

CONCEPTS OF AIRPORT TERMINAL BUILDING LAYOUTS OF THE EUROPEAN UNION AIRPORTS

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The article focuses on the characteristics of airport terminal buildings in the European Union, as well as on the reasons of their layout and concepts. It is an analysis of particular airports and movement of passengers within the airport terminal building. This work also contains a draft of a multifunctional airport terminal.

K e y w o r d s: airport terminal building, Schengen, Non-Schengen, capacity requirements, passengers, safety

1 INTRODUCTION

One of the most evolving means of transportation is the air travel. Therefore efficient solutions of airport terminals are of higher importance when handling the passenger flows. The type of operations conducted influences the conception and layout of the buildings. To manage the capacity of passenger terminals by an optimal solution is the most important part of this issue. It depends on many factors that affect it directly.

2 DEVELOPMENTS OF AIRPORTS AND AIR TERMINAL BUILDINGS

In the past a mere grassy meadow could serve as an airport. Airports' parameters were selected according to the performance diagrams and geometric characteristics of ground equipment accessible at that time. But as the air travel technology quickly evolved, the parameters of airports had to be adjusted to the newest trends and requirements. Airplanes became more sophisticated, with higher expectations on ground equipment. Ever since then they have been innovated, optimized, made more effective though modern technologies. And airports had to follow this trend and adjust accordingly.

2.1 The history and development of aviation infrastructure

After the World War II roads were devastated and that was the beginning of airport innovations. The war caused a rapid growth of air travel, so as dynamic changes of requirements toward the airports.

Further changes occurred when jet airliners entered the market. Fear of terrorist attacks, acts of unlawful interference and airport privatization contributed to a different perception of airports.

Reconstruction of airport terminals at considerable financial costs was needed after the formation of a common European market and its new requirements.

2.2 Present time

In the present the development of air travel is staggering and leads to a crowded airspace as well as ground. Raising demand on airport efficiency leads to construction and reconstruction of airports accompanied by extensive constructional and financial preparations.

2.3 Airport complex

An airport consists of two areas, the airside and the landside. Safety of transfer within the airport area has to be ensured on the basis of strictly given rules. All airports are required to follow regulations of binding force.

2.4 Airport Terminal Building

Airport terminal is the place of first contact between passenger and airport. Within the terminal passengers purchase tickets, transfer and check-in their luggage, and wait for departure. The main aim of designers is to maintain the functionality of airport terminal by its suitable layout. Check-in is usually passenger's first goal after entering the terminal building.

There are many requirements on airport terminal building. However, the following affect the terminal construction primarily:

- number of passengers;
- type of airport operation (end, start lounges if a passenger has to be transferred from one plane to another);
- passengers' composition (needs, wishes and conditions for scheduled and charter flights).

The terminal ensures a quick check-in process and the fastest possible transfer of passengers from the ground facilities to into the airplanes. The crowd of travelers can be separated according to their destination by physical barriers or multiple levels as follows:

- horizontally;
- vertically (one and a half tier system, two-tier system and three-tier system).

There are three types of airport terminal buildings:

- one central air terminal;
- more decentralized air terminals;
- linear air terminal type.

Designing of an air terminal can be realized:

- statically;
- dynamically.

3 LEGISLATIVE REQUIREMENTS

There has been a rapid development of air transport at the end of 1990's. The Schengen Agreement measures as well as the European Union requirements contributed to this development.

3.1 The Schengen Agreement

The Schengen Agreement is a treaty signed between the states of Benelux Economic Union, Federal Republic of Germany and the French Republic. The Schengen Area was created which operates like a single state with unhindered movement of travelers and freight though internal borders and strict area's outer borders control.

Schengen Borders Code represents one of the Unions' aims to create an area where free movement of persons crossing internal borders will be ensured. Considering people and goods movement internal borders practically do not exist. This allows free movement of persons, regardless their nationality.

In terms of air transport the task was to deal with people arriving from the Schengen countries separately from people who are not.

The main purpose of border checks is to verify whether every person crossing the border fulfills the conditions for their entry into the area.

The border guards have to ensure effective border control. To do so they gather all necessary information about flight schedules and passenger rush to deploy sufficient number of staff. The priority of incoming passengers has to be kept in mind.

Schengen requirements applicable on airports include:

- separation of passengers;
- passport control;
- asylum offices;
- boarding bridges.

Slovakia signed the agreement on the 1st May 2004 and on the 21st December 2007 became a member of free-border-crossing system.

3.2 The European Union Requirements

Each European Union airport is obliged to meet certain criteria and requirements. In Slovakia these rules are determined by the Commission Regulation (EU) No 185/2010 of 4 March 2010 laying down detailed measures for the implementation of the common basic standards on aviation security.

Mentioned requirements include:

- clearly identifiable boundaries;
- a boundary between landside and airside;
- security restricted areas;
- access control.

When crossing an external border, travelers undergo a control that is carried out to establish their identity on the basis of their travel documents and consists of a rapid and straightforward verification of the validity of the documents and a check for signs of falsification or counterfeiting. Not only travelers, but also all personnel and vehicles are checked when crossing a security point. The European Union Regulations also deal with specifications of aircraft security search.

The mentioned regulations dealing with the airport security also discuss many other activities and rules that have to be strictly followed.

4 ANALYSIS OF AIRPORTS

Enforcement of legislative measures is very important for the airport operations and their security. With regard to the whole handling process, small airports function differently from the large ones.

4.1 Charles de Gaulle

This French airport represents one of the world's principal aviation centers. It is located near Paris and is France's largest airport as well.



Figure 1 Charles de Gaulle Airport

Among the airport's strengths can be named:

- a unique geographic location in Europe;
- three complementary airports in vicinity;
- infrastructure adapted for the future growth of traffic;
- first class land access;
- divers clientele;
- a powerful hub.

Here are some numerical examples regarding the number of passengers and their division, cargo handled, the flights distribution and aircraft movements for a better understanding of reasons for the terminal buildings' design.

- In 2010, airport handled 58.2 million passengers, i.e. growth by 0.5 % in comparison to the year 2009.
- In 2011, the airport has provided its service to 61 million passengers, representing an increase of 4.8 %.
- In 2011, the share of international traffic within Europe was raised to 42.3 %, but international traffic outside Europe lowered to 38.8 %.
- In 2010, Paris' airports handled 707,578 aircrafts, from which 499,997 aircrafts took off and landed on the Charles de Gaulle airport. This represents a drop in number of aircrafts by 4.8 % in comparison to the previous year for the Charles de Gaulle airport.
- In 2010, there was 2,501,685 tons of cargo, from which the Charles de Gaulle airport transported 2,399,067 tons.

At the present time the airport has three terminals. These buildings are connected by a free shuttle bus transporting passengers between the parking lots and terminals.

Terminal No 1 serves international flights excluding Air France flights.

Terminal No 2 serves all Air France flights and flights of other European airlines, which are focused mainly on flights to the European countries. Terminal 2 consists of 5 halls. This structure of multiple buildings is interconnected with surface entrances and underground tunnels.

From the mentioned halls passengers are transported as follows:

- Terminal 2A – Hall A – Austria, Madagascar, India, Hong Kong, Brazil, Israel, Spain, USA, Argentina and El Salvador;
- Terminal 2B – Hall B – Bulgaria, Azerbaijan, Hungary, Belarus, Poland, Portugal, Italy, Ukraine, Uzbekistan;
- Terminal 2C – Hall C – Saint Martin, India, China
- Terminal 2D – Hall D – Spain, Norway, Greece, Finland, Germany, Luxembourg, Czech Republic;
- Terminal 2E – Hall E – Brazil, Argentina, Russia, Turkey, Canada, Mexico, Singapore, Croatia, Ireland, Hong Kong;
- Terminal 2F – Hall F – Bulgaria, Germany, Japan, Spain, Switzerland, Poland, Canada, Germany, Italy, Tunis.

In every part, elevators, restaurants, shops, toilets, exchange offices, information offices, room for mothers and passport control posts can be found. Each hall leads to a number of gates.

Terminal No 3, the newest building, serves low-cost flights only. It is located 1km from Terminal No 1 but the walking path is 3km long. All terminals except 2G are connected by this path.

In the present, Terminal No 4 is under construction. The goal is to build the second largest terminal building in Europe. Great prestige should bring a new fully automated baggage handling system.

Meanwhile Terminal 2A contains seven baggage check-in lines with an average capacity of 2,800 bags per hour. In another part four baggage reclaim lines and one transfer baggage handling line can be found.

Terminal 2B also consists of seven baggage check-in lines with an average capacity of 2,400 bags per hour. Number of baggage reclaim lines and transfer baggage handling lines is the same as in Terminal 2A.

Terminal 2D contains 14 baggage check-in lines with an average capacity of 3,000 bags per hour. Baggage reclaim lines and transfer baggage handling lines is the same as in Terminal 2A and 2B.

4.2 Brno Tuřany

Brno-Tuřany is an international airport and like every other airport. The growing demand of travelers has demanded development and reconstruction.

Few key performance indicators will outline the functioning and layout of airport terminal buildings, which represent an important component in terms of coping with airports capacity.

- In 2010, the airport has provided its service to 396,589 and in 2011 to 557,952 travelers, representing an increase by 29 %.
- Number of aircraft movements has raised by 6.7 % versus the previous year.
- Number of transported cargo has decreased by 14 % versus the previous year.

The airport terminal spreads on an area of 5,500 square meters. This building is separated into two different parts:

- airport terminal for departures;
- airport terminal for arrivals.

These two parts are interconnected and travelers can move from one part to the other by a connecting tract where following services can be found:

- car rental providers ;
- airline stands;
- newsagent.

The terminal building consists of eight check-in counters. Special services are offered to speed up the handling process, e.g. passengers with electronic ticket only need to check-in their baggage and can continue straight to security control.

Just as every terminal building, this one is also divided into the public and non-public part.

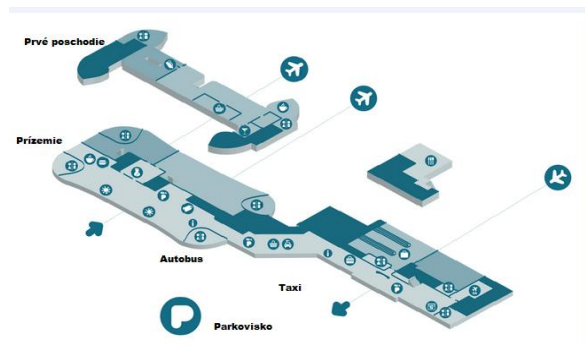


Figure 2 Brno-Tuřany terminal facility

A passenger entering the non-public part is checked by an airport worker. Firstly all travel documents and air tickets are checked. The building's space is divided according to the requirements that apply to all countries belonging to the Schengen area; i.e. into the Schengen and non-Schengen part, in which travelers have to undergo a passport check with check-points situated on the first floor of the building. According to these two different destination areas passengers are separated all the time since crossing the security check.

Within the terminal, smoking areas where smoking is allowed are situated.

The terminal consists of seven gates, from which four gates serve flights to the Schengen countries and the remaining three serve flights to the non-Schengen countries.

4.3 Another examples of terminal buildings

Sydney Airport possesses three terminals.



Figure 3 Sydney Airport

First terminal is an international one with 30 gates. Customs operations are centralized within this terminal.

Terminal 2 is located in the northeastern part known as domestic terminal and Terminal 3 serves VIP flights.

In the future terminals will undergo development changes, including high-rise office buildings, a new parking lot and an overall expansion of international and domestic terminals.

Oslo Airport terminal facility spreads on the area of almost 150 square meters and is almost 800 meters long. In the western part of the airport gates for domestic flights are located.

The gates for international flights are situated in the western part along with the gates for non-Schengen flights. The airport possesses three gates, which are more centered, for domestic and international Schengen flights and another four gates at the end of the east wing.

In the building shops, banks, post office and the largest duty-free shop among European airports can be found. This shop is located in the front part of the international public space. In the western part of the airport there is GA terminal which provides air cargo services.

To make airport operations effective, which is inter alia important also from the financial perspective, the crux to be handled is the flow of goods, passengers and their luggage. Customer satisfaction is important, therefore new ways to shorten their time spent on the airport are being sought. Priority number one is to maintain the process flow and thereby prevent the formation of long lines of passengers either at their arrival or departure.

5 TERMINAL BUILDING PROPOSAL

For effective functioning of the airport it is important to manage the airport's capacity by a suitable configuration of terminal buildings, not to forget that all airports are limited by security measures.

In accordance with previous text the suggestion of a terminal building is a "multifunctional" facility. Such terminal building could serve Schengen as well as non-Schengen scheduled flights, depending on the requirements. Separation of passengers as one of the main legislative requirements is the basis. The separation is also important regarding safety.

In the case of an airline desiring to transport Schengen, non-Schengen and non-EU passengers at once, one terminal would manage to handle all types of travelers. At the same time, it would meet the passengers separation and capacity requirements. At the passport control point Schengen passengers would undergo a valid document check (ID) as well as non-Schengen travellers (passport). One group of the passengers would be divided from the other after the passport control, when passengers would be led through separate exits right to the particular aircrafts.

If an airline requires to handle customers heading to non-Schengen area only, an adjustable barrier would be removed and airport, given the size of the terminal building, would be able to transport all passengers. To maintain continuity and to prevent waiting passengers could check-in their baggage at two places.

In the third case, airline would require to handle passengers travelling to the Schengen countries. Here the whole terminal building area would become the Schengen terminal area and passengers during the passport control would have to be identified by their valid ID. As mentioned above, also in this case passengers could check-in their baggage at two places.

Passenger's convenience and comfort is the basis for their satisfaction. Given case studies lead to shortening of long queues of people, so as of the time being needed. To transfer this necessary time while being handled into a pleasant experience, it is important to ensure that traveler's orientation at the airport will be easy, e.g. by notice boards and audio signals. Although the whole airport process is fully controlled, unforeseen circumstances still can not be avoided. A high quality level of process can cover shortcomings and ensure passenger's satisfaction.

6 CONCLUSION

Airports and airport terminal buildings were the main topic of this article. In terms of expanding market airports and terminal buildings have to adapt to the increasing demand on a daily basis. At the same time, they have to accept legislative changes that bring many financially challenging system and construction adjustments with them. Nevertheless, an appropriate and continuously functioning system is a must.

Particular European Union airports were analyzed with focus on their functioning and airport terminal buildings layout. The current solution of the terminal buildings at airports due to the number and type of passengers were focused on the explanation of passengers flow in terms of the airport terminal building concept.

Based on the analysis of airport terminals, it is possible to claim that the legislative rules and performance indicators highly influence terminal facilities. As a basic requirement is to achieve the highest level of security every innovative change.

The data for this article were collected from many sources of information. In the present, expanding of airport terminal buildings in order to improve services and adjust to the passengers flow is not always the only solution. When rapid changes in requirements occur, airports using the multifunctional terminal buildings could effectively ensure all activities connected to the handling process.

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