FACTORS INFLUENCING THE DEVELOPMENT OF THE KATOWICE INTERNATIONAL AIRPORT IN PYRZOWICE – CASE STUDY

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Abstract: *The thorough airport development is observed regularly on the world scale. Air transportations and airports in Poland grow to meet the economic development, contemporary technological standards and social needs. The Poland's accession to the European Union in 2004 expanded internationals relations and contacts. The paper discusses the case of the Katowice International Airport in Pyrzowice as an actual example of an element of regional development. It concentrates on the determinants of the airport development in the following contexts: political, economical, socio-cultural, and technological, which are elements of PEST analysis, concerning the study of the macro-environment of the airport. The basic areas have been identified using the PEST analysis, which have a significant impact on the development and functioning of the airport in Pyrzowice. The development of an airport can have a positive impact on the air transport of a given country. The development of the port infrastructure is often the result of the airport's requirement to increase the demand for transport services of the aviation industry. The article describes the extension of the Katowice International Airport in Pyrzowice, which contributes to increasing the capacity of the number of used passengers. The rise in the number of passengers served may positively affect regional economic development. The article also describes the genesis of the airport in Pyrzowice, taking into account the historical background. Case study and elements of statistical analysis were used to show the changes taking place at the airport in Pyrzowice. The description of modern technical solutions used in the port of Pyrzowice and information on the construction of the port are described on the basis of information available on the port's website: www.katowice-airport.com.*

Key words: *airport development, regional development, urban planning and design, Katowice Airport, Silesia*

JEL codes: *O12, O14, O19*

1. Introduction

Regional development can be defined as quantitative-qualitative, positive changes in the structure of a given area within a set time. Strahl (1998) defines regional development as a process of positive changes in quantitative growth and qualitative progress taking place in the region, i.e. a supra-local social and territorial system identified by specific features of space, the structure of the economy, as well as a social bond resulting from a shared regional identity.

The airport is a significant element in the development of a given region, but also has a major impact on other branches of transport in cities. An important role in such a system is played by specific market mechanisms, political decisions and strategies of large corporations (Baker et al., 2010).

A regional airport is an important component of the landscape of a specific geographical area and, in the economic dimension; it can function as a strategic domain of air transport. The regional character of airport was initially expressed in the creation of a network of regional airports, whose task was to transport passengers to the main, central airport, which the aircraft transporting passengers outside the territory were operated from. With time, however, international connections from regional ports have gained importance through the geographical

location of the port along with economic and political conditions. As mentioned – the deregulation and liberalization of the aviation market in the eighties of the twentieth century in the United States of America and in relation to the Polish air transport – Poland's accession to the European Union in 2004, which directly related to the policy of open skies along with a simultaneous demonopolization of national carrier. An example of a regional airport is the Katowice International Airport in Pyrzowice. The port area is located in the area of two municipalities: Ożarowice and Mierzęcice, and it is located on the border of the Będzin and Tarnogórski poviats in the Silesian Voivodship.

2. Methodology and Data

In the paper, a case study was used, which is an example of qualitative methods to describe the factors affecting the development of the Katowice International Airport in Pyrzowice. Elements of statistical analysis were also used to quantify the rise of air operations, passenger traffic, regular air transport, charter flights and cargo air transport. The database was based on information available on the website of the Civil Aviation Office (www1), regarding statistics on the operation of Polish airports. To describe the factors determining the development of the airport in Pyrzowice, the author used the analysis of the macro-concept of the PEST of airport, which refers to political, economic, technical and socio-cultural elements taken into account in the development and operation of a particular enterprise.

3. The genesis of the airport in Pyrzowice

The history of the Katowice International Airport in Pyrzowice began in 1940, when the Luftwaffe began to build an airfield in three villages: Zendek, Mierzęcice and Pyrzowice, by preparing three runways on the plan of a triangle. The airport was a reloading base for German aircraft that performed combat flights in the area of the Eastern Front. After the end of the Second World War, until 1951, Red Army soldiers were stationed at the airport in Pyrzowice. It should be noted that on April 17, 1951, the airport was handed over to the 39th Regiment of the Air Fighter of the Polish Army. Air combat aircraft such as Mig-19 and Mig-21 performed from the airport. The nineties of the twentieth century is the period of stationing of the 2nd Squadron of the Fighter Regiment from Wrocław-Strachowice. The last flight of a military aircraft from the Katowice airport took place in 1999; the Aircraft Base was also dissolved.

Passenger flights were inaugurated on October 6, 1966 by connecting PLL Lot to Warsaw. From that moment, the civilian infrastructure of the port was invested in; the first passenger terminal with an area of 550m², apron, as well as taxiways were created. Small air operations were carried out until October 28, 1990, when the last scheduled PLL Lot flight to Warsaw took place. The next two years are a period of specific stagnation caused by economic and political transformation. The central management model was replaced by the civil, free-market nature of business operations. Therefore, aiming for the development of transportation of Upper Silesia, the Upper Silesian Aviation Society was established in the first quarter of 1991, a year later LOT Polish Airlines resumed air connection between Katowice and Warsaw, while the German national carrier Lufthansa launched a connection to Frankfurt in March 1993. Another major undertaking in the history of the port was the takeover of the Katowice International Airport in Pyrzowice from the state-owned entity Airports by the board of GTL S.A., May 1, 1994. In the years 1994-2000, the airport in Katowice expanded its infrastructure significantly: a modernized passenger terminal was opened, a cargo hall was built to support cargo transport, also parking aprons and taxiways were extended, plus the runway was extended. The following years are intensive development of the port in terms of further development of the airport infrastructure.

4. Expansion of the airport

The year 2004 turned out to be crucial for the port because the flights were launched by the Hungarian low-cost carrier Wizzair, which Katowice Airport became one of the most important operational bases for.

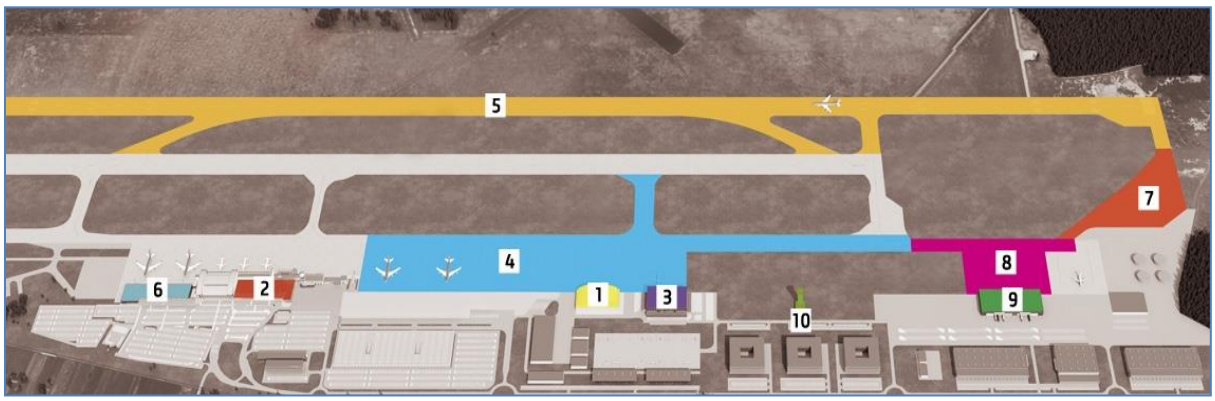
Poland's accession to the European Union, May 2004, contributed to the further, intensive development of the Katowice airport, the port infrastructure as well as access roads from the Silesian conurbation was subject to modification. An expressway S1 was built, which facilitated and shortened the time of travel to the MPL Katowice through the node in Podwarp.

On July 30, 2007, the construction of the second passenger terminal – Terminal B was completed, which increased the capacity of the port from 1.7 million to 3.6 million passengers checked annually. There was another investment undertaken – the construction of a new runway with a length of 3.2 km and a width of 45 m by Budimex SA. This undertaking was co-financed under two EU programs: "Airport in Katowice – modernization and development of airport and port infrastructure", and led to the apron 1 being extended to the east and modernization of taxiways E1, E2 and D as well as the construction of a new runway with the necessary infrastructure. The second program "Expansion of infrastructure in order to increase the operational capabilities

of Katowice International Airport" covered the construction of an arrival terminal, construction of a de-icing stand and a cargo parking stand along with the taxiway E0 (Adamczyk, 2012).

The construction of a new runway should contribute to an increase in the safety of aviation operations by installing a new ILS CAT II system that enables aircraft to approach the instrument accurately and landing at a decision height of less than 60 m, but not less than 30 m for visibility on the runway not less than 300 m. Moreover, the runway has 4 exits tracks enabling, if necessary, fast departure by the aircraft. Importantly, the new runway was equipped with new navigation lights, which was also closely related to the improvement of the energy system of the airport. The power supply system for navigation devices in Pyrzowice is powered by the ST8A transformer station (Adamczyk, 2012), whose main task is to transform the primary and backup power source as well as the distribution of electrical energy to the given elements of the navigation system. The transformer station has been equipped with the Automatic Reserve Switching System – SZR, which increases the quality of the entire power supply system by means of automatic connection of the coupling field between the basic and backup power supply. To ensure a short switching time, no traditional UPS was used, but a UBT + device that stores energy in a kinetic energy reservoir called Powerbridge. Then, the Uniblock generator is responsible for the quality of supplied energy, supervising the processing, storage and supply of necessary energy to the receivers' data. The use of UBT+ makes the switching time of the basic power supply to the backup one is zero, so the continuity of power supply of navigation lights takes place. The key element of Katowice's MPL power system, which stands the airport out on a global scale, is the implementation of the Apotrans device providing switching time for basic and backup systems in less than 3 milliseconds, that ensures the airport infrastructure devices are constantly powered.

Fig. 1 Visualization of MPL changes in Katowice



1-Modernization of the technical hangar, 2-Expansion of passenger terminal A, 3-New technical hangar, 4-New parking apron and modernization of taxiways E1, E2 and D, 5-New runway, 6-Arriving terminal, 7-de-icing board aircraft, 8-parking plate for cargo planes and taxiway E0, 9-New cargo terminal, 10-new tower of air traffic control
Source: (www2).

An important aspect of the development at the International Katowice Airport in Pyrzowice is the opening in 2013 of a new technical hangar with a volume of 106 350 m³ and a usable area of 7912 m² and leasing it to the LineTech company, specializing in servicing aircraft. After certification by ULC, the airport has been able to repair Boeing 737 from version 300 to version 900, Airbus A318, A319, A320, A321, Embraer 135, 145, 170, 190 and French turboprop ATR 42 and 72 The EnterAir charter company, Armavia, PLL LOT, Dniproavia, Eurolot use the LineTech services. It should be noted that the most common aircraft models that land in Pyrzowice are the Boeing 737 and Airbus A320. The proximity of the service provider increases the level of security in the implementation of flight operations significantly and reduces the time of removal of an unexpected defect or failure.

A noteworthy project of the GTL S.A. is the expansion of the cargo base at the airport in Pyrzowice (Sigmund, 2015). The new building has 10,000 m^2 of usable cargo space and 2,000 m^2 of office space. The main user of the hall is the German courier company DHL Express, which the Silesian airport is an important base for the growth of courier parcels in southern Poland for.

GTL S.A. operates on the basis of the Integrated Management System (www3) according to PN-EN ISO 9001 as an implemented quality management system and PN-EN ISO 14001 regarding environmental management as well as the PN-N 18001 standard, which is a health and safety management system. In such a management system, the following elements can be included: management commitment, health and safety policy, planning, implementation, functioning, checking and corrective and preventive actions, reviews made by the management and continuous improvement when necessary. This management model takes its roots in the

Kaizen concept, as well as the assumptions of the Deming's cycle, the author of the principle of continuous improvement of the PDCA Plan-Do-Check-Act – plan, execute, check, correct.

5. Main factors of the development of Katowice International Airport

Airport development can be considered in many categories (Brathen and Halpern, 2011), affecting the operation of the airport itself, impact on companies cooperating with the airport and entities that are directly or indirectly located in the airport's sphere of influence.

According to the general segmentation of the macro-environment of the enterprise, the factors that determine the development of Katowice Airport can be divided into political, economic, socio-cultural and technological factors:

- Political factors:
  - transformation of the economic model from centrally controlled to free market economy;
  - the foundation of Górnośląskie Towarzystwo Lotnicze SA in 1991, and the management of the airport by the company in Pyrzowice since 1994;
  - demonopolization of the aviation market in Poland after the accession to the European Union, as a result of the open sky policy in the Pyrzowice airport, the Hungarian carrier Wizzair started operation in the LCC formula, which Katowice Airport is the largest operating base for. The second low-cost carrier is the Irish Ryanair. The presence of low-cost carriers at the Katowice Airport can significantly contribute to the increase of competitiveness on the air transport market.
- Economic factors:
  - low-cost carriers: WizzAir, Ryanair;
  - performing air operations by national carriers such as PLL Lot, Lufthansa;
  - presence of charter airlines: Enter Air, Small Planet, Travel Service;
  - performing air cargo transport operations by the following companies: TNT, SpritAir Cargo;
  - the use of European funds: the TEN-T Community Program for the airport drainage project including the fitting of oil derivative separators that protect sewage collection equipment from the possible consequences of leakages (Brommelstroet et al., 2014); the Cohesion Fund and the European Regional Development Fund that allow the port and airport infrastructure to be modernized and rescue and fire fighting vehicles to be purchased in order to increase the safety level of flight operations;
  - the development of educational offer of secondary and high schools that fulfils educational needs of the aviation sector in the airport; Universities in Gliwice and Katowice, including the Civil Aviation Personnel Education Centre of Central and Eastern Europe at the Silesian University of Technology;
  - hiring highly-qualified staff;
  - enabling the growth of enterprises closely relates to the increase in number of jobs;
  - unlimited development of the partners of the airport such as airlines, logistics companies, technical support of aircraft;
  - renting space of the airport premises to companies that provide secondary services for the passengers and employees;
  - expanding of new businesses and private ventures offering provision that is built around the airport proximity i.e. hotel Moxy, petrol stations, car parks, restaurants;
  - an increase in the number of passengers contributes to the increase in the number of people employed at the airport (Green, 2017);
  - gaining new investors i.e. Chopin Airport Development;
  - the management of the Upper Silesian-Zagłębie Metropolis association, as one of the priorities in the first year of its activity, aims to improve the public transport accessibility of the airport with the largest conurbation cities. Everything indicates that already in the second half of 2018, two to four bus routes will be launched, which will enable quick access to Pyrzowice at a reasonable price from practically all major metropolitan cities;
  - PKP PLK will be undertaking a project of the reclamation of the 182 railway route between Tarnowskie Góry and Zawiercie in the near future. It has been declared by railmen that the first train to Katowice Airport will be scheduled to arrive in 2021-2022 to enable greater convenience for both the passengers and employees;
  - the airport affects the development of the regions by providing transport services for people and cargo, in recent decades, attention has been paid to tightening airport operations, taking into account potential economic benefits for both the airport itself and companies located in its vicinity (Brommelstroet et al., 2014);
  - referring to table 1, it can be seen that in the years 1996 to 2017 there has been a gradual increase in the number of flight operations, passenger traffic, scheduled air passenger transport, charter flights and

cargo transport. It can be assumed that the development of airport infrastructure significantly contributed to this.

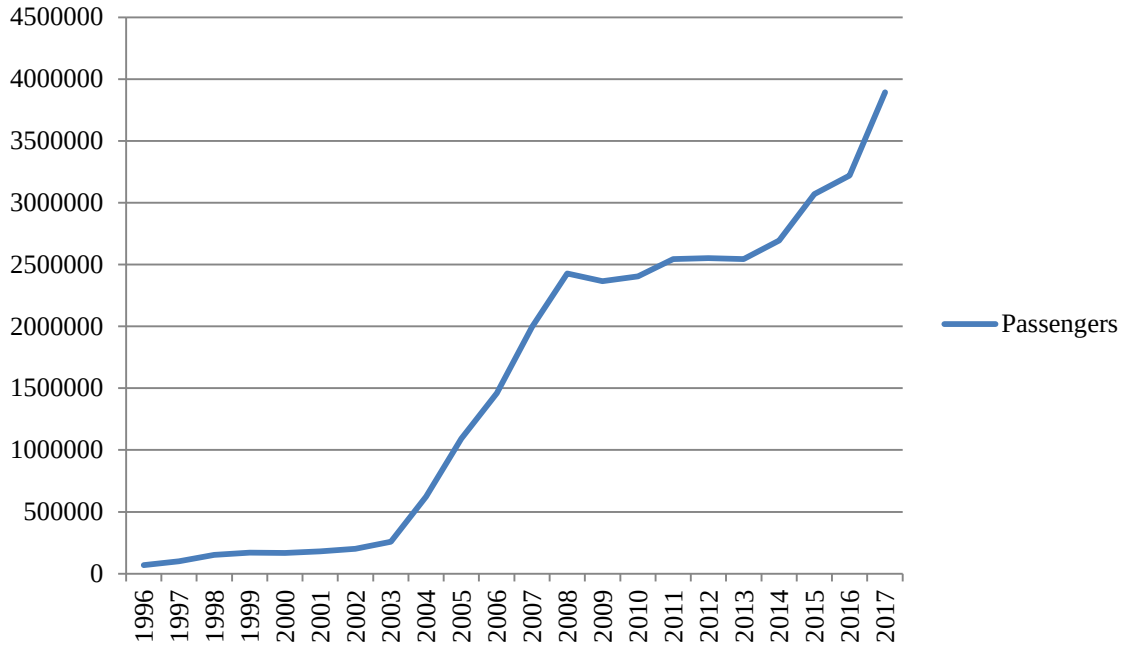
Tab. 1 Annual statistics for Pyrzowice Airport 1996-2018

YEAR	AIRCRAFT OPERATIONS	PASSENGER TRAFFIC	REGULAR TRAFFIC	CHARTER TRAFFIC	CARGO (TONNES)
1996	3 586	68 203	57 445	6 260	596
1997	4 290	101 054	77 933	19 508	1 241
1998	6 256	150 724	97 460	49 142	1 365
1999	6 510	170 230	111 826	52 049	1 522
2000	8 710	168 126	115 094	47 341	7 745
2001	9 441	180 015	124 335	50 906	2 196
2002	8 389	202 267	131 899	66 716	2 886
2003	9 357	257 991	144 946	107 292	3 548
2004	13 803	622 612	465 655	149 758	5 038
2005	16 222	1 092 385	830 988	255 466	5 636
2006	21 014	1 458 411	1 129 895	294 625	6 113
2007	24 489	1 995 914	1 529 734	432 830	7 795
2008	27 030	2 426 942	1 804 638	601 953	12 703
2009	26 206	2 364 613	1 742 804	603 765	6 543
2010	26 770	2 403 253	1 693 512	693 880	11 195
2011	29 259	2 544 124	1 703 188	815 711	12 138
2012	30 584	2 550 848	1 749 625	776 093	10 546
2013	28 990	2 544 198	1 759 647	758 643	10 877
2014	28 771	2 695 732	1 677 057	985 827	16 269
2015	31 727	3 069 279	1 988 231	1 057 449	16 119
2016	31 013	3 221 261	2 126 540	1 079 159	17 674
2017	34 725	3 892 941	2 423 869	1 459 398	17 779
2018*	10 119	1 005 924	827 236	175 066	4 732

*2018 has not finished as yet
Source: (www4).

- Socio-cultural factors:
  - favourable geographical location of the airport within a reasonable distance to the surrounded cities and towns like Katowice, Dabrowa Górnicza, Kraków (Cracow), Wieliczka, Oswiecim, Tarnowskie Góry that are historical, cultural and industrial centres in Poland;
  - the location of airports at a distance of 15 to 30 kilometers from cities largely shows the economic impact on the development of the region (Chen et al., 2011);
  - location within 600km radius to Warszawa (Warsaw), Praque, Berlin, Budapest, Vienna and Bratislava (Kolbre et al., 2013);
  - an increasing number of advertisements related to development land for sale;
  - integrating local communities;
  - connecting individuals that live abroad with families and friends;
  - growing numbers of passengers travelling to and from the airport (fig. 1) – analyzing the chart of the number of passengers transported in the years 1996-2017, it can be noticed that the trend line until 2003 was of a horizontal nature, then up to 2008 there is an upward trend. From 2013, an upward trend can be observed again.

Fig. 1 Numbers of passengers at the Katowice International Airport in 1996-2017



Source: Based on Annual Statistics (www4).

- Technological factors:
  - expanding the infrastructure: the construction of a third passenger terminal C that has already been set up and a passenger terminal A has undergone a general overhaul and expansion; plans regarding a constant development of The International Airport in Katowice involve a construction of a new independent passenger terminal, expansion and modernization of passenger terminal B and further extension of the aprons and also, a new runway strip, a new fire station at the Airport Rescue and Fire Fighting Service, the third hangar for aircraft maintenance, a new base of the Operations Department, a fuel base, a central guardhouse and the expansion of the cargo terminal, as well as a new road system with internal roads and parking lots, including a multi-level car park are also the recent planned projects; the most modern airport control tower for operational use has already been erected and after it has been provided with equipment it will enter a testing phase - it is the highest facility of this type in the country, and the owner of the project is the Polish Air Navigation Services Agency;
  - utilising modern technologies: energy-saving and BAT (Best Available Techniques) technologies.

The listed factors can overlap themselves or act solely on their own. Moreover, one factor can be a result of another one.

6. Conclusions

Due to its successful development the Katowice Airport is an active air transport centre for increasing number of passengers. The airport gathers attention and interest from investors, enterprises and businesses that enable good profits. Its constant growth and modernization extend its attractiveness and usefulness. The plans regarding its further development strongly cooperate with the needs of the clients.

The forceful development of Katowice-Pyrzowice Airport has an influence on how its landside is developed. Over the past 12 years, the urbanization and regionalization power of air transport can be noted in connection with spatial planning. The airport itself and aviation investments are the bases for planning that involves fresh multimodal transport and commercial services. Main transport corridors and transport nodes allow strengthening an activity of airport landsite. Sports and recreation centres, shopping and exhibition, as well as, research and educational institutes are built within a reasonable proximity around the airport. The landside of the Katowice-Pyrzowice Airport was illustrated as an area of broad scale of spatial and functional connections with more direct and further areas of real foundation for development of real synergic relations with a system characteristic for:

- airport city – investments within the airport land and its adjacent areas such as parking lots, offices, hotels, cargo and similar investments, logistics centres, light industry, gastronomy, trade and leisure services;

- airport landside associated economically with the airport - areas for the expansion of intensified business activity and transport infrastructure;
- development of metropolitan functions of supra-local implication which will promote the development of the airport, cities, region, and transport corridors, and also the progress of interdependence and distribution of functions between the cities located within the Silesian agglomeration (Rucinska and Rucinski, 2017).

Referring to the systematic growth of air operations, the number of transported passengers and cargo, it can be stated that the Katowice International Airport in Pyrzowice is an example of a regional airport that significantly affects the surrounding region. The forecasts of the aviation market presented by Boeing in the Current Markt Outlook report, CMO – Current Market Perspectives (Liwiński, 2014) for the next two decades 2014-2033 provide for a 2.5-fold increase in air transport and the purchase of 36.8 thousand aircraft with an estimated market value of $5.2 trillion. The number of currently used aircraft will increase from 20,910 units to 42,188 aircraft. 15.5 thousand older vessels will be withdrawn, airlines will purchase a total of 36,770 machines, which will cause that annual aviation companies will produce 1840 new aircraft. Airports will have to meet the demand of the aviation market and be ready for the increasing number of airships.

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