



**WORKING PAPER**

**DANGEROUS GOODS PANEL (DGP)  
MEETING OF THE WORKING GROUP OF THE WHOLE**

**Montréal, 15 to 19 October 2012**

**Agenda Item 6: Resolution, where possible, of the non-recurrent work items identified by the Air Navigation Commission or the panel**

**GUIDANCE MATERIAL ON AIRCRAFT FIRE FIGHTING AND RESCUE PROCEDURES  
FOR ACCIDENTS INVOLVING DANGEROUS GOODS**

(Presented by the Secretary)

**SUMMARY**

This working paper contains draft amendments to the *Airport Services Manual* (Doc 9137) prepared by ICAO's Rescue and Fire Fighting Working Group. The amendments are related to aircraft fire fighting and rescue procedures for accidents involving dangerous goods. The DGP is asked to review this material.

Action by the DGP-WG is in paragraph 2.

**1. INTRODUCTION**

1.1 The ICAO Rescue and Fire Fighting Working Group (RFFWG) is updating the *Airport Services Manual*, Part 1 — *Rescue and Fire Fighting* (Doc 9137). Draft material on aircraft fire fighting and rescue procedures for accidents involving dangerous goods was presented to the Ninth Meeting of the RFFWG held in Montreal from 16 to 20 July 2012. The Dangerous Goods Panel (DGP) is asked to review the material and to provide comments. The material is presented in the appendix to this working paper.

**2. ACTION BY THE DGP-WG**

2.1 The DGP-WG is invited to form a small working group to review the material presented in the appendix to this working paper.



## APPENDIX

### DRAFT AMENDMENTS TO PART 1 OF THE AIRPORT SERVICES MANUAL RELATED TO AIRCRAFT FIRE FIGHTING AND RESCUE PROCEDURES FOR ACCIDENTS INVOLVING DANGEROUS GOODS

*Airport Services Manual, Part 1 — Rescue and Fire Fighting (Doc 9137)*

#### Chapter 12

#### Aircraft Fire Fighting and Rescue Procedures

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#### 12.4 ACCIDENTS INVOLVING DANGEROUS GOODS

##### *General*

12.4.1 Dangerous goods are frequently carried in commercial transport aircraft, on both passenger and cargo flights. The types of dangerous goods which are permitted for carriage, and the conditions under which they may be carried, are explained in the ICAO *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) which, pursuant to the provisions of Annex 18 — *The Safe Transport of Dangerous Goods by Air* are to be applied by all Contracting States. Reference should be made to the Technical Instructions for full details on the transport of dangerous goods by air.

12.4.2 Under the provisions of the Technical Instructions, certain types of dangerous goods presenting extreme hazards ~~in transport~~ are forbidden from transport by air under any circumstances. Other less dangerous varieties, although normally forbidden for transport by air, may be transported under certain conditions under the terms of an “exemption”, but only with the specific approval of all States concerned (i.e. States of origin, transit, destination and overflight). **Of those types of dangerous goods normally permitted to be transported by air, only those of a relatively limited degree of hazard by air, only those of a relatively limited degree of hazard are permitted aboard passenger aircraft with the remaining, more dangerous goods, restricted to transport aboard cargo aircraft only.**

**Seems confusing, can we get the exact wording from ICAO *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) which, pursuant to the provisions of Annex 18?**

**Suggested new text from Technical Instructions:**

12.4.2 Under the provisions of the Technical Instructions, some dangerous goods are identified as too dangerous ever to be carried on any aircraft. Others are forbidden in normal circumstances but may be carried with specific approval from the States concerned. Some are restricted to carriage only on all-cargo aircraft. Most may be carried on both passenger and all-cargo aircraft, subject to meeting the required conditions. Those restricted to all-cargo aircraft are either in larger quantities than allowed on passenger aircraft or are forbidden on such aircraft; their transport is permitted due to their being usually accessible in flight and to the ability of the flight crew to consider a greater range of actions in an emergency than is possible on passenger aircraft.

*Dangerous goods defined*

12.4.3 Dangerous goods are articles or substances which are capable of posing ~~significant~~ <sup>a</sup> risk to health, safety, ~~or property~~ <sup>or the environment</sup> when transported by air. For the purposes of air transport they are divided by the Technical Instructions into nine classes reflecting the type of hazard they present to transport workers and emergency response personnel.

12.4.4 The nine classes of dangerous goods are:

Class 1 Explosives

Class 2 Gases: compressed, liquefied, dissolved under pressure or deeply refrigerated

Class 3 Flammable liquids

Class 4 Flammable solids; substances liable to spontaneous combustion; substances which, in contact with water, emit flammable gases

Class 5 Oxidizing substances; organic peroxides

Class 6 Poisonous (toxic) and infectious substances

Class 7 Radioactive materials

Class 8 Corrosives

Class 9 Miscellaneous dangerous goods; that is, articles or substances which, during air transport, present a danger not covered by other classes. Examples: magnetized material; acetaldehyde ammonia; expandable polystyrene beads.

*Note.— The order in which these classes are listed does not imply a relative degree of hazard.*

12.4.5 In some classes, dangerous goods are further divided into divisions. The division is expressed by placing a decimal point after the class number and reflecting the number of the division, i.e. Division 6.1. In these cases, reference is made only to the division and not to the class, e.g. Division 5.2, not Class 5, Division 2.

*Communication of hazards presented by dangerous goods*

12.4.6 As a condition for transporting dangerous goods by air, the Technical Instructions prescribe certain actions that must be taken to advise transport workers and emergency response personnel of the hazards presented by the dangerous goods transported. These hazards are communicated principally through markings and labels applied to the package of dangerous goods and through the provision of certain information in transport documents that accompany a shipment.

12.4.7 *Package markings and labels.* Packages of dangerous goods are required to be marked with the “proper shipping name” of the dangerous goods, as listed in the Technical Instructions, and with the **corresponding 4-digit** “United Nations (UN) number”, ~~which is a 4 digit number~~ used to identify the substance. The package is also required to bear one or more hazard labels. These labels are in the form of a 100 mm × 100 mm square on point, with a distinctive symbol and colour. These package markings and

labels enable emergency response personnel to immediately recognize the nature of the hazards presented by any dangerous goods that may be encountered.

12.4.8 *Transport documentation.* The Technical Instructions require that when dangerous goods are offered for transport the shipper must provide to the operator a transport document which contains certain information relative to the dangerous goods. The information required includes the proper shipping name, hazard class or division number, UN number and subsidiary risk of the goods. From this document, the operator prepares a notification to pilot-in-command that provides the information relative to the hazards of the dangerous goods aboard the aircraft to the pilot as well as the location in the aircraft where the dangerous goods have been loaded. The notification to pilot-in-command must be provided to the aircraft commander as early as practicable before departure and must be readily available in flight.

12.4.9 *Information by pilot-in-command in case of in-flight emergency.* If an in-flight emergency occurs, the pilot-in-command should inform the appropriate air traffic services unit, for the information of aerodrome authorities and ~~rescue and fire fighting~~ **RFF** services, of any dangerous goods on board. If the situation permits, the information provided should include the proper shipping names, class and subsidiary risks, the compatibility group for Class 1 and the quantity of each type of dangerous goods as well as the location where they are stowed aboard the aircraft. If a lengthy message is impossible, the dangerous goods on board may be identified by transmitting the UN numbers.

### *Emergency actions*

#### *Fires*

12.4.10 *General.* Many types of dangerous goods (e.g. flammable liquids) would be consumed in large aircraft fires and consideration of the possible types and amount of cargo aboard an aircraft suggests a potential for an even greater hazard. RFF personnel must use proper procedures in response, size-up, and operations to ensure that they are protected from the effects of dangerous goods. ~~without significantly increasing the severity of a fire. In general, because of the packaging employed, the relatively small quantity of dangerous goods present (particularly aboard a typical passenger aircraft) and the relatively low level of hazard of the dangerous goods allowed, the presence of dangerous goods aboard an aircraft should not normally pose a significantly increased risk to rescue and fire fighting personnel.~~ As with any fire, however, normal personal protective clothing, including breathing apparatus (at as a minimum), should always be worn. As far as possible, ~~rescue and fire fighting~~ **RFF** personnel should stay ~~upward~~ upwind and out of smoke, fumes and dust.

12.4.10.1 On cargo-carrying aircraft, hazardous freight is usually placed in containers called unit load devices. These include aircraft containers, aircraft pallets, or aircraft pallets any of which may be secured with a net. These containers are then loaded aboard the aircraft. Some air carriers use specially modified unit load devices for transporting certain dangerous goods on the main deck of freighter aircraft. These containers may have special colors and include an integral fire suppression capability. (Unit load devices containing dangerous goods will have a small tag wired to the outside or placed in a plastic window, indicating which of the nine hazard classes, previously listed, are shipped inside.) The tag will usually have a red "red striped" border. Special discharge nozzles located inside the container are coupled to a portable extinguisher by a connection on the exterior of the unit. Flight personnel can manually discharge extinguishing agent into the container without having to open it. Certain dangerous goods must be accessible to the crew in flight in case of a leak or fire. As a general rule, most dangerous goods on the main deck of cargo aircraft are loaded in the most forward location.

12.4.11 *Class 1: Explosives.* The types of explosives normally permitted aboard passenger or cargo aircraft would be classified in Division 1.4. By definition, this division is comprised of explosive articles or substances which present no significant hazard in the event of accidental ignition or initiation during transport. The effects are largely confined to package (unless the package has been degraded by fire) and no projection of fragments of appreciable size or range to be expected. An external fire should not result in an instantaneous explosion of virtually the entire contents of the package.

12.4.11.1 The only type of explosives normally permitted aboard passenger aircraft are those classed in Division 1.4, Compatibility Group S. These are explosives for which, even when the package is degraded by fire, blast and projection effects are limited to the extent that they do not significantly hinder fire fighting or other emergency response efforts in the immediate vicinity of the package. Where circumstances permit, an effort should be made to ascertain the classification of any explosives aboard an aircraft, e.g. through information provided by the crew (see 12.4.9), since in certain cases explosives of other than Division 1.4 which could pose a risk of mass detonation in a fire, may be carried under an exemption issued by States concerned. The Technical Instructions identify which dangerous goods can only be shipped on cargo aircraft and which can be shipped on both cargo and passenger aircraft. Materials that can only be shipped on cargo aircraft will have “cargo aircraft only” labels on the shipment. RFF personnel should be familiar with local air cargo loading procedures.

12.2.12 *Class 2: Gases.* Cylinders of compressed or liquefied gases may present a risk of explosion if involved in a large-scale aircraft fire. However, as these cylinders are normally constructed to standards similar to those to which oxygen or air cylinders installed in aircraft are constructed, pose a significant risk if they rupture or are exposed to direct fire contact ~~the risk of failure of gas cylinders carried as cargo would be no greater than that of cylinders typically installed in the aircraft.~~

12.2.13 *Class 3: Flammable Liquids.* Flammable liquids include liquids or mixture of liquids, liquids containing solids in solution or in suspension that give off a flammable vapour at temperature of not more than 60.5°C. Typically, flammable liquids will cause bigger fire than flammable gases as they are more concentrated. The vapours of many flammable liquids are also usually heavier than air and most of such liquids will float in water. Methods used to extinguish fires involving jet fuel can be similarly used for flammable liquid.

12.2.14 *Class 4: Flammable Solids.* Flammable solids refer to all solids and substances which are liable for spontaneous combustion, or substances which emit flammable vapours on contact with air, moisture or water, which may lead to fire or explosion. As most of these materials may react violently with water or air, fire fighting personnel must be cautious when using water as an extinguishing agent.

12.4.15 *Class 5: Oxidizing Substances, Organic Peroxides.* Oxidizing substances are not necessarily combustible, but may generally cause or contribute to the combustion of other material. Organic peroxides are thermally unstable and may undergo exothermic (and explosive), self-accelerating decomposition. They are sensitive to heat, shock, impact or friction, and react dangerously with other substances, i.e. may cause an explosion when mixed with jet fuel.

12.4.16 *Class 6: Toxic and Infectious Substances.* Poisonous (toxic) substances are liquids or solids which are known to be liable to cause death if swallowed, inhaled or contacted by the skin. Infectious substances are materials that may cause disease in humans or animals, and include microorganisms and organisms, biological products, diagnostic specimens, and medical waste. Some of these substances may burn, but they do not ignite easily. If these substances are present at the scene of fire, it is advisable to fight the fire from a maximum distance as it is more of a health hazard rather than a fire hazard.

~~12.4.13.~~12.4.17 *Class 7: Radioactive Materials.* Fires involving radioactive materials should be handled in the same manner as fires involving toxic materials. Standard protective clothing and respiratory protection provides some protection against radioactive contamination but not, however, from some direct radiation effects. Fires and the air currents they create, and the use of foam, water or chemicals to suppress fire, can spread radioactive materials about the accident site. RFF personnel entering and working in an aircraft incident scene or impact area should be utilizing the proper personal protective equipment (PPE) and be properly decontaminated immediately after their duties are completed.

12.4.18 *Class 8: Corrosives.* Substances that are grouped in this class may in their original state, damage living tissues severely. These corrosives can also release vapour that may irritate the nose and eyes. A few of these substances may produce toxic gases when decomposed by very high temperatures. Some corrosives are also toxic and may result in poisoning if swallowed. Corrosives are usually acids or alkalis, which can be water reactive, flammable (for organic acids), very reactive and unstable oxidisers. PPE should be worn by all fire fighting & rescue personnel when these substances are present at the scene of fire.

12.4.19 *Class 9: Miscellaneous Dangerous Goods.* This comprises substances and articles which present a danger not covered by other classes. It includes a number of substances and articles which present a relatively low hazard, such as environmental pollutants. Examples of these substances are dry ice, molten sulphur, polychlorinated biphenyls, batteries containing lithium, magnets, etc.

~~12.4.14~~12.4.20 *Spills and leaks*

~~12.4.14.1~~12.4.20.1 *General.* Dangerous goods packages not consumed in, or ~~affected~~ affected by, an aircraft fire may be found damaged and leaking at the accident site. Such damaged and leaking packages may pose a significant risk of injury or adverse health effects to aircraft occupants and ~~rescue~~ RFF personnel. Hazard labels and package markings (see 12.4.7) can be of assistance in identifying the types of dangerous goods involved as well as the nature and seriousness of the hazard they present. Once initial rescue operations are completed, special precautions should be taken with such packages and, if necessary, pre-identified trained personnel assembled to deal with the problems involved. Particular problems may be encountered with radioactive materials (Class 7) and poisonous and infectious (Class 6) substances.

~~12.4.15~~12.4.21 *Radioactive Materials.* In the event radioactive materials are suspected, the following general procedures should be followed:

- a) the nearest authority concerned with atomic energy or the nearest military base or civil defence organization to the accident site should be notified immediately. They may be able to respond to the accident with a radiological team;
- b) injured persons should be wrapped in blankets or other available covering (to reduce the possible spread of contamination) and immediately transported to medical facilities with instruction to the drivers or attendants that the injured persons may be radioactively contaminated and that they should so inform medical facility personnel who are to care for them;
- c) other persons who might have had possible contact with radioactive material should be sequestered until they have been examined by radiological teams;

- d) suspected material should be identified but not handled until it has been monitored and released by radiological emergency teams. Clothing and tools used at the accident scene should be retained in isolation until they can be checked by a radiological emergency team;
- e) food or drinking water that may have been in contact with material from the accident should not be used;
- f) only properly attired rescue and fire fighting personnel should remain on the scene; all other persons should be kept as far away from the scene as possible;
- g) all hospitals shall be notified immediately that radioactive materials are involved so that appropriate radioactive decontamination areas may be established; and
- h) packages of radioactive material should be cordoned off; any loose materials should be covered with plastic sheets or tarpaulins to minimize dispersion by wind or rain.
- i) all rescue and fire fighting personnel should equip themselves with a personal dosimeter to monitor their duration and exposure to radioactive activities.

~~12.4.16~~12.4.22 *Poisonous and infectious substances.* In the event of an occurrence involving poisonous or infectious substances, food or drinking water that may have been in contact with the material should not be used. The public health and veterinary authorities should be informed immediately. Any person exposed to these dangerous goods should be removed from the scene of the occurrence and transported for decontamination as soon as possible to appropriate medical facilities.

12.4.23 Unknown substances (Chemical, Biological and Radioactive threats). Although all Dangerous Goods are required to be clearly labelled and packed, there could be scenarios where the substance is unknown. To enable rescue and fire fighting personnel to at least quickly identify the unknown substance, Rescue & Fire Fighting Services should ensure that basic equipment to detect the nature of the substance is available. These include any chemical, biological or radioactive detectors.

~~12.4.17~~12.4.24 *Additional information.* A number of publications are available that provide more detailed guidance to fire departments and other interested agencies relative to actions to be taken in response to accidents or incidents involving dangerous goods. The ICAO publication *Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods* (Doc 9481) provides information intended for use by aircraft crews during in-flight dangerous goods emergencies. For accidents or incidents occurring on the ground, the *Emergency Response Guidebook* published by the United States Department of Transportation, Washington, D.C., and the *Response Guide for Dangerous Goods* published by Transport Canada, Ottawa, are particularly useful.



*Unlawful interference*

~~12.4.18~~12.4.25 An aircraft which is subjected to a threat of sabotage or unlawful seizure should be parked at an isolated aeroplane parking position located on an area at least 100m away from other aircraft parking positions, buildings or public areas until the act of unlawful interference is terminated. In such cases it may be necessary to evacuate passengers without the use of loading ramps provided at the passenger terminal. Motorized loading ramps may be available which could be driven to the site, or emergency evacuation stairs ~~carried on rescue and fire fighting equipment~~ or the aircraft's slides could be used. Detailed information on procedures for dealing with unlawful interference is given in the ICAO Security Manual.

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— END —