

**Part 1**  
**GENERAL**

Part I  
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## Chapter 1

### SCOPE AND APPLICABILITY

Parts of this Chapter are affected by State Variations AE 3, AE 8, BE 2, BE 4, BE 5, BR 4, CA 6, CA 12, CH 3, DE 1, DE 4, DK 2, FR 2, GB 2, HR 2, HR 3, HR 4, HR 5, IN 1, IR 1, IT 1, IT 5, NL 3, NL 6, RO 1, RO 3, US 1, VC 1, VC 2, VC 3, VU 2, ZA 4; see Table A-1

≠ 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.5 and Amend.1), 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 substances of Division 4.1 and organic peroxides of Division 5.2; and

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.

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

#### 1.1 GENERAL APPLICABILITY

≠ 1.1.1 These Technical Instructions for the Safe Transport of Dangerous Goods by Air, referred to herein as the "Instructions", prescribe the detailed requirements applicable to the international civil transport of dangerous goods by air by any aircraft (including both internal and external carriage). Any addenda to this edition of the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air issued by ICAO constitute part of these Instructions.

≠ 1.1.2 Where specifically provided for in these Instructions, the States concerned may grant an approval provided that in such instances an overall level of safety in transport which is equivalent to the level of safety provided for in these Instructions is achieved.

≠ 1.1.3 In instances:

- a) of extreme urgency; or
- b) when other forms of transport are inappropriate; or
- c) when full compliance with the prescribed requirements is contrary to public interest,

the States concerned may grant an exemption from the provisions of the Instructions provided that in such instances every effort is made to achieve an overall level of safety in transport which is at least equivalent to the level of safety provided for in these Instructions.

≠ 1.1.4 For the State of overflight, if none of the criteria for granting an exemption are relevant, an exemption may be granted based solely on whether it is believed that an equivalent level of safety in air transport has been achieved.

Note 1.— For the purpose of approvals, "States concerned" are the States of Origin and the Operator, unless otherwise specified in these Instructions.

Note 2.— For the purpose of exemptions, "States concerned" are the States of Origin, Operator, Transit, Overflight and Destination.

Note 3.— Guidance for the processing of exemptions, including examples of extreme urgency, may be found in the Supplement to the Technical Instructions (Part S-1;1.2 and 1.3).

Note 4.— Refer to 1;2.1 for dangerous goods forbidden for transport by air under any circumstance.

Note 5.— Due to the differences in the type of operations carried out by helicopters compared with aeroplanes, some additional considerations need to be made when dangerous goods are carried by helicopter, as described in 7;7.

## 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;

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c) for dropping in connection with agricultural, horticultural, forestry, avalanche control or pollution control activities;

d) to provide, during flight, aid in connection with search and rescue operations;

e) 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;

f) 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).

g) 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".

1.1.5.2 Provision must be made to stow and secure dangerous goods transported under 1.1.5.1 a), b), c) and d) during take-off and landing and at all other times when deemed necessary by the pilot-in-command.

1.1.5.3 The dangerous goods must be under the control of trained personnel during the time when they are in use on the aircraft.

1.1.5.4 Dangerous goods transported under 1.1.5.1 a), b), c) and d) 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:

- a) the dangerous goods must be capable of withstanding the normal conditions of air transport;
- b) the dangerous goods must be appropriately identified (e.g. by marking or labelling);
- c) the dangerous goods may only be carried with the approval of the operator;
- d) the dangerous goods must be inspected for damage or leakage prior to loading;
- e) loading must be supervised by the operator;

- f) the dangerous goods must be stowed and secured in the aircraft in a manner that will prevent any movement in flight which would change their orientation;
- g) the pilot-in-command must be notified of the dangerous goods loaded on board the aircraft and their loading location. In the event of a crew change, this information must be passed to the next crew;
- h) all personnel must be trained commensurate with their responsibilities;
- i) the provisions of 7;4.2 and 7;4.4 apply.

## 1.2 GENERAL TRANSPORT REQUIREMENTS

Except as otherwise provided for in these Instructions, no person may offer or accept dangerous goods for international civil transport by air unless those goods are properly classified, documented, certificated, described, packaged, marked, labelled and in the condition for shipment required by these Instructions. If a person performs a function required by these Instructions on behalf of the person who offers the dangerous goods for transport by air or on behalf of the operator, that person must perform that function in accordance with the requirements of these Instructions. No person may transport dangerous goods by air unless those goods are accepted, handled and transported in accordance with these Instructions. No person may label, mark, certify or offer a packaging as meeting the requirements of these Instructions unless that packaging is manufactured, fabricated, marked, maintained, reconditioned or repaired as required by these Instructions. No person shall carry dangerous goods or cause dangerous goods to be carried aboard an aircraft in either checked or carry-on baggage or on his/her person, unless permitted by 8;1.1.2.

*Note.— When dangerous goods intended for air transport are carried by surface transport to or from an aerodrome, any other applicable national or modal transport requirements should be met in addition to those that are applicable for the goods when carried by air.*

## 1.3 APPLICATION OF STANDARDS

Where the application of a standard is required and there is any conflict between the standard and these Instructions, the Instructions take precedence.

## 1.4 DANGEROUS GOODS PACKAGES OPENED BY CUSTOMS AND OTHER AUTHORITIES

Any package opened during an inspection must, before being forwarded to the consignee, be restored by qualified persons to a condition that complies with these Instructions.

## 1.5 RELATIONSHIP TO ANNEX 18

ICAO Standards and Recommended Practices related to the transport of dangerous goods are contained in Annex 18 to the Convention on International Civil Aviation. These Instructions contain the detailed technical material needed to support the broad provisions of Annex 18 (Fourth Edition) in order to provide a fully comprehensive set of international regulations.

## 1.6 REQUESTS FOR AMENDMENTS TO THE TECHNICAL INSTRUCTIONS

Any request for an amendment to the Technical Instructions must be submitted to the appropriate national authority. Requests for amendments should include the following information:

- a) the text or substance of the amendment proposed or identification of the provision the petitioner seeks to have repealed, as appropriate;
- b) a statement of the interest of the petitioner in the action requested; and
- c) any information and arguments to support the action sought.

- 1) The goods must be in the original container and must be sealed in the original container.
- 2) The goods must be in the original container and must be sealed in the original container.
- 3) The goods must be in the original container and must be sealed in the original container.
- 4) The goods must be in the original container and must be sealed in the original container.

### 12. GENERAL TRANSPORT REQUIREMENTS

Goods are transported provided for a brief inspection in transit. The offer is subject to the following conditions for the goods to be transported:

1. The goods must be in the original container and must be sealed in the original container.

2. The goods must be in the original container and must be sealed in the original container.

3. The goods must be in the original container and must be sealed in the original container.

4. The goods must be in the original container and must be sealed in the original container.

Note: When dangerous goods are transported, the offeror must provide a copy of the dangerous goods declaration and a copy of the dangerous goods declaration to the carrier.

### 13. APPLICATION OF STANDARDS

The standards of the International Standards Organization (ISO) apply to the goods and the transport.

### 14. DANGEROUS GOODS RISK ASSESSMENT BY THE TANK AND OTHER AUTHORITIES

The offeror must provide a copy of the dangerous goods risk assessment report to the carrier.

### 15. RELATIONSHIP TO INDEX 8

The offeror must provide a copy of the dangerous goods risk assessment report to the carrier.

### 16. TECHNICAL REQUIREMENTS TO THE FEDERAL GOVERNMENT

The offeror must provide a copy of the dangerous goods risk assessment report to the carrier.

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## Chapter 2

### LIMITATION OF DANGEROUS GOODS ON AIRCRAFT

*Parts of this Chapter are affected by State Variations CA 5, CA 9, DQ 3, FR 6, GB 5, US 2, VC 4; see Table A-1*

#### 2.1 DANGEROUS GOODS FORBIDDEN FOR TRANSPORT BY AIR UNDER ANY CIRCUMSTANCE

Any article or substance which, as presented for transport, is liable to explode, dangerously react, produce a flame or dangerous evolution of heat or dangerous emission of toxic, corrosive or flammable gases or vapours under conditions normally encountered in transport must not be carried on aircraft under any circumstance.

*Note 1.— Certain dangerous goods known to meet the description above have been included in the Dangerous Goods List (Table 3-1) with the word "Forbidden" shown in columns 2 and 3. It must be noted, however, that it would be impossible to list all dangerous goods which are forbidden for transport by air under any circumstance. Therefore, it is essential that appropriate care be exercised to ensure that no goods meeting the above description are offered for transport.*

*Note 2.— Paragraph 2.1 is intended to include articles being returned to the manufacturer for safety reasons.*

#### 2.2 EXCEPTIONS FOR DANGEROUS GOODS OF THE OPERATOR

2.2.1 The provisions of these Instructions do not apply to the following:

- a) articles and substances which would otherwise be classified as dangerous goods but which are required to be aboard the aircraft in accordance with the pertinent airworthiness requirements and operating regulations or that are authorized by the State of the Operator to meet special requirements;
- ≠ b) aerosols, alcoholic beverages, perfumes, colognes, liquefied gas lighters and portable electronic devices containing lithium metal or lithium ion cells or batteries provided that the batteries meet the provisions of 8;1.1.2 19) carried aboard an aircraft by the operator for use or sale on the aircraft during the flight or series of flights, but excluding non-refillable gas lighters and those lighters liable to leak when exposed to reduced pressure;
- c) dry ice intended for use in food and beverage service aboard the aircraft;
- 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 19). 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.

2.2.2 Unless otherwise authorized by the State of the Operator, articles and substances intended as replacements for those referred to in 2.2.1 a), or articles and substances referred to in 2.2.1 a) which have been removed for replacement, must be transported in accordance with the provisions of these Instructions, except that when consigned by operators, they may be carried in containers specially designed for their transport, provided such containers are capable of meeting at least the requirements for the packagings specified in these Instructions for the items packed in the containers.

2.2.3 Unless otherwise authorized by the State of the Operator, articles and substances intended as replacements for those referred to in 2.2.1 b) and c) must be transported in accordance with the provisions of these Instructions.

2.2.4 Unless otherwise authorized by the State of the Operator, battery-powered devices with installed batteries and spare batteries intended as replacements for those referred to in 2.2.1 d) must be transported in accordance with the provisions of these Instructions.

### 2.3 TRANSPORT OF DANGEROUS GOODS BY POST

2.3.1 In accordance with the Universal Postal Union (UPU) Convention, dangerous goods as defined in these Instructions, with the exception of those listed below, are not permitted in mail. Appropriate national authorities should ensure that the provisions are complied with in relation to the transport of dangerous goods by air.

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 which relate to such material:

- a) patient specimens as defined in 2;6.3.1.4 provided that they are classified, packed and marked as required by 2;6.3.2.3.6;
- 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; and
- c) radioactive material, the activity of which does not exceed one-tenth of that listed in Part 2, Chapter 7, Table 2-15;
- + 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.

+ 2.3.3 The procedures of designated postal operators for controlling the introduction of dangerous goods in mail into air transport are subject to review and approval by the civil aviation authority of the State where the mail is accepted.

- + 2.3.4 Before a designated postal operator can introduce the acceptance of lithium batteries as identified in 2.3.2 d) and e) they must have received specific approval from the civil aviation authority.

*Note 1.— Designated postal operators may accept the dangerous goods identified in 2.3.2 a), b) and c) without receiving specific approval from the civil aviation authority.*

*Note 2.— Guidelines for appropriate national authorities and civil aviation authorities are contained in the Supplement to these Instructions (S-1;3).*

### 2.4 DANGEROUS GOODS IN EXCEPTED QUANTITIES

Small quantities of dangerous goods, as defined in Part 3, Chapter 5, are excepted from certain provisions of these Instructions subject to the conditions laid down in that chapter.

### 2.5 EXCEPTIONS FOR DANGEROUS GOODS PACKED IN LIMITED QUANTITIES

Dangerous goods packed in limited quantities are excepted from certain provisions of these Instructions subject to the conditions laid down in Part 3, Chapter 4.



## Chapter 3

### GENERAL INFORMATION

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

#### 3.1 DEFINITIONS

3.1.1 The following is a list of definitions of commonly used terms in these Instructions. Definitions of terms which have their usual dictionary meanings or are used in the common technical sense are not included. Definitions of additional terms used solely in conjunction with radioactive material are contained in 2;7.1.3.

**Aerosols or aerosol dispensers.** Non-refillable receptacles meeting the requirements of 6;3.2.7, made of metal, glass or plastic and containing a gas, compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid state or in a gaseous state.

**Animal material.** Animal carcasses, animal body parts or animal foodstuffs.

**Appropriate national authority.** Any authority designated, or otherwise recognized, by a State to perform specific functions related to provisions contained in these Instructions.

≠ **Approval.** An authorization granted by the appropriate national authority for:

- a) the transport of dangerous goods forbidden on passenger and/or cargo aircraft where the Technical Instructions state that such goods may be carried with an approval; or
- b) other purposes as provided for in the Technical Instructions.

*Note.— In the absence of a specific reference in the Technical Instructions allowing the granting of an approval, an exemption may be sought.*

**Approval.** For the transport of Class 7 material:

**Multilateral approval.** The approval by the relevant competent authority of the country of origin of the design or shipment, as applicable, and also, where the consignment is to be transported through or into any other country, approval by the competent authority of that country.

**Unilateral approval.** The approval of a design which is required to be given by the competent authority of the country of origin of the design only.

**ASTM.** The American Society for Testing and Materials (ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States).

**Baggage.** Personal property of passengers or crew carried on an aircraft by agreement with the operator.

**Bags.** Flexible packagings made of paper, plastic film, textiles, woven material or other suitable materials.

**Boxes.** Packagings with complete rectangular or polygonal faces, made of metal, wood, plywood, reconstituted wood, fibreboard, plastic or other suitable material. Small holes for purposes such as ease of handling or opening, or to meet classification requirements, are permitted as long as they do not compromise the integrity of the packaging during transport.

**Bundles of cylinders.** (See UN Recommendations, Chapter 1.2). Not permitted for air transport.

**Cargo.** For the purposes of these Instructions, any property carried on an aircraft other than mail and accompanied or mishandled baggage.

*Note.— This definition differs from the definition of "cargo" given in Annex 9 — Facilitation.*

**Cargo aircraft.** Any aircraft, other than a passenger aircraft, which is carrying goods or property.

**Cargo transport unit.** A multimodal freight container or portable tank.

**Closed cargo transport unit.** A cargo transport unit which totally encloses the contents by permanent structures with complete and rigid surfaces. Cargo transport units with fabric sides or tops are not considered closed cargo transport units.

**Closures.** Devices which close an opening in a receptacle.

**Combination packagings.** A combination of packagings for transport purposes, consisting of one or more inner packagings secured in an outer packaging in accordance with the relevant provisions of Part 4.

**Competent authority.** Any body or authority designated or otherwise recognized as such for any purpose in connection with these Instructions.

*Note.* — *This applies to radioactive material only.*

**Compliance assurance.** A systematic programme of measures applied by an appropriate authority which is aimed at ensuring that the provisions of these Instructions are met in practice.

**Composite packagings.** Packagings consisting of an outer packaging and an inner receptacle so constructed that the inner receptacle and the outer packaging form an integral packaging. Once assembled, it remains thereafter an integrated single unit; it is filled, stored, transported and emptied as such.

*Note.*— *Composite packagings for the purpose of these Instructions are regarded as single packagings.*

**Confinement system.** For the transport of Class 7 material, the assembly of fissile material and packaging components specified by the designer and agreed to by the competent authority as intended to preserve criticality safety.

**Consignee.** Any person, organization or government which is entitled to take delivery of a consignment.

**Consignment.** One or more packages of dangerous goods accepted by an operator from one shipper at one time and at one address, receipted for in one lot and moving to one consignee at one destination address.

**Containment system.** For the transport of Class 7 material, the assembly of components of the packaging specified by the designer as intended to retain the radioactive material during transport.

**Control temperature.** The maximum temperature at which the substance can be safely transported. It is assumed that during transport the temperature of the immediate surroundings of the package does not exceed 55°C and attains this value for a relatively short time only during each period of 24 hours.

**Crates.** Outer packagings with incomplete surfaces.

*Note.* — *For air transport, crates may not be used as outer packagings of composite packagings.*

**Crew member.** A person assigned by an operator to duty on an aircraft during a flight duty period.

**Critical temperature.** The temperature above which the substance cannot exist in the liquid state.

**Criticality safety index (CSI) assigned to a package, overpack or freight container containing fissile material.** For the transport of Class 7 material, a number which is used to provide control over the accumulation of packages, overpacks or freight containers containing fissile material.

**Cryogenic receptacle.** A transportable, thermally insulated receptacle for refrigerated liquefied gases, of a water capacity of not more than 1 000 litres.

**Cylinders.** Transportable pressure receptacles of a water capacity not exceeding 150 litres.

**Dangerous goods.** Articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in these Instructions, or which are classified according to these Instructions.

**Dangerous goods accident.** An occurrence associated with and related to the transport of dangerous goods by air which results in fatal or serious injury to a person or major property or environmental damage.

**Dangerous goods incident.** An occurrence, other than a dangerous goods accident, associated with and related to the transport of dangerous goods by air, not necessarily occurring on board an aircraft, which results in injury to a person, property or environmental damage, fire, breakage, spillage, leakage of fluid or radiation or other evidence that the integrity of the packaging has not been maintained. Any occurrence relating to the transport of dangerous goods which seriously jeopardizes the aircraft or its occupants is also deemed to be a dangerous goods incident.

*Note.*— *A dangerous goods accident or incident may also constitute an aircraft accident or incident as specified in Annex 13 — Aircraft Accident and Incident Investigation.*

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

**Design.** For the transport of Class 7 material, the description of special form radioactive material, low dispersible radioactive material, package or packaging which enables such items to be fully identified. The description may include specifications, engineering drawings, reports demonstrating compliance with regulatory requirements, and other relevant documentation.

+ **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.

**Drums.** Flat-ended or convex-ended cylindrical packagings made of metal, fibreboard, plastic, plywood or other suitable materials. This definition also includes packagings of other shapes, e.g. round taper-necked packagings, or pail-shaped packagings. Jerricans are not covered by this definition.

**Elevated temperature substance.** A substance which is transported or offered for transport:

- in the liquid state at a temperature at or above 100°C;
- in the liquid state with a flashpoint above 60°C and which is intentionally heated to a temperature above its flashpoint;  
or
- in a solid state and at a temperature at or above 240°C.

**EN (standard).** A European standard published by the European Committee for Standardization (CEN) (CEN — 36 rue de Stassart, B-1050 Brussels, Belgium).

**Exception.** A provision in these Instructions which excludes a specific item of dangerous goods from the requirements normally applicable to that item.

**Excess baggage.** Baggage which a passenger has presented to check-in as accompanied checked baggage, but which exceeds the passenger's baggage allowance specified by the operator and which is consequently consigned as cargo in order to be sent to the same destination as the passenger.

**Exclusive use.** For the transport of Class 7 material, the sole use, by a single shipper, of an aircraft or of a large freight container, in respect of which all initial, intermediate and final loading and unloading is carried out in accordance with the directions of the shipper or consignee.

≠ **Exemption.** An authorization, other than an approval, granted by an appropriate national authority providing relief from the provisions of the Technical Instructions.

*Note.— The requirements for exemptions are given in 1;1.1.2.*

**Explosive article.** An article containing one or more explosive substances.

**Explosive substance.** A solid or liquid substance (or a mixture of substances) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Included are pyrotechnic substances even when they do not evolve gases. A substance which is not itself an explosive but which can form an explosive atmosphere of gas, vapour or dust is not included.

+ **External carriage.** Any load suspended from a helicopter or in equipment attached to a helicopter.

**Filling ratio.** The ratio of the mass of gas to the mass of water at 15°C that would fill completely a pressure receptacle fitted ready for use.

**Flash point.** The lowest temperature of a liquid at which flammable vapour is given off in a test vessel in sufficient concentration to be ignited in air when exposed momentarily to a source of ignition.

*Note.— Some test methods are listed in 2;3.3.*

**Flight crew member.** A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

**Freight container.** See unit load device.

*Note.— For the definition of freight container for radioactive material, see 2;7.1.3.*

**Freight container in the case of radioactive material transport.** An article of transport equipment designed to facilitate the transport of packaged goods by one or more modes of transport without intermediate reloading, which is of a permanent enclosed character, rigid and strong enough for repeated use, and must be fitted with devices facilitating its handling, particularly in transfer between aircraft and from one mode of transport to another. A small freight container is that which has either an overall outer dimension less than 1.5 m, or an internal volume of not more than 3 m<sup>3</sup>. Any other freight container is considered to be a large freight container. For the transport of Class 7 material, a freight container may be used as a packaging.

**Freight forwarder.** A person or organization who offers the service of arranging the transport of cargo by air.

**Fuel cell.** An electrochemical device that converts the chemical energy of a fuel to electrical energy, heat and reaction products.

**Fuel cell engine.** A device used to power equipment and which consists of a fuel cell and its fuel supply, whether integrated with or separate from the fuel cell, and includes all appurtenances necessary to fulfil its function.

≠ **GHS.** The fourth revised edition of the *Globally Harmonized System of Classification and Labelling of Chemicals*, published by the United Nations as document ST/SG/AC.10/30/Rev. 4.

**Gross mass.** The total mass of the package.

**IAEA.** The International Atomic Energy Agency (IAEA, P.O. Box 100 — A 1400 Vienna, Austria).

**ID number.** A temporary identification number for entries in Table 3-1 — Dangerous Goods List — which have not been assigned a UN number.

**IEC.** The International Electrotechnical Commission (IEC, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland).

**IMO.** The International Maritime Organization (IMO, 4 Albert Embankment, London SE1 7SR, United Kingdom).

**Incompatible.** Describing dangerous goods which, if mixed, would be liable to cause a dangerous evolution of heat or gas or produce a corrosive substance.

**Inner packagings.** Packagings for which an outer packaging is required for transport.

**Inner receptacles.** Receptacles which require an outer packaging in order to perform their containment function.

**Inspection body.** An independent inspection and testing body approved by the appropriate national authority.

**Intermediate bulk containers (IBCs).** Any rigid or flexible portable packaging, other than those specified in Part 6;3 of these Instructions, as described in Chapter 6.5 of the UN Model Recommendations, that is designed for mechanical handling and is resistant to the stresses produced in handling and transport, as determined by tests.

*Note.*— IBCs are only authorized by these Instructions for UN 3077, **Environmentally hazardous substance, solid, n.o.s.** as provided in Packing Instruction 956.

**Intermediate packagings.** Packagings placed between inner packagings or articles and an outer packaging.

**International System of Units (SI).** A rational and coherent system of units which provides the basis for the units of measurement used for air and ground operations as contained in Annex 5 to the Convention on International Civil Aviation.

**ISO (standard).** An international standard published by the International Organization for Standardization (ISO — 1, ch. de la Voie-Creuse, CH-1211 Geneva 20, Switzerland).

**Jerricans.** Metal or plastic packagings of rectangular or polygonal cross-section.

**Large packagings.** (See UN Recommendations, Chapter 1.2). Not permitted for air transport.

**Liner.** A separate tube or bag inserted into a packaging but not forming an integral part of it, including the closures of its openings.

**Liquids.** Dangerous goods which at 50°C have a vapour pressure of not more than 300 kPa (3 bar), which are not completely gaseous at 20°C and at a pressure of 101.3 kPa, and which have a melting point or initial melting point of 20°C or less at a pressure of 101.3 kPa. A viscous substance for which a specific melting point cannot be determined must be subjected to the ASTM D 4359-90 test; or to the test for determining fluidity (penetrometer test) prescribed in section 2.3.4 of Annex A of the *European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)* (United Nations publication: ECE/TRANS/202).

**Low dispersible radioactive material.** A solid radioactive material or a solid radioactive material in a sealed capsule, that has limited dispersibility and is not in powder form.

**Mail.** Dispatches of correspondence and other items tendered by, and intended for delivery to, postal services in accordance with the rules of the Universal Postal Union (UPU).

≠ **Manual of Tests and Criteria.** The fifth revised edition of the United Nations publication entitled *Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria (ST/SG/AC.10/11/ Rev.5 and Amend.1)*.

**Maximum capacity.** The maximum inner volume of receptacles or packagings expressed in litres.

**Maximum net mass.** The maximum net mass of contents in a single packaging or maximum combined mass of inner packagings and the contents thereof expressed in kilograms.

**Maximum normal operating pressure.** For the transport of Class 7 material, the maximum pressure above atmospheric pressure at mean sea level that would develop in the containment system in a period of one year under the conditions of temperature and solar radiation corresponding to environmental conditions in the absence of venting, external cooling by an ancillary system, or operational controls during transport.

**Metal hydride storage system.** A single complete hydrogen storage system, including a receptacle, metal hydride, pressure relief device, shut-off valve, service equipment and internal components used for the transport of hydrogen only.

**Multiple-element gas containers (MEGCs).** (See UN Recommendations Chapter 1.2). Not permitted for air transport.

**Net explosive mass (NEM).** The total mass of the explosive substances, without the packagings, casings, etc. (net explosive quantity (NEQ), net explosive contents (NEC), or net explosive weight (NEW) are often used to convey the same meaning).

≠ **Net quantity.** The mass or volume of the dangerous goods contained in a package excluding the mass or volume of any packaging material. For the purposes of this definition, "dangerous goods" means the substance or article as described by the proper shipping name shown in Table 3-1, e.g. for "Fire extinguishers", the net quantity is the mass of the fire extinguisher. For articles packed with equipment or contained in equipment, the net quantity is the net mass of the article, e.g. for lithium ion batteries contained in equipment, the net quantity is the net mass of the lithium ion batteries in the package.

**Open cryogenic receptacle.** A transportable thermally insulated receptacle for refrigerated liquefied gases maintained at atmospheric pressure by continuous venting of the refrigerated liquefied gas.

**Operator.** A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

**Outer packaging.** The outer protection of a composite or combination packaging together with any absorbent materials, cushioning and any other components necessary to contain and protect inner receptacles or inner packagings.

**Overpack.** An enclosure used by a single shipper to contain one or more packages and to form one handling unit for convenience of handling and stowage.

*Note.— A unit load device is not included in this definition.*

**Package.** The complete product of the packing operation, consisting of the packaging and its contents prepared for transport.

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

*Note.— For radioactive material, see 2;7.1.3.*

**Passenger aircraft.** An aircraft that carries any person other than a crew member, an operator's employee in an official capacity, an authorized representative of an appropriate national authority or a person accompanying a consignment or other cargo.

**Pilot-in-command.** The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

**Portable tanks.** For the definition of portable tanks, see Part S-4, Chapter 12 of the Supplement.

**Pressure drums.** (See UN Recommendations, Chapter 1.2). Not permitted for air transport.

**Pressure receptacle.** A collective term that includes cylinders, tubes, pressure drums, closed cryogenic receptacles, metal hydride storage systems, bundles of cylinders and salvage pressure receptacles.

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

**Quality assurance.** A systematic programme of controls and inspections applied by any organization or body which is aimed at providing adequate confidence that the standard of safety prescribed by these instructions is achieved in practice.

**Radiation level.** For the transport of Class 7 material, the corresponding dose rate expressed in millisieverts per hour.

**Radioactive contents.** For the transport of Class 7 material, the radioactive material together with any contaminated or activated solids, liquids, and gases within the packaging.

**Receptacles.** Containment vessels for receiving and holding substances or articles, including any means of closing.

**Reconditioned packagings** include:

- a) metal drums that are:

- i) cleaned to original materials of construction, with all former contents, internal and external corrosion, and external coatings and labels removed;
  - ii) restored to original shape and contour, with chimes (if any) straightened and sealed, and all non-integral gaskets replaced; and
  - iii) inspected after cleaning but before painting, with rejection of packagings with visible pitting, significant reduction in material thickness, metal fatigue, damaged threads or closures, or other significant defects;
- b) plastic drums and jerricans that:
- i) are cleaned to original materials of construction, with all former contents, external coatings and labels removed;
  - ii) have all non-integral gaskets replaced; and
  - iii) are inspected after cleaning with rejection of packagings with visible damage such as tears, creases or cracks, or damaged threads or closures or other significant defects.

*Note.*— It is anticipated that further examples will be added in future.

**Recycled plastic material.** Material recovered from used industrial packagings that has been cleaned and prepared for processing into new packagings. The specific properties of the recycled material used for production of new packagings must be assured and documented regularly as part of a quality assurance programme recognized by the appropriate national authority. The quality assurance programme must include a record of proper pre-sorting and verification that each batch of recycled plastic material has the proper melt flow rate, density, and tensile yield strength, consistent with that of the design type manufactured from such recycled material. This necessarily includes knowledge about the packaging material from which the recycled plastic has been derived, as well as awareness of the prior contents of those packagings if those prior contents might reduce the capability of new packagings produced using that material. In addition, the packaging manufacturer's quality assurance programme must include performance of the mechanical design type test in Part 6, Chapter 4 on packagings manufactured from each batch of recycled plastic material. In this testing, stacking performance may be verified by appropriate dynamic compression testing rather than static load testing.

*Note.*— ISO 16103:2005 "Packaging — Transport packages for dangerous goods — Recycled plastics material", provides additional guidance on procedures to be followed in approving the use of recycled plastics material.

**Remanufactured large packaging.** (See UN Recommendations, Chapter 1.2). Not permitted for air transport.

**Remanufactured packagings** include:

- a) metal drums that:
  - i) are produced as a UN type from a non-UN type;
  - ii) are converted from one UN type to another UN type; or
  - iii) undergo the replacement of integral structural components (such as non-removable heads);
- b) plastic drums that:
  - i) are converted from one UN type to another UN type (e.g. 1H1 to 1H2); or
  - ii) undergo the replacement of integral structural components.

Remanufactured drums are subject to the same requirements of these Instructions as apply to a new drum of the same type.

**Reused large packaging.** (See UN Recommendations, Chapter 1.2). Not permitted for air transport.

**Reused packagings.** Packagings to be refilled which have been examined and found free of defects affecting the ability to withstand the performance tests; the term includes those which are refilled with the same or similar compatible contents and are transported within distribution chains controlled by the shipper of the product.

**Salvage packagings.** Special packagings into which damaged, defective, leaking or nonconforming dangerous goods packages, or dangerous goods that have spilled or leaked, are placed for purposes of transport for recovery or disposal.

+ **Salvage pressure receptacle.** (See UN Recommendations, Chapter 1.2). Not permitted for air transport.

**Self-accelerating decomposition temperature (SADT).** The lowest temperature at which self-accelerating decomposition may occur with a substance in the packaging as used in transport.

**Serious injury.** An injury which is sustained by a person in an accident and which:

- a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or
- b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or
- c) involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage; or
- d) involves injury to any internal organ; or
- e) involves second or third degree burns, or any burns affecting more than 5 per cent of the body surface; or
- f) involves verified exposure to infectious substances or injurious radiation.

**Settled pressure.** The pressure of the contents of a pressure receptacle in thermal and diffusive equilibrium.

**Shipment.** The specific movement of a consignment from origin to destination.

**Siftproof packagings.** Packagings impermeable to dry contents including fine solid material produced during transport.

**Single packagings.** Packagings which do not require any inner packaging to perform their containment function during transport.

**Solid dangerous goods.** Dangerous goods, other than gases, that do not meet the definition of Liquid dangerous goods.

+ **State of Destination.** The State in the territory of which the consignment is finally to be unloaded from an aircraft.

**State of Origin.** The State in the territory of which the consignment is first to be loaded on an aircraft.

**State of Registry.** The State on whose register the aircraft is entered.

**State of the Operator.** The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

**Stores (supplies).** a) Stores (supplies) for consumption; and b) Stores (supplies) to be taken away.

*Stores (supplies) for consumption.* Goods, whether or not sold, intended for consumption by the passengers and the crew on board aircraft, and goods necessary for the operation and maintenance of aircraft, including fuel and lubricants.

*Stores (supplies) to be taken away.* Goods for sale to the passengers and the crew of aircraft with a view to being landed.

Items that meet the classification as dangerous goods and which are transported in accordance with Part 1;2.2.2 or Part 1;2.2.3 are considered as "cargo".

**Tank.** A tank container, portable tank, a road tank-vehicle, a rail tank-wagon or a receptacle intended to contain solids, liquids, or gases and has a capacity of not less than 450 litres when used for the transport of gases as defined in 2;2.1.1.

*Note.* — These Technical Instructions do not permit the use of a tank for the transport of radioactive material by air.

**Test pressure.** The required pressure applied during a pressure test for qualification or re-qualification.

**Transport index (TI) assigned to a package, overpack or freight container.** For the transport of Class 7 material, a number which is used to provide control over radiation exposure.

**Through or into.** For the transport of Class 7 material, through or into the countries in which a consignment is transported but specifically excluding countries "over" which a consignment is carried by air, provided that there are no scheduled stops in those countries.

**UNECE.** The United Nations Economic Commission for Europe (UNECE, Palais des Nations, 8-14 avenue de la Paix, CH-1211 Geneva 10, Switzerland).

**Unit load device.** Any type of freight container, aircraft container, aircraft pallet with a net or aircraft pallet with a net over an igloo.

*Note 1.*— An overpack is not included in this definition.

*Note 2.*— A freight container for radioactive material is not included in this definition (see 2;7.1.3).

**UN number.** The four-digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods to identify a substance or a particular group of substances.

**Working pressure.** The settled pressure of a compressed gas at a reference temperature of 15°C in a full pressure receptacle.

### 3.1.2 Clarifying examples for certain defined terms

The following explanations and examples are meant to assist in clarifying the use of some of the packaging terms defined in this section.

The definitions in this section are consistent with the use of defined terms throughout the Instructions. However, some of the defined terms are commonly used in other ways. This is particularly evident in respect of the term "inner receptacle" which has often been used to describe the "inners" of a combination packaging.

The "inners" of "combination packagings" are always termed "inner packagings" not "inner receptacles". A glass bottle is an example of such an "inner packaging".

The "inners" of "composite packagings" are normally termed "inner receptacles". For example, the "inner" of a 6HA1 composite packaging (plastic material) is such an "inner receptacle" since it is normally not designed to perform a containment function without its "outer packaging" and is therefore not an "inner packaging".

## 3.2 UNITS OF MEASUREMENT AND CONVERSION FACTORS

### 3.2.1 Units of measurement

The units of measurement to be used in the transport of dangerous goods by air are those specified by the International System (SI) as modified for international civil aviation by Annex 5 to the Chicago Convention. The primary units of mass and volume will be the kilogram (kg) and the litre (L) and the unit of pressure will be the kilopascal (kPa). Except as specifically provided for in these Technical Instructions, only those abbreviations for units of measurement that are indicated in this paragraph, or in Annex 5 to the Chicago Convention, may be used in the transport of dangerous goods by air.

*Note.— Where measurements relating to radioactivity occur in these Instructions, the value is given in SI units followed, in parentheses, by the non-SI equivalent.*

### 3.2.2 Non-SI equivalents

It is recognized that there are in existence many packagings which were designed and constructed for use with non-SI quantity limitations and that such packagings will continue to be used for some time to come. Table 1-1 therefore contains a list of authorized non-SI equivalents for quantity limitations expressed in SI units. It is stressed that these are not precise equivalents but are nevertheless acceptable based upon the likely availability of packaging.

### 3.2.3 Conversion factors

Precise conversion factors for commonly used SI units are given in Annex 5 to the Chicago Convention. Tables 1-2 and 1-3 show conversion factors, to four significant figures, for some units widely used in dangerous goods transport.



Table 1-1. Authorized equivalents

Volume		
Litres	Imperial	U.S.
0.5	1 pt	1 pt
1	1 qt	1 qt
2	2 qt	2 qt
2.5	5 pt	5 pt
5	1 gal	1.25 gal
10	2 gal	2.5 gal
15	3 gal	3.75 gal
20	4.25 gal	5 gal
25	5.5 gal	6.25 gal
30	6.5 gal	7.5 gal
42	9 gal	11 gal
50	11 gal	13 gal
60	13 gal	15 gal
100	22 gal	25 gal
120	26 gal	30 gal
220	48 gal	55 gal
250	55 gal	62.5 gal

*Note.*— Where quantities are specified in SI units of mass, for 500 kg or less, quantities expressed in pounds may be substituted on the basis of one pound per 500 grams.

Table 1-2. Conversion to SI units\*

To convert	to	Multiply by
bar	kilopascals (kPa)	100.0
curie (Ci)	gigabecquerel (GBq)	37.00
degrees Fahrenheit	degrees Celsius (°C)	subtract 32°F and multiply by 5/9
feet	metres (m)	0.304 8
gallons (Imperial)	litres (L)	4.546
gallons (U.S. liquid)	litres (L)	3.785
inches	millimetres (mm)	25.40
kilogram-force (kgf)	newton (N)	9.807
kilograms per square centimetre	kilopascals (kPa)	98.07
oersted	amperes per metre (A/m)	79.58
ounces, fluid (Imperial)	millilitres (mL)	28.41
ounces, fluid (U.S.)	millilitres (mL)	29.57
pints (Imperial)	litres (L)	0.568 3
pints (U.S.)	litres (L)	0.473 2
pounds (avoirdupois)	kilograms (kg)	0.453 6
pounds per square inch	kilopascals (kPa)	6.895
quarts (Imperial)	litres (L)	1.137
quarts (U.S.)	litres (L)	0.946 4
rad	gray (Gy)	0.010 00
rem	sievert (Sv)	0.010 00

Table 1-3. Conversion from SI units\*

To convert	to	Multiply by
amperes per metre (A/m)	oersted	0.012 57
degrees Celsius (°C)	degrees Fahrenheit	multiply by 9/5 and add 32°F
gray (Gy)	rad	100.0
kilograms (kg)	pounds	2.205
kilopascals (kPa)	bar	0.010 00
kilopascals (kPa)	kilograms per square centimetre	0.010 20
kilopascals (kPa)	pounds per square inch	0.145 0
litres (L)	gallons (Imperial)	0.220 0
litres (L)	gallons (U.S. liquid)	0.264 2
litres (L)	pints (Imperial)	1.760
litres (L)	pints (U.S.)	2.113
litres (L)	quarts (Imperial)	0.879 9
litres (L)	quarts (U.S.)	1.057
metres (m)	feet	3.281
millilitres (mL)	ounces, fluid (Imperial)	0.035 20
millilitres (mL)	ounces, fluid (U.S.)	0.033 81
millimetres (mm)	inches	0.039 37
newton (N)	kilogram-force (kgf)	0.1020
sievert (Sv)	rem	100.0
terabecquerel (TBq)	curie (Ci)	27.03

\* Where a prefix is used, it indicates a multiplying factor as follows:

- tera (T) × 10<sup>12</sup>
- giga (G) × 10<sup>9</sup>
- mega (M) × 10<sup>6</sup>
- kilo (k) × 10<sup>3</sup>
- milli (m) × 10<sup>-3</sup>
- micro (μ) × 10<sup>-6</sup>
- nano (n) × 10<sup>-9</sup>

## 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 risks 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 18, HK 1;  
see Table A-1*

#### 4.1 ESTABLISHMENT OF TRAINING PROGRAMMES

4.1.1 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, mail or stores;
- 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 their baggage and/or cargo, mail or stores; and
- + h) designated postal operators.

≠ 4.1.2 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. 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. 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;
- b) function-specific training — which must provide detailed training in the requirements applicable to the function for which that person is responsible; and
- c) safety training — which must cover the hazards presented by dangerous goods, safe handling and emergency response procedures.

≠ 4.2.2 Personnel identified in the categories specified in Table 1-4, 1-5 or 1-6 must be trained or training must be verified prior to the person performing any duty specified in Table 1-4, 1-5 or 1-6.

≠ 4.2.3 Recurrent training must be provided within 24 months of previous training to ensure knowledge is current. However, if recurrent training is completed within the final three months of validity of previous training, the period of validity extends from the month on which the recurrent training was completed until 24 months from the expiry month of that previous training.

4.2.4 A test to verify understanding must be provided following training. Confirmation that the test has been completed satisfactorily is required.

4.2.5 A record of training must be maintained which must include:

- a) the individual's name;
  - ≠ b) the most recent training completion month;
  - c) a description, copy or reference to training materials used to meet the training requirements;
  - d) the name and address of the organization providing the training; and
  - e) evidence which shows that a test has been completed satisfactorily.
- ≠ Training records must be retained by the employer for a minimum period of 36 months from the most recent training completion month and must be made available upon request to the employee or appropriate national authority.

4.2.6 The subject matter relating to dangerous goods transport with which various categories of personnel should be familiar is indicated in Table 1-4.

≠ 4.2.7 Staff of operators not carrying dangerous goods as cargo or mail must be trained commensurate with their responsibilities. The subject matter to which their various categories of staff should be familiar with is indicated in Table 1-5.

+ *Note.— Security staff are required to be trained irrespective of whether the operator on which passenger or cargo is to be transported carries dangerous goods as cargo.*

**Table 1-4. Content of training courses**

<i>Aspects of transport of dangerous goods by air with which they should be familiar, as a minimum</i>	<i>Shippers and packers</i>		<i>Freight forwarders</i>				<i>Operators and ground handling agents</i>					<i>Security staff</i>
	1	2	3	4	5	6	7	8	9	10	11	12
General philosophy	x	x	x	x	x	x	x	x	x	x	x	x
Limitations	x		x	x	x	x	x	x	x	x	x	x
General requirements for shippers	x		x			x						
Classification	x	x	x			x						x
List of dangerous goods	x	x	x			x				x		
Packing requirements	x	x	x			x						
Labelling and marking	x	x	x	x	x	x	x	x	x	x	x	x
Dangerous goods transport document and other relevant documentation	x		x	x		x	x					
Acceptance procedures						x						
Recognition of undeclared dangerous goods	x	x	x	x	x	x	x	x	x	x	x	x
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	x
Emergency procedures	x	x	x	x	x	x	x	x	x	x	x	x

#### KEY

- 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 dangerous 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 and load planners
- 11 — Crew members (other than flight crew members)
- # 12 — Security staff who are involved with the screening of passengers 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	7	8	9	10	11
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

#### KEY

- # — Operator's and ground handling agent's staff accepting cargo or mail (other than dangerous goods)
- # — 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
- 9 — Passenger handling staff
- # 10 — Flight crew members, loadmasters and load planners
- 11 — 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 to which their various categories of staff should be familiar with is indicated in Table 1-6.

**Table 1-6. Content of training courses for staff of designated postal operators**

Aspects of transport of dangerous goods by air with which they should be familiar, as a minimum	Designated postal operators		
	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 documents 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

**KEY**

- 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.*

**4.3 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.

**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).

## Chapter 5

### DANGEROUS GOODS SECURITY

Parts of this Chapter are affected by State Variation US 17; see Table A-1

*Note.— This Chapter addresses the security responsibilities of operators, shippers and others involved in the transport of dangerous goods aboard aircraft. It should be noted that Annex 17 — Security, provides comprehensive requirements for implementation of security measures by States to prevent unlawful interference with civil aviation or when such interference has been committed. In addition, the Security Manual for Safeguarding Civil Aviation against Acts of Unlawful Interference (Doc 8973 — Restricted) provides procedures and guidance on aspects of aviation security and is intended to assist States in the implementation of their respective national civil aviation security programmes. The requirements in the Chapter are intended to supplement the requirements of Annex 17 and to implement measures to be taken to minimize theft or misuse of dangerous goods that may endanger persons or property. The provisions of this Chapter do not supersede requirements of Annex 17 or the Security Manual.*

#### 5.1 GENERAL SECURITY PROVISIONS

5.1.1 All persons engaged in the transport of dangerous goods should consider security requirements for the dangerous goods commensurate with their responsibilities.

5.1.2 Dangerous goods should only be offered to operators that have been appropriately identified.

5.1.3 The provisions of this chapter do not apply to:

- a) UN 2908 and UN 2909 excepted packages;
- b) UN 2910 and UN 2911 excepted packages with an activity level not exceeding the A<sub>2</sub> value; and
- c) UN 2912 LSA-I and UN 2913 SCO-I.

#### 5.2 DANGEROUS GOODS SECURITY TRAINING

5.2.1 The training specified in 4.2 should include elements of security awareness.

5.2.2 Security awareness training should address the nature of security risks, recognizing security risks methods to address and reduce such risks, and actions to be taken in the event of a security breach. It should include awareness of security plans (if appropriate) commensurate with the responsibilities of individuals and their part in implementing security plans.

*Note.— Persons who have received security training in accordance with the requirements of a national security plan or other security requirements that fulfil the elements of 5.2.2 need not receive additional training.*

5.2.3 Such training should be provided or verified upon employment in a position involving dangerous goods transport. Recurrent training should take place within 24 months of previous training to ensure knowledge is current.

5.2.4 Records of all dangerous goods security training undertaken should be kept by the employer and made available to the employee or appropriate national authority upon request. Records should be kept by the employer for a period of time established by the appropriate national authority.

#### 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.

**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
Class 1 Division 1.5 explosives
Division 2.3 toxic gases (excluding aerosols)
Class 3 desensitized explosives
Division 4.1 desensitized explosives
Division 6.1 substances of Packing Group 1; except when transported under the excepted quantity provisions in 3;5
Division 6.2 infectious substances of Category A (UN Nos. 2814 and 2900)

5.3.1.3 For dangerous goods of Class 7, high consequence radioactive material is that with an activity equal to or greater than a transport security threshold of 3 000 A<sub>2</sub> per single package (see also 2;7.2.2.1) except for the following radionuclides where the transport security threshold is given in Table 1-8 below.

**Table 1-8. Transport security thresholds for specific radionuclides**

<i>Element</i>	<i>Radionuclide</i>	<i>Transport security threshold (TBq)</i>
Americium	Am-241	0.6
Gold	Au-198	2
Cadmium	Cd-109	200
Californium	Cf-252	0.2
Curium	Cm-244	0.5
Cobalt	Co-57	7
Cobalt	Co-60	0.3
Caesium	Cs-137	1
Iron	Fe-55	8000
Gadolinium	Gd-153	10
Germanium	Ge-68	7
Iridium	Ir-192	0.8
Nickel	Ni-63	600
Palladium	Pd-103	900
Promethium	Pm-147	400
Polonium	Po-210	0.6
Plutonium	Pu-238	0.6
Plutonium	Pu-239	0.6



Element	Radionuclide	Transport security threshold (TBq)
Radium	Ra-226	0.4
Ruthenium	Ru-106	3
Selenium	Se-75	2
Strontium	Sr-90	10
Thallium	Tl-204	200
Thulium	Tm-170	200
Ytterbium	Yb-169	3

- + 5.3.1.4 For mixtures of radionuclides, determination of whether or not the transport security threshold has been met or exceeded can be calculated by summing the ratios of activity present for each radionuclide divided by the transport security threshold for that radionuclide. If the sum of the fractions is less than 1, then the radioactivity threshold for the mixture has not been met nor exceeded.

This calculation can be made with the formula:

$$\sum_i \frac{A_i}{T_i} < 1$$

Where:

$A_i$  = activity of radionuclide  $i$  that is present in a package (TBq)

$T_i$  = transport security threshold for radionuclide  $i$  (TBq).

- + 5.3.1.5 When radioactive material possess subsidiary risks of other classes or divisions, the criteria of Table 1-7 should also be taken into account (see also 1;6.5).

## 5.4 SECURITY PLANS

- ≠ 5.4.1 Operators, shippers and others (including infrastructure managers) engaged in the transport of high consequence dangerous goods (see 5.3.1) should adopt, implement and comply with a security plan that addresses at least the elements specified in 5.4.2.

*Note.— When national authorities issue exemptions, they should consider all of the provisions in this Chapter.*

5.4.2 The security plan should comprise at least the following elements:

- a) specific allocation of responsibilities for security to competent and qualified persons with appropriate authority to carry out their responsibilities;
- b) records of dangerous goods or types of dangerous goods transported;
- c) review of current operations and assessment of vulnerabilities, including inter-modal transfer, temporary transit storage, handling, and distribution, as appropriate;
- d) clear statement of measures including training policies (including response to higher threat conditions, new employee/employment verifications, etc.), operating practices (e.g. access to dangerous goods in temporary storage proximity to vulnerable infrastructure, etc.), equipment and resources that are to be used to reduce security risks;
- e) effective and up-to-date procedures for reporting and dealing with security threats, breaches of security or security incidents;
- f) procedures for the evaluation and testing of security plans and procedures for periodic review and update of the plans;
- g) measures to ensure the security of transport information contained in the plan; and
- h) measures to ensure that the security of the distribution of transport documentation is limited as far as possible. (Such measures must not preclude provision of the transport documentation required by Part 5, Chapter 4 of these Instructions.)

*Note.— Operators, shippers and others with responsibilities for the safe and secure transport of dangerous goods should cooperate with each other and with appropriate authorities to exchange threat information, apply appropriate security measures and respond to security incidents.*

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 Material<sup>1</sup> and the IAEA circular on "The Physical Protection of Nuclear Material and Nuclear Facilities"<sup>2</sup> are applied.

Radioactive Material	Activity (Bq)	Mass (kg)
Plutonium	10000	0.001
Uranium	100000	0.01
Thorium	1000000	0.1
Other	10000000	1

## Chapter 6

### GENERAL PROVISIONS CONCERNING CLASS 7

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

#### 6.1 SCOPE AND APPLICATION

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, 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*, (2009 Edition), Safety Standards Series No. TS-R-1, IAEA, Vienna (2009). Explanatory material can be found in *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material* (2005 Edition), Safety Standard Series No. TS-G-1.1 (Rev. 1), IAEA, Vienna (2008). The prime responsibility for safety must rest with the person or organization responsible for facilities and activities that give rise to radiation risk.

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

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

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 requirements on the design and operation of packages and on the maintenance of the packagings, including consideration of the nature of the radioactive contents. Finally, they are satisfied by requiring administrative controls including, where appropriate, approval by competent authorities.

6.1.3 These Instructions apply to the transport of radioactive material by air, including transport that is incidental to the use of the radioactive material. Transport comprises all operations and conditions associated with and involved in the movement of radioactive material; these include the design, manufacture, maintenance and repair of packaging, and the preparation, consigning, loading, carriage including in-transit storage, unloading and receipt at the final destination of the radioactive material and packages. A graded approach is applied to the performance standards in these Instructions that are characterized by three general severity levels:

- a) routine conditions of transport (incident free);
- b) normal conditions of transport (minor mishaps); and
- c) accident conditions of transport.

6.1.4 These Instructions do not apply to:

- a) radioactive material implanted or incorporated into a person or live animal for diagnosis or treatment;
- b) a person who has been subject to accidental or deliberate intake of or contamination from radioactive material and is to be transported for medical treatment, taking into account the necessary radiological protection measures with respect to other passengers and crew, subject to approval by the operator;

≠ *Note.— Guidance material may be found on [www.icao.int/safety/dangerousgoods](http://www.icao.int/safety/dangerousgoods).*

- c) radioactive material in consumer products which have received regulatory approval, following their sale to the end user;
- d) natural material and ores containing naturally occurring radionuclides which are either in their natural state or have only been processed for purposes other than for extraction of the radionuclides, and are not intended to be processed for use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the values specified in 2;7.2.2.1 b) or calculated in accordance with 2;7.2.2.2 to 7.2.2.6;

- e) non-radioactive solid objects with radioactive substances present on any surfaces in quantities not in excess of the limit specified in the definition of contamination in 2;7.1.

### 6.1.5 Specific provisions for the transport of excepted packages

6.1.5.1 Excepted packages which may contain radioactive material in limited quantities, instruments, manufactured articles and empty packages as specified in 2;7.2.4.1.1 are subject only to the following provisions of Parts 5 to 7:

- a) the applicable provisions specified in 5;1.1 i), 5;1.2.4, 5;1.4, 5;1.6.3, 5;1.7, 5;2.2, 5;2.3, 5;2.4.2, 5;3.2.12 e), 5;3.3, 5;3.4, 5;4.4, 7;2.5, 7;3.2.2 and 7;4.4;
- b) the requirements for excepted packages specified in 6;7.3; and
- c) if the excepted package contains fissile material, one of the fissile exceptions provided by 2;7.2.3.5 must apply and the requirement of 6;7.6.2 must be met.

6.1.5.2 Excepted packages must be subject to the relevant provisions of all other parts of these Instructions.

## 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 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, and doses to persons must be below the relevant dose limits. 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:

- 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; and
- b) is likely to exceed 6 mSv in a year, individual monitoring must be conducted.

When individual monitoring or workplace 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.*

6.2.5 In the event of accidents or incidents 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", Safety Standard Series No. TS-G-1.2 (ST-3), IAEA, Vienna (2002).

6.2.6 Emergency procedures must take into account 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.

6.2.7 Personnel must be appropriately trained in the radiation hazards involved and the precautions to be observed in order to ensure restriction of their exposure and that of other persons who might be affected by their actions.

## 6.3 QUALITY ASSURANCE

Quality assurance programmes based on international, national or other standards acceptable to the competent authority must be established and implemented for the design, manufacture, testing, documentation, use, maintenance and inspection of all special form radioactive material, low dispersible radioactive material and packages, and for transport and in-transit storage operations to ensure compliance with the relevant provisions of these Instructions. Certification that the design specification has been fully implemented must be available to the competent authority. The manufacturer, shipper or user must be prepared to provide facilities for competent authority inspection during manufacture and use and to demonstrate to any cognizant competent authority that:

- a) the manufacturing methods and materials used are in accordance with the approved design specifications; and

- b) all packagings are periodically inspected and, as necessary, repaired and maintained in good condition so that they continue to comply with all relevant requirements and specifications, even after repeated use.

Where competent authority approval is required, such approval must take into account and be contingent upon the adequacy of the quality assurance programme.

#### 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.

6.4.2 Consignments for which conformity with any provision applicable to Class 7 is impracticable must not be transported except under special arrangement. Provided the competent authority is satisfied that conformity with the Class 7 provisions of these Instructions is impracticable and that the requisite standards of safety established by these Instructions have been demonstrated through alternative means, 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 had been met. For international consignments of this type, multilateral approval must be required.

#### 6.5 RADIOACTIVE MATERIAL POSSESSING OTHER DANGEROUS PROPERTIES

6.5.1 In addition to the radioactive and fissile properties, any subsidiary risk of the contents of a package, such as explosiveness, flammability, pyrophoricity, chemical toxicity and corrosiveness, must also be taken into account in the documentation, packing, labelling, marking, placarding, stowage, segregation and transport, in order to be in compliance with all relevant provisions for dangerous goods of these Instructions.

#### 6.6 NON-COMPLIANCE

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

- a) the shipper must be informed of the non-compliance by the operator if the non-compliance is identified during transport; or
- b) the shipper and the operator must be informed of the non-compliance by the consignee if the non-compliance is identified at receipt;
- c) the operator, shipper 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 circumstances that led to the non-compliance; and
  - iv) communicate to the relevant competent authority(ies) the causes of the non-compliance and corrective or preventative actions taken or to be taken; and
- d) 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.

(b) All programs are periodically reported and all programs are reviewed in the annual report. The review is conducted by the Board of Directors and the Board of Directors. The review is conducted by the Board of Directors and the Board of Directors. The review is conducted by the Board of Directors and the Board of Directors.

### 8.1 SPECIAL ARRANGEMENT

8.1.1 Special arrangements shall be made for the purpose of the program. The program shall be conducted in accordance with the provisions of the program. The program shall be conducted in accordance with the provisions of the program.

8.1.2 Group members for which contracts are made shall be subject to the provisions of the program. The program shall be conducted in accordance with the provisions of the program. The program shall be conducted in accordance with the provisions of the program.

### 8.2 REACTIVE MATERIAL POSSESSING OTHER HAZARDOUS SUBSTANCES

8.2.1 In addition to the provisions of the program, the program shall be conducted in accordance with the provisions of the program. The program shall be conducted in accordance with the provisions of the program. The program shall be conducted in accordance with the provisions of the program.

### 8.3 NON-COMPLIANCE

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8.3.9 In the event of a non-compliance with the provisions of the program, the program shall be conducted in accordance with the provisions of the program. The program shall be conducted in accordance with the provisions of the program.

**Chapter 7****INCIDENT AND ACCIDENT REPORTING**

Entities other than operators who are in possession of dangerous goods at the time a dangerous goods accident or incident occurs or at the time a dangerous goods incident is discovered to have occurred should follow the reporting requirements of Part 7;4.4. Entities other than operators who discover undeclared or misdeclared dangerous goods should follow the reporting requirements of Part 7;4.5. These entities may include, but are not limited to, freight forwarders, customs authorities and security screening providers.

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