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THE POTENTIAL POSSIBILITIES OF USAGE OF EXISTING AERODROMES AND LANDING STRIPS NETWORK IN POLAND IN ASPECT OF THE "SMALL AIRCRAFT TRANSPORT SYSTEM" (SATS) CONCEPTION

Summary. The analysis of passenger transport, being made in recent years, indicate that Poland is one of the fastest developing countries in Europe, also in this aspect. It is envisaged that GA traffic will increase until 2012 by approximately 4 % annually. More and more people use air transport, the amount of available connections is increasing as well as the amount of passengers served. Such development we owe, first of all, to entering Poland into the European Union and full opening of polish airspace. All this constitute great opportunity to firms and air traffic operators but also considerable challenge in the form of necessary adaptation of infrastructure to market demands. It is assumed that further development of air transport in Poland will be supported by liberalization of air traffic law regulations, both domestic and international, including liberalization of international agreements, which would make possible construction of new airports, opening new connections and entering into polish marketplace new air carriers. Indispensable condition of proper utilization of growth potential is constant development of airport infrastructure and increasing effective usage of airspace in a way, which ensures necessary capacity to intensifying air traffic.

POTENCJALNE MOŻLIWOŚCI WYKORZYSTANIA ISTNIEJĄCEJ SIECI LOTNISK I LĄDOWISK W POLSCE W ASPEKCIE KONCEPCJI SYSTEMU TRANSPORTU MAŁYMI SAMOLOTAMI

Streszczenie. Analizy przewozów pasażerskich w ostatnich latach wskazują, że Polska jest jednym z najszybciej rozwijających się krajów Europy. Prognozuje się, że ruch GA będzie wzrastał średnio o 4% rocznie do 2012 roku. Coraz więcej osób korzysta z transportu lotniczego, zwiększa się liczba połączeń i obsługiwanych pasażerów. Rozwój ten zawdzięczamy przede wszystkim wejściu Polski do Unii Europejskiej i pełnemu otwarciu polskiego nieba. To ogromna szansa dla przedsiębiorstw jak i operatorów lotniczych, ale także istotne wyzwanie polegające na konieczności dostosowania infrastruktury do potencjału rynku. Zakłada się, że dalszemu rozwojowi przewozów lotniczych w Polsce sprzyjać będzie liberalizacja prawa lotniczego zarówno krajowego, jak i międzynarodowego, w tym liberalizacja umów międzynarodowych, umożliwiająca budowę nowych lotnisk, otwieranie nowych połączeń i wkraczanie na polski rynek nowych przewoźników. Warunkiem właściwego wykorzystania potencjału wzrostu jest ciągły rozwój infrastruktury lotniskowej oraz zwiększanie efektywności

wykorzystania przestrzeni powietrznej w sposób zapewniający niezbędną przepustowość dla rosnącego ruchu lotniczego.

1. INTRODUCTION

The purpose of regional air transport is to serve local (domestic) market usually characterizing itself by limited demand for transport, which conditions utilization of SATS aircraft. The purpose of this paper is to investigate possible usage of existing airports and aerodromes for Small Aircraft Transport System on the territory of Poland. Taking into account targets and intentions, which are expected to be met during designing SATS airports, a draft of requirements concerning airport infrastructure and organization of aircraft and passengers traffic within those airports was worked out.

Most important is to select the proper location of airports from the network of already existing aerodromes and landing strips. The selection must be conforming with comprehensive analysis of all aspects involved with establishing of a public airport. It is assumed that designed SATS airports should meet ICAO standards and that planned amount of air traffic operations performed in them should not exceed 50.000 per year. The development possibilities of GA aviation in Poland indicate that working out a conception of developing SATS aviation on polish territory would influence positively on economic and social development in general.

2. IDENTIFICATION OF ALL POLISH AERODROMES AND LANDING STRIPS

According to the paper, in Poland were identified 186 aerodromes and landing strips, from which only 12 are now used for commercial purposes. Current state of aerodromes in Poland, multilevel classification and numerical data of all identified aerodromes and airstrips are presented in. In the face of increasing demand and infrastructural potential, there are solid justifications for undertaking initiatives concerning regional air transport, taking into account economic, social and territorial conditions. Such initiatives would be an important development stimulus for many regions. Current state of airports in Poland is unsatisfactory in comparison with Western European countries. As an average, 1 airport in Poland serves 3,2 mln citizens, when in Western European countries circa 460.000. This means that in certain regions of Poland passengers must travel over 200 km to get to the nearest airport.

3. PROJECT OF NATIONAL DEVELOPMENT PLAN OF SMALL AIRPORTS NETWORK IN POLAND

Development of airport network in Poland will be realized by means of expansion and modernization of existing commercial airports as well as adaptation and utilization of former military and sports-utility aerodromes. Decisions concerning construction and putting into service new airports will be taken only after wearing out possibilities of expanding and modernization of existing airports.

Referring to the draft of development of SATS airport network the following directions of action should be taken into account:

- modernization and expansion of polish airports infrastructure, anticipating increase in demand, in a way not constraining development of air services and simultaneously improving availability of such services as well as eliminating isolation of certain regions. As a first step, existing airport infrastructure will be used. Then a programme of its expansion will be undertaken, especially in regions of worst availability to air transport;
- improving regional and local availability of airports, taking into special account bigger agglomerations. To such an end coordination of long-term projects of aviation infrastructure development with plans of country-wide and regional territorial development will be

indispensable. As a result, possibility of preparing areas for constructing and developing airports and accompanying infrastructure, including road and rail network, should be available;
- including airport network into country-wide and UE-wide network of intermodal transport.

Activation of regional airports development will demand - simultaneously to organizational and investment activities – undertaking initiatives and promotions ensuring:
- elimination from air traffic regulations and executive instructions loopholes and contradictions as well as implementation of more liberal, consistent with the Chicago Convention, signed 7th of December 1944 in Chicago and EU regulations, law system;
- solving the problem of management of aerodromes jointly used by military and commercial aviation by means of defining most important tasks for them, according to defensive demands and regional development.

National Project of Developing Small Airports Network in Poland should take into account utilization of existing military, sports (aero-clubs) and other aerodromes. It would be indispensably linked with their modernization and enlargement, enabling realization of SATS system assumptions.

The problem of reducing number of military aerodromes is becoming very important because of reduction of armed forces as a whole and liquidation of air force regiments, which have used 2-3 aerodromes (one on permanent basis and two, or three, as reserve). The presence of military on the aerodromes protects them against local authorities initiatives, which wants to use them for other purposes. The aerodromes, devoid of buildings and with areas ranging from tens of dozens to several hundred hectares, are attractive locations of SATS airports.

The network of military aerodromes in Poland is well developed. The largest concentrations of military aerodromes are in region of Pojezierze Pomorskie. Those aerodromes have, as a rule, runways with hardened surfaces as well as radio-navigation and illumination systems for guiding approaching aircraft. Since 1990 the military have been systematically reducing amount of air force units, which results in closings of succeeding aerodromes. Some of them could be modernized and adapted to functioning in SATS framework.

The concept of utilization of sports aerodromes should be based on several to dozen or so aerodromes situated near cities, which are distant from bigger airports. Sports aerodromes have different equipments and surfaces but all of them need investment outlays if they are to be used for transport needs in the SATS framework. Designating list of those aerodromes is difficult because much depends in this matter on local self governments and especially on their vision of economic and social development as well as their decisions and consequence in action.

4. THE CRITERIONS OF CHOOSING LOCATION

The problem of designating location is always linked with contradiction of interests of local community, which inhabits area near planned construction site. In the process of making selection criterions, public interest should be taken into account. One should bear in mind, however, that some people would be always opposing construction of an airport regardless of actual circumstances, like convenient location from air transport feasibility point of view or indirect solution foreseeing utilization of existing infrastructure.

For the purpose of designating new location of an airport for given province, the Rule of maximization and summing up of weighed usefulness was applied (1). Input data consist of features, which were divided into groups according to their importance. On the basis of the Rule of maximization and summing up of weighed usefulness, a variant which has reached highest sum of usefulness weighed, estimated for all features, was chosen.

$$S(L_j) = \sum_{i=1}^{n} W_i \cdot Z_{ij} \tag{1}$$

where: $S(L_j)$ – sum weighed for given variant L_j; L_j – possible variants of selection where, ($j=1...k$; k – number of variants); W_i – weight for feature C_i where, ($i=1...n$; n – number of weights); Z_{ij} – coefficient of given feature attribute ; G_m – groups of features with uniform weights

W_i; C_i – features where, ($i=1...n$; n – number of features); C_{ij} – measure of given feature attribute

Coefficient Z_{ij} was established for every feature separately with the purpose of normalization of given features measure attributes. The features of the same weights were divided into groups G_m corresponding to the criterions.

Table 1

Coefficients and weights for localization

		L_1		L_2		L_j	
W_1	$C_1(G_1)$	C_{11}	Z_{11}	C_{12}	Z_{12}	C_{1j}	Z_{1j}
W_2	$C_2(G_2)$	C_{21}	Z_{21}	C_{22}	Z_{22}	C_{2j}	Z_{2j}
...	...	...	...	...	...	...	...
W_i	$C_i(G_m)$	C_{i1}	Z_{i1}	C_{i2}	Z_{i2}	C_{ij}	Z_{ij}

During considerations about new locations of SATS airports, 5 criterions were chosen for which many features were designated. The created criterions represented main problems taken into account in the process of searching airports locations. On the basis of profound analysis, for every criterion suitable weight was allocated. The sum of all criterions weights was equal to 1. Problems concerning economic side, which means investments and their profitability, were not keenly examined. These problems were left to analysis by suitable experts.

The formulated criterions have made possible finding potential sites suitable for constructing SATS airports. The parameters dealing with selection of locations criterions and the results of calculations for each of them were presented in Report [7]. The above mentioned criterions include:

4.1. Criterion of communication availability of chosen locations

In this criterion relations linking given airport with other means of transport, e.g. road and rail, were taken into account. It turned out to be the most important matter and justify searching for multi-sided tasks aimed at optimal shaping of transport infrastructure and distribution of traffic streams.

From the point of view of potential passengers, the most important is the shortest possible time needed to get to the airport. But there is also second aspect of this problem. For local residents, who do not have the intention of using air transport, the best solution is to locate an airport in the longest possible distance from the city centre for the purpose of minimizing noise, environment pollution and other burdens stemming from its functioning.

Thus, the main goal was to find optimal site with the shortest time to get to and, on the other hand, situated in the longest possible distance from the city centre. That's why it was necessary to examine both the existing rail and road network and its foreseen development. In this criterion, locations with existing links to rail and road transport were more advantageous. It was assumed that it is easier to modernize existing infrastructure than to lay out new corridor for road or rail construction.

4.2. Criterion of landscape and existing infrastructure

Because of questions of safety and effectiveness of airport functioning, it is necessary to secure sufficient area free of obstructions. The area must include the territory of proper airport and considerable terrain surrounding it. For the requirements of this criterion, the limitations of given space were taken mainly into account. The areas of restricted construction around projected airports were designated.

The criterion pays special attention to question of demarcating approach to landing procedures, waiting zones and take off procedures. This is a very detailed problem and demands studying extensive records. Precise determining involves undertaking very substantial research for every proposed location. In this paper only most important areas were chosen, which were taken into account during examining obstructions on approach to landing.

4.3. Criterion of environment protection

Main dangers to environment stemming from aviation are noise and pollution. Construction of airports and flights of aircraft also have negative impact on wildlife habitations. The ecologists currently are developing various environment protection programs, which envision limitation of investments and exploitation of protected areas. One of the most important restrictions for constructing an airport in Poland is European program Nature 2000. Its main purpose is, among others, protection of birds habitats. Birds are also dangerous to aircraft. The presence of woodlands near airport is disadvantageous because significant activity of birds over such areas means direct danger of collision. Collision with a bird can be very dangerous to aircraft.

4.4. Criterion of future expansion possibility and mutual interaction of airports

Considerations about distant future should be one of the basic assumptions during analysis of the location problem. It was assumed that assumptions presented should be sufficient for next 60 years of airport exploitation. In this criterion the distances to other nearest, existing or planned, airports were examined. Proportionally to increasing distance to them, reconciling demands of approaching, take off and waiting zones procedures are becoming easier.

4.5. Criterion of starting operation time

Precise estimate of this problem is not possible. The number of protests and incompatibility of interests depend mainly on the number of residents, who will be affected by airport construction. It was assumed that the residents, whose properties will be situated in the immediate vicinity of the construction area, would be against it. Such occurrence could involve necessity of resettling. The position of local self government on this matter and also on the question of acquiring areas for construction would be of critical importance.

In this criterion existing airport infrastructure suitable for use, or the absence of it, was also taken into account. Time of starting of operations would also be affected by existing Airport Navigation Systems. This criterion was deemed of lowest importance because first of all much depends on steps, which the national government must take to facilitate acquiring areas for construction. On the basis of developed criterions in table 2 are presented suggestions of best localizations for SATS airports in every province.

Table 2

Localization of SATS airports

Province	Localization
Pomorskie	Rębiechowo, Pruszcz Gdański, Lębork, Oksywie
Kujawsko-Pomorskie	Koronowo, Bydgoszcz - Szwederowo, Chełmno,
Zachodnio-Pomorskie	Szczecin-Goleniów, Stargard Szczeciński, Mirosławiec
Lubelskie	Lublin – Radawiec, Biała Podlaska
Łódzkie	Łódź – Lublinek, Piotrków, Kamieńsk
Małopolskie	Kraków – Łęg, Kraków – Rakowiec, Pobiednik Wielki
Mazowieckie	Modlin, Mszczonów, Sochaczew
Podkarpackie	Krosno, Rzeszów – Jasionka, Mielec, Nowa Dęba
Podlaskie	Krywany, Turośń-Kościelna, Białousy
Śląskie	Trynek, Muchowiec, Rudniki
Warmińsko-Mazurskie	Szymany, Olsztyn – Dajtki, Wielbark, Gryźliny
Opolskie	Kamień Śląski, Brzeg- Skarbimierz, Namysłów
Lubuskie	Zielona Góra – Babimost, Przylep, Tomaszowo
Dolnośląskie	Wrocław – Strachowice, Legnica, Mirosławice
Świętokrzyskie	Kielce –Masłów, Komaszyce, Ruda - Kościelna
Wielkopolskie	Granowo, Bednary, Konin- Kazimierz Biskupi

The accession of Poland to EU resulted, among others, in change of character of basic activities of the state. The process of programming country's development is emerging in new form, adjusted to changed conditions. In recent years it applies especially to programming targets and priorities of using EU funds. The change represents very important stimulus for creating domestic network of air transport connections because such connections could only be created after constructing regional aviation infrastructure. The local self governments would have to decide if they are going to use sports or military aerodromes, or undertake completely new investments. It is important, however, that such decisions would be preceded by suitable scientific researches confirming their rationality.

5. SUMMARY

In comparison to Western European countries, the network of airports in Poland is insufficient. In certain regions of the country the distance to the nearest airport exceeds 200 km. Examining time needed to get to an airport, it became obvious that airports network in Poland must be completed by additional airports. And existing airports should be modernized to achieve the standards corresponding to standards in other countries. The airports indicated in the paper (tab. 2) should be expanded and equipped with suitable navigation devices to be able to serve SATS aircraft.

The proposed airports network in Poland, obtained as a result of comprehensive analysis of possible locations, would make possible:

- access to every part of Poland;
- increasing of profitability of airports;
- maintaining rapid pace of regional development;
- creating attractive network of connections for air carriers, both domestic and European;
- increasing interest of foreign tourists;
- creating alternative to low quality of road and rail connections network;
- significant lowering of unemployment rate.

As liabilities one can regard:

- indispensable significant financial investments;
- complicated process of legal and administrative procedures on every level of creating new aviation investments in Poland;
- significant threat to environment (pollution of atmosphere, noise);
- growing safety requirements concerning both air traffic control and dangers of terrorist acts.

Development of this sector of the economy should be supported by local self governments and proper management by companies, which run airports. It can be understood that this signifies suitable using of all EU funds provided for modernization and expanding of airports network and by the same token making up investment arrears and adjusting aviation infrastructure to European standards.

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