



Guidance Document

Transport of Lithium Metal and Lithium Ion Batteries

16 December 2008

Introduction

This document is based on the provisions set out in the 2009/2010 Edition of the ICAO Technical Instruction for the Safe Transport of Dangerous Goods by Air and the 50th Edition (2009) of the IATA Dangerous Goods Regulations (DGR).

The purpose of this document is to provide guidance for complying with provisions applicable to the transport by air of lithium batteries that take effect from 1 January 2009 as set out in the DGR. Specifically the document provides information on:

- ↗ Definitions;
- ↗ Classification;
- ↗ Exceptions;
- ↗ Special Provisions;
- ↗ Packaging provisions for lithium batteries;
- ↗ Prohibitions;
- ↗ Passenger Provisions;

Definitions

Lithium Battery – The term “lithium battery” refers to a family of batteries with different chemistries, comprising many types of cathodes and electrolytes. For the purposes of the DGR they are separated into:

- ↗ Lithium metal batteries. Are generally primary (non-rechargeable) batteries that have lithium metal or lithium compounds as an anode. Lithium metal batteries are generally used to power watches, calculators, cameras, etc.;

Example Lithium Metal Batteries



- Lithium-ion batteries (sometimes abbreviated Li-ion batteries). Are a type of secondary (rechargeable) battery commonly used in consumer electronics. Also included within lithium-ion batteries are lithium polymer batteries. Lithium-ion batteries are generally found in mobile telephones, laptop computers, etc.

Example Lithium Ion Battery



Transport as Cargo

Classification

Lithium batteries are classified in Class 9 – Miscellaneous dangerous goods as:

- UN 3090, **Lithium metal batteries**; and
- UN 3480, **Lithium ion batteries**

or if inside a piece of equipment or packed separately with a piece of equipment as:

- UN 3091, **Lithium metal batteries contained in equipment**; or
- UN 3091, **Lithium metal batteries packed with equipment**; and
- UN 3481, **Lithium ion batteries contained in equipment**; or
- UN 3481, **Lithium ion batteries packed with equipment**.

In the absence of exceptions, these batteries must be shipped in quantities that comply with the limitations contained in the Regulations (see DGR Table 4.2). Also, they must be contained in specification packaging prescribed by the ICAO Technical Instructions and IATA Dangerous Goods Regulations. A completed package must display a Class 9 hazard label in addition to markings that identify the applicable proper shipping name and UN number. A shipper must document the shipment using a Shipper's Declaration for Dangerous Goods.

Exceptions

Small lithium metal and lithium ion batteries are excepted from most of the requirements of the ICAO Technical Instructions and IATA DGR provided that they comply with all of the requirements set out in Part 1 of Packing Instructions 965, 966 and 967 for lithium ion batteries and Part 1 of Packing Instructions 968, 969 and 970 for lithium metal batteries in the 50th edition of the IATA DGR.

Packages containing lithium batteries, or lithium batteries contained in, or packed with, equipment that meet the provisions of Part 1 of these packing instructions are not required to have a Class 9 hazard label and there is no requirement for a Shipper's

Declaration for Dangerous Goods for consignments of these batteries. However, in the event of an incident involving these batteries, the incident reporting requirements apply.

Note:

Only batteries that have successfully passed the test procedures of Part III, Sub-Section 38.3 of the UN Manual of Tests and Criteria qualify under this exception. This is also true for so-called “OEM” or “aftermarket” batteries. Any battery manufacturer or distributor should be able to provide documentation confirming that the batteries have been so tested.

Lithium metal and lithium ion batteries larger than those described in Part 1 of the applicable packing instruction must be assigned to Class 9 and consigned as UN 3090 (Lithium metal batteries), UN 3480 (Lithium ion batteries), UN 3091 (Lithium metal batteries contained in equipment or Lithium metal batteries packed with equipment) or UN 3481 (Lithium ion batteries contained in equipment or Lithium ion batteries packed with equipment). All applicable requirements contained in the IATA Dangerous Goods Regulations relating to these commodities must be complied with, including the training requirements; a “Shipper’s Declaration for Dangerous Goods” must be issued, and packages must bear the Class 9 hazard label.

Special Provisions

Lithium batteries are also subject to a number of special provisions which may allow for the transport of batteries other than in accordance with the defined conditions or limits, or which require the shipper to take additional precautions when preparing batteries for transport. The special provisions applicable to lithium batteries are set out following.

Notwithstanding the general requirement that prior to being transported each type of lithium battery must have successfully passed the UN test requirements, there is provision for prototype lithium batteries that have not yet passed the UN test requirements to be shipped for testing purposes, this testing includes pre-production or product compatibility testing, in accordance with Special Provision A88, as follows:

A88 Prototype lithium batteries and cells to be tested that are packed with not more than 24 cells or 12 batteries per packaging that have not been tested to the requirements in sub-section 38.3 of the UN Manual of Tests and Criteria may be transported aboard cargo aircraft, if approved by the appropriate authority of the State of origin and the following requirements are met:

- (a) the cells and batteries must be transported in an outer packaging that is a metal, plastic or plywood drum or a metal, plastic or wooden box and that meets the criteria for Packing Group I packagings; and
- (b) each cell and battery must be individually packed in an inner packaging inside an outer packaging and surrounded by cushioning material that is non-combustible, and non-conductive. Cells and batteries must be protected against short-circuiting.

For air transport, specific quantity limits apply to the gross weight of each package that contains lithium batteries. The gross weight includes the weight of all of the packaging materials as well as the weight of batteries. The maximum weight for packages consigned for carriage as Cargo Aircraft Only is 35 kg gross. However, there is provision for large batteries that have a weight that exceed the 35 kg packaged weight to be consigned on a cargo aircraft in accordance with Special Provision A99 as follows:

A99 Irrespective of the limit specified in Column L of the List of Dangerous Goods (Subsection 4.2), a lithium battery or battery assembly that has successfully passed the tests specified in the UN Manual of Tests and Criteria, Part III, sub-section 38.3 and that meets the requirements of Packing Instruction 965 for lithium ion batteries, and Packing Instruction 968 for lithium metal batteries as prepared for transport may have a mass exceeding 35 kg G, if approved by the appropriate authority of the State of origin. A copy of the document of approval must accompany the consignment.

There will be occasion where a manufacturer may wish to have a defective battery returned for analysis. However, where such batteries may pose a safety risk they are prohibited from transport by air as set in Special Provision A154, as follows:

A154 Lithium batteries identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

One of the major risks associated with the transport of batteries and battery-powered equipment is short-circuit of the battery as a result of the battery terminals coming into contact with other batteries or metal objects. Special Provision A164 require that all batteries and battery-powered equipment must be packed to prevent short circuit an inadvertent operation as follows:

A164 Any electrical battery or battery-powered device, equipment of vehicle having the potential of a dangerous evolution of heat must be prepared for transport so as to prevent:

- (a) a short circuit (e.g. in the case of batteries by the effective insulation of exposed terminals; or in the case of equipment, by disconnection of the battery and protection of exposed terminals); and
- (b) unintentional activation.

Prohibitions

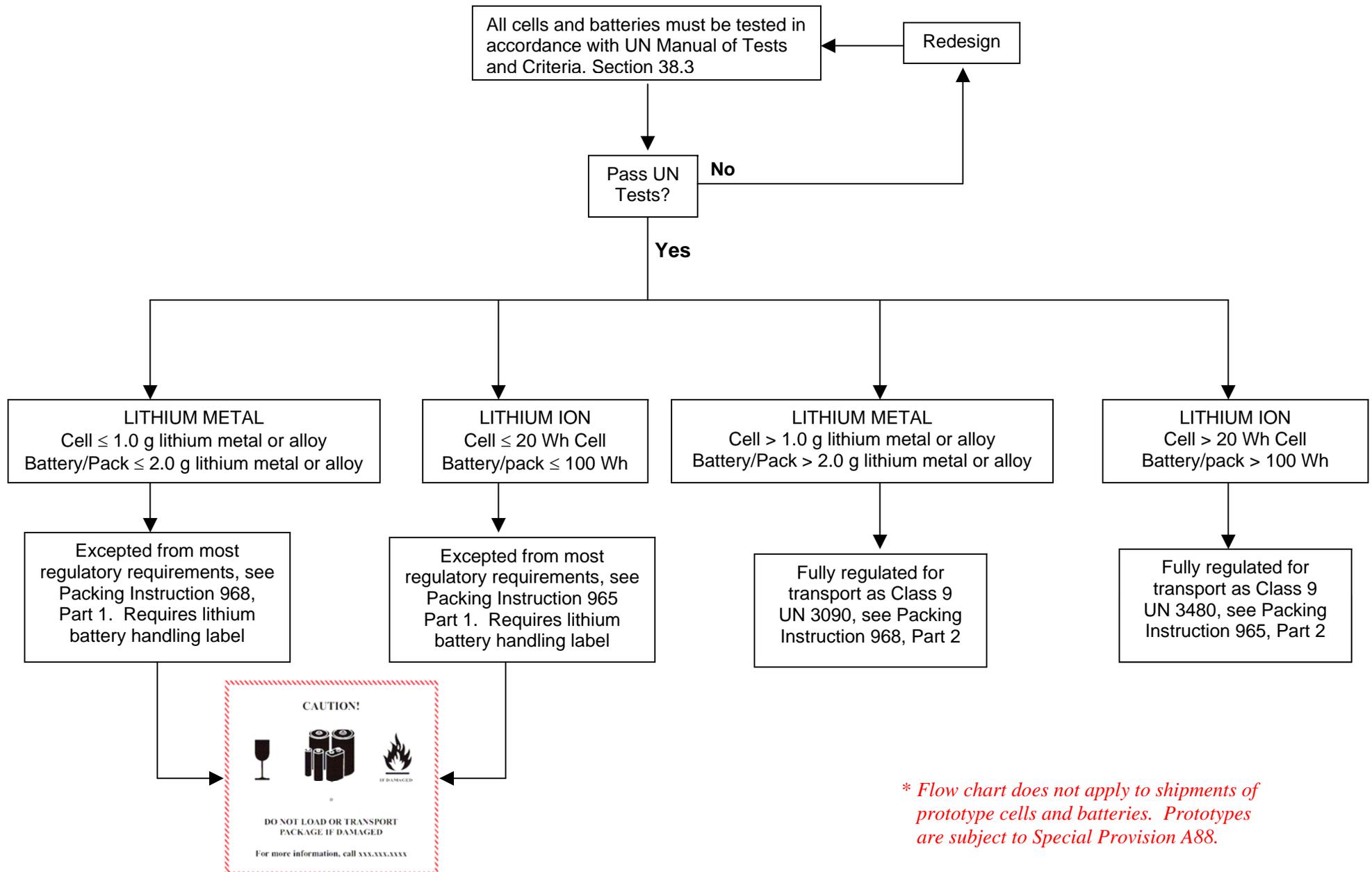
Transport to, from or through the United States

Lithium metal batteries shipped to, from or through the United States are subject to additional limitations specified in the US national dangerous goods regulations contained in Code of Federal Regulations Title 49 (49 CFR). The basis of these limitations is reflected in State Variation USG-02, which states that:

“Primary (non-rechargeable) lithium metal batteries and cells, UN 3090, are forbidden for transportation aboard passenger-carrying aircraft. Equipment containing or packed with primary (non-rechargeable) lithium metal batteries and cells, UN 3091, are forbidden from transport aboard passenger carrying aircraft except if they meet the conditions of 49 CFR 172.102, Special Provision A101 or A102. Packages containing primary (non-rechargeable) lithium batteries and cells that meet the exceptions in 49 CFR 173.185 (b) or (c) or Part 1 of Packing Instructions 968, 969 or 970 of these Regulations are forbidden for transport on passenger aircraft and must be marked “PRIMARY LITHIUM BATTERIES-FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT”.

LITHIUM ION AND LITHIUM METAL CELLS AND BATTERIES

SHIPPING REQUIREMENTS *



* Flow chart does not apply to shipments of prototype cells and batteries. Prototypes are subject to Special Provision A88.

Passenger Provisions

Transport within Passenger Baggage

Certain restrictions apply to the carriage of lithium metal and lithium ion batteries even when carried by passengers as baggage. Once again, only batteries that have successfully passed the Tests outlined in Part III, Sub-Section 38.3 of the UN Manual of tests and criteria may be carried.

As said before batteries manufactured, distributed or sold by major companies do meet this requirement, however, certain replacement batteries which are not OEM or aftermarket batteries but simply low-cost copies of those – also called “fakes” – may not have undergone the required tests. Untested batteries are consequently excluded from air transport.

Users of equipment powered by lithium metal and lithium ion batteries should therefore be vigilant when buying replacement batteries from unknown sources, such as on markets or Internet auction platforms. The differences between genuine and copied battery types may not be visible but could be very dangerous; such untested batteries may have a risk of overheating or causing fires.

Because of the risks associated with the carriage of spare batteries these may not be transported within passenger checked baggage. Spare batteries must be in carry-on baggage.

These requirements are stipulated by subparagraph 2.3.5.9 of the IATA Dangerous Goods Regulations:

2.3.5.9 Consumer electronic devices (watches, calculating machines, cameras, cellular phones, lap-top computers, camcorders, etc.) containing lithium metal or lithium ion cells or batteries when carried by passengers or crew for personal use, which should be carried in carry-on baggage. Spare batteries must be individually protected to prevent short circuits by placement in the original retail packaging or by otherwise insulating terminals, e.g. by taping over exposed terminals or placing each battery in a separate plastic bag or protective pouch, and carried in carry-on baggage only. In addition, each installed or spare battery must not exceed the following quantities:

- (a) for lithium metal or lithium alloy batteries, a lithium content of not more than 2 g; or
- (b) for lithium ion batteries, a watt-hour rating of not more than 100 Wh.

There is also provision, with the approval of the airline, for larger lithium ion batteries with a watt-hour rating in excess of 100 Wh, but not more than 160 Wh in equipment and no more than two spare lithium ion batteries as set out in subparagraph 2.3.2.3 as follows:

2.3.2.3 Lithium ion batteries exceeding a watt-hour rating of 100 Wh but not exceeding 160 Wh may be carried as spare batteries in carry on baggage, or in equipment in either checked or carry on baggage. No more than two individually protected spare batteries per person may be carried.

Although the text provided above does not impose a limit on the number of lithium metal and lithium ion batteries being carried as spares within a passenger’s carry-on baggage

it must be emphasized that the number of spares must be “reasonable” in the context of the equipment used by the passenger and his or her itinerary. Furthermore, these must be intended to power consumer electronic devices (including, but not limited to, cameras and professional film equipment, laptop computers, MP3 players, cell phones, Personal Digital Assistants (PDA's), pocket calculators etc.

Batteries which are carried for the purpose of resale or beyond personal needs are clearly not covered.

The regulations imposed on these commodities by the United States competent authorities (Department of Transportation and FAA) match the ICAO / IATA regulations addressed in this document.

Further information can be found here:

http://www.iata.org/whatwedo/cargo/dangerous_goods/index.htm

<http://safetravel.dot.gov>

You may also contact the airline of your choice or your national civil aviation authority if you have any further concerns about travelling with lithium metal or lithium ion batteries.

You can also contact the IATA Dangerous Goods Support team if you have questions or concerns which may not have been addressed in this document: dangood@iata.org