Draft External Fire Packaging Test

• Objectives
  – To prevent a shipment of lithium cells or batteries from intensifying an otherwise controllable fire within a cargo compartment.
  – To shield a consignment of lithium cells or batteries such that they do not become fuel for an existing fire or become a secondary ignition source i.e. thermal runaway
Cargo Fire Environment

• Class C
  – Exposure to open flames prior to detection and deployment of Halon 1301
  – Exposure to elevated temperatures after Halon 1301 suppression, 400°F, locally higher

• Class E
  – Exposure to open flames prior to decompression
  – Elevated Temperatures
  – Possible reignition on descent
Existing test methods

• Cargo liner certification test
  – 14 CFR Part 25.855, Appendix F, part III
  – Designed to evaluate the flame penetration resistance capabilities of aircraft cargo compartment lining materials.
  – Simulates open flame conditions in a class C cargo compartment prior to Halon 1301 suppression
FAA Cargo Liner Certification Test

- 1700 DegF flame
- Five minute exposure
- Temperature measured 4” above the liner cannot exceed 400 DegF
- No flame penetration
Existing test methods

• Oxygen generator over pack test
  – 49 CFR Part 178
  – Appendix D, Thermal Resistance Test
    • Oven test, three hour exposure to 400°F
    • 400°F is the estimated mean temperature of a cargo compartment during a halon-suppressed fire.
  – Appendix E, Flame Penetration Resistance Test
    • Similar to cargo liner test method
Draft External Fire Test Method

• This test method applies to packages alone (packages in over-packs, FCCs or FRCs not included).

• Open flame exposure
  – The package must meet the same flame penetration resistance standards as required for cargo compartment sidewalls and ceiling panels in transport category aircraft.
Draft External Fire Test Method

• External fire flame exposure
  – An outer packaging’s materials must prevent penetration by a flame of 1700°F for 5 minutes, as described in Part III of Appendix F, paragraphs (a)(3) and (f)(5) of 14 CFR Part 25.

• Oven test
  – the package must remain below the temperature at which the lithium-ion cells self-ignite (thermal runaway).
Draft External Fire Test Method

• Oven test
  – Lithium-ion cells typically go into thermal runaway at 450°F and lithium polymer cells reach thermal runaway at 330°F.
  – The interior of the package must remain below 300°F when exposed to an external temperature of at least 400°F for (X) hours.
  – Package must be tested as prepared for transport
    • A substitute thermal mass may be used to simulate the battery or cells.