

Doc 9375-AN/913
Book 2



INTERNATIONAL CIVIL AVIATION ORGANIZATION

**DANGEROUS GOODS
TRAINING PROGRAMME**

**BOOK 2
LOAD PLANNERS
AND FLIGHT CREW**

*Approved by the Secretary General
and published under his authority*

THIRD EDITION — JANUARY 1993

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(Doc 9375-AN/913)

**BOOK 2
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FOREWORD

Annex 18 to the Convention on International Civil Aviation, entitled "The Safe Transport of Dangerous Goods by Air", requires in Chapter 10 that dangerous goods training programmes be established and updated as provided for in the ICAO document *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284).

The Technical Instructions (Part 6) require that initial and recurrent dangerous goods training programmes be established and maintained for or on behalf of the following:

- regular shippers of dangerous goods and shippers' agents;
- operators;
- agencies located at an aerodrome which perform, on behalf of the operator, the act of receiving, loading, unloading, transferring or other processing of passengers or cargo;
- agencies other than operators involved in processing or transporting either passengers or cargo; and
- agencies engaged in the security screening of passengers and their baggage.

It also recommends that these training programmes be subjected to review and approval as determined by the appropriate national authority, with the exception of the operators' training programmes which must be subject to review and approval by the appropriate authority of the State of the operator.

A series of four books, of which this is Book 2, has been produced for the training of particular categories of personnel involved in the transport of dangerous goods by air. The four books are:

- Book 1: Shippers, cargo agents and operators' cargo acceptance staff
- Book 2: Load planners and flight crew
- Book 3: Passenger handling staff and flight attendants
- Book 4: Loading and warehouse personnel

This programme of books has been developed to help achieve a uniform world-wide level of training in all aspects of handling and transporting dangerous goods by air and particularly to assist those who are responsible for the establishment of training programmes. The material contained in these books was developed jointly by ICAO and IATA in support of the provision contained in Annex 18 to the Convention on International Civil Aviation. It is believed that the use of an internationally developed training programme will facilitate approval by national authorities. Those parts of this particular book relating to flight crew have been developed in co-ordination with the International Federation of Air Line Pilots' Associations (IFALPA).

It is intended that revised editions of these books will be published from time to time to maintain alignment with changes to the provisions on which they are based.

This third edition of the training programme series is based on the 1993-1994 Edition of the Technical Instructions.

TABLE OF CONTENTS

	<i>Page</i>
Introduction	1
General Information	3
Dangerous Goods	4
General	4
Dangerous goods acceptable	4
Dangerous goods forbidden for transport	4
Dangerous goods excepted or limited	4
Passengers who wish to carry dangerous goods	7
Classes and Divisions	8
Description of classes and divisions	9
Dangerous Goods List	15
Packing	17
General packing requirements	17
Types of packagings	17
Packaging performance tests	17
Marking	18
Marking specifications and requirements	18
Labelling	19
General	19
Hazard labels	19
Handling labels	21
Labelling of unit load devices containing dangerous goods	21
Storage	23
Radioactive material	23
Organic peroxides and self-reactive substances	23
Loading	24
Inspection for damaged packages of dangerous goods	24
Securing of dangerous goods	24
Loading restrictions on the flight deck and on passenger aircraft	24
Loading on cargo aircraft	25
Loading of incompatible dangerous goods	25
Loading of self-inflating appliances	26

(vi)

	<i>Page</i>
Loading of wheelchairs as checked baggage	26
Loading of packages containing liquid dangerous goods.....	26
Stowage of poisonous and infectious substances	26
Loading and stowage of radioactive material	27
Loading of magnetized material	27
Loading of dry ice	27
Loading of expandable polymeric beads.....	27
Provision of Information.....	28
Information to pilot-in-command	28
Information by the pilot-in-command in case of in-flight emergency.....	28
Reporting of dangerous goods accidents and incidents	31
Reporting of undeclared or misdeclared dangerous goods.....	31
Information by operator in case of an aircraft accident or incident	31
Review Questions	32
Answers to Review Questions	35
Illustration of Hazard and Handling Labels	



INTRODUCTION

This is a self-study training book intended to familiarize flight crew members and personnel such as load planners and other operational staff with the provisions of the International Civil Aviation Organization (ICAO) *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284). The Technical Instructions contain the internationally agreed rules which ensure that dangerous goods are carried safely. Flight crew members need to be aware of the content of that document so that they may monitor the system where possible and can properly carry out their own responsibilities. Similar awareness is necessary for load planners and other personnel whose duties may include the assignment of locations for the loading of dangerous goods on board aircraft. Do not attempt to memorize any part of this book or the Technical Instructions.

Dangerous goods are commodities with a potential for danger, but if the regulations are followed, transporting such goods by air is not dangerous.

Within the definition of dangerous goods are not only obvious substances such as acids, radioactive material, poisons and explosives but also some unlikely items such as magnets, wheelchairs with wet-cell batteries, breathing apparatus with compressed gas cylinders, bull semen packed in dry ice, some pesticides, etc.

The Technical Instructions cover the procedures to be followed by everyone involved in preparing a consignment and placing it on an aircraft.

The shipper must:

- identify any dangerous article or substance using the nine hazard classes;
- limit the quantity contained in each package to the maximum allowed (note that the listed limits of mass or volume are for each individual package);
- use the correct type of packaging which could be a combination or single packaging;
- put the required labels and markings on the package;
- enter the required details on the dangerous goods transport document and sign a declaration that the goods have been properly prepared for transport.

The cargo agent and operator's cargo acceptance staff must:

- inspect each package for leakage or damage and for the correct labels and markings;
- complete a comprehensive checklist and only accept the consignment if all relevant requirements have been complied with.

The loading personnel must:

- inspect each package for leakage or damage before loading into a unit load device or bulk loading on the aircraft;
- inspect each unit load device for evidence of leakage or damage before loading on the aircraft;
- correctly position, segregate and secure each package or unit load device aboard the aircraft.

The pilot-in-command must:

- receive and retain full written details of all the dangerous goods loaded on the aircraft, including their location (Information to pilot-in-command);
- be aware of the action to be taken in the event of emergencies involving dangerous goods. (The airline is required to provide this information in its Operations Manual.)

Note.— The ICAO Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods (Doc 9481) contains general information on the factors that may need to be considered when dealing with any dangerous goods incident. It does not cover incidents which occur while the aircraft is on the ground.

The pages that follow will help you to understand the relevant parts of the Technical Instructions more fully.

Throughout this book, cross-references to the relevant parts of the Technical Instructions appear in parentheses. These always begin with a figure indicating the part of the Technical Instructions, followed by a semicolon and then followed by a group of figures representing the paragraph. For example:

4;2.3 refers to paragraph 2.3 in Part 4

A single figure following the semicolon refers to a whole chapter. For example:

2;9 refers to Chapter 9 of Part 2

It is worth noting that a detailed Index appears at the back of the Technical Instructions (Attachment 4) and this will help you find any other references you may need.

It is intended that you read the relevant paragraphs of the Instructions in conjunction with the notes contained in this book to obtain a fuller understanding of the procedures involved in the transport of dangerous goods by air. To test your understanding, it is suggested that you attempt to answer the review questions given at the end of the book, using the Instructions for reference as necessary. The answers to the review questions are also given to enable you to check your own responses and to indicate areas where further study might be required.

The Technical Instructions are updated and reissued every two years. Only the current edition should be used.

GENERAL INFORMATION

Part 1, Chapter 3 of the Technical Instructions contains information concerning definitions, units of measurement, authorized equivalents and conversion factors.

While working through this book, you may need to refer to the list of definitions given in this chapter of the Technical Instructions in order to confirm the meaning of some of the terms used.

Note that the International System (SI) of units of measurement is used throughout the Technical Instructions. Some SI units with which you may not be too familiar are:

Kilopascals (kPa) for measurements of pressure

Becquerel (Bq) for measurements of the activity of radioactive material

Sievert (Sv) for measurements of the equivalent radiation dose.

DANGEROUS GOODS

General

Dangerous goods may be divided into three categories:

- a) those which are acceptable for transport by air provided all the provisions of the Instructions are complied with;
- b) those which are forbidden for transport by air; and
- c) those which are excepted from the provisions of the Instructions.

Provided that the requirements of the Technical Instructions are followed, the desired level of safety will be maintained.

Dangerous goods acceptable — 1;1.2

A great many dangerous goods may be safely carried on aircraft as cargo provided they are properly prepared for transport in accordance with the Instructions. Generally, however, they are not permitted in passengers' or crews' checked baggage or as carry-on articles (but see "Dangerous goods excepted or limited" below).

A major aspect of the requirements is the use of secure packaging when transporting limited quantities of dangerous goods. The Instructions, in general, restrict the quantity per package rather than the number of packages.

Dangerous goods forbidden for transport — 1;2.1

Certain dangerous goods are considered to be too dangerous for transport by air under any circumstances. Special care is taken to ensure that such goods are not accepted for transport.

Dangerous goods excepted or limited

The provisions contained in the Instructions do not apply to the following:

A. Exceptions for dangerous goods of the operator (1;2.3)

-
- a) articles and substances which would otherwise be classed 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, safety matches and liquefied gas lighters carried aboard a passenger aircraft by the operator for use or sale on the aircraft during the flight or series of flights, but excluding disposable 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.
-

Replacement parts and spares must meet the normal requirements except that they can be carried in specially designed containers.

B. Dangerous goods in excepted quantities (1;2.5)

Certain types of dangerous goods may be carried in small quantities without complying with all the requirements of the Instructions. Special provisions have been made which exempt them from the usual provisions for dangerous goods including documentation, hazard labels and segregation loading. However, such packages must be marked "Dangerous goods in excepted quantities" (1;2.5.6.1)

Packages containing excepted quantities of dangerous goods do not require any special handling or loading except that they must not be carried in a passenger cabin or on the flight deck.

An incident involving leakage or spillage of a package containing excepted quantities of dangerous goods or any other occurrences must be reported in accordance with Part 5;4.4 and 4.5 of the Instructions.

C. Dangerous goods in limited quantities (1;2.6)

The Instructions contain provisions for limited quantities of dangerous goods. These recognize that many dangerous goods when in reasonably limited quantities present a reduced hazard during transport and can safely be carried in good quality packagings of the types specified in the Instructions but which have not been tested and marked accordingly. The provisions applicable for dangerous goods in limited quantities appear in Part 1;2.6 of the Instructions. The packing instructions are indicated in Column 9 of Table 2-14 where they are prefixed by the letter "Y"; the associated quantity limitation is shown in Column 10. These packages must be marked, labelled and stowed in the same way as other dangerous goods.

D. Dangerous goods carried by passengers or crew (9;1.2)

Dangerous goods must not be carried by passengers or crew members as or in carry-on baggage, or as checked baggage, or on their person, except for the following:

-
-
- a) alcoholic beverages not exceeding 70 per cent alcohol by volume when packed in receptacles of less than 5 L;
 - b) non-radioactive medicinal or toilet articles (including aerosols). Also aerosols in Division 2.2, with no subsidiary risk, for sporting or home use in checked baggage only. The total net quantity of all such articles carried by each person must not exceed 2 kg or 2 L and the net quantity of each single article must not exceed 0.5 kg or 0.5 L. The term 'medicinal or toilet articles (including aerosols)' is intended to include such items as hair sprays, perfumes, colognes and medicines containing alcohols;
 - c) with the approval of the operator(s), small gaseous oxygen or air cylinders required for medical use;
 - d) small carbon dioxide gas cylinders worn for the operation of mechanical limbs, also spare cylinders of a similar size if required to ensure an adequate supply for the duration of the journey;
 - e) with the approval of the operator(s), as checked baggage only, securely boxed cartridges for sporting purposes, in Division 1.4S, in quantities not exceeding 5 kg gross mass per person for that person's own use, excluding ammunition with explosive or incendiary projectiles. Allowances for more than one person must not be combined into one or more packages;
 - f) dry ice in quantities not exceeding 2 kg per person, when used to pack non-dangerous perishables, provided the package permits the release of carbon dioxide gas:
 - in carry-on baggage; or
 - with the approval of the operator(s), in checked baggage;
 - g) safety matches or a lighter intended for use by an individual when carried on the person. However, lighters containing unabsorbed liquid fuel (other than liquefied gas), lighter fuel and lighter refills are not permitted on one's person or in checked or carry-on baggage;
 - h) radioisotopic cardiac pacemakers or other devices, including those powered by lithium batteries, implanted into a person, or radio-pharmaceuticals contained within the body of a person as the result of medical treatment;

- i) with the approval of the operator(s), wheelchairs or other battery-powered mobility aids with non-spillable batteries (see Packing Instruction 806 and Special Provision A67), as checked baggage provided that the battery is disconnected, the battery terminals are insulated to prevent accidental short circuits and the battery is securely attached to the wheelchair or mobility aid;
- j) with the approval of the operator(s), wheelchairs or other battery-powered mobility aids with spillable batteries as checked baggage, provided that the wheelchair or mobility aid can be loaded, stowed, secured and unloaded always in an upright position and that the battery is disconnected, the battery terminals are insulated to prevent accidental short circuits and the battery is securely attached to the wheelchair or mobility aid. If the wheelchair or mobility aid cannot be loaded, stowed, secured and unloaded always in an upright position, the battery must be removed and the wheelchair or mobility aid may then be carried as checked baggage without restriction. The removed battery must be carried in strong, rigid packagings as follows:
 - 1) these packagings must be leaktight, impervious to battery fluid and be protected against upset by securing to pallets or by securing them in cargo compartments using appropriate means of securement (other than by bracing with freight or baggage) such as by use of restraining straps, brackets or holders;
 - 2) batteries must be protected against short circuits, secured upright in these packagings and surrounded by compatible absorbent material sufficient to absorb their total liquid contents; and
 - 3) these packagings must be marked 'Battery, wet, with wheelchair' or 'Battery, wet, with mobility aid' and be labelled with a 'Corrosive' label (Figure 4-19) and with a package orientation label (Figure 4-23).

The pilot-in-command must be informed of the location of a wheelchair or mobility aid with an installed battery or the location of a packed battery.

It is recommended that passengers make advance arrangements with each operator; also unless batteries are non-spillable they should be fitted, where feasible, with spill-resistant vent caps;

- k) hair curlers containing hydrocarbon gas, no more than one per person, provided that the safety cover is securely fitted over the heating element. Gas refills for such curlers must not be carried;
- l) with the approval of the operator(s), as carry-on baggage only, a mercurial barometer carried by a representative of a government weather bureau or similar official agency. The barometer must be packed in a strong outer packaging, having a sealed inner liner or a bag of strong leak-proof and puncture-resistant material impervious to mercury, which will prevent the escape of mercury from the package irrespective of its position. The pilot-in-command must be informed of any such barometer;
- m) with the approval of the operator(s), one small carbon dioxide cylinder per person fitted into a self-inflating life-jacket, plus one spare cartridge;
- n) with the approval of the operator(s), heat producing articles (i.e. battery-operated equipment such as underwater torches and soldering equipment which, if accidentally activated, will generate extreme heat and can cause fire) may be carried in carry-on baggage only. The heat producing component, or the energy source, must be removed so as to prevent unintentional functioning during transport;
- o) with the approval of the operator(s) and as checked baggage only, a small oxygen generator for personal use, one per person, that meets the following requirements:
 - 1) the generator, without its packaging, must be capable of withstanding a 1.8 m drop test onto a rigid, non-resilient, flat and horizontal surface, in the position most likely to cause damage, without loss of its contents and without actuation;
 - 2) the generator must be equipped with an actuating device with at least two positive means of preventing unintentional actuation;
 - 3) when actuated at a temperature of 20°C with the generator well insulated, the temperature of any external surface of the generator must not exceed 100°C;
 - 4) the generator must be in the manufacturer's original packaging and this must include a sealed outer wrapping or other means which can be taken as clear evidence that the generator has not been tampered with; and
 - 5) the generator packaging must be marked to indicate that it meets the above requirements.
- p) one small medical or clinical thermometer which contains mercury, for personal use, when in its protective case.

In the case of electric wheelchairs, if the passenger is unable to confirm that the battery is of the non-spillable type, it must be treated as a spillable battery.

Security attaché cases (which may contain lithium batteries and/or pyrotechnic material) are totally forbidden.

Passengers who wish to carry dangerous goods

It is dangerous, and unlawful, for passengers or crew members to have dangerous goods on their person, in carry-on baggage or in checked baggage apart from the excepted items mentioned above (9;1.2). Passengers should have been warned of this by means of notices displayed at the check-in counter and printed on their tickets (9;2.1).

Passengers who wish to transport dangerous goods can only do so by submitting them, well in advance, to the airline's cargo department. There a fully trained acceptance clerk will see that the goods are safely packaged and properly documented. This can never be done at the passenger check-in counter.

CLASSES AND DIVISIONS

Dangerous goods are divided into nine classes reflecting the type of risk involved, but the order in which they are listed does not imply a relative degree of danger (2;1 to 2;9). It is the responsibility of the shipper to classify the dangerous goods into one of these classes.

The nine classes of dangerous goods are:

- Class 1 Explosives
- Class 2 Gases
- 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 material
- Class 8 Corrosives
- Class 9 Miscellaneous dangerous goods

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, e.g. 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.

Dangerous goods are identified by proper shipping names and UN numbers. These names and numbers are assigned under the United Nations classification system to specific articles and substances.