



WORKING PAPER

**DANGEROUS GOODS PANEL (DGP)
MEETING OF THE WORKING GROUP OF THE WHOLE**

Auckland, New Zealand, 4 to 8 May 2009

Agenda Item 5: Resolution, where possible, of the non-recurrent work items identified by the Air Navigation Commission or the panel

Agenda Item 5.3: Review of provisions for dangerous goods relating to batteries

- a) **lithium batteries**
- b) **battery-powered devices**
- c) **battery-powered mobility aids**

SHIPPING REQUIREMENTS FOR PROTOTYPE AND LOW PRODUCTION LITHIUM BATTERIES

(Presented by PRBA – The Rechargeable Battery Association)

SUMMARY

This working paper proposes amendments to the requirements applicable to prototype and low production lithium batteries and lithium batteries with a mass of 12 kg or greater.

Action by the DGP-WG is in paragraph 2.

1. INTRODUCTION

1.1 At the November 2008 DGP Working Group of the Whole Meeting (DGP-WG/08), agreement in principle was reached on the proposal in DGP-WG/08-WP/25 to align Special Provision A88 of the Technical Instructions with Special Provision 310 of the UN Model Regulations and IMDG Code and amend Packing Instruction 900 to authorize prototype lithium batteries in battery powered vehicles under an approval from the State of Origin (Packing Instruction 900 will be replaced with Packing Instructions 950, 951 and 952 in 2011.) However, the working group noted that additional consideration of conditions for such approvals may be warranted; verification was needed that the proposed alignment of Special Provision A88 is consistent with the UN Model Regulations and IMDG Code, and provisions for shipping prototype lithium batteries is needed for hybrid-electric vehicles in the new Packing Instructions 950, 951 and 952. Each of these issues is addressed below.

1.2 A new, but related, issue also has been added to this paper in paragraph 1.4. PRBA is proposing amendments to Special Provision A88 to allow, with the approval of the appropriate authority, lithium batteries with a mass of 12 kg or greater and having a strong, impact resistant outer casings, and assemblies of such batteries, to be packed in strong outer packagings or protective enclosures not subject

to the requirements of Part 6 of these Instructions, and, as prepared for transport, to have a mass exceeding 35 kgG.

1.3 In regard to Special Provision A88, it was correctly pointed out at DGP-WG/08 that PRBA's proposal to authorize prototype and low production batteries "contained in equipment" was not consistent with the UN Model Regulations and IMDG Code. Until those regulations are amended to authorize such shipments, PRBA is at this time only proposing that Special Provision A88 be amended to authorize the transport of "low production" batteries, which is consistent with the language in Special Provision 310 of the UN Model Regulations and the IMDG Code.

1.4 In addition, with the ever-increasing use of large lithium batteries in a variety of applications, such as electric and hybrid vehicles and satellites, the need frequently arises to transport large prototype or low production batteries by aircraft. Owing to the size and/or limited number of such large batteries that may be required to be transported, the use of UN packagings conforming to the requirements of Part 6 of the Technical Instructions may not be practicable. For example, for prototype batteries produced in very low numbers and of varying weights, shapes and dimensions, it is not practical to develop packagings and subject them to the required performance tests in Part 6 "as prepared for transport" in that numerous packagings would be required to be destructively tested in order to qualify only one or two packagings of a particular design type that may be needed to transport a prototype battery of a given design. Moreover, some low production batteries, such as are commonly used in satellites, may be produced in quantities of only one or two of a particular design, and in some cases may actually exceed the maximum authorized mass of UN packagings as authorized under Part 6. Currently, Special Provision A99 allows the transport by cargo-only aircraft of batteries exceeding the 35 kg G limit per package as prescribed in column 13 of Table 3-1 with the approval of the appropriate authority, and the various lithium battery packing instructions allow the use of non-UN tested packagings for large batteries (i.e. 12 kg or greater) fitted with an impact-resistant outer casing (and assemblies of such batteries) with the approval of the appropriate authority. However, in both cases these provisions may be invoked only for large batteries that have passed all of the UN tests as required for classification in Class 9, and not to prototypes or, as proposed herein, low production batteries transported without full UN testing under appropriate authority approval in accordance with Special Provision A88. Accordingly, in this working paper PRBA further proposes to amend Special Provision A88 to allow, with the approval of the appropriate authority, lithium batteries with a mass of 12 kg or greater and having a strong, impact resistant outer casings, and assemblies of such batteries, to be packed in strong outer packagings or protective enclosures not subject to the requirements of Part 6 of the Instructions, and, as prepared for transport, to have a mass exceeding 35 kgG.

1.5 In regard to shipping prototype lithium batteries in hybrid-electric vehicles, new Packing Instructions 950, 951 and 952 apply to both hybrid-electric vehicles consigned under UN 3166 and electric vehicles consigned under UN 3171. Therefore, PRBA proposes to amend identical provisions in Packing Instructions 950, 951 and 952 to authorize shipments of prototype lithium batteries in hybrid-electric vehicles and electric vehicles.

1.6 In regard to additional consideration of conditions for approvals of prototype lithium batteries, PRBA does not believe amendments to the current approval provisions in the Technical Instructions are necessary. For example, placing prescriptive tests in the Technical Instructions for shipping prototype batteries would place unrealistic expectations on manufactures of these batteries. It would be unrealistic to require an 80 Watt-hour prototype lithium ion battery for a cordless drill be subject to the same tests as an 8,000 Watt-hour prototype lithium ion battery for an electric vehicle. Members of PRBA have secured approvals from many different national appropriate authorities and found that the requirements for such approvals vary only slightly from one country to the next and the process works very well. PRBA believes national appropriate authorities should have the flexibility and

discretion to require specific tests or Packing Group I packagings when drafting these approvals rather than following very prescriptive requirements in the Technical Instructions. A more practical approach is for ICAO to issue guidelines on this subject matter that includes sample approvals issued by appropriate authorities (with company names redacted). PRBA is willing to assist in developing such guidelines based on our members' experience with shipping small and very large prototype lithium batteries and securing the necessary approvals. These guidelines will be particularly valuable to appropriate authorities that have little experience with lithium battery approvals and also provide a consistent level of safety for shipments of these batteries.

2. ACTION BY THE DGP-WG

2.1 Based on this information, the DGP-WG is invited to amend Special Provision A88 as follows:

- A88 Prototype ~~or low production (i.e., annual production runs consisting of not more than 100 lithium batteries or cells)~~ lithium batteries and cells ~~to be tested that are packed,~~ with not more than 24 cells or 12 batteries per packaging ~~ing~~ that have not been tested to the requirements in subsection 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; ~~or~~
 - ~~c) alternatively, for lithium batteries with a mass of 12 kg or greater and having a strong, impact resistant outer casing, or assemblies of such batteries, the batteries or battery assemblies may be packed in strong outer packagings or protective enclosures not subject to the requirements of Part 6 of these Instructions;~~
 - ~~d) Irrespective of the limit specified in column 13 of Table 3-1, the battery or battery assembly as prepared for transport may have a mass exceeding 35 kg G.~~

2.2 The DGP-WG also is invited to amend Packing Instructions 950, 951 and 952 as follows:

Batteries

All batteries must be installed and securely fastened in the battery holder of the vehicle, machine or equipment and must be protected in such a manner so as to prevent damage and short circuits. In addition:

- 1) if spillable batteries are installed, and it is possible for the vehicle, machine or equipment to be handled in such a way that batteries would not remain in their intended orientation, they must be removed and packed according to Packing Instruction 492 or 870 as applicable;
- 2) if lithium batteries are installed, they must be of a type that has successfully passed the tests specified in the UN *Manual of Tests and Criteria*, Part III, subsection 38.3, ~~unless approved by the appropriate authority of the State of Origin~~, must be securely fastened in the vehicle, machinery or equipment and must be protected in such a manner so as to prevent damage and short circuits; and
- 3) if sodium batteries are installed they must conform to the requirements of Special Provision A94.