International Civil Aviation Organization

DGP-WG/23-WP/32
19/05/23

WORKING PAPER

DANGEROUS GOODS PANEL (DGP)
WORKING GROUP MEETING (DGP-WG/23)

Rio de Janeiro, Brazil, 15 to 19 May 2023

REPORT OF THE MEETING

(Presented by the Secretary)

1. INTRODUCTION

1.1 The Dangerous Goods Panel Working Group Meeting (DGP-WG/23) convened from 15 to 19 May 2023 in Rio de Janeiro, Brazil. Mr. T. Muller chaired and Mr. L. Cascardo vice-chaired the meeting. The meeting was opened by Mr. Rogério Benevides Carvalho, Director of the Agência Nacional de Aviação Civil (ANAC) Mr. Muller, on behalf of the working group, expressed deep appreciation to Mr. Benevides Carvalho for hosting the meeting and providing the excellent facilities.

2. ATTENDANCE

2.1 The meeting was attended by the following panel members, advisers and observers:

Members	Advisers	State/International Organization
S. Ellis		Australia
L. Cascardo	P. Macário R. Santiago	Brazil
P. Tatin		France
N. Kumar		India
T. Tabata	N. Iki Y. Matsushita T. Okamoto I. Torii	Japan
T. Muller	R. Dardenne E. Boon T. Groffen K. Vermeersch	Netherlands

Members	Advisers	State/International Organization
E. Gillett	M. Cowlishaw	Qatar
S. Kang	S. Yoo	Republic of Korea
w	B. Ngiba	South Africa
M. de Castro		Spain
	M. Ranito	United Kingdom
D. Pfund	M. Givens K. Ranck K. Leary	United States
D. Brennan	T. Howard	International Air Transport Association (IATA)
D. Ferguson		International Coordinating Council of Aerospace Industries Associations (ICCAIA)
S. Schwartz		International Federation of Air Line Pilots' Associations (IFALPA)
Advisers		
G. Leach	Dangerous Goods Advisory Council (DGAC)	
Observers		
L. Calleja Barcena		European Aviation Safety Agency (EASA)
E. Remy C. Litus-Koza		North Atlantic Treaty Organization (NATO)
A. McCulloch		Global Express Association (GEA)

3. SUMMARY OF DISCUSSIONS

3.1 A summarized outcome of discussions is provided in Appendix D to this report. The report of discussions is provided in paragraph 4.

4. REPORT OF DISCUSSIONS

4.1 Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods

4.1.1 Agenda Item 1.1: Develop proposals, if necessary, for amendments to Annex 18 — *The Safe Transport of Dangerous Goods by Air*

4.1.1.1 An amendment to the definition for unit load device in both Annex 18 and the Technical Instructions was proposed. The amendment was discussed under Agenda Item 2 (see paragraph 4.2.2.6 of this report).

4.1.2 Agenda Item 1.2: Develop proposals, if necessary, for amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2025-2026 Edition

4.1.2.1 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS PROPOSED BY THE DGP WORKING GROUP ON UN HARMONIZATION (DGP-WG/UN HARMONIZATION)

4.1.2.1.1 **Background**

4.1.2.1.1.1 The meeting reviewed amendments to the Technical Instructions to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals (subsequently referred to in the report as "UNCOE") at its eleventh session (Geneva, 9 December 2022). The amendments were developed by the DGP Working Group on UN Harmonization (DGP-WG/UN Harmonization). The amendments, along with any additional amendments proposed by DGP-WG/23, are consolidated with amendments proposed by DGP-WG/22 and presented in Appendix A to this working paper. A summary of DGP-WG/23's review is provided in paragraphs 4.1.2.1.2 to 4.1.2.1.9 of this report.

4.1.2.1.2 **Part 1 (DGP-WG/23-WP/11)**

4.1.2.1.2.1 There were no objections to the amendments proposed to Part 1.

4.1.2.1.3 **Part 2 (DGP-WG/23-WP/12)**

4.1.2.1.3.1 DGP-WG/UN Harmonization alerted the meeting to the following:

a) Two organic peroxides that were not included in the list of currently assigned organic peroxides in packagings contained in 2.5.3.2.4 of the UN Model Regulation but were included in the list of organic peroxides permitted in intermediate bulk containers (IBCs) in accordance with packing instruction IBC520 were added to Table 2-7 of the Instructions.

b) An amendment was made to the entry for Monkeypox virus in the list of indicative examples of infectious substances included as a Category A to specify that it applied to cultures only. The amendment in the UN Model Regulations was made based on determinations by the World Health Organization (WHO). However, the virus was divided into two distinct clades: Central African and West African. One State continued to classify the Central African clade as a Category A infectious substance, as it was considered more virulent. DGP-WG/23 was invited to consider whether a more conservative approach should be made for transport by air such as the inclusion of a note indicating different danger levels and the possibility that competent authority approval might be needed for one. The chairman of the United Nations Sub-Committee of Experts on the Transport of Dangerous Goods (subsequently referred to in this report as the "UN Sub-Committee") advised DGP-WG/23 that its decision to consider both clades as UN 2814 in cultures only and clinical samples and other materials potentially contaminated with the Monkeypox virus as UN 3373 or UN 3291 was based on technical advice of the WHO. The UN Sub-Committee was confident supporting WHO's recommendation based on their relevant expertise.

c) An exception from the Instructions for COVID-19 vaccines containing GMOs or GMMOs added to the Technical Instructions via Addendum No. 1 to the 2021-2022 Edition during the COVID-19 pandemic was replaced with an exception developed by the UN Sub-Committee that was not specific to COVID-19 vaccines made the existing text in the Technical Instructions unnecessary.

d) Classification criteria was added for sodium ion batteries in 2;9.4 which was based on the criteria for lithium batteries in 2;9.3. The following comments related to this text were raised:

1) The grammatical structure of sub paragraphs e) and f) of 2;9.3 and e) of 2;9.4 was not consistent with the other list items. This would be corrected, and the Secretariat would advise the UN Sub-Committee.

2) A note providing guidance on the intent of the requirement for manufacturers and subsequent distributors of cells or batteries to make the test summary specified in subsection 38.3 of the UN Manual of Texts and Criteria available was added under the criteria for lithium batteries but not sodium ion batteries. DGP-WG/23 agreed it should be added in both cases. Omitting it from the sodium ion battery criteria was believed to be an oversight which should be reported to the UN Sub-Committee. Incorrect references to lithium cells in the note under 2;9.4 f) would be corrected by replacing the references with "sodium ion".

4.1.2.1.3.2 There were no objections to the amendments proposed to Part 2.

4.1.2.1.4 **Part 3 (DGP-WG/23-WP/13)**

4.1.2.1.4.1 DGP-WG/23 discussed the following:

a) DGP-WG/23 was invited to consider whether a special provision added to the UN Model Regulations (SP 406) should be included in the Technical Instructions. The UN special provision permitted UN 1006 — **Argon, compressed** and **Nitrogen, compressed**, UN 1013 — **Carbon dioxide** and UN 1046 — **Helium, compressed** to be shipped under the limited quantity provisions provided certain conditions were met.

DGP-WG/UN Harmonization questioned whether there was value including the provision in the Technical Instructions, given that limited quantity packages transported by air were still required to be marked and labelled in accordance with the Technical Instructions. DGP-WG/23 agreed that the special provision should not be adopted.

b) DGP-WG/UN Harmonization recommended assigning Special Provision A88 to the entries for articles containing dangerous goods (UN Nos. 3537 to 3548) to align with a revised provision in Part 2;0.6.2. The revised provision specified that Special Provision A88 applied to articles containing preproduction prototype lithium cells or batteries transported for testing or articles containing lithium cells or batteries manufactured in annual productions runs of 100 cells or batteries or less. Corresponding UN special provision 310 would be assigned to the entries in the UN Model Regulations. It was questioned whether assigning A88 to these entries was necessary, noting that there was already a requirement for State approval through Special Provision A2 that was assigned to each of the entries allowing them to be transported on a cargo aircraft despite being forbidden under normal circumstances. It was suggested that requiring multiple approvals might cause an undue burden. The rapporteur of DGP-WG/UN Harmonization noted the importance of providing the appropriate authorities with all necessary information needed to evaluate risk, which may include the requirements of both Special Provisions A2 and A88. DGP-WG/UN Harmonization considered it important to assign Special Provision A88 to the entries in Table 3-1 despite the fact this would be repeating what was already required through the provisions in Part 2, as this would reduce the risk of it being overlooked.

c) Issues were raised with respect to a new special provision assigned to new entries in Table 3-1 for UN 3551 — **Sodium ion batteries**, UN 3552 — **Sodium ion batteries contained in equipment** and UN 3552 — **Sodium ion batteries packed with equipment**. The special provision aligned with SP 400 of the UN Model Regulations which made UN 3551 and UN 3552 not subject to regulation provided certain conditions were met, including a requirement for the cell or battery to be short-circuited in a way that there was no electrical energy contained in the cell or battery. It was suggested that the implication that the risk was low enough to make them not subject to the regulation appeared to contradict the need for the other conditions in the special provision. One of the conditions required the application of the lithium battery mark, which was what was required in accordance with Section II of the packing instructions for the lithium ion and lithium metal packing instructions. Having the requirement in the special provision for sodium ion and in the packing instruction for lithium ion and lithium metal batteries was inconsistent. One of the conditions limited the quantity of dangerous goods contained in each cell to those permitted as limited quantities. It would be challenging if not impossible for anyone other than the cell manufacturer to know what quantity of dangerous goods was contained in each cell. The fact that limited quantities permitted by the Technical Instructions were less than what was permitted by the UN Model Regulations also presented challenges. The chairman of the UN Sub-Committee advised that the committee had been presented with data from testing sodium ion batteries in thermal runaway. The reaction for some sodium ion batteries was similar to lithium ion batteries, while for others it was much less reactive. The ability to remove the electrical energy from the battery made them much safer, and the additional measures added a safety buffer. The Secretary was requested to bring the issues raised to the UN Sub-Committee.

d) New Special Provision A232 was assigned to new entries in Table 3-1 for **Fire suppressant dispersing devices** (UN 0514 for Division 1.4S and UN 3559 for Class 9). It contained conditions for assignment to Class 9 including a requirement for the article to be packaged in a manner that ensured the temperatures of the outside of the package did not exceed 200°C when activated. The rationale for 200°C was questioned, given it was inconsistent with limits set for other articles. While no justification for lower limits applied to other articles could be given, it was suggested that 200°C was established here to ensure the temperature did not exceed the ignition temperature of fibreboard. There were no objections to keeping this limit.

e) Incorrect bolding of additional text in column one of Table 3-1 would be corrected for UN 1835 — **Tetramethylammonium hydroxide aqueous solution** with more than 2.5% but less than 25% tetramethylammonium hydroxide.

f) Modifications to the classification criteria for Tetramethylammonium hydroxide resulted in new entries and revisions to the dangerous goods list. New Special Provision A234 was assigned to each entry stating that the limits specified in Table 3-1 in the 2023-2024 Edition of the Instructions could continue to be used until 31 December 2026. It was noted that the wording of the corresponding special provision in the Model Regulations (SP 409) specified that the "provisions of the dangerous goods list" could continue to be applied until 31 December 2026. DGP-WG/23 recommended aligning with the wording in the UN Model Regulations to avoid any unintended consequences.

4.1.2.1.5 **Part 4 (DGP-WG/23-WP/14)**

4.1.2.1.5.1 DGP-WG/23 discussed revisions to Packing Instruction 650 and new packing instructions for sodium ion batteries. DGP-WG/23 agreed that text in a new note added to Packing Instruction 650 of the UN Model Regulations, assigned to UN 3373 — **Biological substance, Category B**), was not necessary in the Technical Instructions. The note was added under a requirement for a primary receptacle or the secondary packaging to be capable of withstanding an internal pressure of 95 kPa (0.95 bar). It clarified that capability could be demonstrated by testing, assessment, or experience. The text was not necessary in the Technical Instructions because of an existing note there, although it appeared incorrectly under paragraph 7 f) of Packing Instruction 650. DGP-WG/23 agreed to move it under 7 e). A concern with allowing the capability to be demonstrated by assessment or experience was raised. It was explained that the objective of the UN Sub-Committee's revision was to harmonize the way State authorities evaluate what is considered as "capable".

4.1.2.1.5.2 **Packing instructions for sodium ion batteries**

4.1.2.1.5.2.1 DGP-WG/23 focused most of its discussion on the structure and limitations established in new packing instructions for sodium ion batteries as described below. DGP-WG/UN Harmonization based the packing instructions on the provisions for lithium ion batteries.

Structure of the provisions for sodium ion batteries

4.1.2.1.5.2.2 DGP-WG/UN Harmonization provided two options for DGP-WG/23 to consider:

a) merging the provisions for sodium ion with the provisions for lithium ion batteries in Packing Instructions 965, 966, 967; or

b) one new standalone packing instruction for sodium ion batteries that contained separate sections for sodium ion batteries packed on their own, packed with equipment, and contained in equipment.

4.1.2.1.5.2.3 There was little support raised for merging the provisions into the existing packing instructions for lithium ion batteries. The Secretary suggested a consistent approach be taken for all of the lithium battery packing instructions, i.e. either by making three separate packing instructions for sodium ion batteries like was done for lithium ion and lithium metal batteries or by making one standalone packing instruction for sodium ion batteries and reducing the three packing instructions for lithium ion and lithium metal batteries down to one. There was strong opposition to modifying the lithium ion and lithium metal battery packing instructions as it would create significant difficulties.

4.1.2.1.5.2.4 It was suggested that there may not be a need to provide the same exceptions for sodium ion batteries that were provided for lithium ion and lithium metal batteries packed with or contained in equipment. The exceptions for lithium ion and lithium metal were provided to facilitate the transport of portable consumer electronic devices, but sodium ion batteries were generally larger and used in specialized applications. It was further suggested that consideration could be given in the future if there was a need to facilitate smaller batteries that may enter the market.

4.1.2.1.5.2.5 Inconsistencies were noted during the discussion with respect to referencing of batteries and cells in the packing instructions with all of the following being used: “lithium ion batteries/cells”, “lithium batteries/cells”, and “batteries/cells”. The working group agreed that in most cases, simply referring to batteries and/or cells was acceptable, because the scope of each packing instruction was established in the opening section.

Limitations for sodium ion batteries

4.1.2.1.5.2.6 There was no opposition to taking a conservative approach when establishing the quantity limits for sodium ion by using the same ones established for lithium ion batteries. This would mean that sodium ion batteries packed on their own would also be prohibited for transport on passenger aircraft. While data had shown certain sodium ion batteries were much less reactive than lithium ion, for others the reaction was similar. There would be no way of distinguishing batteries that were less reactive from those that were more reactive until the new hazard classification system was established by the UN Sub-Committee. It would therefore be necessary to base limitations on the more reactive ones. Relief from regulation could be considered in the future once more experience was gained and more data was collected. This was considered a better approach than being less conservative and finding out the batteries posed hazards that were not anticipated resulting in a need to repeatedly make the provisions more stringent, as had been done for lithium ion and lithium metal batteries.

Future work on packing instructions for sodium ion batteries

4.1.2.1.5.2.7 Panel members were invited to carefully review the packing instructions for sodium ion batteries and to provide comments to the Rapporteur before the end of July 2023.

4.1.2.1.6 **Part 5 (DGP-WG/23-WP/15)**

4.1.2.1.6.1 The rapporteur of DGP-WG/UN Harmonization noted that references to packing instructions for lithium and sodium ion batteries in 5;2.4.16 would need to be updated as they did not take into account the potential new packing instruction for sodium ion batteries (see paragraph 4.1.2.1.5.2 of this report). He also noted a three-month transition period that was added for shippers to identify vehicles powered by lithium batteries as UN 3171 — **Battery powered vehicle** on the dangerous goods transport document instead of the new entries for vehicles powered by batteries. There were no objections to the amendments to Part 5.

4.1.2.1.7 **Part 6 (DGP-WG/23-WP/16)**

4.1.2.1.7.1 There were no objections to the amendments to Part 6 presented to DGP-WG/23 and no comments raised.

4.1.2.1.8 **Attachment 2 (DGP-WG/23-WP/20)**

4.1.2.1.8.1 There were no objections to the amendments to Attachment 2 presented to DGP-WG/23 and no comments raised.

4.1.2.1.9 **Future work**

4.1.2.1.9.1 Panel members were invited to further review the amendments to Parts 1 through 6 and the Attachment to the Technical Instructions developed by DGP-WG/Harmonization, as amended by DGP-WG/23 (see Appendix A to this report). Any discrepancies should be reported to the Rapporteur of DGP-WG/UN Harmonization through the Secretary, preferably by the end of July 2023. DGP-WG/UN Harmonization would consider the comments raised and submit final amendments in working papers to DGP/29 for approval.

4.1.3 **Agenda Item 1.3: Develop proposals, if necessary, for amendments to the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) for incorporation in the 2025-2026 Edition**

4.1.3.1 **Draft Amendments to the Supplement to the Technical Instructions to Align with the UN Recommendations (DGP-WG/23-WP/19)**

4.1.3.1.1 Draft amendments to the Supplement were developed by DGP-WG/UN Harmonization to reflect the decisions taken by UNCOE. The DGP Working Group on the Supplement (DGP-WG/Supplement) was invited to review the proposed amendments and develop a new packing instruction for UN 3555 —**Trifluoromethyltetrazole sodium salt in acetone,** which had been added to the dangerous goods list. DGP-WG/Supplement would coordinate with DGP-WG/UN Harmonization through the respective rapporteurs. There were no comments raised. Panel members were invited to further review the amendments and advise DGP-WG/Supplement of any discrepancies, preferably by the end of July 2023. DGP-WG/UN Harmonization and DGP-WG/Supplement would consider the comments raised and submit final amendments in a working paper to DGP/29 for approval.

4.2 Agenda Item 2: Managing air-specific safety risks and identifying anomalies (REC-A-DGS-2025)

4.2.1 Agenda Item 2.1: Develop proposals, if necessary, for amendments to Annex 18 — *The Safe Transport of Dangerous Goods by Air*

4.2.1.1 There were no proposals developed under this agenda item.

4.2.2 Agenda Item 2.2: Develop proposals, if necessary, for amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2025-2026 Edition

4.2.2.1 Clarification on the Condition of "Dangerous Evolution of Heat" (DGP-WG/23-WP/1)

4.2.2.1.1 The working group was invited to discuss what was expected of shippers shipping batteries not having the potential of dangerous evolution of heat. The condition was specified in Special Provisions A67, A123, A154, A164, A199 and Packing Instructions 967 and 970, with some shippers concluding that their batteries were not subject to the Technical Instructions if there was no potential for a dangerous evolution of heat. While it was recognized that the lack of clarity on what constituted a dangerous evolution of heat was a multimodal issue, there was agreement that all batteries needed to be protected from short circuit and from unintentional activation when contained in equipment, even if not restricted. One view was that reference to "the potential of dangerous evolution of heat" should be deleted except for in Special Provision A154, where it was used as a determining factor for when batteries could not be transported by air. Others were not comfortable deleting the text and suggested rewording the provisions if there was need to clarify intent. There was no formal proposal submitted to the working group, but one would be considered for DGP/29 based on feedback provided.

4.2.2.2 Revision to Special Provision A183 (DGP-WG/23-WP/2)

4.2.2.2.1 Special Provision A183 prohibited batteries from transport by air if they were being shipped for recycling or disposal. The twenty-second meeting of the Dangerous Goods Panel (DGP/22, Montreal, 5 to 16 October 2009) agreed to apply the special provision to all battery entries in Table 3-1. However, the special provision was not assigned to UN 3292 — **Cells containing sodium**. DGP-WG/23 concluded that this was an oversight that may have occurred because of the absence of a reference to cells in the special provision. It agreed to add references to cells in the special provision and to assign it to UN 3292. While agreeing to the proposal, comments were raised that highlighted the need for a more thorough review of the special provision, i.e.:

a) It focused on standalone batteries with no reference to batteries with equipment, which could also be sent for recycling or disposal.

b) It focused on specific end uses. On the one hand this might result in certain types of end uses for which batteries should be forbidden being overlooked and on the other might unnecessarily penalize shippers wanting to ship batteries for recycling that were still safe to transport by air.

4.2.2.3 **Retention of Documents by the Shipper (DGP-WG/23-WP/9)**

4.2.2.3.1 Information justifying the hazard classes assigned to specific dangerous good offered for transport by air could be important for accident or incident investigations but was often no longer available. The Technical Instructions did require retaining certain documentation such as the dangerous goods transport document, but not classification-related documentation. An amendment to the introductory chapter of the classification provisions in Part 2 was therefore proposed to require the shipper to retain information or documentation demonstrating the basis of the classification assigned to dangerous goods offered for transport by air. An amendment to the retention of dangerous goods transport information provisions in Part 5;4.4 was also proposed to require that it be made available to the appropriate national authority upon request.

4.2.2.3.2 There was sympathy for the objective of the proposal, but little support for the amendment to Part 2. Members considered it too prescriptive and would not be effective at achieving the objective globally. There were no objections to the amendment to Part 5;4.4, with some believing it would achieve the intent on its own, although the author of the proposal did not agree. The following comments were raised:

a) There were several objections to the types of information identified that could be used to demonstrate the basis for classification proposed for inclusion as examples in a note Part 2;0.1, particularly a reference to safety data sheets. It was suggested that these were not intended for transport purposes and were ineffective for classification purposes. An opposing view was that the examples were simply guidance and that safety data sheets did provide useful information.

b) The requirement proposed for inclusion in Part 2 would impose a burden on shippers. While there may be benefit for certain dangerous goods such as lithium batteries, the benefits for many other dangerous goods transported might not justify it. An opposing view was that operators were required to retain every acceptance check list, so it was logical to expect the shippers to retain documents pertinent to them.

c) The proposed requirement in Part 2 would have multimodal implications, so it would need to be considered by the UN Sub-Committee as a first step.

d) Guidance material might be a better approach towards achieving the intent. DGP-WG/Reporting had developed guidance to aid States in conducting safety investigations that would be reviewed by DGP-WG/Annex. Consideration could be given to incorporating guidance within this material.

4.2.2.3.3 The amendment to Part 2;0 was not agreed. The amendment to Part 5;4.4 was agreed.

4.2.2.4 **Passenger Provisions (DGP-WG/23-WP/28)**

4.2.2.4.1 Challenges with determining which conditions applied to personal protection devices carried by passengers and crew in accordance with Table 8-1 were reported. These devices could contain a variety of dangerous goods such as airbags, gas cartridges, batteries, and capacitors. There were two items in Table 8-1 that could be categorized as personal safety devices: self-inflating personal safety devices intended to be worn by a person and avalanche rescue packs. Some conditions applied to both entries, others did not, and neither of the entries covered all items on the market. DGP-WG/23 was asked to consider ways to capture conditions under which all personal safety devices could be carried safely in Table 8-1.

4.2.2.4.2 DGP-WG/23 noted that work on the passenger provisions in recent years had led to improvements, but it agreed that more improvements were needed. The goal of the work had been to slow down the frequency of amendments and the steady increase in items added to the list that were needed to address emerging passenger needs. The steady increase in items added to the list had made it difficult to maintain and to navigate. The panel had simplified it by grouping entries according to their hazard and function instead of end use. This resulted in more general categories that could address multiple items and the removal of redundant text that had been repeated in the earlier provisions. While the working group considered this an over-all better approach for most items, for some it made it more challenging to communicate what was permitted to passengers, opened the door to differences of interpretation, and introduced a risk of broadening the scope of what passengers and crew should be permitted to carry. It might be reasonable for passengers to carry certain items posing a specific hazard, but unreasonable to carry others posing the same hazard. This suggested the need for a hybrid approach to maintaining the list, i.e. a list that was generally hazard and function based, but with some additional specificity for certain articles.

4.2.2.4.3 There were no amendments proposed. Feedback provided would be considered when developing an amendment to address the specific inconsistencies between self-inflating personal safety devices and avalanche rescue packs and potentially the limitations associated with not taking end-use into account. The Secretary would assist in researching the justification for the established conditions for carrying self-inflating personal safety devices and avalanche rescue packs to prevent an amendment from introducing unintended consequences.

4.2.2.5 Addressing Inconsistencies in Annex 18 and the Technical Instructions (DGP-WG/23-WP/29)

4.2.2.5.1 DGP-WG/23 was invited to consider potential gaps in regulations that may have emerged through changes in aviation, technology, the types and quantities of dangerous goods shipped and the increased complexity of international supply chains since dangerous goods regulations were originally developed. The objective was to generate discussion and gather feedback that might be used in a future proposal to amend the regulatory structure. Suggested identified gaps, inconsistencies and weaknesses were:

a) Inconsistent levels of safety for different types and quantities of dangerous goods, notably between lithium batteries which were permitted on aircraft despite the potential for them to overwhelm aircraft safety systems if a single cell entered thermal runaway and other less dangerous goods that did not pose a significant threat to an aircraft or that would require several failures before they posed a significant safety threat.

b) The effectiveness of mitigating risk at the package level, the premise on which the Technical Instructions were based. Package level mitigation might no longer be sufficient for the increased quantities and different types of dangerous goods being shipped since they were originally developed. The cargo compartment safety provisions in Annex 6 — *Operation of Aircraft* were an acknowledgement of this, but the Technical Instructions had not been adapted to align with the principles outlined in Annex 6.

c) Outdated justification for allowing certain types or larger quantities of dangerous goods on a cargo aircraft but not on a passenger aircraft. The Foreword to the Technical Instructions stated that the justification was due to the dangerous goods being

accessible in flight and the ability of the flight crew to take a wider range of actions in an emergency. However:

1) not all aircraft cargo compartments were accessible;

2) two-piot crew in the cockpit would not allow for a crew member to leave the cockpit to respond to an emergency;

3) some passenger aircraft and cargo aircraft have cargo compartments with the same fire suppression capabilities, but certain dangerous goods would still be forbidden on the former and permitted on the latter, suggesting a higher level of safety was expected for passenger aircraft.

d) The specific safety risk assessment on items in the cargo compartment required by Annex 6 was important for flight safety, but effectively assessing and managing the risks was a challenge for some operators.

4.2.2.5.2 DGP/23 was invited to consider the following to address the above:

a) develop a system that ensured all articles and substances could be regulated to the same level of safety consistent with airworthiness and flight operations provisions;

b) develop a performance-based dangerous goods regulatory structure based on aircraft and operational capability rather than the type of operation being conducted;

c) amend the justification for differentiating between passenger and cargo aircraft in the Foreword to the Technical Instructions.

d) consider a hybrid regulatory structure that would provide both prescriptive measures for operators to carry limited types and quantities of dangerous goods on aircraft without having to take them into account as part of their safety risk assessment process and performance-based measures for operators wanting to extend what they could carry beyond prescriptive provisions based on their specific safety risk assessment.

4.2.2.5.3 There was support for addressing potential gaps with respect to accessibility. It was noted that the Twenty-sixth meeting of the DGP (DGP/26, 16 to 27 October 2017) had developed a job card on the subject, but it was never approved as it overlapped with a job card assigned to the Airworthiness Panel (AIRP) on cargo compartment fire suppression provisions (AIRP.011.04). It was believed that the issue would be resolved through that job card and the cargo compartment safety provisions in Annex 6, but it appeared gaps remained in the Technical Instructions.

4.2.2.5.4 There were different views with respect to expecting the same level of safety for passenger and cargo aircraft. One was that a higher risk was accepted for cargo aircraft, because the flight crew was aware of what was on board the aircraft whereas paying passengers were not aware. It was suggested that a precedent for different levels of safety for paying versus non-paying passengers was clearly stated in Annex 6, Part II — *International General Aviation — Aeroplanes.* However, this was countered by the fact that the same level of protection needed to be provided to persons on the ground and to other aircraft, regardless of the type of operation.

4.2.2.5.5 There was sympathy for considering the capabilities of the aircraft, recognizing it might be safer to carry certain dangerous goods in Class C compartments than the Class E compartments common

on freighter aircraft. There was a suggestion to develop more clearly defined criteria for what was permitted on a passenger versus cargo aircraft that reflected current practices. There was also a suggestion that Class E compartments were insufficient and that more robust fire suppression systems needed to be in place for freighter aircraft. This was countered with a suggestion that it was up to the operator to request more robust systems from the airframe manufacturers.

4.2.2.5.6 There was little support for any exceptions from the specific safety risk assessment on items in the cargo compartment currently required for operators in Annex 6. While challenges in complying with the requirement for a safety risk assessment were recognized, it was an important part of the overall safety system. Prescriptive regulations applicable to all were necessary to establish a baseline level of safety and to facilitate multimodal transport. However, risks specific to each operator needed to be considered through a safety risk assessment. The author clarified that his intention was not to eliminate the requirement for a specific safety risk assessment on the carriage of items in the cargo compartment, but rather to identify a very limited list of dangerous goods whose risks could be mitigated through the Technical Instructions without having to take the other elements listed in Annex 6 into account.

4.2.2.5.7 Several members expressed caution with respect to changing the foundation of the existing regulatory system. Many of the inconsistencies had been identified because of challenges with safely transporting lithium batteries, but these challenges were not an indication that the entire system was broken.

4.2.2.5.8 There was some support for addressing the issues related to accessibility in the shorter term, but the working group concluded that it was premature to address the other issues raised given the large workload the panel was already responsible for. The author would continue to engage with panel members.

4.2.2.6 Proposal to Amend the Definition of "Unit Load Device" (DGP-WG/23-WP/31)

4.2.2.6.1 An amendment to the definition for unit load device (ULD) in Annex 18 and the Technical Instructions was proposed. The author suggested that the wording of the definition reflected old technology that was no longer used (i.e. "igloos") and was not specific to aircraft ULDs (i.e. it referred to any type of freight container). He suggested that freight containers were different to ULDs in that they were not subject to defined standards and were not aircraft equipment that interfaced with aircraft loading systems. They were a type of overpack, which made it important for them not be included in the definition to ensure the required marks and labels were applied.

4.2.2.6.2 There were no strong objections to the proposal in principle, but members wanted more time to gather information around the assumptions made to ensure they were valid and the amendment would not have any unintended consequences. The definition in Annex 18 would need to be adopted before the Technical Instructions were amended, and this could not be done in time for incorporation in the 2026-2027 Edition. An amendment would be considered for incorporation in Annex 18 and the 2027-2028 Edition of the Technical Instructions at DGP/29.

4.2.3 Agenda Item 2.3: Develop proposals, if necessary, for amendments to the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) for incorporation in the 2025-2026 Edition

4.2.3.1.1 There were no proposals developed under this agenda item.

4.2.4 **Agenda Item 2.4: Development of proposals, if necessary, for amendments to the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods* (Doc 9481) for incorporation in the 2025-2026 Edition**

4.2.4.1 **Draft Amendments to the Drill Codes in the Emergency Response Guidance to Reflect Amendments to the Dangerous Goods List Made to Align with the UN Model Regulations (DGP-WG/23-WP/30)**

4.2.4.1.1 The meeting reviewed amendments to the drill codes in the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods* (Doc 9481) consequential to the decisions taken by UNCOE. The following revisions to the amendments were made by DGP-WG/23:

a) drill code "6C" was incorrectly assigned to UN 1835 — **Tetramethylammonium hydroxide aqueous solution**. It would be replaced with "8P"**.**

b) drill code "9L" was assigned to UN 3551 — **Sodium ion batteries**, UN 3552 — **Sodium ion batteries contained in equipment and UN 3552 — Sodium ion batteries packed with equipment**. It was replaced with "12FZ", which was consistent with the drill code assigned to lithium ion batteries. Assigning it to sodium ion batteries reflected the fact that reaction from some sodium ion batteries was similar to lithium ion batteries.

c) Drill code "9F" was assigned to UN 3558 — **Vehicle, sodium ion battery powered**. It would be replaced with "9FZ" for the sake of consistency with the drill code assigned to UN 3556 — **Vehicle, lithium ion battery powered** and UN 3557 —**Vehicle, lithium metal battery powered** and to reflect the fact that reaction from some sodium ion batteries was similar to lithium ion batteries.

4.3 **Agenda Item 3: Facilitating safe transport of dangerous goods by air (Ref: REC-A-DGS-2025)**

4.3.1 **Revision to Special Provision A190 (DGP-WG/23-WP/3)**

4.3.1.1 Amendments aimed at clarifying Special Provision A190 were proposed. The special provision permitted the transport of neutron radiation detectors containing non-pressurized boron trifluoride gas under certain circumstances, even though the gas was normally only permitted on cargo aircraft under State approval issued in accordance with Special Provision A2. Special Provision A190 made a distinction between radiation detectors containing more than 1 g of boron trifluoride, which could be transported on cargo aircraft in accordance with the Technical Instructions provided certain conditions were met, and those containing 1 g or less of boron trifluoride, which were not subject to the Technical Instructions provided certain conditions are met. The structure of the special provision led some operators to believe a reference to Special Provision A2 was required on the dangerous goods transport document and rejected the shipment if it did not. The amendments to Special Provision A190 aimed to clarify the distinction between radiation detectors containing more than 1 g and those containing 1 g or less of boron trifluoride and to make it clear that the requirements of Special Provision A2 did not apply. The specification that the requirements of Special Provision A2 did not apply was added to the provisions for radiation detectors containing more than 1 g of boron trifluoride and not to the provisions for radiation detectors containing less than 1 g of the gas since the latter were completely excepted from all other parts of the Technical Instructions.

4.3.1.2 There were no objections to the proposal in principle, but members proposed further amendments to improve the structure. A revised amendment was agreed.

4.3.2 New Special Provision for Assignment to UN 3363 (DGP-WG/23-WP/27)

4.3.2.1 UN 3548 — **Articles containing miscellaneous dangerous goods, n.o.s.** was forbidden for transport on passenger and cargo aircraft under normal circumstances. Special Provision A224 made an exception by permitting articles containing environmentally hazardous substances on both passenger and cargo aircraft in accordance with Packing Instruction 975, provided they were the only dangerous goods contained in the article. Packing Instruction 975 specified that the articles could only be transported as UN 3548 if the net quantity of the environmentally hazardous substances contained in the articles was at least 5 L for liquids or 5 kg for solids. The minimum net quantities were established to ensure classification was consistent with the criteria in the UN Model Regulations, which permitted environmentally hazardous substances to be classified as UN 3548 instead of UN 3363 (**Dangerous goods in articles**, **Dangerous goods in apparatus**, and **Dangerous goods in machinery**) if the quantities exceeded 5 kg for solids and 5 L for limits. However, this created a gap between the upper net quantity of environmentally hazardous substances limits established in Packing Instruction 962 of the Technical Instructions for UN 3363, which was 0.5 L for liquids and 1 kg for solids, and the minimum quantity limits of 5 kg and 5 L established for UN 3548. This meant that the only way to transport articles containing quantities of environmentally hazardous greater than 0.5 L/1 kg but less than 5 L/5 kg would be through an approval in accordance with Special Provision A107, which was considered irrational. An amendment to Packing Instruction 962 was proposed at DGP/28 to address this (see paragraph 3.9 of the DGP/28 Report), but it was not supported based on concerns it created more confusion and did not address consequential changes related to documentation requirements. DGP-WG/23 was presented with an alternate proposal to address the gap. It included a new special provision and consequential amendments to the documentation requirements in Part 5;4.1.5 c).

4.3.2.2 There were no objections to the objective of the proposal, but members believed it could be achieved through a revision to Special Provision A107, assigned to UN 3363, instead of creating a new special provision and amending Part 5. Members also believed that an exception from the Instructions should be permitted if articles, apparatus or machinery assigned to UN 3363 contained only environmentally hazardous substances in quantities not exceeding 5 L or 5 kg, since environmentally hazardous substances packed on their own within these quantities were already excepted in accordance with Special Provision A197. A revised proposal, which amended Special Provision A107, was agreed.

4.3.3 Use of the Terms Appropriate National Authority and Competent Authority (DGP-WG/23-WP/22)

4.3.3.1 Inconsistencies between use of the terms “appropriate national authority” and “competent authority” throughout the Technical Instructions were noted. “Appropriate national authority” was defined in Part 1;3 as any authority designated, or otherwise recognized, by a State to perform specific functions related to provisions contained in the Instructions. “Competent authority” was defined in Part 1;3 as any body or authority designated or otherwise recognized as such for any purpose in connection with the Instructions with a note under the definition specifying the term applied only radioactive material. However, the Technical Instructions contained several references to competent authority in cases unrelated to radioactive material but rather for intermodal compatibility. It was suggested that the note under the definition was therefore inaccurate. Other terms were also used, including “civil aviation authority” (only used in relation to post), “appropriate authority”, and “appropriate competent authority”. There was no clear rationale for using one of these terms over the other. DGP-WG/23 was provided with a list of provisions that referred to these terms and was invited to provide feedback on how consistency could be improved.

4.3.3.2 DGP-WG/23 acknowledged the inconsistencies and agreed there was a need to address them. It also acknowledged that the inconsistencies likely appeared in Annex 18 and the Supplement to the Technical Instructions, so changes could not be made to the Technical Instructions before they were made in those documents. Issues with inconsistencies had been identified by DGP-WG/Annex 18, and that working group was taking measures to ensure consistency in the final proposed amendments to the Annex. There was general agreement that one term should be used as much as possible, unless there was clear rationale for using another. The reference to "civil aviation authority" in relation to transport of dangerous goods by post was one case where the term was used deliberately based on a decision of the panel, i.e. to address the need for the involvement of an authority that understands risks to aviation. A formal proposal would be considered for submission to DGP/29.

4.4 Agenda Item 4: Managing safety risks posed by the carriage of lithium batteries by air (Ref: Job Card DGP.003.04)

4.4.1.1 Reduced Charge for Vehicles Powered by Lithium Ion Batteries (DGP-WG/23-WP/4)

4.4.1.2 A new entry for UN 3556 — **Vehicle, lithium ion powered** was added to the UN Model Regulations and proposed for inclusion in Table 3-1 with Packing Instruction 952 assigned to it through the UN harmonization process. The new entry provided the ability to differentiate between vehicles powered by lithium ion and other battery types and therefore the ability to apply more specific risk mitigation measures. There were no limits on the energy capacity or mass of lithium batteries used to power the vehicles. The consequences of a thermal runaway event could therefore be significant, particularly if shipped at a 100 per cent state of charge. An amendment to Packing Instruction 952 was therefore proposed to require vehicles assigned to this entry to have the battery discharged as far as practical while allowing for a remaining indicated driving range or battery capacity not exceeding twenty-five per cent. The remaining capacity would allow the vehicle to be moved under its own power for ease of loading and unloading. Twenty-five per cent driving range or battery capacity as indicated on a fuel gauge was considered equivalent to an approximate 30 to 35 per cent state of charge based on information from representatives of large automobile manufacturers.

4.4.1.3 There was agreement that a reduction in the state of charge would enhance safety with some supporting the proposal as written. Others could not support the proposal as written. The following comments were raised:

a) Small vehicles powered by lithium batteries were not different from batteries contained in equipment. DGP/28 concluded that a decision on adopting a requirement for lithium ion batteries contained in equipment to be shipped at a reduced state of charge should be based on a safety risk assessment and tasked the DGP-WG/Energy Storage Devices with conducting it. It would be inconsistent to implement a requirement for vehicles powered by lithium ion batteries to be discharged without a safety risk assessment.

b) The risk assessment under development by DGP-WG/Energy Storage Devices and an impact assessment should come first. But the job card assigned to that working group did not include vehicles. However, the Rapporteur of the working group reported that there were plans to consider vehicles as a second step.

c) Packing Instruction 952 applied to vehicles ranging from omni balance wheels to full sized automobiles. It was suggested the requirements would be difficult to comply with or to verify, particularly for smaller packaged vehicles. An opposing view was that this would not be different to other requirements imposed by the Technical Instructions.

Additionally, an operator might choose to check, but there was no requirement to do so.

d) The provision would be difficult to implement and was therefore premature. Guidance material would be needed. Some thought it would be better to wait for the outcome of the safety risk assessment that DGP-WG/Electronic Storage Devices was conducting before making a decision. An opposing view was that it was better for the amendment to be introduced in conjunction with the new entry being added to the dangerous goods list than to add additional restrictions later.

e) Some questioned whether twenty-five per cent was an appropriate limit for the battery capacity. The number was based on information from representatives of large automobile manufacturers. However, there was no clear standard on how the capacity should be indicated on the gauge, and other manufacturers used different methodologies that would make twenty-five per cent inappropriate. The author noted the value proposed could only be approximate because of the lack of a standardized approach, but suggested it provided a significant safety enhancement.

f) The requirement that the battery be discharged as far as practicable might result in the battery being completely discharged for items such as hoverboards.

g) The proposed amendment referred to a single battery being discharged. The provisions should also address a vehicle powered by multiple batteries.

h) There should be similar restrictions placed on hybrid vehicles consigned under Packing Instructions 950 and 951.

i) Some could support the proposal if it applied to large vehicles only. This might be achieved by limiting the requirement to batteries above a certain Watt-hour rating and a certain mass. Others thought the reduced state of charge should apply to all regardless of size. The batteries in large vehicles might pose greater risk because of their size, but the vehicles were subject to additional safety standards and approval processes. There was a greater risk of thermal runway in some of the smaller items which were not subject to these.

j) The existing ability to ship batteries installed in vehicles as cargo on either passenger or cargo aircraft without any limits on mass or state of charge meant that large batteries, some weighing over 1,000 kilograms, could be shipped fully charged. The rationale behind allowing these batteries solely because they were in the vehicles they powered was questioned, since lithium batteries packed on their own of any size were prohibited on passenger aircraft and were only allowed on cargo aircraft in quantities of less than 35 kg per package and only when their state of charge did not exceed 30 percent. The restrictions for lithium batteries packed on their own were introduced to mitigate against the risk of thermal runaway and the ability of a fire involving lithium batteries to overwhelm the cargo compartment fire suppression system, potentially leading to the loss of an aircraft. The consequences of thermal runaway were much higher for large, fully charged batteries than they were for smaller batteries shipped at 30 per cent state of charge. Not applying the same 30 per cent state of charge limit to lithium ion batteries in vehicles was therefore considered unjustified.

4.4.1.4 The author of the proposal would continue working on the amendment and submit a final proposal to DGP/29.

4.4.1.5 **Exception for Lithium Battery Powered Data Loggers / Cargo Tracking Devices (DGP-WG/23-WP/7)**

4.4.1.5.1 The panel, at its twenty-seventh meeting (DGP/27, 16 to 20 September 2019), developed an exception for in-use data loggers and cargo-tracking devices powered by lithium batteries attached to or placed in packages, overpacks or unit-load devices (DGP/27 Report, paragraph 1.2.1.3 and Appendix C to the Report on Agenda Item 1 refers). The exception was based on one included in the UN Model Regulations. The panel recommended including it as a new item under the general exceptions contained in Part 1;1.1.5.1 of the Technical Instructions. DGP/27 added additional criteria for the application of the UN exception to address concerns related to the hazards posed by lithium batteries in air transport, particularly since the devices would remain active during and might be more vulnerable to damage when attached to the package or ULD. It also added a general requirement for data loggers or cargo tracking devices to meet defined standards for electromagnetic radiation, based on existing text in the packing instructions for lithium batteries contained in equipment (Packing Instructions 967 and 970). This was an interim measure in anticipation of output from the Airworthiness Panel (AIRP) on the subject. DGP/27 agreed to recommend incorporating the exception in the Technical Instructions despite concerns from some members that the energy capacity limits of the lithium batteries and cells that powered the devices did not provide an adequate safety margin. The Air Navigation Commission (ANC) shared these concerns during its review of the DGP/27 Report. It appreciated that the lack of known incidents involving devices commonly used could be evidence that these did not pose an unacceptable risk, but wanted data to demonstrate the proposed upper limits were safe. It requested the DGP to establish lower limits to reflect the energy capacity of data loggers and tracking devices that were already in use. The ANC also requested that a revised exception and existing guidance material contained in in *Guidance for Safe Operations Involving Aeroplane Cargo Compartments* (Doc 10102) be passed on to the Flight Operations Panel (FLTOPSP) Specific Working Group on the Carriage of Goods (FLTOPSP-SCG/SWG) for further review.

4.4.1.5.2 DGP-WG/22 reviewed the provisions developed at DGP/27, particularly the lithium metal content and Watt-hour rating established for the cells and batteries, and supported moving forward with developing provisions for exceptions with lithium content and Watt hour limits based on what was in use (see paragraph 4.2.2 of the DGP-WG/22 Report). DGP-WG/22 also supported moving forward with developing guidance material to support the provisions that would be forwarded to FLTOPSP-SCG/SWG for further review. Members were invited to reach out to industry to gain an understanding of the size of cells and batteries in use. The results of this engagement were presented to DGP-WG/23 along with a revised proposal taking gathered information into account. The revised proposal limited the energy capacity under which the exception could apply to a lithium content of 1 g for a lithium metal cell, the aggregate lithium content of a lithium metal battery to 2 g, a Watt-hour rating of 20 Wh for lithium ion cells, and a Watt-hour rating of 20 Wh for lithium ion batteries. The amendment was supported in principle, but some did not support the 2 g limit for lithium metal batteries. A revised proposal limiting the lithium metal content to 1 g was agreed. There was some opposition to including a requirement for devices to meet defined standards for electromagnetic radiation as this was beyond the scope of the Technical Instructions. The working group decided to keep the provision, given that similar statements were already included in other parts of the Instructions. The amendment was agreed.

4.4.1.5.3 The Secretary would inform the Flight Operations Panel Safe Carriage of Goods Specific Working Group (FLTOPSP-SCG-SWG) of the amendment and encourage the group to develop guidance material to address the risk of electromagnetic interference with aircraft systems.

4.4.1.6 Interpretation of the New Exceptions Incorporated in Table 8-1 (DGP-WG/23-WP/10)

4.4.1.6.1 DGP-WG/23 was invited to consider whether a new provision allowing passengers or crew to carry active devices containing batteries not exceeding a lithium content of 0.3 grams for lithium metal and a watt-hour rating of 2.7 Wh for lithium ion batteries applied to each cell or battery installed in a portable electronic device or to the whole set of cells or batteries installed in the device needed to power it. Panel members agreed that the limits applied to the whole device and not to the individual cells or batteries for this particular provision. The author suggested this needed to be clarified in the provision and would consider whether there was a way to do so.

4.4.1.7 Transport of Portable Electronic Devices Containing Lithium Batteries by Passengers (DGP-WG/23-WP/21)

4.4.1.7.1 A concern was expressed with the decision of the panel to allow passengers or crew to carry active devices containing small batteries and not to limit the provision to tracking devices. A provision was incorporated in the 2023-2024 Edition of the Technical Instructions through Addendum No. 1 with the intent of allowing passengers to carry tracking devices, something that had become more and more popular to track lost baggage. The panel did not restrict the provision to tracking devices based on its principle of regulating based on hazard rather than end use. Test results suggested that allowing such devices did not pose an increased risk to air transport, but the tests were specific to tracking devices and not to any other active device a passenger would be permitted to carry under the new provision. Several incidents involving devices other than tracking devices had been reported by one State since the panel's decision, and it was suggested this justified revising the decision not to limit the provision. It was further suggested that the potential interaction of active devices with other dangerous goods that were packed in baggage, such as aerosols, had not been considered when the panel agreed to the addendum. It was therefore proposed that the provision be further amended, limiting it either to tracking devices or to those that needed to be active during transport to achieve their function.

4.4.1.7.2 There was no support for the proposal. DGP-WG/23 did not see a correlation between the reported incidents and the addendum to the Technical Instructions. The exception was based on an assessment that there was no greater risk of thermal runaway when a device powered by such small batteries was turned on than when it was turned off.

4.4.1.8 Lithium Battery Carried by Passengers or Crew (DGP-WG/23-WP/24)

4.4.1.8.1 The energy capacity limits in the passenger provisions for lithium batteries were expressed in Watt-hours for lithium ion and lithium content for lithium metal batteries. However, these limits were not generally identified on batteries or devices containing batteries carried by passengers or crew. The capacity was usually expressed in Volts (V) and sometimes Amperes (Ah) or milliamps (mAh). A formula for calculating Watt hour rating was contained in Annex 5 — *Units of Measurement to be Used in Air and Ground Operations*, an Annex referenced in Part 1;3.2.3 of the Instructions, but there was nothing for determining the lithium metal content in the Technical Instructions or Annex 5. Subsection 38.3 of the UN Manual of Tests and Criteria provided a methodology, but only by knowing the amount of grams of lithium in the cell or battery. The common practice for industry was to use a formula based on an estimate of 0.3 grams of lithium metal to produce 1 ampere hour of energy. An easy-to find method for calculating the energy content was important for staff verifying whether passengers were carrying lithium batteries within the limits established in Table 8-1. A new note referring to Annex 5 and subsection 38.3 of the UN *Manual of Tests and Criteria* along with a new entry in Table 1-3 for conversion from amperes-hour to grams of lithium was therefore proposed.

4.4.1.8.2 There was sympathy for the intent of the proposal, but no support for it. It was noted that the amount of lithium metal per amperes-hour was dependent on several variables, including the type or shape of the battery and design differences among manufacturers. It was therefore inappropriate to include a formula with a constant that was an estimate. Including the formula in the Technical Instructions would potentially lead to shippers using it and deriving incorrect values instead of acquiring accurate information from the manufacturer through their test summary reports. It was recognized that this information would not be available to the passenger, but the formula was not considered a reliable way to address this.

4.4.1.9 **Add Clarity on the Watt-Hour Rating Limit of Lithium Battery(ies) that Remain Installed in Mobility Aids (DGP-WG/23-WP/25)**

4.4.1.9.1 A Note under 7;2.13.3.2 and Table 8-1, 4) e) iii) clarifying that there was no Watt-hour limit when lithium batteries remained installed in a mobility aid carried by passengers and crew was proposed. The amendment was agreed.

4.4.1.10 **Introduction of all-Solid-State Lithium-ion Batteries Propagation Test Results that Considered According to the Test Protocol at Hazard-Based Classification Working in UN (DGP-WG/23-IP/1)**

4.4.1.10.1 DGP-WG/23 was provided with data from propagation tests on solid-state lithium ion batteries based on the hazard-based classification test protocol an informal working group of the UN Sub-Committee of Experts on the Transport of Dangerous Goods was developing. Propagation did not occur in any of the solid state lithium batteries tested, and the temperature of the initiation cell did not exceed the temperature of the heating plate. The test results suggested that these batteries did not pose the same level of risk to transport as conventional lithium batteries. It was suggested that they should therefore not be subject to the same stringent transport requirements.

4.4.1.11 **Report of the Dangerous Goods Panel Working Group on Energy Storage Devices (DGP-WG Storage Devices) (DGP-WG/23-IP/3)**

4.4.1.11.1 A proposal to extend the existing state of charge limit for UN 3480 — **Lithium ion batteries** to UN 3481 — **Lithium ion batteries packed with equipment**, UN 3481 — **Lithium ion batteries contained with equipment**, UN 3171 — **Battery-powered equipment** and UN 3171 — **Battery-powered vehicle** was considered at DGP/28. The panel could not reach consensus on mandating such a requirement without first conducting a thorough safety risk assessment and tasked the DGP Working Group on Energy Storage Devices (DGP-WG/Electronic Storage Devices) with conducting it. The group was supported by safety management experts from the ICAO Secretariat. The Rapporteur of the working group provided an update to DGP-WG/23 on progress made since DGP-WG/22 (see paragraph 4.4.1 of the DGP-WG/23 Report).

4.4.1.11.2 DGP-WG/Electronic Storage Devices shifted its focus to a safety risk analysis once the bowtie described at DGP-WG/22 reached a sufficient level of maturity. The traditional approach of assessing risk based on likelihood and severity proved to be challenging because of the complexity of the lithium battery transport system and the limited data available, which made it impossible to predict likelihood with any acceptable level of accuracy. It also did not necessarily predict future behaviour that might result from changes to the system. Safety management experts from the ICAO Secretariat therefore recommended an alternative risk assessment approach known as system theoretic process analysis (STPA) to evaluate the safety of a system. STPA provided a four-step method for proactively identifying potential

hazards that might arise due to complex relationships among system components. Mitigation measures would be considered following completion of these four steps. Mitigation measures in STPA were measured by examining their effectiveness in reducing or eliminating the risk associated with identified hazards in the system. A narrative report of the safety risk assessment would be provided to the panel well in advance of DGP/29 so that members had sufficient time to review and comment. The Secretary would submit a working paper to DGP/29 inviting the panel to consider the proposal to extend the existing state of charge limit for UN 3480 to UN 3481 and UN 3171 originally presented at DGP/28 (see paragraph 4.3 of the DGP/28 report) based on this report.

4.4.1.12 Thermal Incident Data Related to Aircraft Operations Reported through the Voluntary Thermal Runaway Incident Program (TRIP) (DGP-WG/23-IP/4)

4.4.1.12.1 Thermal runaway incident data related to aircraft operations reported through the voluntary thermal runaway incident program (TRIP) was provided. It was a follow up to data provided at DGP-WG/22 (see paragraph 4.4.1.5.3 of the DGP-WG/22 Report) based on a compilation of 601 incidents that occurred up to 18 April 2023.

4.5 Agenda Item 5: Clarifying State oversight responsibilities in Annex 18 (Ref: Job Card DGP.005.04)

4.5.1 Report of the DGP Working Group on Annex 18: Clarifying States' Responsibilities in Annex 18 (DGP-WG/23-IP/2)

4.5.1.1 A summary of progress made by the DGP Working Group on Annex 18 (DGP-WG/Annex 18) on clarifying State oversight responsibilities in Annex 18 was provided to DGP-WG/23 along with the latest version of draft amendments to the Annex. The panel was encouraged to provide comments on the draft via the Secretary. DGP-WG/Annex 18 also developed amendments to simplify the dangerous goods provisions in Annex 6, Part I, Chapter 14; Part III — *International Operations — Helicopters*, Chapter 12; and proposed new Part IV — *International IFR Operations — Remotely Piloted Aircraft Systems*, Chapter 14. It would provide the proposed amendments to Annex 6 to the ad hoc working group established to review Annex 6 provisions having an impact on dangerous goods (see paragraph 4.7 of this report). DGP-WG/Annex 18 would continue progressing the work through virtual meetings and potentially one more face-to-face meeting. A completed draft amendment to Annex 18 would be provided to DGP/29.

4.6 Agenda Item 6: Dangerous goods provisions to support RPAS operations (Ref: Job Card DGP.007.01)

4.6.1 A summary of progress made by the DGP Working Group on Remotely Piloted Aircraft Systems (DGP-RPAS) was provided. Four meetings had been convened since the group was established. An RPAS expert joined one of the meetings to provide an overview of the principles applied to proposed new Part IV to Annex 6. The principles that had an impact on dangerous goods included the applicability of the Standards and Recommended Practices (SARPs), which was the operation of RPAS certificated in accordance with Annex 8 — *Airworthiness of Aircraft* by operators authorized to conduct international RPAS operations. It had the same flow and format as Annex 6, Part I, varying only when needed. Some of the variances might have an impact on dangerous goods such as the absence of a requirement for an emergency locator beacon, which could cause problems in the event of an incident or accident with dangerous goods on board. The working group would be reviewing all dangerous goods-related documents including Annex 18, the Technical Instructions, its Supplement, Doc 9481, and Doc 10102. A review of

Annex 18 would be given priority so that the timeline of any amendments necessary would align with Council adoption of Annex 6, Part IV.

4.7 Agenda Item 7: Review of Annex 6 provisions having an impact on dangerous goods (REC-A-DGS-2025)

4.7.1 DGP-WG/22 agreed to establish a small ad hoc working group to review Annex 6 provisions having an impact on dangerous goods for potential inconsistencies with Annex 18 (see paragraph 4.7.1 of the DGP-WG/22 Report). The Secretariat would lead the ad hoc group. The ad hoc group was assigned two other tasks during DGP-WG/22:

a) develop provisions to address how operators not approved to carry dangerous goods as cargo should deal with packages containing dangerous goods not required to be formally identified by way of marks, labels or documentation (see paragraph 4.9.1.1 of this report); and

b) address inconsistencies with how the definition for passenger aircraft was applied internationally when determining who could be on board a cargo aircraft carrying "cargo aircraft only" dangerous goods (see paragraph 4.9.1.2 of this report).

DGP-WG/23 added one more task: review amendments to dangerous goods provisions in Annex 6 developed by DGP-WG/Annex 18 (see paragraph 4.5 of this report).

4.7.2 The group would meet virtually during summer 2023 to progress the work.

4.8 Agenda Item 8: Aviation Security/Dangerous Goods Coordination (REC-A-DGS-2025)

4.8.1 There were no proposals developed under this agenda item.

4.9 Agenda Item 9: Coordination with other panels

4.9.1 Agenda Item 9.1: Flight Operations Panels (FLTOPSP)

4.9.1.1 Provisions for the Use of Electronic Data for Information to the Pilot-In-Command (DGP-WG/23-WP/8)

4.9.1.1.1 DGP-WG/23 continued discussions on allowing electronic information to be provided to the pilot-in-command in accordance with Part 7;4.1.1 of the Technical Instructions. There had always been support for allowing the information to be provided electronically, with many believing the existing provisions did not preclude electronic transmission. But the member nominated by the International Federation of Air Line Pilots' Associations (IFALPA) could only support allowing electronic information if it was not a sole source requirement, because electronic information might not always be obtainable by the flight crew or emergency responders during an emergency.

4.9.1.1.2 The subject was first discussed at DGP-WG/16 (see paragraph 3.2.7.1 of the DGP-WG/16 Report) and DGP/27 (see paragraph 2.2.9 of the DGP/27 Report). DGP/27 agreed to wait until a study on the emergency response information needs of relevant stakeholders was complete before considering any amendments to the provisions. The group included pilots, rescue and firefighting personnel and dangerous goods experts. A new proposal was presented to DGP/28, but it was not supported (see paragraph 2.2.8 of the DGP/28 Report). DGP/28 felt an amendment was premature, given that the work of the stakeholder

group was not yet complete. There were also related activities underway at ICAO, including multidisciplinary work on electronic information by the Flight Operations Panel and a review of provisions in the *Airport Services Manual*, Part 1 — *Rescue and Fire Fighting* and Part 7 — *Airport Emergency Planning* (Doc 9137). A holistic review of the provisions for information to the pilot-in-command following the completion of the stakeholder group and ICAO working groups was the preferred approach.

4.9.1.1.3 The subject was raised again at DGP-WG/22 to gauge support for electronic transmission as a sole source of information to the pilot-in-command. There were no pilots present for the discussion, but others present supported the development of provisions for electronic transmission if measures were in place to ensure information could be provided if the electronic system failed. The need for more performance-based provisions was reiterated, as was the need to ensure the needs of rescue and firefighting services were considered. Accordingly, a new amendment to Part 7;4.1.1 was presented to DGP-WG/23. The amendment introduced a requirement for an agreement between the operator and the appropriate national authority of the State of the Operator for information to be provided via electronic data processing (EDP) or electronic data interchange (EDI) transmission in lieu of written or printed information. The member nominated by the International Federation of Air Line Pilots' Associations (IFALPA) could not support the amendment as it did not address concerns raised in the past, i.e.:

a) The information needed to be available during an emergency, but it might not be because of electronic system breakdowns.

b) The stakeholder group had yet to complete its work, and the panel had agreed to wait for its report.

c) The information to pilot in command played an important role in rescue and fire fighting, but the regulatory requirements were not clearly defined in ICAO provisions. The panel should wait for that to be done before making any amendments.

4.9.1.1.4 The working group was reminded of an ICAO task force that was developing provisions for electronic documents and certificates. It was suggested that the panel wait for that work to be done before making any amendments, since it could have an impact on electronic information to the pilot in command. The need for guidance material was also suggested, as this could clarify expectations.

4.9.1.1.5 Most supported the intent of the proposal, but not as written. The following comments were raised:

a) There was support for introducing a form of State approval, with suggestions that this be captured by requiring the operator to include processes and procedures for providing information to the pilot in command in its Operations Manual and requiring a form of acceptance or approval of these by the State of the Operator.

b) Reference to only EDP and EDI technology was too limiting.

c) "Or the information" added after "a copy of the information" in square brackets in the proposed amendment was unnecessary.

d) The need for the provisions to be more performance-based was expressed at DGP-WG/22 and by the flight operations experts at the Secretariat, but the proposed amendment maintained the prescriptive nature of the provisions.

4.9.1.1.6 The author expressed appreciation for the comments and would work with the member nominated by IFALPA to develop an acceptable amendment at DGP/29. The work of the recently established Cyber Security Panel (CSP) at ICAO was noted. The Secretary was invited to coordinate with that panel with respect to anything related to electronic information to the pilot in command.

4.9.1.2 **Definition of "Passenger Aircraft" (DGP-WG/23-WP/26)**

4.9.1.2.1 Amendments to Annex 18, the Technical Instructions, and the *Procedures for Air Navigation Services — Aircraft Operations* (Doc 8168) were proposed to address issues raised with respect to who can be onboard a cargo aircraft transporting dangerous goods forbidden for carriage on passenger aircraft. Guidance on operational conditions operators needed to implement if persons other than flight crew were on a cargo aircraft was also proposed for the consideration of FLTOPSP.

Proposed amendments to Annex 18 and the Technical Instructions

4.9.1.2.2 The potential need for an amendment was first raised at DGP-WG/19 (see paragraph 3.8.1 of the DGP-WG/19 report) in response to an event where a State prohibited a category of person from travelling on a cargo aircraft carrying dangerous goods not permitted on passenger aircraft based on the application of the passenger aircraft definition. An amendment to the definition for passenger aircraft in the Technical Instructions that broadened the scope of who could be on board was recommended by DGP/27 (see paragraph 8.1.1 of the DGP/27 Report). However, the ANC did not support the amendment because of concerns raised by flight operations experts. They opposed determining who could be on board an aircraft through a definition in Annex 18 because this was an operational issue under Annex 6. They also raised concerns that permitting certain dangerous goods on cargo aircraft and not on passenger aircraft implied that a higher level of safety was required for passenger aircraft, and amending the definition reinforced this notion. They proposed that a more logical approach would be to determine whether dangerous goods could be safely carried on an aircraft based on its capabilities rather than on the type of operation. This would align with Annex 6 while making the definition irrelevant. The ANC did recognize a problem existed, so it requested the Secretariat to develop a short-term solution to address the inaccurate interpretation and use of the definition and tasked FLTOPSP-SCG- SWG with addressing the broader issue. The Secretariat published guidance on the ICAO operations public website, but DGP did not see the guidance as a solution. The issue was not yet on the FLTOPSPS-SCG-SWG work programme, so the problem remained.

4.9.1.2.3 The proposed amendments presented to DGP-WG/23 did not take the capabilities of the aircraft into account nor did they address the concerns related to the implied perception of a higher degree of safety given to passenger aircraft than to cargo aircraft. It was argued that taking the capabilities of the aircraft into account would take decades to achieve, and a solution was needed in the near term. Annex 6, Part II acknowledged in its Foreword that there were different levels of safety based on different types of operations by stating that it was accepted that the passenger in international general aviation aircraft would not necessarily enjoy the same level of safety as the fare-paying passenger in commercial air transport. Regardless, the objective of the Technical Instructions was always to ensure an acceptable level of safety for flight crew for the carriage of dangerous goods, including dangerous goods carried as "cargo aircraft only".

4.9.1.2.4 The proposed amendment deleted the definitions for passenger and cargo aircraft in Annex 18. It was suggested the definition was not needed in the Annex because neither term was referred to in it. It was proposed that the definition for cargo aircraft and an amended version of the definition for passenger aircraft remain in the Technical Instructions, on the basis that they were referred to extensively in that document and were needed to differentiate between what was permitted on each type of aircraft. The proposed amendment to the definition for "passenger aircraft" provided operators with more flexibility in determining who was considered a passenger and therefore who could be on board a cargo aircraft

transporting dangerous goods forbidden on a passenger aircraft. It included a provision for an operator to allow any person on board provided this was permitted within the conditions approved by the appropriate national authority.

4.9.1.2.5 There was support for deleting the definition from Annex 18 and support for the intent of the amendment to the definition in the Technical Instructions. However, some thought the list was too prescriptive and that it highlighted commercial needs. By doing so it excluded other categories of people that should be allowed, including some that could enhance safety. Others thought that being too performance based would result in a lack of global harmonization which could result in authorities in some States not allowing persons on cargo aircraft that were permitted by others. The Secretary reminded the working group that regulating through definitions was something that should be avoided and suggested consideration be given to deleting the definition from both the Annex and the Technical Instructions. The intent of the definition could then be achieved through regular provisions.

4.9.1.2.6 There were no strong objections to the intent of the proposal, but it was agreed that the Secretary would obtain feedback from flight operations experts given their objection to the DGP/27 recommendation to amend the definition. This would be done through the ad hoc working group established to review Annex 6 provisions having an impact on dangerous goods (see paragraph 4.7 of this report). It was noted that an amendment to the Technical Instructions could not be adopted before the amendment Annex 18 was processed, so there was time to develop provisions that were acceptable to all.

Proposed guidance material

4.9.1.2.7 Guidance on what operators needed to consider when allowing persons on an all-cargo aircraft was developed. It was proposed that it be provided to FLTOPS for potential inclusion in the PANS-OPS, Volume III. The development of guidance material had been supported by the Secretary of FLTOPSP at DGP/27 (see paragraph 8.1.1 of the DGP/27 Report). The Secretary would seek feedback from the ad hoc working group established to review Annex 6 provisions having an impact on dangerous goods (see paragraph 4.8 of this report) as a first step.

4.9.2 Agenda Item 9.2: Airworthiness Panel (AIRP)

4.9.2.1 Loading of Dangerous Goods in Aircraft not Occupied by Passengers (DGP-WG/23-WP/23)

4.9.2.1.1 Repurposing underutilized passenger aircraft during the COVID-19 pandemic to increase cargo capacity by loading cargo in the passenger cabin suggested potential deficiencies in the loading and stowage provisions of the Technical Instructions. Part 7;2.1 contained requirements limiting the loading of dangerous goods on an aircraft occupied by passengers to Class B or C cargo compartments, and Part 7;2.4.1 contained requirements limiting the loading of dangerous goods bearing the “cargo aircraft only” label on a cargo aircraft. The Technical Instructions did not include any limitations, however, for cases where there were no passengers onboard and packages containing dangerous goods did not bear the “cargo aircraft only” label. The cargo compartment safety provisions in Annex 6 did require that the operator take the capabilities of the aeroplane and its systems into account when conducting its specific safety risk assessment, but this applied to items in the cargo compartment and not the passenger cabin. DGP-WG/23 was therefore invited to discuss whether there were gaps that needed to be filled.

4.9.2.1.2 There was agreement that operators needed to load cargo in compartments certified to carry cargo regardless of whether passengers were onboard, unless an approval was granted by the appropriate authorities to do otherwise, but this did not appear to be clearly stated in any SARPs. It was indirectly addressed through the cargo compartment safety SARPs in Annex 6, Part I, but not explicitly. The cargo

compartment safety SARPs were not included in Annex 6, Part III, but helicopters would also be indirectly addressed through the operator's safety management system responsibilities required by Annex 19. ICAO did make it clear through outreach and on its public site during the COVID-19 pandemic that the ability to repurpose passenger aircraft to carry cargo in the cabin would be subject to approvals and coordination among various State authorities, potentially including the State of Registry, the State of the Operator and the State of Manufacturer.

4.9.2.1.3 There was also agreement that dangerous goods should only be loaded in certified cargo compartments, regardless of whether there were passengers on board, but again this was not clearly stated in the Technical Instructions or other ICAO provisions. There was a suggestion that it should be.

4.9.2.1.4 The intent of the working paper was to get a clear understanding of how panel members interpreted the cargo loading provisions. The author expressed his appreciation to the working group for the discussion.

4.9.3 Agenda Item 9.3: Safety Management Panel (SMP)

4.9.3.1 There were no discussions under this agenda sub-item.

4.9.4 Agenda Item 9.4: Remotely Piloted Aircraft Systems Panel (RPASP)

4.9.4.1 There were no discussions under this agenda sub-item.

4.9.5 Agenda Item 9.5: Any other panels

4.9.5.1 There were no discussions under this agenda sub-item.

4.10 Agenda Item 10: Harmonization of Guidance Material for the Dangerous Goods Panel (DGP) to Aid in the Preparation of the Technical Instructions and Supporting Documents with revised dangerous goods provisions

4.10.1 Proposed Revised Edition of Guidance Material for the Dangerous Goods Panel (DGP-WG/23-WP/5)

4.10.1.1 Guidance material to aid in the preparation of the Technical Instructions and supporting documents had been developed by the DGP. It contained general principles used in developing the dangerous goods documents and guidance for deciding how to make changes to them. It also provided a mechanism to record justification behind decisions made by the panel. The guidance material was intended as a useful resource for both existing and future panel members. The document needed a thorough review, as it had not been updated since 1999. The newly established DGP Working Group on UN Harmonization (DGP-WG/UN Harmonization) was tasked with updating it and maintaining it in the future. A first draft was presented at DGP/28 (see paragraph 7.1 of the DGP/28 Report). DGP-WG/UN Harmonization further updated the document based on comments received.

4.10.1.2 Updates to address a concern at DGP/28 that guidance on stowage distances of radioactive material from persons might not ensure the necessary level of protection for flight crew were made, but there was an opinion that the revised text incorrectly implied that the provisions in the Technical Instructions on their own guaranteed that flight and cabin crew would not be exposed to harmful dose rates. There were those who disagreed with this opinion, noting that it was simply guidance, but those interested would work towards developing text acceptable to all.

4.10.1.3 DGP-WG/23 expressed its appreciation for the work done. The need to ensure the document remained up to date in the future was emphasized. It was agreed that proposed amendments to the Technical Instructions that deviated from the UN Model Regulations or that introduced requirements specific to air transport should be accompanied by proposed amendments to the DGP guidance document and that an agenda item on harmonizing the guidance would remain for all DGP meetings so that a formal mechanism for review was in place.

4.10.1.4 Members were encouraged to provide any further comments on the guidance material they might have to DGP-WG/UN Harmonization through the Secretary. The document would be formally adopted at DGP/29 and then uploaded to the DGP public site. The document would be provided to new panel members as an on-going practice.

4.11 Agenda Item 11: Other business

4.11.1 Communication to Member States of Proposals and Changes Agreed to Each Edition of the Technical Instructions (DGP-WG/23-WP/6)

4.11.1.1 The working group was invited to consider requesting the Secretariat to establish an administrative process whereby States and relevant international organizations would be invited to comment on working papers presented to the DGP by alerting them of upcoming DGP meetings and providing them a link to the DGP website where working paper papers were published. This was proposed in recognition of the fact that the Technical Instructions, while binding on States through Standard 2.2 of Annex 18, did not go through the State consultation process that Annex amendments were subject to. Not subjecting the Technical Instructions to a State consultation process was agreed by States when Annex 18 was first adopted, recognizing it would be impractical to include such detailed technical information in SARPs material, largely because of the difficulties that would arise with harmonizing the Instructions with the UN Model Regulations biennially. However, the Air Navigation Commission had expressed apprehension in the past with recommending some amendments to that Technical Instructions that had an impact on States without consulting them.

4.11.1.2 There was support for providing a mechanism for States to provide comments before a meeting, but also concerns about potential consequences should a formal process be implemented. The need to make working papers available on the website much earlier than currently was the case and how States' comment would be addressed if the panel disagreed were two specific consequences raised. Whether it was appropriate to encourage States to comment on panel working papers was also questioned, given that they were primarily a basis for discussion in a specific meeting and not necessarily complete, accurate, or the views of the panel. It was suggested that inviting States to review the report after the meeting might be more effective, as the report captured the panel's viewpoints. But this approach would eliminate the benefit of having States' comments when the panel deliberates. It was agreed that a thorough analysis of the strengths and weaknesses of the current system should be done before implementing any new measures. There might be alternative approaches to engaging with States that could then be considered, such as reminding them of the system that was currently in place and advising them of where they could access meeting documentation. This could also be achieved through the work of DGP-WG/Annex 18, i.e. by including a description of the system for maintaining the Technical Instructions and how it related to the State's obligation to develop specific operating regulations in the guidance material that would be developed to support the revised Annex 18.

4.11.1.3 The Secretary expressed appreciation for the proposal. She would report the panel's discussion on the topic to the Secretariat and the ANC and provide feedback from each body to the panel.

4.11.2 **Future meetings**

4.11.2.1 Dates for upcoming DGP meetings were announced:

a) DGP/29: 13 to 17 November 2023 at ICAO Headquarters in Montréal (potentially preceded by a working group meeting the week before, to be confirmed at a later date);

b) DGP-WG/Annex 18: Will convene weekly 60-90 virtual meetings until at least September with a potential face-to-face meeting in August;

c) DGP-WG/RPAS: Will meet virtually on 13 July 2023 for 90 minutes. Two meetings will be held that day to accommodate different time zones, i.e. 1300 and 2200 UTC;

d) DGP-WG/Electronic Storage Devices: Will hold regular as-needed virtual meetings to complete safety risk assessment process on lithium batteries in equipment and vehicles.

4.11.3 **Adjournment**

4.11.3.1 DGP-WG/23 adjourned after expressing its appreciation to the chairs and to Mr. Cascardo and his organization for hosting the meeting.

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APPENDIX A

CONSOLIDATION OF AMENDMENTS TO THE TECHNICAL INSTRUCTIONS DEVELOPED AT DGP-WG/22 AND DGP-WG/23

Part 1

GENERAL

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Chapter 1

SCOPE AND APPLICABILITY

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1.1 GENERAL APPLICABILITY

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Amendments to battery provisions

Paragraph 4.4.1.5 of DGP-WG/23 report:

1.1.5 General exceptions

1.1.5.1 Except for 7;4.2, these Instructions do not apply to dangerous goods carried by an aircraft where the dangerous goods are:

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h) contained within items of excess baggage being sent as cargo provided that:

1) the excess baggage has been consigned as cargo by or on behalf of a passenger;

2) the dangerous goods may only be those that are permitted by and in accordance with 8;1.1.2 to be carried in checked baggage;

3) the excess baggage is marked with the words “Excess baggage consigned as cargo”.

i) data loggers and cargo tracking devices with installed lithium batteries, attached to or placed in packages, overpacks or unit load devices are not subject to any provisions of these Instructions provided the following conditions are met:

1) the data loggers or cargo tracking devices must be in use or intended for use during transport;

2) each cell or battery must meet the provisions of Part 2;9.3 a), e), f) (if applicable) and g);

3) for a lithium ion cell, the Watt-hour rating not exceeding 20 Wh;

4) for a lithium ion battery, the Watt-hour rating not exceeding 20 Wh;

5) for a lithium metal cell, the lithium content not exceeding 1 g;

6) for a lithium metal battery, the aggregate lithium content not exceeding 1 g;

7) the number of data loggers or cargo tracking devices in or on any package or overpack must be no more than the number required to track or to collect data for the specific consignment;

8) the data loggers or cargo tracking devices must be capable of withstanding the shocks and loadings normally encountered during transport;

9) the devices must not be capable of generating a dangerous evolution of heat; and

10) the devices must meet defined standards for electromagnetic radiation to ensure that the operation of the device does not interfere with aircraft systems.

Note.— This exception does not apply where the data loggers or cargo tracking devices are offered for transport as a consignment in accordance with Packing Instruction 967 or 970.

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1.3 APPLICATION OF STANDARDS

Where the application of a standard is required and there is any conflict between the standard and these Instructions, the Instructions take precedence. The requirements of the standard that do not conflict with these Instructions must be applied as specified, including the requirements of any other standard, or part of a standard, referenced within that standard as normative.

UN harmonization amendments

Paragraph 4.1.2.1.2 of DGP-WG/23 report:

UN Model Regulations, Chapter 1.1, 1.1.1.7 (see ST/SG/AC.10/50/Add.1)

Note. — A standard provides details on how to meet the provisions of these Instructions and may include requirements in addition to those set out in these Instructions.

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Chapter 3

GENERAL INFORMATION

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3.1 DEFINITIONS

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UN harmonization amendments

Paragraph 4.1.2.1.2 of DGP-WG/23 report:

UN Model Regulations, Chapter 1.2, 1.2.1 (see ST/SG/AC.10/50/Add.1)

Dangerous goods security. Measures or precautions to be taken by operators**,** shippers and others involved in the transport of dangerous goods aboard aircraft to minimize theft or misuse of dangerous goods that may endanger persons or property.

Degree of filling. The ratio, expressed in %, of the volume of liquid or solid introduced at 15ºC into the means of containment and the volume of the means of containment ready for use.

Design. For the transport of radioactive material, the description of fissile material excepted under 2;7.2.3.5.1 f), special form radioactive material, low dispersible radioactive material, package or packaging which enables such items to be fully identified. The description may include specifications, engineering drawings, reports demonstrating compliance with regulatory requirements, and other relevant documentation.

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Manual of Tests and Criteria. The ~~seventh~~ eighth revised edition of the United Nations publication bearing this title (ST/SG/AC.10/11/Rev.~~7~~8 ~~and Amend. 1~~).

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Model Regulations. The twenty-~~second~~third revised edition of the United Nations publication entitled *Recommendations on the Transport of Dangerous Goods: Model Regulations* (ST/SG/AC.10/1/Rev.~~22~~23).

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Recycled plastic~~s~~ material. Material recovered from used industrial packagings or from other plastics material that has been ~~cleaned~~ pre-sorted and prepared for processing into new packagings, including IBCs. The specific properties of the recycled material used for production of new packagings, including IBCs, must be assured and documented regularly as part of a quality assurance programme recognized by the appropriate national authority. The quality assurance programme must include a record of proper pre-sorting and verification that each batch of recycled plastics, which is of homogeneous composition, is consistent with the material ~~has the proper~~ specifications (melt flow rate, density, and tensile ~~yield strength, consistent with that~~ property) of the design type manufactured from such recycled material. This necessarily includes knowledge about the ~~packaging~~ plastics material from which the recycled plastics ~~has~~ have been derived, as well as awareness of the prior use, including prior contents, of ~~those packagings~~ the plastics material if ~~those~~ that prior ~~contents~~ use might reduce the capability of new packagings, including IBCs, produced using that material. In addition, the manufacturer's quality assurance programme for packaging ~~manufacturer's quality assurance programmes~~ under 6;1.1.3 of these Instructions or IBC under 6.5.4.1 of the UN Model Regulations must include performance of the mechanical design type test on packagings in Part 6, Chapter 4 ~~on packagings~~ of these Instructions or IBCs in 6.5.6 of the UN Model Regulations, manufactured from each batch of recycled plastics material. In this testing, stacking performance may be verified by appropriate dynamic compression testing rather than static load testing.

≠ *Note.— ISO 16103:2005 "Packaging — Transport packages for dangerous goods — Recycled plastics material", provides additional guidance on procedures ~~to be~~ which may be followed in approving the use of recycled plastics material. These guidelines have been developed based on the experience of the manufacturing of drums and jerricans from recycled plastics material and as such may need to be adapted for other types of packagings, IBCs and large packagings made of recycled plastics material.*

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Chapter 4

DANGEROUS GOODS TRAINING

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Amendments to facilitate transport or State oversight

Paragraph 4.3.5 of DGP-WG/22 report:

4.4 TRAINING AND ASSESSMENT RECORDS

4.4.1 The employer must maintain a record of training and assessment for personnel.

4.4.2 The record of training and assessment must include:

a) the individual's name;

b) the month of completion of the most recent training and assessment;

c) a description, copy or reference to training and assessment materials used to meet the training and assessment requirements;

d) the name and ~~address of the organization providing~~ other information that identifies the organization providing the training and assessment (e.g. registered address); and

e) evidence which shows that the personnel have been assessed as competent.

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Part 2

CLASSIFICATION OF DANGEROUS GOODS

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INTRODUCTORY CHAPTER

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6. CLASSIFICATION OF ARTICLES AS ARTICLES CONTAINING DANGEROUS GOODS N.O.S.

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UN harmonization amendments

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

UN Model Regulations, Chapter 2.0, 2.0.5.2 (see ST/SG/AC.10/50/Add.1)

6.2 Such articles may in addition contain cells or batteries. Lithium cells and batteries that are integral to the article must be of a type proven to meet the testing requirements of the UN *Manual of Tests and Criteria*, Part III, subsection 38.3~~, except when otherwise specified by these Instructions (e.g. for pre-production prototype articles containing lithium batteries or for a small production run, consisting of not more than 100 such articles)~~. For articles containing pre-production prototype lithium cells or batteries transported for testing, or for articles containing lithium cells or batteries manufactured in production runs of not more than 100 cells or batteries, the requirements of Special Provision A88 apply.

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Chapter 1

CLASS 1 — EXPLOSIVES

UN harmonization amendments

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

UN Model Regulations, Chapter 2.1, 2.1.1.3 (see ST/SG/AC.10/50/Add.1)

1.2 DEFINITIONS

For the purposes of these Instructions, the following definitions apply:

a) ***Explosive substance*** is a solid or liquid substance (or a mixture of substances) which is in itself capable, by chemical reaction, of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic substances are included even when they do not evolve gases.

b) ***Pyrotechnic substance*** is ~~a substance or a mixture of substances~~ an explosive substance designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative, self-sustaining, exothermic, chemical reactions.

c) ***Explosive article*** is an article containing one or more explosive substances.

d) ***Phlegmatized*** means that a substance (or “phlegmatizer”) has been added to an explosive to enhance its safety in handling and transport. The phlegmatizer renders the explosive insensitive, or less sensitive, to the following actions: heat, shock, impact, percussion or friction. Typical phlegmatizing agents include, but are not limited to: paper, wax, water, polymers (such as chlorofluoropolymers), alcohol and oils (such as petroleum jelly and paraffin).

e) ***Explosive or pyrotechnic effect*** means, in the context of 1.1 c), an effect produced by self-sustaining exothermic chemical reactions including shock, blast, fragmentation, projection, heat, light, sound, gas and smoke.

Note.— Explanations for a number of other terms used in connection with explosives can be found in Attachment 2 to these Instructions.

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Chapter 3

CLASS 3 — FLAMMABLE LIQUIDS

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UN harmonization amendments

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

UN Model Regulations, Chapter 2.3, 2.3.1.4 (see ST/SG/AC.10/50/Add.1)

3.1.4 Liquid desensitized explosives are explosive substances which are dissolved or suspended in water or other liquid substances, to form homogeneous liquid mixture to suppress their explosive properties (see 1.5.2.3). Entries in the Dangerous Goods List (Table 3-1) for liquid desensitized explosives are: UN 1204, UN 2059, UN 3064, UN 3343, UN 3357 ~~and~~, UN 3379 and UN 3555.

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Chapter 4

CLASS 4 — FLAMMABLE SOLIDS; SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION; SUBSTANCES WHICH, IN CONTACT WITH WATER, EMIT FLAMMABLE GASES

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4.2 FLAMMABLE SOLIDS, SELF-REACTIVE SUBSTANCES, DESENSITIZED EXPLOSIVES AND POLYMERIZING SUBSTANCES

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4.2.2 Division 4.1 — Flammable solids

4.2.2.1 *Definitions and properties*

4.2.2.1.1 Flammable solids are readily combustible solids and solids which may cause fire through friction.

4.2.2.1.2 Readily combustible solids are powdered, granular or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly. The danger may not only come from the fire but also from toxic combustion products. Metal powders are especially dangerous because of the difficulty of extinguishing a fire since normal extinguishing agents such as carbon dioxide or water can increase the hazard.

UN harmonization amendments

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

UN Model Regulations, Chapter 2.4, 2.4.2.2.1 (see ST/SG/AC.10/50/Add.1)

4.2.2.1.3 Metal powders are powders of metals or metal alloys.

4.2.2.2 *Classification of flammable solids*

UN Model Regulations, Chapter 2.4, 2.4.2.2.2.1 (see ST/SG/AC.10/50/Add.1)

4.2.2.2.1 Powdered, granular or pasty substances must be classified as readily combustible solids of Division 4.1 when the time of burning of one or more of the test runs, performed in accordance with the test methods and criteria in the UN *Manual of Tests and Criteria,* Part III, subsection 33.2.1, is less than 45 seconds or the rate of burning is more than 2.2 mm/s. ~~Powders of metals or metal alloys~~ Metal powders must be classified in Division 4.1 when they can be ignited and the reaction spreads over the whole length of the sample in 10 minutes or less.

4.2.2.2.2 Solids which may cause fire through friction must be classified in Division 4.1 by analogy with existing entries (e.g. matches) until definitive criteria are established.

UN Model Regulations, Chapter 2.4, 2.4.2.2.3.1 (see ST/SG/AC.10/50/Add.1)

4.2.2.3 *Assignment of packing groups*

4.2.2.3.1 Packing groups are assigned on the basis of the test methods referred to in 4.2.2.2.1. For readily combustible solids (other than metal powders), Packing Group II must be assigned if the burning time is less than 45 seconds and the flame passes the wetted zone. Packing Group II must be assigned to ~~powders of metal or metal alloys~~ metal powders if the zone of reaction spreads over the whole length of the sample in 5 minutes or less.

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Chapter 5

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

Table 2-7. List of currently assigned organic peroxides in packagings

Note.— Peroxides to be transported must fulfil the classification and the control and emergency temperatures (derived from the self-accelerating decomposition temperature (SADT)) as listed.

UN harmonization amendments

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

Organic peroxide	*Concentration (per cent)*	*Diluent type A (per cent)*	*Diluent type B (per cent) (Note 1)*	*Inert solid (per cent)*	*Water (per cent)*	*Control tempera-ture (°C)*	*Emergency tempera-ture (°C)*	*UN generic entry*	*Sub-sidiary hazards and notes*
tert-Butyl peroxybenzoate	≤52			≥48				3106	
UN Model Regulations, included in IBC520 and, see 2.5.3.2.4 of UN Model Regulations									
tert-Butyl peroxybenzoate	≤32	≥ 68						3109	
tert-Butyl peroxybutyl fumarate	≤52	≥48						3105	
. . .									
Dibenzoyl peroxide	≤42 as a stable dispersion in water							3109	
UN Model Regulations, Chapter 2.5, 2.5.3.2.4 (see ST/SG/AC.10/50/Add.1)									
Dibenzoyl peroxide	≤ 42	≥ 38			> 13			3109	
Dibenzoyl peroxide	≤35			≥65				Exempt	29
Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤100					+30	+35	3114	
. . .									
Di-2,4-dichlorobenzoyl peroxide	≤77				≥23			FORBIDDEN	3
Di-2,4-dichlorobenzoyl peroxide	≤52 as a paste with silicon oil							~~3106~~3104	
Di-2,4-dichlorobenzoyl peroxide	≤52 as a paste					+20	+25	3118	
. . .									
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexane	≤47 as a paste							3108	
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexane	≤ 22		≥ 78					Exempt	29
2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexyne-3	>86-100							FORBIDDEN	3
. . .									
Methylcyclohexanone peroxide(s)	≤67		≥33			+35	+40	3115	

Organic peroxide	*Concentration (per cent)*	*Diluent type A (per cent)*	*Diluent type B (per cent) (Note 1)*	*Inert solid (per cent)*	*Water (per cent)*	*Control tempera-ture (°C)*	*Emergency tempera-ture (°C)*	*UN generic entry*	*Sub-sidiary hazards and notes*
Methyl ethyl ketone peroxide(s)	See remark 33	≥ 41			> 9			3105	33 34
Methyl ethyl ketone peroxide(s)	see remark 8)	≥48						FORBIDDEN	3,8,13

. . .

Notes:

. . .

32. Active oxygen ≤4.15 per cent.
33. Available oxygen ≤ 10 per cent.
34 Sum of diluent type A and water ≥ 55 per cent, and in addition methyl ethyl ketone.

Chapter 6

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

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6.3 DIVISION 6.2 — INFECTIOUS SUBSTANCES

. . .

6.3.2 Classification of infectious substances

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Table 2-10. Indicative examples of infectious substances included in Category A in any form unless otherwise indicated (6.3.2.2.1 a))

UN harmonization amendments

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

UN Model Regulations, Chapter 2.6, 2.6.3.2.2.1 (see ST/SG/AC.10/50/Add.1)

UN Number and Proper Shipping Name	Micro-organism
UN 2814 **Infectious substances affecting humans**	. . . Monkeypox virus (cultures only) . . .

. . .

Chapter 7

CLASS 7 — RADIOACTIVE MATERIAL

. . .

7.1.3 Definitions of specific terms

. . .

UN harmonization amendments

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

UN Model Regulations, Chapter 2.7, 2.7.1.3 (see ST/SG/AC.10/50/Add.1)

Specific activity of a radionuclide. The activity per unit mass of that nuclide. The specific activity of a material must mean the activity per unit mass of the material in which the radionuclides are essentially uniformly distributed.

Note.— The terms "activity concentration" and "specific activity" are synonymous for the purpose of these Instructions.

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Chapter 9

CLASS 9 — MISCELLANEOUS DANGEROUS SUBSTANCES AND ARTICLES, INCLUDING ENVIRONMENTALLY HAZARDOUS SUBSTANCES

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UN harmonization amendments

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

UN Model Regulations, Chapter 2.9, 2.9.2 (see ST/SG/AC.10/50/Add.1)

9.2 ASSIGNMENT TO CLASS 9

The substances and articles of Class 9 are subdivided as shown in Table 2-16.

Table 2-16. Substances and articles of Class 9

UN number	*Name*	*Notes*
. . .		
Lithium batteries		
3090	**Lithium metal batteries** (including lithium alloy batteries)	See ~~2~~9.3
3091	**Lithium metal batteries contained in equipment** (including lithium alloy batteries)	
3091	**Lithium metal batteries packed with equipment** (including lithium alloy batteries)	
3480	**Lithium ion batteries** (including lithium ion polymer batteries)	
3481	**Lithium ion batteries contained in equipment** (including lithium ion polymer batteries)	
3481	**Lithium ion batteries packed with equipment** (including lithium ion polymer batteries)	
3536	**Lithium batteries installed in cargo transport unit**	

UN harmonization amendments

and

Amendments to battery provisions

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

UN Model Regulations, Chapter 2.9, 2.9.2 (see ST/SG/AC.10/50/Add.1)

Sodium ion batteries		
3551	**Sodium ion batteries** with organic electrolyte	See 9.4
3552	**Sodium ion batteries contained in equipment** with organic electrolyte	

UN number	*Name*	*Notes*
3552	**Sodium ion batteries packed with equipment** with organic electrolyte	
. . .		
Life-saving appliances		
2990	**Life-saving appliances, self-inflating**	
3072	**Life-saving appliances, not self-inflating** containing dangerous goods as equipment	
3268	**Safety devices**, electrically initiated	

UN harmonization amendments

Paragraph 4.1.2.1.3 of DGP-WG/23 report:

UN Model Regulations, Chapter 2.9, 2.9.2 (see ST/SG/AC.10/50/Add.1)

3559	**Fire suppressant dispersing devices**	
. . .		
Genetically modified micro-organisms (GMMOs) and genetically modified organisms (GMOs)		
3245	**Genetically modified micro-organisms**	GMMOs or GMOs which do not meet the definition of toxic substances (see 6.2) or infectious substances (see 6.3) must be assigned to UN 3245. GMMOs or GMOs are not subject to these Instructions when authorized for use by the appropriate national authorities of the States of Origin, Transit and Destination. Pharmaceutical products (such as vaccines) that are packed in a form ready to be administered, including those in clinical trials, and that contain GMMOs or GMOs are not subject to these Instructions. Genetically modified live animals must be transported under terms and conditions of the appropriate national authorities of the States of Origin and Destination. ~~COVID-19 vaccines containing GMOs or GMMOs, including those in clinical trials, are not subject to these Instructions.~~
3245	**Genetically modified organisms**	
. . .		
Other substances or articles presenting a danger during transport, but not meeting the definitions of another class		
. . .		
3548	**Articles containing miscellaneous dangerous goods, n.o.s.**	
3556	**Vehicle, lithium ion battery powered**	
3557	**Vehicle, lithium metal battery powered**	

UN number	*Name*	*Notes*
3558	**Vehicle, sodium ion battery powered**	
. . .		

9.3 LITHIUM BATTERIES

Amendments to battery provisions

Paragraph 4.1.2.1.3.1 d) of DGP-WG/23 report:

Cells and batteries, cells and batteries contained in equipment, or cells and batteries packed with equipment, containing lithium in any form must be assigned to UN Nos. 3090, 3091, 3480 or 3481, as appropriate. They may be transported under these entries ~~if they meet the following provisions~~ provided:

a) each cell or battery is of the type proved to meet the requirements of each test of the UN *Manual of Tests and Criteria*, Part III, subsection 38.3;

. . .

e) cells and batteries ~~must be~~ are manufactured under a quality management programme that includes:

1) a description of the organizational structure and responsibilities of personnel with regard to design and product quality;

2) the relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;

3) process controls that should include relevant activities to prevent and detect internal short circuit failure during manufacture of cells;

4) quality records, such as inspection reports, test data, calibration data and certificates. Test data must be kept and made available to the appropriate national authority upon request;

5) management reviews to ensure the effective operation of the quality management programme;

6) a process for control of documents and their revision;

7) a means for control of cells or batteries that are not conforming to the type tested in accordance with Part III, subsection 38.3 of the UN *Manual of Tests and Criteria*;

8) training programmes and qualification procedures for relevant personnel;

9) procedures to ensure that there is no damage to the final product;

Note.— In-house quality management programmes may be accepted. Third-party certification is not required, but the procedures listed in 1) to 9) above must be properly recorded and traceable. A copy of the quality management programme must be made available to the appropriate national authority upon request.

f) lithium batteries, containing both primary lithium metal cells and rechargeable lithium ion cells, that are not designed to be externally charged (see Special Provision A213) ~~must~~ meet the following conditions:

i) the rechargeable lithium ion cells can only be charged from the primary lithium metal cells;

ii) overcharge of the rechargeable lithium ion cells is precluded by design;

iii) the battery has been tested as a lithium primary battery;

iv) component cells of the battery ~~must be~~ are of a type proved to meet the respective testing requirements of the UN *Manual of Tests and Criteria*, Part III, subsection 38.3.; and

UN Model Regulations, Chapter 2.9, 2.9.4 (g) (see ST/SG/AC.10/50/Add.1)

g) except for button cells installed in equipment (including circuit boards), manufacturers and subsequent distributors of cells or batteries manufactured after 30 June 2003 ~~must~~ make available the test summary as specified in the UN *Manual of Tests and Criteria*, Part III, subsection 38.3, paragraph 38.3.5.

Note.— The term "make available" means that manufacturers and subsequent distributors ensure that the test summary for lithium cells or batteries or equipment with installed lithium cells or batteries is accessible so that the shipper or other persons in the supply chain can confirm compliance.

UN harmonization amendments

and

Amendments to battery provisions

Paragraph 4.1.2.1.3.1 d) of DGP-WG/23 report:

UN Model Regulations, Chapter 2.9, 2.9.5 (see ST/SG/AC.10/50/Add.1)

9.4 SODIUM ION BATTERIES

Cells and batteries, cells and batteries contained in equipment, or cells and batteries packed with equipment containing sodium ion, which are a rechargeable electrochemical system where the positive and negative electrode are both intercalation or insertion compounds, constructed with no metallic sodium (or sodium alloy) in either electrode and with an organic non aqueous compound as electrolyte, must be assigned to UN Nos. 3551 or 3552, as appropriate.

Note.— Intercalated sodium exists in an ionic or quasi-atomic form in the lattice of the electrode material.

They may be transported under these entries provided:

a) each cell or battery is of the type proved to meet the requirements of applicable tests of the UN *Manual of Tests and Criteria*, Part III, subsection 38.3;

b) each cell and battery incorporates a safety venting device or is designed to preclude a violent rupture under conditions normally encountered during transport;

c) each cell and battery is equipped with an effective means of preventing external short circuits;

d) each battery containing cells or a series of cells connected in parallel is equipped with effective means as necessary to prevent dangerous reverse current flow (e.g. diodes, fuses, etc.);

e) cells and batteries are manufactured under a quality management program as prescribed under 9.3 e) 1 to 9;

f) manufacturers and subsequent distributors of cells or batteries make available the test summary as specified in the UN *Manual of Tests and Criteria*, Part III, subsection 38.3, paragraph 38.3.5.

Note.— The term "make available" means that manufacturers and subsequent distributors ensure that the test summary for sodium ion cells or batteries or equipment with installed sodium ion cells or batteries is accessible so that the shipper or other persons in the supply chain can confirm compliance.

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Part 3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND EXCEPTED QUANTITIES

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Chapter 2

ARRANGEMENT OF THE DANGEROUS GOODS LIST (TABLE 3-1)

. . .

2.1 ARRANGEMENT OF THE DANGEROUS GOODS LIST (TABLE 3-1)

2.1.1 The Dangerous Goods List (Table 3-1) is divided into 13 columns as follows:

UN harmonization amendments

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

UN Model Regulations, Chapter 3, 3.2.1 (see ST/SG/AC.10/50/Add.1)

Column 8 "UN packing group" — this column contains the UN packing group number (i.e. I, II or III) assigned to the ~~article or~~ substance. If more than one packing group is indicated for the entry, the packing group of the substance or formulation to be transported should be determined, based on its properties, through application of the hazard grouping criteria as provided in Part 2.

. . .

Table 3-1. Dangerous Goods List

Name	*UN No.*	*Class or division*	*Sub-sidiary hazard*	*Labels*	*State varia-tions*	*Special provi-sions*	*UN packing group*	*Excepted quantity*	*Passenger and cargo aircraft*		*Cargo aircraft only*	
									Packing instruction	*Max. net quantity per package*	*Packing instruction*	*Max. net quantity per package*
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*

UN harmonization amendments

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

Aircraft hydraulic power unit fuel tank (containing a mixture of anhydrous hydrazine and methyl hydrazine) (M86 fuel)	3165	3	6.1 8	Liquid flammable & Toxic & Corrosive	AU 1 CA 7 IR 3 NL 1 US 3	A1 A48	~~I~~	E0	FORBIDDEN		372	42 L

Name	UN No.	Class or division	Sub-sidiary hazard	Labels	State varia-tions	Special provi-sions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Aluminium borohydride in devices	2870	4.2	4.3				~~I~~		FORBIDDEN		FORBIDDEN	

UN Model Regulations, Chapter 2.0, 2.0.5.2 (see ST/SG/AC.10/50/Add.1):

Articles containing corrosive substance, n.o.s.*	3547	8	See 2;0.6			A2 A88			FORBIDDEN		FORBIDDEN	
Articles containing flammable gas, n.o.s.*	3537	2.1	See 2;0.6			A2 A88			FORBIDDEN		FORBIDDEN	
Articles containing flammable liquid, n.o.s.*	3540	3	See 2;0.6			A2 A88			FORBIDDEN		FORBIDDEN	
Articles containing flammable solid, n.o.s.*	3541	4.1	See 2;0.6			A2 A88			FORBIDDEN		FORBIDDEN	
Articles containing miscellaneous dangerous goods, n.o.s.*	3548	9	See 2;0.6			A2 A88 A224			FORBIDDEN		FORBIDDEN	
Articles containing non-flammable, non toxic gas, n.o.s.*	3538	2.2	See 2;0.6			A2 A88 A225			FORBIDDEN		FORBIDDEN	
Articles containing toxic substance, n.o.s.*	3546	6.1	See 2;0.6			A2 A88			FORBIDDEN		FORBIDDEN	

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

Batteries, containing metallic sodium or sodium alloy †	3292	4.3		Danger if wet		A94 A183 A228		E0	FORBIDDEN		492	No limit
Batteries, wet, filled with alkali, electric storage †	2795	8		Corrosive		A51 A164 A183 A228		E0	870	30 kg	870	400 kg
Bombs, smoke, non-explosive with corrosive liquid, without initiating device	2028	8		Corrosive			~~II~~	E0	FORBIDDEN		866	50 kg
Butadienes and hydrocarbon mixture, stabilized, containing more than ~~40%~~ 20% butadienes	1010	2.1		Gas flammable	AU 1 CA 7 IR 3 NL 1 US 3	A1 A209 A229		E0	FORBIDDEN		200	150 kg

Name	UN No.	Class or division	Sub-sidiary hazard	Labels	State varia-tions	Special provi-sions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Amendments to battery provisions												
Paragraph 4.2.2.2 of DGP-WG/23 report:												
Cells, containing metallic sodium or sodium alloy †	3292	4.3		Danger if wet		A94 A183 A228		E0	492	25 kg	492	400 kg
UN harmonization amendments												
Paragraph 4.1.2.1.4 of DGP-WG/23 report:												
UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):												
Detonators, electric for blasting †	0030	1.1B				A226			FORBIDDEN		FORBIDDEN	
Detonators, electric for blasting †	0255	1.4B		Explosive 1.4		A226		E0	FORBIDDEN		131	75 kg
Detonators, electric for blasting †	0456	1.4S		Explosive 1.4		A165 A226		E0	131	25 kg	131	100 kg
Detonators, electronic programmable for blasting †	0511	1.1B				A226		E0	FORBIDDEN		FORBIDDEN	
Detonators, electronic programmable for blasting †	0512	1.4B		Explosive 1.4		A226		E0	FORBIDDEN		131	75 kg
Detonators, electronic programmable for blasting †	0513	1.4S		Explosive 1.4		A165 A226		E0	131	25 kg	131	100 kg
Disilane	3553	2.1						E0	FORBIDDEN		FORBIDDEN	
Amendments to facilitate transport												
Paragraph 4.3.2 of DGP-WG/22 report:												
Engine, internal combustion	3530	9		Miscellaneous		A70 A87 A154 A208		E0	972	No limit	972	No limit

Name	UN No.	Class or division	Sub-sidiary hazard	Labels	State varia-tions	Special provi-sions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Machinery, internal combustion	3530	9		Miscellaneous		A70 A87 A154 A208		E0	972	No limit	972	No limit

UN harmonization amendments

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

Fire suppressant dispersing devices†	0514	1.4S		Explosive 1.4		A232		E0	135	25 kg	135	100 kg
Fire suppressant dispersing devices †	3559	9		Miscellaneous		A232		E0	961	25 kg	961	100 kg
Gallium contained in manufactured articles	3554	8		Corrosive		A48 A69		E0	869	No limit	869	No limit
Isosorbide dinitrate mixture with not less than 60% lactose, mannose, starch or calcium hydrogen phosphate	2907	4.1		Solid flammable	BE 3	A40 A49	II	E0	445	15 kg	448	50 kg

UN harmonization amendments

and

Amendments to battery provisions

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

Lithium ion batteries (including lithium ion polymer batteries)	3480	9		Miscellaneous — Lithium or sodium ion batteries	US 3	A88 A99 A154 A164 A183 A201 A213		E0	FORBIDDEN		See 965	

Name	UN No.	Class or division	Sub-sidiary hazard	Labels	State varia-tions	Special provi-sions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Lithium ion batteries contained in equipment (including lithium ionpolymer batteries)	3481	9		Miscellaneous — Lithium or sodium ion batteries	US 3	A48 A88 A99 A154 A164 A181 A185 A213 A220		E0	967	5 kg	967	35 kg
Lithium ion batteries packed with equipment (including lithium ion polymer batteries)	3481	9		Miscellaneous — Lithium or sodium ion batteries	US 3	A88 A99 A154 A164 A181 A185 A213		E0	966	5 kg	966	35 kq
Lithium metal batteries (including lithium alloy batteries) †	3090	9		Miscellaneous — Lithium or sodium ion batteries	US 2 US 3	A88 A99 A154 A164 A183 A201 A213		E0	FORBIDDEN		See 968	
Lithium metal batteries contained in equipment (including lithium alloy batteries) †	3091	9		Miscellaneous — Lithium or sodium ion batteries	US 2 US 3	A48 A88 A99 A154 A164 A181 A185 A213 A220		E0	970	5 kg	970	35 kg
Lithium metal batteries packed with equipment (including lithium alloy batteries) †	3091	9		Miscellaneous — Lithium or sodium ion batteries	US 2 US 3	A88 A99 A154 A164 A181 A185 A213		E0	969	5 kg	969	35 kg

UN harmonization amendments

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

Nitrocellulose membrane filters with not more than 12.6% nitrogen, by dry mass	3270	4.1		Solid flammable		A73 A122 A230	II	E2	458 Y458	1 kg 1 kg	458	15 kg

Name	UN No.	Class or division	Sub-sidiary hazard	Labels	State varia-tions	Special provi-sions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
Nitrocellulose solution, flammable with not more than 12.6% nitrogen, by dry mass, and not more than 55% nitrocellulose	2059	3		Liquid flammable	BE 3	A3 A40 A91	I II III	E0 E0 E0	351 353 Y341 355 Y344	1 L 5 L 1 L 60 L 10 L	361 364 366	30 L 60 L 220 L
Nitrocellulose with alcohol, not less than 25% alcohol, by mass, and not more than 12.6% nitrogen, by dry mass	2556	4.1		Solid flammable	BE 3	A40 A217	II	E0	452	1 kg	453	15 kg
Nitrocellulose with water, not less than 25% water by mass	2555	4.1		Solid flammable	BE 3	A40 A217	II	E0	452	15 kg	453	50 kg
Nitroglycerin mixture, desensitized, liquid, n.o.s.* with not more than 30% nitroglycerin, by mass	3357	3			BE 3	A40 A17	II		FORBIDDEN		FORBIDDEN	
Nitroglycerin mixture, desensitized, liquid flammable, n.o.s.* with not more than 30% nitroglycerin, by mass	3343	3			BE 3	A40			FORBIDDEN		FORBIDDEN	
Nitroglycerin mixture, desensitized, solid, n.o.s.* with more than 2% but not more than 10% nitroglycerin, by mass	3319	4.1		Solid flammable	AU 1 BE 3 CA 7 IR 3 NL 1 US 3	A1 A40 A68	II	E0	FORBIDDEN		499	0.5 kg
Nitroglycerin solution in alcohol with more than 1% but not more than 5% nitroglycerin	3064	3		Liquid flammable	BE 3	A40 A188	II	E0	FORBIDDEN		371	5 L
Nitroglycerin solution in alcohol with not more than 1% nitroglycerin	1204	3				A40	II	E0	371 Y341	5 L 1 L	371	60 L
Pentaerythrite tetranitrate mixture desensitized, solid, n.o.s.* with more than 10% but not more than 20% PETN, by mass	3344	4.1			BE 3	A40	II		FORBIDDEN		FORBIDDEN	
Pentaerythritol tetranitrate mixture desensitized, solid, n.o.s.* with more than 10% but not more than 20% PETN, by mass	3344	4.1			BE 3	A40	II		FORBIDDEN		FORBIDDEN	

Name	UN No.	Class or division	Sub-sidiary hazard	Labels	State varia-tions	Special provi-sions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
PETN mixture desensitized, solid, n.o.s.* with more than 10% but not more than 20% PETN, by mass	3344	4.1			BE 3	A40	II		FORBIDDEN		FORBIDDEN	

UN harmonization amendments

and

Amendments to battery provisions

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

Sodium ion batteries with organic electrolyte	3551	9		Miscellaneous — Lithium or sodium ion batteries		A88 A99 A154 A164 A183 [A201] A227 A228		E0	FORBIDDEN		See 976	
Sodium ion batteries contained in equipment with organic electrolyte	3552	9		Miscellaneous — Lithium or sodium ion batteries		A48 A88 A99 A154 A164 A185 A227 A228		E0	97Y	5 kg	97Y	35 kg
Sodium ion batteries packed with equipment with organic electrolyte	3552	9		Miscellaneous — Lithium or sodium ion batteries		A48 A88 A99 A154 A164 A185 A227 A228		E0	97Y	5 kg	97Y	35 kg

UN harmonization amendments

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

Tetramethylammonium hydroxide, solid	3423	~~8~~6.1	8	Toxic & Corrosive		A113 A234	~~II~~I	~~E2~~E5	~~859~~ ~~Y844~~655	~~15 kg~~ ~~5 kg~~1 kg	~~863~~672	~~50 kg~~15 kg

Name	UN No.	Class or division	Sub-sidiary hazard	Labels	State varia-tions	Special provi-sions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
Tetramethylammonium hydroxide aqueous solution with not less than 25% tetramethylammonium hydroxide	3560	6.1	8	Toxic & Corrosive		A113 A233 A234	I	E5	651	0.5 L	657	2.5 L
Tetramethylammonium hydroxide aqueous solution with more than 2.5% but less than 25% tetramethylammonium hydroxide	1835	8	6.1	Corrosive & Toxic		~~A3~~A113 A233 A234	II ~~III~~	E2 ~~E1~~	851 Y840 ~~852~~ ~~Y841~~	1 L 0.5 L ~~5 L~~ ~~1 L~~	855 ~~856~~	30 L ~~60 L~~
Tetramethylammonium hydroxide aqueous solution with not more than 2.5% tetramethylammonium hydroxide	1835	8		Corrosive		A3 A233 A234	III	E1	852 Y841	5 L 1 L	856	60 L
Trifluoromethyltetrazole sodium salt in acetone with not less than 68% acetone, by mass	3555	3		Liquid flammable		A40	II	E0	FORBIDDEN		FORBIDDEN	

UN harmonization amendments

and

Amendments to battery provisions

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

Vehicle, lithium ion battery powered	3556	9		Miscellaneous — Lithium or sodium ion batteries		A87 A118 A120 A154 A164 A214		E0	**952**	No limit	952	No limit
Vehicle, lithium metal battery powered	3557	9		Miscellaneous — Lithium or sodium ion batteries		A87 A118 A120 A154 A164 A214		E0	**952**	No limit	952	No limit

Name	UN No.	Class or division	Sub-sidiary hazard	Labels	State varia-tions	Special provi-sions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Vehicle, sodium ion battery powered	3558	9		Miscellaneous — Lithium or sodium ion batteries		A87 A118 A120 A154 A164 A214 A231		E0	**952**	No limit	952	No limit

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Amendments to the Chinese version of Table 3-1 only:

UN harmonization amendments

Table 3-1. Dangerous Goods List

Paragraph 4.1.2.2 of DGP-WG/22 report:

Name	*UN No.*	*Class or division*	*Subsidiary risk*	*Labels*	*State variations*	*Special provisions*	*UN packing group*	*Excepted quantity*	*Passenger aircraft*		*Cargo aircraft*	
									Packing instruction	*Max. net quantity per package*	*Packing instruction*	*Max. net quantity per package*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Guanyl nitrosaminoguanylidene hydrazine, wetted with not less than 30% water, by mass **胍基·亚硝氨亚胍基肼, 湿的,** 按质量计, 含水不低于30%	0113	1.1A							FORBIDDEN 禁运		FORBIDDEN 禁运	
Ethyl methyl ketone ~~乙基·甲基~~甲乙酮	1193	3		Liquid flammable 易燃液体			II	E2	353 Y341	5 L 1 L	364	60 L
Hydrogen cyanide, aqueous solution with not more than 20% hydrogen cyanide *or* **Hydrocyanic acid, aqueous solution** with not more than 20% hydrogen cyanide ~~氢氰酸~~氰化氢水溶液, 含氢化氰不超过20% 或 氢氰酸水溶液, 含氢化氰不超过20%	1613	6.1							FORBIDDEN 禁运		FORBIDDEN 禁运	
Calcium hydrosulphite ~~连二~~亚硫酸~~氢~~钙	1923	4.2		Spontaneous combustion 自燃物质			II	E2	467	15 kg	470	50 kg
Dibromodifluoromethane ~~丙酸丁酯~~二溴二氟甲烷	1941	9		Miscellaneous 杂项危险物品			III	E1	964	100 L	964	220 L

Name	*UN No.*	*Class or division*	*Subsidiary risk*	*Labels*	*State variations*	*Special provisions*	*UN packing group*	*Excepted quantity*	*Passenger aircraft*		*Cargo aircraft*	
									Packing instruction	*Max. net quantity per package*	*Packing instruction*	*Max. net quantity per package*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Pentane-2, 4-dione 戊-**2, 4-**戊二酮	2310	3	6.1	Liquid flammable & Toxic 易燃液体和毒性物质			III	E1	355 Y343	60 L 2 L	366	220 L
Adsorbed gas, toxic, flammable, n.o.s.* 吸附气体, 毒性, 易燃，未另作规定的*	3514	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2		E0	FORBIDDEN 禁运		FORBIDDEN 禁运	
Adsorbed gas, toxic, flammable, corrosive, n.o.s.* 吸附气体, 毒性, 易燃, 腐蚀性，未另作规定的*	3517	2.3	2.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2		E0	FORBIDDEN 禁运		FORBIDDEN 禁运	
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Chapter 3

SPECIAL PROVISIONS

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Table 3-2. Special provisions

TIs	*UN*	

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UN harmonization amendments

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

UN Model Regulations, Chapter 3.3, SP 28 (see ST/SG/AC.10/50/Add.1):

A40	(28)	This substance may be transported under provisions of Class 3 or Division 4.1 only if it is so packed that the percentage of diluent will not fall below that stated at any time during transport (see 2;3.1.4 and 2;4.2.4). In cases where the diluent is not stated, the substance must be packed so that the amount of explosive substance does not exceed the stated value.

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Consequential amendment, changes adopted in UN Model Regulations, Chapter 3.3, SP 365 and 366

A69	The following are not subject to these Instructions when carried as cargo: a) articles other than lamps, such as thermometers, switches and relays, each containing a total quantity of not more than 15 g of mercury or gallium, if they are installed as an integral part of a machine or apparatus and so fitted that shock or impact damage, leading to leakage of mercury or gallium, is unlikely to occur under normal conditions of transport. b) articles other than lamps, each containing not more than 100 mg of mercury, gallium or inert gas and packaged so that the quantity of mercury, gallium or inert gas per package is 1 g or less. The words “not restricted” and the special provision number A69 must be provided on the air waybill when an air waybill is issued. *Note.— For lamps containing dangerous goods, see Part 1;2.6.*

TIs *UN*

Amendments to facilitate transport or State oversight

Paragraph 4.3.2 of DGP-WG/22 report:

A70 Internal combustion or fuel cell engines or machinery being shipped either separately or incorporated into a vehicle, machine or other apparatus, without batteries or other dangerous goods, are not subject to these Instructions when carried as cargo provided that:

a) for ~~flammable~~ liquid fuel powered engines:

1) the engine is powered by a liquid fuel that does not meet the classification criteria for any class or division; or

2) the fuel tank of the vehicle, machine or other apparatus has never contained any fuel or the fuel tank has been flushed and purged of vapours and adequate measures taken to nullify the hazard; and

3) the entire fuel system of the engine has no free liquid and all fuel lines are sealed or capped or securely connected to the engine and vehicle, machinery or apparatus.

b) for flammable gas powered internal combustion or fuel cell engines:

1) the entire fuel system must have been flushed, purged and filled with a non-flammable gas or fluid to nullify the hazard;

2) the final pressure of the non-flammable gas used to fill the system does not exceed 200 kPa at 20°C;

3) the shipper has made prior arrangements with the operator; and

4) the shipper has provided the operator with written or electronic documentation stating that the flushing, purging and filling procedure has been followed and that the final contents of the engine(s) have been tested and verified to be non-flammable.

Multiple engines may be shipped in a unit load device provided that the shipper has made prior arrangements with the operator(s) for each shipment.

When this special provision is used, the words “not restricted” and the special provision number A70 must be provided on the air waybill when an air waybill is issued.

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UN harmonization amendments

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Amendments to battery provisions

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

Consequential amendment, changes adopted in UN Model Regulations, Chapter 3.3, SP 310

A88 Pre-production prototypes of lithium batteries or cells or sodium ion cells or batteries, when these prototypes are transported for testing, or low production runs (i.e. annual production runs consisting of not more than 100 lithium batteries or cells or sodium ion cells or batteries) of lithium batteries or cells or sodium ion cells or batteries that have not been tested to the requirements in Part III, 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 State of the Operator and the requirements in Packing Instruction 910 of the Supplement are met.

TIs *UN*

A copy of the document of approval including the quantity limitations must accompany the consignment. Transport in accordance with this special provision must be noted on the dangerous goods transport document.

Irrespective of the limit specified in column 13 of Table 3-1, the cell or battery as prepared for transport may have a mass exceeding 35 kg.

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Consequential amendment, changes adopted in UN Model Regulations, Chapter 3.3, SP 310

A99 Irrespective of the quantity limits for cargo aircraft specified in column 13 of Table 3-1, and in Section I of Packing Instructions 965, 966, 967, 968, 969 and 970, a lithium or sodium ion cell or battery (i.e. UN 3090, ~~or~~ UN 3480 or UN 3551), including when packed with equipment or contained in equipment (i.e. UN 3091, ~~or~~ UN 3481 or UN 3552) that meets the other requirements of Section I of the applicable packing instruction, may have a mass exceeding 35 kg, if approved by the appropriate authority of the State of Origin and the State of the Operator and the requirements in Packing Instruction 974 of the Supplement are met.

A copy of the document of approval must accompany the consignment. Transport in accordance with this special provision must be noted on the dangerous goods transport document.

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Amendments to facilitate transport or State oversight

Paragraph 4.3.2 of DGP-WG/23 report:

A107 (≈301) This entry only applies to articles such as machinery, apparatus or devices containing dangerous goods as a residue or as an integral element of the articles. It must not be used for articles for which a proper shipping name already exists in Table 3-1.

Where the quantity of dangerous goods ~~contained as an integral element in articles~~ exceeds the limits permitted by Packing Instruction 962, and the dangerous goods meet the provisions of Special Provision 301 of the UN Model Regulations, the articles may be transported only with the prior approval of the appropriate authority of the State of Origin and the State of the Operator under the written conditions established by those authorities.

Notwithstanding the quantities specified in Packing Instruction 962, articles may also contain up to 5 kg of UN 3077 — **Environmentally hazardous substance, solid, n.o.s**. and/or 5 L of UN 3082 — **Environmentally hazardous substance, liquid, n.o.s**. The quantity of environmentally hazardous substance must not be indicated on the dangerous goods transport document.

Articles containing only UN 3077 — **Environmentally hazardous substance, solid, n.o.s**. and/or UN 3082 — **Environmentally hazardous substance, liquid, n.o.s**. in quantities not exceeding 5 L or 5 kg are not subject to these Instructions.

Note.— ~~This special provision is assigned to UN 3363 — Dangerous goods in articles, Dangerous goods in machinery and Dangerous goods in apparatus. The same requirements of these Instructions apply to each of these items.~~ Where the quantity of dangerous goods in the article exceeds the quantity permitted by Special Provision 301 of the UN Model Regulations, or the dangerous goods are not permitted as limited quantity by the UN Model Regulations, classification of the article must be in accordance with Part 2, Introductory Chapter, 6.1 to 6.6.

TIs *UN*

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UN harmonization amendments

Paragraph 4.1.2.1.4 of DGP-WG/23 report:

UN Model Regulations, Chapter 3.3, SP 280 (see ST/SG/AC.10/50/Add.1):

A115 (280) This entry applies to safety devices for vehicles, vessels or aircraft, e.g. air bag inflators, air bag modules, seat belt pretensioners, and pyromechanical devices and which contain dangerous goods of Class 1 or dangerous goods of other classes and when transported as component parts and if these articles as presented for transport have been tested in accordance with test series 6 (c) of Part I of the UN *Manual of Tests and Criteria*, with no explosion of the device, no fragmentation of the device casing or pressure receptacle, and no projection hazard or thermal effect which would significantly hinder firefighting or other emergency response efforts in the immediate vicinity.

This entry does not apply to life saving appliances described in Packing Instruction 955 (UN Nos. 2990 and 3072) or to fire suppressant dispersing devices (UN Nos. 0514 and 3559).

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Amendments to battery provisions

Paragraph 4.3.4 of DGP-WG/22 report:

A123 This entry applies to Batteries, electric storage, not otherwise listed in Table 3-1. Examples of such batteries are: alkali-manganese, zinc-carbon and nickel-cadmium batteries. Any electrical battery or battery-powered device, equipment or vehicle having the potential of a dangerous evolution of heat must be prepared for transport so as to prevent:

a) a short circuit (e.g. in the case of batteries, by the effective insulation of exposed terminals; or, in the case of equipment, by disconnection of the battery and protection of exposed terminals); and

b) unintentional activation.

The words “not restricted” and the special provision number A123 must be provided on the air waybill when an air waybill is issued.

Devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be transported when intentionally active. When active, these devices must meet defined standards for electromagnetic radiation to ensure that the operation of the device does not interfere with aircraft systems. The devices must not be capable of emitting disturbing signals (such as buzzing alarms, strobe lights, etc.) during transport.

UN harmonization amendments

Paragraph 4.1.2.1.4 of DGP-WG/22 report:

UN Model Regulations, Chapter 3.3, SP 252 (see ST/SG/AC.10/50/Add.1):

A129 (252) ~~Provided the ammonium nitrate remains in solution under all conditions of transport, aqueous solutions of ammonium nitrate, with not more than 0.2 per cent combustible material, in a concentration not exceeding 80 per cent are not subject to these Instructions when carried as cargo.~~Ammonium nitrate hot concentrated solutions can be transported under this entry provided:

a) the solution contains not more than 93 per cent ammonium nitrate;

b) the solution contains at least 7 per cent water;

c) the solution contains not more than 0.2 per cent combustible material;

TIs *UN*

d) the solution contains no chlorine compounds in quantities such that the chloride ion level exceeds 0.02 per cent;

e) the pH of an aqueous solution of 10 per cent of the substance is between 5 and 7, measured at 25ºC; and

f) the maximum allowable transport temperature of the solution is 140ºC.

Ammonium nitrate hot concentrate solutions are not subject to these Instructions when carried as cargo, provided:

a) the solution contains not more than 80 per cent ammonium nitrate;

b) the solution contains not more than 0.2 per cent combustible material;

c) the ammonium nitrate remains in solution under all conditions of transport; and

d) the solution does not meet the criteria of any other class or division.

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UN Model Regulations, Chapter 3.3, SP 328 (see ST/SG/AC.10/50/Add.1):

A146 (328) This entry applies to fuel cell cartridges including when contained in equipment or packed with equipment. Fuel cell cartridges installed in or integral to a fuel cell system are regarded as contained in equipment. Fuel cell cartridge means an article that stores fuel for discharge into the fuel cell through a valve(s) that controls the discharge of fuel into the fuel cell. Fuel cell cartridges, including when contained in equipment, must be designed and constructed to prevent fuel leakage under normal conditions of transport.

Fuel cell cartridge design types using liquids as fuels must pass an internal pressure test at a pressure of 100 kPa (gauge) without leakage.

Except for fuel cell cartridges containing hydrogen in metal hydride which must be in compliance with A162, each fuel cell cartridge design type, including fuel cell cartridges installed in or integral to a fuel cell system, must be shown to pass a 1.2 metre drop test onto an unyielding surface in the orientation most likely to result in failure of the containment system with no loss of contents.

When lithium metal batteries, ~~or~~ lithium ion batteries or sodium ion batteries are contained in the fuel cell system, the consignment must be consigned under this entry and under the appropriate entries for UN 3091 **Lithium metal batteries contained in equipment**, ~~or~~ UN 3481 **Lithium ion batteries contained in equipment** or UN 3552 **Sodium ion batteries contained in equipment**.

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UN harmonization amendments

and

Amendments to battery provisions

UN Model Regulations, Chapter 3.3, SP 376 (see ST/SG/AC.10/50/Add.1):

A154 (≈376) Lithium ion ~~cells or batteries and~~, lithium metal or sodium ion cells or batteries, identified as being defective for safety reasons, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons or cells or batteries that cannot be diagnosed as defective prior to transport).

Lithium ion ~~cells or batteries and~~, lithium metal or sodium ion cells or batteries identified as being damaged such that they do not conform to the type tested according to the applicable provisions of the UN *Manual of Tests and Criteria* are forbidden for transport. For the purposes of this special provision, these may include, but are not limited to:

a) cells or batteries that have leaked or vented;

b) cells or batteries that cannot be diagnosed prior to transport; or

TIs *UN*

c) cells or batteries that have sustained physical or mechanical damage.

In assessing a cell or battery as defective or damaged, an assessment or evaluation must be performed based on safety criteria from the cell, battery or product manufacturer or by a technical expert with knowledge of the cell's or battery's safety features. An assessment or evaluation may include, but is not limited to, the following criteria:

a) acute hazard, such as gas, fire, or electrolyte leaking;

b) the use or misuse of the cell or battery;

c) signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;

d) external and internal short circuit protection, such as voltage or isolation measures;

e) the condition of the cell or battery safety features; or

f) damage to any internal safety components, such as the battery management system.

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UN Model Regulations, Chapter 3.3, SP 360 (see ST/SG/AC.10/50/Add.1):

A185 (360) Vehicles only powered by lithium metal ~~batteries or~~, lithium ion or sodium ion batteries must be assigned to ~~UN 3171 **Battery-powered vehicle**~~ UN 3556 **Vehicle, lithium ion battery powered** or UN 3557 **Vehicle, lithium metal battery powered** or UN 3558 **Vehicle, sodium ion battery powered**, as applicable.

Lithium batteries installed in cargo transport units, designed only to provide power external to the transport unit must be assigned to UN 3536 **Lithium batteries installed in cargo transport unit**.

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Amendments to facilitate transport or State oversight

Paragraph 4.3.1 of DGP-WG/23 report:

A190 (373) Neutron radiation detectors containing non-pressurized boron trifluoride gas may be transported under this entry provided that:

a) radiation detectors containing in excess of 1 gram of boron trifluoride and radiation detection systems containing neutron radiation detectors as components may be transported on cargo aircraft in accordance with all applicable requirements of these Instructions irrespective of the indication of "forbidden" in columns 12 and 13 of Table 3-1 ~~and with "Toxic gas" and "Corrosive" labels displayed on each package irrespective of no labels being indicated in column 5~~, provided the following conditions are met:

~~a~~i) each radiation detector must meet the following conditions:

~~i~~1) the pressure in each neutron radiation detector must not exceed 105 kPa absolute at 20°C;

~~ii~~2) the amount of gas must not exceed 13 grams per detector;

~~iii~~3) each detector must be manufactured under a registered quality assurance programme;

Note.— The application of ISO 9001:2008 may be considered acceptable for this purpose.

~~iv~~4) each neutron radiation detector must be of welded metal construction with brazed metal to ceramic feed through assemblies. These detectors must have a minimum burst pressure of 1 800 kPa as demonstrated by design type qualification testing; and

~~v~~5) each detector must be tested to a 1 x 10^{-10} cm^3/s leaktightness standard before filling.

TIs *UN*

~~b~~ii) radiation detectors transported as individual components must be transported as follows:

~~i~~1) they must be packed in a sealed intermediate plastic liner with sufficient absorbent or adsorbent material to absorb or adsorb the entire gas contents;

~~ii~~2) they must be packed in strong outer packagings and the completed package must be capable of withstanding a 1.8 m drop test without leakage of gas contents from detectors; and

~~iii~~3) the total amount of gas from all detectors per outer packaging must not exceed 52 grams.

~~c~~iii) completed neutron radiation detector systems containing detectors meeting the conditions of sub-paragraph ~~a~~i) must be transported as follows:

~~i~~1) the detectors must be contained in a strong sealed outer casing;

~~ii~~2) the casing must contain sufficient absorbent or adsorbent material to absorb or adsorb the entire gas contents; and

~~iii~~3) the completed system must be packed in strong outer packagings capable of withstanding a 1.8 m drop test without leakage unless a system's outer casing affords equivalent protection.

iv) each package must bear a "Toxic gas" and "Corrosive" hazard label irrespective of no labels being indicated in column 5;

v) ~~T~~transport in accordance with this special provision must be noted on the dangerous goods transport document. A packing instruction must not be shown on the transport document.

If the above conditions are met, the requirements of Special Provision A2 do not apply.

b) ~~When transported as cargo,~~ neutron radiation detectors containing not more than 1 gram of boron trifluoride, including those with solder glass joints, and radiation detection systems containing such detectors are not subject to these Instructions when carried as cargo, provided ~~they~~ the following conditions are met:

i) each radiation detector must meet the requirements in sub-paragraph a) i) and ~~are~~ be packed in accordance with sub-paragraph ~~b)~~ a) ii) ~~irrespective of the indication of "forbidden" in columns 10 to 13.~~;

ii) ~~R~~radiation detection systems containing such detectors ~~are not subject to these Instructions provided they are~~ must be packed in accordance with sub-paragraph ~~c)~~ a) iii) ~~.~~; and

iii ~~T~~the words "not restricted" and the special provision number A190 must be provided on the air waybill when an air waybill is used.

If the above conditions are met, the requirements of Special Provision A2 do not apply.

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UN harmonization amendments

Paragraph 4.1.2.1.4 of DGP-WG/22 report:

UN Model Regulations, Chapter 3.3, SP 397 (see ST/SG/AC.10/50/Add.1):

A195 (371) 1) This entry also applies to articles containing a small pressure receptacle with a release device. Such articles must comply with the following requirements:

a) the water capacity of the pressure receptacle must not exceed 0.5 litres and the working pressure must not exceed 25 bar at 15°C;

b) the minimum burst pressure of the pressure receptacle must be at least four times the pressure of the gas at 15°C;

c) each article must be manufactured in such a way that unintentional firing or release is avoided under normal conditions of handling, packing, transport and use. This may be achieved by an additional locking device linked to the activator;

d) each article must be manufactured in such a way as to prevent hazardous projections of the pressure receptacle or parts of the pressure receptacle;

e) each pressure receptacle must be manufactured from material which will not fragment upon rupture;

f) the design type of the article must be subjected to a fire test. For this test, the provisions of paragraphs 16.6.1.2, except sub-paragraph g), 16.6.1.3.1 to 16.6.1.3.1.4, 16.6.1.3.6, 16.6.1.3.7 b) and 16.6.1.3.8 of the UN *Manual of Tests and Criteria* must be applied. It must be demonstrated that the article relieves its pressure by means of a fire degradable seal or other pressure relief device, in such a way that the pressure receptacle will not fragment and that the article or fragments of the article do not rocket more than 10 metres; and

g) the design type of the article must be subjected to the following test. A stimulating mechanism must be used to initiate one article in the middle of the packaging. There must be no hazardous effects outside the package such as disruption of the package, metal fragments or a receptacle which passes through the packaging.

2) The manufacturer must produce technical documentation of the design type, manufacture as well as the tests and their results. The manufacturer must apply procedures to ensure that articles produced in a series are made of good quality, conform to the design type and are able to meet the requirements in 1). The manufacturer must provide such information to the appropriate national authority on request.

Amendments to battery provisions

Paragraph 4.3.4 of DGP-WG/22 report:

A199 Nickel-metal hydride batteries or nickel-metal hydride battery-powered devices, equipment or vehicles having the potential of a dangerous evolution of heat are not subject to these Instructions provided they are prepared for transport so as to prevent:

a) a short circuit (e.g. in the case of batteries, by the effective insulation of exposed terminals, or, in the case of equipment, by disconnection of the battery and protection of exposed terminals); and

b) unintentional activation.

The words “not restricted” and the special provision number A199 must be provided on the air waybill when an air waybill is issued.

Devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be transported when intentionally active. When active, these devices must meet defined standards for electromagnetic radiation to ensure that the operation of the device does not interfere with aircraft systems. The devices must not be capable of emitting disturbing signals (such as buzzing alarms, strobe lights, etc.) during transport.

TIs *UN*

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UN harmonization amendments

and

Amendments to battery provisions

Paragraph 4.1.2.1.4 of DGP-WG/22 report:

UN Model Regulations, Chapter 3.3, SP 388 (see ST/SG/AC.10/50/Add.1):

A214 (388) UN No. 3166 entries apply to vehicles powered by flammable liquid or flammable gas internal combustion engines or fuel cells.

Vehicles powered by a fuel cell engine must be assigned to UN 3166 **Vehicle, fuel cell, flammable gas powered** or UN 3166 **Vehicle, fuel cell, flammable liquid powered**, as appropriate. These entries include hybrid electric vehicles powered by both a fuel cell and an internal combustion engine with wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries, transported with the battery(ies) installed.

Other vehicles which contain an internal combustion engine must be assigned to UN 3166 **Vehicle, flammable gas powered** or UN 3166 **Vehicle, flammable liquid powered**, as appropriate. These entries include hybrid electric vehicles powered by both an internal combustion engine and wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries, transported with the battery(ies) installed.

If a vehicle is powered by a flammable liquid and a flammable gas internal combustion engine, it must be assigned to UN 3166 **Vehicle, flammable gas powered**.

Entry UN 3171 only applies to vehicles powered by wet batteries, metallic sodium batteries or sodium alloy batteries, ~~lithium metal batteries or lithium ion batteries and equipment powered by wet batteries or sodium batteries~~ transported with these batteries installed.

UN 3556 **Vehicle, lithium ion battery powered**, UN 3557 **Vehicle, lithium metal battery powered** and UN 3558 **Vehicle, sodium ion battery powered**, as applicable, apply to vehicles powered by lithium ion, lithium metal or sodium ion batteries transported with the batteries installed.

For the purpose of this special provision, vehicles are self-propelled apparatus designed to carry one or more persons or goods. Examples of such vehicles are cars, motorcycles, scooters, three- and four-wheeled vehicles or motorcycles, trucks, locomotives, bicycles (pedal cycles with a motor) and other vehicles of this type (e.g. self-balancing vehicles or vehicles not equipped with at least one seating position), wheelchairs, lawn tractors, self-propelled farming and construction equipment, boats and aircraft. ~~This includes vehicles transported in a packaging. In this case some parts of the vehicle may be detached from its frame to fit into the packaging~~ When vehicles are transported in a packaging, some parts of the vehicle, other than the battery, may be detached from its frame to fit into the packaging.

Examples of equipment are lawnmowers, cleaning machines or model boats and model aircraft. Equipment powered by lithium metal batteries or lithium ion batteries must be assigned to UN 3091 **Lithium metal batteries contained in equipment** or UN 3091 **Lithium metal batteries packed with equipment** or UN 3481 **Lithium ion batteries contained in equipment** or UN 3481 **Lithium ion batteries packed with equipment**, as appropriate. Lithium ion batteries or lithium metal batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit must be assigned to UN 3536 **Lithium batteries installed in cargo transport unit**.

UN harmonization amendments

UN Model Regulations, Chapter 3.3, SP 399 (see ST/SG/AC.10/50/Add.1):

A226 (399) For articles that meet the definition for **Detonators, electronic** as described in Attachment 2 and assigned to UN Nos. 0511, 0512 and 0513, the entries for **Detonators, electric** (UN Nos. 0030, 0255 and 0456) may continue to be used until 30 June 2025.

TIs *UN*

UN harmonization amendments

and

Amendments to battery provisions

UN Model Regulations, Chapter 3.3, SP 400 (see ST/SG/AC.10/50/Add.1)
and
Paragraph 4.1.2.1.4.1 c) of DGP-WG/23 report:

A227 (400) [Sodium ion cells and batteries and sodium ion cells and batteries contained in or packed with equipment, prepared and offered for transport, are not subject to other provisions of these Instructions if they meet the following:

a) the cell or battery is short-circuited, in a way that the cell or battery does not contain electrical energy. The short-circuiting of the cell or battery must be easily verifiable (e.g. busbar between terminals);

b) each cell or battery meets the provisions of 2;9.4 a), b), d), e) and f);

c) each package must be marked according to 5;2.4.16;

d) except when cells or batteries are installed in equipment, each package must be capable of withstanding a 1.2 m drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery (or cell to cell) contact and without release of contents;

e) cells and batteries when installed in equipment must be protected from damage. When batteries are installed in equipment, the equipment must be packed in strong outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained;

f) each cell, including when it is a component of a battery, must only contain dangerous goods that are authorized to be transported in accordance with the provisions of 3;4.1.2, and the quantity of the dangerous goods in the cell must not exceed the quantity specified in Table 3-1, column 11 for the limited quantity packing instruction.]

Paragraph 4.1.2.1.4 of DGP-WG/22 report:

UN Model Regulations, Chapter 3.3, SP 401 (see ST/SG/AC.10/50/Add.1):

A228 (401) Sodium ion cells and batteries with organic electrolyte must be transported as UN 3551 or UN 3552 as appropriate. Sodium ion batteries with aqueous alkali electrolyte must be transported as UN 2795 **Batteries, wet, filled with alkali**, electric storage.

UN harmonization amendments

UN Model Regulations, Chapter 3.3, SP 402 (see ST/SG/AC.10/50/Add.1):

A229 (402) Substances transported under this entry must have a vapour pressure at 70°C not exceeding 1.1 MPa (11 bar) and a density at 50°C not lower than 0.525 kg/L.

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UN Model Regulations, Chapter 3.3, SP 403 (see ST/SG/AC.10/50/Add.1):

A230 (403) Nitrocellulose (NC) membrane filters covered by this entry with NC content not exceeding 53 g/m² and a NC net weight not exceeding 300 g per inner packaging, are not subject to the requirements of these Instructions if they meet the following conditions:

a) they are packed with paper separators of minimum 80 g/m² placed between each layer of NC membrane filters;

b) they are packed to maintain the alignment of the NC membrane filters and the paper separators in any of the following configurations:

1) rolls tightly wound and packed in plastic foil of minimum 80 g/m² or aluminium pouches with an oxygen permeability of equal or less than 0.1% according to standard ISO 15105-1:2007;

2) Sheets packed in cardboard of min. 250 g/m² or aluminium pouches with an oxygen permeability of equal or less than 0.1% according to standard ISO 15105-1:2007;

3) round filters packed in disc holders or cardboard packaging of minimum 250 g/m² or single packed in pouches of paper and plastic material of total minimum 100 g/m².

UN harmonization amendments

and

Amendments to battery provisions

UN Model Regulations, Chapter 3.3, SP 404 (see ST/SG/AC.10/50/Add.1):

A231 (404) Vehicles powered by sodium ion batteries, containing no other dangerous goods, are not subject to other provisions of these Instructions, if the battery is short-circuited, in a way that the battery does not contain electrical energy. The short-circuiting of the battery must be easily verifiable (e.g. busbar between terminals).

UN harmonization amendments

UN Model Regulations, Chapter 3.3, SP 406 (see ST/SG/AC.10/50/Add.1)
and
Paragraph 4.1.2.1.4.1 a) of DGP-WG/23 report):

~~[A23X (406) This entry may be transported in accordance with the limited quantity provisions of Chapter 3.4 when transported in pressure receptacles containing not more than 1 000 ml. The pressure receptacles shall meet the requirements of packing instruction P200 of 4.1.4.1 and have a test pressure capacity product not exceeding 15.2 MPa·L (152 bar·L). The pressure receptacles shall not be packed together with other dangerous goods.]~~

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Paragraph 4.1.2.1.4 of DGP-WG/22 report:

UN Model Regulations, Chapter 3.3, SP 407 (see ST/SG/AC.10/50/Add.1):

A232 (407) Fire suppressant dispersing devices are articles which contain a pyrotechnic substance, which are intended to disperse a fire extinguishing agent (or aerosol) when activated, and which do not contain any other dangerous goods. These articles, as packaged for transport, must fulfil the criteria for Division 1.4S, when tested in accordance with test series 6(c) of Section 16 of Part 1 of the UN *Manual of Tests and Criteria*. The device must be transported with either the means of activation removed or equipped with at least two independent means to prevent accidental activation.

Fire suppressant dispersing devices must only be assigned to Class 9, UN 3559 if the following additional conditions are met:

a) the device meets the exclusion criteria in 2;1.5.2.4 b), c) and d);

b) the suppressant must be deemed safe for normally occupied spaces in compliance with international or regional standards (e.g. NFPA2010);

c) the article must be packaged in a manner such that when activated, temperatures of the outside of the package must not exceed 200°C;

d) This entry must be used only with the approval of the appropriate national authority of the State of manufacture.

This entry does not apply to UN 3268 **Safety devices**, electrically initiated described in Special Provision A115.

UN Model Regulations, Chapter 3.3, SP 408 (see ST/SG/AC.10/50/Add.1):

A233 (408) This entry applies only to aqueous solutions comprised of water, tetramethylammonium hydroxide (TMAH), and no more than 1 per cent other constituents. Other formulations containing tetramethylammonium hydroxide must be assigned to an appropriate generic or n.o.s. entry (e.g. UN 2927, **Toxic liquid, corrosive, organic, n.o.s.**, etc.), except as follows:

a) Other formulations containing a surfactant in a concentration > 1% and with not less than 8.75% tetramethylammonium hydroxide must be assigned to UN 2927 **Toxic liquid, corrosive, organic, n.o.s.**, Packing Group I; and

b) Other formulations containing a surfactant in a concentration > 1% and with more than 2.38% but less than 8.75% tetramethylammonium hydroxide must be assigned to UN 2927, **Toxic liquid, corrosive, organic, n.o.s.**, Packing Group II.

UN Model Regulations, Chapter 3.3, SP 409 (see ST/SG/AC.10/50/Add.1)
and
Paragraph 4.1.2.1.4.1 f) of DGP-WG/23 report:

A234 (409) The provisions specified in Table 3-1 in the 2023-2024 Edition of these Instructions may continue to be applied until 31 December 2026.

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Part 4

PACKING INSTRUCTIONS

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Chapter 1

GENERAL PACKING REQUIREMENTS

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1.1.3 Compatibility requirements

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Amendments to facilitate transport or State oversight

Paragraph 4.3.6 of DGP-WG/22 report:

1.1.6 Packagings for which retention of liquid is a basic function must be capable of withstanding without leakage an internal pressure which produces a pressure differential of not less than 95 kPa (not less than 75 kPa for liquids in Packing Group III of Class 3, ~~or~~ Division 6.1 or Class 9), or a pressure related to the vapour pressure of the liquid to be conveyed, whichever is the greater. The pressure related to the vapour pressure must be determined as either:

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Chapter 4

CLASS 2 — GASES

4.1 SPECIAL PACKING PROVISIONS FOR DANGEROUS GOODS OF CLASS 2

4.1.1 General requirements

4.1.1.1 This section provides general requirements applicable to the use of cylinders and closed cryogenic receptacles for the transport of Class 2 gases (e.g. UN 1072 **Oxygen, compressed**). Cylinders and closed cryogenic receptacles must be constructed and closed so as to prevent any loss of contents which might be caused under normal conditions of transport, including by vibration, or by changes in temperature, humidity or pressure (resulting from change in altitude, for example).

UN harmonization amendments

Paragraph 4.1.2.1.5 of DGP-WG/23 report:

UN Model Regulations, Chapter 4.1, 4.1.6.1.2 (see ST/SG/AC.10/50/Add.1)

4.1.1.2 Parts of cylinders and closed cryogenic receptacles that are in direct contact with dangerous goods must not be affected or weakened by those dangerous goods and must not cause a dangerous effect (e.g. catalysing a reaction or reacting with the dangerous goods). In addition to the requirements specified in the relevant packing instruction, which take precedence, the applicable provisions of ISO ~~11114-1:2012 + A1:2017~~ 11114-1:2020 and ISO ~~11114-2:2013~~ 11114-2:2021 must be met.

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UN Model Regulations, Chapter 4.1, 4.1.6.1.8 (see ST/SG/AC.10/50/Add.1)

4.1.1.8 Valves must be designed and constructed in such a way that they are inherently able to withstand damage without release of the contents or must be protected from damage, which could cause inadvertent release of the contents of the cylinder and closed cryogenic receptacle, by one of the following methods:

a) Valves are placed inside the neck of the cylinder and closed cryogenic receptacle and protected by a threaded plug or cap;

b) Valves are protected by caps or guards. Caps must possess vent holes of a sufficient cross-sectional area to evacuate the gas if leakage occurs at the valves;

c) Valves are protected by shrouds or ~~guards~~ permanent protective attachments;

d) Not used; or

e) Cylinders and closed cryogenic receptacles are transported in an outer packaging. The packaging as prepared for transport must be capable of meeting the drop test specified in 6;4.3 at the Packing Group I performance level.

For cylinders and closed cryogenic receptacles with valves as described in b) ~~and c)~~, the requirements of ISO 11117:1998, ISO 11117:2008 + Cor 1:2009 or ISO 11117:2019 must be met~~:~~. Requirements for shrouds and permanent protective attachments used as valve protection under c) are given in the relevant pressure receptacle shell design standards, see 6;5.2.1.~~for~~ ~~v~~Valves with inherent protection used for refillable cylinders must meet~~,~~ the requirements of ~~Annex A~~ clause 4.6.2 of ISO 10297:2006~~, Annex A~~ or clause 5.5.2 of ISO 10297:2014 ~~or Annex A of ISO 1029~~ or clause 5.5.2 of ISO 10297:2014 + Amd 1:2017 ~~must be met. For cylinders and closed cryogenic receptacles with~~ or**,** in the case of self-closing valves**,** of clause 5.4.2 of ISO 17879:2017. For valves with inherent protection used for non-refillable cylinders, the requirements of ~~Annex A~~ clause 9.2.5 ~~of ISO 17879:2017 must be met For metal hydride storage systems, the valve protection requirements specified in ISO 16111:2008 or ISO 16111:2018~~ of ISO 11118**:**2015 or of clause 9.2.5 of ISO 11118:2015 + Amd 1:2019 must be met.

4.2 PACKING INSTRUCTIONS

Packing Instruction 200

For cylinders, the general packing requirements of 4;1.1 and 4;4.1.1 must be met.

Cylinders, constructed as specified in 6;5 are authorized for the transport of a specific substance when specified in the following tables (Table 1 and Table 2). Cylinders other than UN marked and certified cylinders may be used if the design, construction, testing, approval and marks conform to the requirements of the appropriate national authority in which they are approved and filled. The substances contained must be permitted in cylinders and permitted for air transport according to these Instructions. Cylinders for which prescribed periodic tests have become due must not be charged and offered for transport until such retests have been successfully completed. Valves must be suitably protected or must be designed and constructed in such a manner that they are able to withstand damage without leakage as specified in Annex B of ISO 10297:1999. Cylinders with capacities of one litre or less must be packaged in outer packaging constructed of suitable material of adequate strength and design in relation to the packaging capacity and its intended use, and secured or cushioned so as to prevent significant movement within the outer packaging during normal conditions of transport. For some substances, the special packing provisions may prohibit a particular type of cylinder. The following requirements must be met:

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UN Model Regulations, Chapter 4.1, 4.1.4.1, P200 (4) (see ST/SG/AC.10/50/Add.1)

5) The filling of cylinders must be carried out by qualified staff using appropriate equipment and procedures. The procedures should include checks of:

—a) the conformity of cylinders and accessories with these Instructions;
—b) their compatibility with the product to be transported;
—c) the absence of damage which might affect safety;
—d) compliance with the degree or pressure of filling, as appropriate;
—e) marks and identification.

These requirements are deemed to be met if the following standards are applied:

ISO 10691: 2004 Gas cylinders — Refillable welded steel cylinders for liquefied petroleum gas (LPG) — Procedures for checking before, during and after filling.
ISO 11372: 2011 Gas cylinders — Acetylene cylinders — Filling conditions and filling inspection
ISO 11755: 2005 Gas cylinders — Cylinder bundles for compressed and liquefied gases (excluding acetylene) — Inspection at time of filling
ISO 13088: 2011 +AMD. 1:2020 Gas cylinders — Acetylene cylinder bundles — Filling conditions and filling inspection
ISO 24431:2016 Gas cylinders — Seamless, welded and composite cylinders for compressed and liquefied gases (excluding acetylene) — Inspection at time of filling

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6) "Special packing provisions":

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Gas specific provisions:

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UN Model Regulations, Chapter 4.1, 4.1.4.1, P200 (5) (see ST/SG/AC.10/50/Add.1)

s) Aluminium alloy cylinders must be:

a) Equipped only with brass or stainless steel valves; and
b) Cleaned in accordance with ISO 11621:1997 and not contaminated with oil.

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Table 2. LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Class or Division	Subsidiary hazard	LC_{50} ml/m³	Cylinders	Test period, years	Test pressure, bar	Filling ratio	Special packing provisions
1001	**Acetylene, dissolved**	2.1			X	10	60 52		c, p
1009	**Bromotrifluoromethane (refrigerant gas R 13b1)**	2.2			X	10	42 120 250	1.13 1.44 1.60	
1010	**Butadienes, stabilized** (1,2-butadiene)	2.1			X	10	10	0.59	
1010	**Butadienes, stabilized** (1,3-butadiene)	2.1			X	10	10	0.55	z

UN Model Regulations, Chapter 4.1, 4.1.4.1, P200 Table 2 (see ST/SG/AC.10/50/Add.1)

1010	**Butadienes and hydrocarbon mixture, stabilized** containing more than ~~40%~~ 20% butadienes	2.1			X	10			v z

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Packing Instruction 202

This instruction applies to Class 2 refrigerated liquefied gases in open and closed cryogenic receptacles.

Requirements for closed cryogenic receptacles

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UN Model Regulations, Chapter 4.1, 4.1.4.1, P203 (5) (see ST/SG/AC.10/50/Add.1)

5) ~~Degree of f~~Filling

For non-flammable, non-toxic refrigerated liquefied gases, the volume of liquid phase at the filling temperature and at a pressure of 100 kPa (1 bar) must not exceed 98 per cent of the water capacity of the pressure receptacle.

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Requirements for open cryogenic receptacles

Open cryogenic receptacles must be constructed to meet the following requirements:

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UN Model Regulations, Chapter 4.1, 4.1.4.1, P203 (9) (see ST/SG/AC.10/50/Add.1)

9. Open cryogenic receptacles must bear the following marks permanently affixed, e.g. by stamping, engraving or etching:

—a) the manufacturer's name and address;
—b) the model number or name;
—c) the serial or batch number;
—d) the UN number and proper shipping name of gases for which the receptacle is intended;
—e) the capacity of the receptacle in litres.

Note.— The size of the mark must be as set out for cylinders in Part 6;5.2.7.1. Open cryogenic receptacles manufactured prior to 1 January 2012 are not required to be so marked.

10. Open cryogenic receptacles are permitted for nitrogen, argon, krypton, neon and xenon refrigerated liquids.

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Packing Instruction 218

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ADDITIONAL PACKING REQUIREMENTS

a) Cylinders must be so filled that at 50°C the non-gaseous phase does not exceed 95% of their water capacity, and they are not completely filled at 60°C. When filled, the internal pressure at 65°C must not exceed the test pressure of the cylinders. The vapour pressures and volumetric expansion of all substances in the cylinders must be taken into account.
b) Spray application equipment (such as a hose and wand assembly) must not be connected during transport.
c) The minimum test pressure must be in accordance with Packing Instruction 200 for the propellant but must not be less than 20 bar.

UN Model Regulations, Chapter 4.1, 4.1.4.1, P206 (PP89) (4) (see ST/SG/AC.10/50/Add.1)

d) Non-refillable cylinders used may have a water capacity in litres not exceeding 1 000 litres divided by the test pressure expressed in bars provided capacity and pressure restrictions of the construction standard comply with clause 1 of ISO 11118:~~1999~~2015 + Amd 1:2019, which limits the maximum capacity to 50 litres.
e) For liquids charged with a compressed gas, both components — the liquid and the compressed gas — have to be taken into consideration in the calculation of the internal pressure in the cylinder. When experimental data is not available, the following steps must be carried out:

   i) Calculation of the vapour pressure of the liquid and of the partial pressure of the compressed gas at 15°C (filling temperature);

   ii) Calculation of the volumetric expansion of the liquid phase resulting from the heating from 15°C to 65°C and calculation of the remaining volume for the gaseous phase;

   iii) Calculation of the partial pressure of the compressed gas at 65°C considering the volumetric expansion of the liquid phase;

   Note.— The compressibility factor of the compressed gas at 15°C and 65°C must be considered.

   iv) Calculation of the vapour pressure of the liquid at 65°C;

   v) Calculation of the total pressure, which is the sum of the vapour pressure of the liquid and the partial pressure of the compressed gas at 65°C;

   vi) Consideration of the solubility of the compressed gas at 65°C in the liquid phase.

   The test pressure of the cylinders must not be less than the calculated total pressure minus 100 kPa (1 bar).

   If the solubility of the compressed gas in the liquid phase is not known for the calculation, the test pressure can be calculated without taking the gas solubility (sub-paragraph vi)) into account.
f) For fire extinguishing agents assigned to UN 3500, the maximum test period for periodic inspection must be ten years.

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Packing Instruction 220

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Batteries

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

Amendments to manage aviation specific risks

Paragraph 4.2.2.3 of DGP-WG/22 report:

1) If spillable batteries are installed, and it is possible for the 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:

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) lithium batteries must meet the provisions of Part 2;9.3, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, 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 State of the Operator. A copy of the document of approval must accompany the consignment.

3) If sodium batteries are installed, they must conform to the requirements of Special Provision A94.

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Chapter 5

CLASS 3 — FLAMMABLE LIQUIDS

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UN harmonization amendments

Paragraph 4.1.2.1.5 of DGP-WG/23 report:

Packing Instruction 372

Cargo aircraft only for UN 3165 only

UN Model Regulations, Chapter 4.1, 4.1.4.1, P301 (see ST/SG/AC.10/50/Add.1)

General requirements

The requirements of Part 4~~, Chapter 1 requirements~~;1.1.1, 4;1.1.5; 4;1.1.8 and 4;1.1.10 must be met~~, including:~~.

1) **Compatibility requirements**

— Substances must be compatible with their packagings as required by 4;1.1.3.

~~2) **Closure requirements**~~

~~— Closures must meet the requirements of 4;1.1.4.~~

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Packing Instruction 378

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Batteries

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

Amendments to manage aviation specific risks

Paragraph 4.2.2.3 of DGP-WG/22 report:

1) If spillable batteries are installed, and it is possible for the 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:

i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

ii) lithium batteries must meet the provisions of Part 2;9.3, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, 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 State of the Operator. A copy of the document of approval must accompany the consignment.

3) If sodium batteries are installed, they must conform to the requirements of Special Provision A94.

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Chapter 6

CLASS 4 — FLAMMABLE SOLIDS; SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION; SUBSTANCES WHICH, IN CONTACT WITH WATER, EMIT FLAMMABLE GASES

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UN harmonization amendments

Paragraph 4.1.2.1 of DGP-WG/22 report:

Packing Instruction 451

Passenger and cargo aircraft — wetted explosives (Packing Group I)

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COMBINATION PACKAGINGS					SINGLE PACKAGINGS
UN number and proper shipping name	*Inner packaging (see 6;3.2)*	*Inner packaging quantity (per receptacle)*	*Total quantity per package — passenger*	*Total quantity per package — cargo*	
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UN 3474 **1-Hydroxybenzotriazole~~, anhydrous, wetted~~ monohydrate**	Glass Plastics	0.5 kg	0.5 kg	0.5 kg	No

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Paragraph 4.1.2.1.5 of DGP-WG/23 report:

Packing Instruction 492

Passenger and cargo aircraft for UN 3292 only

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

— Substances must be compatible with their packagings as required by 4;1.1.3.
— Metal packagings must be corrosion resistant or be protected against corrosion.

2) **Closure requirements**

— Closures must meet the requirements of 4;1.1.4.

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

UN number and proper shipping name		*Packing conditions*	*Total quantity per package — passenger*	*Total quantity per package — cargo*
UN 3292	**Batteries, containing metallic sodium or sodium alloy**	Batteries may be offered for transport and transported unpacked or in protective enclosures such as fully enclosed or wooden slatted crates that are not subject to the requirements of Part 6 of these Instructions.	Forbidden	No limit
UN 3292	**Cells, containing metallic sodium or sodium alloy**	There must be sufficient cushioning material to prevent contact between cells and between cells and the internal surfaces of the outer packaging and to ensure that no dangerous movement of the cells within the outer packaging occurs in transport.	25 kg	400 kg

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Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

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UN harmonization amendments

Paragraph 4.1.2.1.5.1 of DGP-WG/23 report:

Packing Instruction 650

This packing instruction applies to UN 3373.

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UN Model Regulations, Chapter 4.1, 4.1.4.1, P650 (6) (see ST/SG/AC.10/50/Add.1)

6) The completed package must be capable of ~~successfully passing the drop test in 6;6.5.3 as specified in 6;6.5.2 of the Instructions except that the height of the drop must not be less than 1.2 m. Following the appropriate drop sequence, there must be no~~ withstanding a 1.2 m drop in any orientation without leakage from the primary receptacle(s), which must remain protected by absorbent material, when required, in the secondary packaging.

Note.— Capability may be demonstrated by testing, assessment or experience.

7) For liquid substances:

a) The primary receptacle(s) must be leakproof and must not contain more than 1 litre;

b) The secondary packaging must be leakproof;

c) If multiple fragile primary receptacles are placed in a single secondary packaging, they must be either individually wrapped or separated to prevent contact between them;

d) Absorbent material must be placed between the primary receptacle(s) and the secondary packaging. The absorbent material must be in quantity sufficient to absorb the entire contents of the primary receptacle(s) so that any release of the liquid substance will not compromise the integrity of the cushioning material or of the outer packaging;

e) The primary receptacle or the secondary packaging must be capable of withstanding, without leakage, an internal pressure of 95 kPa (0.95 bar); and

UN Model Regulations, Chapter 4.1, 4.1.4.1, P650 (7) (see ST/SG/AC.10/50/Add.1)
and
Paragraph 4.1.2.1.5.1 of DGP-WG/23 report:

Note.— The capability of a packaging to withstand an internal pressure without leakage that produces the specified pressure differential should be determined by testing samples of primary receptacles or secondary packagings. Pressure differential is the difference between the pressure exerted on the inside of the receptacle or packaging and the pressure on the outside. The appropriate test method should be selected based on receptacle or packaging type. Acceptable test methods include any method that produces the required pressure differential between the inside and outside of a primary receptacle or a secondary packaging. The test may be conducted using internal hydraulic or pneumatic pressure (gauge) or external vacuum test methods. Internal hydraulic or pneumatic pressure can be applied in most cases as the required pressure differential can be achieved under most circumstances. An external vacuum test is not acceptable if the specified pressure differential is not achieved and maintained. The external vacuum test is a generally acceptable method for rigid receptacles and packagings but is not normally acceptable for:

— flexible receptacles and flexible packagings;
— receptacles and packagings filled and closed under an absolute atmospheric pressure lower than 95 kPa.

f) The outer packaging must not contain more than 4 litres. This quantity excludes ice, dry ice or liquid nitrogen when used to keep specimens cold.

~~*Note.— The capability of a packaging to withstand an internal pressure without leakage that produces the specified pressure differential should be determined by testing samples of primary receptacles or secondary packagings. Pressure differential is the difference between the pressure exerted on the inside of the receptacle or packaging and the pressure on the outside. The appropriate test method should be selected based on receptacle or packaging type. Acceptable test methods include any method that produces the required pressure differential between the inside and outside of a primary receptacle or a secondary packaging. The test may be conducted using internal hydraulic or pneumatic pressure (gauge) or external vacuum test methods. Internal hydraulic or pneumatic pressure can be applied in most cases as the required pressure differential can be achieved under most circumstances. An external vacuum test is not acceptable if the specified pressure differential is not achieved and maintained. The external vacuum test is a generally acceptable method for rigid receptacles and packagings but is not normally acceptable for:*~~

~~— *flexible receptacles and flexible packagings;*~~

~~— *receptacles and packagings filled and closed under an absolute atmospheric pressure lower than 95 kPa.*~~

8) For solid substances:

a) The primary receptacle(s) must be siftproof and must not exceed the outer packaging mass limit;

b) The secondary packaging must be siftproof;

c) If multiple fragile primary receptacles are placed in a single secondary packaging, they must be either individually wrapped or separated to prevent contact between them;

d) Except for packages containing body parts, organs or whole bodies, the outer packaging must not contain more than 4 kg. This quantity excludes ice, dry ice or liquid nitrogen when used to keep specimens cold; and

e) If there is any doubt as to whether or not residual liquid may be present in the primary receptacle during transport, then a packaging suitable for liquids, including absorbent materials, must be used.

9) Refrigerated or frozen specimens: ice, dry ice and liquid nitrogen:

a) When dry ice or liquid nitrogen is used to keep specimens cold, all applicable requirements of these Instructions must be met. When used, ice or dry ice must be placed outside the secondary packagings or in the outer packaging or an overpack. Interior supports must be provided to secure the secondary packagings in the original position after the ice or dry ice has dissipated. If ice is used, the outside packaging or overpack must be leakproof. If carbon dioxide, solid (dry ice) is used, the packaging must be designed and constructed to permit the release of carbon dioxide gas to prevent a build-up of pressure that could rupture the packagings; and

b) The primary receptacle and the secondary packaging must maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

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Chapter 10

CLASS 8 — CORROSIVE SUBSTANCES

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Packing Instruction 866

Cargo aircraft only for UN 2028 only

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

— Substances must be compatible with their packagings as required by 4;1.1.3.
— Metal packagings must be corrosion resistant or be protected against corrosion.

2) **Closure requirements**

— Closures must meet the requirements of 4;1.1.4.

COMBINATION PACKAGINGS				SINGLE PACKAGINGS
UN number and proper shipping name	*Packing conditions*	*Total quantity per package — passenger*	*Total quantity per package — cargo*	
UN 2028 **Bombs, smoke, non-explosive** with corrosive liquid, without initiating device	Bombs, smoke may be carried provided they are without ignition elements, bursting charges, detonating fuses or other explosive components.	Forbidden	50 kg	No

UN harmonization amendments

UN Model Regulations, Chapter 4.1, 4.1.4.1, P803 (7) (see ST/SG/AC.10/50/Add.1)

ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS

— Packagings must meet the Packing Group II performance requirements.
— The articles must be individually packaged and separated from each other using partitions, dividers, inner packagings or cushioning material.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)

Boxes

Aluminium (4B)
Fibreboard (4G)
Natural wood (4C1, 4C2)
Other metal (4N)
Plastics (4H1, 4H2)
Plywood (4D)
Reconstituted wood (4F)
Steel (4A)

Drums

Aluminium (1B2)
Fibre (1G)
Other metal (1N2)
Plastics (1H2)
Steel (1A2)

UN harmonization amendments

UN Model Regulations, Chapter 4.1, 4.1.4.1, P003 (see ST/SG/AC.10/50/Add.1)

Packing Instruction 869

Passenger and cargo aircraft for UN Nos. 3506 and 3554 only

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

— Substances must be compatible with their packagings as required by 4;1.1.3.
— Metal packagings must be corrosion resistant or be protected against corrosion.

2) **Closure requirements**

— Closures must meet the requirements of 4;1.1.4.

COMBINATION PACKAGINGS			SINGLE PACKAGINGS
UN number and proper shipping name	*Net quantity* per package — passenger*	*Net quantity* per package — cargo*	
UN 3506 **Mercury contained in manufactured articles** UN 3554 **Gallium contained in manufactured articles**	No limit	No limit	No

*For the purposes of Part 5;4.1.5.1 the "net quantity" shown on the dangerous goods transport document is the net mass of the manufactured articles in each package.

ADDITIONAL PACKING REQUIREMENTS

— Manufactured articles or apparatuses of which metallic mercury or gallium is a component part, such as manometers, pumps, thermometers, and switches must be packed in sealed inner liners or bags of strong leakproof and puncture-resistant material impervious to mercury which will prevent the escape of mercury or gallium from the package irrespective of its position before being packed in outer packagings.

Note.— Mercury switches and relays are excepted from the requirement for a sealed inner liner or bag providing they are of the totally enclosed leakproof type in sealed metal or plastic units.

— Electron tubes, mercury vapour tubes (tubes with less than a total net quantity of 450 g of mercury) must be packed in strong outer packagings with all seams and joints sealed with self-adhesive, pressure-sensitive tape which will prevent the escape of mercury from the package.

Note.— Tubes with 450 g of mercury or more must be packaged according to the requirements for manufactured articles or apparatuses (above).

— Electron tubes which are packed in sealed leakproof metal cases may be shipped in the manufacturer's original packagings.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)

Boxes *Drums* *Jerricans*

Strong outer packagings

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

Packing Instruction 950

Batteries

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

Amendments to manage aviation specific risks

Paragraph 4.2.2.3 of DGP-WG/22 report:

1) If spillable batteries are installed, and it is possible for the vehicle 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:

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) lithium batteries must meet the provisions of Part 2;9.3, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, 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 State of the Operator. A copy of the document of approval must accompany the consignment.

3) If sodium batteries are installed, they must conform to the requirements of Special Provision A94.

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Packing Instruction 951

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Batteries

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

Amendments to manage aviation specific risks

See paragraph 4.2.2.3 of DGP-WG/22 report:

1) If spillable batteries are installed, and it is possible for the vehicle 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:

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) lithium batteries must meet the provisions of Part 2;9.3, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, 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 State of the Operator. A copy of the document of approval must accompany the consignment.

3) If sodium batteries are installed, they must conform to the requirements of Special Provision A94.

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Amendments to manage aviation specific risks

and

Amendments to battery provisions

and

UN harmonization amendments

Paragraph 4.2.2.3 of DGP-WG/22 report and paragraph 4.1.2.1.5 of DGP-WG/23 report:

Packing Instruction 952

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

Passenger and cargo aircraft for UN Nos. 3171, 3556, 3557 and 3558 only
(See Packing Instruction 220 for flammable gas-powered engines and machinery, Packing Instruction 378 for flammable liquid-powered engines and machinery, Packing Instruction 950 for flammable liquid-powered vehicles, Packing Instruction 951 for flammable gas-powered vehicles or Packing Instruction 972 for engines or machinery containing only environmentally hazardous fuels)

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

— Substances must be compatible with their packagings as required by 4;1.1.3.

2) **Closure requirements**

— Closures must meet the requirements of 4;1.1.4.

UN number and proper shipping name	*Quantity — passenger*	*Quantity — cargo*
UN 3171 **Battery-powered equipment** or **Battery-powered vehicle** UN 3556 **Vehicle, lithium ion battery powered** UN 3557 **Vehicle, lithium metal battery powered** UN 3558 **Vehicle, sodium ion battery powered**	No limit	No limit

DGP-WG/22 (see paragraph 4.2.2.3 of DGP-WG/22 report) and UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

ADDITIONAL PACKING REQUIREMENTS

This entry applies to vehicles and equipment, including machinery which are powered by wet batteries, metallic sodium batteries ~~or~~, lithium batteries or sodium ion batteries and which are transported with these batteries installed. Examples of such vehicles and equipment are electrically-powered cars, lawn mowers, wheelchairs and other mobility aids. Vehicles that also contain an internal combustion engine must be consigned under the entry UN 3166 Vehicle (flammable gas powered) (See Packing Instruction 951) or Vehicle (flammable liquid powered) (See Packing Instruction 950), as appropriate.

Where vehicles or equipment could possibly be handled in other than an upright position, the vehicle or equipment must be secured in a strong, rigid outer packaging of the type below. The vehicle or equipment must be secured and restrained in the outer packaging to prevent any movement during transport which could change the orientation or cause the vehicle or equipment to be damaged. ~~The vehicle must be secured by means capable of restraining the vehicle in the outer packaging to prevent any movement during transport which would change the orientation or cause the vehicle to be damaged.~~

Battery-powered vehicles~~, machines~~ or equipment must meet the following requirements:

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 or sodium ion batteries are installed:

   i) ~~lithium~~ batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) lithium batteries must meet the provisions of Part 2;9.3 and sodium ion batteries must meet the provisions of Part 2;9.4, unless otherwise approved by the appropriate authority of the State of Origin, except that pre-production prototypes of lithium or sodium ion batteries or cells, when these prototypes are transported for testing, or low production runs of lithium or sodium ion batteries or cells that have not been tested to the requirements in Part III, 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 State of the Operator. A copy of the document of approval must accompany the consignment.

iii) ~~W~~where the ~~lithium~~ battery is removed from the vehicle and is packed separate from the vehicle in the same outer packaging, the package must be consigned as UN 3481— **Lithium ion batteries packed with equipment**, UN 3552 — **Sodium ion batteries packed with equipment** or UN 3091 — **Lithium metal batteries packed with equipment** and packed according to Packing Instruction 966, 977 or 969, as applicable.

3) If metallic sodium or sodium alloy batteries are installed, they must conform to the requirements of Special Provision A94.

Other operational equipment

1) Dangerous goods required for the operation or safety of the vehicle~~, machine~~ or equipment, such as fire extinguishers, tire inflation canisters or safety devices, must be securely mounted in the vehicle~~, machine~~ or equipment. Aircraft may also contain other articles and substances which would otherwise be classified as dangerous goods but which are installed in that aircraft in accordance with the pertinent airworthiness requirements and operating regulations. If fitted, life-rafts, emergency escape slides and other inflation devices must be protected such that they cannot be activated accidentally. Vehicles or equipment containing dangerous goods identified in Table 3-1 as forbidden on passenger aircraft may only be transported on cargo aircraft. Replacements for the dangerous goods permitted must not be carried under this packing instruction.

2) Vehicles equipped with theft-protection devices, installed radio communications equipment or navigational systems must have such devices, equipment or systems disabled.

Strong outer packagings — vehicles and equipment

Boxes	*Drums*	*Jerricans*
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

UN harmonization amendments

and

Amendments to battery provisions

Paragraph 4.1.2.1.5 of DGP-WG/23 report:

Packing Instruction 955

Passenger and cargo aircraft for UN 2990 and UN 3072 only

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ADDITIONAL PACKING REQUIREMENTS

Life-saving appliances may only contain the dangerous goods listed below:

a) Division 2.2 gases, must be contained in cylinders which conform to the requirements of the appropriate national authority of the country in which they are approved and filled. Such cylinders may be connected to the life-saving appliance. These cylinders may include installed actuating cartridges (cartridges, power device of Division 1.4C and 1.4S) provided the aggregate quantity of deflagrating (propellant) explosives does not exceed 3.2 grams per unit. When the cylinders are shipped separately, they must be classified as appropriate for the Division 2.2 gas contained and need not be marked, labelled or described as explosive articles;

b) signal devices (Class 1), which may include smoke and illumination signal flares; signal devices must be packed in plastic or fibreboard inner packagings;

c) small quantities of flammable substances, corrosive solids and organic peroxides (Class 3, Class 8, Division 4.1 and 5.2), which may include a repair kit and not more than 30 strike-anywhere matches. The organic peroxide may only be a component of a repair kit and the kit must be packed in strong inner packaging. The strike-anywhere matches must be packed in a cylindrical metal or composition packaging with a screw-type closure and be cushioned to prevent movement;

d) electric storage batteries (Class 8), which must be disconnected or electrically isolated and protected against short circuits;

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

e) lithium batteries and sodium ion batteries:

1) identified as damaged or defective in accordance with Special Provision A154 are forbidden for transport;

2) must meet the applicable requirements of 2;9.3 or 2;9.4, as applicable;

3) must be disconnected or electrically isolated and protected against short circuits; and

4) must be secured against movement within the appliance.

f) first aid kits which may include flammable, corrosive and toxic articles or substances.

The appliances must be packed, so that they cannot be accidentally activated, in strong outer packagings and, except for life vests, the dangerous goods must be in inner packagings packed so as to prevent movement. The dangerous goods must be an integral part of the appliance without which it would not be operational and in quantities which do not exceed those appropriate for the actual appliance when in use.

Life-saving appliances may also include articles and substances not subject to these Instructions which are an integral part of the appliance.

UN harmonization amendments

Paragraph 4.1.2.1.5 of DGP-WG/23 report:

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

Packing Instruction 961

Passenger and cargo aircraft for UN Nos. 3268 and 3559 only

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

— Substances must be compatible with their packagings as required by 4;1.1.3.

2) **Closure requirements**

— Closures must meet the requirements of 4;1.1.4.

UN number and proper shipping name	*Quantity — passenger*	*Quantity — cargo*	**SINGLE PACKAGINGS**
UN 3268 **Safety devices**, electrically initiated UN 3559 **Fire suppressant dispersing devices**	25 kg	100 kg	No

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Packing Instruction 964

Passenger and cargo aircraft for UN 1941, UN 1990, UN 2315, UN 3151, UN 3082 and UN 3334 only

Amendments to manage aviation specific risks

Paragraph 4.2.2.2 of DGP-WG/22 report:

General requirements

Part 4, Chapter 1 requirements must be met (with the exception that for UN 3082 packed in combination packagings, the requirements of 4;1.1.6 do not apply).

These requirements include:

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UN harmonization amendments

and

Amendments to battery provisions

Paragraph 4.1.2.1.5.2.5 of DGP-WG/23 report:

Packing Instruction 965

Cargo aircraft only for UN 3480

1. **Introduction**

This entry applies to lithium ion or lithium polymer batteries. This packing instruction is structured as follows:

— Section IA applies to lithium ion cells with a Watt-hour rating in excess of 20 Wh and lithium ion batteries with a Watt-hour rating in excess of 100 Wh, which must be assigned to Class 9 and are subject to all of the applicable requirements of these Instructions; and
— Section IB applies to lithium ion cells with a Watt-hour rating not exceeding 20 Wh and lithium ion batteries with a Watt-hour rating not exceeding 100 Wh.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

2. **Lithium batteries forbidden from transport**

The following applies to all ~~lithium ion~~ cells and batteries in this packing instruction:

Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.

Waste ~~lithium~~ batteries and ~~lithium~~ batteries being shipped for recycling or disposal are forbidden from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

IA. **SECTION IA**

Each cell or battery must meet the provisions of 2;9.3.

IA.1 **General requirements**

— Part 4;1 requirements must be met.
— ~~Lithium ion c~~Cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity. Cells and/or batteries at a state of charge greater than 30 per cent of their rated capacity may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities.

Note.— Guidance and methodology for determining the rated capacity can be found in sub-section 38.3.2.3 of the UN Manual of Tests and Criteria*.*

Table 965-IA

UN number and proper shipping name		*Net quantity per package*	
		Passenger	*Cargo*
UN 3480	**Lithium ion batteries**	Forbidden	35 kg

Packing Instruction 965

IA.2 **Additional requirements**

- ~~Lithium ion c~~Cells and batteries must be protected against short circuits.
- ~~Lithium ion c~~Cells and batteries must be placed in inner packagings that completely enclose the cell or battery then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance requirements.
- ~~Lithium ion c~~Cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).
- [A ~~lithium ion c~~Cell or battery with a mass of 12 kg or greater and having a strong, impact-resistant outer casing may be transported when packed in strong outer packagings or protective enclosures (e.g. in fully enclosed or wooden slatted crates) not subject to the requirements of Part 6 of these Instructions, if approved by the appropriate authority of the State of Origin. A copy of the document of approval must accompany the consignment.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

IA.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium (4B)	Aluminium (1B2)	Aluminium (3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H2)
Natural wood (4C1, 4C2)	Other metal (1N2)	Steel (3A2)
Other metal (4N)	Plastics (1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A2)	
Reconstituted wood (4F)		
Steel (4A)		

IB. **SECTION IB**

~~Lithium ion c~~Cells or batteries prepared in accordance with this section are subject to all of the applicable provisions of these Instructions (including the requirements in paragraph 2 of this packing instruction and of this section) except for the provisions of Part 6.

~~Lithium ion c~~Cells or batteries shipped in accordance with the provisions of Section IB must be described on a dangerous goods transport document as set in Part 5;4. The packing instruction number “965” required by 5;4.1.5.8.1 a) must be supplemented with “IB”. All other applicable provisions of Part 5;4 apply.

~~Lithium ion c~~Cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3 a), e) and g) and the following:

1) for ~~lithium ion~~ cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;

2) for ~~lithium ion~~ batteries, the Watt-hour rating is not more than 100 Wh;
   - the Watt-hour rating must be marked on the outside of the battery case except for ~~those~~ batteries manufactured before 1 January 2009;

IB.1 **General requirements**

- Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).
- ~~Lithium ion c~~Cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity. Cells and/or batteries at a state of charge greater than 30 per cent of their rated capacity may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities.

Note.— Guidance and methodology for determining the rated capacity can be found in sub-section 38.3.2.3 of the UN Manual of Tests and Criteria*.*

Table 965-IB

Contents	*Net quantity per package*	
	Passenger	*Cargo*
Lithium ion cells and batteries	Forbidden	10 kg

Packing Instruction 965

IB.2 **Additional requirements**

— Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong rigid outer packaging.
— Cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).
— Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit.
— Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
  — damage to cells or batteries contained therein;
  — shifting of the contents so as to allow battery to battery (or cell to cell) contact;
  — release of contents.
— Each package must be capable of withstanding, without damage to the cells or batteries contained therein and without any reduction of effectiveness, a force applied to the top surface equivalent to the total weight of identical packages stacked to a height of 3 m (including the test sample) for a duration of 24 hours.
— Each package must be marked with the ~~appropriate~~ lithium battery mark (Figure 5-3) in addition to the appropriate Class 9 hazard label (Figure 5-26) and the cargo aircraft only label (Figure 5-28).

IB.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

1. **Introduction**

This entry applies to lithium ion or lithium polymer batteries packed with equipment.

Section I of this packing instruction applies to lithium ion and lithium polymer cells and batteries that are assigned to Class 9. Certain lithium ion and lithium polymer cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

For the purpose of this packing instruction, "equipment" means apparatus for which the ~~lithium~~ cells or batteries will provide electrical power for its operation.

2. **Lithium batteries forbidden from transport**

The following applies to all ~~lithium ion~~ cells and batteries in this packing instruction:

Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.

I. **SECTION I**

Each cell or battery must meet the provisions of 2;9.3.

I.1 **General requirements**

Part 4;1 requirements must be met.

UN number and proper shipping name	*Package quantity (Section I)*	
	Passenger	*Cargo*
UN 3481 **Lithium ion batteries packed with equipment**	5 kg of ~~lithium ion~~ cells or batteries	35 kg of ~~lithium ion~~ cells or batteries

Packing Instruction 966

I.2 **Additional requirements**

- ~~Lithium ion c~~Cells and batteries must be protected against short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit.
- ~~Lithium ion c~~Cells and batteries must:
  - be placed in inner packagings that completely enclose the cell or battery, then placed in a packaging of a type shown below that meets the Packing Group II performance requirements, then placed with the equipment in a strong, rigid outer packaging; or
  - be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a packaging of a type shown below that meets the Packing Group II performance requirements.
- The equipment must be secured against movement within the outer packaging.
- The number of cells or batteries in each package must not exceed the number required for the equipment's operation, plus two spare sets. A "set" of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

I.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium (4B)	Aluminium (1B2)	Aluminium (3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H2)
Natural wood (4C1, 4C2)	Other metal (1N2)	Steel (3A2)
Other metal (4N)	Plastics (1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A2)	
Reconstituted wood (4F)		
Steel (4A)		

II. **SECTION II**

~~Lithium ion c~~Cells and batteries packed with equipment, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

- Part 1;2.3 (General — Transport of dangerous goods by post);
- Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium or sodium ion batteries);
- Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
- Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);
- Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and
- Paragraphs 1 and 2 of this packing instruction.

~~Lithium ion c~~Cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3 a), e) and g) and the following:

1) for ~~lithium ion~~ cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;

2) for ~~lithium ion~~ batteries, the Watt-hour rating is not more than 100 Wh;
   - the Watt-hour rating must be marked on the outside case except for ~~those~~ batteries manufactured before 1 January 2009.

II.1 **General requirements**

Contents	*Package quantity (Section II)*	
	Passenger	*Cargo*
Net quantity of ~~lithium ion~~ cells or batteries per package	5 kg	5 kg

Packing Instruction 966

II.2 **Additional requirements**

- ~~Lithium ion c~~Cells and batteries must:
  - be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging that conforms to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1); or
  - be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging that conforms to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).
- Cells and batteries must be protected against short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit.
- The equipment must be secured against movement within the outer packaging.
- The number of cells or batteries in each package must not exceed the number required for the equipment's operation, plus two spare sets. A "set" of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.
- Each package of cells or batteries, or the completed package, must be capable of withstanding a 1.2 m drop test in any orientation without:
  - damage to cells or batteries contained therein;
  - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
  - release of contents.
- Each package must be marked with the ~~appropriate~~ lithium battery mark (Figure 5-3).
  - the package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
- The words "lithium ion batteries, in compliance with Section II of PI966" must be placed on the air waybill, when an air waybill is used. Where packages of Section II[~~lithium~~] batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different[~~lithium~~] battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable[~~lithium~~] battery type(s) and packing instruction numbers.
- Where a package contains a combination of[~~lithium~~] batteries contained in equipment and[~~lithium~~] batteries packed with equipment that meet the limits for[~~lithium~~] cells or batteries of Section II, the following additional requirements apply:
  - the shipper must ensure that all applicable parts of both packing instructions are met. The total mass of [~~lithium~~] batteries contained in any package must not exceed 5 kg;
  - the words "lithium ion batteries, in compliance with Section II of PI966" must be placed on the air waybill, when an air waybill is used.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible.

II.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

II.4 **Overpacks**

When packages are placed in an overpack:

a) the packages must be secured within the overpack;

b) the intended function of each package must not be impaired by the overpack; and

c) the lithium battery mark (Figure 5-3) required by this packing instruction must either be clearly visible or the mark must be reproduced on the outside of the overpack and the overpack must be marked with the word "Overpack" in lettering of at least 12 mm high.

Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

1. **Introduction**

This entry applies to lithium ion or lithium polymer batteries contained in equipment.

Section I of this packing instruction applies to lithium ion and lithium polymer cells and batteries that are assigned to Class 9. Certain lithium ion and lithium polymer cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

For the purpose of this packing instruction, "equipment" means apparatus for which the ~~lithium~~ cells or batteries will provide electrical power for its operation.

2. **Lithium batteries forbidden from transport**

The following applies to all ~~lithium ion~~ cells and batteries in this packing instruction:

Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.

I. **SECTION I**

Each cell or battery must meet the provisions of 2;9.3.

I.1 **General requirements**

Equipment must be packed in strong rigid outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1). Large equipment can be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

	Package quantity (Section I)	
UN number and proper shipping name	*Passenger*	*Cargo*
UN 3481 **Lithium ion batteries contained in equipment**	5 kg of ~~lithium ion~~ cells or batteries	35 kg of ~~lithium ion~~ cells or batteries

I.2 **Additional requirements**

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- Where multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

I.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

Packing Instruction 967

II. **SECTION II**

~~Lithium ion c~~Cells and batteries contained in equipment, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

— Part 1;2.3 (General — Transport of dangerous goods by post);
— Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium or sodium ion batteries);
— Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
— Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);
— Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and
— Paragraphs 1 and 2 of this packing instruction.

~~Lithium ion c~~Cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3 a), e) and g) and the following:

1) for ~~lithium ion~~ cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;

2) for ~~lithium ion~~ batteries, the Watt-hour rating is not more than 100 Wh;
   — the Watt-hour rating must be marked on the outside of the battery case except for ~~those~~ batteries manufactured before 1 January 2009.

Devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be transported when intentionally active. When active, these devices must meet defined standards for electromagnetic radiation to ensure that the operation of the device does not interfere with aircraft systems. The devices must not be capable of emitting disturbing signals (such as buzzing alarms, strobe lights, etc.) during transport.

II.1 **General requirements**

Equipment must be packed in strong rigid outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1). Large equipment can be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

Contents	*Package quantity (Section II)*	
	Passenger	*Cargo*
Net quantity of ~~lithium ion~~ cells or batteries per package	5 kg	5 kg

II.2 **Additional requirements**

— The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
— Cells and batteries must be protected so as to prevent short circuits.
— Where multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment.
— Each package must be marked with the ~~appropriate~~ lithium battery mark (Figure 5-3). The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
   — This requirement does not apply to:
      — packages containing only button cell batteries installed in equipment (including circuit boards); and
      — packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment.
— Where a consignment includes packages bearing the lithium battery mark, the words "lithium ion batteries, in compliance with Section II of PI967" must be placed on the air waybill, when an air waybill is used. Where packages of Section II[~~ lithium~~] batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different[~~ lithium~~] battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable[~~ lithium~~] battery type(s) and packing instruction numbers.
— Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible.

Packing Instruction 967

II.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

II.4 **Overpacks**

When packages are placed in an overpack:

a) the packages must be secured within the overpack;

b) the intended function of each package must not be impaired by the overpack; and

c) the lithium battery mark (Figure 5-3) required by this packing instruction must either be clearly visible or the mark must be reproduced on the outside of the overpack and the overpack must be marked with the word "Overpack" in lettering of at least 12 mm high.

. . .

Packing Instruction 972

Batteries

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

Paragraph 4.2.2.3 of DGP-WG/22 report:

1) If spillable batteries are installed, and it is possible for the 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:

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) they must meet the provisions of Part 2;9.3, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, 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 State of the Operator. A copy of the document of approval must accompany the consignment.

3) If sodium batteries are installed, they must conform to the requirements of Special Provision A94.

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. . .

Paragraph 4.1.2.1.5.2 of DGP-WG/23 report:

Packing Instruction 976

Cargo aircraft only for UN 3551

[1. **Introduction**

This entry applies to sodium ion batteries.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

2. **Sodium ion batteries forbidden from transport**

The following applies to all cells and batteries in this packing instruction:

Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.

Waste batteries and batteries being shipped for recycling or disposal are forbidden from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

I.1 **General requirements**

— Each cell or battery must meet the provisions of 2;9.4.
— Part 4;1 requirements must be met.
— Cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity. Cells and/or batteries at a state of charge greater than 30 per cent of their rated capacity may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities.

Note.— Guidance and methodology for determining the rated capacity can be found in sub-section 38.3.2.3 of the UN Manual of Tests and Criteria.

— Batteries manufactured after 31 December 2025 must be marked with the Watt-hour rating on the outside case.

I.2 **Additional requirements**

— Cells and batteries must be protected against short circuits.
— Cells and batteries must be placed in inner packagings that completely enclose the cell or battery then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance requirements.
— Cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).]
— A cell or battery with a mass of 12 kg or greater and having a strong, impact-resistant outer casing may be transported when packed in strong outer packagings or protective enclosures (e.g. in fully enclosed or wooden slatted crates) not subject to the requirements of Part 6 of these Instructions, if approved by the appropriate authority of the State of Origin. A copy of the document of approval must accompany the consignment.

Table 976-I-1

UN number and proper shipping name	*Net quantity per package*	
	Passenger	*Cargo*
UN 3551 **Sodium ion batteries**	Forbidden	35 kg

Packing Instruction 976

I.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium (4B)	Aluminium (1B2)	Aluminium (3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H2)
Natural wood (4C1, 4C2)	Other metal (1N2)	Steel (3A2)
Other metal (4N)	Plastics (1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A2)	
Reconstituted wood (4F)		
Steel (4A)		

Packing Instruction 977

Passenger and cargo aircraft only for UN 3552 (packed with equipment) only

[

1. Introduction

This entry applies to sodium ion batteries packed with equipment.

Section I of this packing instruction applies to sodium ion cells and batteries that are assigned to Class 9. Certain sodium ion cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

For the purpose of this packing instruction, "equipment" means apparatus for which the lithium cells or batteries will provide electrical power for its operation.

2. Sodium ion batteries forbidden from transport

The following applies to all cells and batteries in this packing instruction:

Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.

Waste batteries and batteries being shipped for recycling or disposal are forbidden from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

I. SECTION I

Each cell or battery must meet the provisions of 2;9.4.

I.1 General requirements

— Part 4;1 requirements must be met.

Table 977-I

UN number and proper shipping name	*Net quantity per package*	
	Passenger	*Cargo*
UN 3552 **Sodium ion batteries packed with equipment**	5 kg	35 kg

I.2 Additional requirements

— Cells and batteries must be protected against short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit.
— Cells or batteries must:
  — be placed in inner packagings that completely enclose the cell or battery, then placed in a packaging of a type shown below that meets the Packing Group II performance requirements, then placed with the equipment in a strong, rigid outer packaging; or
  — be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a packaging of a type shown below that meets the Packing Group II performance requirements.
— The equipment must be secured against movement within the outer packaging.
— The number of cells or batteries in each package must not exceed the number required for the equipment's operation, plus two spare sets. A "set" of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.
— Batteries manufactured after 31 December 2025 must be marked with the Watt-hour rating on the outside case.

Packing Instruction 977

I.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium (4B)	Aluminium (1B2)	Aluminium (3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H2)
Natural wood (4C1, 4C2)	Other metal (1N2)	Steel (3A2)
Other metal (4N)	Plastics (1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A2)	
Reconstituted wood (4F)		
Steel (4A)		

II. SECTION II

Cells and batteries packed with equipment, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

— Part 1;2.3 (General — Transport of dangerous goods by post);
— Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium or sodium ion batteries);
— Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
— Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods); and
— Paragraphs 1 and 2 of this packing instruction.

Cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.4 a), e) and f) and the following:

1) for cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;

2) for batteries, the Watt-hour rating is not more than 100 Wh.
— the Watt-hour rating must be marked on the outside of the battery case [except for those batteries manufactured before 1 January 2026].

II.1 **General requirements**

Table 977-II

Contents	*Package quantity (Section II)*	
	Passenger	*Cargo*
Net quantity of sodium ion cells or batteries per package	5 kg	5 kg

Packing Instruction 977

II.2 **Additional requirements**

— Cells and batteries must:
  — be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging that conforms to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1); or
  — be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging that conforms to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).
— Cells and batteries must be protected against short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit.
— The equipment must be secured against movement within the outer packaging.
[— The number of cells or batteries in each package must not exceed the number required for the equipment's operation, plus two spare sets. A "set" of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.]
— Each package of cells or batteries, or the completed package, must be capable of withstanding a 1.2 m drop test in any orientation without:
  — damage to cells or batteries contained therein;
  — shifting of the contents so as to allow battery to battery (or cell to cell) contact;
  — release of contents.
— Each package must be marked with the sodium ion battery mark (Figure 5-3).
  — the package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
— The words "sodium ion batteries, in compliance with Section II of PI977" must be placed on the air waybill, when an air waybill is used. Where packages of Section II batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable battery type(s) and packing instruction numbers.
— Where a package contains a combination of batteries contained in equipment and batteries packed with equipment that meet the limits for cells or batteries of Section II, the following additional requirements apply:
  — the shipper must ensure that all applicable parts of both packing instructions are met. The total mass of batteries contained in any package must not exceed 5 kg;
  — the words "sodium ion batteries, in compliance with Section II of PI977" must be placed on the air waybill, when an air waybill is used.
— Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

II.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

II.4 **Overpacks**

When packages are placed in an overpack:

a) the packages must be secured within the overpack;

b) the intended function of each package must not be impaired by the overpack; and

c) the sodium ion battery mark (Figure 5-3) required by this packing instruction must either be clearly visible or the mark must be reproduced on the outside of the overpack and the overpack must be marked with the word "Overpack" in lettering of at least 12 mm high.

]

Packing Instruction 978

Passenger and cargo aircraft only for UN 3552 (contained in equipment) only

1. Introduction

This entry applies to sodium ion batteries contained in equipment.

Section I of this packing instruction applies to sodium ion cells and batteries that are assigned to Class 9. Certain sodium ion cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

For the purpose of this packing instruction, "equipment" means apparatus for which the lithium cells or batteries will provide electrical power for its operation.

2. Sodium ion batteries forbidden from transport

The following applies to all cells and batteries in this packing instruction:

Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.

Waste batteries and batteries being shipped for recycling or disposal are forbidden from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

I. SECTION I

Each cell or battery must meet the provisions of 2;9.4.

I.1 General requirements

Equipment must be packed in strong rigid outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1). Large equipment can be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

Table 978-I

UN number and proper shipping name	*Net quantity per package*	
	Passenger	*Cargo*
UN 3552 **Sodium ion batteries contained in equipment**	5 kg	35 kg

I.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- Where multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment.
- Batteries manufactured after 31 December 2025 must be marked with the Watt-hour rating on the outside case.

Packing Instruction 978

I.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

II. SECTION II

Cells and batteries contained in equipment, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

— Part 1;2.3 (General — Transport of dangerous goods by post);
— Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium or sodium ion batteries);
— Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
— Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods); and
— Paragraphs 1 and 2 of this packing instruction.

Cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.4 a), e) and f) and the following:

1) for cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;

2) for batteries, the Watt-hour rating is not more than 100 Wh;
   — the Watt-hour rating must be marked on the outside of the battery case [except for those batteries manufactured before 1 January 2026].

Devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be transported when intentionally active. When active, these devices must meet defined standards for electromagnetic radiation to ensure that the operation of the device does not interfere with aircraft systems. The devices must not be capable of emitting disturbing signals (such as buzzing alarms, strobe lights, etc.) during transport.

II.1 **General requirements**

Equipment must be packed in strong rigid outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1). Large equipment can be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

Table 978-II

Contents	*Package quantity (Section II)*	
	Passenger	*Cargo*
Net quantity of sodium ion cells or batteries per package	5 kg	5 kg

Packing Instruction 978

II.2 **Additional requirements**

— The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
— Cells and batteries must be protected so as to prevent short circuits.
— Where multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment.
— Each package must be marked with the sodium ion battery mark (Figure 5-3). The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
[— This requirement does not apply to:
— packages containing only button cell batteries installed in equipment (including circuit boards); and
— packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment.]
— Where a consignment includes packages bearing the sodium ion battery mark, the words "sodium ion batteries, in compliance with Section II of PI968" must be placed on the air waybill, when an air waybill is used. Where packages of Section II [sodium ion] batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable [sodium ion] battery type(s) and packing instruction numbers.
— Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible.

II.3 **Outer packagings**

Boxes	*Drums*	*Jerricans*
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

II.4 **Overpacks**

When packages are placed in an overpack:

a) the packages must be secured within the overpack;

b) the intended function of each package must not be impaired by the overpack; and

c) the sodium ion battery mark (Figure 5-3) required by this packing instruction must either be clearly visible or the mark must be reproduced on the outside of the overpack and the overpack must be marked with the word "Overpack" in lettering of at least 12 mm high.

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UN harmonization amendments

and

Amendments to battery provisions

Paragraph 4.1.2.1.6 of DGP-WG/23 report:

Part 5

SHIPPER'S RESPONSIBILITIES

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Chapter 2

MARKING

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2.4 MARKING SPECIFICATIONS AND REQUIREMENTS

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UN Model Regulations, Chapter 5.2, 5.2.1.9 (see ST/SG/AC.10/50/Add.1)

2.4.16 Special marking requirements for lithium or sodium ion batteries

2.4.16.1 Packages containing lithium or sodium ion cells or batteries prepared in accordance with Section II of Packing Instructions 966, 967, 969 ~~or~~, 970, 977 or 978 and Section IB of Packing Instructions 965 and 968 must be marked as shown in Figure 5-3.

2.4.16.2 The mark must indicate the appropriate UN number preceded by the letters "UN" as follows:

a) "UN 3090" for lithium metal cells or batteries;

b) "UN 3480" for lithium ion cells or batteries;

c) "UN 3091" for lithium metal cells or batteries contained in, or packed with, equipment; ~~or~~

d) "UN 3481" for lithium ion cells or batteries contained in, or packed with, equipment ~~.~~;

e) "UN 3551" for sodium ion cells or batteries; or

f) "UN 3552" for sodium ion cells or batteries contained in, or packed with, equipment.

Where a package contains lithium cells or batteries assigned to different UN numbers, all applicable UN numbers must be indicated on one or more marks.

2.4.16.3 The mark must be in the form of a rectangle or a square with hatched edging. The symbol (group of batteries, one damaged and emitting flame, above the UN number for lithium ion ~~or~~, lithium metal or sodium ion batteries or cells) must be black on white or suitable contrasting background. The hatching must be red. The mark must be a minimum dimension of 100 mm wide × 100 mm high and the minimum width of the hatching must be 5 mm. If the size of the package so requires, the dimensions may be reduced to not less than 100 mm wide × 70 mm high. Where dimensions are not specified, all features must be in approximate proportion to those shown on the full-size mark (Figure 5-3).

[2.4.16.4 Packages containing lithium or sodium ion batteries batteries that meet the requirements of Section IB of Packing Instructions 965 or 968 must bear both the lithium or sodium ion battery mark (Figure 5-3) and the lithium or sodium ion battery Class 9 hazard label (Figure 5-26).]

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UN Model Regulations, Chapter 5.2, Figure 5.2.5 (see ST/SG/AC.10/50/Add.1)

Figure 5-3. Lithium or sodium ion battery mark

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Chapter 3

LABELLING

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3.5 LABEL SPECIFICATIONS

3.5.1 Class hazard label specifications

3.5.1.1 Labels must satisfy the provisions of this section and conform, in terms of colour, symbols and general format, to the specimen labels shown in Figures 5-4 to 5-26.

Note.— Where appropriate, labels in Figures 5-4 to 5-26 are shown with a dotted outer boundary as provided for in 3.5.1.1 a). This is not required when the label is applied on a background of contrasting colour.

Class hazard labels must conform to the following specifications:

. . .

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

c) With the exception of labels for Divisions 1.4, 1.5 and 1.6 of Class 1, the upper half of the label must contain the pictorial symbol and the lower half must contain the class or, in the case of labels for Class 5, the division number, as

appropriate. However for the Class 9 label for lithium or sodium ion batteries (Figure 5-26), the upper half of the label must only contain the seven vertical stripes of the symbol and the lower half must contain the group of batteries of the symbol and the class number. Except for the Class 9 label for lithium or sodium ion batteries (Figure 5-26), the label may include such text as the UN number, or words describing the hazard class (e.g. “flammable”) in accordance with 3.5.1.1 e) provided that the text does not obscure or detract from the other required label elements.

d) In addition, except for Divisions 1.4, 1.5 and 1.6, labels for Class 1 must show in the lower half, above the class number, the division number and compatibility group letter for the substance or article. Labels for Divisions 1.4, 1.5 and 1.6 must show in the upper half the division number and in the lower half the class number and the compatibility group letter.

e) On labels other than those for material of Class 7, the insertion of any text (other than the class or division number or compatibility group) in the space below the symbol must be confined to particulars indicating the nature of the hazard and precautions to be taken in handling. In the case of the Class 9 label for lithium or sodium ion batteries (Figure 5-26), no text other than the class number must be included in the bottom part of the label.

. . .

(Miscellaneous — Lithium or sodium ion cells and batteries)

Symbol (seven vertical stripes in upper half); battery group, one broken and emitting flame in lower half: black
Background: white
Figure “9” underlined in bottom corner

Figure 5-26. Miscellaneous dangerous goods — lithium or sodium ion batteries, Class 9

Chapter 4

DOCUMENTATION

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4.1.4 Information required on the dangerous goods transport document

4.1.4.1 *Dangerous goods description*

The dangerous goods transport document must contain the following information for each dangerous substance, material or article offered for transport:

a) the UN or ID number preceded by the letters “UN” or “ID” as appropriate;

b) the proper shipping name, as determined according to 3;1.2, including the technical name enclosed in parenthesis, as applicable (see 3;1.2.7);

c) the primary hazard class or, when assigned, the division of the goods, including for Class 1 the compatibility group letter. The words “Class” or “Division” may be included preceding the primary hazard class or division numbers;

d) subsidiary hazard class or division number(s) corresponding to the subsidiary hazard label(s) required to be applied, when assigned, must be entered following the primary hazard class or division and must be enclosed in parenthesis. The words “Class” or “Division” may be included preceding the subsidiary hazard class or division numbers;

e) where assigned, the packing group for the substance or article which may be preceded by “PG” (e.g. “PG II”).

Amendments to facilitate transport or State oversight

And

Amendments to battery provisions

*Note.— Until 31 March 2025, shippers may identify vehicles powered by lithium batteries, UN 3171 — **Battery powered vehicle** as shown in the 2023-2024 Edition of these Instructions. The marks and labels applied, when required, must be consistent with the information shown on the dangerous goods transport document.*

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Amendments to manage aviation specific risks

Paragraph 4.2.2.3 of DGP-WG/23 report:

4.4 RETENTION OF DANGEROUS GOODS TRANSPORT INFORMATION

4.4.1 The shipper must retain a copy of the dangerous goods transport document and additional information and documentation as specified in these Instructions, for a minimum period of three months and be made available to the appropriate national authority upon request.

4.4.2 When the documents are kept electronically or in a computer system, the shipper must be able to reproduce them in a printed form.

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UN harmonization amendments

Paragraph 4.1.2.1.7 of DGP-WG/23 report:

Part 6

PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS

. . .

Chapter 2

MARKING OF PACKAGINGS OTHER THAN INNER PACKAGINGS

. . .

UN Model Regulations, Chapter 6.1, 6.1.3.1 (see ST/SG/AC.10/50/Add.1)

2.1 MARKING REQUIREMENTS FOR PACKAGINGS OTHER THAN INNER PACKAGINGS

2.1.1 Each packaging intended for use according to these Instructions must bear marks on a non-removable component which are durable, legible and placed in a location and of such a size relative to the packaging as to be readily visible. For packages with a gross mass of more than 30 kg the marks, or a duplicate thereof, must appear on the top or on a side of the packaging. Letters, numerals and symbols must be at least 12 mm high, except for packagings of 30 L capacity or less or of 30 kg maximum net mass, when they must be at least 6 mm in height and except for packagings of 5 L capacity or less or of 5 kg maximum net mass when they must be of an appropriate size.

Note.— The provisions of 2.1.1 of the 2023-2024 Edition of these Instructions may continue to be applied until 31 December 2026. Packagings manufactured before 1 January 2027 according to the provisions applicable at the date of manufacture may continue to be used.

The marks must show:

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Chapter 3

REQUIREMENTS FOR PACKAGINGS

3.1 REQUIREMENTS FOR PACKAGINGS OTHER THAN INNER PACKAGINGS

GENERAL REQUIREMENTS

. . .

3.1.1 Steel drums
1A1 non-removable head
1A2 removable head

. . .

UN Model Regulations, Chapter 6.1, 6.1.4.1.4 (see ST/SG/AC.10/50/Add.1)

3.1.1.4 ~~The body of a drum of a capacity greater than 60 L must, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops.~~ Drums may have rolling hoops, either expanded or separate. If there are separate rolling hoops they must be fitted tightly on the body and so secured that they cannot shift. Rolling hoops must not be spot welded.

. . .

3.1.2 Aluminium drums
1B1 non-removable head
1B2 removable head

. . .

UN Model Regulations, Chapter 6.1, 6.1.4.2.3 (see ST/SG/AC.10/50/Add.1)

3.1.2.3 ~~The body of a drum of a capacity greater than 60 L must, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops.~~ Drums may have rolling hoops, either expanded or separate. If there are separate rolling hoops they must be fitted tightly on the body and so secured that they cannot shift. Rolling hoops must not be spot welded.

. . .

UN Model Regulations, Chapter 6.1, 6.1.4.3.3 (see ST/SG/AC.10/50/Add.1)

. . .

3.1.3 Drums of metal other than aluminium or steel
1N1 non-removable head
1N2 removable head

. . .

3.1.3.3 ~~The body of a drum of a capacity greater than 60 L must, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops.~~ Drums may have rolling hoops, either expanded or separate. If there are separate rolling hoops, they must be fitted tightly on the body and so secured that they cannot shift. Rolling hoops must not be spot welded.

. . .

UN Model Regulations, Chapter 6.1, 6.1.4.12 (see ST/SG/AC.10/50/Add.1)

3.1.11 Fibreboard boxes **(including corrugated fibreboard boxes)**
4G

3.1.11.1 Strong and good quality solid or double-faced corrugated fibreboard (single or multiwall) must be used, appropriate to the capacity of the box and to its intended use. The water resistance of the outer surface must be such that the

increase in mass, as determined in a test carried out over a period of 30 minutes by the Cobb method of determining water absorption, is not greater than 155 g/m^2 — see ISO 535:~~1991~~2014. It must have proper bending qualities. Fibreboard must be cut, creased without scoring, and slotted so as to permit assembly without cracking, surface breaks or undue bending. The fluting of corrugated fibreboard must be firmly glued to the facings.

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Chapter 4

PACKAGING PERFORMANCE TESTS

. . .

4.5 INTERNAL PRESSURE (HYDRAULIC) TEST

. . .

4.5.3 Test method and pressure to be applied: metal packagings including their closures must be subjected to the test pressure for 5 minutes. Plastic packagings and composite packagings (plastic material) including their closures must be subjected to the test pressure for 30 minutes. This pressure is the one to be included in the mark required by 2.1.1 d). The manner in which the packagings are supported must not invalidate the test. The test pressure must be applied continuously and evenly: it must be kept constant throughout the test period. The hydraulic pressure (gauge) applied, as determined by any one of the following methods, must be:

Amendments to facilitate transport or State oversight

Paragraph 4.3.6 of DGP-WG/22 report:

a) not less than the total gauge pressure measured in the packaging (i.e. the vapour pressure of the filling liquid and the partial pressure of the air or other inert gases minus 100 kPa) at 55°C, multiplied by a safety factor of 1.5. This total gauge pressure must be determined on the basis of a maximum degree of filling in accordance with Part 4;1.1.5 and a filling temperature of 15°C. The test pressure must be not less than 95 kPa (not less than 75 kPa for liquids in Packing Group III of Class 3, ~~or~~ Division 6.1 or Class 9); or

. . .

UN harmonization amendments

Chapter 5

REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF CYLINDERS AND CLOSED CRYOGENIC RECEPTACLES, AEROSOL DISPENSERS AND SMALL RECEPTACLES CONTAINING GAS (GAS CARTRIDGES) AND FUEL CELL CARTRIDGES CONTAINING LIQUEFIED FLAMMABLE GAS

. . .

5.1 GENERAL REQUIREMENTS

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5.1.5 Initial inspection and testing

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5.1.5.2 Closed cryogenic receptacles must be subjected to testing and inspection during and after manufacture in accordance with the applicable design standards or recognized technical codes, including the following:

. . .

Paragraph 4.1.2.1.7 of DGP-WG/23 report:

UN Model Regulations, Chapter 6.2, 6.2.1.5.2 (see ST/SG/AC.10/50/Add.1)

For all completed closed cryogenic ~~pressure~~ receptacles:

q) testing for leakproofness.

Note.— Closed cryogenic receptacles which were constructed in accordance with the initial inspection and test requirements of 5.1.5.2 applicable in the 2021-2022 Edition of these Instructions but which do not however conform to the requirements of 5.1.5.2 relating to the initial inspection and test applicable in the 2023-2024 Edition of these Instructions may continue to be used.

. . .

5.1.6 Periodic inspection and testing

5.1.6.1 Refillable cylinders other than cryogenic receptacles must be subjected to periodic inspections and tests by a body authorized by the appropriate national authority, in accordance with the following:

a) check of the external conditions of the cylinder and verification of the equipment and the external marks;

b) check of the internal conditions of the cylinder (e.g. internal inspection, verification of minimum wall thickness);

c) check of the threads either:

i) if there is evidence of corrosion; or

ii) if the closures or other service equipment are removed;

d) a hydraulic pressure test of the cylinder shell and, if necessary, verification of the characteristics of the material by suitable tests;

Note 1.— With the agreement of the appropriate national authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.

UN Model Regulations, Chapter 6.2, 6.2.1.6.1 (d) (see ST/SG/AC.10/50/Add.1)

Note 2.— For seamless steel cylinder shells the check of 5.1.6.1 b) and hydraulic pressure test of 5.1.6.1 d) may be replaced by a procedure conforming to ISO 16148:2016 + Amd 1:2020 "Gas cylinders — Refillable seamless steel gas cylinders and tubes — Acoustic emission examination (AT) and follow-up ultrasonic examination (UT) for periodic inspection and testing".

Note 3.— The check of internal conditions of 5.1.6.1 b) and the hydraulic pressure test of 5.1.6.1.d) may be replaced by ultrasonic examination carried out in accordance with ISO 18119:2018 + Amd 1:2021 for seamless steel and seamless aluminium alloy cylinder shells. For a transitional period until 31 December 2026, the standard ISO 18119:2018 may be used for this same purpose. For a transitional period until 31 December 2024, the standard ISO 10461:2005 +Amd 1:2006 may be used for seamless aluminium alloy cylinders and ISO 6406:2005 may be used for seamless steel cylinder shells for this same purpose.

e) check of service equipment if to be reintroduced into service. This check may be carried out separately from the inspection of the cylinder shell.

Note.— For the periodic inspection and test frequencies, see Packing Instruction 200 or, for a chemical under pressure, Packing Instruction 218.

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5.2 REQUIREMENTS FOR UN CYLINDERS AND CLOSED CRYOGENIC RECEPTACLES

. . .

5.2.1 Design, construction and initial inspection and testing

5.2.1.1 The following standards apply for the design, construction and initial inspection and test of refillable UN cylinder shells, except that inspection requirements related to the conformity assessment system and approval must be in accordance with 5.2.5:

UN Model Regulations, Chapter 6.2, 6.2.2.1.1 and 6.2.2.1.2 (see ST/SG/AC.10/50/Add.1)

Reference	*Title*	*Applicable for manufacture*
ISO 9809-1:1999	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa. *Note.— The note concerning the F factor in section 7.3 of this standard must not be applied for UN cylinders.*	Until 31 December 2018
ISO 9809-1:2010	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa.	Until 31 December 2026
ISO 9809-1:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa.	Until further notice
ISO 9809-2:2000	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa.	Until 31 December 2018
ISO 9809-2:2010	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa.	Until 31 December 2026
ISO 9809-2:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1 100 MPa.	Until further notice
ISO 9809-3:2000	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 3: Normalized steel cylinders.	Until 31 December 2018
ISO 9809-3:2010	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 3: Normalized steel cylinders.	Until 31 December 2026
ISO 9809-3:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 3: Normalized steel cylinders and tubes.	Until further notice

Reference	*Title*	*Applicable for manufacture*
ISO 9809-4:2014	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing— — Part 4: Stainless steel cylinders with an Rm value of less than 1 100 MPa	~~Until further notice~~ Until 31 December 2028
ISO 9809-4:2021	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 4: Stainless steel cylinders with an Rm value of less than 1 100 MPa *Note.— Small quantities are a batch of cylinders not exceeding 200.*	Until further notice
ISO 7866:1999	Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing. *Note.— The note concerning the F factor in section 7.2 of this standard must not be applied for UN cylinders. Aluminium alloy 6351A — T6 or equivalent must not be authorized.*	Until 31 December 2020
ISO 7866: 2012+ Cor 1:2014	Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing *Note.— Aluminium alloy 6351A or equivalent must not be used.*	Until further notice
ISO 4706:2008	Gas cylinders — Refillable welded steel cylinders — Test pressure 60 bar and below.	Until further notice
ISO 18172-1:2007	Gas cylinders — Refillable welded stainless steel cylinders — Part 1: Test pressure 6 MPa and below.	Until further notice
ISO 20703:2006	Gas cylinders — Refillable welded aluminium-alloy cylinders — Design, construction and testing.	Until further notice
ISO 11119-1:2002	Gas cylinders of composite construction — Specification and test methods — Part 1: Hoop wrapped composite gas cylinders.	Until 31 December 2020
ISO 11119-1:2012	Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 L	~~Until further notice~~Until 31 December 2028
ISO 11119-1:2020	Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 L	Until further notice
ISO 11119-2:2002	Gas cylinders of composite construction — Specification and test methods — Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners.	Until 31 December 2020
ISO 11119-2:2012 + Amd 1:2014	Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with load-sharing metal liners.	~~Until further notice~~Until 31 December 2028
ISO 11119-2:2020	Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with load-sharing metal liners.	Until further notice
ISO 11119-3:2002	Gas cylinders of composite construction — Specification and test methods — Part 3: Fully wrapped fibre reinforced composite gas cylinders with non-load-sharing metallic or non-metallic liners. *Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.*	Until 31 December 2020
ISO 11119-3:2013	Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with non-load-sharing metallic or non-metallic liners. *Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.*	~~Until further notice~~Until 31 December 2028
ISO 11119-3:2020	Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with non-load-sharing metallic or non-metallic liners.	Until further notice
ISO 11119-4: 2016	Gas cylinders — Refillable composite gas cylinders — Design, construction and testing — Part 4: Fully wrapped fibre reinforced composite gas cylinders up to 150 L with load-sharing welded metallic liners.	Until further notice

Note 1.— In the above-referenced standards, composite cylinder shells must be designed for a design life of not less than fifteen years.

Note 2.— Composite cylinder shells with a design life longer than fifteen years must not be filled after fifteen years from the date of manufacture, unless the design has successfully passed a service life test programme. The programme must be part of the initial design type approval and must specify inspections and tests to demonstrate that composite cylinder shells manufactured accordingly remain safe to the end of their design life. The service life test programme and the results must be approved by the appropriate national authority of the country of approval that is responsible for the initial approval of the cylinder design. The service life of a composite cylinder shell must not be extended beyond its initial approved design life.

. . .

UN Model Regulations, Chapter 6.2, 6.2.2.1.4 (see ST/SG/AC.10/50/Add.1)

5.2.1.4 The following standard applies for the design, construction and initial inspection and test of UN closed cryogenic receptacles, except that inspection requirements related to the conformity assessment system and approval must be in accordance with 5.2.5:

Reference	*Title*	*Applicable for manufacture*
ISO 21029-1:2004	Cryogenic vessels — Transportable vacuum insulated vessels of not more than 1 000 L volume — Part 1: Design, fabrication, inspection and tests.	Until 31 December 2026
ISO 21029-1:2018 + ~~Amd.1~~ Amd.1:2019	Cryogenic vessels — Transportable vacuum insulated vessels of not more than 1 000 L volume — Part 1: Design, fabrication, inspection and tests.	Until further notice

. . .

UN Model Regulations, Chapter 6.2, 6.2.2.1.9 (see ST/SG/AC.10/50/Add.1)

5.2.1.9 The following standards apply for the design, construction and initial inspection and test of non-refillable UN cylinders except that the inspection requirements related to the conformity assessment system and approval must be in accordance with 6;5.2.5.

Reference	*Title*	*Applicable for manufacture*
ISO 11118:1999	Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.	Until 31 December 2020
ISO 13340:2001	Transportable gas cylinders — Cylinder valves for non-refillable cylinders — Specification and prototype testing.	Until 31 December 2020
ISO 11118:2015	Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.	Until 31 December 2026
ISO 11118:2015 + ~~Amd.1~~ Amd 1:2019	Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.	Until further notice

5.2.2 Materials

In addition to the material requirements specified in the design and construction standards, and any restrictions specified in the applicable Packing Instruction for the gas(es) to be transported (e.g. Packing Instruction 200, Packing Instruction 202 or Packing Instruction 214), the following standards apply to material compatibility:

UN Model Regulations, Chapter 6.2, 6.2.2.2 (see ST/SG/AC.10/50/Add.1)

Reference	*Title*	*Applicable for manufacture*
~~ISO 11114-1:2012 + A1:2017~~11114-1:2020	Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials.	Until further notice
~~ISO 11114-2:2013~~11114-2:2021	Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials.	Until further notice

5.2.3 Closures and their protection

The following standards apply to the design, construction, and initial inspection and test of closures and their protection:

UN Model Regulations, Chapter 6.2, 6.2.2.3 (see ST/SG/AC.10/50/Add.1)

Reference	*Title*	*Applicable for manufacture*
ISO 11117:1998	Gas cylinders — Valve protection caps and valve guards for industrial and medical gas cylinders — Design, construction and tests.	Until 31 December 2014
ISO 11117:2008+ Cor 1:2009	Gas cylinders — Valve protection caps and valve guards — Design, construction and tests.	Until 31 December 2026
ISO 11117:2019	Gas cylinders — Valve protection caps and guards — Design, construction and tests.	Until further notice
ISO 10297:1999	Gas cylinders – Refillable gas cylinder valves – Specification and type testing.	Until 31 December 2008
ISO 10297:2006	Gas cylinders — Refillable gas cylinder valves — Specification and type testing.	Until 31 December 2020
ISO 10297:2014	Gas cylinders — Cylinder valves — Specification and type testing	Until 31 December 2022
ISO 10297:2014 + Amd 1:2017	Gas cylinders — Cylinder valves — Specification and type testing	Until further notice
ISO 14246:2014	Gas cylinders — Cylinder valves — Manufacturing tests and examination	Until 31 December 2024
ISO 14246:2014 + Amd 1:2017	Gas cylinders — Cylinder valves — Manufacturing tests and examination	Until further notice
ISO 17871:2015	Gas cylinders — Quick-release cylinders valves — Specification and type testing *Note.— This standard must not be used for flammable gases.*	Until 31 December 2026
ISO 17871:2020	Gas cylinders — Quick-release cylinder valves — Specification and type testing.	Until further notice
ISO 17879:2017	Gas cylinders — Self-closing cylinder valves — Specification and type testing *Note.— This standard must not be applied to self-closing valves in acetylene cylinders.*	Until further notice
ISO 23826:2021	Gas cylinders — Ball valves — Specification and testing	Until further notice

For UN metal hydride storage systems, the requirements specified in the following standard apply to closures and their protection:

Reference	*Title*	*Applicable for manufacture*
ISO 16111:2008	Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride	Until 31 December 2026
ISO 16111:2018	Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride.	Until further notice

5.2.4 Periodic inspection and test

5.2.4.1 The following standards apply to the periodic inspection and testing of UN cylinders:

UN Model Regulations, Chapter 6.2, 6.2.2.4 (see ST/SG/AC.10/50/Add.1)

Reference	*Title*	*Applicable for manufacture*
ISO 6406:2005	Seamless steel gas cylinders — Periodic inspection and testing.	Until 31 December 2024
ISO 18119:2018	Gas cylinders — Seamless steel and seamless aluminium-alloy gas cylinders and tubes — Periodic inspection and testing.	~~Until further notice~~Until 31 December 2026
ISO 18119:2018 + Amd 1:2021	Gas cylinders — Seamless steel and seamless aluminium-alloy gas cylinders and tubes — Periodic inspection and testing.	Until further notice
ISO 10460:2005	Gas cylinders – Welded carbon-steel gas cylinders – Periodic inspection and testing. *Note.— The repair of welds described in clause 12.1 of this standard must not be permitted. Repairs described in clause 12.2 require the approval of the appropriate national authority which approved the periodic inspection and test body in accordance with 5.2.6.*	Until 31 December 2024
ISO 10460:2018	Gas cylinders — Welded aluminium-alloy, carbon and stainless steel gas cylinders — Periodic inspection and testing.	Until further notice
ISO 10461:2005~~/~~ + Amd 1:2006	Seamless aluminium-alloy gas cylinders — Periodic inspection and testing.	Until 31 December 2024
ISO 10462:2013	Gas cylinders — Acetylene cylinders — Periodic inspection and maintenance.	Until 31 December 2024

. . .

5.2.7 Marking of UN refillable cylinders and closed cryogenic receptacles

5.2.7.2 The following certification marks must be applied:

. . .

UN Model Regulations, Chapter 6.2, 6.2.2.7.3 (see ST/SG/AC.10/50/Add.1)

l) In the case of cylinders for UN 3374 **Acetylene, solvent free**:

i) the tare in kilograms consisting of the total of the mass of the empty cylinder shell, the service equipment (including porous material) not removed during filling and any coating expressed to three significant figures rounded down to the last digit followed by the letters “KG”. At least one decimal must be shown after the decimal point. For cylinders of less than 1 kg, the mass must be expressed to two significant figures rounded down to the last digit;

ii) the identity of the porous material (e.g. name or trademark); and

iii) the total mass of the filled acetylene cylinder in kilograms followed by the letters “KG”.

Note.— Acetylene cylinders constructed in accordance with the 2021-2022 Edition of these Instructions which are not marked in accordance with 6;5.2.7.2 k) or l) applicable in the 2023-2024 Edition of these Instructions may continue to be used until the next periodic inspection and test two years after the coming into force of this edition of these Instructions where they must be marked according to the provisions above or be taken out of operation.

. . .

5.2.7.4 The following manufacturing marks must be applied:

. . .

UN Model Regulations, Chapter 6.2, 6.2.2.7.4 (p) (see ST/SG/AC.10/50/Add.1)

p) In the case of steel cylinders and closed cryogenic receptacles and composite cylinders and closed cryogenic receptacles with steel liner intended for the transport of gases with a risk of hydrogen embrittlement, the letter "H" showing compatibility of the steel (see ISO 11114-1:~~2012~~2020);

. . .

5.2.9 Marking of UN metal hydride storage systems

. . .

5.2.9.2 The following marks must be applied:

. . .

UN Model Regulations, Chapter 6.2, 6.2.2.9.2 (j) (see ST/SG/AC.10/50/Add.1)

j) In the case of steel cylinders and composite cylinders with steel liner, the letter "H" showing compatibility of the steel (see 1SO 11114-1:~~2012~~2020); and

. . .

5.2.11 Marking of closures for refillable UN cylinders and closed cryogenic receptacles

. . .

UN Model Regulations, Chapter 6.2, 6.2.2.11 (see ST/SG/AC.10/50/Add.1)

5.2.11.2 The valve test pressure must be marked when it is less than the test pressure which is indicated by the rating of the valve filling connection.

Note.— Closures of refillable cylinders manufactured before 1 January 2027 in accordance with the requirements applicable in the 2021-2022 Edition of these Instructions which are not marked in accordance with the requirements of 5.2.11 applicable in the 2023-2024 Edition of these Instructions may continue to be used.

. . .

Part 7

OPERATOR'S RESPONSIBILITIES

Amendments to battery provisions

Paragraph 4.4.1.9 of DGP-WG/23 report:

Chapter 2

STORAGE AND LOADING

. . .

2.13 LOADING OF BATTERY-POWERED MOBILITY AIDS CARRIED UNDER THE PROVISIONS OF PART 8

. . .

2.13.3 Loading of mobility aids powered by lithium ion batteries

2.13.3.1 An operator must secure, by use of straps, tie-downs or other restraint devices, a battery-powered mobility aid with installed battery(ies). The mobility aid, the battery(ies), electrical cabling and controls must be protected from damage including by the movement of baggage, mail or cargo.

2.13.3.2 An operator must verify that:

a) the battery terminals are protected from short circuits (e.g. by being enclosed within a battery container);

b) the battery(ies) is either:

1) adequately protected against damage by the design of the mobility aid and securely attached to the mobility aid. The electrical circuits must be isolated following the manufacturer's instructions; or

2) removed from the mobility aid, following the manufacturer's instructions; and

c) each removed battery does not exceed 300 Wh. A maximum of one spare battery not exceeding 300 Wh or two spare batteries each not exceeding 160 Wh may be carried.

Note.— When the lithium battery(ies) remain installed in the mobility aid, there is no Watt-hour limit.

2.13.3.3 An operator must ensure that any battery(ies) removed from the mobility aid and any spare battery(ies) is (are) carried in the cabin and protected from damage (e.g., by placing each battery in a protective pouch) and the battery terminals protected from short circuit (by insulating the terminals, e.g. by taping over exposed terminals).

2.13.3.4 The operator must inform the pilot-in-command of the location of any mobility aids with installed lithium ion battery(ies), removed battery(ies) and spare battery(ies).

. . .

Part 8

PROVISIONS CONCERNING PASSENGERS AND CREW

Chapter 1

PROVISIONS FOR DANGEROUS GOODS CARRIED BY PASSENGERS OR CREW

1.1 DANGEROUS GOODS CARRIED BY PASSENGERS OR CREW

. . .

1.1.2 Except for the reporting provisions of 7;4.4 and 7;4.5, the provisions of these Instructions do not apply to the dangerous goods permitted by Table 8-1 when those dangerous goods are:

a) carried by passengers or crew for personal use only;

Amendments to manage aviation specific risks

Paragraph 4.2.2.4 of DGP-WG/22 report:

b) contained in baggage that has been separated from its owner during transit (e.g. mishandled baggage such as lost baggage or improperly routed baggage); or

. . .

1.1.9 Except for the reporting provisions of 7;4.4 and 7;4.5, the provisions of these Instructions do not apply to the dangerous goods permitted in accordance with Table 8-2 when those dangerous goods are:

a) carried by staff members of the OPCW on official travel or government agencies listed in Table 8 2 on official travel;

Amendments to manage aviation specific risks

Paragraph 4.2.2.4 of DGP-WG/22 report:

b) contained in baggage that has been separated from its owner during transit (e.g. mishandled baggage such as lost baggage or improperly routed baggage); or

. . .

Amendments to battery provisions

Table 8-1. Provisions for dangerous goods carried by passengers or crew

Dangerous Goods	*Location*		*Approval of the operator(s) is required*	*Restrictions*
	Checked baggage	*Carry-on baggage*		
Batteries				
1) Lithium batteries (including portable electronic devices)	Yes (except for g) and h))	Yes	(see c) and d))	a) each battery must be of a type which meets the requirements of each test in the UN *Manual of Tests and Criteria*, Part III, subsection 38.3; b) each battery must not exceed the following: — for lithium metal batteries, a lithium content of 2 grams; or — for lithium ion batteries, a Watt-hour rating of 100 Wh; c) each battery may exceed 100 Wh but not exceed 160 Wh Watt-hour rating for lithium ion with the approval of the operator; d) each battery may exceed 2 grams but not exceed 8 grams lithium content for lithium metal for portable medical electronic devices with the approval of the operator; Paragraph 4.4.3 of DGP-WG/22 report and Addendum No. 1 to the 2023-2024 Edition of the Technical Instructions. The text below was further modified for inclusion in the addendum by DGP-WG/22 and then by the ANC. DGP-WG/22 decided to only include provision for active devices in the addendum and not the requirement for all devices to be protected from damage and inadvertent activation when carried in the cabin. It considered the latter premature, given that the panel had not thoroughly discussed the potential impact on States and industry. It agreed it could be given future consideration. e) batteries contained in portable electronic devices [must be protected from damage and unintentional activation. Devices containing batteries exceeding]: — for lithium metal batteries, a lithium content of 0.3 grams; or — for lithium ion batteries, a Watt-hour rating of 2.7 Wh should be carried as carry-on baggage; however, if carried as checked baggage, the devices must be completely switched off (not in sleep or hibernation mode).~~:~~ ~~measures must be taken to prevent unintentional~~

Dangerous Goods	*Location*		*Approval of the operator(s) is required*	*Restrictions*
	Checked baggage	*Carry-on baggage*		
				~~activation and to protect the devices from damage; and~~ ~~— the devices must be completely switched off (not in sleep or hibernation mode);~~ f) batteries and heating elements must be isolated in portable electronic devices capable of generating extreme heat, which could cause a fire if activated, by removal of the heating element, battery or other components; g) spare batteries, including power banks: — must be carried as carry-on baggage; and — must be individually protected so as to prevent short circuits (by placement in original retail packaging or by otherwise insulating terminals, e.g. by taping over exposed terminals or placing each battery in a separate plastic bag or protective pouch); h) baggage equipped with a lithium battery(ies) exceeding: — for lithium metal batteries, a lithium content of 0.3 grams; or — for lithium ion batteries, a Watt-hour rating of 2.7 Wh must be carried as carry-on baggage unless the battery(ies) is removed from the baggage, in which case the battery(ies) must be carried in accordance with g); i) no more than two spare batteries meeting the requirements of c) or d) may be carried per person.
. . .				
4) Mobility aids (e.g. wheelchairs) powered by: – spillable batteries; – non-spillable wet batteries; – dry batteries; – nickel-metal hydride batteries; or – lithium ion batteries	Yes	(see e))	Yes	a) for use by passengers whose mobility is restricted by either a disability, their health or age, or a temporary mobility problem (e.g. broken leg); b) the passenger should make advance arrangements with each operator and provide information on the type of battery installed and on the handling of the mobility aid (including instructions on how to isolate the battery); c) in the case of a dry battery or nickel-metal hydride battery, each battery must comply with Special Provision A123 or A199, respectively; d) in the case of a non-spillable wet battery: i) each battery must comply with Special Provision A67; and ii) a maximum of one spare battery may be carried per passenger; e) in the case of a lithium ion battery: i) each battery must be of a type which meets the requirements of each test in the *UN Manual of Tests and Criteria*, Part III, subsection 38.3; ii) when the mobility aid does not provide adequate protection to the battery:

Dangerous Goods	*Location*		*Approval of the operator(s) is required*	*Restrictions*
	Checked baggage	*Carry-on baggage*		
				— the battery must be removed in accordance with the manufacturer's instructions; — the battery must not exceed 300 Wh; — the battery terminals must be protected from short circuit (by insulating the terminals, e.g. by taping over exposed terminals); — the battery must be protected from damage (e.g. by placing each battery in a protective pouch); and — the battery must be carried in the cabin; iii) a maximum of one spare battery not exceeding 300 Wh or two spare batteries not exceeding 160 Wh each may be carried. Spare batteries must be carried in the cabin. Paragraph 4.4.1.9 of DGP-WG/23 report: *Note.— When the lithium battery(ies) remain installed in the mobility aid, there is no Watt-hour limit.*

. . .

UN harmonization amendments

Paragraph 4.1.2.1.8 of DGP-WG/23 report:

Attachment 2

GLOSSARY OF TERMS

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Glossary of terms

Term and explanation	*UN Number(s), when relevant*
. . .	
UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):	
BATTERIES, CONTAINING METALLIC SODIUM OR SODIUM ALLOY. Articles consisting of a series of CELLS, CONTAINING METALLIC SODIUM OR SODIUM ALLOY that are secured within, and fully enclosed by a metal casing so constructed and closed as to prevent the release of dangerous goods under normal conditions of transport. Although designed and intended to provide a source of electrical energy, these batteries are electrically inert at any temperature at which the metallic sodium or sodium alloy contained in the battery is in a solid state.	3292
. . .	
CELLS, CONTAINING METALLIC SODIUM OR SODIUM ALLOY. Articles consisting of hermetically sealed, metal casings which fully enclose the dangerous goods and which are so constructed and closed as to prevent the release of the dangerous goods under normal conditions of transport. In addition to metallic sodium or sodium alloy, cells covered by this entry may also contain sulphur, but no other dangerous goods. Although designed and intended to provide a source of electrical energy, these cells are electrically inert at any temperature at which the metallic sodium or sodium alloy contained in the cell is in a solid state.	3292
. . .	
UN Model Regulations, Appendix B (see ST/SG/AC.10/50/Add.1):	
FIRE SUPPRESSANT DISPERSING DEVICES. Articles which contain a pyrotechnic substance, which are intended to disperse a fire extinguishing agent (or aerosol) when activated, and which do not contain any other dangerous goods.	0514, 3559
. . .	

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APPENDIX B

PROPOSED AMENDMENTS TO THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS

Part S-3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND QUANTITY LIMITATIONS

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Note.— Revisions to Table 3-1 of the Technical Instructions will automatically be reflected in related records included in the Supplement through the publishing process. The dangerous goods list entries shown here are records which contain values different to the values in Table 3-1.

Chapter 3

SUPPLEMENTARY DANGEROUS GOODS LIST

Class 2

Table S-3-1. Supplementary Dangerous Goods List (Class 2)

Name	*UN No.*	*Class or division*	*Sub-sidiary hazard*	*Labels*	*State varia-tions*	*Special provi-sions*	*UN packing group*	*Excepted quantity*	*Passenger and cargo aircraft*		*Cargo aircraft only*	
									Packing instruction	*Max. net quantity per package*	*Packing instruction*	*Max. net quantity per package*
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*

UN harmonization amendments

Paragraph 4.1.3.1 of DGP-WG/23 report:

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

Disilane	3553	2.1						E0	FORBIDDEN		200	xxx kg

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Chapter 4

SUPPLEMENTARY DANGEROUS GOODS LIST

Classes 3 to 9

Table S-3-1. Supplementary Dangerous Goods List (Classes 3 to 9)

Name	*UN No.*	*Class or division*	*Sub-sidiary hazard*	*Labels*	*State varia-tions*	*Special provi-sions*	*UN packing group*	*Excepted quantity*	*Passenger and cargo aircraft*		*Cargo aircraft only*	
									Packing instruction	*Max. net quantity per package*	*Packing instruction*	*Max. net quantity per package*
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
. . .												
UN harmonization amendments												
Paragraph 4.1.3.1 of DGP-WG/23 report:												
UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):												
[Sodium ion batteries with organic electrolyte	3551	9		Miscellaneous — Lithium or sodium ion batteries		A88 A99 A154 A164 A183 [A201] A227 A228		E0	**FORBID**DEN		See [965] [9XX]]	
Trifluoromethyltetrazole sodium salt in acetone with not less than 68% acetone, by mass	3555	3		Liquid flammable		A40	II	E0	**FORBID**DEN		3XX	xx L
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Part S-4

PACKING INSTRUCTIONS

(ADDITIONAL INFORMATION FOR PART 4 OF THE TECHNICAL INSTRUCTIONS)

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Chapter 4

CLASS 2 — GASES

UN harmonization amendments

Paragraph 4.1.3.1 of DGP-WG/23 report:

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

Packing Instruction 200

For cylinders, the general packing requirements of 4;1.1 and 4;4.1.1 must be met.

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Table 2. LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Class or Division	Subsidiary Hazard	LC_{50} ml/m^3	Cylinders	Test period, years	Test pressure, bar	Filling ratio	Special packing provisions
. . .									
1032	**Dimethylamine, anhydrous**	2.1			X	10	10	0.59	b
1033	**Dimethyl ether**	2.1			X	10	18	0.58	
3553	**Disilane**	2.1			X	10	225	0.39	q
1035	**Ethane**	2.1			X	10	95 120 300	0.25 0.30 0.40	

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Chapter 4

CLASS 2 — GASES

UN harmonization amendments

Paragraph 4.1.3.1 of DGP-WG/23 report:

UN Model Regulations, Chapter 4.1, 4.1.4.1, P303 (see ST/SG/AC.10/50/Add.1)

Draft (further work to be done by DGP-WG/Supplement):

[Packing Instruction 3XX

This instruction applies to UN No. 3555.

The following packagings are authorized, provided that the general provisions of 4;1.1.1 and 4;1.1.2 as well as 4;3.3.1.7 are met:

Plastics drum non-removeable head (1H1) of maximum capacity 250 L.

Additional requirements

— The packagings must be transported in an upright position.
— Packagings must be lead free.]

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Chapter 6

CLASS 4 — FLAMMABLE SOLIDS; SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION; SUBSTANCES WHICH, IN CONTACT WITH WATER, EMIT FLAMMABLE GASES

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UN harmonization amendments

Paragraph 4.1.3.1 of DGP-WG/23 report:

Paragraph 4.1.2.1.1 b) of DGP-WG/22 report:

Packing Instruction 451

Passenger and cargo aircraft — wetted explosives (Packing Group I)

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COMBINATION PACKAGINGS					SINGLE PACKAGINGS
UN number and proper shipping name	*Inner packaging (see 6;3.2)*	*Inner packaging quantity (per receptacle)*	*Total quantity per package — passenger*	*Total quantity per package — cargo*	
. . .					
UN 3474 **1-Hydroxybenzotriazole~~, anhydrous, wetted~~ monohydrate**	Glass Plastics	0.5 kg	0.5 kg	0.5 kg	No

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

UN harmonization amendments

Paragraph 4.1.3.1 of DGP-WG/23 report:

UN Model Regulations, Chapter 4.1, 4.1.4.1, P910 (see ST/SG/AC.10/50/Add.1)

Packing Instruction 910

Cargo aircraft only

Introduction

This packing instruction applies to UN Nos. 3090, 3091, 3480 ~~and~~, 3481, 3551 and 3552 annual production runs consisting of not more than 100 cells or batteries and to pre-production prototypes of cells or batteries when these prototypes are transported for testing.

General requirements

Part 4, Chapter 1 requirements of the Technical Instructions must be met.

Lithium ion and sodium ion cells and batteries (UN 3480 and UN 3551), including when packed with or contained in equipment (UN 3481 and UN 3552), must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity unless a higher state of charge is specifically approved by the State~~s~~ of Origin and the State of the Operator.

ADDITIONAL PACKING REQUIREMENTS

— Packagings, including large packagings, must meet the Packing Group I performance requirements.
— Cells and batteries must be protected against short circuit. Protection against short circuits includes, but is not limited to:

  — individual protection of the battery terminals;
  — inner packaging to prevent contact between cells and batteries;
  — batteries with recessed terminals designed to protect against short circuits; or
  — the use of an electrically non-conductive and non-combustible cushioning material to fill empty space between the cells or batteries in the packaging.

Cells and batteries, including when packed with equipment

1) Batteries and cells, including equipment, of different sizes, shapes or masses must be packaged in an outer packaging of a tested design type listed below provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested. Rigid large packagings, as shown below, are permitted for a single battery including when packed with equipment;
2) Each cell or battery must be individually packed in an inner packaging and placed inside an outer packaging;
3) Each inner packaging must be completely surrounded by sufficient non-combustible and electrically non-conductive thermal insulation material to protect against a dangerous evolution of heat;
4) Appropriate measures must be taken to minimize the effects of vibration and shocks and prevent movement of the cells or batteries within the package that may lead to damage and a dangerous condition during transport. Cushioning material that is non-combustible and electrically non-conductive may be used to meet this requirement;
5) The ~~N~~non-combustibility of the thermal insulation material and the cushioning material must be assessed according to a standard recognized in the State where the packaging is designed or manufactured;
6) A cell or battery with a net mass of more than 30 kg is limited to one cell or battery per outer packaging.

Packing Instruction 910

Cells and batteries contained in equipment

1) Equipment of different sizes, shapes or masses must be packed in an outer packaging of a tested design type listed below provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested. Rigid large packagings, as shown below, are permitted for a single item of equipment containing cells or batteries;

2) The equipment must be constructed or packaged in such a manner as to prevent accidental operation during transport;

3) Appropriate measures must be taken to minimize the effects of vibration and shocks and prevent movement of the equipment within the package that may lead to damage and a dangerous condition during transport. When cushioning material is used to meet this requirement it must be non-combustible and electrically non-conductive; and

4) The ~~N~~non-combustibility of the thermal insulation material and the cushioning material must be assessed according to a standard recognized in the State where the packaging is designed or manufactured.

Packagings not subject to Part 6 of the Technical Instructions

The equipment or batteries may be packed in outer packagings or protective enclosures not subject to the requirements of Part 6 of the Technical Instructions under conditions specified by the appropriate national authority. Additional conditions that may be considered in the approval process include, but are not limited to:

1) The equipment or the battery must be strong enough to withstand the shocks and loadings normally encountered during transport, including trans-shipment between unit load devices and between unit load devices and warehouses as well as any removal from a pallet or unit load device for subsequent manual or mechanical handling; and

2) The equipment or the battery must be fixed in cradles or crates or other handling devices in such a way that it will not become loose during normal conditions of transport.

Note.— The authorized packagings may exceed a net mass of 400 kg (see 4;2.3 of the Technical Instructions).

OUTER PACKAGINGS

Boxes	*Drums*	*Jerricans*
Aluminium (4B)	Aluminium (1B2)	Aluminium (3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H2)
Natural wood (4C1, 4C2)	Other metal (1N2)	Steel (3A2)
Other metal (4N)	Plastics (1H2)	
Plywood (4D)	Plywood (1D)	
Reconstituted wood (4F)	Steel (1A2)	
Plastics (4H1, 4H2)		
Steel (4A)		

RIGID LARGE PACKAGINGS

Boxes

Aluminium (50B)
Fibreboard (50G)
Natural wood (50C)
Other metal (50N)
Plastics (50H)
Plywood (50D)
Reconstituted wood (50F)
Steel (50A)

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APPENDIX C

PROPOSED AMENDMENTS TO THE EMERGENCY RESPONSE GUIDANCE

Note.— Revisions to the proper shipping name in Table 3-1 of the Technical Instructions will automatically be reflected in the associated records included in Tables 4-2 and 4-3 of Doc 9481 through the publishing process. The entries shown here are those for which an amendment to the drill code is necessary.

Amendment to drill codes to reflect amendments to dangerous goods list in the UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/50/Add.1):

Amendments to manage aviation specific risks

Paragraph 4.2.4.1 of DGP-WG/23 report:

Amend Tables 4-2 and 4-3 as indicated:

UN No.	*Drill Code*	*Proper shipping name*
0514	3L	**Fire suppressant dispersing devices**
1835	~~8L~~8P	**Tetramethylammonium hydroxide aqueous solution**
1835	8L	**Tetramethylammonium hydroxide aqueous solution**
3423	~~8L~~6C	**Tetramethylammonium hydroxide, solid**
3551	12FZ	**Sodium ion batteries**
3552	12FZ	**Sodium ion batteries contained in equipment**
3552	12FZ	**Sodium ion batteries packed with equipment**
3553	10L	**Disilane**
3554	8L	**Gallium contained in manufactured articles**
3555	3L	**Trifluoromethyltetrazole sodium salt in acetone**
3556	12FZ	**Vehicle, lithium ion battery powered**
3557	12FZ	**Vehicle, lithium metal battery powered**
3558	12FZ	**Vehicle, sodium ion battery powered**
3559	9L	**Fire suppressant dispersing devices**
3560	6C	**Tetramethylammonium hydroxide aqueous solution**

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APPENDIX D

SUMMARIZED OUTCOME OF DISCUSSIONS

WP No.	FL No.	IP No.	Title	Presented by	Outcome
1			Clarification on the Condition of "Dangerous Evolution of Heat"	D. Brennan	Discussed. Potential proposal for DGP/29.
2			Revision to Special Provision A183	D. Brennan	Agreed. Future review of special provision to address potential issues with existing wording.
3	3		Revision to Special Provision A190	D. Brennan	Amended proposal agreed.
4			Reduced Charge for Vehicles Powered by Lithium Ion Batteries	D. Brennan	Some support as written, general support for smaller vehicles only. New proposal for DGP/29.
5			Proposed Revised Edition of Guidance Material for the Dangerous Goods Panel	Rapporteur, DGP-WG/UN Harmonization	Supported. Final version to be submitted for adoption at DGP/29.
6			Communication to Member States of Proposals and Changes Agreed to Each Edition of the Technical Instructions	D. Brennan	Support in principle, but need to conduct thorough analysis of problem, potential consequences of proposed solution, and consider alternate solutions
7			Exception for Lithium Battery Powered Data Loggers / Cargo Tracking Devices	D. Brennan	Revised proposal agreed (changed lithium metal content limit from 2 g to 1 g)
8			Provisions for the Use of Electronic Data for Information to the Pilot-In-Command	D. Brennan	Support intent of allowing electronic data. Issues raised by IFALPA not yet addressed. Solution needs to be more performance-based.
9			Retention of Documents by the Shipper	E. Gillett	Not agreed.
10			Interpretation of the New Exceptions Incorporated in Table 8-1	L. Cascardo	Discussed. Limits apply to the whole device and not to the individual cells or batteries for this particular provision

WP No.	FL No.	IP No.	Title	Presented by	Outcome
11			Draft Amendments to Part 1 of the Technical Instructions to Align with the UN Recommendations	Rapporteur, DGP-WG/UN Harmonization	No objections. Members to further review amendments and provide comments to Rapporteur of DGP-WG/UN Harmonization preferably before end of July 2023. Final proposal to DGP/29.
12			Draft Amendments to Part 2 of the Technical Instructions to Align with the UN Recommendations	Rapporteur, DGP-WG/UN Harmonization	No objections. Members to further review amendments and provide comments to Rapporteur of DGP-WG/UN Harmonization preferably before end of July 2023. Final proposal to DGP/29.
13			Draft Amendments to Part 3 of the Technical Instructions to Align with the UN Recommendations	Rapporteur, DGP-WG/UN Harmonization	No objections. Aligned wording in Special Provision A224 with the corresponding provision in the UN Model Regulations (SP 409) Secretary to bring issues related to sodium ion batteries to the attention of the UN Sub-Committee Members to further review amendments and provide comments to Rapporteur of DGP-WG/UN Harmonization preferably before end of July 2023. Final proposal to DGP/29.

WP No.	FL No.	IP No.	Title	Presented by	Outcome
14			Draft Amendments to Part 4 of the Technical Instructions to Align with the UN Recommendations	Rapporteur, DGP-WG/UN Harmonization	No objections. Members to carefully review amendments, especially packing instructions for sodium ion batteries and to provide comments to Rapporteur of DGP-WG/UN Harmonization before the end of July 2023 Final proposal to DGP/29.
15			Draft Amendments to Part 5 of the Technical Instructions to Align with the UN Recommendations	Rapporteur, DGP-WG/UN Harmonization	No objections. Members to further review amendments and provide comments to Rapporteur of DGP-WG/UN Harmonization preferably before end of July 2023. Final proposal to DGP/29.
16			Draft Amendments to Part 6 of the Technical Instructions to Align with the UN Recommendations	Rapporteur, DGP-WG/UN Harmonization	No objections. Members to further review amendments and provide comments to Rapporteur of DGP-WG/UN Harmonization preferably before end of July 2023. Final proposal to DGP/29.
19			Draft Amendments to the Supplement to the Technical Instructions to Align with the UN Recommendations	Rapporteur, DGP-WG/UN Harmonization	No objections. Members to further review amendments and provide comments to Rapporteur of DGP-WG/UN Harmonization preferably before end of July 2023. Final proposal to DGP/29.

WP No.	FL No.	IP No.	Title	Presented by	Outcome
20			Draft Amendments to Attachment 2 to the Technical Instructions to Align with the UN Recommendations	Rapporteur, DGP-WG/UN Harmonization	No objections. Members to further review amendments and provide comments to Rapporteur of DGP-WG/UN Harmonization preferably before end of July 2023. Final proposal to DGP/29.
21			Transport of Portable Electronic Devices Containing Lithium Batteries by Passengers	L. Cascardo	Not agreed.
22			Use of the Terms Appropriate National Authority and Competent Authority	L. Cascardo	Agreement that there were inconsistencies. Potential proposal for DGP/29.
23			Loading of Dangerous Goods in Aircraft not Occupied by Passengers	L. Cascardo	Discussed. Agreement that gaps existed.
24			Lithium Battery Carried by Passengers or Crew	J. Luro	Not agreed.
25			Add Clarity on the Watt-Hour Rating Limit of Lithium Battery(ies) that Remain Installed in Mobility Aids	D. Brennan	Agreed.
26			Definition of "Passenger Aircraft"	D. Brennan	No objections. Secretary to request feedback from OPS experts through ad hoc working group on Annex 6
27	2		New Special Provision for Assignment to UN 3363	T. Muller	Revised amendment agreed.
28			Passenger Provisions	T. Muller	Discussed. Potential future amendment proposal.
29			Addressing Inconsistencies in Annex 18 and the Technical Instructions	S. Schwartz	Discussed. Support for addressing potential gaps with respect to accessibility, premature to address issues given heavy workload of panel.
30			Draft Amendments to the Drill Codes in the Emergency Response Guidance to Reflect Amendments to the Dangerous Goods List Made to Align with the UN Model Regulations	the Secretary	Revised amendments supported. Final proposal to DGP/29.

WP No.	FL No.	IP No.	Title	Presented by	Outcome
31			Proposal to Amend the Definition of "Unit Load Device"	D. Brennan	No strong objections in principle, but members wanted more time to gather information around the assumptions made to ensure they were valid and that the amendment would not have any unintended consequences.
		1	Introduction of all-Solid-State Lithium-ion Batteries Propagation Test Results that Considered According to the Test Protocol at Hazard-Based Classification Working in UN	T. Tabata	Discussed.
		3	Report of the Dangerous Goods Panel Working Group on Energy Storage Devices (DGP-WG/Electronic Storage Devices)	Rapporteur, DGP-WG/Electronic Storage Devices	Discussed.
		4	Thermal Incident Data Related to Aircraft Operations Reported through the Voluntary Thermal Runaway Incident Program (TRIP)	the Secretary	Presented.
		2	Report of the DGP Working Group on Annex 18: Clarifying States' Responsibilities in Annex 18	the Secretary	Discussed.

— END —