

# RFS as an Unconventional Method of Cargo Shipment by Air Transport

Jagienka Rzeźny Ciepłińska, Małgorzata Wach-Kłoskowska  
*WSB University in Gdansk, Poland*

The role of air transport in logistics and supply chains seems difficult to be overestimated. In recent years increasing amounts of cargo have been transported by air. Numerous high-tech devices, valuable equipment, medical products and appliances are transported by air. The main advantage of air transport is speed but also broad transportation geography, high reliability and security of goods supplies and continuous monitoring of cargo flows. Air transport can be organized in a traditional way, however there are also some unconventional methods to handle such transport processes. The RFS model (Road Feeder Service) comes as a response to the demands of the contemporary market of logistics services.

**Scopes:** The subject of the paper is the presentation of an unconventional way of organizing the carriage of goods by air, presenting its attractiveness to all parties involved in the transportation process, as well as directions of its development.

**Methodology:** The methodology of the paper is based on 2 dimensions: analysis and synthesis. The first phase included a thorough thematic literature review, analysis of case studies of Polish air cargo market. It was complemented by interviewing airlines representatives about RFS solutions. In the synthetic phase, the study provided conclusions based on the theoretical analysis and the survey of case study.

**Results:** Results of the research shows RFS solution, involving transportation of cargo (commissioned by airlines) by trucks from regional airports to major cargo airports, referred to as hubs, and then transportation of cargo by air, using is caused by the necessity of increasing cargo transport efficiency by the airlines. It is also important to note the willingness of airports, both hubs and regional, to cooperate with air carriers in the area of air cargo handling in RFS model.

**Keywords:** air transport, cargo shipments, RFS (Road Feeder Service).

## 1. INTRODUCTION

The processes of globalization became more intensified at the end of the 20th century, along with the appearance and development of the Internet, the improvement and massive use of air transport. Air transport creates and accelerates the processes of globalizations and at the same time, it also becomes involved in such processes. It is defined as a foundation, a pillar and the infrastructure of globalization. Considering its characteristic features, namely: impressive speed and global range, it allows us to reach any destination in the world within a day and to transport any products there within that time period. The indisputable advantage of air transport over any other transport modes is the fact that air

transport is the only way which offers strong time-space compression, which comes as one of the greatest achievements of our modern civilization. Air transport may be considered as a spectacular example of a sector and a market which is characterized by strong and evidently global features. [15]

The handling of cargo transported by air requires a number of model operations carried out within the framework of the transport process where some unconventional solutions are applied. Such solutions involve other transport modes into the process of air transport. In Poland air transport of cargo is divided into the following groups:

- cargo transported in the loading compartments of aircrafts (“on board”) which can be classified as standard shipment.

- cargo transported with the use of the RFS technology<sup>1</sup> which can be defined as unconventional shipment.

Additionally, air mail transport is also considered here, because it comes as 15% of all the transported cargo.

The aim of the article is to present an unconventional way referring to the organization of cargo transport by air, to present its advantageous character for all the parties involved in the transport process and to indicate the directions of its further development.

## 2. SPECIFICITY OF CARGO TRANSPORTED BY AIR

Air cargo transport is mainly used for international trade and its main advantage is short delivery time. Despite that fact, however, it seems that in Poland, as well as in the world, the role of air transport is often ignored or marginalized. It may, first of all, result from high costs involved in the organization of the logistics processes in air transport, and also from the strictly limited weight and size of transported cargo. The main advantages of air transport include its widest range of destinations, the speed of transport, high level of cargo security which is especially significant for goods with short expiry dates and fragile goods. [8] The development of air cargo transport may be positively affected by the development of the infrastructure required for this transport mode. The development of multipurpose terminals, longer runways and larger airport aprons, innovative solutions (modern cargo handling systems, ILS), lower handling charges and the awareness of the fact that air transport comes as the safest transport mode, would provide a chance not only for the development of air passenger transport but also for air cargo transport.

Considering the priority of issues connected with terrorism hazard, numerous and detailed regulations and procedures have been established in order to provide safe air cargo transport. Since 2002 in Europe all the entities involved into the organization of supply chains with the use of air transport have been obliged to follow special regulations. They are obliged to submit a certificate of security and to confirm by signature

<sup>1</sup> RFS - Road Feeder Service. The cargo transported by RFS trucks is cleared at a particular airport in Poland, and after it has reached the hub where large aircrafts of a cargo airline land, it is loaded on a plane.

their compliance to the regulations issued by the federal Civil Aviation Authority. Since 2010 the entities involved in air cargo transport have been obliged to follow an ordinance issued by the European Parliament which states the rules of providing safe air transport services. There is a rule, according to which the cargo transported by air may be loaded on an aircraft only after it has obtained the security status (SPX - Secured for Passenger Aircraft or SCO – Secured for Cargo Aircraft Only). A safe air shipment realized by an individual is possible only after it has been officially granted a status of a known consignor by the federal Civil Aviation Authority. All the processes involved into air cargo transport must be registered in the security programme of the air cargo consignment. All the companies which participate in the supply chain must have a status of a regulated agent, and they undergo detailed control procedures as regards the following of the safety rules for air cargo transport. [18]

The cargo which is most frequently transported by air includes:

- perishable goods,
- goods the value of which is quickly depreciated,
- goods of increased value;
- fragile goods;
- food (citrus fruit),
- plants (flowers) and animals,
- goods of small weight and size,
- express consignments of short delivery time,
- spare parts and accessories required for production.

It should be however mentioned that air transport has been more and more often applied to the delivery of oversized cargo. Airports which can handle large cargo aircrafts must be equipped in runways of a suitable length, and they also must meet the following requirements [6]:

- optimal location – offering an easy access to the airport, close vicinity of a seaport, close vicinity of railway infrastructure, close vicinity and accessibility of specialist facilities required for the loading/unloading of oversized and heavy consignments (a port, shipyards, military objects);
- facilitated customs procedures in cargo transit in the EU countries,
- attractive airport charges,
- good cooperation with airport authorities and handling agents,

- merit-based and flexible business negotiations,
- possibility to handle aircrafts and to perform airport operations 24 hours a day.

The limitations of air transport refer mainly to the capacity of the loading compartments and lifting capacity of an aircraft, the size of its loading hatches, abilities of an airport to handle the aircraft (the length of runways), possibilities of transporting an oversized consignment to/from the airport from the consignor/to the consignee. Considering cargo aircrafts, there are some aircrafts which offer great possibilities to transport large amounts of cargo during one flight: Airbus A 300 cargo – 45 tones, Boeing 767 cargo – 60 tones, McDonnell MD 11 - 80 tones, Antonov An-124 - 110 tones, Boeing 747 cargo - 11 tones, Antonov - 225 – 250 tones.[6]

Air transport may also involve shipment of hazardous materials. During such transport operations it is necessary to comply with strict requirements defined by national and international legal regulations. Hazardous materials are divided into 9 categories, namely: explosives, gases, flammable liquids, flammable solid materials, pyrophoric materials, materials which emit flammable gases in reaction to water, oxidising agents, organic peroxides, toxic and contagious substances, radioactive and caustic materials and any other hazardous cargo. To get hazardous cargo accepted for air transportation, it is necessary to obtain a relevant official permission granted by the countries involved in that operation. Usually, hazardous materials are transported by cargo aircrafts. All the requirements referring to air transport of hazardous materials have been defined by the ICAO (International Civil Aviation Organization) and IATA (International Air

Transport Association), and they can be found in the ICAO Technical Instructions and the IATA DGR regulations [7].

### 3. GLOBAL AIR OF TRANSPORT CARGO SHIPMENT

The development of air transport is determined by general transformations and trends observed in the development of global economy. At the same time, the rate of air development strongly affects the development of global economy. It is possible mainly because of the growing number of connections between the cities which allow the flows of goods, passengers, capital and technologies to increase. The number of the pairwise air connections between the cities will have grown to 17 000 by the end of 2016, and it means that the number will be doubled in comparison to that of 20 years ago. [2] At the same time, the more and more intensive use of air transport is possible due to the fact that the prices of flights have become lower.

Approximately one sixth of the world trade takes place in European Union countries. The value of international trade is much higher for goods than for services. The dynamics of trade turnover is also less stable and more violent than the dynamics of GDP changes. [3] Figure 1 illustrates the level of turnover of world trade in goods relative to the volume of air transport. It shows a sharp collapse in the level of both the volume of world trade in goods and the volume of cargo transported by air in 2009. Until this moment they are rising again. The growing tendency of both variables means that in both cases the increase in the volume of world trade in goods as well as the increase in the volume of cargo transported by the airport are taking place.

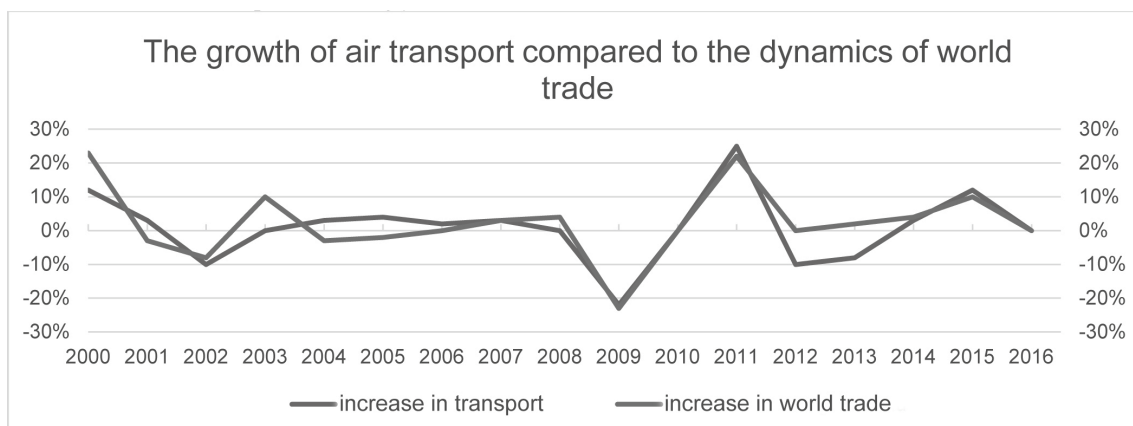


Fig. 1. The growth of air transport compared to the dynamics of world trade. Sources: IATA statistics.

Air cargo transport comes as a business operation which enables us to activate a number of economic branches; it affects the development of the market of products and services even more than any other type of business activities. IATA emphasizes the fact that the financial performance of airlines is strictly connected with the condition of global economies [16]. The long-term predictions referring to the development of air cargo transport indicate that crises are natural phenomena which result from the cyclic character of economic conditions in particular sectors. After the periods of recession, new and favourable conditions usually appear, and the efficiency of transport operators is increased, provided that their activities are intensified in all the sectors of their business operations.

#### 4. SPECYFITY OF THE AIR CARGO TRANSPORT MARKET

In practice, cargo (freight) carriers who transport consignments by air follow two business models [18]:

- a traditional model of a cargo carrier;
- a model of an integrator;

A traditional cargo carrier is an entity which closely cooperates with its contractors who provide transport services, realizing only a part of the whole operation connected with air transportation. In this case, there are four groups of transport operators:

- cargo services come as an element of the operations performed by traditional carriers who provide access to the loading compartments of their passenger aircrafts (e.g. British Midland),
- mixed – a carrier has its own passenger and cargo fleet of aircrafts (e.g. British Airways, Lufthansa),
- a carrier has a fleet of aircrafts for cargo transportation only (e.g. Cargolux with its B747-400F aircrafts), the carrier offers regular and charter connections for cargo transport,
- a carrier who provides transport services against a contract for some selected services (e.g. crews, aircrafts, cargo handling, insurance).

An integrator can be defined as a carrier who provides door-to-door transport services, without any cooperation with middlemen who usually realize some parts of a supply chain involving

transport modes other than by air; integrators operate from large and medium airports, and they guarantee fast deliveries (e.g. 24-hour overnight delivery), often at night, taking advantage of low traffic at roads and at airports (e.g. DHL, FedEx, TNT, UPS).

While analyzing the market of air cargo transport, it is possible to determine several models of service [1]:

- transport by small passenger aircrafts,
- transport by regular liner or charter aircrafts,
- transport by small cargo aircrafts (regular or charter – courier companies),
- regular transport by large cargo aircrafts,
- trucking (RFS) as the continuation of air transport or separate regular road shipment against a bill of lading.

#### 5. RFS AS AN UNCONVENTIONAL METHOD OF HANDLING THE TRANSPORT PROCESSES IN AIR CARGO SHIPMENT

In all the models of handling air cargo transport, the air freight transported on the boards of specialised cargo aircrafts and of passenger aircrafts (in loading compartments) is the most significant. Another important way to transport cargo from airports is via road connections handled by RFS trucks.

The organizational service provided for this type of cargo shipment involves the cooperation of the following entities:

- forwarding agent,
- airport,
- handling agents,
- air carriers.

In such a system, air cargo is handled based on a standard handling agreement which is entered by a handling agent and an airline. Sometimes a cargo department of an airport handles the whole airline, or some particular functions, without any participation of a handling agent. Such a situation can be observed in the airport of Gdansk. Here, in some cases, the Cargo Department of the airport performs the functions (depending on the agreements between the airport and the particular airlines) of a warehousing agent, whereas loading and unloading services are provided by a ramp agent – in Gdansk it is Welcome Airport Services or LS Airport Services. In such a situation the income generated for the airport is even higher. There is also a possibility to use services provided

by agents located outside the airport. However, both carriers and forwarding agents prefer cooperation with agents who operate inside the airport, considering the required safety procedures and services of the Customs Office and Polish Border Guard available 24 hours a day. Additionally, the Customs Offices located at airports have extended competences and handling agents are supervised by the Civil Aviation Authority.

Considering the fact that during the recent decades the demand for air transport has increased, but – at the same time – the capabilities of airports have not been able to catch up and to follow that increase, numerous airlines have switched to the RFS system, the main assumption of which is the fact that cargo is transported by trucks from so called “off-line airports” to major cargo airports, such as Frankfurt, Paris, Vienna or London. Then the cargo is transported by air. The system also operates in the reverse direction: the cargo is delivered to a major cargo airport by air and then it is transported by trucks to off-line airports.

One of the reasons for which air cargo transport is supported by trucks is the limited catchment area of a particular airport. The catchment area of an airport is measured by the time required to access the airport or by the distance from the airport. In accordance with the EU standards, it is assumed that the time limit to reach a particular airport which defines its communication accessibility is 90 minutes. In Poland, that time period is extended to 120 minutes [16]. Considering distance measured in kilometres, it is 100 km and in Poland – even up to 300 km. It often happens that the markets which function around regional airports are not able to provide regular large amounts of cargo for air carriers who are handled at those airports. Therefore, carriers do not use large freight aircrafts to transport cargo – instead they use combo aircrafts, that is passenger planes with some loading compartments for cargo transportation. Such a situation generates the need of collecting cargo from particular consignors to the airport hubs, with the use of services provided not only by aircrafts from regional airports but also by road transport carriers.

## 6. RFS IN AIR CARGO SHIPMENT IN POLAND

Due to the favourable structure of costs, the system has been successfully implemented into practice also in Poland. Airlines assess that 85% of

the total air traffic of cargo to and from Poland is covered by the RFS; the remaining 15% is transported between the hubs by air [20]. The RFS system has been actually accepted by all the European airlines as a basic means of delivering cargo to transcontinental cargo aircrafts. None of the airlines has taken the risk of establishing regular air connections to transport cargo between Poland and their intercontinental airports (however, it does not apply to courier companies). The main advantage of RFS system concerns enabling users to quickly eliminate any delays by transferring and transportation of cargo at nights; such a form of cargo delivery does not make any difference to the forwarding agent or the ordering party. An RFS truck is legally considered as an element of air cargo shipment process, and it performs its operations under the number of a particular flight [19].

The RFS system in Poland means that cargo is transported by roads on trucks from Poland to airports in Europe and vice versa. The European hubs are equipped with the infrastructure which is indispensable to handle cargo traffic. Such a type of carriers has appeared for the following reasons [19]:

- the lack of well-developed infrastructure which is applied to handle cargo traffic, that is namely: runways of the required length, airport aprons of the required surface, cargo terminals required to provide comprehensive services to handle various types of cargo;
- high prices of ground handling of cargo;
- high prices of renting the warehouse and office surface;
- customs and tax procedures.

At present, a considerable part of Polish air trade of goods starts and ends at European hubs located outside the territory of Poland. Such a situation results from the economic calculation: an aircraft is the most expensive means of transport. The expenses incurred to handle the RFS road system are several times lower, and the potential market is nine times bigger when compared to air cargo transport [20]. Considering the present volume of cargo traffic, the establishment of regular connections dedicated to cargo shipment is unprofitable. In their business operation, most airlines use the means of road transport as they are able to transport cargo of much larger sizes than most aircrafts which operate on regular connections to and from Poland. The cargo transported by RFS trucks is cleared at a particular

airport in Poland, and after it has reached, for instance, Frankfurt, it is directly placed in

the loading compartments of an aircraft. It does not need to undergo any further customs clearance proceedings at its departure airport. The RFS connection may be viewed as the first stage of an air connection “on wheels” [19].

In 2014 there were 129.9 thousand tonnes of freight cleared at the Polish airports, that is by 16% more than in 2013. The airport of Warsaw has the biggest share in the national cargo handling: 67%; 13% belongs to the airport of Katowice. The most significant increase in cargo handling operations was recorded by the airports of Łódź and Rzeszów. Approximately 57% of cargo cleared in 2014 was directly transported to and from the airports by aircrafts. 28% of cargo was transported between Polish airports and European hubs by trucks (of RFS system), 15% cargo was defined as mail shipment [19]. The figure below presents the share of the cargo handled at the Polish airports, based on the data provided by the national airports.

## Cargo in Poland in 2014

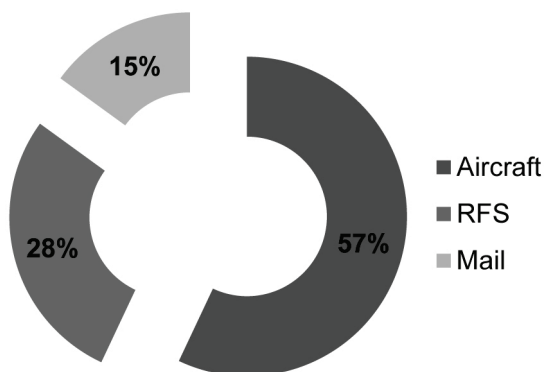


Fig. 2. Share of cargo (in %) handled at the Polish airports in 2014.

Source: the author own study based on: T. Wyszynski, *Cargo w 2014 r. na polskich lotniskach*, <http://www.pasazer.com/news/25515/cargo,w,2014,r,na,polskich,lotniskach.html>, accessed on 25<sup>th</sup> March 2016.

In the largest “on board” segment of the cargo cleared in Poland, there were totally 74.2 thousand tonnes of freight cleared. As much as 72% of air on-board cargo is cleared in Warsaw (53.4 thousand tonnes). The airport of Katowice comes as the second air cargo hub in Poland. It has cleared 19% of the total on-board cargo. The third airport which has a significant share in air cargo handling operations is Gdansk (7%).

Almost one-third of cargo has been transported to and from the Polish airports with the use of the RFS system (Road Feeder Service). In 2014 36.7 thousand tonnes of cargo was cleared as RFS freight, that is by 35% more than in 2013. This segment is also dominated by the airport in Warsaw: 50% of share in the total amount of RFS cargo. The second position was taken by the airport of Łódź (advancement from the third position) with the share of 15.5%. Wrocław recorded the share of 14.5%. Poznań, Kraków and Katowice each cleared approximately 6% of the total RFS cargo.

While summing up the discussed cargo, it is necessary to consider also mail shipment, which in 2014 came as 15% of the total cargo handled at the Polish airports. The highest amount of mail was cleared in Warsaw (80%) and 6% of mail shipment was cleared in Kraków. Other airports did not clear any considerable amount of mail and some of them did not clear mail at all.

Summing up all the cargo segments (on-board, RFS and mail), it should be stated that the total amount of shipment cleared in 2014 at the Polish airports reached the level of 129 891 thousand tonnes. The chart presented below indicates that the largest cargo hub in the country is Warsaw, the second place is taken by the airport of Kraków (Pyrzowice); Gdansk, Wrocław and Łódź are competing for the third place.<sup>2</sup>

<sup>2</sup> It should be mentioned that until the year 2013 the Civil Aviation Authority was not provided with any comprehensive data referring to cargo handled at the Polish airports. Some airports informed the CAA about the aircraft traffic, others provided information on air and road traffic; some airports included mail shipment in their information, others did not mention that at all. In accordance with the CAA, the dynamics of the increase in cargo transport between the years 2010 – 2015 in Poland was improved.

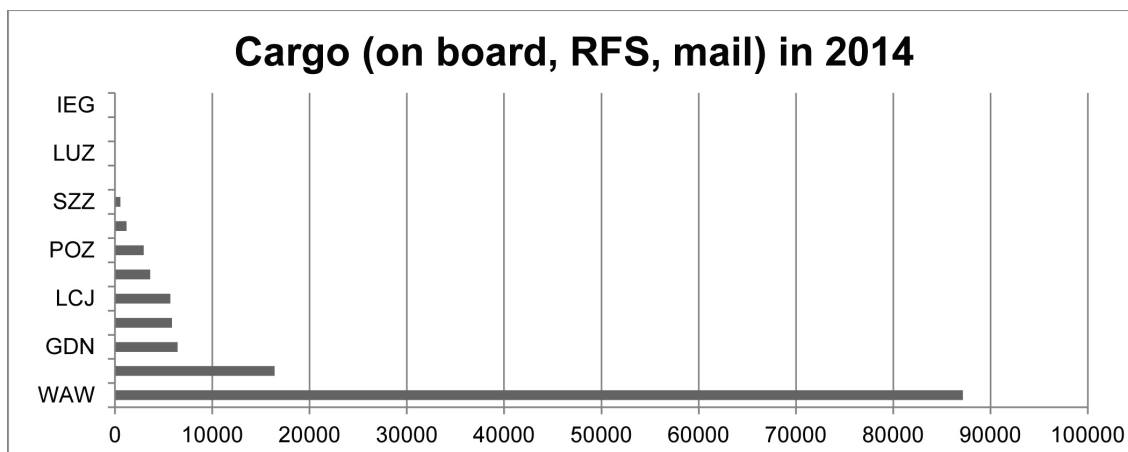


Fig. 3. The amount of cargo cleared in 2014 at the Polish airports.

Source: the author own study based on: T. Wyszynski, *Cargo w 2014 r. na polskich lotniskach*, <http://www.pasazer.com/news/25515/cargo,w,2014,r,na,polskich,lotniskach.html>, accessed on 25<sup>th</sup> March 2016.

As it is indicated by the statistical data, an unquestionable leader on the Polish cargo market is the Warsaw Chopin Airport. It receives the largest cargo aircraft in Poland, namely: McDonnell Douglas MD-11F, which belongs to the UPS carrier. Among the regional airports Katowice takes the leading position, followed by Gdansk and Wroclaw. However, if we consider the statistics provided by the particular airports on the cargo handled with the use of the RFS system, it turns out that the first position has been taken by the airport of Łódź, where 100% of the cargo is handled in that way. The following positions are taken by Wroclaw (91%), Poznań (78%), Kraków (61%).

According to the statistics provided by the CASS, the Lufthansa Cargo carrier comes as the leader of the cargo carriers in Poland; “in Europe it handles approximately 75 thousand RFS flights per year. For the carriers operating in the hub&spoke system, it is the most economical way to deliver goods imported to regional airports (...). The cost of transporting one kilogram of cargo with the use of the RFS system is not high – therefore it is possible to provide much higher frequency of flights and to reach smaller airports which are handled by smaller aircrafts or airports which do not have any regular air connections. The RFS connections applied instead of connections handled by aircrafts is often considered by laics as half-measures. They could not be more wrong.” [20]

According to the data provided by Lufthansa Cargo AG, approximately 75% of cargo shipment from and to Poland (the first section in export and the last one in import) is by road transport. The carrier provides regular connections between

Poland and the airports in Frankfurt and Vienna. The regular RFS connections are included into the schedule of air connections offered by the hubs, with the consideration of the required transit time. Additionally, Lufthansa Cargo offers any number of trucks that can be sent to four airports in Germany. The carrier uses the services provided by 11 trucking companies which transport cargo by regular line connections across Europe. Moreover, Lufthansa Cargo has signed agreements of ad-hoc services (additional transport services complementary to the regular connections) with over 80 trucking companies. The carriers have to meet specific requirements which refer to the safety of shipment (Regulated Agent) and to the proper type of trucks used to transport goods (roll-off container and aircraft pallet trucks, cooler trucks). [11]

## 7. RFS IN AIR CARGO SHIPMENT – PERSPECTIVES FOR DEVELOPMENT

According to IATA, the prospects for the development of cargo shipment by air indicate a considerable increase in transport, especially to Asian destinations and from Europe to the American and African markets (see Fig.4) [2].



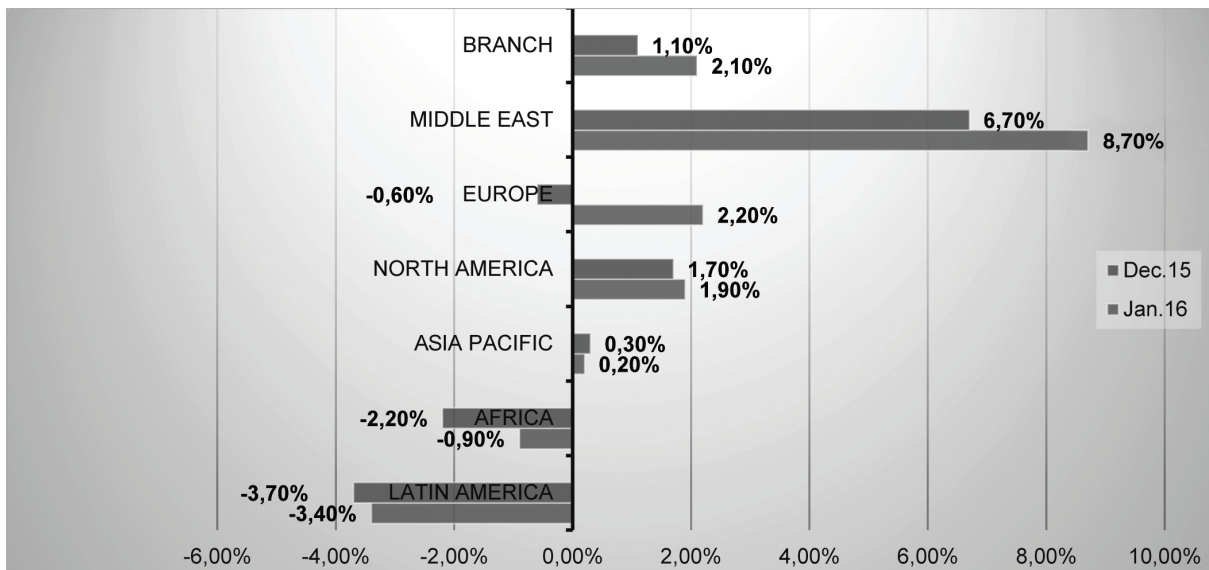


Fig.4. International cargo shipment by air as regards the carrier's country of origin.

Source: Inner Urban Freight Transport and City Logistics. EU-funded Urban Research. Transparencies 2013, [www.eu-portal.net](http://www.eu-portal.net)

In 2015 there was an increase of 1.1% in the international cargo shipment transported by air (in comparison to the previous year). The carriers from the Middle East indicate the most dynamic development in that field: at the level of 8.7% by January 2016, in comparison to the previous year. Such a growth rate is almost four times higher than the one indicated by European carriers. It results from the continuation of large scale operations and a dynamic development of air fleet owned by the carriers from that region of the world.

Considering the potential demand for air cargo transport, it is predicted that during the next 15 years the annual average increase in the amount of cargo transported by air will reach the level of 5.9%. It will generate a demand for almost 3 000 airplanes, including 870 brand-new machines. Almost 2 000 will be adapted to cargo transportation. The development of aircraft fleet will result from intensified cargo transport, especially in North America and Asia[13]

Other predictions referring to the development of air cargo transport indicate that it will grow at the rate of 5% per year in the global scale (Boeing Current Market Outlook 2012-2032). [14] The data which refer to Polish airports indicate a considerable fluctuation of the dynamics of transported cargo. Without any significant investment into the airport infrastructure and into the infrastructure required to secure cargo transport, the development of that economic sector will not be as spectacular as the development of

passenger air transport within the time perspective of the next 15 years. [7]

Transport of goods by air in Poland is certainly considered as a developing segment. Growth trends as well as strengthening position of regional airports are noticeable. A number of analyses show that handling of the freight segment significantly improves the efficiency of air carriers operations and it is also gaining interest among foreign investors. Predictably, the role of air cargo transportation will increase with the economic development.

The collected data indicate great significance of unconventional methods applied for air cargo handling, including the RFS technology. Although this type of shipment is not treated as air cargo transport, the goods which are handled in such a way also undergo the clearance procedures at airports, and they generate some considerable income for airports. The latest figures for 2016 confirm the increase in cargo traffic at Polish airports by more than a dozen percent and RFS is a significant part of this traffic.

## 8. CONCLUSIONS

The analysis of data and considerations presented in the article indicate that the Road Feeder Service comes as one of the important forms of cargo handling in air transport in Europe, and certainly on the Polish market. It seems that all the entities involved in the transport processes which take place on the market of air cargo



transport services have been already following the current trends. The exploitation of trucks by airlines appears to be an element which allows them to increase the efficiency of the services they offer mainly in the transcontinental traffic. Large international airports (hubs), where carriers operate and feed deliveries to reach a high load factor, cooperate with carriers and

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**Jagienka Rześny Cieplińska**  
**WSB University in Gdansk, Poland**  
**jrzesny@wsb.gda.pl**

**Małgorzata Wach-Kłoskowska**  
**WSB University in Gdansk, Poland**  
**malgorzatakloskowska@wp.pl**

