



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:

5.3: Review of provisions for dangerous goods relating to batteries:

- a) **lithium batteries**
- b) **battery-powered devices**
- c) **battery-powered mobility aids**

ENHANCED REQUIREMENTS FOR THE TRANSPORT OF LITHIUM BATTERIES

(Presented by R. Richard)

SUMMARY

This paper supplements DGP/22-WP/62 which addresses issues relevant to the safe transport of lithium batteries. A summary of recent incidents involving fires aboard aircraft caused by lithium batteries is provided.

Action by the DGP: To address the issue in a comprehensive and collective manner, it is proposed that an informal working group be convened to discuss the many facets of the issue and potential ways in which the panel can work together to help reduce the likelihood of future incidents. To facilitate this discussion, a listing of outreach actions currently being undertaken by the United States Department of Transportation (DOT) is attached in Appendix B to this information paper, and a sample oversight action plan is in Appendix C to this information paper. These items are intended to serve only as a starting point for discussion, as it is recognized that a cooperative global effort is key to enhancing awareness, ensuring compliance and ultimately enhancing safety by reducing the potential likelihood of future incidents.

1. INTRODUCTION

1.1 This information paper is provided to supplement DGP/22-WP/62 which informs the DGP of recent initiatives within the United States related to enhancing the safe transportation of lithium

batteries. In the short time following the submission of this information paper, several fires aboard aircraft involving lithium batteries have been reported. These incidents demonstrate the potential for a significant fire event while in-flight and underscore the importance of addressing this real safety issue. The emphasis the United States is placing on introducing additional regulatory provisions is in response to the risk identified as a result of research, testing, trend analysis and studies in an effort to reduce the likelihood of a future catastrophic event. However, regulatory amendments take time to introduce, publish, and implement. On the basis of the severity and potential consequences of these incidents, it is suggested that the panel consider what immediate actions can be implemented to ensure focused efforts are made world-wide to help to preclude future potentially catastrophic incidents. A description of the recent incidents is provided in Appendix A to this information paper.

1.2 While WP/62 identified potential regulatory actions which may be considered by the U.S. DOT, other more immediate steps to increase awareness and vigilance through outreach and enforcement must be considered. A detailed review of the incidents indicates that many have resulted from a lack of compliance with the existing requirements of the Technical Instructions. Specific regulatory provisions alone may not improve compliance in cases where lack of compliance with existing regulations is a result of awareness of any regulatory requirements. As such, it is suggested that the Panel consider how to raise awareness and enhance compliance with the current requirements on a global scale. The Panel could consider how best to reach the broadest possible audience including shippers, carriers, operators, freight forwarders, and others who directly affect the safe transport of lithium batteries. Cooperative oversight efforts must also be consistent and effective to play a prominent role in these efforts.

1.3 To facilitate discussion and the work of the proposed informal working group if established, a listing of outreach actions currently being undertaken by the U.S. DOT is attached as Appendix B, and an oversight action plan is attached as Appendix C.

APPENDIX A

RECENT TRANSPORT INCIDENTS

Since 1991, we have identified over 40 air transport-related incidents involving lithium batteries and devices powered by lithium batteries. A list of these incidents can be found on the FAA website at: http://www.faa.gov/about/office_org/headquarters_offices/ash/ash_programs/hazmat/aircarrier_info/media/Battery_incident_chart.pdf. These incidents occurred, variously, aboard passenger aircraft and cargo aircraft, prior to loading batteries aboard an aircraft, and after batteries were transported by air. A brief summary of the most recent incidents is provided below:

Incident 1: On August 25 Federal Express reported a smoking and burning package was discovered at their Medford Massachusetts facility. Upon inspection, the consignment contained 30 individual batteries grouped together in 6 or 7 battery packs. Fedex made an attempt to put out the fire by cutting open the package and applying the extinguisher directly onto the contents inside the box. Upon failing to extinguish the fire, the Medford Fire Department was called. The shipment was being sent standard overnight to Seattle, WA, and the package of containing lithium batteries was undeclared dangerous goods. There were no markings or labels on the outer package indicating the material was hazardous. The inner contents were discovered to be 33 GPS trackers bundled together in groups of five. Each device was sealed in clear plastic and each GPS consisted of a circuit board, battery and a tubular type container with a red top. It appears that two of the devices heated, causing the surrounding packaging and cushioning to ignite. The surrounding foam wrap melted.



Incident 2: On August 15 United Parcel Service Airline reported that a smoldering package was noticed at its Taiwan Hub. The package was transported from Macau, China. Inspection of other packages in the same consignment indicated that similar batteries were offered without terminal protection.



Incident 3: On August 14 Federal Express reported that after landing and exiting the runway at Minneapolis – St. Paul International Airport (MSP) a flight crew received a warning indicating smoke in the forward cargo compartment. Although the investigation is presently ongoing, initial indications are that the fire originated with a shipment of approximately 1,000 e-cigarettes, each containing lithium metal batteries. A ULD was discovered on fire shortly after the arrival of a Federal Express aircraft. There was no damage to the aircraft and the aircraft was eventually released. Upon inspection of the ULD, numerous packages were discovered with fire, water and smoke damage. Packages containing primary lithium batteries are suspected to be the source of the fire. The shipment consisted of 40 cartons with each package containing 50 RappE-Mystick personal disposable vaporizers. Lithium batteries were not listed as a component of the device. There were no markings or labels indicating the materials were hazardous or contained lithium batteries.



Incident 4: On July 15, United Parcel Service Airline reported that one of several related packages transported from Romulus, MI was discovered to be emitting smoke and smoldering Santo Domingo, Dominican Republic. Upon inspection, package was found to contain numerous, loose lithium-ion cell phone batteries with no protection of the points of contact. Packaging indicated “used batteries – non hazardous”. The burning/smoldering lithium batteries were discovered after off-loading. The shipment in question was listed as a used lithium ion cell – non hazardous materials. There were 15,000 used lithium ion cells in the package, as well as, 500 used plastic pouches. Reportedly, the shipper sells refurbished cell phone supplies to other countries.



Incident 5: On June 18, United Parcel Service Airline reported that a burned package was discovered inside a Unit Load Device as it was being unloaded in Honolulu, HI. The package contained a lithium-ion bicycle power device, which was originally loaded in Philadelphia and subsequently transported to Ontario, California. The shipment was offered to UPS in New Jersey, it was then transported on aircraft from Philadelphia, Pennsylvania to Ontario, California and finally Honolulu, Hawaii. Upon arrival, the shipment was found to be charred and black. The Unit Load Device had black smoke marks, as well as, the surrounding shipments. The shipper included an MSDS which indicated the lithium ion battery was not regulated. The item being transported was a 2-piece shipment containing the components to convert a regular bicycle into an eclectic powered bicycle.



APPENDIX B

OUTREACH EFFORTS

A review of the incidents which have occurred shows that in many cases incidents directly resulted from non-compliant shipments. This trend points to a need for a strong emphasis on outreach to educate affected industry and the public regarding the requirements that are currently in place to help to ensure the safe transport of lithium batteries. The U.S. DOT has initiated a public awareness campaign to educate the traveling public, shippers, and aircraft operators about the potential dangers of lithium batteries and how to properly handle and transport such devices. The campaign uses various media to reach the broadest possible audience. However unilateral efforts on the part of a single country are limited in their effectiveness in today's global marketplace. In order to enhance safety for the traveling public worldwide, the U.S. is interested in partnering with other Panel Members to work towards enhanced outreach on a global scale. In order to foster discussion, a listing of the completed and planned outreach initiatives that this campaign encompasses is included in this Annex for discussion. The actions are categorized according to the target audience.

Press Release and Safety Advisory Activity
<i>Completed and Planned Initiatives</i>
Published a Safety advisory, press release, passenger brochure and SafeTravel web page.
Worked with ALPA to distribute advisory to approximately 100,000 airline pilots worldwide, and to flight safety departments for coordination with flight attendant safety organizations.
Completed a "media kit" of SafeTravel link graphics, print-ready SafeTravel emblems, and approved press releases and outreach materials; replication of 1,000 disks.
Completed web content for inclusion on TSA's site, accepting TSA's offer of hosting our material, as well as linking to SafeTravel.
Expanded SafeTravel website to address additional items including aerosols, fireworks, ammunition, lighters, matches, camping gear, medicines and toiletry articles and self defense sprays.
Published a press release describing revised passenger and crew carry-on limits in § 175.10 (ICAO TI Part 8) pertaining to lithium batteries effective 1 January, 2008.
Updated a battery pocket guide card. Airports, airlines, travel agents, and others are encouraged to freely distribute at ticket and luggage counters, or in other passenger-accessible areas of airports.
Pursuing the addition of <i>safe travel</i> web address to battery retail packaging. Working to include SafeTravel information in printed information accompanying rechargeable batteries, such as those for laptop computers.
Pursuing ways to advertise in community newspapers. Goal is to attain minimum distribution to 10,000 community newspapers with a combined circ. of over 200 million. Use for continuous "presence" between hard-news press releases.

Outreach activities with airlines and ticketing agents
<i>Completed and Planned Initiatives</i>
Worked with ATA members to include SafeTravel materials/links in airline magazines, e-tickets, and electronic correspondence. For example, Delta and American Airlines have planned battery safety information pages for their in-flight magazines. Delta has included SafeTravel links on their electronic correspondence, including e-tickets.
Met with the airline safety officers in May 2007 and sent a letter requesting additional assistance and refocused effort.
Requested ITSA members (i.e., Orbitz et al.) to promote battery safety in newsletters, safety advisories, links, etc. <ul style="list-style-type: none">• Orbitz: Posted informational story on Travel News section of website about lithium battery rule• Added information to relevant travel tips stories posted on Orbitz• Posted information about new rule to Orbitz "Road Warrior" microsite for small business travelers• Developed blog post on the new Lithium battery rule• Sent customer base an email "alert" message regarding new rules• Promoting the U.S. DOT battery safety message through consistent broadcast promotions
Provided SafeTravel Flyer and Advisories to American Airlines. Material was used to brief their Corporate Communications Manager with hopes of including in "American Way" magazine.
Working with ATA to make the SafeTravel link available and prominent on ATA member airline websites, passenger communications, seat-back pockets and/or in-flight magazines.

Outreach efforts with the battery industry
<i>Completed and Planned Initiatives</i>
Published a guide entitled "Shipping Batteries Safely By Air; What You Need To Know". This guide describes the regulations for the classification criteria, packaging requirements, and hazard communication for the transportation of batteries.
Worked with Panasonic to secure placement of SafeTravel logo/website link on retail packaging of lithium batteries. Working with other major manufacturers to do the same.
PRBA and NEMA have authored articles on their own in support of battery safety awareness for air travelers. Both have committed to "drilling down" to companies in their memberships, urging company-level participation in the marketing of SafeTravel.
Participated in the 25th International Battery Seminar March 17-20 2008.
Acquired a list of the top 100 computer/software magazines, and other lists of computer, electronics, and gaming publications. Exploring ways to get a battery safety message out through these publications.
Published battery recall guidance to help ensure the safe transport of recalled batteries.
Working to make available an 18" x 24" poster for use in retail environments (along with pocket card). Partners to accept responsibility for printing poster.

Efforts to develop a sustained battery safety campaign
<i>Completed and Planned Initiatives</i>
Worked with over 20 major retailers and distributors to introduce DOT’s Safe Travel initiative and help promote public safety. In addition, sent information to more than 40 various retailers and distributors in an effort to promote public awareness.
Working to target major retailers. For example, relationships with Hasbro, Inc., and Wal-Mart have been established, with the goal of establishing in-store (Wal-Mart), electronic, and print media promotion of battery safety agenda.
Secured an agreement with Batteries Plus, LLC, who agreed to promote customer awareness in its chain of 600 stores. Provided artwork for the “quick action guide” for reprinting by Batteries Plus. Existing graphics have been used to provide a poster suitable for in-store display to customers.
Working to expand and enhance the SafeTravel Website while improving the layout so that information reaches target audiences more effectively.

APPENDIX C

OVERSIGHT EFFORTS

In January 2007, the U.S. DOT's Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Enforcement and the Federal Aviation Administration's Office of Hazardous Materials established a Lithium Battery Program. The Program was established to strengthen the focus, enhance the expertise, and ensure the uniform application of inspection and oversight pertaining to the manufacture, testing, and transport of lithium batteries. By gaining a better understanding of the entire transport stream, cradle to grave, the Program is designed to identify and reduce the potential for battery transport incidents.

Non-compliance with the existing provisions of the ICAO TI has caused or enhanced the severity of a significant number of air transport safety incidents involving lithium batteries. A review of the incident data reveals that many of these incidents involve un-declared shipments, improperly marked packages, battery designs that have not successfully passed the UN design tests, and improper packaging to include lack of protection against short circuit. As such, an effective oversight program that results in compliance from lithium battery manufacturers, testers, shippers and recyclers is necessary to address non-compliance before the shipment is offered and accepted for transport.

When an incident does occur it is vital that a swift and coordinated investigative response is initiated that secures and preserves the evidence for analysis when possible. This requires prior planning to ensure that investigators and carriers have procedures and training in place to safely handle and secure suspect cargo, and that joint protocols are in place when needed. Coordination and facilitation are essential for oversight to be an effective tool.

The Panel is requested to consider the general actions items outlined below and discuss how States can collaboratively work together to provide a consistent global approach to incident or non-compliant shipment investigation. In particular, can States establish guidance to improve the ability to communicate information and provide data as it becomes available?

Focus on Shippers:

1. Improve inspector expertise on lithium battery safety that will improve the ability to identify unsafe and non-compliant practices or trends.
2. Identify and focus on high risk battery shippers/shipments, including noncompliant or unsafe industry practices.
 - a. Survey battery manufacturer and other shipper facilities in a given geographical area. Develop standard inspection guidelines consistent with individual State's oversight program policies. (See worksheet 1)
 - b. Prioritize an inspection schedule using a risk based methodology. This process should drive down risk by targeting the greatest threats:
 - i. Incidents
 - ii. Violations
 - iii. Complaints
 - iv. Shipment volume
 - v. Highest hazard materials in terms of energy capacity and chemistry type (See worksheet 2)

3. Inspect a manufacturer's or shipper's compliance with the applicable requirements of the TI. This should include at a minimum a review of the following: battery design testing records, training records, packaging, marking, and labeling as applicable. Use of a pre-developed checklist might prove helpful. (See worksheet 3)
4. Develop and document corrective actions consistent with individual State's oversight program policies.
5. Establish a follow-up inspection schedule to track and monitor completion of corrective actions consistent with individual State's oversight program policies.
6. Maintain an activity log to track all inspection activities in order to recognize trends consistent with individual State's oversight program policies.

Incident Investigations:

1. Establish sample inspection guidelines among the various authorities involved. Consistency in guidance is necessary to ensure swift and effective response to an incident.
2. Develop consistent and effective lines of communication that allow States to share information relevant to an incident.
3. Develop guidance to ensure the safe and proper preservation of evidence when needed. This should be coordinated among appropriate government and carrier activities.
4. When appropriate, analyze evidence and determine root causes.
5. Develop and share corrective action plans. Establish a follow-up enforcement schedule to track and monitor completion of corrective actions consistent with individual State's oversight program policies.

Worksheet 1
Lithium Battery Inspection Checklist

No.	<input checked="" type="checkbox"/>	Inspection Point	Comment
1		Identify all cell and battery types that are manufactured/assembled at the facility being inspected.	
2		Record data to include cell and battery: Manufacturer, Type (cell chemistry), Configuration (Serial/Parallel), Capacity, Lithium Content or Equivalent Lithium Content (or watt-hours as applicable).	
3		Review the UN test reports, record test number and date, and verify that the test data matches the battery's configuration and the type of cells and batteries. Verify cells and batteries were tested.	
4		Establish the company's verification process to determine that all cells and batteries were tested.	
5		Establish and record the classification used by the company for shipping the cells and batteries. Verify that the classification matches the current standards, special provisions or exceptions. Note: If batteries are shipped through the Postal Service, document how they are offered. If discrepancies are noted forward documentation to the appropriate authority. Notify the shipper the Postal Service has specific regulations for shipping cells and batteries.	
6		Review the packaging and packing methods used to ship the cells and batteries. Identify methods used to prevent short circuits.	
7		If UN-standard packagings are used for Class 9 shipments, verify the validity of the UN-packaging certification and check that the packaging configuration reflects the packaging configuration that what was actually tested. Note: This should be done even if the batteries could be shipped under a specific modal exception as the certified package could be used by a re-shipper to ship by a different mode or internationally.	
8		Identify mode of shipping (ground/water/air) and verify that all required package markings, labeling, shipping paper and/or other required documentation is complied with. Note: Modal, National, and international regulations may impose different requirements.	
9		Review the training program and records to include; general awareness, function-specific and safety.	

Worksheet 2
Prioritizing Lithium Battery Inspections
Based On Hazard Potentials in Transport

Higher Than Average Risk:

- ✓ Lithium metal cells and batteries with liquefied compressed gas or liquid cathodes (sulfur dioxide, thionyl chloride and sulfuryl chloride) - Mostly used in extreme temperature specialty applications for defense, aerospace, down-hole oil and gas exploration.
- ✓ “D” size and above solid cathode lithium metal cells and batteries. (including “Double C” , “Double D” and larger sizes)
- ✓ Bulk packed lithium metal or lithium ion “polymer” pouch cells and batteries, especially where the cells within the packaging or within the batteries have adjacent sidewalls.
- ✓ Lithium ion batteries with large numbers of small metal or plastic pouch cells (.e.g. a vehicle battery for hybrids which may employ hundreds of small cells in a very tightly massed array.

Average Risk:

- ✓ “AA”, “123A”, “CR2” and “C” size lithium metal cells in small numbers, individually packaged or segregated apart.
- ✓ Lithium ion 18650 size cells or cell phone prismatic cells in small numbers, individually packaged or segregated.
- ✓ Lithium ion polymer or pouch cells that are not damaged, but have a soft plastic film cell wall that can be easily punctured.

Lower Than Average Risk:

- ✓ Lithium metal “coin size” cells. Small lithium ion “button” cells.

Note: Damaged cells or batteries must be handled separately from the regular inspection program. The damage to the cells and batteries must be evaluated on a case by case basis to determine the extent of the damage and hazard posed in transport.

Worksheet 3
General Investigative Notes
Lithium Battery Manufacturer/Assembler/Shipper

Inspection Date: _____

Facility Name/Address: _____

Responsible Parties:

Title:

Activity Conducted at the facility (check all that apply)

- Manufacture/assemble/modify
- Ship lithium batteries/battery packs or
- Distribute/reship prepackaged cells/batteries
- Manufacture or distribute equipment containing lithium batteries

General Cell and Battery Information

Chemistry

Lithium metal including lithium alloy (non-rechargeable)

Lithium-ion including polymer (rechargeable, secondary)

Configuration: Series Parallel Depends on application

How many different designs of batteries do you manufacture/distribute? _____

Has each cell or battery design type passed the UN T1 through T8 tests (sec. 38.3)? _____

What is the nominal voltage, capacity (amp hours) and Watt-hour rating? _____

For lithium metal batteries, what is the range of Lithium content? _____ grams/cell
grams/battery

For Lithium-ion batteries, what is the watt-hour rating?

_____ Wh/cell

_____ Wh/battery

Is the watt-hour rating marked on the battery case?

Transport Provisions

Packing Instructions utilized:

965 966 967

968 969 970

When shipping batteries/battery packs or equipment, do you use the Provisions of Section II of the appropriate packing instruction or ship as Class 9 items in accordance with the provisions of Section 1 of the appropriate packing instruction?

_____ Section II _____ Class 9

Section I Class 9:

- Cells/batteries must be protected from damage and short circuits
- Ensure packages do not exceed weight limits specified in the appropriate packing instruction
- Outer package must meet UN PG II requirements
- Outer packages must be marked with the proper shipping name and UN identification number?
- Class 9 Labels must appear on the outer package?
- Check for appropriate documents and emergency response information

Section II:

- For lithium metal batteries (non-rechargeable) to be excepted, the maximum lithium content must not exceed:

1.0 grams/cell and 2.0 grams lithium/battery

- For lithium-ion batteries (rechargeable) to be excepted, the Watt-hour rating (or equivalent lithium content (ELC)) must not exceed:

Lithium-ion: 20 Wh/cell or 100 Wh/battery

NOTE: The watt-hour rating must be marked on the outside case of lithium batteries manufactured after 01/01/2009

Lithium-ion: 1.5 grams ELC/cell and 8.0 grams ELC/battery
(ELC = 0.3 multiplied by the capacity in amp-hours)

- Packaging: 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).
- Each package must be able to withstand a 1.2 meter drop test in any orientation without damage to the cells/batteries inside and without shifting of the contents allowing for cell to cell contact
- For UN 3090 and UN 3480 each package must display the lithium battery handling label
- Each consignment of packages bearing the lithium battery handling label must be accompanied by a document with an indication that:
 - The package contains lithium batteries
 - The package must be handled with care and a flammability hazard exists if the package is damaged
 - Special procedures should be followed in the event the package is damaged (including repacking if necessary)
 - A telephone number for additional information

— END —