International Civil Aviation Organization

DGP/22-WP/60
14/8/09

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

LITHIUM BATTERIES AND EQUIPMENT CONTAINING LITHIUM BATTERIES

(Presented by PRBA – The Rechargeable Battery Association
in coordination with RECHARGE (European Rechargeable Battery Association),
EUROBAT (The Association of European Storage Battery Manufacturers –
Automotive and Industrial Batteries), Verband der Automobilindustrie (VDA -
German Association of Automobile Industry), Zentralverband Elektrotechnik-
und Elektronikindustrie (ZVEI – German Battery Association))

SUMMARY

This paper seeks to modify the 35 kg mass limitation for shipments consisting of one lithium battery or single piece of equipment containing lithium batteries.

Action by the DGP: The DGP is invited to consider assigning the new special provision to lithium ion batteries (UN3480), lithium metal batteries (UN3090), lithium ion batteries contained in equipment (UN3481) and lithium metal batteries contained in equipment (UN3091) as presented in the appendix.

1. INTRODUCTION

1.1 In May 2009, the Dangerous Goods Panel Working Group of the Whole considered a proposal to eliminate the 35 kg mass limitation applicable to lithium ion and lithium metal batteries (DGP/22-WP/3, paragraph 3.5.1.11 refers). It was noted during discussions that the 35 kg limit for small batteries was appropriate and if this restriction were to be removed, it would allow much bigger packages of larger batteries or larger aggregates of batteries. However, there also was recognition that a higher limit

might be considered, especially if environmental issues raised were taken into account (DGP/22-WP/3, paragraph 3.5.1.11.2 refers).

1.2 After considering the concerns raised at DGP-WG09 regarding this proposal and the environmental issues, PRBA, in coordination with the world's leading automotive and lithium battery manufacturers, is proposing a 400 kg mass limitation for lithium batteries but only for consignments consisting of an individual battery or a single piece of equipment containing lithium batteries. That is, consignments consisting of one battery, or batteries contained in one piece of equipment with a battery net mass of up to 400 kg would be authorized for transport on cargo aircraft provided all other requirements of the Technical Instructions are met. This change to the Technical Instructions can be accomplished by adding a new special provision to Table 3-2 as noted on page 3. (In addition to coordinating with the battery and automobile organizations listed above, this proposal has been discussed with the Japan Automobile Manufacturers Association and Japan Automobile Research Institute Battery Working Group.)

1.3 PRBA's proposal is generally consistent with the current requirements for items consigned under UN 3171 (**Battery-powered equipment** or **Battery-powered vehicle**) where no mass limitation is applied.

1.4 Lithium batteries are being developed as a solution to the critical global warming environmental issue and with the objective of reducing dependency on fossil fuels. These issues were raised at DGP-WG09 in an information paper (DGP/22-WP/3, paragraph 3.5.1.11.2 refers). Excerpts of the paper are provided below:

> Societal goals and political guidelines for CO_2 reduction can only be met with the help of suitable technical solutions. Within this context, large rechargeable lithium batteries could be used for storage in energy production from renewable sources such as solar, wind and hydropower, in particular in decentralized installations.
>
> An additional focus in CO2 reduction is to reduce consumption of fossil fuels in the automotive sector through the use of large rechargeable lithium batteries, in particular as traction batteries in hybrid and electric vehicles. The future high volume production of large rechargeable lithium batteries is, in the interim, being driven by competition between automotive companies.
>
> International proliferation of new battery technologies to support achievement of the goals described above is directly linked with the ability to transport large rechargeable lithium batteries. **As a result, revision of the dangerous goods transportation regulations for large rechargeable lithium batteries, e.g. for automotive applications or as energy store for renewable energy, is urgently required** (emphasis added by PRBA).

1.5 In addition, over the past several years there has been a significant increase in the use of large lithium batteries in many military, aerospace and stationary applications. For example, large lithium ion batteries and battery assemblies are being designed for use in uninterruptible power supply (UPS) systems, which historically have been powered by lead batteries. Lithium batteries designed for aerospace and military applications (e.g. submarine or satellite batteries) include significant qualifications and severe specifications by the nature of such applications that often exceed the testing requirements in the UN *Manual of Tests and Criteria*.

1.6 DGP-WG09 was also provided with an elaborate description of the high levels of safety features of large lithium batteries. Excerpts from the description are provided below:

> To meet the requirements e.g. in hybrid vehicles and pure electric vehicles,, lithium cells with the necessary performance characteristics are subjected to comprehensive tests and then built into complex battery systems. In addition to thermal management, such batteries typically have an electrical management system which monitors and controls the conditions of each cell during charge and discharge. Such systems are typically housed in a robust secondary casing, in order that the mechanical requirements of the application can be met. The required performance data, safety requirements, reliability and operating life can only be achieved in this way.
>
> Regarding safety tests for transportation according to subparagraph 38.3 of the UN Manual of Tests and Criteria, certain adaptations should be made which reflect this situation more specifically.
>
> *Note.— A UN Working Group has been established to update the lithium battery tests in 38.3 of the UN Manual of Tests and Criteria.*

1.7 The chart below was presented to DGP-WG09 (DGP/22-WP/3, paragraph 3.5.1.11 refers) to highlight the mass of the lithium ion cells, battery components and packaging materials from large lithium ion batteries shipped by PRBA members. The chart clearly shows that the packaging and components of a large lithium ion battery, which are not dangerous goods, can average 60% of the gross mass of a consignment.

LIST OF RECENT SHIPMENTS OF LARGE LITHIUM BATTERIES BY PRBA MEMBERS			
Chemistry	**Mass of Cells**	**Mass of Components and Packaging (non-dangerous goods)**	**Total Gross Mass (Packaging, components and cells)**
Lithium ion	300 kg	270 kg (47%)	570 kg
Lithium ion	130 kg	110 kg (45%)	240 kg
Lithium ion	52 kg	123 kg (70%)	175 kg
Lithium ion	48 kg	170 kg (78%)	218 kg

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APPENDIX

AMENDMENT TO THE TECHNICAL INSTRUCTIONS

Part 3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND EXCEPTED QUANTITIES

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Chapter 3

SPECIAL PROVISIONS

Parts of this Chapter are affected by State Variations AU 2, CA 7, CA 8, GB 3, IR 3, JM 1, NL 1, US 11, ZA 1; see Table A-1

≠ Table 3-2 lists the special provisions referred to in column 7 of Table 3-1 and the information contained in them is additional to that shown for the relevant entry. Where the wording of the special provision is equivalent to that in the UN Model Regulations, the UN special provision number is shown in parentheses.

Table 3-2. Special provisions

TIs	*UN*	
AXXX		Irrespective of the maximum mass limits specified in Column 13 of Table 3-1 for UN 3480 and UN 3090 and mass limits specified in Packing Instructions 965, 967, 968 and 970, a consignment consisting of one lithium battery or single piece of equipment containing lithium batteries that in all other respects meet the requirements of the applicable packing instruction, may be transported on cargo aircraft provided the net mass of the batteries do not exceed 400 kg. Transport in accordance with this special provision must be noted on the dangerous goods transport document

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