



WORKING PAPER

DANGEROUS GOODS PANEL (DGP)

TWENTY-SECOND MEETING

Montréal, 5 to 16 October 2009

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

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

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

LIQUID CATHODE BATTERIES FORBIDDEN FOR TRANSPORT IN THE TECHNICAL INSTRUCTIONS

(Presented by PRBA - The Rechargeable Battery Association)

SUMMARY

This paper proposes an amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284), Section I in Packing Instructions 968, 969 and 970 by removing a provision that no longer applies to liquid cathode batteries due to changes in technology and the *UN Manual of Tests and Criteria*.

Action by the DGP: The DGP is invited to consider deleting a provision from Section I of Packing Instructions 968, 969 and 970 as shown in the appendix in order to update the requirements applicable to liquid cathode cells and batteries.

1. INTRODUCTION

1.1 At the DGP Working Group of the Whole Meeting held in May (DGP-WG09, Auckland, 4 to 8 May 2009), it was correctly noted (DGP/22-WP/3, paragraph 3.5.1.9) that Section I of Packing Instructions 968, 969 and 970 prohibits the transport of the following lithium metal cells and batteries:

Cells and batteries with a liquid cathode containing sulphur dioxide, sulphuryl chloride or thionyl chloride which have been discharged to the extent that the open circuit voltage is less than the lower of a) two volts; or b) two-thirds of the voltage of the undischarged cell.

1.2 It was questioned why the same requirements should not apply to lithium metal cells and batteries shipped pursuant to Section II of the same Packing Instructions. PRBA agreed to research the origin of this prohibition in Section I to determine whether it was based on old liquid cathode technologies and if it was still necessary to have the prohibition in the Technical Instructions. It is worth noting that this provision is not contained in the UN Model Regulations or IMDG Code.

1.3 Because several PRBA members are major manufacturers of these types of cells and batteries, PRBA was able to determine that there were problems with these chemistries in the mid-to-late 1970's. For example, the major cause of hazardous behaviour of lithium sulfur dioxide cells on forced-discharge was the reaction between lithium and the electrolyte acetonitrile. In some cases, the origin of the hazard was traced to the formation of a deposit of highly reactive lithium dendrites on the surface of the electrically isolated lithium that was immediately adjacent to the anode weld site. The dendritic lithium deposits could result in an internal short or initiate a reaction with other cell discharge components such as lithium dithionite.

1.4 Manufacturers have made significant improvements to their cell and battery designs since the late 1970's, and more importantly, the lithium battery tests in the UN *Manual of Tests and Criteria* were updated in 1999 and 2000 and now include a forced discharge test. Lithium metal cells with liquid cathodes must now pass this test before being offered for transport. Cells meet the requirement of this test if there is no disassembly and no fire within seven days of the test. Passing this test ensures the cell and battery designs do not have the weaknesses that were found in the old designs from the 1970s.

APPENDIX

AMENDMENT TO THE TECHNICAL INSTRUCTIONS

Part 4

PACKING INSTRUCTIONS

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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Packing Instruction 968

Passenger and cargo aircraft for UN 3090

This entry applies to lithium metal or lithium alloy batteries in Class 9 (Section I) and lithium metal or lithium alloy batteries subject to specific requirements of these Instructions (Section II).

SECTION I

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~~Cells, and batteries containing one or more cells, with a liquid cathode containing sulphur dioxide, sulphuryl chloride or thionyl chloride which have been discharged to the extent that the open circuit voltage is less than the lower of:~~

- ~~a) two volts; or~~
- ~~b) two thirds of the voltage of the undischarged cell;~~

~~are forbidden from transport.~~

...

Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

This entry applies to lithium metal or lithium alloy batteries packed with equipment in Class 9 (Section I) and lithium metal or lithium alloy batteries packed with equipment subject to specific requirements of these Instructions (Section II).

...

SECTION I

...

~~Cells, and batteries containing one or more cells, with a liquid cathode containing sulphur dioxide, sulphuryl chloride or thionyl chloride which have been discharged to the extent that the open circuit voltage is less than the lower of:~~

- ~~a) two volts; or~~
- ~~b) two thirds of the voltage of the undischarged cell;~~

~~are forbidden from transport.~~

...

Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

This entry applies to lithium metal or lithium alloy batteries contained in equipment in Class 9 (Section I) and lithium metal or lithium alloy batteries contained in equipment subject to specific requirements of these Instructions (Section II).

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SECTION I

...

~~Cells, and batteries containing one or more cells, with a liquid cathode containing sulphur dioxide, sulphuryl chloride or thionyl chloride which have been discharged to the extent that the open circuit voltage is less than the lower of:~~

- ~~a) two volts; or~~
- ~~b) two thirds of the voltage of the undischarged cell;~~

~~are forbidden from transport.~~

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