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## INFLUENCE OF LOW-COST CARRIERS ON AIRPORT INFRASTRUCTURE DEVELOPMENT

### ABSTRACT

The European low-cost carriers share in passenger traffic is getting higher each year. Their business model benefits from many aspects. Still, one of the most important aspects is usage of secondary airports. Those airports are mainly regional in character with relatively low passenger figures. With arrival of low cost carriers, traffic volume has greatly increased which brings additional load on airport infrastructure. Because of this extra load, additional planning of future development as well as extension of movement surfaces, primarily apron area, and terminal areas is necessary.

Several low-cost carriers currently operate to Croatian airports, and with forthcoming regulation liberalization their number is expected to grow. The paper presents the increase in passenger traffic at European and Croatian airports generated by low-cost carriers, and its influence on development of airport infrastructure.

### KEYWORDS

air transport, airports, low-cost carriers, airport infrastructure development, planning

### 1. INTRODUCTION

The low-cost passenger air transport model was first offered by the "Pacific Southwest Airlines" carrier in the USA as early as 1949. Very often this title is assigned to the carrier "Southwest" that was founded in 1971 which confirmed success of this model by being profitable since 1973. The market deregulation brought expansion of the model to Europe at the beginning of the 90s, where the Irish "Ryanair" and the British "EasyJet" were the most successful ones. At the beginning of the new millennium, the low-cost carriers started to operate successfully also in other parts of the world, e. g. Australia, India, the Far East, etc. The number of low-cost carriers in the world is continuously growing, as well as the number of passengers

using their services. There is an analogous increase in the number of aircraft in the fleets of these carriers, an increase in the number of destinations to which they operate and also an increase in the total number of operations at the airports used by these carriers. All this represents a load for the existing infrastructure and sets the requirements for the construction of new or for the reconstruction of the existing terminal facilities, as well as extension and adaptation of aprons and manoeuvring surfaces. This influence is most obvious at secondary airports, primarily in Europe, where the great increase in traffic over the last several years is almost exclusively conditioned by the low-cost carriers operations.

### 2. LOW-COST CARRIER OPERATION MODEL

Low-cost carriers are, generally speaking, those carriers who offer low prices for their services, but without providing any additional services that are common for the conventional network carriers. The passengers are charged for these additional services, if offered. However, considering from the operative-commercial viewpoint the low-cost model brings savings in all operation aspects. It is almost in every part of the technological process of service generation in air traffic oriented to the efficiency and cost reduction. The only aspect of the technological process where the low-cost carriers must not set the cost reduction as a priority is the air traffic safety, which has been regulated or should be regulated at a legislative level.

Their business model has the following basic characteristics:

- They use mid-haul aircraft of an average capacity of about 160 passengers, and two types of aircraft have proven as the most adequate ones: A319/320 and B737. The fleet is conceptualized around one

- aircraft type, since in this way the aircraft crew efficiency is greater, the costs of their training reduced as well as the maintenance costs of the very aircraft;
- The aircraft interior is simple, with a single class and simplified service, whereas the space between seats is reduced so that as many seats as possible can be accommodated in the aircraft;
  - The destinations are primarily selected according to the traffic demand, but also according to the optimal distance of the destinations from their main airport. In this way, namely, the carriers insure the optimal number of aircraft turnarounds during one day and increase their utility level. Also, the carriers target the point-to-point transport, thus avoiding the costs of passenger transfer, as well as making the route structure much more flexible and simpler;
  - By using the secondary airports they realize great discounts for airport taxes since they are usually the main operations generators at these airports. They also avoid heavy traffic at major airports, thus achieving great punctuality in their flights. By simple handling, the turnaround time is reduced to a minimum, thus also increasing the time utilization of the aircraft;
  - Since the very beginnings the carriers were oriented to advanced methods of capacity distribution, thus achieving great savings. Of course, this involves electronic operation, and primarily distribution via the Internet. The carriers offer simple tariff system, which increases the efficiency of managing the revenues;
  - The carrier's employees are usually trained to perform multiple tasks, so that e. g. cabin crew also cleans the aircraft or organizes passenger boarding at airport gates. Although the staff is often additionally paid for these jobs, eventually the carriers still realize large savings;
  - All the food, drinks and other products are sold during flight. Also, on their Internet pages they offer services that include hotel reservations, rent-a-car services, etc. All this brings additional revenues to the carriers.

Apart from all these basic characteristics or methods of business optimization, the carriers implement also a number of others as well.

Regarding high competitiveness that has appeared among low-cost carriers, they had to find a way to provide the passengers with recognizable service. This may be best seen in the example of the US carrier "JetBlue" offering their passengers leather seats and free satellite television fitted in every aircraft seat.

It is to be assumed that in the future these carriers will gradually introduce additional services trying to attract potential passengers, which will logically in-

crease their costs as well. This is precisely the reason why they will have to find new ways of improving the quality of service at the same time retaining low prices. In these attempts they will be supported best by the implementation of advanced technologies. An example is the German "Germanwings" that introduced a frequent flyer club, providing these passengers with the possibility of getting free trips. However, the club functions exclusively via the Internet. Some of the carriers are likely to remain aggressive in their intention of providing raw services of transport but at extremely low prices. The best example is the Irish "Ryanair" that has recently even introduced charging of every piece of luggage.

### 3. REGIONAL AIRPORTS

As mentioned before, a part of the operation concept of the low-cost carriers is the use of regional or secondary airports. Two basic characteristics render these airports attractive, and they include the existence of available capacities and their locations. Many regional airports have been built in order to serve regional flights from minor centres for the big cities and their hubs. Other regional airports are usually abandoned airbases. They were usually built so that their capacity exceeded their actual needs by many times.

This is of great advantage for the low-cost carriers for several reasons:

- airport slots are available at all times which makes it possible to create optimal flight schedule which increases the time utilization of the fleet;
- there are no traffic congestions which allows carriers high level of flight punctuality, and reduces the costs that result from aircraft delays;
- marginal costs of these airports are minimal, so that aeronautical fees may be extremely low;
- the infrastructure within passenger terminals, such as the passenger check-in counters or the baggage handling facilities are very modestly designed which allows carriers to make new ones that will be fully adapted to their respective operations [1].

Another essential advantage is the location of these airports. The distance of these airports from the cities they serve is greater than the distance of the main airports. The passengers need more time, but also more money, to reach the cities from the airports and vice versa. However, passengers who use services of low-cost carriers are ready for this since their priority is the low price of air transport. The advantages resulting from the dislocation of these airports include cheaper labour, as well as their greater availability, since the areas surrounding these airports usually suffer from unemployment. Regional authorities are ready to promote employment through the develop-

ment and reconstruction of facilities at secondary airports.

The excess of capacities at airports and the unemployment in the regions provide good preconditions for the low-cost carriers and regional authorities to become good business partners. The reduction of aeronautical fees for landing and aircraft handling is eventually in the interest of both parties. Airports are being developed, passenger traffic is growing, but they also realize revenues from secondary activities, such as catering, parking charges, sales of duty-free and other products, etc., whereas carriers enjoy all the earlier mentioned advantages, and especially low aeronautical fees. Sometimes this symbiosis is so strong that the pullout of carriers from an airport may result in serious problems for local authorities.

#### a. Traffic increase at European regional airports

Passenger traffic in Europe and in the world is on the increase, and the greatest increase is realized precisely by low-cost carriers. Therefore, the traffic increase is likely to be the greatest at the regional airports. According to the statistics of ACI - Airport Council International in 2004, the highest increase of passenger traffic was experienced by airports from the so-called Group 4. These are the airports with annual turnover of less than 5 million passengers. Only in the first five months they had a traffic increase of 14.1% compared to the same period last year. Whereas the airports from Group 1 (traffic greater than 25 million passengers), Group 2 (traffic between 10 and 25 million passengers), group 3 (traffic between 5 and 10 million) in the first five months had a traffic increase of 8.7%, 9.2% and 10.7%, respectively, compared to the year before (Table 1). Strong increase in traffic continued also in 2005, when the airports from Group 4 showed traffic increase of 13.3% compared to 2004.

**Table 1 - Increase in the number of passengers at airports in the first 5 months of 2004 compared to the same period in 2003 [2]**

| Group 1<br>(>25 mil.<br>PAX) | Group 2<br>(10-25 mil.<br>PAX) | Group 3<br>(5-10 mil.<br>PAX) | Group 4<br>(<5 mil.<br>PAX) |
|------------------------------|--------------------------------|-------------------------------|-----------------------------|
| 8.7%                         | 9.2%                           | 10.7%                         | 14.1%                       |

The increase in traffic at regional airports is presented in Table 2. It is interesting to note that the only airport that marked a decrease in passenger traffic in 2005 was Charleroi in Brussels. The reasons lie in the cancellation of the line for London as well as the reduction in the frequency of "Ryanair" flights to some destinations. Also, a large number of foggy days and industrial actions resulted in the loss of a certain part of traffic. In 2006, however, an increase in traffic is forecast in the volume of 21% per 2.26 million passen-

gers [3]. Other mentioned airports marked a significant increase in traffic.

The greatest increase at the regional airports was marked by the Milan Orio al Serio, better known as Milan Bergamo, with 4.3 million passengers which is 30.5% more than in 2004 [4].

**Table 2 - Increase in the number of passengers at regional airports**

|                    | Number of<br>PAX 2003<br>(in mil.) | Number of<br>PAX 2004<br>(in mil.) | Number of<br>PAX 2005<br>(in mil.) |
|--------------------|------------------------------------|------------------------------------|------------------------------------|
| Brussels-Charleroi | 1.8                                | 2.03                               | 1.87                               |
| Milan-Bergamo      | 2.84                               | 3.33                               | 4.35                               |
| Frankfurt Hahn     | 2.43                               | 2.76                               | 3.1                                |
| Stuttgart          | 7.59                               | 8.8                                | 9.41                               |
| Southampton        | 1.22                               | 1.53                               | 1.8                                |
| Cologne-Bonn       | 7.83                               | 8.41                               | /                                  |
| Vienna *           | 12.78                              | 14.78                              | 15.85                              |

\* Hub with great share of LCC (12.4%) [5]

This increase of traffic at the regional airports has occurred thanks first of all to the low-cost carriers, but partly also to the recovery of the regional carriers. The low-cost carriers continuously increase the number of destinations to which they fly, in order to make their development and expansion sustainable. The traffic increase, however, is also a consequence of general increase in the aircraft occupancy on the flights of observed carriers.

Some major airports can also thank the low-cost carriers for the traffic increase, e. g. Vienna, where low-cost carriers generated 1.97 million or 12.5% out of 15.85 million in 2005. In the same year, the traffic share was increased by 19.7% compared to the previous year [5].

#### b. Development of infrastructure at the European regional airports

The traffic increase at regional, i. e. secondary airports set new requirements for the development of the existing infrastructure at those airports, and especially the capacity of the passenger terminal, apron and the access roads and parking lots. And, as already mentioned, the greatest contribution to this traffic increase were the low-cost carriers, and therefore these airports had to adapt to their new role and new type of passengers.

A good example is Southampton, which is one of the fastest growing airports in Europe. The BAA company which owns this airport, invested over the last ten years £50 million for infrastructure modernization. Further £6 million in the previous year were invested in the expansion of departure lounges and improvement of the boarding system and passenger baggage

handling. Liverpool Airport, in 2005, had the greatest traffic in its history, 4.5 million passengers, which justified the investment of more than £80 million. The new passenger terminal worth £70 million was opened in 2002 and planned for the traffic of 3 million passengers yearly. The additional £20 million are invested in the expansion of aprons, parking lots, as well as the expansion of the passenger terminal in order to satisfy the increasing demand [6].

Frankfurt Hahn is one of the many airports in Germany with regional character. The annual passenger traffic of 3.1 million passengers in 2005 and the increase of 12% compared to 2004 represent good justification for the planned investment of EUR 185 million in the next five years. [7].

Airport Brussels Charleroi signed a ten-year agreement with the "Ryanair" carrier, that promises through its leading position in Europe continuously high levels of traffic, justifying thus the investment into a new terminal which will start with operations in the summer 2007.

It is interesting that in the first half of 2005 the share of low-cost carriers at major hubs fell to 10% from 12% in the previous year (Figure 1) [8]. There is obviously a trend of increasing orienteering of the low-cost carriers to secondary airports. Therefore, big airports are trying to attract low-cost carriers by building terminals adequate for their simpler service. An example is the Amsterdam Schiphol which was one among the first in Europe to build a terminal intended for low-cost carriers. The terminal is very simply equipped and provides low level of service, but this is precisely what the carriers and their passengers expect.

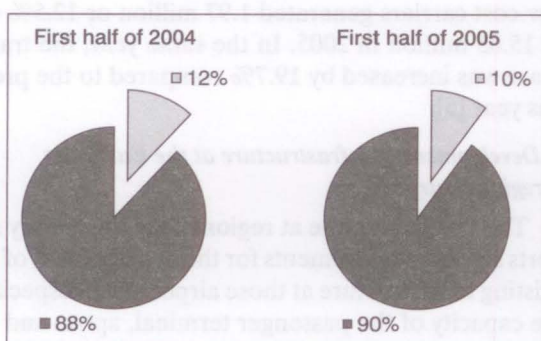


Figure 1 - Decrease in the share of traffic of low-cost carriers at hubs [8]

#### 4. CROATIAN AIRPORTS AND LOW-COST CARRIERS

The first arrivals of low-cost carriers to Croatia were related to the carriage of tourists, as a traffic demand category which occurs during the summer months. Therefore, the scheduled flights were related

to the tourist season, for the two biggest coastal airports, Dubrovnik and Split. The significant tourist offer of these two cities, i. e. regions and the relatively high occupancy of the aircraft allowed these airports to achieve relatively favourable commercial conditions for the accommodation of low-cost carriers. The amount ranged usually above EUR 20 per passenger. The next phase of the arrival of low-cost carriers is related to the all-year-round flight operations to those destinations that allow the carriers relatively acceptable occupancy and that was concretely the arrival of the carrier "Gernmanwings" to Zagreb and later the carrier "Hapag Loyd Express" to Rijeka. The arrival of the latter was conditioned by a far lower price of the airport fee per passenger since the market did not promise high occupancy. In practice, the Primorje-Gorski Kotar County as well as the neighbouring counties proved to be good generators of traffic demand so that in 2005 the annual number of passengers increased by 115% compared to the previous year, i. e. 122 thousand passengers. This rendered Rijeka Airport the first airport in Croatia that, following the independence of Croatia, managed to exceed the pre-war traffic volume. Led by the good results, Rijeka Airport signed a contract for this year with the carrier "EasyJet" for four flights a week to London on a full-year schedule, thus, and also with the increased number of flights operated by the carrier "Hapag Loyd Express" about 200,000 passengers in 2006 are expected. The example of Rijeka Airport shows that the airports as well can compete by commercial conditions among each other and that they can substantially expand their catchment area offering low fares. Thus, the destinations covered by "Hapag Loyd Express" from Rijeka Airport, the catchment area has been expanded to Zagreb, Zadar and Pula, which means that it covers around 2.5 million Croatian inhabitants. Croatia belongs to the countries with an average growth of traffic share (increase between 1 and 5%) in the entire European traffic of low-cost carriers (Table 3). It may be seen that the absolute growth of the total traffic, including overflights, amounts to 3.5%, and of traffic with the destination or origin in Croatia – 3.1%. Therefore, it may be concluded that great majority of the newly generated traffic has its destination or origin in Croatia [8].

Table 3 - Increase in the share of traffic of low-cost carriers in Croatia in the entire European traffic [8]

|                                     | First half of 2004 | First half of 2005 | Difference |
|-------------------------------------|--------------------|--------------------|------------|
| All flights (including overflights) | 3.5%               | 7.0%               | 3.5%       |
| All flights (excluding overflights) | 1.8%               | 4.8%               | 3.1%       |

Out of the seven airports of Croatia, three belong to the major ones, Zagreb, Dubrovnik and Split, and the remaining four are minor airports and can be characterized for the Croatian circumstances as secondary ones. These are Pula, Rijeka, Zadar and Osijek. Due to their location and role in the traffic system of Croatia, the three big airports in Croatia are sufficiently attractive to the carriers that they can retain higher aircraft, passenger and baggage handling prices. The minor or secondary airports are forced to attract new carriers, first of all low-cost carriers, by reduction of prices. The most successful for the moment is Rijeka Airport. It is interesting to emphasise that Osijek Airport has a large catchment area including also the border areas of the neighbouring countries. However, it has not activated its potentials until now. The possible reason is the difficult economic situation in this part of Croatia.

## 5. FUTURE TENDENCIES IN EUROPE AND CROATIA

The traffic forecasts show a general tendency of passenger air traffic increase. According to the European Airbus, an average annual growth of 5.3% is expected in the next 20 years, whereas US Boeing predicts an annual growth of 4.8% (Figure 2) [9], [10]. The traffic share of low-cost carriers in the last ten years has been continuously growing, and further growth is to be expected regarding the total carried passengers. The low-cost carriers have generated new traffic demand in those categories of population who earlier could not afford the services of network carriers. Also, the more attractive airports will be those that have lower traffic volume and no congested capacities. Therefore, in the future as well we can expect that the traffic at secondary airports will grow, especially in Europe where there are over 400 international airports or about a third of international airports in the world. The highest traffic growth, however, is expected at the secondary airports that have

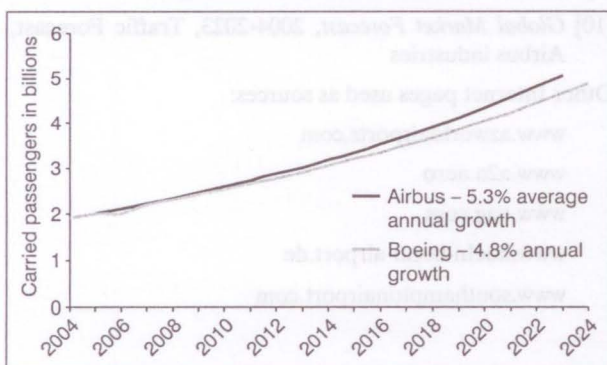


Figure 2 - Forecasts of scheduled passenger traffic in the world 2004 – 2024 [9], [10]

large catchment areas, i. e. are located relatively close to big cities, and serve also as alternatives to major airports. Thus e. g. Airports Hahn in Frankfurt, Charleroi in Brussels, Bergamo in Milan etc. These airports have adjusted their future infrastructure development to the needs of low-cost carriers which puts efficiency and cost-efficiency in the foreground.

Part of traffic at big airports is also performed by low-cost carriers. They achieve great discounts at these airports as well, regardless of the fact that the service they get does not differ much from the service obtained by network carriers. Understandably, the network carriers are not happy about this. In the long run, such a model will not be able to survive without terminals for low-cost carriers, because they get a service they are not actually interested in, and the network carriers pay for the same service a much higher price. Therefore, great challenge in the future will be to reconcile the requirements of the scheduled and low-cost carriers at the same airport. A likely solution is in the construction of separate passenger terminals for the low-cost carriers which is already a practice today at some airports. This is also the situation at Zagreb Airport where the German "Germanwings" pays probably a lower price, and the level of service is almost the same as for other carriers.

With the soon integration of Croatia into the ECAA (European Civil Aviation Area) the carriers from the member countries will be able to fly without any limits to all the Croatian airports. Therefore, a greater traffic increase may be expected at the Croatian airports in 2006, as well as in the future. The arrival of low-cost carriers will stimulate further construction of passenger terminals. Thus e. g. in case of Zagreb Airport development the new passenger terminal will be built for scheduled carriers, and the existing one would be used for low-cost carriers. There are indications for the construction of terminals for low-cost carriers at Dubrovnik Airport, whereas Rijeka Airport is planning reconstruction of the existing passenger terminal in order to be able to accommodate a significantly increased traffic.

## 6. CONCLUSION

The low-cost carriers base their operation on the rationalization and optimization of the technological process in all the segments. One of the essential segments of their operation lies also in the selection of the secondary, i. e. regional airports. These airports bring a number of advantages, such as lower tariffs, no delays and the possible development in accordance with the traffic needs. Due to the attractiveness of these airports they have marked the greatest increase in traffic in the last several years. This great increase in traffic has burdened the existing infrastructure and

conditioned large investments into the development of capacities of the passenger building, aprons and the access roads and parking lots.

The low-cost carriers usually require lower airport fees which is mainly accepted by minor airports or big airports specialized for this type of transport. Although the threshold of the productivity of airports with low-cost carriers is much higher and, depending on the airport fees, amounts to from a million to two million passengers, one may find also minor airports with lower traffic that find their interest in accepting the low-cost carriers.

Even the big airports, when they have enough capacities on the airside, accept under more favourable conditions the low-cost carriers. It is logical that there is resistance from the network carriers who pay much more for the approximately same services. These big airports have to insure co-living of the low-cost carriers and the network carriers, offering them the service at the level of the price they are paying. One of the solutions is the construction of specialized passenger terminals or relocation of the already existing ones with simpler handling, without air-bridges, and lower standards in the lounges.

The number of low-cost carriers in Croatia will grow in the future, resulting in the traffic increase at airports as well. For the moment, only Rijeka Airport out of the secondary airports in Croatia has managed to attract the low-cost carriers, primarily by offering low airport service charges. The increase in traffic of 115% in the past year as well as the expected increase in 2006 are the indicators that show that the Rijeka Airport strategy is likely to be the right one. Rijeka Airport is also the only one in Croatia whose planned investments into the infrastructure are directly related to the traffic of low-cost carriers.

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## SAŽETAK

### UTJECAJ NISKO-TARIFNIH PRIJEVOZNIKA NA RAZVOJ INFRASTRUKTURE ZRAČNIH LUKA

Europski nisko-tarifni prijevoznici u Europi iz godine u godinu uzimaju sve veći udio putničkog prometa. Među broj-

nim prednostima njihovog poslovnog modela, veliku ulogu imaju sekundarne zračne luke koje ti prijevoznici koriste. Te luke su obično regionalnog karaktera, s relativno malim prometom. Dolaskom nisko-tarifnih prijevoznika na takve zračne luke putnički promet naglo raste što je znatno opterećenje za infrastrukturu zračne luke. Upravo zbog pojave velikih opterećenja na tim, do jučer pod-kapacitiranim zračnim lukama, sada dolazi do potrebe za donošenjem novih planova razvoja, te nadogradnje površina i objekata na zračnoj luci, prvenstveno stajanki i terminalnih objekata. Na hrvatske zračne luke slijede nekolicina nisko tarifnih prijevoznika, a skorašnjom liberalizacijom regulative, za pretpostaviti je da će njihov broj znatno porasti. U radu su prikazana povećanja prometa na europskim i hrvatskim zračnim lukama, generirana operacijama nisko-tarifnih prijevoznika, te njihov utjecaj na razvoj infrastrukture tih zračnih luka.

## KLJUČNE RIJEČI

zračni promet, zračne luke, nisko-tarifni prijevoznici, razvoj infrastrukture, planiranje

## LITERATURE

- [1] *Low cost carriers, secondary airports and State aid: an economic assessment of the Charleroi affair* Research - n°159, Cristina Barbot, October 2004.
- [2] "Small is beautiful", Cathy Buyck, ATW, September 2004
- [3] Brussels South Charleroi Airport, *Press release*, 01/2006, www.charleroi-airport.com
- [4] Milan Orio Airport, *Traffic statistics*, www.orioaeroporto.it
- [5] Vienna Airport, *Annual Results*, 2005, www.viennaairport.com
- [6] Low-cost the effect on Airports, *Airports of the world*, Jan-Feb 2006, Issue 3
- [7] Frankfurt Hahn airport, *Press Release* 01-06, 2005: The Year of the "Hahn"
- [8] *Low-Cost Carrier Market Update*, September 2005, EUROCONTROL
- [9] *Current Market Outlook* 2005., Boeing
- [10] *Global Market Forecast, 2004-2023*, Traffic Forecast, Airbus industries

Other Internet pages used as sources:

www.azworldairports.com

www.a2a.aero

www.oag.com

www.koeln-bonn-airport.de

www.southamptonairport.com