

Power Down or **Fire Up:** Lithium Battery Risk at Altitude

With

Ted Dunlap	General Counsel, RTI Forensics
Dana Schulze	Deputy Director, Deputy Director, Office of Aviation Safety, National Transportation Safety Board (NTSB)
John DeLeeuw	Deputy Chairman, National Safety Committee, Allied Pilots Association (APA)
Vickie Toman	Flight SMS Manager, American Airlines

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Lithium Batteries – Why Use Them?

Pros

- Light Weight
- High Energy Density

Cons

- High Energy Density – Hot, difficult to extinguish fire

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NTSB Role

- Independent accident investigation agency
 - Mission -- Improve Transportation Safety
- Determine probable cause
 - Through independent accident and incident investigations
 - Make findings (lesson learned) public
- Make recommendations to prevent recurrence
- On lithium batteries:
 - Investigate the most significant occurrences
 - 25+ safety recommendations since 1999 (PHMSA/RSPA, FAA, manufacturers)
 - Continued advocacy

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NTSB Lessons Learned - Aviation

- Prevent propagation to control safety risk
 - Investigated a number of fatal accidents and incidents involving lithium and, more recently, lithium-ion batteries (LIBs)
 - In almost all cases, the NTSB has become involved because thermal runaway propagation:
 - (1) occurred (primary or secondary cause), and...
 - (2) worst case effects not anticipated and/or adequately mitigated
- Overall challenges
 - Forensic analysis of failures paramount but difficult (damage, equipment/expertise)
 - Regulatory inertia (U.S. restriction on new rulemaking, international harmonization)
 - Applications outpacing regulations and standards

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NTSB Lessons Learned – Aviation (cont.)

- Lithium batteries as cargo
 - Multiple accidents, U.S. and International (1999 – Present)
 - Multiple system deficiencies identified (fire mitigation, detection, suppression, regulations/standards for carriage & packaging)
 - Most recently...
 - Segregate LIBs from other hazardous materials
 - Limit quantities to capabilities of suppression systems
- Lithium batteries as installed equipment
 - Applications growing (airplane power systems, ELTs, etc.)
 - Consensus on certification standards elusive
 - Determining worst case
 - Accurately assessing risk with limited data
 - Test standards / credibility ("test to spec" vs. "test to failure")
- In the cabin – emerging risk...

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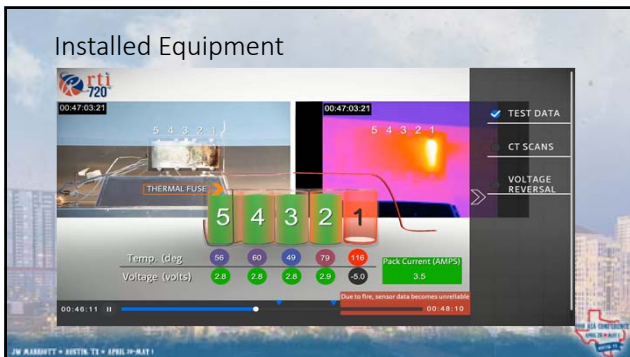
NTSB Advocacy on LIBs

- 2017 – 2018 Most Wanted List
- "Ensure the Safe Shipment of Hazardous Materials"
 - In aviation – lithium ion battery focus
 - NTSB fact sheet:
<https://www.ntsb.gov/safety/mwl/Pages/mwl10-2017-18.aspx>

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