

DANGEROUS GOODS REGULATIONS

Edition 64 - 2022

IATA Category 6



Last Review/Updates Details			
Document Updated by:	SMSA ID: 500049, 6856		
Reviewed on:	08-Aug-23		
Version number:	2		
Document number:	6374		
Effective Validity	07-Jun-24		

Issue No.	Date	Details of Change	Amended Pages
1	15-Mar-21	Creation of Training Manual	NA
2	08-Aug-23	Document formatted to SMSA Standard	Cover
3	08-Aug-23	Added GACA logo	Cover
4	08-Aug-23	Added Revision and Edition number	Cover
5	08-Aug-23	Content page updated with page numbers	3,4,5 & 6
6	08-Aug-23	Added difference between hazard and risk	25
7	08-Aug-23	Added scope of dangerous goods course material	7
8	08-Aug-23	Added GACAR part 109 basic regulations	10
9	08-Aug-23	Updated IATA DGR 64 edition table 2.3. A	22,23
10	08-Aug-23	Added retention of document	12

TABLE OF CONTENTS	PAGE
Introduction	6
Scope and Purpose	6
Course Objectives	7
General Philosophy	9
	9
MODULE 1 APPLICABILITY	
1.1 Basis of the Regulations	10
1.2 Application of the IATA Dangerous Goods Regulations	11
1.3 Shippers Responsibilities	12
1.4 Operators Responsibilities	13
1.5 Training Requirements	14
1.6 How to use the IATA DGR	15
Review exercises for Module - 1	17
	20
MODULE 2 LIMITATIONS	
2.1 Forbidden Dangerous Goods	20
2.2 Hidden Dangerous Goods	21
2.3 Awareness of Hidden Dangerous Goods	21
2.4 Examples of Hidden Dangerous Goods	21
2.5 Transport of Dangerous Goods by Post Office Mail	24
2.6 STATE AND OPERATOR VARIATIONS	25
Review exercises for Module - 2	28
	33
MODULE 3 CLASSIFICATION OF DANGEROUS GOODS	
3.1 Introduction	33
3.2 Dangerous Goods Classes	35
3.3 Dangerous Goods Classes, IMP Codes and Description	36
3.4 Dangerous Goods Class examples	36
3.5 Packing Groups	41
Review Exercises for Classification	47
3.6 Identification of Dangerous Goods	52
3.7 Selecting the Proper Shipping Name	52
3.8 Items listed by name (DGR: 4.1.1)	53
3.9 Items not listed by name (DGR: 4.1.2)	54
3.10 Mixtures and Solutions not listed by name	56
3.11 Proper Shipping Name -unchanged	57
3.12 Proper Shipping Name- Differs from the List of Dangerous Goods	57
3.13 Classification of items with multiple hazards (DGR: 3.10)	58
3.14 Assigning of PSN for Mixtures or Solutions containing two or more	59
3.15 Classification of items with multiple hazards	59

Review Exercises for Identification	60
	73
MODULE 4 -PACKING AND PACKAGING REQUIREMENTS FOR DANGEROUS GOODS	72
4.1 Definitions	73
4.2 Terms used	74
4.3 Conditions in Air Transport	75
4.4 General Packing Requirements	76
4.5 List of UN Specification Packagings	78
4.6 Conditions normal to Air Transport	79
4.7 UN Specification Packagings	79
4.8 (a)Combination Packing	80
4.8 (b)Single Packaging	80
4.8 (c) Composite Packaging	81
4.8 (d) Intermediate Bulk Containers	82
4.9 Limited Quantity Packagings	82
4.10 Other Packagings	85
4.11 Excepted Packaging	85
4.12 UN Specification Package Markings	85
4.13 Overpacks	86
4.14 Different Dangerous Goods in One Outer Packaging (All Packed In One)	87
4.15 Q Value	88
4.16 All Packed In One (APIO) and Overpacks differences	90
Review exercises for Packing Requirements	92
4.17 Packaging Specifications	95
4.18 Codes used to designate types of UN packaging	96
4.19 UN Packaging Performance Tests	98
Review exercises for Packing Specifications	100
<u> </u>	100
MODULE 5 - MARKING & LABELLING OF DANGEROUS GOODS	109
5.1 General	109
5.2 Marking	109
5.3 Size of marks	110
5.4 Additional Marking	111
5.5 Labelling	112
5.6 Types of labels	113
5.7 Hazard Label	113
5.8 Primary and Subsidiary Hazards	113
5.9 Handling Labels	113
5.10 How to affix the labels	114
5.11 Overpack Markings	114
Review exercises for Marking and Labelling	120

MODULE 6 - DOCUMENTATION	128
6.1 Introduction	128
6.2 Responsibilities	128
6.3 Shipper's Declaration for Dangerous Goods (DGD) -	128
6.4 Air Waybill (AWB)	129
6.5 Articles and Substances Not Subject to these Regulations	130
6.6 Checklist	130
Review exercises for Documentation	134
Review questions for Checklist	144
	158
MODULE 7 - RADIOACTIVE MATERIALS	150
7.1 Introduction	158
7.2 Units of Measurement	158
7.3 Forms	159
7.4 Fissile or fissile excepted	160
7.5 Proper Shipping Names	161
7.6 Types of Packages	161
7.7 Type A Package	163
7.8 Type B Packages	165
7.9 Type C Packages	165
7.10 Transport Index	166
7.11 Criticality Safety Index	168
7.12 Category Determination for Packages, Overpacks and Freight Containers	169
7.13 Marking and Labeling	170
7.14 Affixing Radioactive Material Labels	174
7.15 Documentation	177
7.16 Completion of the Air Waybill	179
7.17 Loading and Stowage of Radioactive Material	179
Review Questions for Radioactive Materials	183
MODULE 8 - DANGEROUS GOODS IN EXCEPTED QUANTITIES	201
8.1 Dangerous Goods in Excepted Quantities	201
8.2 Table 2.6.A	201
8.3 Excepted Quantity Package Mark	202
8.4 Transporting Dangerous Gods in excepted quantities	202
Review Questions for Excepted Quantities	204
MODULE 9 - DANGEROUS GOODS HANDLING	208
9.1 Storage and Loading (DGR: 9.2 and 9.3)	208
9.2 Securing and separating Dangerous Goods	208
3.2 Securing and Separating Dangerous Goods	200

9.3 Loading	209
9.4 Segregation of Packages	210
9.5 The Two Methods to separate Dangerous Goods	211
9.6 Stowage of Packages Containing Liquid Dangerous Goods	212
9.7 Cargo Aircraft Only (CAO) Shipments	212
9.8 Damaged Packages of Dangerous Goods	213
9.9 Special Load – Notification to Captain (NOTOC)	216
9.10 Information by the Pilot-In-Command in case of in-Flight Emergency	217
9.11 Sample NOTOC	218
9.12 Dangerous Goods Accidents and Incidents	219
9.13 Dangerous Goods Emergency Response	222
9.14 Dangerous Goods Emergency Response Chart	223
Review Exercises for Incident/Accident	229
MODULE 10 - DANGEROUS GOODS SECURITY	231
10.1 Introduction	231
10.2 Definition of High Consequence Dangerous Goods	231
10.3 Indicative List of High Consequence Dangerous	231
10.4 Security Plans	232
10.5 Security measures to be addressed	232

Introduction

This course is designed for operators and ground handling agents staff accepting dangerous goods based on (table. 1.5.A) DGR (CAT 6)

The availability of access to the IATA DGR for SMSA employees kingdom wide will be through the DG help Desk team email dghelpdesk@smsaexpress.com who has the direct access of the current DGR online as well as the hard copy.

Scope and purpose of DGR manual

This DGR training manual is designed to provide SMSA employees with summarized and easily accessible information. It is designed to be used in combination with the IATA Dangerous Goods Regulations with enough exercises to test employees' knowledge, skills and understanding of the DGR.

Course Objectives

- Apply the IATA Dangerous Goods Regulations
- Understand the Legal requirements
- Identify the Shipper's and Operator's responsibilities
- Classify Dangerous Goods
- Identify the 9 classes of Dangerous Goods
- Locate and apply the information in the numerical list of Dangerous Goods
- Locate and apply the information the alphabetical List of Dangerous Goods
- Apply the general packing requirements
- Apply the packing instructions of the shipment
- Verify that the use of a packaging complies with its limitations
- Correctly mark and label a DG Package
- Complete the shipper's Declaration for Dangerous Goods and check that the information provided on the form complies with the DG Regulations
- Accept or Reject a shipment using an Acceptance check list
- Understand the loading and storage procedure
- Apply emergency response procedures

LESSON PLAN

Time	08:30-09:30	09:30-10:00	10:30-12:30	13:15-15:00	15:20-16:00
DAY 1	Introduction, General Philosophy,	Module -1 Applicability, Limitations, Structure of DGR	Exercises	Module -2 Classification & Identification	Exercises
DAY 2	Day1 Review	Module -2 Continues Classifications & Identification Including Multiple Hazards	Exercises	Module -3 Packing and Packaging Requirements Exercises	Module -4 Marking & Labeling Exercises
DAY 3	Day2 Module -5 Review Documentation		Exercises	Module -6 Radioactive Materials	Exercises
DAY 4	Day3 Review	Module -7 Dangerous Goods in Excepted Quantities	Exercises	Module -8 Dangerous Goods Handling	Exercises
DAY 5	Day4 Review	Module -9 Dangerous Goods Security	Recap	FINAL EXAM	

For classroom training employee will get one exam attempt during the training.

A mandatory written examination at the end of the course is required.

Pass Marks

90%& above : Distinction

80 - 90% : Pass 79% & below : Fail

GENERAL PHILOSOPHY

Introduction

IATA Dangerous Goods Regulations are published in order to provide procedures to Shipper and Operator for articles and substances with hazardous properties to enable it to be transported safely by air.

The IATA DGR is based on the international Civil Aviation Organization (ICAO) Technical Instruction and incorporates additional operational requirements that provide a harmonized system for Operators to accept and transport dangerous goods safely and efficiently.

Main principles used to ensure safe transport:

- Classifying and Identifying the dangerous goods
- Make sure that prohibited items are not shipped by air, unless exempted.
- Use of correct packaging
- Correctly Marked and Labelled
- Understand the completion of the Shipper's declaration
- Vigilant for hidden hazards
- Reporting incidents and accidents
- Training

APPLICABILITY

Definition

Dangerous Goods are articles or substances or articles which are capable of posing a hazard to health, safety, property or the environment and which are shown in the list of dangerous goods in the Dangerous Goods Regulations or which are classified according to the Dangerous Goods Regulations.

1.1 BASIS OF THE REGULATIONS

IAEA – INTERNATIONAL ATOMIC ENERGY AGENCY

Develops recommended procedures for the transport of Radioactive Material

UNCE – UNITED NATIONS COMMITTEE OF EXPERTS

Develops recommended procedures for the transport of all other classes of Dangerous Goods

ICAO – INTERNATIONAL CIVIL ORGANISATION

Incorporates all IAEA and UN CoE recommendations and procedures as the basis for the Technical Instructions

• IATA – INTERNATIONAL AIR TRANSPORT ASSOCIATION

Incorporates all ICAO requirements and may add other restrictive requirements

In addition to this manual and the training, employee should refer to the GACAR 109 articles that are accessible through the link:

https://gaca.gov.sa/web/en-gb/content/laws-and-regulations > Part 109 Transportation of Dangerous Goods by Air

§ 109.1 Applicability

- (a) Except as provided in paragraphs (c) and (d) of this section, this part prescribes rules governing the offering, preparation, and transportation of dangerous goods by air in the Kingdom of Saudi Arabia.
- (b) This part applies to—
- (2) Any person who performs, attempts to perform or is required to perform any function subject to this part including operators, ground handling agents, shippers, freight forwarders and their flight and nonflight employees, agents, and subsidiary and contract personnel;
- (3) Any person who offers any dangerous goods for transportation by air

1.2 Application of the Regulations

- All Airlines Members or Associate members of IATA
- All Airlines party to the IATA Multilateral Interline Traffic Agreement –
 Cargo
- All Shippers and Agents offering consignments of dangerous goods to Airline Operators

Exemptions (1.2.6)

In instances of extreme urgency or when other forms of transport are inappropriate or when full compliance with the prescribed requirements is contrary to the public interest, the States concerned may grant exemption from the provisions of the Regulations provided that in such instances every effort is made to achieve an overall level of safety in transport which is equivalent to the level of safety provided for in these Regulations.

Exceptions (1.2.7)

Except for information provided to operator employees, as shown in 1.4.2, the provisions of the Regulations do not apply to dangerous goods carried by an aircraft where the dangerous goods are:

- (a) to provide medical aid to a patient during flight,
- (b) to provide veterinary aid or a humane killer for an animal during flight;
- (c) for dropping during flight in connection with agricultural, horticultural, forestry, avalanche control or pollution control activities;
- (d) to provide aid in connection with search and rescue operations during flight;
- (e) vehicles carried in aircraft designed or modified for vehicle ferry operations if all of the requirements 1.2.7.1 (e) 1, 2, 3, 4 are met
- (f) dangerous goods that are required for the propulsion of the means of transport or the operation of its specialized equipment during transport
- (g) contained within items of excess baggage sent as cargo, provided that 1.2.7.1 (g) 1, 2, 3 are met.

General Transport Requirements (1.2.8)

All Dangerous Goods packages must be classified, certificated, described, packaged, marked, labelled, handled and transported accordance with IATA Dangerous Goods Regulations, unless otherwise stated in the IATA DGR Regulations.

Packages opened by Customs (1.2.10)

Packages opened by Customs must be restored to a condition complying with the IATA DGR Regulations by qualified persons.

1.3 SHIPPERS RESPONSIBILITIES

The individual or company offering a consignment for shipment must fully comply with the DGR Regulations when offering a consignment of Dangerous Goods

What is the Shipper responsible for?

- Providing any information that will enable employees to carry out their dangerous goods related responsibilities.
- Ensuring that the articles are not prohibited.
- Properly identifying, classifying, packing, marking, labelling and documenting articles.
- Ensuring employees are trained in dangerous goods.

1.3.4 Retention of Documents

STATE VARIATIONS: USG-01

1.3.4.1 The shipper must ensure that at least one copy of the documents, appropriate to the transport by air of a dangerous goods consignment, is retained for a minimum period of three months. As a minimum, the documents which must be retained are the Shipper's Declaration for Dangerous Goods and any other transport documents applicable to the consignment as specified in these Regulations.

1.3.4.2 Where the documents are kept electronically or in a computer system, the shipper must be able to reproduce them in a printed form.

1.4 OPERATORS RESPONSIBILITIES

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

Acceptance (Cargo acceptance, Check in staff)

Storage (Warehousing after check in)

Loading onto aircraft)

Inspection (Awareness of damaged parcels)

Provision of information (NOTOC, Shippers declaration)

• Emergency Response (Emergency Procedures)

Retention of records (NOTOC; Shippers Declarations)

Training (Training of all relevant staff

Information to Operator Employees

members)

An Operator must, in the Operations Manual and/or other appropriate manuals, provide employees with information so as to enable them to carry out their responsibilities with regard to dangerous goods.

Provision of information at Cargo Acceptance Areas

An operator/operators handling agent must prominently display sufficient notices at visible locations at cargo acceptance points. They must include visual examples of dangerous goods, including batteries

1.5 TRAINING REQUIREMENTS

Recurrent training must take place within 24 months of previous training. The IATA DGR is printed annually with various amendments and incorporates the changes in the ICAO Technical Instructions. A list of different categories of personnel is included in the DGR along with the aspects of training.

TABLE 1.5.A Minimum Requirements for Training Curricula (1.5.2)

=		pers ackers	Freigl	ht forw	arders	Opera	ators ar	nd grou	ınd har	ndling a	gents	Security screeners
Aspects of transport of dangerous goods by air with	Category											
which they should be familiar, as a minimum	1	2	3	4	5	6	7	8	9	10	11	12
General philosophy	X	Х	Х	X	X	Х	Х	Х	Х	Х	X	X
Limitations	X		Х	Х	Х	Х	X	Х	Х	Х	Х	X
General requirements for shippers	X		Х			Х						,
Classification	X	X	Х	-		Х						X
List of dangerous goods	X	X	Х			X				Х		
General packing requirements	X	Х	Х			Х						
Packing instructions	X	Х	Х			Х						
Labelling and marking	X	Х	Х	X	X	X	Х	X	Х	Х	Х	Х
Shipper's Declaration and other relevant documentation	X		Х	Х		Х	X					
Acceptance procedures						Х						
Recognition of undeclared dangerous goods	X	X	Х	Х	X	Х	Х	Х	X	X	Х	Х
Storage and loading procedures					Х	Х		Х		Х		
Pilots' notification						Х		Х		Х		
Provisions for passengers and crew	X	Х	X	Х	Х	Х	Х	Х	Х	Х	Х	Х
Emergency procedures	X	X	X	X	Х	X	Х	Х	Х	X	Х	X

CATEGORY

- Shippers and persons undertaking the responsibilities of shippers', including operator's staff acting as shippers, operator's staff preparing dangerous goods as Company Materials (COMAT)
- 2. Packers
- 3. Staff of freight forwarders involved in processing dangerous goods
- 4. Staff of freight forwarders involved in processing cargo or mail (other than dangerous goods)
- 5. Staff of freight forwarders involved in the handling, storage and loading of cargo or mail
- 6. Operator's and ground handling agent's staff accepting dangerous goods
- 7. Operator's and ground handling agent's staff accepting cargo or mail (other than dangerous goods)
- 8. Operator's and ground handling agent's staff involved in the handling, storage and loading of cargo or mail and baggage
- 9. Passenger handling staff
- 10. Flight crew members, loadmasters, load planners and flight operations officers/flight dispatchers
- 11. Crew members (other than flight crew members)
- △ 12. Security staff who deal with the screening of passengers and crew and their baggage and cargo or mail, e.g. security screeners, their supervisors and staff involved in implementing security procedures.

1.6 HOW TO US THE IATA DGR

From the **Table of Contents**, you can find the **Sections and Subsections**. The **List of Figures** and **List of Tables** provide access to the tables using the reference system.

Locate and extract information from the Regulations using the **Table of Contents** and **Index** and apply the **Appendix A** and **B**.

Appendix A

Contains definitions of Terms in the DGR and an explanation of Proper Shipping Names (PSN).

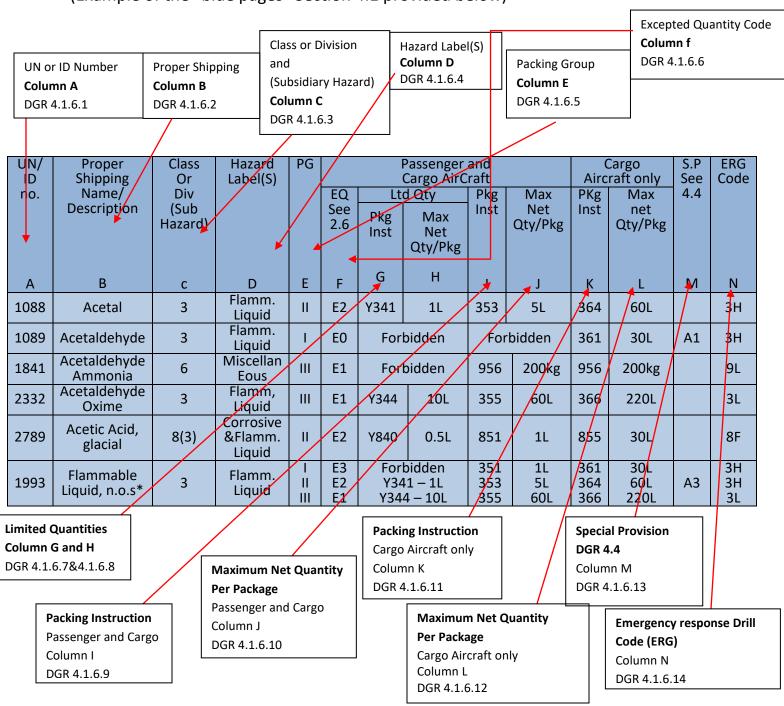
Appendix B

Contains the meanings of all symbols and abbreviations and conversion factors for commonly used International System (SI) units of measurement.

Blue Pages

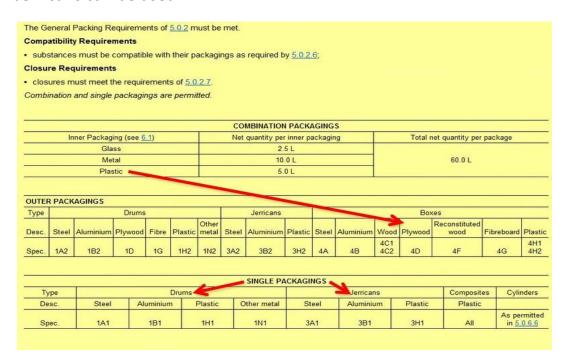
Is a detailed *alphabetical list* of Proper Shipper Names of individual articles and substances specifying the UN Classification of each and their acceptability for air transport. This includes specific and generic entries or "not otherwise specified".

(Example of the "blue pages" Section 4.1 provided below)



Yellow Pages

Refers to the **Packing Instructions** for the individual shipments. (See example for combination and single packaging below) As an example the red arrow points from the inner packaging (plastic) to the outer packaging (plywood) that can be used as a combination packaging. For single packaging examples drums or Jerricans can be used.



Review exercises for Module - 1 (Applicability Revision Questions)

Exercise 1

Read the Table of Co	ontents and enter the headings of the following Sections:
Section 1	
Section 4	
Section 5	
Section 7	
Section 8	
Section 10	

Exercise 2

Read the Table of Contents and enter the headings of the Appendices:		
Appendix A		
Appendix B		
Appendix C		

Exercise 3

What is the meaning	g of the Symbols, abbreviations and codes
+	
TI	
LTD QTY	

1.	What is the IATA DGR definition for DANGEROUS GOODS?					

2. Assign the responsibility to Shipper and Operator

Responsibility	Shipper	Operator
Classify articles and substances		
Inspect for Damage or leakage		
Loading		
Mark & label packages		
Storage and loading of dangerous goods		

- 3. Within which time frame must you complete training to remain compliant?
- a) 12 months
- b) Permanent qualification
- c) 24 months

4.	IATA DGR prevents operators from imposing special requirements over and
	above the requirements contained in the Regulations.
a)	True DGR Ref
b)	False DGR Ref
5.	When may States grant exemption from the provisions of the IATA DGR?

Module 2 - LIMITATIONS

2.1 Forbidden Dangerous Goods

Some dangerous goods are too dangerous to be carried by aircraft under any circumstances. When it 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.

These are usually shown in the IATA DGR Manual Section 4.1 when looking up the Proper Shipping Name and UN number. It is then shown whether the Dangerous Goods can be accepted on aircraft.

Forbidden Unless Exempted

Some dangerous goods are forbidden unless exempted. In some cases dangerous goods, even when forbidden can be exempted, i.e. special permission can be granted for:

- (1) humanitarian relief;
- (2) environmental relief;
- (3) pestilence;
- (4) national or international security;
- (5) saving of life (e.g. rescue); and
- (6) limited availability at destination.

Cargo Aircraft Only

Dangerous goods that cannot be carried by passenger aircraft

Passenger and Cargo Aircraft

Dangerous Goods when acceptable can be carried on both

2.2 Hidden Dangerous Goods

Cargo declared under a general description may contain hazardous articles that are not apparent. Such articles may also be found in baggage.

2.3 Awareness of Hidden Dangerous Goods

General descriptions that are often used for items in cargo or in passengers' baggage which may contain dangerous goods. Other indications that dangerous goods may be present (e.g. labels, markings); and those dangerous goods which may be carried by passengers in accordance with DGR 2.3.

2.4 Examples of Hidden Dangerous Goods

(See DGR Ref. 2.2)

- Electrical Equipment
- Aircraft On Ground (AOG) Spares
- Frozen Fruit, Vegetables, Etc



Dangerous Goods Carried by Passengers and Crew (DGR: 2.3)

Dangerous goods must not be carried by passengers and crew, except for those listed in DGR: 2.3, and shown in Table 2.3.A.

- As checked baggage
- As carry-on -baggage
- on their person

Table 2.3.A Provisions for Dangerous Goods Carried by Passengers or Crew (Subsection 2.3)

Dangerous goods must not be carried in or as passengers or crew, checked or <u>carry-on baggage</u>, except as otherwise provided below. Dangerous goods permitted in carry-on baggage are also permitted "on one's person", except where otherwise specified.

Interesting 5.1, with a total net quantity per person of 5.1. Interestination, security packaged (in DN: 1.45, UN 0012 or UN 0014 only). In quantities not exceeding 5 kg gross weight per person for that sessoris own use. Allowances for more than one person must not be controlled into one or more packages. Interestination containing a chief per person, containing antidispes of compressed gas in DN: 22. May also be equipped with a your provision of the person		Permitte	ed in or as carr	y-on baggage	
No vesseling 5, with a botal net quantity per person of 5 L. conceiving 5, with a botal net quantity per person of 5 L. conceiving 24% or less about 19 you have are not subject to any restrictions. **Moreovering 5, with a botal net quantity per person of 5 L. conceiving 24% or less about 19 you have are not subject to any restrictions. **Moreovering 5, with a botal net quantity per person of 5 L. conceiving 5, with a botal net quantity per person of 5 L. conceiving 6, with a district person of 5 L. conceiving 6, with a district person of 5 L. conceiving 6, with a district person of 5 L. conceiving 6, with a district person of 5 L. conceiving 6, with a district person of 5 L. conceiving 6, with a district person of 5 L. conceiving 6, with a conceived 6 batteries more removable batteries non-removable batteries non-removable batteries non-removable batteries non-removable batteries and organized 6. Conceiving 6, with material 6, non-spiral 6 batteries with 6 batteries must be removed if baggage is to be checked in. Removed batteries must be carried in the cabin. **FORBIDDEN** **FORBIDDEN** **FORBIDDEN** **FORBIDDEN** **PES** **NO** **NO** **NO** **YES** **NO** **NO** **YES** **NO** **NO** **NO** **YES** **NO** **NO** **NO** **YES** **NO** **NO** **NO** **YES** **YES** **NO** **NO** **NO** **NO** **YES** **YES** **NO** **NO** **NO** **NO** **NO** **YES** **YES** **NO** **NO** **NO** **NO** **YES** **YES** **NO** **NO** **NO** **NO** **NO** **NO** **YES** **YES** **NO** **NO** **NO** **NO** **NO** **NO** **YES** **YES** **NO** **NO** **NO** **NO** **NO** **NO** **NO** **NO** **YES** **YES** **NO** **YES** **YES** **NO** **NO** **NO** **NO** **NO** **NO** **NO** **NO** **	Permitted	in or as che	cked baggage		
Interesting 5.1, with a total net quantity per person of 5.1. Interestination, security packaged (in DN: 1.45, UN 0012 or UN 0014 only). In quantities not exceeding 5 kg gross weight per person for that sessoris own use. Allowances for more than one person must not be controlled into one or more packages. Interestination containing a chief per person, containing antidispes of compressed gas in DN: 22. May also be equipped with a your provision of the person	The approval of the operato	r is required			
Iterative beverages containing 24% or less actord by volume are not subject to any restrictions. ***Ammunition**, securely packaged (in Div. 1.45, UN 0012 or UN 0014 only), in quantities not exceeding 5 kg gross weight per person for that yet of the sense of the packages of the packag	Alcoholic beverages, when in retail packagings, containing more than 24% but not more than 70% alcohol by volume, in receptacles not exceeding 5 L, with a total net quantity per person of 5 L.	NO	YES	YES	NO
Lammunition, securely packaged (in Div. 1.45, UN 0012 or UN 0014 only), in quantities not exceeding 5 kg gross weight per person for that essents on use. Allowances for more than one person must not be combined into one or more panages. Virial note rescure backgoads, one (1) per person, containing cartifoges of compressed gas in Div. 2.2. May also be equipped with a young cartifoges of compressed gas in Div. 2.2. May also be equipped with a grown of the containing on more than 200 mg net of Div. 1.4. be backgoads must be than a cardioristic without he authorists on containing no more than 200 mg net of Div. 1.4. be backgoads must be the backgoads in such a manner that it cannot a cardioristic without his distinguishment of the containing on more than 0.3 gl lithium metal or 2.7 Wh. **RORBIDORN** **RORBIDORN** **NO** **YES** **YES** **NO** **YES** **YES** **NO** **YES** **NO** **YES** **YES** **NO** **YES** **NO** **YES** **NO** **YES** **NO** **YES** **NO** **NO** **NO** **YES** **NO** **NO** **YES** **NO** **NO** **NO** **YES** **NO** **NO** **NO** **YES** **NO** **NO** **NO** **YES** **NO** **NO** **YES** **NO** **NO** **YES** **NO** **NO** **NO** **YES** **YES** **NO** **NO** **NO** **YES** **YES** **NO** **	Note:				
vivalenche rescue backpack, one (1) per person, containing cathidges of compressed gas in Div. 22. Hay also be equipped with a yoydechnic trigger mechanism containing no more than 200 mg net of Div. 1.45. The backpack must be packed in such a manner that it cannot be accidentially activitied. The airtogs within the backpack must be filled with pressure relief valves. Jaggage with installed lithium batteries non-removable batteries exceeding-0.3 g lithium metal or 2.7 Wh. FORBIDDEN The removable batteries. Batteries must contain no more than 0.3 g lithium metal or for lithium ion must not exceed 2.7 Wh; removable batteries. Batteries must contain no more than 0.3 g lithium metal or for lithium ion must not exceed 2.7 Wh; removable batteries. Batteries must contain no more than 0.3 g lithium metal and or for lithium ion must not exceed 2.7 Wh; removable batteries, spareholose, including lithium batteries, non-spillable batteries, incide-lined in high data the carnot. Jatteries, spareholose, including lithium batteries, non-spillable batteries, incide-lined in high data the carnot in the carnot. Jatteries, spareholose, including lithium batteries, non-spillable batteries, incide-lined in high data the carnot in the carnot. Jatteries, spareholose, including lithium batteries, non-spillable batteries, incide-lined in high data the carnot in the carnot in control of vices must be carded in carny-on baggage only. Articles which heave the primary purpose as a power source, e.g. power such as a considered as spare batteries. These batteries must be located to lithium metal advanced to lithium metal and the activities. Jatteries, paranote and any purpose and a power advanced and the primary purpose as a power source, e.g. power such as a state of the contained and the carnot of the contained state in the carnot of the contained state in the carnot of the contained state in the carnot of more than 20 batteries. Jackpain part of the carnot of more than 20 batteries. Jackpain part of the carnot of more than 20 b	Alcoholic beverages containing 24% or less alcohol by volume are not subject to any restrictions.				
agaged with installed lithium batteries monatoring no more than 200 mg net of Div. 1.4S. The badgack must be packed in such a manner that it cannot be accidentally activated. The airtags within the badgacks must be filled with pressure relief valves. Agaged with installed lithium batteries non-nerrowable batteries exceeding-0.3 g lithium metal or 2.7 Wh. FORBIDDEN NO YES YES NO YES YES NO NO' NO' YES NO NO' NO' YES NO NO' NO' YES NO NO' YES NO NO' NO' YES NO NO' YES NO NO' YES NO NO' YES NO NO' NO' YES NO NO' YES NO NO' NO' YES NO' NO' NO' YES NO' NO' NO' YES NO' NO' NO' YES NO' NO' NO' NO' YES NO' NO' NO' YES NO' NO' NO' YES NO' NO' NO' YES YES NO' N	Ammunition, securely packaged (in Div. 1.4S, <u>UN 0012</u> or <u>UN 0014</u> only), in quantities not exceeding 5 kg gross weight per person for that person's own use. Allowances for more than one person must not be combined into one or more packages.	YES	YES	NO	NO
Paggage with Installed lithium batteries: Indicate a contraction of the properties of the paggage is to be checked in. Removed batteries must not exceed 2.7 Wh; Indicate a contraction of the paggage is to be checked in. Removed batteries must be carried in the cabin. Relateries, sparelloose, including lithium batteries, non-spillable batteries, nickel-metal hydride batteries and dry batteries (see 2.3.5.8) for contable electronic devices must be carried in carry-on-baggage only. Articles which have the primary purpose as a power source, e.g. power and save considered as page batteries. These batteries must be individually protected to prevent short circuits. Ithium metal batteries: the lithium metal content must not exceed 2.9 (see 2.3.5.8.4). Itahium netal batteries: the Warh-hour rating must not exceed 100 Wh (see 2.3.5.8.4). Itahium in haterificis: the Warh-hour rating must not exceed 100 Wh (see 2.3.5.8.4). Reading herson is limited to a maximum of 2 spare batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batterie	Avalanche rescue backpack, one (1) per person, containing cartridges of compressed gas in Div. 2.2. May also be equipped with a pyrotechnic trigger mechanism containing no more than 200 mg net of Div. 1.4S. The backpack must be packed in such a manner that it cannot be accidentally activated. The airbags within the backpacks must be fitted with pressure relief valves.	YES	YES	YES	NO
Introversionable batteries. Batteries must be removed if baggage is to be checked in. Removed batteries must be carried in the cabin. Batteries, sparelloose, including lithium batteries, non-spillable batteries, nickel-metal hydride batteries and dry batteries (see 2.35.8) for ontable electronic devices must be carried in carry-no baggage only. Articles which have the primary purpose as a power source, e.g. power saints are considered as spare batteries. These batteries must be individually protected to prevent short circuits. Ithium metal batteries: the lithium metal content must not exceed 2 (see 2.35.8.4). Ithium into batteries: the Watt-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries: the Vieth-hour rating must not exceed 100 Wh (see 2.35.8.4). Ithium into batteries into batteries. The batteries must be individually protected to prevent accidental content must not exceed a pagage must be marked	Baggage with Installed lithium batteries non-removable batteries exceeding-0.3 g lithium metal or 2.7 Wh.		FORB	IDDEN	
removable batteries. Batteries must be removed if baggage is to be checked in. Removed batteries must be carried in the cabin. Batteries, sparelloose, including lithium batteries, non-spillable batteries, nickel-metal hydride batteries and dry batteries (see 2.3.5.8) for outside lectronic devices must be carried in carry-on baggage only. Anticles which have the primary purpose as a power source, e.g. power saints are considered as spare batteries. The lithium metal batteries is the lithium metal content must not exceed 20 (see 2.3.5.8.4). Batteries is limited to a maximum of 20 spare batteries. These batteries must be individually protected to prevent short circuits. Batteries is limited to a maximum of 20 spare batteries. Batteries may approve the carriage of more than 20 batteries. Batteries may approve the carriage of more than 20 batteries. Batteries may be considered as spare batteries and flow for class. Each person is limited to a maximum of 2 spare batteries (see 2.3.5.6.5). Batteries when the containing must not exceed 20 (see 2.3.5.8.4). Batteries when the containing and intrinst or lineage of the Organization for the Prohibition of Chemical Weapons on flightlian travel (see 2.3.4.4.5). Batteries (see 2.3.4.4.5). Batteries when the carries of the Organization for the Prohibition of Chemical Weapons on flightlian travel (see 2.3.4.4.5). Batteries when the carries of carries on the person, in checked or carry-on baggage. Possibling devices such as mace, pepper spray, etc. containing an intriant or incapacitating substance are forbidden on the person, in checked or carry-on baggage, provided the baggage package) permits the release of carbon dioxide gas. Checked baggage must be marked of york or carry-on baggage, provided the baggage package) permits the release of carbon dioxide gas. Checked baggage must be marked or carry-on baggage, provided the baggage on the person and vaportzers) containing batteries must be individually protected to prevent accidental containing fuel, powering portable	Baggage with installed lithium batteries:	NO	YES	YES	NO
Postable electronic devices must be carried in carry-on baggage only. Articles which have the primary purpose as a power source, e.g. power aims are considered as spare batteries. These batteries must be individually protected to prevent short circuits. Ithium metal abatteries: the lithium metal content must not exceed 2g (see 2,35.8.4). Ithium metal batteries: the lithium metal content must not exceed 100 VM (see 2,35.8.4). Ithium in on harmics: the Walt-hour rating must not exceed 100 VM (see 2,35.8.4). Ithium in on harmics: the Walt-hour rating must not exceed 100 VM (see 2,35.8.4). Ithium containeds: the Walt-hour rating must not exceed 100 VM (see 2,35.8.4). Ithium containeds: the Walt-hour rating must not exceed 100 VM (see 2,35.8.4). Ithium containeds: the Walt-hour rating must not exceed 100 VM (see 2,35.8.4). Ithium containeds: the Walt-hour rating must not exceed 100 VM (see 2,35.8.4). Ithium containeds: the Walt-hour rating must not exceed 100 VM (see 2,35.8.4). Ithium containeds: the Walt-hour rating must not exceed 100 VM (see 2,35.8.4). Ithium contained to a maximum of 25 spare hatteries (see 2,35.8.5). Ithium containeds: the walt-hour rating must not exceed 100 VM (see 2,35.8.4). Ithium containeds: the walt-hour rating must not exceeding 2.5 kg per person when entired the prohibition of Chemical Weapons on Midical India (say on baggage). Ithium contained (see 2,34.4.4). Ithium conta	- non-removable batteries. Batteries must contain no more than 0.3 g lithium metal or for lithium ion must not exceed 2.7 Wh;				
contable electronic devices must be carried in carry-on baggage only. Articles which have the primary purpose as a power source, e.g. power aniks are considered as spare batteries. These batteries must be individually protected to prevent short circuits. Ithium metal abatteries the Watt-hour rating must not exceed 2 g (see 2.3.5.8.4). Each person is limited to a maximum of 20 spare batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator may approve the carriage of more than 20 batteries. The operator of batteries must be included in on the person, in checked and carry-on baggage, provided the baggage (pactage) permits the release of carbon dioxide gas. Checked baggage must be marked dry loci or "carbon dioxide, solid" and with the net weight of dry loc or an indication that there is 2.5 kg or less dry loc. The operator of the operator of the operator of dry loc or an indication that there is 2.5 kg or less dry loc. The operator of the oper	- removable batteries. Batteries must be removed if baggage is to be checked in. Removed batteries must be carried in the cabin.				
The operator may approve the carriage of more than 20 batteries. Ion-spillable batteries: must be 12 V or less and 100 Wh or less. Each person is limited to a maximum of 2 spare batteries (see 2.3.5.8.5). Ion-spillable batteries: must be 12 V or less and 100 Wh or less. Each person is limited to a maximum of 2 spare batteries (see 2.3.5.8.5). Ion-spillable batteries: must be 12 V or less and 100 Wh or less. Each person is limited to a maximum of 2 spare batteries (see 2.3.5.8.5). Ion-spillable batteries: must be 12 V or less and 100 Wh or less. Each person is limited to a maximum of 2 spare batteries (see 2.3.5.8.5). Ion-spillable batteries: must be 12 V or less and 100 Wh or less. Each person is limited to a maximum of 2 spare batteries (see 2.3.5.8.5). Ion-spillable batteries: must be 12 V or less and 100 Wh or less. Each person is limited to a maximum of 2 spare batteries (see 2.3.5.8.5). Ion-spillable batteries: must be individually protected to the person, in checked or carry-on baggaage, person, in checked or carry-on baggaage, provided the baggaage (package) permits the release of carbon dioxide gas. Checked baggaage must be marked of yor lee' or 'carbon dioxide, solid' and with the net welght of dry lee or an indication that there is 2.5 kg or less dry lee. Incigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental containing and gargerous goods such as explosives, compressed gases, lithilum batteries, etc. are forbidden in carry-on baggaage or on the person. Incigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental network of the devices of the checked baggaage or on the person. Incigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental network of the person of the person. Incigarettes (including e-cigars, e-pipes, other personal vaporizers	Batteries, spare/loose, including lithium batteries, non-spillable batteries, nickel-metal hydride batteries and dry batteries (see 2.3.5.8) for portable electronic devices must be carried in carry-on baggage only. Articles which have the primary purpose as a power source, e.g. power banks are considered as spare batteries. These batteries must be individually protected to prevent short circuits. Lithium metal batteries: the lithium metal content must not exceed 2 g (see 2.3.5.8.4). Lithium lon batteries: the Watt-hour rating must not exceed 100 Wh (see 2.3.5.8.4).	NO*	NO	YES	NO
chemical Agent Monitoring Equipment, when carried by staff members of the Organization for the Prohibition of Chemical Weapons on difficial travel (see 2.3.4.4). Disabiling devices such as mace, pepper spray, etc. containing an irritant or incapacitating substance are forbidden on the person, in checked and carry-on baggage. Dry ice (carbon dioxide, solid), in quantities not exceeding 2.5 kg per person when used to pack perishables not subject to these Regulations on checked or carry-on baggage, provided the baggage (package) permits the release of carbon dioxide gas. Checked baggage must be marked dry loc" or "carbon dioxide, solid" and with the net weight of dry loc or an indication that there is 2.5 kg or less dry loc. cigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental in carry-on baggage or checked baggage or on the person. FORBIDDEN NO NO YES NO NO NO YES NO Or details. NO NO YES NO Ses cartridges, spare for portable electronic devices (e.g. cameras, cellular phones, laptop computers and camcorders), see 2.3.5.9 NO NO YES NO ses cartridges, small, non-flammable containing carbon dioxide or other suitable gas in Division 2.2. Up to two (2) small cartridges fitted into see 2.3.4.2). Ses cylinders, non-flammable, non-toxic worn for the operation of mechanical limbs. Also, spare cylinders of a similar size if required to NO YES YES NO	Each person is limited to a maximum of 20 spare batteries. 'The operator may approve the carriage of more than 20 batteries. Non-spillable batteries: must be 12 V or less and 100 Wh or less. Each person is limited to a maximum of 2 spare batteries (see 2.35.8.5).				
And carry-on baggage endex of carry-on baggage permits the net weight of dry loe or an indication that there is 2.5 kg or less dry loe. **Collectro shock weapons** (e.g. Tasers) containing dangerous goods such as explosives, compressed gases, lithium batteries, etc. are forbidden in carry-on baggage or or the cked baggage or or the person. **FORBIDDEN** **TES** **YES** **YES** **YES** **NO** **N	Camping stoves and fuel containers that have contained a flammable liquid fuel, with empty fuel tank and/or fuel container (see 2.3.2.5 for details).	YES	YES	NO	NO
The properties of the properties of the personal carry-on baggage. No properties (carbon dioxide, solid), in quantities not exceeding 2.5 kg per person when used to pack perishables not subject to these Regulations on checked or carry-on baggage, provided the baggage (package) permits the release of carbon dioxide gas. Checked baggage must be marked dry loc or "carbon dioxide, solid" and with the net welght of dry loc or an indication that there is 2.5 kg or less dry loc. **Cigarettes** (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental activation (see 2.3.5.8.2). **Electro shock weapons** (e.g. Tasers) containing dangerous goods such as explosives, compressed gases, lithium batteries, etc. are forbidden in carry-on baggage or checked baggage or on the person. **Fuel cells** containing fuel, powering portable electronic devices (e.g. cameras, cellular phones, laptop computers and camcorders), see 2.3.5.9 Fuel cell cartridges, spare for portable electronic devices, see 2.3.5.9 for details. **Fuel cell cartridges, small, non-flammable electronic devices, see 2.3.5.9 for details. **Fuel cell cartridges, small, non-flammable electronic devices, see 2.3.5.9 for details. **Puel cell cartridges, small, non-flammable electronic devices, see 2.3.5.9 for details. **Puel cell cartridges, small, non-flammable electronic devices, see 2.3.5.9 for details. **Puel cell cartridges, small, non-flammable electronic devices, see 2.3.5.9 for details. **Puel cell cartridges, small, non-flammable, non-flammable, non-toxic worn for the operation of mechanical limbs. Also, spare cylinders of a similar size if required to see the devices of a similar size if required to see the device of the devices of a similar size if required to see the second of the devices of a similar size if required to see the second of the devices of a similar size if required to see the second of the devices of a similar size if required to second of the devices of a sim	Chemical Agent Monitoring Equipment, when carried by staff members of the Organization for the Prohibition of Chemical Weapons on official travel (see 2.3.4.4).	YES	YES	YES	NO
n checked or carry-on baggage, provided the baggage (package) permits the release of carbon dioxide gas. Checked baggage must be marked dry loc" or "carbon dioxide, solid" and with the net weight of dry loc or an indication that there is 2.5 kg or less dry loc. cigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental notitivation (see 2.3.5.8.2). cigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental notitivation (see 2.3.5.8.2). cigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental notitivation (see 2.3.5.8.2). cigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental notitivation (see 2.3.5.8.2).	Disabiling devices such as mace, pepper spray, etc. containing an irritant or incapacitating substance are forbidden on the person, in checked and carry-on baggage.		FORB	IDDEN	
activation (see 2.3.5.8.2). Electro shock weapons (e.g. Tasers) containing dangerous goods such as explosives, compressed gases, lithium batteries, etc. are forbidden n carry-on baggage or checked baggage or on the person. FORBIDDEN The cells containing fuel, powering portable electronic devices (e.g. cameras, cellular phones, laptop computers and camcorders), see 2.3.5.9 NO NO YES NO or details. Fuel cell cartridges, spare for portable electronic devices, see 2.3.5.9 for details. NO YES YES NO as cartridges, small, non-flammable containing carbon dioxide or other suitable gas in Division 2.2. Up to two (2) small cartridges fitted into a self-inflating personal safety device, inlended to be worn by a person, such as a life jacket or vest. Not more than two (2) devices per lassenger and up to two (2) spare small cartridges per device, not more than four (4) cartridges up to 50 mL water capacity for other devices see 2.3.4.2). Sas cylinders, non-flammable, non-toxic worn for the operation of mechanical limbs. Also, spare cylinders of a similar size if required to NO YES YES NO	Dry ice (carbon dioxide, solid), in quantities not exceeding 2.5 kg per person when used to pack perishables not subject to these Regulations in checked or carry-on baggage, provided the baggage (package) permits the release of carbon dioxide gas. Checked baggage must be marked "dry lce" or "carbon dioxide, solid" and with the net weight of dry lce or an Indication that there is 2.5 kg or less dry lce.	YES	YES	YES	NO
n carry-on baggage or checked baggage or on the person. Fuel cells containing fuel, powering portable electronic devices (e.g. cameras, cellular phones, laptop computers and camcorders), see 2.3.5.9 NO NO YES NO YES NO YES NO YES NO Sas cartridges, spare for portable electronic devices, see 2.3.5.9 for details. NO YES YES NO YES NO YES YES NO Sas cartridges, small, non-flammable containing carbon dioxide or other sultable gas in Division 2.2. Up to two (2) small cartridges fitted into YES YES NO YES YES NO YES YES NO Sas cartridges fitted into YES YES NO Sas cartridges, small, non-flammable containing carbon dioxide or other sultable gas in Division 2.2. Up to two (2) small cartridges fitted into YES YES NO YES YES NO YES YES NO YES NO YES NO YES YES NO	e-cigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries must be individually protected to prevent accidental activation (see 2.3.5.8.2).	NO	NO	YES	NO
or details. fuel cell cartridges, spare for portable electronic devices, see 2.3.5.9 for details. NO YES YES NO Sas cartridges, small, non-flammable containing carbon dioxide or other suitable gas in Division 2.2. Up to two (2) small cartridges fitted into YES YES NO NO YES YES NO NO YES YES NO NO See 2.3.4.2). Sas cylinders, non-flammable, non-toxic worn for the operation of mechanical limbs. Also, spare cylinders of a similar size if required to NO YES YES NO	Electro shock weapons (e.g. Tasers) containing dangerous goods such as explosives, compressed gases, lithium batteries, etc. are forbidden in carry-on baggage or checked baggage or on the person.	FORBIDDEN			
Sas cartridges, small, non-flammable containing carbon dioxide or other suitable gas in Division 2.2. Up to two (2) small cartridges fitted into yes yes No self-inflating personal safety device, inlended to be worn by a person, such as a life jacket or vest. Not more than two (2) devices per lassenger and up to two (2) spare small cartridges per device, not more than four (4) cartridges up to 50 mL water capacity for other devices see 2.3.4.2). Sas cylinders, non-flammable, non-toxic worn for the operation of mechanical limbs. Also, spare cylinders of a similar size if required to NO YES YES NO	Fuel cells containing fuel, powering portable electronic devices (e.g. cameras, cellular phones, laptop computers and camcorders), see 2.3.5.9 for details.	NO	NO	YES	NO
self-inflating personal safety device, intended to be worn by a person, such as a life jacket or vest. Not more than two (2) devices per assenger and up to two (2) spare small cartridges per device, not more than four (4) cartridges up to 50 mL water capacity for other devices see 2.3.4.2). Sas cylinders, non-flammable, non-toxic worn for the operation of mechanical limbs. Also, spare cylinders of a similar size if required to NO YES NO	Fuel cell cartridges, spare for portable electronic devices, see 2.3.5.9 for details.	NO	YES	YES	NO
Sas cylinders, non-flammable, non-toxic worn for the operation of mechanical limbs. Also, spare cylinders of a similar size if required to NO YES YES NO	Gas cartridges, small, non-flammable containing carbon dioxide or other sultable gas in Division 2.2. Up to two (2) small cartridges fitted into a self-inflating personal safety device, intended to be worn by a person, such as a life jacket or vest. Not more than two (2) devices per passenger and up to two (2) spare small cartridges per device, not more than four (4) cartridges up to 50 mL water capacity for other devices (see 2.3.4.2).	YES	YES	YES	NO
	Gas cylinders, non-flammable, non-toxic 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.	NO	YES	YES	NO

Hair styling equipment containing a hydrocarbon gas cartridge, up to one (1) per passenger or crew-member, provided that the safety cover is securely fitted over the heating element. This hair styling equipment must not be used on board the aircraft. Spare gas cartridges for	NO	YES	YES	NO
such hair styling equipment are not permitted in checked or carry-on baggage. Insulated packagings containing refrigerated liquid nitrogen (dry shipper), fully absorbed in a porous material containing only non-	NO	YES	YES	NO
dangerous goods.				
Internal combustion or fuel cell engines, must meet A70 (see 2.3.5.12 for details).	NO	YES	NO	NC
Lithium Batteries: Portable electronic devices (PED) containing lithium metal or lithium ion cells or batteries, including medical devices such as portable oxygen concentrators (POC) and consumer electronics such as cameras, mobile phones, laptops and tablets (see 2,3.5.8). For lithium metal batteries the lithium metal content must not exceed 2 g and for lithium ion batteries the Watt-hour rating must not exceed 100 Wh. Devices in checked baggage must be completely switched off and must be protected from damage. Each person is limited to a maximum of 15 PED.	NO*	YES	YES	NC
*The operator may approve the carriage of more than 15 PED.				
Lithium batteries, spare/loose, including power banks, see Batteries, spare/loose Lithium battery-powered electronic devices. Lithium ion batteries for portable (including medical) electronic devices, a Wh rating exceeding 100 Wh but not exceeding 160 Wh. For portable medical electronic devices only, lithium metal batteries with a lithium metal content exceeding 2 g but not exceeding 8 g. Devices in checked baggage must be completely switched off and must be protected from damage.	YES	YES	YES	NC
Lithium batteries, sparefloose with a Watt-hour rating exceeding 100 Wh but not exceeding 160 Wh for consumer electronic devices and PMED or with a lithium metal content exceeding 2 g but not exceeding 8 g for PMED only. Maximum of two spare batteries in carry-on baggage only. These batteries must be individually protected to prevent short circuits.	YES	NO	YES	NO
Matches, safety (one small packet) or a small cigarette lighter that does not contain unabsorbed liquid fuel, other than liquefled gas, intended for use by an individual when carried on the person. Lighter fuel and lighter refills are not permitted on one's person or in checked or carry-on baggage. Note: "Strike anywhere" matches, "Blue flame" or "Cigar" lighters or lighters powered by a lithium battery without a safety cap or means of protection against unintentional activation are forbidden (see 2.3.5.8.4(e)).	NO	ON ONE	S PERSON	NO
Mobility Aids: Battery-powered wheelchairs or other similar mobility devices with non-spillable wet batteries, nickel-metal hydride batteries or dry batteries, (see 2.3.2.2).	YES	YES	NO	YE
Mobility Aids: Battery-powered wheelchairs or other similar mobility devices with spillable batteries or with lithium ion batteries (see 2.3.2.3 and 2.3.2.4 for details).	YES	YES	NO	YE
Mobility Aids: Battery-powered wheelchairs or other similar mobility devices with lithium ion batteries where the design of the mobility aid does not provide adequate protection for the battery(les) (see 2.3.2.4.3 for details).	YES	NO	YES	YE
Non-radioactive medicinal or tolletry articles (including aerosols) such as hair sprays, perfumes, colognes and medicines containing alcohol; and Non-flammable, non-toxic (Division 2.2) aerosols, with no subsidiary hazard, for sporting or home use (see 2.3.5.1). The total net quantity of non-radioactive medicinal or toiletry articles and non-flammable, non-toxic (Division 2.2) aerosols 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. Release valves on aerosols must be protected by a cap or other sultable means to prevent inadvertent release of the contents.	NO	YES	YES	NO
Oxygen or air, gaseous, cylinders required for medical use. The cylinder must not exceed 5 kg gross weight. Note: Liquid oxygen systems are forbidden for transport.	YES	YES	YES	YE
Permeation devices, must meet A41 (see 2.3.5.13 for details).	NO	YES	NO	NO
Radioisotopic cardiac pacemakers or other devices, including those powered by lithium batteries, implanted into a person or fitted externally.	NO	ON ONE'S	S PERSON	N
Security-type equipment (see 2.3.2.6 for details).	YES	YES	NO	NO
Security-type attaché cases, cash boxes, cash bags, etc. incorporating dangerous goods, such as lithium batteries and/or pyrotechnic material, except as provided in 2.3.2.6 are totally forbidden. See entry in 4.2—List of Dangerous Goods.		FOR	BIDDEN	
Specimens, non-infectious packed with small quantities of flammable liquid, must meet A180 (see 2.3.5.11 for details).	NO	YES	YES	NO
Thermometer, medical or clinical, which contains mercury, one (1) per person for personal use, when in its protective case.	NO	YES	NO	NO
Thermometer or barometer, mercury filled carried by a representative of a government weather bureau or similar official agency (see 2.3.3.1 for details).	YES	NO	YES	YE

Note

 $The provisions of \underline{\textit{Subsection 2.3}} \ \text{and Table } \underline{\textit{2.3.A}} \ \text{may be limited by State or operator variations.} \ Passengers should check with their airline for the current provisions.}$

2.5 Transport of Dangerous Goods by Post Office Mail

Dangerous Goods are generally forbidden in airmail. Exceptions are made for some infectious substances, dry ice, low levels of radioactive material, patient specimens and lithium ion batteries contained in equipment.

Note: It is important to check state and operator variations.

Dangerous Goods in Operator's Property (DGR: 2.5)

Dangerous Goods Regulations (DGR) does not apply to the articles and substances which form an integral part of the aircraft equipment such as;

- Fire extinguishers,
- Oxygen bottles,
- Life rafts,
- First aid kits

Consumer commodities for use or sale on the aircraft such as

- aerosol
- alcoholic beverages
- perfumes
- colognes
- safety matches and liquefied gas lighters or
- Dry ice for use in food and beverage service aboard the aircraft

(Ref: 2.5.1.1 to 2.5.1.3)

Replacement spares parts, fire extinguishers, aircraft batteries, in-flight sales items, etc., being shipped as cargo must comply with the Regulations.

Difference between Hazard and Risk

The term **hazard** is defined in the ICAO Safety Management Manual (SMM) (Doc 9859) as: A condition or object with the potential of causing injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

Risk is the assessed potential for adverse consequences resulting from a hazard. It is the likelihood that the hazard's potential to cause harm will be realised. (ICAO Doc 9859)

2.6 State and Operator Variations (DGR: 2.8)

State and Operator variations are shown in the DGR: 2.8.

It is important to know that these states and operators use their right to be more restrictive than the provisions contain in the ICAO Technical Instructions and IATA DGR

The State variations are listed under DGR: 2.8.1 State variations use a three letter code.

The variations published by the States (countries) involved in the routing from (State of origin) through (State(s) of transit) and to (State of destination) and the operators (airlines) involved in the transport and the State of the operator are those that must be applied to the shipment.

Note that the "Trefoil" radioactive material symbol is shown next to every State and operator variation that is related entirely to Radioactive Material.

State Variations (DGR: 2.8.2)

State Variations are identified by a two-letter country code and the letter "G" (for Government), followed by a two-digit number in sequence.

Example: Saudi Arabia State Variations

SA — SAUDI ARABIA

- **SA 1** The transport of alcoholic beverages for delivery to any destination in Saudi Arabia is forbidden.
- **SA 2** The shipper of any dangerous goods must provide a written undertaking to reship the consignment at the shipper's cost and risk if the shipment is not cleared and received by the consignee within 15 working days from the arrival of the consignment at any destination in Saudi Arabia.
- **SA 3** The name, address and telephone number of the consignee must be written in full on the air waybill for dangerous goods being shipped to any destination in Saudi Arabia.
- **SA 4** Prior permission is required from the concerned government departments for the importation of the following:
 - a) Explosives and munitions of war, which require further approval from:

General Authority of Civil Aviation (GACA)

Riyadh — King Abdulaziz Center For National Dialogue

Safety, Security & Air Transport

Riyadh — King Abdulaziz Center For National Dialogue

P.O.Box 47360, Riyadh Area Code 11552

Telephone: (966) 8001168888, Facsimile: +966 (11) 5253303, E-mail: Safety-ecoreg@gaca.gov.sa

- b) Chemical products, except for perfumery products, cosmetics and dry ice;
- c) Radioactive material. The final destination of radioactive material must be Jeddah, Riyadh or Dammam only, except those for medical purposes, which may be imported to any point in Saudi Arabia.
- **SA 5** The final destination for radioactive material must be Jeddah, Riyadh or Damman only, except those intended for medical purposes which may be shipped anywhere in Saudi Arabia as long as this intent is indicated on the shipper's declaration.
- **SA 6** The name, address and telephone number of the consignee must be written in full on each package of dangerous goods being shipped to any destination in Saudi Arabia.

Operator Variations (DGR: 2.8.3)

Operator Variations are identified by a two-character operator code (airline code) followed by a two-digit number in sequence.

Example: Saudi Arabian Airlines Operator Variations

SV (Saudi Arabian Airlines)

SV-14 The following dangerous goods will not be accepted for carriage as cargo on Saudia aircraft (passenger and cargo):

UN 3090 - Lithium metal cells and batteries, including lithium alloy cells and batteries, prepared in accordance with Section IA, IB and II of Packing Instruction 968. This prohibition also includes lithium metal batteries shipped under an approval in accordance with Special Provision A88 and A99 and exemption in accordance with Special Provision A201.

UN 3480 - Lithium ion cells and batteries, including lithium polymer cells and batteries, prepared in accordance with Section IA, IB and II of Packing Instruction 965. This prohibition also includes lithium ion batteries shipped under an approval in accordance with Special Provision A88 and A99. I ed. – Exception: COMAT parts and Supplies offered by SV Stores.

Review exercises for Module - 2

Exercise -1

1. Which organization developed the Technical Instructions for the Safe Transpor of Dangerous Goods by Air?		
	DGR Ref:	
2. Which Regulations contain all the and reflect industry standard practic	requirements of the Technical Instructions es or operational considerations?	
	DGR Ref:	
3. Do the Regulations apply to dange with search and rescue operations?	erous goods used to provide aid in connection	
Yes, or No	DGR Ref:	
4.		
Referring to Table 1.5.A in the IATA following questions:	DG Regulations : answer the	
State what subject matter should be Addressed for shippers, but not for Packers		

Exercise – 2

Review Questions for Limitation

1. An infected live animal forbidden to transport as per DGR: 2.1.2(c) is to be shipped.				
Under exemption by which authorities is this possible?				
(a). The State of origin and the State of the operator				
(b). The States of origin, transit, and destination				
(c). The States of origin, transit, overflight, destination and that of the operator.				
What is correct: (a) (b) or (c)DGR Ref:				
2. What kind of Hazard might be hidden in "Hot air balloon"?				
DGR Ref/Page:				
3. Unaccompanied passenger baggage or Personal effects may contain hidden dangerous goods				
TRUE FALSE				
DGR Ref/Page:				

4. For the following it	tems, does the passe	nger need the approval o	of the operator?
	ning Lithium Batteries	s (47 Wh)	
(b) Dry ice as chec	ked baggage		
(c) 20 power bank	cs with 70 Wh		
(d) Ammunitions			
(e) Liquid-fuelled	camping stove		
5. A passenger intended is it acceptable?	ds to carry 10 spare li	thium batteries of 60 wh	each
(a) As carry-on baggage	Yes/no:	DGR Ref:	
(b) As checked baggage	Yes/no:	DGR Ref:	
6. Give the DGR Refe carried by Post Office		Dangerous Goods may po	essibly be

<u>Exercise – 3 Review Questions for State and Operator Variations</u>

1. Are Following States have logg variation code.	ged State variati	ons? If YES give the State
(a) Bahrain	YES/NO	
(b) Austria	YES/NO	
(c) France	YES/NO	
(d) Philippines	YES/NO	
(e) Croatia	YES/NO	
2. Are following airlines have log variation code	ged operator va	ariations? If YES give the operator
(a) Malaysia Airlines	YES/NO	
(b) Air Canada	YES/NO	
(c) Indian Airlines	YES/NO	
(d) Etihad Airways	YES/NO	
(e) Air Arabia	YES/NO	
3. Which airline is referred to wh Variations?		
4. Which Country is referred to v Variation?	vhen the letter '	"OMG" appear in the State

		e code for Saudia
	meone forv	ward Radioactive Materials Type B(U) package having 3.5 Tl on
YES/NO:_		DGRREF:
-	_	erous goods packed according to Excepted Quantities can be dirways (EY).
TRUE	FALSE	DGR REF:
		destined Explosive shipment requires permission from the f Civil Aviation (GACA).
TRUE	FALSE	DGR REF:
Notes		

Module 3 - CLASSIFICATION OF DANGEROUS GOODS

- Identify the nine classes of dangerous goods by their principle criteria;
- Recognize the hazard label for each class or division of dangerous goods;
- Understand and apply the principles of Packing Groups.
- Identify the proper shipping name and the applicable UN or ID Number;
- Identify the hazard Class or Division and applicable Subsidiary hazard(s);
- Identify the hazard labeling requirements;
- Identify the packing group (if applicable);
- Determine the maximum quantity permitted for each package according to the packing instruction;
- Recognize whether the item is acceptable for passenger and cargo aircraft or restricted to cargo aircraft only, or forbidden;
- > Identify the requirements of special provisions, when applicable;
- Apply the Appendix C1 and C2
- Assign a proper shipping name for items not listed by name;
- > Determine the proper shipping name for mixtures and solutions with single or multiple hazards.

3.1 Introduction

The IATA DGR Section 3 deals with the classification of Dangerous Goods. IATA DGR Section: 3.0.5 – Shippers Responsibilities

Dangerous goods are classified into 9 hazard Classes according to their primary hazard. Classes 1 to 9 in which they are provided do not indicate the degree of danger of the particular class.

Classes 1,2,4,5 and 6 are further subdivided into Divisions to identify particular hazards within the Class.

Classes are expressed by single digit numbers. Example: Class 1, Class 2, Class 3. Divisions are expressed by 2-digit numbers. Example: Division 6.1

The DGR Section 3 provides information in accordance with the Class and Division.

Example: Class 2.3

Section 3 = Classification Section

Sub-Section 3.2 = Class 2 - Gases

Paragraph 3.2.2.3 = Div 2.3 - Classification of Toxic Gases

Each of the 9 Classes of Dangerous Goods have their own:

- Hazard
- Label
- Restrictions
- IMP Codes

3.2 Dangerous Goods Classes

D	ANGEROUS G	OODS CLASSE	S
CLASS 1 Explosives eg. TNT	EXPLOSIVE 1.1	CLASS 4.3 Dangerous when wet	DANGEROUS WHEN WET 4.3
CLASS 2.1 Flammable Gases eg. Acetylene	FLAMMABLE GAB 2.1	CLASS 5.1 Oxidising Substances eg. Silver Nitrate	OXIDIZING AGENT 5.1
CLASS 2.2 Non-Flammable Non-Toxic Gases eg. Nitrogen	NON-FLAMMABLE NON-TOXIC GAS 2.2	CLASS 5.2 Organic Peroxides eg. Methyl Ethyl Ketone Peroxide	ORGANIC PEROXIDE 5.2
CLASS 2.3 Toxic Gases eg. Chlorine	TOXIC GAS 2.3	CLASS 6 Toxic Substances eg. Sodium Cyanide	TÖXİC 6.1
CLASS 3 Flammable Liquids eg. Petrol	FLAMMABLE JOHN 3	CLASS 7 Radioactive Substances eg. Uranium	RADIOACTIVE 7
CLASS 4.1 Flammable Solids eg. Sulfur	FLAIMABLE So 19 4	CLASS 8 Corrosive Substances eg. Hydrochloric Acid	CORROSIVE 8
CLASS 4.2 Spontaneously Combustible Substances eg. Zinc Dust	COMBUSTIBLE 4.2	CLASS 9 Miscellaneous eg. Asbestos	MISCELLANEOUS GANGEROUS GOODS
	DANGEROUS GOOL	OS PACKING GROUPS	
	PACKING GROUP I	GREAT DANGER	
	PACKING GROUP II	MEDIUM DANGER	
	PACKING GROUP III	MINOR DANGER	

3.3 Dangerous Goods Classes, IMP Codes and Description

Class	Div.	Cargo IMP Code	Name
1	1.1	REX/RCX/RGX	Explosives w. mass explosion hazard
	1.2	REX/RCX/RGX	Explosives w. projection hazard
	1.3	REX/RCX/RGX	Explosives w. fire hazard, minor blast/projection h.
			Explosives w/o significant hazard
	1.4	RXB/RXC/RXD/	.,
		RXE/RXG/RXS	Very insensitive explosives w. mass explosion
	1.5	REX	Extremely insensitive explosives w. mass
	1.6	REX	explosion
2	2.1	RFG	Flammable gas
	2.2	RNG	Non-flammable non-toxic gas
	2.2	RCL	Cryogenic liquid
	2.3	RPG	Toxic gas
3		RFL	Flammable liquid
4	4.1	RFS	Flammable solid
	4.2	RSC	Spontaneously combustible
	4.3	RFW	Dangerous when wet
5	5.1	ROX	Oxidizer
	5.2	ROP	Organic peroxide
6	6.1	RPB	Toxic
	6.2	RIS	Infectious substance
	6.2	RDS	Biological substance, Category B
7		RRW	Radioactive – white
		RRY	Radioactive – yellow
		RRE	Radioactive material-excepted package (must not
			be on the NOTOC)
8		RCM	Corrosive
9		RSB	Polymeric beads
		MAG	Magnetized material
		ICE	Dry ice, Carbon dioxide, solid
		RMD	Miscellaneous dangerous goods

3.4 Dangerous Goods Class examples

CLASS 1

EXPLOSIVES

Common items include: airbags, ammunition, fireworks, confetti cannon, cartridges, signal flare, firearms, etc.



GASES

Common items include: ammonia, lamp oil, gasoline, acetone, lighters, propylene and methane, spray cans, fire extinguishers, etc.



Class 3

FLAMMABLE LIQUIDS

Common items include: gasoline, perfume, turpentine, oil based paints, alcohol, solvents, diluents, ether alcohol, etc.



FLAMMABLE SOLIDS

Common items include: matches, camphor, rubber scraps, lighters, desensitised explosives, oily fabrics, iron sponges, etc.



Class 5

OXIDISING SUBSTANCES; ORGANIC PEROXIDES

Common items include: chemical oxygen generators, nitrates, chlorine, chlorates, perchlorates, fluorine, ozone, peroxides, ammonium nitrate fertilisers, lead nitrate, lithium hypochlorite, sodium nitrate, etc.



FERTILISERS



NITRATES

TOXIC SUBSTANCES; INFECTIOUS SUBSTANCES

Common items include: tear gas substances, dyes, acids, beryllium, arsenic, cyanide, lead compounds, medical or biomedical waste, biological samples and cultures, medical samples, etc.







CLINICAL WASTE

MEDICAL CULTURES

DYES

Class 7

RADIOACTIVE MATERIAL

Common items include: uranium metal, some smoke alarms containing a radioactive source, etc.



RADIOACTIVE



DENSITY GAUGES

CORROSIVES

Common items include: car batteries, sulphuric acid, hydrochloric acid and various acids, etc.



BATTERIES

ACID SOLUTIONS

Class 9

MISCELLANEOUS

Common items include: dry ice, asbestos, lithium batteries, zinc hydrosulfite, magnets, lithium batteries, first aid kits, etc.



DRY ICE

LITHIUM BATTERIES

FIRST AID KITS

3.5 Packing Groups

Packing Groups are assigned to dangerous goods according to the degree of danger they present. They are shown as Roman numerals: I, II, III. Packing Groups have been assigned to Classes 3, 4, 8 and Div 5.1, Div 6.1. Some substances in Class 9, Liquids in Div 5.1 and waste material in Div 6.2 have been assigned to Packing Groups by experience rather than the test.

PG I - High Danger

PGII - Medium Danger

PGIII - Low Danger

Let us look at the criteria for assigning packing groups for each of the classes.

Class 1: Explosives

No Packing group assigned

Class 2: Gases

No Packing group assigned

Class 3: Flammable liquids

Flammable liquids are grouped for packing purposes according to their flashpoint, their boiling point, and their viscosity. Below table shows the relationship between flashpoint and boiling point

PG	Flashpoint in °C closed cup (c.c.)	Initial boiling point in °C	
I	-	≤ 35	
II	< 23	> 35	
III	≥ 23 to ≤ 60	> 35	

Viscous substances such as paints, enamels, lacquers, varnishes, adhesives and polishes having a flashpoint of less than 23 °C may be placed in packing group III in conformity with the procedures prescribed in part III, chapter 32.3, of the United Nations Manual of Tests and

Criteria on the basis of:

- 1. The viscosity, expressed as the flow time in seconds;
- 2. The closed-cup flashpoint;
- 3. A solvent separation test.

Viscous flammable liquids such as paints, enamels, varnishes, adhesives and polishes with a flashpoint of less than 23 °C are included in packing group III provided that:

- 1. Less than 3% of the clear solvent layer separates in the solvent separation test;
- 2. The mixture or any separated solvent does not meet the criteria for class 6.1 or class 8.
- 3. The viscosity and flashpoint are in accordance with the following table:

Flow time t in seconds	Jet diameter in mm	Flashpoint in °C c.c.
20 < t ≤ 60	4	above 17
$60 < t \le 100$	4	above 10
20 < t ≤ 32	6	above 5
32 < t ≤ 44	6	above -1
44 < t ≤ 100	6	above -5
100 ≤ t	6	-5 and below

4. The capacity of the receptacle used does not exceed 30l.

Substances classified as flammable liquids due to their being transported or offered for transport at elevated temperatures are included in packing group III.

Class 4.1 Flammable solids

Substance	Packing Group	Criteria
Readily combustible solids (other than metal powders)	II	If the burning time is less than 45 s and the flame passes the wetted zone
Powders of metal or metal alloys	II	if the zone of reaction spreads over the whole length of the sample in five minutes or less
Readily combustible solids (other than metal powders)	III	If the burning time is less than 45 s and the wetted zone stops the flame propagation for at leastfour minutes
Powders of metal	III	if the reaction spreadsover the whole length of the sample in more than five minutes but not more than ten minutes
Solids which may cause fire through friction		packing group shall be assigned by analogy with existing entries or in accordance with any appropriate special provision

Class 4.2 – Substances liable to spontaneous combustion

Class 4.2 comprises Pyrophoric substances & Self-heating substances

Substance	Packing Group	Criteria
Pyrophoric solids and liquids	I	Always Packing group I
Self-heating substances	II	which give a positive result in atest using a 25 mm sample cube at 140 °C
Self-heating substances	III	A positive result is obtained in a test using a 100 mm cube sample at 140 °C and a negative result is obtained in a test using a 25 mm cube sample at 140 °C and the substance is to be transported in packages with a volume of more than 3 m3;A positive result is obtained in a test using a 100 mm cube sample at 140 °C and a negative result is obtained in a test using a 25 mm cube sample at 140 °C, a positive result is

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

Class 4.3 – Substances which, in contact with water, emit flammable gases

Packing Group	Criteria
1	any substance which reacts vigorously with water at ambient temperatures and demonstrates generally a <u>tendency for the gas produced to ignite spontaneously</u> , or which reacts readily with water at ambient temperatures such that the rate of evolution of flammable gas is equal to or greater than <u>10 liters per kilogram</u> of substance over <u>any one minute</u> .
II	any substance which reacts readily with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 20 litres per kilogram of substance per hour, and which does not meet the criteria for packing group I.
III	any substance which reacts slowly with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 1 liter per kilogram of substance per hour, and which does not meet the criteria for packing groups I or II.

Class 5.1 – Oxidizing substances

Packing Group	Criteria
I	any substance which, in the 1:1 mixture (by mass) of substance and cellulose tested, spontaneously ignites; or the mean pressure rise time of a 1:1 mixture (by mass) of substance and cellulose is less than that of a 1:1 mixture (by mass) of 50% perchloric acid and cellulose;
II	Packing group II: any substance which, in the 1:1 mixture (by mass) of substance and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture (by mass) of 40% aqueous sodium chlorate solution and cellulose; and the criteria for packing group I are not met;
III	any substance which, in the 1:1 mixture (by mass) of substance and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture (by mass) of 65% aqueous nitric acid and cellulose; and the criteria for packing groups I and II are not met;
Not Classified as 5.1	any substance which, in the 1:1 mixture (by mass) of substance and cellulose tested, exhibits a pressure rise of less than 2070 kPa gauge; or exhibits a mean pressure rise time greater than the mean pressure rise time of a 1:1 mixture (by mass) of 65% aqueous nitric acid and cellulose.

Class 5.2 - Organic peroxides - No Packing group assigned

Class 6.1 – Toxic substances

Grouping criteria for administration through oral ingestion, dermal contact and inhalation of dusts and mists

	Packing	Oral toxicity	Dermal toxicity	Inhalation toxicity
	group	LD_{50}	LD_{50}	by dusts and mists
		(mg/kg)	(mg/kg)	LC ₅₀ (mg/l)
Highly	I	≤5	≤ 50	≤ 0.2
toxic				
Toxic	II	> 5 and ≤ 50	> 50 and ≤ 200	$> 0.2 \text{ and } \le 2$
Slightly	III a	$> 50 \text{ and } \le 300$	> 200 and ≤	> 2 and ≤ 4
toxic			1 000	

Tear gas substances shall be included in packing group II even if data concerning their toxicity correspond to packing group III criteria.

Where a substance exhibits different degrees of toxicity for two or more kinds of exposure, it shall be classified under the highest such degree of toxicity.

Liquids having toxic vapours

Liquids having toxic vapours shall be assigned to the following packing groups, where "V" is the saturated vapour concentration in ml/m3 air at 20 °C and standard atmospheric pressure:

Packing group I: If $V \ge 10 \text{ LC50}$ and $LC50 \le 1,000 \text{ ml/m3}$.

Packing group II: If $V \ge LC50$ and $LC50 \le 3,000$ ml/m3, and do not meet the criteria for packing group I.

Packing group III: If $V \ge 5/1$ LC50 and LC50 $\le 5,000$ ml/m3, and do not meet the criteria for packing groups I or II.

Tear gas substances shall be included in packing group II even if their toxicity data correspond to packing group III values.

Class 6.2 - Infectious substances - No Packing group assigned

Class 7 – Radioactive material - No Packing group assigned

Class 8 – Corrosive substances

Packing Group	Criteria
I	substances that cause full thickness destruction of intact skin tissue within an observation period of up to 60 minutes starting after an exposure time of 3 minutes or less
II	substances that cause full thickness destruction of intact skin tissue within an observation period of up to 14 days starting after an exposure time of more than 3 but not more than 60 minutes.
III	cause full thickness destruction of intact skin tissue within an observation period of up to 14 days starting after an exposure time of more than 60 minutes but not more than 4 hours; or are judged not to cause full thickness destruction of intact skin tissue but which exhibit a corrosion rate on either steel or aluminum surfaces exceeding 6.25 mm a year at a test temperature of 55 °C when tested on both materials.

Class 9 – Miscellaneous dangerous substances and articles and environmentally hazardous substances

Some are assigned to Packing Group II and some to III.

Test methods for determining packing groups for each class are published in United Nations Recommendations on the Transport of Dangerous Goods-Manual of Tests and Criteria, as amended

Review Exercises for Classification

Exercise 1

1.

Check IATA DGR Section3 and complete below
Class1
Div 1.1
Div 1.2
Div 1.3
Div 1.4
Div 1.5
Div 1.6
Class2
Div 2.1
Div2.2
Div2.3
Class 3
Class 4
Div4.1
Div 4.2

Div 4.5		
Class 5		
Div 5.1		
Div 5.2		
Class 6		
Div 6.1		
Div 6.2		
Class7		
Class 8		
Class 9		
2.		
Which Cla	ass 1 is allowed on passenger Aircraft?	
	DGR Ref	
3.		
Check DG	R: 3.2 and answer below questions	
List the fi	ve possible physical states of Class 2	
1.		
2.		
3.		
4.		
5.		
4.		
Assign ea	ch packing group:	
a. Flash	n point -6°C/Initial boiling point 43°C	
b. Flasł	n point 30°C/Initial boiling point 70°C	
c. Flash	point 60.5°C/Open Cup	
d. Flash	n point 25.3°C/Initial boiling point 42°C	
e. Flasł	n Point 12°C. Initial boiling point greater than 35°C	

5.
What are the Divisions of Class 4:
(a)
(b)
(c)
6.
What are the characteristics of substances of Division 4.1:
(d)
(e)
(f)
(g)
7.
What are the Divisions of Class 5
a)
b)
8.
What are the properties a substance in Division 5.2 may have?
a)
b)
c)

d)		
e)		
9.		
Tox	c Substances can harm human health in t	he following way:
(a)_		
(b)_		
(c)_		
10.		
Det	ermine the Packing Group for Class 6.1, T	able 3.6A
a).	LD ₅₀ value (oral toxicity) 15 mg/kg;	
	LD ₅₀ value (dermal toxicity) 45 mg/kg;	
	Provide Packing Group:	
b).	Solid Oral toxicity LD ₅₀ value 45 mg/kg	
	Provide Packing Group:	
c).	Liquid Oral toxicity LD ₅₀ value 65 mg/kg	
	Provide Packing Group:	

11.

Identify the proper shipping name and UN number for the following:						
A blood sample suspected to						
contain Lassa Virus						
Patient specimen such as Dengue						
Virus or Rabies Virus						
A culture of African Swine fever						
Virus						
Laboratory stock culture of						
pathogen in Category B, e.g. Influenza Virus						
Dried blood spots, collected by applying a drop of blood onto						
absorbent materials?						
L						
12.						
When there is minimal likelihood tha	t a human patient specimen contain					
pathogens, what must be stated on the	he packaging?					
13.						
What is the Class and/or Division and	packing group for the following substance:					
a)) Substance that cause irreversible damage of intact skin tissue within an observation time of 49 minutes and an exposure time of 3 minutes.						
Class/Div: PG:_						

1	_	4	ļ

What is the Class and/or Division	on and packing group for the following substance:
,	rsible damage of intact skin tissue within an an exposure time of 12 minutes.
Class/Div:	PG:

3.6 Identification of Dangerous Goods (DGR: Section 4)

The list of dangerous goods updated yearly and approximately there are 3000 articles or substances with dangerous properties which are most likely to be shipped by air. This list not intended to be all inclusive, therefore for it contains several names of a general nature The absence of an article or substance from the list of dangerous goods should not be interpreted as permitting it for carriage by air as general cargo.

3.7 Selecting the Proper Shipping Name (DGR: 4.1)

This Section is the heart of the Regulations. The Shippers and the Airline DG acceptance staff must comprehensively learn this section. Dangerous goods must be assigned to one of the proper shipping names shown in the List of Dangerous Goods. The proper shipping name is used to identify the dangerous article or substance on the outside of the package and on the "Shipper's Declaration for Dangerous Goods".

3.8 Items listed by name (DGR: 4.1.1)

If the name is known, go directly to the List of Dangerous Goods (Subsection 4.2).

If the UN or ID number is known, go to the Numerical/Cross-reference Index (Subsection 4.3) to find the List of Dangerous Goods

The Emergency Response Drill Code (ERG Code) in Column N, is provided to the operators to insert in the NOTOC (Special Load — Notification to Captain) for the pilot's use during an in-flight emergency.

Self-reactive Substances of Division 4.1 and Organic Peroxides of Division 5.2 are publicized in the Appendix C.1 and C.2 respectively. (PGR: 4.1.0.3 and 4.1.0.4)

Follow the following steps:

- A) Locate the name of the substance in Appendix C.
- B) Check for the correct formulation of the substance.
- C) Locate the UN number of the Generic proper shipping name.
- D) Check the numerical list (DGR: 4.3) for the proper shipping name.
- E) Check against the proper shipping name in the List of Dangerous Goods for details (DGR: 4.2).

Example:

Find the UN number and the Proper Shipping name for 100% concentration of Sodium 2- Diazo-1 -naphthol-4-Sulphonate.

First check Appendix C.1, and then follow the rest of the above mentioned steps.

The Proper Shipping Self-reactive solid, Type D (Sodium 2-Diazo-1-

Name: Naphthol-4-Sulphonate)

UN No: **UN3226**

3.9 Items not listed by name (DGR: 4.1.2)

The Shipper is responsible to classify dangerous goods, but the cargo agent, the freight forwarder and the operator's acceptance staff must be familiar with the procedures for the Shipper to use.

The List of Dangerous Goods is not exhaustive; therefore there will be occasions when certain mixtures, new articles or substances are not shown in this list. Therefore the absence of a substance or article does not make it automatically non-hazardous for transportation by air.

Read DGR: 4.0.2.1

When assigning the proper shipping name for an item not listed by name, select the entry which is most accurately describes that item. See DGR: 4.1.2.1(c)

When the specific name of an article or substance does not appear in the List of Dangerous Goods (4.2), the Shipper must follow the following steps;

Step

- 1. Determine the characteristics of the substance (using Material Safety Data Sheets (SDS), test results, flash point, boiling point, etc.).
- 2. Check if substance is forbidden for transport. (DGR: 2.1 and 4.2.)
- 3. Classify the substance by comparing its characteristics with the criteria listed in DGR: 3.1 to 3.9 (Class 1 to Class 9)
- 4. For substances with more than one hazardous property see Precedence of Hazards DGR: 3.10
- 5. Assign the appropriate generic or n.o.s. proper shipping name referring to the DGR: Table 4.1.A

Check for the

-Specific n.o.s, entries

- -General n.o.s, entries
- -Pesticide entries, only for Class 3 and Division 6.1;

See DGR: 4.1.0.2 and 4.1.2.1 (C) for the preferred order of use

Example:

Substance: Butyl ethylene with a flashpoint of 26°C and an initial boiling point of 78°C and is not listed in DGR: 4.2

- a) Determine the characteristics: Flash point 26.C, initial boiling point 78°C
- b) Check if forbidden: According to DGR: 2.1.1 and 4.2 not forbidden
- c) Classify the substance: Class3, Packing Group II (See DGR:3.3.1.1 and Table 3.3.A)
- d) Assign the proper shipping name that describes the substance most accurately:

The Proper Shipping Name is: Flammable liquid, n.o.s. (Ethyl cyclohexane)

Note:

If the article or substance characteristics do not correspond to any of the classes or divisions in the regulations in section 3, it can be treated as non-dangerous goods and can be accepted without any limits. The word "Not-Restricted "must be included in the air waybill nature and quantity of goods column.

Self-reactive Substances of Division 4.1 and Organic Peroxides of Division 5.2 are publicized in the Appendix C.1 and C.2 respectively. (PGR: 4.1.0.3 and 4.1.0.4)

Follow the following steps:

- A) Locate the name of the substance in Appendix C.
- B) Check for the correct formulation of the substance.

- C) Locate the UN number of the Generic proper shipping name.
- D) Check the numerical list (DGR: 4.3) for the proper shipping name.
- E) Check against the proper shipping name in the List of Dangerous Goods for details (DGR: 4.2).

Example:

Find the UN number and the Proper Shipping name for 100% concentration of Sodium 2- Diazo-1 -naphthol-4-Sulphonate.

First check Appendix C.1, and then follow the rest of the above mentioned steps.

Proper Shipping Name: Self-reactive solid, Type D (Sodium 2-Diazo-1-

Naphthol-4-Sulphonate)

UN No:

UN3226

3.10 Mixtures and Solutions not listed by name (DGR: 4.1.3)

When a substance mix with another non-dangerous substances and packing group remain unchanged, proper shipping name must be identified according to the list of dangerous goods and the qualifying word "Mixture or Solution" as appropriate must be added the proper shipping name. Additionally, the concentration of the "Mixture or Solution" may be added.

Examples:

- 1. A solid mixture of Arsenic and a substance not subject to these regulations has an oral toxicity of LD50 of 15 mg/kg.
- •Class/Div-Div6.1
- •Name of the Class/Div Toxic substance
- Packing group PG II

Arsenic listed in the blue pages and the packing group remain unchanged;

The proper shipping name: Arsenic mixture, UN1558 and PG: II.

3.11 Proper Shipping Name of a Mixture or Solution where the Degree of Hazard Remains Unchanged;

2. Pure Acetal mixed with a non-hazardous ingredients having Flash point -16.C, initial boiling point 78.C.

Based on test the Packing Group remains unchanged as for the pure substance.

Since neither hazard class nor the packing group has changed and there is no significant change in the measures to be taken in emergencies, the proper shipping name will be: Acetal solution or Acetal mixture (UN 1088, Class 3, Packing Group II)

Based on DGR Ref: 4.1.3.1 Mixture or Solution Must be added to the proper shipping name

3.12 Proper Shipping Name of a Mixture or Solution where the Degree of Hazard Differs from that Shown in the List of Dangerous Goods

3. Acetal is again the hazardous constituent in a mixture.

But now, Flash point 26.C, initial boiling point 178.C.

Based on tests, Packing Group III has been established for this mixture. The hazard class remains the same, but as there is a change in the packing group, the proper shipping name will be:

Flammable liquid, n.o.s. (Acetal solution) or Flammable liquid, n.o.s. (Acetal mixture) (UN1993, Class 3, PG III)

3.13 Classification of items with multiple hazards (DGR: 3.10)

If an item presents two or more hazardous properties, the procedure shown in DGR: 3.10 must be used to ascertain which hazardous characteristic takes precedence.

The predominant hazard is called the "Primary Hazard" and the other hazard(s) is (are) called "Subsidiary Hazard(s)".

Following Hazards always takes precedence (DGR: 3.10.2)

The following are **ALWAYS** considered to be the Primary Hazard, and therefore not included in DGR: Table 3.10.A

- Class 1 Explosives
- Class 2 Gases
- Class 3 Liquid desensitized explosive
- Division 4.1 Self-reactive substances and solid desensitized explosives
- Division 4.2 Pyrophoric substances
- Division 5.2 Organic peroxides
- Division 6.1 Toxic substances with an inhalation toxicity of PGI
- Division6.2 Infectious substances
- Class 7 Radioactive material other than excepted packages

3.14 Assigning of Proper Shipping Name for Mixtures or Solutions containing two or more Dangerous Substances (DGR: 4.1.3.1). Example:

A liquid mixture consisting of the components Caprylyl Chloride and Tetrahydrofuran; The mixture, after tests, is found to meet the criteria of:

Class 8, Packing Group II and

Class 3, Packing Group II

According to DGR: <u>Table 3.10.A</u> the Primary hazard is Class 3, Flammable liquid and therefore the subsidiary hazard is Class 8, Corrosive.

The applicable Packing Group is II. The proper shipping name and the UN number are: **UN 2924,** Flammable liquid, Corrosive, n.o.s. (Caprylyl Chloride and Tetrahydrofuran mixture)

Review Exercises for Identification (DGR: Section 4)

Exercise 1

Give the applicable proper shipping name for the following item:

UN No:	Proper Shipping Name
(a) UN 1641	
(b) UN 3166	
(c) UN 1558	
(d) UN 2857	
(e) UN 2667	
(f) UN 8001	

Select the applicable UN or ID number for the Following Items:

Substance UN or ID Number

Calcium nitrate	
Acetyl iodide	
Toluene	
Benzyl bromide	
1-Hexene	
Consumer commodity	
Nicotine	
Barium peroxide	

3. Give the proper shipping names and UN numbers for the following articles or substances, which are also known by other names.

Alternative Name	Proper Shipping Name	<u>UN Number</u>
(a) Liquefied petroleum		
gas		
(b) Cajeputene		
(c) Motorcycle		
(d) Table tennis balls		
(e) Cement, flammable		
(f) Liquor		
(g) Oleum		

4. Precedence of Hazards, Table 3.10.A

Which is the correct Class/Div and PG:

<u>Exercise2 - Complete the below table for a one package (Net Quantities are only for a once package)</u>

UN	Net	Proper	Class	PG	Applicable	Max	Aircraft
NO	Qty/ Pkg	Shipping Name(PSN)	/Div (Sub Hazard)		Pkg/Instr no	Qty/Pkg	Type (Pax or CAO)
UN2509	7.5 kg						
UN1717	3L						
UN2800	67kg						
UN0341	5kg						
UN1922	10L						

Exercise3 - Complete the table below, for **UN Specification** Packaging's:

Article/	QTY	UN/ID	Class	Hazard	PKg	Acceptable for		
Substance	per	No:	Or	Label	Group	PAX	CAO	Spec.
Name	packag		Div	(s)		Aircraft	Aircraft	Prov
	е					Yes/No	Yes/No	
Kerosene	50L							
Chlorobenzene	80L							
Barium alloys,	0.5kg							
Pyrophoric								
Sodium chlorate	5kg							
Mercaptans,								
Liquid,	2L				II			
Flammable								
n.o.s. *								

Exercise4

1. (a) Is "Diiodoacetylene" allowed for air transport?
(b) the "Barium sulphate" is a Proper Shipping Name? Yes/No:
Explain Your answer:
(c) Is Copra, allowed for transport?
(d)How Would you classify (DGR or Non DGR) Carbon, non-activated, mineral origin?
(f) What additional considerations under special provisions required for 1,2,3-Benzodiaxaborole?
(g)
2. A Mixture contains 25% Ethylene oxide and 75% Carbon dioxide.
What is its UN Number?
3. What is the hazard class/division and compatibility group for Fuse, igniter?
4. What subsidiary hazards does methldichloroslilane have?

5. Complete	The following info	ormation:
(a) The o	quantity limitations	s shown in columns H, J and L are per
(Circle the corre	ect answer)	
i. Package	ii. Aircraft	iii. Shipment
(b)What is the e	exact term used for	r the quantities shown in columns H, J and L?
(C) In some inst	ances, column H ir	ndicates the letter 'G' What does it mean?
6. What haz	ard labels are requ	uired for?
(a) Diallyl	amine :	
(b) Sulphi dioxide	ur :	
(C) Lithiu batteries	m ion :	
(d) Phosp amorpho		

7. What is the packing Group for Manganese nature?	
8. What Packing Instructions are used for Anisole on passenger aircraft?	
9. What is the Packing Instruction number for Isobutylene on cargo air craft only?	
10. What is the maximum net quantity per package on passenger aircraft for Propylene oxide?	
11. Special Provisions (SP) are listed in Which column of the list of dangerous goods, and where in the Regulations can the requirements applicable to th SP be found	E
12.A shipment of Titanium powder, wetted (Un1352) may be transported as "not restricted". As this is a proper shipping name, explain under which circumstances it can be accepted as "Not restricted".	
	_

13. The PSN of UN2037 is Receptacles, small containing gas (toxic,oxidizing & corrosive) without release a device, non-refillable. Is it allowed to transport sterilization device containing UN1067, Nitrogen dioxide on a passenger air craft? if yes, what hazard labels are required on the package?

14. Match the following substance in the left column with corresponding answer in the right column.

1. UN1560, Arsenic trichlpride, 5L a. Permitted dangerous goods in DGR 4.2, 4.4, 2.5. b. Forbidden DG under any 2. UN1089, Acetaldehyde, 5L carried by circumstances (DGR 2.1.1) passenger aircraft c. Normally Forbidden, but may be 3. UN1088, Acetal, 5L carried by shipped on a passenger air craft with Passenger aircraft. UN 1090, Acetone the approval of state concerned as per S.P.A1 15L, carried by cargo aircraft d. Forbidden for Transport. However it 4. Acrolein, unestablished may be possible to be shipped under an Exception (See 1.2.6)

Exercise 5

Referring to Table C.2 in the IATA DG Regulations: Identify the appropriate			
propershipping name and UN number for the following substances.			
Dilauroyl peroxide 785	UN No:		
Concentration	PSN:		
Tert-Butyl peroxy-2-	UN No:		
ethlhexlcarbonate	PSN:		
80%concentrarion	PSIN.		
Ethyl 3,3-di-(tert-	UN No:		
butylperoxy) butyrate	PSN:		
79% concentration	I JIV.		

Exercise 6

1. "2-propanone" is a Ketone, with a fla greater than 99°C	ash point of 48°C and a boiling point
What is the:	
(a) Class/Div	
(b) Packing group	
(c) Proper shipping name	
(d) UN Number	

a dermal toxicity of LD ₅₀ of 65 mg/kg.	tance not subject to these Regulations has
(a) Class/Div	
(b) Packing group	
(c) Proper shipping name	
(d) UN Number	
3. A liquid mixture of Dimethyl Carbona has a flash point of 24°C and a boiling po	te and oqther non-hazardous ingredients pint greater than 35°C
(a) Class/Div?	
(b) Packing group?	
(c) Proper shipping name?	
(d) UN Number	
4. A liquid mixture of 2-Ethylfuran and a Regulation has a flash point of 21°C and	•
What is the	
(a) Class/Div?	
(b) Packing group?	
(c) Proper shipping name?	
(d) UN Number	

Exercise7

1. Shown Below in the chart the details of live substances which have multiple hazards and are not listed by name in the regulations.

Complete the chart by inserting the missing information.

Class or	Packing	Class or	Packing	Primary	Subsidiary	Packing
Division	Group	Division	Group	Class/Div	hazard	Group
3	I		II			
4.2	II	and8	II			
4.1	II	and 8 (S)	I			
6.1 (o)	I	and3	II			
8 (s)	II	and 5.1	III			

2.

Referring to Table 3.10.A of the Regulations state the primary and subsidiary hazard and the applicable packing group for each of the following; Class 3, Packing Group II and Primary: Division Subsidiary: 6.1Packing Group II App PG: Liquid Class8, packing Group II and Primary: Division 6.1 packing Group II Subsidiary: Inhalation App PG: Div 4.2, Packing Group III and class Primary: Div 6.1 Subsidiary: Packing Group II App PG: Class 3, Packing Group III and Div Primary: 6.1 Subsidiary: Packing Group I liquid. App PG: Div 5.1, Packing Group III and Class Primary: 8, Packing Group II liquid Subsidiary: App PG:

3. Determine the primary and subsidiary hazard for the following substances:					
(a) A substance having hazard classes of class 8 (I) PG II and Div 5.2.					
(b) A Solid having hazard clas	sses of Division 6.1 PG II and Div 2.2.				
(c) A Radioactive material als	so exhibits corrosive properties.				
4. A Chemical Reagent is a mSubstance A -Substance B -Methylal					
Determine the following:	rd:				
b). Packing Group c). UN Number	:				
d). Proper Shipping Name	·				

Notes			

Module 4

PACKING AND PACKAGING REQUIREMENTS FOR DANGEROUS GOODS

The Shipper is responsible for all aspects of the packing of dangerous good. Packing must not exceed the exceed the maximum permitted quantities and packed according to its packing instruction.

4.1 Definitions

Single packaging	Packaging which do not require any inner packaging in order to
Jiligie packagilig	perform their containment function during transport.

Packaging for which an outer packaging is required for transport

The outer protection of a composite or combination packaging together with components necessary to contain and protect **Outer packaging** inner receptacles or inner packaging

A combination of one or more inner packaging secured in an outer packaging

> Different classes of compatible dangerous goods which are packed into one outer package

An enclosure used by a single shipper to contain one or more packages of compatible dangerous goods and form one handling unit for convenience of handling and stowage

Inner packaging

Combination packaging

All packed in one

Overpack

4.2 Terms used

Packaging Quality

Dangerous Goods must be packed in good quality packaging's which must be strong to withstand the shocks and loadings normally encountered during transport

Ullage

When filling packaging's for liquids, sufficient ullage must be left to ensure that neither leakage nor permanent distortion of the packaging will occur

Friction

The nature and thickness of the outer packaging must be such that friction during transport do not generate any heat

Orientation

Combination packaging containing liquid dangerous goods must be packed so that the closures on the inner packaging's must be upward and the upright position must be shown on the package

Minimum size

The package must be of such a size that there is adequate space to affix all the required markings and labels

Plastic drums, Jerricans and intermediate bulk containers

Unless a shorter period is prescribed, the period of use permitted for the transport of dangerous goods not be more than 5 years from the date of manufacture

4.3 Conditions in Air Transport

Temperature

The extremes in temperature that could be encountered during transportation are in the range of -40 and 55 degrees Celsius. Increases in temperature may cause leakage of liquids and packages to burst. Therefore suitable ullage (outage) must be used and packagings must meet the pressure requirements.

Pressure

Due to altitude the pressure experienced by a package during flight will be lower than the pressure it was packed at. Therefore there will be a difference in the pressure between contents of that package and the aircraft hold, which could result in leakage, bursting during flight. Therefore all packaging must meet their test requirements.

Vibrations

The extent of exposure of vibration to a package of dangerous goods must be carefully considered and calculated.

The packaging requirements are the most important aspect of the dangerous goods regulations. Dangerous goods which are in appropriate packagings and which have been properly packed, under normal transport conditions, will be safe. An error in preparing a packaging could have serious consequences. In addition, statistics shows that the most common cause of leaking packages is the failure of the shipper to properly close the inner packagings.

For consignments by air, dangerous goods must be packed in quality packagings, strong enough to withstand the impacts, vibration, temperature variations and pressure variations normally encountered in air transport.

We will need to define some terms to be sure you understand the regulatory language. IATA defines the container that you will place your dangerous good in as packaging. An empty drum or a fiberboard box is an example of "packaging". Once you have placed the dangerous good in the container, it is called the

"package", or more specifically, the completed product consisting of the packaging and contents (dangerous good) properly prepared for transport is called the package.

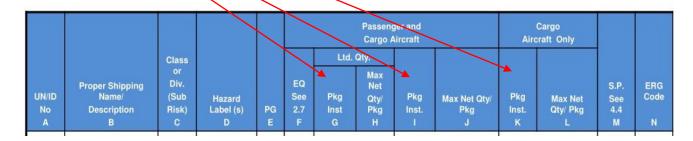
4.4 General Packing Requirements (DGR 5.0)

The packing instructions in DGR Section 5 give the maximum permissible quantity per inner packaging.

The maximum net quantity permitted in each outer package is shown in the List of the Dangerous Goods in DGR: 4.2.

Read DGR: 5.0.1. This Subsection details the shipper's responsibility.

Columns G, I and K in the regulations section **4.2** (Blue Pages) refer to the packing section. It will guide shippers to select correct inner and outer packaging for their shipment.



Information that can be obtained from the Packing Instructions:

- State Variations
- Operator Variations
- Types of packaging that is allowed for use
- Maximum weight limitations
- Packing Group requirements
- Additional packing requirements
- Any other documentation requirements
- Any other marking requirements

The format of Packing Instructions (Yellow Pages – SECTION 5)

Example



Packing Instructions — Class 3 — Flammable Liquids

PACKING INSTRUCTION 364

STATE VARIATIONS: BEG-03

OPERATOR VARIATIONS: 5X-02 7L-04 AY-04 CA-10 CX-02 CX-05 EY-03 FX-02 IR-06 JL-09 KE-07 KZ-07 LD-02 LD-05 M6-01 MK-12 NH-05 OZ-08 SU-01 TG-02

This instruction applies to flammable liquids with no subsidiary hazard or a subsidiary hazard of Division 6.1 in Packing Group II on Cargo Aircraft Only.

The General Packing Requirements of 5.0.2 must be met.

Compatibility Requirements

substances must be compatible with their packagings as required by 5.0.2.6;

Closure Requirements

closures must meet the requirements of <u>5.0.2.7</u>.

Additional Packing Requirements

UN 1308, Zirconium suspended in a flammable liquid, only combination packagings are permitted. The completed package must not have a gross weight exceeding 75 kg.
 Combination and single packagings are permitted.

COL	HOUSE	TION	PACKA	CIMICE

Inner Packaging (see 6.1)	Net quantity per inner packaging	Total net quantity per package
Glass	2.5 L	
Metal	10.0 L	60.0 L
Plastic	5.0 L	

OUTER PACKAGINGS

Т	Гуре			Dru	ims				Jerricans						Boxes			
D	Desc.	Steel	Alumin- ium	Plywood	Fibre	Plastic	Other metal	Steel	Alumin- ium	Plastic	Steel	Alumin- ium	Wood	Plywood	Reconstituted wood	Fibreboard	Plastic	Other metal
S	pec.	1A1 1A2	181 182	1D	1G	1H1 1H2	1N1 1N2	3A1 3A2	3B1 3B2	3H1 3H2	4A	48	4C1 4C2	4D	4F	4G	4H1 4H2	4N

SIN	GLE	РΔ	CKA	GIN	GS

Туре		Dru	ums			Jerricans		Composites	Cylinders
Desc.	Steel	Aluminium	Plastic	Other metal	Steel	Aluminium	Plastic	Plastic	
Spec.	1A1	181	1H1	1N1	3A1	3B1	3H1	All	As permitted in 5.0.6.6

4.5 List of UN Specification Packagings

Description	Codes	Cross reference
OUTER AND SINGLE PACKAGINGS		
STEEL DRUMS		
Non-removable head	1A1	6.2.1
Removable head	1A2	6.2.2
ALUMINIUM DRUMS		
Non-removable head	1B1	6.2.2
Removable head	1B2	6.2.2
PLYWOOD DRUMS	1D	6.2.3
FIBREBOARD DRUMS	1G	6.2.4
STEEL JERRICANS		
Non-removable head	3A1	6.2.5
Removable head	3A2	6.2.5
ALUMINIUM JERRICANS		
Non-removable head	3B1	6.2.5
Removable head	3B2	6.2.5
PLASTIC DRUMS AND JERRICANS		
Drums Non-removable head	1H1	6.2.6
Drums Removable head	1H2	6.2.6
Jerricans Non-removable head	3H1	6.2.6
Jerricans Removable head	3H2	6.2.6
METAL DRUMS (other than steel or aluminium/drums)		
Non-removable head	1N1	6.2.7
Removable head	1N2	6.2.7
STEEL OR ALUMINIUM BOXES		
Steel	4A	6.2.8
Aluminium	4B	6.2.8
BOXES OF NATURAL WOOD OR WOODEN BOX		
Ordinary	4C1	6.2.9
Sift Proof walls	4C2	6.2.9
PLYWOOD BOXES	4D	6.2.10
RECONSTITUTED WOOD BOXES	4F	6.2.11
FIBREBOARD BOXES	4G	6.2.12
PLASTIC BOXES		
Expanded plastic boxes	4H1	6.2.13
Solid plastic boxes	4H2	6.2.13
TEXTILE BAGS		
Sift-proof	5L2	6.2.14
Water resistant	5L3	6.2.14
WOVEN PLASTIC BAGS		
With or without inner lining or coating	5H1	6.2.15
Sift-proof	5H2	6.2.15
Water resistant	5H3	6.2.15

Although the packing is solely the shipper's responsibility, the cargo agent, the freight forwarder and the operator's dangerous goods acceptance personnel must ensure that the shipper has used the appropriate packing instructions and packaging, and to do so, they must also be familiar with the applicable packing requirements.

4.6 Conditions normal to Air Transport (DGR: 5.0.4)

All dangerous goods packages are subject to the effect of changes in temperature, pressure or by vibration normally occurring in air transport.

Therefore, dangerous goods must be packed in packagings that are free of any indication that their integrity has been compromised.

Packaging used to ship Dangerous Goods

The following types of packagings are used to ship dangerous goods;

- UN Specification Packagings : Used for normal quantities
- Limited Quantity Packagings: Used for small quantities
- Other packagings: Used only when packing instructions permits.
- Excepted Packagings: Used for very small quantities (See Module8)

4.7 UN Specification Packagings

In UN Specification Packaging, we can find various types of packages. The most commonly used are:

- a) Combination
- b) Single
- c) Composite
- d) Intermediate Bulk Containers (IBC)

4.8 The list of UN Specification Packaging can be found in DGR: Table 5.0.C

(a) Combination Packing – These packaging consists of one or more inner packaging contained in one outer packaging.

Examples:

A metal can is an inner packing.



Some packing instructions require the use of intermediate packaging before packing in an outer packaging and some packing instructions not requires. Read Packing Instruction 351 for UN 1133, Adhesives and note the requirements of Additional Packing Requirement.

(b)Single Packaging



Single packagings do not require any inner packaging in order to perform their containment function during transport and are manufactured from steel, plastic, aluminium or other permitted material.

Large Packagings (DGR Ref: 5.0.1.12)



With the approval of the appropriate authority of the Sates of origin and of the operator, an article with a total net weight exceeding 400 kg may be packed in a large packaging and carried on cargo aircraft in accordance with the provisions of ICAO Technical Instructions

(c) Composite Packaging

Composite Packaging

Composite Packagings consisting of an outer packaging and an inner receptacle so constructed that the inner receptacle and the outer packaging form an integral packaging.



Composite Packaging Is defined as packaging that is made from two or more layers of different materials, which are bonded together: Appendix A provide the definitions and distinct meaning of: "Composite Packagings", "Combination Packagings". "Inner Receptacles" and "Inner Packagings".

(d) Intermediate Bulk Containers (IBC) DGR Ref; 6.8



IBC's are UN Specification packagings that are designed for medical handling and permitted only for UN3077, Environmentally hazardous substance, solid, n.o.s.in air transport.

4.9 Limited Quantity Packagings

Read DGR: 2/7 and 5.0.3.

Some dangerous goods can be safely carried in good combination packaging under the Limited Quantity Provisions of Section 2.7 of the DGR. They must comply with the restrictions found in Section 2.7.

After you determine the appropriate shipping name of your dangerous good, Columns G and H of the List of Dangerous Goods will let you know if that material can be carried under the Limited Quantity Provision. If there is a limited quantity

Packing Instruction number preceded by the letter "Y" in Column G, for that material in Section 5 of the DGR. It should be noted that the limited quantity provisions may be used as an acceptable alternative to UN packaging, subject to any State and Operator variations.

Limited quantities must be packaged according to the appropriate limited quantity packaging instruction indicated in Column G. In addition, the net quantity per package must not exceed the quantity specified in Column H. The gross weight of the entire package must not exceed 30 kg (66 pounds) under the Limited Quantity Provision. Other general packing requirements for Limited Quantities are found in IATA Section 2.7.5 and include the following:

Single packagings, including composite packagings, are not permitted under the Limited Quantity provision.

Packages must be capable of passing the performance tests specified in Section 2.7.6 including drop test (from 1.2 m) and stacking test (where a force equivalent to the total weight of identical packages if stacked to 3 m applied to the top surface for 24 hours).

General packing requirements must also be met (Section 5.0.2 through 5.0.4 (with the exception of 5.0.2.3, 5.0.2.5, 5.0.2.11(f), 5.0.2.11(f) and 5.0.2.14) including the requirements for compatible packaging, cushioning material, orientation arrows for liquids, and large enough package to affix all required marks and labels. The package must also hold up to the normal vibration, and pressure and temperature changes typical during air travel.

They do not require any specification markings, but must be marked with "LIMITED QUANTITIES" mark.

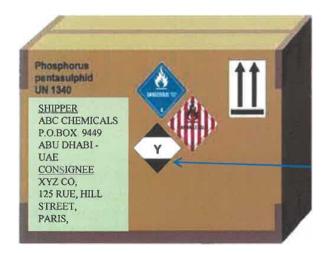


For different dangerous goods packed in one Limited Quantity "LTD QTY" packaging, the following steps must be followed:

- Check and observe the details of each item according to the List of Dangerous Goods
- The shipper must ensure that the substances do not react dangerously with each other and check that they do not require segregation according to the DGR: Table 9.3.A.

For each item, refer to each applicable Y-Packing Instruction to ensure that:

- The inner packaging's used must be permitted.
- The maximum quantity limits for the inner packagings have been observed.
- Inner packaging's must meet the criteria of DGR: 6.1.
- Ensure that the maximum gross weight of any Limited Quantity package does not exceed 30 kg.



"Limited Quantities" Mark Figure 7.1.A in the DG Regulations.

4.10 Other Packagings

Some Dangerous Goods do not require UN specification packagings or packagings

for limited Quantities. However, these packagings have to withstand the regular

transport conditions by air, without any damage, breakage or leakage.

Other packagings are permitted by certain packing instructions. They must meet

the General Packing Requirements of DGR: 5.0.2.

For example, go through the Packing Instructions 200, 378, 869, 954.

Some articles may be shipped without packaging. Example, Automobiles shipped

as UN3166 Packing Instruction 950.

4.11 Excepted Packaging

In some cases, shippers may want or need to transport very small quantities of

dangerous goods. The regulations allow some shipments to be excepted from

marking, labelling and documentation requirements when transported in such

small quantities. When the quantities are small enough and the corresponding

hazards are minor, IATA allows shippers to use the excepted quantity

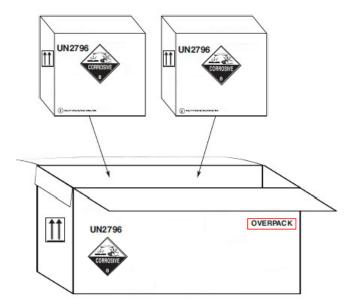
requirement.

This topic will be covered under Module - 8 in this workbook

4.12 UN Specification Package Markings

Reference: DGR6.0.4

4.13 "Overpacks" (DGR: 5.0.1.5)



Definition of an overpack is 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. All Dangerous goods packages contained in the overpack must be properly packed, marked, labelled and in proper condition as required by the Regulations.

An Aircraft Unit Load Device (ULD) is not an overpack.

See DGR: Appendix A for definitions.

Shrink wrapping or strapping/binding may be used as "overpack".

The following additional conditions need to be met in order for an "Overpack to be acceptable:

Substances that might react together dangerously must not be packed in the same overpack; and Substances that require segregation according to DGR: Table 9.3.A must not be packed in the same overpack;

The intended function of each package must not be impaired by the overpack.

4.14 Different Dangerous Goods in One Outer Packaging (DGR: 5.0.2.11)

UN Specification Packagings

Dangerous goods in one outer packaging should not be confused with "OVERPACK"

Note: the completed package must always be prepared for the most restrictive substance contained within. This means that passenger and cargo aircraft substances would not be mixed with CAO substances as the whole "all packed in one" would have to be prepared for CAO.

A shipper may pack different DG in one outer packaging providing that:

STEP 1- Observe the details of each item according to the List of Dangerous Goods.

STEP 2 -The shipper must ensure that the substances do not react dangerously with each other and check that they do not require segregation according to the DGR Table 9.3.A.

STEP 3-Refer to each applicable packing instruction and make sure that:

- (a) The inner packagings used are permitted;
- (b)The maximum quantity limits for the inner packagings have been observed; and
- (c)The outer packaging meets the requirements for each packing instruction
- **STEP 4** Refer to the List of Dangerous Goods and each packing instruction and determine:
- (a) The most restrictive packing group. The package must meet the performance standards of this packing group.
- (b) The Q value: the highest permitted net quantity per package according to the formula, whereas Q must not exceed 1.

Q=n1/m1+n2/m2+n3/m3 n1, n2, n3, etc. = net quantity per package of the substance M1, M2, M3, etc. = maximum net quantity per package

The calculated "Q" value must be rounded-up to the first decimal place and entered on the Shipper's Declaration.

STEP 5-Ensure that the outer packaging does not contain inner packagings of infectious substances with inner packagings of other types of dangerous goods.

The calculation of the "Q" value is not required for: carbon dioxide, solid (dry ice) UN 1845;

When the "Max Net Qty/Pkg" (Columns J or L) in the blue pages indicate "No limit" or "Gross Weight";

With the same UN number, packing group and physical state (i.e. Solid or liquid),

Example; 04kg UN 1688, Sodium Cacodylate, 05 kg UN 1684, Silver Cyanide and 02 kg UN 1503, Sodium permanganate

4.15 Q Value

Refer to the List of Dangerous Goods and each packing instruction and determine the "Q"-value for Classes other than 2 and 9:

For Classes 2 and 9 when packed together without goods of other classes: the gross weight of the package does not exceed 30 kg; and the total net quantity in the package of goods other than in Classes 2 or 9 does not exceed the value of 1 when calculated according to the "Q" formula.

"Q" value is not required when different dangerous goods, packed together, have the same UN number, packing group and physical state (i.e. solid or liquid). However, the total net quantity in the package must not exceed the maximum net quantity according to Column H in the List of Dangerous Goods (DGR: 4.2).

Ensure that the outer packaging meets the construction criteria of DGR: 6.1 and 6.2 and the test criteria of DGR: 6.6

		Class					Passenger Cargo AirC				Cargo raft only		
UN/ ID no. A	Proper Shipping Name/ Description B	Or Div (Sub Hazard) C	Hazard Label(S) D	PG E	EQ See 2.6 F	Pkg Inst G	d Qty Max Net Qty/Pkg H	Pkg Inst I	Max Net Qty/Pkg J	PKg Inst K	Max net Qty/Pkg L	S.P See 4.4 M	ERG Code N
1688	Sodium Cacodylate	6.1	Toxic	П	E4	Y644	1 Kg	669	25Kg	676	100Kg		6L
1684	Silver Cyanide	6.1	Toxic	Ш	E4	Y644	1 Kg	669	25Kg	676	100Kg		6L
1503	Sodium Permanganate	5.1	Oxidizer	П	E2	Y544	2.5 KG	558	5Kg	562	25 Kg		5L

The above Substances are packed in UN Specification packaging and transported on a passenger aircraft.

The maximum net quantity pre-package for the transport on a passenger aircraft

is:

The Q - Value can be calculated as follows;

$$\frac{n1}{m1} + \frac{n2}{m2} + \frac{n3}{m3}$$

$$\frac{4}{25} + \frac{5}{25} + \frac{2}{5}$$

Q=

Q = 0.76 (the Q-value must be rounded up to the first decimal place)

$$Q = 0.8$$

The shipper must ensure that the substances do not react dangerously with each other and check that do not require segregation according to the DGR: Table 9.3.A

APIO and **Overpack**



4.16 Overpack and All Packed In One (APIO) differences

	OVERPACKS (5.0.1.5)	All packed in one (APIO) 2.7.5.6 & 5.0.2.11
General	One, or more multiple (UN Spec., or LTD QTY) outer packages containing same of different UN NO, which forms a handling until.	Two or more different dangerous goods packed in one (UN Spec., or LTD QTY) outer package.
Segregation	As per Table 9.3.A	As per Table 9.3.A(UN3316 not permitted with other dangerous goods)
Inner Packaging	Within OVERPACK UN or LTD QTY packaging	The inner packagings used are permitted and the maximum quantity limits for the inner packagings have been observed.
Outer Packaging	Any type of packaging may be used (e.g. Fiberboard box or Strapped/Shrink wrapped on skid)	UN Spec., or LTD QTY package meeting the PG requirements for the most restrictive article/substance in the package
Q Value	Q value not applicable	Required, except for 1.DRY ICE UN 1845 2.Column J or L of 4.2 DG list indicate No Limit Class 2 (UN1950) and Class 9 with maximum quantity 30kg G in column H of DGR 4.2. When APIO LRT QTY packaging (2.7.5.6 (e), (f));
Marks (UN Specification, Y and Packaging use marks	1.Unless all marks are clearly visible, the word OVERPACK must be marked. 7.1.7 and 7.1.4.1 2.UN Spec mark must not be reproduced on the OVERPACK 3.LTD QTY mark (7.1 .A) must be marked	The package must be marked as required for each substance contained within the package. (7.1.4.1 and 7.1.4.6)
Labeling	Unless all labels within the OVERPACK are clearly visible, the labels must be reproduced on the outside of the OVRPACK. (7.2.7)	When two or more different dangerous goods are packed in the same outer packaging, the package must be labeled as required for each substance (7.2.3.12)
DGD	Wording "OVERPACK USED" (8.1.6.9.2, Step 7)	1.Wording "All packed in one" (type of packaging) 8.1.6.9.2. Step 6(f) 2.Q Value (e.g. Q= 0.8)

Review exercises for Packing Requirements (DGR: Section 5 & 6)

Exercise 1Complete the below table for UN combination packagings for Passenger Aircraft

UN Number	Max Net Qty/Pkg	Net Qty per plastic	How many plastic
		Inner Packaging	inner packagings are
			required to send the
			Max Net Qty/Pkg
UN1715			
UN3295, PG II			
UN2496			
UN2077			

2. The ite	em is	: Potassium hydrogen sulphate			
Net Quan	ntity	: 7.5 kg			
Inner Pac	kaging	: 15 glass packagings 0.5 kg each			
Outer Pac	ckaging	: UN Specification plywood box (4D)			
Aircraft ty	ype	: Passenger aircraft			
What is t	he applic	able?			
a UN	Number				
b Cla	ss or Divi	sion			
c Pac	cking Gro	up			
d Pac	cking Insti	ruction number			
e Ma	Maximum net quantity per package				
What is th	What is the maximum quantity allowed for each inner glass packaging?				

3. The item is	: Ethano	l,					
Packing Group	: PG II						
Net Quantity	: 20 L to be shipped in one single packaging.						
a) What is the app	licable U	N number:					
b) Can it be transp	orted on	a passenger aircraft:					
c) What is the app	licable Pa	cking Instruction number:					
d) Which aluminur	n packag	ing(s) can the Shipper use for this item					
4. The item is	: Alumin	nium phosphide pesticide					
Net Quantity	: 10 kg						
The shipment will	be transp	oorted on a cargo aircraft					
(a)What is the app	licable U	N number:					
(b)What is the app	licable Pa	acking Instruction number:					
(c)How many plast	ic inner p	backagings would be required:					
5.The item is	:	Lithium ion batteries (Returned for repairs)					
Net qty	:	2.0 kg					
Outer Packaging	:	UN Specification Plywood box					
Type Aircraft	:	Freighter (Cargo) flight					
(a)What is the applicable UN Number:							
(b)Class or Divisior	n:						
(c)Name of the ha	zard labe	l:					
(d)Packing Instruction Number:							
(e)Is this shipment acceptable?:							

(f) Explain you answer:
6. A shipment consists of 5 liters of UN1221, Isopropylamine PG I, packed in glass bottles of 500ml capacity each in UN combination packages. The shipment will be transported by passenger aircraft.
a)What packing instruction is involved?
b) Instead of glass bottles, can plastic inner packagings be used as an inner packagings
c) What is the minimum number of outer packagings required?
d) What is specified in the regulations with regard to the upright position of the inner packagings?
DGR Ref:
e) How many different types of UN Specifications packagings are permitted?
f) Is the use of absorbent material mandatory? If yes, how much?
7. Find the maximum quantity allowed in a plastic inner using UN Specification packaging for passenger aircraft for "Alkali metal amides - UN1390"?

8. UN 2031, Nitric acid (Other than red fuming, with 20% or less nitric acid) whis the maximum quantity allowed in an inner glass receptacle using limited Quantity packaging?				
9. Is the use of a "Single Packaging" allowed for Acetic anhydride, UN 1715, Packing Group II? If so when?				
10. What packing group performance standard is required to send UN2225 on Cargo Aircraft?				
11. Determine if the following chemicals can be shipped under the limited quantity provisions of Section 2.7. If yes provide the applicable packing instruction number and the maximum quantity allowed.				
a)Acetone:				
b)Dichlorodifluoromethane:				
c) Hydrochloric acid, PG II :				

4.17 Packaging Specifications

UN Marking indicates that the packaging bearing the marking corresponds to a successfully tested design type. The marking is intended to be of assistance in identifying the type and to indicate the performance tests that have been met.

4.18 Codes used to designate types of UN packaging

Type of Container

1 = Drums/Pails

2 = (Reserved, formerly Barrels)

3 = Jerricans

4 = Boxes

5 = Bags

6 = Composite Packaging

7 = (Reserved, formerly Pressure receptacle)

Material of Construction

Steel = A

Aluminum = B

Natural wood = C

Plywood = D

Reconstituted wood = F

Fibre = G

Plastic = H

Paper = M

Metal (Other than steel or aluminum)= N

Glass = P

Markings of UN Packaging



The United Nations (UN) symbol means that the packaging has gone through UN testing and certification.

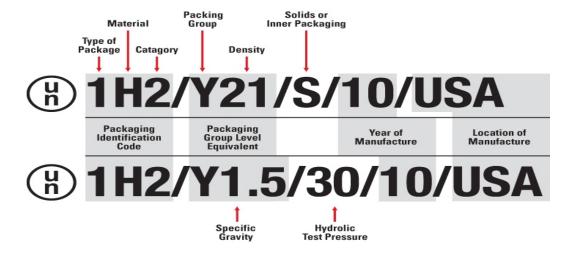


Year of Manufacture

Noted by last two digits. Plastic drums (1H1 & 1H2) and jerricans (3H1 & 3H2) must also be marked with the month of manufacture on package.

Examples of UN Specification markings

The UN code on a package indicates that the package has been tested according to set specifications to ensure durability and strength for carrying dangerous goods safely.





Specifications for UN Outer, Single and Composite Packagings (6.2). Packaging must pass the test in subsection 6.3 unless specifically exempted by the Regulations.

4.19 UN Packaging Performance Tests (6.3)

The performance tests specified in section 6.3 take into account the material used as well as the construction design and whether the goods are in liquid or solid form. (See example)

DROP TEST

TEST	TEST CRITERIA	
TEST CONTENTS: SAMPLE PREPARATION: CONDITIONING: TEST CONTENTS TEMP.:	Methanol/Water Solution (0.963 SG) Refer to Section II -18°C (0°F) Chamber #202 -18.3°C (-1.0°F)	For all IBC design types, there may be no damage which renders the IBC unsafe to be transported for salvage or for disposable, and no loss of contents. The IBC shall be capable of being
DROP HEIGHT: DROP ORIENTATION: TEST EQUIPMENT:	1.9 Meters (75") (Refer to Section IV) Most Vulnerable Part of Base Quick Release Hook Mechanism 5 Ton Overhead Hoist	 If the IBC shall be capable of being lifted by an appropriate means until clear of the floor for five minutes. A slight discharge from closures upon impact is not considered a failure provided that no further leakage occurs. (§178.810)

Set-Up Photo: Post Drop Photo: Results: PASS Comments/Observations The IBC met the criteria for passing the test. No leakage. Damage to bottle, cage and pallet upon impact.

Requirements for inner Packaging (6.1). Packaging's must be well constructed and of good quality. Must not be liable to react with the dangerous goods. Closures must prevent leaking and sifting and stoppers/corks must be held securely with wire, adhesive tape or other positive means.

Review exercises for Packing Specifications

Identify the meaning of the following:

		Description/definition
1		
	un	
2	10 1 12 1 2 3 8 7 6 5 4	
3	IP	
4	"V"	
5	"W"	
6	X, Y, Z	

Exercise 1



4G/Y35/S/06/US/TC145

1	What does Y indicate?	
2	What does 35 indicate?	
3	Can this be used as a single package for	
	liquids?	

1B1/X1.3/100/07/US/TC845

1	What does 1B1 indicate?	
2	What does 1.3 indicate?	
3	What does 07 indicate?	
4	Can this be used as a single package for	
	liquids?	

1B1/Z100/S/06/GB/G1235

The following may not be accepted for transport. Advise why?

1	Contents	4.5L UN2529 Isobutyric acid
	Package 1 x 1B1 (single) Gross weight 6.5kg.	
	Aircraft	Passenger and cargo aircraft

un 4C1/X18/S/08/US/CFL2453

1	Contents	UN1517 Zirconium picramate, wetted		
	Package	Inner: 2 x glass inner packaging each		
		containing 0.7kg.		
		Outer 1 x 4C1		
Gross weight 19.8kg.		19.8kg.		
	Aircraft Cargo aircraft only			
	Allerate	Cargo anciait only		

Exercise 2

	-		•	•	e description the code for each	
	•	net weight (kg)	crice to the mana	actaring requirem	that packaging, and its	
	escription		Code	DGR REF:	Max net Weight (Kg)	
Fi	bre Drum					
St	eel Box					
Pl	astic Jerri	icans				
Fi	berboard	Boxes				
Pl	astic Film	Bags				
PA m Pl	aterial)	GS (plastic				
2.	. UN227	73, net Quai	ntity of 80L is to	o be packed usi	ing the packing instruction	663
			•	-	um capacity of such a jerrio	
		in plastic j	211164113 (014,31	iij. The maxim	arr capacity or sacina jerri	carris
2.	20l.					
TI	RUE FA	LSE				
D	GR REF	:				
3.	. Which	packing gro	oup(s) the lette	r "Y" relates to	?	
4.	4. You want to ship 20kg of UN 2940 in a single packaging?					
Tl	he follo	wing UN pa	ckages are ava	ilable:		
	ndicate cceptab		packaging(s) a	nd explore why	each of the others are not	
	$\begin{pmatrix} u \\ n \end{pmatrix}$	4G/z 25/S/	17/GB/1234:			
٠.	$\begin{pmatrix} u \\ n \end{pmatrix}$	1A1/Y1.4/	L50/17/USA/12	234 :		
•	4D/X25/S/17/A/WESER:					
l .	(u)					

e.	(U)	1B2/Y19/S/17/AE/GAC123:
	$\backslash n$	

5. You want to ship 4plastic bottles each 1 L of UN 1206. The following packaging is available:

(u) 4GV/X 10/S/17D/AB1326			
a) Is this type of packaging permitted?	_		
b) What signifies the letter "V" in this 4G box?			
c) Provide the reference from the DG regulations:			

6. Which UN specification markings match with the type of packages discretion?

	UN Specification Marking		Type of	Answer
			Package	
Α	1D/Y25/S/17/GB/2333	1	Salvage	A=
			packaging	
В	1A1/X1.4/300/16/D/BAM123	2	Packages	B=
			Containing	
			solids	
С	1A2T/Y60/S/15/A/PA-2	3	Single	C=
			package	
			Containing	
			liquids	
D	4G/Y/5/S/16/A/PA-03	4	Combination	D=
			containing	
			solid or	
			liquids	

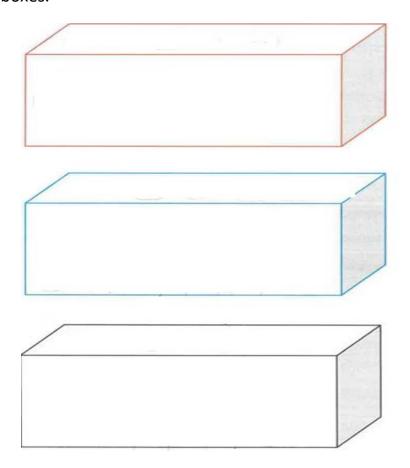
Exercise 3 (Group work)

The following DG shipments are to be transported on UN specification 4G boxes on passenger aircraft.

1.UN1149	PG III - quantity to be shipped 11.0 L
2.UN1607	PG II - quantity to be shipped 8.5 kg
3.UN1789	PG III - quantity to be shipped 1.5 L

Refer to the DGR and check whether 4G boxes can be used to send these shipments.

Also choose the suitable inner packages and draw UN Specification markings on the boxes.



Exercise – 4

1. How is "Q" 0.31 shown in the Shippers DGD?_____

The contents of the three different dangerous goods are packed in an inner packagings are shown below; (Same as exercise 3 on previous page)

Find the Q- value to check whether it is acceptable for air transport in one outer package.



Q=			
			_

UN No.	Name	Class or Division	Packing Group	Packing Instruction	Quantity offered
1500	Sodium nitrite	5.1	Ш	559	20.0 Kg
1690	Sodium fluoride, solid	6.1	III	670	86.0 kg
1845	Carbon dioxide, solid (dry ice)	9		954	25 kg

Q=

UN No.	Name	Class or Division	Packing	Packing Instruction	Quantity offered
			Group		
1451	Ceasium nitrate	5.1	Ш	563	20.0 Kg
1845	Carbon dioxide, Solid(dry ice)	9	-	954	40.0 kg
2001	Calbalt naphthenates, powder.	4.1	Ш	449	45.0 kg

Q=	=

Exercise – 5

1. Shown below are the contents of packages containing inner receptacles of different articles. Find the Q- value for each article to check whether it is acceptable for air transportation.

PACKAGE 1: Limited Quantity

UN No.	Name	Class or Division	Packing Group	Packing Instruction	Quantity offered
1688	Sodium Cacodylate	6.1	Ш	Y644	0.5 Kg
1684	Carbon dioxide, Silver Cyanide	6.1	-	Y644	0.5 kg
1503	Sodium permanganate	5.1	Ш	Y544	0.5 kg

Q=

PACKAGE 2: Limited quantity

UN No.	Name	Class or Division	Packing Group	Packing Instruction	Quantity offered
1090	Acetone	3	Ш	Y644	0.5 Kg
1716	Acetyl Bromide	8	-	Y644	0.5 kg
1987	Alcohols, N.O.S.	3	III	Y544	0.5 kg

Q=

Exercise –	- 6		
	neone pack UN gerous goods?	3316 – Chemical kit in the	same outer packaging with
Yes, or No):	DGR REF:	
2. Can sor 4.1?	neone packed l	JN3090 in the same outer	Packaging with Class 3 and Div
Yes, or No):	DGR REF:	
Exercise-7			
1. The follow	ving packages a	re overpacked in a plywoo	d box:
Package A	: 3L	Acetyl	UN1088
Package B	: 12 kg	Krill meal	UN3497, PGII
Package C	: 5 kg	Sodium nitrate	UN1498
The overpac	k bears the labe	els and markings required	by the Regulations.
(a)Does the	shipment meet	all the requirements for o	verpack?
(b)Explain y	our answer give	en under (a).	
2. The overp	ack contains th	e following 5 DG boxes:	
1 box contai	ning UN 2461		
1 box contai	ning UN 2802		
1 box contai	ning UN 1066		

- 1 box containing UN 1479
- 1 box containing UN 3088
- 1 box containing General Cargo

Which box has to be removed from the overpack in order to transport by air?

Exercise-8

1.

Referring to Appendix A of The Regulation: Write in the adjacent space th suited to the definition Provided below:	e word or term best
The complete product of the packing operation consisting of the packaging and contents prepared for transport	
One or more receptacles any other components or materials necessary for the receptacles to perform their containment and other safety functions and to ensure compliance with the minimum packing requirements of these regulations.	
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 Section 5.	

Referring to Appendix A of The Regulation: Write in the adjacent space the word or term best suited to the definition Provided below:		
Packagings for which an outer packaging is required for transport.		
Receptacles which require an outer packaging in order to perform their containment function.		
Are packagings consisting of an outer packaging which contains articles or inner packagings and which are designed for mechanical handling and exceed 400 kg net mass or450L capacity but have a volume not more than 3,000 L.		

Module 5 - Marking and labelling

5.1 General

The correct marking and labelling of dangerous goods packages is an important element in the safe transport process. Markings and labels fulfill the following general purposes:

- They indicate the contents of the package;
- > They indicate that the packaging meets approved standards;
- They provide safe handling and stowage information;
- They indicate the nature of hazard(s).

The shipper is responsible for the correct marking and labelling of the packages presented for transport.

The cargo agent, freight forwarder and operators' dangerous goods acceptance staff are required to check and make sure that all packages are correctly marked and labelled before accepting the consignment.

5.2 Marking (DGR: 7.1)

For each package and overpack containing dangerous goods that required marks the shipper must:

- Check that the required marks are applied in the correct locations on the package and that it meets the quality and specification requirements of the Regulations;
- ➤ Ensure that where specification packaging is required, the specification marks are as specified in 6.0.4;
- Remove or obliterate any irrelevant marking;

Ensure that all of the required markings have been applied when the package is presented to the operator.

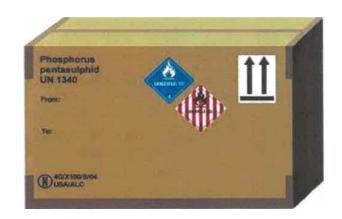
5.3 Size of marks

The mark of the UN number and the letters "UN" as specified in 7.1.4.1(a) must be at least 12 mm high, except for packagings of 30 L or 30 kg capacity or less, when they must be at least 6 mm in height and for packagings of 5 L or 5 kg or less when they must be of an appropriate size.

Types of Marks:

(DGR: 7.1.2)

Packaging Use Markings UN Specification Markings



It is the shipper's responsibility to ensure that the dangerous goods are properly marked and labeled.

Following packaging Use Marks are required on all packages containing dangerous goods:

- Proper Shipping Name
- o UN/ID –Number
- Full Name and Address of Shipper
- o Full Name and Address of Consignee

5.4 Additional Marking:

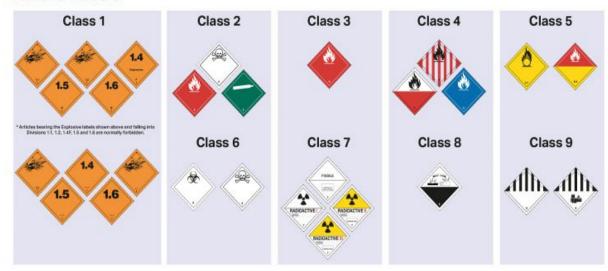
Net Quantity of Dangerous Goods or If the maximum net quantity per package shown in Gross in the column H blue pages, the GROSS WEIGHT. This required only for more than one package with different contents. (ID8000 in Class 9 and Class 7 exempted from this rule) Ref; DGR: 7.1.4.1 (c) Dry ICE (UN1845): Net Quantity per package. Ref; DGR: 7.1.4.1 (d) Name and Telephone Number of a responsible person. Ref; DGR: 7.1.4.1 (e)
in the column H blue pages, the GROSS WEIGHT. This required only for more than one package with different contents. (ID8000 in Class 9 and Class 7 exempted from this rule) Ref; DGR: 7.1.4.1 (c) Dry ICE (UN1845): Net Quantity per package. Ref; DGR: 7.1.4.1 (d) Name and Telephone Number of a responsible
different contents. (ID8000 in Class 9 and Class 7 exempted from this rule) Ref; DGR: 7.1.4.1 (c) Dry ICE (UN1845): Net Quantity per package. Ref; DGR: 7.1.4.1 (d) Name and Telephone Number of a responsible
exempted from this rule) Ref; DGR: 7.1.4.1 (c) Dry ICE (UN1845): Net Quantity per package. Ref; DGR: 7.1.4.1 (d) Name and Telephone Number of a responsible
Dry ICE (UN1845): Net Quantity per package. Ref; DGR: 7.1.4.1 (d) Name and Telephone Number of a responsible
Name and Telephone Number of a responsible
Name and Telephone Number of a responsible
Name and Telephone Number of a responsible
Division 6.2:
person. Ref ; DGR: 7.1.4.1 (e)
Package Orientation," Keep Upright", Do not drop -
handle with care ", as well as instructions to be
Div 2.2 (refrigerated, liquefied gases): followed in the event of an emergency, delay en
route, or if the consignment is unclaimed at
destination. Ref; DGR: 7.1.4.1 (f)
"BIOLOGICAL SUBSTANCE, CATEGORY B" and
UN3373 must be in the diamond -shaped mark as
shown in PI 650 Ref; DGR: 7.1.4.1 (g)
"Air Crew Protective Breathing Equipment (Smoke
For Chemical Oxygen Generators hood) in accordance with Special Provision A133"
Ref; DGR: 7.1.4.1 (h)
Environmentally Environmentally Hazardous Substance Mark Ref;
DGR: 7.1.4.1 (i)
Hazardous Substances:
Dangerous Goods in limited Quantities: Limited Quantities mark as shown DGR: Figure
Dangerous Goods in limited Quantities: 7.1.A. Ref; DGR: 7.1.4.2
Salvage & Empty packagings "Salvage Packagings" Ref; DGR: 7.1.4.3 "Empty
Packagings" Ref; DGR: 7.1.4.5
For Lithium Pottorios
For Lithium Batteries Lithium Batteries DGR 7.1.5.5

5.5 Labelling (DGR: 7.2)

DANGEROUS GOODS

Hazard and Handling Labels

Hazard Labels



Handling Labels and Marks





























Packages containing dangerous goods must be properly labeled to indicate their content. It is the shipper's responsibility to provide adequate labeling and remove any old labels to avoid confusion. The use of the correct prescribed labels is a mandatory requirement.

5.6 Types of labels:

There are two types of labels:

Hazard Labels (Diamond shape); and

➤ Handling Labels (Square or rectangular shape)

5.7 Hazard Label

Hazard labels are required for all packages containing Dangerous Goods articles or

substances.

The hazard label(s) required for each item is specified in Column D of the List of

Dangerous Goods.

5.8 Primary and Subsidiary Hazards

When Dangerous Goods presenting more than one hazard, these packages

require primary and subsidiary hazard labels required by the blue pages' column

D.

5.9 Handling Labels

In addition to hazard labels, handling labels are used to provide information on

the proper handling and stowage of packages of dangerous goods.

Read: DGR: 7.2.4 to 7.2.4.7

5.10 How to affix the labels (DGR: 7.2.6)

Remember, labels must:

- Be securely fixed or printed on the package and must not be obstructed by part of the packaging;
- Be on a background of contrasting colour or must have a dotted or solid line on the boundary;
- Not be folded or so that parts appear on different faces of the package;
- If the package is of such an irregular shape that the label cannot be attached or printed on a surface, it is acceptable to attach the labels to the package by means of a strong tag.

Remember the package must be large enough to accept all required labels.

5.11 Overpack Markings (DGR: 7.1.7.)

If the required package use markings on packages in overpacks are not clearly visible from the outside of the overpack, they must be reproduced on the outside of the overpack along with the word "Overpack":



Overpack packages must have following marking as required:

- Proper shipping names;
- ➤ UN or ID numbers;
- Full name and address of the shipper and consignee;
- ➤ Additional required markings for Dry ice, Division 6.2 Infectious substances, Div 2.2 refrigerated liquefied gases, Biological substance, category B, and chemical oxygen generators;
- ➤ Any special handling instructions appearing on package inside the overpack.

If the overpack contains UN specification packages, and the specification markings are not visible, they need not be reproduced on the overpack. The "Overpack" marking is an indication that packages contained within, comply with the prescribed specifications.

Refer to DGR 7.1.7 for markings and 7.2.7 for labeling for Overpacks

The following quick reference guide summarizes the instructions contained in this module concerning the marking and labelling of dangerous goods

Markings and Labels	When required	DGR Reference
For all Dangerous Goods shipments	Marking requirements Proper shipping name UN/ID Number Shipper and Consignee full name & address	7.1.4.1 (a) (b)
For all classes of DG's (except ID 8000 and Radioactive Materials) and Dry ice as applicable	Net weight or Gross weight followed by "G" as applicable, unless contents are identical	7.1.4.1 (c) , (d)
Additional markings	 As required for: Some refrigerated liquefied gases Infectious substances; Biological Substance, Category B; chemical oxygen generators Environmentally Hazardous Substances 	7.1.4.1 (e) to (i)
For Limited Quantity	Limited Quantity mark	7.1.4.1, 71.4.2 (Figure 7.1.A)
Salvage packagings	"Salvage"	7.1.4.3

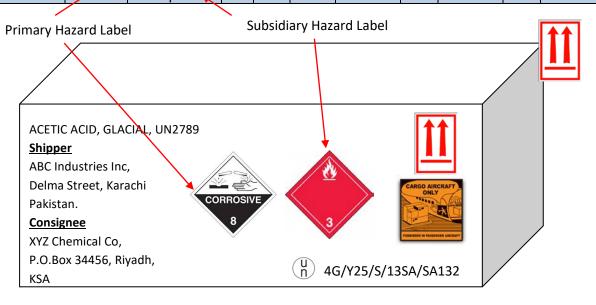
Markings and Labels	When required	DGR Reference
For all classes.	Hazard label(s)	List of Dangerous
		Goods (4.2) column
		D(and M. if
		applicable); 7.2.3 and 7.3, State and Operator Variations
Cargo Aircraft Only label	 For items not acceptable for transport on a passenger aircraft. For items packed according to Packing Instruction shown in Column K, in quantities permitted in Column L 	7.2.4.2, 7.4.2 and 7.2.6.3
Magnetized Material	For packages and overpacks of magnetized material.	List of Dangerous Goods (4.2) Column –D. 7.2.4.1 and 7.4.1
Cryogenic Liquid Handling label	For packages and overpacks containing Cryogenic liquids.	7.2.4.3 and 7.4.3
Package Orientation label(s)	For combination packagings and overpacks containing liquid substances.	7.2.4.4 and 5.0.2.13.3; 7.4.4. and 7.4.5
Keep Away from Heat label	For packages and overpacks containing self-reactive substances in Division 4.1 and Division 5.2, Organic Peroxides	7.2.4.5 and 7.4.6
Dangerous Goods in Excepted Quantities label	For packages containing dangerous goods in excepted quantities as per the provisions of DGR 2.6	2.6 and 2.6.7

Environmentally Hazardous Substance Mark	For packages which are environmentally hazardous7. 1.6.3	7.1.4.1 (i) and 7.1.5.3.
Overpack	Reproducing of marking and labels except UN Specification marking	7.1.7, 7.2.7
UN Specification Package used	When a UN specification packaging is used.	6.0.4.2 and 7.1.2.1
Lithium Batteries	When packed according to the Section II of PI965 to PI970 and Section IB of PI965 & PI968	7.1.5.5 Figure 7.1.C

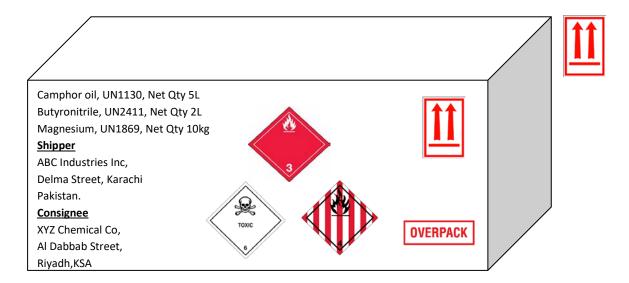
Examples:

Acetic acid, glacial, UN2789, 10L

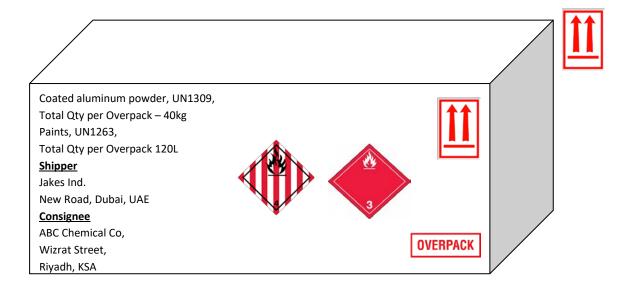
			Class					Passenger Cargo AirC				Cargo raft only		
		Proper	Or		DC.	F0	Lt	d Qty		N.4	PKg	Max		
U	JN/	Shipping	Div		PG	EQ	Disa	Max	Pkg	Max	Inst	net	S.P	
	ID	Name/	(Sub	Hazard	E	See	Pkg	Net	Inst	Net	K	Qty/Pkg	See	ERG
	no.	Description	Hazard)	Label(S)		2.6	Inst	Qty/Pkg	- 1	Qty/Pkg		L	4.4	Code
	Α	В	С	D		F	G	Н		J			М	N
		Acetic		Corrosive										
2	789	Acid,glacial	8(3)	&Flammable	П	E2	Y840	0.5L	851	1L	855	30L		8F
				liquid 🔪										



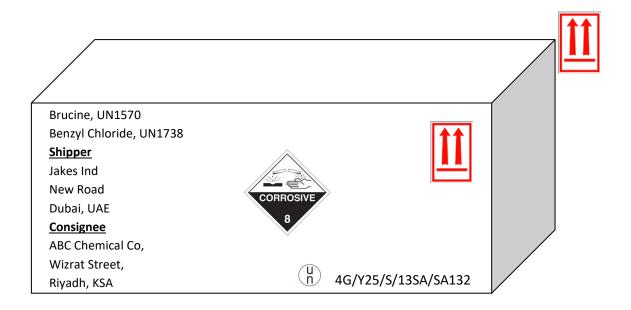
Example of correctly marked & labeled Dangerous Goods package (OVERPACK)



Overpacks with identical contents, but comprising both solid and liquid dangerous goods. Note this Consignment comprises 4 fiberboard boxes containing 10 kg solid substance and 6 steel drums containing a 20L liquid.



Example of All Packed in one outer package (APIO) for UN Specification Package



Review exercises for Marking and Labelling (DGR: Section7)

1. What do you know with respect to the language of any text that appears on hazard labels?

2. (a) What packagings always require the packing Orientation ("This Way up") label?

(b) Is the application of only one label of this type enough? Explain

3. (a) What marks must always appear on any dangerous goods package?
(b) What special marks are required on package containing "infectious substance"?
4. What Marking identifies package being shipped using "Y" packing instruction?
5. Mention the two types of labels that are used when "Dangerous Goods are involved.
6. What do you know about the size of the letters that used to mark on a DG package?
DGR Ref:
7. A Yamaha motorbike is presented without a miscellaneous dangerous goods label
(a) Is it acceptable? Yes/No:
(b) If yes, explain under which special provision is this acceptable.
8. UN2814, a triple packaging fibreboard box is presented to the acceptance staff without a technical name. Is this box acceptable? Yes/No DGR Ref: 9. List the markings and labels required for the articles and substance below; (a) Fuzes, detonating, UN0367, 30kg in one package.
(b) Neon, refrigerated liquid, UN1913 in 125kg in a cylinder.

10.

Referring to the Regulations: answ	er the following questions:
What handling label(s) is required for a	
package of Potassium, UN 2257, Division	
4.3?	
What handling label(s) is required for a	
package of Lithium ion batteries packed	
in accordance with packing instruction	
965, Section II	
What handling label(s) is required for a	
combination packaging containing one	
bottle of 300 ml of flammable liquid?	
What handling label(s) is required for a	
package of Nitrogen, refrigerated liquid,	
UN 1977?	
What handling label(s) is required for a	
package of Self-reactive solid type E *	
UN 3228, Div 4.1?	

11.

Substance	Primary hazard	Subsidiary hazard (If applicable)
Ammonium sulphide		
Solution, UN 2683		
Allyl ethyl ether,		
UN 2335		
Ethyl chloroacetate,		
UN 1181		
Iodine pentafluoride,		
UN2495		

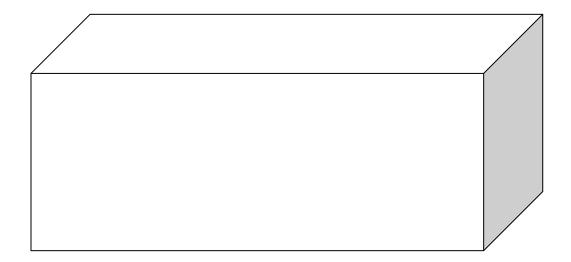
12. When is the net quantity of dangerous goods required to be marked on the
outside of a package?

DGR Ref:			

13. Show the marks and labels required on the outside of an overpack containing the following packages, prepared for carriage on a passenger aircraft.

Contents:

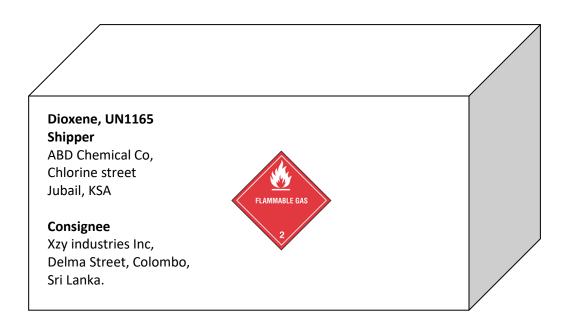
- Package1: 5 L, UN 1203, Motor spirit packed in a UN 4G fiberboard box.
- Package2: 4 L, UN 1654, Nicotine in a UN 1A2 Steel Drum.
- Package3: 10 kg UN 0405, Cartridges, signal in a UN 4D plywood box,



15. Activity

The following package is handed over the operator for shipment. Find the errors and list the missing marks or label(s), if any.

This is a **Limited Quantity** package and planned for Cargo Air craft.

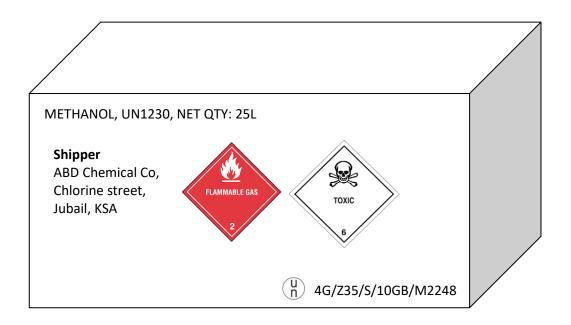


List all the errors:		

16. Activity.

The following package is handed over the operator for shipment. Find the errors and list the missing marks or label(s), if any.

This is a Combination package and planned for Cargo Aircraft.



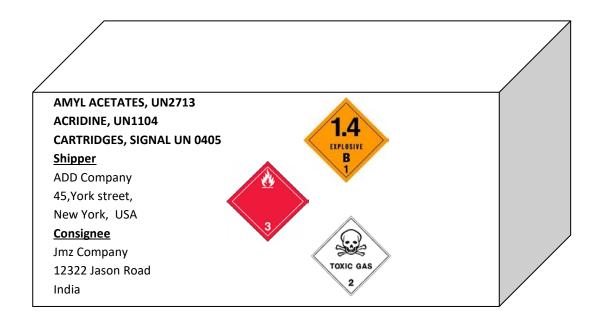
List all the errors:	

17. Activity

The following package is presented to the operator for shipment. Find the errors and list the missing marks or label(s), if any.

This is an "OVERPACK" with the following dangerous goods planned for Passenger aircraft.

- Package one: 5 L net, UN 1104, Amyl Acetates packed in a UN 4G fibreboard box.
- Package two: 2 kg net, UN 2713, Acridine in a UN 1A2 steel drum.
- Package three: 10 kg net, UN 0405, Cartridges, signal in a UN 4D plywood box.



List all the errors:

<u>Notes</u>		

Module 6 - DOCUMENTATION

6.1 Introduction

There are three legal documents involved in the transport of dangerous goods.

- > The Shippers Declaration for Dangerous Goods (DGD)
- ➤ The Air Waybill (AWB)
- > The load notification to Captain (NOTOC)

The correct and accurate completion of the appropriate transport documentation for dangerous goods is an essential requirement for the safe transportation process

6.2 Responsibilities (DGR: 8.0.2)

- ➤ The Shipper is responsible for completion of the Shipper's Declaration for Dangerous Goods.
- The freight forwarder/Agent is responsible for the completion of the Air Waybill.
- The operator is responsible for the completion of the NOTOC.

6.3 Shipper's Declaration for Dangerous Goods (DGD) - (DGR: 8.1)

For completion of the shipper' declaration form, see DGR: 8.1.5 and 8.1.6.

The Shipper's Declaration must be signed and dated by the shipper. Persons or organizations (including consolidators, freight forwarders and IATA cargo agents) employed by the shipper to act on their behalf to undertake the shipper's responsibilities in the preparation of the consignment and trained as required by DGR: Subsection 15 may sign the Shipper's Declaration for Dangerous Goods.

The specimens of Shipper's Declarations for Dangerous Goods reproduced on the following pages of this training workbook are shown in DGR Section 8 and must be used for all shipments of dangerous goods, unless otherwise specified. The form may be printed in black and red on white paper or in red only. The diagonal hatchings printed vertically in the left and right margins must be printed in red.

6.4 Air Waybill (AWB)

The rules concerning the completion of the Air Waybills for shipments of dangerous goods are contained in DGR: 8.2.1 to 8.2.6.

The Air Waybill must be completed in the usual manner and must contain in the handling information box the following statement(s) as required:

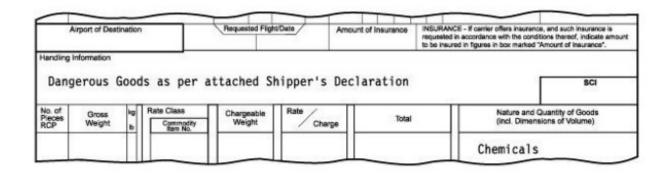
"DANGEROUS GOODS AS PER ATTACHED SHIPPER'S DECLARATION"

Or

"DANGEROUS GOODS AS PER ATTACHED DGD";

If required, add the words: "CARGO AIRCRAFT ONLY" or "CAO".

When an Air Waybill is issued for a shipment containing both dangerous and non-dangerous goods, there must be an indication in the "Handling Information" box of the Air Waybill of the number of packages containing dangerous goods. This should be shown either before or after the statement "Dangerous Goods as per attached Shipper's Declaration".



6.5 Articles and Substances Not Subject to these Regulations (Not Restricted)

If an article or substance contains a chemical which could be suspected of being dangerous but does not meet the criteria for any of the hazard classes or divisions appearing in Section 3 and is known to be non-dangerous, it may be offered for transport as not restricted if the words "Not Restricted" are included in the description of the article or substance on the Air Waybill to indicate that it has been checked (DGR: 8.2.6).

Refer to the Air waybill examples given in the DGR 8.2.7.

6.6 Checklist - to complete/confirm all the documents and packages to mark and labeled or conform with the DG Regulations

The following checklists can be used to confirm that the documentation and packages conform with the requirements of the DGR. The items shown in the checklists below do not identify every applicable requirement that may apply, but rather address the elements that require checking for the majority of shipments.

Shipper's Declaration- Note: The AWB no. and airport of departure and destination may be left blank for completion by the freight forwarder or airline. The Declaration must conform with the IATA format, have a minimum of two copies and be completed in English.

- 1. Full name and address of Shipper [8.1.6.1]
- 2. Full name and address of Consignee [8.1.6.2]
- 3. The number of pages [8.1.6.4]
- 4. The non-applicable Aircraft Type deleted or not shown [8.1.6.5]
- 5. The word "Radioactive" deleted or not shown [8.1.6.8]

Nature & Quantity of Dangerous Goods

- 6. UN or ID number(s), preceded by prefix [8.1.6.9.1, Step 1]
- 7. Proper Shipping Name and the technical name in brackets for asterisked entries [8.1.6.9.1, Step 2]
- 8. Class or Division, and for Class 1, the Compatibility Group, [8.1.6.9.1, Step 3]
- 9. Subsidiary Hazard, in parentheses, immediately following Class or Division [8.1.6.9.1, Step 4]
- 10. Packing Group [8.1.6.9.1, Step 5]
- 11. Number and Type of Packages [8.1.6.9.2, Step 6]
- 12. Quantity and unit of measure (when gross followed by "G") within per package [8.1.6.9.2, Step 6]
- 13. For Class 1 the net quantity supplemented with the net explosive mass (NEM, NEQ, NEW) followed by unit of measurement. [8.1.6.9.2, Step 6]
- 14. When "all packed in one outer package" is indicated, the dangerous goods are compatible, and "Q" value is listed and does not exceed 1. {5.0.2.11: 5.0.3.2:
- 2.7.5.6: 8.1.6.9.2. Step 6(g)}
- 15. If overpacked, the dangerous goods are compatible, and the word "OVERPACK USED" [8.1.6.9.2, Step 7.] If more than one overpack is used, identification marks shown and total quantity of dangerous goods [8.1.6.9.2, Step 7]

Packing Instructions

16. Packing Instruction Number, Followed by "IB" for Section IB lithium battery shipments. [8.1.6.9.3, Step 8]

Authorization

17. Special provision number where required or other authorization or approvals. Indication that governmental authorization is attached, including a copy in English and additional approvals for other items under [8.1.6.9.4, Step 9]

Additional Handling Information

- 18. The mandatory statement shown for self-reactive and related substance of Div 4.1 and organic peroxides of Div 5.2, or samples thereof, PBE, viscous flammable liquids and fireworks. [8.1.6.11.1, 8.1.6.11.2, 8.1.6.11.3, 8.1.6.11.5 and 8.1.6.11.6]
- 19. Name and Telephone Number of a responsible person for Die 6.2 Infectious Substance shipment [8.1.6.11.4]
- 20. The air transport statement included. [8.1.6.12]
- 21. Name and date indicated. [8.1.6.13 and 8.1.6.14]
- 22. Signature of shipper [8.1.6.15]
- 23. Any amendments or alterations signed by shipper [8.1.2.6]

Air Waybill

- 24. The Handling Information box shows: "Dangerous goods as per attached Shipper's Declaration" or "Dangerous Goods as per attached DGO" [8.2.1(a)]
- 25. "Cargo Aircraft Only" or "CAO", if applicable [8.2.1(b)]
- 26. Where non-dangerous goods are included, the number of pieces of dangerous goods shown [8.2.2]

Packages

- 27. Packaging conforms with packing instruction and is free from damage or leakage [9.1.3]
- 28. Same number and type of packagings and overpacks as shown on DGD [9.1.3]
- 29. UN specification packaging, marked according to 6.0.4 and 6.0.5 Symbol and Specification Code-X, Y orZ, agrees with packing group/packing instruction-gross weight within limits (solids or inner packagings)

Marks

- 30. The Proper Shipping Name(s) including technical name in brackets where required, and the UN or ID number(s) prefixed by "UN" or "ID", as applicable [7.1.4.1(a)]
- 31. The full name(s) and address(es) of Shipper and Consignee [7.1.4.1(b)]
- 32. For consignments of more than one package of, except ID 8000, the net quantity or gross weight, as applicable marked on the packages [7.1.4.1(c)]
- 33. Carbon dioxide, solid (dry ice), the net quantity marked on each package [7.1.4.1(d)]
- 34. The name and telephone number of a responsible person for Division 6.2 Infectious Substances shipment [7.1.4.1(e)]
- 35. The special marking requirements shown for Packing Instruction 202 [7.1.4.1(f)]
- 36. Limited Quantity packagings marked [7.1.4.2]
- 37. Environment Hazardous Substances mark [7.1.5.3]
- 38. Lithium battery mark [7.1.5.5]

Labeling

- 39. The label(s) identifying the primary hazard, affixed to each package [7.2.3.2 and 7.2.3.3(b)]
- 40. The label(s) identifying the subsidiary hazard next to primary hazard label(s)
- [7.2.3.2 and 7.2.6.2.3]
- 41. "Cargo Aircraft Only" label, on the same surface near the hazard label(s) [7.2.4.2 And 7.2.6.3]
- 42. "Orientation Labels affixed [7.2.4.4]
- 43. "Cryogenic Liquid" label, if applicable [7.2.4.3]
- 44. "Keep Away From Heat" label if applicable [7.2.4.5]
- 45. All above labels correctly affixed, [7.2.6] and all irrelevant marks and labels removed [7.1.1: 7.2.1]

Overpacks

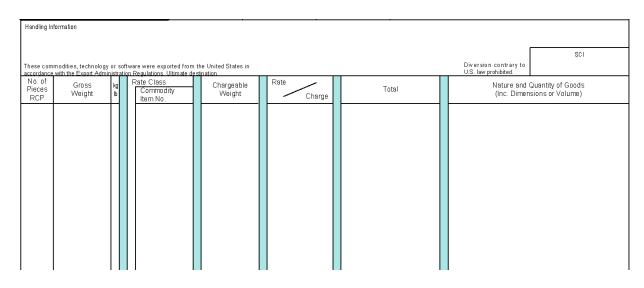
- 46. Packaging use marks as required must be clearly visible or reproduced on the outside of the overpack [7.1.7.1]
- 47. The word "OVERPACK" marked if all marks and labels are not visible [7.1.7.1]

Review exercises for Documentation

Exercise 1

- 1. The Proper Shipping name of UN 3496 is Batteries, nickel-metal hydride
- a. How would you classify "Batteries, nickel-metal hydride" when transporting by air?

b. Complete the Air Waybill extract shown below.



2. When a shipper used multiple pages to complete DGD, each page must be signed by the shipper.

True /False: _____

DGR Ref: _____

Exercise2

The following shipment will be transported on a passenger aircraft.

Date: Today

Airline: Saudia Airlines

Shipper:

XYZ Chemicals

P.O. Box: 12354

Riyadh, KSA

Shipper's Emergency Contact No: Tel; +966 35436878

Consignee: K. Masiudse

2586 Livingstone Road

Southampton NWE 5EN, England. Tel; +44 34353132

Item 1: Hexahydrotoluene

Packing: 5 x 1 L Glass inner packagings in 1 plywood box

(UN specification packaging)

Item 2:

Batteries wet, filled with acid

(Special information - Battery is an Aircraft battery)

Packing: Batteries are in sealed plastic bags in a UN Specification Fibreboard box.

The weight of the batteries 55 kg

Air Waybill number: 065-3456 7821

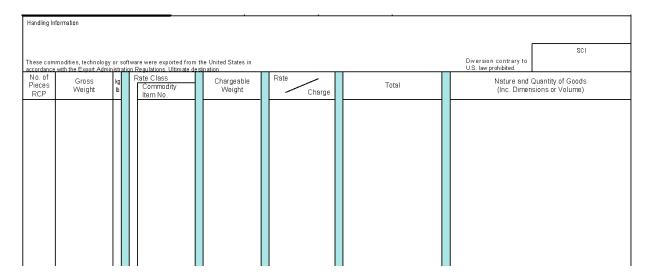
- (a) As Mr. Ahmed Hussain, the Export Manager for XYZ Chemicals, complete the Shipper's Declaration for Dangerous Goods.
- (b) Complete the Air Waybill extract and,
- (c) Draw the marking & labeling required on each package.

SHIPPER'S DECLARATION FOR DANGEROUS GOODS

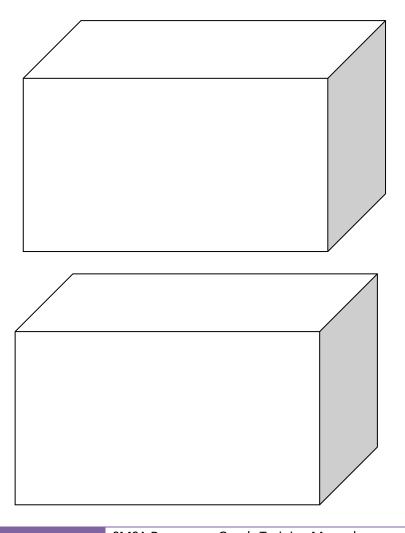


				-					
Shippe	r			Air	Waybill N	Ο.			
			Page of Pages						
		Shipper's Reference No.							
				(op	tional)				
Consig	nee								
Two complet	ted and pianed conice of this	Declaration must be handed to the	operator	- Invance					
TWO COMPLET	od and signed copies or this	Decidiation must be manded to the	operator.	VVA	RNING				
TRANSI	PORT DETAILS						l respects wations may be		
This shipmer	nt is within the limitations	Airport of Departure ((optional):				egal penalties.		
(delete non-a									
PASSENGE									
CARGO AIR				- Ch	inmont tu	an: (dalata n	on-applicable)		
Airport o	f Destination (optio	nal):		311		DIOACTIVE	RADIOACTI	7	
NATURI	E AND QUANTITY	OF DANGEROUS GO	ODS		NON-KA	DIOACTIVE	KABIOACII	V.L.	
		127 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2						I	
	1.70	ous Goods Identification	1						
UN or ID No.	Proper Shipping Name		Class or Div		Packing Group	Quantity and Type of Packing		Packing Inst.	Authorization
30 CH21									
Additiona	I Handling Information	1							
	I hereby declare that the contents of this consignment are fully						gnatory		
described above by the proper shipping name, and are class marked and labelled/placarded, and are in all respects in pro-			per co	ondition fo	r But				
transport according to applicable international and national regulations. I declare that all of the applicable air transport rec									
been met.		37				Signature			
						(See warnir	ng above)		

(b) Complete the Air Waybill extract shown below



(c) Draw all the marking & labeling required on each package



Exercise 3

1. The following shipment to be transported on KLM Airways

Date : Today

Airline : KLM

Shipper : UI Air cargo

Maintenance Divisiom

Jeddah Airport

Jeddah, KSA Tel; + 966 353543543

Consignee : Glass Airlines

Flight Operations

Amsterdam Airport

Item1 : Toxic Liquid, Organic, n.o.s, (THPS)

PG II and Quantity = 2.5 L

Item2 : Corrosive Liquid, Acidic, Organic, n.o.s,

(Pentanedial)

P.G; II and Quantity= 1.25L

Packing : All packed in One Fibreboard box.

The gross Weight of the box is 7.5kg

Assume that SDS is available at the time of acceptance and above details are true and correct. Calculated Q value must be shown on the Shipper's Declaration.

Air Waybill number: 074 - 035668662

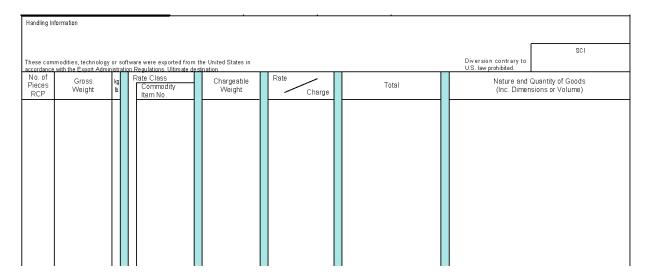
- (a)As Mr. John Nime, Shipping Manager of UI Air cargo complete the Shipper's Declaration for Dangerous Goods
- (b)Complete the Air Waybill extract and,
- (c)Draw all the marking and labeling required on the package.

SHIPPER'S DECLARATION FOR DANGEROUS GOODS

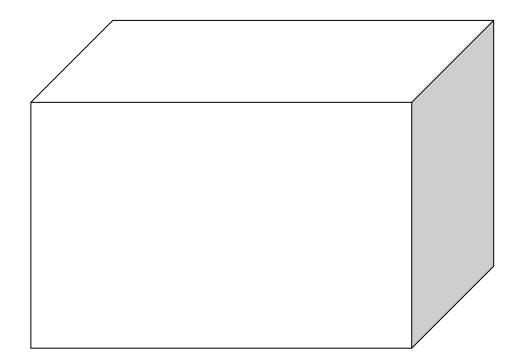


Shipper			Air Waybill No. Page of Pages Shipper's Reference No. (optional)						
Consig	nee								
Two completed and signed copies of this Declaration must be handed to the operator.		WARNING							
TRANSPORT DETAILS		Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the							
This shipmer prescribed for (delete non-a		Airport of Departure (optional):	applicable law, subject to legal penalties.					
PASSENGE CARGO AIR	RAND CARGO								
5	f Destination (option	nal):		Shi	pment typ	pe: (delete no	on-applicable)		
	(NON-RA	DIOACTIVE	RADIOACTI	/E	
NATURE	E AND QUANTITY	OF DANGEROUS GO	ODS						
	Danger	ous Goods Identification	on						
UN or ID No.			Class or Div (subsidiary h		Packing Quantity and Type of Packing		Type of Packing	Packing Inst.	Authorization
Additiona	Handling Information								
Additional Handling Information									
I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. I declare that all of the applicable air transport requirements have been met.									
mercens at 1866						Signature (See warnin	ng above)		

(b) Complete the Air waybill extract show below



(c) Draw all the marking and labeling required on the package.



Exercise 4

Ask two shippers declarations from your instructor to complete the below exercises.

1. Assume you are the Export Manager and compete the shippers Declaration and draw the package back side of DGD.

Reference must be made to subsection 4.2 List of Dangerous Goods.

AWB No : 777-8856 5632 : Casey

Name and address of SHPR : Chemicals Corp,

P.O.Box 3668,

Airport road, Abu Dhabi - U.A.E

Name and address of CNEE : F. Noies Chemicals,

11 Long street,

London W.C.I - England.

Substance name : Ethyl propionate

No and Type of packaging : 1 Fibreboard box marked with Limited

Quantity

Net quantity of each box : 1.0 L

Airport of departure : Abu Dhabi Airport of arrival : London

2. Complete the Shipper's Declaration from, using the following information and draw the package back side of the DGD.

AWB No : 777-2341 8544

Name and address of Shipper : S.F.C. Smart Cells Crop.

P.O.Box; 36688, Airport road, Abu

Dhabi -U.A.E.

Name and address of CNEE : S.E.I. Spiriting Co.

103, High Street, Singapore 1123

Airport of departure : **Abu Dhabi**Airport of arrival : Singapore

Item 1 : Organochlorine pesticide liquid, toxic,

Flammable, (Aldrin)

Packing Group III

Packing : 1 Plywood box containing 40 L (4D) Item 2 : Quicklime, 20Kg, packed in 4G box

Above two packages are OVERPACKED in a wooden box.

REVIEW EXERCISES FOR ACCEPTANCE CHECKLISTS (DGR: 9.1.3)

Many operators have developed their own acceptance checklists to meet the requirements of the DGR. They vary in degree of detail and number of questions, but are at the heart of their training programmers to ensure that their staffs make the best use of this tool.

The acceptance checklist must include all reasonable steps to ensure that:

- The packages, overpack(s) or freight container(s) as applicable are correctly marked and labeled;
- The Shipper's Declaration is correctly completed; and
- ➤ The acceptance requirements of DGR: 9.1.1 are met.

The carrier's acceptance staff must;

- > Be licensed.
- > Be authorized to accept dangerous goods shipment and
- Use a checklist for non-radioactive and radioactive shipments.

The use of a checklist involves a comprehensive check of the package and documentation. If any question on the checklist is answered "NO" the shipment must not be accepted and a copy of the checklist should be given to the shipper or his agent. A copy of the completed checklist is retained by the carrier.

Note:

Many questions have a "N/A" (Not applicable) alternative. If a question does not apply to the shipment being checked, mark the "N/A" box. This is not a "No".

The "Comments" box should be used to explain clearly the reason for a rejection, that may not be obvious from the "No" mark by the question.

If the checklist is completed and the shipment is accepted, the original copy of the checklist must be attached to the Airway Bill along with the original copy of the shipper's declaration.

Review questions for Checklist.

Exercise 1: - Check-list usage Non-Radioactive Consignment,

Proper Shipping Name: Acetic anhydride

UN Number: UN 1715, Net Quantity: 15.0L / Gross Wt; 18 kg

Type of Packing: 4D Plywood box

Routing: Abu Dhabi (AUH) / Singapore (SIN) - Sydney (SYD)

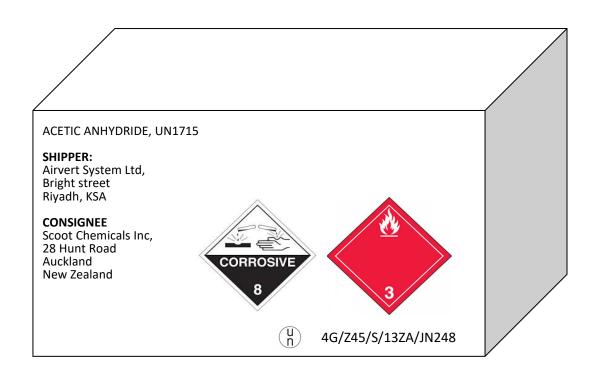
Abu Dhabi (AUH) / Singapore (SIN) - Etihad airways (EY)

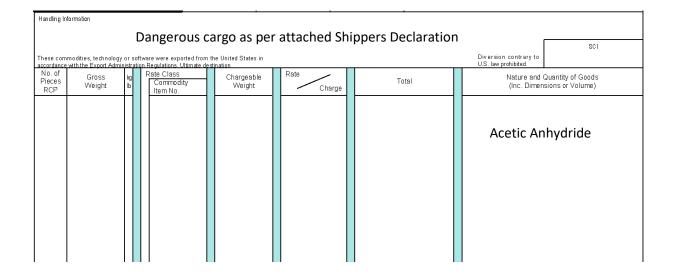
Singapore (SIN) - Sydney (SYD) - Singapore airlines (SQ)

Aircraft Type: Both flights are operated as cargo aircraft.

For exercise purposes assume two copies of Shippers Declarations are present. Package with following markings and labels and the AWB Handling Information Box shown below:

Using the checklist find all errors and missing information on the package and the AWB extracts.





SHIPPER'S DECLARATION FOR DANGEROUS GOODS



Shippe	r			Air۱	Waybill N	0.			
				Page of Pages					
			Shipper's Reference No.						
Concia	noo			(opt	ional)				
Consig	nee								
Two complete	ed and signed copies of this	Declaration must be handed to the	operator.	WΔ	RNING				
						amalı in all	reconnecte with	ith the o	nnliaahla
TRANSF	PORT DETAILS			Dan	gerous G	oods Regula	respects wi		
This shipmer prescribed fo	nt is within the limitations or.	Airport of Departure	(optional):	app	licable lav	, subject to le	egal penalties.		
(delete non-a	applicable)								
PASSENGEI CARGO AIRO									
Airport o	f Destination (optio	nal):		Sh	ipment typ	oe: (delete no	on-applicable)		
					NON-RA	DIOACTIVE	RADIOACTIV	√E	
NATURE	E AND QUANTITY	OF DANGEROUS GO	ODS						
	Danger	ous Goods Identification	on						
UN or ID No.	Proper Shipping Name	,	Class or Div	200	Packing Group	Quantity and Type of Packing Packing		Authorization	
ID No.			(Subsidiary II	azaru)	Group			Inst.	
					_				_
1715	Acetic and hy	dride	8		Ш	01 Plyw	ood box	851	
	<u> </u>		<u> </u>		<u> </u>	x 18.0 k	(G	855	<u> </u>
Additional	Handling Information	1						ı	
1 6500	alectrone here were	STATE OF STA		a gazer		/ Name of Sig	inatory		
described	above by the pro	ontents of this consignmo oper shipping name, ar	nd are clas	sified,	packaged	d	, natory		
		ed, and are in all respondicable international a							
regulations	s. I declare that al	of the applicable air t							
been met.						Signature (See warnin	ra above)		
						(See warnin	g anove)		

Exercise 2

Following shipment, consisting of:

An extract from the accompanying Air Waybill,

- ➤ A Shipper's Declaration and
- ➤ A drawing indicating the labels and marks appearing on the package is presented for shipment.
- Complete the check list to determine if the shipment is acceptable.

Using the checklist, find all error and missing information shown on (a), (b) and (c)

For exercise purposes assume two copies of Shippers Declarations are present.

Explain all the reasons for rejection, and correct it

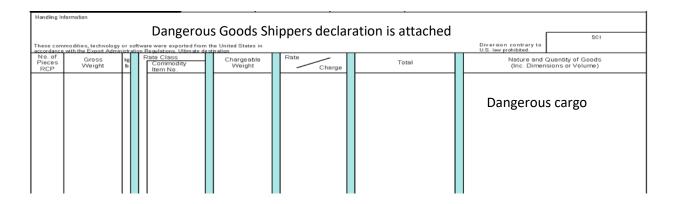
The checklists provided to you are same as those published in the current edition of the IATA dangerous Goods Regulations.

Routing: Dammam to Frankfurt / Germany

Operator Aircraft type: KLM Airways - Cargo Aircraft

AWB No: 074-1342 4451

a) Air Waybill "Handling Information" and Quantity of Goods" boxes

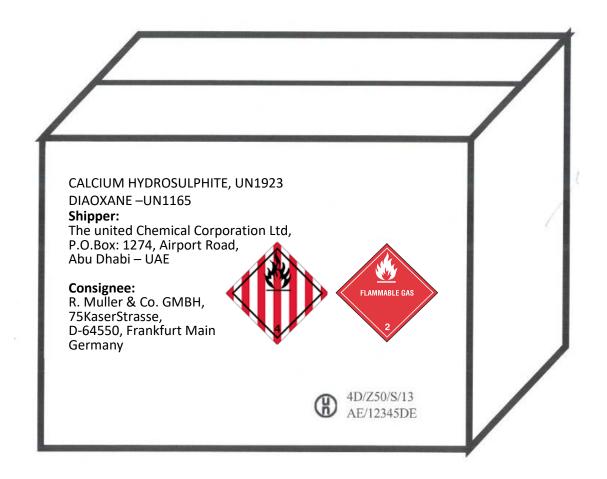


SHIPPER'S DECLARATION FOR DANGEROUS GOODS



THE THE PERSON ASSESSED AND ASSESSED ASSESSED ASSESSED ASSESSED ASSESSED ASSESSED ASSESSED ASSESSEDA ASSESSED ASSESSED ASSESSED ASSESSED ASSESSED ASSESSED ASSESSEDA			22				
Shippe	er		Air '	Waybill N	0.		
			Page of Pages				
			Shipper's Reference No.				
				ional)			
Consig	nee						
Two comple	ted and signed copies of this Declaration must be handed to the	operator.	WA	RNING			
			F-11		construction for soll construction so	AATON TATONS OF	was the sale for
TRANS	PORT DETAILS		Dan	gerous G	omply in all respects wo oods Regulations may be	in bread	
This shipme	nt is within the limitations Airport of Departure	(optional):	арр	licable lav	v, subject to legal penalties.		
(delete non-							
PASSENGE	RAND CARGO						
CARGO AIR	CRAFT AIRCRAFT ONLY		100				
Airport c	of Destination (optional):		Sh	ipment ty	pe: (delete non-applicable)	<u> </u>	
			v	NON-RA	DIOACTIVE RADIOACTI	VE	
NATUR	E AND QUANTITY OF DANGEROUS GO	ODS					
	Dangerous Goods Identification	on					
UN or	Proper Shipping Name	Class or Div	Division Packing Out IT SP Packin		Packing	HOSE THE A SOL	
ID No.	Topol dispense that	(subsidiary h	2000	Group	Quantity and Type of Packing	Inst.	Authorization
		1					
1923	Calcium hydrosulphite	4.2		П	18 KG	470	
1165	Dioxene	3		П	25 L	364	
					Packed in a box		
					Q=0.74L		
Li		<u> </u>				<u> </u>	
۸ ططانا: م	l Handling Information				35	Į	
Additiona	ii Handiing information						
I hereby	declare that the contents of this consignm	ent are full	y and	accuratel	Name of Signatory	·	
described	above by the proper shipping name, ar	nd are clas	sified,	package	d		
	and labelled/placarded, and are in all resp according to applicable international a	man with the second of the second			District		
regulation been met	s. I declare that all of the applicable air t	ransport red	quirem	ents have			
2001111100					Signature (See warning above)		
					(CCC marning above)		

(c) The package, showing following marks and labels;



Exercise 3

The following **Limited Quantity** shipment, consisting of:

- > A Shipper's Declaration;
- An extract from the accompanying Air Waybill and
- ➤ A drawing indicating the labels and marks appearing on the package is presented for shipment.

Complete the check list to determine if the shipment is acceptable.

Using the checklist, find all error and missing information shown on (a), (b) and (c).

For exercise purposes Assume Shippers Declaration is in duplicate Explain all the reasons for rejection, and correct it

The check lists used in this book are the same as is published in the current Edition of the IATA Dangerous Goods Regulations.

Routing and operator: Frankfurt to Bahrain on Lufthansa Cargo

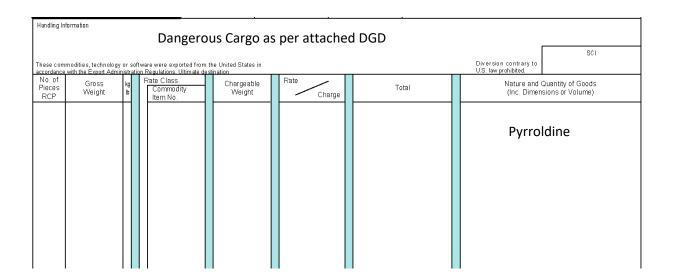
Aircraft type: B777 - Passenger aircraft.

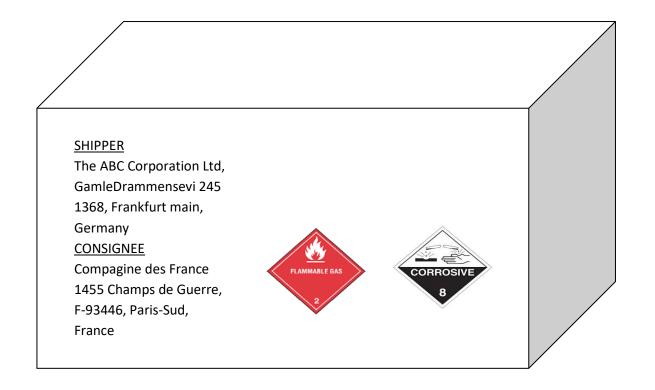
SHIPPER'S DECLARATION FOR DANGEROUS GOODS



			15					274 174
Shipper				Waybill No	Э.			
			Page of Pages					
			Shipper's Reference No.					
Consig	unoo.		(op	tional)				
Collsig	niee							
Two comple	ted and signed copies of this Declaration must be handed to the	operator.	WA	RNING				
TRANS	PORT DETAILS					respects w		
This shipme	nt is within the limitations Airport of Departure	(optional):				tions may be egal penalties.		n of the
prescribed for (delete non-	Dr.							
PASSENGE								
CARGO AIR	CRAFT AIRCRAFT ONLY		_					
Airport o	of Destination (optional):		Sh	_		on-applicable)	_	
NATUR	E AND QUANTITY OF DANGEROUS GO	ODS		NON-RA	DIOACTIVE	RADIOACTI	VE	
	Dangerous Goods Identification	on						
UN or ID No.	Proper Shipping Name	Class or Div (subsidiary h		Packing Group	Quantity and Type of Packing		Packing Inst.	Authorization
 		 	Т	 -				1
4000		4.2		!	40.46		470	
1923 1165	Calcium hydrosulphite Dioxene	4.2		 	18 KG		470 364	
1102	Dioxene	3			25 L Packed i	n a hov	304	
					Q=0.74L			
L	<u> </u>	<u> </u>		<u> </u>	Q=0.74L		i	
Additiona	l Handling Information							
I hereby	declare that the contents of this consignm	ent are full	v and	accurately	/ Name of Sig	gnatory		
described	above by the proper shipping name, ar	nd are clas	sified	packaged	i			
transport	and labelled/placarded, and are in all resp- according to applicable international a	nd nationa	l go	vernmental	Date			
regulation been met	s. I declare that all of the applicable air t	ransport red	quirem	ents have				
					Signature (See warnin	ng above)		

(b) Air Waybill "Handling Information" and Nature and Quantity of Goods Boxes





Exercise 4

Shipment Information

AWB Number: 000- 1234 1232

Routing : RUH (Riyadh) to HKG (Hong Kong)

Carrier : Saudia Airlines

Packages : 2 pieces general cargo and one 4G box

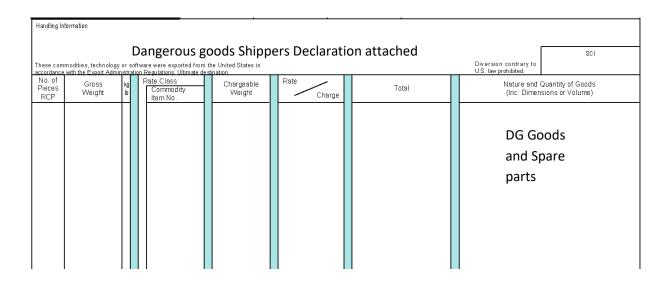
containing DG's

(1L of UN1090, 12kg of UN2713 & 2L of UN3105*)

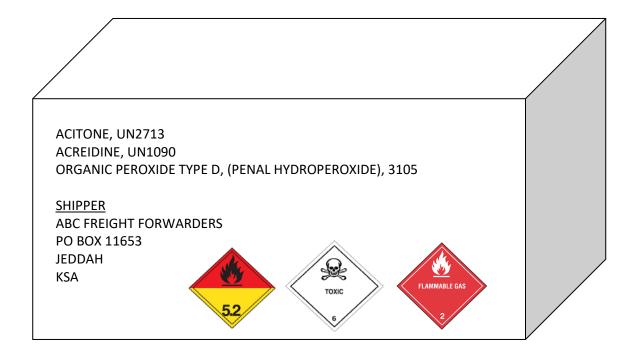
* Technical name - 72% Pinanylhydroperoxide

Emergency Tel: + 971 22 33 44 55

A. The Air Waybill extract shown on this page may contain errors and/or omissions. Correct all errors and/or add missing information



B. The marks and labels of the package shown below may contain errors and/or omissions correct all errors and add missing marks and/ or labels.



SHIPPER'S DECLARATION FOR DANGEROUS GOODS



				T					
Shippe	er			Air Waybill No.					
				Page of Pages					
			Shipper's Reference No.						
					tional)	roronoo rro.			
Consig	jnee								
Two comple	ted and signed copies of this	Declaration must be handed to the	e operator.	WA	RNING				
								***	and the set of se
TRANS	PORT DETAILS						l respects wations may be		
This shipme prescribed f	ent is within the limitations or.	Airport of Departure	(optional):	app	olicable lav	v, subject to le	egal penalties		
(delete non-									
PASSENGE	ERAND CARGO								
CARGO AIR	RCRAFT AIRCRAFT ONLY			-		A100			
Airport o	of Destination (option	nal):		Sh		980	on-applicable,	_	
					NON-RA	DIOACTIVE	RADIOACTI	VE	
NATUR	E AND QUANTITY	OF DANGEROUS GO	ODS						
	Danger	ous Goods Identificati	on						
UN or	Proper Shipping Name	9	Class or Div	vision	Packing	Packing Packing Packing		* * * *	
ID No.			(subsidiary h	azard)	Group	Quantity and	Type of Packing	Inst.	Authorization
1090	Acitone		3		II	1 L		305	
2713	Acridnie		6		li l	12kg		619	
3105	Oranganic perc	xide type D,	5			2L		500	
	1	nyi hydropecide)				All packe	d in one		
		, , , , ,				4G box			
						Q=0.72L			
 	l		-		<u>_</u>	 ~ • • • • • • • • • • • • • • • • • • 			
Additions	 al Handling Information								
7.dditione	in rialianing information								
		ntents of this consignm					gnatory		
		per shipping name, a d, and are in all resp							
transport	according to app	olicable international a	and nationa	l go	vernmental	Date			
regulation been met		of the applicable air	transport red	quirem	nents have				
						Signature (See warnin	ng above)		
						1 (3/4//////	· · · · · · · · · · · · · · · · ·		

<u>Notes</u>	

Module 7 - RADIOACTIVE MATERIALS

7.1 Introduction

What are Radioactive Materials?

These are articles or substances which spontaneously and continuously emit certain types of radiation (ionizing radiation) which can be harmful to health — but which, nevertheless, cannot be detected by any of the human senses (sight, hearing, smell, touch); this radiation can also affect other materials, particularly undeveloped photographic film and undeveloped X-Ray film) — and can be detected, and also measured, with appropriate instruments. It should be noted that appropriate instruments can detect and measure levels of radiation which are far below those which significantly affect health. The radiation is caused by atomic decay or transformation and this is called the activity of the element. The unit to be used is the Becquerel (Bq)

Alpha and Beta radiation have very short range, but can be absorbed by conventional packing materials.

Gamma and X-radiation have theoretically an infinite range, but can be reduced to acceptable levels by high density shielding such as lead. In any case, their effects decline rapidly with distance.

7.2 Units of Measurement

Activity

The activity of radioactive material is a measure of quantity and is used to determine the amount of material allowed to be transported in each package.

The SI unit of activity is the Becquerel (Bq).

The Becquerel is an extremely small unit. The shipper will declare decimal multiples of Becquerel (Bq) such as;

- terabecquerel(TBq)
- gigabecquerel(GBq)
- megabecquerel(MBq)
- Kilobecquerel(kBq)

Example:

```
1TBq = 1,000x 1 = 1000 GBq
```

$$1GBq = 1,000 \times 1 = 1000 MBq$$

$$1GBq = 1 / 1000 = 0.001 TBq$$

$$1MBq = 1/1000 = 0.001 GBq$$

(See DGR: Appendix B.2.2.3)

7.3 Forms - Radioactive materials are delivered to the Carriers in two:

- 1. Special Form (A1)
- 2. Other Form Radioactive Material (A2)

Special Form Radioactive Material (A1) (DGR: Appendix A and 10.3.4)

Special form radioactive material is a description used in the transport of radioactive materials to identify radioactive material which, in effect, is in sealed, integral form; the significance is that, for all practical purposes, such material cannot produce radioactive contamination. Special Form Radioactive material must be accompanied by a competent authority approval.

Other Form Radioactive Material (A2) (DGR: Appendix A and 10.3.91)

Radioactive materials in Liquid, Solid or Gas that does not meet the definition of Special Form Radioactive Material, as specified in DGR: 10.3.4.

7.4 Fissile or fissile excepted

Fissile Material (DGR: Appendix A and 10.3.7)

- Only the following Radionuclides are considered to be fissile:
- -Uranium-233 and -235,
- -Plutonium-239 and-241;

and any mixture containing any one of these.

Fissile excepted (DGR: 10.3.7.2).

Fissile materials can create a chain reaction and the packaging requires special design approval and shipment approval. Certain Uranium's and Plutonium's are fissile materials.

A few number of Uranium's, as ores may also be carried as Low Specific Activity (LSA). Other materials will be declared as Surface Contaminated Objects (SCO).

Low Specific Activity (LSA) Material (DGR: Appendix A and 10.3.5)

Radioactive material which by its nature has a limited specific activity; or radioactive material for which limits of estimated average specific activity apply is classified into one of three groups (LSA-I, II or III).

Surface Contaminated Object (SCO) (DGR: Appendix A and 10.3.6)

A solid object that has radioactive material distributed on its surfaces is classified into one of two groups SCO-I or II).

Low Dispersible Material. (DGR: Appendix A and 10.3.8)

Either a solid radioactive material or a liquid radioactive material in a sealed capsule that has limited dispensability and which is not in powder form.

Note:

Dispersible means capable of being dispersed or scattered over a wide area. Indispersible means not capable of being dispersed or scattered over a wide area.

7.5 Proper Shipping Names (PSNs)

The proper shipping names and UN Numbers for radioactive materials are listed separately in Section 10 of the DGR: (Refer to the DGR: Table 10.4.Aand paragraph 10.4.1)

7.6 Types of Packages

General

The instructions for packaging for radioactive material are specified in DGR: 10.5

The general packing requirements applicable to radioactive material can be found in DGR: <u>10.5.3</u>.

Excepted radioactive material does not require any special packaging. However, the packaging used must meet the general packing requirements applicable to radioactive material as specified in DGR: <u>10.5.3.</u>

The following types of packages are used for radioactive material (10.5.3.11):

- a) Excepted package;
- b) Industrial package of: Type 1, Type 2 or Type 3;
- c) Type A package;
- d) Type B(U) and B(M) packages;
- e) Type C packages.

The packaging for the transport of radioactive material must provide for:

• Containment: Preventing contamination of people and the environment;

- Protection from radiation: The type of packaging depends on the amount and type of radiation (alpha, beta, gamma, neutron);
- Prevention of criticality: A concern when Fissile material is shipped; and
- Protection from internal heat generation.

Excepted Packages (DGR: 10.5.8)

These are radioactive materials in limited quantities, instruments, manufactured articles, articles manufactured from natural uranium or depleted uranium or natural thorium, or empty packages that had previously contained radioactive material, that have such a low activity and radioactive level that they are only subject to the provisions of DGR: 10.5.8.

Excepted packages may only contain quantities of radioactive material which are so small that the potential hazards during transport are insignificant.

There are no test requirements for excepted packages and therefore it must be assumed that in any form of accident the package may fail completely and that the contents may be dispersed. The radiation level at any point on the surface of an excepted package cannot exceed 5pSv/h, to ensure that any radiation dose to members of the public would be insignificant and that any sensitive photographic material in close proximity would not be damaged.

Excepted packages can be any of the following:

- Radioactive Material in Limited Quantities
- Instruments and Manufactured articles in limited quantities
- Articles manufactured of natural uranium, depleted uranium or natural thorium;
- Empty packages having contained radioactive material.

Excepted packages of radioactive do not require:

- Categorization of packages
- Marking and labeling, except that the Radioactive in excepted quantities
 label and if the permissible gross mass must be marked if this exceeds 50kg.
- Shipper's Declaration of dangerous Goods
- NOTOC.

<u>Industrial Package Type 1, 2, 3 (DGR: 10.5.9.3 to 10.5.9.5)</u>

Industrial package Types 1, 2 and 3 (Type IP-1, Type IP-2, Type IP-3) are only used for SURFACE CONTAMINATED OBJECTS (SCO) and LOW SPECIFIC ACITIVITY (LSA) radioactive material. See definitions in <u>DGR: Appendix A.</u>

7.7 Type A Package (DGR: 10.6.2.4)

Type A packages for shipment can be used only, if they do not contain quantities over A1 and A2 as appropriate:

The activity limits which are permissible for a Type A package are defined as:

- A1 value when the radioactive material is in special form and
- A2 value when the radioactive material is in other Forms.

Read the definition for A1 and A2 value in DGR: Appendix A

The calculation of the activity limits will be explained later in this Unit.

These packaging do not normally require government approvals unless they are used for fissile materials. If the radionuclide is in Special Form, a special Form approval certificate is required.

QUANTITY LIMITATIONS — TYPE "A" PACKAGES

Radioactive material may be offered in two forms, either "Special Form", i.e. a radioactive material offered in a sealed integral form which during transport cannot produce radioactive contamination (see <u>DGR: Appendix A</u>) or "Other Form", i.e. in a solid, liquid or gaseous form and the quantity limitations vary accordingly. Activity limits in Type A Packages are given for common radionuclides in DGR: <u>Table 10.3.A.</u> This table shows the limits for Special Form material (A1) and other forms (A2).

A1 and A2 Values for Common Radionuclides

DGR: Table 10.3.A provides the maximum activity limits for Type A packages.

This Table lists the A1 (Special Form) and A2 (Other Form) values in Tera becquerels (TBq), the SI unit.

Examples:

- The maximum activity limit in Type A packaging for Ag-105 in Special Form is 2TBq.
- The maximum activity limit in Type A packaging forAu-194 in Other Form is
 1TBq

Summary:

Type A packages are intended to provide a safe, economical means for transporting relatively small quantities of radioactive material. They are expected to retain their integrity under the kind of abuse considered "normal", i.e. quite likely to occur during transport: falling from surface vehicles or being dropped from similar heights, being exposed to rain, being struck by a sharp object which may penetrate the package or having other cargo stacked on top.

However, it is assumed that Type A packages may be damaged in a severe accident and that a fraction of the contents may be released. Limits are therefore prescribed in the Regulations for the maximum activity of radionuclides that can be transported in Type A packages. These limits ensure that in the event of a release the hazards of external radiation or contamination are low.

7.8 Type B Packages (DGR: 10.6.2.5 and DGR: 10.6.2.6)

Radioactive material with higher activity may be transported in a Type B package. It is required that these Type B packages be able to withstand the effects of severe transport accidents.

Type B packages are used when the activity (quantity) for Type A packages has been exceeded:

- **Type B(U)** packages require the design approval of the government of the country of origin (unilateral approval).
- **Type B(U)** packages designed for fissile material or low dispersible radioactive material require multilateral approval. (DGR: 10.10.2.1.2).
- **Type B(M)** packages require multilateral government design and shipment approval and can only be transported on cargo aircraft (DGR: 10.9.3.3.2 and 10.10.3.1.3)

7.9 Type C Packages (DGR: 10.6.2.7)

The test requirements are more demanding than for a Type B package, e.g. there is an enhanced thermal test and an additional high impact test.

- Type C packages require unilateral design approval of the competent authorities of the state of origin.
- Type C packages designed for fissile material or low dispersible radioactive material require multilateral approval.

Special Arrangement

When the packages are not any of those specified above, the radioactive material can only be transported by special arrangement which requires multilateral government approval (DGR: 10.5.16).

Requirements for packages of Radioactive Material

Type of Packages	Reference
Excepted Packages	10.5.3 and 10.5.8
Type A Packages	10.5.3 and 10.6.2.4
Type B(U) and Type B(M) Packages	10.5.3, 10.6.2.5 and 10.6.2.6
Overpacks of Radioactive Material	10.5.6

7.10 Transport Index

The transport index (TI) is a number expressing the radiation level emitted from a package and is the basis on which a carrier will decide the segregation of radioactive consignments from persons, live animals, undeveloped film and other radioactive materials. Segregation and distance will ensure safety and limit the level of radiation to a safe level for public and transport workers during storage and transport.

Transport Index



- The number given indicates the maximum radiation level (in mrem/hr) at a distance of one meter from the external surface of a package or container. (Readings in mSv/hr are multiplied by 100 to get mrem/hr.) For example, a TI of 3 (as shown above) would indicate that, at one meter from the labelled package, the radiation intensity that can be measured is no more than 3 mrem/hr (0.03 mSv/hr).
- If the radiation level at one meter from a package is found to be higher than the specified value, a radiation authority should be consulted. The package contents might have shifted, shielding might have been breached, or an error might have occurred in packaging or labelling.

The TI is shown only on Category II-Yellow and Category III-Yellow labels.

Category I White label must show only the contents and activity of the package, however, no transport index is required. The radiation level of a Category I white label must not exceed 5pSv/h.

Radiation Labels

- Radioactive White-I
 - Almost no radiation
 0.5 mrem/hr maximum on surface



- Radioactive Yellow-II
 - Low radiation levels
 50 mrem/hr maximum on surface;
 - 1 mrem/hr maximum at 1 meter



- Radioactive Yellow-III
 - Higher radiation levels
 200 mrem/hr maximum on surface;
 - 10 mrem/hr maximum at 1 meter



Note:

Category II-Yellow and Category III-Yellow labels will be discussed later in this Unit.

7.11 Criticality Safety Index (CSI)

The CSI is a number that is assigned to a package, overpack or freight container, containing fissile material (other than fissile exempt). It is a number that is used to provide control over the accumulation of packages, overpacks and freight containers containing fissile material for the purposes of preventing unintentional criticality.

These packages of fissile material will bear the Criticality Safety Index Label.

(See DGR: Figure 10.7.7.4)



TABLE 10.5.C

7.12 Category Determination for Packages, Overpacks and Freight Containers

Transport	Surface Radiation	Category of
index		Label
0*	Up to 0.005 msv/h or 0.5 merm/h	1-White
0.0 to 1.0	More than 0.005 mSv/h (0.5 mrem/h) but not more than 0.5 mSv/h (50 mrem/h)	II-Yellow
1.1 to 10.0	More than 0.5 mSv/h (50 mrem/h) but not more than 2 mSv/h (200 mrem/h)	III-Yellow
More than 10	More than 2 mSv/h (200 mrem/h) but not more than 10 mSv/h (1000 mrem/h)	III-Yelow**

^{*} If the measured TI is not greater than 0.05, the value quoted may be zero in accordance with 10.5.14.1.1(c).

Example:

The radiation level, 1 meter from the surface of a package is 0.025mSv/h (2.5 mrem/h). Therefore, the Transport Index is 2.5 (0.025 X 100 = 2.5).

^{**}Must be transported under exclusive use and special arrangement (see 10.5.16 and 10.5.17 and Table 10.9.B).

7.13 Marking and Labeling

Radioactive Material Categories and Required Labels:

There are three Categories of Radioactive Material.

Transport Index	Maximum Surface Radioactive Level in mSv/h	Category	Label
0 (Zero)	Less or equal to (^) 0.005 mSv/h	I - White	RADIOACTIVE I CONTENTS. TO THE TOTAL TO THE
more than (>) 0 but less or equal to (<) 1	More than (>) 0.005 mSv/h but less or equal to (<) 0.5 mSv/h	II - Yellow	RADIOACTIVE II STORY 7 X2
more than (>) 1 but less or equal to (<) 10	More than (>) 0.5 mSv/h but less or equal to (<) 2 mSv/h	III - Yellow	RADIOACTIVE III

Criticality Safety Index (CSI) Label

This label is only used for packages containing fissile material. The Criticality Safety index is stated on the certificate of approval for special arrangement or for the package design issued by the competent authority.



Marking of Radioactive Material packages

Markings of Radioactive material packages also can be divided into two types.

- 1. Packaging Use Markings
- 2. Package Specification Markings (IAEA markings)

Packaging Use Marking Requirements

As a minimum each package must be clearly marked to show:

- The proper shipping name(s) of the item;
- The applicable UN Number preceded by the prefix UN;
- The full Name and Address of the Shipper and the Consignee; and Other package use marking, as applicable:
- The permissible gross weight if this exceeds 50 kg (110 lb). This weight may be greater than the actual weight of the package. The reason for

- this marking is to facilitate safe handling by ensuring that floor, vehicle and/or crane loading limits are not exceeded;
- When Carbon dioxide, solid is used as a refrigerant, the additional marking requirements of DGR: 7.1.5.1 (d) is required.

Packaging Specification Markings for Type A packages

Type A packages are marked:

- Type A
- International vehicle registration code (VRI Code) for country of design
- Name of manufacturer or other identification of the packaging specified by the competent authority.

For type B (U) Type B (M) and Type C packages

These packages are marked:

- Type B(U), Type B(M) or Type C as applicable.
- The identification mark allocated to the design by the competent authority
- A serial number uniquely identifying each packaging conforming to that design.
- A trefoil symbol embossed, stamped or otherwise resistant to the
 effects of fire and water, on the outermost surface of the packaging that
 is resistant to fire and water. This may not be the external surface of the
 package as presented for transport.

Overpack Markings

As a minimum an overpack containing radioactive material must be marked according to the following guidelines:

- Unless all markings and labels representative of all dangerous goods in the overpack are clearly visible, the overpack must be marked with the word "Overpack", the proper shipping name, UN number, other package use markings as required by 10.7.1 and labels as required by 10.7.2 for each item contained in the overpack. These must be reproduced on the outside of the overpack;
- Packaging specification markings need not be reproduced on the overpack. The "Overpack" marking is an indication that packages contained within comply with prescribed specifications.

Determination of the Category Label

The proper label to affix to a package of radioactive material is based on the radiation level at the surface of the package and the transport index. The proper category of label is determined according to Table 10.5.C.

- Determine the maximum radiation level at a distance of 1 meter from the external surfaces of the package, overpack or freight container.
- The value determined must be multiplied by 100.
- The figure obtained must be rounded up to the first decimal place
- A value of 0.05 or less may be considered as 0 (zero)

Apply the highest category label required for any of the two.

Radioactive Category I-White = lowest category

Category III-Yellow = highest category

Example: a package with a transport index of 0.8 and a maximum surface radiation level of 0.6 mSv/h (60 mrem/h) must have a Category III-Yellow label

7.14 Affixing Radioactive Material Labels

Each package requiring a "RADIOACTIVE" label must have two of these labels affixed to opposite sides of the package.

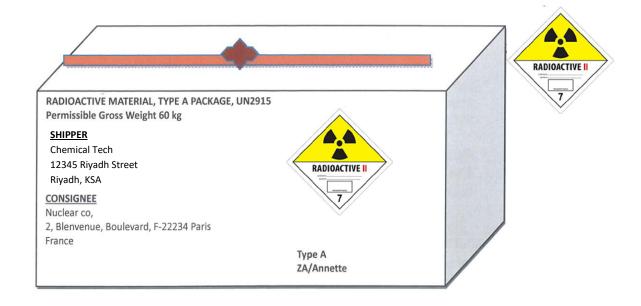
All labels must be securely affixed or printed on the packaging so that they are completely visible and not obscured by any part of the packaging or by any other label.

Radioactive material labels must be affixed as follows:

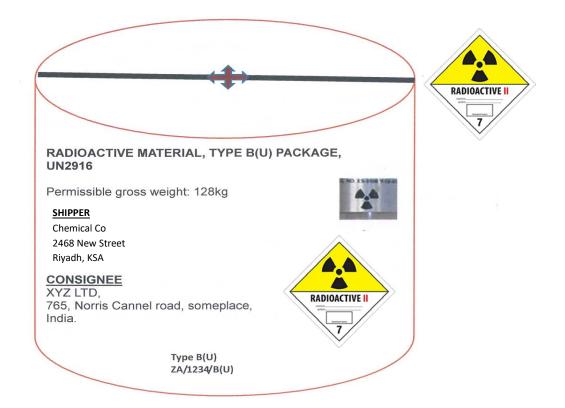
- On packages: 2 identical labels affixed to opposite sides
- On containers: 4 identical labels affixed to all four sides
- On cylinders: 2 identical labels affixed opposite to each other
- On a rigid overpack: 2 identical labels affixed to opposite sides
- On a non-rigid overpack: At least 1 label affixed by a securely attached durable tag

Example for marking & labeling for type A package

Transportation Seal (10.6.2.4.1.2)



Example for marking & labeling for type B(U) package



For Marking and Labeling Radioactive Material. Cross Check the Following:

Markings and Labels	When required	DGR References
1.		
Packaging Use Marking requirements;	For all packages and overpacks containing radioactive material.	10.7.1.2,10.7.1.3.1
		& 10.7.1.4
Proper shipping name UN number.	(Excepted packages only require the UN number)	10.7.1.3.2
number.	number)	
Name and address of	When gross weight exceeds 50kg.	
shipper and consignee.		10.7.1.3.1&
The permissible gross weight		10.7.1.3.2

Carbon dioxide, solid dry ice	When carbon dioxide solid, is used as a refrigerant	10.7.1.3.2
2.Specification or other markings		
Excepted Packages	For excepted packages	10.7.1.3.2
Industrial Packages	Type IP-1, Type IP-2, Type IP-3	10.7.1.3.3
For Type A	For Type A packages;	10.7.1.3.4
For Type B(U) or B(M) Type C	For Type B(U) and Type B(M) packages; For Type C packages	10.7.1.3.5
On Overpacks	For Overpacks	10.7.1.3.5
3. Hazard Labels	For all packages and overpacks containing radioactive material, other than the excepted packages.	DGR: 4.2 Column D (and, if applicable) 10.7.3.1 to 10.7.3.3.
4. Cargo Aircraft Only label	For Type B (M) packages and freight containers containing such Type B(M) containers.	10.7.4.4.1

7.15 Documentation (DGR: 10.8)

Completion of the Shipper's Declaration for Dangerous Goods DGR: 10.8.3 Instructions to complete the Declaration Form.

As a rule, Radioactive Material must not be included on the same declaration as other dangerous goods except for Carbon dioxide (dry ice) when used as a refrigerant. Since we know how to prepare the shipper's declaration form for non-radioactive shipments, this will become very easy for you to prepare the dangerous goods shipper's declaration for radioactive shipment.

On the DGD, from shipper's address up to nature and quantity column packing group it's similar to non-radioactive shipments. However, except the Type B (M) radioactive materials, all the other radioactive materials are acceptable for passenger aircraft provided that the enough space or distance is available to load it. *Type B (M) radioactive materials are only allowed to load on cargo flights.*

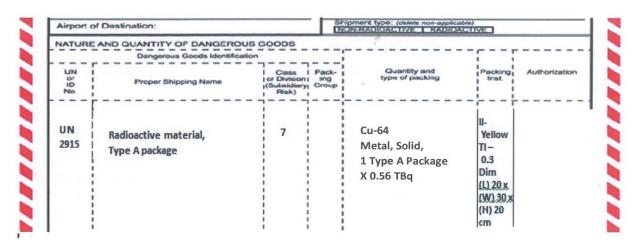
Also, in shipment type box column, delete the "Non-Radioactive" material to indicate that the contents are radioactive materials.

Complete the Quantity and Type of Packing. (DGR: 10.8.3.9.2)

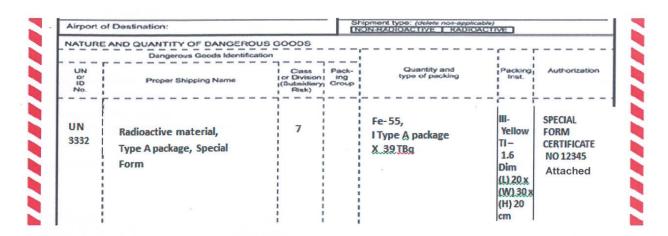
- a) Name or Symbol of each radionuclide(s)
- b) A description of the physical and chemical form of the material, or a notation that the material is Special Form radioactive material (not required for UN 3332 and UN 3333) or low dispersible material. A generic chemical description is acceptable for chemical form;

Number of packages, their type of package and activity in Becquerel (units used must be clearly indicated) of the radioactive contents in each package, including packages in overpacks.

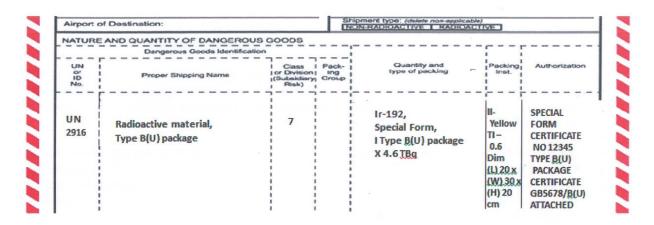
e.g.; Type A Package Other Form



E.g. Type A Package, Special Form

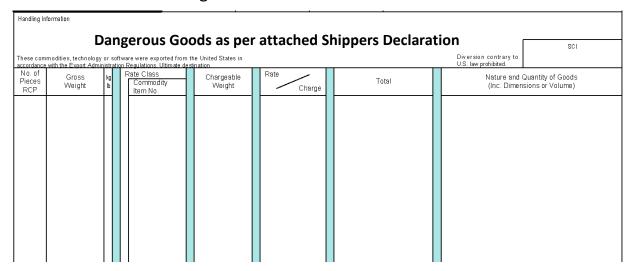


Eg. Type B(U), Special From package,



7.16 Completion of the Air Waybill (DGR:10.8.8)

The Air waybill must be completed in the usual manner and must contain the DG statement in the handling box



7.17 Loading and Stowage of Radioactive Material

Segregation must be done in accordance with the table listed in the current edition of the IATADGR: (Section 10.9.2 and 10.9.3).

Radioactive material in Categories I-White, II-Yellow or III-Yellow must not be loaded in a compartment occupied by passengers or crew. To keep exposure to radiation as low as reasonably achievable, packages of radioactive material should

be loaded on the floor of under-floor compartments or in the furthermost end of the main deck compartments. In addition, when loading radioactive material, the following should be taken into consideration:

- When the material is awaiting loading, ensure appropriate segregation is maintained.
- Load the material last whenever possible.

"Transport Index" is a convenient unit for indicating the radiation level of a package containing radioactive materials. It is used for controlling the accumulation of such packages that may be loaded on an aircraft. The Transport Index is shown on Radioactive Category II-Yellow and Category III-Yellow labels.

Packages labelled Category I-White may be loaded in unlimited quantities with no separation requirements. These shipments do not have a Transport Index.

Packages labelled as Category II-Yellow or Category III-Yellow must be separated from the passenger cabin and flight deck. The Transport Index appearing on the label determines the separation distance. The required separation distances for radioactive packages based on their Transport Index, appear in DGR: 10.9.C/D

Packages containing fissile material, which are rarely transported by air, must also bear a label identifying the Criticality Safety Index (CSI). The CSI is assigned to a package, overpack or freight container containing fissile material (other than fissile exempt). It is a number that is used to provide control over the accumulation of packages, overpacks and freight containers containing fissile material.

TABLE 10.9.C. Separation of Radioactive Material — Passenger and Cargo Aircraft

Total Sum of	Minimum
ті	Distance ¹
1.0-0.1	0.30
2.0- 1.1	0.50
3.0- 2.1	0.70
4.0 - 3.1	0.85
5.0 – 4.1	1.00
6.0- 5.1	1.15
7.0- 6.1	1.30
8.0 – 7.1	1.45
9.0 - 8.0	1.55
10.0 - 9.1	1.65
11.0-10.1	1.75
12 - 11.1	1.85
13.0- 12.1	1.95
14.0 – 13.1	2.05
15.0 – 14.1	2.15
16.0- 15.1	2.25
17.0 – 16.1	2.35
18.0-17.1	2.45
19.0 – 18.1	2.60
20.0- 19.0	2.90
30.1 - 25.1	3.20
35.0 – 30.1	3.50
35.1 – 40.0	3.75
45.0 – 40.1	4.00
50.0 – 45.1	4.25

(1): If more than one package, overpack or freight container is placed in the aircraft, the minimum separation distance for each individual package, overpack or freight container must be determined in accordance with the this table, on the basis of the sum of the transport indices of the individual packages, overpacks or freight containers. Alternatively, if the packages, overpacks or freight containers are separated into groups, minimum distance from each group to the nearest inside surface of the partitions or floors of the flight deck or other areas occupied by personnel is the distance applicable to the sum of the transport indices within the individual groups, provided that each group is separated from each other group by at least three times the distance applicable to the one that has the larger sum of transport indices.

Note:

For larger sums of transport indices, to be carried by cargo aircraft only, see DGR: Table 10.9.D

Operators are required to provide information, in the operations and/or other appropriate manuals, with regard to:

(a)details of the location and identification of cargo holds. This should also include the dimensions of the holds; and

(b)Instructions on the loading of radioactive material, based on the requirements of DGR 10.9.3

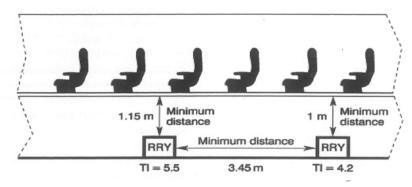
Example:

Package 1 = 5.5 Tl

1= needs 1.15m separation from the top of the package to the nearest inside surface of the floor of the aircraft cabin. If the height of package 1 is 50 cm, then the cargo hold must be at least 1.65 m high. i.e. 1.15 m + 50 cm

Package 2 = 4.2 Tl

= needs 1.00 m separation from the top of the package to the nearest inside surface of the floor of the aircraft



- Package 1 has the larger sum of Tls.
- Therefore, the minimum distance between Package 1 and Package 2

=1.15x3 =**3.45 Meters**

Review Exercises for Radioactive Material (DGR: Section 10)

	_
Exercise	1
LACI CISC	_

1. The definition of Activity is:
2. The definition of Special From Radioactive Material is:
3. What three items must be entered on a Yellow-II or Yellow-III Label?
4. In addition to the mandatory markings, what additional markings are required on a Type A package?
5. List the number of Radioactive Materials labels required on package and their location:

6. List the three categories of Radioactive Materials:
7. Is a package containing the following radioactive isotopes acceptable?
(a) Rh-105, Type A, Other Form, activity per package: 980 GBq
(b) Ce-139, Type A, Other Form, activity per package: 900 000 MBq
8. Determine the PSN and UN No for the below radionuclides
(a) Au-195 Type A, Special From – activity 8 TBq
UN No:
PSN:
(b) Cu-64 Type A Other From – activity 0.8 TBq
UN No:
PSN:
(c) IR -192 Type B(U) Special Form — activity 2.5 TBq
UN No:
PSN:

9. Determine in the "Category" for the below Radioactive Materials items

TI	Surface Radiation	Category
0.0	0.05 msv/h	
0.2	0.46 msv/h	
0.8	0.67 msv/h	
0	0 msv/h	

10. If the radiation level 1 meter from a package is 0.00346 msv/h, what is it Transport Index?
11.If the surface radiation from any point of the above package is 0.6405 mSv/h. What is the category of the label?

12.In what subsection of the regulations are the radioactive material documentation requirement found?

13. In addition to the AWB and DGD, indicate which documents are required for the following radioactive material consignments:

Туре	Name of the certificate (s)	DGR Reference
Type A – Special Form (A ₁)		
Type B(U) Package Special Form		
Type B (M) package – Fissile		

14. Indicate which documents are required fo	r the following radioactive material
consignments:	

a)	Α	Type	A package	containing	Ir-192 in	special	form
----	---	------	-----------	------------	-----------	---------	------

b) A Type B(U) package containing Co-60 in special form.

Exercise 2

1. The following shipment consisting of radioactive materials is delivered for transport by passenger aircraft from Riyadh to Johannesburg, South Africa.

The Air Waybill Number is - 607-7700 0000.

Shipper: ABC Chemical Company Ltd.

P.O. Box 49993, Old Airport Road,

Riyadh, KSA. Tel; 009662 505 1234

Consignee: Isotope Inc.

Longbank.187 Bree street- Johannesburg,

South Africa.

Contents : Caesium 129 in solid metal

("Other") form

Activity : 3TBq

Surface radiation level from any point any point: 0.569 mSv/h

Radiation level from 1 m :0.006mSv/h

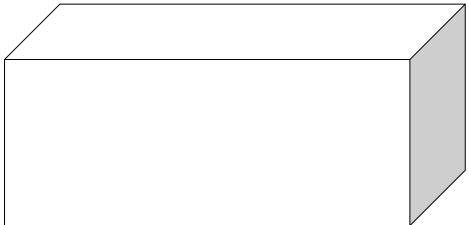
Permissible gross weight :58 kg

Package :Type A

Specification Marking :GB/TUA1236

Dimensions : $(L)60 \times (W) 40 \times (H)30 \text{ cm}$

- A) Show the markings and labels required on the Type A box.
- B) As Mr. Farooq Mohd, Shipping Manager of Maximus Airlines Complete the Shipper's Declaration for Dangerous Goods



HIPPE	R'S DECLARATION FOR DANGE	ROUS GOOD						IATA
mppe	•		5 30000	Vaybill N				
			Pag		Pages			
				onal)	erence No.			
Consig	nee							
wo comple	ted and signed copies of this Declaration must be handed	to the operator	WAI	RNING				
BANG	PORT DETAIL 9		Falle	ire to c	omply in all	respects w	ith the a	pplicable
TRANSPORT DETAILS This shipment is within the limitations prescribed for: (delete non-applicable) PASSENGERAND CARGO					oods Regulat , subject to le		In bread	h of the
ARGO AIR	CRAFT AIRCRAFT ONLY		Chi	nmont tu	an: (doloto no	n anniinahia)		
Airport o	of Destination (optional):		Shipment type: (delete non-applicable) NON-RADIOACTIVE RADIOACTIVE					
IATUR	E AND QUANTITY OF DANGEROUS	GOODS						
	Dangerous Goods Identifi	cation						
JN or D No.			ivision Packing hazard) Group		Quantity and Type of Packing Inst.		Authorization	

2. The following shipment consisting of dangerous goods is delivered for transport from Riyadh, KSA to Sydney, Australia.

Air Waybill number : 111-5432 2345

Shipper'sAddress : ABC

KSA.

Consignee's Address : XYZ Power, 112 Hyde Park Road,

Kiwiville,

Sydney, NSW 2000, AUSTRALIA

Contents : Cobalt (Co-60) is in Special form,

Special form certified under : GB/2100/s

Package : One Type B(U) steel drum

Certified under : GB/12345 B(U)

Activity : 2.5 Tbq

Surface radiation level from any : 0.691 mSv/h

point

Radiation level from 1 m : 0.0086 mSv/h

Permissible gross Weight

Dimensions : 165 Kg

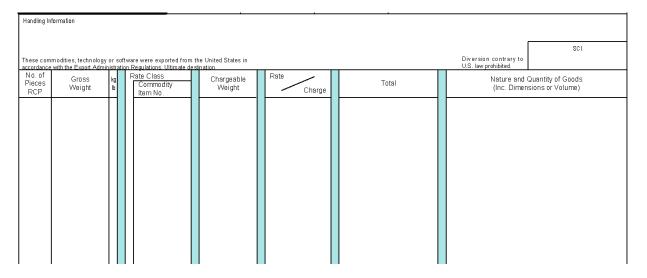
: (L)33cm x (W)33 cm x (H) 50 cm

- (a) Complete the Air Waybill extract reproduced on the next page.
- (b) As Mr. Abdul Wagied, Shipping Manager of ABC Nuclear plc, complete the Shipper's Declaration for Dangerous Goods
- (c)Show all the required Marks and labels on the package.

Note:

All required competent authority certificates are valid and attached to the Shipper's Declaration

(a) Air Waybill



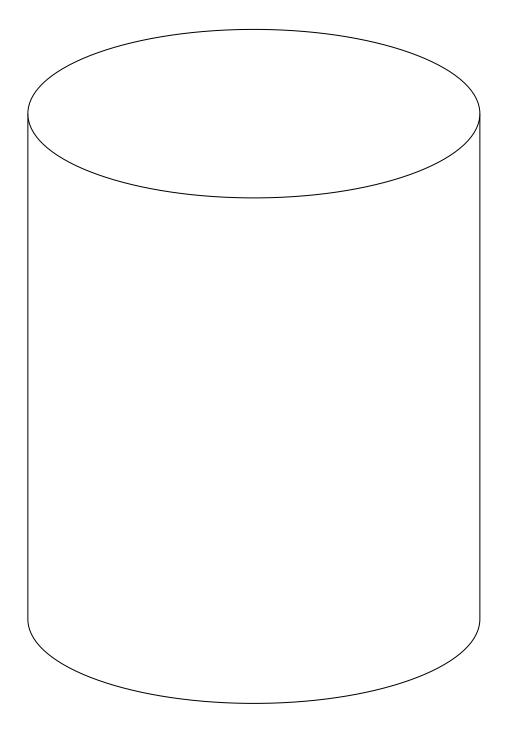
(b) Shipper's Declaration for Dangerous Goods



SHIPPER'S DECLARATION FOR DANGEROUS GOODS

Additional Handling Information I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable air transport requirements have	Shipper				Air Waybill No. Page of Pages Shipper's Reference No.					
TRANSPORT DETAILS Airport of Departure (optional): PASSENGERAND ACROD AND ARROWN ARROWN ARROWN TO ANY ARROWN TO ANY ARROWN TO ANY ARROWN ARROWN ARROWN ARROWN ARROWN ARROWN TO ANY ARROWN AR					(opt	ional)				
TRANSPORT DETAILS The shipment is within the industors prescribed for: (delete non-applicable) Mirport of Departure (optional): Mirport of Destination (optional): MATURE AND QUANTITY OF DANGEROUS GOODS To Dangerous Goods Identification UN or ID No. Proper Shipping Name Class or Division (oubsidiary hexard) Class or Division (oubsidiary hexard) Class or Division (oubsidiary hexard) Authorization A	Consig	nee								
Dangerous Goods Regulations may be in breach of the applicable Shipment type: (delete non-applicable)	Two completed and signed copies of this Declaration must be handed to the operator.									
Additional Handling Information Additional Handling Information Inf	TRANSF	PORT DETAILS								
Additional Handling Information Packing Inst. Name of Signatory Marked and labelled/placerded, and are in all respects in proper condition for transport according to applicable international and national governmental requirements have Date D	prescribed fo	prescribed for:		optional):						
Additional Handling Information Additional Handling Information (optional): Shipment type: (delete non-applicable)	PASSENGE	RAND CARGO								
NATURE AND QUANTITY OF DANGEROUS GOODS Dangerous Goods Identification			asl).		Shi	ipment tyr	oe: (delete no	on-applicable)		
Dangerous Goods Identification UN or ID No. Proper Shipping Name Class or Division (subsidiary hazard) Group Class or Division (subsidiary hazard) Group Quantity and Type of Packing Inst. Authorization Authorization Authorization Authorization Additional Handling Information I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable in international and national governmental regulations. I declare that all of the applicable air transport requirements have	Allpoit o	Destination (option	ial).							
UN or ID No. Proper Shipping Name Class or Division (subsidiary hazard) Group Quantity and Type of Packing Inst. Authorization Authorization Additional Handling Information I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. I declare that all of the applicable air transport requirements have	NATURE	AND QUANTITY	OF DANGEROUS GO	ODS			,			
Additional Handling Information I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable air transport requirements have		Danger	ous Goods Identification	on						
I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. I declare that all of the applicable air transport requirements have		Proper Shipping Name				- Quantity and Type of Packing		Authorization		
I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. I declare that all of the applicable air transport requirements have	Additional	Handling Information								
described above by the proper shipping name, and are classified, packaged marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. I declare that all of the applicable air transport requirements have	Additional	Handling Information	i							
Signature (See warning above)	described marked a transport	above by the pro and labelled/placarde according to app s. I declare that all	per shipping name, an d, and are in all respe licable international ar	d are clas ects in prop nd nationa	sified, per co I gov	packaged ondition for vernmental	Date Signature			

(c) Show all the required marks and labels.



3. The following shipment consisting of radioactive materials is delivered for transport by passenger aircraft from Abu Dhabi to Johannesburg, South Africa.

The Air Waybill Number is - 607-7700 0000.

Shipper : ABC Chemical Company Ltd.

P.O. Box 49993, Old Airport Road

Riyadh - KSA

Tel; 009662 5051234

Consignee : Isotope Inc.

Long bank, 187 Bree Street

Johannesburg, South Africa.

Contents

Activity : Mo-99, in Special Form

Transport Index : 600 Gbq

Surface radiation Level (External : 0.3 TI

Surface)

Packages : 1.5 msv/h

Special Form Certificate No : 1Type A package

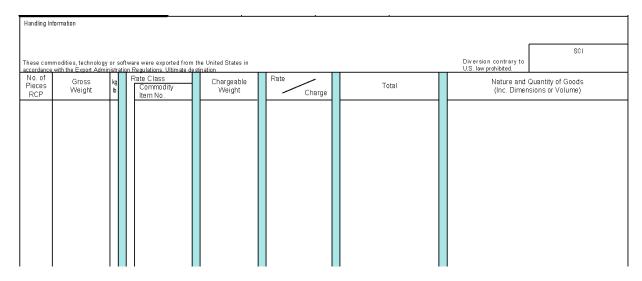
Dimensions : ZA/NNr-1213-A

Package : (L) 40 x (W)40 x (H) 35 cm

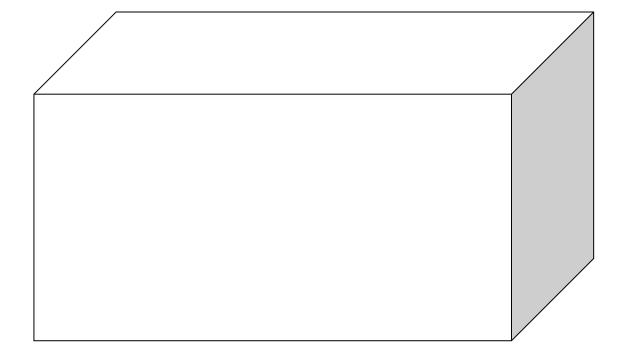
Specification Marking : Type A

: GB/TUA 1236

- (A) Complete the AWB extract reproduced below:
- (B) Show the markings and labels required on the Type A box.
- (C) Complete the blank Shipper's Declaration for Dangerous Goods.
- (a) Air Waybill



(b) Markings and Labels



(C) Complete the DGD

SHIPPER'S DECLARATION FOR DANGEROUS GOODS



Shippe	r			Air \	Vaybill N	0.			
			Page of Pages						
				Shipper's Reference No.					
Tile Saabke 1 of the Association could	61200000000			(opt	ional)				
Consig	nee								
Two complet	fed and signed copies of this i	Declaration must be handed to the	operator.	WA	RNING				
TRANS	PORT DETAILS			Faile	ure to co	omply in all	respects wi	th the a	pplicable th of the
This shipmer	nt is within the limitations	Airport of Departure (optional):				gal penalties.	III DIOU	
(delete non-									
PASSENGE	RAND CARGO	-							
CARGO AIR	CRAFT AIRCRAFT ONLY					Section and a section of	The second se		
Airport o	f Destination (option	nal):		Shi		7 (4.5)	n-applicable)		
NATURI	F AND QUANTITY	OF DANGEROUS GO	ODS		NON-RA	DIOACTIVE	RADIOACTIV	/E	
TO TO TO	- AIID GOAITIII	or partocitodo do					7		
	Danger	ous Goods Identification	on						
UN or ID No.	Proper Shipping Name		Class or Div	Quantity and Type of Pack		Type of Packing	Packing Inst.	Authorization	
Additiona	l Handling Information	r.							
Lhereby	declare that the so	ntents of this consignme	ent are full	v and	accurately	, Name of Sig	natory		
described	above by the pro	per shipping name, an	d are clas	ssified,	packaged	d l			
transport	according to app	d, and are in all respo dicable international a	nd nationa	d gov	ernmental	Date			
regulation been met.	s. I declare that all	of the applicable air t	ransport red	quirem	ents have				
2.7.1.11100						Signature (See warnin	g above)		

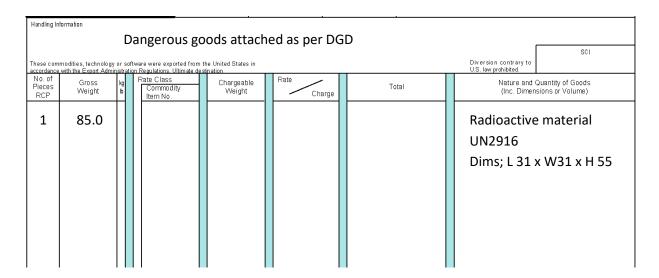
4. Activity

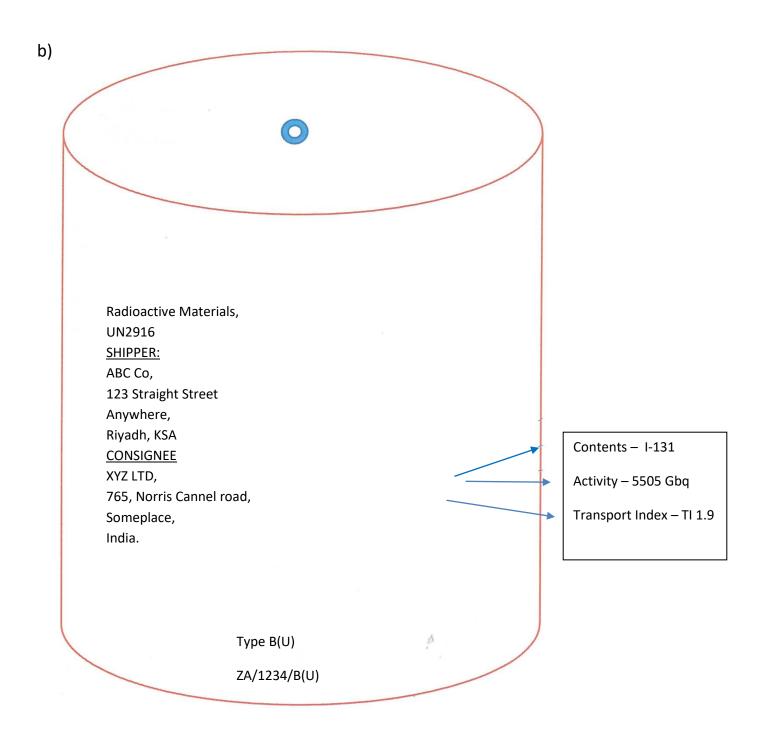
Check list usage for radioactive material.

Following shipment Consist of;

- a) An extract from the accompanying Airwaybill.
- b) A drawing indicating the marks and labels appearing on the package.
- c) A completed shipper's declaration by the shipper

a)





SHIPPER'S DECLARATION FOR DANGEROUS GOODS



				i i					-,0,0,-,0,0,
Shippe	r			Air \	Waybill No	D.			
				Pag	je of	Pages			
				Shipper's Reference No. (optional)					
Consig	nee			(S)					
Two complet	ted and signed copies of this t	Declaration must be handed to the	operator.	WA	RNING				
2227 272727272				Failu	ure to co	omply in all	I respects w	ith the a	applicable
2754752.000 30742527000	PORT DETAILS	Aire art of Danastura (antion a D.	Dan	gerous G	oods Regula	itions may be egal penalties.	in bread	
This shipmer prescribed fo	nt is within the limitations or:	Airport of Departure (optional):	арр	ileable law	, subject to it	egai periantes.		
(delete non-a	applicable)								
PASSENGE CARGO AIR									
Airport o	f Destination (option	nal):		Shi	ipment typ	oe: (delete no	on-applicable)		
	50.00 Sp.	**			NON-RA	DIOACTIVE	RADIOACTIV	VE	
NATURI	E AND QUANTITY	OF DANGEROUS GO	ODS						
	Danger	ous Goods Identification	on						
UN or	Proper Shipping Name		Class or Div	vision Packing Quantity and Type of Packing Packing Author					Authorization
ID No.			(subsidiary h	nazard) Group		additity and Type of Facting		Inst.	Authorization
Addition	Lunding Information								
Additiona	l Handling Information								
		ntents of this consignme					gnatory		
		per shipping name, an d, and are in all respe				r .			
transport	according to app	licable international ar of the applicable air to	nd nationa	l gov	ernmental	Date			
been met.		a applicable dil ti		74 0111		Signature			
						(See warnin	ng above)		

Exercise 3

1. Can the following package of radioactive material loaded?

The height of the package is 65cm and the TI is 3.6. The height of the cargo compartment from its floor to the floor of the passenger cabin is 1.25m.

Explain your answer:			

2. Calculate the minimum distance required between the following radioactive packages:



Explain your	ranswer:			

<u>NOTES</u>			
_			
_			
_			

Module 8 - EXCEPTED QUANTITIES

8.1 Dangerous Goods in Excepted Quantities (DGR: 2.6)

Dangerous Goods in Excepted Quantities are very small quantities of certain classes of dangerous goods that are allowed in non-specification packaging without a Shipper's Declaration.

When transporting, regulations exempt them from the usual requirements for documentation, hazard labels, and segregation in loading and even NOTOC.

An alphanumeric code can be found in column "F" of the DGR: 4.2 List of Dangerous Goods (blue pages) for the items which may be carried as "excepted quantities" and then referring to the below table, the shipper can determine whether or not to ship his article or substance under this provision.

8.2 Table 2.6.A (Excepted Quantity Code for Table 4.2 - Blue Pages)

Code	Maximum Quantity per Inner Packaging	Maximum Quantity per Outer Packaging		
EO	Not permitted as Excepted Quantity			
E1	30g/30ml	1kg/1L		
E2	30g/30ml	500g/500 ml		
E3	30g/30ml	300g/300 ml		
E4	1g/1ml	500g/500 ml		
E5	1g/1ml	300g/300 ml		

Any incident involving leakage or spillage of a package containing excepted quantities of dangerous goods must be reported, therefore, each package is labelled with a special red hatched label (as shown below) for ease of identification.

8.3 Excepted Quantity Package Mark



8.4 Transporting Dangerous Goods in excepted quantities

List of Steps:

- Step 1 Check DGR4.2 List of Dangerous Goods:
 Column F for EQ code assigned to each DG.
- Step 2 Check Table 2.6.A for maximum quantity of Excepted Quantities allowable per code
- Step 3 Check Table 2.6.A for the most restrictive code per outer packaging if Dangerous Goods assigned different EQ Codes are packaged together
- Step 4 Check for compatibility when packing using Table 9.3.
- Step 5 Marking and Documentation

When a package contains dangerous goods in excepted quantities that are assigned different codes, the maximum total quantity per outer packaging must be that of the most restrictive code.

Eg. UN 1088 Acetal: E2 = Max net qty 500 ml

UN 2273 2-Ethylaniline: E1 = Max net qty 1.0 L

UN 1565 Barium cyanide: E5 = Max net qty 300ml

The most restrictive code - E5

Therefore, outer package must not contain more than 300ml or 300g

De-Minimis Quantities

Dangerous goods that are assigned codes E1, E2, E4 or E5 in Column F of Table

- 4.2 are not subject to these Regulations when carried as cargo provided that:
- (a)The maximum net quantity of material per inner packaging is limited to 1ml for liquids and gases and 1g for solids;
- (b)The provisions of 2.6.5 are met, except that an intermediate packaging is not required if the inner packagings are securely packed in an outer packaging with cushioning material in such a way that, under normal conditions of transport, they cannot break, be punctured, or leak their contents; and for liquid dangerous goods, the outer packaging contains sufficient absorbent material to absorb the entire contents of the inner packagings;
- (c)The provisions of 2.6.6 are complied with; and
- (d)The maximum net quantity of dangerous goods per outer packaging does not exceed 100 ml for liquids and gases or 100 g for solids.

Review Questions for Excepted Quantities

1. Refer to the list of Dangerous Goods (DGR: below may be treated as "excepted quantities	•
(a) UN2076, Cresols, liquid	
(b) UN1708, Toluidines, liquid	
(C) UN1071 Oil gas, compressed	

2. Referring to the DGR: 2.6 and 4.2, complete the below table for an excepted quantity package:

Total Quantity to be shipped in one package	UN Number	Proper Shipping Name	Maximum net Quantity per Inner Packaging	Maximum net quantity per outer packaging	Allowed/ Not allowed (Yes or No)
330 ml	UN 1090	Acetone			
2 Kg	UN 1451	Caesium			
		Nitrate			
250 g	UN 3316	First Aid Kit			
650 ml	UN 1155	Ethyl Ether			
600 ml	UN 1547	Aniline			

3. A checklist is required for shipment of Excepted Quantities

TRUE	FALSE

4. Can the UN1061 be sent as Excepted Quantity?

Yes / No ______

5. An overpack containing excepted quantity may also contain other package of dangerous goods.

TRUE	FALSE

6. Which 2 package tests will need to be performed with a prototype intended for use as Excepted Quantities?

a).

b).

DGR REF:____

7. When sending a shipment under Excepted Quantity, NOTOC is not required.

TRUE FALSE

8. Complete the mark reproduces below for "Dangerous Goods in Excepted Quantities" for the following shipment:

Shipper Name : Jakes Gowala, Shipping Manager, P.O.Box;

12456, Riyadh - KSA.

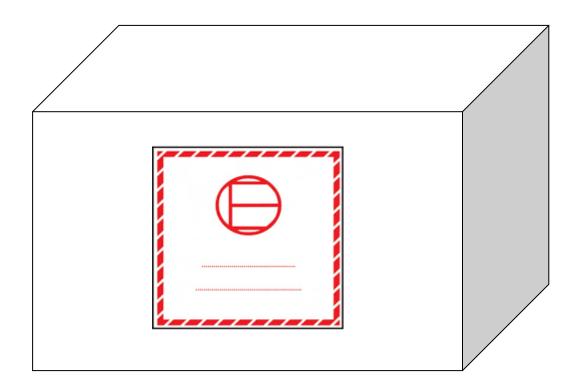
PSN : Acetal

PG : II

Outer Package : 1 x Fiberboard box

Actual net quantity : 20 ml

Date of dispatch : Today



<u>NOTES</u>		

Module 9 - DANGEROUS GOODS HANDLING

9.1 Storage and Loading (DGR: 9.2 and 9.3)

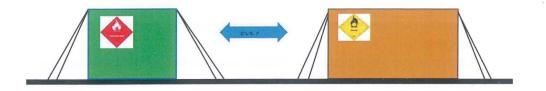
General

Dangerous goods are packaged to prevent the release of the contents in conditions normal to air transport. However, conditions normal to air transport rely on proper warehouse storage and handling and correct loading on to aircraft floor or Unit Load Devices. If handled improperly, the packaging containing dangerous goods may fail.

The following aspects must be addressed to ensure proper storage and handling of packages containing dangerous goods inside the warehouse and when being loaded on, or unloaded from, an aircraft:

- Protect from damage;
- Inspection; and
- Handling of self-reactive substances.

9.2 Securing and separating Dangerous Goods



When loaded in an aircraft compartment or ULD, packages containing dangerous goods must be protected from damage and secured to prevent displacement in flight or allow packages to move.

The rules of load distribution and restraint that apply to general cargo, apply equally to dangerous goods - particularly to large packages, drums containing

liquid dangerous goods, and cylinders of compressed gases.

When loading dangerous goods, the following conditions must be considered to

ensure they are carried safely:

Segregation;

Restraint;

Shoring requirements;

• Commodity specific requirements

9.3 Loading – DGR: 9.3

Incompatible Dangerous Goods - DGR: 9.3.2

Packages containing dangerous goods, which might react dangerously with each other, must not be stowed on an aircraft (or in a warehouse) next to each other, or in such position that would allow interaction between them in the event of a leakage.

J

As a minimum, the segregation indicated by table 9.3.A must be followed.

An "X" indicates at the inter-section of row and column, the classes which must be separated from each other.

209

9.4 Segregation of Packages

DGR: TABLE 9.3.A

Hazard Label	1 excl . 1.4S	2.1	2.2	3	4.1	4.2	4.3	5.1	5.2	8	9 see 9.3.2.1.3
1 excluding 1.4S	See9.3.2.2.5	х	x	х	Х	x	х	x	Х	х	Х
2.1	Х	-	-	-	-	-	-	-	-	-	Х
2.2, 2.3	Х	-	-	-	-	-	-	-	-	-	-
3	Х	-	-	-		-	-	х	-	-	Х
4.1	Х	-	-	-	-	-	-	-	-	-	Х
4.2	х	-	-	-	-	-	-	Х	-	-	-
4.3	х	-	-	-	-	-	-	-	-	Х	-
5.1	х	-	-	Х	-	Х	-	-	-	-	Х
5.2	х	-	-	-	-	-	-	-	-	-	-
8	х	-	-	-	-	-	х	-	-	-	-
9see 9.3.2.1.3	х	Х	-	х	Х	-	-	х	-	-	-

[&]quot;X" = Indicates that packages must be segregated.

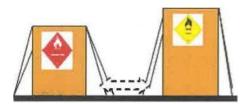
Important:

Division 1.4S, and Classes 6, 7 and 9 (other than lithium batteries) are not included in Table 9.3. Aas they do not require segregation from other classes of dangerous goods.

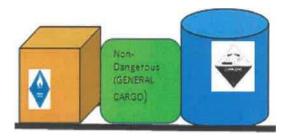
[&]quot;—" = Indicates that packages do not require segregation.

9.3.2.1.3 Packages and overpacks containing lithium ion batteries prepared in accordance with Section IA or Section IB of PI 965 and packages and overpacks containing lithium metal batteries prepared in accordance with Section IA or Section IB of PI 968 must not be stowed on an aircraft next to, or in a position that would allow interaction in the event of damage/fire with packages or overpacks containing dangerous goods which bear a Class 1, other than Division 1.4S, Division 2.1, Class 3, Division 4.1 or Division 5.1 hazard label. To maintain acceptable segregation between packages and overpacks, the segregation requirements shown in Table 9.3.A must be observed. The segregation requirements apply based on all hazard labels applied on the package or overpack, irrespective of whether the hazard is the primary or subsidiary hazard.

9.5 The Two Methods to separate Dangerous Goods



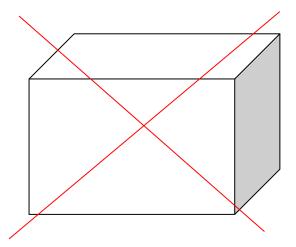
Tie down so the article or substances cannot interact in case of leakage



Locating ordinary Non-dangerous cargo in between the incompatible packages

9.6 Stowage of Packages Containing Liquid Dangerous Goods –

DGR: 9.3.3



Packages bearing the package orientation "This way up" label must be loaded, stowed and handled at all times in accordance with such a label. Single packaging with end closures containing liquids must be stowed with such closers upwards

9.7 Cargo Aircraft Only (CAO) Shipments (DGR: Ref: 9.3.4.1)



Packages or overpacks of Dangerous Goods bearing the "Cargo Aircraft Only" label must be loaded in accordance with one of the following provisions;

In a Class "C" aircraft cargo compartment; or

In a **unit load device** equipped with a fire detection/suppression system equivalent to that required by the certification requirements of a Class C aircraft cargo compartment as determined by the appropriate national authority; or

In such manner that in the event of an emergency involving such packages or overpacks, a crewmember or other authorized person can access those packages or overpacks, and can handle and where size and weight permit, separate such packages from other cargo

Where requested, packages or overpacks bearing "Cargo Aircraft Only" label should be made available to the crew for inspection prior to departure.

9.8 Damaged Packages of Dangerous Goods - DGR: 9.3.6

Operator and Agents staff must protect packages of dangerous goods from being damaged. In the event of visible damage to a DG package never to be LOADED to a vehicle, warehouse or on an aircraft or must be OFFLOADED immediately when discovered.





UNIT LOAD DEVICES (ULD) CONTAINING DANGEROUS GOODS- DGR: 9.3.8

Each ULD containing restricted commodities must clearly display on its exterior an indication that restricted commodities are contained within the ULD.

This is normally done by attaching a regular white identification tag. But for dangerous goods this tag has border of prominent red hatching on both sides and with minimum dimensions of 148 X 210 mm).

The tag must be removed from the ULD immediately after the dangerous goods have been unloaded.

If the ULD contains packages bearing the "Cargo Aircraft Only" label, the tag must indicate that the ULD can only be loaded on a cargo aircraft.

Loading of Magnetized Materials - DGR: 9.3.9



MAGNETIZED MATERIALS are Cover materials with relatively high magnetic field strength such as magnetrons and non-shielded permanent magnets without keeper bars installed. Masses of ferro-magnetic metals such as automobiles, automobile parts, metal fencing, piping and metal construction material, even if not meeting the definition of magnetized materials, may be subject to operator's special stowage regulations since they may affect aircraft instruments, particularly the compasses.

Magnetized materials must not be loaded in such a position that they will have a significant effect on the direct-reading magnetic compasses or on the master compass detector units of the aircraft.

DRY ICE -Carbon Dioxide solid - DGR: 9.3.10



Live animals should not be loaded in close proximity to Dry Ice.

The operator must ensure that ground staff is informed that Carbon dioxide; solid dry ice is being loaded or is on board the aircraft. The maximum limit per compartment is depending on the Aircraft type. Thus before loading Dry Ice the

operator must refer to the Aircraft Loading manual whether it can be loaded without any restrictions.

To avoid suffocation, before entering a confined space where Carbon dioxide, solid (dry ice) has been loaded or stored, ensure adequate ventilation has occurred.

Handling of Self-Reactive Substances and Organic Peroxide - DGR: 9.3.15

Packages containing organic peroxide of division 5.2 and self-reactive substances of Division 4.1 must be protected from direct sunlight and must be stored in a cool well- ventilated place from all sources of heat.

Inspection of for Damage or Leakage - DGR: 9.4

When handling and loading of Dangerous Goods packages, all the handling labels must be respected.

Packages or overpacks must not be loaded onto an aircraft or into a unit load device unless they have been inspected immediately prior to loading and found free from visible leaks or damage.

Before loading on an aircraft, ULD's must be checked and found free from any evidence of leakage or damage that would cause it to be unserviceable (DGR: 9.3.6.2).

On unloading, packages and overpacks containing dangerous goods must be inspected for damage or leakage. If evidence of damage or leaking is found, the position where the dangerous goods or the unit load device was stowed on the aircraft must be inspected for damage or contamination and hazardous contamination removed.

Any package, which become visible to be damaged or leaking, must be OFFLOADED from the aircraft and incident report must be raised in accordance with company, airport and governmental procedures.

This may require the services of specialist personnel. In the case of spillage of radioactive material or infectious substances, the appropriate national authority

must be advised. In the case of leakage, the operator must ensure the remainder of the consignment is undamaged and that no other load has been contaminated (DGR: 9.3.6.3).

Summary of Stowage and loading of Dangerous Goods

- Do Not load any damage packages
- Respect the handling labels
- Liquids are to be loaded in an upright position
- Secure the package against movement, i.e.; lashing or tightly loaded with other cargo
- Protect the light packages with heavy cargo
- Check the incompatibility
- CAO packages must be loaded according to stipulated requirement in the regulation
- If any state and operator variations are apply to your shipment

9.9 Special Load – Notification to Captain (NOTOC) – DGR: Ref. 9.5

It is the captain's right to receive and retain full details of all dangerous goods loaded on the aircraft.

The NOTOC enables the Pilot-In-Command to take the necessary actions in case of any irregularities or an emergency situation.

The NOTOC is not required for Dangerous Goods in Excepted Quantities or for Excepted Packages of Radioactive Material.

The operator of an aircraft in which dangerous goods are carried must provide the pilot-in- command as soon as possible prior to departure, with written information concerning dangerous goods which have been loaded on the aircraft.

NOTOC is issued on the basis of the Shipper's Declaration for all flights on which dangerous goods are carried. Normally cargo department is responsible for the completion of the NOTOC. The ramp agent inserts the loading position and confirms by his signature that the loading position is identical with the actual loading position and that loading regulations as per his responsibilities have been adhered to.

The original and a copy of the NOTOC shall be handed to the captain for signature as early as possible before departure. The original remains on the flight deck, the signed copy by the captain is kept on the flight file at the departure station.

9.10 Information by the Pilot-In-Command in case of in-Flight Emergency (DGR: Ref: 9.5.1.3)

If an in-flight emergency occurs, the pilot-in-command must, as soon as the situation permits, inform the appropriate air traffic services unit for the information of airport authorities, of any dangerous goods carried as cargo on board an aircraft. Wherever possible, this information should include:

- > The proper shipping names and/or UN/ID number,
- ➤ The Class/Division (and for Class 1 the compatibility group),
- Any identified Subsidiary hazard(s),
- > The quantity and the location on board the aircraft.

Alternatively, the pilot-in-command can provide a telephone number where a copy of the information to the pilot-in-command can be obtained.

When it is not possible to include all the information, those parts thought most relevant in the circumstances, or a summary of the quantities and class or division of dangerous goods in each cargo compartment, should be provided by the operator.

				හි	ECIAL	OAD	- NOT	SPECIAL LOAD - NOTIFICATION TO CAPTAIN	201	APIA	_				
Station of Loading	Flig	Flight Number	Date	Aircraft Registration			Prepared								
8	DANGEROUS GOODS	SC					à								
)o u	Air Waybill	Č		Class or Division			Number of	Net quantity or	Radioa- active		Code		Loaded	pa	ER S
Unloading	Number	Propera	Proper Shipping Name	For Class 1 compat. grp.	UN or ID Number	Sub Risk	Packages	를 B		Packing Group	(see reverse)	88	30	Position	Code
												8		, so	
E	OTHER SPECIAL LOAD	AD AD	There is no evidence that any damaged or leaking packages containing dangarous goods have been loaded on the airdaft. AD	or leaking packac	ges containing d	langerous	goods have b	een loaded on t	he aircraft.			28			
9.	Air Wavhill			Number			3.8		100		dWI			Loaded	Ш
Unloading	Number	Contents	Contents and Description	of Packages	Quantity		ddns	Supplementary Information	nation		(see reverse)	euge euge	음 =	Position	-
Loaded as shown		Captain's Signature		Other Information											
										l		l	l		

9.12 Dangerous Goods Accidents and Incidents (DGR: Ref: 9.6.1)

HANDLING EMERGENCIES

IATA DGR Chapter 9.5.1.2 (Emergency Response Information)

The operator must ensure that for consignments requiring a Shipper's Declaration for Dangerous Goods, appropriate information is immediately available at all times for use in emergency response to accidents and incidents involving dangerous goods in air transport. The information must be available to the pilot-in-command and can be provided by:

- The Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (ICAO Doc. 9481–AN/928); or
- any other document, which provides appropriate information concerning dangerous goods on board.

For this reason we must ensure that the Shipper Declaration and all other documentation is accurately checked when received from the Shipper and compared with the cargo prior to delivering the cargo to the Operator. This will assist the Pilot and Crew to determine the necessary procedures during an emergency by referring to the correct information provided.

Emergencies at Facilities will follow the guidelines provided in Emergency Procedures Manual specific to the area (e.g. warehouse) where the incident occurs where the accident or incident occurred.

9) REPORTING OF INCIDENTS AND ACCIDENTS

Dangerous Goods Reporting Requirements

- (a) Reporting dangerous goods incidents and accidents. Staff must report in writing all dangerous goods incidents and accidents to GACA and the appropriate authority in the State
- (b) Reporting undeclared or misdeclared dangerous goods. Staff must report in writing the finding of undeclared or misdeclared dangerous goods discovered at

its facilities, on to the GACA and arrival to its facilities to the appropriate authority in the state where the accident or incident occurred.

- (c) Written reports made under this section must be in a format approved by the President and contain the information specified in Appendix A of GACAR Part 109 (Contents of Reports):
- (1) Date of the incident or accident or the finding of undeclared or misdeclared dangerous goods;
- (2) Location, the flight number, and flight date;
- (3) Description of the goods and the reference number of the air waybill, pouch, baggage tag, ticket or other identifier;
- (4) Proper shipping name (including the technical name, if appropriate) and UN/ID number1, when known;
- (5) Class or division and any subsidiary risk;
- (6) Type of packaging, and the packaging specification marking on it;
- (7) Quantity;
- (8) Name and address of the shipper, passenger, or other involved person;
- (9) Any other relevant details;
- (10) Suspected cause of the incident or accident;
- (11) Action taken;
- (12) Any other reporting action taken; and
- (13) Name, title, address, and telephone number of the person making the report.

Copies of relevant documents and any photographs taken should be attached to a report.

(d) First reports must be submitted within 72 hours of the event or discovery, unless exceptional circumstances prevent this, and include the details that are known at that time. If necessary, a subsequent report must be made as soon as possible giving all the details that were not known at the time the first report was sent. If a report has been made verbally, written confirmation must be sent as soon as possible.

Dangerous Goods Discrepancy Report

- (a) Each person who discovers a discrepancy, as defined in paragraph (b) of this section, relative to the shipment of a dangerous good following its acceptance for transportation aboard an aircraft must, as soon as practicable, notify the GACA by telephone or electronically and must provide the following information:
- (1) Name and telephone number of the person reporting the discrepancy,
- (2) Name of the operator,
- (3) Specific location of the shipment concerned,
- (4) Name of the shipper,
- (5) Nature of the discrepancy, and address of the shipper or person responsible for the discrepancy, if known.
- (b) Discrepancies that must be reported under paragraph (a) of this section are those involving dangerous goods which are improperly—
- (1) Described in the dangerous goods transport document;
- (2) Certified on the declaration attached to the dangerous goods transport document; or
- (3) Labelled, marked or packaged in a manner making their status as dangerous goods not ascertainable when accepted under the provisions of GACAR 109.61, including packages and baggage that are found to contain dangerous goods subsequent to their being offered and accepted as other than dangerous goods.

9.13 Dangerous Goods Emergency Response

How to react in case of an Emergency due to dangerous goods accidents and incidents

Act cautiously and in case of doubt always follow the emergency procedures. Be aware that the actions taken are only precautions and panic must be avoided.

When a package containing dangerous goods is damaged, but no spillage occurred:

- Separate the package from other shipments and contact your immediate supervisor
- Make a log entry and prepare the incident/accident occurrence report.

Classes 1 to 5 and 9

When leakage or spillage of the contents

- Inform immediate supervisor
- > Identify the substances by referring to the shipper's declaration.
- Place the package in a safe location if safe to do so;
- ➤ If it is a Div 2.3 toxic gas keep away minimum 25 M
- ➤ Get professional help from Fire Police or other emergency services.
- Make a log entry and prepare the incident/accident occurrence report.

Contamination of clothing and or skin

- ✓ Thoroughly wash off body with plenty of water;
- ✓ Remove contaminated clothes; s Do not eat or smoke;
- ✓ Keep hands away from eyes, mouth and nose;
- ✓ Seek medical assistance.

Classes 6,7 and 8

When a package containing dangerous goods is damaged, but no spillage occurred:

- > Do not touch or move.
- Restrict access to the immediate surrounding area
- Avoid possible contamination of the skin an inhalation of vapor
- > Get professional help from Fire Police or other emergency services.
- ➤ Make a log entry and prepare the incident/accident occurrence report

Contamination of clothing and or skin

- ✓ Thoroughly wash off body with plenty of water;
- ✓ Remove contaminated clothes;
- ✓ Do not eat or smoke;
- ✓ Keep hands away from eyes, mouth and nose;
- ✓ Seek medical assistance.

9.14 IATA Dangerous Goods Emergency Response Chart (Ground Incidents).

Hazard	Dangerous Goods Class	Hazard Description	Immediate Action
Class /Division and			Minimize leakage and
Compatibility			contact with other
Group			cargo
1.3C		Fire and minor blast hazard	
	Explosives	and/or minor propulsive	
	(acceptable on Cargo Aircraft only)	hazard	
1.4B	• •	Fire, but no other	Notify Fire Department

1.4C		significant hazard	Guard against fire
1.4D			
1.4E			
1.4G			
1.45	Explosives (safety)	Small fire hazard	
2.1	Flammable Gas	Ignites when leaking	Notify Fire Department
2.2	Non-Flammable Gas	High pressure cylinder	Guard against fire
2.2	Cryogenic Liquid	bursting Sub cooling	Evacuate goods - ventilate
	Toxic Gas (acceptable on	High pressure cylinder	area
2.3	Cargo Aircraft only)	,	Keep away
	cargo / in craft offiy)	and toxic inhalation	minimum 25 m
3	Flammable Liquid	Gives off flammable vapour	Notify Fire Department
4.1	Flammable Solid	Combustible, contributes to fire	Guard against fire
4.2	Spontaneously Combustible	Ignites in contact with air	Do NOT use water
4.3	Dangerous when wet		under any circumstances
5.1	Oxidizer	Ignites combustibles on	Notify Fire Department
5.2	Organic Peroxide	contact	Guard against fire
		Reacts violently with other	Do NOT use water
		substances	
6.1	Toxic Substance	Harmful if swallowed, inhaled	Isolate area
		or in contact with skin	Obtain qualified
	Infectious Substance	Causes disease in Humans	assistance
7 Cat I	Radioactive - White	Radiation hazards and	Do NOT touch
7 Cat II/III	Radioactive – Yellow	harmful to health	
		Hazardous to skin and metal	Keep away
		1	

			minimum 25 m
8	Corrosive		Notify Fire Department
			Guard against fire
9	Polymeric Beads	Evolves small quantities of	Avoid contact with skin
	Magnetized Material	flammable gas	No immediate action
	Carbon dioxide, solid (Dry	Affects navigation system	required.
	lce),	Causes sub cooling /	
	Miscellaneous Dangerous	suffocation Hazards not	
	Goods	covered by other	
		classes	

Aircraft Emergency Response Drills

- 1. COMPLETE APPROPRIATE AIRCRAFT EMERGENCY PROCEDURES.
- 2. CONISIDER LANDING AS SOON AS PRACTICCABLE
- 3. USE DRILL FROM THE CHART BELOW

DRI	INHERENT	RISK TO	RISK RO	SPILL OR	FIRE-	ADDITIONAL
LL	DICK	ALDCDAFT	OCCUPANTS	LEAK	FIGHTING	CONSIDERATION
	RISK	AIRCRAFT	OCCUPANTS	PROCRDUR	PROCEDUR	S
NO				E	E	
•						
1	Explosion may	Fire and /or	As indicated	Use 100%	All agents	Possible abrupt
	cause structural	explosion	by the drill	Oxygen: no	according	loss of
	failure		letter (s)	smoking	to	pressurization
					availability:	
					use	
					standard	
					fire	
					procedure	
	Canada	N 4: mino a l	A - i - di t - d	11 1000/	Allacasta	Danible about
2	Gas non-	Minimal	As indicated	Use 100%	All agents	Possible abrupt
	flammable,		by the drill	oxygen:	according	loss of
	pressure may			establish	to	

	create hazard in fire		letter (s)	and maintain maximum ventilation for "A" "I" or "P" drill letter	availability: use standard fire procedure	pressurization
3	Flammable liquid or solid	Fire and /or explosion	Smoke, fumes and heat. And as indicated by the drill letter(s)	Use 100% oxygen: establish and maintain maximum ventilation: No Smoking minimum electrics	All agents according to availability: no water on "W" drill letter	Possible abrupt loss of pressurization
4	Spontaneously combustible or pyrophoric	Fire and/or explosion	Smoke, fumes and heat. And as indicated by the drill letter(s)	Use 100% oxygen: establish and maintain maximum ventilation	All agents according to availability: no water on "W" drill letter	Possible abrupt loss of pressurization: minimum electrics if "F" OR "H" drill letter
5	Oxidizer, may ignite other materials, may explode in heat of a fire	Fire and/or explosion possible corrosion damage	Eye, nose and throat irritation: skin damage on contact	Use 100% oxygen: establish and maintain maximum ventilation:	All agents according to availability: no water on "W" drill letter	Possible abrupt loss of pressurization
6	Toxic, may be fatal if inhaled, ingested, or absorbed packages	Contaminatio n with toxic liquid or solid	Acute toxicity effects may be delayed	Use 100% oxygen: establish and maintain	All agents according to availability: no water on "W" drill	Possible abrupt loss of pressurization: minimum electrics if "F" OR "H" drill

7	Radiation from broken and/or	Contaminatio n with spilled	Exposure to radiation, and	maximum ventilation: do not touch without gloves Don't move packages:	All agents according	Call for qualified person to meet
	unshielded packages	radioactive material	personal contaminatio n	avoid contact	to availability	the aircraft
8	Corrosive, fumes disabling if inhaled or in contact with skin	Possible corrosion damage	Eye, nose and throat irritation: skin damage on contact	Use 100% oxygen: establish and maintain maximum ventilation: do not touch without gloves	All agents according to availability: no water on "W" drill letter	Possible abrupt loss of pressurization: minimum electrics if "F" OR "H" drill letter
9	No general inherent risk	As indicated by the drill letter	As indicated by the drill letter	Use 100% oxygen: establish and maintain maximum ventilation: if "A" drill letter	All agents according to availability: no water on "A" drill letter	None
10	Gas flammable. High fire risk if any ignition source present	Fire and/or explosion	Smoke, Fumes and heat, and as indicated by the drill letter	Use 100% oxygen: establish and maintain maximum	All agents according to availability	Possible abrupt loss of pressurization

11	affect or ani inhale ingest absor thoug muco memb	ances may humans mals if ed. eed or bed th the	Contaminatio n with infectious substances	Delayed infection to humans or animals	ventilation: No Smoking minimum electrics Do not touch minimum recirculatio n and ventilation in affected area	All agents according to availability: no water on "Y" drill letter	Call for qualified person to meet the aircraft
DRILL	-				DRILL		
LETT	ER	ADD	ITIONAL RISK		LETTER	AD	DITIONAL RISK
А		ANAESTHE	TIC		М	MAGNETIC	
С		CORROSIV	E		N	NOXIOUS	
E		EXPLOSIVE		Р	TOXIC (POISO	N)	
F		FLAMMABLE		S	SPONTANEOU	JSLY	
Н		HIGH IGNITABLE		w		E OR PYROPHORIC	
						IF WT GIVES OFF POISONS OR FLAMMABLE	
I		IRRITANT/	TEAR PRODUCIN	G		GAS	
L		OTHER RIS	K LOW OR NONE	:	х		
					Υ		
						OXIDIZER	
			xic has the same oison	meaning as		TYPE OF INFE SUBSTANCE T NATIONAL AL	ON THE TYPE OF CTIONS THE APPROPRIATE JTHORITY MAY BY O QUARANTINE

				INDIVIDUALS ANIMALS CARGO AND THE AIRCRAFT					
Aircraft Eme	ergency response	e drills							
Internationa	al Civil Aviation C	Organization (ICA	vO)						
Emergency (Doc 9481-A		nce for Aircraft I	ncidents inv	olving Dangerous Goods					
Review Exe	rcise for Incident	t/Accident and S	Segregation						
1. What pre dangerous g		e taken when loa	ading each c	of the following types of					
(a) Flamma	ble liquid								
(b) Self-read	(b) Self-reactive Substances								
2. Can the following packages of dangerous goods be loaded next to each other?									
Packages			Compatible						
(a) Division	6.1 and class 3	YES/NO							
(b) Division	4.3 and class 8	YES/NO							
(c) Class 3 a	nd Class 8	YES/NO							
(d) Division	5.1 and Class 3	YES/NO							
3. The fo	ollowing dangero	ous goods to be	loaded for a	ir transportation:					
UN145	2 Div	5.1							
UN184	.5 Cla	iss 9							

UN1435	Div 4.3
UN1604	Class 8
UN1088	Class 3
UN1015	Div 1.4S
UN3413	Div 6.1
UN1056	Div 2.2
UN1385	Div 4.2
UN2911	Class 7 (Except Package)
UN3480	Class 9 (Packed according to PI-965,Section 1A)

You need to plan and load above DG's into the below 3 ULDs.

ULD No. 1	ULD No. 2	ULD No. 3

4. While unloading an air craft, you see a fiberboard box with a wet corner and the box bears an "Infectious Substance" label.

What	immediate	actions	are	required	?
vviiat	IIIIIICalati	. actions	arc	required	٠

Module 10 - DANGEROUS GOODS SECURITY

10.1 Introduction

Security plays a vital role in the safe transport of dangerous goods. Every contracting State must establish dangerous goods security measures, applicable to Shippers, Operators and other individuals engaged in the transport of dangerous goods by air. The purpose is to minimize theft or misuse of dangerous goods that may endanger persons, property or the environment.

10.2 Definition of High Consequence Dangerous Goods

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.

An indicative list of high consequence dangerous goods in classes and divisions other than Class 7 is given in Table 1.7.A

10.3 Indicative List of High Consequence Dangerous

Security plays a vital role in the safe transport of dangerous goods. Every contracting State must establish dangerous goods security measures, applicable to Shippers, Operators and other individuals engaged in the transport of dangerous goods by air. The purpose is to minimize theft or misuse of dangerous goods that may endanger persons, property or the environment.

An indicative list of high consequence dangerous goods in classes and divisions other than Class 7 is given in Table 1.7.A.

Class	Division	Substance or article
1	1.1	Explosives
	1.2	Explosives
	1.3	Compatibility group C explosives
	1.4	Explosives of UN Nos. 0104, 0237, 0255, 0267, 0289, 0361, 0365, 0366, 0440, 0441, 0455, 0456 and 0500
2	2.3	Toxic gases (excluding aerosols)
3		Desensitized explosives
4	4.1	Desensitized explosives
6	6.1	Toxic substances of packing group I, excluding excepted quantities
6	6.2	Infectious substances of Category A (UN2814 and UN2900)

For Class 7, chapter 1.7.3.1.3, 1.7.3.1.4 and Table 1.7B must be met.

10.4 Security Plans

Operators, shippers and others (including infrastructure managers) engaged in the transport of high consequence dangerous goods (see 1.7.3) should adopt, implement and comply with a security plan that addresses at least the elements specified in 1.7.4.2 of the IATA DGR.

10.5 Security measures to be addressed

The Plan should address measures to take that would minimize security risks. Security plans must include the following elements:

- Specific allocation of responsibilities to competent and qualified persons.
- Records of the dangerous goods or types of dangerous goods transported.
- Review of current operations and assessment of vulnerabilities.
- Statement of measures implemented to reduce security risks (including training, security policies, operating practices, equipment and resources used).
- Effective and up-to-date procedures for reporting and dealing with security threats, breaches of security and security-related incidents.
- Procedures or the evaluation, testing, periodic review and update of security plans.
- Measures to ensure the physical security of the transport information contained in the plan.
- Measures to ensure that the distribution of information relating to the transport operation contained in the security plan is limited, as far as possible, to only those who need to have it.

For radioactive material, the provisions agreed by the International Atomic Energy Agency (IAEA) must be applied, particularly those of the Convention on Physical Protection for Nuclear material and the IAEA circular on The Physical Protection of Nuclear Material Facilities.

FOR INTERNAL TRAINING USE

Copyright:

SMSA Express Transportation Company Ltd.

Al- Dabbab Street P.O. Box 63529 Riyadh 11526, Saudi Arabia

Tel: +966 11 4633999

Fax: +966 11 4160565

Email: info@smsaexpress.com

Contact Center: (24/7): 92000 9999

Outside Saudi Arabia: +966 11 2187777