

Lithium Battery - Risk Mitigation

IATA World Cargo Symposium
Shanghai - 10 March 2015

Lithium Batteries “The Cathay Perspective”

1. The Risk
2. Experience
3. Mitigating the Risk
4. Where next
5. Conclusions



1.The Risk

The Lithium (Li) Battery risk has emerged...

UPS Cargo Plane Crashes Near Dubai - WSJ



Asiana Air Freightier Crash Raises Questions Again On Lithium Battery



Fire forces UPS plane to make emergency landing - CNN



Two main type of Lithium Batteries

Lithium Ion

- Rechargeable
- Halon is effective



Lithium Metal

- Non-rechargeable
- Halon is **not** effective



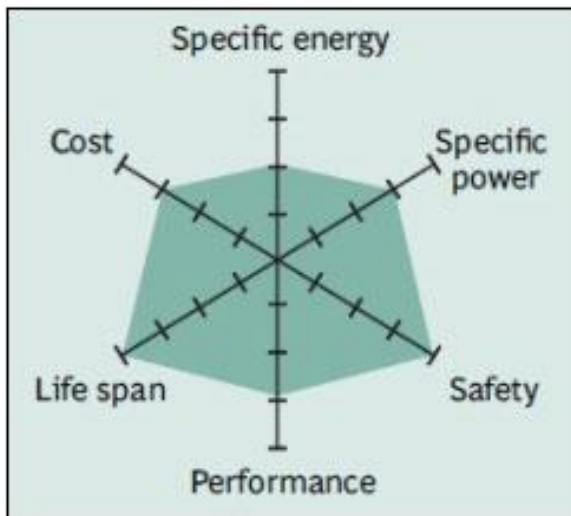
Batteries are everywhere!

- Lithium-ion batteries are widely used as a power source in portable electrical and electronic products.
- Approximately **5.5 billion** lithium batteries manufactured in 2013 growth rate of 25-30% per annum.
- Market for lithium batteries is projected to reach nearly \$10 billion 2014
- 86% of the market is lithium-ion batteries

Quality and Design



**Physical properties
(size, power &
design) and use
vary considerably**



Battery Failure Modes

- Overrun
- Overheat
- Design issues
- Manufacturing techniques
- Handling
- Packaging and Shipping
- Environment

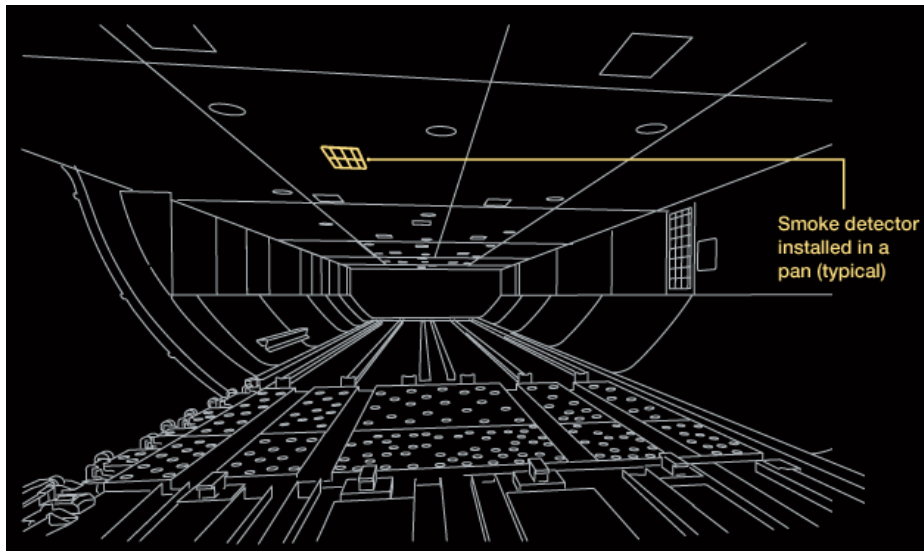
Carriage of batteries

- Passengers
 - Cabin Baggage
 - Checked Baggage
 - Mobility Devices
- Cargo
 - DG shipments
 - Regulated Class 9
 - Excepted ELM / ELI
- Mail
 - Authorised Postal Provides only

Battery verses Aircraft

The time from initial smoke indication to Hull loss can be very short and depends on either:

- Fire suppression systems onboard.
- Emerging Supplemental fire suppression systems.



Passenger Aircraft Fire Suppression

- Lower Deck – Class C Halon System
 - FAA tests have shown that Lithium Ion fires can be put out using Halon in the lower deck.
 - FAA tests have shown that Lithium Metal exhibit a much higher risk and Halon will not extinguish a LI Metal Fire.
- Passenger Cabin – Cabin Crew
 - Cabin Crew are trained to deal with passenger Cabin Fires.

Freighter Aircraft Fire Suppression

- Lower Deck – Class C Halon System
 - Same as the Passenger Aircraft.
- Main Deck Cargo – Class E System
 - Depressurisation of the Main Deck to starve the fire of oxygen.



2.Experience

Lithium fire events continue to happen...

Selected incidents over the last three years:

- Mail bag fire, LHR, APR12
- Mail bag fire, HEL, JAN12
- Cargo fire, Warsaw, MAY12
- Cargo fire, YVR, JUN12
- Warehouse fire, AUG12
- Dropped package, AKL, NOV 12
- Lithium Battery Fire in Baggage, HKG, MAY 14
- Cargo fire during re-sort, SIN, AUG 2014
- FSS Activation and Diversion, STL, FEB 2015

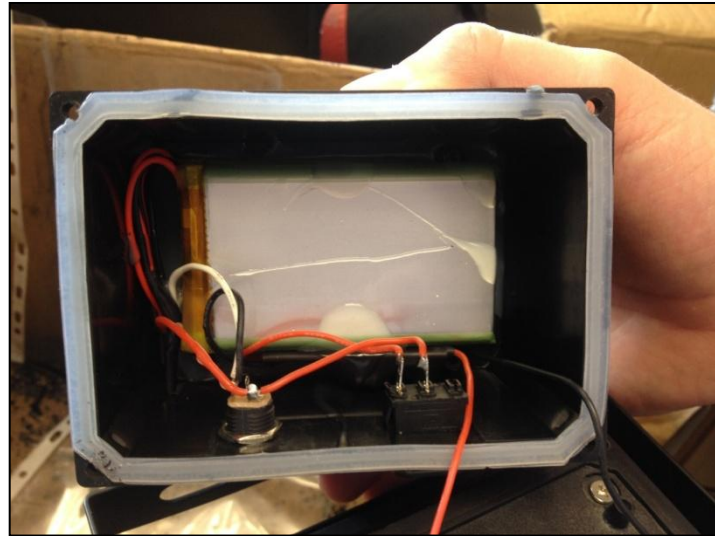
Mail Shipment Fire – April 2012



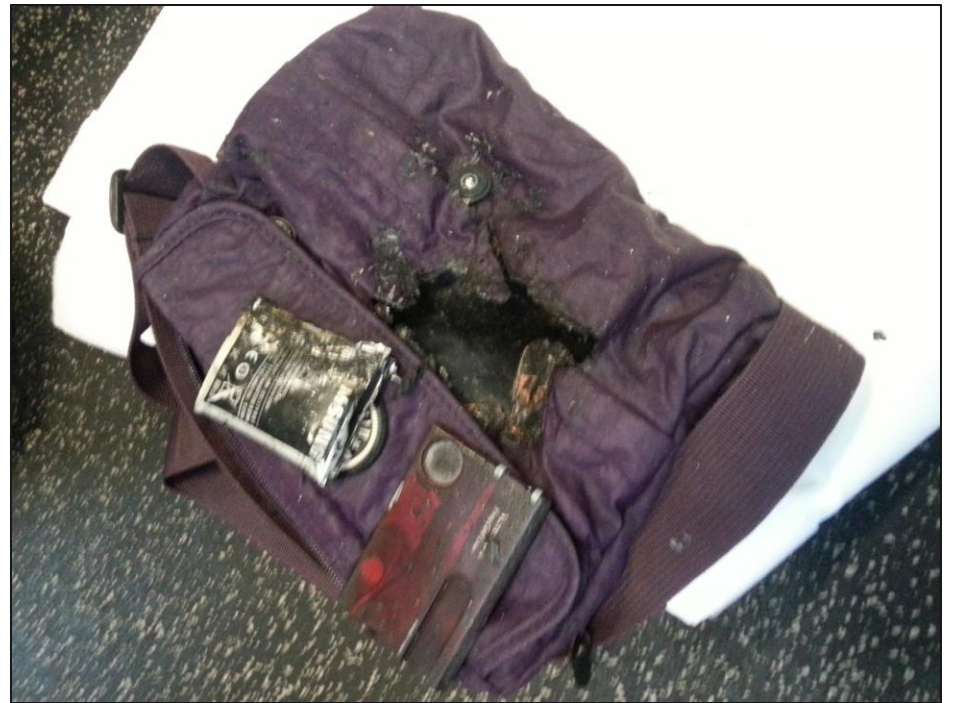
Cargo Shipment Fire – May 2012



Checked Baggage Fire - May 2014



Cabin Fires



Regulation Complexity

- It's becoming more and more complex to understand the regulations.
- The rules are constantly changing to keep up with the risk.
- Training of Shippers and forwarders is a challenge.

As regulations increase the methods and lengths in which shippers will go to is alarming



Passenger baggage – Lack of awareness?



2 x check-in bags containing **300-400 lithium batteries** each found during transfer due to the zip bursting open.



400 **Lithium batteries** detected by routine scanning



Security detected 600 **Lithium batteries** in carry on baggage.

Found on Arrival – Shipper forgot to declare?

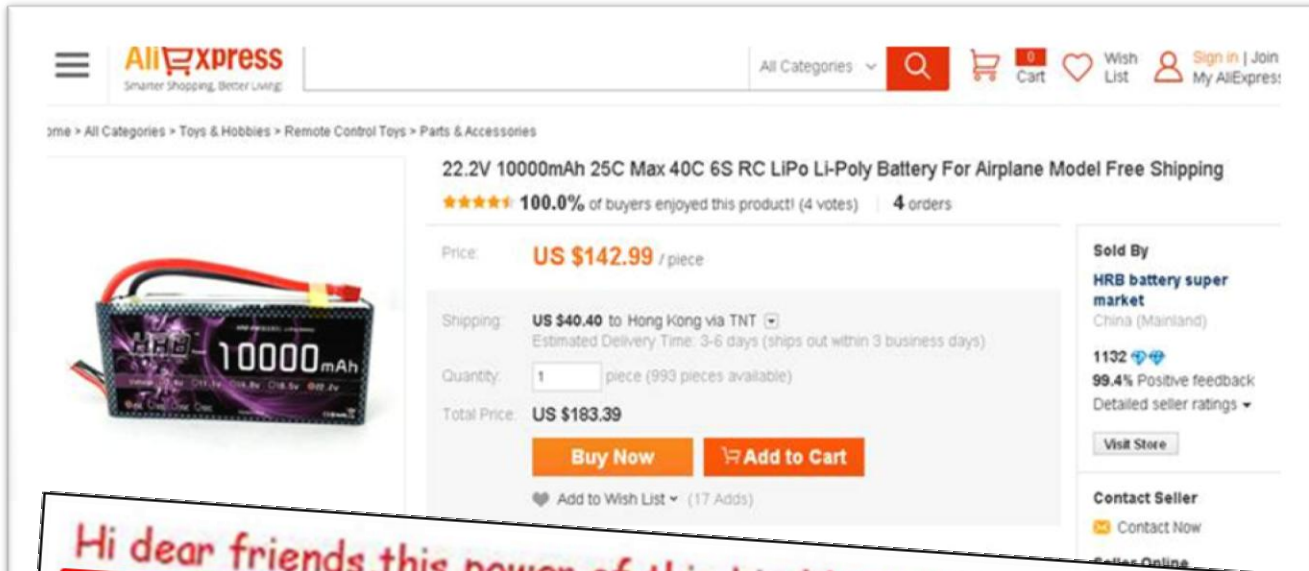
Several thousand undeclared **Lithium batteries** found on arrival







Was there an intent to mis-declare?



Or just blatantly breaking the rules!



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22.2V 10000mAh 25C Max 40C 6S RC LiPo Li-Poly Battery For Airplane Model Free Shipping

★★★★★ 100.0% of buyers enjoyed this product! (4 votes) | 4 orders


Price: **US \$142.99** / piece

Shipping: **US \$40.40** to Hong Kong via TNT 
Estimated Delivery Time: 3-6 days (ships out within 3 business days)



Quantity: piece (993 pieces available)

Total Price: **US \$183.39**



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Sold By
HRB battery super market
China (Mainland)

1132 
99.4% Positive feedback
Detailed seller ratings 

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Hi dear friends, this power of this kind battery is more than 100W, we will attach the real label inside the cover of the battery and attach one wrong label for battery which is below 100W, on the surface of the battery. Because if the power of the battery is more than 100W, it can't be transported by air. Hope you can understand us. We are so apologized to you for this inconvenience. Thanks.

Description
22.2 10000mAh 25C Max 40C 6S RC LiPo Li-Poly Battery For Airplane Model



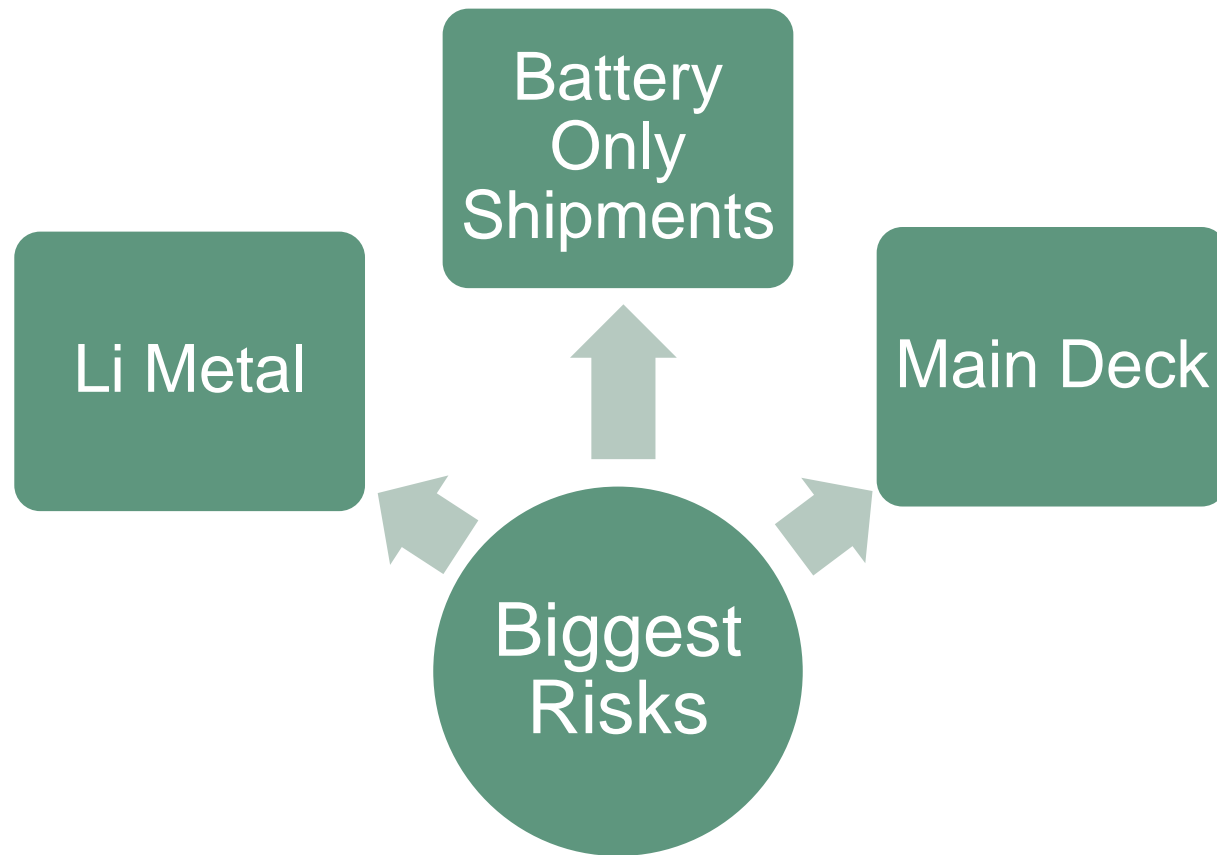
3. Risk Mitigations

The Risk has clearly been identified

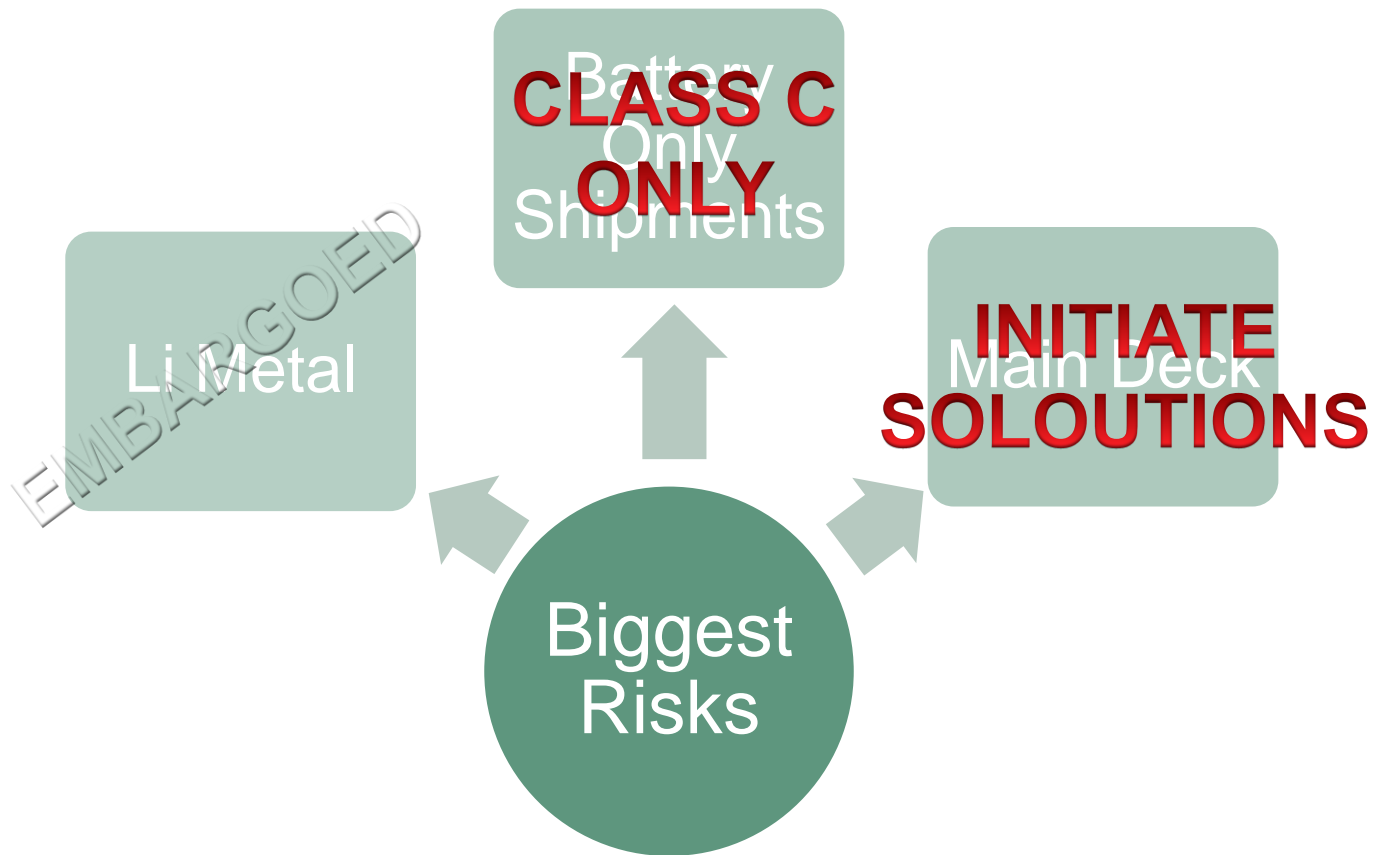
- Severity
 - Catastrophic, event leading to multiple fatalities or hull loss.
- Likelihood
 - Unlikely, unlikely to occur.
- Risk
 - High, risk must be understood and a high Level of risk reduction put in place.



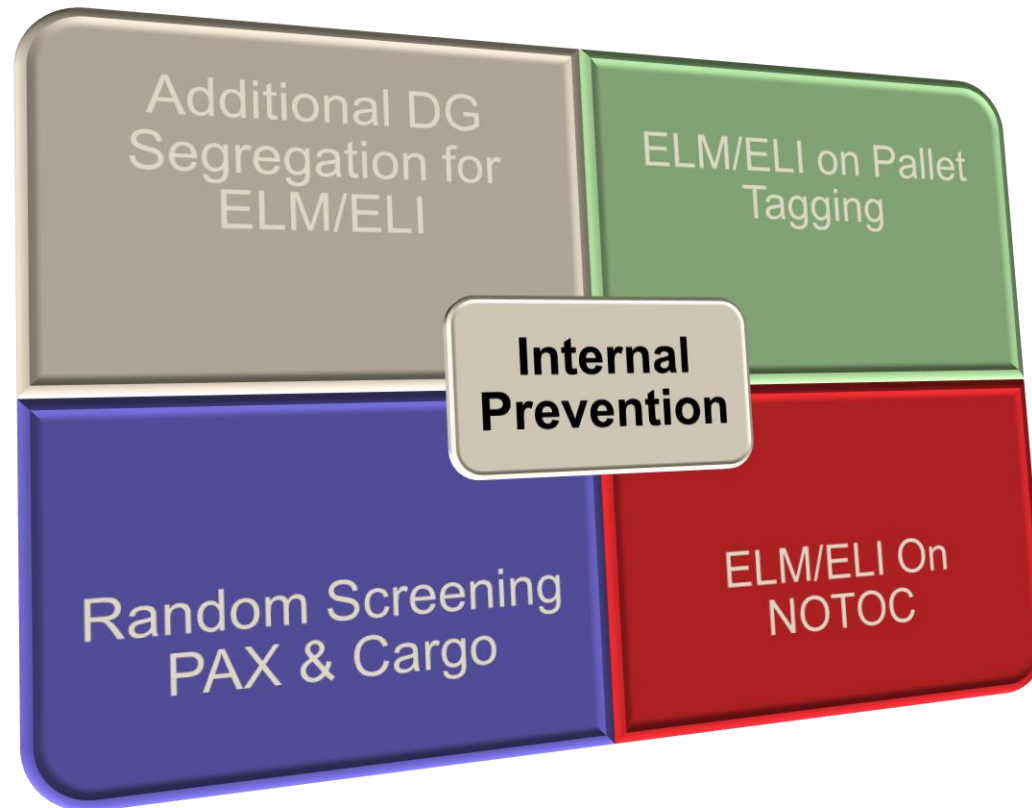
Immediate Areas of Concern



Immediate Areas of Concern



Immediate Internal Risk Mitigations Completed



Immediate External Risk Mitigations initiated...



Immediate - Education of Staff and Passengers

- Passenger education
 - Updated info on Website
 - Additional questions at check-in touch-points
 - Limits for “spare batteries” in checked baggage
- Staff education
 - Updated information in SOPs
 - Dedicated training concerning Li Batteries



Immediate - Cabin Mitigations

- Revised and Re-enforced Training for Cabin Crew
- Introduction of Firebane® and Aircare FireSock™

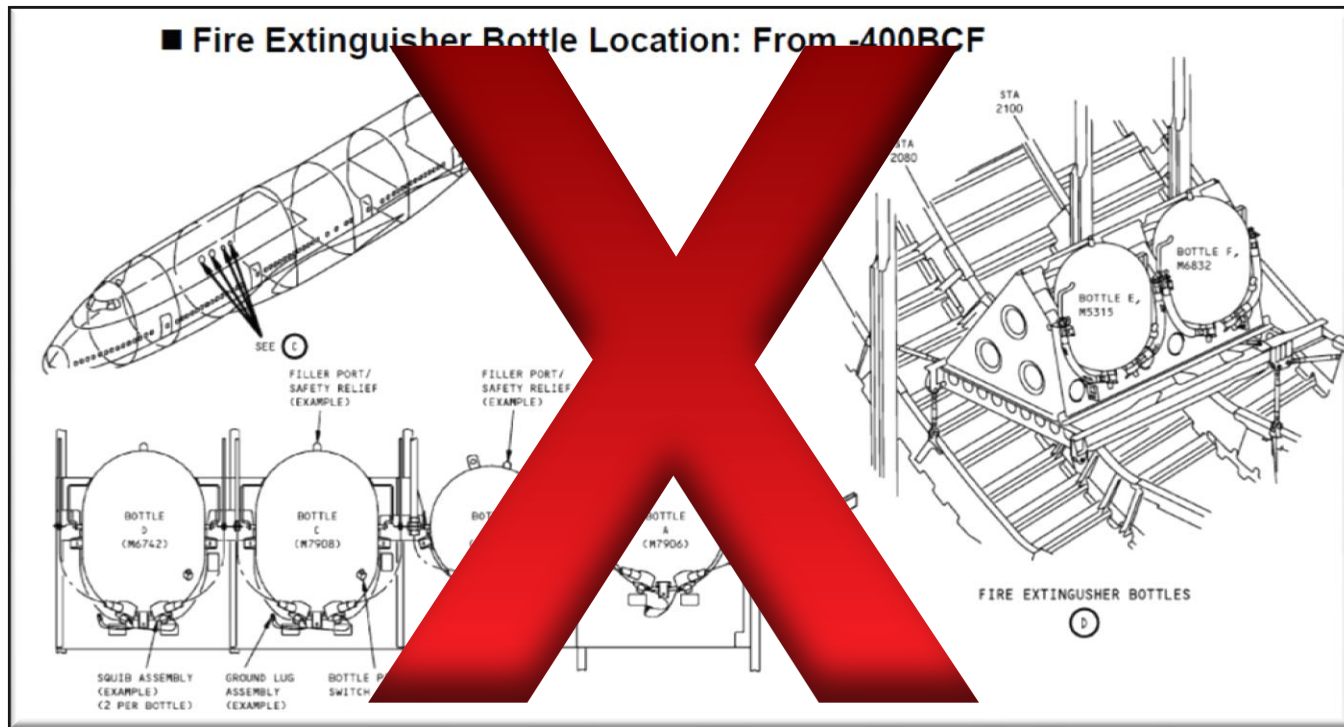


Medium and Long Term Mitigations - Cargo

Two possible options identified

- Active Fire Suppression System
 - Class E Modification
- Passive fire suppression
 - Fire Containment Covers
 - Fire Resistant Containers

Enhanced Class E on the Main deck



Fire Containment Covers



To implement FCCs or not?

Risk
Reduction

Operation
& Costs

Additional Weight

Only Viable solution available

Expensive

Buys Time

Complexity

Saves the Aircraft

Time



What to Cover?

- Impossible to install an FCC on every Main Deck Pallet.
- Initially 6 types of shipment were identified representing the highest risk.
- Adopt a risk-prioritised and progressive approach, focussing on ex HKG.
- Approx: 10 FCCs will be deployed on every HKG departure.
- However, there is always a chance that not all MDPs which contains undeclared or hidden DG are covered.

Proving too complex to manage so many priorities.

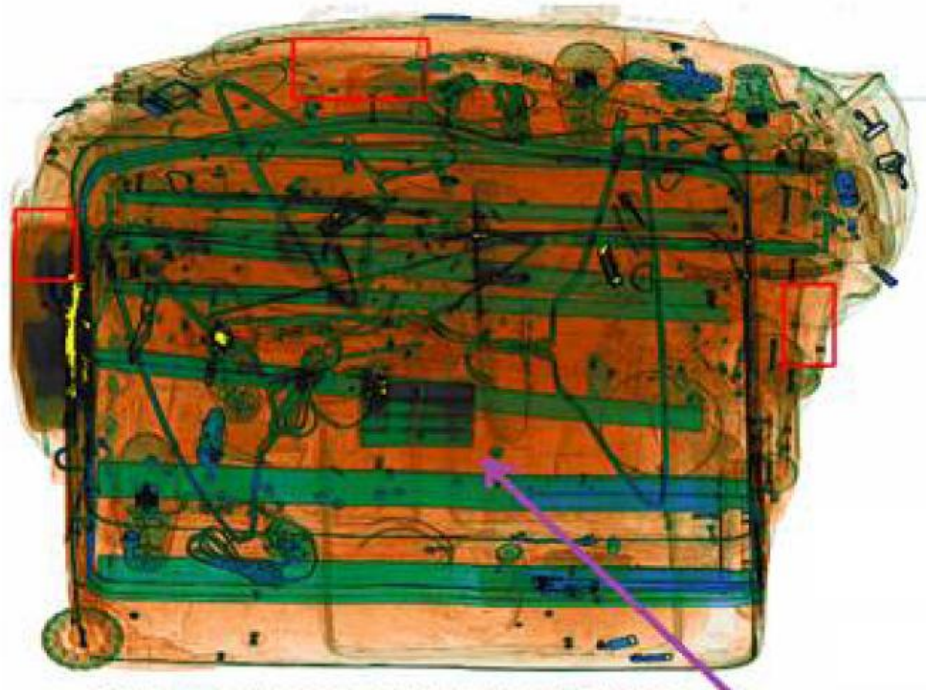
Currently revising the approach.



Emergency Vision Assurance System (EVAS)



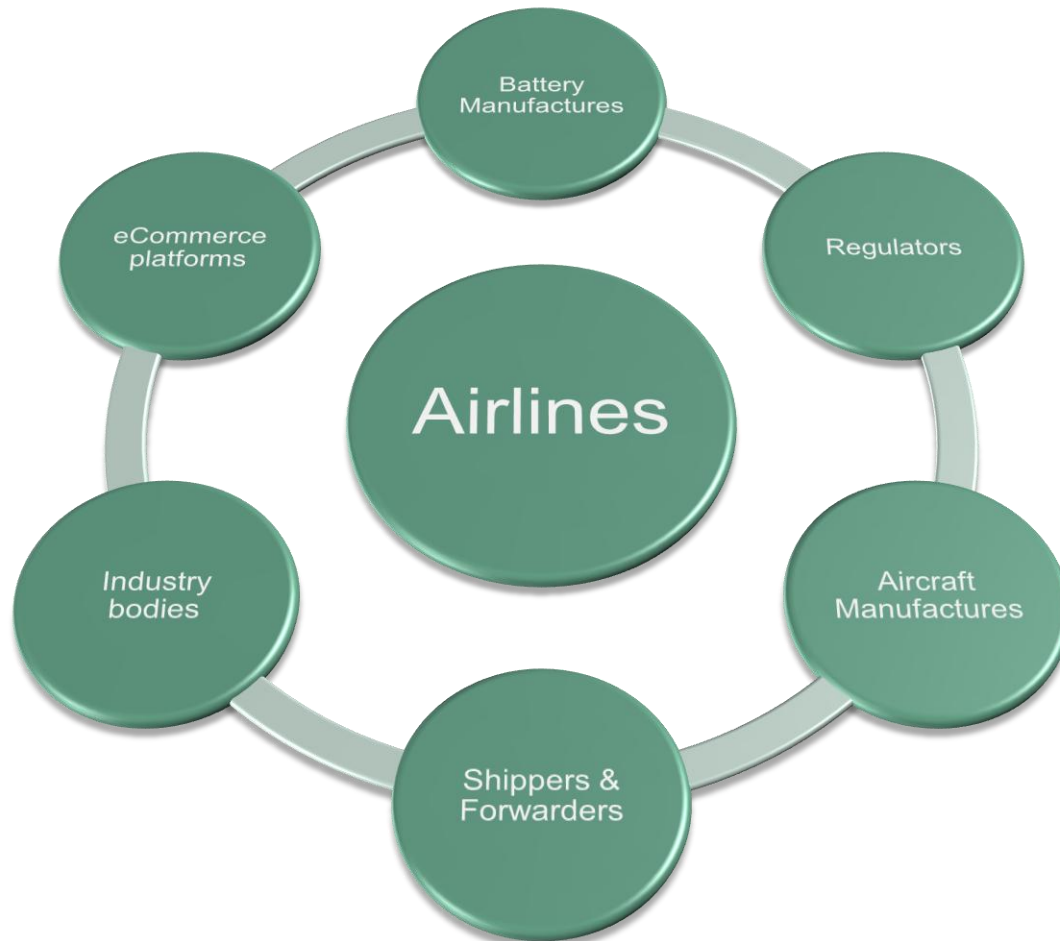
Screening – Auto-detect for Li Batteries





4. Where next?

All this is great but it's just individual Airlines!!



Battery and Aircraft Design and Resilience



Battery
Manufactures



Aircraft
Manufactures

- Research and Development
- New Technologies
- Use of better materials

Education and Enforcement



Regulators



Industry
Bodies

- Enforcement of existing regulations.
- Share inelegance on Li Battery events.
- Share inelegance on non-compliant shippers
- Additional guidance and education for passengers and shippers

Up the Supply Chain



Shippers &
Forwarders



eCommerce
platforms

- Employ and Train sufficiently qualified staff
 - Follow the rules!
-
- Manage site content and ban sellers who knowingly breach the law

Manage your own Risks



- Risk assess your own operations and mitigate against your risks!!
- Join us in spreading the word and increasing awareness.



5. Conclusions

Conclusions

- Need to buy extra time to get the aircraft on the ground.
 - Active solutions - Aircraft Design improvements.
 - Passive Solutions – FCCs & FRCs.
- Hardened Battery design.
 - Better Technologies.
 - Better Quality controls.
- Increase Awareness to passengers and shippers
 - Educations & Training
 - Enforcement of the regulations



