

Lithium Battery Incidents

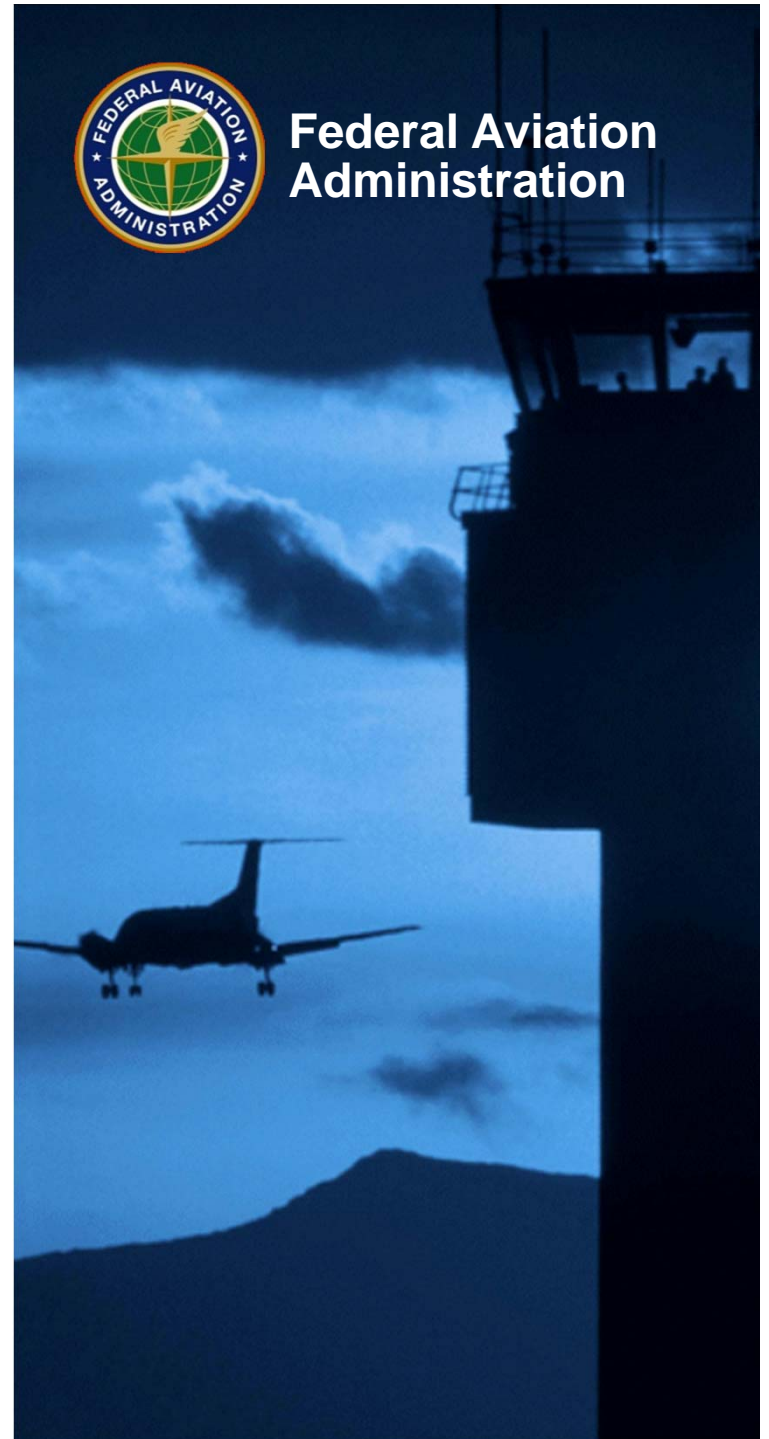
Presented to: **The Seventh Triennial
International Fire & Cabin Safety
Research Conference**

By: Michael D. Givens, FAA

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**Federal Aviation
Administration**



Objectives

- **Overview of Two Lithium Batteries Incidents Related to Aviation**
- **Show how the Lithium Battery Incidents Provided the Basis for Research and Change.**
- **Now and in the Future, How do you Manage the Changes in Mitigating the Risk?**

Aviation Lithium Battery Incidents

- **Over 50+ Lithium Battery Incidents in Aviation**
- **The Incidents involved have encompassed both traveling passengers baggage and cargo shipments**



Lithium Metal Battery Fire - Northwest/LAX

- **April 28, 1999: A shipment of lithium metal batteries caught fire at the Northwest Cargo Facility at LAX.**
- **A pallet of lithium batteries was rolled onto its side while being offloaded at the cargo facility**

Lithium Metal Battery Fire - Northwest/LAX

- **3 hours and 40 minutes after the pallet overturned, it caught on fire**
- **This demonstrates the risk due to the latent affect of Lithium Batteries being damaged in handling.**
- **NTSB report expressed the concern that a damaged shipment of lithium batteries could subsequently be placed in an aircraft cargo compartment that could result in an in-flight fire**

Lithium Metal Battery Fire - Northwest/LAX

- **The Lithium Metal Batteries involved in the fire totaled 120,000 and had been off-loaded from on a passenger flight from Japan to Los Angeles prior to the fire.**
- **NTSB report expressed concern with the rapid spread of the fire during the incident.**

NTSB Recommendations (NWA/LAX)

- **NTSB Recommendations:**
 - A-99-80: Pipeline & Hazardous Materials Safety Administration (PHMSA) & FAA were to evaluate fire hazards in cargo compartments posed by lithium batteries in air transportation.

FAA Research on Lithium Metal Batteries

- **A series of tests were conducted to assess the flammability characteristics of nonrechargeable lithium primary batteries, both individually and as packaged for bulk shipment onboard cargo and passenger aircraft.**
- **Tested lithium metal batteries (CR2, PL123A)**
- **FAA Tech Center Report: DOT/FAA/AR-04/26**

FAA Research on Lithium Metal Batteries

- **The testing determined the issue of cell/battery propagation**
- **The testing determined that Halon 1301 fire suppression agent was ineffective**



NTSB Recommendations (NWA/LAX)

- **NTSB Recommendations:**

- A-99-81: Pending the outcome of the research and testing, PHMSA/FAA were to prohibit the air transportation of lithium batteries on passenger-carrying aircraft.
- The US banned the transport of Lithium Metal Batteries on passenger aircraft in 2004 upon the issuance of the FAA Tech Center Report.

NTSB Recommendations (NWA/LAX)

- **NTSB Recommendations:**
 - A-99-83: Initiate action at the ICAO Dangerous Goods Panel (DGP) to prohibit the international air transportation of lithium batteries on passenger-carrying aircraft.
 - The US proposed a similar ban on lithium metal batteries on passenger-carrying aircraft at ICAO DGP.

AC Propulsion Fire in Memphis, TN

- **On August 7, 2004, a shipment of lithium ion batteries being loaded on a FedEx aircraft in Memphis, TN caught fire.**
- **This fire incident demonstrated the in-flight fire risk of transporting Lithium Ion Batteries on aircraft as cargo.**

AC Propulsion Fire in Memphis, TN

- **The lithium ion batteries were transported on a flight from LAX to Memphis, TN prior to the fire being discovered.**
- **The fire was discovered while being loaded onto a flight destined to Paris from Memphis, TN.**

AC Propulsion Fire in Memphis, TN

- **The significance of this incident in time is the demonstration that a lithium ion battery can cause a fire in air transportation**
- **The fact that the fire was discovered while 1/2 way loaded on the aircraft shows how close this was to being a potential in-flight fire**



Aviation Lithium Battery Incidents

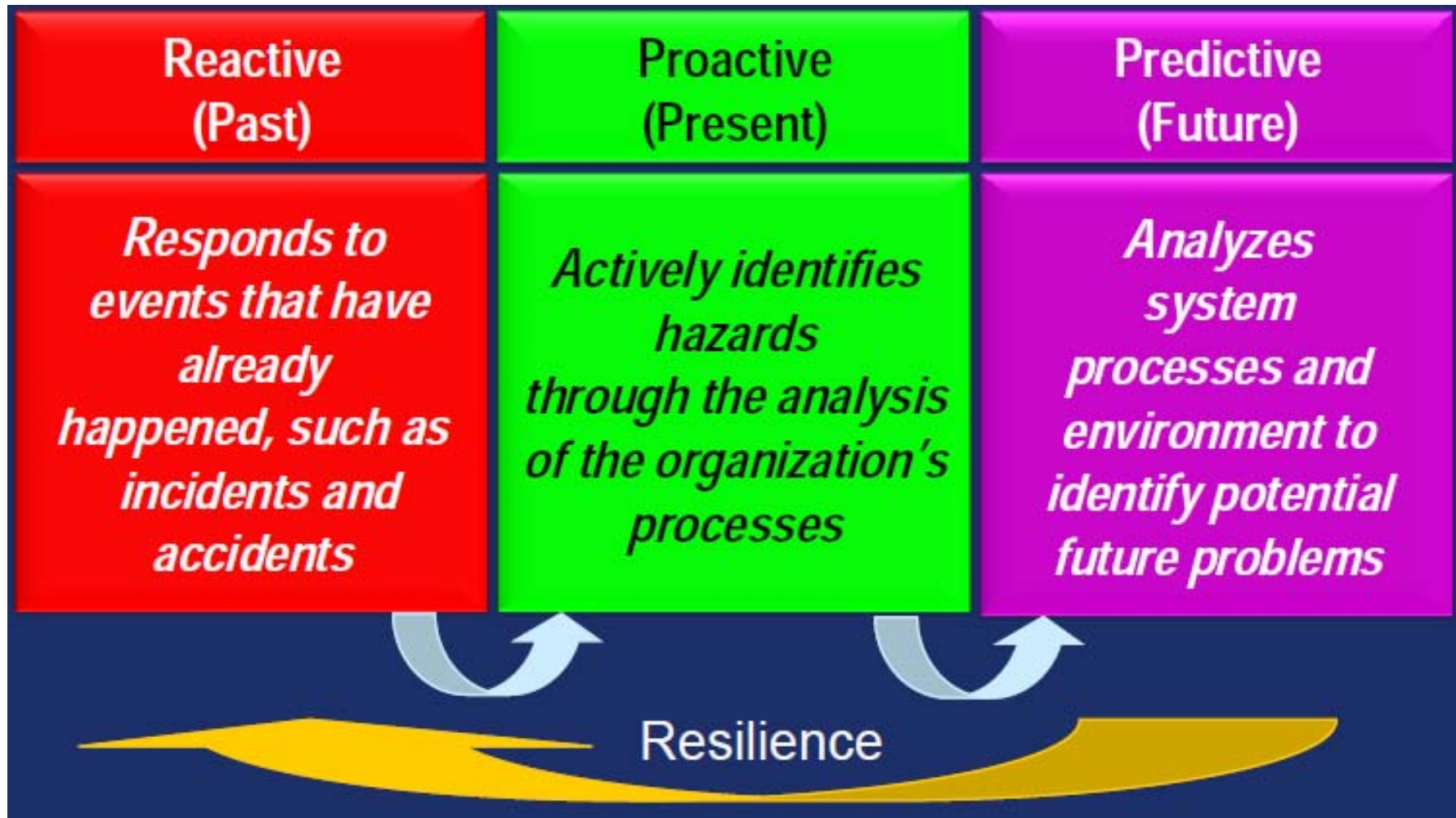
- **Is the history of incidents a predictor of a risk for future accidents and incidents related to lithium batteries in air transport?**
 - We have had continued reports of incidents involving lithium batteries
 - Continued research by the FAA Tech Center on lithium batteries has validated the previous research conclusions and identified additional risks.

Aviation Lithium Battery Incidents

- UPS 006 Accident: Lithium batteries were involved in the fire on the aircraft at the cargo positions where the smoke detector first alarmed.



Safety Management System (SMS)



SMS Depends on Risk

- Provides information to assist in prioritizing and assigning resources
 - Identifies areas of risk (low, medium, and high)
- Low Risk → minimal FAA involvement
- Medium Risk → moderate FAA involvement
- High Risk → significant FAA involvement

Nothing black & white – systematic and data driven approach to standardize decisions

Other Predictive Examples

- **Valujet Accident Report from the NTSB:**
- **It was determined that there was 5 separate incidents involving Oxygen Generators between 1986-1994 that initiated fires in transportation.**

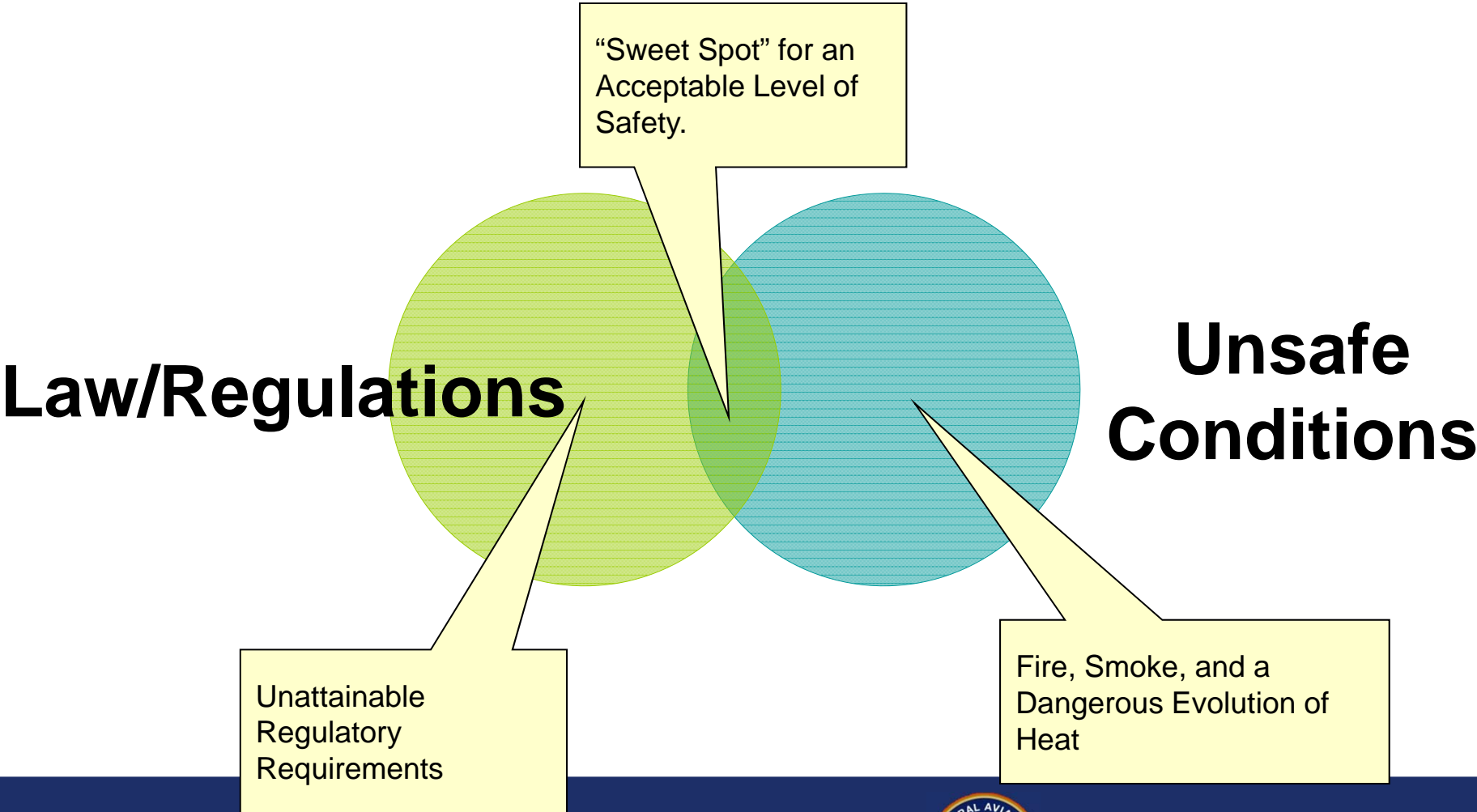
What Has Been Done Recently?

- **In the US, by Legislation we are restricted to the same provisions as contained in the ICAO Technical Instructions for the regulation of lithium batteries**
- **FAA has been working for the last several years on lithium batteries at the ICAO Dangerous Goods Panel**

What Needs to Continue?

- **Oversight & monitoring of the data and information on lithium batteries as it develops**
 - More incidents
 - Higher energy density
 - Larger battery designs
 - Evolving lithium battery chemistries
 - Research and Testing

Finding the Acceptable Level of Safety



Aviation Safety Systems

- **This is not a Hazardous Materials Risk, this Is an Aviation Safety Risk**
- **Therefore, it is going to require the whole Aviation Safety Community to work together to mitigate this risk**

Aviation Lithium Battery Incidents

- **What are the mitigation options to reduce the likelihood of future incidents and accidents?**

Cargo Compartment Limitations

Fire Containment Covers

International Dangerous Goods Regulations

Fire Hardened Containers

ULD Suppression

Hazardous Materials Regulations

Aircraft Fire/Smoke Detection Systems

Aircraft Fire Suppression

Battery Designs

Package Mitigation Standards



Contact Information

Michael D. Givens

FAA Hazardous Materials Safety Program

michael.givens@faa.gov

Janet McLaughlin

**Deputy Director, FAA Hazardous Materials
Safety Program**

janet.mclaughlin@faa.gov