# SELECTION OF A SUITABLE AIRCRAFT TYPE FROM COMMERCIAL POINT OF VIEW

**Peter Hanák - Stanislav Szabo – Jarosław Kozuba**

The contribution is dealing the importance of proper assessment and selection of a suitable type of aircraft for the airliner. In view of the great extent of the selection process, it is focused only on part of the aircraft analysis, i.e. on commercial point of view. Also described are the fundamental elements of commercial aspect taken into account when comparing the aircraft on the short list, after having passed performance analysis.

K e y w o r d s: airliner, air transport, aircraft equipment, terms of transportation, aircraft selection.

## 1 INTRODUCTION

In practice, airliners are often facing the decision related to the renewal or enlargement of their aircraft fleet. A wrongly performed evaluation followed by the decision made in favour of new aviation equipment may result in disasters for a starting-up company where the selection of the right type is an existencial step. Consequently, assessment and the choice made thereupon is of vital importance for the airliner

In the regulated times, decisons made by the airlines were unambigious and usually based on asssumptions considering their technical level. As manufacturers of airframes and aeroengines kept bringing up continous improvements, more moder types, airlines were willing to buy them, regardless of their prices. High-performance characteristics, reliability of engines, digital cockpits, excellent output and higher maintainability of those types seemed to be irresistable for airlines. Jet engines entering the market in the 60s and wide-body airframes in the 70s accounted for giant leaps in the airline performances.

Deregulation in the USA and liberalization in Europe have, however, changed the rules of the game so far applicable to the selection of aircraft equipment. For an airliner to become successful in the competitive business enviromnent, choice of an aircraft solely on the basis of performance characteristics is no longer viable.

It is a general knowledge that choosing an aircraft for a given route depends is based on trasport reqirements for the time concerned, load-carrying capacity and its range. The notion of transport requirements is meant to cover particularly the number of passengers and the amount of load to be transported within a given period of time from one place to another, at a distant place. The magnitude of transport requirements and their distribution over a specified period of time is influential to the size of the aircraft and the number of legs between the places of visits.

Currently, managers have to perform and assess several analyses so as to obtain the most precise and valuable data for their decisions to be made on the aircraft type that would best fit their company both in terms of performance and economics as well as finance.

Process of selecting the suitable type is made up of several stesp, such as:

- Aircraft analysis,
- Planning analysis,
- Economic analysis,
- Financial analysis.

The approaches to analyses have to be sensitive and thorough, as a wrong choice of an aircraft will incur hihger costs with simultaneous decline in performances, bringing about reductions in the overal revenues, or losses in some case.

In view of the vast extent of the aircraft type selection proces, let us focus only on part of aircraft analyses, i.e. on commercial aspect.
Aircraft analyses can be divided into:

- Performance analysis,
- Comparison of aircraft.

Performance analysis is concentrated on assessment of the aircraft´s capability of operating

at specific routes within the system of airline route networks under the operational conditions specific for the routets. They involve:

- Analysis of airport characteristics – length and width of runways, altitude, reference temperatures, airport operational requirements,
- Analysis of aircraft characteristics – geometry, fuel consumption, weights of the individual types, range, payload.

In the area of comparing aircraft, assessments are focused on performance characteristics of the aircraft of interest. The types succesfully meeting the requirements set for the given route will be subjected to further, more detailed screening, i.e. with the analysis concentrated onto a lower number of objects, involving mostly comparisons of operational and commercial aspects.

## 2 COMMERCIAL ASPECT

Generally, the product of an airliner provided to its passengers can be a transport of passengers from one pint to another. It is not, however, a clear definition of product, as in air transportation it covers everything a traveller is provided by the airliner as a countervalue of their payments. Both material and immaterial elements are involved. An example of material ellement can be a comfort suit while the immaterial one might consist in cabin friendliness. One has to realize that the passenger is the buyer of not only the product only but the benefit, which is perceived as satisfaction sought by the trasveller. Awarenes of the required services on the part of the travellers will depend on lots of factors such as comfort, precision, quality of food, aircrew and flight attendants, flight reservation etc. Most of these components, however, are bound to the airline policies, with some of them directly related to aircraft internal layout. It is therefore necessary to devote ourselves to the issue of comparing aircraft with their internal arrangement in mind. For air cargo customers, most of these aspect are omitted, as the load carried need not pose requirements in terms of comfort whereas the most important factor is limited to the size of the cargo compartment and to the way of transportation (freely loaded, carried in containers or on pallets).

### Cabin internal layout

When comparing passenger cabin internal arrangement, the following part should remain in focus:

- Number of passengers and seat configuration,
- Aircraft body diameter.

When designing cabin configuration for passengers, prominence dominance should be given to the following three aspects :

- Width of seats,
- Width of the aisle,

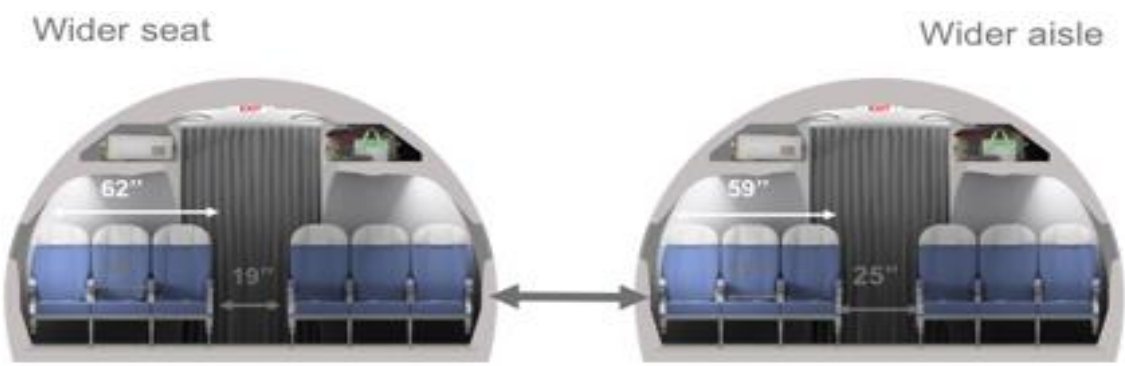



Fig. 1.: Cross-section of an Airbus A320 line body and options for seat configurations (Source: Airbus)

- Distance between seats, both lateral and longitudinal.

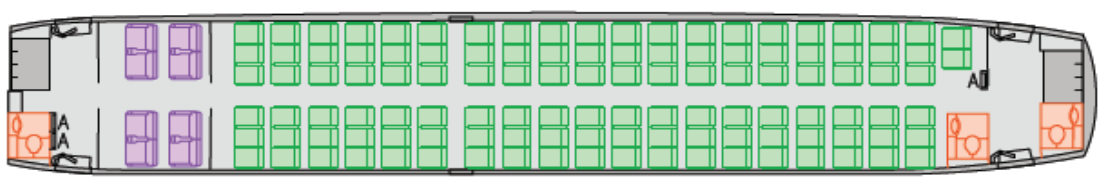
When determining the width of seat, aisle and the number of seats to be placed laterally, the most important are the dimensions of the aircraft body, its diameter in particular. Different types have different diameters, e.g. the A320 family are wider by 7 inches (18 cm) than those of the Boeing 737 family. The diameter of a concrete aircraft, however, need not be the same. Sometimes, reduction in the number of seats in a row is inevitable due to keeping the width of the aisle unchanged to facilitate passenger movemements (in and out) of the cabin.

Lateral distance or spacing between seats and passenger cabin length is decisive for seat capacity of the aircraft considered. The distance is determined as the one between a given point on the seat and the very point on the seat located ahead or behind us.

It is generally given that the minimum spacing between seats measures 28 inches (71 cm). The distance can be quite limiting for long-haul flights. However, it raises the number of seats that can be placed at a given length of the passenger cabin. Arrangement of seats an their number is of crucial impact in terms of the unit-costs of aircraft (costs per seat-miles). It also affects the passenger comfort, which can be reflected on the airline revenues.

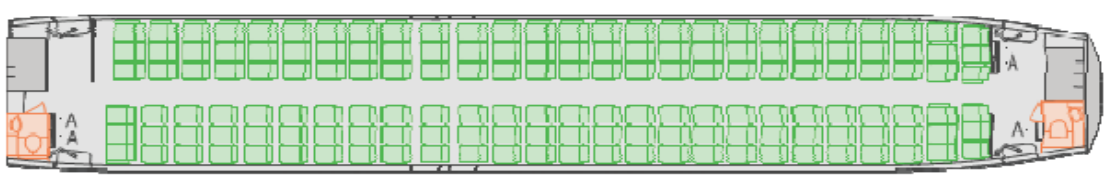
Aircrafts designed for regional transportation regularly a single-class layout. Airlines carrying passengers for medium- and long-haul routes offer several classes resulting various layouts of seats differing by classes.

In the economy class, positioning of the highest number of seats is preferred. It cannot be, however , made to the detriment of the comfort of travel, and is allowed on markets offering flights short distances or with no competition at all.



*Typical two-class layout 124 seats (8F at 36in + 116Y at 32in pitch)*

*Single-class layout 134 seats (134Y at 32 in pitch)*



*Single-class, high density layout 156 seats (156Y at 28/30in pitch)*

Fig. 2. Examples of seat configurations for Airbus A319 (Source: Airbus)

Buisness class is typical of higher comfort of travelling and services provided during flight. Higher comfort is achieved through higher spacings between seats, wider seats, elbow-rests, aisles width and overhead bins. The characteristics listed result in lower number of passengers carried in the cabin, yet the increased unit costs can be compensated for, at least partially, by higher cost of the ticket for passsengers travelling in the business class.

It is apparent, that not all classes (business, economy) are affered by airliners. The number of classes depends on the strategy adopted by the individual airliner and the composition of its clients.

Volume capacity of the load-carrying compartment affects the amount of extra load to be carried. Requirements set for baggage and the load carried vary with time and markets served by the aircraft. A long-time experience of airlines carrying passengers have revealed that at short-distance routes baggage is taking up 0,085 up to 0,100 $m^3$ of the load-carrying compartment per seat. Coefficient of load-compartment capacity use for this type of routes is 15 up to 20 %. For long-haul flights, baggage is taking up 0,170 as much as 0,200 $m^3$ of the load compartment calculated per seat and the coefficient of load compartment use is rapidly increasing and can rise up to 60 %. For regional transportation (medium-haul routes ) it is 0,125 $m^3$ and the

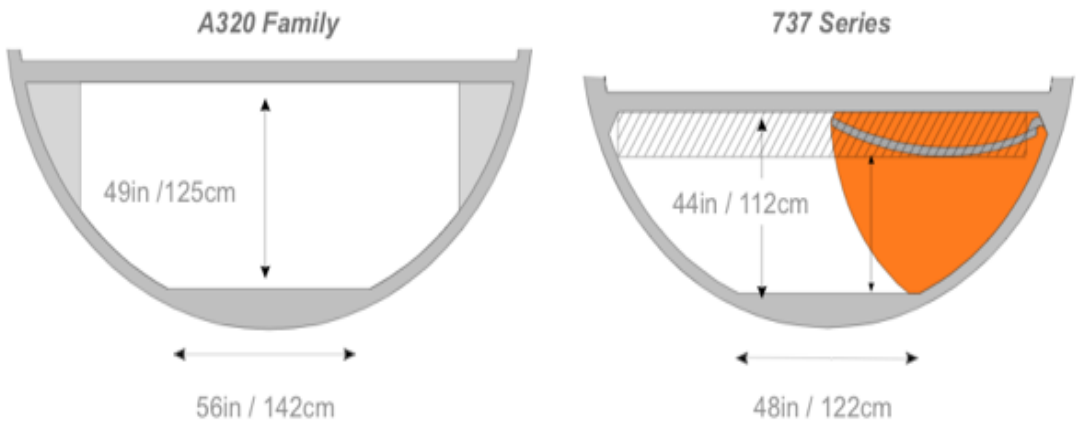



Fig. 3. Comparing the cross-sections of load compartments of the Airbus A320 and Boeing 737 families (Source : Airbus)

**Load carrying compartments at aircraft**

Even though the fundamental function of the load-carrying areas of passenger aircraft is transporting the baggage on list, whereas the remaining part of the area can be used to transport postal packages, cargo or material of the the airline.

Dimensions of the compartment, its internal finish, location and size of the cargo doors have certain effect on the time of loading baggage and cargo in-and out of the aircraft technical handling.

coefficient of load-carrying compartment use is 35 %. It then follows that the baggage requirements and the coefficient of the load-carrying compartment use is higher for larger, wide-body aircraft, mostly if used for long-haul.

In cargo tranpsort, there are several ways of carrying load. For medium- and long-haul aircraft, it is typical that baggage is transported in containers and load in the load-carrying compartment can be transported in containers, pallets or in bulk mode.

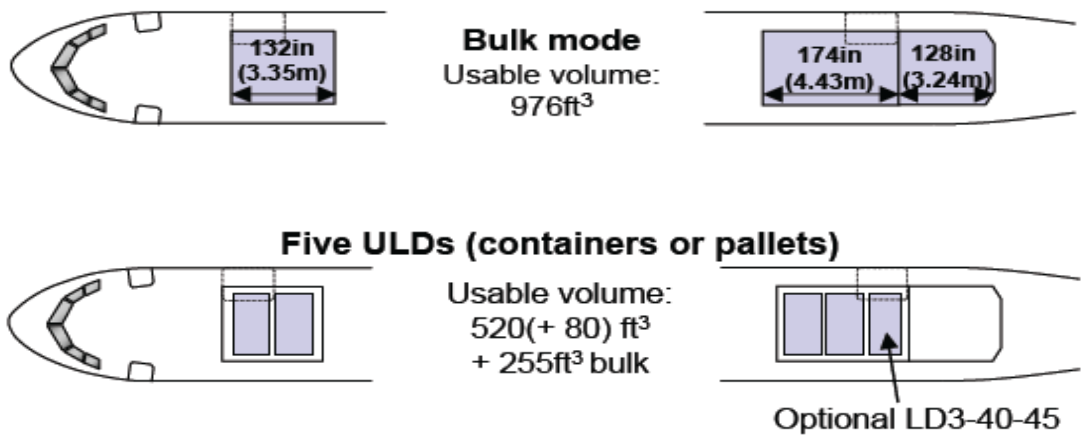



Fig. 4 Configuration of the coad compartment of the Airbus A319 (Source: Airbus)

## 3 CONCLUSION

As mentioned above, assesment and selection of the suitable type of aircraft is of high importance for the airliner and must not be underestimated. Proper decision-making of managers is crucial in terms of viability and competitiveness.

Performance analysis of aircraft ensures meeting the requierements for safe aircraft operation in the airline route network.

This article has described the fundamental elements of the commercial aspect, taking into account the narrowed down comparison of aircraft having passed initial performance analysis.

Properly determined aircraft capacity, passenger classes, size of the load-carrying compartment bear close relationship to the airline costs and revenues per seats and miles or kilometers flown.

Comparison of aircraft from commercial aspects can also involve many other factors such as the size of overhead bins available for passengers, number of toilets, location of the kitchen and snack-bar on board, number of inlet and outlet doors. All that depends, however, on the airliners and what is included into the process of comparison.

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AUTHORS´ ADDRESSES

Peter Hanák, Dipl.Eng., PhD.
Čajkovského 42, 917 08 Trnava
Slovak Republic
e-mail: hanakpeter@hotmail.com

Stanislav Szabo, Assoc. Prof. Dipl. Eng., PhD. ,MBA
Technical University of Košice
Fakulty of Aeronautic
Rampová 7, 041 21 Košice
e-mail: Stanislav.Szabo@tuke.sk

Jarosław Kozuba, Dipl. Eng., Phd
Polish Air Force Academy
Department of National Safety
Dywizjonu 303 bl.12, 08521 Dęblin
Republic of Poland
e-mail: aabuzok@wp.pl