

TRENDS IN AIRLINE CARGO FLEET

Slavica Dožić^{a*}, Danica Babić^a

^a University of Belgrade, Faculty of Transport and Traffic Engineering, Serbia

Abstract: *Although the global air cargo industry has recorded significant increase, it is expected that it will be more than doubled in the next two decade. The fleet involved in world air cargo transport consists of freighters and passenger's aircraft carrying cargo in its belly. The fleet of passenger aircraft has a larger number of aircraft and lower belly capacity compared to freighters. Therefore it is not unexpected that more than half of world's cargo is carried by freighters. In this paper, the cargo fleet structure and changes related to fleet size and fleet types are analysed. Bearing in mind that more than half of freighters are converted passenger aircraft it is worth noting aircraft conversion/production and retirement in the cargo fleet. The authors also give an overview of air cargo fleet both worlds and European, pointing the factors that influence on freighter fleet growth.*

Keywords: *Airline Cargo Fleet, Air Cargo Transport, Aircraft Capacity.*

1. INTRODUCTION

The cargo transport plays a significant role in the world transport system due to the fact that it makes more money for a transport company in comparison with transport of passengers (Wensween, 2007). The air cargo transport has not achieved this success yet, but still is unavoidable means of transport for specific goods. The speed of air transport and the lower risk of losing or damaging of the freight make air transport favourable for carrying the perishable, time-sensitive and valuable cargo despite the high charges. The value of freight carried by air is over a third of the total value, while the tonnage represents only few percent of the total freight carried in the world by all other modes of transport (Boeing, 2014).

Aiming to achieve the ground and water means of transport, air cargo is the fastest-growth area in the world cargo transport. Its growth depends on international trade and it is easily influenced by the changes in world's economy. After few years of stagnation, during the world economic crisis and economy recovering, the air cargo traffic started to grow. Although the global air cargo industry has recorded significant increase, it is expected that it will be more than doubled in the next two decade (Airbus, 2014).

The fleet involved in world air cargo transport consists of freighters and passenger's aircraft carrying cargo in its belly. The fleet of passenger aircraft has a larger number of aircraft but lower belly capacity compared to freighters. Therefore it is not unexpected that more than half of world's cargo is carried by freighters. In this paper, the cargo fleet structure and changes related to fleet size and fleet types are analyzed. Bearing in mind that more than half of freighters are converted passenger, aircraft conversion/production and aircraft retirement also

* s.dozic@sf.bg.ac.rs

should be noted. An air cargo fleet overview both worlds and European is given, pointing out the factors that influence on freighter fleet growth.

2. THE HISTORY OF AIR CARGO FLEET

The aircraft is constructed mainly for carrying passengers (Wensween, 2007). Therefore, the fact that passengers transport by air is more profitable than air cargo transport is reasonable. Depending on aircraft used in the fleet for cargo transport, development of air cargo services could be divided into three parts. Taking a look back in the past it can be seen that air cargo transport started after World War II in order to use spare capacity of transport military aircraft with the piston power plant. These aircraft were characterized by low speed, small range, low payload and low available volume. Hence, they were employed to carry valuable shipment such as gems, precious metals, small packages etc.

The second part of air cargo history is related to appearance of narrow body aircraft with jet power plant. These aircraft have higher speed, larger range and larger payload. They are used for transport of passengers in the cabin while cargo is carried in their belly as supplement to full payload, enabling to make additional earnings for an airline. The narrow body aircraft offered a possibility to transport different types of cargo, while the transport cost per unit of cargo were reduced. The type of cargo that could be transported is limited due to the cargo door dimensions and belly volume, as well as due to the volume and mass of cargo consignment. The disadvantages of narrow bodies are related to the fact that there are many different units of cargo which means that the great diversity of handling equipment is needed.

The third part of air cargo history has started with the appearance of wide body aircraft (in the sixties) that gave opportunity to transport a variety of goods. At the beginning the cargo was shipped by passenger aircraft in the bellies of wide bodies as supplement to full payload. Later, the aircraft that carried cargo in both belly and main deck and allowed even the transport of unusual shipments were came. These aircraft (known as freighters) offer possibility to transport a large amount of goods (up to 250 tonnes on the same flight). They are equipped with cargo loading systems (mechanical and powered), which enables better stacking and securing of cargo and reduction of cargo loading and unloading time as well. With these improvements the unit costs of transport are further reduced. The wide body freighters provide the ability to transport a large number of containers and pallets of different sizes, as well as the transport of intermodal containers. The intermodal containers are very suitable having in mind that air cargo transport includes inter-modality because the cargo must be moved to and from the airport by surface mode of transport. Also, high capacity of freighters is convenient for transport of oversized and heavy cargo (e.g. helicopters, aircraft fuselages, trains etc.).

The wide body aircraft are produced in combi and quick change version. Both passengers and cargo are carried on the main deck of combi aircraft (passengers may occupy the front section of the aircraft, with cargo occupying the back section), while quick change aircraft are used as passengers aircraft by day and as freighter by night. The quick change aircraft are equipped with quick change systems that include passenger seats on flooring panels which are put on and off the aircraft like cargo containers.

The freighter aircraft are divided into three categories according to Boeing (2014) (large wide-body, medium wide-body and standard-body) and Airbus (large freighters, mid-size freighters and small freighters). Each freighter category corresponds to particular market. As stated by Boeing (2014), the share of wide-body freighters in the current airline cargo fleet is about 65% and they offer about 95% of the total cargo fleet's capacity. Due to the range limitation of small and mid-size freighter, large freighters are usually employed on long-haul routes with high market demand. Mid-size freighters operate the regional routes where the usage of large freighters presents a capacity risk, and demand is not small. Small freighters are versatile and

flexible, thus they are used when terrain is geographically difficult (mountains, forests or islands).

Customers that sent their shipments by air consider the speed, reliability and quality of air transportation as main advantages and crucial factors while choosing the mode of transport. According to Hsu et al. (2009) it is very important to select not only optimal transport mode but also the optimal carrier that will deliver the goods to customer. The authors noted that the logistics cost of the shipper is influenced by the charge, flight frequency and transit time of the carrier as well as by product characteristics (high pricing and/or perishable characteristics lead to a high inventory loss). They showed that the shippers forwarding the product of high value on short distance consider the shipping charge as important factor and prefer the air cargo carrier that offers higher frequencies. On the other hand, the freighter operators are sensitive to tonne-kilometre costs due to the competition with other modes of transport. They also should adjust their supply attributes to the product characteristics in order to increase the market share (Hsu et al., 2009). While choosing their fleet, airlines must take into consideration both the interest of customers and their own interests, which are usually conflicting. The art of fleet planning lies in the ability to harmonize these interests in the most convenient way.

3. FACTORS INFLUENCING THE FREIGHTER FLEET GROWTH

According to Airbus (2014) the key drivers of air freight growth are: 1) economic and trade growth that strengthen or induce cargo flows, 2) globalisation of exchanges and free trade agreements that enables smooth and easy flows of goods, 3) expanding middle class demanding higher added value products (it is forecasted that the middle class will grow from 33% in 2013 to over 60% in 2032), 4) increasing urbanisation and industrialisation that require specific goods to be delivered in right place and right time from central warehouse, without local warehousing (there is no large investments in warehousing and inventories). Also, the increase of passenger demand and its impact on air cargo demand should not be omitted, too.

The market conditions have strong influence on world freighter fleet growth. The consequence of the global downturn reflects in decline of cargo flows as well as decline of freighter demand. Freighters solve the problem related to surplus of capacity by parking certain number of their aircraft. According to Boeing (2014) different factors often cause contrary effects. The high fuel prices increase air cargo transport costs, which further decrease demand for services. The contrary effect is that high fuel prices and fuel costs are reason to replace old less efficient freighters (usually converted passenger aircraft that constitute more than half of freighters) with the newer ones, which further induce the demand for new freighters. This demand for freighters decreases when yields, load factor and utilization are reduced. The new wide-body passenger aircraft with large cargo compartment also affects the demand for freighters, by reducing it slightly. However, the freighters offer specific, unique advantage on the market that could not be offered by passenger aircraft. Competitive mode of transport and belly capacity could influence on demand for mid-size freighter by reducing demand for air cargo service offering lower prices. The intercontinental flights are operated by wide-body freighters.

4. WORLD'S AIR CARGO FLEET

Airbus (2014) predicts increase in air cargo fleet from 2014 to 2033 (Figure 6). They expect that 328 of 341 small freighters will be replaced, 13 will stay in service, while the fleet will be enlarged with 284 aircraft (in 2033, 625 small freighters will be in service). The fleet of mid-size freighters will be increased from 750 to 1242. Only 97 aircraft will stay in service, 653 will be replaced, while growth will be 492 aircraft. Finally, 337 large freighters will be replaced, 177 will stay in service, while the fleet will be enlarged with 264 large freighters. The total freighter

fleet will increase from 1605 to 2645 aircraft. Only 287 aircraft will stay in service, while 1318 will be replaced, therefore enlargement of fleet is 1040 freighters (Figure 1).

Considering the conversion – new-built share, it could be noted that the conversion of large freighters is not usual, because new built aircraft are more reliable and have lower operating costs. Small freighters are subject to the conversion because of the lower acquisition costs. Both manufacturers Airbus and Boeing similarly forecasted the conversion – new-built share in the total fleet in the next 20 years of approximately one third of fleet to be new built, while the rest will be conversion. Also both manufacturers noted that air cargo fleet will be doubled in the next 20 years.

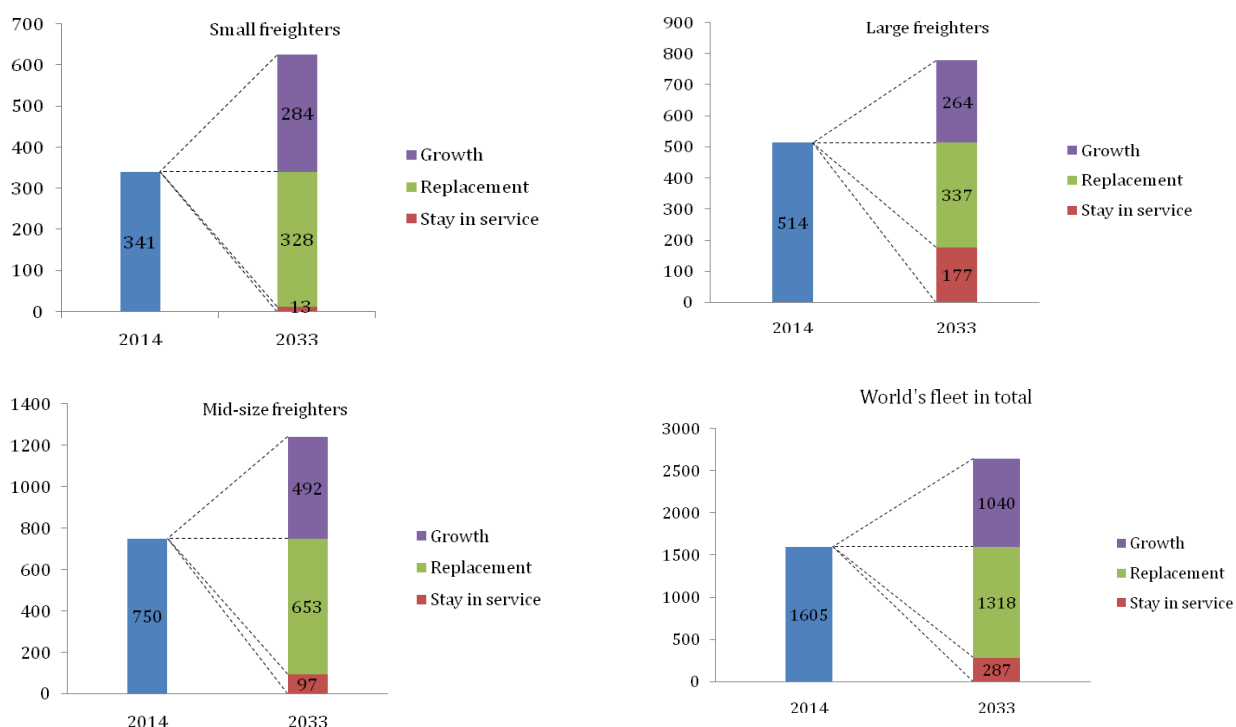


Figure 1. World's freighter fleet forecast (*Data source Airbus GMT 2014*)

Boeing (2014) expects that the world cargo capacity measured in available tonne-kilometres (ATKs¹) will be more than doubled in the next two decade (more than 1000 billion ATKs). Capacity in combi aircraft will not be offered. Although the increase of the cargo capacity in passenger aircraft measured in ATKs is predicted, the dedicated freighters will transport more than half revenue tonne-kilometres (RTKs). The dedicated freighters are preferable due to their operating advantages, especially on long haul routes or for unusual shipment transport. It also should be noted that the belly capacity has increased with the size of aircraft, while the available belly capacity per passenger has remained stable during the last 25 years.

5. EUROPEAN AIR CARGO FLEET

The air cargo transport is influenced by economic conditions on the market. The effects of world crisis can be observed through the Eurostat data related to 32 European countries for the period from 2001 to 2012. It can be seen that the total number of cargo aircraft in considered countries

¹ Available tonne kilometres (ATKs) is a measure of an airline's total capacity. It is calculated by multiplying capacity in tonnes and kilometres flown.

is reduced from 427 in 2008 to 416 in 2012. The number of cargo aircraft by countries in 2012 is given on Figure 2, while Figure 3 presents the share of cargo aircraft in the total fleet by countries in 2012. Germany had the largest fleet consisting of 68 aircraft, while Portugal and Estonia had only one cargo aircraft (Figure 2). The eight countries (according to Eurostat data) did not have cargo aircraft in their fleet in 2012. Serbia also did not have cargo aircraft in its fleet, thus air cargo was carried in the belly of passenger aircraft. The largest fleet in total can be observed in United Kingdom and Germany, consisting of 1229 and 1146 aircraft respectively.

Considering the share of cargo aircraft in the total fleet (Figure 3) Luxembourg has the largest share of about 24%, that could be explained by the fact that large cargo airline Cargolux is originated from this countries. The share of cargo aircraft in Portugal fleet was less than one percent, while in France and Italy, the percentage was 2.3%. Although the share of cargo fleet in France in 2012 was small, the number of cargo aircraft in its fleet is not negligible (14 cargo aircraft).

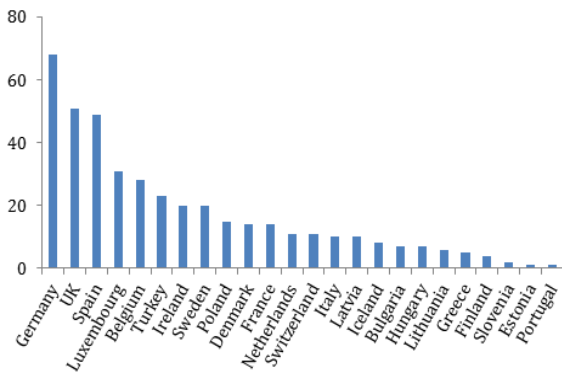


Figure 2. Number of cargo aircraft in 2012 (Data source: Eurostat)

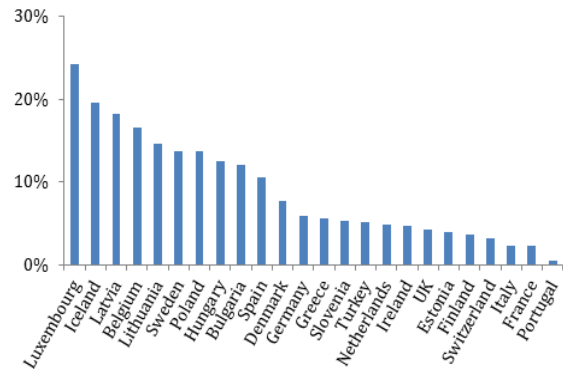


Figure 3. The share of cargo aircraft in the total fleet in 2012 (Data source: Eurostat)

According to Eurostat (data related to 32 European countries), the number of combi aircraft is insignificant. Unlike these data, Zhang and Zhang (2002) pointed that most passenger carriers in Asia have substantial cargo business and operate combi fleets. The quick change aircraft were used in European countries. Its number in 2012 is presented on Figure 4. The nine countries owned quick change aircraft in their fleet, and the leaders were France and UK with 15 and 14 aircraft respectively.

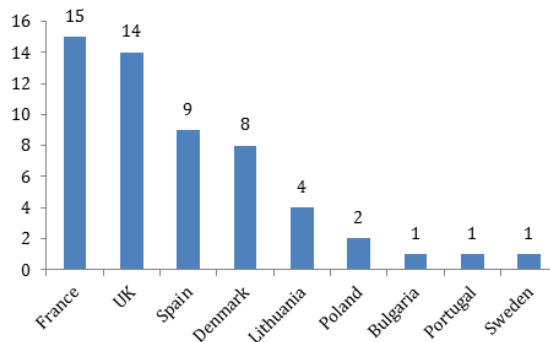


Figure 4. Number of quick change aircraft in 2012 (Data source: Eurostat)

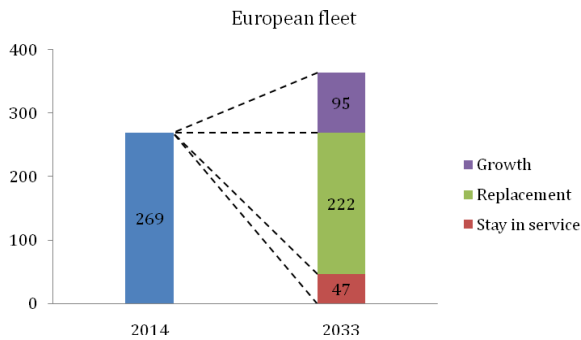


Figure 5. The growth of European fleet

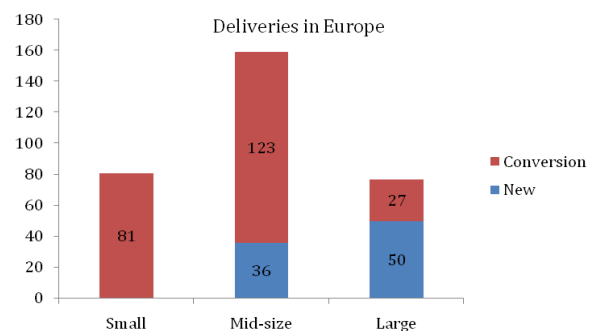


Figure 6. Freighters delivery in Europe

(Data source: Airbus GMT 2014)

The forecasted growth of European freighters fleet (Airbus, 2014) for next 20 years is presented on Figure 5. The fleet will expand for 95 aircraft, 222 freighters will be replaced, while 47 will stay in service. Considering deliveries in Europe (Figure 6) it can be seen that all small aircraft will be converted passengers aircraft. The share of new mid-size freighters is 23%, while large freighters are in 65% new ones.

6. CONCLUSION

The fleet planning is the problem of strategic importance for an airline. Aircraft acquisition and fleet renewal enables an airline to reduce the costs, because newer aircraft are more flexible, fuel efficient and better match the demand on the market, especially on short-haul and medium-haul routes. New generation of freighters are designed to be more adoptable to the market conditions, therefore allowing the airline to be more competitive with other modes of transport. Forecasted trends, both in Europe and world, indicate the growth of air cargo fleets, which means that air cargo transport has been recovering from recession.

ACKNOWLEDGMENT

This research has been supported by the Ministry of Education, Science and Technological Development, Republic of Serbia, as part of the project TR36033 (2011-2015).

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