



WORKING PAPER

**DANGEROUS GOODS PANEL (DGP)
WORKING GROUP MEETING**

Montréal, 1 to 5 October 2018

- Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air**
3.4: Consider measures to mitigate safety risks posed by lithium batteries carried and/or used by passengers, crew and the operator (Job card DGP.005.01)

**SUMMARY OF DISCUSSIONS RELATED TO RISKS ASSOCIATED WITH THE CARRIAGE
OF PORTABLE ELECTRONIC DEVICES CONTAINING LITHIUM BATTERIES AND
CONSIDERATION OF WAY FORWARD**

(Presented by the Secretary)

SUMMARY

This working paper provides a summary of discussions related to risks associated with the carriage of portable electronic devices containing lithium batteries leading to the development of ANC job card DGP.006.01 on lithium batteries carried and/or used by passengers.

Action by the DGP-WG: DGP-WG/18 is invited to:

- a) consider the status of the safety risk related to the use of spare batteries and power banks identified at DGP-WG/17 and determine if immediate efforts to address it are necessary;
- b) consider whether guidance to States is needed to address the risks identified by the CSG, taking into account the recommendations listed in paragraph 2.3 above; and
- c) review the work programme elements in ANC job card DGP.006.01 to be addressed in the longer term.

1. INTRODUCTION

1.1 On 28 June 2018, the Air Navigation Commission (ANC) approved a new job card on lithium batteries carried and/or used by passengers, crew and the operator (DGP.006.01, reproduced in Appendix A to this working paper). The job card originated from Recommendation 6/1 of the Twenty-Sixth Meeting of the Dangerous Goods Panel (DGP/26, Montréal, 16 to 27 October 2017) and was further

modified by a lithium battery working group established following DGP/26 and through the ICAO peer review process. This working paper:

- a) summarizes the work which led to the development of the ANC job card;
- b) invites the panel to consider whether there is a need to address identified safety risks in the short term; and
- c) invites DGP-WG/18 to discuss addressing the work elements on the job card to be addressed in the longer term.

2. BACKGROUND

2.1 The issue of lithium batteries and lithium battery-powered portable electronic devices (PEDs) carried and/or used by passengers, crew and the operator was raised by the Air Navigation Commission (ANC) during its review of an amendment proposed by the DGP related to power banks (ANC Min 203, 204 and 205) (see paragraph 2.2 below) and indirectly through the recommendations of the Multidisciplinary Cargo Safety Group (CSG) (C 212/5) (see paragraph 2.3 below).

2.2 Amendment proposed by the DGP related to power banks

2.2.1 The 2017 Working Group Meeting of the DGP (DGP-WG/17, Montréal, 24 to 28 April 2017) recommended an amendment to the passenger provisions prohibiting spare batteries and power banks from being recharged or from being electrically connected or providing power to an external device for incorporation in the 2017-2018 Edition of the Technical Instructions by way of an addendum (see paragraph 3.5.3.7 of the DGP-WG/17 Report and paragraph 6.3.4 of the DGP/26 report). The need for the amendment was prompted by a number of reported incidents involving power banks in the cabin and the fact that manufacturing and use of them was on the rise. The Air Navigation Commission considered the working group's proposed amendment and agreed to recommend that the Council approve it for incorporation in an addendum to the Technical Instructions. Subsequent to the Commission's but prior to the Council's review, consequential difficulties for some operators should the amendment be adopted were reported. These operators were using power banks as a secondary or emergency power supply for electronic flight bags (EFBs) and other devices used during flight through the use of the operator exception in Part 1;2.2.1 d). It was assumed that because this exception required the batteries to meet the provisions of the entry for PEDs in Table 8-1, the operator would no longer be permitted to use the power banks during flight should the amendment be adopted. The ANC decided that the amendment should be withdrawn to allow time for the panel to re-consider how best to address the risks posed.

2.2.2 Some panel members had questioned whether referring to passenger provisions in the operator exceptions or even including operator exceptions in the Technical Instructions at all was appropriate. The ANC asked the panel to take this into account when considering how to address the risks posed by power banks. Additionally, the CSG, tasked with addressing the safety impact of requiring PEDs to be carried in checked baggage, recommended that the Airworthiness Panel (AIRP), Flight Operations Panel (FLTOSP) and the DGP take this into account. The CSG also recommended that these panels consider whether the exceptions should be considered during airworthiness certification approval (see paragraph 2.3 below and paragraph 6.1.1 of the DGP/26 report).

2.2.3 DGP/26 agreed that a working group should be established to consider how best to mitigate the risks posed, taking into account feedback provided by the ANC, and to consider whether the

Technical Instructions was the most appropriate place for the current exceptions for the operator contained in Part 1;2.2. The meeting developed Recommendation 6/1 (see paragraph 3 below).

2.3 Recommendations from the CSG

2.3.1 The CSG was established to respond to concerns of increased safety risks resulting from security measures which restricted the carriage of PEDs in checked baggage that were introduced by some States in March 2017. The group was tasked with identifying the safety hazards, assessing the associated safety risks, and developing mitigation strategies to reduce the safety risk to an acceptable level. Although alternate measures were introduced to address the security threat, the CSG did identify hazards associated with the carriage of PEDs, including the potential for an explosion if personal items containing permitted dangerous goods, such as aerosol cans, were placed in the same checked baggage as a PED. These hazards were identified through testing at the Federal Aviation Administration (FAA) Technical Center. The CSG developed recommendations for addressing the identified hazards (see the Report of the Second Meeting of the CSG). The recommendations applicable to DGP (as amended by the ANC) were:

- a) that the DGP evaluate whether the Technical Instructions should be amended to restrict the carriage of PEDs as carry-on baggage unless otherwise approved by the operator;
- b) that the DGP review the items permitted to be carried by passengers in checked baggage and establish whether certain combinations should be forbidden;
- c) that the DGP together with the battery manufacturing industry develop a clear definition of what was meant by PEDs; and
- d) that the AIRP, FLTOPSP and DGP review the issue of operators placing charged PEDs in the cabin for passenger use, utilising the provisions of the Technical Instructions rather than seeking airworthiness certification approval.

2.3.2 DGP/26 was invited to consider amendments to the Technical Instructions which were developed to address the CSG's recommendations (see paragraph 6.3.6 of the DGP/26 Report). The amendments were not agreed, as the meeting could not reach a consensus. Some panel members were of the opinion that further data was required in order to thoroughly analyze the likelihood of an incident involving PEDs occurring in the cargo compartment. They also noted that as the security threat which had originally given rise to the issue was being mitigated through alternate measures, time should be taken to evaluate further data. Other DGP Members were of the opinion that immediate mitigation measures were necessary even if the likelihood of an explosive event was low, given the potential for it to be catastrophic. Recognizing that the Council would be reviewing the CSG/2 Report after DGP/26, it was decided to wait for guidance from the Council on the way forward. The Council, during its review of that report (C 212/5), instructed the ANC, in consultation with DGP and other relevant technical panels, to consider the CSG's recommendations while the collection of more complete data was being undertaken to avoid delays.

3. DGP/26 CONCLUSIONS

3.1 DGP/26 developed the following recommendation and agreed that a working group would begin addressing the issues virtually:

Recommendation 6/1 — Carriage of dangerous goods by passengers, crew, and the operator

That the provisions for passenger and crew to carry dangerous goods on aircraft be reviewed with the aim of:

- a) ensuring that measures to mitigate risks posed are effective and can be feasibly implemented by operators, passengers and crew taking into account specific risks posed by portable electronic devices being used during flight; and
- b) evaluating the relationship between the exceptions for dangerous goods of the operator and the provisions for passengers and crew to avoid misinterpretation and unintended consequences

as described in the draft job card contained in Appendix C to the report on this agenda item.

4. DANGEROUS GOODS PANEL LITHIUM BATTERY WORKING GROUP

4.1 The Dangerous Goods Panel Lithium Battery Working Group held three virtual meetings on 21 November 2017, 18 January 2018 and 5 February 2018. A list of participants is provided in Appendix B to this working paper.

4.2 The working group finalized the draft job card contained in the DGP/26 Report and further considered the recommendations of the Cargo Safety Group (CSG). The job card, which was further revised through the ICAO peer review process and approved by the ANC, is provided in Appendix A to this working paper.

4.3 With regard to the CSG recommendations, there were two opposing views on whether amendments to the Technical Instructions to address the hazards with respect to portable electronic devices in checked baggage should be made. One was that the likelihood of an event was so remote, no action was necessary and that in any event, the issue was no longer relevant since the security restrictions had been removed. The other was that while the risk of an incident involving a PED in checked baggage was lower because the security measures were no longer in place, the hazard identified remained and the risk, however low, needed to be mitigated. Despite the differences of opinions as to whether or not additional restrictions needed to be added to the Technical Instructions, there was acknowledgement by all that there would be implementation and enforcement difficulties should a ban on the carriage of PEDs in checked baggage be implemented. There was much discussion on the different types of PEDs carried by passengers and crew and the varying risks they posed. A blanket ban on PEDs was considered unreasonable, recognizing that not all would pose a risk. The CSG recommendation to define PED was made for this reason. Some thought the acknowledged implementation difficulties did not justify not taking action and that at the very least, efforts to alert industry and the flying public needed to be made.

All supported taking measures to communicate the risk and to recommend simple ways to mitigate it. In this regard, a State letter (M 16/1-18/2) seeking data for the purpose of more precisely determining the safety risks referred to notices issued by the FAA and the European Aviation Safety Agency (EASA) alerting operators of the safety concerns, i.e.:

Further information can be found in notices issued by the Federal Aviation Administration (FAA) (https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2017/InFO17008.pdf) and the European Aviation Safety Agency (EASA) (<https://ad.easa.europa.eu/ad/2017-04R1>). States are encouraged to advise operators to take this information into account when conducting safety risk assessments related to the carriage of PEDs.

4.4 With regard to data collection and the questionnaire included in the State letter, a number of comments were raised by the lithium battery working group, including the feasibility of obtaining the data and whether or not the type of data being collected would allow for a valid and reliable assessment. This was acknowledged, while also recognizing that there was a need for data and that whatever data could be collected would be useful. A report on the data collected will be provided in a DGP-WG/18 information paper.

5. ACTION BY THE DGP-WG

5.1 The DGP-WG is invited to:

- a) consider the status of the safety risk related to the use of spare batteries and power banks identified at DGP-WG/17 and determine if efforts to address it in the short-term are necessary;
 - b) consider whether guidance to States is needed to address the risks identified by the CSG, taking into account the recommendations listed in paragraph 2.3 above; and
 - c) review the work programme elements in ANC job card DGP.006.01 to be addressed in the longer term.
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APPENDIX A

**ANC JOB CARD DGP.006.01 — LITHIUM BATTERIES CARRIED AND/OR USED BY
PASSENGERS, CREW AND THE OPERATOR**

DGP.006.01	Lithium batteries carried and/or used by passengers, crew and the operator
Source	DGP/26, Recommendation 6/1
Problem Statement	Current measures to mitigate the potential safety risks posed by lithium batteries carried by passengers, crew and the operator on aircraft may not be effective
Specific Details	<p>1. Overview</p> <p>Lithium batteries may be carried by passengers and crew members in carry-on baggage, on the person, or, when contained in the equipment they power*, in checked baggage subject to the provisions of Part 8 of the Technical Instructions. Additionally, lithium batteries and equipment containing them such as electronic flight bags (EFB), personal entertainment devices, and credit card readers may be carried and used aboard the aircraft by the operator in accordance with Part 1;2.2 of the Technical Instructions provided the batteries meet the provisions for dangerous goods carried by passengers and crew in Part 8. These provisions provide various measures intended to mitigate the potential safety risks posed by lithium batteries carried by passengers, crew and the operator. However, thermal runaway events in the cabin and passenger baggage have become an increasingly regular occurrence. This suggests that the existing provisions may not be fully effective at mitigating the potential safety risks. Additionally, the provisions have become increasingly complex over time, increasing the potential to misunderstand and incorrectly implement them. Some of the restrictions, such as only allowing batteries that have passed specific UN tests, may not be realistic to implement since it may be impossible for anyone other than the battery manufacturer to determine this. These implementation difficulties may be contributing to the effectiveness of the mitigation measures. Work on ensuring the safety risks are effectively mitigated to an acceptable level is therefore necessary.</p> <p>Provisions related to lithium batteries and/or electronic devices are contained in several documents and would therefore need to be reviewed. These include:</p> <ol style="list-style-type: none"> Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284); Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (Doc 9481); Annex 6 — Operation of Aircraft; Manual of Electronic Flight Bags (Doc 10020); and Cabin Crew Safety Training Manual (Doc 10002). <p>There is no single primary expert group that can complete this work. A multidisciplinary approach is necessary to ensure the potential safety risks posed by lithium batteries carried and operated by passengers, crew and the operator are mitigated holistically.</p> <p>2. Additional background information</p> <p>The issue of lithium batteries and lithium battery-powered portable electronic devices (PEDs) carried and/or used by passengers, crew and the operator was raised by the Air Navigation Commission (ANC) during its review of an amendment proposed by the DGP related to power banks (ANC Min 203, 204 and 205) and indirectly through the recommendations of the Multidisciplinary Cargo Safety Group (CSG) (C 212/5) as described below.</p> <p>ANC</p> <p>During its review of the proposed amendment related to power banks, which was later withdrawn because of a potential conflict with operator exceptions for the carriage of dangerous goods in Part 1;2.2, the ANC tasked the Dangerous Goods Panel (DGP) with:</p> <ol style="list-style-type: none"> developing meaningful criteria that passengers and staff could realistically apply when carrying PEDs; clarifying language used with respect to exceptions for dangerous goods of the operator in Part 1;2.2 to avoid misinterpretation and unintended consequences; considering the effects of power bank provisions on operators providing them for use by passengers during flight; considering manufacturing requirements and the feasibility of requiring batteries carried by passengers or crew to be subject to UN testing requirements; and developing meaningful guidance for States, operational staff and passengers on criteria for carriage of devices on board an aircraft.

DGP.006.01	Lithium batteries carried and/or used by passengers, crew and the operator
	<p>In developing meaningful criteria, the Commission further suggested that the DGP consider provisions such as requiring that devices:</p> <ul style="list-style-type: none"> a) be professionally manufactured, preferably indicating a trademark and model number; b) be in good repair and free from damage; c) be used in accordance with manufacturer's instructions when carried on the aircraft; d) be switched off completely if carried but not in use (not hibernation); and e) be meaningfully labelled with information on watt and amp hours. <p>Recommendations of the CSG</p> <p>The CSG was established to respond to concerns of increased safety risks resulting from security measures which restricted the carriage of PEDs in checked baggage that were introduced by some States in March 2017. The group was tasked with identifying the safety hazards, assessing the associated safety risks, and developing mitigation strategies to reduce the safety risk to an acceptable level. Although alternate measures were introduced to address the security threat, the CSG did identify hazards associated with the carriage of PEDs including the potential for an explosion if personal items containing permitted dangerous goods, such as aerosol cans, are placed in the same checked baggage as a PED. The CSG developed recommendations for addressing the identified hazards (see Report of the Second Meeting of the Multidisciplinary Cargo Safety Group (CSG). The applicable recommendations (as amended by the ANC) are:</p> <ul style="list-style-type: none"> 1) that the DGP evaluate whether the Technical Instructions should be amended to restrict the carriage of PEDs as carry-on baggage unless otherwise approved by the operator; 2) that the DGP review the items permitted to be carried by passengers in checked baggage and establish whether certain combinations should be forbidden; 3) that the DGP together with the battery manufacturing industry develop a clear definition of what was meant by PEDs; and 4) that the AIRP, FLTOSP and DGP review the issue of operators placing charged PEDs in the cabin for passenger use, utilising the provisions of the Technical Instructions rather than seeking airworthiness certification approval.
Expected Benefits	<p>Improved safety as a result of a reduction in incidents involving lithium batteries carried and/or used by passengers, crew and the operator</p> <p>Reduced operational cost as a result of clear, realistic provisions</p>
Reference Documents	<p>DGP/26 Report (Recommendation 6/5)</p> <p>Report of the Multidisciplinary Cargo Safety Group (CSG) (C-WP/14663)</p> <p>C Min. 212/5</p> <p>ANC Min. 205-3, 4, 5</p> <p>AN-WP/9174</p> <p>DGP-WG/17 Report (paragraph 3.5.3.7)</p> <p>ANC Job cards DGP.003.01, AIRP.012.01</p>
Primary Expert Group:	<p>Dangerous Goods Panel (DGP)</p>

DGP.006.01		Lithium batteries carried and/or used by passengers, crew and the operator						
WPE No.	Document Affected or Actions Needed	Description of Amendment proposal or Action	Supporting Expert Group	Status	Expected dates:			
					Delivery	Effective	Applicability	
✓ 9901	Actions	Consider whether it is appropriate to maintain provisions currently in the Technical Instructions for COMAT otherwise classified as dangerous goods but which is required to be aboard an aircraft in accordance with operating regulations or to meet special requirements authorized by the State of the Operator or to be used during flight. If so, consider whether the current methodology of basing the safety of these provisions on restrictions applied to dangerous goods carried by passengers and crew is appropriate. Based on the above, revisions to passenger and crew provisions to carry dangerous goods in Part 8 and to exceptions for dangerous goods of the operator in Part 2;2 may be necessary.	FLTOPSP AIRP SMP	On-schedule	Q4 2019	Jan 2021	Jan 2021	
✓ 9902	Actions	Review of emergency response procedures related to lithium batteries and PEDs and develop revisions to Doc 9481 if necessary	FLTOPSP AIRP	On-schedule	Q4 2019	Jan 2021	Jan 2021	
✓ 9903	Actions	Consider whether provisions in the Technical Instructions for COMAT otherwise classified as dangerous goods but which is required to be aboard an aircraft in accordance with operating regulations or to meet special requirements authorized by the State of the Operator or to be used during flight should be included in Annex 6 and develop revisions if necessary	FLTOPSP	On-schedule	Q4 2019	Jan 2021	Jan 2021	
✓ 9906	Actions	Review provisions in Doc 10020, Manual of Electronic Flight Bags, to ensure alignment with dangerous goods provisions	FLTOPSP AIRP	On-schedule	Q4 2019	Jan 2021	Jan 2021	

DGP.006.01		Lithium batteries carried and/or used by passengers, crew and the operator						
WPE No.	Document Affected or Actions Needed	Description of Amendment proposal or Action	Supporting Expert Group	Status	Expected dates:			
					Delivery	Effective	Applicability	
✓ 9904	Actions	Consider whether provisions in the Technical Instructions for COMAT otherwise classified as dangerous goods but which is required to be aboard an aircraft in accordance with airworthiness requirements or to meet special requirements authorized by the State of the operator should be included in Annex 8.	FLTOPSP AIRP	On-schedule	Q4 2019	Jun 2021	Nov 2021	
✓ 9905	Actions	Consideration of aircraft limitations with respect to lithium batteries carried aboard an aircraft by the operator for use on the aircraft and develop revisions in Annex 8 if necessary.	AIRP	On-schedule	Q4 2019	Jun 2021	Nov 2021	
Status:		Priority:	Initial Issue Date:	Date Approved by ANC:	Session / Meeting:			
Approved		Medium	28 June 2018	28 June 2018	208-11			
RATIONALE								
AN-WP/9262								

APPENDIX B

**DGP WORKING GROUP ON LITHIUM BATTERIES (VIRTUAL)
21 November 2017, 18 January 2018 and 5 February 2018**

LIST OF PARTICIPANTS

NAME	NOMINATED BY
Adrian Tusek	Australia
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Lynn McGuigan	Secretariat
Katherine Rooney	Secretariat
