



U.S. Department
of Transportation

**Research and
Special Programs
Administration**

The Administrator

400 Seventh Street, S.W.
Washington, D.C. 20590

MAR 29 2000

The Honorable Jim Hall
Chairman
National Transportation Safety Board
Washington, DC 20594

Dear Mr. Chairman:

This letter addresses the National Transportation Safety Board's Safety Recommendations A-99-80 through 84 issued to the Research and Special Programs Administration (RSPA). The recommendations were issued as the result of the Safety Board's investigation of a hazardous materials incident that occurred on April 28, 1999, at the Northwest Airlines cargo facility at Los Angeles International Airport (LAX). A fire ensued and destroyed freight, including lithium batteries. The Safety Board stated that lithium batteries of the type involved in the fire can be transported on both passenger-carrying and cargo-only aircraft but are not classified as a hazardous material.

Safety Recommendation A-99-80. With the Federal Aviation Administration (FAA), evaluate the fire hazards posed by lithium batteries in an air transportation environment and require that appropriate safety measures be taken to protect aircraft and occupants. The evaluation should consider the testing requirements for lithium batteries in the United Nation's *Transport of Dangerous Goods Manual of Tests and Criteria (UN Test Manual)*, the involvement of packages containing large quantities of tightly packed batteries in a cargo compartment fire, and the possible exposure of batteries to rough handling in an air transportation environment, including being crushed or abraded open.

RSPA Comments. RSPA, in coordination with FAA, is re-evaluating both the hazards posed by lithium batteries in air transport and the safety measures necessary to protect an aircraft and its occupants. Our evaluation encompasses the current testing requirements of the United Nations Transport of Dangerous Goods Manual of Tests and Criteria as well as current regulatory requirements. In recent meetings with battery industry representatives, we have requested information on battery resistance to mechanical and heat damage and the hazards presented by damaged batteries.

Safety Recommendation A-99-81. Pending completion of your evaluation of the fire hazards posed by lithium batteries in an air transportation environment, prohibit the transportation of lithium batteries on passenger-carrying aircraft.



RSPA Comments. Taking into account the hazards that lithium batteries present in transportation, the unusual nature of the LAX incident, the number of lithium batteries that have been transported safely aboard passenger-carrying aircraft, and the potential economic consequences of a ban - particularly with regard to the consumer products industry - RSPA cannot justify an immediate prohibition on the transportation of lithium batteries on passenger-carrying aircraft. For the same reasons, RSPA cannot justify the immediate imposition of a requirement to mark and label packages containing lithium batteries. Although the LAX incident does demonstrate that lithium batteries may present a risk to an aircraft, RSPA believes that the risks presented by lithium batteries can be mitigated if the batteries are appropriately packaged and handled in transportation, and the hazards of damaged lithium batteries are understood by cargo handling personnel. Accordingly, RSPA will initiate alternative actions to address the risk lithium batteries present in air transportation.

First, with the assistance of FAA, RSPA will develop and distribute information aimed at shippers and airline personnel on the potential hazards of lithium batteries. This initiative will highlight the hazards that lithium batteries present when they have been damaged.

Secondly, based on the findings of our evaluation, RSPA will initiate rulemaking action as necessary to address the classification, hazard communication, packaging and operational controls needed to manage the risks associated with the transportation of lithium batteries aboard aircraft.

Safety Recommendation A-99-82. Require that packages containing lithium batteries be identified as hazardous materials, including appropriate marking and labeling of the packages and proper identification in shipping documents, when transported on aircraft.

RSPA Comments. As noted in our response to Recommendation A-99-81, RSPA believes that the risks presented by lithium batteries can be mitigated if the batteries are appropriately packaged and handled in transportation, and the hazards of damaged lithium batteries are understood by cargo handling personnel. Therefore, based on the findings of our evaluation, RSPA will initiate rulemaking action as necessary to address the classification, hazard communication, packaging and operational controls needed to minimize the risks associated with the transportation of lithium batteries aboard aircraft.

Safety Recommendation A-99-83. Pending completion of your evaluation of the fire hazards posed by lithium batteries in an air transportation environment, notify the International Civil Aviation Organization's Dangerous Goods Panel about the circumstances of the fire in the Northwest Airlines cargo facility at Los Angeles International Airport on April 28, 1999. Also pending completion of your evaluation of the fire hazards posed by lithium batteries in an air transportation environment, initiate action through the Dangerous Goods Panel to revise the *Technical Instructions for the Safe Transportation of Dangerous Goods by Air* to prohibit the transportation of lithium batteries on passenger-carrying aircraft.

Safety Recommendation A-99-84. Initiate action through the Dangerous Goods Panel to revise the *Technical Instructions for the Safe Transportation of Dangerous Goods by Air* to require that packages containing lithium batteries be identified as hazardous materials when transported on aircraft.

RSPA Comments to A-99-83 and A-99-84. In a United Nations working group meeting that was held March 13-15, 2000 in Ottawa, Canada, RSPA recommended that the United Nations Recommendations on the Transport of Dangerous Goods (UN Recommendations) be revised so that all lithium batteries be subject to the UN Test Manual and that small lithium batteries be regulated as hazardous materials. A copy of the recommended proposal is attached for your information. RSPA is also taking steps to notify the International Civil Aviation Organization (ICAO) Dangerous Goods Panel of the LAX incident. RSPA anticipates transmitting the notification within the next couple of weeks. RSPA will initiate any additional proposals to amend the international requirements for the transportation of lithium batteries, including the ICAO *Technical Instructions on the Safe Transport of Dangerous Goods by Air*, consistent with any amendments to the Hazardous Materials Regulations.

We request that you classify recommendations A-99-80 - 84 as "Open-Acceptable Action," pending further review. We thank you for your consideration of our request.

If you have any questions, please contact me or Jack Murray, Associate Administrator for Policy and Program Support, at (202) 366-4831.

Sincerely,



Kelley S. Coyner

Enclosure



Secretariat

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**COMMITTEE OF EXPERTS ON THE
TRANSPORT OF DANGEROUS GOODS**

**Sub-Committee of Experts on the
Transport of Dangerous Goods**
**(Eighteenth session,
Geneva, July 2000,
agenda item**

REQUIREMENTS FOR LITHIUM BATTERIES

Transmitted by the expert from the United States

Introduction

1. Based on a recent incident at Los Angeles International Airport (LAX) involving small lithium batteries with less than one gram of lithium per cell, the expert from the United States believes that additional considerations need to be taken with respect to the transport of lithium batteries. As demonstrated by the LAX incident, small lithium batteries if mishandled have the potential of initiating a fire through mechanical abuse and once ignited batteries have the potential of propagating the fire to other batteries in the package. This hazard is further extenuated by the difficulty in extinguishing a lithium battery fire. For these reasons the expert from the United States believes that these small lithium batteries should be subjected to regulation.
2. It should be noted that under the current requirements, any quantity of lithium is prohibited from transport on passenger aircraft under the current ICAO Technical Instructions. With this in mind, it is the opinion of the expert from the United States that some conditions should apply to even small lithium batteries to ensure that their transport on passenger aircraft can be carried out safely. This can be accomplished through a combination of changes which (1) first ensure the safety of the batteries themselves, (2) ensure that lithium batteries are properly packaged to prevent release from the packaging under normal conditions of transport and (3) identify these batteries as dangerous goods in transport to ensure their proper handling. At the same time it is recognized that lithium batteries play an increasingly

important role in the technically advanced world that we now live in. For this reason it is necessary to make some exceptions for the transport of small quantities of lithium batteries. With this in mind it is proposed that the following changes be made through amendments to the UN special provisions for lithium batteries:

- a) require that all lithium batteries independent of size must be subjected to the lithium battery testing requirements in order to qualify for classification in Class 9;
 - b) allow up to 5 cells or batteries with a lithium content limited in accordance with the current special provision 188 paragraphs (a) and (b) to be transported as not being subject to the regulations provided the batteries are protected against short circuits.
 - c) require that more than 5 small cells or batteries (as per special provision 188 paragraph (a) and (b)) in packagings up to 30 kg gross mass and cells and batteries with up to 5grams and 25 grams respectively be treated as limited quantities of dangerous goods provided the packaging is capable of withstanding in any drop orientation a 1.2 metre drop test without releasing batteries from the packaging and retaining the batteries in their original orientation;
 - d) packagings containing more than 5 small cells or batteries and more than 30 kg gross mass would be subject to the regulations as class 9 dangerous goods and subject to the packing group II performance criteria.
 - e) batteries larger than described in (c) above would be subject to the regulations as class 9 dangerous goods and subject to package testing at the packing group II performance level.
3. Draft amended special provisions reflecting the above changes to the lithium battery requirements are attached as an Annex to this paper.

Annex

Proposed Revisions to the UN Lithium Battery Special Provisions

Revise the existing Special Provision to read as follows:

“188 Lithium cells and batteries offered for transport are not subject to these Regulations if they meet the following provisions:

- (a) For a lithium metal or lithium alloy cell with a liquid cathode, the lithium content is not more than 0.5 g, for a lithium metal or lithium alloy cell with a solid cathode, the lithium content is not more than 1 g, and for a lithium-ion cell, the equivalent lithium content is not more than 1.5 g;
- (b) For a lithium metal or lithium alloy battery with liquid cathodes, the aggregate lithium content is not more than 1 g, for a lithium metal or lithium alloy battery with solid cathodes, the aggregate lithium content is not more than 2 g, and for a lithium-ion battery, the aggregate equivalent lithium content is not more than 8 g;
- (c) Each cell or battery containing a liquid cathode is hermetically sealed;
- (d) No more than 5 cells or batteries or portable battery packs (as defined in 38.3) are packed, alone or with electronic device(s), in strong packagings provided that the cells or batteries or portable battery packs are separated so as to prevent short circuits; and
- (e) If, when fully charged, the aggregate lithium content of the anodes in a liquid cathode battery is more than 0.5g, or of the aggregate lithium content of the anodes in a solid cathode battery is more than 1 g, it does not contain a liquid or a gas which is considered dangerous unless the liquid or gas, if free, would be completely absorbed or neutralized by other materials in the battery.

As used above and elsewhere in these Regulations, "lithium content" means the mass of lithium in the anode of a lithium metal or lithium alloy cell, except in the case of a lithium-ion cell the "equivalent lithium content" in grams is calculated to be 0.3 times the rated capacity in ampere-hours. The lithium-equivalent content of a battery equals the sum of the grams of lithium-equivalent content contained in the component cells of the battery.”

Add a new special provision as follows:

“188A Packages of less than 30 kg gross mass containing more than 5 cells or batteries or portable battery packs meeting the size limitations prescribed in SP 188 (a) and (b) or containing lithium cells or batteries where the lithium content of the anode of each cell when fully charged is not more than 5g and the aggregate lithium content of the anodes of each battery, when fully charged is not more than 25g may be transported in accordance with the requirements for limited quantities provided that the packaging is capable of withstanding a 1.2 metre drop in any orientation without release of content and without shifting of the contents so as to allow battery to

battery contact.”

Revise the existing special provision 230 by adding a new paragraph (e) as follows:

230 This entry applies to cells and batteries containing lithium in any form, including lithium polymer and lithium ion cells and batteries. Lithium cells and batteries may be transported under this entry if they meet the following provisions:

- (a) Each cell or battery type has been determined to meet the criteria for assignment to Class 9 on the basis of tests carried out in accordance with the *Manual of Tests and Criteria*, Part III, sub-section 38.3;
- (b) Each cell and battery incorporates a safety venting device or is designed to preclude a violent rupture under conditions normally incident to transport;
- (c) Each cell and battery is equipped with an effective means of preventing external short circuits;
- (d) Each battery containing cells or series of cells connected in parallel is equipped with effective means as necessary to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.).
- (e) Cells and batteries transported in equipment are protect from short circuit within the equipment.

The existing special provision 287 is deleted.