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WORKING PAPER

DANGEROUS GOODS PANEL (DGP) WORKING GROUP MEETING (DGP-WG/24)

Montreal, 21 to 25 October 2024

Agenda Item 4: Managing safety risks posed by the carriage of lithium batteries by air (Ref: Job Card DGP.003.05)

SAFETY CONCERNS WITH LITHIUM BATTERY POWERED MOBILITY DEVICES

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SUMMARY

Airlines are concerned with the rising increase in the energy storage capacity of mobility devices which are powered by lithium batteries and the limited ability to manage a thermal runaway event involving those batteries.

Airlines are also concerned about the unintended consequence of an express statement in the Technical Instructions that there is no limit for lithium batteries that remain installed in the mobility aid.

The paper has been drafted as a discussion paper to shape consideration for concrete proposals to be decided upon at DGP/30.

Action by the DGP-WG: Action by the DGP-WG is in paragraph 2.

1. INTRODUCTION

1.1 The carriage of mobility devices, powered by batteries, has been continually increasing as air travel accessibility improves and mobility device manufacturing costs reduce. Similarly, battery technology, including the storage capacity of different battery types, has also continued to evolve.

1.2 When the current provisions in Part 8 of the Technical Instructions were introduced for the carriage of mobility aids with lithium-ion batteries, where the mobility device did not protect the battery from damage, an upper limit of 300 Wh was introduced and the batteries were required to be removed from the device and transported in the passenger cabin. There was no watt-hour limit imposed for lithium-ion batteries that were installed and protected by the device and which were carried in the cargo hold as it was assumed that such lithium-ion battery fires could be suppressed, or even extinguished, in a class C cargo compartment.

1.3 Testing by the United States Federal Aviation Administration (FAA) indicates that an accumulation of flammable gases, discharged from batteries in a thermal runaway event, if ignited, could overwhelm the structural integrity of the cargo hold and aircraft.

1.4 The work of ICAO and leading regulators, in developing standards to mitigate the consequences of a lithium-ion battery thermal runaway through improved packaging standards and the development of fire-resistant containers, in a standard cargo compartment is acknowledged.

1.5 Airlines are experiencing a wide diversity in mobility devices; one operator maintains a database of over 2000 mobility devices, including essential details to support their considerations about the capability of transporting passengers who wish to be carried with their mobility device. The database covers all battery types. Approximately 1700 devices are considered as being genuine mobility aids for "passengers whose mobility is restricted by either a disability, their health or age, or a temporary mobility problem (e.g. broken leg)". Just over 96% of the lithium-ion battery powered mobility devices in the database, are less than 300 Wh. In the absence of a Wh limit, it is expected that the proportion of mobility devices powered by a lithium ion battery greater than 300 Wh will increase.

1.6 It is not uncommon for mobility device manufacturers to assert that their devices are "ICAO/IATA compliant" and to be strident in their demands that their devices be carried on aircraft, irrespective of the requirement for the approval of the operator to be given. IATA has experienced two device manufacturers (580 and 750 Wh) making this demand and airlines have had experience of up to 1440 Wh. There are also reputable manufacturers who are comfortable in advising their customers that a particular device, or battery, cannot be carried on an aircraft.

1.7 In addition to traditional battery-powered mobility aids, operators are reporting increased varieties of lithium-ion powered attachments to manual wheelchairs. One example attaches to the front of the manual chair and is powered by a 540 Wh e-bike battery. For a passenger with an e-bike, as there is no provision for the e-bike in the passenger provisions of the Technical Instructions, it can only be carried as properly consigned dangerous goods, as cargo. Other devices hook on behind and propel the wheelchair; others replace the wheel hubs and power the axels. When attached, it is no longer a manual, non-regulated mobility aid. But separated, the device is just UN 3481 and would ordinarily be forbidden in baggage (as they are always over 100 Wh.)

1.8 It is acknowledged that in technical research, analysis of onboard events, event statistics and studies, it is highly recommended that lithium-ion batteries are only transported in the cabin, where quick and proper intervention and firefighting by the crew is possible.

1.9 However, for containerized aircraft some operators have invested in fire resistant containers which have been tested with up to 5000 lithium ion batteries; and in this circumstance, operators have a strong preference for not having the batteries in the cabin.

1.10 *Annex 19 – Safety Management* requires that all States implement a State safety programme (SSP) and operators to implement a safety management system. Paragraph 1.1.1 of the fourth edition of the *Safety Management Manual (SMM)* (Doc 9859) states:

> Safety management seeks to proactively mitigate safety risks before they result in aviation accidents and incidents.

Furthermore, Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes*, Chapter 15 — Cargo compartment safety requires operators to conduct a specific safety risk

assessment on the transport of items in the cargo compartment, which includes the capabilities of the aeroplane and its systems (e.g. cargo compartment fire suppression capabilities).

1.11 The carriage of lithium batteries, as cargo, is prohibited on aircraft that are also carrying passengers.

1.12 Furthermore, while carriage of such batteries, as cargo, is limited to Cargo-only aircraft, there are further restrictions, in the interests of safety, such as limiting the State of Charge (SoC) of the batteries to 30%. The consignment and transport of a battery at an SoC exceeding 30% requires regulatory approvals from the States of Operator and Origin.

1.13 Similarly, there is a weight limit of 35 kg for a lithium battery in a consignment, which can only be exceeded with approvals from the States of Operator and Origin.

1.14 In a further step forward in safety risk mitigation, the current 30% SoC for lithium ion batteries (UN 3480) will be recommended for lithium ion batteries that are packed with equipment (UN 3481, when consigned as cargo) with effect from 1 January 2025 and become mandatory from 1 January 2026 for equipment packed with such batteries that exceed 2.7 Wh. Again, it will require approvals from the States of Operator and Origin for a piece of equipment (UN 3481), packed with a 3 Wh lithium ion battery, at a charge exceeding 30% SoC, consigned as cargo; yet there is no equivalent regulatory safety assessment and approval for a 300 Wh battery at a 100% SoC as part of a passenger's mobility device.

1.15 Many operators have chosen not to carry equipment packed with, or containing, lithium batteries, as cargo, where that consignment requires a dangerous goods declaration; or to limit themselves by not carrying used batteries, or new batteries in used equipment. Yet because the passenger provisions allow the carriage of mobility devices powered by lithium-ion batteries; these operators are being expected to carry these batteries of much greater power, at a higher state of charge, with unknown conditions, maintenance and usage history.

1.16 Carriage of larger batteries in the cabin raises safety concerns with many fire containment bags, in the cabin, that have not been tested and are not rated beyond 100 Wh. Videos capturing instances of the speed with which some lithium batteries have entered a thermal runaway, raises concern at the ability of crews to quickly respond to a 300 Wh battery going into thermal runaway, and the subsequent fire, in an overhead bin or under a passenger seat, during flight, even more so at a critical phase of flight (i.e. take-off).

1.17 The demand for larger lithium-ion batteries, and the practice of developing smaller, compliant batteries that are to be stacked or bundled to form larger batteries requires examination. The risk arises from thermal runaway in one cell or battery, propagating into adjacent batteries.

1.18 It is essential that any new restrictions/standards apply to all 192 ICAO Member States, for passenger convenience and especially to be in line with EU PRM-Persons with Reduced Mobility regulations and interlining (passenger connecting from one airline to another) between air operators.

1.19 A number of options are being reflected upon; including:

a) imposing a 300 Watt hour on mobility devices powered by lithium-ion batteries, irrespective of where the battery is carried;

b) mandating the removal of lithium-ion batteries and requiring their carriage in the cabin;

c) prohibiting the carriage of mobility devices powered by lithium-ion batteries until it has been demonstrated that the batteries can be carried safely;

d) imposing a 25% indicated battery capacity prior to accepting a mobility device containing a lithium-ion battery for carriage as baggage in the cargo hold;

e) introducing a requirement for State of Operator approvals for mobility devices, powered by lithium-ion batteries, where the SoC exceeds 30% or where the total power capacity in the device exceeds 300 Wh; and

f) clarifying the definition of manual wheelchairs and the acceptability of power assist devices.

1.20 Each of these options are challenging for passengers who have a genuine need for their mobility device. The situation is also challenging for the operators who want to carry those passengers with the same degree of safety afforded to all passengers.

1.21 It may be appropriate to form a small multidisciplinary working group, including airworthiness, the International Coordinating Council of Aerospace Industries Associations (ICCAIA) and representative stakeholders from passenger accessibility and facilitation forums, to develop a proposal for DGP/30 and implementation on 1 January 2027.

2. ACTION BY THE DGP-WG

2.1 The DGP-WG is invited to reflect upon the challenges of facilitating the safe transport of all passengers, equally and irrespective of mobility, in a manner that is globally consistent.

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APPENDIX

MANY AIRLINES ARE REQUESTING THE REGULATORS: DON'T LET UNLIMITED WH LI-ION BATTERY-POWERED MOBIITY AIDS LEAD TO THE NEXT HINDENBURG DISASTER!

Many airlines are requesting the regulators:

Don't let unlimited Wh li-ion BPMA lead to the next Hindenburg disaster!

- Non-spillable and wet-cell mobility aid batteries are safe.

- Helium is nonflammable and therefore safe for airships.

- But Battery Powered Mobility Aid makers want more power for their devices, so they use li-ion. And many are now in kilowatt hours.

- Although designed for helium, the Hindenburg couldn't carry as great a payload with the heavier gas, so hydrogen was used.
- It couldn't have flown transatlantic with helium.

- Some regulators say li-ion BPMA rules won't change until there is an accident.

- The Germans had never had a fatality using hydrogen.
  - The Hindenburg made 56 flights in 1936, including 10 roundtrips between Germany and the US, and 7 to Brazil.
  - The Hindenburg had already made 1 round trip to Brazil and was on its 7th flight in 1937, when, attempting to dock at Lakehurst, NJ on May 6, 35 passengers and crew and 1 person on the ground were killed. 62 passengers survived. The largest flying craft the world has ever seen was destroyed in 32 seconds.

Mobility aid batteries are similar to airship gases. Choose safety vs catastrophic failure!