Agenda

• Why did ICAO Change the Standards?

• Overview of Changes

• Discussion of Packaging Instructions

• Operator Requirements

• Batteries Packed with or Contained in Equipment

• Questions
Why Were ICAO Standards Changed?
Why Were ICAO Standards Changed?

SECTION II

Lithium ion cells and batteries offered for transport are not subject to other additional requirements of these Instructions if they meet the requirements of this section.

• Large bulk shipments of batteries

• FAA Technical Center Testing
Why Were ICAO Standards Changed?

Benefits of the Hazardous Materials Safety System:

- Pilot notification
- Operator acceptance and inspection of each package
- Documentation from shippers
- Training requirements and documentation for the shipper and operator
- Less automated handling than general cargo
Layers of Safety

Determination that substance or material is capable of posing unreasonable risk to health, safety, and property when transported

Classification of Risk

Packaging Requirements

Quantity Limitations

Passenger Aircraft → Cargo Aircraft

Hazard Communication (Shipping Papers, Marking, Labeling, and Pilot Notification)

Shipper Training

Air Carrier Training (Package Loading and Acceptance)

Public Outreach (Industry and Passengers)

Stowage and Segregation (Location of Hazmat and Compartment Qty Limits)

Aircraft Safety (Fire Suppression)

Emergency Response Information
UPS Flight 006 Accident
September 2010 -- Dubai, UAE

N571UP, B-747-44AFSCD
Changes to ICAO Standards for Transporting Lithium Batteries
February 2012
UPS PHL Accident in 2006
FAA Tech Center Work

- **DOT/FAA/AR-04/26** – Flammability Assessment of Bulk-Packed, Nonrechargeable Lithium Primary Batteries in Transport Category Aircraft
  

- **DOT/FAA/AR-06/38** – Flammability Assessment of Bulk-Packed, Rechargeable Lithium-Ion Cells in Transport Category Aircraft
  
  http://www.fire.tc.faa.gov/pdf/06-38.pdf

- **Training Videos**
  

- **DOT/FAA/AR-09/17** – A Cost-Benefit Analysis for the Installation of Fire Suppression Systems in Cargo Compartments of Cargo Airplanes
  

- **DOT/FAA/AR-09/55** – Flammability Assessment of Lithium-Ion and Lithium-Ion Polymer Battery Cells Designed for Aircraft Power Usage
  

- **DOT/FAA/AR-10/31** – Fire Protection for the Shipment of Lithium Batteries in Aircraft Cargo Compartments
  
Overview of Changes

• Effective in the ICAO Technical Instructions on January 1, 2013
  – Assuming approval by the ICAO Council and Air Navigation Commission
Changes Applicable to All Lithium Battery Packing Instructions

• All Sections:
  – Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).
  – Waste lithium batteries and lithium batteries being shipped for recycling or disposal are forbidden from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

• Section 1: Each cell or battery must be manufactured under a quality management program.
  – See ICAO TI Part 2;9.3.1 e)
Changes Applicable to All Lithium Battery Packing Instructions

• Section II: Clarification that certain portions of the TI remain applicable.
  – Part 1;2.3 (Transport of HazMat by Post)
  – Part 7;4.4 (Reporting of Accidents and Incidents)
  – Part 8;1.1 (Passenger/Crew Provisions)
Overview of Changes

• All other changes discussed in this presentation are applicable only to batteries not packed with or contained in equipment – Only PI 965 and 968

• If your battery is fully regulated today, there will be no additional changes.

• There are no additional safety standards under Section II. However, fewer shipments will be allowed under this provision.
Overview of Changes

• A new provision (1.B), will allow some batteries outside of Section II to be shipped without all of the requirements of 1.A shipments.
  – Section 1.A is the original Section I (Class 9 regulations).

• Compared to fully regulated batteries (1.A), 1.B shipments of Lithium Ion/Polymer batteries can be shipped in larger quantities per package on PAX aircraft.
Discussion of Packing Instructions
Packing Instruction 965

Passenger and cargo aircraft for UN 3480

This entry applies to lithium ion or lithium polymer batteries.

Lithium batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

Waste lithium batteries and lithium batteries being shipped for recycling or disposal are prohibited from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

Section I of this packing instruction applies to lithium ion and lithium polymer cells and batteries that are assigned to Class 9. Certain lithium ion and lithium polymer cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to the paragraphs above, are not subject to other additional requirements of these Instructions.
### Packing Instruction 965
What Section Does my Shipment Fall Under?

First see if the package is within Section II

<table>
<thead>
<tr>
<th>Type of Lithium Ion Cell or Battery</th>
<th>Cells/Batteries under 2.7 Wh</th>
<th>Cells with a Watt-hour rating over 2.7 Wh, but less than 20 Wh</th>
<th>Batteries over 2.7 Wh, But not more than 100 Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max number per pkg</td>
<td>No limit</td>
<td>8 cells</td>
<td>2 batteries</td>
</tr>
<tr>
<td>Max net quantity (mass) per pkg</td>
<td>2.5 kg</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

The limits specified in each column must not be combined the same package.
### Packing Instruction 965

What Section Does my Shipment Fall Under?

<table>
<thead>
<tr>
<th>Section  I.A</th>
<th>Cells</th>
<th>Batteries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 20 Wh</td>
<td>&gt; 100 Wh</td>
</tr>
<tr>
<td></td>
<td>(5 kg PAX) (35 kg Cargo)</td>
<td>(5 kg PAX) (35 kg Cargo)</td>
</tr>
<tr>
<td>Section  1.B</td>
<td>&lt; 20 Wh and &lt; 10 kg but Above Section II Limits</td>
<td>&lt;100 Wh and &lt; 10 kg but Above Section II Limits</td>
</tr>
<tr>
<td>Section  II</td>
<td>&lt; 20 Wh and within limits</td>
<td>&lt; 100 Wh, and within limits</td>
</tr>
</tbody>
</table>
Packing Instruction 965

• **Section 1.A** -- A fully regulated Class 9 shipment. There are no changes from the requirements of a section I shipment today.
  – **Section 1.A in 2013 = The current Section I**

• **Section 2** -- Much more narrow in scope. However, if a shipment qualifies there are no new standards.
Packing Instruction 965 -- SECTION I.B

Quantities of lithium ion cells or batteries that exceed the limits specified in Table 965-II (Section II) **must be assigned to Class 9 and are subject to all of the applicable provisions of these Instructions except that the provisions of Part 6 do not apply**, and the dangerous goods transport document requirements of 5.4 are not applicable provided alternative written documentation is provided by the shipper describing the contents of the consignment...
The information required is as follows and should be shown in the following order:

- The name and address of the shipper and consignee;
- UN 3480;
- Lithium ion batteries PI 965 I.B;
- The number of packages and the gross mass of each package.
### Packing Instruction 965 -- SECTION I.B

**What’s the Difference with 1.A?**

<table>
<thead>
<tr>
<th>Qty Limit</th>
<th>Passenger Aircraft</th>
<th>Cargo Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1.A</td>
<td>5 kg</td>
<td>35 kg</td>
</tr>
<tr>
<td><em>Net Qty/Package</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 1.B</td>
<td>10 kg G</td>
<td>10 kg G</td>
</tr>
<tr>
<td><em>Package Qty</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

And…

- No specification packaging
- Alternative(s) to shipping paper
- Require a Lithium Battery handling label **in addition to a** Class 9 label
Packing Instruction 968

Passenger and cargo aircraft for UN 3090

This entry applies to lithium metal or lithium alloy batteries in Class 9 (Section I) and lithium metal or lithium alloy batteries subject to specific requirements of these Instructions (Section II).

Lithium batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).
## Packing Instruction 968

### What Section Does my Shipment Fall Under?

First see if the package is within Section II

<table>
<thead>
<tr>
<th>Type of Lithium Metal Cell or Battery</th>
<th>Cells/Batteries under 0.3 g</th>
<th>Cells with a lithium content over 0.3 g but less than 1 g</th>
<th>Batteries with a lithium content over 0.3 g but less than 2 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max number per pkg</td>
<td>No limit</td>
<td>8 cells</td>
<td>2 batteries</td>
</tr>
<tr>
<td>Max net quantity (mass) per pkg</td>
<td>2.5 kg</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

The limits specified in each column must not be combined in the same package.
### Packing Instruction 968
What Section Does my Shipment Fall Under?

<table>
<thead>
<tr>
<th>Section</th>
<th>Cells</th>
<th>Batteries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section I.A</strong></td>
<td>&gt; 1 g (2.5 kg PAX) (35 kg Cargo)</td>
<td>&gt; 2 g (2.5 kg PAX) (35 kg Cargo)</td>
</tr>
<tr>
<td><strong>Section 1.B</strong></td>
<td>&lt; 1 g lithium and &lt;2.5 kg/package but Above Section II Limits</td>
<td>&lt; 2 g lithium and &lt;2.5 kg/package but Above Section II Limits</td>
</tr>
<tr>
<td><strong>Section II</strong></td>
<td>&lt; 1 g, and within limits</td>
<td>&lt; 1 g, and within limits</td>
</tr>
</tbody>
</table>
Packing Instruction 968

Similar Structure to PI 965:

• **Section 1.A** -- A fully regulated Class 9 shipment. There are no changes from the requirements of a section I shipment today.

• **Section 2** -- Much more narrow in scope. However, if a shipment qualifies there are no new standards.
Packing Instruction 968 – Section I.B

Almost identical language to Section 1.B of PI 965.

The information required is as follows and should be shown in the following order:

- The name and address of the shipper and consignee;
- UN 3090;
- Lithium metal batteries PI 968 I.B;
- The number of packages and the gross mass of each package.
Packing Instruction 968 – Section I.B

What’s the Difference with 1.A?

• No specification packaging

• Alternative(s) to shipping paper

• Require a Lithium Battery handling label in addition to a Class 9 label
### Packing Instruction 968 – Section 1.B

**What’s the Difference with 1.A?**

<table>
<thead>
<tr>
<th>Qty Limit</th>
<th>Passenger Aircraft</th>
<th>Cargo Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1.A</td>
<td>2.5 kg*</td>
<td>35 kg</td>
</tr>
<tr>
<td><em>Net Qty/Package</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 1.B</td>
<td>2.5 kg G*</td>
<td>2.5 kg G</td>
</tr>
<tr>
<td><em>Package Qty</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Remember: US Regulations prohibit the transport of most metal batteries on passenger aircraft*
Operator Requirements

Under ICAO, operators must retain shipping papers and NOTOCs for 90-days.

The alternative documents/information that may be utilized under PI965-IB and PI968-IB instead of a formal shipping paper are retained by operator as if a shipping paper were offered.

– The information/documentation must be retained for 90-days and must be made available to the appropriate national authority upon request.
Batteries Packed with or Contained in Equipment
Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

This entry applies to lithium ion or lithium polymer batteries packed with equipment.

Lithium batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

Section I of this packing instruction applies to lithium ion and lithium polymer cells and batteries that are assigned to Class 9. Certain lithium ion and lithium polymer cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to the paragraph above, are not subject to other additional requirements of these Instructions.

SECTION I

Section I requirements apply to each cell or battery type that has been determined to meet the criteria for assignment to Class 9.

Each cell or battery must:

1) be of the type proven to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, section 38.3; and

   Note.— Batteries are subject to these tests irrespective of whether the cells of which they are composed have been so tested.

2) incorporate a safety venting device or be designed to preclude a violent rupture under conditions normally incident to transport and be equipped with an effective means of preventing external short circuits.

Each battery containing cells or a series of cells connected in parallel must be equipped with an effective means, as necessary, to prevent dangerous reverse current flow (e.g. diodes, fuses).

General requirements

Part 4;1 requirements must be met.
Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

This entry applies to lithium ion or lithium polymer batteries contained in equipment.

Lithium batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

Section I of this packing instruction applies to lithium ion and lithium polymer cells and batteries that are assigned to Class 9. Certain lithium ion and lithium polymer cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to the paragraph above, are not subject to other additional requirements of these Instructions.

SECTION I

Section I requirements apply to each cell or battery type that has been determined to meet the criteria for assignment to Class 9.

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   Note — Batteries are subject to these tests irrespective of whether the cells of which they are composed have been so tested.

2) incorporate a safety venting device or be designed to preclude a violent rupture under conditions normally incident to transport and be equipped with an effective means of preventing external short circuits.

Each battery containing cells or a series of cells connected in parallel must be equipped with an effective means, as necessary, to prevent dangerous reverse current flow (e.g. diodes, fuses).

General requirements

Equipment must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.9 (except 1.1.9.1).

<table>
<thead>
<tr>
<th>Contents</th>
<th>Net quantity per piece of equipment (Section I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium ion batteries contained in equipment</td>
<td>Passenger: 5 kg</td>
</tr>
</tbody>
</table>
Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

This entry applies to lithium metal or lithium alloy batteries packed with equipment.

Lithium batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

Section I of this packing instruction applies to lithium metal and lithium alloy cells and batteries that are assigned to Class 9. Certain lithium metal and lithium alloy cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to the paragraph above, are not subject to other additional requirements of these Instructions.

SECTION I

Section I requirements apply to each cell or battery type that has been determined to meet the criteria for assignment to Class 9.

Each cell or battery must:

1) be of the type proven to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, section 38.3; and

   Note.—Batteries are subject to these tests irrespective of whether the cells of which they are composed have been so tested.

2) incorporate a safety venting device or be designed to preclude a violent rupture under conditions normally incident to transport and be equipped with an effective means of preventing external short circuits.

Each battery containing cells or a series of cells connected in parallel must be equipped with an effective means, as necessary, to prevent dangerous reverse current flow (e.g. diodes, fuses).

General requirements

Part 4.4 requirements must be met.
Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

This entry applies to lithium metal or lithium alloy batteries contained in equipment.

Lithium batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

Section I of this packing instruction applies to lithium metal and lithium alloy cells and batteries that are assigned to Class 9. Certain lithium metal and lithium alloy cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to the paragraph above, are not subject to other additional requirements of these Instructions.

SECTION I

Section I requirements apply to each cell or battery type that has been determined to meet the criteria for assignment to Class 9.

Each cell or battery must:

1) be of the type proven to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, section 38.3; and

   Note.— Batteries are subject to these tests irrespective of whether the cells of which they are composed have been so tested.

2) incorporate a safety venting device or be designed to preclude a violent rupture under conditions normally incident to transport and be equipped with an effective means of preventing external short circuits.

Each battery containing cells or a series of cells connected in parallel must be equipped with an effective means, as necessary, to prevent dangerous reverse current flow (e.g. diodes, fuses).

General requirements
Passenger Aircraft

- **Lithium Metal batteries** – PROHIBITED

- **Lithium metal batteries packed with equipment** – 5 kg (11 pounds) net weight or less or primary lithium batteries or cells and the package contains no more than the number of lithium batteries or cells necessary to power the piece of equipment

- **Lithium metal batteries contained in equipment** - 5 kg (11 pounds) net weight or less or primary lithium batteries or cells and the package contains no more than the number of lithium batteries or cells necessary to power the piece of equipment
Batteries contained in Equipment
Lithium batteries contained in equipment must

- Be packaged so that it prevents dangerous evolution of heat
- Protects against short circuits or the batteries must be properly installed in the equipment
- The article should be properly cushioned to prevent shifting
- Not operate on its own or short circuit the battery. This can be accomplished by using a trigger lock or disabling the power button
- Not exceed 5kg net (passenger), 35kg net (cargo)
Questions???

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