2 solid-state	Test 3 Typical Li-Ion
<b>Maximum Cell Temperature (degC)</b>	N/A	814.4	690.6
<b>Gas Volume (liters at 1atm)</b>	3.75	3.73	4.318
<b>Total Hydrocarbon (%)</b>	16.77	17.02	21.13
<b>Hydrogen (%)</b>	18.5	17.27	22.97
<b>Carbon Monoxide (%)</b>	23	23.84	16.75
<b>Carbon Dioxide (%)</b>	30.55	29.7	27.97



# Summary

- **Maximum temperatures were hotter with the solid-state cells.**
  - This could be due to a number of factors such as higher energy density or less phase change energy loss etc.
- **Total gas output was about 10% less than typical li-ion.**
  - Hydrocarbon: about 30% less gas.
  - Hydrogen: about 30% less gas.
  - Carbon Monoxide: about 20% more gas.
- **Overall: gas output was safer but temperatures were less safe.**



# Questions?

- **Contact information:**
  - Thomas.Maloney@faa.gov
  - 1-609-485-7542

