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## INTERNATIONAL CARGO AIR TRANSPORT

### Abstract

Air transport is one of the most developing field of the global transport market. Every year there is an increase in the number of transported people and loads. The share of passenger and cargo transport by air in relation to other competitive transport branches is still growing. The biggest advantage of this branch is the possibility of transporting passengers as well as long-distance loads in a relatively short time. One of the service segments of the air transport market is cargo sub-market. Its development is primarily due to the needs of the economy and environmental conditions. The effects of spatial differentiation causing that goods are produced in places where they are not always consumed, contributes to the increase in demand for transport services, including air transport. As a result of the development of globalization processes on transport markets, changes in the structure of transported goods are observed. In the 21st century, the e-commerce segment plays a significant role. It should be presumed that there will still be changes in the structure of the cargo transport.

The main goal of the article will be to analyze the market for air freight transport. Reaching the goal will be carried out secondary research based on available literature on the subject.

As a result of the data analysis, it was found that the largest forwarding companies are: DHL Global Forwarding, CEVA Logistic and DB Schenker. The remaining 55% are other forwarding companies

**Keywords:** air cargo, air transport, air carriers

**JEL:** R40

## Introduction

Air transport is one of the most developing field of the global transport market. Every year there is an increase in the number of transported people and loads. The share of passenger and cargo transport by air in relation to other competitive transport branches is still growing. The biggest advantage of this branch is the possibility of transporting passengers as well as long-distance loads in a relatively short time. One of the service segments of the air transport market is cargo sub-market. Its development is primarily due to the needs of the economy and environmental conditions. The effects of spatial differentiation causing that goods are produced in places where they are not always consumed, contributes to the increase in demand for transport services, including air transport. As a result of the development of globalization processes on transport markets, changes in the structure of transported goods are observed. In the 21st century, the e-commerce segment plays a significant role. It should be presumed that there will still be changes in the structure of the cargo transport.

### 1. Operation of air transport

Air transport defined in aviation law as “scheduled air transport (...) if, on each flight, seats on aircraft intended for the carriage of passengers, baggage, goods or mail are publicly offered for purchase and the transport is carried out between the same points according to the timetable either at fixed intervals or with a frequency indicating the regularity of flights.

Air transport services are performed using natural airways, the so called air corridors.

The means of air transport are aircraft, usually called planes. The main aircraft with which transport is possible are: Airbus, Boeing and Antonov.

In air transport, the share of cargo transport accounts for a small percentage of overall freight transport. Cargo transport by air is most often chosen for intercontinental as well as continental transport, where distances are hundreds and thousands of kilometers. Air transport is also used for inter-regional transport of a given country, although in this case other competitors, e.g. road transport or rail transport, are major competitors.

Advantages for choosing cargo transport by air are:

- high freight transport safety,
  - high reliability,
  - fast transport time,
  - the largest range of cargo transportation compared to other modes of transport.
- Air cargo transport also has disadvantages, which include:
- limited load capacity of means of transport, which causes restrictions on the size of transported cargo lots,
  - the obligation to engage separate transport modes when transporting cargo from and to an airport,

- high range of freight rates.

The service market can be defined as the interaction between demand and supply. The market can also be a place of negotiations between sellers and buyers of air services.

The air transport market is characterized by:

- huge transport distance,
- inability to directly deliver parcels from and to air transport,
- cost and speed of transport,
- limited load capacity of the means of transport,
- susceptibility to transport costly and urgent shipments.

The market of air transport services included in the global transport market has characteristic elements which are: supply, demand and price. The supply of air transport services is defined as the size of the offer of enterprises representing air transport services at a given time and place depending on the price level.

The supply on the air transport market is represented by:

- air transport companies (operators and airports),
- enterprises cooperating with carriers and airports,
- institutions creating policy in the field of air transport.

The relation between the need, the demand and the purchase of air transport services will be presented below.

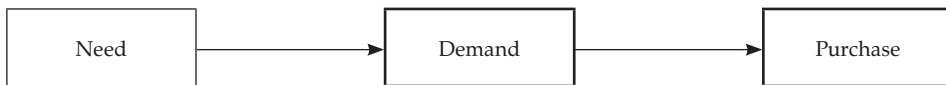


Figure 1. The relation between the need, the demand and the purchase of an offer on the transport market

Source: (Rucińska, Ruciński, 2000, p. 113)

All three elements directly interact with each other. The need for transporting goods by air simply influences the creation of demand in the discussed issue. The demand for transport usually creates the willingness of the company to enter into a purchase and sale contract with a customer whose inseparable part will be transport of goods by means of an airplane. Demand combined with the desire to produce and earn automatically creates demand for carriers' offers. Enterprises that represent the demand for air transport have a variety of offers from transport companies and forwarders.

In the transport of cargo by means of the discussed branch, the demand is most often created by enterprises that deal with production, trade, forwarding and logistics.

The demand for cargo transport is a consequence of trade agreements concluded and the conditions binding in them. Air transport of mail results from the demand of postal and courier companies. Demand for the transport of mail and cargo is objective, which means that it is a consequence of the contract "purchase and sale (commercial transactions) taking into account factors prompting the choice of air transport (...) or the need to urgently supply spare parts or articles urgent help to places affected by disasters or war".

## 2. Cargo as an object of air transport

Air transport is most often combined with rail and road transport to implement the transport process included in multimodal and intermodal transport. From the point of view of transport technology, plans are being carried out for cooperation between air transport and rail and public transport, e.g. on the German rail market, the DB company from Lufthansa.

Transportation of goods by air can be carried out in regular or irregular traffic.

The regular traffic is defined as the transport of small consignments whose main feature is weight diversity. The most common are shipments whose weight is from several to several hundred kilograms. This type of traffic allows you to transport cargo using passenger aircraft as well as standard cargo aircraft.

Charter traffic "includes full-plane loads, intended from one sender to one recipient, while the sender can also be a forwarder-consolidator collecting loads from many customers". In passenger transport, travellers are usually people who are planning to stay in tourist destinations. For this reason, the charter transport segment is characterized by seasonality.

When discussing freight transport, the freight's vulnerability is an important aspect. "Transport vulnerability expresses the resistance of loads to the conditions and effects of moving (or storage) resulting from their physical and chemical characteristics".

In the literature, cargo vulnerability to transport is most often divided into: natural, economic and technical.

The natural vulnerability takes into account materials whose degree of nuisance affects the transport process. They include:

- dangerous goods – they include all substances, materials and articles that may pose a threat to safety or health during transport,
- goods sensitive to external factors and transport conditions – these include "loads whose chemical, physical or biological properties reduce their resistance to: changes in temperature, transport time, humidity, exposure to sunlight, tremors and hits etc."

The economic vulnerability depends on the value of the transported cargo. The value of the good reduces economic vulnerability, as it forces greater care over the good during transport. Analyzing this feature in air transport, it can be stated that it allows the transport of high value cargo due to the high safety of air transport.

The technical vulnerability of cargo mainly results from the size, shape as well as from the spaciousness of the goods. By means of technical cargo vulnerability the carrier decides which means and branch of transport will be most advantageous transport the goods.

The following groups are usually transported by air:

- exotic fruits and other goods with a short best-before date,
- animals and plants,
- items needed in the event of a rescue operation (disaster),
- high value cargo (jewellery, works of art),
- seasonal products related to fashion or a given period of the year.

Due to the limited load capacity of rolling stock, air transport is not adapted to the transport of oversized loads. Organizing cargo transport using this branch requires modern service from rolling stock and airports.

Based on IATA data, three transport segments are distinguished:

- medicines and other medical assortment,
- electronics,
- e-commerce.

Loads that require fast transport are most frequently transported, they include: perishable and valuable goods.

Analyzing the structure of transported loads, we can distinguish two main groups: standard and special shipments. Special shipments require increased carrier work. The group of special packages includes:

- oversized shipments, these include heavy loads (over 125 kg) and non-standard dimensions, which means using at least two pallets for transport,
- corpses and human ashes, additional prior confirmation of airway booking is required for this type of shipment. "The use of a double casket – internal metal, hermetically sealed and external – wooden" is also required. A death certificate, too. The exception is human ashes, which were placed in tightly packed urns, this type of shipment does not require airway booking,
- live animals, conditions for the transport of live animals are individually imposed by the laws of countries or airlines. The necessary transport requirements are: a valid passport, valid vaccinations (usually an animal's health booklet), and the ability to identify the animal after a tattoo or implanted chip. The animal that is transported should be watered and fed earlier. The requirements also include the type and size of the cage, which should allow the animal to move freely,
- hazardous materials, so-called DGR. DGR are divided into nine classes:
  - "class 1 explosives,
  - class 2 gases,
  - class 3 flammable liquids,
  - class 4 combustible solids,
  - class 5 oxidizing substances,
  - class 6 – toxic and infectious substances,
  - class 7 – radioactive materials,
  - class 8 – corrosive substances,
  - class 9 – various hazardous materials",
- diplomatic consignments, which should be packed in a special way to prevent third parties from accessing the content. This type of shipment can be sent or picked up on special conditions (outside the working hours at airports or directly to the means of transport). Diplomatic consignments are marked with a DIP reference number, which means "Diplomatic Cargo",
- perishable goods, so-called PER. Perishable goods are goods that are exposed for a long time to inappropriate climatic and environmental factors, they are destroyed or lose their properties to a significant extent. Perishable goods include, among others: meat, citrus, plants, medical consignments, fish,

- valuable shipments, the load of which exceeds 1000 USD/kg is qualified to the group of valuable shipments. Valuable shipments can be: paintings, jewellery, money, precious stones, securities.

### 3. Analysis of the global cargo air transport market

Due to the continuous increase in demand for air cargo transport, Table 1 below presents cargo handling at Polish airports in 2014–2017.

Table 1. Summary of cargo handled by air transport in Poland in 2014–2017 in tones

| Kind of operation | 2014       | 2015      | 2016      | 2017      |
|-------------------|------------|-----------|-----------|-----------|
| Loading           | 83,400.15  | 52,409.35 | 55,176.34 | 69,522.43 |
| Unloading         | 111,904.93 | 51,233.62 | 56,513.93 | 65,349.36 |

Source: (www.stat.gov.pl)

There is a noticeable decrease in the number of operations in air transport at the turn of 2015/2014, but in the following years there is a growing tendency of unloading and loading at airports.

Enterprises that represent the demand for air transport have a variety of offers from transport companies and forwarders. The share of major airlines on the Polish air transport market is shown in Figure 2.

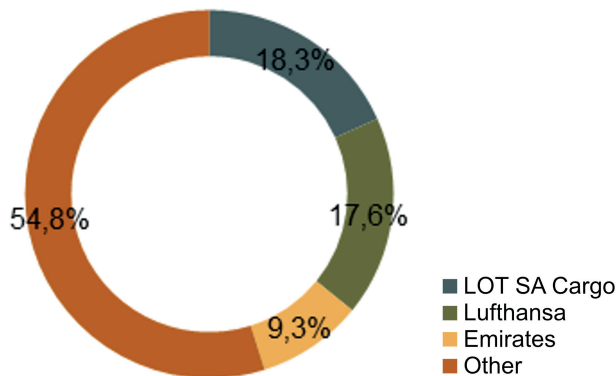


Figure 2. Share of major airlines on the Polish air transport market

Source: (*Air cargo transport in Poland, 2017*, p. 30)

The main air carriers with a significant share in cargo transport include: LOT Polish Cargo SA, whose market share is 18.3%, Lufthansa – 17.6% and Emirates – 9.3%. These carriers represent approximately 45% share in air cargo transport. Figure 3 presents data on the share of the largest forwarding companies on the Polish cargo air transport market in 2017.

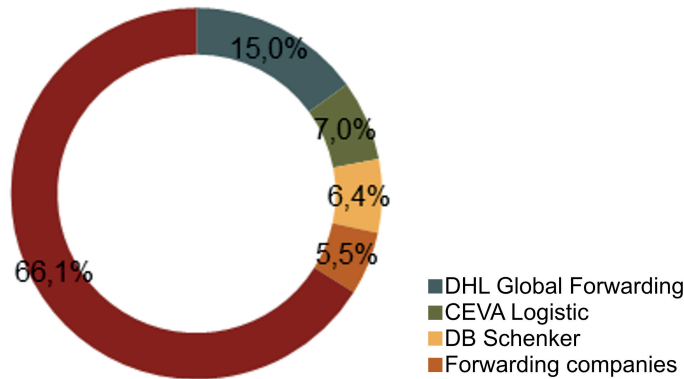


Fig. 3. Share of the largest forwarding companies on the Polish air cargo transport market in 2017

Source: (*Air cargo transport in Poland, 2017, p. 30*)

On the Polish air transport market in 2017, the largest forwarding companies turned out to be: DHL Global Forwarding, which handled 15% of Polish exports, CEVA Logistic – 7%, then DB Schenker – with a share of 6.4%. General sales agents of other airlines, which offered transport of goods, had a 5.5% share. The remaining 60% is represented by other, approximately 120 forwarding companies.

According to forecasts conducted in 2017 by the OECD, the dynamics of demand for transport of goods in various transport sectors was estimated.

Table 2. The forecast increase in demand for global freight transport services in 2015–2050, in %

| Specification      | 2015–2030 | 2015–2050 |
|--------------------|-----------|-----------|
| Transport in total | 3.3       | 3.1       |
| Railway transport  | 3.0       | 2.6       |
| Car transport      | 3.2       | 2.8       |
| Air transport      | 5.6       | 5.4       |
| Sea transport      | 3.4       | 3.3       |

Source: (Menes, 2011, p. 27)

Based on OECD statistics, the dynamics of demand for global cargo transport by air will increase by an average of 5.6% between 2015–2030, and 5.4% between 2015–2050. That in relation to forecasts of the other branches is very interesting. It is expected that the average annual increase in demand for air freight cargo transport services in both cases 2015–2030 and 2015–2050 will be higher than the average annual increase in total demand for transport.

The factor reducing the demand for transport services is to a large extent cargo transport costs. The price of the full transport service is clearly determined by the level of fuel prices on the market. For goods with a clearly higher value, the costs associated with air transport do not play a vital role, however, for other loads, the price of fuel is of great importance. “High transport costs significantly reduce

market demand for this type of service. This in turn leads to a situation in which it would be unprofitable to run regular cargo connections”.

Analyzing the aviation market, it was noticed that the revenues obtained from the transport of cargo and passenger transport. The data of the International Air Transport Association (IATA) will be used for this.

Table 3. Global revenues from air transport in 2016–2019 in USD trillion

| Revenue             | 2016 | 2017 | 2018  | 2019  |
|---------------------|------|------|-------|-------|
| Total               | 709  | 755  | 821   | 885   |
| Passenger transport | 498  | 534  | 564   | 606   |
| Cargo               | 80.8 | 95.9 | 109.8 | 116.1 |

Source: (www.iata.org)

Since 2016, there has been a continuous increase in revenues from air transport. Analyzing the above data, the overall revenues generated in 2018 were 13.6% higher than in 2016. Revenues from passenger transport resulted in 11.7% in 2018 compared to 2016. In turn, revenues from cargo service in 2018 were 26.4% higher than in 2016. Data for 2019 were presented on the basis of data from last years.

Analyzing 2018, according to IATA (International Air Transport Association), the annual demand for freight transport measured in tonne-kilometer freight (FTK) increased by 3.5% compared to 2017. Shipping companies from Asia-Pacific countries recorded a 4.5% decrease in demand for freight in December 2018. Capacity possibilities increased by 2.6%, which resulted in an increase in demand for freight by about 1.7%. North American shipping companies recorded a 2.9% increase in demand for freight. On the other hand, capacity increased by 4.5%, which contributed to an annual increase in demand in 2018 of 6.8%.

European airlines in December 2017 achieved a 1.9% increase in freight demand and a 3.7% increase in capacity. Demand for freight transport also improved by 3.2% in 2018. The production capacity increased by 4.3%.

Middle East transport companies increased the share of carriers by 0.1% year-on-year in December, and the capacity increased by 4.5%. Annual productivity increased by 6.2%. Annual demand increased by 3.9%, which meant that lines from the Middle East achieved the third fastest-growing growth rate in all regions.

Latin American airlines achieved a 0.1% year-on-year drop in demand in December. The capacity increased by 6.0%. The annual increase in demand for freight among carriers raised by 5.8%, which caused the second fastest growth from all regions.

African carriers reported a decrease in freight demand by 2.2% in December 2018. The capacity increased by 4.9%. Annual demand for loads among African carriers in 2018 decreased by 1.3%.



## Conclusions

The air transport sub-market is one of the most developing elements of the global transport market. The subjective side of the analyzed market is represented by these entities: passengers, enterprises and institutions commissioning and organizing the transport of people and cargo. The supply side is represented by air carriers offering cargo and passengers.

Cargo transportation by air is based on the use of available cargo space of aircraft. The availability of this space is due to the technical characteristics of the aircraft. On the air transport market, cargo can be transported by specialized air carriers, including Fedex, DHL, or air carriers providing cargo transport services by separate companies, e.g. KLM Cargo, Lufthansa Cargo and by other operators, then the cargo being carried complements the available cargo space of passenger aircraft.

In many cases, the main criteria in the transport of cargo are the time and timeliness of delivery, as well as the value of the goods transported. These are quite different factors than in the case of passenger transport. The most frequently transported goods in air transport are pharmaceutical goods, electronic components and goods from the e-commerce market.

As a result of secondary data analysis, it was found that the largest forwarding companies are: DHL Global Forwarding, CEVA Logistic, and DB Schenker. The remaining 55% is represented by other forwarding companies.

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