



Aspects influencing arrival behavioural pattern of air travellers

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ABSTRACT

This paper focuses on analysis of arrival behavioural pattern of air travellers and provides operational data gathered through three independent data collection campaigns at three different airports.

This paper aims at comprehensive analysis of the arrival processes at the following airports: Bratislava Airport in the Slovak Republic (LZIB), Brno-Turany Airport in the Czech Republic (LKTB) and Hamburg Airport (EDDH) in Germany. This paper also provides a description the airports in terms of annual passenger throughput, number of movements and further airside and landside characteristics.

KEYWORDS: air transport, airport, passenger, flight

1. Introduction

On time performance of European air transport Europe shows weak results these days. Compared to the ACARE¹ goal of 99% punctuality within 15 minutes² the average actual value in Europe is only around 78%.

Recent studies from Eurocontrol Performance Review Commission (e.g. Punctuality of Airports Study and Performance Review Report) reveal that main contribution to insufficient punctuality results from a variance of the time an aircraft leaves its stand for departure ("off-block time"). This leads to poor predictability within the flight planning. In order to maintain a basic stability, airlines introduce costly time buffers within their schedules and/or reserve extra aircraft. Reducing only 5 minutes of buffer in 50% of the flight-plans in Europe would save a magnitude of one billion Euro per year³. Punctuality is therefore primarily achieved by the predictability and duration of the turnaround process at the airport. The introduction of tightened security measures after 9/11 terrorist attacks and subsequent terrorist activities added an

additional burden to this predictability and reduced passenger comfort at airports in addition.

Considering recent development, some ideas already are being developed (e.g. Total Airport Management, developed by EUROCONTROL and DLR or Collaborative Decision Making) to foster time efficiency in airport operations but so far most solutions are only focussing on one specific aspect or area of airport procedures.

2. Bratislava Airport (LZIB) operational data

2.1. LZIB Characteristics

Bratislava Airport is the main and busiest airport in Slovakia. It is situated in the southwest edge of the country, 9 km from the Bratislava city centre. Thanks to its geographical position it has favourable meteorological conditions throughout the year. The airport is used by both passenger and cargo air carriers for operating scheduled and non-scheduled flights to international and domestic destinations. The Bratislava airport has dominance in the market of Slovak international airports and its market share

¹ ACARE - Advisory Council for Aeronautics Research in Europe

² see Strategic Research Agenda-2 / Vision 2020, ACARE

³ see Performance Review Report 2005, EUROCONTROL Performance Review Commission

in terms of aircraft movements as well as in terms of passenger throughput significantly exceeds the market share of other Slovak airports but has to face to strong competition from the Vienna airport on the traditional airlines scheduled flights.

2.1.1. Airport ground access/egress

Bratislava airport is easily accessible by road thanks to its immediate vicinity to the motorway that connects Bratislava with the northern parts of Slovakia. On the other hand, public airport access/egress services are provided only by means of city transport bus that directly connects Bratislava airport with the Bratislava Main Train station located close to the city centre. The bus trip from Bratislava Main Train station to the airport takes 21 minutes and the service frequency is 15 minutes. The accessibility of airport from other parts of Bratislava by means of public transport modes is poor. For example, there is no direct public transport connection between Bratislava Main Coach station and the airport. The low quality of public airport access/egress services is reflected by the fact that as much as 73% of passengers use car or taxi to access the Bratislava airport.

The plans for future development of Bratislava airport include the integration of the airport into city tram and railway network, which will lead to improvement of the airport accessibility by public transport.

2.1.2. Activity and traffic mix

The Bratislava airport has been during last 6 years experiencing huge growth in operations. The reason is just like at many the other airports in Central Europe: boom of the low-cost carriers which expand new routes and attract large segments of the population. However, in recent months, as a result of current economic crises, two of key airlines operating their flights from Bratislava went to bankrupt (i.e. SkyEurope and Seagle Air). This fact will probably lead to slowdown of Bratislava airport development and it can be even expected that there will be a slight decline in traffic volumes in a few following months/years. On the other hand, it is expected that one of the leading European low-cost carriers (i.e. Ryanair or Wizz Air) will overtake SkyEurope's and Seagle Air's market share which will likely lead to the recovery of the air transport market in Slovakia.

The following figure and tables (see Figure 1 and Table 1) depict the overall passenger throughput and total aircraft movements at Bratislava airport in the past.

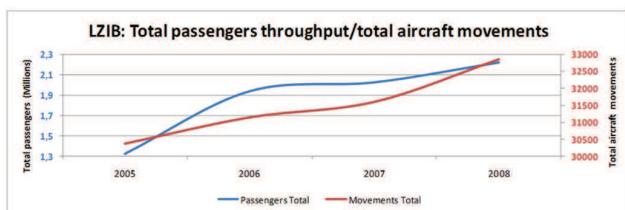


Fig. 1. LZIB: Total passenger throughput/total aircraft movements

As a complement to the above mentioned data, the following tables clearly demonstrate enormous traffic growth at Bratislava airport in the past.

Table 1. LZIB: Passenger throughput in 2001 – 2008 (Source: Bratislava airport)

Year	Passengers Scheduled	Passengers Non-Scheduled	Passengers Total	Transit Passengers
2001	134,842	153,580	293,326	15,549
2002	159,441	204,039	368,203	3,428
2003	250,460	223,931	480,011	13,906
2004	560,138	330,140	893,614	42,722
2005	971,245	349,663	1,326,493	51,386
2006	1,603,526	328,921	1,937,642	28,674
2007	1,611,211	393,330	2,024,142	42,241
2008	1,753,752	464,793	2,218,545	26,489

The structure of offered destinations and contribution of particular destinations to the overall passenger throughput influence the passenger typology and consequently the passenger behavioural pattern. The following chart (see Figure 2) depicts the basic passenger structure at Bratislava airport considering the passengers' origin and the trip purpose.

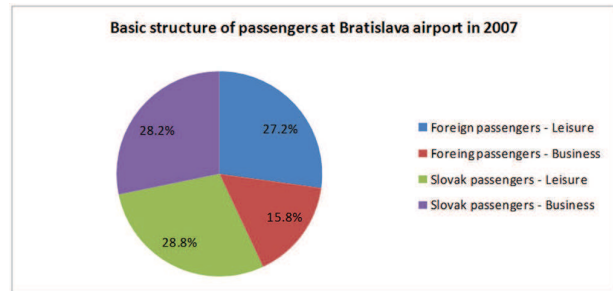


Fig. 2. Basic structure of passengers at LZIB in 2007

2.1.3. Analysis of Arrival Processes at Bratislava Airport

The analysis of arrival behaviour of passengers at Bratislava airport has been performed based on passenger survey data that were collected during summer months of 2003, 2004 and 2007.

Bearing in mind that business passengers⁴ are more experienced and they fly more frequently than holiday and other leisure travellers, it is possible to see differences in behaviour of both groups of passengers in terms their arrivals to the airport before the flight. While average arrival time of a business passenger is 116 minutes (115.59 minutes) before STD (Scheduled Time of Departure) (BTS Airport case, see Figure 3), leisure traveller arrives to the airport more than two hours before the flight (average arrival time of leisure traveller before STD from Airport Bratislava is 121.32 minutes, Figure 4).

⁴ passengers flying for business purposes

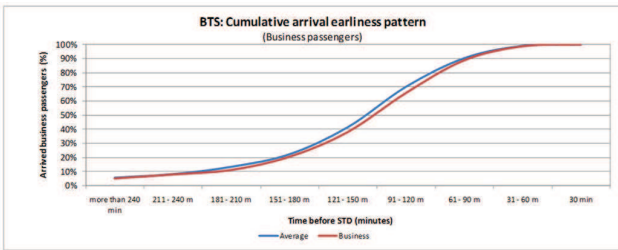


Fig. 3. BTS: Cumulative arrival earliness pattern (business passengers)

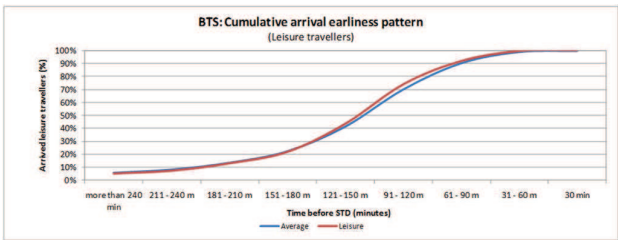


Fig. 4. BTS: Cumulative arrival earliness pattern (leisure travellers)

There is also slight difference to be observed in the behaviour of Slovak citizens and foreigners flying from Bratislava airport. From our point of view, this has something to do with the fact that Slovak travellers are using the “home base” airport while foreigners are generally less experienced in using public transportation system to reach the airport. That is why they plan their journeys with bigger “time buffer” to be able to accommodate some uncertainties and irregularities. This example is to be observed on the following charts (see Figure 5 and Figure 6). Slovak travellers come to Bratislava Airport 113.79 minutes (in average) before STD and foreigners’ average arrival time before STD from Airport Bratislava is 126.03 minutes.

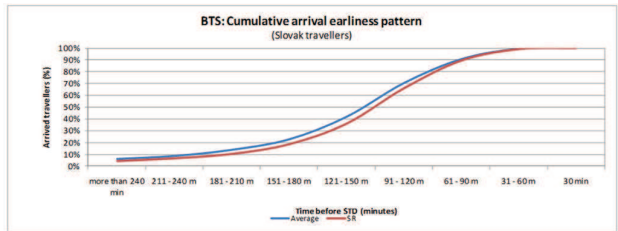


Fig. 5. BTS: Cumulative arrival earliness pattern (Slovak travellers)

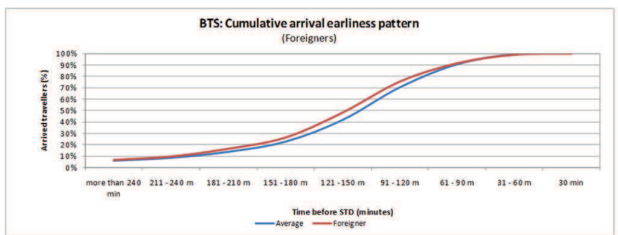


Fig. 6. BTS: Cumulative arrival earliness pattern (foreigners)

As can be seen in figures below (see Figure 7, Figure 8, Figure 9), arrival behaviour of passengers fluctuates during the day. Passengers departing in the morning (i.e. before 11:00) tend to have shorter time buffers as everybody likes to sleep longer in the morning while passengers departing in the afternoon or in the evening usually come to the airport more in advance. Longer time buffers in the evening probably results from the fact that business passengers go to the airport immediately after the meeting regardless the departure time. In the case of Bratislava airport, average arrival time in the morning is 105.63 minutes before STD (Scheduled Time of Departure), average arrival time during day (i.e. 11:00 – 16:00) is 126.42 minutes before STD and average arrival time in the evening (i.e. after 16:00) is 127.05 minutes. This arrival earliness fluctuations throughout the day are also reflected in arrival earliness distributions published in IATA’s Airport Development Reference Manual. However, compared to IATA’s figures, average dwell times in terminal at Bratislava airport are significantly longer.

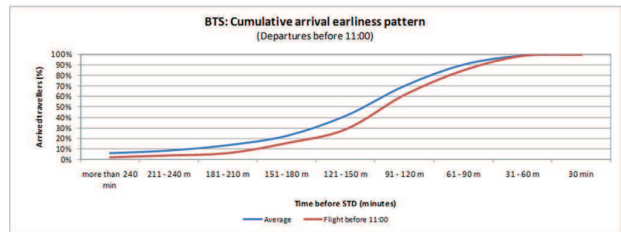


Fig. 7. BTS: Cumulative arrival earliness pattern (departures before 11:00)

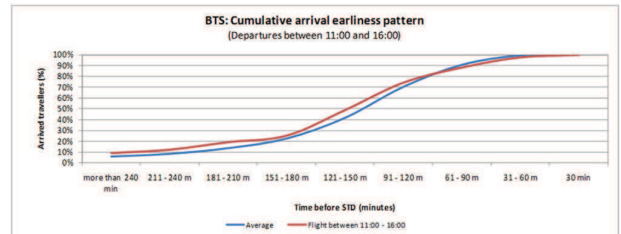


Fig. 8. BTS: Cumulative arrival earliness pattern (departures between 11:00 and 16:00)

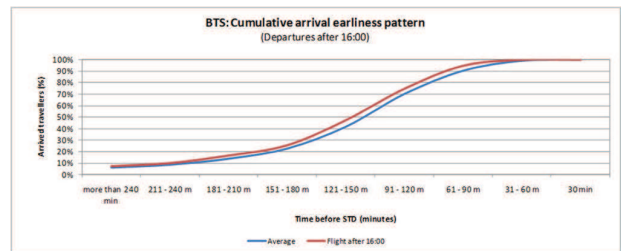


Fig. 9. BTS: Cumulative arrival earliness pattern (departures after 16:00)

3. Brno-Turany Airport (LKTB) operational data

3.1. LKTB characteristics

Although with the statute of international airport, LKTB is a typical regional European airport as far as traffic is concerned. The non-scheduled (or charter) flights represent a vast majority of movements, followed by general aviation (GA) movements; regular, or scheduled, flights add up to only a small percentage of all flights (movements) at the airport. However, this situation might change in near future due to establishment of new routes by low-cost carriers. The development of traffic is described further in this paper.

3.1.1. Activity, traffic mix and future projections

Recently, the airport has been experiencing huge growth in operations. The reason, just like in other countries of Central Europe, is a boom of low-cost carriers that introduce new routes and attract a large portion of the population. The recent development in operational parameters at Brno-Turany airport is described in the following figure and table (see Figure 10 and TABLE II).

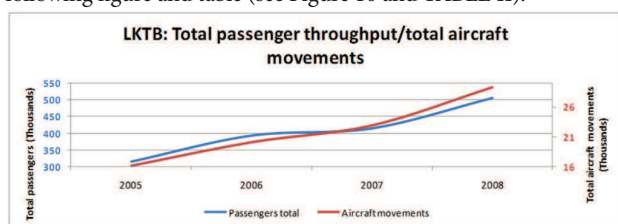


Fig 10. LKTB: Total passenger throughput/total aircraft movements

Table 2. Passenger and aircraft movement figures [Source: Brno-Turany airport website]

Year	Passengers total	Passengers scheduled	Aircraft movements
1995	101,679	5,412	8,070
1996	124,163	6,298	8,332
1997	138,276	4,976	9,343
1998	110,948	4,748	8,246
1999	127,954	0	7,899
2000	112,950	4,816	7,406
2001	128,583	4,500	8,052
2002	156,519	4,600	13,506
2003	166,142	1,400	16,596
2004	171,888	0	17,823
2005	315,672	90,246	16,126
2006	393,686	151,864	20,081
2007	415,276	unknown	22,893
2008	506,174	unknown	29,303

As can be seen in TABLE II, the non-scheduled flights still add up to more than 60 % of total traffic at Brno-Turany airport. Therefore, it is very difficult to predict future traffic at this airport. Considering the STATFOR's optimistic scenario for the air traffic growth in Central Europe for the years 2005 – 2025, the peak hour traffic at LKTB will reach declared hourly capacity of the terminal in the second half of the next decade. However, these are very rough estimations as a new low-cost carrier entering the market or established operators opening new route could cause the traffic boom similar to the one when Ryanair came to Brno-Turany airport in 2005.

3.1.2 Analysis of Arrival Processes at Brno-Turany Airport

The arrival behaviour of passengers at Brno-Turany airport has been performed using data that were originally collected for the purposes of comprehensive airport landside capacity enhancement study [5]. Data were collected during spring 2007.

Based on the available data, we were able to analyse arrival behaviour of passengers flying with charter and scheduled airlines. Scheduled airlines includes both low-cost and traditional airline. As can be seen from , holiday makers (i.e. passengers of charter airlines) tend to arrive significantly earlier than passengers of traditional and low-cost carriers. In the case of Brno-Turany airport, the passengers of charter airlines arrive as much as 31% earlier compared to passengers of scheduled airlines. Average arrival time of passengers flying with charter airlines is 144.63 minutes before STD (Scheduled Time of Departure), while average arrival time of passengers using the services of scheduled airlines is only 110.40 minutes before STD. This trend results from several factors:

- Higher potential financial loss of charter flight passengers in the case of missing flight (risk of spoiled holidays);
- Charter flights usually have higher share of inexperienced passengers;
- Holiday makers usually carry more check-in baggage;
- Holiday makers usually travel in bigger groups (e.g. families, couples, friends), which make travelling to/from the airport more complicated;
- Charter flight passengers have to visit travel agent counter before proceeding to check-in.

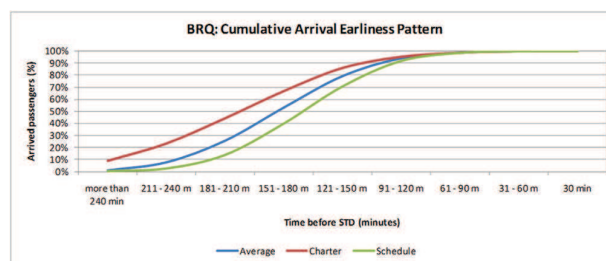


Fig. 11. BRQ: Cumulative arrival earliness pattern

4. Hamburg Airport (EDDH)

4.1. EDDH Characteristics

Hamburg airport is the fifth busiest airport (out of 16 commercially operated airports) in Germany. In 2008, Hamburg airport served 12,840,000 passengers and 173,500 aircraft movements [8].

4.1.1. Analysis of Arrival Processes at Hamburg Airport

The arrival behaviour of passengers at Hamburg airport has been analysed based on data provided by DLR for the purposes of the ASSET project.

The arrival behaviour of passengers at Hamburg airport has been analysed from several points of view:

- Access transport mode (taxi, bus, car)
- Booking class (business and economy)
- Time of aircraft departure (early morning, day, evening)

As can be seen from the charts hereinafter (see Figure 12. Figure 13. Figure 14. Figure 15. Figure 16. Figure 17. Figure 18. and Figure 19), the differences in arrival behaviour of particular group of passengers at Hamburg airport are statistically insignificant.

The analysis of arrival earliness distribution of passengers according to transport mode showed that passengers using taxi arrive at the airport on average 90.76 minutes before STD (Scheduled Time of Departure). Passengers travelling by bus arrive at the airport by 2 % earlier compared to those travelling by taxi. Passenger travelling by car arrive at the airport by 2.4 % earlier (in the case of short-term parking) or by 2.9% earlier (in the case of long-term parking) in comparison with those travelling by taxi (see Figure 12. Figure 13. Figure 14. and Figure 15.).

According to available data, business class passengers arrive at the airport slightly earlier compared to economy class passengers. But the average difference between these two groups of passengers is less than 1 % (Figure 16. and Figure 17.).

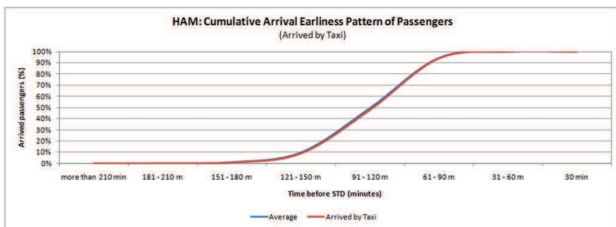


Fig. 12. HAM: Cumulative arrival earliness pattern of passengers (Arrived by taxi)

The fluctuations in arrival behaviour of passengers at Hamburg airport are also insignificant. Passengers departing in the early morning (i.e. 06:00 – 10:00) tend to arrive at the airport on average 91.26 minutes before STD. During day (i.e. 10:00 – 18:00), passengers arrive at the airport on average 94.06 minutes before STD and in

the evening (i.e. 18:00 – 24:00) 90.36 minutes before STD. The fluctuations of arrival behaviour of passengers at Hamburg airport does not fully correspond with the fluctuations published in IATA's Airport Reference Development Manual.

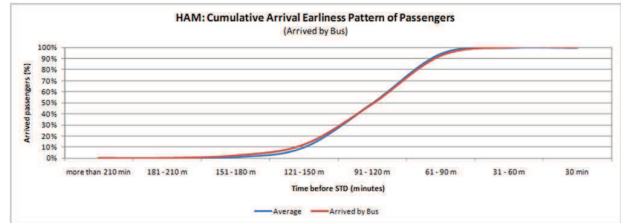


Fig. 13. HAM: Cumulative arrival earliness pattern of passengers (arrived by bus)

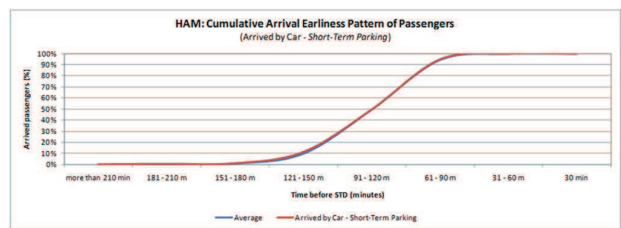


Fig. 14. HAM: Cumulative arrival earliness pattern of passengers (arrived by car – short-term parking)

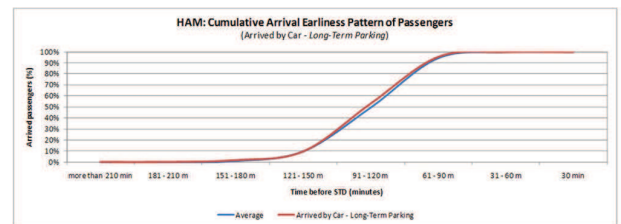


Fig. 15. HAM: Cumulative arrival earliness pattern of passengers (arrived by car – long-term parking)

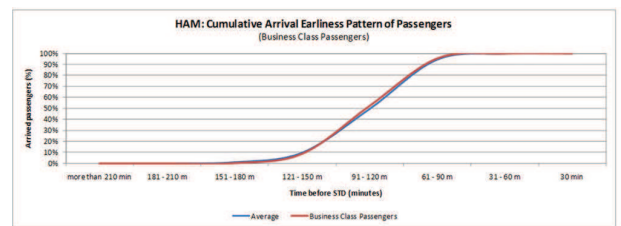


Fig. 16. HAM: Cumulative arrival earliness pattern (business class passengers)

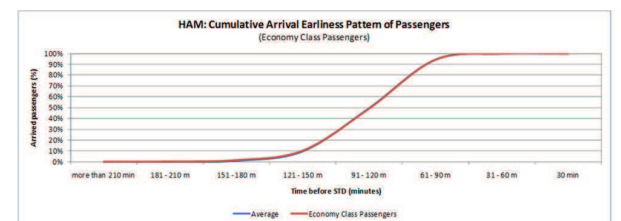


Fig. 17. HAM: Cumulative arrival earliness pattern (economy class passengers)

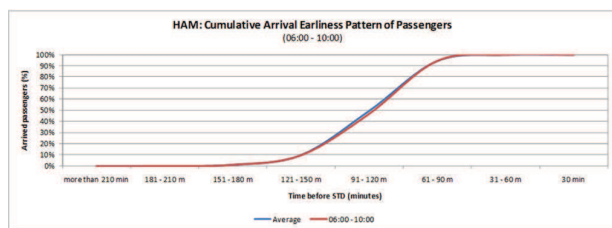


Fig. 18. HAM: Cumulative arrival earliness pattern (departures between 6:00 and 10:00)

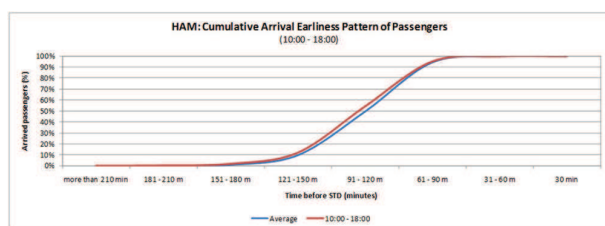


Fig. 19. HAM: Cumulative arrival earliness pattern (departures between 10:00 and 18:00)

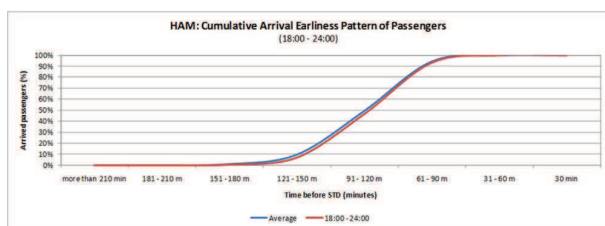


Fig. 20. HAM: Cumulative arrival earliness pattern (departures between 18:00 and 24:00)

5. Conclusion

In conclusion, it can be said that arrival behavioural pattern of each airport is influenced by number of factors, e.g. traffic mix, integration of airport to regional/national/international ground transport network, check-in and security search requirements, airline procedures etc. For this reason, every airport has specific arrival behavioural pattern. In order to understand arrival related processes at particular airport, it is necessary to perform data collection directly at concrete airport.

Based on analysis of arrival earliness pattern at three European airports, we can define the following trends in arrival behaviour of passengers that can be considered as universal (i.e. can be observed at majority of airports):

- Leisure passengers arrives earlier than business passengers;
- Charter flights passengers arrives earlier than passengers of scheduled flights;
- Inexperienced travellers tend to arrive at the airport earlier compared to experienced passengers;
- Foreigners tend to arrive at the airport earlier compared to domestic travellers;

- Passengers travelling in the morning usually have shorter time buffer compared to passengers travelling in the afternoon and in the evening.

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