

Freighter Fire Protection During **Smoke/Fire/Fume** Events



Captain Bob Brown
UPS/IPA Safety Task Force



Industry Consultants



Existing Aviation Products



UPS/IPA Safety Task Force



Fire Fighting Community



Aerospace

The Air Business Model Has Changed

- A growing percentage of payload involves batteries and technology
- \$3.17/watt hour in 1991
- \$0.12/watt hour in 2014

Bottom Line – Transportation of Batteries and Energy is Increasing

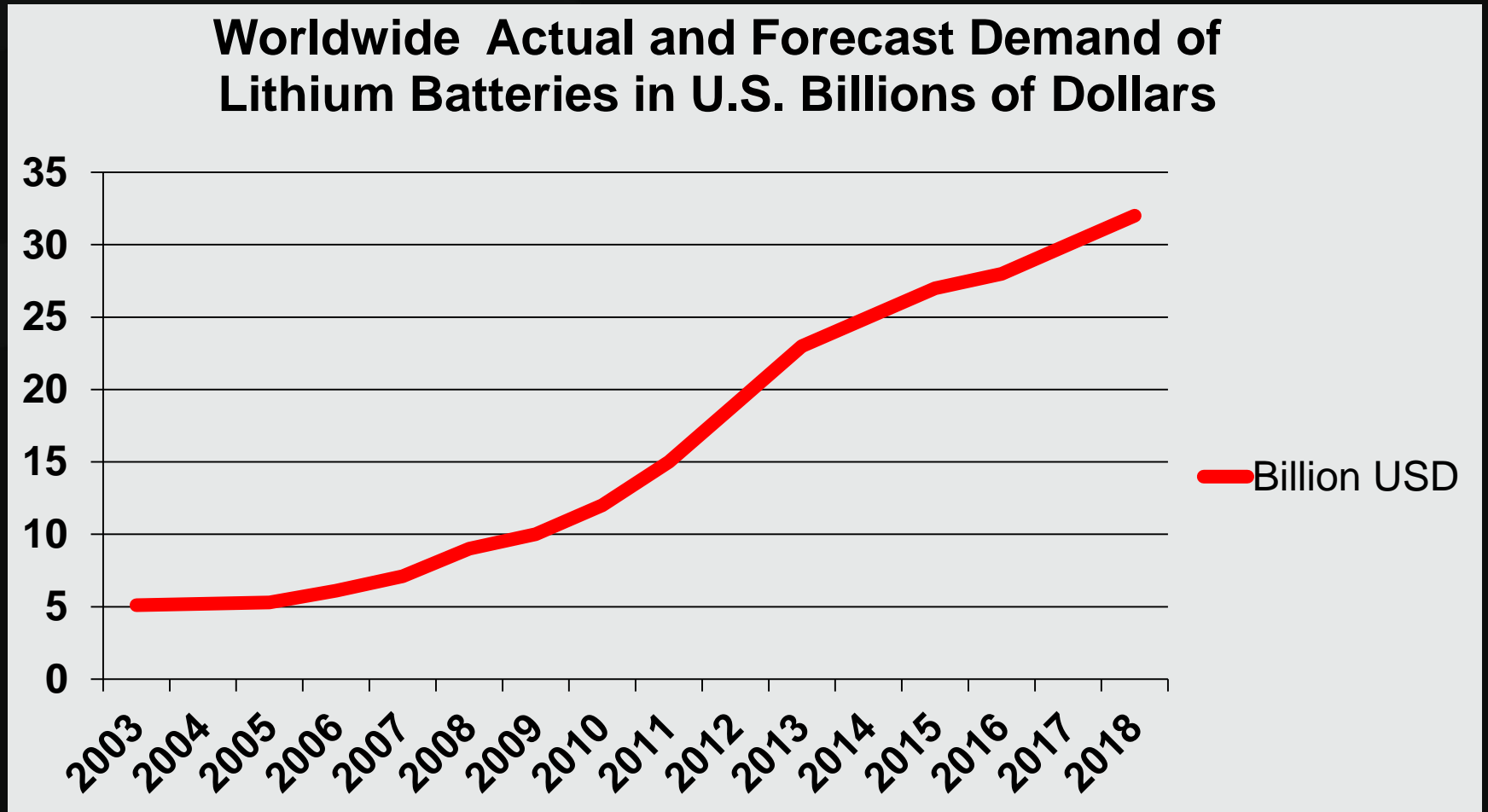
1988



2014

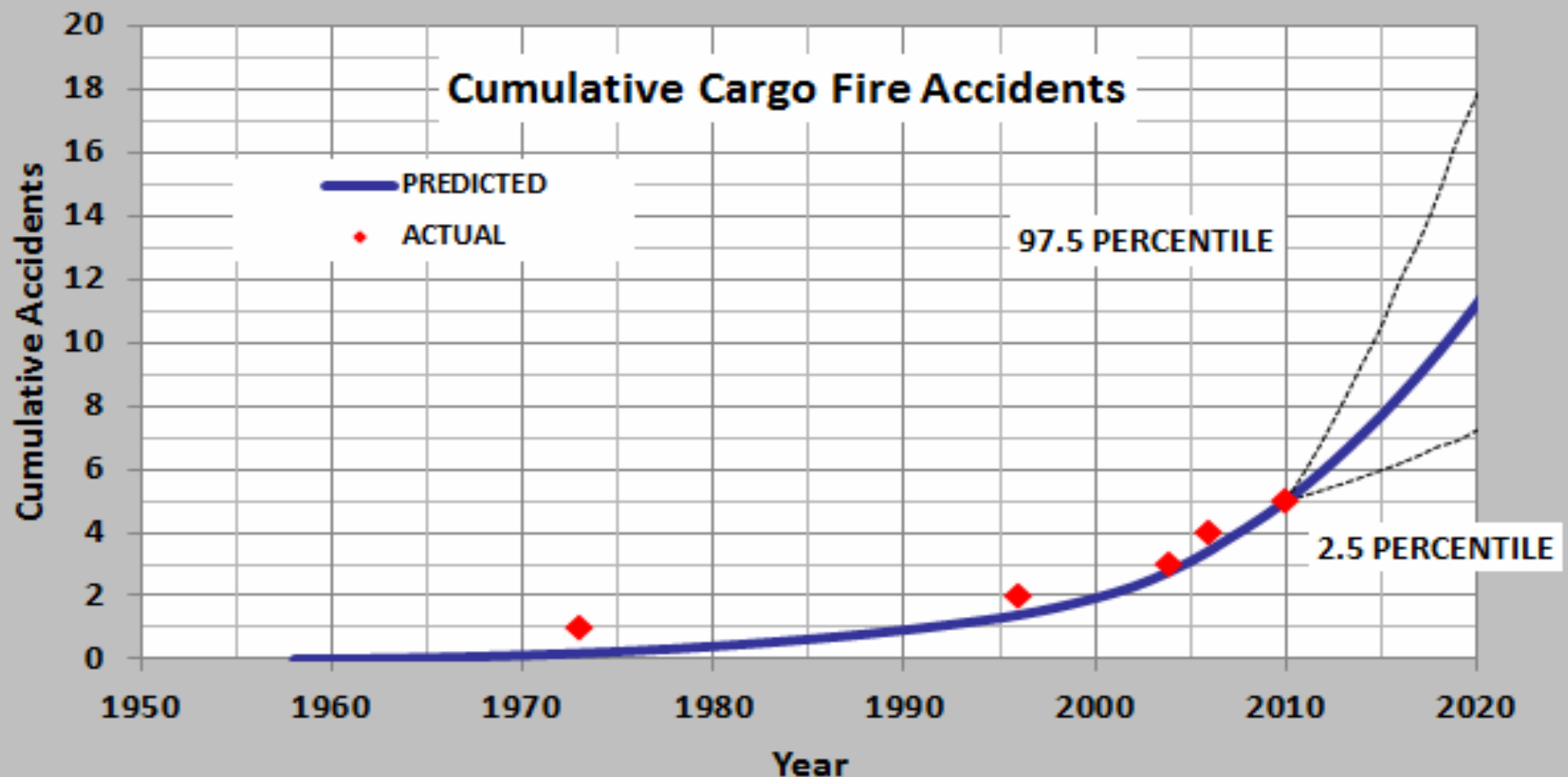


Global Lithium Battery Market in (\$US) Billions



FAA Study on Cargo Fire Accidents

FAA Safety Analysis of U.S. domestic freighters predicts approximately six (6) accidents likely to occur from now to 2021



Flight Deck Protection

Pilots and the Flight Deck

The Last Line of Defense



The Combination of Two Technologies Greatly Improves Safety



Emergency Vision Assurance System



Training

Pilot Training

Improving the Process



Checklist Design

Human Factors Example: Checklist Numbering System

Training

ENGINE FIRE, Severe Damage or Separation

MESSAGE: L or R ENGINE FIRE

AUTOTHROTTLE ARM SWITCH OFF

THRUST LEVER (Affected side) CLOSE

FUEL CONTROL
SWITCH (Affected side) CUT OFF

ENGINE FIRE SWITCH (Affected side) PULL

If Engine Fire Warning light remains illuminated:

ENGINE FIRE SWITCH ROTATE

Rotate to stop and hold for 1 second.

**After 30 seconds, if Engine Fire Warning light
remains illuminated:**

ENGINE FIRE
SWITCH ROTATE TO REMAINING BOTTLE

Rotate to stop and hold for 1 second.

**If high airframe vibration occurs and continues
after engine is shut down:**

Without delay, reduce airspeed and descend to a
safe altitude which results in an acceptable
vibration level. If high vibration returns and
further airspeed reduction and descent is not
practical, increasing the airspeed may reduce the
vibration.

APU (If available) START

(CONTINUED)

ENGINE FIRE or Engine Severe Damage or Separation

N301UP through N315UP

Messages: L ENGINE FIRE R ENGINE FIRE

Condition: One or more of these occur:

- Engine fire warning
- Airframe vibrations with abnormal engine indications
- Engine separation

1 A/T ARM switch OFF

2 Thrust lever (affected side) .Confirm Idle

3 FUEL CONTROL switch
(affected side)Confirm ... CUTOFF

4 Engine fire switch
(affected side)Confirm Pull

5 **If the engine fire warning light is illuminated:**

Engine fire switch Rotate to the stop and
hold for 1 second

**If after 30 seconds the engine fire warning light
stays illuminated:**

Engine fire switch. Rotate to
the other stop and
hold for 1 second

▼ Continued on next page ▼

Checklist Design

Human Factors Example: Condition and Confirmation Steps

Training

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▼ Continued on next page ▼

Training



... into a sequence-based learning experience.



———— Inflight Smoke/Fire —————→



Containers

FCC and ULD

Protecting the Aircraft

**New Materials and Designs are
making a Difference**

Fire Containment Covers (FCC)

Containers

- Covers high-energy shipments and unknown palletized freight
- Used from origin to final destination
- FCC requires no additional time
- Demonstrated 1500F fire containment for 4 hours



Unit Load Device (ULD)

Containers

The initial goal was:

- Contain a Class-A fire in a ULD for 4 hours
- 4 hour containment achieved with Class-A fires
- 2000+ Fire Resistant ULD's in service



ULD with Suppression

Containers

- UPS has applied for an STC
- All aircraft positions covered
- Multi-modal protection
- Certification testing underway





Final Thoughts...

- Enhancing aviation safety is possible
- New technologies show promise
- We need to work together
- Cargo fires can become survivable events