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COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS

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WORK OF THE SUB-COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS

Draft amendments to the Recommendations on the Transport of Dangerous Goods

Special provisions for lithium batteries

Transmitted by the expert from the United States of America

Introduction

1. The expert from the United States of America proposes that the special provisions applicable to lithium batteries be revised in accordance with the proposals in Annex 1. Much of what is being proposed in this document is in response to an incident involving lithium batteries that occurred at Los Angeles International Airport (LAX). This incident was investigated by the U.S. National Transportation Safety Board (NTSB). NTSB recommendations stemming from this incident are provided in Annex 2 to this paper. The complete NTSB report can be viewed at http://www.ntsb.gov/Recs/letters/1999/A99_80_84.pdf. In response to this incident the government of the United States of America has issued a Transportation of Lithium Batteries Advisory Notice. In preparing the advisory notice, the government of the United States of America has worked with the lithium battery industry worldwide to take preliminary steps in addressing the concerns raised by the LAX incident. The voluntary steps being taken by the industry are shown in Annex 3. These voluntary steps are expected to be followed in transporting the vast majority of small lithium primary and lithium ion rechargeable cells and batteries worldwide. A copy of the complete advisory notice may be viewed at http://hazmat.dot.gov/rules/not2000_10.htm.

2. In this document the expert from the United States of America proposes that provisions similar to the voluntary industry provisions as well as the proposal to test small lithium batteries (as proposed in Information Paper 49 to the 18th session of the Sub-Committee) be adopted through amendments to the special provisions affecting lithium batteries.

Amendments to the Special Provisions

3. *Testing of small batteries.* As indicated in INF 49 to the eighteenth session, the expert from the United States of America, based on the LAX incident which involved small lithium batteries, believes that all lithium batteries independent of size should be subjected to testing. Small lithium batteries have the potential of initiating a fire if mishandled. Once ignited, such small lithium batteries may have the potential of propagating fire to other batteries in the package. For these reasons, the expert from the United States of America believes that in order for small lithium cells and batteries to be excepted from most of the requirements of the Model Regulations, they should be shown to demonstrate that they are significantly robust to withstand conditions of transport to which nondangerous goods may be subjected.

4. The expert from the United States of America believes that lithium cells and batteries larger than those dealt with in subparagraphs (a) through (f) of Special provision 188 should no longer be allowed to be transported as not being subject to the Model Regulations and on this basis proposes that subparagraphs (g) through (j) of Special Provision 188 be deleted. As a consequence of applying the test requirements to the small lithium cells and batteries, subparagraphs (c) and (f) would no longer be necessary and should also be deleted.

5. *Proposed requirements adopting industry voluntary measures.* Under the current provisions small lithium batteries may only be regarded as not subject to the Regulations provided they are packaged so as to prevent short circuiting. When a package containing such batteries is mishandled, protection against short circuiting may no longer be provided or the batteries may be damaged so as to cause a fire. The LAX incident highlighted the need for some kind of hazard communication to appear on the outside of the packagings so that in the event of mishandling, carriers have sufficient information to determine that special precautions are appropriate.

6. Recognizing the frequency with which lithium batteries are transported in small quantities and recognizing that small quantities of small lithium batteries pose a lesser degree of risk than large volume shipments (The LAX incident involved 120,000 non-rechargeable lithium primary batteries on two pallets.), the expert from the United States of America proposes a pragmatic approach whereby:

(a) small packages of lithium batteries containing less than or equal to 20 cells or 10 batteries are allowed to be transported as not subject to other provisions of the Model Regulations provided they are packaged so as to be protected against short circuiting;

(b) packages of lithium batteries containing more than 20 cells or 10 batteries are subject to the following additional requirements:

- each outer package is marked indicating that the package contains lithium batteries and that special procedures are to be followed in the event that the package is damaged;

- each shipment is accompanied by a document indicating that packages contain lithium batteries and that special procedures are to be followed in the event a package is damaged;

(c) each package must be capable of withstanding a 1.2 metre drop test in any orientation; and

(d) except packages of lithium batteries packed in or with equipment, packages may not exceed 30 kilograms gross mass.

6. *Special Provision 287.* The expert from the United States of America believes that special provision 287 should be deleted. This provision is difficult to enforce and experience has shown that the normal practice is to apply some charge to batteries prior to their distribution.

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ANNEX 1

Special Provisions for Lithium Batteries

It is proposed that the special provisions applicable to lithium batteries be amended as follows:

188 Lithium cells and batteries offered for transport are not subject to **other provisions** of 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;~~

(c) Each cell or battery is of the type proved to meet the requirements of each test in the Manual of Tests and Criteria, Part III, sub-section 38.3;

~~(e) Cells are separated so as to prevent short circuits;~~

(d) **Cells and** batteries are separated so as to prevent short circuits and are packed in strong packagings, except when installed in electronic devices; and

(e) Each package containing more than 20 lithium cells or 10 lithium batteries shall in addition meet the following requirements:

Each package shall be marked indicating that it contains lithium batteries and that special procedures should be followed in the event that the package is damaged;

Each shipment shall be accompanied with a document indicating that packages contain lithium batteries and that special procedures should be followed in the event a package is damaged;

Each package is capable of withstanding a 1.2 meter drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery contact and without release of contents; and

Except in the case of lithium batteries packed in or with equipment, packages may not exceed 30 kg gross mass.

~~(f) If, when fully charged, the aggregate lithium content of the anodes in a liquid cathode battery is more than 0.5 g, 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 gas which is considered dangerous unless the liquid or gas, if free, would be completely absorbed or neutralized by other materials in the battery;~~

~~Lithium cells and lithium batteries are also not subject to these Regulations if they meet the following provisions:~~

~~(g) The lithium content of the anode of each cell, when fully charged, is not more than 5g.~~

~~(h) The aggregate lithium content of the anodes of each battery, when fully charged, is not more than 25 g;~~

~~(i) Each cell or battery is of the type proved to be non-dangerous by testing in accordance with tests in the Manual of Tests and Criteria, Part III, sub-section 38.3; such testing shall be carried out on each type prior to the initial transport of that type; and~~

~~(j)Cells and batteries are designed or packed in such a way as to prevent short circuits under conditions normally encountered in transport.~~

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.

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~~ is of the type proved to meet the requirements of each test ~~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.).

~~287 New, uncycled and uncharged lithium ion cells and batteries are not subject to these Regulations if:~~

~~(a) the electrolyte does not meet the definition of any class or division in these Regulations; or~~

~~(b) the electrolyte meets the definition of a hazard class or division in these Regulations, the electrolyte will not flow from a ruptured or cracked case and there is no free liquid to flow.~~

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ANNEX 2

NTSB Recommendations Relative to Lithium Batteries

On November 16, 1999, the National Transportation Safety Board issued five safety recommendations to the Department of Transportation, Research and Special Programs Administration on the transportation of lithium batteries. The recommendations were issued as the result of the Safety Board's investigation of the incident that occurred on April 28, 1999, at Los Angeles International Airport (LAX). The recommendations are as follows:

A-99-80. With the Federal Aviation Administration, 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, 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 or abraded open.

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.

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.

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.

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.

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ANNEX 3

Voluntary Steps Taken by Industry in Response to the Lithium Battery Incident

Companies from around the world involved in the manufacture and distribution of small lithium primary, and lithium ion lithium polymer rechargeable cells and batteries voluntarily are implementing a program to identify and provide information concerning these batteries. The activity is expected to result in modification of shipping practices associated with the vast majority of small lithium primary and lithium ion rechargeable cells and batteries. The batteries affected are those small batteries that are excepted from the UN Model Regulation under special provision 188 (a) through (f).

Each shipment of covered products that is originated by a participating company and contains more than 20 new primary lithium cells or 10 new primary lithium batteries will be marked to identify its content and recommended response actions in the event of an accident or damage to packaging. The text will appear in both English and the language of the shipment's origin, and will state:

> ***Lithium batteries inside. Do not damage or mishandle this package. If package is damaged or mishandled, batteries must be quarantined, inspected, and repacked.***

The label will include a toll free number to call in the event of an emergency. Each shipment of covered products that is originated by a participating company and contains more than 40 new lithium ion or lithium polymer cells or more than 20 new lithium ion or lithium polymer multi-cell battery packs (regardless of the number of cells in each) will carry a label explicitly identifying its content and recommended response actions in the event of an accident or damage to packaging. The text will appear in both English and the language of the shipment's origin, and will state:

> ***Lithium ion rechargeable batteries inside. (No lithium metal.) In the event of fire, use Class B or C extinguisher. If package is damaged or mishandled, batteries must be quarantined, inspected, and repacked.***

Packages which are marked will not exceed 30 kg and will be UN 4G fiberboard boxes, at the Packing Group II performance level, or equivalent.

Participating companies will provide to air carriers, freight forwarders and other shippers involved in the air transportation of covered products brochures or similar documents that describe the covered products and packages, the physiochemical characteristics of covered products, the communications program, and safe shipment handling procedures for covered packages.

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