

**STATEMENT OF THE  
AIR LINE PILOTS ASSOCIATION, INTERNATIONAL  
TO THE  
NATIONAL TRANSPORTATION SAFETY BOARD  
FORUM ON LITHIUM BATTERIES IN TRANSPORTATION**

**April 11-12, 2013**

The Air Line Pilots Association, International (ALPA) represents 50,000 passenger and all-cargo airline pilots at 34 U.S. and Canadian airlines. ALPA has long advocated for improved regulations regarding the safe transport of lithium ion and lithium metal batteries. Accordingly, we are especially grateful to the National Transportation Safety Board (NTSB) for holding this forum and providing an opportunity to submit our views on this timely safety issue.

**Background**

Types and Characteristics of Lithium Batteries

Two major types of lithium batteries power many types of consumer electronic devices: lithium ion batteries (including lithium ion polymer) and lithium metal batteries. Lithium ion batteries are typically rechargeable, and power devices such as laptop computers, mobile phones and portable music players, while non-rechargeable lithium metal batteries are normally used to power devices including cameras, flashlights and Automatic External Defibrillators. A lithium metal battery typically is composed of a single cell, while a lithium ion laptop battery may be composed of between 6 and 12 cells.

Risks Posed by Lithium batteries

When lithium batteries are mishandled, damaged, misused, improperly packaged, overcharged, defective or of an inferior design, they may overheat and ignite. They may also ignite when exposed to heat or an external fire source. Unlike previous battery chemistries, lithium ion batteries contain a flammable electrolyte that is vented as the temperature in a cell increases. This electrolyte is easily ignited, and the heat from a single burning lithium ion cell is transferred to adjacent cells, creating an escalating fire within a multiple cell battery, and spreading to multiple batteries in a single shipment.

Lithium metal batteries also pose both an electrical and chemical hazard, and have different characteristics in a fire from lithium ion batteries. Testing conducted by the U.S. Federal Aviation Administration (FAA) determined that Halon, the extinguishing agent typically used in aircraft, is ineffective in suppressing a fire involving lithium metal batteries. In fact, the fire proceeded as if the Halon were not present. The tests found that a fire involving a single lithium metal battery would spread to adjacent batteries, that a pressure pulse would be generated that could cause a cargo liner to fail, and that a relatively small fire source was sufficient to ignite the batteries. The tests also determined that the heat from a suppressed cargo fire was above the auto-initiation temperature of the lithium metal batteries, resulting in a situation where a successfully suppressed fire from an independent source would be sufficient to ignite a shipment of lithium metal batteries.

Because of the propensity for lithium batteries to ignite and burn violently when exposed to heat or fire, large quantities of even properly prepared, undamaged batteries can pose a significant risk to the safety of an aircraft. A shipment of lithium batteries can significantly intensify the severity of a fire, turning a survivable event into an uncontrollable fire.

### **Lithium Battery Incident History**

According to the FAA, there have been over 40 lithium battery incidents documented involving smoke, fire, extreme heat or explosion in air transportation since the introduction of lithium batteries in the early 1990s. The incidents have occurred both in the passenger cabin and in cargo compartments when batteries have been shipped as cargo on passenger and cargo-only aircraft. Lithium battery fires may be the result of an external short circuit (e.g. contact with other batteries or metal), internal short circuit (e.g. design deficiency, manufacturing defect), damage, or exposure to an external fire or heat source. Counterfeit batteries (i.e., those that are made by illicit manufacturers and deliberately not designed to meet UN standards and are not subject to UN-approved testing) often lack safety features and are poorly manufactured, leading to a higher likelihood of being involved in an incident.

Additionally, while the investigation is ongoing and no cause has yet been determined, a cargo-only aircraft carrying over 80,000 lithium batteries crashed in September 2010 after departing Dubai International Airport, and reporting a fire on the main deck cargo compartment. Regardless of the cause of the fire, the lithium batteries aboard almost certainly contributed to the severity and intensity of the fire, which ultimately led to the loss of the flight crew, aircraft and cargo. The flight crew was not aware that they were

carrying such large quantities of batteries, nor were they required to be, based on the rules at the time.

### **Present Regulations Applicable to Consumer Lithium Batteries**

Under the current United States Hazardous Materials Regulations (HMRs), the lithium batteries used in most consumer electronic devices are not subject to the majority of the provisions for dangerous goods, including requirements to: place a dangerous goods label on the package; place the shipment on the notification to the pilot in command (NOTOC); have airline personnel perform an acceptance check of the package; or ensure that shippers are trained in the dangerous goods regulations. While the regulations do prohibit the transport of batteries recalled for safety reasons, and specify the types of tests batteries are required to pass before being shipped in commerce, they place no restriction on the total quantity of lithium ion or lithium metal batteries allowed on either passenger or cargo aircraft.

Responding to a perceived need for bolstered regulations governing the shipment of lithium batteries, the Pipeline and Hazardous Materials Safety Administration (PHMSA) in January 2010 issued a Notice of Proposed Rulemaking (NPRM) to amend the HMRs so as to bring the batteries into full regulation. ALPA supported this effort, but the NPRM has not been finalized and published as a final rule.

In February 2012, the International Civil Aviation Organization's (ICAO) Dangerous Goods Panel, with the involvement of PHMSA, took steps to address the risks associated with large shipments of lithium batteries aboard aircraft. The new provisions that took effect on January 1, 2013 for international shipments require full regulation for packages containing more than 2 batteries or 8 cells. These changes result in packaging improvements, new training, inspection, and labeling requirements, and inclusion on the pilot notification form for dangerous goods. These new requirements do not, however, address batteries in equipment, nor do they place any new stowage or quantity restrictions on lithium battery shipments.

PHMSA has not yet adopted these important provisions, making them unenforceable for international shipments arriving in or departing the U.S., and not applicable to domestic shipments. PHMSA has, however, issued two notices of proposed rulemaking since April 2012 querying the industry on (1) whether harmonization with ICAO is warranted and (2) whether shippers and carriers should be allowed to choose between compliance with existing U.S. HMRs or the new ICAO standards. ALPA has strongly gone on the record in favor of harmonization with ICAO and against permitting

shippers and carriers to choose their own compliance regimes, which would create confusion and actually lessen current margins of safety.

## **ALPA's Position**

ALPA believes that the U.S. Hazardous Materials Regulations must be revised to protect the flight crew, passengers, and the aircraft from the risk of a fire caused or exacerbated by the shipment of lithium batteries as cargo. The specific provisions requiring revision are described below.

### Lithium Ion Batteries Shipped as Cargo

Lithium ion batteries are shipped both in or with equipment, and as packages containing only batteries. While batteries contained in equipment are afforded some external protection by the equipment, incident data have shown that fires involving equipment may still occur. ALPA therefore believes that the regulatory exceptions granted to lithium ion batteries, lithium ion batteries in equipment, and lithium ion batteries packed with equipment must be eliminated, providing for full regulation under the HMRs. Fully regulating lithium batteries would provide that each shipment be subject to the following conditions:

- Design testing of each battery according to the UN Manual of Tests and Criteria
- Each cell or battery must be protected from short circuit
- Packaging in strong outer UN specification packaging
- A Dangerous Goods Transport Document must be provided
- The package must be marked with a Class 9 Dangerous Goods label
- An acceptance check is required to be performed by the operator
- A Pilot Notification Form (NOTOC) must be provided to the pilot in command
- Training must be provided to persons preparing batteries for shipment

These provisions would significantly improve the safety of lithium battery shipments. By eliminating regulatory exceptions, the batteries would be shipped in improved packaging, reducing the possibility or severity of damage to a package. A Class 9 label, recognized worldwide regardless of language, would increase awareness of the potential hazard from the shipment and reduce the likelihood that damaged packages would be loaded onto an aircraft. An acceptance check would provide an opportunity to detect any damage to a package or irregularity in the preparation of a shipment, as well as remove the package from many of the automated processes at an airport,

reducing the opportunity for damage. A Pilot Notification Form (NOTOC) would alert the flight crew to the shipment, providing information regarding the type, quantity and location of shipments on their aircraft, which may influence crew decision-making during an in-flight emergency. The Pilot Notification Form would also allow the flight crew to communicate the hazard aboard the aircraft to emergency response personnel on the ground. Training is crucial to ensure that battery shippers can comply with the existing regulatory requirements and safely prepare shipments. The overall visibility of lithium ion battery shipments would be greatly improved by fully regulating each shipment.

Furthermore, ALPA believes that stowage should be required in cargo compartments having adequate fire suppression, and that the total quantity of lithium ion batteries at any single location or in a single cargo compartment must be limited. The risk of a fire from a battery can never be completely eliminated, but by limiting the number of batteries at a single location, the severity of a fire can be reduced. A conservative approach to the number of batteries at a single location must be adopted until testing is available to determine the quantity of batteries that can be successfully extinguished using aircraft fire suppression systems.

#### Lithium Metal Batteries Shipped as Cargo

ALPA believes that lithium metal batteries must be fully regulated under HMRs and that current regulatory exceptions must be eliminated. Full regulation of lithium metal batteries would result in the same safety improvements cited above for lithium ion batteries, as would limiting the quantity of lithium metal batteries at any single location or in a single cargo compartment.

Additionally, ALPA believes that lithium metal batteries should not be carried as cargo on either passenger or cargo-only aircraft until adequate packaging can be developed to protect the batteries from damage or from an external fire or heat source. The fire characteristics of these batteries and the ineffectiveness of Halon in suppressing a lithium metal battery fire mean that a fire involving a single lithium metal battery could be sufficient to cause the loss of an aircraft. Furthermore, an independent fire successfully suppressed by the aircraft Halon system would still provide enough heat to ignite a shipment of lithium metal batteries.

## **ALPA Recommendations**

ALPA urges the NTSB to support our comments made to PHMSA on March 8, 2013 (attached) including recommendations that the agency:

1. Issue an immediate final rule to harmonize with ICAO
2. Urge ICAO to further improve its technical instructions to correct certain deficiencies
3. Finalize and publish additional safeguards that it proposed in 2010 that would correct known deficiencies with respect to the transport of lithium batteries

Provided as another attachment to this submission is a new ALPA information document entitled "A Primer on the Safety of Transporting Lithium Batteries by Air," which gives additional specifics about ALPA's views on this important subject.

ALPA appreciates the opportunity to contribute to the Board's forum on lithium batteries through this submission.

Attachments

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