

Jakub Dyrzcz

Mgr inż.

doktorant Katedry Systemów

Transportowych, Politechnika Krakowska

dyrczus177@gmail.com

Anton Pashkevich

Dr inż.

adiunkt Katedry Systemów

Transportowych, Politechnika Krakowska

apashkevich@pk.edu.pl

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Air traffic analysis of General Aviation in the airports of the South Poland

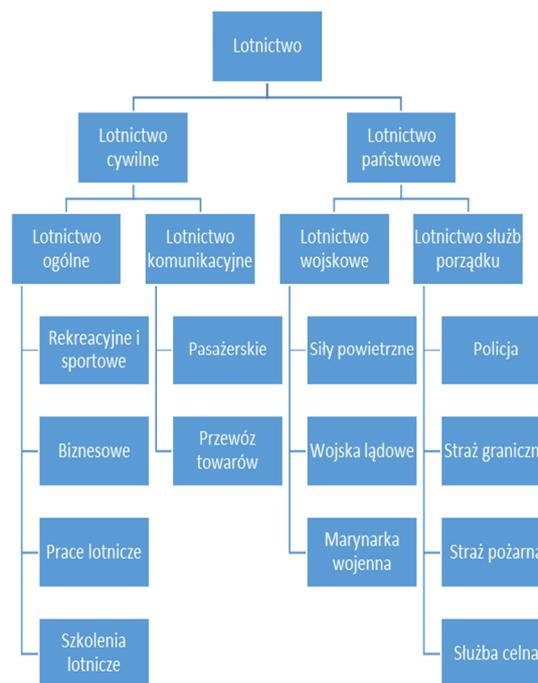
Abstract: General Aviation is a separate segment of Civil Aviation, taking into account different type of aviation activities it includes recreational and sport aviation, business aviation, aerial work and flight training. Also it is often overlooked in the aviation statistics. This article concerns mainly the statistics of General Aviation in the airports of the South Poland. This research paper raises also the issue of the whole sector of General Aviation - its characteristics and features, which determine it as a separate branch of air transport. Therefore, the general statistics of the considered air transport segment are presented as the first step, and only then the results of air traffic analysis in the selected airports are described, namely International Airport Kraków–Balice, Wrocław–Copernicus Airport, Katowice International Airport and Rzeszów–Jasionka Airport. The evaluation of trends in General Aviation as well as the determination of opportunities to develop this sector of air transport were done.

Keywords: General Aviation; Aircraft operation; Airport

Introduction

Currently, having a small private aircraft, using air taxi or doing some aerial work is no longer an extraordinary thing, just like moving a transport plane from point A to point B.

General Aviation is the second, in addition to aviation, part of civil aviation (Figure 1). The general aviation segment is skipped during the statistics and analyzes. Therefore, the article analyzed the general aviation movement at the airports of Southern Poland. The analysis covered airports in Krakow - Balice, Katowice - Pyrzowice, Wrocław - Strachowice and Rzeszów - Jasionka.



1. Division of aviation into segments (source: own study based on [2])

General Aviation

Definition of general aviation and features determining the separation of this segment

General Aviation (in accordance with the Convention of 7 December 1944 on International Civil Aviation, Annex 6, this is "all aviation activities other than those performed as part of commercial air transport" [29]. In Poland, according to the information provided on the website of the Civil Aviation Office [16] and the Minister of Infrastructure and Construction [10], "general aviation is all other air operations that do not belong to scheduled aviation - communication (passenger and freight flights are included under this concept)) and state aviation, which includes military aviation and aeronautical services. " It also means that all other operations, according to the nomenclature applicable in Poland, will be included in all statistics for general aviation flights. Therefore, taking into account the whole aviation sector, general aviation is a separate category complementing what aviation does not fulfill. General aviation can be assigned to any type of aviation activity consisting of sport and recreational flying, business aviation (commonly known as air taxi), training flights and flights used to perform any kind of aerial work (Figure 1). In Poland, the Civil Aviation Office is the authority that oversees all civil aviation operations. The overriding authority for all European Union countries is EASA (European Aviation Safety Agency). [11]

Recreational and sport aviation

Recreational and sport aviation is a kind of general aviation, it is all kinds of flights not related to a gainful activity. This aviation uses small piston aircraft, gliders, motor gliders, gyroplanes, helicopters, and hot air balloons.

Air sport is all kinds of sports competitions played by using airplanes, gliders, balloons, parachutes and airplane modeling. With the development of aviation, there has been a sharp increase in interest in the use of aircraft for sports competition. This contributed to the development of aircraft competition, which currently are precise flying and aerial aerobatics. In addition to sports played on airplanes, gliding is very popular, i.e. flying with an aircraft, not equipped with a drive, and using the force of nature to move. The glider flight is started mainly by using the foyer by an airplane or using a winch. Similarly to air sports, glider

competitions are divided into precision flights, that is defeating a specific route at a specific time, and aerobatic flights. In addition to aircraft and glider competition, balloons, parachutes and flying models are used to compete in sports aviation [2].

Business aviation

According to the definition of the International Business Aviation Council, business aviation is all kinds of aircraft operations that are used by companies to transport passengers and goods, serving as business assistance and which are not available publicly [2]. Business aviation can be divided into the following two categories:

- non-commercial flights by own aircraft,
- commercial flights - so-called air taxi.

Flights operated by own aircraft owned by the enterprise are non-commercial and non-commercial operations. Commercial operations in general aviation are so-called air taxi transporting goods and passengers on demand on a given route. These operations are ad-hoc operations, i.e. operations that are not subject to any decomposition.

All operations performed by such carriers are characterized by flexibility regarding the date of travel, as well as the choice of take-off and landing. Carriers are able to organize transport from the most remote parts of the world. The main requirement for commercial transport is that the air carrier has a valid certificate authorizing to perform operations in exchange for remuneration [4]. In order to obtain such a certificate, it is necessary to submit relevant documents and have sufficient funds to operate the air carrier for a period of at least 3 months without taking into account revenues [23]. There are 45 registered airlines registered in Poland [26]. This applies to carriers providing both ad-hoc flights, as well as balloon flights, gliders, and sightseeing flights. Among the business carriers, the most frequently used aircraft are turboprop planes (e.g. Beechcraft King Air 350) and small disposable jet airplanes (e.g. Cessna Citation X).

Aerial work

In addition to the obvious use of airplanes and helicopters, which is the transport of people or cargo, general aviation also means the use of aircraft to perform many aerial works. Such works include agro-military works, search and rescue flights, sanitary flights, as well as patrolling and registering flights [3]. For some of the activities mentioned above, you need to obtain an AWC (Aerial Work Certificat) certificate, allowing such activities to be carried out for a fee. In Poland, such a certificate currently has 16 entities [27]. Works requiring such a certificate are classified as such:

- agro-flight,
- patrol and inspection flights using special equipment,
- firefighting flights,
- service flights, e.g. taking photos from the air.

The AWC certificate does not require sanitary services, carriers providing such services must hold an Air Operator's Certificate - AOC (Air Operator's Certificate) [14]. In Poland, the main entity providing services in the field of sanitary flights is the Air Rescue Service, which in its operations uses 27 Eurocopter EC135 helicopters, while for long-distance transport of two planes, Piaggio Avanti are used. [9].

Air training

Air training is a paid activity, therefore, similarly to any commercial aviation activity, every organization conducting such activity requires entering the appropriate list and obtaining the

appropriate certificate - for the training organizations, it is FTO (Flight Training Organization) [2]. This list includes both entities providing activities in the field of basic aviation training (for the license of a tourist pilot, glider pilot or balloon pilot) as well as entities providing professional training for air carriers. The aviation training sector is developing very quickly. Currently, most professional pilots are people who have completed training in private centers, only a few years ago professional flying was intended only for a small group of former military pilots or people graduating from universities with a pilot specialty.

There are 115 entities on the Civil Aviation Authorities list that have the right to conduct flight training [24]. These are various types of training, starting from basic training to the pilot's qualifications, ending with organizations training professional pilots of large jets. The list also includes operators training pilots of balloons, gliders, and helicopters.

General aviation in Poland

Statistical characteristics of the general aviation segment in Poland and in the world

Statistics on general aviation are really impressive. Currently, general aviation covers approx. 350,000 aircraft around the world, to which licenses have about 700,000 people. However, transport aviation is about 60,000. pilot aircraft, about 400,000 authorized people [5]. In Poland, currently general aviation is not so widespread, but a huge increase in its significance can be observed. For example, in the general aviation segment in the US, more than 200,000 registered. aircraft, while in Poland the entire register of civil aircraft is currently over 2.4 thousand. flying machines (Table 1).

Tab. 1: Number of aircraft in the Civil Registry of the Civil Aviation Office in particular years (source: own study based on [8])

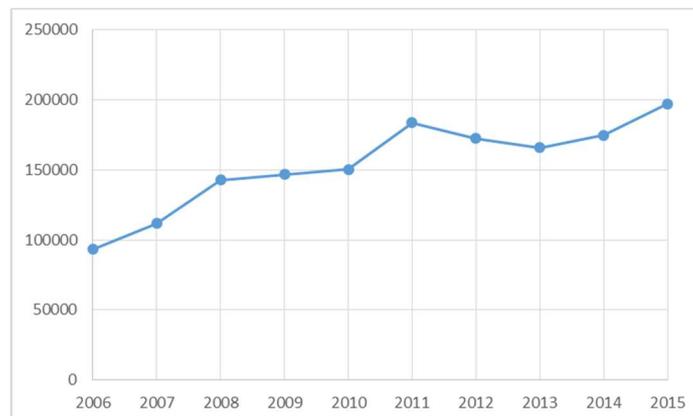
Year	2001	2005	2010	2015
The total number of machines in the civil register	2076	2183	2235	2407

At the end of 2014 in Poland, there were almost 8.5 thousand people holding valid licenses authorizing them to use airplanes, helicopters, gliders and a balloon. Among the license holders, 2079 people have a professional pilot license or a linear airplane, and 278 people have such qualifications for helicopters. The rest of the people with the powers are pilots who treat flying as an activity that is not a source of income for them. The number of valid civil aviation licenses in Poland at the end of 2014 is presented in table 2.

Tab. 2: The number of valid civil aviation licenses in Poland. Status on 14 XII 2014 (source: own study based on [7])

Total number of licenses	Air pilot licenses	Helicopter pilot licenses	Glider pilot licenses	Balloon pilot licenses
8477	5455	728	2416	178

According to the information of the Polish Air Navigation Services Agency on the statistics of aviation operations performed by the General Aviation segment serviced by the FIS (Flight Information Service), 2015 was a record year in terms of operations performed in the general aviation segment (Figure 2). It is worth noting that the statistics only include flights that have made contact with the FIS body or have a composite flight plan. It does not cover a large part of air operations that pilots have not reported to air traffic services. Statistics of operations performed with FIS connectivity are treated as the most authoritative statistics of general aviation traffic in individual countries.



2. The total number of aviation operations performed with FIS connectivity in 2006-2015 (source: own study based on [19] and [20])

Infrastructure used by the general aviation segment in Poland

Of the 15 airports in Poland, many of them have a special infrastructure designed to serve general aviation flights. The most advanced infrastructure for handling General Aviation flights occurs at the central airport of the country - Warsaw - Okęcie. The first special passenger service terminal General Aviation was built at this airport [22]. Also here is the largest Polish carrier on the general aviation market - Jet Story Sp. z o.o.

In addition to airports with the status of airports in Poland, there are also 43 airports listed in the Register of Civil Airports, which can be used for air operations, 35 of which are managed by the Polish Aeroclub [17]. Some of them have only hardened runways that cannot be operated on heavy jet machines and are only suitable for operating aircraft with a maximum take-off mass of up to 5,700 kilograms.

In addition, apart from 58 airports reported to the Civil Aviation Office [17], which are in a special register, there are 333 landings in Poland submitted to the register kept by the Civil Aviation Office [25]. These are places not subject to supervision by the supervisory body (Civil Aviation Office), but only requiring entry into the register and obtaining consent issued by the competent Commune Office, in the area where such a place is located. A very large part of landing sites are those intended for operating helicopters (especially rescue helicopters) and private areas used for operating private aircraft.

The majority of general aviation traffic in Poland takes place at uncontrolled airports. These are mainly air operations carried out using small aircraft with a maximum take-off weight (MTOW) of up to 5700 kg. These operations are primarily air operations performed without the need for special navigation equipment on board the aircraft. These are VFR (Visual Flight Rule) operations, i.e. aerial operations with ground visibility. Due to their specification, the largest part of these air operations falls on holiday months [20]. At that time, local airports, which are quite numerous in Poland, are characterized by very large traffic. Also, the infrastructure of these airports is getting better every year. Most are equipped with hangars, where you can hold a plane for a fee. More and more local airports are expanding additional infrastructure, including aviation fuel stations, restaurants, small hotels are created. The main problem for local airports in Poland is the lack of paved runways, where operations could be carried out throughout the year, without interruptions due to unfavorable weather conditions.

Companies on the general aviation market

Each economy segment in the world is governed by its laws of demand and supply. In Poland, there is a steady increase in the interest of entrepreneurs in investing in the general aviation

segment. Certain carriers, service companies, training companies and manufacturers of aircraft intended for general aviation also arrive on the Polish market.

In Poland, access to aviation is not as widespread as in the United States. However, there is a considerable increase in interest in its development and there are no signs of filling the market, on the contrary, each newly emerging entity finds a place for itself on this difficult market.

Air carriers

Along with the growing importance of air transport, apart from already existing companies on the market and specializing mainly in passenger transport on scheduled and charter flights (e.g. LOT Polish Airlines or Enter Air), there began to arrive on the market of companies specializing in operating commercial flights on order. Currently, there are several carriers operating on the Polish market specializing in transport under the so-called air taxi. Also, companies specializing in sightseeing flights were established, which are also part of this segment and require a certificate that allows performing air operations for which remuneration is levied. An air carrier in accordance with Art. 2. The Act of 3 July 2002 is an entity that has a special license entitling to perform commercial operations. This certificate is commonly referred to as AOC [23]. In Poland, this certificate has 45 entities authorized to operate various aircraft, including gliders and balloons [26].

Service companies

In air transport, service companies are an important element of the entire transport chain. These companies handle aircraft during the arrival and departure of a given airport - called handling companies, and companies servicing [1]. Due to restrictive regulations in aviation, the activity carried out while servicing aircraft requires obtaining a special certificate or entry into the list of organizations authorized to perform activities carried out by the Civil Aviation Office [13]. Operations requiring a special permit or entry on the list are:

- handling hazardous materials,
- supplying aircraft with propulsion materials,
- maintaining current airworthiness,
- all types of airframe, drives, and avionics service.

The entry on the list guarantees compliance with the conditions resulting from national regulations (Act on Aviation Law [23]), and international (provisions of the Chicago Convention with attachments and European regulations EASA Part M [18]). Continuous supervision and certification guarantee the proper performance of operations, which is why air transport is the safest mode of transport in the world.

Aircraft manufacturers

Poland is not famous for the production of large aircraft, however, on the market, you can meet manufacturers of components for the production of large communication or military aircraft. The most famous plane produced in Poland was Antonov AN-2, most of which was created at the PZL Mielec plant [21]. In socialist times, it was one of the most popular aircraft in the Eastern bloc countries. Currently, Black Hawk helicopters and PZL M28 Bryza aircraft are produced there [12]. In Poland, the production of many components for the two largest manufacturers of communication aircraft - Airbus and Boeing [6]. In addition to large production plants, whether for the needs of the army or the aviation of transport aircraft, in Poland, you can meet aircraft manufacturers that are typically intended for general aviation flights, e.g. the production of gliders, gyroplanes or small aircraft. This market is growing rapidly, which is why new products are coming every year.

Analysis of general aviation traffic at selected airports

Pursuant to the Annex to Guideline No. 8 of the President of the Civil Aviation Office of 26 August 2015 [28], "air traffic" is called "movement of all aircraft during flight and on the maneuvering area of the airport". To quantify air traffic at a particular airport, one can turn to a parameter such as the number of flight operations, i.e. the number of take-offs and landings or the number of flights to and from the selected airport. An additional indicator determining the volume of traffic is the number of passengers served in general aviation traffic.

Data for the analysis of general aviation segment flights at the southern Poland airports came directly from the operational departments of the analyzed airports. Due to some kind of differences in the way statistics are conducted for each of the airports, some of the analysis points do not match each other. The analysis used data on general aviation operations in the years from 2010 to 2015. In the case of Rzeszów - Jasionka Airport, the data refer to the period from 2011 to 2015.

The data obtained allowed to determine the number of flights performed and passengers served for particular airports in the analyzed period of time. In comparison with the general statistics of airports, the share of operations of the general aviation segment in the total number of air operations and in the total number of passengers served was determined. On the basis of the data, the aircraft duty factor, i.e. how many passengers did check-in during each flight operation, was determined (for the passengers served, the crew members of the aircraft are not included).

The compilation of these statistics with national statistics on general aviation flights allows for the analysis of trends in this segment, the identification of airports where there is development potential and determine what the cause of development may be, comparing the airport with another having e.g. developed infrastructure for general aviation.

Krakow - Balice International Airport

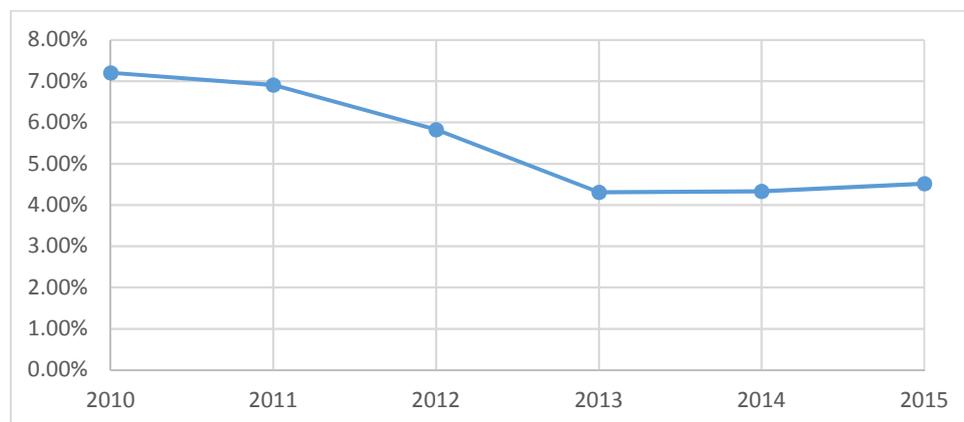
The International Krakow-Balice Airport (MPL Kraków-Balice) is the second largest airport in Poland in terms of the number of passengers served. Based on the received data, General Aviation traffic analysis was carried out. The analysis uses data of over 11.5 thousand air operations during which over 22 thousand passengers in the general aviation segment (Table 3).

Tab. 3: Number of air operations and served passengers in the general aviation segment at the Kraków - Balice International Airport in 2010-2015 (source: own study)

Year	Number of operations in general aviation traffic	Number of checked in passengers in general aviation traffic
2010	2369	4511
2011	2267	4605
2012	2293	4086
2013	1640	3229
2014	1540	2996
2015	1641	3001

In the MPL Kraków - Balice, in the analyzed period of time, the significance of general aviation operations in the total number of operations performed at that airport can be clearly seen (Figure 3). This shows not only the decline of general aviation traffic at the airport but also indicates a much more dynamic development of the aviation sector. The

authorities of this airport are more conducive to the development of transport aviation than the general aviation sector.



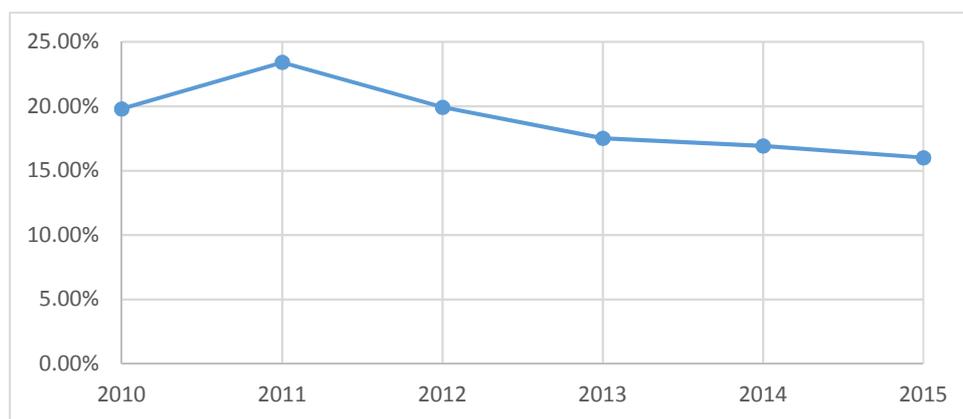
3. The percentage share of air operations of the general aviation segment in the total number of operations performed at Kraków - Balice Airport in 2010-2015

Wrocław - Strachowice Airport

Wrocław Airport - Strachowice, the westernmost airport from the analyzed cities. Flight data for the general aviation segment were used for the study. In the period from 2010 to 2015, a total of over 28.5 thousand were made in this segment. air operations during which 25.3 thousand were served passengers (Table 4). The share of general aviation sector operations in the total number of aviation operations in the analyzed period decreased from 19.79% to 16.01% (Figure 4). The actual number of operations decreased by 16%, while in percentage terms the share decreased by 19.1%. This decrease can be explained by limited possibilities of receiving general aviation vessels during airport peak hours and by a more rapid increase in the total number of airport operations carried out at the airport.

Tab. 4: Number of air operations and passengers served in the general aviation segment at Wrocław - Strachowice Airport in 2010-2015 (source: own study)

Year	Number of operations in general aviation traffic	Number of checked in passengers in general aviation traffic
2010	4676	3059
2011	5932	3761
2012	5571	6341
2013	4370	4153
2014	4226	3976
2015	3935	4073



4. The percentage share of air operations of the general aviation segment in the total number of operations performed at the Wrocław - Strachowice Airport in 2010-2015

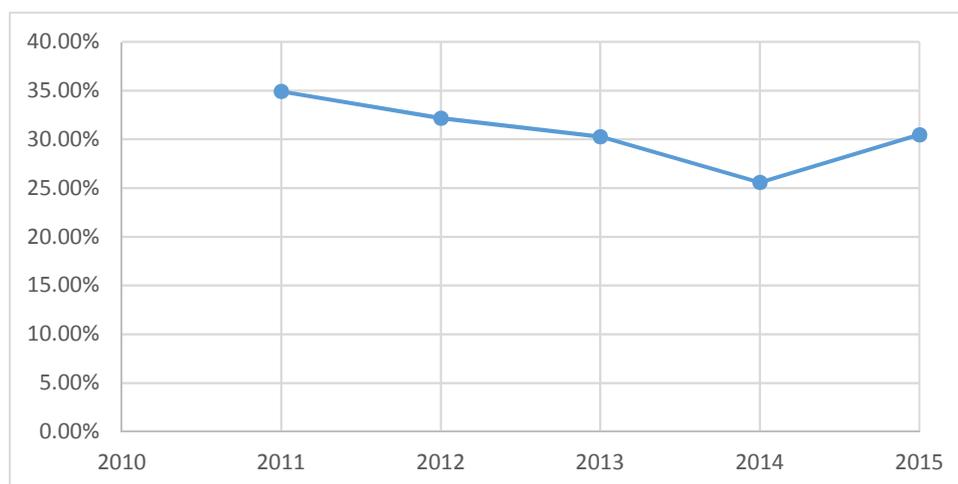
Rzeszów - Jasionka Airport

Due to the limited amount of data provided by the operating department of Rzeszów-Jasionka Airport, the data from the general aviation segment for the years 2011-2015 were used for the analysis. During this period, over 19.2 thousand passengers were made in the General Aviation segment at the airport. flight operations during which 10.2 thousand were served passengers (Table 5).

Tab. 5: Number of air operations and passengers served in the general aviation segment at Rzeszów - Jasionka Airport in 2010-2015 (source: own study)

Year	Number of operations in general aviation traffic	Number of checked in passengers in general aviation traffic
2010	no data	no data
2011	4314	2650
2012	3975	1910
2013	4088	1772
2014	2726	1896
2015	4181	2069

The percentage share of general aviation operations in the total number of operations performed at the Rzeszów - Jasionka Airport is a very large part of all flights (Figure 5). In the record year of 2011, the percentage of General Aviation flights accounted for 34.91% of all operations. By 2015, there was a decrease in operations to 30.47%. In quantitative terms, this decrease was 3%, while in the total number of operations, the decrease was 12.7%. This is due to the fact that the total number of operations in the analyzed period increased much faster than the decline in general aviation traffic.



5. The percentage share of air operations of the general aviation segment in the total number of operations performed at the Rzeszów - Jasionka Airport in 2010-2015

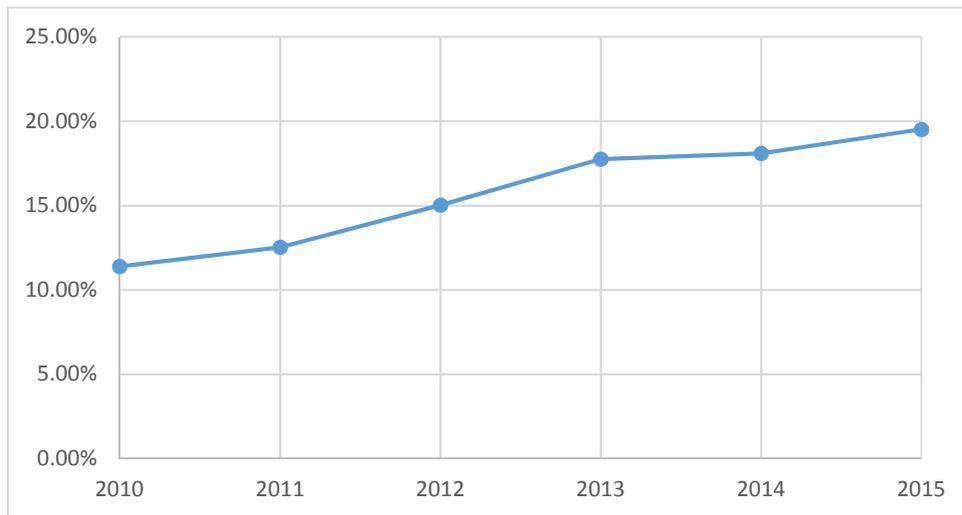
Katowice - Pyrzowice International Airport

For the analysis of traffic at the International Katowice Airport - Pyrzowice, data regarding operations performed in the period from 2010 to 2015 were used. During this period, over 27.8 thousand aircraft operations were carried out in the general aviation segment, during which over 11.2 thousand passengers were served (Table 6).

Tab. 6: Number of air operations and passengers served in the general aviation segment in Katowice- Pyrzowice International Airport in 2010-2015 (source: own study)

Year	Number of operations in general aviation traffic	Number of checked in passengers in general aviation traffic
2010	3051	1211
2011	3669	1070
2012	4598	1673
2013	5148	1815
2014	5205	2614
2015	6193	2886

The dynamic increase in the number of general aviation operations performed at the Katowice-Pyrzowice International Airport is noticeable in the graph of the percentage share of these operations in the total number of operations (Figure 6). In 2010, general aviation operations accounted for 11.4%, and in 2015 it was already 19.52%. Such a fast growth also indicates a faster development of general aviation in comparison to other aviation segments at the airport in Katowice.

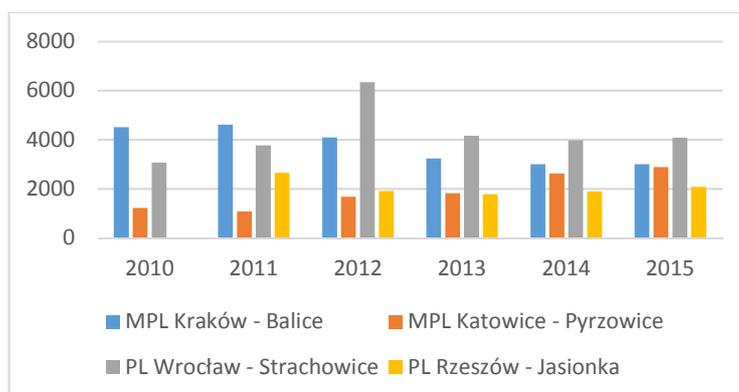


6. The percentage share of the number of aviation operations performed by the general aviation segment in the total number of flight operations carried out at Katowice- Pyrzowice International Airport in 2010-2015

Comparative analysis of selected airports

The comparative analysis uses data from four previously analyzed airports located in southern Poland. These are airports in Kraków, Katowice, Wrocław, and Rzeszów. In order to better illustrate the data, the order of airports was arranged in descending order in terms of the current (data for 2015) passenger traffic. This allowed a better assessment of general aviation statistics in the analyzed airports.

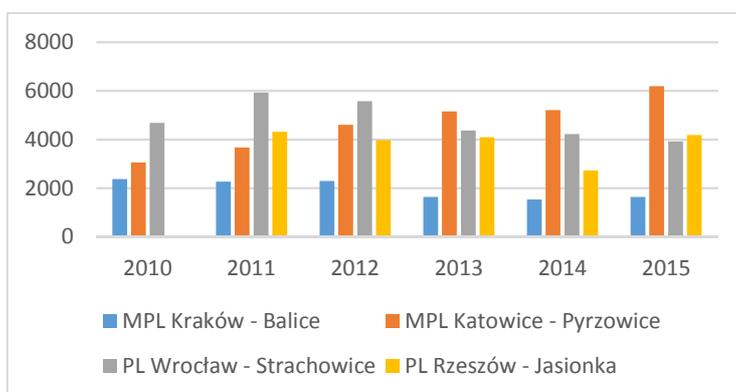
Chart 7 shows the number of passengers served in general aviation traffic at individual airports. The largest one-year result in the analyzed period of time (2010-2015) was achieved in 2012 by Wrocław Airport - Strachowice. In the record year, the port served 6,341 passengers. Such a rapid, one-off increase in passengers can be attributed to the European Football Championships taking place in 2012 in this city. Wrocław, as the only city among the analyzed ones, was the host of the games. The organization of international events favors the development of general aviation traffic. In the case of other airports, a steady increase in the number of passengers can be proud of the Katowice - Pyrzowice International Airport, which in the analyzed period (2010-2015) increased the number of passengers serviced by 138%, while Wrocław - Strachowice Airport recorded a 33% increase.



7. Number of served passengers in general aviation flights at analyzed airports in 2010-2015 (source: own work)

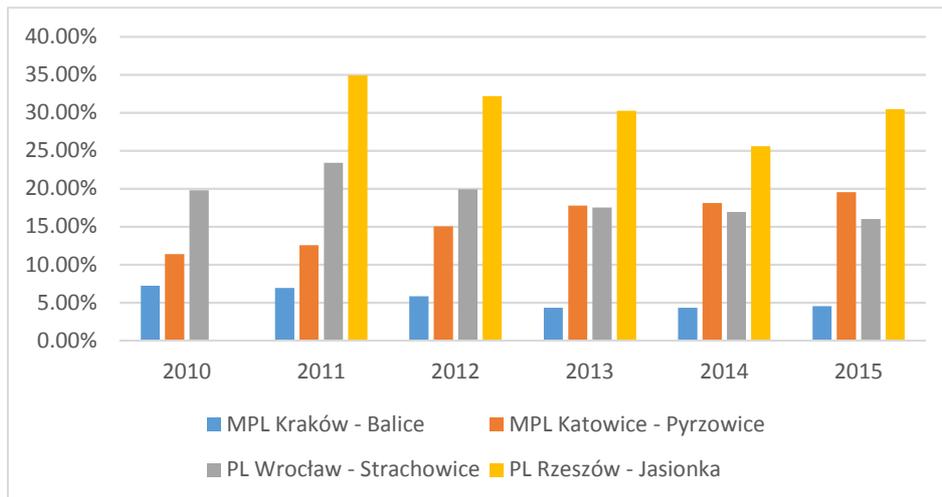
At the Balice International Airport in the analyzed period of time (2010-2015), the number of served passengers dropped by 33%. Due to the lack of data for 2010 at the Rzeszów - Jasionka Airport, the change in the number of served passengers was calculated for the period from 2011 to 2015. During this period, the number of served passengers dropped by 22%.

Chart 8 refers to the number of flight operations performed at the airports under analysis (Figure 8). The smallest number of general aviation operations is performed at the airport in Kraków - Balice. This may be due to restrictions on the airport's accessibility to the general aviation segment, which are contained in the airport's operational document. The most noticeable is the steady increase in the number of general aviation operations at the Katowice International Airport - Pyrzowice, which is not supported by any changes in the port infrastructure and may result from a more friendly approach of the port authorities to general aviation. In the case of airports in Rzeszów and Wrocław, the number of operations in general aviation does not show strong changes and is evidence of a constant grounding of these airports and their position in General Aviation flights service.



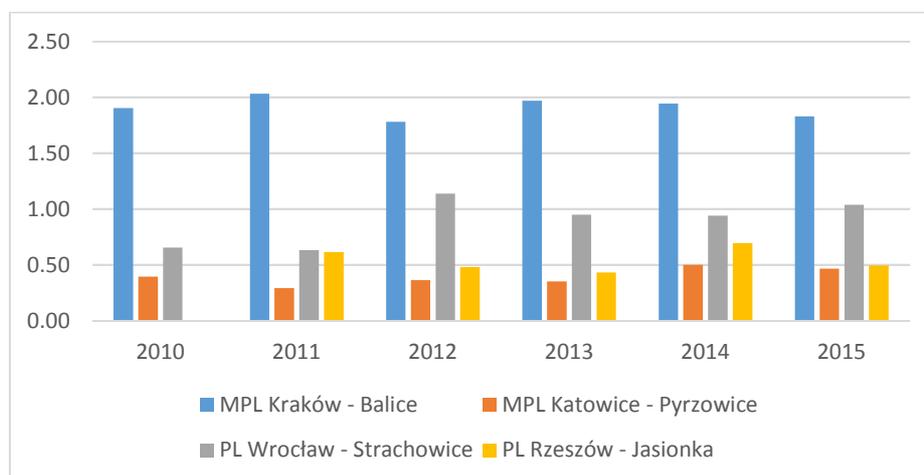
8. Number of general aviation operations carried out at the analyzed airports in 2010-2015
(source: own work)

Chart 9 shows the percentage share of general aviation operations in the total number of operations in the analyzed airports. This is an example of the dependence of the size of an airport on the size of General Aviation's share of flights. The larger the airport, the smaller the share of general aviation and vice versa. In the case of the largest analyzed airport - Kraków airport - Balice - the maximum share was 7.22% in 2010 and fell to the minimum value in 2013, reaching the value of 4.31%, in 2015 it was 4.52%. The largest share of general aviation segment flights can be found at Rzeszów - Jasionka airport, where the minimum value in the analyzed period was 25.58% in 2014, and the largest part of General Aviation port operations was recorded in 2011, when the general aviation segment was responsible for 34, 91% of all air operations carried out at that airport.



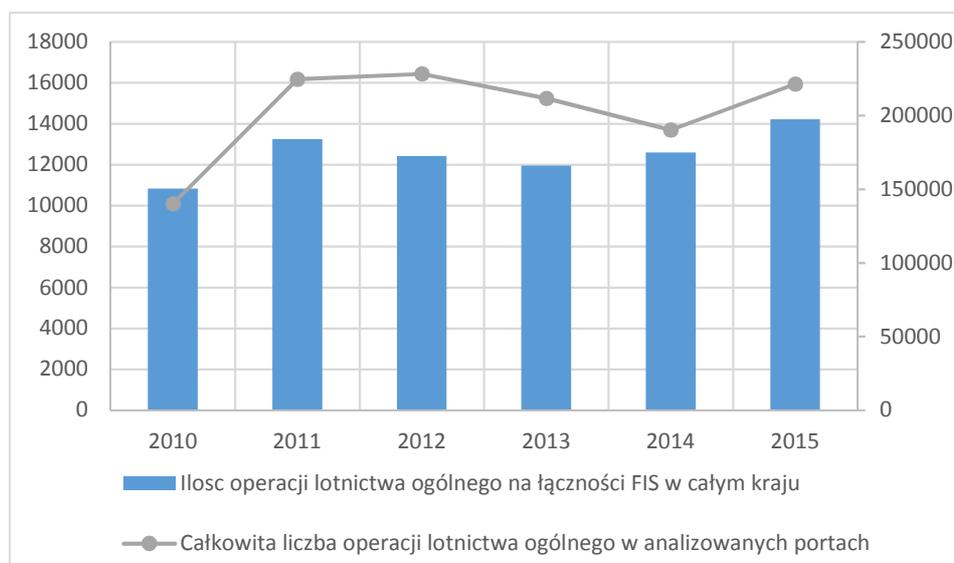
9. The percentage share of general aviation operations in relation to the total number of operations performed at analyzed airports in 2010-2015 (source: own study)

Chart 10 shows that the most filled aircraft operate from the airport in Kraków and Wrocław. In Kraków, the average number of passengers fluctuates around 2, while in Wrocław it is an average of 1 passenger per flight operation. In the case of the other two airports, the average plane being full is only 0.5 passengers per flight. Such values allow determining the structure of general aviation flights at individual airports. The passenger served is considered to be a person flying on an aircraft which is not a member of the crew, so the average filling below 1 passenger per operation allows to conclude that these ports have the advantage of non-passenger operations, i.e. for example school flights or flights related to aerial work. The highest filling is characteristic of flights to and from the Krakow-Balice International Airport, so you can assume that it is this airport that mainly handles business flights.



10. Number of passengers served per one aircraft operation under general aviation at the analyzed airports in 2010-2015 (source: own study)

Diagram 11 presents a summary of the entire analysis. It is noted that the volume of general aviation traffic in the whole country is developing very much like general aviation traffic at the analyzed airports. Despite the differences in general aviation traffic at individual airports, in the overall picture, the general aviation segment looks very good and still has great potential for development.



11. Total number of general aviation operations at the analyzed airports with the total number of operations performed on FIS communications in Poland in 2010-2015 (source: own study)

Summary

According to the analysis, several relationships can be observed that shed new light on the general aviation segment. Each of the ports has a different structure of air operations. The general aviation segment in the whole country is growing every year, however, the analysis shows that not every analyzed airport can see an analogous increase. There is not enough infrastructure to handle both general aviation and communication aircraft at the same time. Various types of restrictions are issued, which, as a consequence, discourage people from using the services of individual airports.

Depending on the airport, the situation is different. All kinds of investments are carried out in such a way as to develop communication aviation as much as possible. The only port that has a strong service base for general aviation is the Rzeszów - Jasionka Airport, where it is possible to service both jet and piston aircraft. The International Krakow-Balice Airport, in spite of the very high traffic, there is no suitable hangar station enabling service of communication airplanes and general aviation.

In the case of the largest analyzed airport - Kraków - Balice, general aviation operations are very limited, and this movement is mainly limited to the operation of business aircraft, especially those with jet propulsion. The airport is used by businessmen, but there are no operations of a school nature or operations during the execution of aerial work. In the case of smaller airports, the type of operation structure is more diversified, as evidenced by the parameters analyzed, as well as the size of the accompanying infrastructure, which allows machine operation and service.

Similar conclusions arise for airports in Katowice - Pyrzowice and Rzeszów - Jasionka, where the filling of machines is also very low. Probably the majority of operations in these ports are, like in the case of Wrocław - Strachowice airport, school flights and flights related to the performance of aerial work.

At the airport - Rzeszów - Jasionka, the share of general aviation flights in the analyzed period constituted a maximum of 34.91% of all flights performed at that port. For the largest analyzed airport - Kraków - Balice, at the peak of the percentage of general aviation flights constituted a maximum of 7.21% of all flights operated at that airport.

At airports, there is a large variation in general aviation traffic. These ports differ in the structure and size of the traffic being handled. However, summing up the results for all analyzed airports and imposing them on the graph of total air operations in Poland, it can be

seen that this movement is very similar to each other. A more liberal approach to this segment is needed as well as the improvement of airport infrastructure intended for operating General Aviation aircraft. It may also contribute to the increase in the volume of general aviation traffic at airports and allow the segment to be an important source of income for airport operators.

The general aviation sector in Poland is not yet fully used. Its advantages are still being discovered, it is possible that in a short period of time there will be an even more significant development due to the change of regulations concerning aeroclub airports. This will allow for more complete use of this infrastructure when connecting to airports, which in turn can significantly contribute to the development of air traffic. Another important aspect is the liberalization of regulations and the development of existing airports towards the general aviation segment. The creation of special parking aprons, hangars for operating and storing aircraft machines, and finally special terminals enabling efficient service of passengers as well as preparing the flight crew will significantly improve the functioning of this segment. In Poland, typically business aviation is developing faster, managing airports will not have problems finding tenants for hangar surfaces both among service companies and among the owners of aircraft, which are arriving every year in Poland. An example is the airport in Krakow, where the newest Learjet 75 airplane, belonging to one of the Małopolska province companies, stays under the open sky, and during longer breaks in operations could be hangared, for which the owner would certainly be willing to pay.

The key task for each port is to prepare an infrastructure consisting of the following elements:

- construction of special parking slabs for the general aviation segment,
- construction of terminals intended for General Aviation traffic service equipped with a part for passenger service and a part for crews enabling preparation for the flight,
- construction of technical facilities enabling ongoing servicing of aircraft,
- construction of a hangar base enabling safe storage of aircraft during long stops.

In addition to the development of the analyzed airports, the same infrastructure development should apply to airports of local significance. This is not about replicating unsuccessful patterns, such as the construction of the airport in Gdynia - Kosakowo or the smallest airport currently in Radom - Sadków. Better use of local airports should take place through the construction of paved runways with a length of about 1200 meters, enabling the landing of a small jet and turboprop aircraft, construction of a hangar and technical-administrative facilities. Such preparation of local airports in connection with the existing airport network is able to ensure efficient displacement of aircraft in Poland. This type of transport is an alternative to travel by road or rail.

The Polish Aero Club together with the Institute of Aviation in Warsaw even developed a special project named DART [15]. Its purpose is to use the existing airport infrastructure to operate private aircraft that take up to 9 people on board. The project provides for the activation of, inter alia, existing aerodrome airports. Airplanes will be used for transportation by private owners, flying clubs, training centers, thanks to which the owners will reduce the costs of aircraft maintenance. The main assumption of the program is its availability 365 days a year, for use for journeys lasting no longer than 4 hours and for a distance of no more than 1000 kilometers.

Maybe soon the use of the aircraft will be just as common in Poland as car ownership. An appropriate awareness of future passengers and customers that the plane is not an expensive means of transport, will increase the number of general aviation operations and significantly contribute to its faster development in Poland.

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