Transportation of Lithium Batteries by Air

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Lithium Batteries

► Billions Shipped By Air As Cargo Each Year

► Can Initiate And Propagate Dangerous Events
  - Fire
  - Smoke Evolution
  - Explosive Gas Production
  - Heat Generation
  - Projectiles

► Fire Suppression Systems/Procedures Inadequate
Thermal Runaway And Propagation

1. Short Circuit
2. Heat Generation
3. Chemical Breakdown
4. Cycle Repeats and Accelerates
5. Short Circuit

Air Line Pilots Association, International
Batteries On Aircraft

► Operator Equipment
► Passenger Carry On
► Passenger Checked Baggage
► **Cargo Shipments**
Hoverboards And Phones

- Undeclared/Non Compliant Shipments
- Adequacy of Regulations
  - UN Tests
  - Batteries in Equipment
- Regulatory Complexity
Cargo Hold Fire Suppression

- **Halon (Passenger And Freighter)** - Class C
  - Belly

- **Depressurization (Freighter)** - Class E
  - Main Deck And Some Bellies

- None Are Effective On Lithium Batteries

- Detection Issues
Layered Approach

- Battery Design
- Package
- Container
- Compartment
- Aircraft
2015 Regulations

- No ULD/Compartment/Aircraft Limits
- Reduced Regulations for Most Shipments
- No Limit On Overpacking
- Li Metal Battery Shipments Banned on PX Flights
2016 ICAO Cargo Changes

- Temporary Ban of Li Ion Battery Shipments on Passenger Flights
- 30% State Of Charge Limit on Cargo Aircraft
- Overpack Restrictions
- Safety Risk Assessment
ICAO Process

► SAE Standard Produces A Package With A Known Hazard

► How will ICAO Incorporate Result?
  ▪ Applicability
  ▪ One Part Of Mitigation System?
  ▪ One Means Of Compliance?
SAE Approach

► Develop a standard to prevent propagation between packages following thermal runaway

► Standard consists of a test

► Successful test contains any resulting:
  - Hazardous Flames
  - Hazardous Fragments
  - Hazardous Heat
  - Flammable Gas
SAE Issues

► Technical:
  ▪ How To Initiate Thermal Runaway
  ▪ Defining And Measuring Hazards
  ▪ What Constitutes A New Battery Or Package?
  ▪ Demonstrated Containment Time

► External Fire Threat

► Low Hazard Batteries
One Airline’s Strategy

► Only Accept Fully Regulated Batteries
► Segregate Them From Flammable DG
► Load Them In Lowest Risk Compartments
► Use Container Fire Protection
► Supplement Aircraft Systems
Conclusions

► Important Progress Is Being Made

► Goal-Safe Transportation Of All Cargo

► Effective Solution Is
  ▪ Multilayered
  ▪ Multidisciplinary
Questions?

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