

The Change of International Standards and Improvement of Management System for the Transport of Dangerous Goods by Air

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I. Introduction

When shipments of dangerous goods (hazardous chemical substances that could endanger public safety or the environment, such as flammable liquids or radioactive materials) are properly packaged, labeled, and stowed onboard, they can be transported safely, but when they are not, they can pose significant threats to people and property. Improper or undeclared

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pose significant threats to people and property. Improper or undeclared shipments of dangerous goods are particularly dangerous in air transport because there is little room for error or time to take corrective action if a problem occurs in flight.

According to Korean Airlines, from 1999 to 2002 the volume of air shipments of dangerous goods formed 1.32 % by annual average of the total volume of cargo carried by them, and the volume of dangerous goods carried by them amounted to 23,125 ton by annual average during the period.¹⁾

The broad principles governing the international transport of dangerous goods by air are contained in Annex 18 to the Chicago Convention- the Safe Transport of Dangerous Goods by Air. The ICAO Technical Instructions of the Safe Transport of Dangerous Goods by Air amplify the basic provisions of Annex 18 and contain all the detailed instructions necessary for the safe international transport of dangerous goods by air. Dangerous goods are unlikely to cause a problem when they are prepared and handled in compliance with the Technical Instructions.

This paper intends to prevent dangerous goods shipments from compromising safety, and to minimize the risks to life and property inherent in air transport of dangerous goods. For this purpose, this paper reviews the changes of international standards for the international air transport of dangerous goods , and researches the actual status and relevant issues of handling dangerous goods by carriers and shippers in air transport, and recommends the methods for improving the management system for the air transport of dangerous goods.

As for the research methodology, this paper reviews the current regulations of the ICAO Technical Instructions for the Safe Transport of Dangerous Goods, IATA Dangerous Goods Regulations and national regulations governing the air transport of dangerous goods in Korea. Also this paper analyzes recent reports and documents on the shipment of

1) Air Consulting Co., Ltd.(2004), Monthly Magazine-Cargo Press (March), p.45.

The Change of International Standards and Improvement of Management System for the Transport of Dangerous Goods by Air 75 focused the review primarily on the shipments of dangerous goods onboard cargo aircraft, in part, because more types and quantities of dangerous goods are permitted on cargo aircraft than on passenger aircraft.

II. International Standards for the Air Transport of Dangerous Goods by Air

1. ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air

(1) Applicability

The international transport of dangerous goods by air has been regulated since 1956. In 1984 the International Civil Aviation Organization (ICAO) assumed this responsibility under Annex 18 to the Chicago Convention on International Civil Aviation and its accompanying Technical Instructions for the Safe Transport of Dangerous Goods by Air. The ICAO requirements are now mandatory for all 160 ICAO member countries.²⁾

The Technical Instructions are divided into eight Parts as follows: Part 1. General, Part 2. Classification of dangerous goods, Part 3. Dangerous goods list and limited quantities exceptions, Part 4. Packing instructions, Part 5. Shipper's responsibilities, Part 6. Packaging nomenclature, marking, requirements and tests, Part 7. Operator's responsibilities, Part 8. Provisions concerning passengers and crew.

These Technical Instructions prescribe the detailed requirements applicable to the international civil transport of dangerous goods by air. In cases of extreme urgency, or when other forms of transport are inappropriate, or full compliance with the prescribed requirements is contrary to public interest,

2) IATA (2003), Cargo Agent's Handbook-Resolution 801 Edition (1 October), p.xxv.

compliance with the prescribed requirements is contrary to public interest, the States concerned may grant exemptions from the provisions of the instructions provided that in such cases every effort is made to achieve an overall level of safety in transport, which is equivalent to the level of safety provided by these instructions. The States concerned are the States of origin, transit, overflight and destination of the consignment, and the State of the operator. For the State of overflight, if none of the criteria for granting an exemption are relevant, an exemption may be granted bases solely on whether it is believed that an equivalent level of safety in air transport has been achieved (Part1 Chapter 1 Paragraph1).

(2) General Principles

General principles used in developing the provisions of ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air are as follows.³⁾

Dangerous goods can be carried safely by air transport providing certain principles are adopted. They are intended to facilitate transport whilst giving a level of safety such that dangerous goods can be carried without placing an aircraft of its occupants at risk, providing all the requirements are fulfilled.

In general dangerous goods are divided into various classes or divisions according to the hazard they present. A detailed list of individual commodities is shown which indicates the class or division into which each commodity falls as well as its acceptability for transport by air and under what conditions. Table 1 shows dangerous goods classification and descriptions.

Some dangerous goods are identified as too dangerous ever to be carried on any aircraft; some are forbidden in normal circumstances but may be carried with specific approval from the States concerned: some are restricted

3) ICAO(2003), Technical Instructions for the Safe Transport of Dangerous Goods by Air, 2003-2004 Edition, pp.(iii)-(iv).

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to carriage only on all-cargo aircraft: but most may be carried on both
passenger and all-cargo aircraft, subject to meeting the required conditions.

The provisions are based on material produced by the United Nations, which is contained in the Recommendations on the Transport of Dangerous Goods (ST/SG/AC.10/1), the Recommendations on the Transport of Dangerous Goods: Tests and Criteria (ST/SG/AC.10/11), and, for radioactive materials, the International Atomic Energy Agency Regulations for the Safe Transport of Radioactive Material (TR-S-1).

There are packing requirements of a general nature and packing instructions which, together, are intended to ensure that safety of dangerous goods in air transport is assured by their packagings and the way in which they are packed. The packing requirements apply in almost all circumstances; the packing instructions mostly use UN packagings but sometimes these are not required, for instance when dangerous goods are in limited quantities. There is usually a wide choice of inner and outer packaging and single packagings are often permitted; sometimes, however, very restrictive packagings or only one or two types are permitted, or triple packagings are required. Generally, the quantity which can be put into an inner packaging and a complete package is strictly controlled.

After dangerous goods are packed, the packages are marked with essential information, including the proper shipping name and UN number, and labels depicting all the potential hazard(s) of the contents are affixed. This is to ensure packages containing dangerous goods can be recognized and warning given of the potential hazard(s) without relying on information on accompanying documents. There is a dangerous goods transport document which accompanies most consignments to provide detailed information about the goods and so that if required there is a separate means of identifying the contents of packages.

There is generally no restriction on the number of package of dangerous goods which can be loaded on an aircraft but there are provisions for their stowage. Incompatible dangerous goods are segregated and most are

separated from passengers. The pilot-in-command is informed of what is on board an aircraft since, among other things, in an emergency the dangerous goods need to be considered when deciding on action. If an in-flight emergency does occur, the pilot-in-command needs to convey information to the air traffic services, in order to aid the response to such an accident or incident. In the event of an accident or incident, information is provided by the operator to the relevant authority as quickly as possible so as to ensure that any hazard arising from damage to the dangerous goods is minimized.

Dangerous goods accidents and incidents have to be reported so that an investigation by a relevant authority can establish the cause and take action to prevent a recurrence, where possible. In particular, any weakness or error in the Technical Instructions has to be identified.

Training is an important aid to achieving an understanding of the philosophy and requirements of the Technical Instructions. There is a need for everyone concerned to receive training on the subject either for general familiarization or to provide detailed knowledge, so that the responsibilities of the individual can be met. Dangerous goods are very unlikely to cause problem when they are prepared and handled in compliance with the Technical Instructions.

<Table 1> Dangerous Goods Classes and Descriptions

Class	Description	Example(s)
1	Explosives	Fireworks
2	Gases	Propane
3	Flammable liquids	Acetone, lighter fluid, paints
4	Flammable solids	Safety matches
5	Oxidizers and organic peroxides	Swimming pool chemicals
6	Toxic material and infectious substance	Regulated medical waste, motor fuel anti-knock mixtures
7	Radioactive materials	Uranium hexafluoride
8	Corrosive materials	Batteries, cleaning compounds
9	Miscellaneous dangerous goods	Asbestos

Source: U.S. Department of Transportation, RSPA.

(3) Amendments to the 2003-2004 Edition

The Technical Instructions have been amended to make them as up to date as possible and to clarify, where necessary, the intent of the requirements. Account has been taken of comments received from users throughout the worlds. This has resulted in numerous minor changes in all parts of the book.

It is intended, for the time being, to continue issuing new versions of the Technical Instructions biennially. The 2003-2004 Edition of the Technical Instructions will be valid for two years, i.e. from 1 January 2003 to 31 December 2004 or until such later time as a new edition becomes valid.

The requirements have been amended so as to align them, as far as possible, with the twelfth revised Edition of the United Nations Recommendations on the Transport of Dangerous Goods and the International Atomic Energy Agency (IAEA) regulations for the Safe Transport of Radioactive Material, as incorporated therein.

The amendments include the following: UN number for diagnostic specimens; air eligibility marking; cryogenic liquid label; packing and packaging for gases; alternative sequences of information on the transport document.⁴⁾

(4) Notified Variations from the Instructions

It is hoped that all airline operators will abide completely by the requirements of the Technical Instructions and thus assist the smooth and rapid carriage of dangerous goods by air. If some special concerns or problems make it necessary for individual airlines to impose some more restrictive requirements, they are invited to notify such variations to ICAO for inclusion in this section.

4) ICAO, *supra* note 3, p.(v).

Korean Airlines notified the following variations to ICAO⁵⁾:

KE-01 Dangerous goods in consolidations must not be accepted for carriage, the only exception being consolidations having one master air waybill with one house air waybill (Relevant paragraph 7;1).

KE-02 Reservations must be made well in advance for any shipment containing dangerous goods as defined in these Instructions.

KE-03 Shipper's Declarations for dangerous goods must be completed in English, with copies requested by KE but not less than two copies for each shipment (Relevant paragraph 5;2.5). All package and overpack markings required by these Instructions must also be completed in English.

KE-04 Radioactive material shipments of Type B(U), Type(B)M, and Fissile Material packages are not permitted for carriage on passenger aircraft (Relevant paragraphs 2;7, 5;1.1).

2. IATA Dangerous Goods Regulations

(1) Applicability

The IATA Dangerous Goods Regulations are published by the IATA Dangerous Goods Board pursuant to IATA Resolutions 618 and 619 and constitute a manual of industry carrier regulations to be followed by all IATA member airlines.

The IATA Dangerous Goods Regulations is based on the requirements of Annex 18 to the Convention on International Civil Aviation (Chicago, 1944) and the associated Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc9284-AN/905) adopted by the Council of ICAO and published by ICAO.

Annex 18 to the Chicago Convention and the associated Technical Instructions for the Safe Transport of Dangerous Goods by Air are recognized as the sole authentic legal source material in the air transport of

5) ICAO, *supra* note 3, p.A3-2-9.

dangerous goods.

Consequently, any additional or explanatory material added by IATA does not form part of authentic text of the ICAO Technical Instructions and does not have the same legal force.

There are certain differences between the IATA and ICAO regulations which stem from operational considerations and result in a regulatory regime which is necessarily more restrictive than the ICAO requirements.⁶⁾

The IATA Dangerous Goods Regulations are divided into ten Sections as follows: Section 1. Applicability, Section 2. Limitations, Section 3. Classification, Section 4. Identification, Section 5. Packing, Section 6. Packaging specifications and performance tests, Section 7. Marking and labelling, Section 8. Documentation, Section 9. Handling, Section 10. Radioactive material.

The IATA Dangerous Goods Regulations are applicable to: all airlines which are Members of Associate Members of IATA; all airlines which are party to the IATA Multilateral Interline Traffic Agreement-Cargo; and all shippers and agents that offer consignments of dangerous goods to the operators (Section 1.2).

(2) General Philosophy

The general philosophy used in developing the provisions of IATA Dangerous Goods Regulations are as follows.⁷⁾

Dangerous goods can be transported safely by air transport provided certain principles are strictly followed. The IATA Dangerous Goods Regulations is an easy-to-use manual based on the International Civil Aviation Organization (ICAO) Technical Instructions. It incorporates additional operational requirements, which provide harmonized system for operators to accept and transport dangerous goods safely and efficiently.

6) IATA (2004), *Dangerous Goods Regulations Manual*, 45th Edition, p.xv.

7) IATA, *supra* note 6, pp.xix-xx.

The Regulations include a detailed list of individual articles and substances specifying the United Nations classification of each article or substance and their acceptability for air transport as well as the conditions for their transport.

Some dangerous goods have been identified as being too dangerous to be carried on any aircraft under any circumstances; others are forbidden under normal circumstances but may be carried with specific approvals from the States concerned; some are restricted to carriage on all cargo aircraft; most however, can be safely carried on passenger aircraft as well, provided certain requirements are met.

Packing is the essential component in the safe transport of dangerous goods by air. The IATA Dangerous Goods Regulations provide packing instructions for all dangerous goods acceptable for air transport with a wide range of options for inner, outer and single packagings.

Training is also an essential element in maintaining a safe regulatory regime. It is necessary for all individuals involved in the preparation or transport of dangerous goods to be properly trained to carry out their responsibilities. Depending on the job-function, this may entail only familiarization training or may also include more detailed training in the intricacies of the Regulations.

The proper declaration of dangerous goods by the shipper ensures that all in the transportation chain know what dangerous goods they are transporting, how to properly load and handle them and what to do if an incident or accident occurs either in-flight or on the ground.

The pilot-in-command must know what is on board the aircraft in order to properly deal with any emergencies, which may occur. The pilot must also convey this information, if possible, to air traffic services to aid in the response to any aircraft incident or accident.

Information regarding Hidden Dangerous Goods must also be conveyed to passengers to assist them in recognizing dangerous goods, which they are not permitted to carry on their person or in their baggage and which

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may not be readily recognizable as being dangerous.

Dangerous goods accidents or incidents must be reported, so that an investigation by the relevant authorities can establish the cause and take corrective action. Also, if as a result of these investigations changes are required in the regulations, appropriate regulatory action can be taken without delay.

(3) Significant Amendments to the 45th Edition (2004)

The 45th edition of the IATA Dangerous Goods Regulations incorporates all amendments made by the Dangerous Goods Board and includes changes advised, at time of printing, by ICAO to the 2003-2004 Edition of the ICAO Technical Instructions. The following list is intended to assist the user with identifying the main changes introduced in this edition.⁸⁾

Table 1.5.A- and cargo has been added to Key 5 to identify that persons involved in security screening of cargo should also be provided with dangerous goods training.

Table 2.1.A- This table has been deleted. The list of items previously shown in Table 2.1.A are all included in 4.2-List of Dangerous Goods.

2.9.2- State variations. Belgium variation BEG-03 containing the list of substances defined as explosives for the purpose of BEG-02 has been amended to include air bag inflator, air bag modules and seat belt pretensioners classified in Class 9, UN 3268.

United States variations, USG-01 and USG-13 have been modified to requires that the shipper, and the operator first accepting a dangerous goods consignment, must retain a copy of the Shipper's Declaration for a minimum of 375 days. The US has added a new variation, USG-16, requiring that transport approval be obtained before air bag inflators, air bag module and seat belt pretensioners are transported to, from or through the US.

2.9.4- Operator variations. There have been a significant number of

8) IATA, supra note 6, pp.xxi-xxii.

additions, deletions and modifications to the operator variations.

Section 3.3 to 3.5- Much of the additional material extracted from the UN Manual of Tests and Criteria contained in these sections that related solely to testing has been removed as they were of little value in the current format. Section 3.4 and 3.5 have been reformatted to more clearly identify the requirements applicable to classification and determination of packing groups.

3.6.2- Specific reference has been included in the definition of Diagnostic Specimens to identify that substances being shipped for diagnostic or investigational purposes may contain, or be suspected of containing pathogens. This reflects the text produced by ICAO at the end of 2002 clarifying the intent and application of the definition of diagnostic specimens. The Note in 3.6.2 also references the indicative list of pathogens contained in Appendix 1.

Table 3.10.A- Revisions have been made to the precedence of hazards table. These changes reflect recent amendments made by ICAO to align with the UN Model Regulation.

4.2- List of Dangerous Goods. A number of amendments have been made to the entries in 4.2. These reflect recent amendments by ICAO to the Technical Instructions and corrections issued by the UN to the Model Regulations. Of note are: UN1278-The proper shipping name has been changed from Propyl chloride to 1-Chloropropane; UN 1305- The proper shipping name is now Vinyltrichlorosilane. Stabilized has been deleted from the proper shipping name; UN 1350- Sulphur. The limit per package was prepared under the limited quantity, passenger aircraft and Cargo Aircraft Only packing instructions.

5- Packing Instructions

416- entries for UN numbers, 3364, 3365, 3366, 3368, 3369 and 3370 have been added to the table. These substances were added to 4.2 in the 44th edition of the DGR, but no corresponding entries were added PI 416.

Y501- The limitations for inner packagings for UN 3139-Oxidising liquid, n.o.s. have added.

650- The minimum size requirements for packages have been amended to allow packages smaller than 100 mm(4 in) in the smallest overall dimension. However, packages must still be of a size such that one side is no smaller than 100x100mm(4x4 in).The package markings are now required to just be DIAGNOSTIC SPECIMENS. This aligns the requirement with the UN requirements and reflects that PI 650 is now a multimodal standard. Additional wording has been added to reinforce that where dry ice or liquid nitrogen is used as a refrigerant, that all of the provisions applicable to those substances in these Regulations apply.

905- Paragraph (a) has been amended to include provision for items previously shipped under the proper shipping name Gas generator assemblies. The proper shipping name Gas generator assemblies, ID 8013, was deleted from the 2003-2004 edition of the ICAO Technical Instructions, and consequently the 44th edition of the DGR, on the basis that these articles were no longer in existence. However, it was subsequently realized that these articles are still in use. They may now be shipped as Life-saving appliances, self-inflating.

7.1.5.1- The requirements for marking the net quantity on packages and overpacks has been clarified.

7.1.5.8- The requirements for the air eligibility marking have been revised by ICAO. The marking now applies to the package rather than the packaging. The placement of the marking is now standard for all packages.

7.2.4.5- A Keep Away From Heat label has been introduced (7.4.6 and Figure 7.4.F) for packages containing substances self-reactive substances of division 4.1 and organic peroxides subject to Special Provision A 20. Application of this handling label is recommended from 2004, but will become mandatory from 1 January 2005.

8.1.6.9- Sequence of Information. The note regarding a single sequence, commencing with UN Number, being applicable from 1 January 2005 has been amended. The note now states that the objective will be to only allow a single sequence from 1 January 2007. This matter is being addressed

through the UN to ensure that multimodal harmonization is not impeded.

Ⅲ. National Regulations Governing the Air Transport of Dangerous Goods in Korea

1. Aviation Act⁹⁾

The purpose of this Act is to contribute the development of aviation and the promotion of public welfare by determining methods to assure the safety in air navigation, increasing the efficiency of installation and management of air navigation facilities, and establishing order in air transportation services, pursuant to the provisions of the Convention on International Civil Aviation and in conformity with the standards and methods adopted by the Annex to the said Convention(Article 1).

The Aviation Act is divided into ten Chapters as follows: Chapter 1. General provisions, Chapter 2. Aircraft, Chapter 3. Airmen, Chapter 4. Operation of aircraft, Chapter 5. Navigation safety facilities, Chapter 6. Air transportation business, etc., Chapter 7. Air handling business, etc., Chapter 8. Foreign aircraft, Chapter 8-2. Investigation of aviation accident, Chapter 9. Supplementary provisions, Chapter 10. Penal provisions.

Article 61 (Prohibition of Transporting and Carrying of Explosives) paragraph (1) provides as follows: High explosives, combustible material or other things which might inflict and danger or injury on other persons, damage or destruct other things, which are prescribed by the Ordinance of the Ministry of Construction and Transportation, shall not be transported by aircraft: Provided, That this shall not apply in case where it is permitted by the Minister of Construction and Transportation.

9) As amended, December 30, 2003.

2. Enforcement Decree of the Aviation Act¹⁰⁾

Article 49 (Offence on which Penalty is Imposed, and Amount, etc. of Penalty) paragraph (1) provides as follows: The categories of offenses on which the penalty is imposed under Article 131 of the Act (including cases where it is applicable mutatis mutandis under Articles 132(4), 134(3), 142(1) and (3), and 150(2) of the Act), and the amount of the penalty shall be as shown in Table 2.

<Table 2> Offence and Penalty Amount

(Unit: thousand won)

Offence	Penalty Amount			
	Regular Air Carrier	Irregular Air Carrier	Aerial Work Operator	Foreigner International Air Carrier
Where explosives, etc. prescribed under the Ordinance of the Ministry of Construction and Transportation have been carried on an aircraft without obtaining permission by the Minister of Construction and Transportation.	30,000	15,000	10,000	30,000
Where explosives have been carried on an aircraft without identifying whether there were things of explosives, etc. among shipments.	30,000	10,000	5,000	30,000

Source: Korea Enforcement Decree of the Aviation Act

¹⁰⁾ As amended, November 4, 2003.

3. Enforcement Regulation of the Aviation Act¹¹⁾

Article 188 (Prohibitive Things of Transporting, and Storage of weapons, etc.) provides as follows: (1) Prohibitive things of transporting under the Article 61(1) of the Act are the following articles, which are prescribed under ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air. (2) Notwithstanding the provision of paragraph (1), the following things may be carried on an aircraft: (a) Things being carried subject to ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air; (b) Things being used in such aircraft for the safety of aircraft operation and human life.

4. Aviation Safety and Security Act¹²⁾

The purpose of this Act is to prevent and unlawful act in airport facilities, air navigation safety facilities and aircraft in compliance with international conventions, including the Convention on International Civil Aviation and to provide for standards, procedures, and mandatory matters needed to ensure the safety and security of civil aviation(Article 1).

The Aviation Safety and Security Act is divided into eight Chapters as follows: Chapter 1. General provisions, Chapter 2. Aviation safety council, etc., Chapter 3. Security of airports and aircraft, etc., Chapter 4. Safety and security in aircraft, Chapter 5. Aviation safety and security equipment, etc., Chapter 6. Response to threat to aviation safety, Chapter 7. Supplementary provisions, Chapter 8. Penal provisions.

Article 21 (Prohibition on Carrying Hazardous Objects onto Aircraft) paragraph(1) provides as follows: Weapons (including biochemical weapons

11) As amended, November 22, 2003.

12) As amended, December 31, 2003.

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such as a bacteria of anthrax and smallpox germ), swords, explosives, toxic chemicals or highly flammable substances, etc. shall be prohibited from being carried or loaded onto aircraft. Provided, That the same shall not apply to the cases where permission therefore is obtained from the Minister of Construction and Transportation in accordance with the provision of Article 61(1) of the Aviation Act and specific duties are performed in accordance with the provision of paragraph (3) of the same Article.

Article 44 (Crime of Carrying Hazardous Objects onto Aircraft) provides as follows: Any person who has carried or loaded hazardous objects onto aircraft or let other person carry or load them in violation of Article 21 shall be punished by imprisonment for not less than 2 years to not more than 5 years

5. Notice of the Ministry of Construction and Transportation-Flight Safety Regulations¹³⁾

In accordance with Korean Aviation Regulation, ICAO and Annex, the objective of these regulations is to ensure the aviation operational safety standards which airmen and aircraft owners must comply with(Article 1.1.1).

The Flight Safety Regulations is divided into nine Parts as follows: Part 1. General, Part 2. Personal licensing, Part 3. Aviation training organizations, Part 4. Aircraft registration and marking, Chapter 5. Airworthiness, Part 6. approval for maintenance organization, Part 7. Instrument and equipment, Part 8. Operations, Part 9. Air operator certification and administration.

Part 9 (Air Operator Certification and Administration) Subpart 9.6(AOC Dangerous Goods Management) provides those AOC requirements that apply to operations and management of operations personnel and their functions regarding dangerous goods (9.6.1.1). Also Subpart 9.6 provides the following requirements: Approval to Transport Dangerous Goods (9.6.1.2); Scope

13) As amended, April 14, 2004.

(9.6.1.3); Limitations on The Transport of Dangerous Goods (9.6.1.4); Classification (9.6.1.5); Packing (9.6.1.6); Labeling and Marking (9.6.1.7); Dangerous Goods Transport Document (9.6.1.8); Acceptance of Dangerous Goods (9.6.1.9); Inspection for Damage, Leakage or Contamination (9.6.1.10); Removal of Contamination (9.6.1.11); Loading Restrictions (9.6.1.12); Provision of Information (9.6.1.13); Training Programmes (9.6.1.14); Dangerous Goods Incident and Accident Reports (9.6.1.15).

6. Comparison of Korean Regulations with International Standards

There are certain differences between Korean regulations and international standards for the air transport of dangerous goods. Korean current regulations have only the provisions governing things which shall not transport by aircraft, and penalty which is imposed where explosives, etc. have been carried without obtaining permission or identifying, and air operator certification and dangerous goods management.

For transporting dangerous goods safely by air, it is necessary for Korean regulations to contain additionally the provisions governing packing and packaging test, shipper's responsibilities, dangerous goods occurrence by the operator in compliance with above-mentioned international standards.

IV. Improvements of Management System for the Air Transport of Dangerous Goods

1. Enactment of Detailed National Regulations Governing the Air Transport of Dangerous Goods

National regulations create a framework for transporting dangerous goods

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safely by air, and outreach to shippers and carriers helps to prevent undeclared shipments. Accordingly, The government authority should monitor and enforce compliance with national regulations for transporting dangerous goods by air¹⁴).

Korea has only comprehensive regulations that provide Articles which are prescribed under ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air may be carried on an aircraft under the Article 61 of the Aviation Act and the Article 188 of its Enforcement Regulation. Also Subpart 9.6 of Flight Safety Regulations includes the provision of Air Operator Certificate (AOC) Dangerous Goods Management.

At present Korea has not detailed national regulations governing air shipments of dangerous goods in compliance with the international standards for the air transport of dangerous goods. Therefore, the government authority should establish detailed standards and procedures with a view to achieving compliance with the national regulations and international standards for the air transport of dangerous goods. Also the government authority should amend and update the present national regulations governing the air transport of dangerous goods in accordance with the changes to ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air and IATA Dangerous Goods Regulations.

2. Strengthening of Dangerous Goods Training

Initial and recurrent dangerous goods training programmes must be established and maintained by or on behalf of: a) shippers of dangerous goods, including packers and shipper's agents; b) operators; c) agencies which perform, on behalf of the operator, the act of accepting, handling, loading, unloading, transferring of other processing of cargo; d) agencies

14) United States General Accounting Office(2003), AVIATION SAFETY-Undeclared Air Shipments of Dangerous Goods and DOT's Enforcement Approach (January), p.1.

located at an aerodrome which perform, on behalf of the operator, the act of processing passengers; e) agencies not located at an aerodrome which perform, on behalf of the operator, the act of checking in passengers; f) agencies other than operators involved in processing cargo; and g) agencies engaged in the security screening of passengers and their baggage.

Dangerous goods training programmes required by the operator must be subject to review and approved by the appropriate authority of the State of the operator. Dangerous goods training programmes required by other than the operator should be subjected to review and approval as determined by the appropriate national authority.¹⁵⁾

Personnel must receive training in the requirements commensurate with their responsibilities. Such training must include: a) general familiarization training-which must be aimed at providing familiarity with the general provisions; b) function-specific training-which must provide detailed training in the requirements applicable to the function for which that person is responsible; and c) safety training-which must cover the hazards presented by dangerous goods, safe handling and emergency response procedures. Table 3 shows the content of training courses.

Training must be provided or verified upon the employment of a person in a position involving the transport of dangerous goods by air. Recurrent training must take place within 24 months of previous training to ensure knowledge is current .

A test to verify understanding must be undertaken following training and a certificate issued confirming that the test has been completed satisfactorily.

A record of training must be maintained which must include: a) the individual's name; b) the most recent training completion date; c) a description, copy or reference to training requirements; d) the name and address of the organization providing the training; and a copy of the certification issued when the individual was trained, which shows that a

15) ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air, Part 1 Chapter 4 Paragraph 1.

The Change of International Standards and Improvement of Management System for the Transport of Dangerous Goods by Air 93 test has been completed satisfactorily. The records of training must be made available upon request to the appropriate national authority. The subject matter relating to dangerous goods transport with which various categories of personnel should be familiar is indicated in Table 3.¹⁶⁾

Before a consignment of dangerous goods is offered for air transport, all relevant persons involved in its preparation must have received training to enable them to carry out their responsibilities, as detailed in Part 1 of ICAO Technical Instructions. Where a shipper does not have trained staff, the relevant persons may be interpreted as applying to those employed to act on the shipper's behalf and to undertake the shipper's responsibilities in the preparation of the consignment. However, such persons must be trained as required by Part 1, Chapter 4 of ICAO Technical Instructions.¹⁷⁾

An operator must ensure training is provided in accordance with the detailed requirements of Part 1, Chapter 4 of ICAO Technical Instructions to all relevant employees, including those of agencies employed to act on the operator's behalf, to enable them to carry out their responsibilities with regard to the transport of dangerous goods.¹⁸⁾

16) ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air, Part 1 Chapter 4 Paragraph 2.

17) ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air, Part 7 Chapter 4 Paragraph 9.

18) ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air, Part 7 Chapter Paragraph 9.

<Table 3> Content of Training Courses

Aspects of transport of dangerous goods by air with which they should be familiar as a minimum	Category of personnel - see key below								
	1	2	3	4	5	6	7	8	9
General philosophy	X	X	X	X	X	X	X	X	X
Limitations	X		X		X	X	X	X	X
General requirements for shippers	X		X			X			
Classification	X	X	X			X			
List of dangerous goods	X	X	X			X	X		
General packing requirements	X	X	X			X			
Packing instructions	X	X	X			X			
Labeling and marking	X	X	X	X	X	X	X	X	X
Dangerous goods transport document and other relevant documentation	X		X			X			X
Acceptance procedures			X						X
Storage and loading procedure			X	X			X		X
Pilots' notification			X	X			X		
Provisions for passengers and crew	X	X	X	X	X	X	X	X	X
Emergency procedures	X	X	X	X	X	X	X	X	X

Source : ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air 2003-2004 Edition.

KEY

- 1 - Shippers and shippers' agents
- 2 - Packers
- 3 - Dangerous acceptance staff of operators and agencies acting on behalf of operators
- 4 - Staff of operators and agencies acting on behalf of operators engaged in the ground handling , storage and loading of cargo and baggage
- 5 - Passenger-handling staff and security staff who deal with the screening of passengers and their baggage

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- 6 - Staff of agencies other than operators involved in processing cargo
- 7 - Flight crew members and load planners
- 8 - Crew members (other than flight crew members)
- 9 - Cargo acceptance staff (other than dangerous goods acceptance staff)
of operators and agencies acting on behalf of operators

At present Korea has not the characterized training organization for the air transport of dangerous goods. The Education Center of Korean Airlines performs the dangerous goods training courses for its employees, cargo agencies and ground handling agencies. To strengthen the dangerous goods training, the characterized training organization should be designated and provide dangerous goods training programmes in the requirements commensurate with their responsibilities to shippers, packers, cargo agents, freight forwarders, ground handling agents, and air carriers.¹⁹⁾

3. Designation of Inspection Organization for Packaging Performance Tests

The packing performance tests are designed to ensure that will be no loss of contents under normal transport conditions. The severity of the tests on a packing is dependent on the intended contents, taking account of the degree of danger, relative density and vapour pressure (for liquids).

The design type of each packaging must be tested as provided in the Chapter 4 of ICAO Technical Instructions in accordance with procedure established by the appropriate national authority.

Tests must be successfully performed on each packaging design type before such packaging is used. A packaging design type is defined by the design, size, material and thickness, manner of construction and packing,

19) Korea Transportation Safety Authority and DGCT Co., Ltd.(2004), Establishment and Enforcement of Methods of the Safety Management System for the Air Transport of Dangerous Goods (19 February), p.12.

but may include various surface treatments. It also includes packagings which differ from the design type only in their lesser design height.

Tests must be repeated on production samples at intervals established by the appropriate national authority. For such tests on paper of fireboard packagings, preparation at ambient conditions is considered equivalent to the provisions of 4.2.3. in the Chapter 4 of ICAO Technical Instructions. Tests must also be repeated after each modification which alters the design, material or manner of construction of a package.

The appropriate national authority may permit the selective testing of packagings that differ only in minor respects from a tested type, e.g. smaller sizes of inner packagings or inner packagings of lower net mass; and packagings such as drums, bags and boxes which are produced with small reductions in external dimension.²⁰⁾

At present Korea has not the characterized inspection organization for the packing performance tests of air shipments of dangerous goods. To ensure no loss of contents under normal transport conditions, the characterized inspection organization should be designated and perform the packing performance tests in accordance with procedure established by the appropriate national authority²¹⁾.

4. Establishment of Central Information System for Air Shipments of Dangerous Goods

To establish effectively the safety management system for the air transport of dangerous goods, it is necessary to establish the Central Information System by using the electronic system, and the dangerous goods should be transported by air through the Central Information System.²²⁾

20) ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air, Part 6 Chapter 4 Paragraph 1.

21) Korea Transportation Safety Authority and DGCT Co., Ltd., *supra* note 19, p.15.

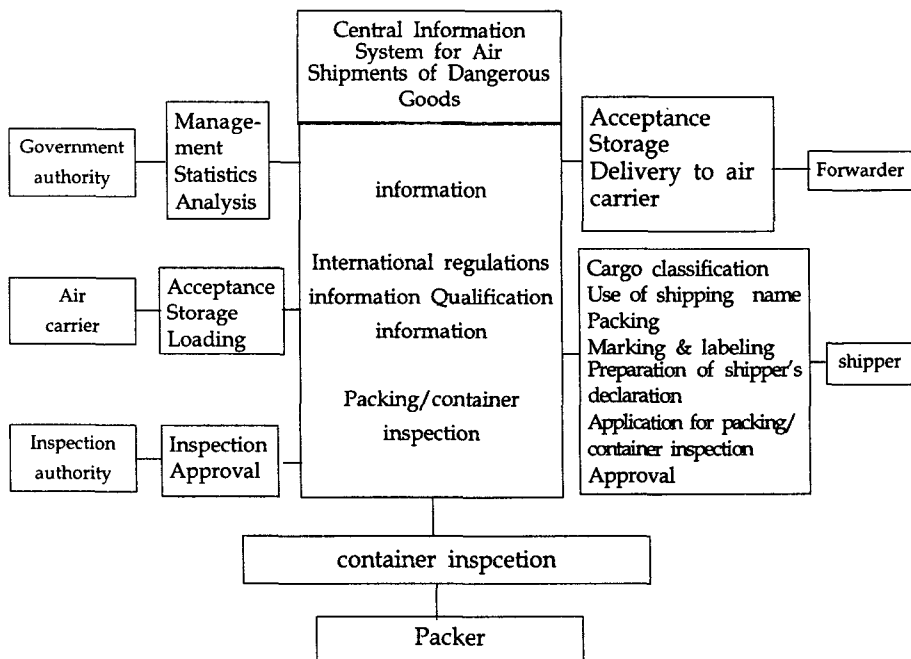
22) Korea Transportation Safety Authority and DGCT Co., Ltd., *supra* note 19, p.17.

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The Central Information System shall provides the applied programmes and technical information which are necessary for the operations of transporting the dangerous goods by air, and the reporting operations to the government authority shall be carried out through the Central Information System.

As shown in Table 4, the operator of the Central Information System shall collect and manage the information with regard to the regulation noncompliance, accident, statistics and analysis, acceptance, storage, loading, registered operator, legislation, international regulations, qualification, employee, dangerous goods list, packing, marking and labeling, airline variations, state variations, and packing and container inspection, etc. for the air transport of dangerous goods.

<Table 4> Central Information System for Air Shipments of Dangerous Goods



Source : Korea Transportation Safety Authority and DGCT Co., Ltd.(2004), Establishment and Enforcement Methods of the Safety Management System for the Air Transport of Dangerous Goods (19 February), p.16.

5. Imposition of Penalty on Undeclared Air Shipments of Dangerous Goods

Undeclared²³⁾ shipments of dangerous goods are particularly dangerous in air transport because there is little room for error or time to take corrective action if a problem occurs in flight- a lesson learned tragically in 1996 when a ValuJet plane crashed in Florida after oxygen generators caught fire in the plane's cargo compartment.

Little is known about the nature and frequency of undeclared shipments of dangerous goods. While major carriers believe such shipments are rare, their belief is based mainly on inspections of problem shipments such as those that leak.

Statistically valid, generalizable data are not available and would be difficult to obtain because more inspections would entail costly delays for carriers.

A change in the law requiring that shippers' consent to the opening of packages for inspection might be appropriate for air transport and would enable the government authority to obtain such data.

Private industry does business primarily with known shippers (those that have shown they comply with the regulations). Carriers train their employees to screen for undeclared shipments.

The government authority and carriers know that undeclared air shipments of dangerous goods occur and can have serious consequences, but they lack statistically valid, generalizable data to reliably estimate the nature and frequency of such shipments, assess their risks, profile potential violators, and allocate resources optimally for prevention, detection, and correction. Technological, economic, and legal hurdles combine to make

23) The term undeclared describes two types of improper shipments of dangerous goods: (1) those that a shipper has explicitly denied are hazardous or has not identified as hazardous and (2) those that a shipper has identified as hazardous but has otherwise misrepresented.

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estimates of undeclared dangerous goods shipments difficult.

The current less intrusive screening equipment is not designed to detect many types of dangerous goods, and therefore opening packages is the only reliable means of obtaining information on undeclared shipments.

While carriers generally obtain the consent of shippers to open packages that they accept for shipment, they seldom open packages because doing so is slow and costly to be practicable except when incidents occur.²⁴⁾

To enforce the shipper's declaration for shipping dangerous goods by air, the government authority should monitor shippers' performance and impose civil penalties on undeclared air shipments of dangerous goods. Accordingly it is necessary to include the prescription of appropriate penalties on undeclared air shipments of dangerous goods in the national regulations.

Carriers may impose sanctions for shipping undeclared dangerous goods. A shipper who fails to properly declare a dangerous goods shipment can face serious consequences from a major carrier. Carriers may, depending on the seriousness of the violation, require a shipper to provide additional remedial training in shipping dangerous goods; apply more stringent terms for accepting shipments from the shipper, or, in more serious instances, permanently terminate the business relationship with the shipper.²⁵⁾

V. Conclusion

To prevent dangerous goods shipments from compromising safety, the national government relies on regulation, research, and outreach, and private industry relies on policies for dealing with 'known shippers²⁶⁾, other restrictions on customers or the materials they carry, training, and sanctions.

24) United States General Accounting Office, *supra* note 14, p.3.

25) United States General Accounting Office, *supra* note 14, p.26.

26) known shippers is a term for shippers that have demonstrated their previous business history.

National regulations create a framework for transporting dangerous goods safely. If the government authority finds that these regulations are insufficient to ensure safety, it should modify the regulations.

To evaluate the effectiveness of and enforce national regulations for shipping dangerous goods by air, the government authority should collect data on incidents involving dangerous goods, monitor shippers' and carriers' performance, and assess civil penalties.

In Korea the government authority should establish such management system as follows for ensuring the safe transport of dangerous goods: Firstly, the legal dangerous goods training should be strengthened. Secondly, the inspection organization for the packing performance tests should be designated. Thirdly, the central information system for collecting and managing the information should be established.

Carriers should try to prevent dangerous goods shipments from compromising safety. Carriers should train their employees to be a first line of defense against undeclared shipments. Also carriers may require shippers to take remedial training or may refuse to do business with them if they repeatedly violate the dangerous goods regulations.

As the results of this paper, it is anticipated that; a) the government authority will enact detailed national regulations in accordance with the changes of the international standards for the air transport of dangerous goods, and enforce compliance with the regulations governing the air transport of dangerous goods; b) shippers will train their employees to package their shipments safely, and tell the carriers to whom they deliver these shipments that they contain dangerous goods; c) carriers will train their employees to handle these shipments properly, and identify likely instances of improper shipments such as those containing undeclared dangerous goods, and report to the government authority any instance of noncompliance they discover.

In conclusion, ensuring the safe transport of dangerous goods by air is a shared responsibility of the government authority, carriers and shippers.

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Dangerous goods can be carried safely by air transport providing certain principles are adopted. They are intended to facilitate transport whilst giving a level of safety such that dangerous goods can be carried without placing an aircraft or its occupants at risk, providing all the requirements are fulfilled.

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ABSTRACT

The Change of International Standards and Improvement of Management System for the Transport of Dangerous Goods by Air

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This paper intends to prevent dangerous goods shipments from compromising safety, and to minimize the risks to life and property inherent in air transport of dangerous goods. For this purpose, this paper reviews the changes of international standards for the international air transport of dangerous goods, and recommends the methods for improving the management system for the air transport of dangerous goods. As for the research methodology, this paper reviews the current regulations of the ICAO Technical Instructions for the Safe Transport of Dangerous Goods, IATA Dangerous Goods Regulations, and national regulations governing the air transport of dangerous goods in Korea. As the results of this paper, it is anticipated that the national regulations for shipping dangerous goods by air will be detailed, and compliance with the regulations will be enforced. In conclusion, ensuring the safe transport of dangerous goods by air is a shared responsibility of the government authorities, carriers and shippers.

Key Words : Dangerous goods, International standards, ICAO Technical Instructions, IATA Dangerous Goods Regulations, Undeclared dangerous goods
