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**COMMITTEE OF EXPERTS ON THE TRANSPORT OF
DANGEROUS GOODS AND ON THE GLOBALLY
HARMONIZED SYSTEM OF CLASSIFICATION
AND LABELLING OF CHEMICALS**

Sub-Committee of Experts on the
Transport of Dangerous Goods

Thirtieth session
Geneva, 4-12 (a.m.) December 2006
Item 2(a) of the provisional agenda

**PROPOSALS OF AMENDMENTS TO THE RECOMMENDATIONS
ON THE TRANSPORT OF DANGEROUS GOODS**

Model Regulations on the Transport of Dangerous Goods

New entries for lithium ion batteries

Transmitted by the International Federation of Air Line Pilots Association (IFALPA)

1. At its twenty-ninth session, the Sub-Committee considered a proposal by the Portable Rechargeable Battery Association (PRBA) to assign lithium ion cells and batteries a distinct UN Number (ST/SG/AC.10/C.3/2005/45). While this proposal was not adopted, IFALPA believes that transport safety would be enhanced by a distinct UN Number for lithium ion cells and batteries (hereafter referred to as lithium ion batteries), and is resubmitting a revised version of the PRBA proposal, accompanied by additional safety justification.

Justification for new UN numbers and proper shipping names for lithium ion batteries

2. Lithium metal batteries and lithium ion batteries are distinctly different products, both chemically and functionally. Lithium metal batteries are generally non-rechargeable (primary), and are used in many consumer and medical applications, including digital cameras, flashlights, and defibrillators. They are also used extensively by the military and aerospace industry. Lithium ion batteries are rechargeable, and are the preferred technology for many portable consumer electronic products and power devices, including portable computers, mobile
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telephones and MP3 players. Larger lithium ion batteries also are being developed for use in battery powered (electric) vehicles and hybrid vehicles.

Both products contain lithium, but at different oxidation states, making them chemically very different. Just as table salt (NaCl) is very different chemically from metallic sodium (Na), the lithium ion compound used in lithium ion batteries is chemically very different from the metallic lithium used in lithium metal batteries. The UN Manual of Tests and Criteria correctly observes that a lithium ion cell or battery is constructed with no metallic lithium in either electrode, making them much less chemically reactive, thus justifying distinct entries for lithium metal and lithium ion batteries.

3. When evaluating this proposal, the Sub-Committee is asked to consider the different requirements for *batteries, containing sodium* (UN 3292) and a battery where sodium hydroxide was used as an electrolyte. Sodium is present in both batteries, albeit at different oxidation states. While batteries conforming to UN 3292 are forbidden for transport on passenger aircraft, a battery containing sodium hydroxide could be shipped under UN 2795, *batteries, wet, filled with alkali*. IFALPA believes it is appropriate to similarly distinguish between lithium metal and lithium ion batteries.

4. Because of the significantly different chemical properties, lithium metal and lithium ion batteries react very differently to an external fire source. Through testing at the Federal Aviation Administration's (FAA) Technical Center, the U.S. Department of Transportation (DOT) has shown that a fire involving lithium metal batteries would involve all batteries in a shipment, burn at a temperature above the melting point of aluminum, and be accompanied by a pressure pulse that would possibly cause the failure of a cargo compartment liner in an aircraft. Most importantly, the Halon suppression systems currently in use on commercial aircraft would have no effect on a fire involving lithium metal batteries. In contrast, several tests have shown that fires involving lithium ion batteries are easier to control. The UK CAA published a report ("Dealing With In-Flight Lithium Battery Fires in Portable Electronic Devices" (CAA Paper 2003/4)), where it was shown that battery fires involving single batteries in the cabin of an aircraft could be extinguished effectively with the onboard suppression devices. Additionally, while the report has not yet been published, in July 2006 a representative from the FAA Technical Center stated at the National Transportation Safety Board (NTSB) Hearing for the UPS 1307 accident (In-flight fire and evacuation at Philadelphia in February 2006) that testing involving lithium ion batteries is complete, and that fires involving those batteries could be extinguished with Halon.

5. At the twenty-ninth session, members of the Sub-Committee questioned the necessity of the PRBA proposal, noting that there was no proposed change in the transportation requirements between lithium metal and lithium ion batteries. The Sub-Committee is asked to consider, however, that both individual states and operators have imposed additional restrictions on lithium metal batteries, including prohibiting them from transport (except when contained in or packed with equipment) on passenger aircraft. These additional restrictions do not apply to lithium ion batteries, but because lithium metal and lithium ion batteries share the same UN number, there is often confusion surrounding the transport of these dangerous goods. Distinct UN Numbers would facilitate correct acceptance of these batteries and compliance with regulation. Furthermore, the Sub-Committee has historically taken the view that when substances

elicit different emergency response procedures, different UN numbers should be used (see for example 2.0.2.5(d)). Distinct UN numbers would aid in ensuring appropriate emergency response procedures are taken in the event of an accident involving lithium metal or lithium ion batteries.

6. While IFALPA is not proposing further changes to the regulations beyond distinct UN Numbers at this time, it does anticipate bringing proposals to ICAO for consideration for the air mode. These proposals may include changes in packaging requirements, quantity limitations, or procedures for emergency response for both flight crew and emergency responders. Having distinct UN Numbers and being able to quickly distinguish between lithium metal and lithium ion batteries is an important precursor to many of these proposals. It also is consistent with how UN numbers and proper shipping names are established under the Model Regulations. That is, dangerous goods are assigned UN numbers and proper shipping names “according to their hazard classification and their composition.” (See Section 2.0.2.1 of the Regulations.) The composition of lithium metal and lithium ion batteries are significantly different and therefore warrant separate UN numbers and shipping names.

Proposal

7. IFALPA proposes:

- .1 that new UN numbers and shipping names for lithium ion batteries be provided in the Dangerous Goods List as follows:

UN XXXX **LITHIUM ION BATTERIES** (including lithium ion polymer batteries)

and

UN YYYY **LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT** or
UN YYYY **LITHIUM ION BATTERIES PACKED WITH EQUIPMENT.**

The column entries in the Chapter 3.2 Dangerous Goods list would be the same as for UN 3090.

- .2 that consequential amendments to Special Provision 188 be made as follows:

188 ~~Lithium~~ *Cells* and batteries offered for transport are not subject to other provisions of these Regulations if they meet the following:

- (a) For a lithium metal or lithium alloy cell, the lithium content is not more than 1 g, and for a lithium ion cell, the Watt-hour rating is not more than 20 Wh;
- (b) For a lithium metal or lithium alloy battery the aggregate lithium content is not more than 2 g, and for a lithium ion battery, the Watt-hour rating is not more than 100 Wh. Lithium ion batteries subject to this provision shall be marked with the Watt-hour rating on the outside case;
- (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;
- (d) Cells and batteries are separated so as to prevent short circuits and are packed

in strong packagings, except when installed in equipment; and

- (e) Except when installed in equipment, each package containing more than 24 ~~lithium~~ cells or 12 ~~lithium~~ batteries shall in addition meet the following requirements:
 - (i) Each package shall be marked indicating that it contains lithium batteries *or lithium ion batteries, as appropriate*, and that special procedures should be followed in the event that the package is damaged;
 - (ii) Each shipment shall be accompanied with a document indicating that packages contain lithium batteries *or lithium ion batteries, as appropriate*, and that special procedures should be followed in the event a package is damaged;
 - (iii) Each package is capable of withstanding a 1.2 m 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 (or cell to cell) contact and without release of contents; and
 - (iv) Except in the case of lithium batteries *or lithium ion batteries* packed with equipment, packages may not exceed 30 kg gross mass.

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.

.3 that consequential amendments be made to the introduction to SP 310 as follows:

310 The testing requirements in Chapter 38.3 of the Manual of Tests and Criteria do not apply to production runs consisting of not more than 100 ~~lithium~~ cells and batteries, or to pre-production prototypes of cells and batteries when these prototypes are transported for testing, if:

.4 that consequential amendments be made to packing instruction P903 as follows:

P903	<i>PACKING INSTRUCTION</i>	P903
This instruction applies to UN Nos. 3090, 3091, XXXX and YYYY.		
The following packagings are authorized, provided the general provisions of 4.1.1 and 4.1.3 are met: Packagings conforming to the packing group II performance level. In addition, batteries employing a strong, impact resistant outer casing of a gross mass of 12 kg or more, and assemblies of such batteries, may be packed in strong outer packagings, in protective enclosures (e.g., in fully enclosed or wooden slatted crates) unpackaged or on pallets. Batteries shall be secured to prevent inadvertent movement, and the terminals shall not support the weight of other superimposed elements. When lithium cells and batteries are packed with equipment, they shall be packed in inner fibreboard packagings that meet the requirements for packing group II. When lithium cells and batteries included in Class 9 are contained in equipment, the equipment shall be packed in strong outer packagings in such a manner as to prevent accidental operation during transport.		
Additional requirement: Batteries shall be protected against short circuit		