



International Civil Aviation Organization

DANGEROUS GOODS PANEL (DGP)

TWENTY-SEVENTH MEETING

Montréal, 16 – 20 September 2019

REPORT FOLDER

The material in this report has not been considered by the Air Navigation Commission. The views expressed therein should be taken as advice of a panel of experts to the Air Navigation Commission but not as representing the views of the Organization. After the Air Navigation Commission has reviewed this report, a supplement setting forth the action taken by the Air Navigation Commission thereon will be issued to this report.

**TWENTY-SEVENTH MEETING OF THE
DANGEROUS GOODS PANEL (DGP) (2019)**

LETTER OF TRANSMITTAL

To: President, Air Navigation Commission

From: Chairperson, Dangerous Goods Panel (DGP) (2019)

I have the honour to submit the report of the twenty-seventh meeting of the Dangerous Goods Panel (DGP) which was held in Montréal, from 16 to 20 September 2019.

A handwritten signature in black ink, appearing to read 'Micheline Paquette', with a long, sweeping flourish extending to the right.

Micheline Paquette
Chairperson

Montréal, 20 September 2019

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* Recommendations annotated "RSPP" relate to proposals for amendment of Standards, Recommended Practices and Procedures for Air Navigation Services or guidance material in an Annex.

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DANGEROUS GOODS PANEL (DGP)**TWENTY-SEVENTH MEETING****Montréal, 16 to 20 September 2019****HISTORY OF THE MEETING****1. DURATION**

1.1 The twenty-seventh meeting of the Dangerous Goods Panel (DGP) was opened by Mr. Claude Hurley, President of the ANC of the Air Navigation Commission in Montréal, at 1000 hours on 16 September 2019. The meeting ended on 20 September 2019.

2. ATTENDANCE

2.1 The meeting was attended by members and observers nominated by twenty-one Contracting States and six international organizations, as well as by advisers and others as shown in the list below:

Members	Advisers	Nominated By
S. Bitossi		Australia
L. Cascardo		Brazil
M. Paquette	D. Bolton D. Evans N. McCulloch A. Sultan	Canada
A. Song	F. K. Lam S. K. Law Z. Qiu F. Tai	China
P. Tatin		France
H. Brockhaus		Germany
P. Privitera	G. Li Calzi	Italy
M. Araya	K. Nakano T. Tanaka N. Iki A. Uchizawa A. Shibata Y. Matsushita	Japan

Members	Advisers	Nominated By
T. Muller	R. Dardenne D. Van der Vegt K. Vermeersch	Netherlands
L. Gqeke	D. Kurdchenko	Russian Federation
M. de Castro	J. Ngiba	South Africa
H. Al Muhairi	K. Al Blooshi H. Al Obaidli T. Howard A. Wagih	Spain United Arab Emirates (UAE)
E. Gillett		United Kingdom
D. Pfund	M. Givens K. Leary E. Petrie	United States
D. Brennan	C. Chan S. Gill	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		
A. Altemos G. Leach		Dangerous Goods Advisory Council (DGAC)
Observers		
M. Böhm		Austria
J.W. Bengtsson		Denmark
S. Hakola		Finland
F. Hamilton Carroll		Rwanda
I. Alsayer		Saudi Arabia
R. Cataldo		Switzerland
A. McCulloch T. Rogers		Global Express Association (GEA)
E. Remy		North Atlantic Treaty Organization (NATO)

3. OFFICERS AND SECRETARIAT

3.1 Mrs. Micheline Paquette (Canada) was elected Chairperson of the meeting and Mr. Teun Muller (Netherlands) was elected Vice-Chairperson.

3.2 The Secretary of the meeting was Dr. Katherine Rooney, Chief of the Cargo Safety Section, who was assisted by Mrs. Haaba Baldeh and Ms. Lynn McGuigan, Technical Officers of the same section.

4. AGENDA OF THE MEETING

4.1 The agenda for the meeting shown hereunder was approved by the Air Navigation Commission on 14 March 2019.

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

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

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 2021-2022 Edition

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 2021-2022 Edition

Agenda Item 2: Managing air-specific safety risks and identifying anomalies

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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 2021-2022 Edition

- Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air
- 3.1: Consider how lithium battery package standard under development by SAE G27 Committee (AS6413) can be incorporated into ICAO provisions (*Ref: Job Card DGP.003.02*)
 - 3.2: Consider marking, labelling and documentation requirements for lithium battery packages meeting the SAE G27 Committee draft standard AS6413 (*Ref: Job Card DGP.003.02*)
 - 3.3: Consider the need for amendments to address impact from proposed amendment to Annex 6, Volume I on cargo compartment safety (*Ref: Job Cards DGP.003.02 and FLTOPSP.043*)
 - 3.4: Consider measures to mitigate safety risks posed by lithium batteries carried and/or used by passengers, crew and the operator (*Ref: Job Card DGP.003.02*)
 - 3.5: Consider the need for specific measures to mitigate safety risks posed by lithium batteries packed with or contained in equipment
 - 3.6: Develop provisions aimed at improving compliance throughout the transport supply chain, including simplification of provisions, guidance on State oversight and outreach, and responsibilities of entities outside the aviation stream (*Ref: Job Card DGP.003.02*)
 - 3.7: Monitor UN Committee's work on hazard-based system for classification of lithium batteries and consider impact on ICAO provisions (*Ref: Job Card DGP.003.02*)
- Agenda Item 4: Clarifying State oversight responsibilities in Annex 18 (*Ref: Job Card DGP.005.02*)
- Agenda Item 5: Dangerous good accident and incident reporting system (*Ref: Job Card DGP.002.02*)
- Agenda Item 6: Dangerous goods training for entities handling general cargo (*Ref: Secretariat Job Card*)
- Agenda Item 7: Aviation Security/Dangerous Goods Coordination (*Ref: Job Card DGP.001.02*)
- 7.1: Develop proposals, if necessary, for amendments to Annex 18 and/or Doc 9284 for the sake of alignment with Annex 17 — *Security* and the *Aviation Security Manual* (Doc 8973)
 - 7.2: Consider control measures for the cargo supply chain that addresses both safety and security concerns
 - 7.3: Review guidance material on chemical, biological or radiological attack

Agenda Item 8: Coordination with other panels

- 8.1: Flight Operations Panels (FLTOPSP)
- 8.2: Airworthiness Panel (AIRP)
- 8.3: Safety Management Panel (SMP)
- 8.4 Remotely Piloted Aircraft Systems Panel (RPASP)
- 8.5: Any other panels

Agenda Item 9: 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

Agenda Item 10: Other business

5. WORKING ARRANGEMENTS

5.1 The panel met as a single body, with ad hoc drafting groups as required. Discussions in the main meeting were conducted in Arabic, Chinese, English, French, Russian and Spanish. Some working papers were presented in English only. The report was issued in Arabic (narrative only), Chinese, English, French, Russian and Spanish.

6. OPENING REMARKS BY THE PRESIDENT OF THE AIR NAVIGATION COMMISSION

6.1 Good morning everyone and welcome to the Dangerous Goods Panel. I am happy to see the room full on a sunny day like today. My name is Claude Hurley, I am the President of the Air Navigation Commission, and I do want to welcome you to Montreal on behalf of the Air Navigation Commission. This is the twenty-seventh meeting of the Dangerous Goods Panel which will meet for one week. The Dangerous Goods Panel has traditionally held its panel meetings for two weeks, which is unique among ANC panels. I understand informal working group meetings were held last week and that they were very successful. I do hope that the informal setting allowed you to constructively progress many of the items in your work programme before formally reviewing them this week in plenary.

6.2 Your work programme has grown in recent years from one focusing primarily on maintaining the Technical Instructions to now dealing with complex issues, often of a multidisciplinary nature. The Commission recognizes the challenges involved in addressing these issues and appreciates your hard work. Many of you have also assisted other panels in progressing their work, including the Flight Operations Panel in developing safety risk assessment provisions for the carriage of cargo for incorporation in Annex 6. The Commission will be recommending that Council adopt these provisions for applicability in November 2020. We are very grateful for your contributions to this work.

6.3 Since the twenty-sixth meeting, we approved a number of changes in membership to your panel. Mr. Jin Junhao, Mr. Mirko, Mr. Rohrbach, Ms. Stubblefield, Mr. Sugimoto and Mr. Tusek were replaced by Mr. Song nominated by China, Mr. Pavlov nominated by the Russian Federation, Mr. Ferguson nominated by ICCAIA, Mr. Pfund nominated by the United States, Mr. Araya nominated by Japan and Ms. Bitossi nominated by Australia. Ms. Galeote left the panel, and we are waiting for a

replacement nominee from Spain which I understand is in process. These changes resulted in the panel being composed of nineteen members nominated by sixteen States and three international organizations. The Commission is very grateful for the contributions of the outgoing members and welcomes these new members. The Commission is also grateful to all of you. Your work on this panel is highly appreciated, and I would particularly like to thank Mr. Muller and Mr. Wagih; Mr. Muller for his contribution to the development of competency training standards, and Mr. Wagih for his contribution to the work on clarifying States' responsibilities for Annex 18.

6.4 You will be meeting as a panel of experts this week. As such I would like, as usual, to remind each member that you are here in a personal capacity representing your own expertise, which may not necessarily be those of your administration or organization. This is very much in line with what we do in the ANC itself. Although you have been nominated by your government or organization, you have been accepted by the Air Navigation Commission as an expert in the field of dangerous goods and therefore, you are expected to express your own professional opinions. I also want to remind you of the importance of reaching consensus-driven solutions and outcomes. This will help ensure that amendments are processed and then implemented effectively at the State level.

6.5 Your Secretary has advised me of support from panel members for allowing relevant experts from non-governmental organizations to participate at individual meetings of the DGP. The Commission recognizes that seeking specific expertise when it is not already available among panel members or their advisers is often necessary for the sake of informed conclusions, and we appreciate this support. I leave it up to the panel Secretary and the Chair to advise you of the procedures if need be from the Directives for Panels of the ANC, which you should all have a copy. It is not unusual for the ANC to often refer to these procedures.

6.6 The agenda for the meeting is quite large. I look forward to hearing the outcome of your discussions on these agenda items. The Commission is confident that you will maintain the high standards that you have shown at previous meetings. If you require any assistance in your work, I trust your chair and vice-chairs will not hesitate to call upon the Secretariat or myself.

6.7 Do note that this week is in lead up to the Assembly. I am slightly surprised that we have managed to find you a room at this time of year, but it is a good sign of the importance of this panel. We will not have a debrief at the end of the week because of the lead up to the Assembly, but ANC members who are here will be introduced to you this morning. This is my favourite part, being introduced to you. Commissioners will also be in and out of the room to keep in touch throughout the week. Although we will not have a chance for a debrief at this panel meeting, we will be sure to read the report in detail.

6.8 It remains for me to wish you well as we declare open the twenty-seventh meeting of the Dangerous Goods Panel and to wish you every success in your work and a very pleasant stay in Montréal.

- Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods**
- 1.1: Develop proposals, if necessary, for amendments to Annex 18 — *The Safe Transport of Dangerous Goods by Air***

1.1.1 DRAFT AMENDMENTS TO ANNEX 18 TO ALIGN WITH THE UN RECOMMENDATIONS (DGP/27-WP/10)

1.1.1.1 The meeting agreed to an amendment to the definition for “packaging” contained in Annex 18 that was developed at the 2018 DGP Working Group Meeting (DGP-WG/18, Montréal, 1 to 5 October 2018). The amendment harmonized the definition with the one contained in the UN Recommendations on the Transport of Dangerous Goods and corrected an out-of-date reference in the note under it. The definition was also contained in the Technical Instructions, but it was already aligned with the UN Model Regulations. In this regard, the panel recognized the need to ensure that amendments to Annex 18 were considered before amending the Technical Instructions in the future.

1.1.2 RECOMMENDATION

1.1.2.1 In light of the foregoing discussions, the meeting developed the following recommendation:

RSPP | **Recommendation 1/1 — Amendment to the definition for packaging in Annex 18**

That comments from States be sought on a proposed amendment to the definition for “packaging” contained in Annex 18 as presented in Appendix A to the report on this agenda item.

- Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods**
- 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 2021-2022 Edition**

1.2.1 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS — PART 1 (DGP/27-WP/11)

1.2.1.1 Background

1.2.1.1.1 The meeting reviewed amendments to Part 1 of 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, for the sake of brevity, as “UNCOE”) at its ninth session (Geneva, 7 December 2018). The amendments were given an initial review at DGP-WG/19 by a DGP working group on UN harmonization (DGP-WG/UN harmonization) (see paragraph 3.1.2.3 of the DGP-WG/19 report). DGP-WG/UN harmonization conducted a final review prior to DGP/27 and recommended several editorial revisions, which are listed in Appendix B to the report on this agenda item, and several non-editorial revisions described in the following paragraphs.

1.2.1.2 General revisions

1.2.1.2.1 References to an IBC and a portable tank in the definition for self-accelerating polymerization temperature (SAPT) and a note specifying that these were not permitted for transport by air were added. This would align with the UN Model Regulations and the decision made at DGP/24 to include references to terms in definitions even if the item being defined was not permitted for transport by air (see paragraph 2.1.1.2 of the DGP/24 Report).

1.2.1.2.2 The list of references to provisions for which transport of excepted packages of radioactive material would apply (1;6.1.5.1) was updated to align with revisions to the list in the UN Model Regulations. DGP-WG/UN Harmonization considered the following references unnecessary and recommended they be removed from the list:

- a) Reference to the package orientation arrow provisions in 5;3.2.12 b). The Secretariat had added this reference in the original working paper in addition to the changes introduced into the 20th revised edition of the UN Model Regulations, since it appeared to have been missing (corresponding 5.2.1.7 was referenced in the UN Model Regulations). DGP-WG/UN Harmonization determined other consequential amendments would need to be made to make it relevant, but did not see value in including it. The reference was therefore not added.
- b) Reference to the documentation provisions for consignments required to be shipped under exclusive use in 5;4.1.5.7.1 i). DGP-WG/UN Harmonization considered a reference to this provision to be irrelevant, since excepted packages of radioactive material required to be shipped under exclusive use would never be transported by air. The reference was therefore not added.

- c) Operator responsibilities in 7;2.9.4.3 regarding fissile material considered to be excepted in accordance with one of the provisions in 2;7.2.3.5. DGP-WG/UN Harmonization considered a reference to this provision to be inappropriate and therefore removed it.

The Secretary was requested to raise the issues related to the list of references to the International Atomic Energy Agency (IAEA). The Secretary invited those panel members who also attended IAEA meetings to support her in this regard.

1.2.1.3 Revisions to exceptions for data loggers and cargo tracking devices with installed lithium batteries

1.2.1.3.1 There was considerable discussion on new provisions excepting data loggers and cargo tracking devices with installed lithium batteries from the relevant provisions of Section II of Packing Instructions 967 and 970, which DG-WG/Harmonization recommended be included as a new item under the general exceptions contained in Part 1;1.1.5.1 of the Instructions. The exception, which was introduced into section 1.1.1.2 of the UN Model Regulations, had been carefully drafted by the UN Sub-Committee to differentiate between data loggers or cargo tracking devices shipped as cargo versus those attached to or integrated into containers, overpacks or packaging. The UN Sub-Committee concluded that the latter would be beyond the scope of the UN Model Regulations and therefore should not be subject to full regulation. The Secretariat suggested there was a need for airworthiness and operations experts to consider whether devices attached to or integrated into containers, overpacks or packaging would be hazardous to the aircraft even if not fully regulated in accordance with dangerous goods regulations. Accordingly, the provisions would be provided to the newly-established multidisciplinary Safe Carriage of Goods Specific Working Group (SCG-SWG) of the Flight Operations Panel (FLTOPSP). There were concerns that waiting for input from the specific group would delay adoption of the amendments, and that this would cause significant problems for multimodal transport. Some believed the issue to be solely a dangerous goods one making it unnecessary for SCG-SWG to consider it. However, while the DGP was responsible for risk mitigation of dangerous goods at the package level, the risk beyond the package needed to be considered. The panel could agree to incorporate the exceptions in the Instructions, but an assessment of the risk beyond the package by SCG-SWG would be appropriate.

1.2.1.3.2 In considering the criteria for exception from the Technical Instructions, the panel made a distinction between the hazards posed by the potential for electromagnetic interference with the aircraft's systems versus the hazards posed by lithium batteries. It was noted that the Airworthiness Panel (AIRP) had been tasked with assessing the risk of the former but that work was not yet complete (see paragraph 8.2.1 of the report under Agenda Item 8). A general requirement to ensure the data loggers or cargo tracking devices met defined standards for electromagnetic radiation, based on existing text in the packing instructions for lithium batteries contained in equipment (Packing Instructions 967 and 970), was added as an interim measure. The hazards posed by lithium batteries was of bigger concern to the meeting, particularly since the devices were intended to be active during transport and could be used on or in packages containing substances that would be required to be segregated from lithium batteries fully regulated as cargo. A requirement that the devices must not be capable of generating a dangerous evolution of heat was added to alleviate this concern. Some thought there was potential for the provisions to be abused by applying them to equipment other than data loggers and cargo tracking devices. References to equipment were replaced with specific references to data loggers and cargo tracking devices to lower this risk of abuse. There were also concerns that the lack of a specific limit on the numbers permitted per package would result in abuse. Text limiting the number of devices in or on any package or overpack to no more than the number required to track or to collect data for the specific

consignment was added to alleviate this concern. Finally, there were concerns related to the energy limits established. These were based on the limits provided by Section II of Packing Instructions 967 and 970. There was concern that even if the batteries that powered data loggers and cargo tracking devices were much smaller than the upper limit established, there were no provisions guaranteeing only small ones would be carried and, with time, transmitters would likely require larger batteries. Others thought the limits were logical on the basis that they were the threshold under which exceptions from full regulation could be applied for batteries shipped as cargo in accordance with Section II of Packing Instructions 967 and 970. Some did not see this as sufficient justification, noting the fact that the data loggers and cargo tracking devices were intended to remain active during transport. This introduced hazards that were not present when batteries were transported inactive, which was the case when they were shipped as cargo. They believed the lack of a limit on the number of data loggers or cargo tracking devices that could be carried on a given flight, which could result in a significant number of active batteries or cells in a cargo compartment, and the potential for all of them to be at the upper energy density limits might result in an unacceptable safety risk.

1.2.1.3.3 The panel ultimately agreed that the revised provisions should be incorporated in the Technical Instructions despite concerns from some members that they did not provide an adequate safety margin. However, it was recognized that the use of data loggers and cargo tracking devices during transport was a common practice and that the revised provisions provided a safer option than the status quo. The revised amendment was agreed, with a suggestion to review the provisions for active devices in Packing Instructions 967 and 970 and to adopt a more systematic, performance-based approach for developing provisions in the future.

1.2.1.4 Recommendation for amendment to Part 1

1.2.1.4.1 The amendments to Part 1, including the revisions proposed by DGP-WG/UN Harmonization, were agreed. They are provided, along with amendments agreed to other parts of the Technical Instructions, in Appendix C to this agenda item.

1.2.2 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS — PART 2 (DGP/27-WP/12)

1.2.2.1 Background

1.2.2.1.1 The meeting reviewed amendments to Part 2 of the Technical Instructions to reflect the decisions taken by UNCOE at its ninth session (Geneva, 7 December 2018). The amendments were given an initial review at DGP-WG/19 by DGP-WG/UN harmonization (see paragraph 3.1.2.4 of the DGP-WG/19 report). DGP-WG/UN harmonization conducted a final review prior to DGP/27 and recommended several editorial revisions, which are listed in Appendix B to the report on this agenda item.

1.2.2.2 Recommendation for amendment to Part 2

1.2.2.2.1 The amendments to Part 2, including the revisions proposed by DGP-WG/UN Harmonization, were agreed. They are provided, along with amendments agreed to other parts of the Technical Instructions, in Appendix C to this agenda item.

1.2.3 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS — PART 3 (DGP/27-WP/13)

1.2.3.1 Background

1.2.3.1.1 The meeting reviewed amendments to Part 3 of the Technical Instructions to reflect the decisions taken by UNCOE at its ninth session (Geneva, 7 December 2018). The amendments were given an initial review at DGP-WG/19 by DGP-WG/UN harmonization (see paragraph 3.1.2.5 of the DGP-WG/19 report). DGP-WG/UN harmonization conducted a final review prior to DGP/27 and recommended several editorial revisions, which are listed in Appendix B to the report on this agenda item, and non-editorial revisions to Special Provision A154.

1.2.3.2 Special Provision A154

1.2.3.2.1 Special Provision A154 prohibited the transport of lithium batteries by air that had been identified as being damaged or defective. It had been revised for the sake of alignment with the UN Model Regulations. DGP-WG/UN Harmonization recommended further revisions that focused on the need to ensure the cells or batteries were not damaged or defective rather than on assessing whether they were damaged or defective, which was the focus in the Model Regulations. The revisions also distinguished between defective and damaged cells or batteries, recognizing that defects would be introduced during the manufacturing process whereas damages could occur at any time.

1.2.3.3 Recommendation for amendment to Part 3

1.2.3.3.1 The amendments to Part 3, including the revisions proposed by DGP-WG/UN Harmonization, were agreed. They are provided, along with amendments agreed to other parts of the Technical Instructions, in Appendix C to this agenda item.

1.2.4 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS — PART 4 (DGP/27-WP/14)

1.2.4.1 Background

1.2.4.1.1 The meeting reviewed amendments to Part 4 of the Technical Instructions to reflect the decisions taken by UNCOE at its ninth session (Geneva, 7 December 2018). The amendments were given an initial review at DGP-WG/19 by DGP-WG/UN harmonization (see paragraph 3.1.2.6 of the DGP-WG/19 report). DGP-WG/UN harmonization conducted a final review prior to DGP/27 and recommended some editorial revisions, which are listed in Appendix B to the report on this agenda item.

1.2.4.2 Recommendation for amendment to Part 4

1.2.4.2.1 The amendments to Part 4, including the revisions proposed by DGP-WG/UN Harmonization, were agreed. They are provided, along with amendments agreed to other parts of the Technical Instructions, in Appendix C to this agenda item.

1.2.5 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS — PART 5 (DGP/27-WP/15)

1.2.5.1 Background

1.2.5.1.1 The meeting reviewed amendments to Part 5 of the Technical Instructions to reflect the decisions taken by UNCOE at its ninth session (Geneva, 7 December 2018). The amendments were given an initial review at DGP-WG/19 by DGP-WG/UN harmonization (see paragraph 3.1.2.7 of the DGP-WG/19 report). DGP-WG/UN harmonization conducted a final review prior to DGP/27 and recommended minor editorial revisions, which are listed in Appendix B to the report on this agenda item, and several non-editorial revisions described here in paragraphs 1.2.5.2 through 1.2.5.5.

1.2.5.2 Criteria for determining the transport index for overpacks or freight containers

1.2.5.2.1 Revisions to the criteria for determining the transport index for overpacks or freight containers were recommended at DGP-WG/19 (5.1.5.3.2 of the UN Model Regulations and 5;1.2.3.1.2 of the Instructions) for the sake of clarity (see paragraph 3.1.2.7.1 b) of the DGP-WG/19 Report). The revisions were made to address the fact that:

- a) the UN text referred specifically to a shipment from a single shipper, despite the fact that overpacks could only be offered from a single shipper; and
- b) a new sentence added for non-rigid overpacks was considered unnecessary, as the requirement was the same for rigid overpacks.

The Secretary raised this issue through an information paper to the fifty-fifth session of the UN Sub-Committee and was invited to present a formal working document at the next session to give the Sub-Committee the opportunity to consider revisions. Accordingly, a paper was submitted for consideration at the fifty-sixth session. DGP-WG/UN Harmonization recommended further revisions to the text in the Instructions to address the anomalies at DGP/27. The Secretary would update the UN Sub-Committee on these through an information paper at the fifty-sixth session.

1.2.5.3 Marking requirements for radioactive material

1.2.5.3.1 New marking requirements for radioactive material were added to 5;2.4.5.5. They incorrectly referred to the UN number and proper shipping name *assigned to a consignment*. DGP-WG/UN Harmonization recommended removing these words. The Secretary was requested to advise the UN Sub-Committee.

1.2.5.4 Dimensions for lithium battery mark

1.2.5.4.1 The figure of the lithium battery mark in the Instructions (Figure 5-3) had been modified to reflect smaller minimum dimensions. DGP-WG/UN Harmonization recommended including a note to clarify that the larger mark appearing in the 2019-2020 Edition of the Instructions could continue to be used.

1.2.5.5 Information required for radioactive material consignments

1.2.5.5.1 References to overpacks and freight containers were added to the requirement for the category of the package to be provided with the information for consignments of radioactive material in 5;4.1.5.7.1 d). DGP-WG/UN Harmonization suggested the revised text included in the UN Model Regulations was based on changes from the IAEA and was incorrect. Revisions were therefore proposed. The Secretary was requested to advise the UN Subcommittee.

1.2.5.6 Recommendation for amendment to Part 5

1.2.5.6.1 The amendments to Part 5, including the revisions proposed by DGP-WG/UN Harmonization, were agreed. They are provided, along with amendments agreed to other parts of the Technical Instructions, in Appendix C to this agenda item.

1.2.6 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS — PART 6 (DGP/27-WP/16)

1.2.6.1 Background

1.2.6.1.1 The meeting reviewed amendments to Part 6 of the Technical Instructions to reflect the decisions taken by UNCOE at its ninth session (Geneva, 7 December 2018). The amendments were given an initial review at DGP-WG/19 by DGP-WG/UN harmonization (see paragraph 3.1.2.8 of the DGP-WG/19 report). DGP-WG/UN harmonization conducted a final review prior to DGP/27 and recommended some editorial revisions, which are listed in Appendix B to the report on this agenda item.

1.2.6.2 Recommendation for amendment to Part 6

1.2.6.2.1 The amendments to Part 6, including the revisions proposed by DGP-WG/UN Harmonization, were agreed. They are provided, along with amendments agreed to other parts of the Technical Instructions, in Appendix C to this agenda item.

1.2.7 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS — PART 7 (DGP/27-WP/17)

1.2.7.1 Background

1.2.7.1.1 The meeting reviewed an amendment to Part 7 of the Technical Instructions to reflect the decisions taken by UNCOE at its ninth session (Geneva, 7 December 2018). The amendments were given an initial review at DGP-WG/19 by DGP-WG/UN harmonization (see paragraph 3.1.2.9 of the DGP-WG/19 report). DGP-WG/UN harmonization conducted a final review prior to DGP/27. The amendment was straightforward in that it simply replaced a reference to “radiation level” with “dose rate” in 7;2.9.3.3, as had been done throughout the Instructions for the sake of alignment with the UN Model Regulations. DGP-WG/Harmonization, in reviewing the amendments, questioned whether the actual provision was relevant to the air mode and recommended deleting it. The provision in question related to limits on the dose rate at any point on the external surface of the aircraft. The corresponding provision in the UN Model Regulations referred to

the surface of a vehicle or freight container. The group suggested to the meeting that although measuring the dose rate on a vehicle or freight container was feasible, measuring it on a large aircraft might not be. This led to a discussion on the intent of the requirement. Some thought it was to protect passengers, but it was pointed out that separation of radioactive material consignments from the passenger cabin or flight deck requirements achieved this. Some thought it was to protect workers or anyone near the outside the aircraft. The meeting concluded that more consideration would need to be given before deleting the requirement. A proposal would be prepared for the next working group meeting.

1.2.7.2 Recommendation for amendment to Part 7

1.2.7.2.1 The amendment to Part 7 was agreed. It is provided, along with amendments agreed to other parts of the Technical Instructions, in Appendix C to this agenda item.

1.2.8 REVISIONS TO PERMITTED PACKAGINGS IN PACKING INSTRUCTION 492 AND PACKING INSTRUCTIONS 870 TO 872 (DGP/27-WP/26)

1.2.8.1 Amendments to Packing Instructions 492 and 870-872 were proposed for the sake of alignment with the UN Model Regulations (i.e. Packing Instruction 492 for UN 3292 — **Batteries, containing sodium** and **Cells, containing sodium**; Packing Instruction 870 for UN 2794 — **Batteries, wet, filled with acid** and UN 2795 — **Batteries, wet, filled with alkali**; Packing Instruction 871 for UN 3028 — **Batteries, dry, containing potassium hydroxide solid**; and Packing Instruction 872 for UN 2800 — **Batteries, wet, non-spillable**). The amendments were agreed, subject to additional revisions that were identified as necessary during the discussion.

1.2.9 REVISIONS TO FORMULAS TO CALCULATE CRITICALITY SAFETY INDEX OF PACKAGES CONTAINING FISSILE MATERIAL (DGP/27-WP/46)

1.2.9.1 Missing brackets in the equations to calculate the criticality safety index of packagings containing fissile material in Part 6;7.10.2 were identified. They were essential in that their absence could change the result of the calculation. It was noted that the brackets in the UN Model Regulations did not completely align with the IAEA *Regulations for the Safe Transport of Radioactive Material* (SSR-6), but that this would not result in a different calculation. Amendments to correct the errors were agreed.

1.2.10 SUBSIDIARY HAZARD OF UN 3547 (DGP/27-WP/40)

1.2.10.1 A missing reference to the classification criteria for articles containing dangerous goods n.o.s. in the list of n.o.s. and generic proper shipping names contained in Attachment 1;2 was identified. Accordingly, the meeting agreed to the addition of “See 2;0.6” in the subsidiary hazard column for UN 3547 — **Articles containing corrosive substance, n.o.s.** This was in alignment with the value in the subsidiary hazard column of Table 3-1 for this substance.

**1.2.11 REVISIONS TO THE LIST OF N.O.S. AND GENERIC
PROPER SHIPPING NAMES (DGP/27-WP/47)**

1.2.11.1 Revisions to the list of n.o.s. and generic proper shipping names in Attachment 1;2 proposed for the sake of alignment with the UN Model Regulations were agreed.

1.2.12 RECOMMENDATION

1.2.12.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 1/2 — Amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) proposed for the sake of alignment with the UN Recommendations on the Transport of Dangerous Goods for incorporation in the 2021-2022 Edition

That the Technical Instructions be amended as indicated in Appendix C to the report on this agenda item.

- Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods**
- 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 2021-2022 Edition**

1.3.1 DRAFT AMENDMENTS TO THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS (DGP/27-WP/19)

1.3.1.1 The meeting reviewed amendments to the Supplement to the Technical Instructions to reflect the decisions taken by UNCOE at its ninth session (Geneva, 7 December 2018). The amendments were given an initial review at DGP-WG/19 by DGP-WG/UN harmonization (see paragraph 3.1.3.1 of the DGP-WG/19 report). DGP-WG/UN harmonization conducted a final review prior to DGP/27 and recommended one editorial revision shown in Appendix B to the report on this agenda item.

1.3.1.2 The amendments to the Supplement, including the revision proposed by DGP-WG/UN harmonization, were agreed. They are provided in Appendix D to this agenda item.

1.3.2 RECOMMENDATION

1.3.2.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 1/3 — Amendment to the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) proposed for the sake of alignment with the UN Recommendations on the Transport of Dangerous Goods for incorporation in the 2021-2022 Edition

That the Supplement to the Technical Instructions be amended as indicated in Appendix D to the report on this agenda item.

APPENDIX A

**PROPOSED AMENDMENTS TO ANNEX 18 FOR THE SAKE OF
HARMONIZATION WITH THE UN RECOMMENDATIONS ON THE
TRANSPORT OF DANGEROUS GOODS**

**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

**THE SAFE TRANSPORT OF
DANGEROUS GOODS BY AIR**

ANNEX 18 TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

...

CHAPTER 1. DEFINITIONS

...

See paragraph 1.1.1 of the report under Agenda Item 1:

Packaging. One or more receptacles and any other components or materials necessary for the receptacles to perform ~~its~~ their containment and other safety functions.

Note.— For radioactive material, see Part 2, paragraph ~~7.2~~ 7.1.3 of the Technical Instructions.

...

APPENDIX B

**REVISIONS TO AMENDMENTS TO THE TECHNICAL
INSTRUCTIONS AND ITS SUPPLEMENT TO ALIGN WITH THE UN
RECOMMENDATIONS PRESENTED IN DGP/27-WPS/11, 12, 13, 14, 15,
16, 17 AND 19 PROPOSED BY DGP-WG/UN HARMONIZATION**

Note.— The proposed revisions to the Technical Instructions shown in the following table have been incorporated in Appendices C to this report on Agenda Item 1, and the proposed revisions to the Supplement to the Technical Instructions have been incorporated in Appendix D to the report on Agenda Item 1.

Working paper number	TI reference	Amendment
DGP/27-WP/11	1;1.1.5.1, new i)	See paragraph 1.2.1.3 of the report under Agenda Item 1
DGP/27-WP/11	1;3.1 definition for Self-accelerating decomposition temperature (SADT)	Add “UN” before “ <i>Manual of Tests and Criteria</i> ”
DGP/27-WP/11	1;3.1 definition for Self-accelerating polymerization temperature (SAPT)	Amend as follows: Self-accelerating polymerization temperature (SAPT). The lowest temperature at which self-accelerating polymerization may occur with a substance in the packaging. <u>IBC or portable tank</u> as offered for transport. The SAPT must be determined in accordance with the test procedures established for the self-accelerating decomposition temperature for self-reactive substances in accordance with Part II, Section 28 of the UN <i>Manual of Tests and Criteria</i> . <u><i>Note.— IBC and portable tanks are not permitted for transport by air unless otherwise provided for in these Instructions.</i></u>
DGP/27-WP/11	1;6.1.5.1 a)	Delete references to 5;3.2.12 b), 5;4.1.5.7.1 i) and 7;2.9.4.3
DGP/27-WP/12	Table 2-12	— Replace “radiation level” with “dose rate” in subparagraph c) — Add “1” before new footnote
DGP/27-WP/12	2;7.2.4.1.1.2 and 2;7.2.4.1.1.3 a)	Replace “radiation level” with “dose rate”
DGP/27-WP/12	2;7.2.4.1.1.7	— Remove square brackets in sub-paragraph e); — Insert “in the definition for fissile nuclides” before “in 7.1.3” in sub-paragraph e) — Replace “radiation level” with “dose rate” in note
DGP/27-WP/13	Table 3-1	Delete “Explosive” from column 5 and “E0” from column 9 or UN 0511
DGP/27-WP/13	Table 3-1	Delete “I” from column 8 for UN 3380

Working paper number	TI reference	Amendment
DGP/27-WP/13	Table 3-1	<i>Delete</i> “Infectious” from column 5 and “E0” from column 9 for UN 3549 (two records)
DGP/27-WP/13	Table 3-2, Special Provision A107	<i>Replace</i> “articles” with “items” in last sentence
DGP/27-WP/13	Table 3-2, Special Provision A154	<p>— <i>Insert</i> “≈” before “367”</p> <p>— <i>Amend</i> as follows:</p> <p><u>Lithium ion cells or batteries and lithium metal 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).</u></p> <p>Lithium ion cells or batteries and lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the <u>UN Manual of Tests and Criteria</u> are forbidden for transport. For the purposes of this special provision, these may include, but are not limited to:</p> <p>a) cells or batteries identified as being defective for safety reasons <u>that have leaked or vented;</u></p> <p>b) cells or batteries that have leaked or vented;</p> <p>e) cells or batteries that cannot be diagnosed prior to transport; or</p> <p><u>d) cells or batteries that have sustained physical or mechanical damage.</u></p> <p>In assessing a cell or battery as damaged or defective, 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:</p> <p>a) acute hazard, such as gas, fire, or electrolyte leaking;</p> <p>b) the use or misuse of the cell or battery;</p> <p>c) signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;</p> <p>d) external and internal short circuit protection, such as voltage or isolation measures;</p> <p>e) the condition of the cell or battery safety features; or</p> <p>f) damage to any internal safety components, such as the battery management system.</p>
DGP/27-WP/13	Table 3-2, Special Provision A215	<i>Delete</i> “(≈274)” from the second column

Working paper number	TI reference	Amendment
DGP/27-WP/13	Table 3-2, Special Provisions A216 and A217	<i>Insert</i> “UN” before “ <i>Manual of Tests and Criteria</i> ”
DGP/27-WP/14	4;9.1.11 and 4;9.1.23	<i>Replace</i> “radiation level” with “dose rate”
DGP/27-WP/15	5;1.2.3.1.2	<i>Amend</i> to read as follows: 1.2.3.1.2 The transport index for each overpack or freight container must be determined as either the sum of the transport indices of all the packages contained therein . However, for a rigid overpack, or a freight container from one single shipper, the shipper may determine the transport index by direct measurement of radiation level, except in the case of dose rate. The transport index for a non-rigid overpacks for which the transport index must be determined only as the sum of the transport indices of all the packages, <i>within the overpack.</i>
DGP/27-WP/15	5;2.4.5.5	<i>Delete</i> square brackets and “assigned to the consignment” from new text
DGP/27-WP/15	Figure 5-3	<i>Add</i> the following note: <i>Note.— The mark illustrated in Figure 5-3 of the 2019-2020 Edition of the Technical Instructions with minimum dimensions of 120 mm x 110 mm my continue to be used.</i>
DGP/27-WP/15	5;3.5.1.1 h) 4)	<i>Amend</i> to read as follows: Transport index: The number determined in accordance with 1.2.3.1.1 and 1.2.3.1.2. (No transport index entry is required except for category I-WHITE-).
DGP/27-WP/15	5;4.1.5.7.1 d)	<i>Amend</i> to read as follows: d) The category of the package <i>and if applicable for the overpack and freight container, as assigned per 1.2.3.1.4</i> , i.e. I-WHITE, II-YELLOW, III-YELLOW;
DGP/27-WP/16	6;3.1.2.9	<i>Renumber</i> as 3.1.2.8
DGP/27-WP/16	6;5.2.1.1	<i>Replace</i> “150 I” with “150 L” in the title for ISO 11119-4:2016
DGP/27-WP/16	6;5.2.1.3	<i>Replace</i> “aluminum” with “aluminium” in the title for ISO 7866:2012 + Cor 1:2014 and in the note underneath the title
DGP/27-WP/16	6;5.2.7.2, Note 2	<i>Replace</i> “country” with “State” and “competent authority” with “appropriate national authority”
DGP/27-WP/16	6;5.2.9.2, Note 2	<i>Replace</i> “country” with “State”.
DGP/27-WP/16	6;7.1.4	<i>Replace</i> “packaging” with “package”
DGP/27-WP/16	6;7.4.2 b)	<i>Replace</i> “radiation level” with “dose rate”
DGP/27-WP/16	6;7.4.4.1 c) ii)	<i>Replace</i> “radiation level” with “dose rate”
DGP/27-WP/16	6;7.4.4.2 c) ii)	<i>Replace</i> “radiation level” with “dose rate”
DGP/27-WP/16	6;7.6.14	<i>Replace</i> “radiation level” with “dose rate”
DGP/27-WP/16	6;7.9.3 b) i)	<i>Replace</i> “radiation level” with “dose rate”
DGP/27-WP/16	6;7.24.2.2	<i>Replace</i> “must be” with “is”
DGP/27-WP/16	6;7.24.2.3	<i>Replace</i> “must be” with “is”

Working paper number	TI reference	Amendment
DGP/27-WP/16	6;7.24.3	<i>Replace “must be” with “is”</i>
DGP/27-WP/19	Packing Instruction 622	<i>Replace “UN 3468” with “UN 3549” in the second row of the heading</i>

APPENDIX C

**PROPOSED AMENDMENTS TO THE TECHNICAL INSTRUCTIONS
FOR THE SAKE OF HARMONIZATION WITH THE UN
RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS
GOODS**

Part 1

GENERAL

...

Chapter 1

SCOPE AND APPLICABILITY

...

Paragraph 3.1.2.3.1 a) of the DGP-WG/19 report:

Note.— Recommendations on Tests and Criteria, which are incorporated by reference into certain provisions of these Instructions, are published as a separate Manual (United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria) (ST/SG/AC.10/11/Rev.6 and Amend.1Z), the contents of which are:

Part I. Classification procedures, test methods and criteria relating to explosives of Class 1;

Part II. Classification procedures, test methods and criteria relating to self-reactive and polymerizing substances of Division 4.1 and organic peroxides of Division 5.2;

Part III. Classification procedures, test methods and criteria relating to substances or articles of Class 2, Class 3, Class 4, Division 5.1, Class 8 and Class 9;

For languages other than English: There may be a need for amendment to the following for the sake of alignment with 1.1 of the UN Model Regulations, (see ST/SG/AC.10/46/Add.1), e.g. French version should read:

1.1 Sous le Nota 1 des dispositions générales, à la quatrième partie, remplacer « au matériel de transport » par « aux équipements de transport ».

Part IV. Test methods concerning transport equipment; and

Part V. Classification procedures, test methods and criteria relating to sectors other than transport.

Appendices. Information common to a number of different types of tests and national contacts for test details.

...

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:

a) to provide, during flight, medical aid to a patient when those dangerous goods:

1) have been placed on board with the approval of the operator; or

2) form part of the permanent equipment of the aircraft when it has been adapted for specialized use;

providing that:

- 1) gas cylinders have been manufactured specifically for the purpose of containing and transporting that particular gas;
- 2) equipment containing wet cell batteries is kept and, when necessary, secured in an upright position to prevent spillage of the electrolyte;

Note.— *For dangerous goods that passengers are permitted to carry as medical aid, see 8;1.1.2.*

- b) to provide, during flight, veterinary aid or a humane killer for an animal;
- c) for dropping in connection with agricultural, horticultural, forestry, ice jam control and landslide clearance or pollution control activities;
- d) for dropping or triggering in connection with avalanche control activities;
- e) to provide, during flight, or related to the flight, aid in connection with search and rescue operations;
- f) vehicles carried in aircraft designed or modified for vehicle ferry operations and all of the following requirements are met:
 - 1) authorization has been given by the appropriate authorities of the States concerned, and such authorities have prescribed specific terms and conditions for the particular operator's operation;
 - 2) vehicles are secured in an upright position;
 - 3) fuel tanks are so filled as to prevent spillage of fuel during loading, unloading and transit; and
 - 4) adequate ventilation rates are maintained in the aircraft compartment in which the vehicle is carried;

For French version: There may be a need for amendment to the following for the sake of alignment with 1.1.1.2 (a) of the UN Model Regulations, (see ST/SG/AC.10/46/Add.1), e.g.

1.1.1.2 a) Remplacer « engins de transport » par « matériels de transport ». Dans le nota 3, remplacer « moyen de transport » par « matériel de transport »

- g) required for the propulsion of the means of transport or the operation of its specialized equipment during transport (e.g. refrigeration units) or that are required in accordance with the operating regulations (e.g. fire extinguishers) (see 2.2).

Note.— *This exception is only applicable to the means of transport performing the transport operation.*

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".

UN Model Regulations, 1.1.1.2 (see ST/SG/AC.10/46/Add.1) and DGP/27 (see paragraph 1.2.1.3 of the report under Agenda Item 1):

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 and 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 must not be more than 20 Wh;
- 4) for a lithium ion battery, the Watt-hour rating must not be more than 100 Wh;
- 5) for a lithium metal cell, the lithium content must not be more than 1 g;
- 6) for a lithium metal battery, the aggregate lithium content must not be more than 2 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 data loggers or cargo tracking devices must not be capable of generating a dangerous evolution of heat; and
- 10) the data loggers or cargo tracking 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.

...

Chapter 3

GENERAL INFORMATION

Parts of this Chapter are affected by State Variation BE 1; see Table A-1

3.1 DEFINITIONS

...

Designated postal operator. Any governmental or non-governmental entity officially designated by a Universal Postal Union (UPU) member country to operate postal services and to fulfil the related obligations arising from the acts of the UPU Convention on its territory.

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1)

Dose rate. The ambient dose equivalent or the directional dose equivalent, as appropriate, per unit time, measured at the point of interest.

...

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1)

Radiation level. ~~For the transport of radioactive material, the corresponding dose rate expressed in millisieverts per hour or microsieverts per hour.~~

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.3.1 c) of DGP/27-WP/3):

Self-accelerating decomposition temperature (SADT). The lowest temperature at which self-accelerating decomposition may occur ~~with~~ in a substance in the packaging, IBC or portable tank as used in offered for transport. The SADT must be determined in accordance with the test procedures given in Part II, Section 28 of the UN Manual of Tests and Criteria.

Note.— IBC and portable tanks are not permitted for transport by air unless otherwise provided for in these Instructions.

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1) and DGP/27 (see paragraph 1.2.1.2.1 of the report under Agenda Item 1):

Self-accelerating polymerization temperature (SAPT). The lowest temperature at which self-accelerating polymerization may occur with a substance in the packaging, IBC or portable tank as offered for transport. The SAPT must be determined in accordance with the test procedures established for the self-accelerating decomposition temperature for self-reactive substances in accordance with Part II, Section 28 of the UN *Manual of Tests and Criteria*.

Note.— IBC and portable tanks are not permitted for transport by air unless otherwise provided for in these Instructions.

...

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.3.1 d) of DGP/27-WP/3):

Transport index (TI) assigned to a package, overpack or freight container, or to unpackaged LSA-I, SCO-I or SCO-III. For the transport of radioactive material, a number which is used to provide control over radiation exposure.

Note.— Unpackaged LSA-I, SCO-I or SCO-III material are not permitted for transport by air.

...

DGP-WG/18 (see paragraph 3.2.2.10 of DGP/27-WP/2):

UN number. The four-digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals to identify an article or substance or a particular group of articles or substances.

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Chapter 5

DANGEROUS GOODS SECURITY

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5.3 PROVISIONS FOR HIGH CONSEQUENCE DANGEROUS GOODS

5.3.1 Definition of high consequence dangerous goods

5.3.1.1 High consequence dangerous goods are those which have the potential for misuse in a terrorist event and which may, as a result, produce serious consequences such as mass casualties, mass destruction or, particularly for Class 7, mass socio-economic disruption.

5.3.1.2 An indicative list of high consequence dangerous goods in classes and divisions other than Class 7 is given in Table 1-7.

UN Model Regulations, Table 1.4.1 (see ST/SG/AC.10/46/Add.1)

Table 1-7. Indicative list of high consequence dangerous goods

Class 1 Division 1.1 explosives
Class 1 Division 1.2 explosives
Class 1 Division 1.3 compatibility group C explosives
Class 1 Division 1.4 UN Nos. 0104, 0237, 0255, 0267, 0289, 0361, 0365, 0366, 0440, 0441, 0455, 0456 and 0500, <u>0512 and 0513</u>
Class 1 Division 1.5 explosives

Class 1 Division 1.6 explosives

Division 2.3 toxic gases (excluding aerosols)

Class 3 desensitized explosives

Division 4.1 desensitized explosives

Division 6.1 substances of Packing Group I; except when transported under the excepted quantity provisions in 3;5

Division 6.2 infectious substances of Category A (UN Nos. 2814 and 2900) and medical waste of Category A (UN 3549)

...

UN Model Regulations, 1.4.3.2.3 (see ST/SG/AC.10/46/Add.1)

5.5 RADIOACTIVE MATERIAL

For radioactive material, the provisions of this Chapter are deemed to be complied with when the provisions of the Convention on Physical Protection of Nuclear Material¹ and the IAEA circular on "The Physical Protection of Nuclear Material and Nuclear Facilities"² are applied.

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Chapter 6**GENERAL PROVISIONS CONCERNING RADIOACTIVE MATERIAL**

Parts of this Chapter are affected by State Variations BR 8, JP 3, JP 23, VC 7; see Table A-1

6.1 SCOPE AND APPLICATION

UN Model Regulations, 1.5.1.1 (see ST/SG/AC.10/46/Add.1)

6.1.1 These Instructions establish standards of safety which provide an acceptable level of control of the radiation, criticality and thermal hazards to ~~persons~~ people, property and the environment that are associated with the transport of radioactive material. These Instructions are based on the IAEA *Regulations for the Safe Transport of Radioactive Material*, (2012-2018 Edition), IAEA Safety Standards Series No. SSR-6 (Rev.1), IAEA, Vienna (2012-2018). Explanatory material can be found in *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012-2018 Edition)*, Safety Standard Series No. SSG-26 (Rev.1), IAEA, Vienna (2014-2019). The prime responsibility for safety must rest with the person or organization responsible for facilities and activities that give rise to radiation risk.

UN Model Regulations, 1.5.1.2 (see ST/SG/AC.10/46/Add.1)

6.1.2 The objective of these Instructions is to establish requirements that must be satisfied to ensure safety and to protect ~~persons~~ people, property and the environment from the harmful effects of ionizing radiation ~~in~~ during the transport of radioactive material. This protection is achieved by requiring:

- a) containment of the radioactive contents;
- b) control of external ~~radiation levels~~ dose rate;
- c) prevention of criticality; and
- d) prevention of damage caused by heat.

1. INFCIRC/274/Rev.1, IAEA, Vienna (1980).

2. ~~INFCIRC/225/Rev.4 (Corrected), IAEA, Vienna (1999)~~ INFCIRC/225/Rev.5, IAEA, Vienna (2011).

These requirements are satisfied firstly by applying a graded approach to the limits of the contents for packages and aircraft and to the performance standards, which are applied to package designs depending upon the hazard of the radioactive contents. Secondly, they are satisfied by imposing conditions on the design and operation of packages and on the maintenance of the packagings, including consideration of the nature of the radioactive contents. ~~Finally~~ **Thirdly**, they are satisfied by requiring administrative controls including, where appropriate, approval by competent authorities. **Finally, further protection is provided by making arrangements for planning and preparing emergency response to protect people, property and the environment.**

...

6.1.5 Specific provisions for the transport of excepted packages

6.1.5.1 Excepted packages which may contain radioactive material as specified in 2;7.2.4.1.1 are subject only to the following provisions of Parts 5 to 7:

UN Model Regulations, 1.5.1.5.1 a) (see ST/SG/AC.10/46/Add.1), DGP-WG/19 (see paragraph 3.1.2.3.1 e) of DGP/27-WP/3) and DGP/27 (see paragraph 1.2.1.2.2 of the report under Agenda Item 1):

- a) the applicable provisions specified in 5;1.1 (as applicable), 5;1.2.2.2, 5;1.2.2.3, 5;1.2.4, 5;1.4, 5;1.6.3, 5;2.2, 5;2.4.10, 5;3.2.12 e), 5;3.3, **5;4.1.5.7.1 f) 1), 5;4.1.5.7.1 f) 2)**, 5;4.4, 7;1.6, 7;2.5, 7;2.9.3.1, 7;3.2.1, 7;3.2.4, 7;4.4 and 7;4.5; and
- b) the requirements for excepted packages specified in 6;7.3;

except when the radioactive material possesses other hazardous properties and has to be classified in a class other than Class 7 in accordance with Special Provision A130 or A194, where the provisions listed in a) and b) above apply only as relevant and in addition to those relating to the main class or division.

UN Model Regulations, 1.5.1.5.2 (see ST/SG/AC.10/46/Add.1)

6.1.5.2 Excepted packages are subject to the relevant provisions of all other parts of these Instructions. ~~If the excepted package contains fissile material, one of the fissile exceptions provided in 2;7.2.3.5 must apply and the requirements of 7;2.9.4.3 must be met.~~

6.2 RADIATION PROTECTION PROGRAMME

6.2.1 The transport of radioactive material must be subject to a radiation protection programme, which must consist of systematic arrangements aimed at providing adequate consideration of radiation protection measures.

6.2.2 Doses to persons must be below the relevant dose limits. Protection and safety must be optimized in order that the magnitude of individual doses, the number of persons exposed and the likelihood of incurring exposure must be kept as low as reasonably achievable, economic and social factors being taken into account, within the restriction that the doses to individuals are subject to dose constraints. A structured and systematic approach must be adopted and must include consideration of the interfaces between transport and other activities.

6.2.3 The nature and extent of the measures to be employed in the programme must be related to the magnitude and likelihood of radiation exposure. The programme must incorporate the requirements in 6.2.2 and 6.2.4 to 6.2.7, 7;2.9.1.1 and 7;2.9.1.2. Programme documents must be available, on request, for inspection by the relevant competent authority.

6.2.4 For occupational exposure arising from transport activities, where it is assessed that the effective dose either:

- a) is likely to be between 1 and 6 mSv in a year, a dose assessment programme via workplace monitoring or individual monitoring must be conducted; or
- b) is likely to exceed 6 mSv in a year, individual monitoring must be conducted.

UN Model Regulations, 1.5.2.4 (see ST/SG/AC.10/46/Add.1)

~~When individual monitoring or workplace monitoring~~ **or individual monitoring** is conducted, appropriate records must be kept.

Note.— For occupational exposure arising from transport activities, where it is assessed that the effective dose is most unlikely to exceed 1 mSv in a year, no special work patterns, detailed monitoring, dose assessment programmes or individual record-keeping need be required.

 UN Model Regulations, 1.5.2.5 (see ST/SG/AC.10/46/Add.1)

6.2.5 In the event of ~~accidents or incidents~~ a nuclear or radiological emergency during the transport of radioactive material, ~~emergency~~ provisions, as established by relevant national and/or international organizations, must be observed to protect persons, property and the environment. ~~Appropriate guidelines for such provisions are contained in "Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material", IAEA Safety Standard Series No. TS-G-1.2 (ST-3), IAEA, Vienna (2002).~~ This includes arrangements for preparedness and response established in accordance with the national and/or international requirements and in a consistent and coordinated manner with the national and/or international emergency arrangements.

 UN Model Regulations, 1.5.2.6 (see ST/SG/AC.10/46/Add.1)

6.2.6 ~~Emergency procedures must take into account~~ The arrangements for preparedness and response must be based on the graded approach and take into consideration the identified hazards and their potential consequences, including the formation of other dangerous substances that may result from the reaction between the contents of a consignment and the environment in the event of an accident a nuclear or radiological emergency. Guidance for the establishment of such arrangements is contained in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7, IAEA, Vienna (2015); Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2, IAEA, Vienna (2011); Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1, IAEA, Vienna (2007), and Arrangements for the Termination of a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-11, IAEA, Vienna (2018).

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6.4 SPECIAL ARRANGEMENT

6.4.1 Special arrangement means those provisions, approved by the competent authority, under which consignments which do not satisfy all the requirements of these Instructions applicable to radioactive material may be transported.

 UN Model Regulations, 1.5.4.2 (see ST/SG/AC.10/46/Add.1)

6.4.2 Consignments for which conformity with any provision applicable to radioactive material is impracticable must not be transported except under special arrangement. Provided the competent authority is satisfied that conformity with the radioactive material provisions of these Instructions is impracticable and that the requisite standards of safety established by these Instructions have been demonstrated ~~through alternative means~~ through means alternative to the other provisions of these Instructions, the competent authority may approve special arrangement transport operations for a single consignment or a planned series of multiple consignments. The overall level of safety in transport must be at least equivalent to that which would be provided if all the applicable requirements in these Instructions had been met. For international consignments of this type, multilateral approval must be required.

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6.6 NON-COMPLIANCE

 UN Model Regulations, 1.5.6.1 (see ST/SG/AC.10/46/Add.1)

In the event of non-compliance with any limit in these Instructions applicable to ~~radiation level~~ dose rate or contamination:

- a) the shipper, consignee, operator and any organization involved during transport, who may be affected, as appropriate, must be informed of the non-compliance:
 - i) by the operator if the non-compliance is identified during transport; or
 - ii) by the consignee if the non-compliance is identified at receipt;
- b) ~~the operator,~~ shipper, operator or consignee, as appropriate, must:
 - i) take immediate steps to mitigate the consequences of the non-compliance;
 - ii) investigate the non-compliance and its causes, circumstances and consequences;
 - iii) take appropriate action to remedy the causes and circumstances that led to the non-compliance and to prevent a recurrence of ~~similar~~ the causes and circumstances similar to those that led to the non-compliance; and

- iv) communicate to the relevant competent authority(ies) the causes of the non-compliance and the corrective or preventative actions taken or to be taken;
- c) the communication of the non-compliance to the shipper and relevant competent authority(ies), respectively, must be made as soon as practicable and it must be immediate whenever an emergency exposure situation has developed or is developing.

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Part 2

CLASSIFICATION OF DANGEROUS GOODS

INTRODUCTORY CHAPTER

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

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6.3 This section does not apply to articles for which a more specific proper shipping name already exists in Table 3-1.

UN Model Regulations, 2.0.5.4 (see ST/SG/AC.10/46/Add.1)

6.4 This section does not apply to dangerous goods of Class 1, Division 6.2, Class 7 or radioactive material contained in articles. However, this section applies to articles containing explosives which are excluded from Class 1 in accordance with 2.1.5.2.4.

6.5 Articles containing dangerous goods must be assigned to the appropriate class or division determined by the hazards present using, where applicable, Table 2-1 for each of the dangerous goods contained in the article. If dangerous goods classified as Class 9 are contained within the article, all other dangerous goods present in the article must be considered to present a higher hazard.

6.6 Subsidiary hazards must be representative of the primary hazard posed by the other dangerous goods contained within the article. When only one item of dangerous goods is present in the article, the subsidiary hazard(s), if any, is the subsidiary hazard(s) identified in column 4 of Table 3-1. If the article contains more than one item of dangerous goods and these could react dangerously with one another during transport, each of the dangerous goods must be enclosed separately (see 4;1.1.8).

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Chapter 1

CLASS 1 — EXPLOSIVES

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1.5.2 Exclusion from Class 1

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1.5.2.4 An article may be excluded from Class 1 when three unpackaged articles, each individually activated by its own means of initiation or ignition or external means to function in the designed mode, meet the following test criteria:

- a) no external surface has a temperature of more than 65°C. A momentary spike in temperature up to 200°C is acceptable;
- b) no rupture or fragmentation of the external casing or movement of the article or detached parts thereof of more than one metre in any direction;

 UN Model Regulations, 2.1.3.6.4 (b) (see ST/SG/AC.10/46/Add.1)

Note.— Where the integrity of the article may be affected in the event of an external fire, these criteria must be examined by a fire test, ~~such as described in ISO 12097-3.~~ One such method is described in ISO 14451-2 using a heating rate of 80 K/min.

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Chapter 2

CLASS 2 — GASES

2.1 DEFINITIONS AND GENERAL PROVISIONS

2.1.1 A gas is a substance which:

- a) at 50°C has a vapour pressure greater than 300 kPa; or
- b) is completely gaseous at 20°C at a standard pressure of 101.3 kPa.

2.1.2 The transport condition of a gas is described according to its physical state as:

- a) compressed gas — a gas which when packaged under pressure for transport is entirely gaseous at –50°C; this category includes all gases with a critical temperature less than or equal to –50°C;
- b) liquefied gas — a gas which when packaged under pressure for transport is partially liquid at temperatures above –50°C. A distinction is made between:

High pressure liquefied gas: a gas with a critical temperature between –50°C and +65°C, and

Low pressure liquefied gas: a gas with a critical temperature above +65°C;

- c) refrigerated liquefied gas — a gas which when packaged for transport is made partially liquid because of its low temperature;
- d) dissolved gas — a gas which when packaged under pressure for transport is dissolved in a liquid phase solvent; or
- e) adsorbed gas — a gas which when packaged for transport is adsorbed onto a solid porous material resulting in an internal receptacle pressure of less than 101.3 kPa at 20°C and less than 300 kPa at 50°C.

 UN Model Regulations, 2.2.1.3 (see ST/SG/AC.10/46/Add.1)

2.1.3 This class comprises compressed gases; liquefied gases; dissolved gases; refrigerated liquefied gases; mixtures of one or more gases with one or more vapours of substances of other classes; articles charged with a gas; ~~and~~ aerosols and chemicals under pressure. (For aerosols, see 1;3.1.)

Note.—“Cryogenic liquid” means the same as “refrigerated liquefied gas”.

2.1.4 Pressures of all kinds relating to receptacles (such as test pressure, internal pressure, safety-valve opening pressure) are always indicated in gauge pressure (pressure in excess of atmospheric pressure); however, the vapour pressure of substances is always expressed in absolute pressure.

2.2 DIVISIONS

2.2.1 Substances of Class 2 are assigned to one of three divisions based on the primary hazard of the gas during transport.

*Note.— UN 1950 — **Aerosols**, UN 2037 — **Receptacles, small, containing gas** and UN 2037 — **Gas cartridges** must be regarded as being in Division 2.1 when the criteria in 2.5.1 a) are met. For chemicals under pressure of UN Nos. 3500 to 3505, see Special Provision A187.*

a) Division 2.1 — Flammable gases.

Gases which at 20°C and a standard pressure of 101.3 kPa:

- i) are ignitable when in a mixture of 13 per cent or less by volume with air; or

UN Model Regulations, 2.2.2.1 a) ii) (see ST/SG/AC.10/46/Add.1)

- ii) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. Flammability must be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:2010~~2010~~2017). Where insufficient data are available to use these methods, tests by a comparable method recognized by the appropriate national authority must be used.

> b) Division 2.2 — Non-flammable, non-toxic gases.

Gases which:

- i) are asphyxiant — gases which dilute or replace the oxygen normally in the atmosphere; or
- ii) are oxidizing — gases which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does; or
- iii) do not come under the other divisions.

UN Model Regulations, 2.2.2.1 b) iii) (see ST/SG/AC.10/46/Add.1)

Note.— In 2.2.1 b) ii), “gases which cause or contribute to the combustion of other material more than air does” means pure gases or gas mixtures with an oxidizing power greater than 23.5 per cent as determined by a method specified in ISO 10156:2010~~2010~~2017.

c) Division 2.3 — Toxic gases.

Gases which:

- i) are known to be so toxic or corrosive to humans as to pose a hazard to health; or
- ii) are presumed to be toxic or corrosive to humans because they have an LC₅₀ value equal to or less than 5 000 mL/m³ (ppm) when tested in accordance with 6.2.1.3.

≠ *Note.— Gases meeting the above criteria owing to their corrosivity are to be classified as toxic with a subsidiary corrosive hazard.*

1.

2.4 MIXTURES OF GASES

For the classification of gas mixtures into one of the three divisions (including vapours of substance from other classes), the following principles must be used:

UN Model Regulations, 2.2.3 a) (see ST/SG/AC.10/46/Add.1)

- a) Flammability must be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:2010~~2010~~2017). Where insufficient data are available to use these methods, tests by a comparable method recognized by the appropriate national authority may be used.

- b) The level of toxicity is determined by either tests in accordance with 6.2.1.3 or a calculation method using the following formula:

$$LC_{50} \text{Toxic (mixture)} = \frac{1}{\sum_{i=1}^n \frac{f_i}{T_i}}$$

where f_i = mole fraction of the i^{th} component substance of the mixture, and

where T_i = toxicity index of the i^{th} component substance of the mixture (the T_i equals the LC_{50} value when available).

When LC_{50} values are unknown, the toxicity index is determined by using the lowest LC_{50} value of substances of similar physiological and chemical effects, or through testing if this is the only practical possibility.

- ≠ c) A gas mixture has a subsidiary hazard of corrosivity when the mixture is known by human experience to be destructive to the skin, eyes or mucous membranes or when the LC_{50} value of the mixture's corrosive components is equal to or less than 5 000 mL/m³ (ppm) when the LC_{50} value is calculated by the formula:

$$LC_{50} \text{Corrosive (mixture)} = \frac{1}{\sum_{i=1}^n \frac{f_{ci}}{T_{ci}}}$$

where f_{ci} = mole fraction of the i^{th} corrosive component substance of the mixture, and

where T_{ci} = Toxicity index of the i^{th} corrosive component substance of the mixture (the T_{ci} equals the LC_{50} value when available).

UN Model Regulations, 2.2.3 d) (see ST/SG/AC.10/46/Add.1)

- d) Oxidizing ability is determined either by tests or by calculation methods adopted by the International Standards Organization (see the Note in 2.2.1 b) and ISO 10156:2010~~2014~~2017).

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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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4.3 SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION (DIVISION 4.2)

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4.3.2.3 Self-heating substances

4.3.2.3.1 A substance must be classified as a self-heating substance of Division 4.2 if, in tests performed in accordance with the test method given in the current edition of the UN *Manual of Tests and Criteria*, Part III, subsection 33.3.1.6:

- a positive result is obtained using a 25 mm sample cube at 140°C;
- a positive result is obtained in a test using a 100 mm sample cube at 140°C and a negative result is obtained in a test using a 100 mm sample cube at 120°C and the substance is to be transported in packages with a volume of more than 3 m³;
- a positive result is obtained in a test using a 100 mm sample cube at 140°C and a negative result is obtained in a test using a 100 mm sample cube at 100°C and the substance is to be transported in packages with a volume of more than 450 L;

- d) a positive result is obtained in a test using a 100 mm sample cube at 140°C and a positive result is obtained using a 100 mm sample cube at 100°C.

UN Model Regulations, 2.4.3.2.3.1 (see ST/SG/AC.10/46/Add.1)

Self-reactive substances, ~~except for type G~~, which also give a positive result according to this test method must not be classified in Division 4.2 but in Division 4.1 (see 4.2.3.1.1).

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Chapter 5

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

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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.

<i>Organic peroxide</i>	<i>Concentration (per cent)</i>	<i>Diluent type A (per cent)</i>	<i>Diluent type B (per cent) (Note 1)</i>	<i>Inert solid (per cent)</i>	<i>Water (per cent)</i>	<i>Control tempera- ture (°C)</i>	<i>Emergency tempera- ture (°C)</i>	<i>UN generic entry</i>	<i>Sub- sidiary hazards and notes</i>
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UN Model Regulations, 2.5.3.2.4 (see ST/SG/AC.10/46/Add.1)

Dibenzoyl peroxide	≤35			≥65				Exempt	29
Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤100					+30	+35	3114	
+ Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤42 as a paste					+35	+40	3116 3118	
Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤42 as a stable dispersion in water					+30	+35	3119	

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Chapter 6

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

Parts of this Chapter are affected by State Variation CA 8

INTRODUCTORY NOTE

Note.— Toxins from plant, animal or bacterial sources which do not contain any infectious substances or toxins that are not contained in substances which are infectious substances should be considered for classification in Division 6.1 and assignment to UN 3172.

6.1 DEFINITIONS

Class 6 is divided into two divisions as follows:

- a) Division 6.1 — Toxic substances.

Substances liable either to cause death or injury or to harm human health if swallowed, if inhaled or by skin contact.

Note.— In these Instructions “poisonous” has the same meaning as “toxic”.

- b) Division 6.2 — Infectious substances.

UN Model Regulations, 2.6.1 b) (see ST/SG/AC.10/46/Add.1)

Substances known to contain, or reasonably expected to contain, pathogens. Pathogens are defined as micro-organisms (including bacteria, viruses, ~~rickettsiae~~, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals.

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6.3 DIVISION 6.2 — INFECTIOUS SUBSTANCES

6.3.1 Definitions

For the purposes of these Instructions:

UN Model Regulations, 2.6.3.1.1 (see ST/SG/AC.10/46/Add.1)

6.3.1.1 *Infectious substances* are substances which are known to contain, or are reasonably expected to contain, pathogens. Pathogens are defined as micro-organisms (including bacteria, viruses, ~~rickettsiae~~, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals.

6.3.1.2 *Biological products* are those products derived from living organisms which are manufactured and distributed in accordance with the requirements of appropriate national authorities, which may have special licensing requirements, and are used either for prevention, treatment or diagnosis of disease in humans or animals, or for development, experimental or investigational purposes related thereto. They include, but are not limited to, finished or unfinished products such as vaccines.

6.3.1.3 *Cultures* are the result of a process by which pathogens are intentionally propagated. This definition does not include patient specimens as defined in 6.3.1.4.

6.3.1.4 *Patient specimens* are those collected directly from humans or animals, including, but not limited to, excreta, secretions, blood and its components, tissue and tissue fluid swabs, and body parts being transported for purposes such as research, diagnosis, investigational activities, and disease treatment and prevention.

UN Model Regulations, 2.6.3.1.6 (see ST/SG/AC.10/46/Add.1)

6.3.1.5 *Medical or clinical wastes* are wastes derived from the veterinary treatment of animals, the medical treatment of ~~animals or~~ humans or from bio-research.

6.3.2 Classification of infectious substances

UN Model Regulations, 2.6.3.2.1 (see ST/SG/AC.10/46/Add.1)

6.3.2.1 Infectious substances must be classified in Division 6.2 and assigned to UN 2814, UN 2900, UN 3291-~~or~~, UN 3373 or UN 3549 as appropriate.

6.3.2.2 Infectious substances are divided into the following categories:

6.3.2.2.1 *Category A*: An infectious substance which is transported in a form that, when exposure to it occurs, is capable of causing permanent disability, life-threatening or fatal disease in otherwise healthy humans or animals. Indicative examples of substances that meet these criteria are given in Table 2-10.

Note. — *An exposure occurs when an infectious substance is released outside of the protective packaging resulting in physical contact with humans or animals.*

- a) Infectious substances meeting these criteria which cause disease in humans or in both humans and animals must be assigned to UN 2814. Infectious substances which cause disease only in animals must be assigned to UN 2900.
- b) Assignments to UN 2814 or UN 2900 must be based on the known medical history and symptoms of the source human or animal, endemic local conditions, or professional judgement concerning individual circumstances of the source human or animal.

Note 1.— *The proper shipping name for UN 2814 is **Infectious substance, affecting humans**. The proper shipping name for UN 2900 is **Infectious substance, affecting animals** only.*

Note 2.— *Table 2-10 is not exhaustive. Infectious substances, including new or emerging pathogens, which do not appear in Table 2-10 but which meet the same criteria must be assigned to Category A. In addition, if there is doubt as to whether or not a substance meets the criteria it must be included in Category A.*

UN Model Regulations, 2.6.3.2.2.1 (see ST/SG/AC.10/46/Add.1)

Note 3.— *In Table 2-10, the micro-organisms written in italics are bacteria, ~~mycoplasma, rickettsiae~~ or fungi.*

6.3.2.2.2 *Category B*: An infectious substance which does not meet the criteria for inclusion in Category A. Infectious substances in Category B must be assigned to UN 3373.

Note.— *The proper shipping name of UN 3373 is **Biological substances, Category B**.*

...

6.3.2.3 *Exceptions*

...

6.3.2.3.9 Except for:

UN Model Regulations, 2.6.3.2.3.9 (see ST/SG/AC.10/46/Add.1)

- a) medical waste (UN 3291 and UN 3549);
- b) medical devices or equipment contaminated with or containing infectious substances in Category A (UN 2814 or UN 2900); and
- c) medical devices or equipment contaminated with or containing other dangerous goods that meet the definition of another hazard class,

medical devices or equipment potentially contaminated with or containing infectious substances which are being transported for disinfection, cleaning, sterilization, repair, or equipment evaluation are not subject to the provisions of these Instructions if packed in packagings designed and constructed in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents. Packagings must be designed to meet the construction requirements listed in 6;3.

...

6.3.5 Medical or clinical wastes

UN Model Regulations, 2.6.3.5.1 (see ST/SG/AC.10/46/Add.1)

6.3.5.1 Medical or clinical wastes containing:

- a) ~~Category A infectious substances must be assigned to UN 2814 or UN 2900~~ or UN 3549 as appropriate. Solid medical waste containing Category A infectious substances generated from the medical treatment of humans or veterinary treatment of animals may be assigned to UN 3549. The UN 3549 entry must not be used for waste from bio-research or liquid waste
- b) ~~Medical or clinical wastes containing infectious substances in Category B~~ infectious substances must be assigned to UN 3291.

6.3.5.2 Medical or clinical wastes that are reasonably believed to have a low probability of containing infectious substances must be assigned to UN 3291. For the assignment, international, regional or national waste catalogues may be taken into account.

*Note.— The proper shipping name for UN 3291 is **Clinical waste, unspecified, n.o.s.** or **Biomedical waste, n.o.s.** or **Medical waste, n.o.s.** or **Regulated medical waste, n.o.s.***

6.3.5.3 Decontaminated medical or clinical wastes that previously contained infectious substances are not subject to these Instructions unless they meet the criteria for inclusion in another class.

...

Chapter 7

CLASS 7 — RADIOACTIVE MATERIAL

...

7.1.3 Definitions of specific terms

...

UN Model Regulations, 1.1.1.2 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.4.1 b) of DGP/27-WP/3):

Transport index (TI) assigned to a package, overpack or freight container, or to unpackaged LSA-I or SCO-I or SCO-III. A number which is used to provide control over radiation exposure.

Note.— Unpackaged LSA-I, SCO-I or SCO-III material are not permitted for transport by air.

...

7.2 CLASSIFICATION

7.2.1 General provisions

UN Model Regulations, 2.7.2.1.1 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.4.1 c) of DGP/27-WP/3):

7.2.1.1 Radioactive material must be assigned to one of the UN numbers specified in Table 2-11 in accordance with ~~7.2.4.2~~ 7.2.4 to 7.2.4.5, taking into account the material characteristics determined in 7.2.3.

Table 2-11. Assignment of UN numbers

UN number	Proper shipping name and description ^a
...	
<i>Surface contaminated objects (7.2.3.2)</i>	
UN Model Regulations, Table 2.7.2.1.1 (see ST/SG/AC.10/46/Add.1)	
UN 2913	Radioactive material, surface contaminated objects (SCO-I or SCO-II or SCO-III) , non-fissile or fissile excepted ^b
UN 3326	Radioactive material, surface contaminated objects (SCO-I or SCO-II) , fissile
...	

7.2.2 Determination of basic radionuclide values

7.2.2.1 The following basic values for individual radionuclides are given in Table 2-12:

- A_1 and A_2 in TBq;
- activity concentration limits for exempt material in Bq/g; and
- activity limits for exempt consignments in Bq.

7.2.2.2 For individual radionuclides:

UN Model Regulations, 2.7.2.2.2 a) and b) (see ST/SG/AC.10/46/Add.1)

- which are not listed in Table 2-12, determination of the basic radionuclide values referred to in 7.2.2.1 requires multilateral approval. For these radionuclides, activity concentration limits for exempt material and activity limits for exempt consignments must be calculated in accordance with the principles established in the [Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, IAEA Safety Standards Series No.415 GSR Part 3, IAEA, Vienna \(1996/2014\)](#). It is permissible to use the A_2 value calculated using a dose coefficient for the appropriate lung absorption type as recommended by the International Commission on Radiological Protection, if the chemical forms of each radionuclide under both normal and accident conditions of transport are taken into consideration. Alternatively, the radionuclide values in Table 2-13 may be used without obtaining competent authority approval.
- in instruments or articles in which the radioactive material is enclosed or is included as a component part of the instrument or other manufactured article and which meet 7.2.4.1.1.3 c), alternative basic radionuclide values to those in Table 2-12 for the activity limit for an exempt consignment are permitted and require multilateral approval. Such alternative activity limits for an exempt consignment must be calculated in accordance with the principles set out in the [International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Safety Series No.115, IAEA, Vienna \(1996\) GSR Part 3](#).

UN Model Regulations, 2.7.2.2.3 (see ST/SG/AC.10/46/Add.1)

7.2.2.3 In the calculations of A_1 and A_2 for a radionuclide not in Table 2-12, a single radioactive decay chain in which the radionuclides are present in their naturally occurring proportions, and in which no daughter progeny nuclide has a half-life either longer than 10 days or longer than that of the parent nuclide, must be considered as a single radionuclide; and the activity to be taken into account and the A_1 or A_2 value to be applied must be that corresponding to the parent nuclide of that chain. In the case of radioactive decay chains in which any daughter progeny nuclide has a half-life either longer than 10

days or greater than that of the parent nuclide, the parent and such daughter progeny nuclides must be considered as mixtures of different nuclides.

...

Table 2-12. Basic radionuclides values for individual radionuclides

UN Model Regulations, Table 2.7.2.2.1 (see ST/SG/AC.10/46/Add.1)

<i>Radionuclide (atomic number)</i>	<i>Special form A₁ (TBq)</i>	<i>Other form A₂ (TBq)</i>	<i>Activity concentration limit for exempt material (Bq/g)</i>	<i>Activity limit for an exempt consignment (Bq)</i>
...				
Barium (56)				
Ba-131 (a)	2×10^0	2×10^0	1×10^2	1×10^6
Ba-133	3×10^0	3×10^0	1×10^2	1×10^6
Ba-133m	2×10^1	6×10^{-1}	1×10^2	1×10^6
<u>Ba-135m</u>	<u>2×10^1</u>	<u>6×10^{-1}</u>	<u>1×10^2</u>	<u>1×10^6</u>
Ba-140 (a)	5×10^{-1}	3×10^{-1}	1×10^1 (b)	1×10^5 (b)
...				
Germanium (32)				
Ge-68 (a)	5×10^{-1}	5×10^{-1}	1×10^1	1×10^5
<u>Ge-69</u>	<u>1×10^0</u>	<u>1×10^0</u>	<u>1×10^1</u>	<u>1×10^6</u>
...				
Iridium (77)				
Ir-189 (a)	1×10^1	1×10^1	1×10^2	1×10^7
Ir-190	7×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Ir-192	1×10^0 (c)	6×10^{-1}	1×10^1	1×10^4
<u>Ir-193m</u>	<u>4×10^1</u>	<u>4×10^0</u>	<u>1×10^4</u>	<u>1×10^7</u>
Ir-194	3×10^{-1}	3×10^{-1}	1×10^2	1×10^5
...				
Nickel (28)				
<u>Ni-57</u>	<u>6×10^{-1}</u>	<u>6×10^{-1}</u>	<u>1×10^1</u>	<u>1×10^6</u>
Ni-59	Unlimited	Unlimited	1×10^4	1×10^8
Ni-63	4×10^1	3×10^1	1×10^5	1×10^8
Ni-65	4×10^{-1}	4×10^{-1}	1×10^1	1×10^6
...				
Strontium (38)				
Sr-82 (a)	2×10^{-1}	2×10^{-1}	1×10^1	1×10^5
<u>Sr-83</u>	<u>1×10^0</u>	<u>1×10^0</u>	<u>1×10^1</u>	<u>1×10^6</u>
Sr-85	2×10^0	2×10^0	1×10^2	1×10^6
Sr-85m	5×10^0	5×10^0	1×10^2	1×10^7

Radionuclide (atomic number)	Special form A_1 (TBq)	Other form A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Sr-87m	3×10^0	3×10^0	1×10^2	1×10^6
Sr-89	6×10^{-1}	6×10^{-1}	1×10^3	1×10^6
Sr-90 (a)	3×10^{-1}	3×10^{-1}	1×10^2 (b)	1×10^4 (b)
Sr-91 (a)	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
Sr-92 (a)	1×10^0	3×10^{-1}	1×10^1	1×10^6
...				
Terbium (65)				
<u>Tb-149</u>	<u>8×10^{-1}</u>	<u>8×10^{-1}</u>	<u>1×10^1</u>	<u>1×10^6</u>
Tb-157	4×10^1	4×10^1	1×10^4	1×10^7
Tb-158	1×10^0	1×10^0	1×10^1	1×10^6
Tb-160	1×10^0	6×10^{-1}	1×10^1	1×10^6
<u>Tb-161</u>	<u>3×10^1</u>	<u>7×10^{-1}</u>	<u>1×10^3</u>	<u>1×10^6</u>
...				
UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)				
(b) Parent nuclides and their progeny included in secular equilibrium are listed in the following <u>(the activity to be taken into account is that of the parent nuclide only)</u> :				
Sr-90	Y-90			
Zr-93	Nb-93m			
Zr-97	Nb-97			
Ru-106	Rh-106			
Ag-108m	Ag-108			
Cs-137	Ba-137m			
Ce-144	Pr-144			
Ba-140	La-140			
Bi-212	Tl-208 (0.36), Po-212 (0.64)			
Pb-210	Bi-210, Po-210			
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)			
Rn-222	Po-218, Pb-214, Bi-214, Po-214			
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207			
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)			
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210			
Ra-228	Ac-228			
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)			
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209			
UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)				
Th-nat ¹	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)			
Th-234	Pa-234m			
U-230	Th-226, Ra-222, Rn-218, Po-214			
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)			
U-235	Th-231			
U-238	Th-234, Pa-234m			
UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)				
U-nat ¹	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210			
Np-237	Pa-233			
Am-242m	Am-242			
Am-243	Np-239			
(c) The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level <u>dose rate</u> at a prescribed distance from the source.				

<i>Radionuclide (atomic number)</i>	<i>Special form A₁ (TBq)</i>	<i>Other form A₂ (TBq)</i>	<i>Activity concentration limit for exempt material (Bq/g)</i>	<i>Activity limit for an exempt consignment (Bq)</i>
(d) These values apply only to compounds of uranium that take the chemical form of UF ₆ , UO ₂ F ₂ and UO ₂ (NO ₃) ₂ in both normal and accident conditions of transport.				
(e) These values apply only to compounds of uranium that take the chemical form of UO ₃ , UF ₄ , UCl ₄ and hexavalent compounds in both normal and accident conditions of transport.				
(f) These values apply to all compounds of uranium other than those specified in (d) and (e) above.				
(g) These values apply to unirradiated uranium only.				
UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)				
<u>NOTE:</u>				
<u>1. In the case of Th-natural, the parent nuclide is Th-232, in the case of U-natural the parent nuclide is U-238.</u>				

...

7.2.3 Determination of other material characteristics

7.2.3.1 Low specific activity (LSA) material

7.2.3.1.1 (Reserved)

7.2.3.1.2 LSA material must be in one of three groups:

a) LSA-I

- i) uranium and thorium ores and concentrates of such ores, and other ores containing naturally occurring radionuclides;
- ii) natural uranium, depleted uranium, natural thorium, or their compounds or mixtures, that are unirradiated and in solid or liquid form;
- iii) radioactive material for which the A₂ value is unlimited. Fissile material may be included only if excepted under 7.2.3.5; or
- iv) other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the values for activity concentration specified in 7.2.2.1 to 7.2.2.6. Fissile material may be included only if excepted under 7.2.3.5.

b) LSA-II

- i) water with tritium concentration up to 0.8 TBq/L;
- ii) other material in which the activity is distributed throughout and the estimated average specific activity does not exceed 10⁻⁴ A₂/g for solids and gases, and 10⁻⁵ A₂/g for liquids.

UN Model Regulations, 2.7.2.3.1.2 c) (see ST/SG/AC.10/46/Add.1)

- c) LSA-III — solids (e.g. consolidated wastes, activated materials), excluding powders that meet the requirements of 7.2.3.1.3, in which:
 - i) the radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen and ceramic); **and**
 - ii) the radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble matrix, so that, even under loss of packaging, the loss of radioactive material per package by leaching when placed in water for seven days would not exceed 0.1 A₂; and

- iii) the estimated average specific activity of the solid, excluding any shielding material, does not exceed 2×10^{-3} A₂/g.

UN Model Regulations, 2.7.2.3.1.3 (see ST/SG/AC.10/46/Add.1)

7.2.3.1.3 ~~LSA-III material must be a solid of such a nature that if the entire contents of a package were subjected to the test specified in 7.2.3.1.4, the activity in the water would not exceed 0.1 A₂.~~ Deleted

...

7.2.3.2 *Surface contaminated object (SCO)*

UN Model Regulations, 2.7.2.3.2 (see ST/SG/AC.10/46/Add.1)

7.2.3.2.1 SCO is classified in one of ~~two~~ three groups:

- a) SCO-I: A solid object on which:
- i) the non-fixed contamination on the accessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 0.4 Bq/cm² for all other alpha emitters;
 - ii) the fixed contamination on the accessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4×10^4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm² for all other alpha emitters; or
 - iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4×10^4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm² for all other alpha emitters;
- b) SCO-II: A solid object on which either the fixed or non-fixed contamination on the surface exceeds the applicable limits specified for SCO-I in a) above and on which:
- i) the non-fixed contamination on the accessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 400 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 40 Bq/cm² for all other alpha emitters;
 - ii) the fixed contamination on the accessible surface, averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 8×10^5 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm² for all other alpha emitters; or
 - iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 8×10^5 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm² for all other alpha emitters-;

UN Model Regulations, 2.7.2.3.2 (c) (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.4.1 d) of DGP/27-WP/3):

c) SCO-III: A large solid object which, because of its size, cannot be transported in a type of package described in these Instructions.

Note.— SCO-III material is forbidden for transport by air.

...

7.2.3.3 *Special form radioactive material*

...

7.2.3.3.5 The relevant test methods are:

- a) Impact test: The specimen must drop onto the target from a height of 9 m. The target must be as defined in 6;7.13;

UN Model Regulations, 2.7.2.3.3.5 (b) (see ST/SG/AC.10/46/Add.1)

- b) Percussion test: The specimen must be placed on a sheet of lead which is supported by a smooth, solid surface and struck by the flat face of a mild steel bar so as to cause an impact equivalent to that resulting from a free drop of 1.4 kg ~~through~~ from a height of 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm. The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm thick, must cover an area greater than that covered by the specimen. A fresh surface of lead must be used for each impact. The bar must strike the specimen so as to cause maximum damage.

UN Model Regulations, 2.7.2.3.3.5 (c) (see ST/SG/AC.10/46/Add.1)

- c) Bending test: The test must apply only to long, slender sources with both a minimum length of 10 cm and a length to minimum width ratio of not less than 10. The specimen must be rigidly clamped in a horizontal position so that one-half of its length protrudes from the face of the clamp. The orientation of the specimen must be such that the specimen will suffer maximum damage when its free end is struck by the flat face of a steel bar. The bar must strike the specimen so as to cause an impact equivalent to that resulting from a free vertical drop of 1.4 kg ~~through~~ from a height of 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm.
- d) Heat test: The specimen must be heated in air to a temperature of 800°C and held at that temperature for a period of 10 minutes and must then be allowed to cool.

...

7.2.3.3.7 For specimens which comprise or simulate indispersible solid material, a leaching assessment must be performed as follows:

- a) The specimen must be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test must be sufficient to ensure that at the end of the 7-day test period, the free volume of the unabsorbed and unreacted water remaining must be at least 10 per cent of the volume of the solid test sample itself. The water must have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20°C;

UN Model Regulations, 2.7.2.3.3.7 (b) (see ST/SG/AC.10/46/Add.1)

- b) The water ~~with~~ and the specimen must then be heated to a temperature of $(50 \pm 5)^\circ\text{C}$ and maintained at this temperature for 4 hours;
- c) The activity of the water must then be determined;
- d) The specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity not less than 90 per cent;

UN Model Regulations, 2.7.2.3.3.7 (e) (see ST/SG/AC.10/46/Add.1)

- e) The specimen must then be immersed in water of the same specification as in a) above and the water ~~with~~ and the specimen heated to $(50 \pm 5)^\circ\text{C}$ and maintained at this temperature for 4 hours;
- f) The activity of the water must then be determined.

7.2.3.3.8 For specimens which comprise or simulate radioactive material enclosed in a sealed capsule, either a leaching assessment or a volumetric leakage assessment must be performed as follows:

- a) The leaching assessment must consist of the following steps:
- i) the specimen must be immersed in water at ambient temperature. The water must have an initial pH of 6-8 with a maximum conductivity of 1 mS/m at 20°C;

UN Model Regulations, 2.7.2.3.3.8 (a)(ii) (see ST/SG/AC.10/46/Add.1)

- ii) the water and specimen must then be heated to a temperature of $(50 \pm 5)^\circ\text{C}$ and maintained at this temperature for 4 hours;
- iii) the activity of the water must then be determined;

- iv) the specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity of not less than 90 per cent;
- v) the process in i), ii) and iii) must be repeated;
- b) The alternative volumetric leakage assessment must comprise any of the tests prescribed in ISO 9978:1992 "Radiation protection — Sealed radioactive sources — Leakage test methods", provided that they are acceptable to the competent authority.

7.2.3.4 *Low dispersible radioactive material*

7.2.3.4.1 The design for low dispersible radioactive material requires multilateral approval. Low dispersible radioactive material must be such that the total amount of this radioactive material in a package, taking into account the provisions of 6;7.7.14, must meet the following requirements:

UN Model Regulations, 2.7.2.3.4.1 (a) (see ST/SG/AC.10/46/Add.1)

- a) The ~~radiation level~~ **dose rate** at 3 m from the unshielded radioactive material does not exceed 10 mSv/h;
- b) If subjected to the tests specified in 6;7.19.3 and 6;7.19.4, the airborne release in gaseous and particulate forms of up to 100 µm aerodynamic equivalent diameter would not exceed 100 A₂. A separate specimen may be used for each test; and
- c) If subjected to the test specified in 7.2.3.1.4, the activity in the water would not exceed 100 A₂. In the application of this test, the damaging effects of the tests specified in b) above must be taken into account.

7.2.3.4.2 Low dispersible material must be tested as follows:

A specimen that comprises or simulates low dispersible radioactive material must be subjected to the enhanced thermal test specified in 6;7.19.3 and the impact test specified in 6;7.19.4. A different specimen may be used for each of the tests. Following each test, the specimen must be subjected to the leach test specified in 7.2.3.1.4. After each test, it must be determined if the applicable requirements of 7.2.3.4.1 have been met.

7.2.3.4.3 Demonstration of compliance with the performance standards in 7.2.3.4.1 and 7.2.3.4.2 must be in accordance with 6;7.11.1 and 6;7.11.2.

7.2.3.5 *Fissile material*

7.2.3.5.1 Fissile material and packages containing fissile material must be classified under the relevant entry as fissile in accordance with Table 2-11 unless excepted by one of the provisions of sub-paragraphs a) to f) below and transported subject to the requirements of 7;2.9.4.3. All provisions apply only to material in packages that meets the requirements of 6;7.6.2.

- a) Uranium enriched in uranium-235 to a maximum of 1 per cent by mass, and with a total plutonium and uranium-233 content not exceeding 1 per cent of the mass of uranium-235, provided that the fissile nuclides are distributed essentially homogeneously throughout the material. In addition, if uranium-235 is present in metallic, oxide or carbide forms, it must not form a lattice arrangement;
- b) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 per cent by mass, with a total plutonium and uranium-233 content not exceeding 0.002 per cent of the mass of uranium, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2;
- c) Uranium with a maximum uranium enrichment of 5 per cent by mass uranium-235 provided:
 - i) there is no more than 3.5 g of uranium-235 per package;
 - ii) the total plutonium and uranium-233 content does not exceed 1 per cent of the mass of uranium-235 per package;
 - iii) transport of the package is subject to the consignment limit provided in 7;2.9.4.3 c);
- d) Fissile nuclides with a total mass not greater than 2 g per package provided the package is transported subject to the consignment limit provided in 7;2.9.4.3 d);

 UN Model Regulations, 2.7.2.3.5 (e) (see ST/SG/AC.10/46/Add.1)

- e) Fissile nuclides with a total mass not greater than 45 g subject to ~~limits provided in~~ [the requirements of 7;2.9.4.3 e](#));
- f) A fissile material that meets the requirements of 7;2.9.4.3 b), 7.2.3.6 and 5;1.2.2.1.

 UN Model Regulations, 2.7.2.3.6 (see ST/SG/AC.10/46/Add.1)

7.2.3.6 ~~A~~Fissile material excepted from classification as fissile under 7.2.3.5.1 f) must be subcritical without the need for accumulation control under the following conditions:

- a) the conditions of 6;7.10.1 a);
- b) the conditions consistent with the assessment provisions stated in 6;7.10.12 b) and 6;7.10.13 b) for packages; and
- c) the conditions specified in 6;7.10.11 a).

7.2.4 Classification of packages

7.2.4.1 The quantity of radioactive material in a package must not exceed the relevant limits for the package type as specified below.

7.2.4.1.1 Classification as excepted packages

7.2.4.1.1.1 A package may be classified as excepted packages if it meets one of the following conditions:

- a) it is an empty packaging having contained radioactive material;
- b) it contains instruments or articles not exceeding the activity limits specified in columns 2 and 3 of Table 2-14;
- c) it contains articles manufactured of natural uranium, depleted uranium or natural thorium; or
- d) it contains radioactive material not exceeding the activity limits specified in column 4 of Table 2-14; or
- e) it contains less than 0.1 kg of uranium hexafluoride not exceeding the activity limits specified in column 4 of Table 2-14.

7.2.4.1.1.2 A package containing radioactive material may be classified as an excepted package provided that the ~~radiation level~~ [dose rate](#) at any point on its external surface does not exceed 5 µSv/h.

7.2.4.1.1.3 Radioactive material which is enclosed in or is included as a component part of an instrument or other manufactured article may be classified under UN 2911 — **Radioactive material, excepted package — instruments or articles** provided that:

- a) the ~~radiation level~~ [dose rate](#) at 10 cm from any point on the external surface of any unpackaged instrument or article is not greater than 0.1 mSv/h; and
- b) each instrument or article bears the mark "RADIOACTIVE" on its external surface except for the following:
 - i) radioluminescent time-pieces or devices;
 - ii) consumer products that either have received regulatory approval in accordance with 1;6.1.4 c) or do not individually exceed the activity limit for an exempt consignment in Table 2-12 (column 5), provided such products are transported in a package that bears the mark "RADIOACTIVE" on an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package; and
 - iii) other instruments or articles too small to bear the mark "RADIOACTIVE", provided that they are transported in a package that bears the mark "RADIOACTIVE" on its internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package;

 UN Model Regulations, 2.7.2.4.1.3 (c), (d), (e) and (f) (see ST/SG/AC.10/46/Add.1)

- c) the active material is completely enclosed by non-active components (a device performing the sole function of containing radioactive material must not be considered to be an instrument or manufactured article); ~~and~~

- d) the limits specified in columns 2 and 3 of Table 2-14 are met for each individual item and each package, respectively;

e) reserved; and

f) if the package contains fissile material, one of the provisions of 7.2.3.5.1 a) to f) must apply.

7.2.4.1.1.4 Radioactive material in forms other than as specified in 7.2.4.1.1.3 and with an activity not exceeding the limits specified in column 4 of Table 2-14 may be classified under UN 2910 — **Radioactive material, excepted package — limited quantity of material**, provided that:

UN Model Regulations, 2.7.2.4.1.4 (a), (b) (ii), (c) (see ST/SG/AC.10/46/Add.1)

- a) the package retains its radioactive contents under routine conditions of transport; ~~and~~
- b) the package bears the mark "RADIOACTIVE" on either:
- i) an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package; or
 - ii) the outside of the package, where it is impractical to mark an internal surface; and

c) if the package contains fissile material, one of the provisions of 7.2.3.5.1 a) to f) must apply.

7.2.4.1.1.5 Uranium hexafluoride not exceeding the limits specified in column 4 of Table 2-14 may be classified under UN 3507 — **Uranium hexafluoride, radioactive material, excepted package**, less than 0.1 kg per package, non-fissile or fissile-excepted provided that:

- a) the mass of uranium hexafluoride in the package is less than 0.1 kg; and
- b) the conditions of 7.2.4.5.2 and 7.2.4.1.1.4 a) and b) are met.

7.2.4.1.1.6 Articles manufactured of natural uranium, depleted uranium or natural thorium and articles in which the sole radioactive material is unirradiated natural uranium, unirradiated depleted uranium or unirradiated natural thorium may be classified under UN 2909, **Radioactive material, excepted package — articles manufactured from natural uranium or depleted uranium or natural thorium** provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

7.2.4.1.1.7 An empty packaging which had previously contained radioactive material may be classified under UN 2908 — **Radioactive material, excepted package — empty packaging** provided that:

- a) it is in a well-maintained condition and securely closed;
- b) the outer surface of any uranium or thorium in its structure is covered with an inactive sheath made of metal or some other substantial material;

UN Model Regulations, 2.7.2.4.1.7 (c) (ii), (d) and (e) (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.4.1 e) and f) of DGP/27-WP/3):

- c) the level of internal non-fixed contamination, when averaged over any 300 cm², does not exceed:
- i) 400 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters; and
 - ii) 40 Bq/cm² for all other alpha emitters; ~~and~~
- d) any labels which may have been displayed on it in conformity with 5.3.2.6 are no longer visible; and

e) if the packaging has contained fissile material, one of the provisions of 7.2.3.5.1 a) to f) or one of the provisions for exclusion for fissile nuclides, as described in the definition for fissile nuclides in 7.1.3, must apply.

*Note.— The external radiation levels dose rates at the surface of empty Type B(U) or Type B(M) packages may exceed 5 μSv/h due to the presence of depleted uranium in the shielding material. Such empty packages cannot be transported as UN 2908 — **Radioactive material, excepted package — empty packaging** as they do not meet the conditions specified in 7.2.4.1.1.2. These packages remain subject to all applicable parts of these Instructions and may be classified as:*

- a) low specific material (LSA-I) as specified in 7.2.3.1.2 a) ii); or
- b) Type B(U) package as specified in 7.2.4.6.2; or

- c) Type B(M) package as specified in 7.2.4.6.3.

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Chapter 8

CLASS 8 — CORROSIVE SUBSTANCES

8.1 DEFINITION AND GENERAL PROVISIONS

For French version: There may be a need for amendment to the following for the sake of alignment with 2.8.1.1 of the UN Model Regulations, (see ST/SG/AC.10/46/Add.1), i.e.:

2.8.1.1 Remplacer « engins de transport » par « matériels de transport ».

8.1.1 Corrosive substances are substances which, by chemical action, will cause irreversible damage to the skin or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport.

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8.3 PACKING GROUP ASSIGNMENT FOR SUBSTANCES AND MIXTURES

8.3.1 Existing human and animal data, including information from single or repeated exposure, must be the first line of evaluation, as they give information directly relevant to effects on the skin.

UN Model Regulations, 2.8.3.2 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.4.1 g) of DGP/27-WP/3):

8.3.2 In assigning the packing group in accordance with 8.2.3, account must be taken of human experience in instances of accidental exposure. In the absence of human experience, the grouping classification must be based on data obtained from experiments in accordance with OECD Guideline for the Testing of Chemicals No. 404, *Acute Dermal Irritation/Corrosion*, 2015 or No. 435, *In Vitro Membrane Barrier Test Method for Skin Corrosion*, 2015, No. 431, *In Vitro Skin Corrosion: Reconstructed Human Epidermis (RHE) Test Method*, 2016 or No. 430, *In Vitro Skin Corrosion: Transcutaneous Electrical Resistance (TER) Test Method*, 2015.

8.3.2.1 A substance or mixture which is determined not to be corrosive in accordance with OECD Guideline for the Testing of Chemicals No. 404, No. 435, No. 431 or No. 430, *In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test (TER)*, 2015 or No. 431, *In Vitro Skin Corrosion: Human Skin Model Test*, 2015 may be considered not to be corrosive to skin for the purposes of these Instructions without further testing. If the in vitro test results indicate that the substance or mixture is corrosive and not assigned to Packing Group I, but the test method does not allow discrimination between Packing Groups II and III, it must be considered to be Packing Group II.

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Chapter 9

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

DGP-WG/19 (see paragraph 3.1.2.4.1 h) of DGP/27-WP/3):

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9.2 ASSIGNMENT TO CLASS 9

Class 9 includes, inter alia: [The substances and articles of Class 9 are subdivided as shown in Table 2-16.](#)

Insert the following new table (the text in existing 9.2 has been incorporated in the “notes” column of the table):

Table 2-16. Substances and articles of Class 9

<i>UN number</i>	<i>Name</i>	<i>Notes</i>
<i>Substances which, on inhalation as fine dust, may endanger health</i>		
2212	Asbestos, amphibole (amosite, tremolite, actinolite, anthophyllite, crocidolite)	
2590	Asbestos, chrysotile	
<i>Substances evolving flammable vapour</i>		
2211	Polymeric beads, expandable , evolving flammable vapour	
3314	Plastics moulding compound in dough, sheet or extruded rope form evolving flammable vapour	
<i>Lithium batteries</i>		
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	
<i>Capacitors</i>		
3499	Capacitor, electric double layer (with an energy storage capacity greater than 0.3 Wh)	
3508	Capacitor, asymmetric (with an energy storage capacity greater than 0.3 Wh)	

<i>UN number</i>	<i>Name</i>	<i>Notes</i>
<i>Live-saving appliances</i>		
2990	Life-saving appliances, self-inflating	
3072	Life-saving appliances, not self-inflating containing dangerous goods as equipment	
3268	Safety devices , electrically initiated	
<i>Substances and articles which, in the event of fire, may form dioxins</i>		
2315	Polychlorinated biphenyls, liquid	Examples of articles are transformers, condensers and apparatus containing those substances.
3432	Polychlorinated biphenyls, solid	
3151	Polyhalogenated biphenyls, liquid	
3151	Halogenated monomethyldiphenylmethanes, liquid	
3151	Polyhalogenated terphenyls, liquid	
3152	Polyhalogenated biphenyls, solid	
3152	Halogenated monomethyldiphenylmethanes, solid	
3152	Polyhalogenated terphenyls, solid	
<i>Substances transported or offered for transport at elevated temperatures</i>		
3257	Elevated temperature liquid, n.o.s. , at or above 100°C and below its flash point (including molten metals, molten salts, etc.)	Elevated temperature substances (i.e. substances that are transported or offered for transport at temperatures equal to or exceeding 100°C in a liquid state or at temperatures equal to or exceeding 240°C in a solid state (these substances may only be carried under 1;1.1)).
3258	Elevated temperature solid, n.o.s. , at or above 240°C	
<i>Environmentally hazardous substances</i>		
3077	Environmentally hazardous substance, solid, n.o.s.	Environmentally hazardous substances (aquatic environment) are those that meet the criteria in 2.9.3 of the UN Model Regulations or that meet criteria in international regulations or national regulations established by the appropriate national authority in the State of Origin, transit or destination of the consignment. Substances or mixtures dangerous to the aquatic environment not otherwise classified under these Instructions must be assigned to Packing Group III and assigned to UN 3077 or UN 3082.
3082	Environmentally hazardous substance, liquid, n.o.s.	
<i>Genetically modified micro-organisms (GMMOs) and genetically modified organisms (GMOs)</i>		
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. Genetically modified live animals must be transported under terms and conditions of the appropriate national authorities of the States of Origin and destination.
3245	Genetically modified organisms	
<i>Ammonium nitrate based fertilizers</i>		
2071	Ammonium nitrate based fertilizer	Solid ammonium nitrate based fertilizers must be classified in accordance with the procedure as set out in the <i>Manual of Tests and Criteria</i> , Part III, Section 39.

<i>UN number</i>	<i>Name</i>	<i>Notes</i>
<i>Other substances or articles presenting a danger during transport, but not meeting the definitions of another class</i>		
1841	Acetaldehyde ammonia	
1845	Dry ice	
1845	Carbon dioxide, solid	
1931	Zinc dithionite	
1931	Zinc hydrosulphite	
1941	Dibromodifluoromethane	
1990	Benzaldehyde	
2216	Fish meal, stabilized	
2216	Fish scrap, stabilized	
2807	Magnetized material	<p>Magnetized material is any material which, when packed for air transport, has a maximum magnetic field strength sufficient to cause a compass deflection of more than 2 degrees at a distance of 2.1 m from any point on the surface of the assembled package. The magnetic field strength at the compass producing a 2 degree deflection is taken to be 0.418 A/m (0.00525 Gauss).</p> <p>The magnetic field strength must be measured with a magnetic compass sensitive enough to read a 2 degree variation, preferably in 1 degree increments or finer, or using a Gauss meter having a sensitivity sufficient to measure magnetic fields greater than 0.0005 Gauss within a tolerance of plus or minus 5 per cent, or by an equivalent means.</p> <p>Compass measurements must be taken in an area free from magnetic interference other than the Earth's magnetic field. When using a compass, the material and the compass must be aligned in an east-west direction. Gauss meter measurements must be in accordance with the manufacturer's instructions. Measurements are taken while the packaged material is rotated through 360 degrees in its horizontal plane while maintaining a constant distance (2.1 m or 4.6 m as referred to in Packing Instruction 953) between the measuring device and any point on the outside surface of the package. Shielding may be used to reduce the package's magnetic strength.</p> <p><i>Note.— Masses of ferro-magnetic metals such as automobiles, automobile parts, metal fencing, piping and metal construction material, even if not meeting the definition of magnetized material may affect aircraft compasses, as may packages or items which individually do not meet the definition of magnetized material but cumulatively may have a magnetic field strength of a magnetized material.</i></p>
2969	Castor beans	
2969	Castor meal	
2969	Castor pomace	
2969	Castor flake	
3166	Vehicle, flammable gas powered	
3166	Vehicle, flammable liquid powered	

<i>UN number</i>	<i>Name</i>	<i>Notes</i>
3166	Vehicle, fuel cell, flammable gas powered †	
3166	Vehicle, fuel cell, flammable liquid powered †	
3171	Battery-powered vehicle	
3171	Battery-powered equipment	
3316	Chemical kit	
3316	First aid kit	
3334	Aviation regulated liquid, n.o.s.	Aviation regulated liquid is any material which has narcotic, noxious or other properties such that, in the event of spillage or leakage on an aircraft, extreme annoyance or discomfort could be caused to crew members so as to prevent the correct performance of assigned duties.
3335	Aviation regulated solid, n.o.s.	Aviation regulated solid is any material which has narcotic, noxious or other properties such that, in the event of spillage or leakage on an aircraft, extreme annoyance or discomfort could be caused to crew members so as to prevent the correct performance of assigned duties.
3359	Fumigated cargo transport unit	
3363	Dangerous goods in machinery	
3363	Dangerous goods in apparatus	
3363	Dangerous goods in articles	
3509	Packagings, discarded, empty, uncleaned	
3530	Engine, internal combustion	
3530	Machinery, internal combustion	
3548	Articles containing miscellaneous dangerous goods, n.o.s.	

Some examples of articles in Class 9 are:

- _____ Engines, internal combustion;
- _____ Life saving appliances, self inflating;
- _____ Battery-powered equipment or vehicle.

Some examples of substances in Class 9 are:

- _____ Asbestos, amphibole (amosite, tremolite, actinolite, anthophyllite, crocidolite)
- _____ Asbestos, chrysotile
- _____ Carbon dioxide, solid (dry ice);
- _____ Zinc dithionite.

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Part 3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND EXCEPTED QUANTITIES

Chapter 2

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

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Table 3-1. Dangerous Goods List

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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	5	6	7	8	9	10	11	12	13
UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):												
Detonators, electronic programmable for blasting†	0511	1.1B							FORBI	DDEN	FORBI	DDEN
Detonators, electronic programmable for blasting†	0512	1.4B		Explosive 1.4				E0	FORBI	DDEN	131	75 kg
UN Model Regulations, Chapter 3.2, dangerous goods list, SP347 (see ST/SG/AC.10/46/Add.1):												
Detonators, electronic programmable for blasting†	0513	1.4S		Explosive 1.4		A165		E0	131	25 kg	131	100 kg
UN Model Regulations, Chapter 3.2, dangerous goods list, SP393 (see ST/SG/AC.10/46/Add.1):												
Nitrocellulose, dry or wetted with less than 25% water (or alcohol), by mass	0340	1.1D				A216			FORBI	DDEN	FORBI	DDEN

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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	5	6	7	8	9	10	11	12	13

UN Model Regulations, Chapter 3.2, dangerous goods list, SP393 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , unmodified or plasticized with less than 18% plasticizing substance, by mass	0341	1.1D				<u>A216</u>			FORBI	DDEN	FORBI	DDEN
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP393 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose, plasticized with not less than 18% plasticizing substance, by mass	0343	1.3C				<u>A216</u>			FORBI	DDEN	FORBI	DDEN
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP393 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose, wetted with not less than 25% alcohol, by mass	0342	1.3C				<u>A216</u>			FORBI	DDEN	FORBI	DDEN
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UN Model Regulations, Chapter 3.2, dangerous goods list, UN 2037 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.5.1 d) of DGP/27-WP/3):

Gas cartridges , (flammable) without a release device, non-refillable	2037	2.1		Gas flammable		<u>A145</u> A167		<u>E0</u>	<u>203</u> <u>Y203</u>	<u>1 kg</u> <u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Gas cartridges , (non-flammable) without a release device, non-refillable	2037	2.2		Gas non-flammable		A98 <u>A145</u> A167		<u>E0</u>	<u>203</u> <u>Y203</u>	<u>1 kg</u> <u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Gas cartridges (oxidizing) without a release device, non-refillable	2037	2.2	5.1	Gas non-flammable & Oxidizer		<u>A145</u> A167		<u>E0</u>	<u>203</u>	<u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Gas cartridges (toxic & corrosive) without a release device, non-refillable	2037	2.3	8		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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	5	6	7	8	9	10	11	12	13
Gas cartridges (toxic, flammable & corrosive) without a release device, non-refillable	2037	2.3	2.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Gas cartridges (toxic & flammable) without a release device, non-refillable	2037	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Gas cartridges (toxic, oxidizing & corrosive) without a release device, non-refillable	2037	2.3	5.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2 A211			FORBI	DDEN	FORBI	DDEN
Gas cartridges (toxic & oxidizing) without a release device, non-refillable	2037	2.3	5.1		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Gas cartridges (toxic) without a release device, non-refillable	2037	2.3			AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (flammable) without a release device, non-refillable	2037	2.1		Gas flammable		<u>A145</u> A167		<u>E0</u>	<u>203</u> <u>Y203</u>	<u>1 kg</u> <u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Receptacles, small, containing gas (non-flammable) without a release device, non-refillable	2037	2.2		Gas non-flammable		A98 <u>A145</u> A167		<u>E0</u>	<u>203</u> <u>Y203</u>	<u>1 kg</u> <u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Receptacles, small, containing gas (oxidizing) without a release device, non-refillable	2037	2.2	5.1	Gas non-flammable & Oxidizer		<u>A145</u> A167		<u>E0</u>	<u>203</u>	<u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Receptacles, small, containing gas (toxic & corrosive) without a release device, non-refillable	2037	2.3	8		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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	5	6	7	8	9	10	11	12	13
Receptacles, small, containing gas (toxic, flammable & corrosive) without a release device, non-refillable	2037	2.3	2.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (toxic & flammable) without a release device, non-refillable	2037	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (toxic, oxidizing & corrosive) without a release device, non-refillable	2037	2.3	5.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2 A211			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (toxic & oxidizing) without a release device, non-refillable	2037	2.3	5.1		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (toxic) without a release device, non-refillable	2037	2.3			AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN

DGP-WG/19 (see paragraph 3.1.2.10 of DGP/27-WP/3):

Fish meal, stabilized	2216	9		<u>Miscellaneous</u>	AU-1 IR-3 NL-3 US-3	A2 <u>A219</u>	III	E1	FORBI <u>956</u>	DDEN <u>100 kg</u>	FORBID <u>956</u>	DEN <u>200 kg</u>
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP386 (see ST/SG/AC.10/46/Add.1):

Dipropylamine	2383	3	8	Liquid flammable & Corrosive		A209	II	E2	352 Y340	1 L 0.5 L	363	5 L
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Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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	5	6	7	8	9	10	11	12	13

UN Model Regulations, Chapter 3.2, dangerous goods list, SP386 (see ST/SG/AC.10/46/Add.1):

2-Dimethylaminoethyl methacrylate, stabilized	2522	6.1		Toxic		A209	II	E4	654 Y641	5 L 1 L	662	60 L
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose with water , not less than 25% water by mass	2555	4.1		Solid flammable	BE 3	A57 A217	II	E0	452	15 kg	453	50 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

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	A57 A217	II	E0	452	1 kg	453	15 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , with not more than 12.6% nitrogen, by dry mass, mixture without plasticizer, without pigment	2557	4.1		Solid flammable	BE 3	A57 A86 A217	II	E0	452	1 kg	453	15 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , with not more than 12.6% nitrogen, by dry mass, mixture without plasticizer, with pigment	2557	4.1		Solid flammable	BE 3	A57 A86 A217	II	E0	452	1 kg	453	15 kg
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Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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	5	6	7	8	9	10	11	12	13

UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , with not more than 12.6% nitrogen, by dry mass, mixture with plasticizer, without pigment	2557	4.1		Solid flammable	BE 3	A57 A86 <u>A217</u>	II	E0	452	1 kg	453	15 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , with not more than 12.6% nitrogen, by dry mass, mixture with plasticizer, with pigment	2557	4.1		Solid flammable	BE 3	A57 A86 <u>A217</u>	II	E0	452	1 kg	453	15 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP274 (see ST/SG/AC.10/46/Add.1):

Environmentally hazardous substance, solid, n.o.s.*	3077	9		Miscellaneous	DE 5 US 4	A97 A158 A179 A197 <u>A215</u>	III	E1	956 Y956	400 kg 30 kg G	956	400 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP274 (see ST/SG/AC.10/46/Add.1):

Environmentally hazardous substance, liquid, n.o.s.*	3082	9		Miscellaneous	DE 5 US 4	A97 A158 A179 <u>A215</u>	III	E1	964 Y964	450 L 30 kg G	964	450 L
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UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):

Biomedical waste, n.o.s.	3291	6.2		Infectious		A117	II	E0	622 <u>621</u>	No limit	622 <u>621</u>	No limit
Clinical waste, unspecified, n.o.s.	3291	6.2		Infectious		A117	II	E0	622 <u>621</u>	No limit	622 <u>621</u>	No limit

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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	5	6	7	8	9	10	11	12	13

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):

Medical waste, n.o.s.	3291	6.2		Infectious		A117	II	E0	622621	No limit	622621	No limit
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UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):

Regulated medical waste, n.o.s.	3291	6.2		Infectious		A117	II	E0	622621	No limit	622621	No limit
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UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):

<u>Dangerous goods in articles</u>	<u>3363</u>	<u>9</u>		<u>Miscellaneous</u>		<u>A48</u> <u>A107</u>		<u>E0</u>	<u>see 962</u>		<u>see 962</u>	
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Desensitized explosive, solid, n.o.s.*	3380	4.1			BE 3	A133 A217			FORBI	DDEN	FORBI	DDEN
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP356 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.5.1 c) of DGP/27-WP/3):

Engine, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A208		E0	FORBI	DDEN	220	No limit
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP356 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.5.1 c) of DGP/27-WP/3):

Machinery, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A208		E0	FORBI	DDEN	220	No limit
---	------	-----	--	---------------	--	--------------------	--	----	-------	------	-----	----------

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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	5	6	7	8	9	10	11	12	13

UN Model Regulations, Chapter 3.2, dangerous goods list, SP395 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.5.1 a) of DGP/27-WP/3):

<u>Medical waste, Category A, affecting humans, solid</u>	<u>3549</u>	<u>6.2</u>				<u>A2</u> <u>A218</u>			<u>FORBI</u>	<u>DDEN</u>	<u>FORBI</u>	<u>DDEN</u>
<u>Medical waste, Category A, affecting animals only, solid</u>	<u>3549</u>	<u>6.2</u>				<u>A2</u> <u>A218</u>			<u>FORBI</u>	<u>DDEN</u>	<u>FORBI</u>	<u>DDEN</u>

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Chapter 3

SPECIAL PROVISIONS

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Table 3-2. Special provisions

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A78 (≈172) Where a radioactive material has a subsidiary hazard(s):

- a) The substance must be allocated to Packing Group I, II or III, if appropriate, by application of the packing group criteria provided in Part 2 corresponding to the nature of the predominant subsidiary hazard.
- b) Packages must be labelled with subsidiary hazard labels corresponding to each subsidiary hazard exhibited by the material in accordance with the relevant provisions of 5;3.2; corresponding placards must be affixed to cargo transport units in accordance with the relevant provisions of 5;3.6.
- c) For the purposes of documentation and package marking, the proper shipping name must be supplemented with the name of the constituents which most predominantly contribute to this subsidiary hazard(s) and which must be enclosed in parenthesis. However, where the constituent is listed by name in Table 3-1 and:
 - i) “forbidden” is shown in columns 10 and 11, the dangerous goods transport document must indicate Cargo Aircraft Only and the package must bear cargo aircraft only labels, except that the substance may be shipped on a passenger aircraft with the prior approval of the appropriate authority of the State of Origin and the State of the Operator under the conditions established by those authorities. A copy of the document of approval, showing the quantity limitations and the packaging requirements, must accompany the consignment; and
 - ii) “forbidden” is shown in columns 12 and 13, the substance is forbidden for transport by air except that the substance may be shipped on a cargo aircraft with the prior approval of the appropriate authority of the State of Origin and the State of the Operator under the conditions established by those authorities. A copy of the document of approval, showing the quantity limitations and the packaging requirements, must accompany the consignment.

Radioactive material with a subsidiary hazard of Division 4.2 in Packing Group I must be transported in Type B packages. These may be transported on passenger or cargo aircraft.

UN Model Regulations, Chapter 3.3, SP 172 (d) (see ST/SG/AC.10/46/Add.1)

- d) The dangerous goods transport document must indicate the ~~subsidiary~~ class or division of the subsidiary hazard and, where assigned, the packing group as required by 5;4.1.4.1 d) and e).

For packing, see also 4;9.1.5.

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UN Model Regulations, Chapter 3.3, SP 301 (see ST/SG/AC.10/46/Add.1)

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

TIs UN

Where the quantity of dangerous goods contained as an integral element in ~~machinery or apparatus~~ 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 ~~machinery or apparatus~~ 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.

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.

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UN Model Regulations, Chapter 3.3, SP 327 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.5.1 d) of DGP/27-WP/3):

A145 Waste aerosols, waste gas cartridges and waste receptacles, small, containing gas are forbidden from air transport. Waste gas cartridges and waste receptacles, small, containing gas that were filled with gases of Division 2.2 and have been pierced are not subject to these Instructions.

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UN Model Regulations, Chapter 3.3, SP 376 (see ST/SG/AC.10/46/Add.1), DGP-WG/18 (see paragraph 3.3.6.3 of DGP/27-WP/2), DGP-WG/19 (see paragraph 3.1.2.5 e) of DGP/27-WP/3) and DGP/27 (see paragraph 1.2.3.2 of the report under Agenda Item 1):

≠ A154 ~~≈376~~ Lithium ion cells or batteries and lithium metal cells or batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, 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 damaged or defective prior to transport).

Lithium ion cells or batteries and lithium metal 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
- c) cells or batteries that have sustained physical or mechanical damage.

In assessing a cell or battery as damaged or defective, 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 356 (d) (see ST/SG/AC.10/46/Add.1)

- A176 (356) Metal hydride storage systems installed in vehicles, vessels, machinery, engines or aircraft or in completed components or intended to be installed in vehicles, vessels, machinery, engines or aircraft must be approved by the appropriate national authority before acceptance for transport. The dangerous goods transport document must include an indication that the package was approved by the appropriate national authority or a copy of the appropriate national authority approval must accompany each consignment.

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UN Model Regulations, Chapter 3.3, SP 360 (see ST/SG/AC.10/46/Add.1)

- A185 (360) Vehicles only powered by lithium metal batteries or lithium ion batteries must be ~~consigned under~~ assigned to the entry UN 3171 Battery-powered vehicle.

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

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DGP-WG/19 (see paragraph 3.1.2.5.1 i) of DGP/27-WP/3):

- A206 (384) The hazard label must conform to the model shown in Figure 5-26. ~~Figure 5-26 may continue to be used until 31 December 2018.~~

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DGP-WG/19 (see paragraph 3.1.2.12 of DGP/27-WP/3):

- A213 (387) Lithium batteries in conformity with 2;9.3 f) containing both primary lithium metal cells and rechargeable lithium ion cells must be assigned to UN Nos. 3090 or 3091 as appropriate. When such batteries are transported in accordance with Section IB or II of Packing Instruction 968, or in accordance with Section II of Packing Instruction 969 or 970, the total lithium content of all lithium metal cells contained in the battery must not exceed 1.5 g, and the total capacity of all lithium ion cells contained in the battery must not exceed 10 Wh.
- 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, sodium batteries, lithium metal batteries or lithium ion batteries and equipment powered by wet batteries or sodium batteries transported with these batteries installed.

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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.

UN Model Regulations, Chapter 3.3, SP 388 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.5.1 g) of DGP/27-WP/3):

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 the entry UN 3536 Lithium batteries installed in cargo transport unit.

UN Model Regulations, Chapter 3.3, SP 274 (see ST/SG/AC.10/46/Add.1)

+ A215 For UN 3077 and UN 3082, the technical name may be a name shown in bold characters in column 1 of Table 3-1, provided that this name does not include "n.o.s." or an "**". The name which most appropriately describes the substance or mixture must be used, e.g.:

UN 3082, **Environmentally hazardous substance, liquid, n.o.s. (Paint)**
UN 3082, **Environmentally hazardous substance, liquid, n.o.s. (Perfumery products)**

UN Model Regulations, Chapter 3.3, SP 393 (see ST/SG/AC.10/46/Add.1)

+ A216 (393) The nitrocellulose must meet the criteria of the Bergmann-Junk test or methyl violet paper test in the UN Manual of Tests and Criteria Appendix 10. Tests of type 3 (c) need not be applied.

UN Model Regulations, Chapter 3.3, SP 394 (see ST/SG/AC.10/46/Add.1)

+ A217 (394) The nitrocellulose must meet the criteria of the Bergmann-Junk test or methyl violet paper test in the UN Manual of Tests and Criteria Appendix 10.

UN Model Regulations, Chapter 3.3, SP 395 (see ST/SG/AC.10/46/Add.1)

+ A218 (395) This entry must only be used for solid medical waste of Category A transported for disposal.

DGP-WG/19 (see paragraph 3.1.2.10 of DGP/27-WP/3):

+ A219 308 Stabilization of fish meal must be achieved to prevent spontaneous combustion by effective application of ethoxyquin, BHT (butylated hydroxytoluene) or tocopherols (also used in a blend with rosemary extract) at the time of production. The said application must occur within twelve months prior to shipment. Fish meal must contain at least 50 ppm (mg/kg) of ethoxyquin, 100 ppm (mg/kg) of BHT or 250 ppm (mg/kg) of tocopherol-based antioxidant at the time of consignment.

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Part 4

PACKING INSTRUCTIONS

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Chapter 1

GENERAL PACKING REQUIREMENTS

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1.1 GENERAL REQUIREMENTS APPLICABLE TO ALL CLASSES EXCEPT CLASS 7

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UN Model Regulations, 4.1.1.3.1 (see ST/SG/AC.10/46/Add.1)

1.1.2 New, remanufactured, reused or reconditioned packagings which are listed in Tables 6-2 and 6-3, must meet the applicable requirements of Part 6 of these Instructions. Such packagings must be manufactured and tested under a quality assurance programme which satisfies the appropriate national authority, in order to ensure that such packagings meet those applicable requirements. Packagings may conform to one or more than one successfully tested design type and may bear more than one mark required by 6:2. Where packagings are required to be tested in accordance with 6:4, their subsequent use must be as specified in the applicable test report and conform in all respects with the design type which was tested, including the method of packing and size and type of any inner packagings, except as provided for in 1.1.10.1 or 6:4.1.7. Before being filled and handed over for transport, every packaging must be inspected to ensure that it is free from corrosion, contamination or other damage. Any packaging which shows signs of reduced strength as compared with the approved design type must no longer be used or must be so reconditioned that it is able to withstand the design type tests.

Note.— ISO 16106:2006 Packaging — Transport packages for dangerous goods — Dangerous goods packagings, intermediate bulk containers (IBCs) and large packagings — Guidelines for the application of ISO 9001 provides acceptable guidance on procedures which may be followed.

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Chapter 4

CLASS 2 — GASES

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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 Model Regulations, 4.1.6.1.2 (see ST/SG/AC.10/46/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~~ ISO 11114-1:2012 + A1:2017 and ISO 11114-2:2013 must be met.

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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. 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;
- 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.

UN Model Regulations, 4.1.6.1.8 (see ST/SG/AC.10/46/Add.1)

For cylinders and closed cryogenic receptacles with valves as described in b) and c), the requirements of ISO 11117:1998 must be met; for valves with inherent protection, the requirements of ~~Annex A of ISO 10297:2006 or Annex A of ISO 10297:2014 must be met~~ Annex A of ISO 10297:2006, Annex A of ISO 10297:2014 or Annex A of ISO 10297 + A1:2017 must be met. For cylinders and closed cryogenic receptacles with self-closing valves with inherent protection, the requirements of Annex A of ISO 17879:2017 must be met. For metal hydride storage systems, the valve protection requirements specified in ISO 16111:2008 must be met.

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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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- 3) In no case must cylinders be filled in excess of the limit permitted in the following requirements:

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UN Model Regulations, P200, paragraph 3) c) (see ST/SG/AC.10/46/Add.1)

- c) For low pressure liquefied gases, the maximum mass of contents per litre of water capacity ~~(filling factor)~~ must equal 0.95 times the density of the liquid phase at 50°C; in addition, the liquid phase must not fill the cylinder at any temperature up to 60°C. The test pressure of the cylinder must be at least equal to the vapour pressure (absolute) of the liquid at 65°C, minus 100 kPa (1 bar).

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- 5) The filling of cylinders must be carried out by qualified staff using appropriate equipment and procedures. The procedures should include checks of:
- the conformity of cylinders and accessories with these Instructions;
 - their compatibility with the product to be transported;
 - the absence of damage which might affect safety;
 - compliance with the degree or pressure of filling, as appropriate;
 - marks and identification.

UN Model Regulations, P200, paragraph 4) (see ST/SG/AC.10/46/Add.1)

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	Gas cylinders — Acetylene cylinder bundles — Filling conditions and filling inspection
ISO 24431:2006/2016	Gas cylinders — <u>Seamless, welded and composite</u> Gas cylinders for compressed and liquefied gases (excluding acetylene) — Inspection at time of filling

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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.
- 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 ISO 11118:1999, 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.

UN Model Regulations, P206 (PP97) (see ST/SG/AC.10/46/Add.1)

Secretariat Note.— The provision for tubes included in PP97 of the Model Regulations is not included since tubes are not permitted for transport of dangerous goods by air.

f) For fire extinguishing agents assigned to UN 3500, the maximum test period for periodic inspection must be ten years.

OUTER PACKAGINGS

Boxes

Drums

Jerricans

Strong outer packagings

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Chapter 5

CLASS 3 — FLAMMABLE LIQUIDS

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Packing Instruction 372

Cargo aircraft only for UN 3165 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.

ADDITIONAL PACKING REQUIREMENTS

UN 3165 **Aircraft hydraulic power unit fuel tank** (containing a mixture of anhydrous hydrazine and methyl hydrazine) (M86 fuel) and designed for installation as complete units in aircraft are acceptable, subject to either of the following conditions:

UN Model Regulations, P301 (see ST/SG/AC.10/46/Add.1)

- a) the unit must consist of an aluminium pressure receptacle made from tubing and having welded heads. Primary containment of the fuel within this receptacle must consist of a welded aluminium bladder having a maximum internal volume of 46 L. The outer receptacle must have a minimum design gauge pressure of 1 275 kPa and a minimum burst gauge pressure of 2 755 kPa. Each receptacle must be leak-checked during manufacture and before shipment and must be found leakproof. The complete inner unit must be securely packed in non-combustible cushioning material, such as vermiculite, in a strong outer tightly closed metal packaging which will adequately protect all fittings. Maximum quantity of fuel per ~~unit~~ primary containment and package is 42 L; or

- b) the unit must consist of an aluminium pressure receptacle. Primary containment of the fuel within this receptacle must consist of a welded hermetically sealed fuel compartment with an elastomeric bladder having a maximum internal volume of 46 L. The pressure receptacle must have a minimum design gauge pressure of 2 860 kPa and a minimum burst gauge pressure of 5 170 kPa. Each receptacle must be leak-checked during manufacture and before shipment and must be found leakproof. The complete inner unit must be securely packed in non-combustible cushioning material, such as vermiculite, in a strong outer tightly closed metal packaging which will adequately protect all fittings. Maximum quantity of fuel per-unit primary containment and package is 42 L.

Note.— This packing instruction is the same as UN packing instruction P301.

...

Chapter 6

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

...

DGP-WG/19 (see paragraph 3.1.2.2 of DGP/27-WP/3):

Packing Instruction 457

Passenger and cargo aircraft for UN 3241 only

...

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

- Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS

<i>Composites</i>	<i>Drums</i>	<i>Jerricans</i>
Plastic receptacle with outer wooden box (6HC)	Plastics (1H1, 1H2)	Plastics (3H1, 3H2)
Plastic receptacle with outer plywood drum (6HD1)		
Plastic receptacle with outer plywood box (6HD2)		
Plastic receptacle with outer fibre drum (6HG1)		
Plastic receptacle with outer fibreboard box (6HG2)		
Plastic receptacle with outer plastic drum (6HH1)		
<u>Plastic receptacle with outer solid plastic box (6HH2)</u>		

...

DGP-WG/19 (see paragraph 3.1.2.2 DGP/27-WP/3):

Packing Instructions 462 – 463

Passenger aircraft

...

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

— Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III ONLY (PI 463)

<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

...

DGP-WG/19 (see paragraph 3.1.2.2 DGP/27-WP/3):

Packing Instructions 464 – 465

Cargo aircraft only

...

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

— Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III ONLY (PI 465)

<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

...

DGP-WG/19 (see paragraph 3.1.2.2 of DGP/27-WP/3):

Packing Instructions 470 – 471

Cargo aircraft only

...

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

- Packagings must meet the Packing Group II performance requirements.
- Fibreboard, fibre, wood and plywood single packagings must be fitted with a suitable liner.

SINGLE PACKAGINGS

<i>Boxes</i>	<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
Aluminium (4B)	All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, 1B2)	Aluminium (3B1, 3B2)
Fibreboard (4G)			Other metal (1N1, 1N2)	Plastics (3H1, 3H2)
Natural wood (4C2)			<u>Fibre (1G)</u>	Steel (3A1, 3A2)
Other metal (4N)			Plastics (1H1, 1H2)	
Plastics (4H2)			<u>Plywood (1D)</u>	
Plywood (4D)			Steel (1A1, 1A2)	
Reconstituted wood (4F)				
Steel (4A)				

...

DGP-WG/19 (see paragraph 3.1.2.2 DGP/27-WP/3):

Packing Instructions 478 – 479

...

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

- Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III (PI 479 only)

<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>)	Aluminium (3B1, <u>3B2</u>)
		Other metal (1N1, <u>1N2</u>)	Plastics (3H1, <u>3H2</u>)
		Plastics (1H1, <u>1H2</u>)	Steel (3A1, <u>3A2</u>)
		Steel (1A1, <u>1A2</u>)	

DGP-WG/19 (see paragraph 3.1.2.2 of DGP/27-WP/3):

Packing Instructions 480 – 482			
Cargo aircraft only			
...			
SINGLE PACKAGINGS FOR PACKING GROUP III ONLY (PI 482)			
<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

...

DGP-WG/19 (see paragraph 3.1.2.2 of DGP/27-WP/3):

Packing Instructions 487 – 491				
...				
ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS				
— Fibreboard, <u>fibre</u> , wood and plywood single packagings must be fitted with a suitable liner.				
<i>Packing Group III</i>				
— Packagings must meet the Packing Group II performance requirements				
...				
SINGLE PACKAGINGS FOR PACKING GROUPS II AND III ONLY				
<i>Boxes</i>	<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
Aluminium (4B) Fibreboard (4G) Natural wood (4C2) Other metal (4N) Plastics (4H2) Plywood (4D) Reconstituted wood (4F) Steel (4A)	All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, 1B2) <u>Fibre (1G)</u> Other metal (1N1, 1N2) Plastics (1H1, 1H2) <u>Plywood (1D)</u> Steel (1A1, 1A2)	Aluminium (3B1, 3B2) Plastics (3H1, 3H2) Steel (3A1, 3A2)

DGP/27 (see paragraph 1.2.8 of the report under Agenda Item 1):

Packing Instruction 492

Passenger and cargo aircraft for UN 3292 only

...

2) Closure requirements

- Closures must meet the requirements of 4;1.1.4.

COMBINATION PACKAGINGS				SINGLE PACKAGINGS
<i>UN number and proper shipping name</i>	<i>Packing conditions</i>	<i>Total quantity per package — passenger</i>	<i>Total quantity per package — cargo</i>	
UN 3292 Batteries, containing sodium	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	No limit
UN 3292 Cells, containing sodium	<u>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.</u>	25 kg-G	No limit	No

ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS

- Packagings for cells must meet the Packing Group II performance requirements.
- Cells and B batteries must be protected against short circuit and must be isolated in such a manner as to prevent short circuits.

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)
Plywood (1D)
Steel (1A2)

Jerricans

Aluminium (3B2)
Plastics (3H2)
Steel (3A2)

...

Chapter 7

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

...

DGP-WG/19 (see paragraph 3.1.2.2 of DGP/27-WP/3):

Packing Instructions 553 – 555

Cargo aircraft only

...

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

— Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III (PI 555)

<i>Composites</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

...

Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

DGP-WG/18 (see paragraph 3.1.2.1 of DGP/27-WP/2):

Packing Instruction 620

This packing instruction applies to UN 2814 and UN 2900.

...

Special packing provisions

...

- d) Before an empty packaging is returned to the shipper, or sent elsewhere, it must be disinfected or sterilized to nullify any hazard, and any label or mark indicating that it had contained an infectious substance must be removed or obliterated.

...

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 (1B1, 1B2)
Fibre (1G)
Other metal (1N1, 1N2)
Plastics (1H1, 1H2)
Plywood (1D)
Steel (1A1, 1A2)

Jerricans

Aluminium (3B1, 3B2)
Plastics (3H1, 3H2)
Steel (3A1, 3A2)

...

DGP-WG/19 (see paragraph 3.1.2.6.1 d) of DGP/27-WP/3):

Packing Instruction ~~622~~621

The general packing requirements of 4;1 except 1.1.20 must be met.

Consignments must be prepared in such a manner that they arrive at their destination in good condition and present no hazard to persons or animals during transport.

Consignments must be packed in steel drums (1A2), aluminium drums (1B2), other metal drums (1N2), plywood drums (1D), fibre drums (1G), plastic drums (1H2), steel jerricans (3A2), aluminium jerricans (3B2), plastic jerricans (3H2), steel boxes (4A), aluminium boxes (4B), wooden boxes (4C1, 4C2), plywood boxes (4D), reconstituted wood boxes (4F) or fibreboard boxes (4G), plastic boxes (4H1, 4H2), other metal boxes (4N). Packagings must meet Packing Group II requirements.

The packaging tests may be those appropriate for solids when there is sufficient absorbent material to absorb the entire amount of liquid present and the packaging is capable of retaining liquids.

In all other circumstances, the packaging tests must be those appropriate for liquids.

Packagings intended to contain sharp objects such as broken glass and needles must be resistant to puncture and retain liquids under the performance test conditions for the packaging.

Chapter 9

CLASS 7 — RADIOACTIVE MATERIAL

...

9.1 GENERAL

...

UN Model Regulations, 4.1.9.1.4 (see ST/SG/AC.10/46/Add.1)

9.1.4 Except as provided in 7;3.2.5, the level of non-fixed contamination on the external and internal surfaces of overpacks and freight containers, must not exceed the limits specified in 9.1.2. This requirement does not apply to the internal surfaces of freight containers being used as packagings, either loaded or empty.

...

9.1.8 Before each shipment of any package, it must be ensured that all the requirements specified in the relevant provisions of these Instructions and in the applicable certificates of approval have been fulfilled. The following requirements must also be fulfilled, if applicable:

- a) It must be ensured that lifting attachments which do not meet the requirements of 6;7.1.2 have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with 6;7.1.3;
- b) Each Type B(U), Type B(M) and Type C package must be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval;
- c) For each Type B(U), Type B(M) and Type C package, it must be ensured by inspection and/or appropriate tests that all closures, valves, and other openings of the containment system through which the radioactive contents might escape are properly closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of 6;7.7.8 and 6;7.9.3 were made;
- d) For packages containing fissile material, the measurement specified in 6;7.10.5 b) and the tests to demonstrate closure of each package as specified in 6;7.10.8 must be performed.

UN Model Regulations, 4.1.9.1.8 (see ST/SG/AC.10/46/Add.1)

- e) For packages intended to be used for shipment after storage, it must be ensured that all packaging components and radioactive contents have been maintained during storage in a manner such that all the requirements specified in the relevant provisions of these Instructions and in the applicable certificates of approval have been fulfilled.

...

UN Model Regulations, 4.1.9.1.11 and 4.1.9.1.12 (see paragraph 1.1.5.1 of the report under Agenda Item 1):

9.1.11 Except for packages or overpacks transported under exclusive use and special arrangement under the conditions specified in 7;2.10.5.3, the maximum-radiation-level dose rate at any point on any external surface of a package or overpack must not exceed 2 mSv/h.

9.1.12 The maximum-radiation-level dose rate at any point on any external surface of a package or overpack under exclusive use must not exceed 10 mSv/h.

9.2 REQUIREMENTS AND CONTROLS FOR TRANSPORT OF LSA MATERIAL AND SCO

9.2.1 The quantity of LSA material or SCO in a single Industrial package Type 1 (Type IP-1), Industrial package Type 2 (Type IP-2), or Industrial package Type 3 (Type IP-3), must be so restricted that the external-radiation-level dose rate at 3 m from the unshielded material does not exceed 10 mSv/h.

9.2.2 LSA material and SCO which are or contain fissile material, which is not excepted under 2;7.2.3.5, must meet the applicable requirements in 7;2.9.4.1 and 7;2.9.4.2.

9.2.3 LSA material and SCO which are or contain fissile material must meet the applicable requirements of 6;7.10.1.

9.2.4 LSA-I material, SCO-I and fissile material must not be transported unpackaged.

9.2.5 LSA material and SCO must be packaged in accordance with Table 4-2.

...

DGP/27 (see paragraph 1.2.8 of the report under Agenda Item 1):

Chapter 10

CLASS 8 — CORROSIVE SUBSTANCES

...

Packing Instruction 870

Passenger and cargo aircraft for UN 2794 and 2795 only

...

2) **Closure requirements**

— Closures must meet the requirements of 4;1.1.4.

COMBINATION PACKAGINGS				SINGLE PACKAGINGS
<i>UN number and proper shipping name</i>	<i>Packing conditions</i>	<i>Total quantity per package — passenger</i>	<i>Total quantity per package — cargo</i>	
UN 2794 Batteries, wet, filled with acid UN 2795 Batteries, wet, filled with alkali	<p>Batteries must be placed in an acid/alkali-proof liner of sufficient strength and adequately sealed to positively preclude leakage in the event of spillage. The batteries must be packed so that the fill openings and vents, if any, are upward; they must be incapable of short-circuiting and be securely cushioned in the packagings. The upright position of the package must be indicated on it by "Package orientation" labels (Figure 5-29) as required by 5;3. The words "This side up" or "This end up" may also be displayed on the top of the package.</p> <p><i>Batteries installed in equipment</i></p> <p>If batteries are shipped as an integral component of assembled equipment, they must be securely installed and fastened in an upright position and protected against contact with other articles so as to prevent short circuits. Batteries must be removed and packed according to this packing instruction if the assembled equipment is likely to be carried in other than an upright position.</p>	30 kg	No limit	Unpackaged batteries No

ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS

- Packagings must meet the Packing Group II performance requirements.
- For batteries, electric storage, packed with battery fluid in the same outer packaging, see UN 2796 and UN 2797.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)

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

Packing Instruction 871

Passenger and cargo aircraft for UN 3028 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
<i>UN number and proper shipping name</i>	<i>Packing conditions</i>	<i>Total quantity per package — passenger</i>	<i>Total quantity per package — cargo</i>	
UN 3028 Batteries, dry, containing potassium hydroxide solid	The batteries must be securely cushioned in the packagings.	25 kg	230 kg	No

ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS

- Packagings must meet the Packing Group II performance requirements.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)

<i>Boxes</i>
Aluminium (4B)
Fibreboard (4G)
Natural wood (4C1, 4C2)
Plastics (4H2)
Plywood (4D)
Reconstituted wood (4F)
Steel (4A)

Packing Instruction 872

Passenger and cargo aircraft for UN 2800

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
<i>UN number and proper shipping name</i>	<i>Packing conditions</i>	<i>Total quantity per package — passenger</i>	<i>Total quantity per package — cargo</i>	
UN 2800 Batteries, wet, non- spillable	Batteries must be protected against short circuits and must be securely packed in strong outer packagings.	No limit	No limit	No

~~OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)~~

Boxes

Drums

Jerricans

Strong outer packagings

...

Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

...

DGP-WG/19 (see paragraph 3.1.2.10 of DGP/27-WP/3):

Packing Instruction 956

Passenger and cargo aircraft for UN 1841, UN 1931, UN 2216, UN 3432, UN 2969, UN 3077, UN 3152 and UN 3335 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	COMBINATION PACKAGINGS				SINGLE PACKAGINGS	
	Inner packaging (see 6;3.2)	Inner packaging quantity (per receptacle)	Total quantity per package — passenger	Total quantity per package — cargo	Quantity — passenger	Quantity — cargo
UN 1841 Acetaldehyde ammonia	Glass	10.0 kg	200 kg	200 kg	200 kg	200 kg
	Fibre	50.0 kg				
	Metal	50.0 kg				
	Paper bag	50.0 kg				
	Plastics	50.0 kg				
	Plastic bag	50.0 kg				
UN 1931 Zinc dithionite or Zinc hydrosulphite	Glass	10.0 kg	100 kg	200 kg	100 kg	200 kg
	Fibre	50.0 kg				
	Metal	50.0 kg				
	Paper bag	50.0 kg				
	Plastics	50.0 kg				
	Plastic bag	50.0 kg				
<u>UN 2216 Fish meal, stabilized</u>	<u>Glass</u>	<u>10.0 kg</u>	<u>100 kg</u>	<u>200 kg</u>	<u>100 kg</u>	<u>200 kg</u>
	<u>Fibre</u>	<u>50.0 kg</u>				
	<u>Metal</u>	<u>50.0 kg</u>				
	<u>Paper bag</u>	<u>50.0 kg</u>				
	<u>Plastics</u>	<u>50.0 kg</u>				
	<u>Plastic bag</u>	<u>50.0 kg</u>				

...

DGP-WG/19 (see paragraph 3.1.2.1 of DGP/27-WP/3):

Packing Instruction 957

Passenger and cargo aircraft for UN 2211 and UN 3314 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.

COMBINATION PACKAGINGS					
<i>UN number and proper shipping name</i>	<i>Inner packaging (see 6:3.2)</i>	<i>Inner packaging quantity (per receptacle)</i>	<i>Quantity — passenger</i>	<i>Quantity — cargo</i>	SINGLE PACKAGINGS
UN 2211 Polymeric beads, expandable , evolving flammable vapour	<u>Glass</u>	<u>10 kg</u>	100 kg	200 kg	Yes
UN 3314 Plastics moulding compound in dough, sheet or extruded rope form evolving flammable vapour	<u>Fibre</u>	<u>50 kg</u>			
	<u>Metal</u>	<u>50 kg</u>			
	<u>Paper bag</u>	<u>50 kg</u>			
	<u>Plastics</u>	<u>50 kg</u>			
	<u>Plastic bag</u>	<u>50 kg</u>			

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 (1B1, 1B2)
Fibre (1G)
Other metal (1N1, 1N2)
Plastics (1H1, 1H2)
Plywood (1D)
Steel (1A1, 1A2)

Jerricans

Aluminium (3B1, 3B2)
Plastics (3H1, 3H2)
Steel (3A1, 3A2)

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGSFor other than metal and plastics packagings, a sealed plastic liner must be used.

SINGLE PACKAGINGS*Boxes*

[Aluminium \(4B\)](#)
[Fibreboard \(4G\)](#)
[Natural Wood \(4C1, 4C2\)](#)
[Other metal \(4N\)](#)
[Plastics \(4H2\)](#)
[Plywood \(4D\)](#)
[Reconstituted wood \(4F\)](#)
[Wooden \(4C1, 4C2\) Steel \(4A\)](#)

Drums

[Aluminium \(1B1, 1B2\)](#)
[Fibre \(1G\)](#)
[Other metal \(1N1, 1N2\)](#)
[Plastics \(1H1, 1H2\)](#)
[Plywood \(1D\)](#)
[Steel \(1A1, 1A2\)](#)

Jerricans

[Aluminium \(3B1, 3B2\)](#)
[Plastics \(3H1, 3H2\)](#)
[Steel \(3A1, 3A2\)](#)

...

Packing Instruction 962

Passenger and cargo aircraft for UN 3363 only

General requirements

Part 4, Chapter 1 requirements must be met (except that the requirements of 4;1.1.2, 1.1.9, 1.1.13 and 1.1.16 do not apply), 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 Model Regulations, 4.1.4.1, P907 (see ST/SG/AC.10/46/Add.1)

This entry only applies to articles, such as machinery, apparatus or machinery devices containing dangerous goods as a residue or as an integral element of the ~~machinery or apparatus~~ article. It must not be used for ~~apparatus or machinery~~ an article for which a proper shipping name exists in Table 3-1. For other than fuel system components, ~~apparatus or machinery~~ articles may only contain one or more of the following: dangerous goods permitted under 3;4.1.2 or UN 2807 or gases of Division 2.2 without subsidiary hazard but excluding refrigerated liquefied gases.

UN Model Regulations, 4.1.4.1, P907 and 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1)

<i>UN number and proper shipping name</i>	<i>State</i>	<i>Total net quantity of dangerous goods in one package (excluding magnetic material)</i>
UN 3363 Dangerous goods in apparatus or Dangerous goods in machinery or <u>Dangerous goods in articles</u>	Liquid	0.5 L
	Solid	1 kg
	Gas (Division 2.2 only)	0.5 kg

ADDITIONAL PACKING REQUIREMENTS

- If the ~~machinery or apparatus~~ article contains more than one item of dangerous goods, the individual dangerous goods must be enclosed to prevent them reacting dangerously with one another during transport (see 4;1.1.3).
- Receptacles containing dangerous goods must be so secured or cushioned so as to prevent their breakage or leakage and so as to control their movement within the ~~machinery or apparatus~~ article during normal conditions of transport. Cushioning material must not react dangerously with the contents of the receptacles. Any leakage of the contents must not substantially impair the protective properties of the cushioning material.
- "Package orientation" labels (Figure 5-29), or preprinted orientation labels meeting the same specification as either Figure 5-29 or ISO Standard 780-1997 must be affixed on at least two opposite vertical sides with the arrows pointing in the correct direction only when required to ensure liquid dangerous goods remain in their intended orientation.
- Irrespective of 5;3.2.10, ~~machinery or apparatus~~ articles containing magnetized material meeting the requirements of Packing Instruction 953 must also bear the "Magnetized material" label (Figure 5-27).
- For Division 2.2 gases, cylinders for gases, their contents and filling ratios must conform to the requirements of Packing Instruction 200.
- Dangerous goods in ~~apparatus or machinery~~ articles must be packed in strong outer packagings unless the receptacles containing the dangerous goods are afforded adequate protection by the construction of the ~~apparatus or machinery~~ articles.

Fuel system components

- Fuel system components must be emptied of fuel as far as practicable and all openings must be sealed securely. They must be packed:
 - 1) in sufficient absorbent material to absorb the maximum amount of liquid which may possibly remain after emptying. Where the outer packaging is not liquid tight, a means of containing the liquid in the event of leakage must be provided in the form of a leakproof liner, plastic bag or other equally efficient means of containment; and
 - 2) in strong outer packagings.

...

DGP-WG/19 (see paragraph 3.1.2.11 of DGP/27-WP/3):

Packing Instruction 964

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

General requirements

~~Except for UN 3082 when the requirements of 4;1.1.6 do not apply, Part 4, Chapter 1 requirements must be met, including~~ (with the exception that for UN 3082 the requirements of 4;1.1.6 do not apply). These requirements include:

...

DGP-WG/19 (see paragraph 3.1.2.11 of DGP/27-WP/3):

Packing Instruction Y964

Limited quantities
Passenger and cargo aircraft for UN 1941, UN 1990, UN 3082 and UN 3334 only

General requirements

Except for UN 3082 when the requirements of 4;1.1.6 do not apply, Part 4, Chapter 1 requirements must be met (with the exception that the requirements of 4;1.1.2, 1.1.9 c), 1.1.9 e), 1.1.16, 1.1.18, and 1.1.20 and in addition for UN 3082 the requirements of 4;1.1.6 do not apply), including These requirements include:

...

...

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;
- 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 packed in quantities that exceed the allowance permitted in Section II, Table 965-II; and
- Section II 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 packed in quantities not exceeding the allowance permitted in Section II, Table 965-II.

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:

UN Model Regulations, Chapter 3.3, SP 376 (see ST/SG/AC.10/46/Add.1) and Instructions, Special Provision A154 (see DGP/27-WP/3) and DGP-WG/19 (see paragraph 3.1.2.6.1 f) of DGP/27-WP/3):

~~Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, 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).~~ 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.

...

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:

UN Model Regulations, Chapter 3.3, SP 376 (see ST/SG/AC.10/46/Add.1) and Instructions, Special Provision A154 (see DGP/27-WP/3) and DGP-WG/19 (see paragraph 3.1.2.6.1 f) of DGP/27-WP/3):

~~Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, 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).~~ Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.

...

...

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:

UN Model Regulations, Chapter 3.3, SP 376 (see ST/SG/AC.10/46/Add.1) and Instructions, Special Provision A154 (see DGP/27-WP/3) and DGP-WG/19 (see paragraph 3.1.2.6.1 f) of DGP/27-WP/3):

~~Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, 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). Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.~~

...

Packing Instruction 968

Cargo aircraft only for UN 3090

1. Introduction

This entry applies to lithium metal or lithium alloy batteries. This packing instruction is structured as follows:

- Section IA applies to lithium metal cells with a lithium metal content in excess of 1 g and lithium metal batteries with a lithium metal content in excess of 2 g, which must be assigned to Class 9 and are subject to all of the applicable requirements of these Instructions;
- Section IB applies to lithium metal cells with a lithium metal content not exceeding 1 g and lithium metal batteries with a lithium metal content not exceeding 2 g packed in quantities that exceed the allowance permitted in Section II, Table 968-II; and
- Section II applies to lithium metal cells with a lithium metal content not exceeding 1 g and lithium metal batteries with a lithium metal content not exceeding 2 g packed in quantities not exceeding the allowance permitted in Section II, Table 968-II.

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 metal cells and batteries in this packing instruction:

UN Model Regulations, Chapter 3.3, SP 376 (see ST/SG/AC.10/46/Add.1) and Instructions, Special Provision A154 (see DGP/27-WP/3) and DGP-WG/19 (see paragraph 3.1.2.6.1 f) of DGP/27-WP/3):

~~Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, 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).~~ 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.

...

Packing Instruction 969

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

1. Introduction

This entry applies to lithium metal or lithium alloy batteries packed with equipment.

Section I of this packing instruction applies to lithium metal and lithium alloy cells and batteries that are assigned to Class 9. Certain lithium metal and lithium alloy 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 metal cells and batteries in this packing instruction:

UN Model Regulations, Chapter 3.3, SP 376 (see ST/SG/AC.10/46/Add.1) and Instructions, Special Provision A154 (see DGP/27-WP/3) and DGP-WG/19 (see paragraph 3.1.2.6.1 f) of DGP/27-WP/3):

~~Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, 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).~~ Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.

...

Packing Instruction 970

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

1. Introduction

This entry applies to lithium metal or lithium alloy batteries contained in equipment.

Section I of this packing instruction applies to lithium metal and lithium alloy cells and batteries that are assigned to Class 9. Certain lithium metal and lithium alloy 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 metal cells and batteries in this packing instruction:

UN Model Regulations, Chapter 3.3, SP 376 (see ST/SG/AC.10/46/Add.1) and Instructions, Special Provision A154 (see DGP/27-WP/3) and DGP-WG/19 (see paragraph 3.1.2.6.1 f) of DGP/27-WP/3):

~~Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, 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).~~ Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.

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Part 5

SHIPPER'S RESPONSIBILITIES

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Chapter 1

GENERAL

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1.2 GENERAL PROVISIONS FOR CLASS 7

1.2.1 Approval of shipments and notification

1.2.1.1 General

In addition to the approval of package designs described in Part 6, Chapter 4, multilateral shipment approval is also required in certain circumstances (1.2.1.2 and 1.2.1.3). In some circumstances it is also necessary to notify competent authorities of a shipment (1.2.1.4).

UN Model Regulations, 5.1.5.1.2 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.7.1 a) of DGP/27-WP/3):

1.2.1.2 Shipment approvals

Multilateral approval must be required for:

- a) The shipment of Type B(M) packages not conforming with the requirements of 6.7.6.5;
- b) The shipment of Type B(M) packages containing radioactive material with an activity greater than 3000 A₁ or 3000 A₂, as appropriate, or 1000 TBq, whichever is the lower; **and**
- c) The shipment of packages containing fissile materials if the sum of the criticality safety indexes of the packages in a single freight container or in an aircraft exceeds 50; ~~and~~

except that a competent authority may authorize transport into or through its country without shipment approval, by a specific provision in its design approval (see 1.2.2.1).

...

1.2.1.4 Notifications

Notification to competent authorities is required as follows:

- a) Before the first shipment of any package requiring competent authority approval, the shipper must ensure that copies of each applicable competent authority certificate applying to that package design have been submitted to the competent authority of the country of origin of the shipment and to the competent authority of each country through or into which the consignment is to be transported. The shipper is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make such acknowledgement of receipt of the certificate;
- b) For each of the following types of shipments:
 - i) Type C packages containing radioactive material with an activity greater than 3000 A₁ or 3000 A₂, as appropriate, or 1000 TBq, whichever is the lower;
 - ii) Type B(U) packages containing radioactive material with an activity greater than 3000 A₁ or 3000 A₂, as appropriate, or 1000 TBq, whichever is the lower;
 - iii) Type B(M) packages;

iv) Shipment under special arrangement;

UN Model Regulations, 5.1.5.1.4 (b) (see ST/SG/AC.10/46/Add.1)

the shipper must notify the competent authority of the country of origin of the shipment and the competent authority of each country through or into which the consignment is to be transported. This notification must be ~~in the hands~~ in the possession of each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance;

...

1.2.3 Determination of transport index (TI) and criticality safety index (CSI)

1.2.3.1 Determination of transport index

1.2.3.1.1 The transport index (TI) for a package, overpack or freight container, must be the number derived in accordance with the following procedure:

UN Model Regulations, 5.1.5.3.1 (see ST/SG/AC.10/46/Add.1)

- a) Determine the maximum ~~radiation level~~ dose rate in units of millisieverts per hour (mSv/h) at a distance of 1 m from the external surfaces of the package, overpack, or freight container. The value determined must be multiplied by 100 and the resulting number is the transport index. For uranium and thorium ores and their concentrates, the maximum ~~radiation level~~ dose rate at any point 1 m from the external surface of the load may be taken as:

0.4 mSv/h for ores and physical concentrates of uranium and thorium;

0.3 mSv/h for chemical concentrates of thorium;

0.02 mSv/h for chemical concentrates of uranium, other than uranium hexafluoride;

- b) For freight containers, the value determined in step a) above must be multiplied by the appropriate factor from Table 5-1;

UN Model Regulations, 5.1.5.3.1 (see ST/SG/AC.10/46/Add.1)

- c) The value obtained in steps a) and b) above must be rounded up to the first decimal place (e.g. 1.13 becomes 1.2), except that a value of 0.05 or less may be considered as zero and the resulting number is the transport index value.

Note.— If the measured dose rate comprises more than one type of radiation, then the transport index should be based on the sum of all the dose rates from each type of radiation (see paragraph 523.1 of the IAEA Specific Safety Guide No. SSG-26 (2012 Edition)).

UN Model Regulations, 5.1.5.3.2 (see ST/SG/AC.10/46/Add.1), DGP-WG/19 (see paragraph 3.1.2.7.1 b) of DGP/27-WP/3) and DGP/27 (see paragraph 1.2.5.2 of the report under Agenda Item 1):

1.2.3.1.2 The transport index for each overpack or freight container must be determined as ~~either the sum of the transport indices of all the packages contained therein. However, for a rigid overpack, or a freight container from one single shipper, the shipper may determine the transport index~~ by direct measurement of radiation level, ~~except in the case of dose rate. The transport index for a non-rigid overpacks for which the transport index~~ must be determined only as the sum of the transport indices of all the packages within the overpack.

...

Chapter 2

MARKING

...

2.4 MARKING SPECIFICATIONS AND REQUIREMENTS

2.4.1 Marking with proper shipping name and UN or ID number

DGP-WG/18 (see paragraph 3.1.2.2 of DGP/27-WP/2) and UN Model Regulations, 5.2.1.1 (see ST/SG/AC.10/46/Add.1):

2.4.1.1 Unless otherwise provided in these Instructions, the proper shipping name of the dangerous goods (supplemented with the technical name(s) if appropriate, see Part 3, Chapter 1) and, when assigned, the corresponding UN or ID number preceded by the letters "UN" or "ID", as appropriate, must be displayed on each package. The UN or ID number and the letters "UN" or "ID" must be at least 12 mm high, except for packagings of 30 litres L capacity or less or of 30 kg maximum net mass and for cylinders of 60 litres L water capacity or less, when they must be at least 6 mm in height and except for packagings of 5 litres L capacity or less or of 5 kg maximum net mass or less when they must be of an appropriate size. In the case of unpackaged articles, the mark must be displayed on the article, on its cradle or on its handling, storage or launching device. A typical package mark would be:

"Corrosive liquid, acidic, organic, n.o.s. (caprylyl chloride) UN 3265".

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2.4.5 Special marking requirements for radioactive material

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UN Model Regulations, 5.2.1.5.6 (see ST/SG/AC.10/46/Add.1), DGP-WG/19 (see paragraph 3.1.2.7.1 c) of DGP/27-WP/3) and DGP/27 (see paragraph 1.2.5.3 of the report under Agenda Item 1):

2.4.5.5 Each package which conforms to a Type B(U), Type B(M) or Type C package design must have the outside of the outermost receptacle which is resistant to the effects of fire and water plainly marked by embossing, stamping or other means resistant to the effects of fire and water with the trefoil symbol, as shown in Figure 5-1 below. Any mark on the package made in accordance with the requirements of 2.4.5.3 a) and b) and 2.4.5.4 c) relating to the package type that does not relate to the UN number and proper shipping name must be removed or covered.

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2.4.16 Special marking requirements for lithium batteries

2.4.16.1 Packages containing lithium cells or batteries prepared in accordance with Section II of Packing Instructions 965 to 970 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:

- a) the appropriate UN number preceded by the letters "UN" as follows:
 - 1) "UN 3090" for lithium metal cells or batteries;
 - 2) "UN 3480" for lithium ion cells or batteries;
 - 3) "UN 3091" for lithium metal cells or batteries contained in, or packed with, equipment; or
 - 4) "UN 3481" for lithium 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.

- b) a telephone number for additional information.

UN Model Regulations, 5.2.1.9.2(see ST/SG/AC.10/46/Add.1):

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 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 ~~420~~ 100 mm wide x ~~140~~ 100 mm high and the minimum width of the hatching must be 5 mm. If the size of the package so requires, the dimensions ~~line thickness~~ may be reduced to not less than ~~105~~ 100 mm wide x ~~74~~ 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 batteries that meet the requirements of Section IB of Packing Instructions 965 or 968 must bear both the lithium battery mark (Figure 5-3) and the lithium battery Class 9 hazard label (Figure 5-26).

...

UN Model Regulations, Figure 5.2.5 (see ST/SG/AC.10/46/Add.1), DGP-WG/19 (see paragraph 3.1.2.7.1 d) of DGP/27-WP/3) and DGP/27 (see paragraph 1.2.5.4 of the report under Agenda Item 1):

Replace Figure 5-3 with the following:



Figure 5-3. Lithium battery mark

Note.— The mark illustrated in Figure 5-4 of the 2019-2020 Edition of the Technical Instructions with minimum dimensions of 120 mm x 110 mm my continue to be used.

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Chapter 3

LABELLING

...

3.5 LABEL SPECIFICATIONS

3.5.1 Class hazard label specifications

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.

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Labelling of radioactive material

- h) Each label conforming to the applicable Figure 5-20, 5-21 or 5-22 must be completed with the following information:
- 1) Contents:
 - A) except for LSA-I material, the name(s) of the radionuclide(s) as taken from Table 2-12, using the symbols prescribed therein. For mixtures of radionuclides, the most restrictive nuclides must be listed to the extent the space on the line permits. The group of LSA or SCO must be shown following the name(s) of the radionuclide(s). The terms "LSA-II", "LSA-III", "SCO-I" and "SCO-II" must be used for this purpose;
 - B) for LSA-I material, the term "LSA-I" is all that is necessary; the name of the radionuclide is not necessary;
 - 2) Activity: The maximum activity of the radioactive contents during transport expressed in units of becquerels (Bq) with the appropriate SI prefix symbol. For fissile material, the total mass of fissile nuclides in units of grams (g), or multiples thereof, may be used in place of activity;
 - 3) For overpacks and freight containers the "contents" and "activity" entries on the label must bear the information required in 3.5.1.1 h) 1) A) and B), respectively, totalled together for the entire contents of the overpack or freight container except that on labels for overpacks or freight containers containing mixed loads of packages containing different radionuclides, such entries may read "See Transport Documents";

UN Model Regulations, 5.2.2.1.12.2 d) (see ST/SG/AC.10/46/Add.1):

- 4) Transport index: The number determined in accordance with 1.2.3.1.1 and 1.2.3.1.2. ~~(No transport index entry is required except for category I-WHITE-).~~
- i) Each label conforming to Figure 5-23 must be completed with the criticality safety index (CSI) as stated in the certificate of approval applicable in the States through or into which the consignment is transported and issued by the competent authority.
- j) For overpacks and freight containers, the label conforming to Figure 5-23 must bear the sum of the criticality safety indexes of all the packages contained therein.
- k) In all cases of international transport of packages requiring competent authority approval of design or shipment, for which different approval types apply in the different countries concerned by the shipment, the labelling must be in accordance with the certificate of the country of origin of design.

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Chapter 4

DOCUMENTATION

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For French language version: please check alignment with the English of the Technical Instructions. The need for an amendment to the UN Model Regulations was identified, but this likely does not affect the French edition of the Technical Instructions because the text in the Technical Instructions is slightly different. Please verify alignment with English Technical Instructions. The amendment to the UN Model Regulations is:

5.4.1.5.1 Modifier la première phrase pour lire comme suit :
« Sauf pour les emballages vides non nettoyés, la quantité totale de marchandises dangereuses à laquelle s'applique la description (volume ou masse, selon le cas) doit être indiquée pour chaque marchandise dangereuse ayant une désignation officielle de transport, un numéro ONU, ou un groupe d'emballage différent. »

UN Model Regulations, 5.4.1.5.1 (see ST/SG/AC.10/46/Add.1):

4.1.5 Information required in addition to the dangerous goods description

In addition to the dangerous goods description the following information must be included after the dangerous goods description on the dangerous goods transport document.

4.1.5.1 Quantity of dangerous goods, number and type of packagings

The number of packages, type of packaging (e.g. steel drum, fibreboard box, etc.) and net quantity of dangerous goods in each package (by volume or mass, as appropriate) must be indicated for each item of dangerous goods bearing a different proper shipping name, UN number or packing group. Abbreviations may be used to specify the unit of measurement for the quantity.

...

UN Model Regulations, 5.4.1.5.7.1 (see ST/SG/AC.10/46/Add.1) and DGP/27 (see paragraph 1.2.5.5 of the report under Agenda Item 1):

4.1.5.7 Radioactive material

4.1.5.7.1 The following information must be included for each consignment of Class 7 material, as applicable, in the order given:

- a) The name or symbol of each radionuclide or, for mixtures of radionuclides, an appropriate general description or a list of the most restrictive nuclides;
- b) A description of the physical and chemical form of the material, or a notation that the material is special form radioactive material or low dispersible radioactive material. A generic chemical description is acceptable for chemical form;

Note.— For empty Type B(U) or Type B(M) packages as specified in the Note to 2;7.2.4.1.1.7, the name or symbol of the radionuclide of the shielding material followed by the physical and chemical form must be included (e.g. U-dep., solid, metal oxide) in which case the indicated radionuclide may differ from the radionuclide(s) authorized in the package design certificate.

- c) The maximum activity of the radioactive contents during transport expressed in units of becquerels (Bq) with an appropriate SI prefix symbol (see 1;3.2). For fissile material, the mass of fissile material (or mass of each fissile nuclide for mixtures when appropriate) in units of grams (g), or appropriate multiples thereof, may be used in place of activity;
- d) The category of the package and if applicable for the overpack and freight container, as assigned per 1.2.3.1.4, i.e. I-WHITE, II-YELLOW, III-YELLOW;

- e) The transport index as determined per 1.2.3.1.1 and 1.2.3.1.2 (~~categories II YELLOW and III YELLOW only~~ except for category I-WHITE);

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Part 6

PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS

Chapter 2

MARKING OF PACKAGINGS OTHER THAN INNER PACKAGINGS

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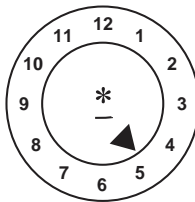
2.1 MARKING REQUIREMENTS FOR PACKAGINGS OTHER THAN INNER PACKAGINGS

DGP-WG/18 (see paragraph 3.1.2.2 of DGP/27-WP/2) and UN Model Regulations, 6.1.3.1 (see ST/SG/AC.10/46/Add.1):

2.1.1 Each packaging intended for use according to these Instructions must bear marks 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 capacity or less 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 ~~or less~~ when they must be of an appropriate size. The marks must show:

...

- e) the last two digits of the year during which the packaging was manufactured. Packagings of types 1H1, 1H2, 3H1 and 3H2 must also be appropriately marked with the month of manufacture; this may be marked on the packaging in a different place from the remainder of the mark. An appropriate method is:



UN Model Regulations, 6.1.3.1 e) (see ST/SG/AC.10/46/Add.1):

- * The last two digits of the year of manufacture may be displayed at that place. In such a case and when the clock is placed adjacent to the UN design type mark, the two digits indication of the year in the type approval mark and in the inner circle of the clock mark may be waived. However, when the clock is not placed adjacent to the UN design type mark, the two digits of the year in the mark and in the clock must be identical.

Note.— Other methods that provide the minimum required information in a durable, visible and legible form are also acceptable.

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UN Model Regulations, 6.1.3.13 (see ST/SG/AC.10/46/Add.1):

2.1.15 Where a packaging conforms to more than one tested packaging design type, the packaging may bear more than one mark to indicate the relevant performance test requirements that have been met. The marks must appear in close proximity to one another and each mark must appear in its entirety.

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Chapter 3

REQUIREMENTS FOR PACKAGINGS

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3.1.2 Aluminium drums

1B1 non-removable head

1B2 removable head

3.1.2.1 Body and heads must be constructed of aluminium at least 99 per cent pure or of an aluminium base alloy. Materials must be of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

3.1.2.2 All seams must be welded. Chime seams, if any, must be reinforced by the application of separate reinforcing rings.

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. 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.

3.1.2.4 Openings for filling, emptying and venting in the bodies or heads on non-removable head (1B1) drums must not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable head type (1B2). Closures for openings in the bodies and heads of drums must be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Closure flanges must be welded in place so that the weld provides a leakproof seam. Gaskets or other sealing elements must be used with closures, unless the closure is inherently leakproof.

3.1.2.5 Closure devices for removable head drums must be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of transport. Gaskets or other sealing elements must be used with all removable heads.

UN Model Regulations, 6.1.4.2.6 (see ST/SG/AC.10/46/Add.1):

3.1.2.6 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments must be applied. These coatings or treatments must retain their protective properties under normal conditions of transport.

~~3.1.2.6~~ 3.1.2.7 Maximum capacity of drum: 450 L.

~~3.1.2.7~~ 3.1.2.8 Maximum net mass: 400 kg.

3.1.3 Drums of metal other than aluminium or steel

1N1 non-removable head

1N2 removable head

3.1.3.1 The body and heads must be constructed of a metal or of a metal alloy other than steel or aluminium. Material must be of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

3.1.3.2 Chime seams, if any, must be reinforced by the application of separate reinforcing rings. All seams, if any, must be joined (welded, soldered, etc.) in accordance with the technical state-of-the-art for the metal or metal alloy used.

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. 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.

3.1.3.4 Openings for filling, emptying and venting in the bodies or heads or non-removable head (1N1) drums must not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable head type (1N2). Closures for openings in the bodies and heads of drums must be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Closure flanges must be joined in place (welded, soldered, etc.) in accordance with the

technical state of the art for the metal or metal alloy used so that the seam join is leakproof. Gaskets or other sealing elements must be used with closures, unless the closure is inherently leakproof.

3.1.3.5 Closure devices for removable head drums must be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of transport. Gaskets or other sealing elements must be used with all removable heads.

UN Model Regulations, 6.1.4.3.6 (see ST/SG/AC.10/46/Add.1):

3.1.3.6 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments must be applied. These coatings or treatments must retain their protective properties under normal conditions of transport.

~~3.1.3.6~~ 3.1.3.7 Maximum capacity of drum: 450 L.

~~3.1.3.7~~ 3.1.3.8 Maximum net mass: 400 kg.

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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

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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 UN cylinders, 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 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
UN Model Regulations, 6.2.2.1.1 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.8.1 c) of DGP/27-WP/3):		
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. <u>Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.</u>	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 <u>Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.</u>	Until further notice
<u>ISO 11119-4: 2016</u>	<u>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.</u>	<u>Until further notice</u>

...

5.2.1.3 The following standards apply for the design, construction and initial inspection and test of UN acetylene cylinders except that inspection requirements related to the conformity assessment system and approval must be in accordance with 5.2.5.

Note.— The maximum of 1 000 L volume as mentioned in the ISO standard ISO 21029-1:2004 Cryogenic vessels, does not apply for refrigerated liquefied gases in closed cryogenic receptacles installed in apparatus (e.g. MRI or cooling machines).

For the cylinder shell:

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
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. <i>Note.— The note concerning the F factor in section 7.3 of this standard must not be applied for UN cylinders.</i>	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 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 further notice
UN Model Regulations, 6.2.2.1.3 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.8.1 c) of DGP/27-WP/3):		
ISO 4706:2008	Gas cylinders — Refillable welded steel cylinders — Test pressure 60 bar and below	Until further notice
ISO 7866:2012 + Cor 1:2014	Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing <i>Note.— Aluminium alloy 6351A or equivalent must not be used</i>	Until further notice

For the [acetylene cylinder including the](#) porous mass in the cylinder:

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 3807-1:2000	Cylinders for acetylene — Basic requirements — Part 1: Cylinders without fusible plugs.	Until 31 December 2020
ISO 3807-2:2000	Cylinders for acetylene — Basic requirements — Part 2: Cylinders with fusible plugs.	Until 31 December 2020
ISO 3807:2013	Gas cylinders — Acetylene cylinders — Basic requirements and type testing	Until further notice

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5.2.2 Materials

In addition to the material requirements specified in the cylinder and closed cryogenic receptacle 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:

Reference	Title	Applicable for manufacture
UN Model Regulations, 6.2.2.2 (see ST/SG/AC.10/46/Add.1):		
ISO 11114-1:2012 ISO 11114-1:2012 + A1:2017	Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials.	Until further notice
ISO 11114-2:2013	Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials.	Until further notice

5.2.3 Service equipment

The following standards apply to closures and their protection:

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 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 further notice Until 31 December 2022
ISO 10297:2014 + A1:2017	Gas cylinders — Cylinder valves — Specification and type testing;	Until further notice
UN Model Regulations, 6.2.2.3 (see ST/SG/AC.10/46/Add.1):		
≠ ISO 13340:2001	Transportable gas cylinders — Cylinder valves for non-refillable cylinders — Specification and prototype testing.	Until 31 December 2020
+ ISO 14246:2014	Gas cylinders — Cylinder valves — Manufacturing tests and examination	Until further notice Until 31 December 2024
ISO 14246:2014 + A1:2017	Gas cylinders — Cylinder valves — Manufacturing tests and examinations	Until further notice
+ ISO 17871:2015	Gas cylinders — Quick-release cylinders valves — Specification and type testing	Until further notice
ISO 17879:2017	Gas cylinders — Self-closing cylinder valves — Specification and type testing	Until further notice
	<i>Note.— This standard must not be applied to self-closing valves in acetylene cylinders.</i>	

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 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 and their closures:

Reference	Title	Applicable for manufacture
ISO 6406:2005	Seamless steel gas cylinders — Periodic inspection and testing.	Until further notice
ISO 10460:2005	Gas cylinders – Welded carbon-steel gas cylinders – Periodic inspection and testing. <i>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.</i>	Until further notice
ISO 10461:2005/A1:2006	Seamless aluminium-alloy gas cylinders — Periodic inspection and testing.	Until further notice
UN Model Regulations, 6.2.2.4 (see ST/SG/AC.10/46/Add.1):		
ISO 10462:2005	Transportable cylinders for dissolved acetylene — Periodic inspection and maintenance.	Until 31 December 2018
ISO 10462:2013	Gas cylinders — Acetylene cylinders — Periodic inspection and maintenance.	Until further notice
ISO 11513:2011	Gas cylinders — Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) — Design, construction, testing, use and periodic inspection.	Until further notice
≠ ISO 11623:2002	Transportable gas cylinders — Periodic inspection and testing of composite gas cylinders.	Until 31 December 2020
+ ISO 11623:2015	Gas cylinders — Composite construction — Periodic inspection and testing	Until further notice
+ ISO 22434:2006	Transportable gas cylinders — Inspection and maintenance of cylinder valves <i>Note.— These requirements may be met at times other than at the periodic inspection and test of UN cylinders.</i>	Until further notice
UN Model Regulations, 6.2.2.4 (see ST/SG/AC.10/46/Add.1):		
ISO 20475:2018	Gas cylinders — Cylinder bundles — Periodic inspection and testing	Until further notice

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5.2.7 Marking of UN refillable cylinders and closed cryogenic receptacles

Note.— Marking requirements for UN metal hydride storage systems are given in 5.2.9.

5.2.7.1 Refillable UN cylinders and closed cryogenic receptacles must be marked clearly and legibly with certification, operational and manufacturing marks. These marks must be permanently affixed (e.g. stamped, engraved or etched) on the cylinder. The marks must be on the shoulder, top end or neck of the cylinder and closed cryogenic receptacle or on a permanently affixed component of the cylinder and closed cryogenic receptacle (e.g. welded collar or corrosion-resistant plate welded to the outer jacket of a closed cryogenic receptacle). Except for the UN packaging symbol, the minimum size of the marks must be 5 mm for cylinders and closed cryogenic receptacles with a diameter greater than or equal to 140 mm and 2.5 mm for cylinders and closed cryogenic receptacles with a diameter less than 140 mm. The minimum size of the UN

packaging symbol must be 10 mm for cylinders and closed cryogenic receptacles with a diameter greater than or equal to 140 mm and 5 mm for cylinders and closed cryogenic receptacles with a diameter less than 140 mm.

5.2.7.2 The following certification marks must be applied:

- a) The UN packaging symbol 

This symbol must not be used for any purpose other than certifying that a packaging complies with the relevant requirements in Chapters 1 to 6;

- b) The technical standard (e.g. ISO 9809-1) used for the design, construction and testing;
- c) The character(s) identifying the country of approval, as indicated by the distinguishing signs used on vehicles in international road traffic;

Note 1.— The distinguishing sign used on vehicles in international road traffic is the distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.

UN Model Regulations, 6.2.2.7.2 c) (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.8.1 c) of DGP/27-WP/3):

Note 2.— For the purpose of this mark the State of approval means the State of the appropriate national authority that authorized the initial inspection and test of the individual receptacle at the time of manufacture.

- d) The identity mark or stamp of the inspection body that is registered with the appropriate national authority of the country authorizing the marking;
- e) The date of the initial inspection, the year (four digits) followed by the month (two digits) separated by a slash (i.e. “/”).

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5.2.9 Marking of UN metal hydride storage systems

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5.2.9.2 The following marks must be applied:

- a) The UN packaging symbol 

This symbol must not be used for any purpose other than for certifying that a packaging complies with the relevant requirements in Chapters 1 to 6;

- b) “ISO 16111” (the technical standard used for design, manufacture and testing);
- c) The character(s) identifying the country of approval, as indicated by the distinguishing signs used on vehicles in international road traffic;

UN Model Regulations, 6.2.2.9.2 c) (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraph 3.1.2.8.1 c) of DGP/27-WP/3):

Note 1.— The distinguishing sign used on vehicles in international road traffic is the distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.

Note 2.— For the purpose of this mark the State of approval means the State of the appropriate national authority that authorized the initial inspection and test of the individual system at the time of manufacture.

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Chapter 6

UN Model Regulations, 6.3 (see ST/SG/AC.10/46/Add.1):

PACKAGINGS FOR INFECTIOUS SUBSTANCES OF CATEGORY A (UN 2814 AND UN 2900)

6.1 GENERAL

UN Model Regulations, 6.3.1.1 (see ST/SG/AC.10/46/Add.1):

The requirements of this chapter apply to packagings intended for the transport of infectious substances of Category A, UN 2814 and UN 2900.

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DGP-WG/18 (see paragraph 3.1.2.2 of DGP/27-WP/2) and UN 6.3.4.1:

6.4.1 Each packaging intended for use according to these Instructions must bear marks 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 capacity or less 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 or less maximum net mass, when they must be of an appropriate size.

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Table 6-4. Tests required for packaging types^a

UN Model Regulations, 6.3.5.2.2:

Type of packaging ^a	Tests required							
	Primary receptacle		Water spray 6.5.3-6.5.1	Cold conditioning 6.5.3-6.5.2	Drop 6.5.3	Additional drop 6.5.3-6.5.3	Puncture 6.5.4	Stacking 6;4.6
Rigid outer packaging	Plastics	Other	No. of samples	No. of samples	No. of samples	No. of samples	No. of samples	No. of samples
Fibreboard box	X		5	5	10		2	
		X	5	0	5		2	
Fibreboard drum	X		3	3	6		2	
		X	3	0	3		2	
Plastics box	X		0	5	5	Required on one sample when the packaging is intended to contain dry ice.	2	Required on three samples when testing a "U"-marked packaging, as defined in 6.5.1.6 for specific provisions.
		X	0	5	5		2	
Plastics drum/jerrican	X		0	3	3		2	
		X	0	3	3		2	
Boxes of other material	X		0	5	5		2	
		X	0	0	5		2	
Drums/jerricans of other material	X		0	3	3		2	
		X	0	0	3		2	

a. *Type of packaging* categorizes packagings for test purposes according to the kind of packaging and its material characteristics.

Note 1.— In instances where a primary receptacle is made of two or more materials, the material most liable to damage determines the appropriate test.

Note 2.— The material of the secondary packagings are not taken into consideration when selecting the test or conditioning for the test.

6.5.2.2.1 Explanation for use of Table 6-4

UN Model Regulations, 6.3.5.2.2 (see ST/SG/AC.10/46/Add.1):

6.5.2.2.1.1 If the packaging to be tested consists of a fibreboard outer box with a plastics primary receptacle, five samples must undergo the water spray test (see 6.5.3-~~6.5.1~~5.1) prior to dropping and another five must be conditioned to –18°C (see 6.5.3-~~6.5.2~~5.2) prior to dropping. If the packaging is to contain dry ice, then one further single sample must be dropped ~~five times after conditioning~~ in accordance with 6.5.3-~~6.5.3~~5.3.

6.5.2.2.1.2 Packagings prepared as for transport must be subjected to the tests in 6.5.3 and 6.5.4. For outer packagings, the headings in Table 6-4 relate to fibreboard or similar materials whose performance may be rapidly affected by moisture, plastics which may embrittle at low temperature, and other materials such as metal whose performance is not affected by moisture or temperature.

6.5.3 Drop test

UN Model Regulations, 6.3.5.3.1 (see ST/SG/AC.10/46/Add.1):

6.5.3.1 Drop height and target

6.5.3.1.1 Samples must be subjected to free-fall drops from a height of 9 metres onto a non-resilient, horizontal, flat, massive and rigid surface in conformity with 6.4.3.3.

UN Model Regulations, 6.3.5.3.2 (see ST/SG/AC.10/46/Add.1):

6.5.3.2 Number of test samples and drop orientation

6.5.3.2.1 Where the samples are in the shape of a box, five must be dropped, one in each of the following orientations:

- a) flat on the base;
- b) flat on the top;
- c) flat on the longest side;
- d) flat on the shortest side;
- e) on a corner.

6.5.3.2.2 Where the samples are in the shape of a drum, three must be dropped, one in each of the following orientations:

- a) diagonally on the top chime, with the centre of gravity directly above the point of impact;
- b) diagonally on the base chime;
- c) flat on the side.

6.5.3.4.3 While the sample must be released in the required orientation, it is accepted that for aerodynamic reasons the impact may not take place in that orientation.

6.5.3.5.4 Following the appropriate drop sequence, there must be no leakage from the primary receptacle(s), which must remain protected by cushioning/absorbent material in the secondary packaging.

6.5.3.6~~5~~ *Special preparation of test sample for the drop test*

6.5.3.6~~5~~.1 *Fibreboard — water spray test*

Fibreboard outer packagings: The sample must be subjected to a water spray that simulates exposure to rainfall of approximately 5 cm per hour for at least one hour. It must then be subjected to the test described in 6.5.3.1.

6.5.3.6~~5~~.2 *Plastics material — cold conditioning*

Plastics primary receptacles or outer packagings: The temperature of the test sample and its contents must be reduced to -18°C or lower for a period of at least 24 hours and within 15 minutes of removal from that atmosphere the test sample must be subjected to the test described in 6.5.3.1. Where the sample contains dry ice, the conditioning period may be reduced to four hours.

6.5.3.6~~5~~.3 *Packagings intended to contain dry ice — additional drop test*

Where the packaging is intended to contain dry ice, a test additional to that specified in 6.5.3.1 and, when appropriate, in 6.5.3.6~~5~~.1 or 6.5.3.6~~5~~.2 must be carried out. One sample must be stored so that all the dry ice dissipates and then that sample must be dropped in one of the orientations described in 6.5.3.2.1 or in 6.5.3.2.2, as appropriate which must be that most likely to result in failure of the packaging.

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Chapter 7

REQUIREMENTS FOR THE CONSTRUCTION, TESTING AND APPROVAL OF PACKAGES FOR RADIOACTIVE MATERIAL AND FOR THE APPROVAL OF SUCH MATERIAL

...

7.1 GENERAL REQUIREMENTS

7.1.1 The package must be so designed in relation to its mass, volume and shape that it can be easily and safely transported. In addition, the package must be so designed that it can be properly secured in the aircraft during transport.

7.1.2 The design must be such that any lifting attachments on the package will not fail when used in the intended manner and that, if failure of the attachments should occur, the ability of the package to meet other requirements of these Instructions would not be impaired. The design must take account of appropriate safety factors to cover snatch lifting.

7.1.3 Attachments and any other features on the outer surface of the package which could be used to lift it must be designed either to support its mass in accordance with the requirements of 7.1.2 or must be removable or otherwise rendered incapable of being used during transport.

UN Model Regulations, 6.4.2.4 (see ST/SG/AC.10/46/Add.1):

7.1.4 As far as practicable, the ~~packaging~~ **package** must be designed and finished so that the external surfaces are free from protruding features and can be easily decontaminated.

7.1.5 As far as practicable, the outer layer of the package must be designed so as to prevent the collection and the retention of water.

7.1.6 Any features added to the package at the time of transport which are not part of the package must not reduce its safety.

7.1.7 The package must be capable of withstanding the effects of any acceleration, vibration or vibration resonance, which may arise under routine conditions of transport without any deterioration in the effectiveness of the closing devices on the various receptacles or in the integrity of the package as a whole. In particular, nuts, bolts and other securing devices must be designed so as to prevent them from becoming loose or being released unintentionally, even after repeated use.

UN Model Regulations, 6.4.2.8 (see ST/SG/AC.10/46/Add.1):

7.1.8 The design of the package must take into account ageing mechanisms.

~~7.1.8~~7.1.9 The materials of the packaging and any components or structures must be physically and chemically compatible with each other and with the radioactive contents. Account must be taken of their behaviour under irradiation.

~~7.1.9~~7.1.10 All valves through which the radioactive contents could escape must be protected against unauthorized operation.

~~7.1.10~~7.1.11 The design of the package must take into account ambient temperatures and pressures that are likely to be encountered in routine conditions of transport.

~~7.1.11~~7.1.12 A package must be so designed that it provides sufficient shielding to ensure that, under routine conditions of transport and with the maximum radioactive contents that the package is designed to contain, the radiation level at any point on the external surface of the package would not exceed the values specified in 2;7.2.4.1.1.2, 4;9.1.10 and 4;9.1.11, as applicable, with account taken of 7;2.10.3.3 c).

~~7.1.12~~7.1.13 For radioactive material having other dangerous properties, the package design must take into account those properties (see Part 2, Introductory Chapter, 3.1, 3.2 and 4;9.1.5).

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7.3 REQUIREMENTS FOR EXCEPTED PACKAGES

UN Model Regulations, 6.4.4 (see ST/SG/AC.10/46/Add.1):

An excepted package must be designed to meet the requirements specified in 7.1 ~~and 7.2~~ to 7.12 and, in addition, the requirements of 7.6.2 if it contains fissile material allowed by one of the provisions of 2;7.2.3.5.1 a) to f), and the requirements of 7.2 if carried by air.

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UN Model Regulations, 6.4.5 and paragraph 1.1.7.1 of this report:

7.4 REQUIREMENTS FOR INDUSTRIAL PACKAGES

7.4.1 Industrial packages Types 1, 2 and 3 (Types IP-1, IP-2 and IP-3) must meet the requirements specified in 7.1, 7.2 and 7.6.2.

7.4.2 A Type IP-2 package must, if it were subjected to the tests specified in 7.14.4 and 7.14.5, prevent:

- a) loss or dispersal of the radioactive contents; and
- b) more than a 20 per cent increase in the maximum ~~radiation level~~ dose rate at any external surface of the package.

7.4.3 A Type IP-3 package must meet all the requirements specified in 7.6.2 to 7.6.15.

UN Model Regulations, 6.4.5.4 and paragraph 1.1.7.1 of this report:

7.4.4 Alternative requirements for industrial packages Types 2 and 3 (Types IP-2 and IP-3)

7.4.4.1 Packages may be used as a Type IP-2 package, provided that:

- a) they satisfy the requirements of 7.4.1;
- b) they are designed to satisfy the requirements prescribed for Packing Group I or II in Part 6, Chapters 1 to 4, of these Instructions; and
- c) when subjected to the tests required for Packing Group I or II in Part 6, Chapter 4, they would prevent:
 - i) loss or dispersal of the radioactive contents; and

- ii) more than a 20 per cent increase in the maximum ~~radiation level~~ dose rate at any external surface of the package.

7.4.4.2 Freight containers with the characteristics of a permanent enclosure may also be used as Industrial package Type 2 or 3 (Type IP-2 or IP-3), provided that:

- a) the radioactive contents are restricted to solid materials;
- b) they satisfy the requirements of 7.4.1; and
- c) they are designed to conform to ISO 1496-1:1990: "Series 1 freight containers — Specification and testing — Part 1: General cargo containers" and subsequent amendments 1:1993, 2:1998, 3:2005, 4:2006 and 5:2006, excluding dimensions and ratings. They must be designed so that, if subjected to the tests prescribed in that document and to the accelerations occurring during routine conditions of transport, they would prevent:
 - i) loss or dispersal of the radioactive contents; and
 - ii) more than a 20 per cent increase in the maximum ~~radiation level~~ dose rate at any external surface of the freight containers.

UN Model Regulations, 6.4.6.2 (see ST/SG/AC.10/46/Add.1):

7.5 REQUIREMENTS FOR PACKAGES CONTAINING URANIUM HEXAFLUORIDE

...

7.5.2 Each package designed to contain 0.1 kg or more of uranium hexafluoride must be designed so that ~~it would meet~~ the package would meet the following requirements:

- a) withstand, without leakage and without unacceptable stress, as specified in ISO 7195:2005, the structural test as specified in 7.20 except as allowed in 7.5.4;
- b) withstand, without loss or dispersal of the uranium hexafluoride, the free drop test specified in 7.14.4; and
- c) withstand, without rupture of the containment system, the thermal test specified in 7.16.3 except as allowed in 7.5.4.

...

7.6 REQUIREMENTS FOR TYPE A PACKAGES

...

7.6.8 Special form radioactive material may be considered as a component of the containment system.

UN Model Regulations, 6.4.7.9 (see ST/SG/AC.10/46/Add.1):

7.6.9 If the containment system forms a separate unit of the package, ~~it~~ the containment system must be capable of being securely closed by a positive fastening device which is independent of any other part of the packaging.

...

UN Model Regulations, 6.4.7.14 and paragraph 1.1.7.1 of this report:

7.6.14 A package must be designed so that if it were subjected to the tests specified in 7.14, it would prevent:

- a) loss or dispersal of the radioactive contents; and
- b) more than a 20 per cent increase in the maximum ~~radiation level~~ dose rate at any external surface of the package.

...

UN Model Regulations, 6.4.7.17 (see ST/SG/AC.10/46/Add.1):

7.6.17 Type A packages to contain gas

A Type A package designed for gases must prevent loss or dispersal of the radioactive contents if the package were subjected to the tests specified in 7.15-A, except for a Type A package designed for tritium gas or for noble gases ~~must be excepted from this requirement.~~

7.7 REQUIREMENTS FOR TYPE B(U) PACKAGES

7.7.1 Type B(U) packages must be designed to meet the requirements specified in 7.1, 7.2 and 7.6.2 to 7.6.15, except 7.6.14 a), and, in addition, to the requirements specified in 7.7.2 to 7.7.15.

UN Model Regulations, 6.4.8.2 (see ST/SG/AC.10/46/Add.1):

7.7.2 A package must be designed so that, under the ambient conditions specified in 7.7.5 and 7.7.6, heat generated within the package by the radioactive contents does not, under normal conditions of transport, as demonstrated by the tests in 7.14, adversely affect the package in such a way that it would fail to meet the applicable requirements for containment and shielding if left unattended for a period of one week. Particular attention must be paid to the effects of heat, which may cause one or more of the following:

- a) alter the arrangement, the geometrical form or the physical state of the radioactive contents or, if the radioactive material is enclosed in a can or receptacle (for example, clad fuel elements), cause the can, receptacle or radioactive material to deform or melt;
- b) lessening of the efficiency of the packaging through differential thermal expansion or cracking or melting of the radiation shielding material;
- c) in combination with moisture, accelerate corrosion.

...

7.7.8 A package must be so designed that, if it were subjected to:

- a) the tests specified in 7.14, it would restrict the loss of radioactive contents to not more than 10^{-6} A₂ per hour; and
- b) the tests specified in 7.16.1, 7.16.2 b), 7.16.3 and 7.16.4 and either the tests in:
 - i) 7.16.2 c), when the package has a mass not greater than 500 kg, an overall density not greater than 1 000 kg/m³ based on the external dimensions, and radioactive contents greater than 1 000 A₂ not as special form radioactive material; or
 - ii) 7.16.2 a), for all other packages,

it would meet the following requirements:

UN Model Regulations, 6.4.8.8 (see ST/SG/AC.10/46/Add.1):

- retain sufficient shielding to ensure that the ~~radiation level~~ dose rate at 1 m from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents which the package is designed to contain; and
- restrict the accumulated loss of radioactive contents in a period of one week to not more than 10 A₂ for krypton-85 and not more than A₂ for all other radionuclides.

Where mixtures of different radionuclides are present, the provisions of 2;7.2.2.4 to 2;7.2.2.6 must apply except that for krypton-85, an effective A₂(i) value equal to 10 A₂ may be used. For case a) above, the assessment must take into account the external non-fixed contamination limits of 4;9.1.2.

...

7.8 REQUIREMENTS FOR TYPE B(M) PACKAGES

UN Model Regulations, 6.4.9.1 (see ST/SG/AC.10/46/Add.1):

Type B(M) packages must meet the requirements for Type B(U) packages specified in 7.7.1, except that for packages to be transported solely within a specified country or solely between specified countries, conditions other than those given in 7.6.5, 7.7.4 to 7.7.6 and 7.7.9 to 7.7.15 may be assumed with the approval of the competent authorities of these countries. Notwithstanding, the requirements for Type B(U) packages specified in 7.7.4 and 7.7.9 to 7.7.15 must be met as far as practicable.

...

UN Model Regulations, 6.4.10.3 and paragraph 1.1.7.1 of this report:

7.9.3 A package must be designed so that, if it were at the maximum normal operating pressure and subjected to:

- a) the tests specified in 7.14, it would restrict the loss of radioactive contents to not more than 10^{-6} A₂ per hour; and
- b) the test sequences in 7.19.1, it would:
 - i) retain sufficient shielding to ensure that the radiation level **dose rate** at 1 m from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents which the package is designed to contain; and
 - ii) restrict the accumulated loss of radioactive contents in a period of one week to not more than 10 A₂ for krypton-85 and not more than A₂ for all other radionuclides.

...

**7.10 REQUIREMENTS FOR PACKAGES
CONTAINING FISSILE MATERIAL**

...

DGP/27 (see paragraph 1.2.9 of the report under Agenda Item 1):

7.10.2 Packages containing fissile material that meet the provisions of subparagraph d) and one of the provisions of a) to c) below are excepted from the requirements of 7.10.4 to 7.10.14.

- a) Packages containing fissile material in any form provided that:
 - i) the smallest external dimension of the package is not less than 10 cm;
 - ii) the criticality safety index of the package is calculated using the following formula:

$$CSI=50 \times 5 \times \left[\left(\frac{\text{Mass of U-235 in package (g)}}{Z} \right) + \left(\frac{\text{Mass of other fissile nuclides* in package (g)}}{280} \right) \right]$$

where the values of Z are taken from Table 6-6.

* Plutonium may be of any isotopic composition provided that the amount of Pu-241 is less than that of Pu-240 in the package

- iii) the CSI of any package does not exceed 10;
- b) packages containing fissile material in any form provided that:

...

- iii) the criticality safety index of the package is calculated using the following formula:

$$CSI=50 \times 2 \times \left[\left(\frac{\text{Mass of U-235 in package (g)}}{Z} \right) + \left(\frac{\text{Mass of other fissile nuclides* in package (g)}}{280} \right) \right]$$

where the values of Z are taken from Table 6-6.

* Plutonium may be of any isotopic composition provided that the amount of Pu-241 is less than that of Pu-240 in the package

- (iv) the criticality safety index of any package does not exceed 10;
- c) packages containing fissile material in any form provided that:
- i) the smallest external dimension of the package is not less than 10 cm;
 - ii) the package, after being subjected to the tests specified in 7.14.1 to 7.14.6:
 - retains its fissile material contents;
 - preserves the minimum overall outside dimensions of the package to at least 10 cm;
 - prevents the entry of a 10 cm cube;
 - iii) the criticality safety index of the package is calculated using the following formula:

$$CSI=50 \times 2 \times \left[\left(\frac{\text{Mass of U-235 in package (g)}}{450} \right) + \left(\frac{\text{Mass of other fissile nuclides* in package (g)}}{280} \right) \right]$$

* Plutonium may be of any isotopic composition provided that the amount of Pu-241 is less than that of Pu-240 in the package

UN Model Regulations, 6.4.11.2 (see ST/SG/AC.10/46/Add.1):

- iv) the ~~maximum~~ total mass of fissile nuclides in any package does not exceed 15 g;
- d) the total mass of beryllium, hydrogenous material enriched in deuterium, graphite and other allotropic forms of carbon in an individual package must not be greater than the mass of fissile nuclides in the package except where ~~their~~ the total concentration of these materials does not exceed 1 g in any 1 000 g of material. Beryllium incorporated in copper alloys up to 4 per cent in weight of the alloy does not need to be considered.
- ...

7.10.8 For a package in isolation, it must be assumed that water can leak into or out of all void spaces of the package, including those within the containment system. However, if the design incorporates special features to prevent such leakage of water into or out of certain void spaces, even as a result of error, absence of leakage may be assumed in respect of those void spaces. Special features must include either of the following:

- a) multiple high standard water barriers not less than two of which would remain watertight if the package were subject to the tests prescribed in 7.10.13 b), a high degree of quality control in the manufacture, maintenance and repair of packagings and tests to demonstrate the closure of each package before each shipment; or
- b) for packages containing uranium hexafluoride only, with maximum enrichment of 5 mass per cent uranium-235:

UN Model Regulations, 6.4.11.8 (see ST/SG/AC.10/46/Add.1):

- i) packages where, following the tests prescribed in 7.10.13 b), there is no physical contact between the valve or the plug and any other component of the packaging other than at its original point of attachment and where, in addition, following the test prescribed in 7.16.3, the valves and the plug remain leaktight; and
 - ii) a high degree of quality control in the manufacture, maintenance and repair of packagings coupled with tests to demonstrate closure of each package before each shipment.
- ...

7.10.11:

- a) The package must be subcritical under conditions consistent with the Type C package tests specified in 7.19.1 assuming reflection by at least 20 cm of water but no water-in leakage.

UN Model Regulations, 6.4.11.11 b) (see ST/SG/AC.10/46/Add.1):

- b) In the assessment of 7.10.10, ~~allowance must not be made for use of special features of as specified in 7.10.8 unless, following the Type C package tests specified in 7.19.1 and, subsequently, the water in leakage test of 7.18.3, leakage of water into or out of the void spaces is prevented~~ provided that leakage of water into or out of the void spaces is prevented when the package is submitted to the Type C package tests specified in 7.19.1 followed by the water leakage test specified in 7.18.3.

...

7.11 TEST PROCEDURES AND DEMONSTRATION OF COMPLIANCE

7.11.1 Demonstration of compliance with the performance standards required in 2;7.2.3.1.3, 2;7.2.3.1.4, 2;7.2.3.3.1, 2;7.2.3.3.2, 2;7.2.3.4.1, 2;7.2.3.4.2 and 6;7.1 to 6;7.10 must be accomplished by any of the methods listed below or by a combination thereof:

UN Model Regulations, 6.4.12 a) (see ST/SG/AC.10/46/Add.1):

- a) Performance of tests with specimens representing ~~LSA-III material~~, or special form radioactive material, or low dispersible radioactive material or with prototypes or samples of the packaging, where the contents of the specimen or the packaging for the tests must simulate, as closely as practicable, the expected range of radioactive contents and the specimen or packaging to be tested must be prepared as presented for transport;
- b) Reference to previous satisfactory demonstrations of a sufficiently similar nature;
- c) Performance of tests with models of appropriate scale incorporating those features which are significant with respect to the item under investigation when engineering experience has shown results of such tests to be suitable for design purposes. When a scale model is used, the need for adjusting certain test parameters, such as penetrator diameter or compressive load, must be taken into account;
- d) Calculation, or reasoned argument, when the calculation procedures and parameters are generally agreed to be reliable or conservative.

...

7.12 TESTING THE INTEGRITY OF THE CONTAINMENT SYSTEM AND SHIELDING AND EVALUATING CRITICALITY SAFETY

UN Model Regulations, 6.4.13 (see ST/SG/AC.10/46/Add.1):

After each of the applicable tests ~~test or group of tests or sequence of the applicable tests, as appropriate~~, specified in 7.14 to 7.20:

- a) faults and damages must be identified and recorded;
- b) it must be determined whether the integrity of the containment system and shielding has been retained to the extent required in 7.1 to 7.10 for the package under test; and
- c) it must be determined, for packages containing fissile material, whether the assumptions and conditions used in the assessments required by 7.10.1 to 7.10.14 for one or more packages are valid.

...

7.14 TESTS FOR DEMONSTRATING ABILITY TO WITHSTAND NORMAL CONDITIONS OF TRANSPORT

...

7.14.4 Free drop test: the specimen must drop onto the target so as to suffer maximum damage in respect of the safety features to be tested.

UN Model Regulations, 6.4.15.4 a) (see ST/SG/AC.10/46/Add.1):

- a) The height of the drop, measured from the lowest point of the specimen to the upper surface of the target, must be not less than the distance specified in Table 6-6 for the applicable mass. The target must be as defined in 7.13;
- b) For rectangular fibreboard or wood packages not exceeding a mass of 50 kg, a separate specimen must be subjected to a free drop onto each corner from a height of 0.3 m;
- c) For cylindrical fibreboard packages not exceeding a mass of 100 kg, a separate specimen must be subjected to a free drop onto each of the quarters of each rim from a height of 0.3 m.

...

7.14.6 Penetration test: the specimen must be placed on a rigid, flat, horizontal surface which will not move significantly while the test is being carried out.

- a) A bar of 3.2 cm in diameter with a hemispherical end and a mass of 6 kg must be dropped and directed to fall, with its longitudinal axis vertical, onto the centre of the weakest part of the specimen so that, if it penetrates sufficiently far, it will hit the containment system. The bar must not be significantly deformed by the test performance;

UN Model Regulations, 6.4.15.6 b) (see ST/SG/AC.10/46/Add.1):

- b) The height of the drop of the bar, measured from its lower end to the intended point of impact on the upper surface of the specimen, must be 1 m.

...

7.16 TESTS FOR DEMONSTRATING THE ABILITY TO WITHSTAND ACCIDENT CONDITIONS IN TRANSPORT

7.16.1 The specimen must be subjected to the cumulative effects of the tests specified in 7.16.2 and 7.16.3, in that order. Following these tests, either this specimen or a separate specimen must be subjected to the effect(s) of the water immersion test(s) as specified in 7.16.4 and, if applicable, 7.17.

7.16.2 Mechanical test: the mechanical test consists of three different drop tests. Each specimen must be subjected to the applicable drops as specified in 7.7.8 or 7.10.13. The order in which the specimen is subjected to the drops must be such that, on completion of the mechanical test, the specimen must have suffered such damage as will lead to the maximum damage in the thermal test which follows:

- a) For drop I, the specimen must drop onto the target so as to suffer the maximum damage, and the height of the drop measured from the lowest point of the specimen to the upper surface of the target must be 9 m. The target must be as defined in 7.13;

UN Model Regulations, 6.4.17.2 b) (see ST/SG/AC.10/46/Add.1):

- b) For drop II, the specimen must drop onto a bar rigidly mounted perpendicularly on the target so as to suffer the maximum damage. The height of the drop measured from the intended point of impact of the specimen to the upper surface of the bar must be 1 m. The bar must be of solid mild steel of circular cross-section, (15.0 ± 0.5 cm) in diameter and 20 cm long unless a longer bar would cause greater damage, in which case a bar of sufficient length to cause maximum damage must be used. The upper end of the bar must be flat and horizontal with its edge rounded off to a radius of not more than 6 mm. The target on which the bar is mounted must be as described in 7.13;
- c) For drop III, the specimen must be subjected to a dynamic crush test by positioning the specimen on the target so as to suffer maximum damage by the drop of a 500 kg mass from 9 m onto the specimen. The mass must consist of a solid mild steel plate 1 m by 1 m and must fall in a horizontal attitude. The lower face of the steel plate must have its edges and corners rounded off to a radius of not more than 6 mm. The height of the drop must be measured from the underside of the plate to the highest point of the specimen. The target on which the specimen rests must be as defined in 7.13.

7.16.3 Thermal test: the specimen must be in thermal equilibrium under conditions of an ambient temperature of 38°C, subject to the solar insolation conditions specified in Table 6-5 and subject to the design maximum rate of internal heat generation within the package from the radioactive contents. Alternatively, any of these parameters are allowed to have different values prior to and during the test, provided due account is taken of them in the subsequent assessment of package response. The thermal test must then consist of:

- a) exposure of a specimen for a period of 30 minutes to a thermal environment which provides a heat flux at least equivalent to that of a hydrocarbon fuel/air fire in sufficiently quiescent ambient conditions to give a minimum average flame emissivity coefficient of 0.9 and an average temperature of at least 800°C, fully engulfing the specimen, with a surface absorptivity coefficient of 0.8 or that value which the package may be demonstrated to possess if exposed to the fire specified, followed by;

UN Model Regulations, 6.4.17.3 b) (see ST/SG/AC.10/46/Add.1):

- b) exposure of the specimen to an ambient temperature of 38°C, subject to the solar insolation conditions specified in Table 6-5 and subject to the design maximum rate of internal heat generation within the package by the radioactive contents for a sufficient period to ensure that temperatures in the specimen are ~~everywhere~~ decreasing in all parts of the specimen and/or are approaching initial steady-state conditions. Alternatively, any of these parameters are allowed

to have different values following cessation of heating, provided due account is taken of them in the subsequent assessment of package response.

...

7.22 APPLICATIONS AND APPROVALS FOR RADIOACTIVE MATERIAL TRANSPORT

See 6.4.23 of the UN Model Regulations.

7.23 REGISTRATION OF SERIAL NUMBERS AND VALIDATION

7.23.1 The competent authority must be informed of the serial number of each packaging manufactured to a design approved by them. The competent authority must maintain a register of such numbers.

7.23.2 Multilateral approval may be by validation of the original certificate issued by the competent authority of the State of Origin of the design or shipment.

7.24 TRANSITIONAL MEASURES FOR CLASS 7

UN Model Regulations, 6.4.24 (see ST/SG/AC.10/46/Add.1):

7.24.1 Packages not requiring competent authority approval of design under the 1985, and 1985

(As Amended 1990), 1996 edition, 1996 edition (revised), 1996 (as amended 2003), 2005, 2009 editions of IAEA Safety Series No. 6 and 2012 edition of IAEA Safety Standards Series No. SSR-6 ~~editions of IAEA Safety Series No. 6~~

7.24.1.1 Packages not requiring competent authority approval of design (excepted packages, Type IP-1, Type IP-2, Type IP-3 and Type A packages) must meet these Instructions in full, except that:

~~a) packages that meet the requirements of the 1985 or 1985 (As Amended 1990) Editions of IAEA Regulations for the Safe Transport of Radioactive Material (IAEA Safety Series No.6);~~

~~a) i) may continue in transport provided that they were prepared for transport prior to 31 December 2003, and are subject to the requirements of 6.4.24.4 of the UN Model Regulations, if applicable;~~

~~b) ii) may continue to be used, provided that all the following conditions are met:~~

~~i) they were not designed to contain uranium hexafluoride;~~

~~ii) the applicable requirements of 1;6.3 of these Instructions are applied;~~

~~iii) the activity limits and classification in Part 2;7 of these Instructions are applied;~~

~~iv) the requirements and controls for transport in Parts 1, 3, 4, 5 and 7 of these Instructions are applied;~~

~~v) the packaging was not manufactured or modified after 31 December 2003.~~

~~b) packages that meet the requirements of the 1996, 1996 (revised), 1996 (as amended 2003), 2005 or 2009 Editions of IAEA Safety Series No. 6, or 2012 Edition of IAEA Safety Standards Series No. SSR-6:~~

~~(i) may continue in transport provided that they were prepared for transport prior to 31 December 2025 and are subject to the requirements of 6.4.24.4 of the UN Model Regulations, if applicable; or~~

~~(ii) may continue to be used, provided that all the following conditions are met:~~

~~1) the applicable requirements of 1;6.3 of these Instructions are applied;~~

~~2) the activity limits and classification in Part 2;7 of these Instructions are applied;~~

~~3) the requirements and controls for transport in Parts 1, 3, 4, 5 and 7 of these Instructions are applied; and~~

~~4) the packaging was not manufactured or modified after 31 December 2025.~~

~~7.24.1.2 Any packaging modified, unless to improve safety, or manufactured after 31 December 2003, must meet the requirements of these Instructions in full. Packages prepared for transport not later than 31 December 2003 under the 1985~~

or 1985 (As Amended 1990) editions of IAEA Safety Series No. 6 may continue in transport. Packages prepared for transport after this date must meet the requirements of these Instructions in full.

UN Model Regulations, 6.4.24.2 (see ST/SG/AC.10/46/Add.1):

7.24.2 Packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) editions of IAEA Safety Series No. 6 Package designs approved under the 1985, 1985 (as amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005 and 2009 Editions of IAEA Safety Series No. 6 and 2012 Edition of IAEA Safety Standards Series No. SSR-6

7.24.2.1 Packages requiring competent authority approval of the design must meet these Instructions in full ~~unless the following conditions are met~~ except that:

a) ~~the packagings that~~ were manufactured to a package design approved by the competent authority under the provisions of ~~the 1973 or 1973 (As Amended) or the 1985 or 1985 (As Amended 1990) Editions of IAEA Safety Series No.6~~ may continue to be used provided that all of the following conditions are met;

~~___~~ b) the package design is subject to multilateral approval;

~~___~~ c) the applicable requirements of 1;6.3 of these Instructions are applied;

~~___~~ d) the activity limits and classification in Part 2;7 of these Instructions are applied;

~~___~~ e) the requirements and controls for transport in in Parts 1, 3, 4, 5 and 7 of these Instructions are applied;

~~___~~ f) for a package containing fissile material and transported by air, the requirement of 7.10.11 is met;

~~___~~ g) for packages that meet the requirements of the 1973 or 1973 (As Amended) Editions of IAEA Safety Series No. 6:

~~___~~ i) ~~the packages retain sufficient shielding to ensure that the radiation level at 1 m from the surface of the package would not exceed 10 mSv/h in the accident conditions of transport defined in the 1973 Revised or 1973 Revised (As Amended) Editions of IAEA Safety Series No. 6 with the maximum radioactive contents which the package is authorized to contain;~~

~~___~~ ii) ~~the packages do not utilize continuous venting;~~

~~___~~ iii) ~~a serial number in accordance with the provision of 5;2.4.5.1 c) is assigned to and marked on the outside of each packaging.~~

b) packagings that were manufactured to a package design approved by the competent authority under the provisions of the 1996, 1996 (revised), 1996 (as amended 2003), 2005 or 2009 Editions of IAEA Safety Series No. 6, or 2012 Edition of IAEA Safety Standards Series No. SSR-6 may continue to be used provided that all of the following conditions are met:

i) the package design is subject to multilateral approval after 31 December 2025;

ii) the applicable requirements of 1;6.3 of these Instructions are applied;

iii) the activity limits and material restrictions of Part 2;7 of these Instructions are applied;

iv) the requirements and controls for transport in Parts 1, 3, 4, 5 and 7 of these Instructions are applied.

DGP/27 (see paragraph 1.2.6.1 of the report under Agenda Item 1):

7.24.2.2 No new manufacture of packagings to a package design meeting the provisions of the 1973, 1973 (As Amended), 1985, and 1985 (As Amended 1990) Editions of IAEA Safety Series No. 6 ~~must be~~ is permitted to commence.

UN Model Regulations, 6.4.24.4 (see ST/SG/AC.10/46/Add.1) and DGP/27 (see paragraph 1.2.6.1 of the report under Agenda Item 1):

7.24.2.3 No new manufacture of packagings of a package design meeting the provisions of the 1996, 1996 (revised), 1996 (as amended 2003), 2005 or 2009 Editions of IAEA Safety Series No. 6, or 2012 Edition of IAEA Safety Standards Series No. SSR-6 is permitted to commence after 31 December 2028.

UN Model Regulations, 6.4.24.6 (see ST/SG/AC.10/46/Add.1) and DGP/27 (see paragraph 1.2.6.1 of the report under Agenda Item 1):

7.24.3 Special form radioactive material approved under the ~~1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990)~~ editions of IAEA Safety Series No. 6 the 1985, 1985 (as amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005 or 2009 Editions of IAEA Safety Series No. 6 or 2012 Edition of IAEA Safety Standards Series No. SSR-6

Special form radioactive material manufactured to a design ~~which~~that had received unilateral approval by the competent authority under the ~~1973, 1973 (As Amended), 1985 or, 1985 (as amended 1990)~~, 1996, 1996 (revised), 1996 (as amended 2003), 2005 and 2009 Editions of IAEA Safety Series No. 6 and 2012 Edition of IAEA Safety Standards Series No. SSR-6 may continue to be used when in compliance with the mandatory management system in accordance with the applicable requirements of 1;6.3. ~~There must be~~ no new manufacture of such special form radioactive material ~~must to a design that had received unilateral approval by the competent authority under the 1985 or 1985 (as amended 1990) Editions of IAEA Safety Series No. 6. No new manufacture of special form radioactive material to a design that had received unilateral approval by the competent authority under the 1996, 1996 (revised), 1996 (as amended 2003), 2005 and 2009 Editions of IAEA Safety Series No. 6, and 2012 Edition of IAEA Safety Standards Series No. SSR-6~~ be is permitted to commence after 31 December 2025.

...

Part 7

OPERATOR'S RESPONSIBILITIES

...

Chapter 2

STORAGE AND LOADING

...

2.9.3 Stowage during transport and storage in transit

...

2.9.3.3 Loading of freight containers and accumulation of packages, overpacks and freight containers must be controlled as follows:

- a) Except under the condition of exclusive use, the total number of packages, overpacks and freight containers aboard a single aircraft must be so limited that the total sum of the transport indexes aboard the aircraft does not exceed the values shown in Table 7-6. For consignments of LSA-I material, there is no limit on the sum of the transport indexes;
- b) Where a consignment is transported under exclusive use, there is no limit on the sum of the transport indexes aboard a single aircraft, but the requirement on minimum separation distances established in 2.9.6 applies;

UN Model Regulations, 7.1.8.3.3 (see ST/SG/AC.10/46/Add.1)

- ~~c) The radiation level~~ dose rate under routine conditions of transport must not exceed 2 mSv/h at any point on, ~~and 0.1 mSv/h at 2 m from,~~ the external surface of the aircraft;
- d) The total sum of the criticality safety indexes in a freight container and aboard an aircraft must not exceed the values shown in Table 7-7.

...

Attachment 1

LISTS OF PROPER SHIPPING NAMES

...

Chapter 2

LIST OF N.O.S. AND GENERIC PROPER SHIPPING NAMES

...

THE MOST SPECIFIC APPLICABLE NAME MUST ALWAYS BE USED

DGP/27 (see paragraph 1.2.11 of the report under Agenda Item 1):

<i>Class or Division</i>	<i>Subsidiary hazard</i>	<i>UN No.</i>	<i>Proper shipping name</i>
...			
CLASS 2			
Division 2.1			
<i>Specific entries</i>			
+ 2.1	See 2;0.6	3537	Articles containing flammable gas, n.o.s.*
...			
<i>General entries</i>			
2.1		3510	Adsorbed gas, flammable, n.o.s.*
2.1		1950	Aerosols, flammable
<u>2.1</u>	<u>See 2;0.6</u>	<u>3537</u>	<u>Articles containing flammable gas, n.o.s.*</u>
...			
Division 2.2			
<i>Specific entries</i>			
+ 2.2	See 2;0.6	3538	Articles containing non-flammable, non-toxic gas, n.o.s.*
...			
<i>General entries</i>			
2.2		3511	Adsorbed gas, n.o.s.*
2.2	5.1	3513	Adsorbed gas, oxidizing, n.o.s.*
2.2		1950	Aerosols, non-flammable
<u>2.2</u>	<u>See 2;0.6</u>	<u>3538</u>	<u>Articles containing non-flammable, non-toxic gas, n.o.s.*</u>
...			
CLASS 3			
<i>Specific entries</i>			
+ 3	See 2;0.6	3540	Articles containing flammable liquid, n.o.s.*
...			
<i>General entries</i>			
<u>3</u>	<u>See 2;0.6</u>	<u>3540</u>	<u>Articles containing flammable liquid, n.o.s.*</u>
...			
CLASS 4			
Division 4.1			

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Appendix C to the Report on Agenda Item 1

	<i>Specific entries</i>				
+	4.1	See 2:0.6	3541	Articles containing flammable solid, n.o.s.*	
...					
	<i>General entries</i>				
	<u>4.1</u>	<u>See 2:0.6</u>	<u>3541</u>	<u>Articles containing flammable solid, n.o.s.*</u>	
...					
	Division 4.2				
	<i>Specific entries</i>				
+	4.2	See 2:0.6	3542	Articles containing a substance liable to spontaneous combustion, n.o.s.*	
...					
	<i>General entries</i>				
	<u>4.2</u>	<u>See 2:0.6</u>	<u>3542</u>	<u>Articles containing a substance liable to spontaneous combustion, n.o.s.*</u>	
...					
	Division 4.3				
	<i>Specific entries</i>				
...					
±	4.3	See 2:0.6	3543	Articles containing a substance which emits flammable gas in contact with water, n.o.s.*	
...					
	<i>General entries</i>				
	<u>4.3</u>	<u>See 2:0.6</u>	<u>3543</u>	<u>Articles containing a substance which emits flammable gas in contact with water, n.o.s.*</u>	
...					
	Division 5.1				
	<i>Specific entries</i>				
+	5.1	See 2:0.6	3544	Articles containing oxidizing substance, n.o.s.*	
	<i>General entries</i>				
	<u>5.1</u>	<u>See 2:0.6</u>	<u>3544</u>	<u>Articles containing oxidizing substance, n.o.s.*</u>	
	Division 5.2				
	<i>Specific entries</i>				
+	5.2	See 2:0.6	3545	Articles containing organic peroxide, n.o.s.*	
...					
	<i>General entries</i>				
	<u>5.2</u>	<u>See 2:0.6</u>	<u>3545</u>	<u>Articles containing organic peroxide, n.o.s.*</u>	
	CLASS 6				
	Division 6.1				
	<i>Specific entries</i>				
+	6.1	See 2:0.6	3546	Articles containing toxic substance, n.o.s.*	
...					
+	6.1	4.1	3535	Toxic solid, flammable, inorganic, n.o.s.*	
...					
	<i>General entries</i>				
	<u>6.1</u>	<u>See 2:0.6</u>	<u>3546</u>	<u>Articles containing toxic substance, n.o.s.*</u>	
...					
	6.1	8	2928	Toxic solid, corrosive, organic, n.o.s.*	

...	<u>6.1</u>	<u>4.1</u>	<u>3535</u>	<u>Toxic solid, flammable, inorganic, n.o.s.*</u>
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DGP/27 (see paragraphs 1.2.10 and 1.2.11 of the report under Agenda Item 1):

CLASS 8*Specific entries*

...

+	8	3547	Articles containing corrosive substance, n.o.s.*
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...

General entries

	<u>8</u>	<u>See 2;0.6</u>	<u>3547</u>	<u>Articles containing corrosive substance, n.o.s.*</u>
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APPENDIX D

**PROPOSED AMENDMENTS TO THE SUPPLEMENT TO THE
TECHNICAL INSTRUCTIONS FOR THE SAKE OF HARMONIZATION
WITH THE UN RECOMMENDATIONS ON THE TRANSPORT OF
DANGEROUS GOODS**

DGP/27 (see paragraph 1.3.1 of the report under Agenda Item 1):

Part S-3

**DANGEROUS GOODS LIST,
SPECIAL PROVISIONS AND QUANTITY LIMITATIONS**

...

Chapter 2

SUPPLEMENTARY DANGEROUS GOODS LIST

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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 Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1)

<u>Detonators, electronic programmable for blasting†</u>	<u>0511</u>	<u>1.1B</u>		<u>Explosive</u>					<u>E0</u>	<u>FORBIDDEN (131)</u>	<u>FORBIDDEN (131)</u>	
<u>Detonators, electronic programmable for blasting†</u>	<u>0512</u>	<u>1.4B</u>		<u>Explosive 1.4</u>					<u>E0</u>	<u>FORBIDDEN (131)</u>	<u>131</u>	<u>75 kg</u>
Desensitized explosive, solid, n.o.s.*	3380	4.1		Solid flammable	BE 3	A133 <u>A217</u>	I		FORBI	DDEN	FORBI	DDEN
Nitrocellulose, dry or wetted with less than 25% water (or alcohol), by mass	0340	1.1D		Explosive		<u>A216</u>			FORBIDDEN (112 b) or c))		FORBIDDEN (112 b) or c))	

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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 , unmodified or plasticized with less than 18% plasticizing substance, by mass	0341	1.1D		Explosive		A216			FORBIDDEN (112 b))		FORBIDDEN (112 b))	
Nitrocellulose, plasticized with not less than 18% plasticizing substance, by mass	0343	1.3C		Explosive		A216 A313			FORBIDDEN (111)		FORBIDDEN (111)	
Nitrocellulose, wetted with not less than 25% alcohol, by mass	0342	1.3C		Explosive		A216 A313			FORBIDDEN (114 a))		FORBIDDEN (114 a))	
Dipropylamine	2383	3	8	Liquid flammable & Corrosive		A209 A330	II	E2	352 Y340	1 L 0.5 L	363	5 L
<u>Dangerous goods in articles</u>	3363	9		<u>Miscellaneous</u>		A48 A107 A332		E0	see 962		see 962	
2-Dimethylaminoethyl methacrylate, stabilized	2522	6.1		Toxic		A209 A330	II	E4	654 Y641	5 L 1 L	662	60 L
Engine, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A176 A208		E0	FORBI	DDEN	220	No limit
Machinery, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A176 A208		E0	FORBI	DDEN	220	No limit

UN Model Regulations, Chapter 3.2, dangerous goods list, SP395 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraphs 3.1.2.5.1 a), 3.1.2.6.1 d) and 3.1.3.1.1 of DGP/27-WP/3):

<u>Medical waste, Category A, affecting humans, solid</u>	3549	6.2		<u>Infectious</u>		A2 A218		E0	FORBI	DDEN	622	400 kg
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Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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
<u>Medical waste, Category A, affecting animals only, solid</u>	<u>3549</u>	<u>6.2</u>		<u>Infectious</u>		<u>A2</u> <u>A218</u>		<u>E0</u>	<u>FORBI</u>	<u>DDEN</u>	<u>622</u>	<u>400 kg</u>

...

Chapter 6

SPECIAL PROVISIONS

Against the entries in the Supplementary Dangerous Goods List (Table S-3-1), column 7 shows any special provisions that are applicable. Where these special provisions have not been listed in Table 3-2 of the Technical Instructions, they are listed in Table S-3-4 below.

Table S-3-4. Special Provisions

Supplementary special provisions

...

UN Model Regulations, Chapter 3.3, SP 370 (see ST/SG/AC.10/46/Add.1)

A326 (370) This entry only applies to ammonium nitrate that meets one of the following criteria:

- ammonium nitrate with more than 0.2% combustible substances, including any organic substance calculated as carbon, to the exclusion of any added substance; ~~and~~ or
- ammonium nitrate with not more than 0.2% combustible substances, including any organic substance calculated as carbon, to the exclusion of any added substance, that gives a positive result when tested in accordance with Test Series 2 (see UN *Manual of Tests and Criteria*, Part I). See also UN 1942.

This entry must not be used for ammonium nitrate for which a proper shipping name already exists in the Table 3-1 of the Technical Instructions including ammonium nitrate mixed with fuel oil (ANFO) or any of the commercial grades of ammonium nitrate.

...

UN Model Regulations, Chapter 3.3, SP 379 (see ST/SG/AC.10/46/Add.1)

A329 (379) Anhydrous ammonia adsorbed or absorbed on a solid contained in ammonia dispensing systems or cylinders intended to form part of such systems may be transported on cargo aircraft 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 in addition to the following:

- a) the adsorption or absorption presents the following properties:
 - 1) the pressure at a temperature of 20°C in the cylinder is less than 0.6 bar;
 - 2) the pressure at a temperature of 35°C in the cylinder is less than 1 bar;

- 3) the pressure at a temperature of 85°C in the cylinder is less than 12 bar;
- b) the adsorbent or absorbent material must not have dangerous properties listed in Classes 1 to 8;
- c) the maximum contents of a cylinder must be 10 kg of ammonia; and
- d) cylinders containing adsorbed or absorbed ammonia must meet the following conditions:
 - 1) cylinders must be made of a material compatible with ammonia as specified in [ISO 11114-1:2012](#) [ISO 11114-1:2012 + A1:2017](#);
 - 2) cylinders and their means of closure must be hermetically sealed and able to contain the generated ammonia;
 - 3) each cylinder must be able to withstand the pressure generated at 85°C with a volumetric expansion no greater than 0.1%;
 - 4) each cylinder must be fitted with a device that allows for gas evacuation once pressure exceeds 15 bar without violent rupture, explosion or projection; and
 - 5) each cylinder must be able to withstand a pressure of 20 bar without leakage when the pressure relief device is deactivated.

When offered for transport in an ammonia dispenser, the cylinders must be connected to the dispenser in such a way that the assembly is guaranteed to have the same strength as a single cylinder.

The properties of mechanical strength mentioned in this special provision must be tested using a prototype of a cylinder and/or dispenser filled to nominal capacity, by increasing the temperature until the specified pressures are reached.

The test results must be documented, must be traceable and must be communicated to the relevant authorities upon request.

...

Part S-4

PACKING INSTRUCTIONS

(ADDITIONAL INFORMATION FOR PART 4 OF THE TECHNICAL INSTRUCTIONS)

...

Chapter 4

CLASS 2 — GASES

...

Replace Packing Instruction 200 with Packing Instruction 200 from the Technical Instructions and amend as shown:

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:

- 1) Pressure relief devices must be fitted on cylinders used for the transport of UN 1013 **Carbon dioxide** and UN 1070 **Nitrous oxide**. Other cylinders must be fitted with a pressure relief device if specified by the appropriate national authority of the country of use. The type of pressure relief device, the set to discharge pressure and relief capacity of pressure relief devices, if required, must be specified by the appropriate national authority of the country of use. Manifolding of cylinders is not permitted.
- 2) The following two tables cover compressed gases (Table 1) and liquefied and dissolved gases (Table 2). They provide:

- a) the UN number, name and description, and classification of the substance;
- b) the LC₅₀ for toxic substances;
- c) the types of cylinders authorized for the substance, shown by the letter "X";
- d) the maximum test period for periodic inspection of the cylinders;

Note.— For cylinders which make use of composite materials, the maximum test period must be five years. The test period may be extended to that specified in Tables 1 and 2 (i.e. up to ten years), if approved by the appropriate national authority of the country of use.

- e) the minimum test pressure of the cylinders;
 - f) the maximum working pressure of the cylinders for compressed gases (where no value is given, the working pressure must not exceed two-thirds of the test pressure) or the maximum filling ratio(s) dependent on the test pressure(s) for liquefied and dissolved gases;
 - g) special packing provisions that are specific to a substance.
- 3) In no case must cylinders be filled in excess of the limit permitted in the following requirements:
- a) For compressed gases, the working pressure must be not more than two-thirds of the test pressure of the cylinders. Restrictions to this upper limit on working pressure are imposed by special packing provision "o". In no case must the internal pressure at 65°C exceed the test pressure.
 - b) For high pressure liquefied gases, the filling ratio must be such that the settled pressure at 65°C does not exceed the test pressure of the cylinders.

The use of test pressures and filling ratios other than those in the table is permitted provided that the above criterion is met, except where special packing provision "o" applies.

For high pressure liquefied gases and gas mixtures for which relevant data are not available, the maximum filling ratio (FR) must be determined as follows:

$$FR = 8.5 \times 10^{-4} \times d_g \times P_h$$

where FR = maximum filling ratio
 d_g = gas density (at 15°C, 1 bar)(in g/l)
 P_h = minimum test pressure (in bar).

If the density of the gas is unknown, the maximum filling ratio must be determined as follows:

$$FR = \frac{P_h \times MM \times 10^{-3}}{R \times 338}$$

where FR = maximum filling ratio
 P_h = minimum test pressure (in bar)
 MM = molecular mass (in g/mol)
 $R = 8.31451 \times 10^{-2}$ bar.l/mol.K (gas constant).

For gas mixtures, the average molecular mass is to be taken, taking into account the volumetric concentrations of the various components.

UN Model Regulations, P200, paragraph 3) c) (see ST/SG/AC.10/46/Add.1)

- c) For low pressure liquefied gases, the maximum mass of contents per litre of water capacity (~~filling factor~~) must equal 0.95 times the density of the liquid phase at 50°C; in addition, the liquid phase must not fill the cylinder at any temperature up to 60°C. The test pressure of the cylinder must be at least equal to the vapour pressure (absolute) of the liquid at 65°C, minus 100 kPa (1 bar).

For low pressure liquefied gases for which filling data is not provided in the table, the maximum filling ratio must be determined as follows:

$$FR = (0.0032 \times BP - 0.24) \times d_1$$

where FR = maximum filling ratio
 BP = boiling point (in Kelvin)
 d_1 = density of the liquid at boiling point (in kg/l).

- d) For UN 1001, **Acetylene, dissolved**, and UN 3374 **Acetylene, solvent free**, see p).

- e) For liquefied gases charged with compressed gases, both components — the liquefied gas and the compressed gas — have to be taken into consideration in the calculation of the internal pressure in the cylinder.

The maximum mass of contents per litre of water capacity must not exceed 0.95 times the density of the liquid phase at 50°C; in addition, the liquid phase must not completely fill the cylinder at any temperature up to 60°C.

When filled, the internal pressure at 65°C must not exceed the test pressure of the cylinders. The vapour pressures and volumetric expansions of all substances in the cylinders must be considered. When experimental data is not available, the following steps must be carried out:

- ≠
- i) Calculation of the vapour pressure of the liquefied gas 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 liquefied gas at 65°C;
- v) Calculation of the total pressure, which is the sum of the vapour pressure of the liquefied gas 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 cylinder must not be less than the calculated total pressure minus 100 kPa (1bar).

≠

If the solubility of the compressed gas in the liquefied phase is not known for the calculation, the test pressure can be calculated without taking the gas solubility (sub-paragraph (vi)) into account.

- 4) Gas mixtures containing any of the following gases must not be offered for transport in aluminium alloy cylinders unless approved by the appropriate national authority of the State of Origin and the State of the Operator:

UN 1037 **Ethyl chloride**
 UN 1063 **Methyl chloride**
 UN 1063 **Refrigerant gas R 40**
 UN 1085 **Vinyl bromide, stabilized**
 UN 1086 **Vinyl chloride, stabilized**
 UN 1860 **Vinyl fluoride, stabilized**
 UN 1912 **Methyl chloride and methylene chloride mixture**

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

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

UN Model Regulations, P200, paragraph 4) (see ST/SG/AC.10/46/Add.1)

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	Gas cylinders — Acetylene cylinder bundles — Filling conditions and filling inspection
ISO 24431:2006/2016	Gas cylinders — <u>Seamless, welded and composite</u> Gas cylinders for compressed and liquefied gases (excluding acetylene) — Inspection at time of filling

6) "Special packing provisions":

Material compatibility

- a) Aluminium alloy cylinders are forbidden.
- b) Copper valves are forbidden.
- c) Metal parts in contact with the contents must not contain more than 65 per cent copper.
- d) When steel cylinders are used, only those bearing the "H" mark in accordance with 6.5.2.7.4 p) are permitted.

Gas specific provisions:

- l) UN 1040 **Ethylene oxide** may also be packed in hermetically sealed glass ampoules or metal inner packagings suitably cushioned in fibreboard, wooden or metal boxes meeting the Packing Group I performance level. The maximum quantity permitted in any glass inner packaging is 30 g, and the maximum quantity permitted in any metal inner packaging is 200 g. After filling, each inner packaging must be determined to be leak-tight by placing the inner packaging in a hot water bath at a temperature, and for a period of time, sufficient to ensure that an internal pressure equal to the vapour pressure of ethylene oxide at 55°C is achieved. The maximum net mass in any outer packaging must not exceed 2.5 kg. When cylinders are used, they must be of the seamless or welded steel types that are equipped with suitable pressure relief devices. Each cylinder must be tested for leakage with an inert gas before each refilling and must be insulated with three coats of heat retardant paint or in any equally efficient manner. The maximum net quantity per cylinder must not exceed 25 kg.
- m) Cylinders must be filled to a working pressure not exceeding 5 bar.
- o) In no case must the working pressure or filling ratio shown in the table be exceeded.
- p) For UN 1001 **Acetylene, dissolved**, and UN 3374 **Acetylene, solvent free**: cylinders must be filled with a homogeneous monolithic porous mass; the working pressure and the quantity of acetylene must not exceed the values prescribed in the approval or in ISO 3807-1:2000, ISO 3807-2:2000 or ISO 3807:2013, as applicable.

For UN 1001 **Acetylene, dissolved**, cylinders must contain a quantity of acetone or suitable solvent as specified in the approval (see ISO 3807-1:2000, ISO 3807-2:2000 or ISO 3807:2013, as applicable); cylinders fitted with pressure relief devices must be transported vertically.

The test pressure of 52 bar applies only to cylinders fitted with a fusible plug.

- ra) Ethyl chloride may be carried in securely sealed glass ampoules (IP.8) containing not more than 5 g of ethyl chloride with a ullage of not less than 7.5 per cent at 21°C. Ampoules must be cushioned with efficient non-combustible material in partitioned cartons with not more than 12 ampoules per carton. The cartons must be tightly packed to prevent movement in wooden boxes (4C1, 4C2), plywood boxes (4D), reconstituted wood boxes (4F), fibreboard boxes (4G) or plastic boxes (4H1, 4H2) that meet the performance testing requirements of 6.4 at the Packing Group II performance level. Not more than 300 g of ethyl chloride is permitted per package.
- s) Aluminium alloy cylinders must be:
 - Equipped only with brass or stainless steel valves; and
 - Cleaned in accordance with ISO 11621:1997 and not contaminated with oil.

Periodic inspection:

- u) The interval between periodic tests may be extended to 10 years for aluminium alloy cylinders when the alloy of the cylinder has been subjected to stress corrosion testing as specified in ISO 7866:2012 + Cor 1:2014.
- v) The interval between periodic inspections for steel cylinders may be extended to 15 years if approved by the appropriate national authority of the country of use.

Requirements for N.O.S. descriptions and for mixtures:

- z) The construction materials of the cylinders and their accessories must be compatible with the contents and must not react to form harmful or dangerous compounds therewith.

The test pressure and filling ratio must be calculated in accordance with the relevant requirements of PI 200.

The necessary steps must be taken to prevent dangerous reactions (i.e. polymerization or decomposition) during transport. If necessary, stabilization or addition of an inhibitor may be required.

Note.— For the carriage of oxygen to provide life support to aquatic animals, see Note 7 of the Introductory Notes to this Part.

Table 1. COMPRESSED GASES

UN No.	Name and description	Class or Division	Subsidiary hazard	LC ₅₀ ml/m ³	Cylinders	Test period, years	Test pressure, bar*	Maximum working pressure, bar*	Special packing provisions*
1002	Air, compressed	2.2			X	10			
1006	Argon, compressed	2.2			X	10			
1046	Helium, compressed	2.2			X	10			
1049	Hydrogen, compressed	2.1			X	10			d
1056	Krypton, compressed	2.2			X	10			
1065	Neon, compressed	2.2			X	10			
1066	Nitrogen, compressed	2.2			X	10			
1071	Oil gas, compressed	2.3	2.1		X	5			
1072	Oxygen, compressed	2.2	5.1		X	10			s
1954	Compressed gas, flammable, n.o.s.	2.1			X	10			z
1956	Compressed gas, n.o.s.	2.2			X	10			z
1957	Deuterium, compressed	2.1			X	10			d
1964	Hydrocarbon gas mixture, compressed, n.o.s.	2.1			X	10			z
1971	Methane, compressed or natural gas, compressed with high methane content	2.1			X	10			
2034	Hydrogen and methane mixture, compressed	2.1			X	10			
3156	Compressed gas, oxidizing, n.o.s.	2.2	5.1		X	10			z

* Where the entries are blank, the working pressure must not exceed two-thirds of the test pressure.

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
1001	Acetylene, dissolved	2.1			X	10	60 52		c, p

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
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
1010	Butadienes and hydrocarbon mixture, stabilized containing more than 40% butadienes	2.1			X	10			v z
1011	Butane	2.1			X	10	10	0.52	v
1012	Butylene (butylenes mixture)	2.1			X	10	10	0.50	z
1012	Butylene (1-butylene)	2.1			X	10	10	0.53	
1012	Butylene (cis-2-butylene)	2.1			X	10	10	0.55	
1012	Butylene (trans-2 butylene)	2.1			X	10	10	0.54	
1013	Carbon dioxide	2.2			X	10	190 250	0.68 0.76	
1018	Chlorodifluoromethane (refrigerant gas R 22)	2.2			X	10	27	1.03	
1020	Chloropentafluoroethane (refrigerant gas R 115)	2.2			X	10	25	1.05	
1021	1-Chloro-1,2,2,2-tetrafluoroethane (refrigerant gas R 124)	2.2			X	10	11	1.20	
1022	Chlorotrifluoromethane (refrigerant gas R 13)	2.2			X	10	100 120 190 250	0.83 0.90 1.04 1.11	
1027	Cyclopropane	2.1			X	10	18	0.55	
1028	Dichlorodifluoromethane (refrigerant gas R 12)	2.2			X	10	16	1.15	
1029	Dichlorofluoromethane (refrigerant gas R 21)	2.2			X	10	10	1.23	
1030	1,1-Difluoroethane (Refrigerant gas R 152 a)	2.1			X	10	16	0.79	
1032	Dimethylamine, anhydrous	2.1			X	10	10	0.59	b
1033	Dimethyl ether	2.1			X	10	18	0.58	
1035	Ethane	2.1			X	10	95 120 300	0.25 0.30 0.40	
1036	Ethylamine	2.1			X	10	10	0.61	b
1037	Ethyl chloride	2.1			X	10	10	0.80	a, ra
1039	Ethyl methyl ether	2.1			X	10	10	0.64	
1041	Ethylene oxide and carbon dioxide mixture with more than 9% ethylene oxide but not more than 87%	2.1			X	10	190 250	0.66 .75	

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
1043	Fertilizer ammoniating solution with free ammonia	2.2			X	5			b, z
1055	Isobutylene	2.1			X	10	10	0.52	
1058	Liquefied gases , non-flammable, charged with nitrogen, carbon dioxide or air	2.2			X	10			
1060	Methylacetylene and propadiene mixture, stabilized	2.1			X	10			c, z
1060	Methylacetylene and propadiene mixture, stabilized (propadiene with 1% to 4% methylacetylene)	2.1			X	10	22	0.52	c
1061	Methylamine, anhydrous	2.1			X	10	13	0.58	b
1063	Methyl chloride (refrigerant gas R 40)	2.1			X	10	17	0.81	a
1070	Nitrous oxide	2.2	5.1		X	10	180 225 250	0.68 0.74 0.75	
1075	Petroleum gases, liquefied	2.1			X	10			v, z
1077	Propylene	2.1			X	10	27	0.43	
1078	Refrigerant gas, n.o.s.	2.2			X	10			z
1080	Sulphur hexafluoride	2.2			X	10	70 140 160	1.06 1.34 1.38	
1081	Tetrafluoroethylene, stabilized	2.1			X	10	200		m, o
1083	Trimethylamine, anhydrous	2.1			X	10	10	0.56	b
1085	Vinyl bromide, stabilized	2.1			X	10	10	1.37	a
1086	Vinyl chloride, stabilized	2.1			X	10	12	0.81	a
1087	Vinyl methyl ether, stabilized	2.1			X	10	10	0.67	
1858	Hexafluoropropylene (refrigerant gas R 1216)	2.2			X	10	22	1.11	
1860	Vinyl fluoride, stabilized	2.1			X	10	250	0.64	a
1912	Methyl chloride and methylene chloride mixture	2.1			X	10	17	0.81	a
1952	Ethylene oxide and carbon dioxide mixture with not more than 9% ethylene oxide	2.2			X	10	190 250	0.66 0.75	
1958	1,2-dichloro-1,1,2,2-tetrafluoroethane (refrigerant gas R 114)	2.2			X	10	10	1.30	
1959	1,1-difluoroethylene (refrigerant gas R 1132a)	2.1			X	10	250	0.77	
1962	Ethylene	2.1			X	10	225 300	0.34 0.38	

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
1965	Hydrocarbon gas mixture, liquefied, n.o.s.	2.1			X	10			v, z
1968	Insecticide gas, n.o.s.	2.2			X	10			z
1969	Isobutane	2.1			X	10	10	0.49	v
1973	Chlorodifluoromethane and chloropentafluoroethane mixture with fixed boiling point, with approximately 49% chlorodifluoromethane (refrigerant gas R 502)	2.2			X	10	31	1.01	
1974	Chlorodifluorobromomethane (refrigerant gas R 12b1)	2.2			X	10	10	1.61	
1976	Octafluorocyclobutane (refrigerant gas R C318)	2.2			X	10	11	1.32	
1978	Propane	2.1			X	10	23	0.43	v
1982	Tetrafluoromethane (refrigerant gas R 14)	2.2			X	10	200 300	0.71 0.90	
1983	1-chloro-2,2,2-trifluoroethane (refrigerant gas R 133a)	2.2			X	10	10	1.18	
1984	Trifluoromethane (refrigerant gas R 23)	2.2			X	10	190 250	0.88 0.96	
2035	1,1,1-trifluoroethane (refrigerant gas R 143a)	2.1			X	10	35	0.73	
2036	Xenon	2.2			X	10	130	1.28	
2044	2,2-dimethylpropane	2.1			X	10	10	0.53	
2073	Ammonia solution , relative density less than 0.880 at 15°C in water, with more than 35% but not more than 40% ammonia with more than 40% but not more than 50% ammonia	2.2			X	5	10	0.80	b
					X	5	12	0.77	b
2193	Hexafluoroethane (refrigerant gas R 116)	2.2			X	10	200	1.13	
2200	Propadiene, stabilized	2.1			X	10	22	0.50	
2419	Bromotrifluoroethylene	2.1			X	10	10	1.19	
2422	Octafluorobut-2-ene (refrigerant gas R 1318)	2.2			X	10	12	1.34	
2424	Octafluoropropane (refrigerant gas R 218)	2.2			X	10	25	1.04	
2451	Nitrogen trifluoride	2.2	5.1		X	10	200	0.50	
2452	Ethylacetylene, stabilized	2.1			X	10	10	0.57	c
2453	Ethyl fluoride (refrigerant gas R 161)	2.1			X	10	30	0.57	
2454	Methyl fluoride (refrigerant gas R 41)	2.1			X	10	300	0.63	

Appendix D to the Report on Agenda Item 1

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
2517	1-chloro-1,1-difluoroethane (refrigerant gas R 142b)	2.1			X	10	10	0.99	
2599	Chlorotrifluoromethane and trifluoromethane azeotropic mixture with approximately 60% chlorotrifluoromethane (refrigerant gas R 503)	2.2			X	10	31 42 100	0.12 0.17 0.64	
2601	Cyclobutane	2.1			X	10	10	0.63	
2602	Dichlorodifluoromethane and difluoroethane azeotropic mixture with approximately 74% dichlorodifluoromethane (refrigerant gas R 500)	2.2			X	10	22	1.01	
3070	Ethylene oxide and dichlorodifluoromethane mixture with not more than 12.5% ethylene oxide	2.2			X	10	18	1.09	
3153	Perfluoro(methyl vinyl ether)	2.1			X	10	20	0.75	
3154	Perfluoro(ethyl vinyl ether)	2.1			X	10	10	0.98	
3157	Liquefied gas, oxidizing, n.o.s.	2.2	5.1		X	10			z
3159	1,1,1,2-tetrafluoroethane (refrigerant gas R 134a)	2.2			X	10	18	1.05	
3161	Liquefied gas, flammable, n.o.s.	2.1			X	10			z
3163	Liquefied gas, n.o.s.	2.2			X	10			z
3220	Pentafluoroethane (refrigerant gas R 125)	2.2			X	10	49 35	0.95 0.87	
3252	Difluoromethane (refrigerant gas R 32)	2.1			X	10	48	0.78	
3296	Heptafluoropropane (refrigerant gas R 227)	2.2			X	10	13	1.21	
3297	Ethylene oxide and chlorotetrafluoroethane mixture with not more than 8.8% ethylene oxide	2.2			X	10	10	1.16	
3298	Ethylene oxide and pentafluoroethane mixture with not more than 7.9% ethylene oxide	2.2			X	10	26	1.02	
3299	Ethylene oxide and tetrafluoroethane mixture with not more than 5.6% ethylene oxide	2.2			X	10	17	1.03	
3337	Refrigerant gas R 404a	2.2			X	10	36	0.82	
3338	Refrigerant gas R 407a	2.2			X	10	32	0.94	
3339	Refrigerant gas R 407b	2.2			X	10	33	0.93	
3340	Refrigerant gas R 407c	2.2			X	10	30	0.95	

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
3354	Insecticide gas, flammable, n.o.s.	2.1			X	10			z
3374	Acetylene, solvent free	2.1			X	5	60 52		c, p

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Chapter 5

CLASS 3 — FLAMMABLE LIQUIDS

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Packing Instruction 372

Cargo aircraft only for UN 3165 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.

ADDITIONAL PACKING REQUIREMENTS

UN 3165 **Aircraft hydraulic power unit fuel tank** (containing a mixture of anhydrous hydrazine and methyl hydrazine) (M86 fuel) and designed for installation as complete units in aircraft are acceptable, subject to either of the following conditions:

UN Model Regulations, P301 (see ST/SG/AC.10/46/Add.1)

- a) the unit must consist of an aluminium pressure receptacle made from tubing and having welded heads. Primary containment of the fuel within this receptacle must consist of a welded aluminium bladder having a maximum internal volume of 46 L. The outer receptacle must have a minimum design gauge pressure of 1 275 kPa and a minimum burst gauge pressure of 2 755 kPa. Each receptacle must be leak-checked during manufacture and before shipment and must be found leakproof. The complete inner unit must be securely packed in non-combustible cushioning material, such as vermiculite, in a strong outer tightly closed metal packaging which will adequately protect all fittings. Maximum quantity of fuel per-unit **primary containment** and package is 42 L; or
- b) the unit must consist of an aluminium pressure receptacle. Primary containment of the fuel within this receptacle must consist of a welded hermetically sealed fuel compartment with an elastomeric bladder having a maximum internal volume of 46 L. The pressure receptacle must have a minimum design gauge pressure of 2 860 kPa and a minimum burst gauge pressure of 5 170 kPa. Each receptacle must be leak-checked during manufacture and before shipment and must be found leakproof. The complete inner unit must be securely packed in non-combustible cushioning material, such as vermiculite, in a strong outer tightly closed metal packaging which will adequately protect all fittings. Maximum quantity of fuel per-unit **primary containment** and package is 42 L.

Note.— This packing instruction is the same as UN packing instruction P301.

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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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DGP-WG/19 (see paragraph 3.1.2.2 of DGP/27-WP/3):

Packing Instructions 470 – 471

Cargo aircraft only

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ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

- Packagings must meet the Packing Group II performance requirements.
- Fibreboard, fibre, wood and plywood single packagings must be fitted with a suitable liner.

SINGLE PACKAGINGS

<i>Boxes</i>	<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
Aluminium (4B)	All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, 1B2)	Aluminium (3B1, 3B2)
Fibreboard (4G)			Other metal (1N1, 1N2)	Plastics (3H1, 3H2)
Natural wood (4C2)			<u>Fibre (1G)</u>	Steel (3A1, 3A2)
Other metal (4N)			Plastics (1H1, 1H2)	
Plastics (4H2)			<u>Plywood (1D)</u>	
Plywood (4D)			Steel (1A1, 1A2)	
Reconstituted wood (4F)				
Steel (4A)				

DGP-WG/19 (see paragraph 3.1.2.2 of DGP/27-WP/3):

Packing Instructions 478 – 479

Passenger aircraft

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ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

- Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III (PI 479 only)

<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>)	Aluminium (3B1, <u>3B2</u>)
		Other metal (1N1, <u>1N2</u>)	Plastics (3H1, <u>3H2</u>)
		Plastics (1H1, <u>1H2</u>)	Steel (3A1, <u>3A2</u>)
		Steel (1A1, <u>1A2</u>)	

DGP-WG/19 (see paragraph 3.1.2.2 of DGP/27-WP/3):

Packing Instructions 480 – 482

Cargo aircraft only

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SINGLE PACKAGINGS FOR PACKING GROUP III ONLY (PI 482)

<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

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Chapter 7

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

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DGP-WG/19 (see paragraph 3.1.2.2 of DGP/27-WP/3):

Packing Instructions 553 – 555

Cargo aircraft only

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ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

— Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III (PI 555)

<i>Composites</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

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Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

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UN Model Regulations, 4.1.4.1, P622 (see ST/SG/AC.10/46/Add.1) and DGP-WG/19 (see paragraphs 3.1.2.5.1 a), 3.1.2.6.1 d) and 3.1.3.1.1 of DGP/27-WP/3):

Packing Instruction 622

Cargo aircraft only for UN 3549 only

This instruction applies to waste of UN 3549 transported for disposal.

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
<u>UN number and proper shipping name</u>	<u>Inner packaging (see 6;3.2)</u>	<u>Intermediate packaging</u>	<u>Total quantity per package</u>	
UN 3549 Medical waste, Category A, affecting humans, solid	Metal	Metal	400 kg	No
	Plastics	Plastics		
UN 3549 Medical waste, Category A, affecting animals only, solid	Metal	Metal	400 kg	No
	Plastics	Plastics		

ADDITIONAL PACKING REQUIREMENTS

- Outer packaging must meet Packing Group I performance requirements for solids.
- Fragile articles must be contained in either a rigid inner packaging or rigid intermediate packaging.
- Inner packagings containing sharp objects such as broken glass and needles must be rigid and resistant to puncture.
- The inner packaging, the intermediate packaging, and the outer packaging must be capable of retaining liquids. Outer packagings that are not capable of retaining liquids by design must be fitted with a liner or suitable measure of retaining liquids.
- The inner packaging and/or the intermediate packaging may be flexible. When flexible packagings are used, they must be capable of passing the impact resistance test to at least 165 g according to ISO 7765-1:1988 *Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 1: Staircase methods* and the tear resistance test to at least 480 g in both parallel and perpendicular planes with respect to the length of the bag in accordance with ISO 6383-2:1983 *Plastics — Film and sheeting — Determination of tear resistance — Part 2: Elmendorf method*. The maximum net mass of each flexible inner packaging must be 30 kg.
- Each flexible intermediate packaging must contain only one inner packaging.
- Inner packagings containing a small amount of free liquid may be included in intermediate packaging provided that there is sufficient absorbent or solidifying material in the inner or intermediate packaging to absorb or solidify all the liquid content present. Suitable absorbent material which withstands the temperatures and vibrations liable to occur under normal conditions of transport must be used.
- Intermediate packagings must be secured in outer packagings with suitable cushioning and/or absorbent material.

OUTER PACKAGINGS OF COMBINATION PACKAGINGSBoxes

Fibreboard (4G)
Aluminium (4B)
Plastics (4H2)
Plywood (4D)
Other metal (4N)
Steel (4A)

Drums

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

Jerricans

Aluminium (3B2)
Plastics (3H2)
Steel (3A2)

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- Agenda Item 2: Managing air-specific safety risks and identifying anomalies**
2.1: Develop proposals, if necessary, for amendments to Annex 18 — *The Safe Transport of Dangerous Goods by Air*

There were no proposals for amendment to Annex 18 developed under this agenda sub-item.

- Agenda Item 2: Managing air-specific safety risks and identifying anomalies**
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 2021-2022 Edition

2.2.1 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ADDRESS AIR SPECIFIC SAFETY RISKS AND IDENTIFIED ANOMALIES AGREED AT DGP-WG/18 AND DGP-WG/19 (DGP/27-WP/21)

2.2.1.1 The meeting reviewed amendments to the Technical Instructions to address air-specific safety risks and identified anomalies related to the transport of dangerous goods that were agreed at DGP-WG/18 and DGP-WG/19. The amendments were agreed, subject to an editorial revision to the heading for 7;2.13.1. It was confirmed that the draft training provisions included in Attachment 4 of the 2019-2020 Edition would replace the training provisions in Part 1;4 in the 2021-2022 Edition. They would include the amendment agreed at DGP-WP/19 (see paragraph 6.1 of the report under Agenda Item 6) and the addition of a transitional period (see paragraph 2.2.13 of the report under this agenda item).

2.2.2 TRAINING: TERMINOLOGY HARMONIZATION (DGP/27-WP/28)

2.2.2.1 Amendments to replace references to “commensurate with their responsibilities” with “commensurate with the functions for which they are responsible” throughout the Technical Instructions were proposed for the sake of alignment with revised training provisions supporting a competency-based approach to training and assessment contained in Part 1;4. There were no objections to the proposal in principle, but the panel did not think it appropriate to modify text in Part 1;5 (Dangerous Goods Security) since these provisions were aligned with the UN Model Regulations. There was also some concern that changing the text in Section II of the lithium battery packing instructions (Packing Instructions 965-970) would change the intent of only requiring adequate instruction on the requirements. Those with concerns were comfortable accepting the proposal with the confirmation from the panel that the new text did not alter this intent. All amendments in the proposal were agreed except for the ones in Part 1;5 (Dangerous Goods Security).

2.2.3 REQUIREMENTS FOR DRY ICE IN POSTAL ARTICLES (DGP/27-WP/4)

2.2.3.1 An amendment to the provisions for transport of dangerous goods by post was proposed. The amendment introduced requirements for the designated postal operator (DPO) to offer mail articles containing dry ice as a refrigerant for infectious substances assigned to Category B (UN 3373) separately from other mail. The intent of the amendment was to ensure the substances were subject to an operator acceptance check so that appropriate safety measures could be taken when loading the dry ice on the aircraft and to ensure information was provided to the pilot in command. Some thought the DPO was already required to do so by virtue of 1;2.3.2 which specified that the provisions of the appropriate national authorities concerned and the Technical Instructions applied to dangerous goods permitted in the post. However, there was evidence of DPOs not complying with the requirements. Some questioned

whether there was an actual need for provisions for dry ice for UN 3373 in the mail. The co-chairman of the ICAO/Universal Postal Union (UPU) Contact Committee noted that a survey on matters related to dangerous goods in the post had been sent to UPU members, and that issues related to dry ice were included in the survey (see paragraph 2.2.14 of the report under this agenda item). The results of the survey would be brought to the panel.

2.2.3.2 There was agreement that adding specific references to the requirements for dry ice in the provisions for dangerous goods in the post would remove any potential ambiguity with respect to what was expected of DPOs. There were strong opinions expressed with respect to the need for DPOs to be treated the same as any other shipper. A revised amendment, which simplified the original proposal by referring to the packing instruction for dry ice (Packing Instruction 954), was agreed. The UPU would be advised of the amendment through the ICAO/UPU Contact Committee, and the panel would be kept up to date on the discussions of the committee including the results from the UPU survey.

2.2.4 REVISION TO SPECIAL PROVISIONS A88 AND A99 TO INCLUDE APPROVAL BY THE STATE OF THE OPERATOR (DGP/27-WP/5)

2.2.4.1 Amendments to Special Provisions A88 (provisions to transport pre-production prototypes and low production run lithium batteries that have not been subject to UN testing) and A99 (provisions to transport lithium batteries larger than 35 kg) were proposed to require approval from the State of the Operator in addition to the State of Origin. The proposal had originally been made at DGP-WG/19 in conjunction with a proposal for a new packing instruction allowing for large packaging for lithium batteries (see paragraph 3.2.2.3 of the DGP-WG/19 report). Adding the State of the Operator to the approval process was agreed in principle at DGP-WG/19, but allowing for large packaging could not be agreed without further consultation with experts. The two issues were discussed separately at DGP/27 (see paragraph 10.3.2 of the report under Agenda Item 10 for discussion on the proposal for large packagings).

2.2.4.2 With regard to the States involved in the approval process, there were some who believed State of Destination should be included in addition to the State of Origin and of the Operator, on the basis that approval for transport on passenger aircraft of smaller lithium batteries that had passed the UN tests was required from these three States in accordance with Special Provision A201. It was suggested any decision should be based on a set of criteria, and the lack of such criteria resulted in differences of opinion. Most considered requiring the State of Origin and the State of the Operator to be adequate, recognizing that this was more than what was currently required. The State of the Operator would be familiar with the operator's capabilities and therefore be an important contributor to the approval process. The amendment was agreed.

2.2.5 REVISION TO EXCEPTIONS FROM APPLICATION OF THE "Q" VALUE (DGP/27-WP/25)

2.2.5.1 An amendment to the list of dangerous goods that did not need to be considered in the calculation of the "Q" value was proposed to address an apparent anomaly in 4;1.1.9 e) 3). It was suggested that the exclusion for dangerous goods with the same UN number, packing group and physical state if they were the only dangerous goods in the package, and the total net quantity did not exceed the maximum net quantity shown in Table 3-1, could result in unintended consequences when it came to

dangerous goods such as UN 1950 — Aerosols. It was possible for aerosols to meet the requirements of the provision but have different net quantity limits (e.g. the maximum net quantity limit on a cargo aircraft was 150 kg for all permitted UN 1950 entries, except for Aerosols, non-flammable (tear gas devices), which was only 50 kg). The amendment, which added a new requirement for the maximum net quantity to also be the same, was agreed.

2.2.6 PROVISION FOR DRY ICE TO BE LOADED INTO A SHIPPER BUILT UNIT LOAD DEVICE WITH ID 8000 (DGP/27-WP/34)

2.2.6.1 An amendment to Packing Instruction Y963 was proposed to clarify that dry ice as a refrigerant could be packed in a ULD containing ID 8000 — **Consumer commodities** prepared by a single shipper, but that dangerous goods other than ID 8000 could not be packed in the same outer packaging. The revised packing instruction would align with the allowance for dry ice provided in Packing Instruction 954. The amendment, subject to some minor revisions, was agreed.

2.2.7 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS AGREED AT DGP-WG/18 AND DGP-WG/19 — PART 8 (DGP/27-WP/18)

2.2.7.1 This working paper was withdrawn on the basis the amendments were included in DGP/27-WP/21.

2.2.8 AMENDMENTS TO PROVISION OF INFORMATION TO EMPLOYEES BY A SHIPPER (DGP/27-WP/42)

2.2.8.1 Annex 18 included a requirement for operators, shippers or other organizations involved in the transport of dangerous goods to provide information to their personnel to enable them to carry out their responsibilities with regard to the transport of dangerous goods by air, including instructions on action to be taken in the event of an emergency involving dangerous goods. The Technical Instructions contained provisions regarding emergency response information to be provided by the operator in Part 7, and a requirement for shippers to provide information to employees in Part 5. The wording in Part 5 was similar to wording in Annex 18, but without a reference to emergency response information. An amendment to expand the provision in the Technical Instructions to align with Annex 18 by including a requirement for instructions for emergency response was therefore proposed. The amendment was not supported, on the basis that this would be beyond the scope of Annex 18 unless the emergency occurred during transport. It was agreed, however, that there was an inconsistency between Annex 18 and the Technical Instructions that needed to be eliminated and that requiring shippers to provide instructions to personnel on action to be taken in the event of an emergency involving dangerous goods *during transport* should be considered. The issue would be given further thought over the next biennium.

2.2.9 PROVISIONS FOR THE USE OF ELECTRONIC NOTICES TO PILOT-IN-COMMAND (DGP/27-WP/44)

2.2.9.1 An amendment allowing for electronic information to be provided to the pilot-in-command in accordance with Part 7;4.1.1 of the Technical Instructions was proposed. While there was support for allowing electronic information, the member nominated by the International Federation of Air Line Pilots' Associations (IFALPA) suggested more needed to be considered before introducing an allowance. He advised that a group had been established to study the emergency response information needs of every stakeholder to determine what information was needed for each and how it could be provided. While recognizing the benefits, he suggested there may be a need to maintain a requirement for a paper copy in addition to electronic data. He noted that electronic data might not always be accessible by the flight crew in the event of an emergency, and it may not be in a format that could be provided to first responders. Relevant stakeholders were members of the working group established to analyse the information needs, including pilots, rescue and firefighting personnel and dangerous goods experts. The panel agreed to wait until the work of this group was completed before considering amending the Technical Instructions.

2.2.10 PROVISIONS FOR BATTERY-POWERED EQUIPMENT CAPABLE OF GENERATING EXTREME HEAT IN PART 8 (DGP/27-WP/9) AND REVISIONS TO THE PROVISIONS FOR PORTABLE ELECTRONIC DEVICES CAPABLE OF GENERATING EXTREME HEAT, WHICH COULD CAUSE A FIRE IF ACTIVATED CONTAINED IN TABLE 8-1 (DGP/27-WP/48)

2.2.10.1 Two proposals related to battery-powered equipment capable of generating extreme heat carried by passengers or crew were presented, both to achieve the same objective of ensuring measures to mitigate this risk applied to all batteries, not just lithium. Both amendments proposed adding a new item for Table 8-1. A revised amendment was agreed which incorporated the intent of both proposals into the existing element for non-spillable wet batteries, and the element was expanded to include nickel-metal hydride and dry batteries.

2.2.11 SPARE DRY BATTERIES FOR NICKEL-METAL HYDRIDE BATTERIES FOR MOBILITY AIDS (DGP/27-WP/39)

2.2.11.1 A proposal to add a specific reference to dry and nickel-metal hydride batteries in the provisions for dangerous goods carried by passengers or crew was agreed at DGP-WG/19 (see paragraph 3.2.2.4 of the DGP-WG/19 Report). The proposal did not include an allowance for passengers to carry this type of battery as a spare. Some thought such a provision was unnecessary, given these batteries were excepted from the Technical Instructions if they complied with Special Provisions A123 or A199. However, the lack of an explicit allowance for these spare batteries created an ambiguity, since there was an explicit allowance for spare non-spillable wet or lithium ion battery. This had caused problems for operators when passengers wished to carry them. An amendment was therefore proposed to permit the carriage of one spare dry or nickel-metal hydride battery complying with Special Provision A123 or A199. One member opposed the amendment, suggesting that passengers were currently permitted to carry an unlimited number of spare batteries complying with Special Provision A123 or

A199 on the basis that they were excepted from the Technical Instructions. He believed the amendment would unjustly introduce more restrictions. Others disagreed, noting that the exceptions were intended to apply to cargo and not to dangerous goods carried by passengers and crew. Dangerous goods were forbidden to be carried by passengers and crew unless they were included in Table 8-1 and were within the limits described in that table. Establishing limits within the table was necessary and particularly justified with respect to these batteries, which could be quite large. Most panel members supported the amendment. It was agreed, subject to an editorial amendment to the reference in the “Carry-on baggage” column.

2.2.12 REVISION TO PROVISIONS FOR BATTERY-POWERED MOBILITY AIDS IN TABLE 8-1 (DGP/27-WP/45)

2.2.12.1 An amendment introducing restrictions for battery-powered mobility aids for spillable batteries in Table 8-1 was proposed. The amendment was not supported on the basis that the restrictions proposed were already contained in Part 7;2.13. The panel had agreed to remove restrictions which could only be implemented by the operator from Table 8-1 at its previous meeting (DGP/26, see paragraph 2.8.3 of the DGP/26 report), and the proposed amendments were the responsibility of the operator. The proposer acknowledged this decision, but believed the passenger needed to be aware of the safety measures and was concerned that the absence of a specific reference would give the false impression that mobility aids powered by spillable batteries were not permitted. However, it was noted that the entry in Table 8-1 referred simply to battery-powered mobility aids, meaning any batteries necessary were permitted. The amendment was not agreed.

2.2.13 REPORT OF THE WORKING GROUP ON TRAINING (DGP/27-IP/1) AND UPDATE ON FRENCH APPROACH TO COMPETENCY-BASED TRAINING FOR DANGEROUS GOODS (DGP/27-IP/18)

2.2.13.1 An update on the work of the Dangerous Goods Panel Working Group on Training (DGP-WG/Training) was provided by its chairman. The group met in Dubai, United Arab Emirates on 21 and 22 July 2019 and at ICAO Headquarters on 9 and 10 September 2019 to fine-tune guidance material on competency-based training and to align training provisions in the Supplement with the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868). The chairman presented amendments to the guidance on competency-based training contained in Attachment 4, Chapters 2 to 5 of the Technical Instructions and revisions to the guidance on competency-based training for State employees contained in the Supplement to the Technical Instructions.

2.2.13.2 Amendments to the Technical Instructions

2.2.13.2.1 Amendments to the Technical Instructions were made to address feedback from industry and States who had begun the process of implementing the competency-based training provisions using the guidance in Attachment 4, Chapters 2 through 5 (see paragraph 3.2.2.6 and 3.2.2.7 of the DGP-WG/19 Report). The amendments included a restructure of the material in line with competency-based training and assessment guidance contained in other ICAO manuals and the addition of:

- a) elements that should be considered when developing an assessment plan and more detailed assessment guidance from the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868);
- b) provisions that took into account different levels of proficiency;
- c) a method which could be used to identify what tasks an employee had been trained and assessed; and
- d) a transition period allowing for the training provisions contained in Part 1;4 of the 2019-2020 Edition of the Technical Instructions to be used until the end of 2020.

DGP-WG/Training did not revisit the issue of whether dangerous goods training for personnel employed by entities not handling dangerous goods should be mandated, which had been debated by DGP-WG/Training and the full panel over many meetings (see paragraph 2.1.4.5 of the DGP/26 Report). However, an amendment had been agreed at DGP-WG/19 which satisfied the needs of all panel members. It is reported on under Agenda Item 6 to this report.

2.2.13.3 Amendments to the Supplement to the Technical Instructions

2.2.13.3.1 Amendments to the Supplement were made to align with revised provisions in the PANS-TRG. This included the conversion of the competency framework for State employees into a generic task list for dangerous goods State employees. In doing so, DGP-WG/Training revised the tasks to align with the integrated components of a State safety programme illustrated in Figure 8-1 of the *Safety Management Manual (SMM)* (Doc 9859) and elaborated on the components as they pertained to dangerous goods State employees, including tasks related to the granting of exemptions and approvals. The list would be further refined following DGP/27, and additional guidance to support the elements in it would be developed in the future.

2.2.13.4 Amendments agreed

2.2.13.4.1 The panel supported incorporating the training provisions contained in Attachment 4, Chapter 1, as amended by DGP-WG/Training and by DGP-WG/19 (see paragraph 6.1 of this report) in Part 1;4 of the 2021-2022 Edition of the Technical Instructions with a transitional period of two years before becoming mandatory. The panel also supported publishing the guidance material contained in Attachment 4, Chapters 2 through 5 as amended by DGP-WG/Training and the amendments to the Supplement with the understanding that they would be further refined following DGP/27.

2.2.13.4.2 The panel expressed its appreciation to the chairman and the working group for the work done.

2.2.14 REPORT ON THE ICAO/UNIVERSAL POSTAL UNION (UPU) CONTACT COMMITTEE (DGP/27-IP/10)

2.2.14.1 A report on the activities of the ICAO/Universal Postal Union (UPU) Contact Committee was provided. Among the topics under discussion on the committee was a centralized dangerous goods reporting system for incidents involving dangerous goods including unpermitted dangerous goods discovered in the post, and the use of security screening to detect undeclared dangerous goods. UPU had sent a dangerous goods survey to its members seeking information on various matters related to safety and security including whether DPOs had been in contact with their CAA regarding dangerous goods approvals required for airmail. Feedback from the survey would be provided when available. Other topics included efforts being taken by the UPU with respect to advance electronic data, work being done by ICAO with respect to drones and challenges that may be encountered with respect to the post, security certifications, lithium batteries, controls over the introduction of dangerous goods in the post, use of customs declaration systems for the purpose of rejecting prohibited dangerous goods from the post, dry ice in the post and e-commerce. The next meeting of the contact committee was likely to be held in the first quarter of 2020. It was anticipated that the topic of extra-territorial offices of exchange (ETOEs) would be included on the agenda.

2.2.15 RECOMMENDATIONS

2.2.15.1 In light of the foregoing discussions, the meeting developed the following recommendations:

Recommendation 2/1 — Amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) to address air-specific safety risks and identified anomalies for incorporation in the 2021-2022 Edition

That the Technical Instructions be amended as indicated in Appendix A to the report on this agenda item.

Recommendation 2/2 — Amendment to the training provisions in Part 1, Chapter 4 for incorporation in the 2021-2022 Edition of the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284)

That the training provisions of the Technical Instructions be amended as indicated in Appendix B to the report on this agenda item.

Recommendation 2/3 — Guidance material to support a competency-based approach to dangerous goods training and assessment

That the guidance material contained in Appendix C to the report on this agenda item be published in a new document.

Recommendation 2/4 — Amendment to the guidance to States on competency-based training for State employees contained in the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU)

That the dangerous goods training provisions for State employees contained in the Supplement to the Technical Instructions be amended as indicated in Appendix D to the report on this agenda item.

- Agenda Item 2: Managing air-specific safety risks and identifying anomalies**
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 2021-2022 Edition

**2.3.1 AMENDMENT OF DIVISION 6.1 LIST WITHIN S-7.2.2.2
OF THE SUPPLEMENT TO THE TECHNICAL
INSTRUCTIONS (DGP/27-WP/32)**

2.3.1.1 Part 7;2.1.2 of the Technical Instructions allowed the State of the Origin and State of the Operator to approve the carriage of certain dangerous goods in main deck cargo compartments of passenger aircraft that did not meet Class B or Class C requirements under the conditions specified in Part S-7;2.2 of the Supplement. Part S-7;2.2.2 listed a number of substances that were excluded from this provision. The section was introduced into the 2003-2004 Edition of the Supplement to the Technical Instructions to accommodate aircraft which did not have underfloor cargo or baggage compartments; the only cargo compartments were on the main deck (see paragraph 2.7.2 of the DGP/18 Report). A number of Division 6.1 substances were identified as missing from the list at DGP/27. The panel supported the establishment of a working group to conduct a complete review of the list. Panel members noted other parts of the Supplement that may also be out of date, and suggested that a working group be tasked with reviewing the Supplement holistically. The member nominated by the International Coordinating Council of Aerospace Industries Associations (ICCAIA), noting the references to Class B and Class C cargo compartments, advised of a newer main deck cargo compartment type (Type F) and suggested it be taken into account as part of the review.

2.3.1.2 The meeting expressed its appreciation to the panel member for bringing the issue forward and recommended that a job card on the subject be submitted to the ANC for approval (see Recommendation 2/6 in paragraph 2.3.4). While the initial intent was a review of the current provisions, it was suggested a more permanent dedicated working group be tasked with maintaining the Supplement in the future.

**2.3.2 AMENDMENTS TO SPECIAL PROVISION A324
(DGP/27-WP/43)**

2.3.2.1 The need for editorial amendments to references in Special Provision A324 was identified. It was agreed that the amendments would be incorporated in the 2019-2020 Edition of the Supplement to the Technical Instructions through a corrigendum. The amendments are shown in Appendix E to the report on this agenda item.

**2.3.3 AMENDMENTS TO THE GUIDANCE TO STATES ON
COMPETENCY-BASED TRAINING FOR STATE
EMPLOYEES (DGP/27-IP/1)**

2.3.3.1 Amendments to the guidance to States on competency-based training for State employees in Part S-1;5 of the Supplement were made by the DGP Working Group on Training (DGP-WG/Training) which are reported on under Agenda Item 2.2 (see paragraph 2.2.13.3 and 2.2.13.4 and

Recommendation 2/4 developed under that agenda item). They will be further refined by DGP-WG/Training. The amendments are shown in Appendix D to the report on this agenda item.

2.3.4 RECOMMENDATIONS

2.3.4.1 In light of the foregoing discussions, the meeting developed the following recommendations:

Recommendation 2/5 — Amendment to the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) to address air-specific safety risks and identified anomalies for incorporation in the 2021-2022 Edition

That the Supplement to the Technical Instructions be amended through a corrigendum to the 2019-2020 Edition as indicated in Appendix E to the report on this agenda item.

Recommendation 2/6 — Review of the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) for the sake of alignment with the Technical Instructions

That a standing working group be established to conduct an initial review of the Supplement to the Technical Instructions to ensure its alignment with the Technical Instructions and to be tasked with maintaining it in the future, as described in the draft job card contained in Appendix G to the report on this agenda item.

- Agenda Item 2: Managing air-specific safety risks and identifying anomalies**
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 2021-2022 Edition

2.4.1 DRAFT AMENDMENTS TO THE EMERGENCY RESPONSE GUIDANCE FOR AIRCRAFT INCIDENTS INVOLVING DANGEROUS GOODS (DOC 9481) AGREED AT DGP-WG/18 AND TO ALIGN WITH THE UN RECOMMENDATIONS — PART 3 (DGP/27-WP/20)

2.4.1.1 The meeting reviewed amendments to the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods* (Doc 9481) to reflect the decisions taken by UNCOE at its ninth session (Geneva, 9 December 2018). The amendments also reflected proposals agreed by DGP-WG/18. The amendments were agreed.

2.4.1.2 It was noted during the review that there were several references to “risk” which should be replaced with “hazard” throughout the document, to align with recommendations for amendment made to Annex 18 and the Technical Instructions at DGP/26 (see paragraph 1.1.2 of the DGP/26 Report). The Secretariat was tasked with amending Doc 9481 accordingly.

2.4.1.3 The amendments are shown in Appendix F to the report on this agenda item.

2.4.2 EMERGENCY RESPONSE INFORMATION (DGP/27-WP/27)

2.4.2.1 References to drill codes consisting of a number “from 1 to 11” were included in Doc 9481. A new drill number 12 had been added to Table 4-1 in the 2019-2020 Edition of the document, but the reference to “1 through 11” had not been updated accordingly. An amendment removing specific references to the range of drill numbers was proposed to prevent the need for updates whenever a new drill number was agreed in the future. The amendment is shown in Appendix F to the report on this agenda item.

2.4.3 RECOMMENDATION

2.4.3.1 In light of the foregoing discussion, the meeting developed the following recommendation:

Recommendation 2/7 — Amendment to the *Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods* (Doc 9481) to address air-specific safety risks and identified anomalies for incorporation in the 2021-2022 Edition

That the *Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods* (Doc 9481) be amended as indicated in Appendix F to the report on this agenda item.

APPENDIX A

**PROPOSED AMENDMENTS TO THE TECHNICAL INSTRUCTIONS
TO ADDRESS AIR-SPECIFIC SAFETY RISKS AND IDENTIFIED
ANOMALIES**

Part 1

GENERAL

Chapter 1

SCOPE AND APPLICABILITY

...

1.1 GENERAL APPLICABILITY

...

1.1.5 General exceptions

...

1.1.5.4 Dangerous goods transported under 1.1.5.1 a), b), c), d) and e) may be carried on a flight made by the same aircraft before or after a flight for the purposes identified above, when it is impracticable to load or unload the dangerous goods immediately before or after the flight, subject to the following conditions:

...

DGP/27 (see paragraph 2.2.2 of the report under Agenda Item 2):

h) all personnel must be trained commensurate with their responsibilities the functions for which they are responsible;

...

Chapter 2

LIMITATION OF DANGEROUS GOODS ON AIRCRAFT

...

DGP/27 (see paragraph 2.2.2 of the report under Agenda Item 2):

2.2 EXCEPTIONS FOR DANGEROUS GOODS OF THE OPERATOR

2.2.1 The provisions of these Instructions do not apply to the following:

...

d) electronic devices, such as electronic flight bags, personal entertainment devices, and credit card readers, containing lithium metal or lithium ion cells or batteries and spare lithium batteries for such devices carried aboard an aircraft by the operator for use on the aircraft during the flight or series of flights, provided that the batteries meet the provisions of 8;1.1.2 20). Spare lithium batteries must be individually protected so as to prevent short circuits when not in use. Conditions for the carriage and use of these electronic devices and for the carriage of spare batteries must be provided in the operations manual and/or other appropriate manuals as will enable flight crew, cabin crew and other employees to carry out ~~their responsibilities~~ the functions for which they are responsible.

...

2.3 TRANSPORT OF DANGEROUS GOODS BY POST

...

2.3.2 The following dangerous goods may be acceptable in mail for air carriage subject to the provisions of the appropriate national authorities concerned and these Instructions:

- a) patient specimens as defined in 2;6.3.1.4 provided that they are classified, packed and marked as required by 2;6.3.2.3.8 a), b), c) and d);

DGP/27 (see paragraph 2.2.3 of the report under Agenda Item 2):

- b) infectious substances assigned to category B (UN 3373) only, when packed in accordance with the requirements of Packing Instruction 650, and solid carbon dioxide (dry ice) when used as a refrigerant for UN 3373. Where dry ice is used as a refrigerant for UN 3373, all applicable requirements of Packing Instruction 954 must be met. Mail containing dry ice as a refrigerant for UN 3373 must be offered separately to the operator by the designated postal operator so that the operator can comply with all applicable requirements of Part 7;~~and~~
- c) radioactive material in an excepted package, UN Nos. 2910 and 2911 only, the activity of which does not exceed one-tenth of that listed in Part 2, Chapter 7, Table 2-14, and that does not meet the definitions and criteria of classes, other than Class 7, or divisions, as defined in Part 2. The package must be marked with the name of the shipper and the consignee, the package must be marked "radioactive material — quantities permitted for movement by post" and must bear the radioactive material, excepted package label (Figure 5-33);
- d) lithium ion batteries contained in equipment (UN 3481) meeting the provisions of Section II of Packing Instruction 967. No more than four cells or two batteries may be mailed in any single package; and
- e) lithium metal batteries contained in equipment (UN 3091) meeting the provisions of Section II of Packing Instruction 970. No more than four cells or two batteries may be mailed in any single package.

...

Part 3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND EXCEPTED QUANTITIES

...

Chapter 2

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

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Table 3-1. Dangerous Goods List

Name	UN No.	Class or division	Subsidiary hazard	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
DGP-WG/18 (see paragraph 3.2.2.7 of DGP/27-WP/2) (incorporated in the 2019-2020 Edition by way of a corrigendum):												
Engine, internal combustion	3530	9		Miscellaneous		A87 A208		E0	972	No limit	972	No limit
Machinery, internal combustion	3530	9		Miscellaneous		A87 A208		E0	972	No limit	972	No limit
DGP-WG/18 (see paragraph 3.2.2.1 of DGP/27-WP/2) (incorporated in the 2019-2020 Edition by way of a corrigendum):												
Toxic solid, flammable, inorganic, n.o.s.*	3535	6.1	4.1	Toxic & Solid flammable		A5	I II	E5 E4	665 668 Y644	1 kg 15 kg 1 kg	672 675	15 kg 50 kg
...												

...

Chapter 3

SPECIAL PROVISIONS

...

Table 3-2. Special provisions

TIs UN

...

DGP/27 (see paragraph 2.2.4 of the report under Agenda Item 2):

A88 Pre-production prototypes of lithium batteries or cells, 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) 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 and the requirements in Packing Instruction 910 of the Supplement are met.

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 battery or battery assembly as prepared for transport may have a mass exceeding 35 kg.

...

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 battery or battery assembly (i.e. UN 3090 or UN 3480), including when packed with equipment or contained in equipment (i.e. UN 3091 or UN 3481) 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. A copy of the document of approval must accompany the consignment.

...

Chapter 4

DANGEROUS GOODS IN LIMITED QUANTITIES

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4.5 PACKAGE MARKING

4.5.1 Packages containing limited quantities of dangerous goods must be marked as required by the applicable paragraphs of 5;2, except that 5;2.4.4.1 does not apply.

4.5.2 Packages containing limited quantities of dangerous goods and prepared in accordance with this chapter must bear the mark shown in Figure 3-1 below. The mark must be readily visible, legible and able to withstand open weather exposure without a substantial reduction in effectiveness. The mark must be in the form of a square set at an angle of 45°(diamond shaped). The top and bottom portions and the surrounding line must be black. The centre area must be white or a suitable contrasting background. The minimum dimension must be 100 mm × 100 mm and the minimum width of the line forming the diamond must be 2 mm. The symbol "Y" must be placed in the centre of the mark and must be clearly visible. Where dimensions are not specified, all features must be in approximate proportion to those shown.

4.5.2.1 If the size of the package so requires, the minimum outer dimensions shown in Figure 3-1 may be reduced to be not less than 50 mm × 50 mm provided the mark remains clearly visible. The minimum width of the line forming the

diamond may be reduced to a minimum of 1 mm. The symbol “Y” must remain in approximate proportion to that shown in Figure 3-1.

DGP-WG/19 (see paragraph 3.2.2.2 of DGP/27-WP/3) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

4.5.2.2 The entire mark must appear on one side of the package.

...

Chapter 5

DANGEROUS GOODS PACKED IN EXCEPTED QUANTITIES

...

5.4 MARKING OF PACKAGES

5.4.1 Packages containing excepted quantities of dangerous goods prepared in accordance with this chapter must be durably and legibly marked with the mark shown in Figure 3-2. The primary hazard class or, when assigned, the division of each of the dangerous goods contained in the package must be shown in the mark. Where the name of the shipper or consignee is not shown elsewhere on the package, this information must be included within the mark.

5.4.2 The mark must be in the form of a square. The hatching and symbol must be of the same colour, black or red, on white or suitable contrasting background. The dimensions of the mark must be a minimum of 100 mm × 100 mm. Where dimensions are not specified, all features must be in approximate proportion to those shown.

DGP-WG/19 (see paragraph 3.2.2.2 of DGP/27-WP/3) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

5.4.3 The entire mark must appear on one side of the package.

...

Part 4

PACKING INSTRUCTIONS

Chapter 1

GENERAL PACKING REQUIREMENTS

...

1.1.9 Subject to 1.1.8 an outer packaging may contain more than one item of dangerous goods provided that:

- a) the inner packaging used for each item of dangerous goods and the quantity contained therein complies with the relevant part of the packing instruction applicable to that item;
- b) the outer packagings used are permitted by all the packing instructions applicable to each item of dangerous goods;
- c) the package as prepared for shipment meets the specification performance tests for the most restrictive packing group of a substance or article contained in the package;
- d) the dangerous goods do not require segregation according to Table 7-1, unless otherwise provided for in these Instructions; and
- e) the quantities of different dangerous goods contained in one outer packaging must be such that "Q" does not exceed the value of 1, where "Q" is calculated using the formula:

$$Q = \frac{n_1}{M_1} + \frac{n_2}{M_2} + \frac{n_3}{M_3} + \dots$$

where n_1 , n_2 , etc. are the net quantities of the different dangerous goods and M_1 , M_2 , etc. are the maximum net quantities for these different dangerous goods according to Table 3-1 for passenger or cargo aircraft, as applicable. However, the following dangerous goods do not need to be taken into account in the calculation of the "Q" value:

- 1) carbon dioxide, solid (dry ice), UN 1845;
- 2) those where columns 11 and 13 of Table 3-1 indicate "No limit";

DGP/27 (see paragraph 2.2.5 of the report under Agenda Item 2):

- 3) those with the same UN number, packing group, and physical state (i.e. solid or liquid) and the same maximum net quantity according to column 11 or 13 of Table 3-1, providing they are the only dangerous goods in the package and the total net quantity does not exceed the maximum net quantity according to Table 3-1.

An outer packaging containing Division 6.2 (Infectious Substances) may contain material for refrigeration, or freezing or packaging material such as absorbent material.

Note.— For packages containing radioactive material, see 9.1.3.

...

Chapter 5**CLASS 3 — FLAMMABLE LIQUIDS**

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DGP-WG/18 (see paragraph 3.2.2.6 of DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

Packing Instruction 378

Passenger and cargo aircraft for UN 3528 only
(See Packing Instruction 220 for flammable gas-powered engines or machinery, Packing Instruction 950 for flammable liquid-powered vehicles, Packing Instruction 951 for flammable gas-powered vehicles, Packing Instruction 952 for battery-powered equipment and vehicles or Packing Instruction 972 for engines or machinery containing only environmentally hazardous fuels)

...

ADDITIONAL PACKING REQUIREMENTS

...

Flammable liquid fuel tanks

Except as otherwise provided for in this packing instruction, fuel tanks must be drained of fuel and tank caps fitted securely. Special precautions are necessary to ensure complete drainage of the fuel system of machines or equipment incorporating internal combustion engines, such as lawn mowers and outboard motors, where such machines or equipment could possibly be handled in other than an upright position. When it is not possible to handle in other than an upright position, machinery must be drained of fuel as far as practicable, and if any fuel remains, it must not exceed one-quarter of the tank capacity.

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...

Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

...

Packing Instruction 650

This packing instruction applies to UN 3373.

...

DGP-WG/19 (see paragraph 3.2.2.2 of DGP/27-WP/3) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

- 4) For transport, the mark illustrated below must be displayed on the external surface of the outer packaging on a background of a contrasting colour and must be clearly visible and legible. The mark must be in the form of a square set at an angle of 45° (diamond-shaped) with each side having a length of at least 50 mm, the width of the line must be at least 2 mm, and the letters and numbers must be at least 6 mm high. The entire mark must appear on one side of the package. The proper shipping name "Biological substance, Category B" in letters at least 6 mm high must be marked on the outer packaging adjacent to the diamond-shaped mark.

...

DGP-WG/18 (see paragraph 3.3.6.4 of DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

- 11) Infectious substances assigned to UN 3373 which are packed and marked in accordance with this packing instruction are not subject to any other requirement in these Instructions except for the following:
- a) the name and address of the shipper and of the consignee must be provided on each package;
 - b) the name and telephone number of a person responsible must be provided on a written document (such as an air waybill) or on the package;
 - c) classification must be in accordance with 2;6.3.2;
 - d) the incident reporting requirements in 7;4.4 and 7;4.5 must be met;

...

DGP-WG/19 (see paragraph 3.2.2.10 of DGP/27-WP/3) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

- 13) Other dangerous goods must not be packed in the same packaging as Division 6.2 infectious substances unless they are necessary for maintaining the viability, stabilizing or preventing degradation or neutralizing the hazards of the infectious substances. A quantity of 30 ml or less of dangerous goods included in Class 3, 8 or 9 permitted as excepted quantities under 3;5 may be packed in each primary receptacle containing infectious substances ~~provided these substances meet the requirements of 3;5~~. When these small quantities of dangerous goods are packed with infectious substances in accordance with this packing instruction no other requirements in these Instructions need be met.

...

Chapter 11**CLASS 9 — MISCELLANEOUS DANGEROUS GOODS**

...

Packing Instruction 959

Passenger and cargo aircraft for UN 3245 only

...

DGP-WG/19 (see paragraph 3.2.2.2 of DGP/27-WP/3) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

For transport, the mark illustrated below must be displayed on the external surface of the outer packaging on a background of a contrasting colour and must be clearly visible and legible. The mark must be in the form of a square set at an angle of 45° (diamond-shaped) with each side having a length of at least 50 mm; the width of the line must be at least 2 mm and the letters and numbers must be at least 6 mm high. The entire mark must appear on one side of the package.

...

DGP-WG/18 (see paragraph 3.3.6.4 DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

GMOs or GMMOs assigned to UN 3245 which are packed and marked in accordance with this packing instruction are not subject to any other requirement in these Instructions except for the following:

- 1) the name and address of the shipper and of the consignee must be provided on each package;
- 2) classification must be in accordance with 2;9.2.1 c);
- 3) the incident reporting requirements in 7;4.4 and 7;4.5 must be met;
- 4) the inspection for damage or leakage requirements in 7;3.1.3 and 7;3.1.4;
- 5) passengers and crew members are prohibited from transporting UN 3245 either as, or in, carry-on baggage or checked baggage or on their person.

...

Packing Instruction Y963

Limited quantities
Passenger and cargo aircraft for ID 8000 only

DGP/27 (see paragraphs 2.2.6 of the report under Agenda Item 2):

Consumer commodities are materials that are packaged and distributed in a form intended or suitable for retail sale for the purposes of personal care or household use. These include items administered or sold to patients by doctors or medical administrations. Except as otherwise provided below, dangerous goods packed in accordance with this packing instruction do not need to comply with 4;1 or Part 6 of these Instructions; they must, however, comply with all other applicable requirements. Other dangerous goods not classified as ID 8000 must not be packed in the same outer packaging with ID 8000.

...

- k) Consumer commodities shipped according to these provisions may be shipped in a unit load device prepared by a single shipper provided they contain no other dangerous goods other than UN 1845 — Carbon dioxide, solid (dry ice) used as a refrigerant. When the unit load device contains dry ice, the provisions of these Instructions applicable to dry ice must be met in addition to the provisions set out in this packing instruction. The shipper must provide the operator with written documentation stating the number of packages of consumer commodities contained in each unit load device.

...

...

Packing Instruction 965

Cargo aircraft only for UN 3480

...

II. SECTION II

Lithium ion cells and batteries, 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;1.1 g) and j) (Shipper's responsibilities — General requirements);
- Part 7;2.1 (Operator's responsibilities — Loading restrictions on the flight deck and for passenger aircraft);
- Part 7;2.4.1 (Operator's responsibilities — Loading of cargo aircraft);
- Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);

DGP-WG/18 (see paragraph 3.3.6.4 of DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

- 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.

...

II.2 Additional requirements

...

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities the functions for which they are responsible.

...

...

Packing Instruction 966

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

...

II. SECTION II

Lithium ion cells and batteries, 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 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);

DGP-WG/18 (see paragraph 3.3.6.4 of DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

- 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.

...

II.2 Additional requirements

...

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with ~~their responsibilities~~ the functions for which they are responsible.

...

...

Packing Instruction 967

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

...

II. SECTION II

Lithium ion cells and batteries, 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 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);

DGP-WG/18 (see paragraph 3.3.6.4 of DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

- ~~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.

...

II.2 Additional requirements

...

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with ~~their responsibilities~~ the functions for which they are responsible.

...

...

Packing Instruction 968

Cargo aircraft only for UN 3090

...

II. SECTION II

Lithium metal or lithium alloy cells and batteries, 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;1.1 g) and j) (Shipper's responsibilities — General requirements);
- Part 7;2.1 (Operator's responsibilities — Loading restrictions on the flight deck and for passenger aircraft);
- Part 7;2.4.1 (Operator's responsibilities — Loading of cargo aircraft);
- Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);

DGP-WG/18 (see paragraph 3.3.6.4 of DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

- ~~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.

...

II.2 Additional requirements

...

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with ~~their responsibilities~~ the functions for which they are responsible.

...

...

Packing Instruction 969

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

...

II. SECTION II

Lithium metal or lithium alloy cells and batteries, 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 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);

DGP-WG/18 (see paragraph 3.3.6.4 of DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

- 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.

...

II.2 Additional requirements

...

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with ~~their responsibilities~~ the functions for which they are responsible.

...

...

Packing Instruction 970

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

...

II. SECTION II

Lithium metal or lithium alloy cells and batteries, 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 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);

DGP-WG/18 (see paragraph 3.3.6.4 of DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

- ~~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.

...

II.2 Additional requirements

...

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with ~~their responsibilities~~ the functions for which they are responsible.

...

...

Packing Instruction 972

Passenger or cargo aircraft for UN 3530 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 952 for battery-powered equipment and vehicles)

...

ADDITIONAL PACKING REQUIREMENTS

...

DGP-WG/18 (see paragraph 3.2.2.6 of DGP/27-WP/2) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

Liquid fuel tanks

Except as otherwise provided for in this packing instruction, fuel tanks must be drained of fuel and tank caps fitted securely. Special precautions are necessary to ensure complete drainage of the fuel system of machines or equipment incorporating internal combustion engines, such as lawn mowers and outboard motors, where such machines or equipment could possibly be handled in other than an upright position. When it is not possible to handle in other than an upright position, machinery must be drained of fuel as far as practicable, and if any fuel remains, it must not exceed one-quarter of the tank capacity.

...

...

Part 5

SHIPPER'S RESPONSIBILITIES

...

Chapter 1

GENERAL

...

1.3 INFORMATION TO EMPLOYEES

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

A shipper must provide such information to employees as will enable them to carry out ~~their responsibilities~~ the functions for which they are responsible with regard to the transport of dangerous goods by air.

1.4 TRAINING

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

Before a consignment of dangerous goods is offered for air transport, all relevant persons involved in its preparation must have received training to enable them to carry out ~~their responsibilities~~ the functions for which they are responsible, as detailed in Part 1. Where a shipper does not have trained staff, the "relevant persons" may be interpreted as applying to those employed to act on the shipper's behalf and to undertake the shipper's responsibilities in the preparation of the consignment. However, such persons must be trained as required by Part 1, Chapter 4.

...

Chapter 2

MARKING

...

2.2 APPLICATION OF MARKS

...

2.2.2 All package marks required by 2.1:

- a) must be durable and printed or otherwise marked on, or affixed to, the external surface of the package;
- b) must be readily visible and legible;
- c) must be able to withstand open weather exposure without a substantial reduction in effectiveness;
- d) must be displayed on a background of contrasting colour; and
- e) must not be located with other package marks that could substantially reduce their effectiveness.

DGP-WG/19 (see paragraph 3.2.2.2 of DGP/27-WP/3) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

2.2.3 The marks required by 2.4.9 (Figure 5-2) and 2.4.16 (Figure 5-3) must be applied on one side of the package.

Part 6

PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS

...

Chapter 3

REQUIREMENTS FOR PACKAGINGS

...

3.2.7 Metal receptacles (aerosols), non-refillable (IP.7, IP.7A, IP.7B)

3.2.7.1 *Receptacles (aerosols) IP.7 and IP.7A*

3.2.7.1.1 *Materials and construction.* Uniform quality steel plate or non-ferrous metal of uniform drawing quality must be used:

- IP.7 receptacles must have a minimum wall thickness of 0.18 mm;
- IP.7A receptacles must have a minimum wall thickness of 0.20 mm.

DGP-WG/19 (see paragraph 3.2.2.9 of DGP/27-WP/3) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

The receptacles may be seamless or with seams welded, soldered, brazed, double-seamed or swaged. The ends must be of pressure design. Maximum capacity must not exceed ~~820 mL~~ 1 L and the maximum inner diameter must not exceed 76 mm.

...

Part 7

OPERATOR'S RESPONSIBILITIES

...

Chapter 2

STORAGE AND LOADING

...

2.13 LOADING OF BATTERY-POWERED MOBILITY AIDS CARRIED UNDER THE PROVISIONS OF PART 8

DGP-WG/19 (see paragraph 3.2.2.4 of DGP/27-WP/3) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

2.13.1 Loading of ~~non-spillable wet battery-powered~~ mobility aids powered by non-spillable wet batteries or batteries which comply with Special Provision A123 or A199

2.13.1.1 An operator must secure, by use of straps, tie-downs or other restraint devices, a battery-powered mobility aid with installed batteries. The mobility aid, the batteries, electrical cabling and controls must be protected from damage including by the movement of baggage, mail or cargo.

2.13.1.2 An operator must verify that:

a) the passenger has confirmed that the battery is:

- 1) a non-spillable wet battery that complies with Special Provision A67;
- 2) a dry battery that complies with Special Provision A123; or
- 3) a nickel-metal hydride battery that complies with Special Provision A199.

b) the battery terminals are protected from short circuits (e.g. by being enclosed within a battery container);

c) the battery is either:

- 1) securely attached to the mobility aid and the electrical circuits are isolated following the manufacturer's instructions; or
- 2) removed by the user, if the mobility aid is specifically designed to allow it to be, following the manufacturer's instructions.

d) a maximum of one spare battery is carried per passenger.

2.13.1.3 An operator must ensure that any battery(ies) removed from the mobility aid and any spare battery are carried in strong, rigid packagings, protected from short circuit and stowed in the cargo compartment.

2.13.1.4 The operator must inform the pilot-in-command of the location of any mobility aids with installed batteries, removed batteries and spare batteries.

...

2.13.2 Loading of mobility aids powered by spillable batteries ~~iesy-powered mobility aids~~

...

2.13.3 Loading of mobility aids powered by lithium ion batteries ~~iesy-powered mobility aids~~

...

Chapter 4

PROVISION OF INFORMATION

...

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

4.2 INFORMATION TO BE PROVIDED TO EMPLOYEES

An operator must provide such information in the operations manual and/or other appropriate manuals as will enable flight crews and other employees to carry out ~~their responsibilities~~ the functions for which they are responsible with regard to the transport of dangerous goods. This information must include instructions as to the action to be taken in the event of emergencies involving dangerous goods, and details of the location and numbering system of cargo compartments together with:

...

DGP-WG/19 (see paragraph 3.2.2.1 of DGP/27-WP/3) and DGP/27 (see paragraph 2.2.1 of the report under Agenda Item 2):

4.6 REPORTING OF DANGEROUS GOODS OCCURRENCES

An operator must report to the appropriate authority of the State of the Operator ~~and the State of Origin~~ any occasion when:

- a) dangerous goods are discovered to have been carried when not loaded, segregated, separated or secured in accordance with Part 7;2; or
- b) dangerous goods are discovered to have been carried without information having been provided to the pilot-in-command in accordance with Part 7;4.1.

...

DGP/27 (see paragraphs 2.2.2 of the report under Agenda Item 2):

4.10 TRAINING

An operator must ensure training is provided in accordance with the detailed requirements of 1;4 to all relevant employees, including those of agencies employed to act on the operator's behalf, to enable them to carry out ~~their responsibilities~~ the functions for which they are responsible with regard to the transport of dangerous goods, passengers and their baggage, cargo and mail.

...

Part 8

PROVISIONS CONCERNING PASSENGERS AND CREW

Chapter 1

PROVISIONS FOR DANGEROUS GOODS CARRIED BY PASSENGERS OR CREW

...

Table 8-1. Provisions for dangerous goods carried by passengers or crew

<i>Dangerous Goods</i>	<i>Location</i>		<i>Approval of the operator(s) is required</i>	<i>Restrictions</i>
	<i>Checked baggage</i>	<i>Carry-on baggage</i>		

Batteries

DGP/27 (see paragraph 2.2.10 of the report under Agenda Item 2):

2) Non-spillable wet, <u>nickel-metal hydride, and dry batteries</u>	Yes	Yes	No	<p><u>a) for a non-spillable battery:</u></p> <ul style="list-style-type: none"> <u>a) must meet the requirements of Special Provision A67;</u> <u>b) each battery must not exceed a voltage of 12 volts and a Watt-hour rating of 100 Wh;</u> <u>c) each battery must be protected from short circuit by the effective insulation of exposed terminals;</u> <u>d) no more than two spare batteries per person may be carried; and</u> <u>e) if contained in equipment, the equipment must be either protected from unintentional activation, or each battery must be disconnected and its exposed terminals insulated;</u> <p><u>b) for a dry battery or nickel-metal hydride battery, each battery must comply with Special Provision A123 or A199, respectively; and</u></p> <p><u>c) batteries and heating elements must be isolated in battery-powered equipment capable of generating extreme heat, by removal of the heating element, battery or other components.</u></p>
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...

Dangerous Goods	Location		Approval of the operator(s) is required	Restrictions
	Checked baggage	Carry-on baggage		

DGP-WG/19 (see paragraph 3.2.2.4 of DGP/27-WP/3) and DGP/27 (see paragraphs 2.2.1 and 2.2.11 of the report under Agenda Item 2):

<p>4) Battery powered Mobility aids (e.g. wheelchairs) <u>powered by:</u></p> <ul style="list-style-type: none"> - <u>spillable batteries;</u> - <u>non-spillable wet batteries;</u> - <u>dry batteries;</u> - <u>nickel-metal hydride batteries; or</u> - <u>lithium ion batteries</u> <p>...</p>	<p>Yes</p>	<p>(see d) e)</p>	<p>Yes</p>	<p>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);</p> <p>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);</p> <p><u>c) in the case of a dry battery or nickel-metal hydride battery:</u></p> <ul style="list-style-type: none"> <u>i) each battery must comply with Special Provision A123 or A199, respectively; and</u> <u>ii) a maximum of one spare battery may be carried per passenger;</u> <p>d) in the case of a non-spillable wet battery:</p> <ul style="list-style-type: none"> i) each battery must comply with Special Provision A67; and ii) a maximum of one spare battery may be carried per passenger; <p>e) in the case of a lithium ion battery:</p> <ul style="list-style-type: none"> i) each battery must be of a type which meets the requirements of each test in the <i>UN Manual of Tests and Criteria</i>, Part III, subsection 38.3; ii) when the mobility aid does not provide adequate protection to the battery: <ul style="list-style-type: none"> - 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.
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APPENDIX B
AMENDMENT TO THE TRAINING PROVISIONS IN THE TECHNICAL INSTRUCTIONS

DGP/27 (see paragraph 2.2.13 of the report under Agenda Item 2):

Replace Part 1;4 with the provisions contained in Attachment 4 of the 2019-2020 Edition of the Technical Instructions as amended below:

Chapter 4
DANGEROUS GOODS TRAINING

Parts of this Chapter are affected by State Variations AE 2, BR 7, CA 11, HK 1; see Table A-1

Note.— In cases where the application of specific provisions within this chapter may be different from the previous version of the Technical Instructions (e.g. an assessment instead of a test to verify understanding, or application of aspects of training identified within Table 1-4), the training provisions contained in Part 1;4 of the 2019-2020 Edition of the Instructions are provided in Attachment 4 and may be used until 31 December 2022.

4.1 ESTABLISHMENT OF DANGEROUS GOODS TRAINING PROGRAMMES

Note.— A training programme includes elements such as design methodology, assessment, initial and recurrent training, instructor qualifications and competencies, training records and evaluation of the effectiveness of training.

DGP/27 (see paragraph 6.1 of the report under Agenda Item 6):

~~4.1.1 The employer must establish and maintain a dangerous goods training programme for personnel performing any function described in these Instructions. The employer of personnel that perform functions aimed at ensuring that dangerous goods are transported in accordance with these Instructions must establish and maintain a dangerous goods training programme.~~

~~The following provision will be further reviewed in conjunction with a review of the training provisions in Annex 18~~

~~[— 4.1.2 The employer [should/must] establish and maintain a dangerous goods training programme for personnel who may not perform any function described in these Instructions but do perform functions related to the movement of cargo, baggage, passengers or mail. The aim of the programme is to ensure personnel are competent to perform functions aimed at preventing undeclared dangerous goods or dangerous goods not permitted from being carried on an aircraft.]~~

Moved from under 4.2.1:

DGP/27 (see paragraph 2.2.13 of the report under Agenda Item 2):

~~*Note. 1— Chapter 6 provides guidance on tasks that personnel responsible for certain well defined functions would typically perform. An approach to ensuring personnel are competent to perform any function for which they are responsible is provided in Guidance on a Competency-based Approach to Dangerous Goods Training and Assessment (see Chapter 2 of this attachment).*~~

Note 2.— Security personnel who are involved with the screening of passengers and crew and their baggage and cargo or mail are required to be trained irrespective of whether the operator on which the passenger or cargo is to be transported carries dangerous goods as cargo.

4.1.3 All operators must establish a dangerous goods training programme regardless of whether or not they are approved to transport dangerous goods as cargo.

4.1.4 Training courses may be developed and delivered by or for the employer.

4.2 OBJECTIVE OF DANGEROUS GOODS TRAINING

4.2.1 The employer must ensure that personnel are competent to perform any function for which they are responsible prior to performing any of these functions. This must be achieved through training and assessment commensurate with the functions for which they are responsible. Such training must include:

- a) general awareness/familiarization training — Personnel must be trained to be familiar with the general provisions;
- b) function-specific training — Personnel must be trained to perform competently any function for which they are responsible; and
- c) safety training — Personnel must be trained on how to recognize the hazards presented by dangerous goods, on the safe handling of dangerous goods, and on emergency response procedures.

Moved to under 4.1.1:

~~Note 1. — An approach to ensuring personnel are competent to perform any function for which they are responsible is provided in Guidance on a Competency based Approach to Dangerous Goods Training and Assessment (see Chapter 2 of this attachment).~~

Note 2. — General information on the provisions for dangerous goods carried by passengers and crew (see Part 8) should be included in training courses, as appropriate.

4.2.2 Personnel who have received training but who are assigned to new functions must be assessed to determine their competence in respect of their new function. If competency is not demonstrated, appropriate additional training must be provided.

...

Attachment 4

DGP/27 (see paragraph 2.2.13 of the report under Agenda Item 2):

**PROPOSED NEW TRAINING PROVISIONS EXTRACT FROM THE 2019-
2020 EDITION OF THE TECHNICAL INSTRUCTIONS
(MAY BE USED IN PLACE OF THE PROVISIONS IN PART 1;4 UNTIL
31 DECEMBER 2022)**

INTRODUCTORY NOTE

- ≠ The successful application of regulations concerning the transport of dangerous goods and the achievement of their objectives are greatly dependent on the appreciation by all individuals concerned of the hazards involved and on a detailed understanding of the regulations. This can only be achieved by properly planned and maintained initial and recurrent training programmes in the transport of dangerous goods for all persons concerned.

Chapter 4**TRAINING**

Parts of this Chapter are affected by State Variations AE 2, BR 7, CA 11, HK 1, VE 5, VE 6; see Table A-1

4.1 DANGEROUS GOODS TRAINING PROGRAMMES**4.1.1 ESTABLISHMENT AND maintenance**

Initial and recurrent dangerous goods training programmes must be established and maintained by or on behalf of:

- a) shippers of dangerous goods, including packers and persons or organizations undertaking the responsibilities of the shipper;
- b) operators;
- c) ground handling agencies which perform, on behalf of the operator, the act of accepting, handling, loading, unloading, transferring or other processing of cargo or mail;
- d) ground handling agencies located at an airport which perform, on behalf of the operator, the act of processing passengers;
- e) agencies, not located at an airport, which perform, on behalf of the operator, the act of checking in passengers;
- f) freight forwarders;
- g) agencies engaged in the security screening of passengers and crew and their baggage and/or cargo or mail; and
- h) designated postal operators.

4.1.2 REVIEW AND APPROVAL

4.1.2.1 Dangerous goods training programmes required by 4.1.1 b) must be subjected to review and approval by the appropriate authority of the State of the Operator.

4.1.2.2 Dangerous goods training programmes required by 4.1.1 h) must be subjected to review and approval by the civil aviation authority of the State where the mail was accepted by the designated postal operator.

4.1.2.3 Dangerous goods training programmes required by other than 4.1.1 b) and h) should be subjected to review and approval as determined by the appropriate national authority.

4.2 TRAINING CURRICULA

4.2.1 Personnel must be trained in the requirements commensurate with their responsibilities. Such training must include:

- a) general familiarization training — which must be aimed at providing familiarity with the general provisions;

Storage and loading procedures				x	x		x		x		
Pilots' notification					x		x		x		
Provisions for passengers and crew	x	x	x	X	x	x	x	x	x	x	x
Emergency procedures	x	x	x	X	x	x	x	x	x	x	x

CATEGORIES

- 1 — Shippers and persons undertaking the responsibilities of shippers
- 2 — Packers
- 3 — Staff of freight forwarders involved in processing dangerous goods
- 4 — Staff of freight forwarders involved in processing cargo or mail (other than dangerous goods)
- 5 — Staff of freight forwarders involved in the handling, storage and loading of cargo or mail
- 6 — Operator's and ground handling agent's staff accepting dangerous goods
- 7 — Operator's and ground handling agent's staff accepting cargo or mail (other than dangerous goods)
- 8 — Operator's and ground handling agent's staff involved in the handling, storage and loading of cargo or mail and baggage
- 9 — Passenger handling staff
- 10 — Flight crew members, loadmasters, load planners and flight operations officers/flight dispatchers
- 11 — Crew members (other than flight crew members)
- 12 — Security staff who are involved with the screening of passengers and crew and their baggage and cargo or mail, e.g. security screeners, their supervisors and staff involved in implementing security procedures

Table 1-5. Content of training courses for operators not carrying dangerous goods as cargo or mail

Contents	Categories of staff				
	13	14	15	16	17
General philosophy	X	X	X	X	X
Limitations	X	X	X	X	X
Labelling and marking	X	X	X	X	X
Dangerous goods transport document and other relevant documentation	X				
Recognition of undeclared dangerous goods	X	X	X	X	X
Provisions for passengers and crew	X	X	X	X	X
Emergency procedures	X	X	X	X	X

CATEGORIES

- 13 — Operator's and ground handling agent's staff accepting cargo or mail (other than dangerous goods)
- 14 — Operator's and ground handling agent's staff involved in the handling, storage and loading of cargo or mail (other than dangerous goods) and baggage
- 15 — Passenger handling staff
- 16 — Flight crew members, loadmasters, load planners and flight operations officers/flight dispatchers
- 17 — Crew members (other than flight crew members)

Note 1.— Depending on the responsibilities of the person, the aspects of training to be covered may vary from those shown in Tables 1-4 and 1-5. For example, in respect of classification, staff involved in implementing security procedures (e.g. screeners and their supervisors) need only be trained in the general properties of dangerous goods.

Note 2.— The categories of personnel identified in Tables 1-4 and 1-5 are not all encompassing. Personnel employed by or interacting with the aviation industry in areas such as passenger and cargo reservation centres, and engineering and maintenance, except when acting in a capacity identified in Table 1-4 or 1-5, should be provided with dangerous goods training in accordance with 4.2.

4.2.8 Staff of designated postal operators must be trained commensurate with their responsibilities. The subject matter with which their various categories of staff should be familiar is indicated in Table 1-6.

4.3 Instructor QUALIFICATIONS

4.3.1 Unless otherwise provided for by the appropriate national authority, instructors of initial and recurrent dangerous goods training programmes must have adequate instructional skills and have successfully completed a dangerous goods training programme in the applicable category, or Category 6, prior to delivering such a dangerous goods training programme.

4.3.2 Instructors delivering initial and recurrent dangerous goods training programmes must at least every 24 months deliver such courses, or in the absence of this attend recurrent training.

Table 1-6. Content of training courses for staff of designated postal operators

<i>Aspects of transport of dangerous goods by air with which they should be familiar, as a minimum</i>	<i>Designated postal operators</i>		
	<i>Categories of staff</i>		
	A	B	C
General philosophy	x	x	x
Limitations	x	x	x
General requirements for shippers	x		
Classification	x		
List of dangerous goods	x		
Packing requirements	x		
Labelling and marking	x	x	x
Dangerous goods transport document and other relevant documentation	x	x	
Acceptance of the dangerous goods listed in 1;2.3.2	x		
Recognition of undeclared dangerous goods	x	x	x
Storage and loading procedures			x
Provisions for passengers and crew	x	x	x
Emergency procedures	x	x	x

CATEGORIES

- A — Staff of designated postal operators involved in accepting mail containing dangerous goods
- B — Staff of designated postal operators involved in processing mail (other than dangerous goods)
- C — Staff of designated postal operators involved in the handling, storage and loading of mail

Note.— Guidance on the aspects of training to be covered by staff of designated postal operators can be found in S-1;3.

4.4 COMPETENCY-BASED TRAINING AND ASSESSMENT

Competency-based training and assessment should be used in accordance with the general provisions contained in Chapter 2 of the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868).

APPENDIX C
(English only)

**PROPOSED NEW GUIDANCE MATERIAL ON A COMPETENCY-
BASED APPROACH TO DANGEROUS GOODS TRAINING AND
ASSESSMENT**

FOREWORD

A safe and efficient air transport system is dependent on a competent workforce. ICAO has recognized that this can be achieved through the implementation of a competency-based approach to training and assessment. The *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284, "Technical Instructions") require that employers ensure personnel are competent to perform any function for which they are responsible prior to performing it. A competency-based approach to training and assessment is an effective way to ensure this requirement is met.

This document provides guidance in implementing a competency-based approach to dangerous goods training and assessment for personnel involved in the transport of cargo, mail, passengers and baggage by air. The *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868) contains greater detail on competency-based training and assessment.

**BENEFITS OF COMPETENCY-BASED TRAINING AND ASSESSMENT
FOR THE SAFE TRANSPORT OF DANGEROUS GOODS BY AIR**

The main benefit of a competency-based approach to training and assessment is its potential to encourage and enable personnel to reach their highest level of capability while ensuring a basic level of competence as a minimum standard. It does this by:

- a) targeting specific training needs;
- b) supporting continuous learning and performance improvement;
- c) gearing towards learning rather than simply passing a test;
- d) ensuring the integration of the knowledge, skills and attitudes needed to perform effectively; and
- e) establishing sufficient, well-trained and competent instructors.

Ensuring personnel are able to perform their functions competently is critical to any organization. A competent workforce reduces cost caused by poor performance or miscommunication of job expectations. The consequences of an incompetent dangerous goods workforce can be especially damaging. It could result in costs and delays in shipment, and even more critically, it could result in the introduction of safety risks. As an example, identifying, classifying, packing, marking, labelling and documenting dangerous goods for transport are critical to the safe transport of dangerous goods by air. The operator depends on these functions being performed competently by those preparing and offering a consignment for transport so that they are aware of the hazards posed and can take the necessary steps to mitigate the risk to the aircraft and its occupants. If personnel performing these functions are not trained to competently perform them, unknown risks may be introduced into air transport. Accepting dangerous goods for air transport requires an operator to verify that dangerous goods are properly prepared for transport through the use of a checklist. If personnel accepting dangerous goods are not trained to competently perform this function, they may accept improperly prepared shipments of dangerous goods into air transport thereby putting the aircraft and its

occupants at risk. Alternatively, they may unnecessarily reject properly prepared shipments thereby delaying shipments and increasing costs to the shipper and the operator.

A competency-based approach to training and assessment ensures that trainees know what they are expected to competently perform and evaluators know what performance to assess..

FUNCTION-SPECIFIC TRAINING

The Technical Instructions state that personnel must be trained commensurate with the functions for which they are responsible. These responsibilities are determined by the specific functions personnel perform and not by their job titles. Concentrating on functions and responsibilities rather than a job title or description ensures that a person is competent to perform the function in compliance with the Technical Instructions. For example, entities such as ground handling companies and freight forwarders may need personnel to perform some functions that are typically performed by shippers or operators. Ground handling and freight forwarder personnel would need to be trained to perform these functions competently regardless of their job title.

In smaller operations, personnel may perform many functions such as accepting dangerous goods and loading and securing dangerous goods on board an aircraft. They would need to be trained to perform all of these functions competently. In larger operations, personnel may perform only a small number of functions. They would only need to be trained to perform those specific functions competently.

The depth of training each person receives should be appropriate to the functions performed. This could range from a familiarization level to an expert level for certain personnel.

Comments concerning this document should be addressed to:

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GLOSSARY

ACRONYMS AND ABBREVIATIONS

ANC	Air Navigation Commission
CAA	Civil Aviation Authority
COMAT	Company Material
SRM	Safety Risk Management

DEFINITIONS

When the following terms are used in this manual, they have the following meanings:

Adapted competency model. A group of competencies with their associated description and performance criteria adapted from an ICAO competency framework that an organization uses to develop competency-based training and assessment for a given role.

Competency. A dimension of human performance that is used to reliably predict successful performance on the job. A competency is manifested and observed through behaviours that mobilize the relevant knowledge, skills and attitudes to carry out activities or tasks under specified conditions..

Competency-based training and assessment. Training and assessment that are characterized by a performance orientation, emphasis on standards of performance and their measurement, and the development of training to the specified performance standards.

Competency standard. A level of performance that is defined as acceptable when assessing whether or not competency has been achieved.

Conditions. Anything that may qualify a specific environment in which performance will be demonstrated.

ICAO competency framework A competency framework, developed by ICAO, is a selected group of competencies for a given aviation discipline. Each competency has an associated description and observable behaviours.

Observable behaviour A single role-related behaviour that can be observed and may or may not be measurable.

Performance criteria. Statements used to assess whether the required levels of performance have been achieved for a competency. A performance criterion consists of an observable behaviour, condition(s) and a competency standard.

Chapter 1

INTRODUCTION

1.1 GENERAL

1.1.1 This document provides guidance in implementing a dangerous goods competency-based training and assessment programme for personnel involved in the transport of cargo, mail, passengers and baggage by air.

1.1.2 Since ICAO regions and member States have differing regulatory, operational, technical and organizational environments, it does not prescribe a “one-size-fits-all” training programme. Instead, it provides generic tools to develop dangerous goods training programmes that can be adapted for specific needs. It is based on the more detailed material provided in the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868).

1.2 COMPETENCY-BASED TRAINING AND ASSESSMENT CONCEPTS

The goal of competency-based training and assessment is to produce a competent workforce by providing focused training. It does so by identifying key competencies that need to be achieved, determining the most effective way of achieving them and establishing valid and reliable assessment tools to evaluate their achievement. Competency-based training is a concept and methodology that was developed during the 1950s and entered the mainstream sometime in the 1980s. Competency-based training has been applied in many different contexts and professions and, therefore, it is understandable that there are many different definitions of “competence” and “competency-based training”. This section elaborates the competency concepts as they are used in this document.

1.2.1 What is a competency?

1.2.1.1 A competency is a dimension of human performance that is used to reliably predict successful performance on the job. It is manifested and observed through behaviours that mobilize the relevant knowledge, skills and attitudes to carry out activities or tasks under specified conditions.

1.2.1.2 A competency standard is a level of performance that is defined as acceptable when assessing whether or not competency has been achieved.

1.2.2 Knowledge, skills and attitudes

1.2.2.1 Developing knowledge, skills and attitudes (KSA) required to perform a task is a critical feature of competency-based training and assessment.

1.2.2.2 **Knowledge.** Knowledge is specific information required to enable a learner to develop and apply the skills and attitudes to recall facts, identify concepts, apply rules or principles, solve problems, and think creatively in the context of work. Knowledge is an outcome of the learning process, whether learning occurs in formal or informal settings. There are different types of knowledge: declarative (e.g. facts and raw data), procedural (e.g. categorized/contextualized and application of conditional if-then rules), strategic (e.g. synthesis, inference to guide

resource allocation for decision making, problem solving and behavioural action), and adaptive (e.g. generalization, innovation. and invention).

1.2.2.3 **Skills.** A skill is an ability to perform an activity or action. It is often divided into three types: motor, cognitive and metacognitive skills. A motor skill is an intentional movement, involving a motor or muscular component, that must be learned and voluntarily produced to proficiently perform a goal-oriented task. A cognitive skill is any mental skill used in the process of acquiring knowledge, such as reasoning, perception and intuition. A metacognitive skill relates to the ability of learners to monitor and direct their own learning processes (“thinking about thinking”); for example, planning how to approach a given learning task, monitoring comprehension and evaluating progress toward the completion of a task.

1.2.2.4 **Attitudes.** Attitude is a persistent internal mental state or disposition that influences an individual’s choice of personal action toward some object, person or event and that can be learned. Attitudes have affective components, cognitive aspects and behavioural consequences. To demonstrate the “right” attitude, a learner needs to “know how to be” in a given context.

1.2.2.5 Examples of KSA applicable to dangerous goods personnel include:

Knowledge	<ul style="list-style-type: none"> — The nine classes of dangerous goods — Information required on the dangerous goods transport document — Components of an acceptance check
Skills	<ul style="list-style-type: none"> — How to determine if the substance/material is dangerous goods — How to complete the dangerous goods documentation — How to check a package (e.g. can it be accepted for transport)
Attitude	<ul style="list-style-type: none"> — Being motivated to ensure safety and to comply with applicable regulations — Wanting to adhere to regulations in asking relevant and effective questions — Appreciating feedback from team members (e.g. adapts when faced with situation where no guidance or procedure exists)

1.2.2.6 Performing a dangerous goods task may require different levels of KSA, depending on the complexity of the specific task and the operational environment. A level of proficiency is a means to determine how critical knowledge, a skill or an attitude is for the successful completion of a task. If used, the concept of a level of proficiency can be very useful in determining the main areas to focus on during training and assessment. In order to determine the level of proficiency of knowledge, a skill or an attitude, the employer should take into account the complexity of the task or sub-task, its criticality and the employee’s autonomy in performing it. KSAs may be developed over time and with practice, thus enabling qualified personnel to take on more difficult tasks with greater responsibility.

1.2.3 Principles of competency-based training and assessment

A competency-based approach to training and assessment is based on the following principles:

- a) relevant competencies are clearly defined for a particular role;
- b) there is an explicit link between competencies and training, required performance on the job, and assessment;
- c) competencies are formulated in a way that ensures they can be trained for, observed and assessed consistently in a wide variety of work contexts for a given role;
- d) trainees successfully demonstrate competency by meeting the associated competency standard;

- e) each stakeholder in the process including the employer (e.g. shipper, freight forwarder, ground handling agent and operator), instructor, trainee, training organization and regulator has a common understanding of the competency standards;
- f) clear performance criteria are established for assessing competence;
- g) evidence of competent performance is valid and reliable;
- h) instructors' and assessors' judgements are calibrated to achieve a high degree of inter-rater reliability;
- i) assessment of competencies is based on multiple observations across multiple contexts; and
- j) to be considered competent, an individual demonstrates an integrated performance of all the required competencies to a specified standard.

1.2.4 ICAO competency framework, adapted competency model and task list

1.2.4.1 Traditional approaches to training development involve the decomposition of jobs into tasks. For each task there is a related objective, an assessment and associated elements in a training plan. A limitation of this approach is that each task must be taught and assessed. In complex systems, or when jobs evolve rapidly, it may not be possible to teach and assess each task. Moreover, learners may demonstrate the ability to perform tasks in isolation without being competent in their job. Competency-based training and assessment is based on the concept that competencies are transferable. In the design of a competency-based training and assessment programme, the purpose of the training and tasks associated with this purpose are identified and a limited number of competencies are defined. In the design of training and assessments, tasks and activities are incorporated because they are useful for facilitating, developing or assessing a competency or competencies. Typically, a task will involve several competencies, and competencies may apply across a variety of tasks and settings. Specific tasks may be used to develop specific competencies. The lack of specific competencies may be identified as a root cause of failure in the performance of a task. A generic, high-level list of tasks ("task list") typically performed by dangerous goods personnel is provided in Chapter 4 to this document. Employers may use this list as a tool for developing specific training specifications for its personnel. The training and assessment record required by the Technical Instructions should detail the task(s) and sub task(s) from the task list for which competency has been demonstrated in order to facilitate verification that appropriate training and assessment has been completed.

1.2.4.2 A competency model provides a means of defining competencies by identifying those needed for a given role, describing them, and providing criteria for each. Generic, high-level competency frameworks for aviation personnel have been developed by ICAO and included in PANS-TRG and various ICAO documents. They are intended as a framework on which customized competency models can be developed. An ICAO competency framework for dangerous goods personnel is provided in Chapter 3 to this document. It provides a set of competencies that are typically needed to perform the dangerous goods tasks identified in the task list provided in Chapter 4. Employers may adapt this framework into competency models that meet the regulatory, operational, technical and organizational environments within which their personnel perform their tasks. This customized model is identified as an *adapted competency model*, which is then used to develop competency-based training and assessment for a given role. Guidance on developing an adapted competency model is provided in Chapter 2.

1.3 DEVELOPING COMPETENCY-BASED TRAINING AND ASSESSMENT

Instructional systems design (ISD) is a systematic process for designing and developing training. Several valid ISD models exist which may be used to design competency-based training and assessment. The analyse, design,

develop, implement and evaluate (ADDIE) framework is generic to all ISD models. Chapter 2 provides guidance for designing dangerous goods competency-based training and assessment using the ICAO competency framework for dangerous goods personnel and the ADDIE model.

1.4 ROLES AND RESPONSIBILITIES IN A COMPETENCY-BASED APPROACH TO TRAINING

1.4.1 Employer

1.4.1.1 A training programme includes elements such as design methodology, initial and recurrent training, assessment, instructor qualifications and competencies, training records and evaluation of its effectiveness. Employers need to determine the purpose and objective of the competency-based training programme based on the functions for which their personnel are responsible. Employers should ensure that training is designed and developed to establish clear links among the competencies to be achieved, the learning objectives, assessment methods, and course materials.

1.4.1.2 The employer must study the target population (future trainees) with a view to identifying the knowledge, skills and attitudes that they already possess, to collect information on preferred learning styles, and on the social and linguistic environments of prospective trainees. The target population may be a mixture of experienced and newly recruited personnel, groups differing in age, etc. All these components could have an impact on the design of the training. Employers must also consider the domestic and international regulatory requirements that apply to their operations.

1.4.1.3 Some employers may utilize third parties for assistance. This approach may be the most suitable for employers who do not have the resources to train their personnel in house. While utilizing third parties may be cost effective, the deciding factor in selecting a third party should be whether or not the training needs are being addressed, and not costs alone. The potential for third parties to cater to the training needs of multiple employers and not address all required competencies of each specific employee needs to be taken into account. Employers remain responsible for ensuring their personnel are competent to perform their functions prior to performing them even if certain aspects of the training programme have been delegated to third parties.

1.4.1.4 Employers should liaise directly with the regulator to ensure that the latter's requirements are taken into account prior to proceeding with the development of competency-based training,

1.4.2 Instructor

In competency-based training, the instructor facilitates the trainee's progression towards the achievement of competencies. Instructors also support continuous improvement by collecting information about the effectiveness of the training materials. Examples of instructor competencies can be found in Part I, Chapter 3 of the PANS-TRG.

1.4.3 Trainee

In competency-based training, trainees are active participants in their learning process and in the achievement of competencies, as opposed to being passive recipients of knowledge. The competency-based training programme provides them with a clear idea of their learning path towards competency through the training programme and beyond. The competency-based training should directly contribute to improving their performance on the job. The trainees' feedback is essential to ensure that competency-based training is effective.

1.4.4 Regulator

1.4.4.1 There are important differences between the ways the regulator would oversee a traditional training programme versus a competency-based training programme. In a traditional training programme, the regulator may assess the course components and final test against knowledge elements and not on the competencies that need to be acquired. The fact that all knowledge components are addressed or appear to be included in a course and that all trainees have passed the required test does not necessarily mean that they can competently perform their assigned functions.

1.4.4.2 Where competency-based training has been implemented, regulators should oversee the training programme to ensure that it actually produces personnel who can perform the functions for which they are responsible in a specific operational setting and in compliance with the national regulatory framework. The *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) provides guidance on overseeing dangerous goods training programmes.

1.5 RELATIONSHIP BETWEEN COMPETENCY-BASED TRAINING AND ASSESSMENT AND SAFETY MANAGEMENT

1.5.1 Before delving into competency-based training and assessment, it is important to understand its relationship to safety management. Safety is ICAO's guiding and most fundamental strategic objective. Annex 19 contains Standards and Recommended Practices (SARPs) dedicated to safety management. The foundation of safety management is the implementation of a State safety programme (SSP) by States and safety management systems (SMS) by service providers listed in 3.3.2 of Annex 19, which includes operators of aeroplanes or helicopters authorized to conduct international commercial air transport. An operator's SMS addresses the aviation activities that are related to the safe operation of the aircraft in accordance with Annex 6, Part I or Part III. These aviation activities include the carriage of dangerous goods. States may also recommend that other entities involved in air transport such as freight forwarders and ground handling agents develop and implement SMS. Other entities may also voluntarily implement SMS.

1.5.2 Implementing SMS requires that all personnel understand the safety philosophy and embrace a disciplined and standardized approach for SMS. Personnel need to know their roles and responsibilities and have the requisite competencies to perform their functions within the SMS. To ensure that personnel have the knowledge, skills and abilities to support SMS, training activities should follow the competency-based approach. Other entities in the dangerous goods transport chain should be encouraged to implement a similar safety system.

1.5.3 The "Swiss-Cheese" Model of accident causation proposes that complex aviation systems are extremely well defended by layers of defences, making single-point failures rarely consequential in such systems (see paragraph 2.3 of the *Safety Management Manual (SMM)* (Doc 9859)). The model illustrates that accidents involve successive breaches of multiple system defences and that all accidents include a combination of both active conditions (actions or inactions that have an immediate adverse effect) and latent conditions (conditions that exist in the aviation system well before a damaging outcome is experienced). Doc 9859 identifies training as one of the three main groups of defences in aviation and identifies deficiencies in training as a latent condition.

1.5.4 Continuous improvement is a component of both safety management and competency-based training and assessment. The use of data from different sources should be utilised to enhance the training programme and address any deficiencies. For entities that also have an SMS, their competency-based training and assessment programme should be integrated with the continuous improvement cycle of their SMS.

Chapter 2

DEVELOPMENT AND IMPLEMENTATION OF COMPETENCY-BASED DANGEROUS GOODS TRAINING AND ASSESSMENT PROGRAMMES

2.1 GENERAL

2.1.1 This chapter provides a step-by-step guide for organizations intending to establish competency-based training and assessment that is specific to their environment and requirements. It makes use of the ICAO competency framework and the ADDIE (analyse, design, develop, implement and evaluate) instructional design model.

2.2 COMPONENTS OF A COMPETENCY-BASED TRAINING AND ASSESSMENT PROGRAMME

2.2.1 The goal of competency-based dangerous goods training and assessment is to provide a competent workforce for the safe and efficient transport of dangerous goods by air. The following components, which are illustrated in Figure 1-1, are essential to achieving this goal:

- a) a training specification that describes the purpose of training, the task list and the requirements that must be fulfilled when designing the training;
- b) a competency model adapted from the ICAO competency framework for a given role;
- c) an assessment plan providing the process and tools for gathering valid and reliable evidence at different stages during training;
- d) a training plan describing the training required to achieve the competencies. It includes but is not limited to a syllabus (including knowledge, skills and attitudes (KSA), milestones, lesson plans and schedules); and
- e) training and assessment materials and human, material and organizational resources needed to implement training and assessment plans.

The remainder of this chapter focuses on the development of these components through the ADDIE instructional design model.

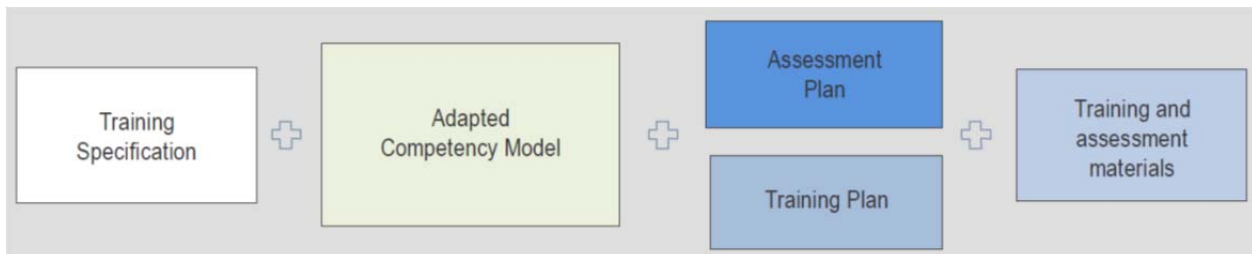


Figure 1-1. Competency-based training components

2.3 BUILDING A COMPETENCY-BASED DANGEROUS GOODS TRAINING AND ASSESSMENT PROGRAMME USING THE ADDIE MODEL

2.3.1 General

The ADDIE model is a generic process traditionally used by instructional designers and training developers to build effective training tools. It consists of five phases: analysis, design, development, implementation, and evaluation. PANS-TRG refers to these phases as “workflows” as illustrated in Figure 2-1. This section provides a detailed overview of the first two workflows (ANALYSE and DESIGN) and a general overview of the remaining three (DEVELOP, IMPLEMENT and EVALUATE).

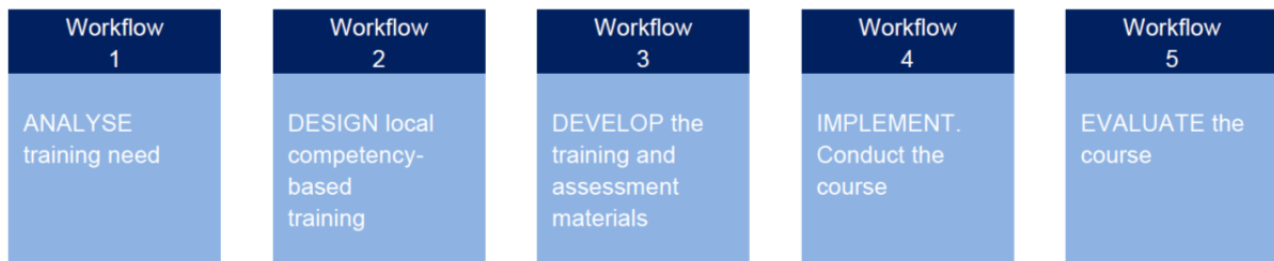


Figure 2-1. Competency-based training and assessment workflows

2.3.2 Workflow 1 — Analyse training need

2.3.2.1 The first phase in the development and implementation of a competency-based training programme is to determine what the training needs are specific to the employer’s environment and requirements through a training needs analysis. Figure 2-2 illustrates a detailed overview of this workflow. The output of this workflow is a training specification, which includes the purpose of the training and the detailed operational, technical, regulatory and organizational requirements that need to be fulfilled when designing the training. PANS-TRG lists a number of questions that should be answered to ensure the training specification provides sufficient detail (see PANS-TRG, Chapter 2, Attachment C). Some of these questions are specific to flight training, but most would also apply to dangerous goods training.

2.3.2.2 This phase includes the development of a task list. A generic list of tasks and sub-tasks typically performed by personnel performing dangerous goods functions is provided in Chapter 4. A complementary flowchart illustrating the typical processes of performing these tasks is provided in the appendix to Chapter 4. The employer may need to adapt the task list in Chapter 4 to reflect the specific tasks performed by its personnel.

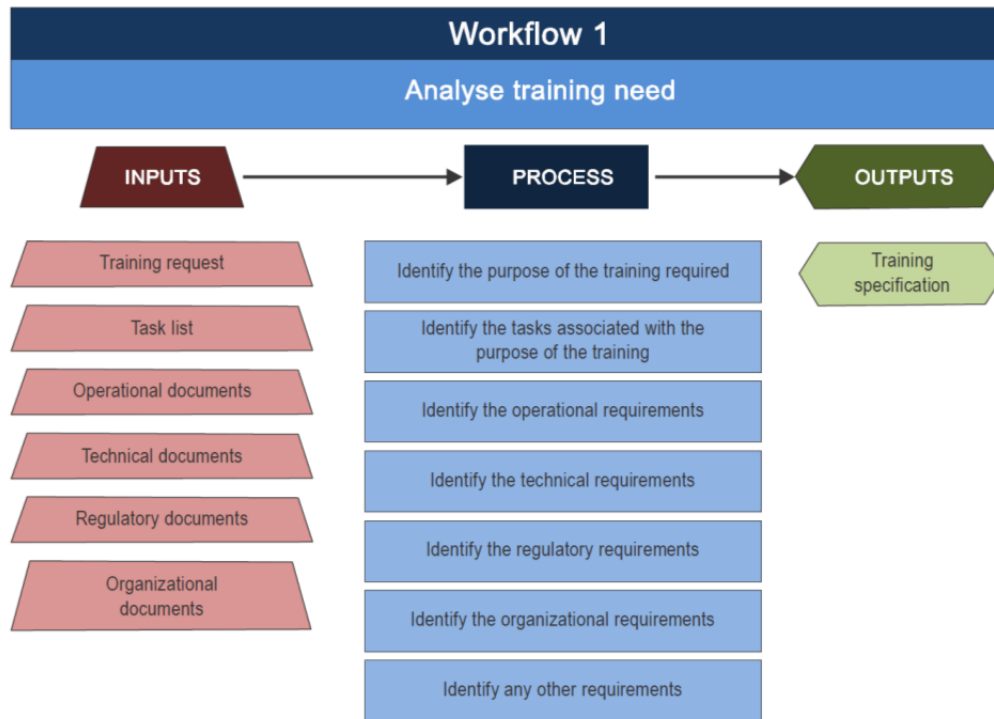


Figure 2-2. Workflow 1 — Analyse training need

2.3.3 Workflow 2 — Design local competency-based training and assessment

2.3.3.1 The second phase in the development and implementation of a local competency-based training and assessment programme is its design. This is done taking into account the training specifications identified in Workflow 1 and will involve:

- establishing an adapted competency model that addresses the training specification identified in Workflow 1;
- designing an assessment plan that will be used to assess the competence of trainees; and
- designing a training plan that will enable the development and delivery of the training course.

Figures 2-3 and 2-4 illustrates this workflow in two Parts: Part 1 (Figure 2-3) deals with the design of the adapted competency model and Part 2 (Figure 2-4) deals with the design of the assessment and training plan.

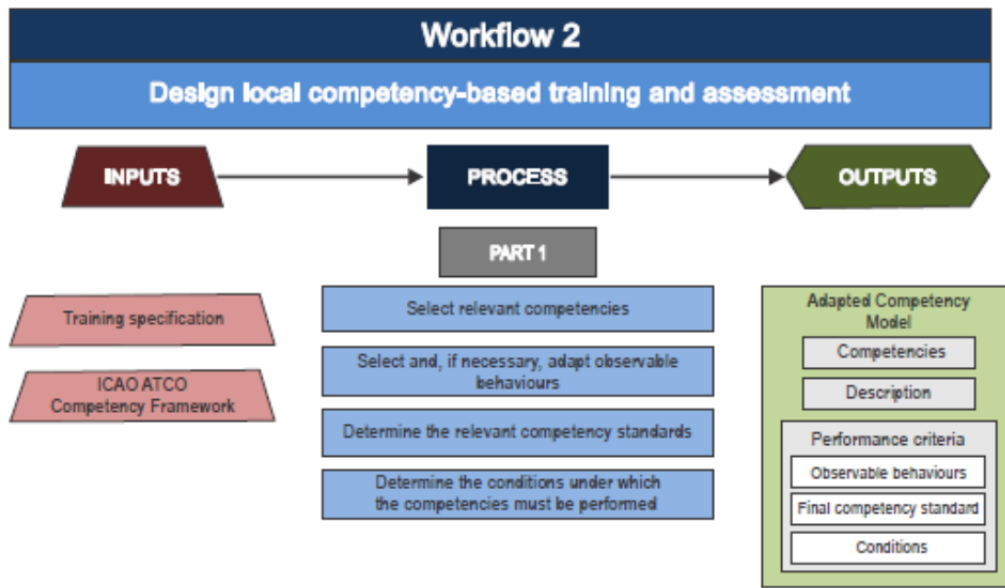


Figure 2-3. Workflow 2, Part 1 — Design local competency-based training

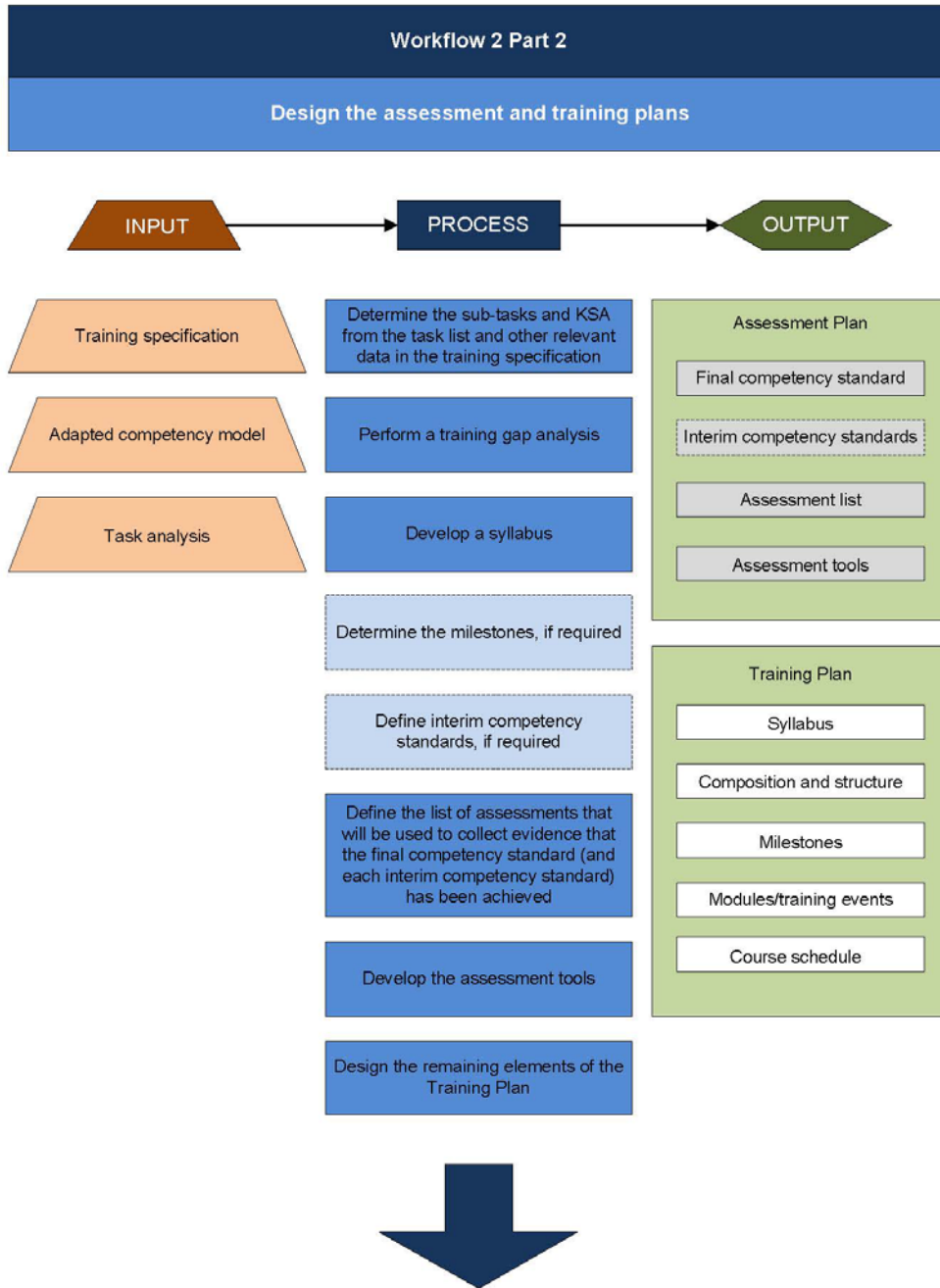


Figure 2-4. Workflow 2, Part 2 — Design local competency-based training

2.3.3.2 Designing the adapted competency model

A dangerous goods competency model should be adapted from the generic ICAO competency framework provided in Chapter 3 to meet the organizational competency requirements using the information contained in the training specification. The adapted model should include the following elements (Table 2-1 may be used as a template for an adapted competency model):

- a) *A list of competencies and a description of each.* A generic ICAO competency framework provides a set of competencies that would typically be needed to perform the dangerous goods tasks listed in the task list that was developed when analysing the training needs (Workflow 1). The vast majority of adapted competency models will contain similar lists of competencies, but there may be a need to add or remove a competency depending on the employers' own operational and organizational environments.
- b) Performance criteria for assessing competency including:
 - 1) *Observable behaviours for each competency.* The generic ICAO competency framework provides a comprehensive list of observable behaviours associated with each of the competencies. Appropriate observable behaviours may be selected from it, adapted from it, or added.
 - 2) *Competency standards and conditions used to assess competency.* Competency standards apply to all observable behaviours and relate to compliance with the standards and procedures and rules and regulations as described in relevant documents (e.g. national rules, the Technical Instructions, local operations manuals). In some instances, there may be specific standards associated with a particular observable behaviour. Conditions that are specific to the environment in which performance will be demonstrated may need to be considered in relation to the competency standard. These include the nature and complexity of the tasks, conditions relating to tools and systems or equipment, and conditions relating to the level of support or assistance a trainee can expect from the instructor or assessor. During the early stages of training, trainees may expect active coaching and teaching from the instructor. However, as the trainee progresses towards the final competency standard and gains more confidence in performing independently, the instructor takes on a more passive role and may only give occasional advice on how to improve efficiency or intervenes in instances where safety may be compromised. Consequently, the condition description of the final competency standard might be that the trainee would be expected to be performing independently without assistance from the instructor. As part of the progression towards the final competency standard, it may be necessary to establish interim competency standards.

Table 2-1. Template for an adapted competency model

<i>Adapted competency</i>	<i>Description</i>	<i>Performance criteria</i>		
		<i>Observable behaviour</i>	<i>Competency assessment</i>	
<i>Adapted competency 1</i>	Description 1	OB 1	Final competency standard	Conditions
		OB 2		
		OB n		
<i>Adapted competency 2</i>	Description 2	OB 1	Final competency standard	Conditions
		OB 2		
		OB n		
<i>Adapted competency 3</i>	Description 3	OB 1	Final competency standard	Conditions
		OB 2		
		OB n		

2.3.3.3 Designing an assessment plan

2.3.3.3.1 Competency-based training requires assessment of the trainees' progress until they are competent to perform their assigned function. A trainee's assessment may be completed using a variety of tools including observation of job performance, tests or other practical exercises. In order for assessment tools to be effective, they must be valid and reliable both in terms of being an appropriate measure of the competency being assessed and of obtaining consistent results when administered by different raters and ratings.

2.3.3.3.2 The purpose of the assessment plan is to detail how competence is going to be determined. Prior to developing the assessment and training plans, it is important to consider:

- a) The following principles of competency-based assessment:
 - 1) *Clear performance criteria are used to assess competence.* The adapted competency model establishes these performance criteria.
 - 2) *An integrated performance of the competencies is observed.* The trainee undergoing assessment must demonstrate all competencies and their seamless interaction with each other.
 - 3) *Multiple observations are undertaken.* To determine whether or not a trainee has achieved the interim and/or final competency standard, multiple observations must be carried out.

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- 4) *Assessments are valid.* All of the components that comprise the adapted competency model must be assessed. There must be sufficient evidence to ensure that the trainee meets the competency specified by the interim and/or final competency standard. The trainee must not be asked to provide evidence for or be assessed against activities that are outside the scope of the adapted competency model.
 - 5) *Assessments are reliable.* All assessors should reach the same conclusion when performing an assessment. All assessors should be trained and monitored to achieve and maintain an acceptable level of inter-rater reliability.
- b) *Typical assessment methods.* The primary method for assessing performance is the conduct of practical assessments, because the focus is on an integrated performance of competencies. Practical assessments can be formative, whereby instructors provide feedback to trainees on their progress toward the interim or final competency standard, or summative, whereby trainees demonstrate competence at defined points during the training which may include or be the end of training. It may be necessary to supplement practical assessments with other forms of evaluation such as examinations, oral assessments, projects or simulation. Detailed guidance on typical assessment methods is provided in PANS-TRG, Attachment C to Chapter 2.
 - c) *The concept of milestones.* When the duration or the complexity of a course is such that it makes pedagogic sense to check that a trainee is progressing towards competence at an acceptable pace, the course may be divided into milestones. Milestones are cohesive building blocks of learning that are organized into a logical sequence that generally progress from the simple to the complex. Each milestone is comprised of both training and assessment(s). Milestones build on one another; therefore, a trainee would need to successfully complete the training and assessment for the first milestone before proceeding to the next one. An example of milestones might be training in a classroom as one and training as part of on-the-job training as a second.
 - d) *Final competency standard and interim competency standards.* If training has been divided into milestones, it will be necessary to define interim competency standards for each milestone.
 - e) The relationship between the adapted competency model and the training and assessment plans. This relationship is described in 2.3.3.5.

2.3.3.3.3 The assessment plan details:

- a) the final competency standard associated with the final milestone;
- b) the interim competency standard associated with each milestone (if required);
- c) the list of assessments (formative and summative assessments, examinations, oral assessments, etc.) required for each of the milestone(s) that have been defined;
- d) when assessments should take place;
- e) the tools to be used to collect evidence during practical assessment;
- f) the pass marks for projects, examinations or oral assessments;
- g) if required, the minimum number of formative assessments to be undertaken prior to starting summative assessments; and
- h) the number of observations required to assess performance for the interim and final competency standards.

2.3.3.3.4 Additional administrative procedures may be necessary in the implementation of the assessment plan in relation to: who is authorized to perform a specific task or assessment, roles and responsibilities of personnel during the conduct of assessments, assessment procedures (preparation, conduct and post-assessment), conditions under which assessments are to be undertaken, record-keeping, and actions to be taken if a trainee fails a competency assessment. Normally these procedures are described in a training and procedures manual.

2.3.3.3.5 The assessment of dangerous goods personnel can be accomplished in a variety of ways. Some common examples to accomplish an assessment would be to utilize a written test, online test, oral test, observed practical exercises, online practical exercises and observation of on-the-job performance by fully trained personnel. An employer of personnel performing dangerous goods functions might choose to utilize one assessment method or a combination of assessment methods, as long as the assessment confirms that the personnel have acquired the necessary competencies to perform the assigned dangerous goods functions. The employer therefore establishes the assessment plan with all the specific details that would need to be accomplished to determine whether competence has been achieved by the trainee.

2.3.3.3.6 Employers electing to send personnel to third-party training providers also need to establish an assessment plan for ensuring that competence has been achieved by the trainee. The employer may incorporate the third-party provider's assessment into its established assessment plan. Even if the employer does not deliver any of the training itself, it can still choose to assess the trainees in the workplace to ensure they can perform their assigned tasks competently and incorporate that process into the assessment plan.

2.3.3.4 **Designing a training plan**

2.3.3.4.1 The purpose of the training plan is to detail:

- a) the composition and structure of the course;
- b) the syllabus;
- c) milestones (if required);
- d) modules, training events and their delivery sequence; and
- e) the course schedule.

2.3.3.4.2 The training plan will be used by the training designer(s) to create the training and assessment materials.

2.3.3.5 **Relationship between the adapted competency model and the assessment and training plans**

2.3.3.5.1 The training specification developed in Workflow 1 (see 2.3.2) serves as the common basis for the development of the adapted competency model and the training and assessment plans. The task list is generally used to aid the selection of the observable behaviours from the generic competency framework provided in Chapter 3. The operational, technical, regulatory and organizational requirements aid the development of the conditions and standards that will apply to the competencies and observable behaviours.

2.3.3.5.2 The same task list and requirements are used to develop the training plan. The training plan is used to prepare the trainees to undertake assessment to determine if they are competent in accordance with the adapted competency model. The adapted competency model and the training plan are used to develop the assessment plan.

2.3.3.5.3 The syllabus in the training plan is composed of training objectives derived from tasks and sub-tasks as well as the underlying knowledge, skills and attitudes necessary to perform them. The knowledge, skills and attitudes

are determined on the basis of the task list in conjunction with operational, technical, regulatory and organizational requirements. Chapter 5 provides a generic task/knowledge matrix table that can be used as a tool to map out the knowledge necessary to perform specific tasks. Tasks corresponding to the list provided in Chapter 3 are listed across the columns of the table and subject matter (knowledge) is listed down the rows. The employer should indicate what knowledge is needed for a particular task within the organization with a check mark at the point at which the task element and the knowledge element intersect. To facilitate this process, some knowledge components have been blacked out if they are considered to be completely irrelevant to specific tasks. The level of knowledge and/or skills necessary will differ depending on the task. For example, the person accepting dangerous goods will not require the same level of knowledge and/or skills related to classification as someone who is classifying dangerous goods.

2.3.3.5.4 When assessing whether competence has been achieved, the adapted competency model, not the syllabus, is referenced. Consequently, the performance criteria are used to assess if competence has been achieved, and the tasks/sub-tasks that are carried out by the trainee are the “vehicle” for enabling the assessment to be conducted. Figure 2-5 illustrates the relationship between Workflows 1 and 2.

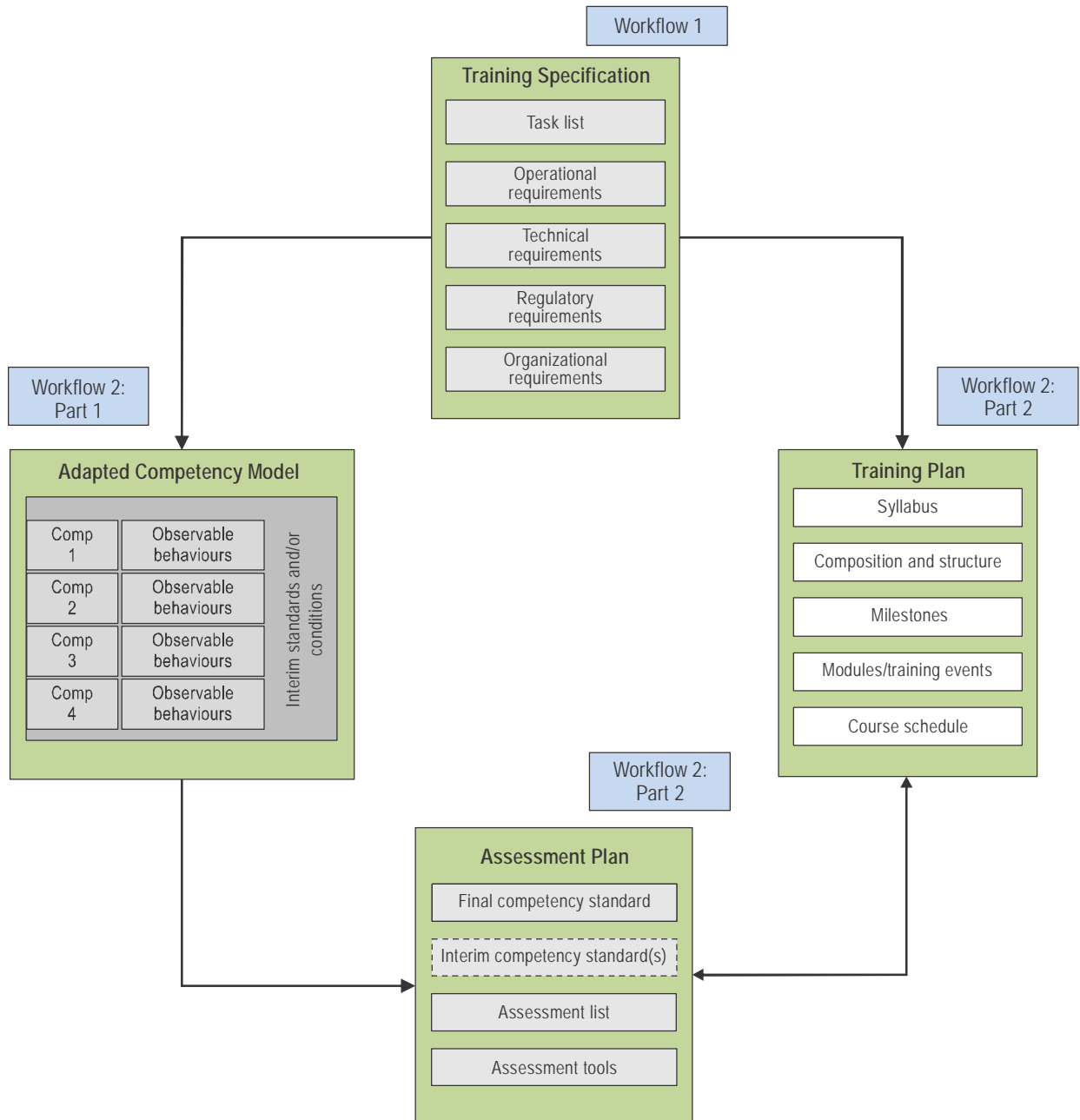


Figure 2-5. Relationship between Workflow 1 and Workflow 2

2.3.4 Workflow 3 — Develop the training and assessment materials

The third phase in the development and implementation of a competency-based training and assessment programme is the development of the training and assessment materials. Development is based on the adapted competency model and the training and assessment plans. Training and assessment materials include but are not limited to training notes, exercise briefings, practical exercises, case studies, presentations, video clips, self-test quizzes, examinations, assessments and assessment tools. Figure 2-6 illustrates a detailed overview of this workflow.

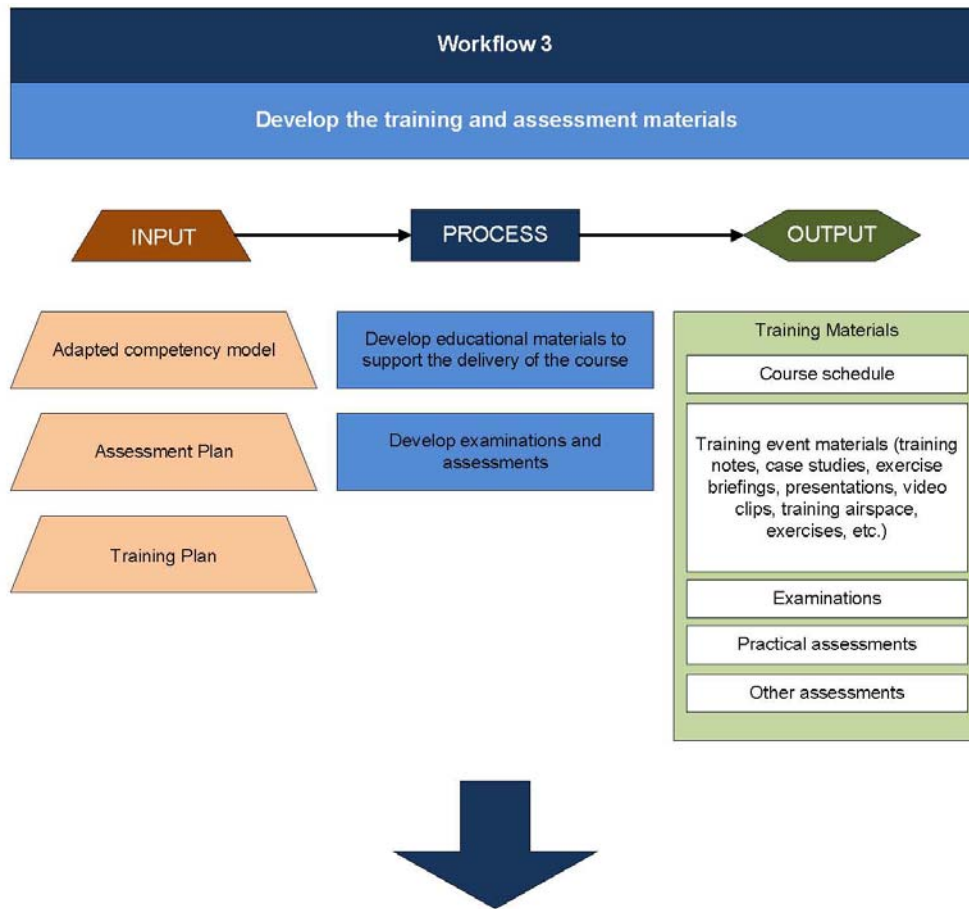


Figure 2-6. Workflow 3 — Develop the training and assessment materials

2.3.5 Workflow 4 — Conduct the course in accordance with the training and assessment plans

The fourth phase in the development and implementation of a competency-based training and assessment programme is conducting the course in accordance with the training and assessment plans. This involves delivering the training; monitoring the progress of the trainees; providing timely and continuous feedback on their performance; diagnosing deficiencies in the training and addressing them in a timely manner; and carrying out assessments according to the assessment plan. The goal of this phase is a competent employee. Figure 2-7 illustrates a detailed overview of this workflow.

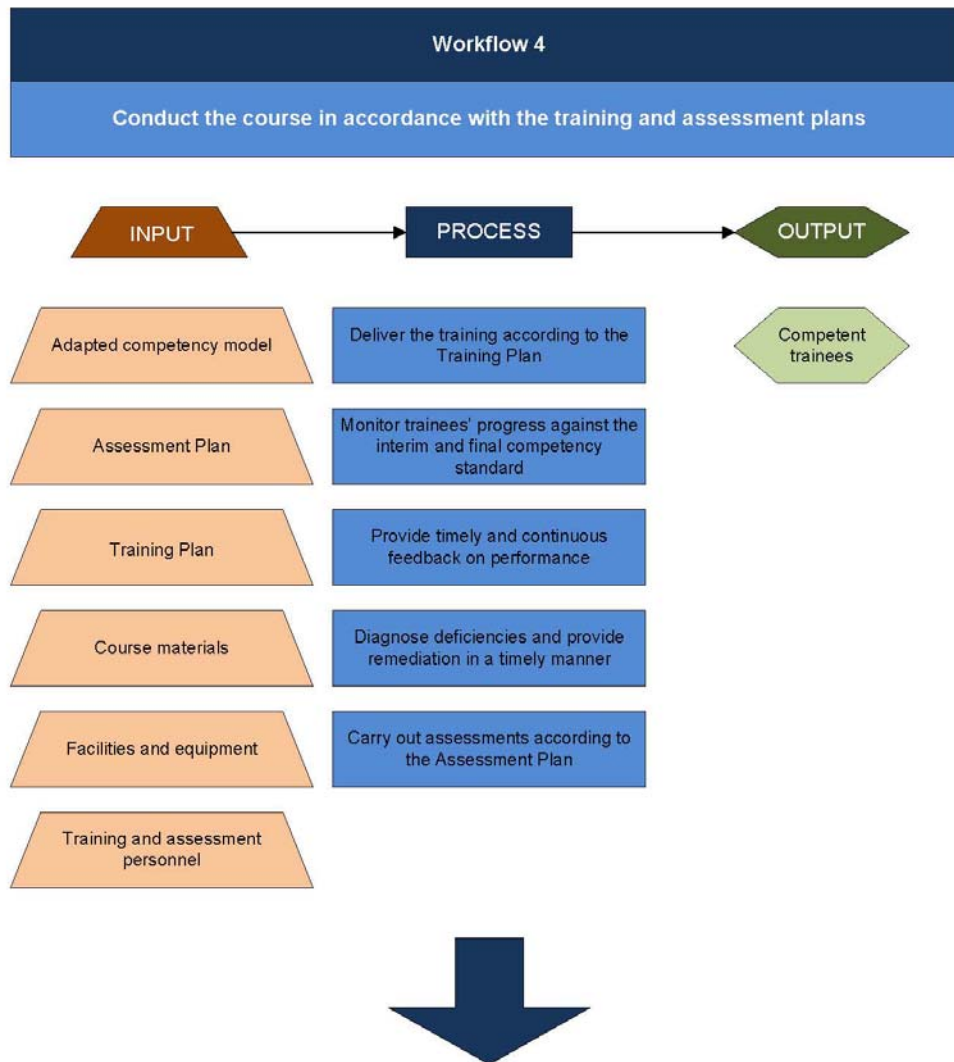


Figure 2-7. Workflow 4 — Conduct the course in accordance with the training and assessment plans

2.3.6 Workflow 5 — Evaluate the course including the training and assessment plans

The employer is responsible for ensuring the effectiveness of the training programme. At the end of a period of training, feedback on performance on the job from trainees, instructors, assessors and employers should be gathered to determine the effectiveness of the training and assessment in supporting the progression of learning towards competence in the workplace. Evaluation of the training should be based on valid and reliable evidence such as course results, trainee feedback, instructor feedback, audit reports, and occurrence reports. This evaluation may lead to changes or improvements being made to the competency-based training and assessment design. Figure 2-8 illustrates a detailed overview of this workflow.

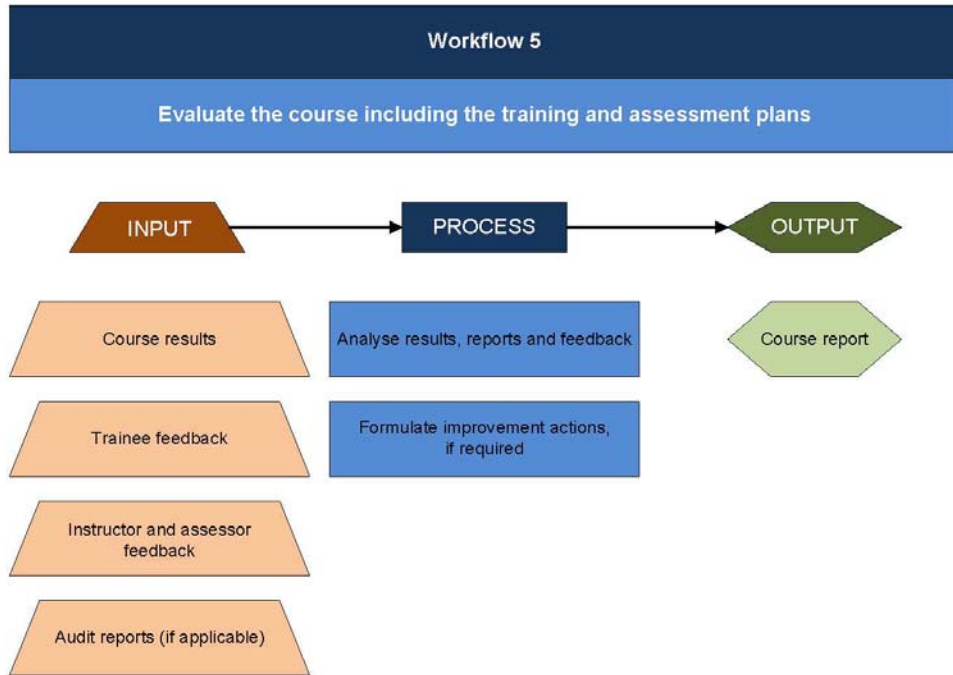


Figure 2-8. Workflow 5 — Evaluate the course including the training and assessment plans

Chapter 3

GENERIC COMPETENCY FRAMEWORK FOR DANGEROUS GOODS PERSONNEL

This chapter contains a generic ICAO competency framework for dangerous goods personnel as described in Chapter 2. Employers implementing competency-based training and assessment should adapt the framework into an adapted competency model based on their specific requirements. The adapted competency model should include the elements listed in 2.2.2.2.

Generic ICAO competency framework for dangerous goods personnel

<i>Generic competency</i>	<i>Description</i>	<i>Observable behaviour</i>
Application of procedures and compliance with regulations	Identifies and applies appropriate procedures in accordance with published operating instructions and in compliance with applicable regulations	Identifies where to find procedures and regulations
		Follows relevant procedures in a timely manner
		Complies with applicable regulations
		Applies relevant procedural knowledge
Communication	Communicates through appropriate means in the work environment, in both normal and non-normal situations	Ensures the recipient is ready and able to receive information
		Selects appropriately what, when, how and with whom to communicate
		Conveys messages clearly, accurately and concisely
		Confirms that the recipient correctly understands important information
		Listens actively and demonstrates understanding when receiving information
		Asks relevant and effective questions
		Completes accurate reports as required by operating procedures
		Announces deviations from normal or intended conditions
		Correctly uses and interprets non-verbal communication

<i>Generic competency</i>	<i>Description</i>	<i>Observable behaviour</i>
Leadership, teamwork and self-management	Demonstrates effective leadership, teamwork and self-management	Encourages team participation and open communication
		Demonstrates initiative and provides direction when required
		Engages others in planning
		Considers inputs from others
		Gives and receives feedback constructively
		Addresses and resolves conflicts and disagreements in a constructive manner
		Exercises decisive leadership
		Admits mistakes and takes responsibility for own performance, detecting and resolving own errors
		Carries out instructions when directed and applies effective intervention strategies when necessary
		Confidently intervenes when important for safety
		Self-evaluates the effectiveness of actions
Problem-solving and decision-making	Identifies problem precursors and resolves actual problems using decision-making techniques, in a timely manner	Seeks accurate and adequate information from appropriate sources
		Identifies and verifies what and why things have gone wrong
		Employs proper problem-solving strategies
		Perseveres in working through problems while prioritizing safety
		Uses appropriate and timely decision-making techniques
		Sets priorities appropriately
		Identifies and considers options as appropriate
		Monitors, reviews, and adapts decisions as required
		Identifies, assesses and manages risks and threats to safety effectively
		Adapts when faced with situations where no guidance or procedure exists
		When an event conducive to startle is encountered, recognizes and manages the situation
Workload management	Maintains available workload capacity by prioritizing and distributing tasks using appropriate resources	Exercises self-control in all situations
		Plans, prioritizes and schedules tasks effectively
		Manages time efficiently when carrying out tasks
		Offers and gives assistance, delegates when necessary
		Seeks and accepts assistance, when appropriate
		Monitors, reviews and cross-checks actions conscientiously

<i>Generic competency</i>	<i>Description</i>	<i>Observable behaviour</i>
		Verifies that tasks are completed to the expected outcome
		Manages and recovers from interruptions, distractions, variations and failures effectively while performing tasks

Chapter 4

DANGEROUS GOODS TASK LIST

This chapter contains a generic list of tasks typically performed by dangerous goods personnel as described in Chapter 1, 1.7. It is an indicative list provided as guidance. More tasks may need to be added or removed depending on the scope of the employer's operations. The employer should therefore adapt this task list to reflect the specific tasks performed by its personnel.

Generic dangerous goods task list

- 1 Classifying dangerous goods
 - 1.1 Evaluate substance or article against classification criteria
 - 1.1.1 Determine if it is dangerous goods
 - 1.1.2 Determine if it is forbidden under any circumstances
 - 1.2 Determine dangerous goods description
 - 1.2.1 Determine class or division
 - 1.2.2 Determine packing group
 - 1.2.3 Determine proper shipping name and UN number
 - 1.2.4 Determine if it is forbidden unless approval or exemption is granted
 - 1.3 Review special provisions
 - 1.3.1 Assess if special provision(s) is applicable
 - 1.3.2 Apply special provision(s)
- 2 Preparing dangerous goods shipment
 - 2.1 Assess packing options including quantity limitations
 - 2.1.1 Consider limitations (de minimis quantities, excepted quantities, limited quantities, passenger aircraft, cargo aircraft only, special provisions, dangerous goods in the mail)
 - 2.1.2 Consider State and operator variations
 - 2.1.3 Determine if all-packed-in-one can be used
 - 2.1.4 Select how dangerous goods will be shipped based on limitations and variations
 - 2.2 Apply packing requirements
 - 2.2.1 Consider constraints of packing instructions
 - 2.2.2 Select appropriate packaging materials (absorbent, cushioning, etc.)
 - 2.2.3 Assemble package
 - 2.2.4 Comply with the packaging test report when UN specification packaging is required

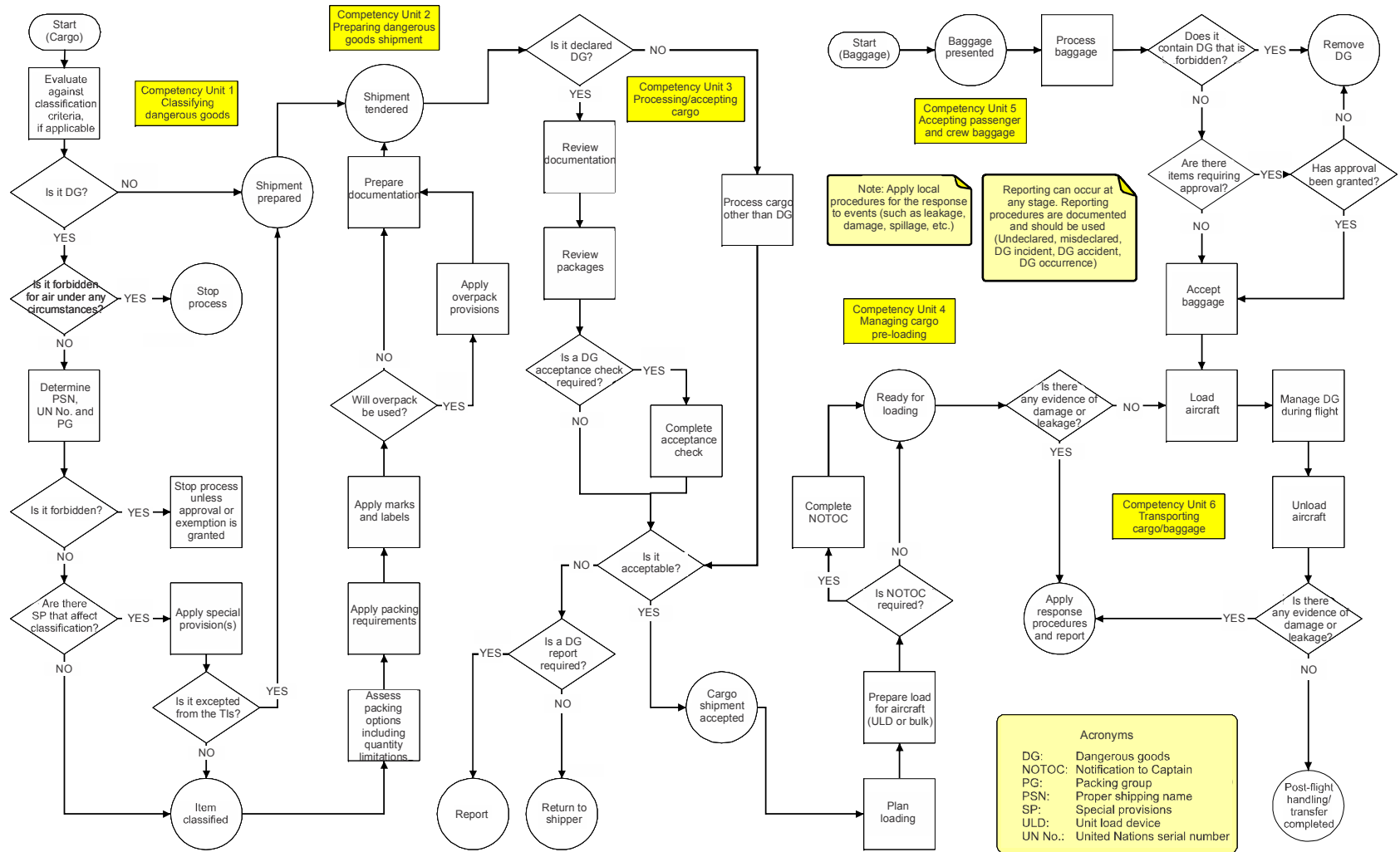
- 2.3 Apply marks and labels
 - 2.3.1 Determine applicable marks
 - 2.3.2 Apply marks
 - 2.3.3 Determine applicable labels
 - 2.3.4 Apply labels
- 2.4 Assess use of overpack
 - 2.4.1 Determine if overpack can be used
 - 2.4.2 Apply marks if necessary
 - 2.4.3 Apply labels if necessary
- 2.5 Prepare documentation
 - 2.5.1 Complete the dangerous goods transport document
 - 2.5.2 Complete other transport documents (e.g. air waybill)
 - 2.5.3 Include other required documentation (approvals/exemptions, etc.)
 - 2.5.4 Retain copies of documents as required
- 3 Processing/accepting cargo
 - 3.1 Review documentation
 - 3.1.1 Verify dangerous goods transport document
 - 3.1.2 Verify other transport documents (e.g. air waybill)
 - 3.1.3 Verify other documents (exemptions, approvals, etc.)
 - 3.1.4 Verify State/operator variations
 - 3.2 Review package(s)
 - 3.2.1 Verify marks
 - 3.2.2 Verify labels
 - 3.2.3 Verify package type
 - 3.2.4 Verify package conditions
 - 3.2.5 Verify State/operator variations
 - 3.3 Complete acceptance procedures
 - 3.3.1 Complete acceptance checklist
 - 3.3.2 Provide shipment information for load planning
 - 3.3.3 Retain documents as required
 - 3.4 Process/accept cargo other than dangerous goods
 - 3.4.1 Check documentation for indications of undeclared dangerous goods
 - 3.4.2 Check packages for indications of undeclared dangerous goods

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- 4 Managing cargo pre-loading
 - 4.1 Plan loading
 - 4.1.1 Determine stowage requirements
 - 4.1.2 Determine segregation, separation, aircraft/compartment limitations
 - 4.2 Prepare load for aircraft
 - 4.2.1 Check packages for indications of undeclared dangerous goods
 - 4.2.2 Check for damage and/or leakage
 - 4.2.3 Apply stowage requirements (e.g. segregation, separation, orientation)
 - 4.2.4 Apply ULD tags when applicable
 - 4.2.5 Transport cargo to aircraft
 - 4.3 Issue NOTOC
 - 4.3.1 Enter required information
 - 4.3.2 Verify conformance with load plan
 - 4.3.3 Transmit to loading personnel
 - 5 Accepting passenger and crew baggage
 - 5.1 Process baggage
 - 5.1.1 Identify forbidden dangerous goods
 - 5.1.2 Apply approval requirements
 - 5.2 Accept baggage
 - 5.2.1 Apply operator requirements
 - 5.2.2 Verify passenger baggage requirements
 - 5.2.3 Advise pilot-in-command

- 6 Transporting cargo/baggage
 - 6.1 Load aircraft
 - 6.1.1 Transport cargo/baggage to aircraft
 - 6.1.2 Check packages for indications of undeclared dangerous goods
 - 6.1.3 Check for damage and/or leakage
 - 6.1.4 Apply stowage requirements (e.g. segregation, separation, orientation, securing and protecting from damage)
 - 6.1.5 Verify that NOTOC reflects against aircraft load
 - 6.1.6 Verify passenger baggage requirements
 - 6.1.7 Inform pilot-in-command and flight operations officer/flight dispatcher
 - 6.2 Manage dangerous goods pre- and during flight
 - 6.2.1 Detect presence of dangerous goods not permitted in baggage
 - 6.2.2 Interpret NOTOC
 - 6.2.3 Apply procedures in the event of an emergency
 - 6.2.4 Inform flight operations officer/flight dispatcher/air traffic control in the event of an emergency
 - 6.2.5 Inform emergency services of the dangerous goods on board in the event of an emergency
 - 6.3 Unload aircraft
 - 6.3.1 Apply specific unloading considerations
 - 6.3.2 Check packages for indications of undeclared dangerous goods
 - 6.3.3 Check for damage and/or leakage
 - 6.3.4 Transport cargo/baggage to facility/terminal
 - 7 Collecting safety data
 - 7.1 Report dangerous goods accidents
 - 7.2 Report dangerous goods incidents
 - 7.3 Report undeclared/misdeclared dangerous goods
 - 7.4 Report dangerous goods occurrences
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Appendix A to Chapter 4

DANGEROUS GOODS FUNCTIONS — PROCESS FLOWCHART



Dangerous goods knowledge	Dangerous goods tasks																							
	1. Classifying dangerous goods			2. Preparing dangerous goods shipment					3. Processing/ accepting cargo				4. Managing cargo pre-loading			5. Accepting passenger and crew baggage		6. Transporting cargo/baggage			7. Collecting safety data			
	1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	4.1	4.2	4.3	5.1	5.2	6.1	6.2	6.3	7.1	7.2	7.3	7.4
Classification — Class 2																								
Classification — Class 3																								
Classification — Class 4																								
Classification — Class 5																								
Classification — Class 6																								
Classification — Class 7																								
Classification — Class 8																								
Classification — Class 9																								
Dangerous goods list — General																								
Dangerous goods list — Arrangement																								
Special provisions																								
Dangerous goods in limited quantities																								
Dangerous goods packed in excepted quantities																								
Packing Instructions — General																								
Packing Instructions — Class 1																								
Packing Instructions — Class 2																								
Packing Instructions — Class 3																								

Dangerous goods knowledge	Dangerous goods tasks																							
	1. Classifying dangerous goods			2. Preparing dangerous goods shipment					3. Processing/ accepting cargo				4. Managing cargo pre-loading			5. Accepting passenger and crew baggage		6. Transporting cargo/baggage			7. Collecting safety data			
	1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	4.1	4.2	4.3	5.1	5.2	6.1	6.2	6.3	7.1	7.2	7.3	7.4
Packing Instructions — Class 4	■		■										■	■	■	■	■	■	■	■				
Packing Instructions — Class 5	■												■	■	■	■	■	■	■	■				
Packing Instructions — Class 6	■												■	■	■	■	■	■	■	■				
Packing Instructions — Class 7													■	■	■	■	■	■	■	■				
Packing Instructions — Class 8	■												■	■	■	■	■	■	■	■				
Packing Instructions — Class 9	■												■	■	■	■	■	■	■	■				
Preparing dangerous goods shipment — general													■	■	■	■	■	■	■	■				
Package markings	■	■																						
Labelling	■	■		■																				
Documentation	■	■	■	■	■	■	■						■	■	■	■	■	■	■	■				
Packaging applicability, nomenclature and codes	■	■	■			■	■						■	■	■	■	■	■	■	■				
Marking of packagings other than inner packagings	■	■		■	■								■	■	■	■	■	■	■	■				
Requirements for packagings	■	■											■	■	■	■	■	■	■	■				
Packaging performance tests	■	■				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				

Dangerous goods knowledge	Dangerous goods tasks																							
	1. Classifying dangerous goods			2. Preparing dangerous goods shipment					3. Processing/ accepting cargo				4. Managing cargo pre-loading			5. Accepting passenger and crew baggage		6. Transporting cargo/baggage			7. Collecting safety data			
	1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	4.1	4.2	4.3	5.1	5.2	6.1	6.2	6.3	7.1	7.2	7.3	7.4
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	█					█	█						█	█	█	█	█	█	█	█				
Packagings for infectious substances of Category A	█	█	█			█	█						█	█	█	█	█	█	█	█				
Requirements for the construction, testing and approval of packages for radioactive material and for the approval of such material						█	█						█	█	█	█	█	█	█	█				
Acceptance procedures	█	█	█	█	█	█	█	█					█	█	█	█	█	█	█	█				
Storage and loading	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█				
Inspection and decontamination	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█				
Provision of information	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█				
Provisions concerning passengers and crew																								
Provisions to aid recognition of undeclared dangerous goods	█																							
Helicopter operations	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█				

Tasks

1. Classifying dangerous goods
 - 1.1 — Evaluate substance or article against classification criteria
 - 1.2 — Determine dangerous goods description
 - 1.3 — Review special provisions
 2. Preparing dangerous goods shipment
 - 2.1 — Assess packing options including quantity limitations
 - 2.2 — Apply packing requirements
 - 2.3 — Apply marks and labels
 - 2.4 — Assess use of overpack
 - 2.5 — Prepare documentation
 3. Processing/accepting cargo
 - 3.1 — Review documentation
 - 3.2 — Review package(s)
 - 3.3 — Complete acceptance procedures
 - 3.4 — Process/accept cargo other than dangerous goods
 4. Managing cargo pre-loading
 - 4.1 — Plan loading
 - 4.2 — Prepare load for aircraft
 - 4.3 — Issue NOTOC
 5. Accepting passenger and crew baggage
 - 5.1 — Process baggage
 - 5.2 — Accept baggage
 6. Transporting cargo/baggage
 - 6.1 — Load aircraft
 - 6.2 — Manage dangerous goods pre- and during flight
 - 6.3 — Unload aircraft
 7. Collecting safety data
 - 7.1 — Report dangerous goods accidents
 - 7.2 — Report dangerous goods incidents
 - 7.3 — Report undeclared/misdeclared dangerous goods
 - 7.4 — Report dangerous goods occurrences
-

Appendix A to Chapter 5

EXAMPLE ADAPTED TASK LISTS FOR CERTAIN WELL-DEFINED ROLES

A. INTRODUCTION

The examples below indicate the tasks from the task list provided in Chapter 3 that personnel responsible for certain well-defined functions would typically perform and for which training and assessment would therefore be required. Personnel would need to have relevant knowledge to competently perform these tasks. The task/knowledge matrix tool provided in Chapter 5 may be used as a guide for determining what knowledge is needed for a given task. The examples in this chapter and the task/knowledge tool provided in Chapter 5 may be used for designing training programmes. However, they should not be considered as mandatory. Additional training and assessment may be required for personnel assigned additional responsibilities, and less training and assessment may be required for personnel assigned fewer responsibilities than those presented in these lists. The employer is responsible for ensuring employees are competent to perform the functions for which they are responsible and must therefore ensure that training programmes are designed to accomplish this. Dangerous goods training programmes are subject to State approval in accordance with national regulations, policies and procedures.

B. PERSONNEL RESPONSIBLE FOR PREPARATION OF DANGEROUS GOODS CONSIGNMENTS

Training and assessment for personnel preparing dangerous goods consignments for transport may be tailored to address only those classes, divisions or even UN numbers that they prepare for transport. Training and assessment may also be limited to address only the specific tasks personnel perform. For example, where personnel are only responsible for the packing, marking and labelling of packages and overpacks, training and assessment may be tailored to address just those tasks. Personnel would need to have relevant knowledge to competently perform these functions. The task/knowledge matrix tool provided in Chapter 5 may be used as a guide for determining what knowledge is needed. The following are tasks personnel responsible for preparation of dangerous goods consignments typically perform and for which training and assessment would therefore be required:

1 Classifying dangerous goods

- 1.1 Evaluate substance or article against classification criteria
 - 1.1.1 Determine if it is dangerous goods
 - 1.1.2 Determine if it is forbidden under any circumstances
- 1.2 Determine dangerous goods description
 - 1.2.1 Determine class or division
 - 1.2.2 Determine packing group
 - 1.2.3 Determine proper shipping name and UN number
 - 1.2.4 Determine if it is forbidden unless approval or exemption is granted
- 1.3 Review special provisions
 - 1.3.1 Assess if special provision(s) is applicable
 - 1.3.2 Apply special provision(s)

2 Preparing dangerous goods shipment

- 2.1 Assess packing options including quantity limitations
 - 2.1.1 Consider limitations (de minimis quantities, excepted quantities, limited quantities, passenger aircraft, cargo aircraft only, special provisions, dangerous goods in the mail)
 - 2.1.2 Consider State and operator variations
 - 2.1.3 Determine if all-packed-in-one can be used
 - 2.1.4 Select how dangerous goods will be shipped based on limitations and variations
- 2.2 Apply packing requirements
 - 2.2.1 Consider constraints of packing instructions
 - 2.2.2 Select appropriate packaging materials (absorbent, cushioning, etc.)
 - 2.2.3 Assemble package
 - 2.2.4 Comply with the packaging test report when UN specification packaging is required
- 2.3 Apply marks and labels
 - 2.3.1 Determine applicable marks
 - 2.3.2 Apply marks
 - 2.3.3 Determine applicable labels
 - 2.3.4 Apply labels
- 2.4 Assess use of overpack
 - 2.4.1 Determine if overpack can be used
 - 2.4.2 Apply marks if necessary
 - 2.4.3 Apply labels if necessary
- 2.5 Prepare documentation
 - 2.5.1 Complete the dangerous goods transport document
 - 2.5.2 Complete other transport documents (e.g. air waybill)
 - 2.5.3 Include other required documentation (approvals/exemptions, etc.)
 - 2.5.4 Retain copies of documents as required

7 Collecting safety data

- 7.1 Report dangerous goods accidents
- 7.2 Report dangerous goods incidents
- 7.3 Report undeclared/misdeclared dangerous goods
- 7.4 Report dangerous goods occurrences

**C. PERSONS RESPONSIBLE FOR PROCESSING OR ACCEPTING GOODS PRESENTED
AS GENERAL CARGO**

Personnel responsible for processing goods presented as general cargo [should/must] be competent to perform tasks aimed at preventing undeclared dangerous goods from being loaded on an aircraft. They may work for freight forwarders, ground handling agents or operators. Personnel would need to have relevant knowledge to competently perform these tasks. The task/knowledge matrix tool provided in Chapter 5 may be used as a guide for determining what knowledge is needed. They may need additional knowledge and be capable of performing at a more advanced skill level depending on the actual responsibilities assigned. The following are tasks aimed at preventing undeclared dangerous goods from being loaded on aircraft that such personnel would typically perform and for which training and assessment may be required.

3 Processing/accepting cargo

- 3.4 Process/accept cargo other than dangerous goods
 - 3.4.1 Check documentation for indications of undeclared dangerous goods
 - 3.4.2 Check packages for indications of undeclared dangerous goods

7 Collecting safety data

- 7.1 Report dangerous goods accidents
- 7.2 Report dangerous goods incidents
- 7.3 Report undeclared/misdeclared dangerous goods
- 7.4 Report dangerous goods occurrences

**D. PERSONNEL RESPONSIBLE FOR PROCESSING OR ACCEPTING
DANGEROUS GOODS CONSIGNMENTS**

The following are tasks personnel responsible for processing or accepting dangerous goods consignments typically perform and for which training and assessment would therefore be required:

3 Processing/accepting cargo

- 3.1 Review documentation
 - 3.1.1 Verify air waybill
 - 3.1.2 Verify dangerous goods transport document
 - 3.1.3 Verify other documents (exemptions, approvals, etc.)
 - 3.1.4 Verify State/operator variations
- 3.2 Review package(s)
 - 3.2.1 Verify marks
 - 3.2.2 Verify labels
 - 3.2.3 Verify package type
 - 3.2.4 Verify package conditions
 - 3.2.5 Verify State/operator variations
- 3.3 Complete acceptance procedures
 - 3.3.1 Complete acceptance checklist
 - 3.3.2 Provide shipment information for load planning
 - 3.3.3 Retain documents as required

7 Collecting safety data

- 7.1 Report dangerous goods accidents
- 7.2 Report dangerous goods incidents
- 7.3 Report undeclared/misdeclared dangerous goods
- 7.4 Report dangerous goods occurrences

**E. PERSONS RESPONSIBLE FOR HANDLING CARGO IN A WAREHOUSE,
LOADING AND UNLOADING UNIT LOAD DEVICES AND
LOADING AND UNLOADING AIRCRAFT CARGO COMPARTMENTS**

The following are tasks personnel responsible for handling cargo in a warehouse, loading and unloading unit load devices, and loading and unloading passenger baggage and aircraft cargo compartments typically perform and for which training and assessment would therefore be required:

4 Managing cargo pre-loading

4.2 Prepare load for aircraft

- 4.2.1 Check packages for indications of undeclared dangerous goods
- 4.2.2 Check for damage and/or leakage
- 4.2.3 Apply stowage requirements (e.g. segregation, separation, orientation)
- 4.2.4 Apply ULD tags when applicable
- 4.2.5 Transport cargo to aircraft

6 Transporting cargo/baggage

6.1 Load aircraft

- 6.1.1 Transport cargo/baggage to aircraft
- 6.1.2 Check packages for indications of undeclared dangerous goods
- 6.1.3 Check for damage and/or leakage
- 6.1.4 Apply stowage requirements (e.g. segregation, separation, orientation, securing and protecting from damage)
- 6.1.5 Verify that NOTOC reflects against aircraft load
- 6.1.6 Verify passenger baggage requirements
- 6.1.7 Inform pilot-in-command and flight operations officer/flight dispatcher

6.3 Unload aircraft

- 6.3.1 Apply specific unloading considerations
- 6.3.2 Check packages for indications of undeclared dangerous goods
- 6.3.3 Check for damage and/or leakage
- 6.3.4 Transport cargo/baggage to facility/terminal

7 Collecting safety data

- 7.1 Report dangerous goods accidents
- 7.2 Report dangerous goods incidents
- 7.3 Report undeclared/misdeclared dangerous goods
- 7.4 Report dangerous goods occurrences

**F. PERSONS RESPONSIBLE FOR ACCEPTING PASSENGER AND CREW BAGGAGE,
MANAGING AIRCRAFT BOARDING AREAS AND OTHER TASKS INVOLVING
DIRECT PASSENGER CONTACT AT AN AIRPORT**

The following are tasks personnel responsible for accepting passenger and crew baggage, managing aircraft boarding areas, and other functions involving direct passenger contact at an airport typically perform and for which training and assessment would therefore be required.

5 Accepting passenger and crew baggage

- 5.1 Process baggage
 - 5.1.1 Identify forbidden dangerous goods
 - 5.1.2 Apply approval requirements
- 5.2 Accept baggage
 - 5.2.1 Apply operator requirements
 - 5.2.2 Verify passenger baggage requirements
 - 5.2.3 Advise pilot-in-command

7 Collecting safety data

- 7.1 Report dangerous goods accidents
- 7.2 Report dangerous goods incidents
- 7.3 Report undeclared/misdeclared dangerous goods
- 7.4 Report dangerous goods occurrences

G. PERSONNEL RESPONSIBLE FOR THE PLANNING OF AIRCRAFT LOADING

The following are tasks personnel responsible for planning of aircraft loading (passengers, baggage, mail and cargo) would typically perform and for which training and assessment would therefore be required:

4 Managing cargo pre-loading

- 4.1 Plan loading
 - 4.1.1 Determine stowage requirements
 - 4.1.2 Determine segregation, separation, aircraft/compartment limitations
- 4.3 Issue NOTOC
 - 4.3.1 Enter required information
 - 4.3.2 Verify conformance with load plan
 - 4.3.3 Transmit to loading personnel

H. FLIGHT CREW

The following are tasks the flight crew would typically perform and for which training and assessment would therefore be required:

6 Transporting cargo/baggage

- 6.2 Manage dangerous goods pre- and during flight
 - 6.2.1 Detect presence of dangerous goods not permitted in baggage
 - 6.2.2 Interpret NOTOC
 - 6.2.3 Apply procedures in the event of an emergency
 - 6.2.4 Inform flight operations officer/flight dispatcher/air traffic control in the event of an emergency
 - 6.2.5 Inform emergency services of the dangerous goods on board in the event of an emergency

7 Collecting safety data

- 7.1 Report dangerous goods accidents
- 7.2 Report dangerous goods incidents
- 7.3 Report undeclared/misdeclared dangerous goods
- 7.4 Report dangerous goods occurrences

I. FLIGHT OPERATIONS OFFICERS AND FLIGHT DISPATCHERS

The following are tasks flight operations officers and flight dispatchers would typically perform and for which training and assessment would therefore be required:

6 Transporting cargo/baggage

- 6.2 Manage dangerous goods pre- and during flight
 - 6.2.2 Interpret NOTOC
 - 6.2.3 Apply procedures in the event of an emergency
 - 6.2.5 Inform emergency services of the dangerous goods on board in the event of an emergency

J. CABIN CREW

The following are tasks the cabin crew would typically perform and for which training and assessment would therefore be required:

5 Accepting passenger and crew baggage

- 5.2 Accept baggage
 - 5.2.1 Apply operator requirements
 - 5.2.2 Verify passenger baggage requirements
 - 5.2.3 Advise pilot-in-command

6 Transporting cargo/baggage

- 6.2 Manage dangerous goods pre- and during flight
 - 6.2.1 Detect presence of dangerous goods not permitted in baggage
 - 6.2.2 Interpret NOTOC
 - 6.2.3 Apply procedures in the event of an emergency
 - 6.2.4 Inform flight operations officer/flight dispatcher/air traffic control in the event of an emergency
 - 6.2.5 Inform emergency services of the dangerous goods on board in the event of an emergency

7 Collecting safety data

- 7.1 Report dangerous goods accidents
- 7.2 Report dangerous goods incidents
- 7.3 Report undeclared/misdeclared dangerous goods
- 7.4 Report dangerous goods occurrences

K. PERSONNEL RESPONSIBLE FOR THE SCREENING OF PASSENGERS AND CREW AND THEIR BAGGAGE, CARGO AND MAIL

The following are tasks that personnel responsible for the screening of passengers and crew and their baggage, cargo and mail would typically perform and for which training and assessment would therefore be required:

3 Processing/accepting cargo

- 3.4 Process/accept cargo other than dangerous goods
 - 3.4.2 Check packages for indications of undeclared dangerous goods

5 Accepting passenger and crew baggage

- 5.1 Process baggage
 - 5.1.1 Identify forbidden dangerous goods
-

REFERENCES

Annex 6 — Operation of Aircraft

Annex 18 — The Safe Transport of Dangerous Goods by Air

Annex 19 — Safety Management

Procedures for Air Navigation Services — Training (PANS-TRG, Doc 9868)

Safety Management Manual (SMM), Doc 9859, 23rd Edition, 2013.

Technical Instructions for the Safe Transport of Dangerous Goods by Air (Technical Instructions) (Doc 9284)

APPENDIX D**AMENDMENTS TO THE GUIDANCE TO STATES ON COMPETENCY-BASED TRAINING FOR STATE EMPLOYEES CONTAINED IN THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS**

Replace Part S-1;5 of the Supplement with the following new text:

Chapter 5**GUIDANCE TO STATES ON TRAINING FOR STATE EMPLOYEES INVOLVED IN THE TRANSPORT OF DANGEROUS GOODS BY AIR****5.1 INTRODUCTION**

Note.— Dangerous goods State employees include employees performing safety management functions related to dangerous goods transport. In this document, “State” refers to the authority that is signatory to the Chicago Convention and which normally establishes a civil aviation authority (CAA) and other aviation-related authorities.

The objective of this chapter is to provide guidance to States on ensuring qualified State employees engaged in safety management of the transport of dangerous goods by air are recruited and that their qualifications are maintained through the implementation of competency-based training and assessment. The principles contained in it are elaborated in the *Manual on the Competencies of Civil Aviation Safety Inspectors* (Doc 10070), which provides guidance on the development and maintenance of a competent civil aviation safety inspectors workforce, and the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868), which provides greater detail on competency-based training and assessment. Guidance on competency-based training for dangerous goods personnel is provided in *Guidance on Competency-based Dangerous Goods Training and Assessment* (Doc xxxx).

5.2 Background

5.2.1 To effectively fulfil its responsibilities, a State civil aviation system needs to be properly organized and staffed with qualified personnel capable of accomplishing a wide range of technical duties involved in safety management. ICAO's *Global Aviation Safety Plan (GASP)* (Doc 10004), together with its *Global Air Navigation Plan (GANP)* (Doc 9750), define the means and targets by which ICAO, States and aviation stakeholders can anticipate and efficiently manage air traffic growth while proactively maintaining or increasing safety. The documents and their amendments are approved by the Council prior to endorsement by the Assembly. Their overarching priority is to continually reduce the global accident rate. The GASP identifies the recruitment and retention of qualified personnel and continued investment in initiatives that develop and enhance the skills of the aviation workforce as a key component towards success in achieving its objectives. An “investing in people” approach enables advances in both educational and training programmes to ensure that employees have the skills necessary to operate the international aviation system safely as it undergoes significant growth and change. The introduction of ICAO provisions that enable more systematic training methodologies include competency-based training and assessment.

5.2.2 Annex 19 — *Safety Management* identifies eight elements critical to an effective safety oversight system. The fourth critical element (CE-4) requires States to establish minimum qualification requirements for technical personnel performing safety-related functions and to provide for appropriate initial and recurrent training to maintain and enhance their competence at the desired level. CE-4 also requires States to implement a system for the maintenance of training records for technical personnel. Data collected through the ICAO Universal Safety Oversight Audit Programme (USOAP) related to this critical element has revealed it to be the critical element with the lowest effective implementation rate at the global level. Data collected has also identified specific deficiencies and inconsistencies in relation to dangerous goods safety oversight programmes globally. For example, some States have clearly established formal dangerous goods training programmes for State employees while others do not. A competency-based approach to training and assessment applying the principles provided in this chapter ensures the recruitment of appropriate/suitable personnel and the development of competent employees. It also encourages harmonized performance standards of dangerous goods State employees globally.

5.3 DANGEROUS GOODS STATE EMPLOYEES

5.3.1 The transport of dangerous goods is recognized as an integral part of a State's safety programme. A training programme should be developed for each staff position commensurate with its responsibilities. This training programme should include all the training required for the new and current employees to acquire and maintain the necessary competencies. The training programme may include initial training, on the job training, recurrent training and all the specialized training necessary for that technical position, with the minimum content for each type of training, as applicable.

5.3.2 Dangerous goods State employees perform a variety of functions including supporting the development and implementation of a State's dangerous goods programme, approving and monitoring an operator's dangerous goods system, conducting oversight of dangerous goods operations, conducting State safety risk management and resolving identified safety issues. The State needs to train dangerous goods State employees to perform these functions competently. In addition to the vital importance of technical competency in performing these functions, it is critical that State employees possess a high degree of integrity, be impartial in carrying out their tasks, be tactful, have a good understanding of human nature and possess good communication skills. These are reflected in the generic task list and competency framework for State employees provided in Attachments I and III to this chapter, both of which are described in more detail below.

5.4 COMPETENCY-BASED TRAINING AND ASSESSMENT

5.4.1 Overview

A competency based training approach is a method of developing competent State employees. The goal of competency-based training and assessment is to produce a competent workforce by providing focused training. It does so by identifying key competencies that need to be achieved, determining the most effective way of achieving them and establishing valid and reliable assessment tools to evaluate their achievement. Competency-based training and assessment can yield the following benefits:

- a) It ensures that State employees achieve a level of performance that enables them to work independently and effectively.
- b) It supports decision-makers/managers in monitoring the ongoing competence of State employees through the identification and collection of assessment evidence.
- c) It supports the early identification of performance gaps and the design of more effective training to close the performance gap.
- d) It supports the development of effective recruitment and selection tools.
- e) It supports a more accurate analysis of how State employees' tasks, techniques and methods will be affected by changes which, in turn, will support the development of more effective continuation training.

All of these benefits contribute to an effective safety management system.

5.4.2 ICAO competency framework, adapted competency model and task list

5.4.2.1 Traditional approaches to training development involve the decomposition of jobs into tasks. For each task there is a related objective, an assessment and associated elements in a training plan. A limitation of this approach is that each task must be taught and assessed. In complex systems, or when jobs evolve rapidly, it may not be possible to teach and assess each task. Moreover, learners may demonstrate the ability to perform tasks in isolation without being competent in their job. Competency-based training and assessment is based on the concept that competencies are transferable. In the design of a competency-based training and assessment programme, the purpose of the training and tasks associated with this purpose are identified and a limited number of competencies are defined. In the design of training and assessments, tasks and activities are incorporated because they are useful for facilitating, developing or assessing a competency or competencies. Typically, a task will involve several competencies, and competencies may apply across a variety of tasks and settings. Specific tasks may be used to develop specific competencies. The lack of specific competencies may be identified as a root cause of failure in the performance of a task.

5.4.2.2 The A competency model provides a means of defining competencies by identifying those needed for a given role, describing them, and providing criteria for each. Generic, high-level competency frameworks for aviation personnel have been developed by ICAO and included in PANS-TRG and various ICAO documents. They are intended as a framework on which customized competency models can be developed.

5.4.2.3 An ICAO competency framework for dangerous goods State employees is provided in Attachment I to this chapter. It is based on the competencies described in the *Manual on the Competencies of Civil Aviation Safety Inspectors* (Doc 10070). States may adapt this framework into competency models that meet their needs. This customized model is identified as an *adapted competency model*, which is then used to develop competency-based training and assessment for a given role. A template for an adapted competency model is provided in Figure S-1. Guidance on developing an adapted competency model is provided in the PANS-TRG. A generic task list covering tasks typically performed by dangerous goods

State employees as part of an integrated State safety programme is provided in Attachment I to this chapter. States may use this list as a tool for developing specific training specifications for its personnel.

Table S-1-2. Template for an adapted competency model

Adapted competency	Description	Performance criteria		
		Observable behaviour	Competency assessment	
Adapted competency 1	Description 1	OB 1	Final competency standard	Conditions
		OB 2		
		OB n		
Adapted competency 2	Description 2	OB 1	Final competency standard	Conditions
		OB 2		
		OB n		
Adapted competency 3	Description 3	OB 1	Final competency standard	Conditions
		OB 2		
		OB n		

5.5 TERMINOLOGY

For the purpose of this chapter, the following terminology applies:

Adapted competency model. A group of competencies with their associated description and performance criteria adapted from an ICAO competency framework that an organization uses to develop competency-based training and assessment for a given role.

Competency. A dimension of human performance that is used to reliably predict successful performance on the job. A competency is manifested and observed through behaviours that mobilize the relevant knowledge, skills and attitudes to carry out activities or tasks under specified conditions.

Competency-based training and assessment. Training and assessment that are characterized by a performance orientation, emphasis on standards of performance and their measurement, and the development of training to the specified performance standards.

Competency standard. A level of performance that is defined as acceptable when assessing whether or not competency has been achieved.

ICAO competency framework. A competency framework, developed by ICAO, is a selected group of competencies for a given aviation discipline. Each competency has an associated description and observable behaviours.

Observable behaviour (OB). A single role-related behaviour that can be observed and may or may not be measurable.

Performance criteria. Statements used to assess whether the required levels of performance have been achieved for a competency. A performance criterion consists of an observable behaviour, condition(s) and a competency standard.

Operations manual. A manual containing procedures, instructions and guidance for use by operational personnel in the execution of their duties.

ATTACHMENT I TO CHAPTER 5

GENERIC COMPETENCY FRAMEWORK FOR STATE EMPLOYEES

1. SCOPE OF THE GENERIC COMPETENCY FRAMEWORK

1.1 The scope of the generic competency framework concerns State employees involved in the regulation and oversight of the transport of dangerous goods by air based on obligations of States according to the Convention on International Civil Aviation.

1.2 The State is responsible for implementing a system for determining compliance with Annex 18 and the relevant parts of Annex 6 and 19.

1.3 The application of the basic principles of a competency-based approach determines the performance level for State employees in carrying out their function to meet the State's obligations as defined by the Annex 18.

1.4 The dangerous goods-related activities referred to in the Universal Safety Oversight Audit Programme Continuous Monitoring Approach (USOAP CMA) are reflected in the competency framework. The details of the competency framework are based on common practices as applied by a number of States on training, operational procedures for inspection, surveillance and enforcement.

Generic ICAO competency framework for dangerous goods State employees

Generic competency	Description	Observable behaviour
Ethics and values	Demonstrates integrity, transparency, openness, respect and fairness and considers the consequences when making a decision or taking action. Acts consistently in accordance with fundamental values of the civil aviation authority.	Treats others respectfully, fairly and objectively regardless of differences.
		Answers questions truthfully without embellishment or attempt to cover up a lack of knowledge.
		Maintains privacy and confidentiality when appropriate.
		Manages professional relationships with appropriate role boundaries.
		Adheres to professional codes of conduct when taking action and making decisions.
		Takes responsibility for own actions.
		Identifies and mitigates conflict of interest situations.
		Acts with integrity.
		Uses resources of the CAA and stakeholders in a cost-conscious manner.
		Demonstrates the values of the CAA.
Communication	Effectively conveys, receives and understands information in oral, written and non-verbal modes.	Verifies that the recipient is prepared to receive information.
		Confirms that information conveyed was received and accurately understood.
		Listens actively and objectively without interrupting.
		Checks own understanding of other's communication (e.g. repeats or paraphrases, asks additional questions).
		Presents appropriate and accurate information in a clear, concise and compelling manner in all media.

Generic competency	Description	Observable behaviour
		<p>Adapts content, style, tone and media of communication to suit the target audience including cultural considerations and to promote dialogue.</p> <p>Understands other people's concerns.</p> <p>Maintains open lines of communication with management, stakeholders and colleagues.</p> <p>Communicates complex issues clearly and credibly with diverse audiences.</p> <p>Delivers difficult or unpopular messages with clarity, tact and diplomacy.</p>
Problem solving and decision making	Solves issues of varied levels of complexity, ambiguity and risk. Makes timely decisions that take into account relevant facts, tasks, goals, constraints, risks and conflicting points of view.	<p>Collects related and sufficient information from a variety of sources in a timely manner.</p> <p>Breaks down complex tasks into manageable parts.</p> <p>Considers multiple possible causes of problems.</p> <p>Identifies risks involved for different solutions to a problem.</p> <p>Identifies interdependencies between various components of a problematic situation.</p> <p>Develops solutions that address the situation in its entirety.</p> <p>Takes steps to mitigate medium- to long-term impact of solutions when developing solutions to fix immediate issues.</p> <p>Provides a rationale behind each decision.</p> <p>Makes timely decisions based on applicable rules and procedures.</p> <p>Responds decisively when inappropriate conduct is identified to affect positive change without delay.*</p> <p>Recognizes scope of own authority for decision making and escalates to the appropriate level if necessary.</p> <p>Demonstrates decisiveness when under pressure or faced with complex or sensitive situations.</p> <p>Incorporates lessons learnt in future decisions.</p>
Initiative	Identifies and addresses issues independently, proactively and persistently to achieve objectives.	<p>Seizes opportunities that arise.</p> <p>Acts promptly in a crisis situation.</p> <p>Deals with obstacles effectively.</p> <p>Looks for ways to enhance efficiency and effectiveness.</p> <p>Looks for resources to support objectives.</p> <p>Anticipates and acts on potential issues.</p> <p>Organizes personal workload to ensure excellence in productivity and quality of service.</p>
Technical expertise	Applies and improves technical knowledge and skills to perform safety oversight duties in a specific aviation discipline.	<p>Applies technical knowledge and skills to correctly address a situation.</p> <p>Accurately answers complex technical questions.</p> <p>Keeps up to date on specialized technical knowledge and skills.</p> <p>Recognizes trends in practice of one's own technical area and anticipates changes.</p>

Generic competency	Description	Observable behaviour
		<p>Interprets correctly and explains the intent of the applicable statute, regulation, or standard for a given context.</p> <p>Evaluates efforts by stakeholders to demonstrate initial compliance with the regulations.</p> <p>Develops and implements an effective programme to monitor continuing compliance of the regulations by stakeholders.</p> <p>Contributes as a subject-matter expert to the development of regulations and guidance.</p> <p>Consistently provides appropriate guidance to stakeholders and colleagues on how to implement performance-based regulations.</p> <p>Applies appropriate procedures in accordance with the CAA standards.</p> <p>Applies enforcement measures when necessary and in accordance with applicable regulations.*</p>
Systems thinking	Understands and determines how the various components of management systems interact and affect the overall system safety performance.	<p>Accurately evaluates the inter-relationship between policies, processes and procedures of the stakeholder's systems.</p> <p>Accurately evaluates the inter-relationship between various systems including quality planning, quality control, and quality assurance of the stakeholder.</p> <p>Determines the effectiveness of the implementation of continuous improvement, reactive and proactive processes.</p> <p>Recognizes the essential components of a functional safety management system and their interoperability.</p> <p>Determines whether the stakeholder's management systems are appropriate for the size and scope of the operation.</p> <p>Accurately evaluates the inter-relationships between the management systems across various stakeholders.</p> <p>Uses the appropriate set of metrics to measure and monitor regulatory and stakeholder safety performance.</p> <p>Interprets findings from analysis of performance data.</p> <p>Assesses if the stakeholder safety performance objectives achieve the desired safety performance.</p> <p>Provides feedback on potential deficiencies of the regulatory framework.</p> <p>Accurately determines whether the root cause(s) of deficiencies results from a single-point or systemic failure(s).*</p> <p>Accurately evaluates the inter-relationship between policies, processes and procedures of the</p>

Generic competency	Description	Observable behaviour
Risk management	Demonstrates an effective approach to the oversight of a stakeholder considering its business model, risk profile and its availability of resources.	Carries out comprehensive risk assessments of service providers using appropriate methodologies.
		Makes strategic decisions based on risk assessment, principles, values and business cases.
		Accurately determines on a timely basis trends, problem areas or hazards that may negatively impact safety.
		Recognizes business practices or organizational cultures that are potential indicators of increased levels of risk.
		Applies appropriate certification requirements and surveillance techniques according to changing levels of risk.
		Evaluates appropriateness of safety cases submitted by service providers.
		Evaluates appropriateness of risk assessments performed by stakeholders and actions taken to manage hazards to an acceptable level.
		Identifies if appropriate remedial or enforcement action is required to address an issue at its root cause.*
		Ensures that stakeholders implement remediation measures.*
Leadership and teamwork	Collaborates up, down and across the organization to foster and promote a clear vision and common goals. Energizes others to achieve the goals and positive results.	Gains the trust and confidence of others.
		Promotes positive working relationships.
		Encourages open discussion.
		Facilitates resolution of conflicts.
		Inspires others to collaborate and strive towards excellence.
		Actively solicits constructive feedback.
		Willingly adopts suggestion for improvement from others.
		Directs the work of the team to adapt to circumstances.
		Empowers team members to make decisions.
Identifies the required resources to support the team.		

Generic competency	Description	Observable behaviour
Critical thinking	Analyses information in order to consistently achieve desired outcomes.	Accurately analyses stakeholder performance data for trends.
		Evaluates information with accuracy and objectivity.
		Seeks additional detail or clarification from colleagues or stakeholders.
		Synthesises data from a variety of sources appropriately.
		Applies procedures appropriately.
		Recognizes that different processes and procedures can lead to similar outcomes.
		Analyses the thoroughness and effectiveness of all documented processes.
		Determines if CAA employees understand and adhere to processes.
		Determines if stakeholders understand and adhere to processes.
		Assesses the efficiency and effectiveness of the implementation and maintenance of mandatory system-based programmes against operational requirements.
Distinguishes between lapses, negligence and reckless action.*		

ATTACHMENT II TO CHAPTER 5

GENERIC TASK LIST FOR DANGEROUS GOODS STATE EMPLOYEES

Table S-1-3. Generic Task List for Dangerous Goods State Employees

This task list aligns with State safety management responsibilities required by Annex 19 and is based on an integrated State safety programme illustrated in Figure 8-1 of the *Safety Management Manual (SMM)* (Doc 9859).

1	Establish and Maintain Safety Policies [State Safety Policy]	
	1.1	Establish safety policies, objectives and resources [CE-1, CE-2, & CE-4]
	1.1.1	Apply procedures to develop national regulations on the transport of dangerous goods by air
	1.1.2	Monitor relevant changes to ICAO provisions and other relevant international provisions that may impact national dangerous goods air transport regulations
	1.1.3	Develop guidance on how to comply with national regulations
	1.1.4	Maintain a safety training programme that ensures that personnel are trained and competent to perform their dangerous goods oversight duties.
	1.2	Develop technical guidance, tools and provisions of safety-critical information [CE-5]
	1.1.1	[Develop policies and procedures to approve an operator's manuals specific to dangerous goods] see 2.1.1 it's already covered.
	1.2.2	[Develop policies and procedures to approve an operator's training programme specific to dangerous goods] see 2.2.1
	1.2.3	[Develop policies and procedures to approve the designated postal operator's training programme specific to dangerous goods]
	1.2.4	Develop policies and procedures to conduct oversight of entities performing any functions prescribed in national regulations for the transport of dangerous goods by air
	1.2.5	[Develop policies and procedures to grant approvals and exemptions] 2.3.1
	2	Manage Safety Risks [Safety Risk Management]
2.1		Approve the dangerous goods component of the operations manual [CE-6]
2.1.1		Verify the operations manual against the national regulations, policies and procedures for the transport of dangerous goods by air
2.1.2		Recommend amendments to the operations manual, as necessary
2.1.3		Verify that the amendments to the operations manual are completed
2.1.4		Issue the approval
2.2		Approve dangerous goods training programme [CE-6]
2.2.1		Verify the training programme against the national regulations, policies and procedures for the transport of dangerous goods by air
2.2.2		Verify that the training programme addresses all dangerous goods functions identified in the operations manual
2.2.3		Recommend amendments to the training programme, as necessary
2.2.4		Verify that the amendments to the training programme are completed
2.3		Grant Exemptions and Approvals [CE-6]
2.3.1		Develop and maintain a process to assess applications
2.3.2		Verify that applicant can adhere to established safety standards
2.4		Accident and incident investigation [CE-6]
2.4.1		Gather evidence
2.4.2		Verify non-compliance against national regulations for the transport of dangerous goods by air
2.5		Take corrective/appropriate actions [CE-6]
2.5.1		Document specific areas of non-compliance
2.5.2		Apply national enforcement policy
2.5.3		Confirm effectiveness of corrective action
2.6		Identify Hazards and Mitigate Safety Risks [CE-6]
2.6.1	Establish and maintain a process to identify dangerous goods hazards from collected safety data	
2.6.2	Develop and maintain a process that ensures the assessment of dangerous goods safety risks associated with the identified hazards	
2.6.3	Identify required mitigations and safety performance indicators	
2.6.4	Review effectiveness of mitigations	

3	Assure Safety [Safety Assurance]		
	3.1	Define and Plan Surveillance Activities [CE-7]	
		3.1.1	Analyse collected safety data, identify hazards, and identify surveillance priorities
		3.1.2	Define and plan surveillance activities on a continuous basis
	3.2	Conduct Surveillance Activities [CE-7]	
		3.2.1	Proactively assure that entities performing any function for the transport of dangerous goods by air continue to meet the established requirements.
		3.2.2	Define and plan surveillance activities on a continuous basis
	3.3	Resolve safety issues [CE-8]	
		3.3.1	Take appropriate actions, up to and including enforcement measures, to resolve identified safety risks.
		3.3.2	Approve an entity's plan to address identified safety risks and findings of non-compliance.
	3.4	Continuous Monitoring [CE-8]	
		3.4.1	Monitor and record progress, including actions taken by entities to resolve identified safety risks.
		3.4.2	Document and assess system performance.
4	Promote Safety [Safety Promotion] [Annex 19, 3.5]		
	4.1	Develop Internal communication and dissemination of safety information	
		4.1.1	Develop a strategy of promoting safety through communication.
		4.1.2	Develop awareness materials related to dangerous goods safety.
		4.1.3	Promote safety awareness and the sharing and exchange of safety data and information.
	4.2	Develop external communication and dissemination of safety information [Annex 19, 3.5]	
		4.2.1	Develop a strategy of promoting state safety through communication.
4.2.2		Develop public awareness materials related to dangerous goods safety.	
	4.2.3	Promote safety awareness and the sharing and exchange of safety data and information with the aviation [dangerous goods] community.	

APPENDIX E

PROPOSED AMENDMENTS TO THE SUPPLEMENT TO THE
TECHNICAL INSTRUCTIONS TO ADDRESS AIR-SPECIFIC SAFETY
RISKS AND IDENTIFYING ANOMALIES

Part S-3

DANGEROUS GOODS LIST,
SPECIAL PROVISIONS AND QUANTITY LIMITATIONS

(ADDITIONAL INFORMATION
FOR PART 3 OF THE
TECHNICAL INSTRUCTIONS)

...

Chapter 6

SPECIAL PROVISIONS

...

DGP/27 (see paragraph 2.3.2 of the report under Agenda Item 2):

- A324 For the purpose of transporting a symbolic flame, the appropriate authority of the States of Origin and of the Operator may approve the carriage of lamps fuelled by UN 1223 — **Kerosene**, or UN 3295 — **Hydrocarbons, liquid, n.o.s.**, carried by a passenger as carry-on baggage only. Lamps must be of a "Davy" type or similar apparatus. In addition, the following conditions apply as a minimum:
- a) no more than four lamps may be carried on board the aircraft;
 - ...
 - g) the crew members of the aircraft must be given a verbal briefing about the carriage of the lamps and the pilot-in-command must be provided with a copy of the approval; and
 - h) Part 7;4.1.1.1 b), c), d), e), f) 4.3, 4.4 and 4.84.9 of the Technical Instructions must apply.
 - ...

APPENDIX F**PROPOSED AMENDMENTS TO THE EMERGENCY RESPONSE
GUIDANCE FOR AIRCRAFT INCIDENTS INVOLVING DANGEROUS
GOODS TO ADDRESS AIR-SPECIFIC SAFETY RISKS AND
IDENTIFYING ANOMALIES****Section 1****GENERAL INFORMATION**

...

1.5 ACCESSIBILITY OF DANGEROUS GOODS

Dangerous goods bearing the “cargo aircraft only” label are required to be accessible in flight, except for those:

- a) loaded:
 - 1) in a Class C aircraft cargo compartment;
 - 2) in a unit load device equipped with a fire detection/suppression system equivalent to that required by the certification requirements of a Class C aircraft cargo compartment as determined by the appropriate national authority;
 - 3) as external carriage by a helicopter; and

DGP/27 (see paragraph 2.4.1.2 of the report under Agenda Item 2):

- b) classified as:
 - 1) flammable liquids (Class 3), Packing Group III, other than those with a subsidiary-risk hazard of Class 8;
 - 2) toxic substances (Division 6.1) with no subsidiary-risk hazard other than Class 3;
 - 3) infectious substances (Division 6.2);
 - 4) radioactive materials (Class 7); and
 - 5) miscellaneous dangerous goods (Class 9).

...

Section 2

GENERAL CONSIDERATIONS

2.1 GENERAL

The following are considerations which may need to be taken into account in assessing an appropriate course of action to take in the event of an incident involving dangerous goods. These considerations apply whether the aircraft involved is carrying passengers, cargo or both.

...

DGP/27 (see paragraph 2.4.1.2 of the report under Agenda Item 2):

- 3) Reducing altitude will reduce the rate of vaporization of liquid and may reduce the rate of leakage, but it may increase the rate of burning. Conversely, increasing altitude may reduce the rate of burning but may increase the rate of vaporization or leaking. If there is structural damage or ~~the risk of an explosion~~ hazard, consideration should be given to keeping the differential pressure as low as possible.

...

DGP-WG/18 (see paragraph 3.2.4.2 of DGP/27-WP/2) and DGP/27 (see paragraph 2.4.1 of the report under Agenda Item 2):

Section 3

EXAMPLES OF DANGEROUS GOODS INCIDENTS PROCEDURES CHECKLISTS

3.1 ~~CHECKLIST~~ PROCEDURES FOR DANGEROUS GOODS INCIDENTS

<i>Step</i>	<i>Action</i>
1.	FOLLOW THE APPROPRIATE AIRCRAFT EMERGENCY PROCEDURES FOR FIRE OR SMOKE REMOVAL
2.	NO SMOKING SIGN ON
3.	CONSIDER LANDING AS SOON AS POSSIBLE
4.	CONSIDER TURNING OFF NON-ESSENTIAL ELECTRICAL POWER
5.	DETERMINE SOURCE OF SMOKE / FUMES / FIRE
6.	FOR DANGEROUS GOODS INCIDENTS IN THE PASSENGER CABIN, SEE CABIN CREW CHECKLIST <u>PROCEDURES</u> AND COORDINATE COCKPIT / CABIN CREW ACTIONS

<i>Step</i>	<i>Action</i>
7.	DETERMINE EMERGENCY RESPONSE DRILL CODE
8.	USE GUIDANCE FROM AIRCRAFT EMERGENCY RESPONSE DRILLS CHART TO HELP DEAL WITH INCIDENT
9.	IF THE SITUATION PERMITS, NOTIFY ATC OF THE DANGEROUS GOODS BEING CARRIED
<i>After landing</i>	
1.	DISEMBARK PASSENGERS AND CREW BEFORE OPENING ANY CARGO COMPARTMENT DOORS
2.	INFORM GROUND PERSONNEL / EMERGENCY SERVICES OF NATURE OF ITEM AND WHERE STOWED
3.	MAKE APPROPRIATE ENTRY IN MAINTENANCE LOG

3.2 ~~AMPLIFIED CHECKLIST~~ **PROCEDURES** FOR DANGEROUS GOODS INCIDENTS

Amplified-checklist <u>procedures</u> for dangerous goods incidents	
<i>Step</i>	<i>Action</i>
1.	FOLLOW THE APPROPRIATE AIRCRAFT EMERGENCY PROCEDURES FOR FIRE OR SMOKE REMOVAL (self-explanatory)
2.	NO SMOKING SIGN ON A smoking ban should be introduced when fumes or vapours are present and be continued for the remainder of the flight.
3.	CONSIDER LANDING AS SOON AS POSSIBLE Because of the difficulties and possibly disastrous consequences of any dangerous goods incident, consideration should be given to landing as soon as possible. The decision to land at the nearest suitable aerodrome should be made early rather than late, when an incident may have developed to a very critical point, severely restricting operational flexibility.
4.	CONSIDER TURNING OFF NON-ESSENTIAL ELECTRICAL POWER As the incident may be caused by electrical problems or as electrical systems may be affected by any incident, and particularly as firefighting activities, etc., may damage electric systems, turn off all non-essential electrical items. Retain power only to those instruments, systems and controls necessary for the continued safety of the aircraft. Do not restore power until it is positively safe to do so.

Amplified-checklist <u>procedures</u> for dangerous goods incidents	
<i>Step</i>	<i>Action</i>
5.	<p>DETERMINE SOURCE OF SMOKE / FUMES / FIRE</p> <p>The source of any smoke / fumes / fire may be difficult to determine. Effective firefighting or containment procedures can best be accomplished when the source of the incident is identified.</p>
6.	<p>FOR DANGEROUS GOODS INCIDENTS IN THE PASSENGER CABIN, SEE CABIN CREW CHECKLIST <u>PROCEDURES</u> AND COORDINATE COCKPIT / CABIN CREW ACTIONS</p> <p>Incidents in the passenger cabin should be dealt with by the cabin crew using the appropriate checklist and procedures. It is essential that the cabin crew and the flight crew coordinate their actions and that each be kept fully informed of the other's actions and intentions.</p>
7.	<p>DETERMINE EMERGENCY RESPONSE DRILL CODE</p> <p>When the item has been identified, the corresponding entry on the pilot-in-command's dangerous goods notification form should be found. The applicable emergency response drill code may be given on the notification form, or if not given, can be found by noting the proper shipping name or the UN number on the notification form and using the alphabetical or numerical list of dangerous goods. If the item causing the incident is not listed on the notification form, an attempt should be made to determine the name or the nature of the substance. The alphabetical list can then be used to determine the emergency response drill code.</p> <p><i>Note.— The alphabetical and numerical lists referred to are those in Section 4 of this document.</i></p>
8.	<p>USE GUIDANCE FROM AIRCRAFT EMERGENCY RESPONSE DRILLS CHART TO HELP DEAL WITH INCIDENT</p> <hr/> <p>DGP/27 (see paragraphs 2.4.1 and 2.4.2 of the report under Agenda Item 2):</p> <hr/> <p>The drill code assigned to an item of dangerous goods consists of a number from 1 to 11, plus a single <u>one or two</u> letters. Referring to the chart of emergency response drills, each drill number corresponds to a line of information concerning the risk <u>hazard</u> posed by that substance and guidance on the preferable action that should be taken. The drill letter is shown separately on the drill chart; it indicates other possible hazards of the substance. In some cases, the guidance given by the drill number may be further refined by the information given by the drill letter.</p>

Amplified-checklist <u>procedures</u> for dangerous goods incidents	
<i>Step</i>	<i>Action</i>
<hr/> DGP-WG/18 (see paragraph 3.2.4.2 of DGP/27-WP/2) and DGP/27 (see paragraph 2.4.1 of the report under Agenda Item 2): <hr/>	
9.	<p>IF THE SITUATION PERMITS, NOTIFY ATC OF THE DANGEROUS GOODS BEING CARRIED</p> <p>If an in-flight emergency occurs and the situation permits, the pilot-in-command should inform the appropriate air traffic services unit of the dangerous goods on board the aircraft. Wherever possible this information should include the proper shipping name and/or UN number, the class/division and for Class 1 the compatibility group, any identified subsidiary-risk <u>hazard</u>(s), the quantity and the location on board the aircraft. When it is not considered possible to include all the information, those parts thought most relevant in the circumstances should be given.</p>

Amplified-checklist <u>procedures</u> for dangerous goods incidents	
<i>Step</i>	<i>Action</i>
<i>After landing</i>	
1.	<p>DISEMBARK PASSENGERS AND CREW BEFORE OPENING ANY CARGO COMPARTMENT DOORS</p> <p>Even if it has not been necessary to complete an emergency evacuation after landing, passengers and crew should disembark before any attempt is made to open the cargo compartment doors and before any further action is taken to deal with a dangerous goods incident. The cargo compartment doors should be opened with the emergency services in attendance.</p>
2.	<p>INFORM GROUND PERSONNEL / EMERGENCY SERVICES OF NATURE OF ITEM AND WHERE STOWED</p> <p>Upon arrival, take the necessary steps to identify to the ground staff where the item is stowed. Pass on by the quickest available means all information about the item including, when appropriate, a copy of the notification to pilot-in-command.</p>
3.	<p>MAKE APPROPRIATE ENTRY IN MAINTENANCE LOG</p> <p>An entry should be made in the maintenance log that a check needs to be carried out to ensure that any leakage or spillage of dangerous goods has not damaged the aircraft structure or systems and that some aircraft equipment (e.g. fire extinguishers, emergency response kit, etc.) may need replenishing or replacing.</p>

3.3 CABIN CREW ~~CHECKLISTS~~ **PROCEDURES** FOR DANGEROUS GOODS INCIDENTS IN THE PASSENGER CABIN DURING FLIGHT

This section consists of cabin crew ~~checklists~~ **procedures** for dangerous goods incidents in the passenger cabin during flight involving:

- a) battery / portable electronic device (PED) fire / smoke (see 3.3.1);
- b) overhead bin battery / portable electronic device (PED) fire / smoke (see 3.3.2);
- c) overheated battery / electrical smell involving a portable electronic device (PED) — no visible fire or smoke (see 3.3.3);
- d) PED inadvertently crushed or damaged in electrically adjustable seat (see 3.3.4);
- e) fire involving dangerous goods (see 3.3.5); and
- f) spillage or leakage of dangerous goods (see 3.3.6)

3.3.1 Battery / portable electronic device (PED) fire / smoke

Checklist Procedures for battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
1.	<p>IDENTIFY THE ITEM</p> <p><i>Note.— It may not be possible to identify the item (source of fire) immediately. In this case, apply Step 2 first, and then attempt to identify it.</i></p> <p>Caution: In order to avoid injury from a flash fire, it is not recommended to open the affected baggage when there is any indication of smoke or flames.</p>
2.	<p>APPLY FIRE-FIGHTING PROCEDURE</p> <ol style="list-style-type: none"> a) Obtain and use the appropriate fire extinguisher. b) Retrieve and use protective equipment, as applicable to the situation. c) Move passengers away from the area, if possible. d) Notify pilot-in-command / other cabin crew members. <p><i>Note.— Actions should occur simultaneously in a multi-crew operation.</i></p>

Checklist <u>Procedures</u> for battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
3.	<p>REMOVE POWER</p> <p>a) Disconnect the device from the power supply, if safe to do so. b) Turn off in-seat power, if applicable. c) Verify that power to the remaining electrical outlets remains off, if applicable.</p> <p>Caution: Do not attempt to remove the battery from the device.</p>
4.	<p>DOUSE THE DEVICE WITH WATER (OR OTHER NON-FLAMMABLE LIQUID)</p> <p><i>Note.— Liquid may turn to steam when applied to the hot battery.</i></p>
5.	<p>LEAVE THE DEVICE IN ITS PLACE AND MONITOR FOR ANY REIGNITION</p> <p>a) If smoke or flames reappear, repeat Steps 2 and 4.</p> <p>Caution: — Do not attempt to pick up or move the device. — Do not cover or enclose the device. — Do not use ice or dry ice to cool the device.</p>
6.	<p>WHEN THE DEVICE HAS COOLED (e.g. approximately 10 to 15 minutes)</p> <p>a) Obtain a suitable empty container. b) Fill the container with enough water (or other non-flammable liquid) to submerge the device. c) Using protective equipment, place the device in the container and completely submerge in water (or other non-flammable liquid). d) Stow and secure (if possible) the container to prevent spillage.</p>
7.	<p>MONITOR THE DEVICE AND THE SURROUNDING AREA FOR THE REMAINDER OF THE FLIGHT</p>
8.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>a) Apply operator's post-incident procedures.</p>

3.3.2 Overhead bin battery / portable electronic device (PED) fire / smoke

Checklist of <u>Procedures for</u> overhead bin battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
1.	<p>APPLY FIRE-FIGHTING PROCEDURE</p> <p>a) Obtain and use the appropriate fire extinguisher. b) Retrieve and use protective equipment, as applicable to the situation. c) Move passengers away from the area, if possible. d) Notify pilot-in-command / other cabin crew members.</p> <p><i>Note.— Actions should occur simultaneously in a multi-crew operation.</i></p>
2.	<p>IDENTIFY THE ITEM</p> <p>If the device is visible and accessible, or, if the device is contained in baggage and flames are visible:</p> <p>a) Re-apply Step 1 to extinguish the flames, if applicable. b) Apply Steps 3 to 5.</p> <p>If smoke is coming from the overhead bin, but the device is not visible or accessible:</p> <p>c) Remove other baggage from the overhead bin to access the affected baggage/item. d) Identify the item. e) Apply Steps 3 to 5.</p> <p>Caution: In order to avoid injury from a flash fire, it is not recommended to open the affected baggage when there is any indication of smoke or flames.</p>
3.	<p>DOUSE THE DEVICE (BAGGAGE) WITH WATER (OR OTHER NON-FLAMMABLE LIQUID)</p> <p><i>Note.— Liquid may turn to steam when applied to the hot battery.</i></p>
4.	<p>WHEN THE DEVICE HAS COOLED</p> <p>a) Obtain a suitable empty container. b) Fill the container with enough water (or other non-flammable liquid) to submerge the device. c) Using protective equipment, place the device in the container and completely submerge in water (or other non-flammable liquid). d) Stow and secure (if possible) the container to prevent spillage.</p>
5.	<p>MONITOR THE DEVICE AND THE SURROUNDING AREA FOR THE REMAINDER OF THE FLIGHT</p>

Checklist of <u>Procedures for</u> overhead bin battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
6.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>a) Apply operator's post-incident procedures.</p>

3.3.3 Overheated battery / electrical smell involving a portable electronic device (PED) — no visible fire or smoke

Checklist <u>Procedures</u> for overheated battery / electrical smell involving a portable electronic device (PED) — no visible fire or smoke	
<i>Step</i>	<i>Cabin crew action</i>
1.	IDENTIFY THE ITEM
2.	INSTRUCT THE PASSENGER TO TURN OFF THE DEVICE IMMEDIATELY
3.	<p>REMOVE POWER</p> <p>a) Disconnect the device from the power supply, if safe to do so. b) Turn off in-seat power, if applicable. c) Verify that power to the remaining electrical outlets remains off, if applicable. d) Verify that the device remains off for the remainder of the flight.</p> <p>Caution: Do not attempt to remove the battery from the device.</p>
4.	<p>INSTRUCT THE PASSENGER TO KEEP THE DEVICE VISIBLE AND MONITOR CLOSELY</p> <p>Caution: Unstable batteries may ignite even after the device is turned off.</p>
5.	<p>IF SMOKE OR FLAMES APPEAR</p> <p>a) Apply BATTERY / PED FIRE / SMOKE-checklist <u>procedures</u> (see 3.3.1).</p>
6.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>a) Apply operator's post-incident procedures.</p>

3.3.4 PED inadvertently crushed or damaged in electrically adjustable seat

Checklist <u>Procedures</u> for PED inadvertently crushed or damaged in electrically adjustable seat	
<i>Step</i>	<i>Cabin crew action</i>
1.	NOTIFY THE PILOT-IN-COMMAND / OTHER CABIN CREW MEMBERS
2.	OBTAIN INFORMATION FROM PASSENGER, BY ASKING HIM/HER a) To identify the item. b) Where he/she suspects that the item may have dropped or slipped into. c) If the seat was moved since misplacing the item.
3.	RETRIEVE AND USE PROTECTIVE EQUIPMENT, IF AVAILABLE
4.	RETRIEVE THE ITEM Caution: Do not move the seat electrically or mechanically when attempting to retrieve the item.
5.	IF SMOKE OR FLAMES APPEAR a) Apply BATTERY / PED FIRE / SMOKE checklist <u>procedures</u> (see 3.3.1).
6.	AFTER LANDING AT THE NEXT DESTINATION a) Apply operator's post-incident procedures.

3.3.5 Fire involving dangerous goods

Checklist <u>Procedures</u> for fire involving dangerous goods	
<i>Step</i>	<i>Cabin crew action</i>
1.	<p>IDENTIFY THE ITEM</p> <p><i>Note.</i> — It may not be possible to identify the item (source of fire) immediately. In this case, apply Step 2 first, and then attempt to identify it.</p> <p>Caution: In order to avoid injury from a flash fire, it is not recommended to open the affected baggage when there is any indication of smoke or flames.</p>
2.	<p>APPLY FIRE-FIGHTING PROCEDURE</p> <p>a) Obtain and use the appropriate fire extinguisher / check use of water. b) Retrieve and use protective equipment, as applicable to the situation. c) Move passengers away from the area, if possible. d) Notify pilot-in-command / other cabin crew members.</p> <p><i>Note.</i>— Actions should occur simultaneously in a multi-crew operation.</p>
3.	<p>MONITOR FOR ANY REIGNITION</p> <p>a) If smoke/flames reappear, repeat Step 2.</p>
4.	<p>ONCE THE FIRE HAS BEEN EXTINGUISHED</p> <p>a) Apply SPILLAGE OR LEAKAGE OF DANGEROUS GOODS-checklist <u>procedures</u>, if required (see 3.3.6).</p>
5.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>a) Apply operator's post-incident procedures.</p>

3.3.6 Spillage or leakage of dangerous goods

Checklist <u>Procedures</u> for spillage or leakage of dangerous goods	
<i>Step</i>	<i>Cabin crew action</i>
1.	NOTIFY THE PILOT-IN-COMMAND / OTHER CABIN CREW MEMBERS
2.	IDENTIFY THE ITEM
3.	COLLECT EMERGENCY RESPONSE KIT OR OTHER USEFUL ITEMS
4.	DON RUBBER GLOVES AND SMOKE HOOD
5.	MOVE PASSENGERS AWAY FROM AREA AND DISTRIBUTE WET TOWELS OR CLOTHS
6.	PLACE DANGEROUS GOODS ITEM IN POLYETHYLENE BAGS
7.	STOW POLYETHYLENE BAGS
8.	TREAT AFFECTED SEAT CUSHIONS / COVERS IN THE SAME MANNER AS DANGEROUS GOODS ITEM
9.	COVER SPILLAGE ON CARPET / FLOOR
10.	REGULARLY INSPECT ITEMS STOWED AWAY / CONTAMINATED FURNISHINGS
11.	AFTER LANDING AT THE NEXT DESTINATION a) Apply operator's post-incident procedures.

3.4 AMPLIFIED CABIN CREW ~~CHECKLISTS~~ **PROCEDURES** FOR DANGEROUS GOODS INCIDENTS IN THE PASSENGER CABIN DURING FLIGHT

This section consists of amplified cabin crew ~~checklists~~ **procedures** for dangerous goods incidents in the passenger cabin during flight involving:

- a) battery / portable electronic device (PED) fire / smoke (see 3.4.1);
- b) overhead bin battery / portable electronic device (PED) fire / smoke (see 3.4.2);
- c) overheated battery / electrical smell involving a portable electronic device (PED) — no visible fire or smoke (see 3.4.3);
- d) PED inadvertently crushed or damaged in electrically adjustable seat (see 3.4.4);
- e) fire involving dangerous goods (see 3.4.5); and
- f) spillage or leakage of dangerous goods (see 3.4.6).

Note.— Although this guidance material presents sequences of tasks, some of these actions occur simultaneously when carried out by crew members.

3.4.1 Battery / portable electronic device (PED) fire / smoke

Amplified checklist procedures for battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
1.	<p>IDENTIFY THE ITEM</p> <p>It may not be possible to identify the item (source of fire) right away, especially if the fire has started in a seat pocket or the device is not readily accessible. In this case, fire-fighting procedures should be applied as a first step. If the item is contained in baggage, the crew's actions would be similar to the actions for a device that is visible or readily accessible.</p> <p>Caution: In order to avoid injury from a flash fire, it is not recommended to open the affected baggage when there is any indication of smoke or flames. However, in certain situations cabin crew members may assess and deem it necessary to slightly open baggage to allow entry of the extinguishing agent and non-flammable liquid. This should be done with extreme caution and only after donning appropriate protective equipment available on the aircraft.</p>

Amplified-checklist <u>procedures</u> for battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
2.	<p>APPLY FIRE-FIGHTING PROCEDURE</p> <p>Any occurrence concerning a fire in the cabin should be notified immediately to the pilot-in-command who should be kept informed of all actions taken and of the effect. It is essential that the cabin crew and the flight crew coordinate their actions and that each are kept fully informed of the other's actions and intentions.</p> <p>Appropriate fire-fighting and emergency procedures must be used to deal with any fire. In a multi-cabin crew operation, the actions detailed in the fire-fighting procedure should be conducted simultaneously. On aircraft operated with only one cabin crew member, the aid of a passenger should be sought in dealing with the situation.</p> <p>Halon, Halon replacement or water extinguisher should be used to extinguish the fire and prevent its spread to additional flammable materials. It is important to wear available protective equipment (e.g. protective breathing equipment, fire gloves) when fighting a fire.</p> <p>If fire develops, cabin crew should take prompt action to move passengers away from the area involved and, if necessary, provide wet towels or cloths and give instructions for passengers to breathe through them. Minimizing the spreading of smoke and fumes into the flight deck is critical for the continued safe operation of the aircraft, therefore it is essential to keep the flight deck door closed at all times. Crew communication and coordination is of utmost importance. The use of the interphone is the primary means of communication unless the interphone system fails.</p>
3.	<p>REMOVE POWER</p> <p>It is important to instruct the passenger to disconnect the device from the power supply, if it is deemed safe to do so. A battery has a higher likelihood of catching fire due to overheating during or immediately following a charging cycle, although the effects may be delayed for some period of time. By removing the external power supply from the device, it will be assured that additional energy is not being fed to the battery to promote a fire.</p> <p>Turn off the in-seat power to the remaining electrical outlets until it can be assured that a malfunctioning aircraft system does not contribute to additional failures of the passengers' portable electronic devices.</p> <p>Visually check that power to the remaining electrical outlets remains off until the aircraft's system can be determined to be free of faults, if the device was previously plugged in.</p>

Amplified-checklist <u>procedures</u> for battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
	<p>The removal of power may occur simultaneously to other cabin crew actions (e.g. obtaining water to douse the device). Depending on the aircraft type, in-seat power may have to be turned off by the flight crew members.</p> <p>Caution: Do not attempt to remove the battery from the device.</p>
4.	<p>DOUSE THE DEVICE WITH WATER (OR OTHER NON-FLAMMABLE LIQUID)</p> <p>Water (or other non-flammable liquid) must be used to cool a battery that has ignited to prevent the spread of heat to other cells in the battery. If water is not available, any non-flammable liquid may be used to cool the device.</p> <p><i>Note.— Liquid may turn to steam when applied to the hot battery.</i></p>
5.	<p>LEAVE THE DEVICE IN ITS PLACE AND MONITOR FOR ANY REIGNITION</p> <p>A battery involved in a fire can reignite and emit flames multiple times as heat is transferred to other cells in the battery. Therefore, the device must be monitored regularly to identify if there is any indication that a fire-risk <u>hazard</u> may still exist. If there is any smoke or indication of fire, the device must be doused with more water (or other non-flammable liquid).</p> <p>Caution:</p> <ol style="list-style-type: none"> Do not attempt to pick up or move the device; batteries may explode or burst into flames without warning. The device must not be moved if displaying any of the following: flames/flaring, smoke, unusual sounds (such as crackling), debris, or shards of material separating from the device. Do not cover or enclose the device as it could cause it to overheat. Do not use ice or dry ice to cool the device. Ice or other materials insulate the device, increasing the likelihood that additional battery cells will reach thermal runaway.
6.	<p>WHEN THE DEVICE HAS COOLED (E.G. APPROXIMATELY 10-15 MINUTES)</p> <p>The device can be moved with caution following a certain period, once it has cooled down and if there is no evidence of smoke, heat, or if there is a reduction in the crackling or hissing sound usually associated with a lithium battery fire (e.g. after approximately 10-15 minutes). The waiting period may vary based on the device and its size. The different circumstances (e.g. types of devices, phase of flight, etc.) should be addressed in the operator's training programme.</p> <p>A suitable empty container, such as a pot, jug, galley unit or toilet waste bin, must be filled with enough water or non-flammable liquid to completely submerge the device. It is important to wear available protective equipment (e.g. protective breathing equipment, fire gloves), when moving any device involved in a fire. Once the device is completely submerged, the container used must be stowed and, if possible, secured to prevent spillage.</p>

Amplified checklist <u>procedures</u> for battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
7.	<p>MONITOR THE DEVICE AND THE SURROUNDING AREA FOR THE REMAINDER OF THE FLIGHT</p> <p>Monitor the device and the surrounding area for the remainder of the flight to verify that the device does not pose further risk <u>hazard</u>.</p>
8.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>Upon arrival, apply the operator's post-incident procedures. These may include identifying to ground personnel where the item is stowed and providing all information about the item.</p> <p>Complete the required documentation, as per operator procedures, so that the operator is notified of the event, proper maintenance action is undertaken and the emergency response kit or any aircraft equipment used is replenished or replaced, if applicable.</p>

3.4.2 Overhead bin battery / portable electronic device (PED) fire / smoke

Amplified checklist <u>procedures</u> for overhead bin battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
1.	<p>APPLY FIRE-FIGHTING PROCEDURE</p> <p>Any occurrence concerning a fire in the cabin should be notified immediately to the pilot-in-command who should be kept informed of all actions taken and of the effect. It is essential that the cabin crew and the flight crew coordinate their actions and that each are kept fully informed of the other's actions and intentions.</p> <p>Appropriate fire-fighting and emergency procedures must be used to deal with an overhead bin fire. In a multi-cabin crew operation, the actions detailed in the fire-fighting procedure should be conducted simultaneously. On aircraft operated with only one cabin crew member, the aid of a passenger should be sought in dealing with the situation.</p> <p>Halon, Halon replacement or water extinguisher should be used to extinguish the fire and prevent its spread to additional flammable materials. It is important to wear available protective equipment (e.g. protective breathing equipment, fire gloves) when fighting a fire.</p> <p>If fire develops, cabin crew should take prompt action to move passengers away from the area involved and, if necessary, provide wet towels or cloths and give instructions for passengers to breathe through them.</p> <p>Minimizing the spreading of smoke and fumes into the flight deck is critical for the continued safe operation of the aircraft, therefore it is essential to keep the flight deck door closed at all times. Crew communication and coordination is of utmost importance. The use of the interphone is the primary means of communication unless the interphone system fails.</p>
2.	<p>IDENTIFY THE ITEM</p> <p>It may not be possible to identify the item right away, especially if the fire has started in the overhead bin and the device is not readily accessible.</p> <p>If the device is visible and accessible or if the device is contained in baggage and flames are visible, the fire-fighting procedures should be applied as a first step.</p> <p>If smoke is coming from the overhead bin, but the device is not visible or accessible, or there is no indication of fire, the fire-fighting procedures should be applied as a first step. Afterwards, all baggage should be removed from the overhead bin with caution until the item can be identified. Once the item is identified, apply Steps 3 to 5.</p>

Amplified-checklist <u>procedures</u> for overhead bin battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
	<p>Caution: In order to avoid injury from a flash fire, it is not recommended to open the affected baggage when there is any indication of smoke or flames. However, in certain situations cabin crew members may assess and deem it necessary to slightly open baggage to allow entry of the extinguishing agent and non-flammable liquid. This should be done with extreme caution and only after donning appropriate protective equipment available on the aircraft.</p>
3.	<p>DOUSE THE DEVICE (BAGGAGE) WITH WATER (OR OTHER NON-FLAMMABLE LIQUID)</p> <p>Water (or other non-flammable liquid) must be used to cool a battery that has ignited to prevent the spread of heat to other cells in the battery. If water is not available, any non-flammable liquid may be used to cool the device.</p> <p><i>Note.— Liquid may turn to steam when applied to the hot battery.</i></p>
4.	<p>WHEN THE DEVICE HAS COOLED</p> <p>The device should be moved from the overhead bin to prevent a hidden fire from potentially developing. The device can be moved with caution following a certain period, once it has cooled down and if there is no evidence of smoke, heat, or if there is a reduction in the crackling or hissing sound usually associated with a lithium battery fire. The waiting period may vary based on the device and its size. The different circumstances (e.g. types of devices, phase of flight, etc.) should be addressed in the operator's training programme.</p> <p>A suitable empty container, such as a pot, jug, galley unit or toilet waste bin, must be filled with enough water or non-flammable liquid to completely submerge the device. It is important to wear available protective equipment (e.g. protective breathing equipment, fire gloves), when moving any device involved in a fire. Once the device is completely submerged, the container used must be stowed and, if possible, secured to prevent spillage.</p>
5.	<p>MONITOR THE DEVICE AND THE SURROUNDING AREA FOR THE REMAINDER OF THE FLIGHT</p> <p>Monitor the device and the surrounding area for the remainder of the flight to verify that the device does not pose further risk hazard.</p>

Amplified-checklist <u>procedures</u> for overhead bin battery / portable electronic device (PED) fire / smoke	
<i>Step</i>	<i>Cabin crew action</i>
6.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>Upon arrival, apply the operator's post-incident procedures. These may include identifying to ground personnel where the item is stowed and providing all information about the item.</p> <p>Complete the required documentation, as per operator procedures, so that the operator is notified of the event, proper maintenance action is undertaken and the emergency response kit or any aircraft equipment used is replenished or replaced, if applicable.</p>

3.4.3 Overheated battery / electrical smell involving a portable electronic device (PED) — no visible fire or smoke

Amplified-checklist <u>procedures</u> for overheated battery / electrical smell involving a portable electronic device (PED) — no visible fire or smoke	
<i>Step</i>	<i>Cabin crew action</i>
1.	<p>IDENTIFY THE ITEM</p> <p>Identify the source of overheat or electrical smell. Ask the passenger concerned to identify the item.</p>
2.	<p>INSTRUCT THE PASSENGER TO TURN OFF THE DEVICE IMMEDIATELY</p> <p>It is important to instruct the passenger to turn off the device immediately.</p>
3.	<p>REMOVE POWER</p> <p>It is important to instruct the passenger or crew member to disconnect the device from the power supply, if it is deemed safe to do so. A battery has a higher likelihood of catching fire due to overheating during or immediately following a charging cycle, although the effects may be delayed for some period of time. By removing the external power supply from the device, it will be assured that additional energy is not being fed to the battery to promote a fire.</p> <p>Turn off the in-seat power to the remaining electrical outlets until it can be assured that a malfunctioning aircraft system does not contribute to additional failures of the passengers' portable electronic devices.</p> <p>Visually check that power to the remaining electrical outlets remains off until the aircraft's system can be determined to be free of faults, if the device was previously plugged in.</p>

Amplified-checklist <u>procedures</u> for overheated battery / electrical smell involving a portable electronic device (PED) — no visible fire or smoke	
<i>Step</i>	<i>Cabin crew action</i>
	<p>The removal of power may occur simultaneously to other cabin crew actions (e.g. obtaining water to douse the device). Depending on the aircraft type, in-seat power may have to be turned off by the flight crew members.</p> <p>It is important to verify that the device remains turned off for the duration of the flight.</p> <p>Caution: Do not attempt to remove the battery from the device.</p>
4.	<p>INSTRUCT THE PASSENGER TO KEEP THE DEVICE VISIBLE AND MONITOR CLOSELY</p> <p>The device must remain visible (not stowed such as in baggage or seat pocket or on a person (pocket)) and should be monitored closely. Unstable batteries may ignite even after the device is turned off. Verify that the device is stowed for landing.</p>
5.	<p>IF SMOKE OR FLAMES APPEAR</p> <p>If smoke or flames appear, apply the BATTERY / PORTABLE ELECTRONIC DEVICE (PED) FIRE / SMOKE-checklist <u>procedures</u> (see 3.4.1).</p>
6.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>Upon arrival, apply the operator's post-incident procedures. These may include identifying to ground personnel where the item is stowed and providing all information about the item.</p> <p>Complete the required documentation, as per operator procedures, so that the operator is notified of the event, proper maintenance action is undertaken and the emergency response kit or any aircraft equipment used is replenished or replaced, if applicable.</p>

3.4.4 PED inadvertently crushed or damaged in electrically adjustable seat

Due to the design of some electrically adjustable passenger seats, a PED can slip under a seat covering and/or cushion, behind an armrest or down the side of a seat. Inadvertent crushing of the device poses a risk of fire hazard.

Amplified checklist <u>procedures</u> for PED inadvertently crushed or damaged in electrically adjustable seat	
<i>Step</i>	<i>Cabin crew action</i>
1.	<p>NOTIFY THE PILOT-IN-COMMAND / OTHER CABIN CREW MEMBERS</p> <p>Any occurrence concerning a risk of fire <u>hazard</u> in the cabin should be notified immediately to the pilot-in-command who should be kept informed of all actions taken and of the effect. It is essential that the cabin crew and the flight crew coordinate their actions and that each are kept fully informed of the other's actions and intentions.</p>
2.	<p>OBTAIN INFORMATION FROM PASSENGER</p> <p>Ask the passenger concerned to identify the item, and where he/she suspects it may have dropped or slipped into, and if he/she has moved the seat since misplacing the item.</p>
3.	<p>RETRIEVE AND USE PROTECTIVE EQUIPMENT, IF AVAILABLE</p> <p>If available, cabin crew members should don fire gloves before trying to retrieve the item.</p>
4.	<p>RETRIEVE THE ITEM</p> <p>To prevent crushing of the PED and reduce the potential fire risk <u>hazard</u> to the device and the surrounding area, cabin crew members and/or passengers must not use the electrical or mechanical seat functions in an attempt to retrieve the item. Move the passenger and, if applicable, the passenger seated next to the affected seat from the area, to facilitate the search. Do not move the seat. If the cabin crew member is unable to retrieve the item, it may be necessary to move the passenger to another seat.</p>
5.	<p>IF SMOKE OR FLAMES APPEAR</p> <p>If smoke or flames appear, apply the BATTERY / PORTABLE ELECTRONIC DEVICE (PED) FIRE / SMOKE checklist <u>procedures</u> (see 3.4.1).</p>

Amplified-checklist <u>procedures</u> for PED inadvertently crushed or damaged in electrically adjustable seat	
<i>Step</i>	<i>Cabin crew action</i>
6.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>Upon arrival, apply the operator's post-incident procedures. These may include identifying to ground personnel where the item is located and providing all information about the item.</p> <p>Complete the required documentation, as per operator procedures, so that the operator is notified of the event, proper maintenance action is undertaken and any aircraft equipment used is replenished or replaced, if applicable.</p>

3.4.5 Fire involving dangerous goods

Amplified-checklist <u>procedures</u> for fire involving dangerous goods	
<i>Step</i>	<i>Cabin crew action</i>
1.	<p>IDENTIFY THE ITEM</p> <p>Ask the passenger concerned to identify the item. The passenger may be able to give some guidance on the hazard(s) involved and how these could be dealt with. If the passenger can identify the item, refer to Section 4 of this document for the appropriate emergency response drill.</p> <p>It may not be possible to identify the item right away, especially if the source of the fire is unknown or the item is not readily accessible. In this case, fire-fighting procedures should be applied as a first step. Once it is possible to do so, identify the item after the fire is under control. If the item is contained in baggage, the crew's actions would be similar to the actions for an item that is visible or readily accessible.</p> <p>Caution: In order to avoid injury from a flash fire, it is not recommended to open the affected baggage when there is any indication of smoke or flames. However, in certain situations cabin crew members may assess and deem it necessary to slightly open baggage to allow entry of the extinguishing agent and non-flammable liquid. This should be done with extreme caution and only after donning appropriate protective equipment available on the aircraft.</p>
2.	<p>APPLY THE FIRE-FIGHTING PROCEDURE</p> <p>Any occurrence concerning a fire in the cabin should be notified immediately to the pilot-in-command who should be kept informed of all actions taken and of the effect. It is essential that the cabin crew and the flight crew coordinate their actions and that each are kept fully informed of the other's actions and intentions.</p>

Amplified-checklist <u>procedures</u> for fire involving dangerous goods	
<i>Step</i>	<i>Cabin crew action</i>
	<p>Appropriate fire-fighting and emergency procedures must be used to deal with any fire. In a multi-cabin crew operation, the actions detailed in the fire-fighting procedure should be conducted simultaneously. On aircraft operated with only one cabin crew member, the aid of a passenger should be sought in dealing with the situation.</p> <p>In general, water should not be used on a spillage or when fumes are present since it may spread the spillage or increase the rate of fuming. Consideration should also be given to the possible presence of electrical components when using water extinguishers.</p> <p>If fire develops, cabin crew should take prompt action to move passengers away from the area involved and, if necessary, provide wet towels or cloths and give instructions for passengers to breathe through them.</p> <p>Minimizing the spreading of smoke and fumes into the flight deck is critical for the continued safe operation of the aircraft, therefore it is essential to keep the flight deck door closed at all times. Crew communication and coordination is of utmost importance. The use of the interphone is the primary means of communication unless the interphone system fails.</p>
3.	<p>MONITOR FOR ANY REIGNITION</p> <p>Monitor the area regularly to identify if there is any indication that a fire-risk <u>hazard</u> may still exist. If there is any smoke or indication of fire, continue to apply the fire-fighting procedure.</p>
4.	<p>ONCE THE FIRE HAS BEEN EXTINGUISHED</p> <p>In the event of a fire involving dangerous goods, the SPILLAGE OR LEAKAGE INVOLVING DANGEROUS GOODS-checklist <u>procedures</u> (see 3.4.6) may need to be applied once the fire has been extinguished.</p>
5.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>Upon arrival, apply the operator's post-incident procedures. These may include identifying to ground personnel where the item is stowed and providing all information about the item.</p> <p>Complete the required documentation, as per operator procedures, so that the operator is notified of the event, proper maintenance action is undertaken and the emergency response kit or any aircraft equipment used is replenished or replaced, if applicable.</p>

3.4.6 Spillage or leakage of dangerous goods

Amplified-checklist <u>procedures</u> for spillage or leakage of dangerous goods	
<i>Step</i>	<i>Cabin crew action</i>
1.	<p>NOTIFY THE PILOT-IN-COMMAND / OTHER CABIN CREW MEMBERS</p> <p>Any incident concerning dangerous goods should be notified immediately to the pilot-in-command who should be kept informed of all actions taken and of their effect. It is essential that the cabin crew and the flight crew coordinate their actions and that each are kept fully informed of the other's actions and intentions.</p> <p>Minimizing the spreading of smoke and fumes into the flight deck is critical for the continued safe operation of the aircraft, therefore it is essential to keep the flight deck door closed at all times. Crew communication and coordination is of utmost importance. The use of the interphone is the primary means of communication unless the interphone system fails.</p>
2.	<p>IDENTIFY THE ITEM</p> <p>Ask the passenger concerned to identify the item and indicate its potential hazards. The passenger may be able to give some guidance on the hazard(s) involved and how these could be dealt with. If the passenger can identify the item, refer to Section 4 of this document for the appropriate emergency response drill.</p> <p>On aircraft with only one cabin crew member, consult with the pilot-in-command as to whether the aid of a passenger should be sought in dealing with the incident.</p>
3.	<p>COLLECT EMERGENCY RESPONSE KIT OR OTHER USEFUL ITEMS</p> <p>Collect emergency response kit, if provided, or collect for use in dealing with the spillage or leakage:</p> <ul style="list-style-type: none"> — a supply of paper towels or newspapers or other absorbent paper or absorbent fabric (e.g. seat cushion covers, head rest protectors); — oven gloves or fire-resistant gloves, if available; — at least two large polyethylene waste bin bags; and — at least three smaller polyethylene bags, such as those used for duty-free or bar sales or, if none available, airsickness bags.
4.	<p>DON RUBBER GLOVES AND SMOKE HOOD</p> <p>The hands should always be protected before touching suspicious packages or items. Fire-resistant gloves or oven gloves covered by polyethylene bags are likely to give suitable protection.</p> <p>Gas-tight breathing equipment should always be worn when attending to an incident involving smoke, fumes or fire.</p>

Amplified-checklist <u>procedures</u> for spillage or leakage of dangerous goods	
<i>Step</i>	<i>Cabin crew action</i>
5.	<p>MOVE PASSENGERS AWAY FROM AREA AND DISTRIBUTE WET TOWELS OR CLOTHS</p> <p>The use of therapeutic oxygen bottles or the passenger drop-out oxygen system to assist passengers in a smoke- or fume-filled passenger cabin should not be considered since considerable quantities of fumes or smoke would be inhaled through the valves or holes in the masks. A more effective aid to passengers in a smoke- or fume-filled environment would be the use of a wet towel or cloth held over the mouth and nose. A wet towel or cloth aids in filtering and is more effective at doing this than a dry towel or cloth. Cabin crew should take prompt action if smoke or fumes develop and move passengers away from the area involved and, if possible, provide wet towels or cloths and give instructions to breathe through them.</p>
6.	<p>PLACE DANGEROUS GOODS ITEM IN POLYETHYLENE BAGS</p> <p><i>Note.— In the case of a spill of known or suspected dangerous goods in powder form:</i></p> <ul style="list-style-type: none"> — <i>leave everything undisturbed;</i> — <i>do not use fire agent or water;</i> — <i>cover area with polyethylene or other plastic bags and blankets;</i> — <i>keep area isolated until after landing.</i> <p>With emergency response kit</p> <p>If it is absolutely certain that the item will not create a problem, the decision may be made not to move it. In most circumstances, however, it will be better to move the item and this should be done as suggested below. Place the item in a polyethylene bag as follows:</p> <ul style="list-style-type: none"> — prepare two bags by rolling up the sides and placing them on the floor; — place the item inside the first bag with the closure of the item, or the point from which it is leaking from its container, at the top; — take off the rubber gloves while avoiding skin contact with any contamination on them; — place the rubber gloves in the second bag; — close the first bag while squeezing out the excess air; — twist the open end of the first bag and use a bag tie to tie it sufficiently tight to be secure but not so tight that pressure equalization cannot take place; — place the first bag (containing the item) in the second bag, which already contains the rubber gloves and secure the open end in the same manner as that used for the first bag.

Amplified-checklist <u>procedures</u> for spillage or leakage of dangerous goods	
<i>Step</i>	<i>Cabin crew action</i>
	<p>With no emergency response kit</p> <p>Pick up the item and place it in a polyethylene bag. Ensure the receptacle containing the dangerous goods is kept upright or the area of leakage is at the top. Using paper towels, newspaper, etc., mop up the spillage, after having ascertained there will be no reaction between what is to be used to mop up and the dangerous goods. Place the soiled towels, etc., in another polyethylene bag. Place the gloves and bags used to protect the hands either in a separate small polyethylene bag or with the soiled towels. If extra bags are not available, place the towels, gloves, etc., in the same bag as the item. Expel excess air from the bags and close tightly so as to be secure but not so tight that pressure equalization cannot take place.</p>
7.	<p>STOW POLYETHYLENE BAGS</p> <p>If there is a catering or bar box on board, empty any contents and place the box on the floor, with the door upward. Place the bag(s) containing the item and any soiled towels, etc., in the box and close the door. Take the box or, if there is no box, the bag(s) to a position as far away as possible from the flight deck and passengers. If a galley or toilet is fitted, consider taking the box or bag(s) there, unless it is close to the flight deck. Use a rear galley or toilet wherever possible, but do not place the box or bag(s) against the pressure bulkhead or fuselage wall. If a galley is used, the box or bag(s) can be stowed in an empty waste bin container. If a toilet is used, the box can be placed on the floor or the bag(s) stowed in an empty waste container. The toilet door should be locked from the outside. In a pressurized aircraft, if a toilet is used, any fumes will be vented away from passengers. However, if the aircraft is unpressurized there may not be positive pressure in a toilet to prevent fumes from entering the passenger cabin.</p> <p>Ensure when moving a box that the opening is kept upward or when moving a bag that either the receptacle containing the dangerous goods is kept upright or the area of leakage is kept at the top.</p> <p>Wherever the box or bag(s) have been located, wedge them firmly in place to prevent them from moving and to keep the item upright. Ensure that the position of the box or bags will not impede disembarkation from the aircraft.</p>
8.	<p>TREAT AFFECTED SEAT CUSHIONS / COVERS IN THE SAME MANNER AS DANGEROUS GOODS ITEM</p> <p>Seat cushions, seat backs or other furnishings which have been contaminated by a spillage should be removed from their fixtures and placed in a large bin bag or other polyethylene bag, together with any bags used initially to cover them. They should be stowed away in the same manner as the dangerous goods item causing the incident.</p>

Amplified checklist <u>procedures</u> for spillage or leakage of dangerous goods	
<i>Step</i>	<i>Cabin crew action</i>
9.	<p>COVER SPILLAGE ON CARPET / FLOOR</p> <p>Cover any spillage on the carpet or furnishings with a waste bag or other polyethylene bags, if available. If not, use airsickness bags opened out so that the plastic side covers the spillage or use the plastic covered emergency information cards.</p> <p>Carpet which has been contaminated by a spillage and which is still causing fumes despite being covered, should be rolled up, if possible, and placed in a large bin bag or other polyethylene bag. It should be placed in a waste bin and stowed, when possible, either in the rear toilet or rear galley. If the carpet cannot be removed it should remain covered by a large bin bag or polyethylene bags, etc., and additional bags should be used to reduce the fumes.</p>
10.	<p>REGULARLY INSPECT ITEMS STOWED AWAY / CONTAMINATED FURNISHINGS</p> <p>Any dangerous goods, contaminated furnishings or equipment which have been removed and stowed away or covered for safety should be subject to regular inspection.</p>
11.	<p>AFTER LANDING AT THE NEXT DESTINATION</p> <p>Upon arrival, apply the operator's post-incident procedures. These may include identifying to ground personnel where the item is stowed and providing all information about the item.</p> <p>Complete the required documentation, as per operator procedures, so that the operator is notified of the event, proper maintenance action is undertaken and the emergency response kit or any aircraft equipment used is replenished or replaced, if applicable.</p>

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DGP/27 (see paragraph 2.4.1.2 and 2.4.2 of the report under Agenda Item 2):

Section 4

CHART OF DRILLS AND LIST OF DANGEROUS GOODS WITH DRILL REFERENCE NUMBERS

...

4.1 AIRCRAFT EMERGENCY RESPONSE DRILLS

The aircraft emergency response drills as shown in Table 4-1 are for the guidance of crew members when an incident occurs in flight which is, or might be, related to a particular package, or packages, containing dangerous goods.

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The drill code assigned to an item of dangerous goods consists of a number ~~from 1 to 11~~ plus one or two letters. Referring to the chart of emergency response drills, each drill number corresponds to a line of information concerning the ~~risk~~ **hazard** posed by that substance and guidance on the preferable action that should be taken. The drill letter is shown separately on the drill chart; it indicates other possible hazards of the substance. In some cases, the guidance given by the drill number may be further refined by the information given by the drill letter(s).

4.2 ALPHABETICAL LIST OF DANGEROUS GOODS WITH DRILL CODES

The list of proper shipping names used for dangerous goods, arranged in alphabetical order, is shown in Table 4-2. For each entry, a drill code is shown and this should be used to find the appropriate drill on the chart of Aircraft Emergency Response Drills. The United Nations identification number is also listed to permit confirmation that the correct entry has been selected.

In a few cases, besides the proper shipping name, the UN number, packing group and/or the subsidiary ~~risk~~ **hazard** must also be used to identify the correct drill code. Where this is necessary, the possible UN numbers, packing groups and/or subsidiary ~~risks~~ **hazards** are given below the proper shipping name and the relevant drill code can be selected. These additional details are shown on the pilot-in-command's notification form.

In determining the alphabetical order of the proper shipping names, numbers and the terms n.o.s., alpha-, beta-, meta-, omega-, sec-, tert-, a-, b-, m-, N-, n-, O-, o- and p- have been ignored. Where names comprise more than one word, they have been alphabetized as if they were a single word.

4.3 NUMERICAL LIST OF DANGEROUS GOODS WITH DRILL CODES

The list of proper shipping names used for dangerous goods, arranged in numerical order of the associated UN identification number, is shown in Table 4-3. For each entry, a drill code is shown and this should be used to find the appropriate drill on the chart of Aircraft Emergency Response Drills.

In a few cases, besides the UN number, the class or division, the packing group or the subsidiary ~~risk~~ **hazard** must also be used to identify the correct drill code. Where this is necessary, the possible classes

or divisions, packing groups or subsidiary risks **hazards** are given below the UN number and the relevant drill code can be selected. These additional details are shown on the pilot-in-command's notification form.

Where alternative proper shipping names can be used with the same UN number, these are all shown separated by oblique lines.

Those dangerous goods which have not yet been allocated a UN identification number are listed first.

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Table 4-1. Aircraft Emergency Response Drills

1. COMPLETE APPROPRIATE AIRCRAFT EMERGENCY PROCEDURES. 2. CONSIDER LANDING AS SOON AS PRACTICABLE. 3. USE DRILL FROM THE CHART BELOW.						
DRILL NO.	INHERENT RISK/HAZARD	RISK/HAZARD TO AIRCRAFT	RISK/HAZARD TO OCCUPANTS	SPILL OR LEAK PROCEDURE	FIREFIGHTING PROCEDURE	ADDITIONAL CONSIDERATIONS
1	Explosion may cause structural failure	Fire and/or explosion	As indicated by the drill letter(s)	Use 100% oxygen; no smoking	All agents according to availability; use standard fire procedure	Possible abrupt loss of pressurization
2	Gas, non-flammable, pressure may create hazard in fire	Minimal	As indicated by the drill letter(s)	Use 100% oxygen; establish and maintain maximum ventilation for "A", "I" or "P" drill letter	All agents according to availability; use standard fire procedure	Possible abrupt loss of pressurization
3	Flammable liquid or solid	Fire and/or explosion	Smoke, fumes and heat, and as indicated by the drill letter(s)	Use 100% oxygen; establish and maintain maximum ventilation; no smoking; minimum electrics	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization
4	Spontaneously combustible or pyrophoric when exposed to air	Fire and/or explosion	Smoke, fumes and heat, and as indicated by the drill letter(s)	Use 100% oxygen; establish and maintain maximum ventilation	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization; minimum electrics if "F" or "H" drill letter
5	Oxidizer, may ignite other materials, may explode in heat of a fire	Fire and/or explosion, possible corrosion damage	Eye, nose and throat irritation; skin damage on contact	Use 100% oxygen; establish and maintain maximum ventilation	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization
6	Toxic*, may be fatal if inhaled, ingested, or absorbed by skin	Contamination with toxic* liquid or solid	Acute toxicity, effects may be delayed	Use 100% oxygen; establish and maintain maximum ventilation; do not touch without gloves	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization; minimum electrics if "F" or "H" drill letter
7	Radiation from broken/unshielded packages	Contamination with spilled radioactive material	Exposure to radiation, and personnel contamination	Do not move packages; avoid contact	All agents according to availability	Call for a qualified person to meet the aircraft
8	Corrosive, fumes disabling if inhaled or in contact with skin	Possible corrosion damage	Eye, nose and throat irritation; skin damage on contact	Use 100% oxygen; establish and maintain maximum ventilation; do not touch without gloves	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization; minimum electrics if "F" or "H" drill letter

DRILL NO.	INHERENT RISK HAZARD	RISK HAZARD TO AIRCRAFT	RISK HAZARD TO OCCUPANTS	SPILL OR LEAK PROCEDURE	FIREFIGHTING PROCEDURE	ADDITIONAL CONSIDERATIONS
9	No general inherent risk hazard	As indicated by the drill letter	As indicated by the drill letter	Use 100% oxygen; establish and maintain maximum ventilation if "A" drill letter	All agents according to availability	None
10	Gas, flammable, high fire risk if any ignition source present	Fire and/or explosion	Smoke, fumes and heat, and as indicated by the drill letter	Use 100% oxygen; establish and maintain maximum ventilation; no smoking; minimum electrics	All agents according to availability	Possible abrupt loss of pressurization
11	Infectious substances may affect humans or animals if inhaled, ingested or absorbed through the mucous membrane or an open wound	Contamination with Infectious substances	Delayed infection to humans or animals	Do not touch. Minimum re-circulation and ventilation in affected area	All agents according to availability. No water on "Y" drill letter	Call for a qualified person to meet the aircraft
12	Fire, heat, smoke, toxic and flammable vapour	Fire and/or explosion	Smoke, fumes, heat	Use 100% oxygen; establish and maintain maximum ventilation	All agents according to availability. Use water if available	Possible abrupt loss of pressurization; consider landing immediately
DRILL LETTER	ADDITIONAL- RISK HAZARD		DRILL LETTER	ADDITIONAL- RISK HAZARD		
A	ANAESTHETIC		S	SPONTANEOUSLY COMBUSTIBLE OR PYROPHORIC		
C	CORROSIVE		W	IF WET GIVES OFF TOXIC* OR FLAMMABLE GAS		
E	EXPLOSIVE		X	OXIDIZER		
F	FLAMMABLE		Y	DEPENDING ON THE TYPE OF INFECTIOUS SUBSTANCE, THE		
H	HIGHLY IGNITABLE			APPROPRIATE NATIONAL AUTHORITY MAY BE REQUIRED TO		
i	IRRITANT / TEAR PRODUCING			QUARANTINE INDIVIDUALS, ANIMALS, CARGO AND THE AIRCRAFT		
L	OTHER- RISK HAZARD LOW OR		Z	AIRCRAFT CARGO FIRE SUPPRESSION SYSTEM MAY NOT		
M	NONE			EXTINGUISH OR CONTAIN THE FIRE; CONSIDER LANDING		
N	MAGNETIC			IMMEDIATELY		
P	NOXIOUS TOXIC* (POISON)					
* Toxic has the same meaning as poison.						

Alignment of UN No. and proper shipping names with UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):

Amend Tables 4-2 and 4-3 as indicated:

<i>UN No.</i>	<i>Drill Code</i>	<i>Proper shipping name</i>
<u>0511</u>	<u>1L</u>	<u>Detonators, electronic programmable for blasting†</u>
<u>0512</u>	<u>1L</u>	<u>Detonators, electronic programmable for blasting†</u>
<u>0513</u>	<u>1L</u>	<u>Detonators, electronic programmable for blasting†</u>
2522	6L	2-Dimethylaminoethyl methacrylate, <u>stabilized</u>
<u>3363</u>	<u>9L</u>	<u>Dangerous goods in articles</u>
<u>3549</u>	<u>11Y</u>	<u>Medical waste, Category A, affecting humans, solid</u>
<u>3549</u>	<u>11Y</u>	<u>Medical waste, Category A, affecting animals only, solid</u>

APPENDIX G
(English only)

**DRAFT ANC JOB CARD ON ALIGNMENT OF THE SUPPLEMENT TO
THE TECHNICAL INSTRUCTIONS WITH THE TECHNICAL
INSTRUCTIONS**

DRAFT ANC JOB CARD

Title	Alignment of the Supplement to the Technical Instructions with the Technical Instructions	Reference DGP/27	DGP.007.01
Source	DGP/27, Recommendation 2/6 (see paragraph 2.3.1 of DGP/27 Report)		
Problem Statement	Inconsistencies between the <i>Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air</i> (Doc 9284SU) and <i>Technical Instructions for the Safe Transport of Dangerous Goods by Air</i> (Doc 9284) have been identified		
Specific Details	Dangerous goods which may be excepted from the requirement for them to be loaded in a Class B or Class C cargo compartment, under certain circumstances with the approval of the State of Origin and the State of the Operator, are listed in Part S-7;2.2 of the Supplement. A number of substances were identified as missing from this list at DGP/27, and a proposal for the establishment of a working group to review the list was made. The proposal was specific to one part of the Supplement, but the panel noted that there were potentially other areas that were out of date. Specific mention of a newer main deck cargo compartment type (Type F) was made, with a suggestion that it be taken into account as part of a review. The panel concluded that a working group should be established to conduct an initial review of the Supplement to the Technical Instructions to ensure its alignment with the Technical Instructions and to be tasked with maintaining it in the future.		
GANP/GASP Link	Effective safety oversight and State safety programme (SSP) implementation		
Expected Benefits	Sound guidance to States when issuing approvals or exemption related to the carriage of dangerous goods by air		
References	DGP/27, Recommendation 2/6 Technical Instructions, Part 7;2.1.2 Supplement to the Technical Instructions, Part S-7;2.2		
Primary Expert Group:	DGP		

WPE No.	Document Affected or Actions Needed	Description of Amendment proposal or Action	Supporting Expert Group	Status	Expected dates		
					Delivery	Effective	Applicability
TBD	Doc 9284SU	Update list in Part S-7;2.2 for all divisions and classes and consider addition of criteria for addition to the list	FLTOPSP, AIRP		Q4 2021	Jan 2023	Jan 2023
TBD	Doc 9284, Doc 9284SU	Determine need to take Class F cargo compartment into account with respect to storage and loading of dangerous goods in Doc 9284 and Doc 9284SU	FLTOPSP, AIRP		Q4 2021	Jan 2023	Jan 2023
TBD	Doc 9284SU	Review and correct any anomalies or inconsistencies identified within Table S-3-1 – the Supplementary Dangerous Goods List			Q4 2021	Jan 2023	Jan 2023
TBD		Develop recommendations for improvement of the Supplement					
TBD		Develop a process for future maintenance and amendment of the Supplement					

Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air
3.1: Consider how lithium battery package standard under development by SAE G27 Committee (AS6413) can be incorporated into ICAO provisions

3.1.1 MARKS ON PACKAGES TESTED TO AN EXTERNAL STANDARD TO IDENTIFY CONTENTS AND PROVIDE TRACEABILITY (DGP/27-WP/8)

3.1.1.1 An update on the progress of a performance-based package standard for lithium batteries that the SAE International G27 Lithium Battery Packaging Performance Committee was developing had been given at DGP-WG/19 (see paragraph 3.3.2.1 of the DGP-WG/19 report). Once complete, the DGP would need to consider whether or not the standard should be adopted in the Technical Instructions. If the panel decided to adopt it, measures to provide confidence to the aviation industry that a battery/package combination had successfully passed the standard test would need to be established. Draft text to address this need was developed for a possible new chapter in Part 6 of the Technical Instructions as a basis for discussion. The text attempted to capture the following principles:

- a) Identification that the packaging and its contents were consistent with the actual tests performed would be critical to the operator. Operators would likely not accept the packages without being able to verify this.
- b) A clear set of marks on the package that identified it met the standard would be needed including the name of the manufacturer and some form of identification that provided an audit trail for components such as configuration, quantity, and the cells or batteries tested.
- c) The performance of the test standard should be in accordance with procedures established by the State, and the State approving the marks should form part of any marks applied on the approved package.

3.1.1.2 It was emphasized that the text was presented for the purpose of discussion only, recognizing that the work of the G-27 Committee was ongoing and the standard had yet to be completed. The following points were raised during discussion:

- a) One of the two co-chairs of the G-27 Committee was present. He expressed his appreciation for the discussion, particularly in relation to identifying what markings or information would need to be provided for the purpose of oversight and operator acceptance of a lithium battery package. While the SAE committee's role was testing criteria, additional marking that would be needed, who could perform the test, and who could authorize testing would be ICAO's role.
- b) The scope of the SAE standard was questioned, i.e. would it apply to passenger aircraft only or to both passenger and cargo aircraft. The SAE co-chair noted that this query was raised repeatedly on the committee. The answer had always been that this decision was not the committee's to make. It's job was to create a performance-based standard that could be used to determine whether the hazards from a thermal runaway event could be maintained within the package. It was intended for the standard to

apply to both lithium ion and lithium metal cells. It would be up to ICAO to determine whether it should be implemented for transport by air and, if so, how.

- c) The need to take into account the use overpacks and whether any markings would be required on them was noted.
- d) There needed to be a clear indication that a package met the SAE standard. This might involve a separate mark or be an additional component of the UN specification marking. It was suggested the marking could identify approval by a State or an independent third party authorized by a State.

3.1.1.3 The chair of the UN Sub-Committee was present and noted the committee had begun discussions on establishing a general mechanism for determining if a packaging is able to mitigate hazards associated with articles with the potential to produce excessive heat. This would include a method of determining who did the package testing, what the results were and whether a particular package had been subject to additional testing. It was suggested that the outcome of this work might support efforts to provide confidence to States and industry that a lithium battery package met the SAE package standard.

- Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air**
3.2: Consider marking, labelling and documentation requirements for lithium battery packages meeting the SAE G27 Committee draft standard AS6413 (Ref: Job Card DGP.003.02)

3.2.1 Discussions on marking and labelling were held under Agenda Item 3.1 (see paragraph 3.1.1 of the report under Agenda Item 3).

- Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air**
3.3: Consider the need for amendments to address impact from proposed amendment to Annex 6, Volume I on cargo compartment safety (Ref: Job Cards DGP.003.02 and FLTOPSP.043)

3.3.1 SAFETY RISK ASSESSMENTS (DGP27-WP/22)

3.3.1.1 An amendment to upgrade an existing recommendation for operators to include a safety risk assessment process for the transport of dangerous goods as part of their approved safety management system to a requirement in Part 7;1 of the Instructions was proposed for the sake of alignment with provisions developed for inclusion in a new Chapter 15 to Annex 6 — *Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes* on cargo compartment safety. The new Annex 6 provisions included a Standard requiring the State of the operator to ensure that the operator established policy and procedures for the transport of items in the cargo compartment, including the conduct of a specific safety risk assessment. The Secretariat noted that the Annex 6 provisions had not yet been adopted. They would be reviewed by the Council during the first quarter of 2020 with an expected applicability date of 5 November 2020.

3.3.1.2 An adviser noted difficulties in his State with regard to collecting data from various entities in the supply chain that would be necessary to conduct effective safety risks assessments. He suggested that a Standard was necessary to ensure data was provided and shared between the various entities. The Secretariat noted that Annex 19 contained Standards regarding safety data collection, exchange and protection, and that additional guidance had been developed to support the Annex 6 amendment.

3.3.1.3 While there was support for the amendment in principle, some questioned the need for including the provision at all since it simply repeated what was already a requirement in other Annexes. The existing provision in the Technical Instructions had been added to clarify that the requirement for operators to conduct safety risk assessments applied to dangerous goods and a specific reference was made to lithium batteries in recognition of the unique hazards they posed. The Annex 6 amendment, supported by guidance material, made this especially clear. The panel ultimately saw value in linking dangerous goods and the Technical Instructions to this requirement. A revised proposal which referred to the Annex 19 and Annex 6 provisions instead of repeating requirements in the Technical Instructions was agreed, subject to the Council adopting the amendment to Annex 6. The amendment is shown in Appendix A to this agenda item.

3.3.2 RECOMMENDATION

3.3.2.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 3/1 — Amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2021-2022 Edition to address the impact on cargo compartment safety resulting from Amendment 44 to Annex 6, Volume I

That, subject to Council adoption of Amendment 44 to Annex 6, Part I, the Technical Instructions be amended as indicated in Appendix A to the report on this agenda item.

- Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air**
3.4: Consider measures to mitigate safety risks posed by lithium batteries carried and/or used by passengers, crew and the operator (Ref: Job Card DGP.003.02)

3.4.1 MULTIFUNCTIONAL BAGGAGE EQUIPPED WITH A LITHIUM BATTERY CARRIED BY PASSENGERS OR CREW (DGP/27-IP/3)

3.4.1.1 New baggage types were equipped with multiple battery-powered functions, including the ability to use the baggage as a mobility aid. The panel was invited to consider which provisions in the table for dangerous goods carried by passengers and crew should apply to such baggage. While applying the provisions for baggage equipped with lithium batteries was considered the most appropriate, the baggage could theoretically be considered as a mobility aid or a portable electronic device. There were no energy density limits established for the batteries in the entry for mobility aids. They were intended for people with legitimate mobility aid needs. However, it was difficult to determine whether or not a passenger was legitimately using baggage as a mobility aid and difficult to argue with a passenger if they claimed they were. Panel members acknowledged difficulties for operators applying the provisions recognizing the rights of persons with disabilities were protected. A medical certificate indicating a disability would be one way of justifying categorization as a mobility aid, but this would be difficult to get in the case of a recent injury. The issue was a long-standing one, and efforts by other groups had been made to harmonize disability processes which addressed the rights of passengers without infringing on operational or safety issues. In fact, a paper had been submitted to the Fortieth Session of the Assembly on the subject (A40-WP/346). The panel would be updated on this on-going work.

3.4.2 PROVISIONS FOR LITHIUM BATTERIES CARRIED BY PASSENGERS AND COMPLIANCE WITH UN MANUAL OF TEST CRITERIA (DGP/27-IP/8)

3.4.2.1 The panel was invited to consider whether the requirement in Part 8 for batteries carried by passengers or crew to have passed the tests in the *UN Manual Test and Criteria* was reasonable, recognizing that neither operator personnel or typical passengers would be able to determine this. It was suggested a method that would allow anyone to make the determination would be to require battery manufacturers to affix a mark on the battery or cell signifying it had passed the tests. While seeing a theoretical benefit to this, panel members believed it would be practically impossible to implement this because of the need to validate the authenticity of such a mark. It was noted that this idea had been rejected by the UN Sub-Committee. While some agreed the requirement seemed nonsensical without the ability of passengers or operator staff to determine whether batteries had passed the UN tests, others suggested the intent of the requirement for UN testing was really aimed at the battery manufacturing industry.

- Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air**
3.5: Consider the need for specific measures to mitigate safety risks posed by lithium batteries packed with or contained in equipment

3.5.1 Guidance material associated with electronic devices powered by lithium batteries was developed under Agenda Item 3.6 (see paragraph 3.6.1 of the report under Agenda Item 3).

- Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air**
3.6: Develop provisions aimed at improving compliance throughout the transport supply chain, including simplification of provisions, guidance on State oversight and outreach, and responsibilities of entities outside the aviation

3.6.1 AMENDMENT TO THE GUIDANCE TO STATES ON THE TRANSPORT OF LITHIUM BATTERIES AS CARGO CONTAINED IN THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS (DGP/27-IP/5)

3.6.1.1.1 Amendments to the guidance material for States on the transport of lithium batteries contained in Part S-1;4 of the Supplement to the Technical Instructions were proposed for the sake of alignment with safety risk assessment provisions contained in an amendment to Annex 6 on cargo compartment safety (new Chapter 15 to Annex 6, Part I) and to highlight the hazards associated with electronic devices powered by lithium batteries in checked baggage, recalled batteries or devices, and undeclared lithium batteries. A breakout working group was tasked with reviewing the material. The breakout group supported the intent of the amendments, but identified a number of areas that would need to be refined. One area was the guidance related to recalled batteries or devices; the group considered it to be too prescriptive and was concerned that it implicitly obliged a ban on their carriage by passengers or crew regardless of the outcome of a safety risk assessment. Another area related to the criteria to be identified as part of a safety risk assessment. The existing text referred to it as the criteria that would need to be taken into account when considering whether or not to grant an approval or an exemption to transport lithium batteries as cargo on passenger aircraft under Special Provision A201. The intent of the proposed amendment was to align the list with the elements listed in the amendment to Annex 6. Reference to Special Provision A201 was removed, recognizing that the amendment to Annex 6 would require a safety risk assessment irrespective of the need for an approval or exemption. The breakout group believed the list of criteria, while appropriate for a State in considering whether or not to grant an approval, was inappropriate for an operator conducting a risk assessment under normal conditions. They noted that criteria such as the specific hazards of the batteries and their chemical composition would be impossible for the operator to determine. The Secretariat noted that the FLTOPSP had listed these elements as necessary criteria for safety risk management activities for the transport of lithium batteries in its statement to DGP/25 without differentiating between passenger and cargo aircraft (see the report of the second meeting of the FLTOPSP). This statement had contributed to the Council's decision to ban their transport as cargo on passenger aircraft and was the impetus for the request to the UN Sub-committee to develop a more granular hazard classification system for lithium batteries. The elements in the Annex 6 amendment were based on the list from the FLTOPSP statement. They were generalized because the Annex 6 provisions applied to all items in a cargo compartment, not just lithium batteries. The Secretariat suggested the fact that an operator could not know the chemical composition of the batteries did not necessarily mean they couldn't transport them, they would just need to take this into account and implement appropriate risk mitigation measures.

3.6.1.1.2 Despite the concerns raised, there was support for further developing the material. It was suggested that a website might be a more appropriate place for some of the material, as it would make it more visible and provide a more flexible mechanism for ensuring up-to-date guidance. A working group through correspondence would take on the task of refining the material and considering where to publish it. The Secretariat noted the work would need to be done in the near term in order for it to be considered by the ANC with all of the recommendations from DGP/27.

3.6.2 **REPORT OF THE UNITED KINGDOM CIVIL AVIATION AUTHORITY'S FIRST INTERNATIONAL LITHIUM BATTERY WORKSHOP (DGP/27-IP/12)**

3.6.2.1.1 The United Kingdom's Civil Aviation Authority hosted an international lithium battery workshop to explore key issues faced in the safe transportation of lithium batteries (London, 13 to 14 June 2019). A report of the meeting was provided to the panel. The workshop identified practical actions that could help ensure lithium batteries met existing design and manufacturing standards and which could result in a reduction in the number of non-compliant shipments in air transport. The report included a table of recommendations on how to mitigate the safety risk with a number of them addressed to ICAO. These included the conduct of safety promotion activities, alignment of other lithium battery-related standards with the tests in the UN *Manual of Tests and Criteria*, ensuring that enforcement procedures included measures aimed at preventing the recurrence of undeclared dangerous goods, ensuring States had addressed their responsibilities with respect to designated postal operators through the Universal Safety Oversight Audit Programme (USOAP), having the FLTOPSP SCG-SWG address dangerous goods responsibilities of freight forwarders, identifying ways to detect undeclared dangerous goods using security measures, and including additional guidance in the Technical Instructions for operators to detect hidden dangerous goods. The Secretariat noted ICAO's participation at the workshop and expressed its appreciation for the success of the workshop.

3.6.3 **RECOMMENDATION**

3.6.3.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 3/2 — Guidance to States on the transport of lithium batteries as cargo contained in the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU)

That the guidance to States on the transport of lithium batteries as cargo contained in the Supplement to the Technical Instructions be modified for the sake of alignment with new safety risk assessment provisions related to cargo compartment safety developed for inclusion in Annex 6 and to address hazards associated with electronic devices powered by lithium batteries in checked baggage, recalled batteries or devices and undeclared lithium batteries.

- Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air**
3.7: Monitor UN Committee's work on hazard-based system for classification of lithium batteries and consider impact on ICAO provisions (Ref: Job Card DGP.003.02)

3.7.1 UNITED NATIONS LITHIUM BATTERY HAZARD CLASSIFICATION WORKING GROUP

3.7.2 The Secretary provided a brief update on the UN Sub-Committee's efforts to develop a hazard-based classification system for lithium batteries. A working group of the Sub-Committee had been established for this purpose. It was difficult to project an accurate timeline for completion of the task, but it was clear it would take at least another biennium. The working group would be meeting later in October 2019 to analyse data from testing. The panel would be kept up-to-date on progress.

APPENDIX A**AMENDMENT TO THE SAFETY RISKS ASSESSMENT PROVISIONS
CONTAINED IN PART 7 OF THE TECHNICAL INSTRUCTIONS****Chapter 1****ACCEPTANCE PROCEDURES**

...

DGP/27 (see paragraph 3.3.1 of the report under Agenda Item 3):

1.7 CONDUCTING SAFETY RISK ASSESSMENTS

~~Operators engaged in commercial air transport operations should include a safety risk assessment process for the transport of dangerous goods as part of their approved safety management system to comply with Annexes 6 — *Operation of Aircraft* and 19. This safety risk assessment should include appropriate information to result in implementation of safety measures that ensure the safe transport of dangerous goods including lithium batteries and cells as cargo. Operators must include the transport of dangerous goods, including lithium batteries and cells as cargo, in the scope of their:~~

- ~~a) safety management system (SMS) in accordance with Annex 19; and~~
- ~~b) specific safety risk assessment on the transport of items in the cargo compartment in accordance with Annex 6 — *Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes.*~~

~~Note 1.— Guidance on implementation of an SMS is contained in the Safety Management Manual (SMM) (Doc 9859).~~

~~Note 2.— Guidance on the conduct of a specific safety risk assessment on the transport of items in the cargo compartment is contained in the Cargo Compartment Operational Safety Manual [working title] (Doc 10102).~~

Agenda Item 4: Clarifying State oversight responsibilities in Annex 18 (Ref: Job Card DGP.005.02)

**4.1 REPORT OF THE DANGEROUS GOODS PANEL (DGP)
WORKING GROUP ON CLARIFYING STATES'
RESPONSIBILITIES IN ANNEX 18 (DGP/27-IP/2)**

4.1.1 An update on the work of the Dangerous Goods Panel Working Group on Clarifying States' Responsibilities in Annex 18 (DGP-WG/Annex 18) was provided. DGP-WG/Annex 18 met in London, England from 16 to 17 July 2018, in Dubai, United Arab Emirates from 23 to 25 July 2019, and in Montréal from 11 to 13 Sep 2019. The working group completed the following tasks:

- a) The identification of common terminology, interrelationships, and potential ambiguities, inconsistencies or gaps between cargo-related provisions in all ICAO Annexes. A document summarizing this review was provided to the panel.
- b) The identification of dangerous-goods related protocol questions for aircraft operations — OPS from the ICAO Universal Safety Oversight Audit Programme (USOAP) Continuous Monitoring Approach (CMA) for which a clear link to associated responsibilities in Annex 18 and/or the Technical Instructions was lacking or unclear. The protocol questions would be reviewed again once amendments to Annex 18 to clarify State responsibilities were developed. It was emphasized that the working group would not use the protocol questions to direct their work, but rather use them to have a clearer picture of the current system. A final review of the protocol questions following the completion of the restructure of Annex 18 would likely result in recommended revisions to them.

4.1.2 Work on draft provisions for Annex 18 to clarify States' dangerous goods safety management responsibilities was on-going. The working group was conducting its work by going through each Standard in Annex 19, Chapter 3 to consider how they applied to dangerous goods State responsibilities using the *Safety Management Manual (SMM)* (Doc 9859) as guidance. Some Standards needed to be elaborated to capture dangerous goods-specific responsibilities while others did not. Repeating all Standards from Annex 19, Chapter 3 even if there was no elaboration necessary was considered, as this would make safety management responsibilities clear to dangerous goods State employees, but this was not the usual approach taken by ICAO as there would be potential to confuse States into thinking they were subject to a different Standard. It was decided a better approach would be to capture all safety management responsibilities as guidance material. The development of more detailed guidance material was recommended as a future task.

4.1.3 The next steps for the working group would be to consider:

- a) the need to highlight interrelationships between Annex 18 and other ICAO Annexes using the document developed at the London face-to-face meeting;
- b) how to structure all of Annex 18 around the safety management provisions developed by the working group;

- c) whether recommendation to modify existing protocol questions was necessary based on the proposed revisions to Annex 18; and
- d) whether existing guidance material related to States' oversight responsibilities contained in the Supplement should be maintained in that document along with additional guidance material that may be identified as necessary, or if consideration should be given to moving appropriate guidance to an attachment to Annex 18 or a separate document.

4.1.3.1.1 The panel expressed its appreciation to the chairman and the working group for the work done.

4.2 REVISIONS TO RECOMMENDATIONS ON ISSUANCE OF APPROVALS AND EXEMPTIONS (DGP/27-WP/7)

4.2.1 The need for additional guidance on the issuance of approvals and exemptions was identified at DGP-WG/19, particularly with respect to which entities the approval or exemption should be issued to and the relationship between the shipper, the operator and the State authorities processing them (see paragraph 3.3.6.1 of the DGP-WG/19 Report). The need to emphasize the need for all relevant information to be included in the approval document and for the document to be passed on to all relevant entities was also identified (see paragraph 3.2.3.2 of the DGP-WG/19 Report). While support for development of guidance material was unanimous, some panel members cautioned against being too prescriptive with regard to procedures. They suggested that a performance-based approach, including the need for qualified technical personnel at the State level, would be more effective. An amendment to existing guidance in Part S-1, Chapter 1, Attachment 1 to the Supplement (Guidance for processing exemptions and approvals for the safe transport of dangerous goods by air) was proposed taking into account these comments.

4.2.2 There was general support for the amendment, although some thought it was still too prescriptive. Regardless, most thought it was much needed guidance, recognizing that more would be done as a result of the work on clarifying State oversight responsibilities in Annex 18. A revised amendment which included an indication that the shipper should be provided with packing instruction information if it wasn't already provided in the Technical Instructions was agreed.

4.3 AMENDMENT TO ATTACHMENT I TO CHAPTER 1 OF THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS (DGP/27-WP/29)

4.3.1 Amendments to the guidance for processing exemptions and approvals for the safe transport of dangerous goods by air contained in Part S-1, Chapter 1, Attachment I to the supplement were proposed to clarify the intent of the use of parenthesis around the maximum net quantities in Table S-3-1 and to describe the difference between exemptions and approvals more clearly. Minor editorial amendments were also proposed. A revised amendment was agreed.

4.4 U.S. STAKEHOLDER ENGAGEMENT STRATEGY (DGP/27-IP/7)

4.4.1 A briefing was given on efforts taken in one State to promote safety, based on the principles of safety promotion and risk-based decision making outlined in the *Safety Management Manual (SMM)* (Doc 9859) in accordance with *Annex 19 — Safety Management*. The briefing focused on the communication and dissemination of safety information to external stakeholders with the objective of developing a safer civil aviation system within the State and effectively targeting and allocating resources to focus on high-impact, high-risk stakeholder engagement efforts. A better understanding of the critical role the State's dangerous goods programme website played in providing information and improving aviation safety was gained through engagement with external stakeholders. This resulted in major efforts to improve the website so as to more effectively inform stakeholders and the travelling public. The website was highly focused on reducing and preventing undeclared dangerous goods from entering the air transport system. It was reported that the amount of traffic to the website had increased ten times to over a million views since launching of the revitalized website. Various social media tools were also used to disseminate information using consistent branding. The Secretariat noted the benefit of sharing methods for implementing dangerous goods safety management activities among States and invited other panel members to share their experience at future meetings.

4.5 RECOMMENDATION

4.5.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 4/1 — Amendment to the Supplement to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) for incorporation in the 2021-2022 Edition with respect to guidance on the processing of exemptions and approvals

That the Supplement to the Technical Instructions be amended as indicated in the appendix to the report on this agenda item.

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APPENDIX

PROPOSED AMENDMENTS TO THE SUPPLEMENT TO THE
TECHNICAL INSTRUCTIONS

Part S-1

GENERAL

(ADDITIONAL INFORMATION
FOR PART 1 OF THE
TECHNICAL INSTRUCTIONS)

...

ATTACHMENT I TO CHAPTER 1

GUIDANCE FOR PROCESSING EXEMPTIONS AND APPROVALS FOR THE
SAFE TRANSPORT OF DANGEROUS GOODS BY AIR

A. General Guidance

DGP/27 (see paragraph 4.3 of the report under Agenda Item 4):

The *Technical Instructions for the Safe Transport of Dangerous Goods by Air* provide requirements to safely transport dangerous goods by air. These requirements often exceed the requirements of other modes of transport commensurate with the unique and sensitive nature of air transport.

Part 1 of the Technical Instructions provides for the issuance of approvals and exemptions in certain instances as described in 1;1.1.2 and 1;1.1.3 respectively. States which issue an exemption or approval should have a review process in place and exercise the appropriate technical competency to conduct a thorough evaluation and impose the necessary safety measures to ensure that the conditions of the exemption or approval issued provide an equivalent level of safety to the requirements of the Technical Instructions.

DGP/27 (see paragraph 4.2 of the report under Agenda Item 4):

Who must obtain an exemption or approval?

The responsibility for obtaining an approval or exemption may rest with the operator or with the shipper or with both depending on the nature of the request and on State procedures. The shipper should be requested to identify an operator that is prepared to carry the cargo should the approval or exemption be issued. It is also useful for States to include the operator in the consideration of the conditions that will apply to the approval or exemption so that the operator is able to conduct a specific safety risk assessment for the planned operation.

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What packaging standards should be considered?

Where an entry in Table S-3-1 has a number in parenthesis after the word "Forbidden", this refers to a packing instruction which contains the method of packing that should be specified when issuing an exemption. As much as possible, appropriate packing instruction numbers are indicated in columns 10 to 13 of Table S-3-1 and the associated detailed requirements appear in Part S-4, where these are additional to those given in the Technical Instructions.

Where the approval or exemption references a packing instruction that is not included in the Technical Instructions, it is recommended that the approval or exemption document that is issued include the packing instruction, or at least those parts

that are required by the shipper when preparing a consignment for transport and the operator when performing their acceptance check of the consignment.

DGP/27 (see paragraph 4.3 of the report under Agenda Item 4):

What quantity limitations should be considered for entries subject to Special Provision A1 or A2?

The quantity shown in parenthesis in columns 11 or 13 of Table S-3-1 is the maximum net quantity per package which qualifies for an approval under Special Provisions A1 and A2. Exceeding this limit may only be made through the issuing of an exemption.

What quantity limitations should be considered for entries not subject to Special Provision A1 or A2?

The suggested maximum quantity limitations to be permitted are indicated in Table S-3-2 or S-3-3 for some classes and divisions.

May an approval be granted to authorize the transport of a forbidden explosive?

Explosives transported in accordance with Special Provision A1 or A2 of the Technical Instructions may only be transported under the provisions of an approval.

May an ~~approval~~ exemption be granted to authorize the transport of a forbidden explosive or an explosive transported in excess of authorized quantities?

Explosives transported in excess of their authorized quantities and forbidden explosives may only be transported under the provisions of an ~~approval~~ exemption.

...

Agenda Item 5: Dangerous goods accident and incident reporting system (Ref: Job Card DGP.002.02)

5.1 DANGEROUS GOODS ACCIDENT AND INCIDENT REPORTING SYSTEM (JOB CARD DGP.002.02)

5.1.1 The DGP Working Group on Reporting (DGP-WG/Reporting) completed draft guidance material to support revised reporting and investigation provisions for Annex 18 and the Technical Instructions that had previously been developed by the working group and presented to DGP/26 (see paragraph 6.2.1 of the DGP/26 Report). The guidance material was the output of a face-to-face meeting hosted by the United Kingdom Civil Aviation Authority in London from 18 to 20 July 2018. The material would need further refinement based on the work to clarify State oversight responsibilities in Annex 18 (ANC job card DGP.005.01).

5.1.2 The panel considered the work tasked to DGP-WG/Reporting complete. It recommended the refinement of the provisions be added as a task to the job card on clarifying States' oversight responsibilities in Annex 18 (DGP.005.01). It was expected that the refined material would be presented to the twenty-eighth meeting of the DGP as part of a full package to clarify States' oversight responsibilities.

Recommendation 5/1 — Dangerous Goods Accident and Incident Reporting System (ANC job card DGP.002.02)

That the status of ANC job card DGP.002.02 be considered complete, and the task of aligning the draft dangerous goods accident and incident reporting provisions with provisions developed under ANC job card DGP.005.01 (Clarifying States' oversight responsibilities in Annex 18) be added as a task on that job card.

Agenda Item 6: Dangerous goods training for entities handling general cargo (Ref: Secretariat Job Card)**6.1 DANGEROUS GOODS TRAINING FOR ENTITIES HANDLING GENERAL CARGO**

6.1.1 DGP/26 had recommended the provisions in Attachment 4, Chapter 1 of the 2017-2018 Edition of the Technical Instructions be incorporated in Part 1 of the 2019-2020 Edition (see Recommendation 2/2 of the DGP/26 Report and its Supplement) and that an amendment to Annex 18, requiring the establishment of training programmes for entities not intending to handle dangerous goods and the establishment of measures preventing the transport of undeclared dangerous goods on aircraft, be sent for State consultation (see Recommendation 6/4 of the DGP/26 Report and its Supplement). The ANC, however, did not believe the amendment to Annex 18 was mature enough for State consultation and, because there was a lack of consensus on the panel with corresponding proposed amendments to the Technical Instructions (Part 1;4.1.2 of Attachment 4), did not support incorporating the Attachment 4 provisions in Part 1;4 of the 2019-2020 Edition.

6.1.2 The inability of the panel to reach consensus was related to whether or not dangerous goods training could be mandated for entities not intending to handle dangerous goods. Some members considered training as a requirement that had been in effect for many years through the application of Tables 1-4 and 1-5 and the provisions of Part 1;4.1.1 of the Instructions. The removal of the tables in the new training provisions resulted in the removal of this requirement. They believed this was an unintended consequence that needed to be rectified and that removing the mandatory status went beyond the scope of the work to align the training provisions with competency-based principles. Others had not interpreted the existing provisions to be mandatory. They believed that requiring training for personnel not performing any functions in the Technical Instructions contradicted the principles of competency-based training and assessment and went beyond the scope of Annex 18. Those supporting a mandatory requirement argued that these entities played a role in preventing undeclared dangerous goods from entering the cargo stream, and removing this long-standing requirement would have a detrimental effect on safety which would be difficult to justify. Others, while agreeing that the risk of undeclared dangerous goods entering the cargo stream needed to be mitigated, maintained that mandating training for personnel employed by entities not performing any functions in the Technical Instructions was not possible within the legal framework of their States and that other measures were available to mitigate the risk (see paragraph 6.4.1 of the DGP/26 Report).

6.1.3 The newly-established Safe Carriage of Goods Specific Working Group of the Flight Operations Panel (FLTOPSP-SCG-SWG) was subsequently tasked with addressing the issue holistically. In the meantime, a revision to the provision that the panel could not reach consensus on at DGP/26 was agreed at DGP-WG/19 with full consensus. The amendment did not introduce any new requirements but instead referred to guidance material in the same manner the current provisions did. It was a compromise solution to allow States who did mandate training for entities not intending to handle dangerous goods to continue doing so without being too explicit for States that could not mandate training for such entities through Annex 18 and the Technical Instructions. The amendment would remove any impediments to incorporating the training provisions in the next edition of the Technical Instructions regardless of the status of the work of FLTOPSP-SCG-SWG to address the issue holistically. This would also allow the DGP more time to review the proposed changes to Annex 18 developed at DGP/26. This work would be incorporated in the work of the working group on clarifying State's responsibilities in Annex 18 (DGP-WG/Annex 18).

6.2 RECOMMENDATIONS

6.2.1 In light of the foregoing discussions, the meeting developed the following recommendations:

Recommendation 6/1 — Amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284)* related to training of entities handling general cargo

That the Technical Instructions be amended as indicated in Appendix A to the report on this agenda item.

Recommendation 6/2 — Annex 18 training provisions

That the training and compliance provisions contained in Annex 18 be reviewed as part of the work under ANC job card DGP.005 — Clarifying State oversight responsibilities in Annex 18 and in follow-up to DGP/26 Recommendation 6/4.

APPENDIX

**PROPOSED AMENDMENT TO THE TRAINING PROVISIONS IN THE
TECHNICAL INSTRUCTIONS**

Editorial Note.— A recommendation to move the training provisions in Attachment 4, Chapter 1 of the 2019-2020 Edition of the Technical Instructions to Part 1;4 of the 2021-2022 Edition was made under Agenda Item 2 of this report (Recommendation 2/2). As such, the amendment in this appendix should be included in Part 1;4.

Attachment 4

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Chapter 1

PROPOSED NEW PART 1, CHAPTER 4 — DANGEROUS GOODS TRAINING

...

Chapter 4

DANGEROUS GOODS TRAINING

*Parts of this Chapter are affected by State Variations AE 2, BR 7, CA 11, HK 1;
see Table A-1*

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4.1 ESTABLISHMENT OF DANGEROUS GOODS TRAINING PROGRAMMES

Note.— A training programme includes elements such as design methodology, assessment, initial and recurrent training, instructor qualifications and competencies, training records and evaluation of the effectiveness of training.

DGP-WG/19 (see paragraph 3.2.2.5 of DGP/27-WP/3):

4.1.1 ~~The employer must establish and maintain a dangerous goods training programme for personnel performing any function described in these Instructions.~~ The employer of personnel that perform functions aimed at ensuring that dangerous goods are transported in accordance with these Instructions must establish and maintain a dangerous goods training programme.

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- Agenda Item 7: Aviation Security/Dangerous Goods Coordination (Ref: Job Card DGP.001.02)**
7.1: Develop proposals, if necessary, for amendments to Annex 18 and/or Doc 9284 for the sake of alignment with Annex 17 — Security and the Aviation Security Manual (Doc 8973)

7.1.1 AMENDMENTS TO ANNEX 18 AND/OR DOC 9284 FOR THE SAKE OF ALIGNMENT WITH ANNEX 17 — SECURITY AND THE AVIATION SECURITY MANUAL (DOC 8973)

- 7.1.1.1 There were no amendments developed under this agenda item.
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- Agenda Item 7: Aviation Security/Dangerous Goods Coordination (Ref: Job Card DGP.001.02)**
7.2: Consider control measures for the cargo supply chain that addresses both safety and security concerns

7.2.1 CONTROL MEASURES FOR THE CARGO SUPPLY CHAIN THAT ADDRESSES BOTH SAFETY AND SECURITY CONCERNS

7.2.1.1 This agenda item was related to the task on ANC job card DGP.001.02 for the development of control measures for the cargo supply chain that addresses both safety and security concerns. It was noted that the newly-established Safe Carriage of Goods Specific Working Group of the FLTOPSP (FLTOPSP-SCGSWG) had been tasked with addressing dangerous goods risks introduced by entities in the cargo supply chain through ANC job card SCGSWG.002.01. It was therefore suggested that the task be removed from ANC job card DGP.001.02.

7.2.2 RECOMMENDATION

7.2.2.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 7/1 — Control measures for the cargo supply chain that addresses both safety and security concerns

That the task of developing control measures for the cargo supply chain that addressed both safety and security concerns be removed from ANC job card DGP.001.02 with the recognition that a similar task had been assigned to the FLTOPSP-SCGSWG through ANC job card SCGSWG.002.01.

- Agenda Item 7: Aviation Security/Dangerous Goods Coordination (Ref: Job Card DGP.001.02)**
7.3: Review guidance material on chemical, biological or radiological attack

**7.3.1 GUIDANCE MATERIAL ON CHEMICAL, BIOLOGICAL
OR RADIOLOGICAL ATTACKS**

7.3.1.1 Guidance material on dealing with chemical, biological or radiological events (CBR) had been developed by the Aviation Security Panel (AVSECP) for inclusion as appendices in the *Aviation Security Manual* (Restricted) (Doc 8973). The DGP had provided feedback on material which dealt with crew members' response to a suspected chemical or biological event during flight (see paragraph 3.7.3 of the DGP-WG/18 report). Checklists related to crew actions had generated a lot of comments from DGP and other expert groups. The Secretariat reported that this feedback was addressed by turning the lists into very high-level checklists which could be adapted to accommodate specific operations. The material had been finalized and published in the Eleventh Edition of Doc 8973. The document will be subject to ongoing review and revision, as necessary.

Agenda Item 8: Coordination with other panels
8.1: Flight Operations Panels (FLTOPSP)

8.1.1 REVISION TO THE DEFINITION OF “PASSENGER AIRCRAFT” (DGP/27-WP/33) AND REMOVE THE DEFINITIONS OF CARGO AND PASSENGER AIRCRAFT FROM ANNEX 18 AND THE TECHNICAL INSTRUCTIONS (DGP/27-WP/37)

8.1.1.1 An amendment to the definition for passenger aircraft in Annex 18 and the Technical Instructions was proposed to address inconsistencies with how the definition was applied internationally when determining who could be on board a cargo aircraft carrying “cargo aircraft only” dangerous goods. The proposal also included an amendment to the Technical Instructions that required operators to perform a safety risk assessment on the carriage of persons other than the operating crew on cargo aircraft.

8.1.1.2 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 whereby a State prohibited a category of person from travelling on a cargo aircraft based on the application of the passenger aircraft definition. The event resulted in a debate over the scope of the definition and concerns that new restrictions on existing operations would ensue. It had been noted that many national regulations allowed for a much broader array of persons on board cargo aircraft than what would be permitted if the definitions from Annex 18 and the Technical Instructions were strictly applied. Operators argued that the strict international application of the definition resulted in a very significant financial and operational impact which, based on their safety risk assessments, was not justified. There was support for further discussion at DGP-WG/19, while also recognizing that determining who could be on board an aircraft was an operational decision. At that time the FLTOPSP Secretary highlighted an inconsistency between Annex 18 and Annex 6 in that the latter did not distinguish between passenger or cargo aircraft but instead referred to passenger-carrying operations. While not supporting definitions for the terms in Annex 6, he did not oppose the development of guidance material. Accordingly, the proposal to DGP/27 included draft text for consideration by the FLTOPSP for inclusion in the *Procedures for Air Navigation Services — Aircraft Operations* (Doc 8168). The guidance was based on provisions in existing national regulations which provided details with respect to the actions an operator must take to allow persons on board a cargo aircraft, including pre-flight emergency briefings.

8.1.1.3 While agreeing there was a problem that needed to be solved and not opposing the amendment proposed, the member nominated by the International Federation of Air Line Pilots’ Associations (IFALPA) raised a number of concerns from an operations point of view with regard to the definition and the unintended impact it might have. One was the potential for it to be interpreted to exclude off-duty pilots from travelling on cargo aircraft with cargo that was not permitted on passenger aircraft, while allowing other categories of people on board. He stressed that the former could be beneficial to flight safety and the latter a detriment, noting data pointing to over 1000 instances where an extra pilot on the flight deck enhanced safety and in some cases prevented loss of life. Conversely, other categories of people that would be permitted under the existing definition could be a distraction to the flight crew, particularly during an emergency. He suggested the assumptions under which the definitions were originally developed were no longer valid, and the risk profile and risk mitigation possibilities had changed as a result of the quantities and types of dangerous goods being transported and the types of aircraft in use. He also noted the lack of any formal definitions for passenger or cargo aircraft in other Annexes and that any rare distinctions were based on risk and had more to do with underlying safety

differences. He therefore suggested deleting the definitions for cargo and passenger aircraft as an alternate solution. He highlighted the role airworthiness, operations, and aviation security experts played in determining who could be on board a cargo aircraft and what non-dangerous goods related training was required, and suggested that the DGP work with other panels to ensure that those allowed on board cargo aircraft were properly qualified and trained. Other panel members, while sympathetic to the issues raised and agreeing that the overall philosophy of the Technical Instructions would benefit from a review based on current operations and aircraft types, could not support deleting the definitions. Deleting the definitions from within the current structure of the Technical Instructions would have negative consequences.

8.1.1.4 The chief of the Operational Safety Section, noting new Annex 6 provisions requiring the operator to take the capabilities of the aircraft into account as part of a specific safety risk assessment on the transport of items in the cargo compartment (expected to be adopted by Council in 2020), suggested the proposed amendment to the definition was too prescriptive and did not support the Annex 6 provisions. He recommended the panel consider addressing the issue holistically by basing restrictions in the Technical Instructions on the capabilities of the aircraft rather than on the type of operation. Although there was support for this approach, there was also recognition that it would be a long-term exercise, and an immediate solution was needed. There were other suggestions to consider addressing the problem in a way that did not involve amending the definition, recognizing the level of scrutiny necessary to amend definitions in an Annex, the drawbacks to a prescriptive list and the extended time frame it would take to amend Annex 18.

8.1.1.5 DGP/27 ultimately agreed to the amendment to the definition for passenger aircraft in Annex 18 and the Technical Instructions, although it was considered an interim, prescriptive solution to address an immediate problem with the understanding that a holistic, performance-based solution was needed in the longer term. It was recognized that the proposed amendment to Annex 18 would be subject to the State consultation process. Incorporating it in the Technical Instructions would therefore be subject to the outcome of the Annex amendment process and the Annex amendment's applicability date. The draft guidance for operators on the carriage of persons, other than flight crew, on cargo aircraft would be provided to the FLTOPSP for consideration as new material in the PANS-OPS or another appropriate document. There was support for the intent of the proposed provision requiring operators to conduct a safety risk assessment on the carriage of persons, other than flight crew, on cargo aircraft, but it was agreed it was an operational issue that needed input from the FLTOPS. It would be revisited based on feedback from that panel following their review of the draft guidance material.

8.1.2 RECOMMENDATIONS

8.1.2.1 In light of the foregoing discussions, the meeting developed the following recommendations:

RSPP | Recommendation 8/1 — Amendment to the definition for passenger aircraft in Annex 18

That the definition for passenger aircraft contained in Annex 18 be amended as indicated in Appendix A to the report on this agenda item.

Recommendation 8/2 — Amendment to the definition for passenger aircraft in the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284)

That the definition for passenger aircraft contained in the Technical Instructions be amended as indicated in Appendix B to the report on this agenda item.

Recommendation 8/3 — Guidance for operators on the carriage of persons, other than flight crew, on freighter aircraft

That the FLTOPSP be requested to consider guidance for operators on the carriage of persons, other than flight crew, on freighter aircraft for incorporation in the *Procedures for Air Navigation Services — Aircraft Operations* (Doc 8168) or other suitable document.

8.1.3 DANGEROUS GOODS CONSIDERATIONS FOR ANNEX 6, PART III (DGP/27-IP/6 AND DGP/27-IP/16)

8.1.3.1 The panel was requested assistance from the Flight Operations Panel (FLTOPSP) in completing job card FLTOPSP.025 which related to the inclusion of dangerous goods provisions for Annex 6 — *Operation of Aircraft, Part III — International Operations — Helicopters*. The fifth meeting of the FLTOPSP (FLTOPSP/5, Montréal, 22 to 26 October 2018) recommended that the work be coordinated with the DGP, i.e.:

Recommendation 4/17 — Dangerous goods considerations for Annex 6 Part III

That the panel coordinate the work for Dangerous Goods provisions in Annex 6 Part III with the DGP and ensure consistency with the Technical Instructions.

8.1.3.2 An ad hoc working group of the DGP reviewed draft material provided by the FLTOPSP Secretary and proposed amendments to it for the sake of alignment with dangerous goods provisions. The panel agreed that these amendments should be recommended to the FLTOPSP. The FLTOPSP secretary expressed appreciation to the DGP on behalf of his panel.

8.1.4 RECOMMENDATION

8.1.4.1 In light of the foregoing, the meeting developed the following recommendation:

Recommendation 8/4 — Dangerous goods considerations for Annex 6, Part III

That amendments to draft dangerous goods provisions for Annex 6, Part III be recommended to the FLTOPSP as indicated in Appendix B to the report on this agenda item.

Agenda Item 8: Coordination with other panels
8.2: Airworthiness Panel (AIRP)

8.2.1 UPDATE ON AIRWORTHINESS PANEL (AIRP)
ACTIVITIES (DGP/27-IP/14)

8.2.1.1 The Secretary of the Airworthiness Panel (AIRP) briefed the panel on AIRP job cards for which DGP had a supporting role, i.e.:

- a) AIRP.011 — Cargo compartment fire suppression provisions. Draft provisions had been developed for Annex 8, Part IIIB for manufacturers to specify cargo compartment fire suppression capabilities needed for operators to conduct their specific safety risk assessments on the transport of items in the cargo compartment, which included dangerous goods. This was in support of the new Annex 6, Part I provisions expected to be adopted by Council in 2020. Guidance material to support these provisions was also developed through the FLTOPSP-CSSG.
- b) AIRP.012.03 — Control of electromagnetic radiation risks posed by the carriage of battery-powered devices in baggage, cargo and mail that are active when inside the aircraft cargo compartment. Progress on this job card had been modest due to limited access to subject matter experts (SMEs) and insufficient data to support a robust safety risk assessment. AIRP was collecting data from type certificate holders. The need for a team of dangerous goods, airworthiness and operations experts to develop comprehensive guidance on all safety risks associated with portable electronic devices was identified. The AIRP working groups tasked with the issue would be presenting conclusions to the seventh meeting of the AIRP (AIRP/7, Montréal, 4 to 8 November 2019).

8.2.1.2 The AIRP secretary also provided feedback on the concerns raised by the DGP with respect to a potential lack of awareness related to dangerous goods responsibilities among aviation maintenance organizations (see paragraph 2.1.5 of the DGP/26 Report and paragraph 3.8.2.2 of the DGP-WG/18 Report). AIRP did not consider it appropriate to develop Standards and Recommended Practices (SARPs) mandating training for all AMOs, but there was support for the development of guidance for States on strengthening awareness of dangerous goods responsibilities for personnel employed by or interacting with the aviation industry in the areas of engineering and maintenance.

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Agenda Item 8: Coordination with other panels
8.3: Safety Management Panel (SMP)

8.3.1 UPDATE ON COORDINATION ACTIVITIES WITH THE SAFETY MANAGEMENT PANEL

8.3.1.1 The Secretariat noted that three new SMP job cards had been approved by the ANC for which the DGP had been assigned a supporting role. They were available on the “All ANC Panels” secure portal. These were:

- a) SMP.020.01: Monitoring the effectiveness of SSP and SMS implementation;
- b) SMP.021.01: Improved safety risk management methodology and tools; and
- c) SMP.022.01: Integrated risk management.

The Secretariat would keep the panel updated with progress of the work and seek guidance when necessary.

8.3.1.2 Guidance would continue to be sought from safety management experts within the Secretariat and from the SMP with regard to clarifying State oversight responsibilities in Annex 18 (ANC job card DGP.005).

Agenda Item 8: Coordination with other panels
8.4: Remotely Piloted Aircraft Systems Panel (RPASP)

8.4.1 UNMANNED AIRCRAFT SYSTEMS (UAS) FOR HUMANITARIAN AID AND DEVELOPMENT AND EMERGENCY RESPONSE TOOLKIT (DGP/27-IP/15)

8.4.1.1 A DGP ad hoc group was established to review draft guidance on the carriage of dangerous goods for humanitarian aid operations on unmanned aircraft (UA). The guidance material would aid governments and international aid agencies in planning and conducting humanitarian aid operations using UA. Development of the guidance material was initiated by the ICAO Task Force for Unmanned Aircraft Systems for Humanitarian Aid and would be completed by the Remotely Piloted Aircraft Systems (RPAS) Secretariat.

8.4.1.2 The DGP ad hoc group recommended a number of amendments to the draft guidance material. During the discussion of the group's review, concern related to the reliability of drones was raised. The Chief of the Remotely Piloted Aircraft Systems Section (RPAS) acknowledged that reliability was critical for dangerous goods operations and that UA used for professional purposes were of a higher quality than those used for hobbies. She noted the crucial role the civil aviation authority played in approving operations. She also noted that the amount of data available for drone operations which could be used when conducting safety risk assessments was nowhere near as robust as it was for manned operations, but that drone operations were a reality and did provide critical aid that would not be possible through other modes of transport. The objective was to make operations as safe as possible. She emphasized that the material was provided as guidance, recognizing that these operations were domestic and therefore outside the scope of ICAO SARPs. The material would be an on-line document which could be updated on a regular basis. It would be launched following ICAO's Third Unmanned Aircraft Systems Industry Symposium (DRONE ENABLE/3, 12 to 14 November 2019).

8.4.1.3 Panel members were encouraged to further review the material and to provide any suggestions to the Secretariat. The Chief of the RPAS Section and the Secretary of the task force expressed their appreciation to the DGP.

8.4.2 RECOMMENDATIONS

8.4.2.1 In light of the foregoing, the meeting developed the following recommendation:

Recommendation 8/5 — Dangerous goods considerations for the Unmanned Aircraft System (UAS) for Humanitarian Aid and Emergency Response Guidance

That amendments to the guidance on the carriage of dangerous goods for humanitarian aid operations on unmanned aircraft (UA) be provided to ICAO for inclusion in the UAS toolkit and that on-going coordination between the DGP and the Remotely Piloted Aircraft Systems Panel continue.

Agenda Item 8: Coordination with other panels
8.5: Any other panels

**8.5.1 UPDATE ON FLIGHT AND FLOW INFORMATION FOR
A COOPERATIVE ENVIRONMENT (FF-ICE)
(DGP/27-IP/13)**

8.5.1.1 The Secretary of the Air Traffic Management Requirements and Performance Panel (ATMRPP) provided an update on progress for the development of provisions to support the initial implementation phase of a new flight planning mechanism known as flight and flow information for a collaborative environment (FF-ICE/R1). The 2016 DGP working group meeting (DGP-WG/16, Montreal, 17 to 21 October 2016) had been requested for feedback on what dangerous goods information should be included in the system (see paragraph 3.6.2 of the DGP-WG/16 Report). The ATMRPP Secretary noted that the DGP had requested that any requirements for dangerous goods information be limited to what was required in the notification to captain (NOTOC) in accordance with the Technical Instructions, and that the request of the DGP had also been supported by the Rescue and Firefighting Working Group (RFF-WG). She advised that this request was addressed in FF-ICE implementation guidance material. The ATMRPP was continuing discussions on accommodating additional information needs and when the new FF-ICE system would replace the existing flight plan system (FLP 2012). Amendments to Annexes and Procedures for Air Navigation Services (PANS) to accommodate FF-ICE were expected to be finalized during the first quarter of 2020. DGP would be kept up to date on the progress of the work and would be requested for feedback when necessary.

APPENDIX A

**AMENDMENT TO THE DEFINITION FOR PASSENGER AIRCRAFT IN
ANNEX 18**

**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

**THE SAFE TRANSPORT OF
DANGEROUS GOODS BY AIR**

ANNEX 18 TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

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CHAPTER 1. DEFINITIONS

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See paragraph 8.1.1 of the report under Agenda Item 8:

Passenger aircraft. An aircraft that carries any person other than:

- a) a crew member;
- b) an operator's employee in an official capacity;
- c) an authorized representative of an appropriate national authority;
- d) ~~or~~ a person accompanying a consignment or other cargo, including when travelling before or after accompanying a consignment or other cargo; or
- e) a person approved by the operator in accordance with conditions approved by the appropriate national authority.

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APPENDIX B**AMENDMENT TO THE DEFINITION FOR PASSENGER AIRCRAFT IN
THE TECHNICAL INSTRUCTIONS****Part 1****GENERAL**

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Chapter 3**GENERAL INFORMATION**

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See paragraph 8.1.1 of the report under Agenda Item 8:

Secretariat Note.— The following definition is also contained in Annex 18. Accordingly, an amendment to the Annex is also proposed (see Appendix A to the report on this agenda item). Incorporating the proposed amendment in the Technical Instructions will be subject to the outcome of the Annex amendment process and the applicability date of the amendment in the Annex.

Passenger aircraft. An aircraft that carries any person other than:

- a) a crew member;
- b) an operator's employee in an official capacity;
- c) an authorized representative of an appropriate national authority; or
- d) a person accompanying a consignment or other cargo, including when travelling before or after accompanying a consignment or other cargo; or
- e) a person approved by the operator in accordance with conditions approved by the appropriate national authority.

Agenda Item 9: 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

9.1 GUIDANCE MATERIAL FOR THE PANEL TO AID IN PREPARATION OF THE TECHNICAL INSTRUCTIONS AND SUPPORTING DOCUMENTS (DGP/27-IP/9)

9.1.1 Guidance material to aid in the preparation of the Technical Instructions and supporting documents had been developed by the DGP, but a process to ensure it was continuously updated had never been established. The guidance document contained general principles used in developing the dangerous goods documents and guidance for deciding how to make changes to them.

9.1.2 The panel agreed that a standing working group should be tasked with maintaining the document.

Agenda Item 10: Other business**10.1 REPORT OF THE DANGEROUS GOODS PANEL (DGP)
WORKING GROUP MEETINGS (DGP-WG/18 AND
DGP-WG/19) (DGP/27-WP/2 AND DGP/27-WP/3)**

10.1.1 The meeting reviewed the narrative parts of the reports of the 2018 and 2019 DGP Working Group Meetings, DGP-WG/18 (Montréal, 1 to 5 October 2018) and DGP-WG/19 (Montréal, 1 to 5 April 2018). The narratives were approved without comment. The amendments proposed by the working groups were reviewed under DGP/27-WPs/10, 11, 12, 13, 14, 15, 16, 17, 19 (see Report on Agenda Item 1), 20 (see Report on Agenda Item 4) and 21 (see Report on Agenda Item 2) which contained consolidations of these amendments.

**10.2 AMENDMENTS PROPOSED TO THE TECHNICAL
INSTRUCTIONS****10.2.1 Preservation during Air Transport of Human Organs
Intended for Transplantation (DGP/27-WP/38)**

10.2.1.1 The meeting considered a proposal to except equipment containing dangerous goods used to preserve human organs intended for transplant through an amendment of the list of general exceptions in Part 1;1.1.5 of the Technical Instructions. While the organs themselves were not subject to the Technical Instructions in accordance with Part 2;6.3.2.3.7, batteries that powered the equipment could be. The amendment therefore included provisions for lithium batteries. There were no objections to the intent of the proposal, although the following concerns were raised:

- a) There was some concern that lithium batteries would be excepted more broadly than intended because of the position of the proposed text within the exceptions, but the proposer noted that the current text did not preclude lithium batteries from being excepted if they were needed for medical aid to a patient during flight. He suggested that the proposed text, which required the batteries to meet the provisions in Part 2;9.3 of the Technical Instructions, established a minimum level of safety that the existing provisions lacked;
- b) The amendment included a provision for spare batteries. It was questioned whether additional safety measures needed to be added, recognizing that spare batteries were required to be carried in the cabin by passengers and crew and there was normally a Watt-hour limit. The proposer suggested this was not necessary since the equipment would be required to be under the control of trained personnel during the time they were in use on the aircraft by virtue of Part 1;1.1.5.3. It was questioned whether this provision clearly applied to each exception listed in 1;1.1.5.1, noting that it would be impossible to comply with this requirement with respect to the exception for excess baggage listed in 1;1.1.5.1 h). It was suggested that future consideration be given to ensuring there was no ambiguity with respect to excess baggage.
- c) There was concern that focusing on end-use set a precedent on which future decisions would be based. Regulating based on safety objectives was a better approach. The

proposer agreed that regulating based on end-use should be avoided when it came to cargo, but that these exceptions did not apply to cargo. He believed regulating based on end use was a better approach when it came to dangerous goods being used during flight.

10.2.1.2 There were no objections to the proposal. A revised amendment, which aligned the terminology related to organs intended for transplant with Part 2;6 of the Technical Instructions, was agreed.

10.2.2 Dropping in Connection with Pest Management (DGP/27-WP/30)

10.2.2.1 The addition of a new exception for dropping in connection with pest management was proposed for inclusion in the list of general exceptions in Part 1;1.1.5. A specific need was described whereby dangerous goods were dispensed from rotorcraft to form a permanent deterrent for animals who may nest on crucial infrastructures. There was a suggestion that the term was not suitable when translated in different languages because not all animals were considered “pests”. However, the term “pest management” was considered appropriate as it encompassed a broad range of pest control practices and deterrence techniques. While there were no objections to the intent of the proposal, the need for less prescriptive and more performance-based exceptions was raised. It was suggested that work be undertaken in the future to focus the exceptions on safety objectives instead of end-use. The amendment, with minor editorial revisions, was agreed.

10.2.3 A New Special Provision for ID 8000 (DGP/27-WP/41)

10.2.3.1 A new special provision assigned to ID 8000 was proposed excepting perfume products from the Technical Instructions under certain conditions when carried as cargo. It was suggested regulating small quantities of perfume was costly and unjustified. There was some sympathy for the proposal, but it was not supported on the basis it was a classification issue that would first need to be considered by the UN Sub-Committee. Some panel members noted they had implemented measures to transport these products domestically by exemption, but that measures they implemented would be difficult to adopt globally. The amendment was not agreed.

10.2.4 Transport of Lithium Batteries on Passenger Aircraft (DGP/27-WP/35)

10.2.4.1 An amendment allowing for the transport of lithium batteries for medical devices on passenger aircraft, with the prior approval of the operator, was proposed. The amendment was prompted by a specific need for medical companies such as Doctors without Borders to transport spare batteries that were urgently needed for health care in destinations where cargo aircraft did not fly. While such batteries would be permitted with the prior approval of the authority of the State of Origin, the State of the Operator and the State of Destination in accordance with Special Provision A201, acquiring these approvals in a timely manner was not always possible. The amendment introduced a one-package limit per flight. While several panel members supported the proposal, others did not.

10.2.4.2 General arguments in support of the proposal were:

- a) Batteries intended for life-saving medical devices were safer than other batteries.

- b) Batteries would be shipped in accordance with medical regulations and standards that were in addition to the existing provisions in the Technical Instructions;
- c) Not allowing batteries intended for life-saving devices as cargo was unjustified when batteries were permitted to be carried by passengers and crew under less stringent conditions.
- d) The performance-based package standard under development by the SAE committee would provide safety benefits, but it would not be ready for implementation for several years. There was an immediate humanitarian need that needed to be met.
- e) Exceptions based on end use were made in other areas of the Technical Instructions, not making an exception for this humanitarian need was unjustified.
- f) Requiring approval from State authorities was unnecessary because the operator was in the best position to determine whether the batteries could be transported safely. The new Annex 6 provisions requiring the State of the Operator to ensure that operators included the conduct of a specific safety risk assessment in its policy and procedures for the transport of items in the cargo compartment, which were expected to become applicable in November 2020, added an additional layer of safety.

10.2.4.3 General arguments not supporting the proposal were:

- a) The prohibition on the transport of lithium batteries was introduced despite known difficulties associated with transporting them to destinations not serviced by cargo aircraft because of the fact that a fire involving lithium batteries could exceed the capabilities of aircraft fire suppression systems, and this risk remained.
- b) The development of measures that would establish an acceptable level of safety, including a performance-based package standard, were not yet in place.
- c) Allowing carriage of lithium batteries by passengers and crew while prohibiting transport of lifesaving devices as cargo was acceptable because there were different sets of controls in place to mitigate the risks.
- d) The exception in the proposal was based on end use and cost rather than the safety risk, and standardizing such an exception in the Technical Instructions would result in more complicated regulations and have a negative impact on compliance. It would also open the door for other industries to seek alleviation for their products.

10.2.4.4 There was considerable discussion on how widespread difficulties in acquiring approvals to transport lithium batteries was, given the lack of documented data demonstrating this. No notifications had been provided to ICAO, which was required in accordance with Special Provision A201. Several members noted they had never received any requests and some suggested the supply of lithium batteries had been managed through transportation and inventory management. However, several panel members acknowledged logistical problems getting batteries to destinations which cargo aircraft did not reach, particularly in remote areas in the world. While acquiring approvals could be possible in more developed parts of the world, it was difficult if not impossible to acquire them in a timely manner from many States which lacked appropriate expertise. It was suggested that if approvals were necessary, they could be

acquired in advance with proper planning. However, while this might be a practicable solution when it came to the State of Origin, the State of Destination and the State of the Operator would not be known in advance. Some did not see the of lack of requests for approvals as an indication that there was no need to transport batteries on passenger aircraft and considered it worrisome that there were no requests, because they knew there was a need. They believed that difficulties acquiring approvals would result in undeclared shipments from shippers desperate to meet a critical demand and that providing a practical method to ship them was a benefit to safety. Others expressed concern with this philosophy, noting the importance of appropriate outreach, oversight and enforcement.

10.2.4.5 Those not supporting the proposal had sympathy for its intent and agreed that humanitarian needs should not be ignored. They did note that difficulties in acquiring approvals was likely an overarching problem that applied to all goods, not just lithium batteries. A systematic approach that addressed the issue holistically would be a preferred approach. However, there was recognition that finding a systematic solution would be a long-term exercise and there was a willingness to find a solution in the short-term. Accordingly, a revised proposal was developed which modified Special Provision A201 by adding a new paragraph allowing for transport on a passenger aircraft with the prior approval of the State of Origin and the operator provided the batteries were intended for urgent medical need. It limited the number of batteries permitted to one consignment of not more than four batteries on an aircraft and required the batteries to be in compliance with Section IA of Packaging Instruction 965 for lithium ion batteries or 968 for lithium metal batteries. Amending Special Provision A201 instead of introducing a new special provision ensured that the measures that applied to regular approvals to transport lithium batteries on passenger aircraft also applied to lithium batteries for medical devices. Adding the State of Origin was a compromise between those who believed the medical batteries were safe enough not to require any State approval and those who thought States needed to be involved in the process so as to provide reassurance that an acceptable level of safety was achieved and that any alleviations were not being abused. Those who did not think there was a need for approval by State authorities were content with involving only the State of Origin, since the State of the Operator and the State of Destination were the ones that impeded the approval process. The concern that an event involving high density lithium batteries could exceed the capabilities of an aircraft's safety systems was alleviated by the significantly limited quantity and size of lithium batteries that would be permitted on a single aircraft. Lithium cells were not addressed in the proposal on the basis that there was no known need to ship them for humanitarian relief, and not including them resulted in less complicated provisions. It was noted that one consignment of four batteries could be one or several different packages, e.g. one package containing four batteries, two packages containing two batteries each, four packages containing one battery each, or any other combination. Those members who objected to the original proposal believed the revised proposal addressed their significant concerns. In the absence of a performance-based package standard, there were no objections to the amendment. The amendment, as revised, was agreed.

10.2.4.6 While the amendment addressed an immediate humanitarian need, the panel agreed that a systematic approach to making the overall approval and exemption system effective globally was necessary. The lack of data cause some to believe a problem was largely anecdotal, but others suggested data was lacking because there was no way to report difficulties in obtaining approvals or exemptions. Panel members affirmed there were significant difficulties and expressed a need to harmonize procedures and to emphasize the importance of qualified technical personnel globally. It was envisaged that some of the difficulties would be addressed through the work on clarifying States' responsibilities with regard to Annex 18 and through the development of guidance on competency-based training for State employees. Additional guidance specific to the granting of approvals and exemptions was necessary. It was agreed this should be given further attention over the next biennium.

10.2.5 **Air Waybill Statement for Section II Consignments (DGP/27-WP/6)**

10.2.5.1 New provisions were proposed for Section II of the lithium battery packing instructions (Packing Instructions 965 to 970) allowing for the grouping of different battery types and packing instruction numbers in the compliance statement required on an air waybill when an air waybill was used. A similar amendment was proposed at DGP-WG/19 (see paragraph 3.3.6.1 of the DGP-WG/19 report). While there was no opposition to the intent of the proposal at DGP-WG/19, it was considered too specific and there was concern that the text would result in a misinterpretation of the provisions, leading to shippers offering multiple packages. The new proposal was more general. It was agreed, subject to revisions to ensure the statement also identified when a package was permitted on cargo aircraft only.

10.2.6 **Self-Inflating Personal Safety Devices Carried by Passengers or Crew (DGP/27-WP/31)**

10.2.6.1 An amendment to the passenger provisions was proposed at DGP-WG/18 extending the allowance of a self-inflating personal safety device permitted to be carried by passengers and crew, with the approval of the operator, from one to four (see paragraph 3.2.2.5 of the DGP-WG/18 report). It was proposed in response to an increase in the use of these safety devices, which had resulted in passengers seeking to travel with multiple devices. There had been support for the amendment in principle, but concerns were raised with the lack of a limit on the gas cartridge size and the potential for the provision to be applied for purposes other than personal use. Whether or not the limit of four per person was justified was also questioned. A revised proposal was presented to DGP/27 which limited the number of spare cartridges permitted to two per device and restricted the types of devices to those intended to be worn by a person. The revised proposal did not limit the size of the cartridges, as this varied depending on the design. Technical information was provided regarding the devices, the cylinders, and the methods of activation which led the proposer to suggest a limit for safety reasons was unjustified. Regardless, a requirement for operator approval meant that the risk would need to be assessed.

10.2.6.2 There were no objections to the proposal, but there were similar concerns related to regulating based on end use rather than safety risk that were raised during discussion on other proposals. However, some thought that focusing on end use was appropriate when it came to the provisions for passengers and crew. The amendment was agreed.

10.3 **AMENDMENTS PROPOSED TO THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS**

10.3.1 **Packing Instruction 623 (DGP/27-WP/36)**

10.3.1.1 UN 3315 — **Toxic chemical samples** were subject to Special Provision A106 of the Technical Instructions and Packing Instruction 623 of the Supplement. They were permitted for transport only for the purpose of analysis in connection with the implementation of the Chemical Weapons Convention with the prior approval of the appropriate authority of the State of Origin or the Director General of the Organization for the Prohibition of Chemical Weapons. The packing instruction was introduced into the 1995-1996 Edition of the Supplement and was based on materials used to transport the chemicals at that time. The provisions were prescriptive and did not allow for more efficient and safer technical solutions that had emerged since that time. A proposal that would allow more advanced and standardized packaging systems while achieving the same level of safety provided by the existing packing

instruction was therefore proposed. The proposal maintained a thermal test, but it was questioned whether this was necessary since it was not required for any other substance of Division 6.1. The need to ensure the toxic chemicals would not be released from the package if they were subjected to heat was considered essential. There was therefore no support for removing the requirement for a thermal test.

10.3.1.2 The amendment was supported in principle, but a number of questions were raised, i.e.:

- a) There was a distinction in the existing packing instruction between dilute and pure substances, with different inner packaging quantity limitations established for each. The proposed packing instruction established one quantity limitation. There were no objections to this since it was the lowest quantity permitted in the existing packing instruction.
- b) The existing packing instruction required features such as seals, coatings or wraps to enable the detection of tampering on the packagings, but the proposal required these features for the package or overpack. There were no objections, since requiring the features for the inner packagings was considered redundant if they were incorporated on the outermost layer.
- c) There were smaller quantities in the proposed packing instruction than what was permitted in accordance with Table S-3-1 of the Supplement. It was confirmed that the higher quantities were unnecessary. Table S-3-1 would be modified to reflect the lower quantity limitations in the packing instruction.
- d) There was a concern that the packing instruction was used by entities other than OPCW, and that without proper consultation, the revised amendments would have unintended consequences for them. An expert from the OPCW suggested there was no risk of this, noting that Special Provision A106 required transport in accordance with chain of custody and security procedures specified by his organization.

10.3.1.3 The amendment was agreed, subject to a revision to Table S-3-1 of the Supplement to reflect the lower quantity limitations provided in the packing instruction.

10.3.2 Allowance in Packing Instruction 910 for the Use of Large Packagings (DGP/27-WP/24)

10.3.2.1 Packing Instruction 910 of the Supplement applied to pre-production prototypes of lithium batteries or cells to be transported for testing without having been tested in accordance with subsection 38.3 of the UN *Manual of Tests and Criteria*, subject to the approval of the appropriate authority of the State of Origin. An amendment to the packing instruction was proposed which would allow for these batteries to be shipped in large packaging. A consequential amendment to Part S-4;13.1, which listed conditions when large packagings could be used was also proposed. Allowing large packaging for prototype lithium batteries was originally proposed at DGP-WG/19 (see paragraph 3.2.2.3 of the DGP-WG/19 report), but panel members needed more time to consult with experts. A revised amendment was agreed, subject to minor editorial revisions and the replacement of the term “cargo transport units”, used in the associated packing instruction in the UN Model Regulations, with “unit load device” to align with aviation terminology.

10.3.3 Proposed Packing Instruction for Large Lithium Batteries (DGP/27-WP/23)

10.3.3.1 A new packing instruction for lithium batteries with a net mass exceeding 35 kg was proposed for inclusion in the Supplement to the Technical Instructions. It included provisions for large packagings to accommodate lithium batteries in excess of 400 kg, which was the limit for packaging size in the Technical Instructions. An amendment to reference the proposed packing instruction in Special Provision A99, which allowed a lithium battery or battery assembly exceeding 35 kg to be transported on a cargo aircraft with the approval of the State of Origin and the State of the Operator, was also proposed. Allowing for large packagings was originally proposed at DGP-WG/19 (see paragraph 3.2.2.3 of the DGP-WG/19 report), but panel members needed more time to consult with experts. Several additional amendments were necessary based on the discussion. These were:

- a) “cell” was added to the introductory text to make it clear that the instruction applied to either a cell or a battery;
- b) a requirement for the battery or cell to meet the provisions of Part 2;9.3 was added;
- c) it was specified that *electrically* non-conductive and non-combustible cushioning material was required to fill empty space in the packaging;
- d) the Packing Group II performance requirement was moved so that it did not apply to cells or batteries in equipment; and
- e) a reference to assemblies of cells or batteries was removed.

10.3.3.2 The revised amendment was agreed.

10.4 RECOMMENDATIONS

10.4.1 In light of the foregoing discussions, the meeting developed the following recommendations:

Recommendation 10/1 — Amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284)* to address miscellaneous issues for incorporation in the 2021-2022 Edition

That the Technical Instructions be amended as indicated in Appendix A to the report on this agenda item.

Recommendation 10/2 — Amendment to the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284SU)* to address miscellaneous issues for incorporation in the 2021-2022 Edition

That the Supplement to the Technical Instructions be amended as indicated in Appendix B to the report on this agenda item.

APPENDIX A

PROPOSED AMENDMENTS TO THE TECHNICAL INSTRUCTIONS

Part 1

GENERAL

Chapter 1

SCOPE AND APPLICABILITY

1.1 GENERAL APPLICABILITY

...

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:

DGP/27 (see paragraph 10.2.1 of the report under Agenda Item 10):

- a) to provide, during flight, medical aid to a patient or to preserve tissues or organs intended for use in transplantation when those dangerous goods:
- 1) have been placed on board with the approval of the operator; or
 - 2) form part of the permanent equipment of the aircraft when it has been adapted for specialized use;
- providing that:
- 1) gas cylinders have been manufactured specifically for the purpose of containing and transporting that particular gas;
 - 2) equipment containing wet cell batteries is kept and, when necessary, secured in an upright position to prevent spillage of the electrolyte;
 - 3) lithium metal or lithium ion cells or batteries meet the provisions of 2;9.3. Spare lithium batteries must be individually protected so as to prevent short circuits when not in use.

Note.— For dangerous goods that passengers are permitted to carry as medical aid, see 8;1.1.2.

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DGP/27 (see paragraph 10.2.2 of the report under Agenda Item 10):

- c) for dropping in connection with agricultural, horticultural, forestry, ice jam control, ~~and landslide clearance or~~ pollution control activities or pest management activities;

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Part 3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND EXCEPTED QUANTITIES

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Chapter 3

SPECIAL PROVISIONS

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Table 3-2. Special provisions

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DGP/27 (see paragraph 10.3.3 of the report under Agenda Item 10):

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 battery or battery assembly (i.e. UN 3090 or UN 3480), including when packed with equipment or contained in equipment (i.e. UN 3091 or UN 3481) 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 <u>and the requirements in Packing Instruction 9xx of the Supplement are met</u> . A copy of the document of approval must accompany the consignment.
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DGP/27 (see paragraph 10.2.4 of the report under Agenda Item 10):

A201	<p>In instances where other forms of transport (including cargo aircraft) are impracticable, lithium cells or batteries may be transported as Class 9 (UN 3480 or UN 3090) on passenger aircraft with the prior approval of the authority of the State of Origin, the State of the Operator and the State of Destination under the written conditions established by those authorities, provided that the quantities per package do not exceed:</p> <p>a) for lithium metal cells or batteries:</p> <ol style="list-style-type: none"> 1) up to 2 batteries with a lithium content more than 0.3 g but not more than 2 g per battery; or 2) up to 8 cells with a lithium content more than 0.3 g but not more than 1 g per cell; or 3) up to 2.5 kg of cells and/or batteries with a lithium content not more than 0.3 g per cell or battery; or <p>b) for lithium ion cells or batteries:</p> <ol style="list-style-type: none"> 1) up to 2 batteries with a Watt-hour (Wh) rating more than 2.7 Wh but not more than 100 Wh per battery; or 2) up to 8 cells with a Watt-hour rating more than 2.7 Wh but not more than 20 Wh per cell; or 3) up to 2.5 kg of cells and/or batteries with a Watt-hour rating not more than 2.7 Wh per cell or battery.
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TIs UN

In instances where other forms of transport (including cargo aircraft) are impracticable and in the case of urgent medical need, one consignment of lithium batteries may be transported as Class 9 (UN 3480 or UN 3090) on a passenger aircraft with the prior approval of the authority of the State of Origin and with the approval of the operator under the following conditions:

- a) the shipper must provide a copy of the test summary report as specified in Part 2:9.3 g);
- b) the consignment must not contain more than 4 batteries;
- c) for lithium ion batteries:
 - 1) the Watt-hour rating of each battery must not exceed 100 Wh; and
 - 2) the batteries must be prepared in accordance with Packing Instruction 965, Section IA;
- d) for lithium metal batteries:
 - 1) the lithium content of each battery must not exceed 2 g; and
 - 2) the batteries must be prepared in accordance with Packing Instruction 968, Section IA.

When States, other than the State of Origin, the State of the Operator or State of Destination have notified ICAO that they require prior approval of shipments made under this special provision, approval must also be obtained from these States, as appropriate.

The requirements of Part 5 for Class 9 (UN 3090 or UN 3480) lithium metal and lithium ion batteries apply. 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.

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Part 4

PACKING INSTRUCTIONS

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Packing Instruction 965

Cargo aircraft only for UN 3480

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II.2 Additional requirements

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DGP/27 (see paragraph 10.2.5 of the report under Agenda Item 10):

- The words “lithium ion batteries, in compliance with Section II of PI965” — cargo aircraft only” or “lithium ion batteries, in compliance with Section II of PI965 — CAO” 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), packing instruction numbers and “CAO”.

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Packing Instruction 966

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

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II.2 Additional requirements

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DGP/27 (see paragraph 10.2.5 of the report under Agenda Item 10):

- 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), packing instruction numbers and “CAO”, when applicable.

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Packing Instruction 967

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

II.2 Additional requirements

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DGP/27 (see paragraph 10.2.5 of the report under Agenda Item 10):

- 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), packing instruction numbers and “CAO”, when applicable.

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Packing Instruction 968

Cargo aircraft only for UN 3090

II.2 Additional requirements

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DGP/27 (see paragraph 10.2.5 of the report under Agenda Item 10):

- The words “lithium metal batteries, in compliance with Section II of PI968” — cargo aircraft only” or “lithium metal batteries, in compliance with Section II of PI968 — CAO” 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), packing instruction numbers and “CAO”.

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Packing Instruction 969

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

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II.2 Additional requirements

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DGP/27 (see paragraph 10.2.5 of the report under Agenda Item 10):

- The words “lithium metal batteries, in compliance with Section II of PI969” 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), packing instruction numbers and “CAO”, when applicable.

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Packing Instruction 970

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

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II.2 Additional requirements

DGP/27 (see paragraph 10.2.5 of the report under Agenda Item 10):

- Where a consignment includes packages bearing the lithium battery mark, the words “lithium metal batteries, in compliance with Section II of PI970” 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), packing instruction numbers and “CAO”, when applicable.

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Part 8

PROVISIONS CONCERNING PASSENGERS AND CREW

Chapter 1

PROVISIONS FOR DANGEROUS GOODS CARRIED BY PASSENGERS OR CREW

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1.1 DANGEROUS GOODS CARRIED BY PASSENGERS OR CREW

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Table 8-1. Provisions for dangerous goods carried by passengers or crew

<i>Dangerous Goods</i>	<i>Location</i>		<i>Approval of the operator(s) is required</i>	<i>Restrictions</i>
	<i>Checked baggage</i>	<i>Carry-on baggage</i>		
...				
Gases in cylinders and cartridges				
DGP/27 (see paragraph 10.2.6 of the report under Agenda Item 10):				
12) Cartridges of Division 2.2 with no subsidiary hazard fitted into a self-inflating personal safety device, <u>intended to be worn by a person</u> , such as a life-jacket or vest	Yes	Yes	Yes	a) no more than one <u>two</u> personal safety devices <u>per</u> person; b) the personal safety device <u>(s)</u> must be packed in such a manner that it <u>they</u> cannot be accidentally activated; c) must be for inflation purposes; d) no more than two cartridges are fitted into the <u>each</u> device; and e) no more than two spare cartridges <u>per device</u> .
...				

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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Chapter 2

SUPPLEMENTARY DANGEROUS GOODS LIST

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	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

DGP/27 (see paragraph 10.3.1 of the report under Agenda Item 10):

Chemical sample, toxic	3315	6.1		Toxic		A106	I		623	(4 kg 25 g)	623	(15 kg 25 g)
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Part S-4

PACKING INSTRUCTIONS

(ADDITIONAL INFORMATION FOR PART 4 OF THE TECHNICAL INSTRUCTIONS)

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Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

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DGP/27 (see paragraph 10.3.1 of the report under Agenda Item 10):

Replace Packing Instruction 623 with the following:

Packing Instruction 623

The general packing requirements of Part 4, Chapter 1 of the Technical Instructions must be met.

Consignments of chemical samples, toxic, liquid or solid must be prepared in such a manner that they arrive at their destination in good condition and present no hazard to persons during transport. They must be packed according to this packing instruction and the construction of the packaging and its testing must be approved by the appropriate authority of the State of Manufacturer.

Packagings must meet the requirements of Part 6;2, 6;3 and 6;4 of the Technical Instructions and must meet Packing Group I performance standards.

The packaging must include:

- a) Inner packagings comprising:
 - 1) leakproof primary receptacle(s) which must not contain more than 1.25 mL or 1.25 g;
 - 2) leakproof rigid secondary packaging(s);
 - 3) If multiple primary receptacles are placed in a single secondary packaging, they must be either individually wrapped or separated so as to prevent contact between them. Cushioning material or, for liquids absorbent material, must be placed between the primary receptacle(s) and the secondary packaging. The absorbent material must be in sufficient quantity to absorb the entire contents of all primary receptacles.

- b) Rigid outer packaging.

The outer packaging must not contain more than 25 mL or 25 g.

Additional requirements

- a) Primary receptacles may be vials of glass, metal or plastics or vapour absorptions devices. Positive means of ensuring a leakproof seal must be provided.
- b) The secondary packaging must be capable, as demonstrated by testing, to withstand a hydraulic pressure test of 250 kPa.
- c) The design type of the package must be tested to demonstrate that it can withstand the free drop test and penetration test in Part 6;7.16.2 a) and b). The complete package must also be capable of withstanding the thermal test in Part 6;7.16.3. There must be no external release of the contents as a result of the tests.
- d) When the package is placed in an overpack, all the applicable requirements of the Technical Instructions must be met.
- e) The package or overpack must incorporate features such as security seals, coatings or wraps to provide an indication of tampering.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)

<i>Boxes</i>	<i>Drums</i>	<i>Jerricans</i>
Aluminium (4B) Other metal (4N) Steel (4A)	Aluminium (1B2) Other metal (1N2) Steel (1A2)	Aluminium (3B2) Steel (3A2)

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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DGP/27 (see paragraph 10.3.2 of the report under Agenda Item 10):

Packing Instruction 910

Cargo aircraft only

Introduction

This instruction applies to UN Nos. 3090, 3091, 3480 and 3481 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 cells and batteries 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 States 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 or contained in 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) Non-combustibility 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 ~~must be~~ is limited to one cell or battery per outer packaging.

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;
- 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) Non-combustibility must be assessed according to a standard recognized in the State where the packaging is designed or manufactured.

~~Equipment or batteries~~ Packagings not subject to Part 6 of ~~these~~ the Technical Instructions

The equipment or ~~Lithium batteries with a mass of 12 kg or greater and having a strong, impact-resistant outer casing, or assemblies of such batteries,~~ may be packed in ~~strong~~ outer packagings or protective enclosures not subject to the requirements of Part 6 of ~~these~~ 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 ~~— cargo transport units~~ unit load devices and between ~~— cargo transport units~~ 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.

OUTER PACKAGINGS*Boxes*

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

Drums

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

Jerricans

Aluminium (3B2)
 Plastics (3H2)
 Steel (3A2)

RIGID LARGE PACKAGINGS*Boxes*

Aluminium (50B)
Fibreboard (50G)
Natural wood (50C)
Other metal (50N)
Plastics (50H)
Plywood (50D)
Reconstituted wood (50F)
Steel (50A)

...

DGP/27 (see paragraph 10.3.3 of the report under Agenda Item 10):

Packing Instruction 9xx

Cargo aircraft only

Introduction

This packing instruction applies to UN Nos. 3090, 3091, 3480 and 3481 where the lithium cell or battery has a mass exceeding 35 kg.

General requirements

Part 4;1 requirements of the Technical Instructions must be met.

Lithium ion cells and batteries 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 of Origin and the State of the Operator.

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

ADDITIONAL PACKING 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 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) 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.
- 3) Packagings, including large packagings, must meet Packing Group II performance requirements.

Cells and batteries contained in equipment

- 1) Strong outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use. Packagings need not meet the requirements of Part 6 of the Technical Instructions;
- 2) The equipment must be constructed or packaged in such a manner as to prevent accidental operation during transport;
- 3) 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.

Packagings not subject to Part 6 of the Technical Instructions

Lithium cells or batteries employing a strong, impact resistant outer casing may be transported:

- 1) in strong outer packagings;
- 2) in protective enclosures (e.g. in fully enclosed or wooden slatted crates); or
- 3) on pallets or other handling devices.

Cells or batteries must be secured to prevent inadvertent movement and the terminals must not support the weight of other superimposed elements.

OUTER PACKAGINGS**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)
Plywood (1D)
Steel (1A2)

Jerricans

Aluminium (3B2)
Plastics (3H2)
Steel (3A2)

RIGID LARGE PACKAGINGS*Boxes**Aluminium (50B)**Fibreboard (50G)**Natural wood (50C)**Other metal (50N)**Plastics (50H)**Plywood (50D)**Reconstituted wood (50F)**Steel (50A)*

...

DGP/27 (see paragraph 10.3.2 of the report under Agenda Item 10):

Chapter 13**LARGE PACKAGINGS**

Note.— This chapter has no corresponding chapter in the Technical Instructions.

13.1 GENERAL

Large packagings may be used for the transport of articles in accordance with the provisions of this chapter only when the following conditions are met:

- a) transport is on cargo aircraft only;
- b) approval of the appropriate authority of the State of Origin and the State of the Operator is obtained; and
- c) there is a specific allowance for the use of large packagings provided for in Part S-4 or the value indicated in column 13 of Table 3-1 of the Technical Instructions shows "no limit".

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— END —