

SAFETY IN THE TRANSPORT OF DANGEROUS GOODS AND SPECIAL LOADS BY AIR

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Abstract

The aim of this paper is to examine the international law governing air cargo transport. The basic research problem concerns the application of the existing procedures in practice. The structure of the article covers three basic exploratory issues. The first refers to the general identification of the international law on air freight transport. The second concerns the classification of dangerous goods and special documents required for air transport. The third relates to the procedures for handling hazardous materials and special goods in air transport. The results of the research process are based on an analysis of the literature and self experience.

Key words: dangerous goods, special goods, cargo air transport, law international, safety

Introduction

Air transport has been booming over the last few decades, compared to previous years when the world was facing economic crisis. The largest increase in the amount of cargo transported by air has been recorded since 2017. This growth is related both to the development of the global economy and GDP growth, as well as to the specificity of air transport. This type of transport ensures fast and safe long-distance transport of loads compared to other means of transport.

Ordinary cargo, known as general cargo, is transported by air. It does not require any special service both in the cargo terminal and in the airport. In addition, special loads and dangerous goods are transported by air too. Special loads include mainly live animals, perishable goods, including food, as well as human corpses and remains, goods stored in dry ice, human organs and blood, and valuable consignments. Dangerous goods are all consignments that contain substances on the dangerous goods list. Transport of both special loads and dangerous goods requires appropriate procedures.// Transport procedures are determined individually by the airlines, while handling procedures are the internal regulations of the ground handling agent responsible for handling shipments at the freight terminal. The agent's duties include

taking care of efficient and, above all, safe handling of shipment entrusted to it. This is done by creating and following internal procedures that are in line with the relevant regulations.

The purpose of this article is to identify the legal regulations and to examine the procedures related to the transport of hazardous and special materials by air. This article attempts to answer the question: what procedures should be followed for handling air freight in order to ensure its safe transport? The research carried out on the subject in question indicates that the literature on air freight transport is insignificant. Therefore, in order to answer this question, it is necessary to include the general characteristics of the air freight of hazardous materials and special loads.

Legislation on the transport of hazardous and special materials by air

Transport of dangerous goods by air should be based on the provisions of Annex 18 Safe transport of dangerous goods by air of the Convention on International Civil Aviation¹. This convention was signed in December 1944 in Chicago. It also established the ICAO, the International Civil Aviation Organisation. The International Air Carrier Association publishes the Dangerous Goods Regulations manual once a year. It defines the basis for creating the procedures for handling dangerous shipments in air transport. These provisions apply to all dangerous goods transported by air using civil aircraft.

Dangerous materials are defined in Annex 18 of the Convention on International Civil Aviation. According to this document, an object or substance that may pose a risk to health, safety, property or the environment and which is included in or classified as hazardous material contained in the Technical Instructions should be treated as hazardous materials². According to the basic interpretation of international law, transport of dangerous goods by air is prohibited. However, it should take place under the provisions of Annex 18 and the procedures in the Technical Instructions³.

Annex 18 together with Technical Instructions lay the foundation for the manual issued by the International Air Carrier Association. The manual regulating the transport of dangerous goods by air supplements the Technical Instructions. It consists of a set of procedures, the correct application of which ensures safety in the handling of dangerous goods. The 61st edition of the handbook is currently applicable. The manual is divided into 10 chapters and supplemented with eight annexes. These rules are updated once a year and the new edition of the manual comes into force on

¹ Convention on International Civil Aviation, signed in Chicago on 7 December 1944, Dz.U. 1959 No. 35 item. 212.

² Annex 18 to the Convention on International Civil Aviation, Safe Transport of Dangerous Goods by Air, Fourth Edition, Dz.U. ULC item. 13.

³ Technical Instructions for the Safe Transport of Hazardous Materials by Air is a document issued by ICAO containing detailed procedures for the transport of hazardous materials by air.

1 January. It is recommended that only the current version of the manual be used for acceptance of shipments containing dangerous goods. The manual is published in English, French, German, Spanish, Russian and Chinese. The Handbook and Annex 18 establish the basis for the formulation of national law and airline regulations. International regulations define the responsibility of the consignor and the carrier. They also contain training requirements for those accepting dangerous goods for transport. They also describe the handling procedures used by ground handling staff.

It is permissible to transport live animals by air. IATA publishes the Live Animals Regulations manual which contains a set of procedures for the handling of live animals in air transport. The regulations in the manual are not only intended for airline employees and ground handling agents, they also contain a number of guidelines and requirements regarding animal breeders and transport of zoo animals. IATA rules oblige those involved in the transport of animals to be familiar with the rules referring to the reservation and admission of an animal for transport, the behaviour and classification of animals, documentation and the proper marking and labelling of the containers with animals. The Manual consists of 13 chapters and 7 annexes. Moreover, this transport is regulated by national law and carriers' regulations. They may be more restrictive than IATA regulations. Animal transport is also subject to European Union law. European Union law governing animal transport focuses mainly on two aspects: health and humanitarianism. The first directive on animal transport originates from the abolition of borders between EU member states, established in 1993. After Directive 91/628/EC came into force, the transport of animals to and out of the European Union began in accordance with IATA rules. All airlines that transport animals to and from the European Union, in accordance with the current Directive, are obliged to stick to IATA rules - whether they are members or not. Over the years, the EU legislators realised that there was a need to change the rules, due to issues not covered in the previous Directive. In 1995, new legislation was introduced addressing the transport of all animals other than those transported for non-commercial purposes, individual animals transported in the care of a person and private transport of pets with their owner. Community law adopted in the Member States may vary slightly because of its interpretation⁴.

The transport of animals is also regulated by the Convention on International Trade in Endangered Species of Wild Fauna and Flora - CITES. Threatened wildlife species are listed in the Annex of this Convention. It came into force in 1975 and is updated every two years, depending on population growth, species are added or removed from the list. Regulations for the transport of endangered species are introduced at government level. These authorities issue permits and licences to ensure that the marketing of endangered species remains under the control of the national authorities. The purpose of CITES provisions is to prohibit or control trade in endangered species. This problem is particularly present in underdeveloped

⁴ Council Directive 95/29/EC of 29 July 1995 amending Directive 91/628/EEC concerning the protection of animals during transport.

countries. There is a lack of staff to supervise transactions involving endangered species. The trade in endangered species is often very profitable, which in poor countries also leads to the violation of international law in this area. However, certain transactions may be carried out with the consent of the competent authorities. The CITES Convention is supplemented by three annexes. Annex 1 contains the list of species which are close to extinction and therefore are excluded from trade. The transport of these species is only permitted in special situations and requires extensive documentation.

The second Annex contains a list of species which can only be transported under strict control. In exceptional circumstances, such as controlled reproduction programmes, the authorities shall allow the transport of these species. The third Annex contains a list of species whose population is decreasing. Due to their rarity, their trade is monitored to prevent extinction. The detailed conditions governing trade in the species listed in the last Annex is determined by the national authorities. All animals of the species listed in one of the Annexes require an identification document. Such a document may be an export or import permit - an import permit is only required for the species in the first annex.

CITES documents also include the re-export certificate, the certificate of origin required for Appendix 3 species, the captive breeding certificate, the certificate of artificial propagation, the travelling exhibition certificate for live animals and labels for exchanges between registered scientists and scientific institutions. Transport of some of the species requires the submission of more than one of the above mentioned documents. This depends on the degree of protection required, the export or import of live specimens or readily recognisable parts coming from the species covered by the CITES Annexes. CITES permits and certificates should contain the full name and logo of the CITES organisation, name and address of the authority issuing the certificate or attestation, the control number, the full name of the exporter and importer, the scientific name and the number of animals transported, all of these components have to be included in consignor's certificate⁵.

Perishable goods and products are also defined as goods requiring special service. In the aviation nomenclature, the special service code PER is indicated. The International Air Carrier's Association issues the IATA Perishable Cargo Regulations manual which establishes the basis for regulations relating to the transport of perishable goods by air. According to the classification made in the PCR manual, perishable goods include: fruit and vegetables, fresh flowers, seafood and fish for consumption, fresh meat, pharmaceutical products requiring temperature-controlled storage, hunting trophies and articles containing parts of animals included in the CITES list⁶. In the transport of such goods, time and temperature play key

⁵ Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, 3 March 1973, Dz.U. 1959 No. 27 item. 112.

⁶ International Air Transport Association (IATA), Perishable Cargo Regulations, Edition 19, IATA, Montreal - Geneva 2020, p. 19.

roles throughout the entire transport process. This handbook sets out in detail the requirements for the packaging of perishable goods. The transport of goods classified as perishable goods is also regulated by veterinary and phytosanitary regulations.

To sum up, over the years of development of air freight transport, a number of legal regulations have been developed to ensure a high level of air transport safety. They are the result of many years of work by specialists in various fields and form the basis for handling air freight. In addition to the norms and rules of international law, the procedures and principles described in the manuals published by IATA are widely used. They are commonly used as best practices, although they do not constitute rules in the meaning of international law. However, they contain a comprehensive set of guidelines, the use of which affects the safety of air transport.

Classification and documentation of hazardous materials and special goods in air transport

International regulations classify hazardous materials. They are divided into classes and subclasses. This classification is related to the risks of the indicated groups of substances and results directly from their chemical structure and physical nature. However, the numbers of classes and subclasses do not reflect the degree of hazard posed by the substances and materials contained therein, but merely facilitate the determination of the material class by indicating the predominant hazard. The list created in this way also includes the possibility of accepting the materials for air transport. However, there are so many substances presenting a risk that there are basic items in the list. The assignment of a substance to a particular class should be according to the hazard or predominant hazard it poses. This distinction is due to the fact that there are materials which contain several hazardous substances, so that they cannot be assigned unambiguously to one class only⁷. The material class determination enables it to foresee the hazards that may potentially occur in the event of an accident or incident involving the material indicated. The appropriate classification of the hazardous materials transported is one of the key elements affecting transport safety. The classification of transported cargo also applies to perishable goods and live animals. These cargoes are not divided into the same classes as hazardous materials. However, the classification used makes it easier to identify the goods transported and thus increases the level of security thanks to the appropriate handling of the various types of goods transported.

Each consignment transported by air, regardless of its content, must be accompanied by the required documents. Their type and appearance are determined by international regulations. The basic document accompanying each air consignment

⁷ International Civil Aviation Organisation (ICAO), Technical Instructions for the Safe Transport of Hazardous Materials by Air, 2015-2016 Edition, p. 2-0-1.

is an air waybill. It contains the data of the consignor and the consignee, information regarding the type of goods transported and special requirements, if any. In addition to that, depending on the type of goods transported, the consignment may be accompanied by other required documents.

Each consignment containing hazardous materials has to hold a shipper's declaration. A pattern of this document is presented in the IATA manual. It is a document containing the data of the consignor and the consignee, the code of the destination airport, as well as information on the type and quantity of hazardous materials transported, additional information on handling, and a statement confirming that the shipment is accepted for transport. These declarations shall be made by the person responsible for the shipment of the goods. It is the responsibility of the ground handler to check the conformity of the declaration with the actual state⁸.

The document which, in addition to the AWB, must accompany the consignment containing the live animal is the shipper's certificate. The certificate consists of two parts. The first is a description of the animal being transported. Its scientific name should be given here and for transport of dogs, cats and pets, the common names should be given there. The first part of the certificate also contains important information about the animal's behaviour and whether the animal is wild, aggressive or subject to regulations. The second part of the certificate is a table containing information on the number of packages, the type of container and the number of animals being transported. It is the shipper's responsibility to hand over all the necessary and correctly completed documents for the whole journey of the animal, including transit and stopovers. Before sending the animal on a journey, it should be carefully checked that the certificate provided is completed correctly. An animal accepted for transport by air should also be accompanied by a valid health certificate which indicates that the animal's health is not an obstacle to transport. Only completely healthy animals may be transported by air⁹.

For transport of perishable goods, the accompanying documents vary depending on the content of the consignment. Consignments of fresh meat and fish must be accompanied by a health certificate issued by a veterinarian in addition to the consignment note. The sender of the consignment is obliged to provide a certificate according to the requirements of the country of destination. The list of requirements for each country can be found on the website of the General Veterinary Inspectorate. If a country is not on the list, it means that Poland has not agreed with this country on the conditions for the import of food products. Knowledge of veterinary requirements prevents the shipment being halted or sent back. The health certificate guarantees the supply of fresh food. For this reason, the handling of such a consignment at the airport is a priority. The time of transport and the maintenance of the required temperature

⁸ International Air Transport Association (IATA), *Dangerous Goods Regulations*, 61st Edition, IATA, Montreal – Genewa 2020, p. 737.

⁹ International Air Transport Association (IATA), *Live Animals Regulations*, 46th Edition, IATA, Montreal – Genewa 2020, p. 205.

depends on whether fresh products reach their destination Air transport as part of the supply chain plays a key role in this respect, due to the time of dispatch¹⁰. However, all plants which are transported through the territory of Poland or sent to a third country have to hold a Phytosanitary Certificate. This is a document that confirms the health status of plants and seeds dispatched to third countries. The regulations of the country to which the consignment is sent are crucial for the issuance of the certificate. The certificate is issued by the Voivodeship Inspectorate for Plant Protection and Seed Production. These certificates are not issued for goods which are not subject to phytosanitary control in the country of destination¹¹.

To sum up, the classification of both hazardous materials and other special goods in the regulations facilitates their identification and the identification of possible hazards. Consignments carried by air have to be accompanied by the required documents, depending on the type of cargo being carried. These requirements are laid down in the regulations and compliance with them speeds up the handling process and facilitates the acceptance of goods for carriage by air.

Procedures for handling of hazardous materials and special goods in air transport

The specific nature and variety of hazards that may be posed by dangerous goods require safety procedures to be followed while handling them. They are primarily derived from international regulations. However, each airline has its own cargo handling procedures and requirements. They are also an indispensable part of the Ground Handling Agent's Manual¹². The procedures for the handling of dangerous goods and special goods in air transport can be divided into those relating to the packaging of goods and the labelling of parcels and those relating directly to the handling of these parcels at the airport.

All hazardous materials may only be transported in specially designed packaging materials. Requirements for the construction of packaging can be found in international regulations. Packaging intended for DGR transport must comply with the required specification. The use of the appropriate packaging reduces the leakage risk of hazardous substances or toxic gases. The packaging should be adapted to the type of material being transported so that the contents of the consignment do not react with the packaging. Packing the goods in accordance with the instructions significantly increases the safety level of transported materials. One part of the

¹⁰ www.wetgiw.gov.pl (access to 31.05.2020).

¹¹ www.piorin.gov.pl (access to 31.05.2020).

¹² The Ground Handling Agent's Manual is the basic organisational document of the ground handling agent, it is an executive manual containing a set of information on how to proceed in order to ensure full and continuous compliance of the agent's operations with the requirements of applicable laws, rules, standards and procedures.

Technical Instructions is entirely devoted to the packaging instructions. They contain a very detailed description of the packaging requirements for each class of hazardous materials. The packing instructions contain information on the required inner, intermediate and outer packaging. It also lists the specific substances for which packaging exceptions apply or which have specific packaging requirements. Packaging instructions will also provide information on required compatibility¹³.

Requirements for animal transport containers are laid down in Chapter 8 of the IATA Manual. It provides descriptions of containers for pets and livestock transport. Depending on the species transported, construction requirements may vary. However, all containers designed for the transport of animals by air have to meet several general requirements. The construction of the container has to fit to the weight and size of the animal. Containers for the transport of pets must be large enough to allow the animal to turn around freely and stand in it. To select the appropriate container size, the animal should be measured from the tip of the nose to the tail end in the case of pet animals. The transport of heavy farm animals and wild animals should be carried out in containers that prevent free moving around. This is because it could lead to a change in the aircraft's centre of gravity in flight. Furthermore, the descriptions of the individual containers indicate the materials that are recommended for use in their construction. For the manufacture of containers for the transport of live animals, materials that are not harmful to them should be used. The bottom of the container, regardless of the species of animal being transported, should be waterproof. Ventilation requirements and the location of water and food containers are indicated. Air circulation is important both in and around the container. Airflow is important because not only does it provide the animals with oxygen they need to breathe, but it also helps to remove gases and heat from inside the container¹⁴.

The variety of consignments considered as perishable goods makes packaging requirements different. However, general requirements may be laid down for such goods to be packaged in a way that ensures maximum safety during transport. The Consignor is obliged to pack the consignment in such a way as to prevent leakage of the contents or loss of the required temperature.

Containers used for the transport of perishable goods should meet the following requirements:

- a) they must maintain the contents in good condition and mitigate the effects of normal transport conditions;
- b) they must ensure that the contents are protected against changing environmental conditions such as temperature or humidity;
- c) when goods are transported wet or submerged in water, they must be waterproof;

¹³ International Air Transport Association (IATA), *Dangerous...* op. cit., p. 433.

¹⁴ International Air Transport Association (IATA), *Live...*, op. cit., p. 205.

d) they must be made of material capable of maintaining a temperature for at least 24 hours¹⁵.

The main materials used in the manufacturing process of containers used for transporting food or fruit by sea are styrofoam and polyurethane. Styrofoam is a material noted for its water resistance and, above all, properties that allow temperature to be maintained. For this reason, styrofoam containers are most often used to transport food that needs to be frozen for storage. However, a property of polyurethane is its absorbency, which is why polyurethane containers are used to transport shipments submerged or kept in water. Double containers, consisting of two containers made of different materials, are also used¹⁶.

In order to increase safety in air freight transport, the use of labelling on parcels is required. The specimens of all internationally accepted labels and markings can be found in the manuals issued by IATA. These markings are divided into safety labels for hazardous materials and handling labels to inform about special requirements for handling these shipments.

In the case of hazardous materials, markings are used that indicate the substance that is being transported. The use of appropriate labels on dangerous goods shipments increases the level of safety. The use of markings and labels on packaging, in addition to indicating the content of the packaging, also provides information necessary for safe handling of the consignment at the airport and indicates possible dangers that may arise. The sender is responsible for marking the parcels, while the personnel in the port is obliged to check the correctness of the marking in question¹⁷. Each package that contains hazardous materials must be clearly marked with the correct shipping name, UN number or ID of the substance being transported and full details of the shipper and consignee.

Each class of hazardous materials has a hazard sticker assigned. All hazard labels should be rhombus-shaped and must have a number in the lower corner corresponding to the class of dangerous material to which the label relates. Several labels may be assigned to one class of hazardous materials, depending on the number of subclasses. Flammable gases, liquids, toxic gases and substances have the same symbol assigned. A number in the lower corner of the label allows identification of the type of material being transported. Some labels may contain text, as is the case of labels for class 8 hazardous materials. However, it is not mandatory, although it may be required by the country or the airline concerned. All labels that are required for a given substance are indicated on the Hazardous Materials List. There are substances with more than one hazard. In this case, the basic risk sticker is indicated on the list first, followed by the additional risk. However, all required labels informing about the danger must be placed on the packaging¹⁸.

15 International Air Transport Association (IATA), *Perishable...*, op. cit., p. 33.

16 *Ibidem*, p. 35.

17 International Air Transport Association (IATA), *Dangerous...*, op. cit., p. 705.

18 International Air Transport Association (IATA), *Dangerous...*, op. cit., p. 712.

Special goods, in particular live animals and perishable goods, should also be marked with an appropriate label. However, for these goods, no distinction should be made between labels according to the classification of the goods transported. One label is used for all consignments containing the special loads indicated. Additional handling requirements or potential hazards are indicated by handling labels. They have been developed to make the work of air cargo handlers at the airport easier. The use of these labels also contributes to a higher level of safety in the handling process. These labels indicate how to arrange the shipment, how to protect it from inappropriate temperature or sunshine, and the required storage temperature. Among the handling labels are also those that inform about the content that might be dangerous to the environment. An example of such content is magnetic material that can interfere with the operation of navigation devices in an aircraft¹⁹.

The basic document used to accept shipments is a checklist. Patterns of checklists can be found in the IATA manual. The check-list is a document consisting of a set of questions. Many airlines have created their own lists, but despite these differences, each check-list must check that the packages, overpacks and containers are properly marked and wrapped, the package is packed according to the required packing instructions, and that the required documents, especially the shipper's declaration, are attached to the package. The shipment to the warehouse is accepted only after all the elements have been checked. The shipment is to be rejected if any of the questions on the checklist have been answered negatively.

The acceptance for the carriage of special loads should take place in accordance with applicable international law. This acceptance should be carried out by staff of the ground handling agent who have the required training. These goods require special attention in order to comply with regulations. The handling of cargoes containing goods that fall into these groups requires appropriate focus and procedures to be followed. When transporting live animals, it must not be forgotten that the load is a living creature. The person accepting a consignment containing a live animal in storage should pay attention to any anomalies, non-conformity of transport documents, required documents and veterinary approvals. Perishable goods are consignments that contain meat, fruit and vegetables, food products, plants and fish and seafood. The uniqueness of these goods is mainly due to the fact that their condition or suitability for use may change or deteriorate as a result of inappropriate temperature, humidity or delay in transport. Any consignment which seems suspicious when it comes to the correctness of marking, packaging or documentation should be withdrawn by the shipper. Only such cargo that fully complies with the applicable requirements may be accepted for air transport. The safety of the transport and flight depends to a large extent on the proper execution of the acceptance process. Admission of a mislabelled consignment for air transport may result in an accident or air crash²⁰.

¹⁹ International Air Transport Association (IATA), *Perishable...*, op. cit., p. 90.

²⁰ International Air Transport Association (IATA), *Perishable...*, op. cit., p. 60.

To sum up, all the procedures discussed aim to maximise the level of safety in the transport of hazardous and special materials by air. They have to be applied and observed by everyone involved in the process of handling of the air freight. At every stage of air freight transport, beginning from the packaging step and accepting goods and loading them into the cargo hold, some irregularities may occur and lead, consequently, to an air accident or incident. Scrupulous application of the procedures described above minimises the risk of such a situation.

Conclusions

The purpose of this article was to answer the question: what procedures should be followed for handling air freight in order to ensure its safe transport. The characteristics of the process of handling hazardous and special materials in air transport, from the identification of legal regulations to the presentation of the classification used and the procedures in force, have led to some conclusions.

The transport of hazardous materials and all special consignments by air requires the application of procedures and safety rules specifically designed for this purpose which have been included in international regulations. The basic documents used for handling dangerous and special cargoes in air transport are manuals issued by IATA - International Air Carrier Association. International regulations also specify how to mark consignments that contain goods requiring special handling. These markings are used to increase the level of security, informing about the content of the consignment without the need to check the accompanying documentation. The required label templates are included in the IATA manuals. In accordance with the applicable procedures, special consignments should be accompanied by the documents required by certain international rules. These requirements may vary from country to country and from airline to airline. Knowledge of these regulations is essential for the process of air transport of hazardous materials and special consignments to proceed safely.

Ground handling staff are responsible for handling air freight. For this reason, human errors such as misapplication of procedures and lack of knowledge are considered to be the main sources of errors and deficiencies in the safe handling of air cargo. These are mainly due to routine violations that have been introduced into the canon of everyday practice. Therefore, improvements should be implemented to minimise this type of situation in the future. All staff handling air cargoes undergo mandatory training, the content and frequency of which are specified in the regulations. These training courses are held every two years, but their thematic scope and dynamic working environment suggest that consideration should be given to increasing the frequency of compulsory training.

In order to increase the level of security and compliance with procedures, investment in training methods and a security management system for air freight transport seems to be the next step in the development of this branch of aviation.

Paying attention to staff training and qualification can minimise errors. In turn, the use of modern training methods should enable the staff responsible for accepting the dangerous goods to improve their qualifications.

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