DGP/22-IP/8
9/10/09

DANGEROUS GOODS PANEL (DGP)

TWENTY-SECOND MEETING

Montréal, 5 to 16 October 2009

Agenda Item 5: Resolution, where possible, of the non-recurrent work items identified by the Air Navigation Commission or the panel:
Agenda Item 5.3: Review of provisions for dangerous goods relating to batteries:
- **a) lithium batteries**
- **b) battery-powered devices**
- **c) battery-powered mobility aids**

LITHIUM BATTERY PROPOSALS TO THE DANGEROUS GOODS PANEL (DGP)

(Presented by M. Rogers)

(20 pages)
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ICAO Safety Management System (SMS)

- Lithium Battery Shipments must be assessed using established SMS principles
- ICAO website provides guidance on applying SMS

Definition of risk

- **Risk –** The assessment, expressed in terms of predicted **probability** and **severity**, of the consequence(s) of a hazard taking as reference the worst foreseeable situation
  - *A wind of 15 knots blowing directly across the runway is a **hazard***
  - *A pilot may not be able to control the aircraft during takeoff or landing is one of the **consequences** of the hazard*
  - *The assessment of the consequences of the potential loss of control of the aircraft by the pilot expressed in terms of probability and severity is the **risk***

Second fundamental – Risk probability

Probability of occurrence		
Qualitative definition	**Meaning**	**Value**
Frequent	Likely to occur many times *(has occurred frequently)*	**5**
Occasional	Likely to occur some times *(has occurred infrequently)*	**4**
Remote	Unlikely, but possible to occur *(has occurred rarely)*	**3**
Improbable	Very unlikely to occur *(not known to have occurred)*	**2**
Extremely improbable	Almost inconceivable that the event will occur	**1**

Third fundamental – Risk severity

- Definition
  - **Severity** – The possible effects of an unsafe event or condition, taking as reference the **worst foreseeable situation**

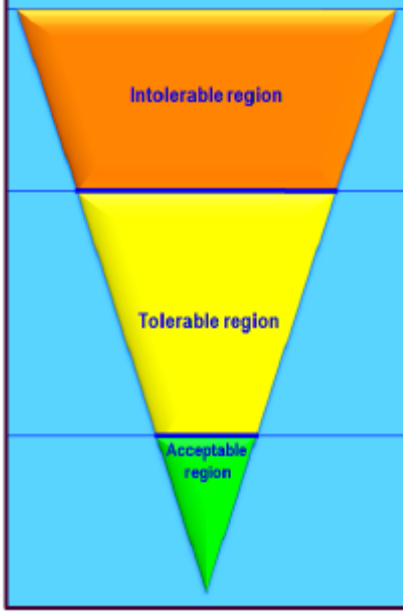
Third fundamental – Risk severity

Severity of occurrences		
Aviation definition	**Meaning**	**Value**
Catastrophic	➢Equipment destroyed. ➢Multiple deaths.	**A**
Hazardous	➢A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely. ➢Serious injury. ➢Major equipment damage.	**B**
Major	➢A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of increase in workload, or as a result of conditions impairing their efficiency. ➢Serious incident. ➢Injury to persons.	**C**
Minor	➢Nuisance. ➢Operating limitations. ➢Use of emergency procedures. ➢Minor incident.	**D**
Negligible	➢Little consequences	**E**

Fourth fundamental – Risk index/tolerability

Risk probability		Risk severity				
		Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	1D	1E

Fourth fundamental – Risk index/tolerability

Risk management	Assessment risk index	Suggested criteria
	5A, 5B, 5C, 4A, 4B, 3A	Unacceptable under the existing circumstances
	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C	Acceptable based on risk mitigation. It might require management decision
	3E, 2D, 2E, 1A, 1B ,1C, 1D, 1E	Acceptable

Lithium Batteries in Current Regulatory Scheme

- The risk presented by large shipments of lithium batteries represent an “unacceptable risk under the existing circumstances”
- Current regulatory scheme excepts “small” batteries, allowing thousands of these batteries together in one cargo compartment
- *SMS principles demand that ICAO act to mitigate this risk*

How to Mitigate the Risk of a Lithium Battery Fire

- Fire is caused by:
  - External Short Circuit
  - Damage
  - Internal Short Circuit (Manufacturing Defect)
  - Improper Design (Counterfeit Batteries)
  - Heat from another suppressed fire
- Not every fire can be eliminated by following the Technical Instructions
- *We must manage the severity of the consequence to mitigate the risk*

Managing the Severity of a Lithium Battery Fire

- The severity of a fire is dependent on the size and number of lithium batteries
- The Technical Instructions place limits on the size of a battery, but not on the number that may be loaded
- New restrictions per cargo compartment must be introduced to limit the severity of a fire
- Cargo compartment restrictions are not possible without batteries being fully regulated

The issue of non-compliance

- Shippers are generally attempting to comply with current regulations
- Fires are often cited as the only indication of non-compliance
- Regulations are complicated and confusing
- Training is essential to ensuring compliance
- A Class 9 system reduces regulatory complexity, making compliance and enforcement easier

August 14th Minneapolis Incident

- Shipment was in compliance with existing U.S. Requirements
  - Batteries were individually wrapped to prevent short circuit and inadvertent activation
  - Batteries had undergone UN Testing
  - Batteries were boxed and then placed in strong outer packagings

August 14th Minneapolis Incident

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August 14th Minneapolis Incident

- Complied with all ICAO requirements except Lithium Battery Handling Label and possibly the document requirement
- Regardless of the origin of the fire, ICAO regulations allow thousands of e-cigarettes to be legally loaded in a single cargo compartment
- The Aircraft Halon System could not have extinguished this fire
- Lithium Metal Battery Shipments such as this are permitted outside of Class 9 on passenger airliners

Statements of Other Organizations

- U.S. National Transportation Safety Board:
  - Require aircraft operators to implement measures to reduce the risk of primary lithium batteries becoming involved in fires on cargo-only aircraft, such as transporting such batteries in fire resistant containers and/or in restricted quantities at any single location on the aircraft
  - Eliminate regulatory exemptions for the packaging, marking, and labeling of cargo shipments of small secondary lithium batteries

Statements of Other Organizations

- U.S. House of Representatives Subcommittee on Pipelines and Hazardous Materials:
  - Require packages containing lithium cells and batteries to be identified as hazardous material
  - Establish limits on the number of lithium cells and batteries that may be contained in a single package, and limits on the number of packages that may be transported in a unit load device, pallet, container or compartment on board aircraft

The Position of the Panel

- If an accident occurs with hundreds of fatalities, it will be difficult to justify a regulatory scheme that allows thousands of batteries on a passenger aircraft considering:
  - Batteries are not fully regulated
  - No limit exists on the number of batteries transported
  - The incident history and clear fire risk
  - The positions of other organizations

IFALPA Proposals

- Fully Regulate Lithium-ion and Lithium-metal batteries as Class 9 Dangerous Goods
- Impose quantity restrictions on batteries in cargo compartment to mitigate the risk of a fire
- Improve Communication to Shippers offering Lithium Batteries

— END —