

Airbus versus Boeing – which Company will Win?

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According to market analysis and their prognosis, passenger air transportation will be characterized by a higher development pace than other branches. There are, however, discrepancies as to the type of aircrafts used. The biggest uncertainty as to the assessment of the prognosis accuracy is the problem of predicting the tempo and the scope of fuel price changes, which is the main component of the costs incurred by airlines. In the coming years the number of air passengers will be rising at a rapid pace. Such a considerable increase in the number of air passengers will most probably make it necessary to double the number of the planes exploited as well as increase their capacity and reduce fuel consumption per passenger in accordance with the EU Climate Package regulations. The air fleet adjustment of the quantity and quality changes to the changing market conditions leaves aircraft constructors faced with unprecedented challenges of mass transportation of people and cargo.

1. THE FORECAST OF CHANGES IN THE AIRCRAFT PRODUCTION MARKET

The authors of the developmental prognosis in the air transport market rest upon demographic analyses, anticipated economic growth and the increasing people's mobility in particular regions of the world.

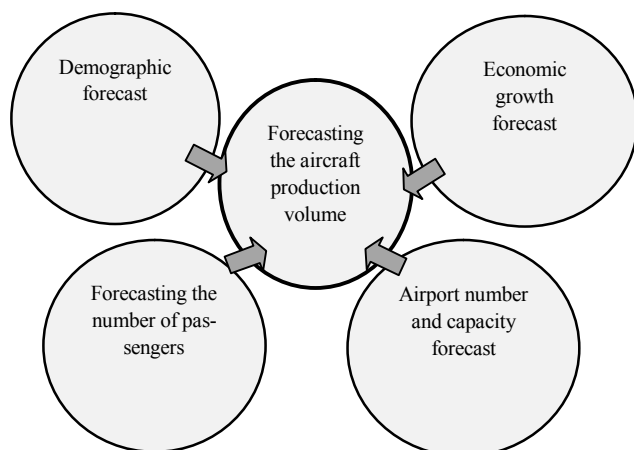


Figure 1. The model of aircraft production volume forecast.

Source: Personal study.

What the analysts also take into consideration is the number of passengers carried in the last years and the number of necessary aircrafts involved (fig.1). The forecasts are usually made by the analysts of the aircraft producer market and air carrier organizations for the period of twenty years with annual corrections depending on the current economic situation. Short-term forecasts are usually dependant on the economic situation, whereas long-term ones are frequently prone to changes.

Over the last years there has been average annual increase in air traffic of 5 %, which is indicative of the resistance of this sector to the ongoing negative trends in the world economy. According to the previous year's analyses air transportation figures double every fifteen years. The changing fuel prices as well as external events of various kinds (local military conflicts, epidemics) have not significantly affected the global passenger air traffic or the demand for transportation aircrafts. Crises, being natural cyclic phenomena, are usually followed by periods of strong economic growth compensating for the loss. The Iraqi War, attack on WTC, or SARS epidemic caused a

temporary fall in air transportation but in a short time we again witnessed its dynamic growth. A rapid increase in passenger air transport is to be noticed in countries of dynamic economic growth and comparatively low people's mobility in the previous period.

According to the Boeing company prognosis the orders will be predominantly for narrow-body aircrafts with the seating capacity of 100 to 240 passengers (in two-class configuration), that is the most common ones B737 and A320. By 2028 the deliveries of these aircrafts will have amounted to 20,000, whose worth will be 1,500 bln USD (they will have served 67% of the world market). The carriers will also have bought 6,700 double-aisle wide-body aircrafts (seating capacity 200-400) and 740 large wide-body aircrafts (seating capacity over 400). According to Airbus prognosis, in the coming 20 years airlines will purchase 24,000 aircrafts in which 16,500 will be narrow-body aircrafts, 6,000 medium wide-body ones and 1,500 large wide-body aircrafts.

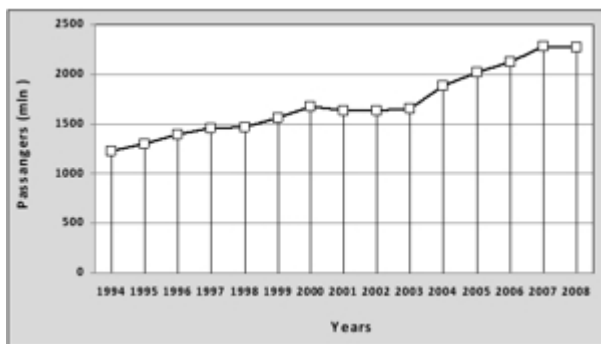


Figure 2. Regular passenger transport worldwide in the years 1994 – 2008.

Source: Personal study based on: ICAO Doc 9916 Annual Report of the Council 2008.

The comparison of the two forecasts (Airbus and Boeing) indicates their convergence in the air traffic volume and the number of planes purchased. The most conspicuous difference between the two, however, is the anticipated demand for biggest aircrafts. Airbus maintains that the demand for this type of aircraft will be twice bigger than Boeing calculations indicate. The forecasts rest on the assumption that the average annual economic growth in the world in the years 2009 – 2028 will be 3.1%, the increase in the number of passengers carried will oscillate

around the level of 4.1% and the transport labour around 4.9%. Market analysts say that the Boeing company is optimistic and Airbus is rational in their forecasts.

The anticipated annual increase in transport labour oscillates comparably in separate world regions. It is bigger in the regions of high economic growth such as China, India or the Middle East, but smaller in North America or Western Europe. The transport labour increase will be the highest in the regions where a comparatively small number of people has used air transport services so far, mainly due to economical reasons. The increasing welfare of the societies will lead to a significant rise in the demand for the services provided by this branch of transport offering fast mobility, which is increasingly gaining relevance for big countries (domestic flights) and in the case of international flights. In order to meet the market needs the leading producers have resolved to design aircrafts able to satisfy the growing demand for mass passenger transportation and cargo shipment. The market need for separate aircraft types is not uniform for different world regions, which is mainly caused by the discrepancies in the demand in separate markets (Tab.1)

Two biggest aircraft producing companies have commenced competition in the global market, American Boeing, concentrating efforts on the construction and modernization of large aircrafts, and European Airbus concern. In fact only these two companies are to be reckoned with in the global market in the process of new design and modernization of large aircrafts and are to decide on the scope of supply and satisfaction of the needs in this aircraft sector. The production volume for both companies as well as their total results in the years 1997 – 2008 are presented in Fig.3.

It is due to this fact that launching a new aircraft model in the market bears a considerable risk and requires increasingly wider international cooperation and contribution by many specialist companies. A specific example of this type of cooperation is the multinational Airbus concern, where separate aircraft parts are manufactured in Italy, Great Britain, Germany and France, and are assembled mainly in Toulouse, in the main production plant.

Table 1. The anticipated communication aircraft deliveries in the years 2009 – 2028.

Region	Total		Number of aircrafts			
	Number	Worth (bln USD)	Regional	Narrow-body aircrafts	Wide-body aircrafts	Large air-crafts
Asia-Pacific	8 960	1 130	440	5 600	2 590	330
South America	7 690	680	890	5 630	1 130	40
Europe	7 330	800	340	5 310	1 480	200
Middle East	1 710	300	50	680	850	130
North America	1 640	150	80	1 260	290	10
Russia and Central Asia	1 050	90	250	610	170	20
Africa	620	70	50	370	190	10
Total	29 900	3 220	2 100	19 460	6 700	740

Source: Current Market Outlook 2009 - 2028. Future air transport Forest Stewardship. Council. Seattle USA 2009.

unprecedented challenges within the sector of mass transportation of people and shipment of goods over long distances. The market is witnessing an intense competition between the two leading aircraft producers, which are concentrating on the production and modernization of large machines able to carry on board several hundreds of passengers at a time. The scenarios by the leading producers concerning the use of large flying units differ in their exploitation preferences for the models of the seating capacity of 200 – 400 passengers and large dimension ones taking over 400 passengers on board. Airbus assumes a greater exploitation of high capacity aircrafts (over 400 passengers on board) by including in the process smaller capacity airplanes that would bring passengers from local airports to central ones, which would serve as communication hubs. Boeing, in turn, sees in the future a wider exploitation of medium capacity aircrafts (200 – 400 passengers) by offering direct air transport in the point to point system.

Both companies have started designing aircrafts in all categories in consideration with individual preferences. In the design and modernization process the companies follow the cost optimization profit enhancing route by:

- reducing the aircraft weight (application of new technologies and composite materials as modern assembly techniques), which enables them to increase the airplane seating or cargo capacity and lengthen the flight distance by the possibility of filling up with more fuel,
- enhancing profits connected with non-standard services by creating separated first class section cabins.

The first class passengers generate most profit for airline companies especially on intercontinental journeys, therefore certain carriers arrange aircraft interior in an individual way and offer additional services.

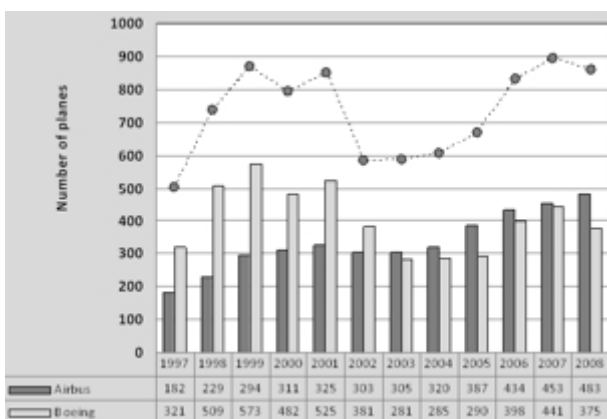


Figure 3. Aircraft production by Airbus and Boeing in the years 1997 – 2008.

Source: personal study based on: J. Liwiński, Airbus – Boeing. Aviation journal 3/2009, p. 20-23.

2. THE DEVELOPMENT ROUTES FOR THE PRODUCTION OF HIGH CAPACITY CIVIL AIRCRAFTS.

The rapid pace of the global market development leaves aircraft producers faced with

2.1. THE AIRBUS CONCEPT ASSUMPTIONS

The leading product of Airbus company in the large dimension aircraft category is A380. Its introduction into exploitation diverted the quality standards of both aircraft production as well as comfort of traveling especially on long distance flights. It is the first full length double-deck aircraft

with an additional lower baggage deck serving also as an amenity base. The model culminates the efforts to introduce technique and technological innovations with a strict compliance with the environmental regulations and has the prospects of becoming the 21st century banner aircraft.

Table 2. The A380 chronological stages from the blueprint to exploitation phase.

Date	Event
1994	Creation of the project labeled A3XX
19 December 2000	Renaming the project to A380
23 January 2002	First model assembled
27 April 2005	First test flight
4 September 2006	First passenger flight with company workers involved in the plane construction on board
12 December 2006	Airworthiness certificates from European EASA and American FAA
25 October 2007	Firsts commercial flight from Singapore to Sydney

Source: personal study based on: J. Litwiński AIRBUS czterdzieści lat innowacji (AIRBUS forty years of innovations) Lotnictwo (Aviation journal) 12/2009, p. 22-29.

The construction of such a huge machine was the greatest challenge in the history of civil aviation due to the necessity of applying new technologies as well as the cost of the project amounting to approximately 17 bln USD. Extending the deck area by 40 % allowed for widening the aisles and the space between the rows of seats as well as the installation of staircases between the decks. The modern passenger cabin interior along with its electronic equipment facilitate many functions connected with work, relaxation, entertainment, sleep and also using the rooms designed for office work and play for children. The interior can also house a bar, duty free shop, club room, business meeting room, and shower rooms. The standard version with the 3 class section arrangement comprises 555 seats whereas the economy class version (designed for charter flights) has 863 seats.

The application of latest technologies (the use of artificial fiber composites Glare, artificial materials reinforced with carbon fiber, and replacing traditional riveting with laser welding) contributed to the reduction of the aircraft weight by 15 tons maintaining at the same time the airplane's compliance with the

obtaining durability requirements. A big asset of the aircraft that improves its economical viability is the low rate of petrol use per passenger, which is also an important element as far as the environmental protection is concerned. The take-off and landing tests proved its compatibility with the infrastructure of big airports (the possibility of using 45 m wide runways was confirmed). Ultimately, out of the 22 special tarmac service vehicles only the aircraft tractor and the top deck service vehicle need to be replaced or adjusted.

2.2. THE BOEING CONCEPT ASSUMPTIONS

In response to the existing market situation and the Airbus project under way, in 2000 Boeing company started considering the possibility of contracting a new aircraft version that could successfully compete with the European giant. In the beginning of the program the new project was labeled 7E7 LCF (Large Cargo Freighter). It was supposed to be a large dimension plane taking on board over 400 passengers, but in the first place the company resolved to implement a project of a slightly smaller capacity aircraft in accordance with the earlier made market development forecast. Now the future of the company appears to belong to Boeing 787 (Dreamliner), a medium range airliner. As planned it is going to be built in three versions: two long-distance ones 787-8 and 787-9, and medium-distance one 787-3.

The wind tunnel testing of Boeing 787 started in 2006 and the aircraft prototype was presented on 8 July 2007 at the Boeing factory airfield in Everett. The test flight was planned for the turn of 2007/2008, and according to the schedule the company was going to deliver 109 airplanes by the end of 2009. The test flight date and the delivery dates, however, have been moved several times. The first airline which is going to introduce the airliner into exploitation is the Japanese ANA. The obstacles in the plane production are basically connected with the outsourcing involved in it (about 80% of the subunits are produced by external companies whereas in the case of other Boeing models the ratio is about 50%). Therefore the main reason for the production

delays has been failure to keep the delivery dates by the external companies, certification problems with separate construction elements as well as assembly problems with large composite elements that the plane is built up of.

Despite the delivery delays, orders for these machines are continually being placed. Still before the first flight of the aircraft the producer from Seattle received orders for 910 Dreamliners worth 140 bln USD (according to catalogue prices). However, the main competitor to A380 is going to be Boeing 747-8 Intercontinental (Fig. 4), whose construction will be based on 747-400 model with 80% of its solutions as well as transferring certain

elements from the simultaneously designed 787 Dreamliner (the interior and cabin lighting), which is going to bring down the costs considerably. The main objective for the aircraft designers is cutting the costs by the reduction of the airframe weight and introduction of some new solutions within avionics. The economizing connected with aircraft weight reduction has allowed for increasing fuel reserves and taking on board additional paid cargo.

As preliminarily assumed the aircraft was designed to carry 500 passengers on board. The project was officially commenced on 14 July 2005.

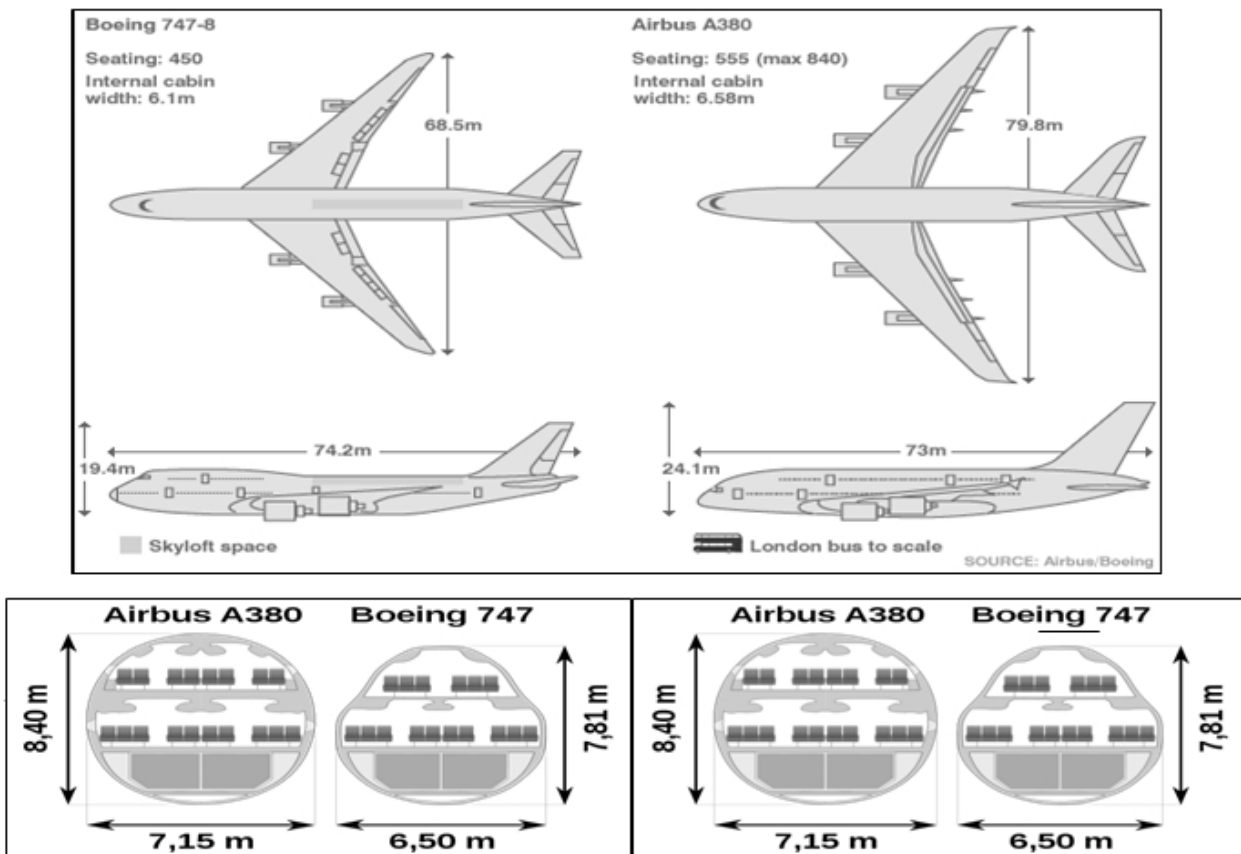


Figure 4. The new generation airliners of seating capacity over 400.
Source: Airbus and Boeing internal documents.

The aircraft with the seating capacity of 450 in the 3 class section arrangement will be the company’s biggest jet airliner. Its flight range will be 14,815 km and its basic asset will be reduced

fuel costs, lower by 20% comparing to the contemporarily used machines of similar parameters. Competitive fuel use is currently the most significant factor in the effective economical

improvement, it also proves to be a great environmental advantage as a result of the reduced emission of exhaust fumes. It is estimated that the savings it generates will be 8% of the costs of one passenger per kilometer. The load capacity will improve thanks to its wing span, modern aerodynamic profile of the wings, and the replacement of triple-slotted flaps with the latest version of double and single-slotted ones. The wings will be built up of high durability newest generation materials and terminated with air whirl dispersing winglets. The data gathered in Table 3 allows for broader analysis and assessment of the anticipated and already existing changes in Boeing 747-800 construction as compared with the base 747-400 model as well as its competitor A380-800.

Table 3. Comparative specification of the technical data of passenger aircrafts of the capacity over 400

Specification	747-700	747-800	A380-800
Length (m)	70,7	74,2	72,7
Span(m)	64,4	68,5	79,8
Height (m)	19,4	19,4	24,1
Max. Ramp weight (t)	396	436	560
Max. Flight range (km)	13 430	14 800	15 000
Speed (Ma)	0,85	0,85	0,85
Number of passengers / 3 class sections	416	450	555
Catalogue price (bln USD)	205-230	250-265	272-292
Year of coming into operation	1989	2010	2006

Source: Personal study based on: J. Litwiński, 747-800 nowe samoloty Boeing. *Lotnictwo journal* 2/2006, p.16.

The comparison of the two aircraft types reveals that A380 gains an advantage with its flight range and cabin volume, whereas Boeing 747-800 is cheaper in exploitation and catalogue price, being also much more compatible with the existing airport infrastructure.

3. CONCLUSIONS

The race between Airbus and Boeing is not only a matter of economy but also of prestige and politics. The outcome of the battle can answer the question of who will be the leader in new technology implementation in aircraft production and then in the whole industry – Europe or the USA.

Launching Airbus A380 into the market marks a new direction in air transportation based on mega hubs and the efficient use of big number of seats offered in direct connections. The divergence in the development scenarios results from the different concept implemented by Boeing, consisting in the exploitation of smaller aircrafts of versatile compatibility with the existing land-based infrastructure as well as minimizing the exploitation costs. This approach forms the basis for the construction of a new passenger airliner Boeing 747-800 Intercontinental. The question of which concept will prove correct still remains unanswered.

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