

Web Site for Cargo Hazards, Risks & Mitigations

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- ICAO formed the “Cargo Safety Sub-Group” under the Flight Operations panel to address Annex 6. The group drafted a new chapter 15 to Annex 6 and also a companion Manual for the safe carriage of goods. These take effect in November of 2020—although the manual could be used now.
- Note that Annex 6 is directed to operators.
 - ***Annex 6 — Operation of Aircraft***

- In addition, the Airworthiness panel was tasked with updating Annex 8 to line up with the new requirements in Annex 6. Working Group 4 of the Airworthiness panel developed new language in annex 8, that has not yet taken effect.
- Note that Annex 8 is directed to States.

- ***Annex 8 — Airworthiness of Aircraft***

Amendment to Annex 6

- New Chapter 15
 - Cargo compartment safety
 - Specific safety risk assessment
 - Cargo compartment fire protection capabilities in the aeroplane flight manual or other documentation supporting the operation of the aeroplane
 - Policy and procedures that address items to be transported in the cargo compartment

- FAA developing guidance material for compliance.
- Will include web site of Hazards, Risks and Mitigations



•Web Site for Cargo Risk Mitigations

- The vast majority of cargo can be safely carried in accordance with published regulatory requirements, guidance, and standards. However, certain cargo can introduce risks (for example, fire) that, under certain conditions, may cause the limitations of an operator's aircraft to be exceeded and overwhelm its crew. It is important for operators to identify their hazards related to cargo and manage the risk that those hazards pose to the safe operations of aircraft.
- This Web site contains a list of hazardous cargo conditions, that have been identified by the FAA, that can produce risks that may exceed the capability of the airplane and further explanation of the reasons this is possible. The web site also contains discussion of the relative risks associated with the carriage of that cargo and certain types of cargo mitigation means and their ability to mitigate the risk.

**Lithium Ion Batteries Shipped in Bulk
UN3480**



•Hazards of lithium ion batteries in bulk:

- Lithium cells present a unique hazard that is unlike other common cell chemistries and almost all other cargo. Traditional batteries and cells such as alkaline, nickel metal hydride, nickel cadmium, and lead acid all use a water-based electrolyte. Lithium batteries and cells use a hydrocarbon-based electrolyte. The hydrocarbon electrolyte is flammable, whereas water-based electrolytes are not flammable. Lithium-metal cells also contain highly flammable metallic lithium. Therefore, lithium cells become fuel for a fire.
- Lithium batteries and cells are also capable of being ignition sources. Lithium cells can reach a state called thermal runaway. A cell in thermal runaway undergoes a chemical reaction within the cell that results in an uncontrolled temperature rise. The exterior temperature of the cell casing can reach temperatures in excess of 1400°F. As the temperature rises, the pressure within the cell increases and activates the pressure-relief ports. This results in the release of the electrolyte. The electrolyte may ignite from contact with the hot cell cases or from burning packaging ignited by the hot cells.
- Thermal runaway may be initiated by many circumstances. These include internal cell failure, heating (exposure to an external fire), physical abuse, rapid discharge, over-charging, or the latent manifestation of a manufacturing contaminant. A cell in thermal runaway produces enough heat energy to cause adjacent cells to heat up. Once these adjacent cells reach a threshold temperature, they too go into thermal runaway. This is a process referred to as thermal runaway propagation. The typical fiberboard bulk packaging does not prevent the propagation of thermal runaway.

- Detailed description of the hazards of lithium ion batteries in bulk
- This will include thermal runaway, what it is and how it can occur. How propagation can occur and the flammable gases that are emitted and can become explosive. Also discussed will be type (cylindrical, polymer and prismatic), size, chemistry and design. It will be noted that all lithium ion cell, for the purpose of shipping come under one UN number.
- Links will be provided to reports, papers, presentations and Videos, reinforcing the statement made in this section.
- This section may be many pages long. All links below will be at the end of the last page of this section.

•Examples

- [Report](#)
- [Presentation](#)

•For operational risks and mitigations click on links below

•Cargo on Passenger Aircraft

•Passenger Carry On Baggage

•Cargo on Freighter Aircraft

•Passenger Checked Baggage

•Return to Hazard List



•Risks of transporting lithium ion batteries (UN3480) in bulk as cargo on freighter aircraft.

•Present mitigation required: All cells/batteries must be at 30% or lower state of charge.

•May be carried at higher states of charge by exception or exemption with proper mitigation.

•Example

[Report](#)

•Here it is assumed that it could be in a class “C” compartment or most likely in a class “E”. It will be discussed as to why Halon does not eliminate the risk. Also discussed will be the effect of limiting the oxygen and depressurization on battery fires. What is the risk? Links to reports, papers, presentations and videos.

•This section may be many pages long. All links below will be at the end of the last page of this section.

•Mitigation Links

- | | | |
|-------------------------------|----------------------------|--------------------------|
| •Packaging | •Fire Resistant Containers | •Trusted Vendors |
| •Flight Deck Smoke Protection | •Fire containment Covers | •Reduced State of Charge |
| •Over-Packs | •ULD Suppression | |

•Return to Hazard



•Mitigation Strategy: Fire Resistant Containers

•Discussion on Fire Resistant Containers

•ISO 19281:2016 Fire resistant containers —
•Design, performance and testing requirements
•<https://www.iso.org/standard/64256.html>

•SAE 8992 Fire Resistant Container –
•Design, Performance and Testing Requirements
•<https://www.sae.org/standards/content/as8992/>

•[FAA Update on FCC.s \(Side 2\)](#)
•<https://www.fire.tc.faa.gov/pdf/systems/May19Meeting/Dadia-0519-SAEISOFCCFRC.pdf>

•https://www.fire.tc.faa.gov/2016Conference/session_details.asp?sessionID=9

•Packaging		•Trusted Vendors
•Reduced State of Charge	•Fire containment Covers	
•Over-Packs	•ULD Suppression	

•[Return to Hazard List](#)