Li-Ion Batteries, SMS and Incidents

ANZSASI

Michael Burdick

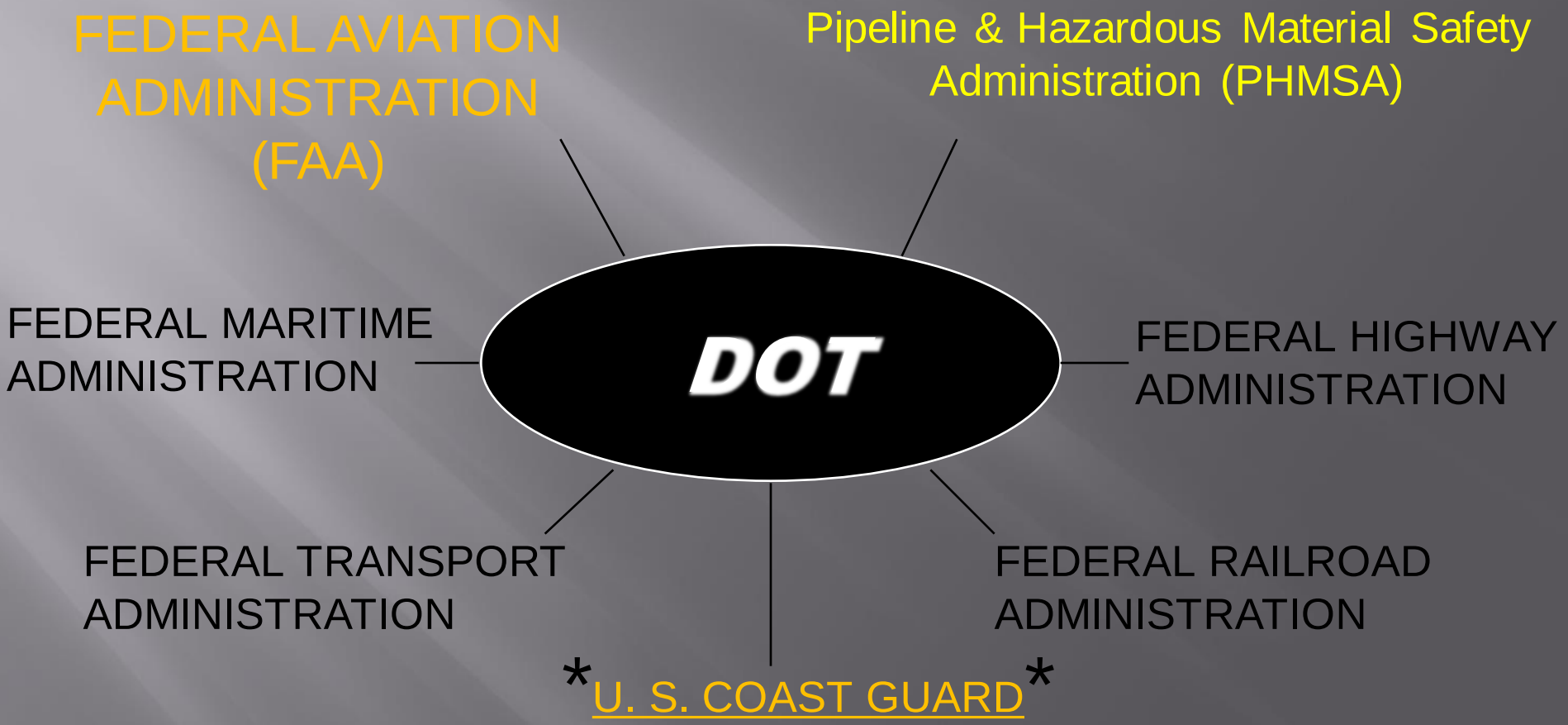
June 2017

New Zealand Society of Air Safety Investigators

OVERVIEW

- Who Regulates Hazmat in the USA
- Hazmat Specialist Responsibilities
- Regulatory Documents
- Brief SMS
- ValuJet, Flight 592
- Lithium Battery Incidents
- Lithium Battery Trends

U.S. DEPARTMENT OF TRANSPORTATION



FAA HAZMAT SPECIALIST

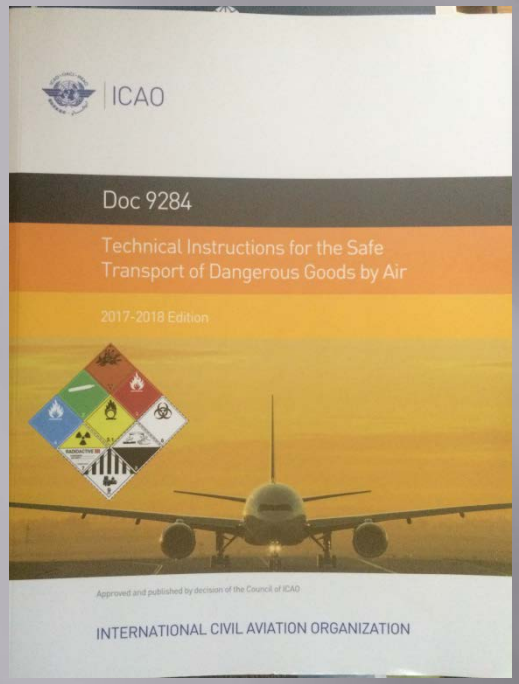
Responsibilities:

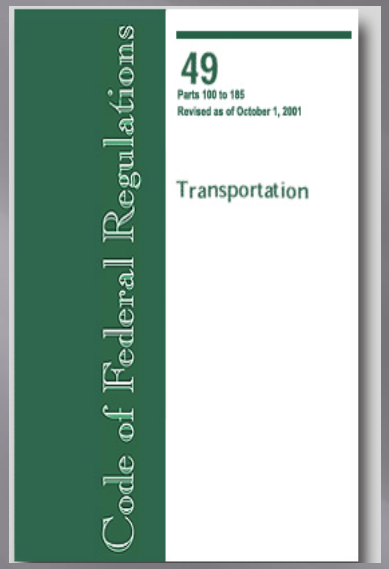
- Mission-Ensure and Promote Aviation Safety
- Compliance and Enforcement of the HMR's
- $450.00 Min $75,000.00 Max per violation

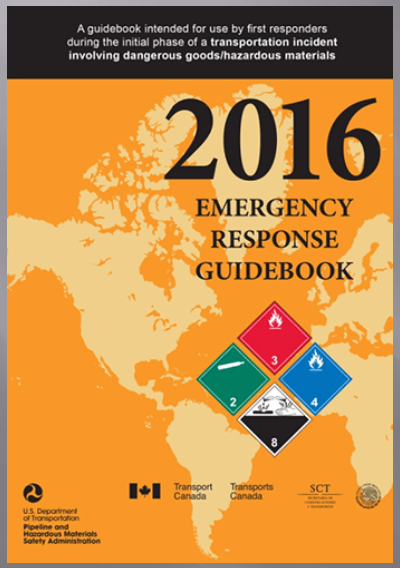
Priorities:

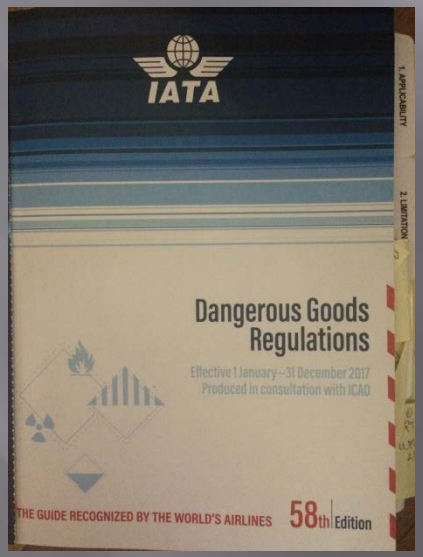
- Passenger Airlines
- Indirect Air Carriers (IAC) (Part 109)
- All-Cargo Airlines
- Repair Stations (Part 145 certificate)
- Shippers (Companies & Individuals)

Printed References









- Title 49 Code of Federal Regulations, Parts 100 – 185 (49 CFR)
- International Civil Aviation Organization Technical Instructions (ICAO TI)
- International Air Transport Association Dangerous Goods Regulations (IATA DGR): Not a regulatory document!!
- 2016 Emergency Response Guidebook

SMS

SAFETY POLICY: Commitment

SRM: Risk Identification

SAFETY ASSURANCE: Verify

SAFETY PROMOTION: Attitude

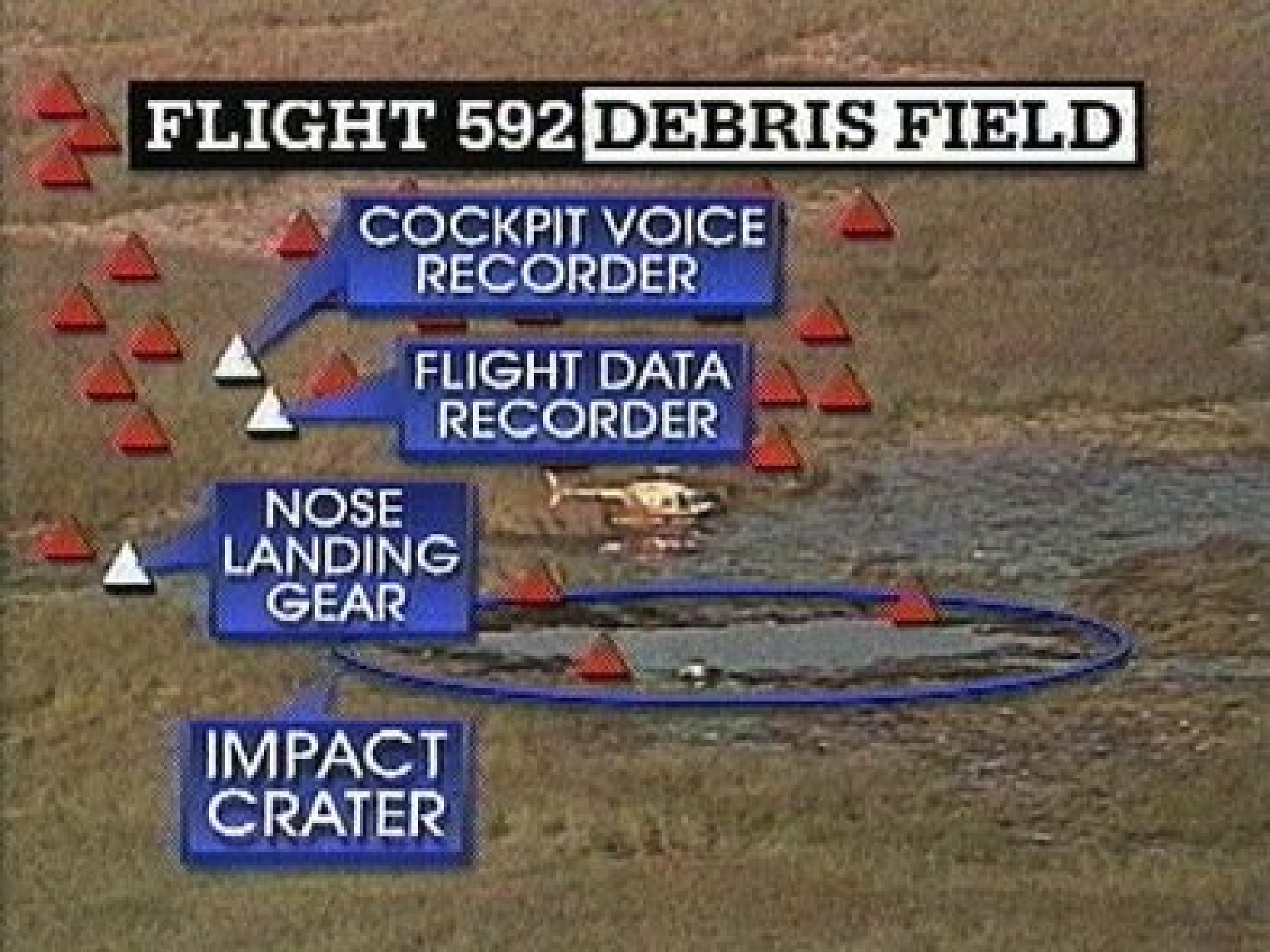
SMS & RISK INTERFACE

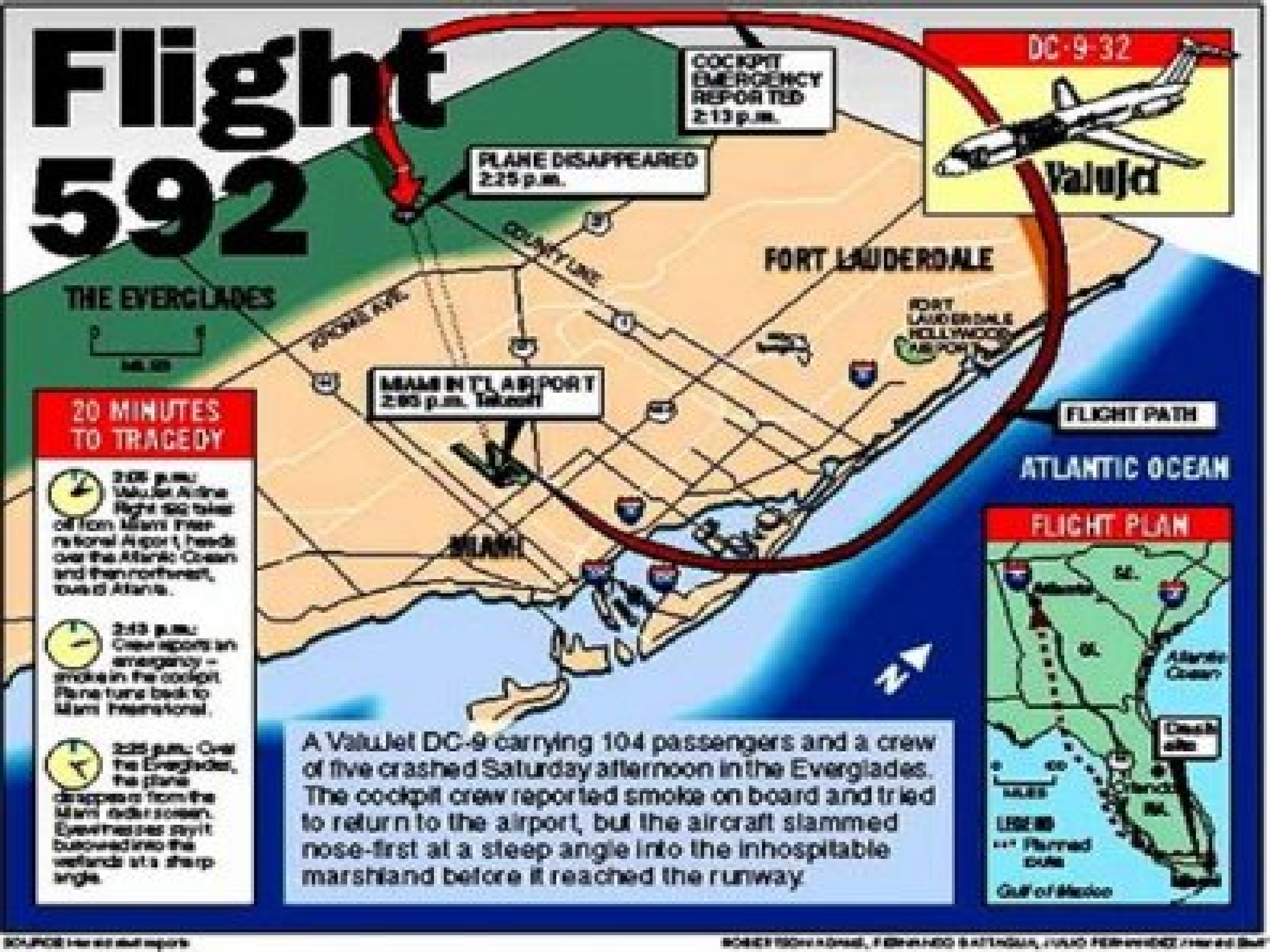
- DATA COLLECTION
- DATA QUALITY
- DETERMINE RISK
- MITIGATE RISK
  - Challenging Budgetary Environment

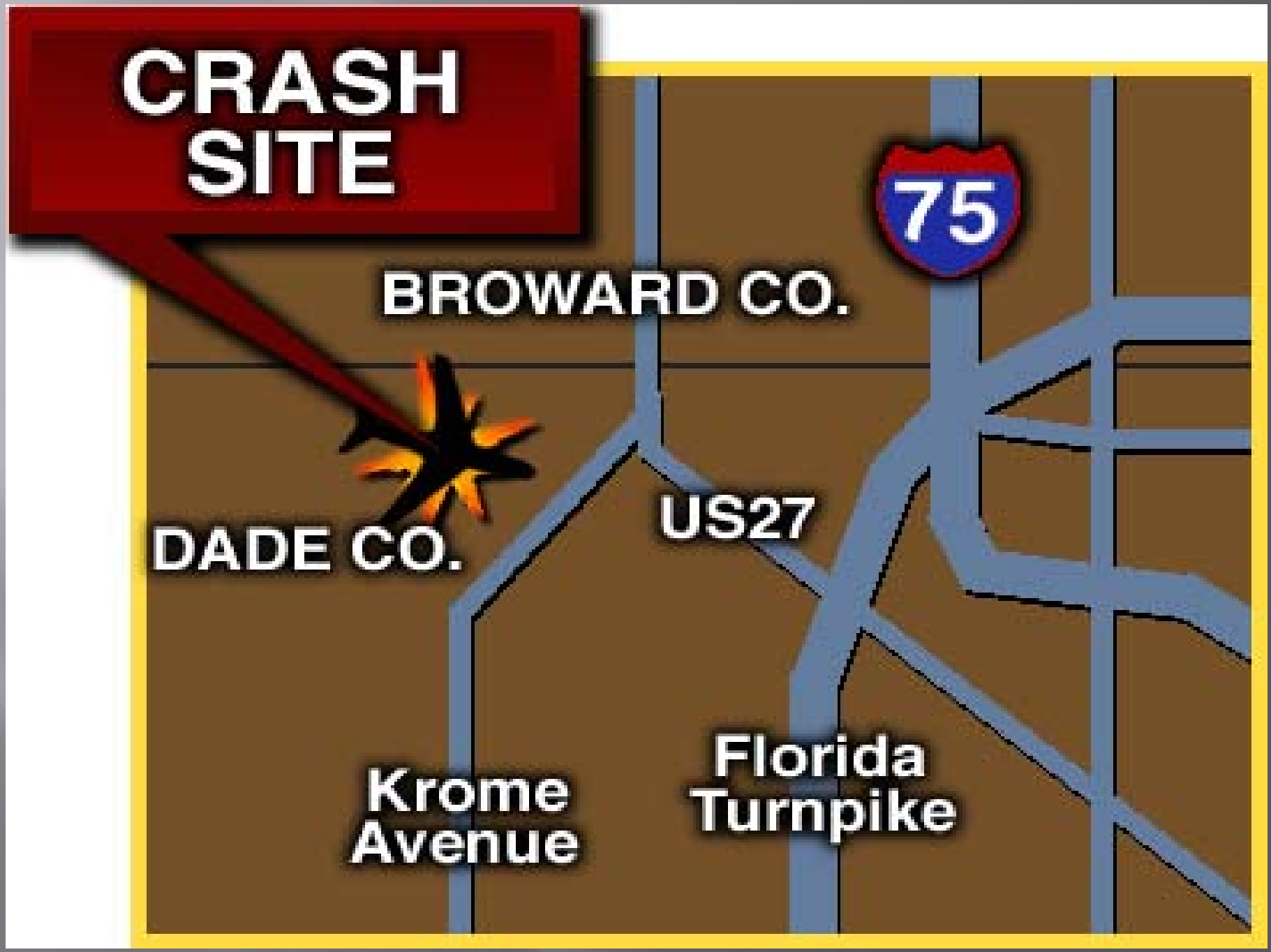
ValuJet Flight 592

- May 11, 1996
- DC-9 w/ 110 passengers onboard
- Impacted the Florida Everglades at 440 kts.
- NTSB Concluded: “The Accident was caused by improperly packaged, marked, and labeled Oxygen Generators.”


Valujet flight 592


FLIGHT 592 DEBRIS FIELD
COCKPIT VOICE RECORDER
FLIGHT DATA RECORDER
NOSE LANDING GEAR
IMPACT CRATER


Flight 592
DC-9-32
ValuJet
COCKPIT EMERGENCY REPORTED 2:13 p.m.
PLANE DISAPPEARED 2:25 p.m.
FORT LAUDERDALE
THE EVERGLADES
COUNTY LINE
MIAMI INT'L AIRPORT
FLIGHT PATH
ATLANTIC OCEAN
MIAMI
20 MINUTES TO TRAGEDY
FLIGHT PLAN
A ValuJet DC-9 carrying 104 passengers and a crew of five crashed Saturday afternoon in the Everglades. The cockpit crew reported smoke on board and tried to return to the airport, but the aircraft slammed nose-first at a steep angle into the inhospitable marshland before it reached the runway.


CRASH SITE
75
BROWARD CO.
DADE CO.
US27
Krome Avenue
Florida Turnpike


ADE
CE


225
FLORIDA


FLORIDA MARINE PATR

Colin Braley / Reuters

Safety failures in ValuJet crash were avoidable

By Robert Davis
USA TODAY

It takes, on average, more than five separate safety system failures to cause a commercial jet to crash in the USA. Officials say that in the case of ValuJet Flight 592, there were even more and the chain of mistakes, miscues and missed opportunities that led to the May 11 crash in the Florida Everglades would have been easy to break. The crash killed all 110 people aboard.

After public hearings last week, the holes in the system are painfully clear to families of victims and to federal officials responsible for aviation safety.

"Change anything at all in that chain of events and the outcome would be very different," says John Goglia, the National Transportation Safety Board (NTSB) member who presided over the hearings. "Just one change could have stopped the whole thing," says Cebert Roberts of Miami, who lost his grandson in the crash.

Investigators say 144 oxygen generators loaded into the forward cargo hold of the DC-9 fueled a fierce fire, causing the plane to crash.

By Hans Deryk, AP

Goglia: ValuJet 'chain of events' could have been changed.

er, and did not have the 15-cent safety caps that would prevent them from firing accidentally. The caps and labels are required by law.

A criminal probe is ongoing.

▶ SabreTech's mechanics signed federal documents saying they had put safety caps on the generators when they knew the generators still needed them. Both mechanics, who signed for work performed by hundreds of others, told investigators they feared they would be fired if they didn't sign.

▶ The FAA's inspector

12A THE HERALD, MONDAY, NOVEMBER 25, 1996

The Miami Herald

JOHN S. KNIGHT (1894-1981) JAMES L. KNIGHT (1909-1991)

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DAVID LAWRENCE JR., Publisher and Chairman
JIM HAMPTON, Editor
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An avoidable disaster

VALUJET FLIGHT 592
The crash west of Miami claimed 110 lives. An inquiry suggests that it need not have happened.

The crash of ValuJet Flight 592 could have been prevented. That's one conclusion to be drawn from the National Transportation Safety Board's week of hearings in Miami. A report is due next spring.

The end of these hearings won't end the anguish of the 110 victims' loved ones. Neither should it end the inquiries; a role remains for a federal grand jury to see whether criminal negligence occurred — and for Congress to see whether new laws are needed. Expect high-profile civil trials as well.

Much attention was focused on what is now believed to be the crash's direct cause: a white-hot fire that began among oxygen canisters improperly stowed in the plane's forward cargo hold. Yet the hearings also revealed a disturbing chain of events that preceded the Atlanta-bound plane's plunge into the Everglades. The panel heard testimony suggesting a broad pattern of failure.

For starters, ValuJet's rapid growth apparently outstripped the capacity of the airline's managers and the Federal Aviation Administration's safety inspectors to monitor its operations. Though an Washington FAA manager recommended in February that the airline be grounded, it was only after the May 11 crash, that ValuJet was finally grounded.

Other testimony suggested that SabreTech, the company that [illegible]led ValuJet's maintenance in Miami, had similar quality-control problems.

Whatever SabreTech's role, however, ValuJet retains ultimate responsibility for the condition and contents of all of its aircraft. That remains true whether its maintenance is performed "in-house" or contracted out.

Meanwhile, the week's most damning testimony concerned the role of the FAA. It is supposed to ensure that air travel is safe by heading off accidents before they occur.

Instead, the FAA too often waits to react after the air disasters while also struggling with other issues, from the threat of terrorism to the obsolescence of computer and radar systems used in air-traffic control. Complicating its mission were pressures to "right-size" at a time of burgeoning workloads.

Belatedly the FAA has proposed rules — first urged by the NTSB in 1988 — to require fire-fighting devices in cargo holds. Also belatedly, the agency has announced the addition of 118 inspectors — after stonewailing for years while inspectors in the field warned of growing risks and pleaded in vain for more help.

Nor can Congress entirely escape blame. It allowed the airline-ticket surcharge to expire for eight months, thus drying up a source of funding that should have been used to promote safer air travel.

Is air travel safe? Statistics say Yes — compared to other modes of travel and to air travel in the past. Yet the crash of Flight 592 was so horrific — and the revelations since so disturbing — that some travelers' confidence has been shattered. Who will restore their trust?

orial hine

[illegible]ctively,

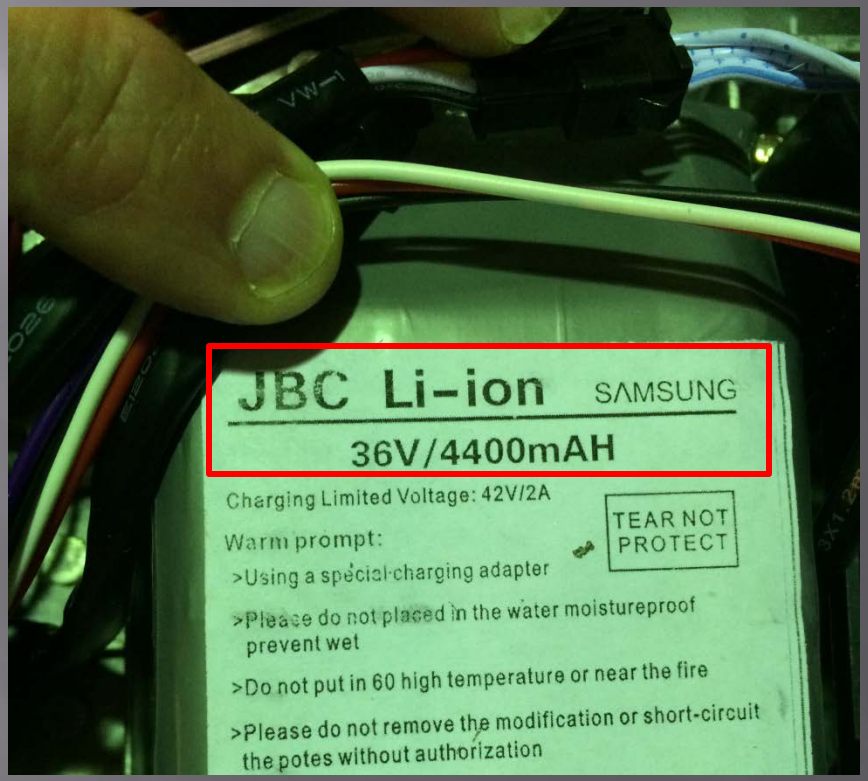
Lithium Batteries

Approximately 152+ air incidents involving batteries carried as cargo or baggage to date.

Lithium ion cell or battery: means a rechargeable electrochemical cell or battery in which the positive and negative electrodes are both intercalation compounds (intercalated lithium exists in an ionic or quasi-atomic form with the lattice of the electrode material) constructed with no metallic lithium in either electrode. A lithium polymer cell or battery that uses lithium ion chemistries, as described herein, is regulated as a lithium ion cell or battery.

(UN 38.3 Manual of Test and Criteria 5th revised edition, Amendment 1 - With Amendment 2 Revisions)

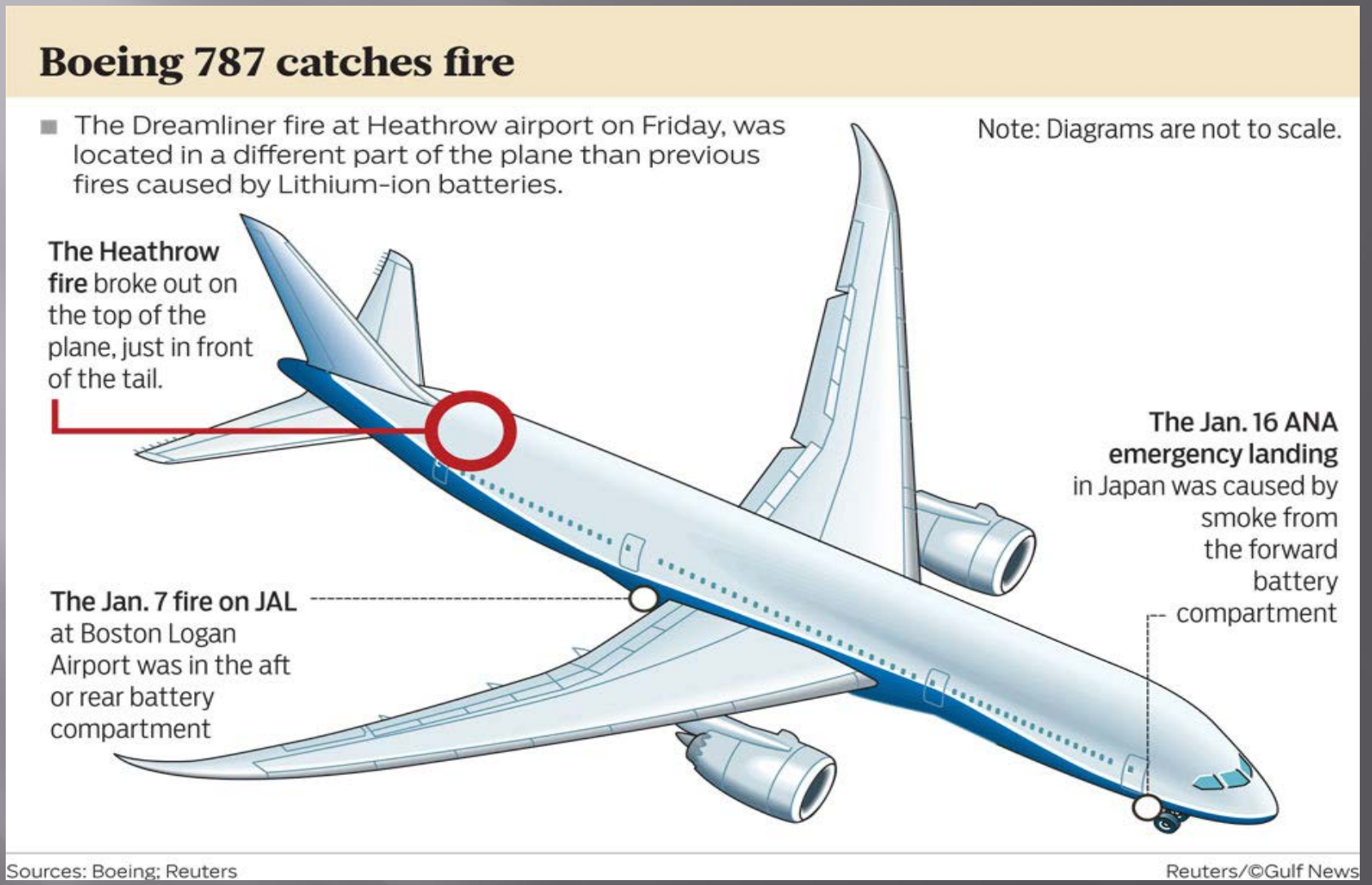
Watt-hour (Wh): means a unit of energy equivalent to one watt (1 W) of work acting for one hour (1 h) of time. The Watt-hour rating of a lithium ion cell or battery is determined by multiplying the rated capacity of a cell or battery in ampere-hours, by its nominal voltage.

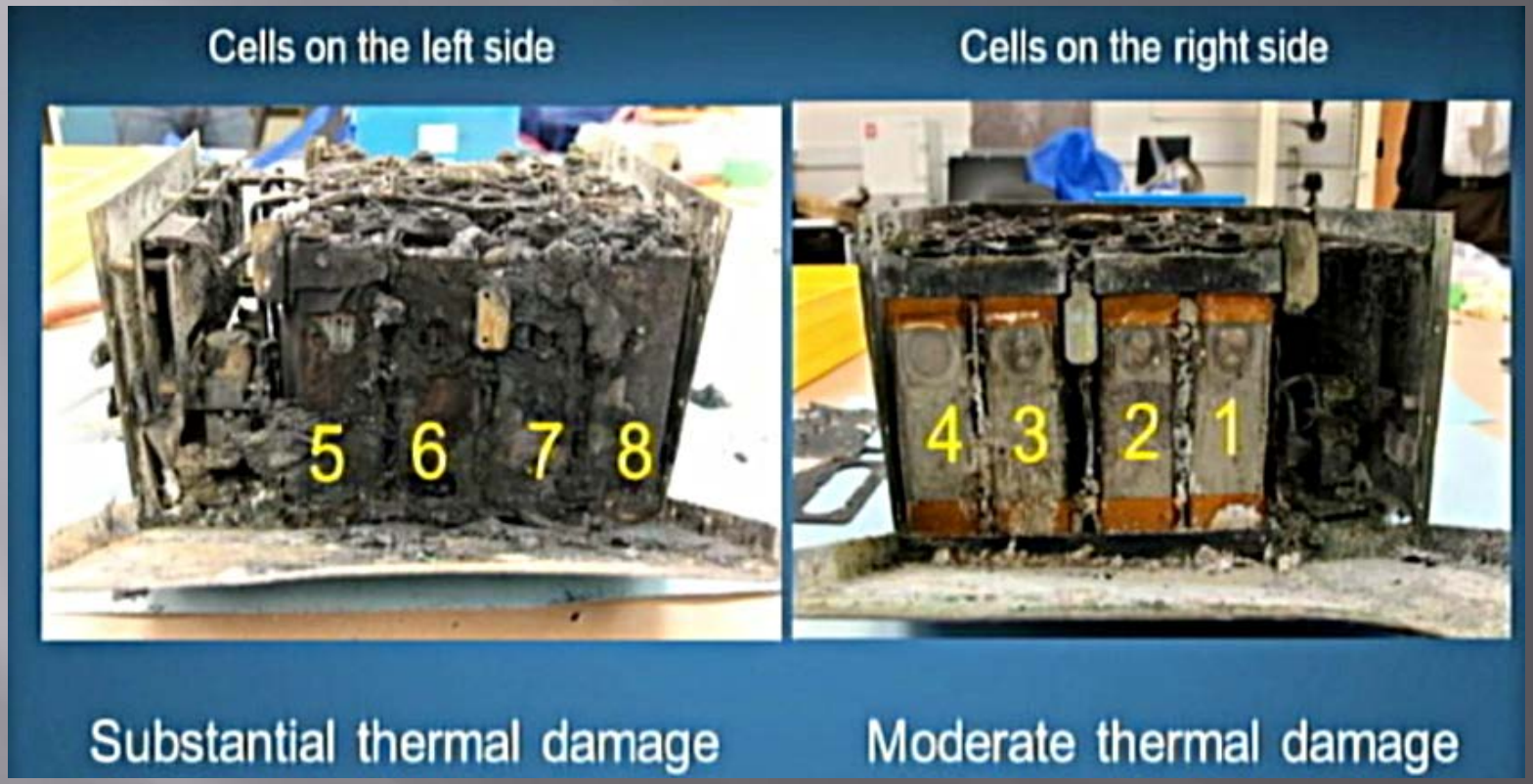


<u>The calculation:</u>

Volts (V) x Ampere-hour (Ah) = Watt hours (Wh). 158.4 Wh

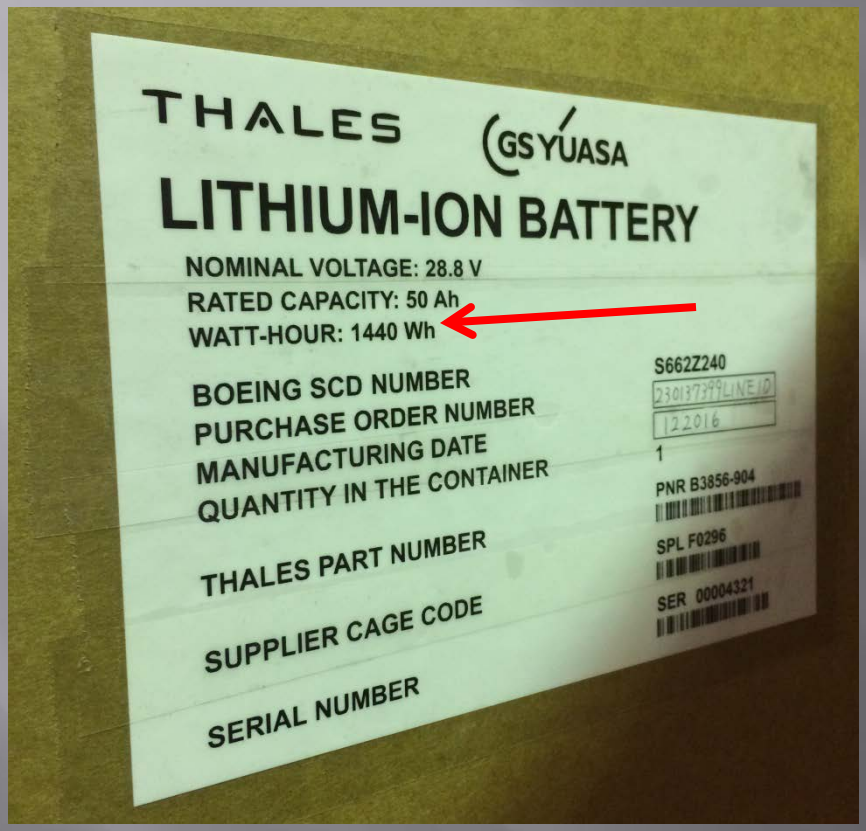
Early Boeing 787 Battery Issues





Battery in Japan Airlines Boeing 787 that caught fire in Boston. January 7, 2013

787 Batteries at SEA Cargo



Boeing and Airbus Advisory

- Boeing: July 17, 2015

"that the aircraft fire protection features are not able to adequately protect against."

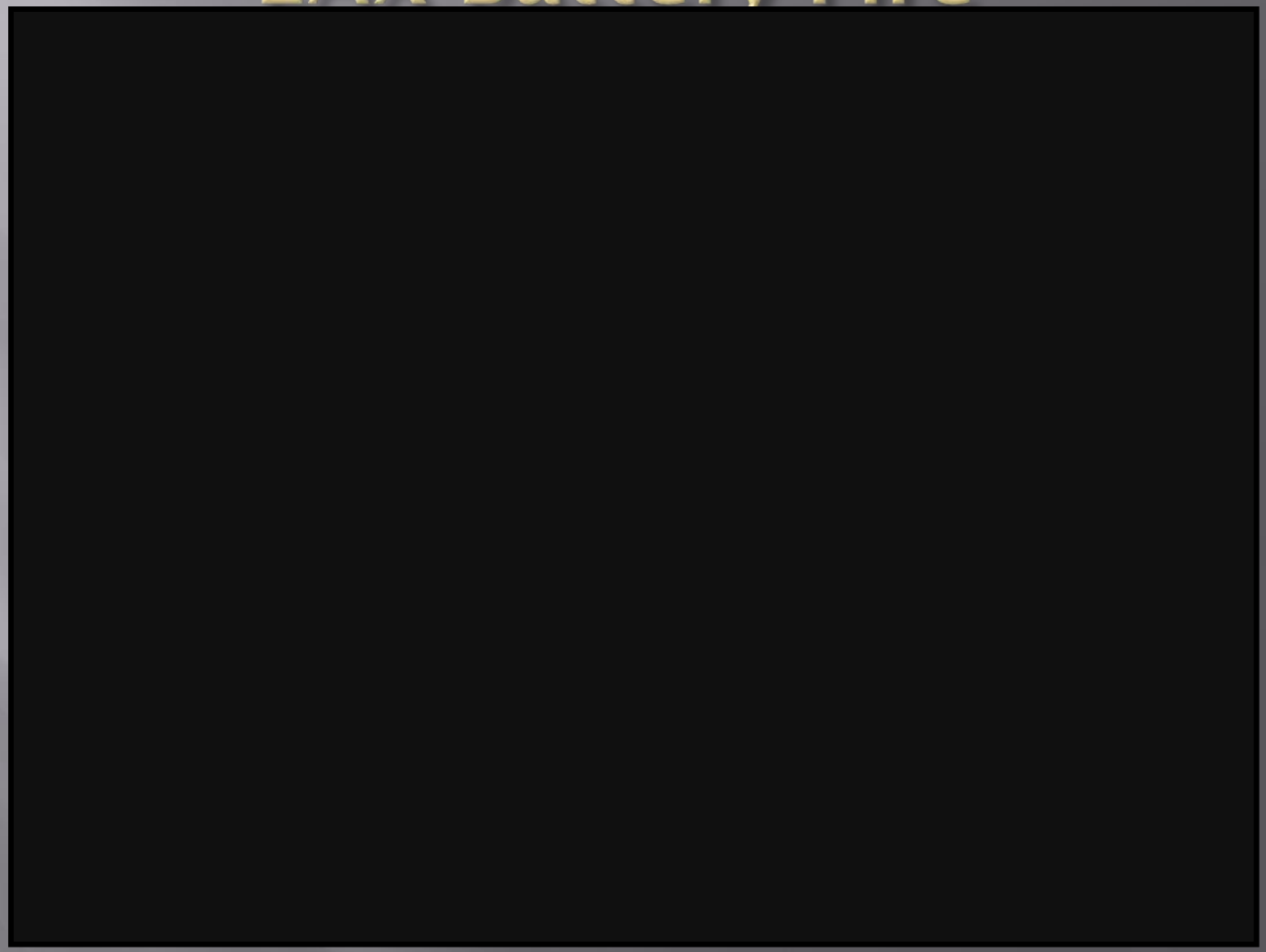
- Airbus: July 24, 2015

"render ineffective, the required Halon concentration for fire suppression and other control mechanism. There is the high likelihood of consequential significant structural damage to the aircraft."

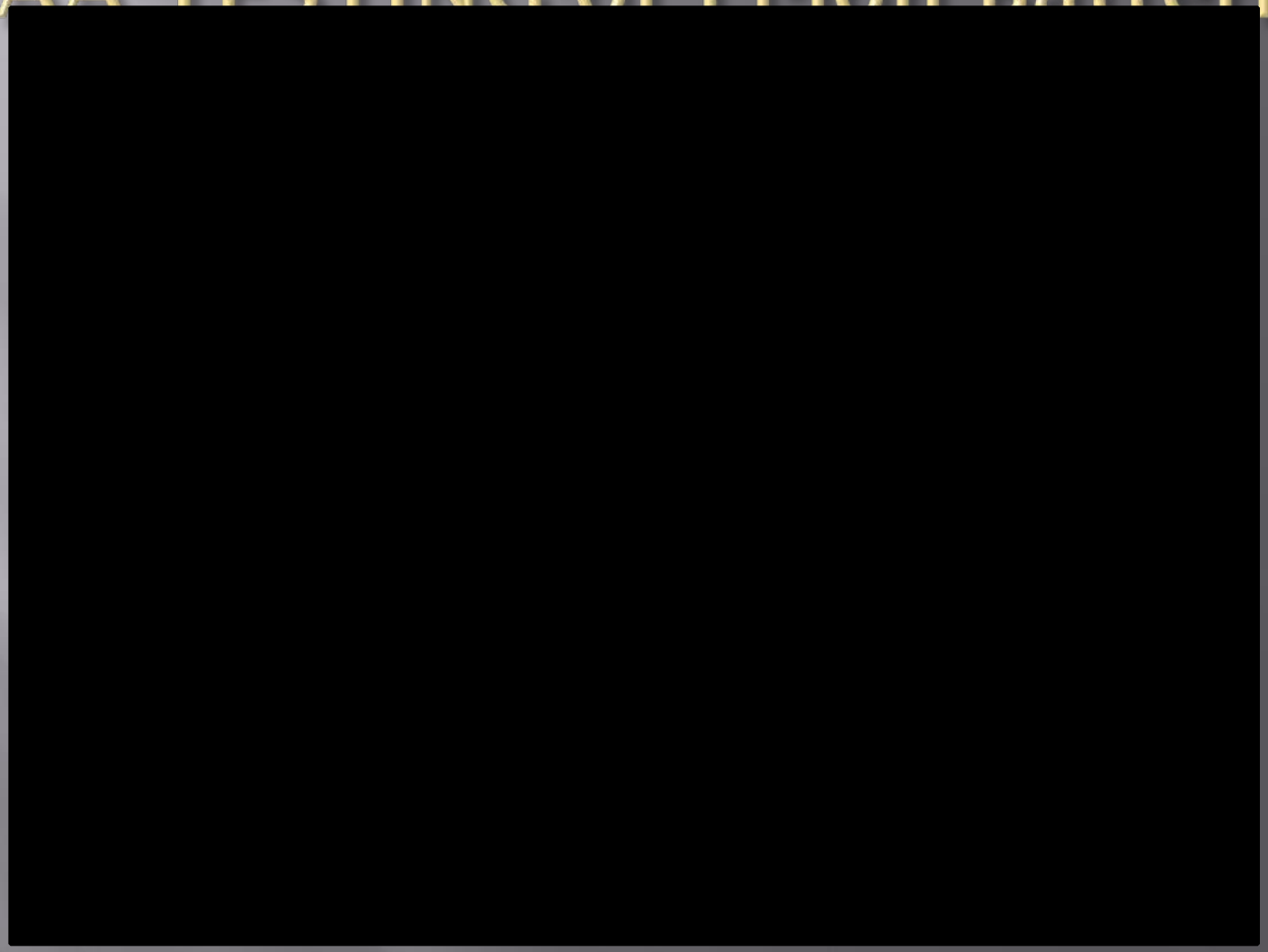
SAFO'S/ EO

- 16001- 19/01/2016: SRA
- 16004- 06/05/2016: Contacting Shippers (ICAO)
- 16011- 16/09/2016: Recalled Batteries and Devices
- Emergency Order 20169288- 14/10/2016: Samsung

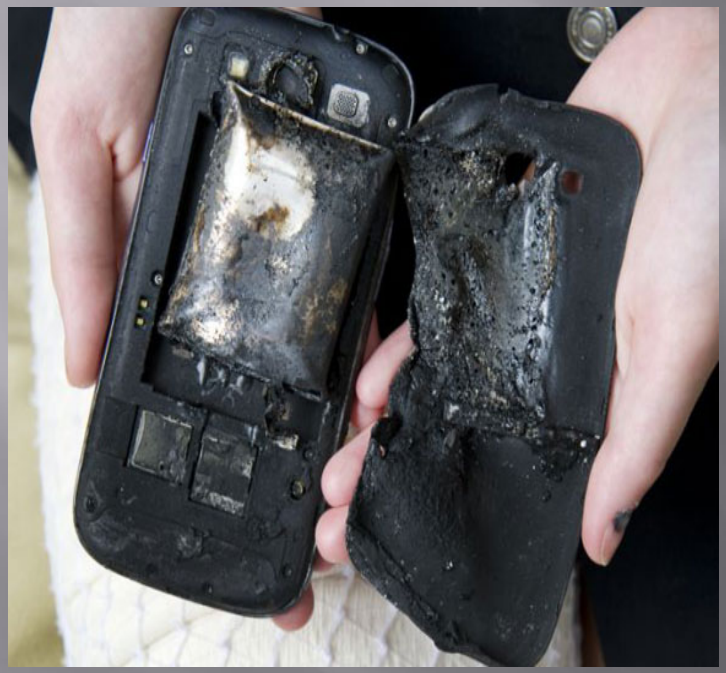
LAX Battery Fire



FAA TESTING of Li-ion Batteries



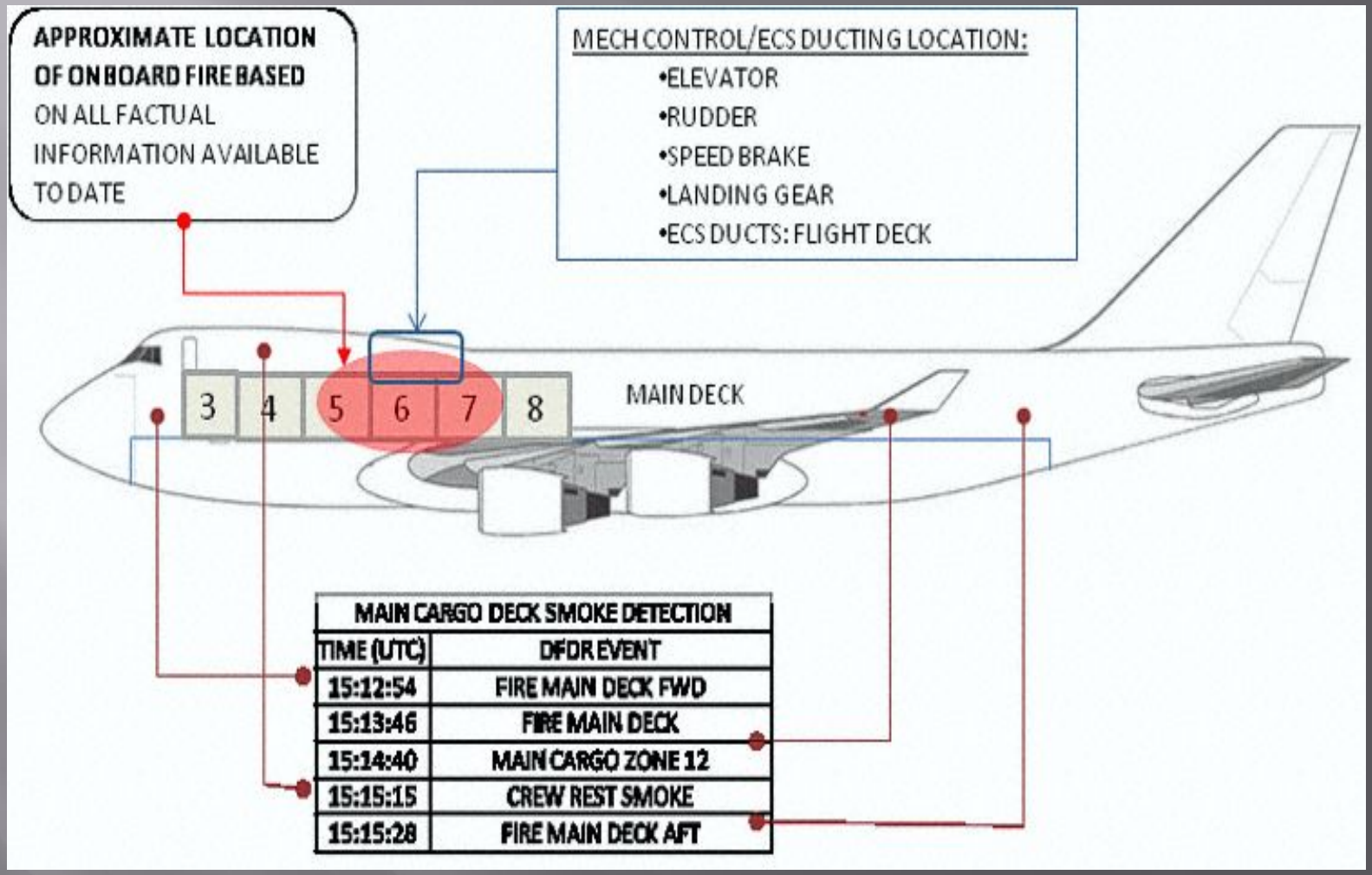
Thermal Runaway



INCIDENTS AND ISSUES

UPS B744 at Dubai on September 3rd 2010, crash result of cargo fire

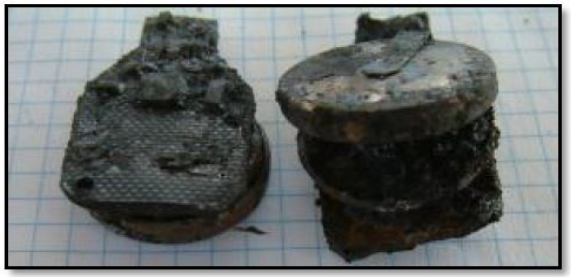
Obtained from UAE General Civil Aviation Authority (GCAA) report
AAIS Case Reference: 13/2010



Obtained from UAE General Civil Aviation Authority (GCAA) report
AAIS Case Reference: 13/2010

Fire damaged remains of battery pack with a fractured cell

Additional battery pack remains [LH]/D-Cell size lithium primary batteries. Photo shows fire damaged and undamaged batteries [RH]



Lithium primary button sized flat cell batteries (watch style) with small circuit board

Obtained from UAE General Civil Aviation Authority (GCAA) report
AAIS Case Reference: 13/2010

36-cell lithium-ion battery pack with thermal damage.

36-cell lithium-ion battery pack with multiple vented cells

Lithium-ion, mobile phone type battery

Crash site in daylight (Photo: APA/EPA/Ali Haider):

Asiana Cargo B744, West of Jeju International Airport on July 28, 2011, crashed result of a cargo fire

Obtained from Aircraft and Railway Accident Investigation Board (ARAIB)
Interim Report Reference: AAR1105

Picture by AviationNewsToday.com

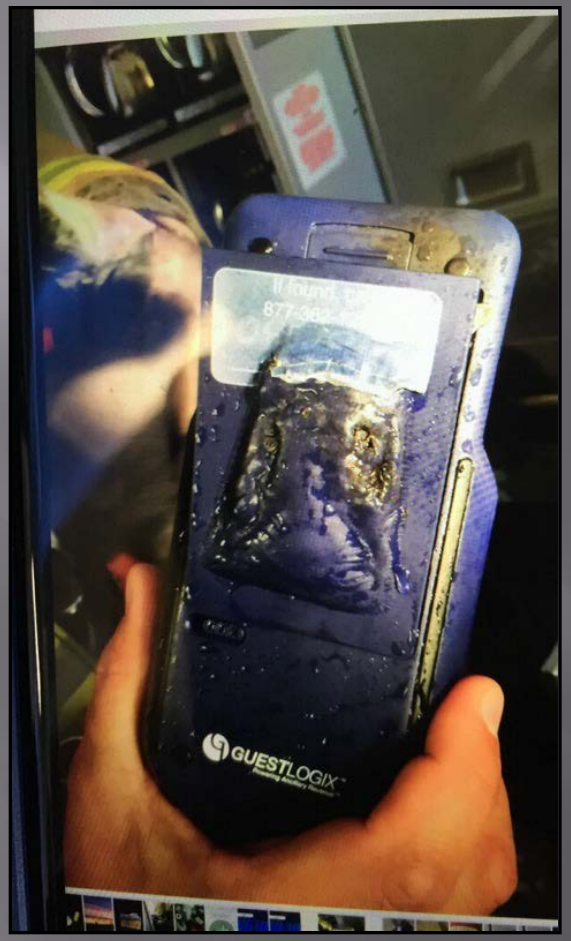
Burnt through skin panel (Photo: ARAIB)

One package containing 12 Lithium-Ion battery cells (Photo: ARAIB):

Debris floating off Jeju Island (Photo: AP):

ASAA POS EVENT

October 12, 2015



SMOKE AFFECTED AREA

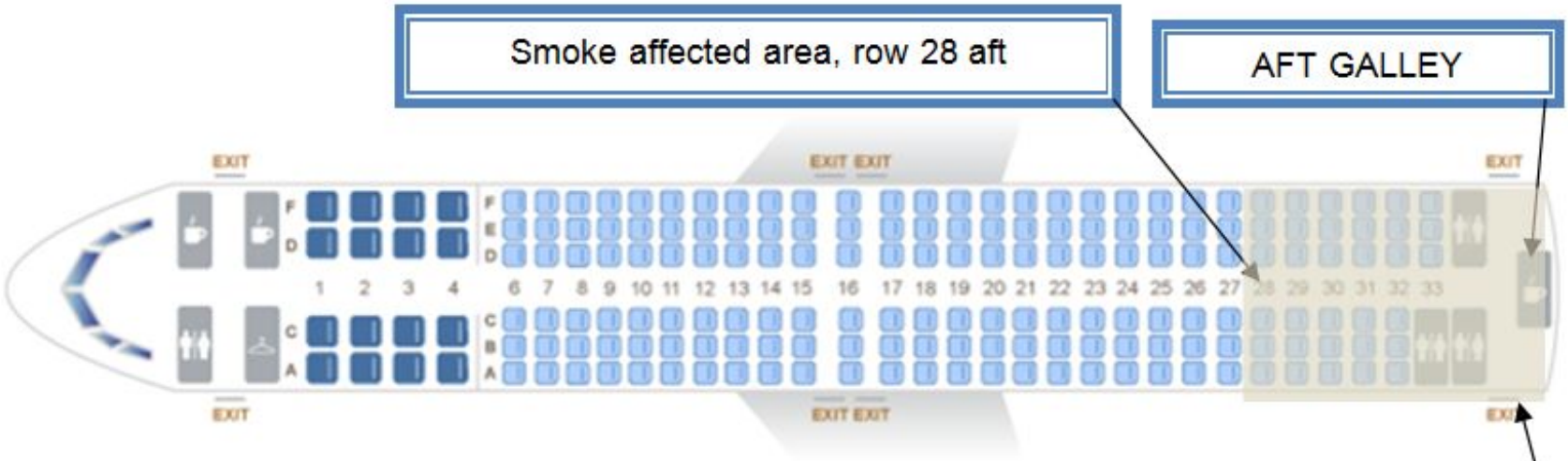


FIGURE 1: THE 737-900 CABIN LAYOUT

SEA BATTERY INCIDENTS

5 Incidents:

- 4 Vape related
- 1 ‘Undetermined’

Incident One: JUNE 16, 2017 a 22 year old female passenger on ASAA


18650 3000mAh 3.7V


6.16.2016 16:23

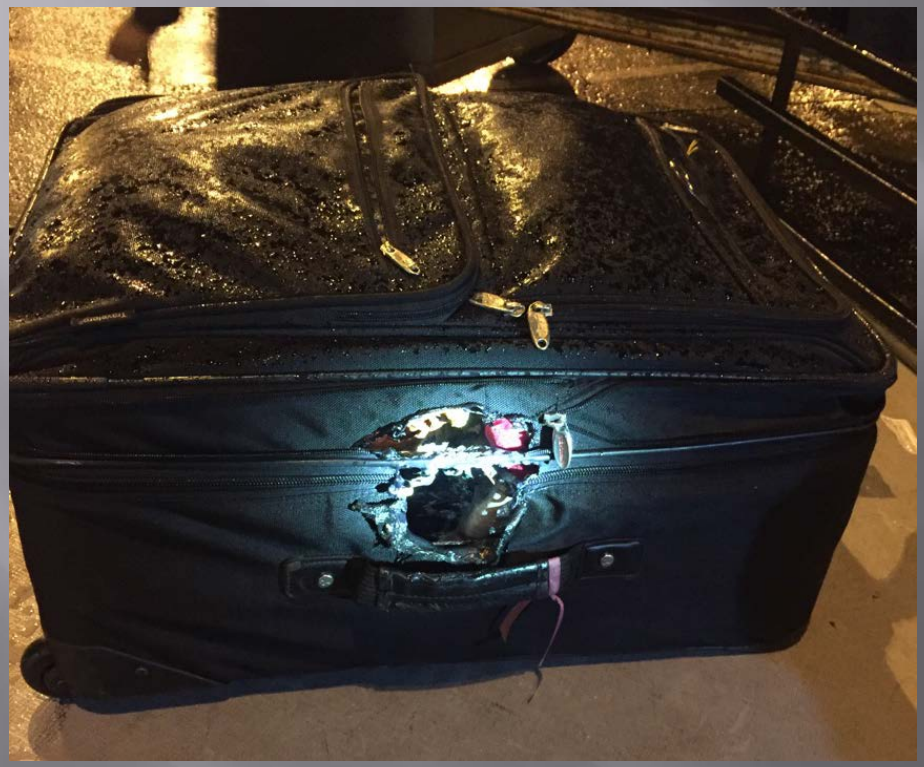
Incident Two: OCTOBER 23, 2016 a 28 year old male passenger on CALA


MXJO
IMR 18650
3.7V 2500MAH 35A
High Drain Rechargeable Battery

Incident Three: November 16, 2016 a 50 year old male passenger

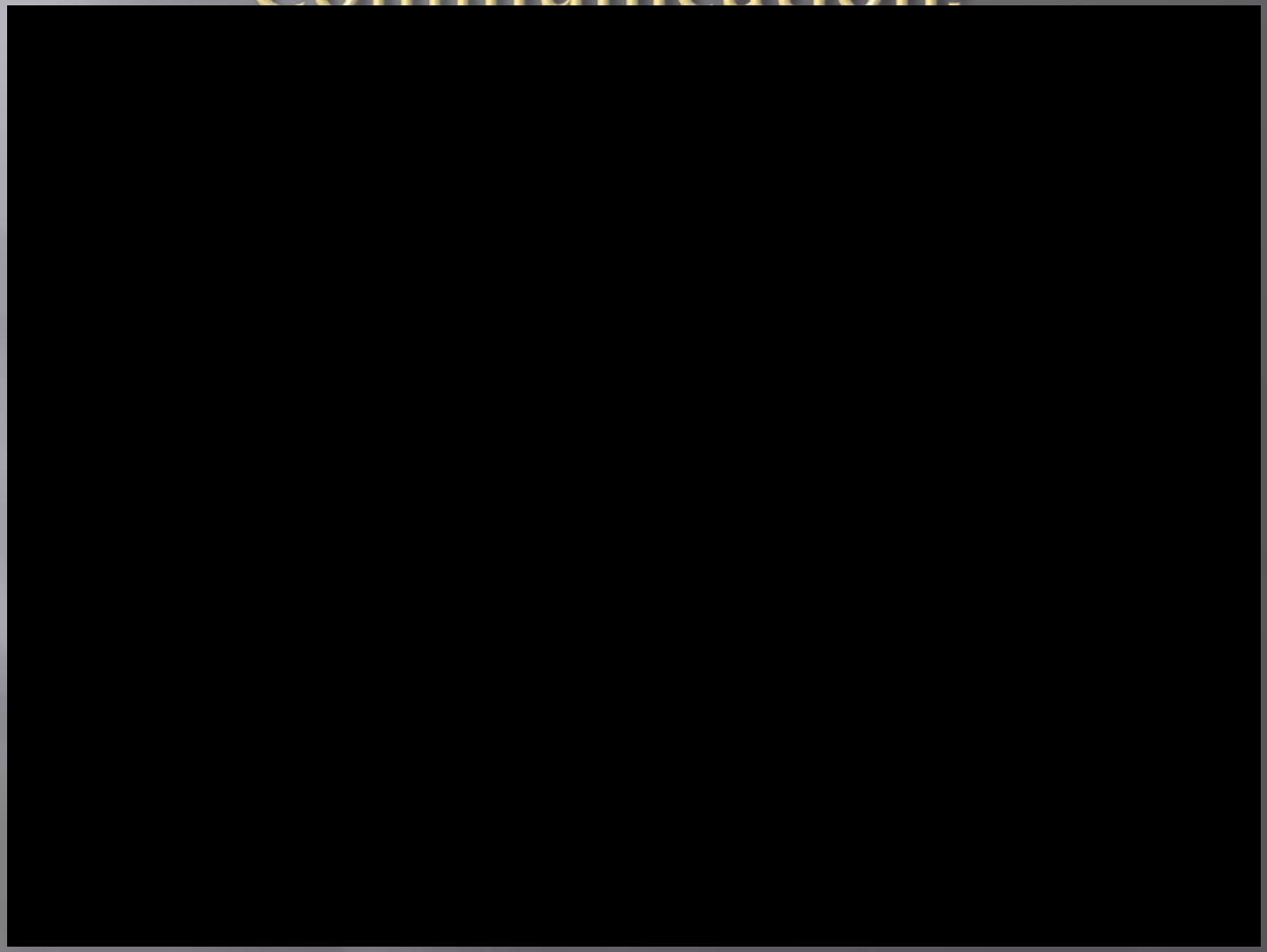

IMR 18650
3000mAh
3.7V 35A
IMR 18650
3000mA
3.7V 35

Incident Four: December 29, 2016 a unknown age female passenger



COMMUNICATION = VALID DATA

Communication!



NOTIFICATION of INCIDENTS

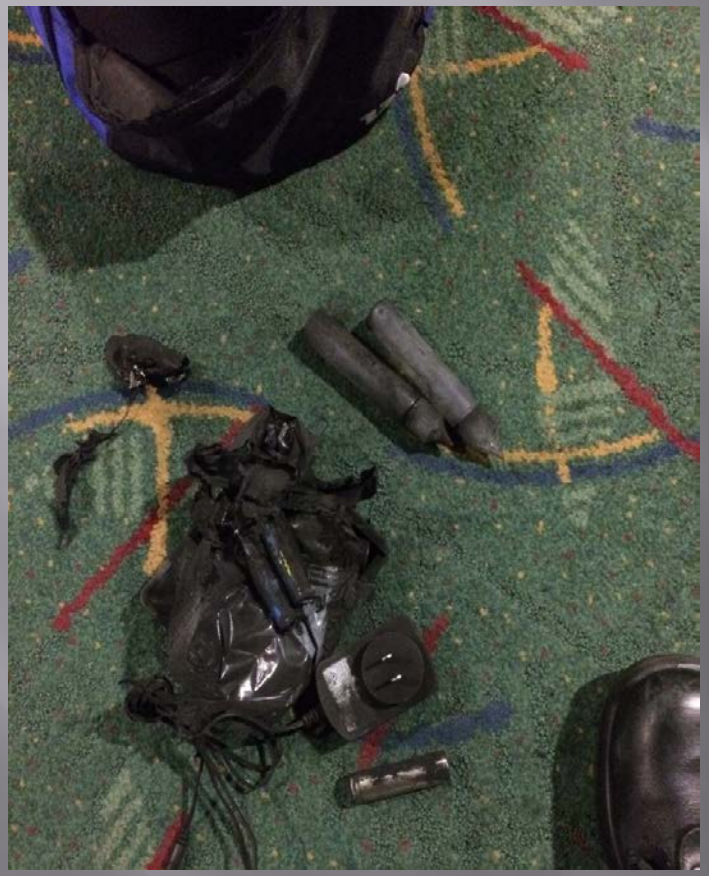
49CFR 171.15 Immediate notice of certain hazardous materials incidents.

(a) *General.* As soon as practical but *no later than 12 hours* after the occurrence of any incident described in paragraph (b) of this section, *each person in physical possession of the hazardous material* must provide notice by telephone to the National Response Center (NRC) on 800-424-8802

NOTIFICATION of INCIDENTS

- (6) During transportation by aircraft, a fire, violent rupture, explosion or dangerous evolution of heat (*i.e.*, an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging, or other evidence) occurs as a direct result of a battery or battery-powered device.

3 Unreported Incidents in PDX



Airport Investigation Resources

- Best Source
  - ARFF
  - AIRPORT PD
  - AIRPORT
  - AIRLINE
  - SECURITY

Reporting and Response

Partnerships with the aviation community

- Airline
- Cargo
- ARFF
- Police
- Consignees

Risk Mitigation

- New packaging guidelines
- New Classifications
- Awareness (Outreach)
- Valid Data

OUTREACH & UPCOMING THREATS

Keep them with you!

Federal Aviation Administration

ELECTRONIC CIGARETTES

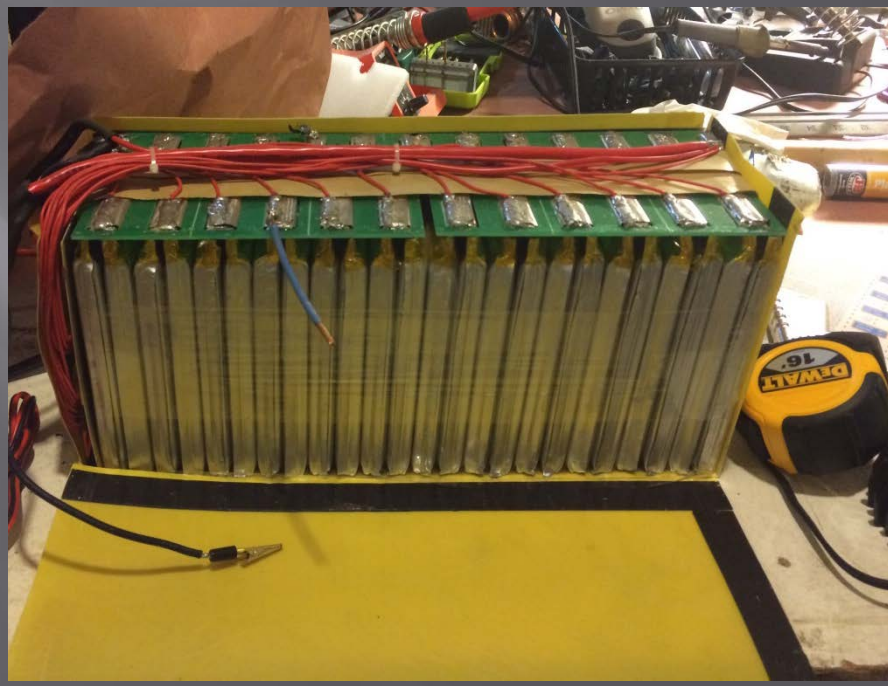
& SPARE LITHIUM BATTERIES FORBIDDEN IN CHECKED BAGGAGE

Also remove them from any carry-on bags that are checked at the gate or planeside.

www.faa.gov/go/PackSafe

USING OR CHARGING E-CIGARETTES ONBOARD THE AIRCRAFT IS FORBIDDEN

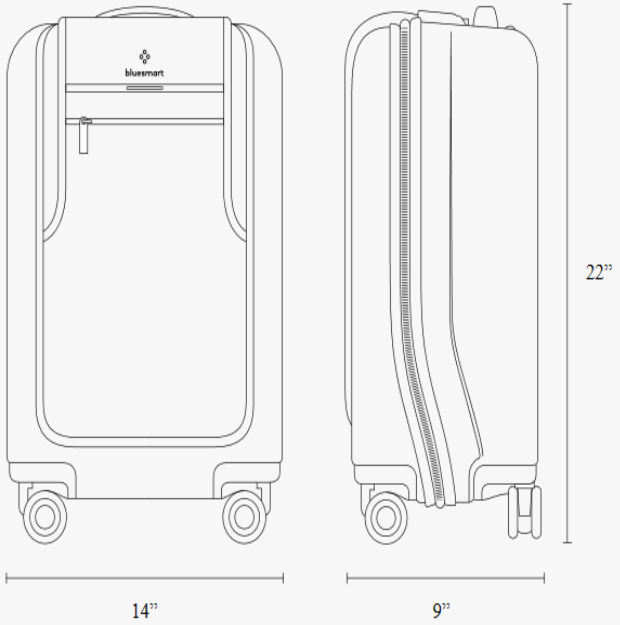
HOMEMADE DANGERS



E-Commerce


Rideable Carry-on Luggage!

Lithium Batteries built into suitcases



Specifications

Dimensions
22" x 14" x 9” / 55,88 x 35,56 x 22,86 cm

Weight
9.4 lbs / 4.26 kg

Materials
Trilayer polycarbonate and nylon

Color
Black with blue accents

Storage
34L packing volume; 15" laptop compartment

Location Tracking
Equipped with 3G Cellular Data and GPS

App Communication
Bluetooth controls lock and functionality

Compatibility
iOS 8.0 or later and Android 4.4 and above

USB Ports
2 standard USB ports (one USB charging cable included)

Battery
10.400 mAh capacity; charge phone 5-6x

Warranty
TSA-approved lock, FAA-compliant battery and 3G
2 years against defects in materials and electronic defects

Electronic ‘travel’ bikes

Self-Propelled Stroller Leads the Way to Hands-Free Parenting

Surfboards

ZUNUM Aero-Lithium battery Aircraft

HAZARDOUS MATERIALS SAFETY

QUESTIONS?