ANALYSIS OF OPERATING EFFICIENCY OF THE WARSAW CHOPIN AIRPORT

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The article deals with a task of analyzing the factors which influence the operating efficiency of Warsaw Chopin Airport and its aim is to identify the so called "critical capacity throughput" of the airport mentioned. This article is based on the theoretical knowledge in the sphere of airports capacity capabilities and specifications of particular factors which influence the capacity of airports.

K e y w o r d s: airport, critical capacity throughput, operating efficiency ,airport capacity.

1 INTRODUCTION

In order to fulfil its task, the airport is equipped with runways, taxiways, parking area, terminals, handling and ramp facilities, maintenance and repair hangars, aircraft refuelling services, rescue and fire department services.

The question of solving the airport capacity is the most extensive part of airport analysis. Operating efficiency is influenced by various factors, e.g. volatile demand, which causes changes and problems in solving the airport capacity issues. The main task of top management of the airport: to ensure the optimal utilization of the airport capacity along with its extension according to the demand expansion.

The output increase in air transportation results in the increase of airport requirements. Airport capacity planning have to be performed for long period in advance. This is the reason, why airports ought to have the analytic assumptions in the sphere of future transportation of passengers, cargo and aircraft equipment.

2 BASIC INFORMATION ABOUT AIRPORT

Warsaw Chopin Airport is the international airport in the capital of Poland, in Warsaw. It is situated in Okęcie. The Warsaw airport has been renamed after Fryderyk Chopin – a Polish pianist and composer – since 21 March 2001. It is the busiest airport in Poland.

Polish Airports' State Enterprise opened a modern terminal at Warsaw Chopin Airport for passengers and crews of private and corporate General Aviation aircraft.

General Aviation Terminal offers:
- short time of passenger and baggage handling,
- efficient border and customs control,
- the highest standard of services.

The mission of Chopin Airport is to stimulate sustainable growth of air traffic in Poland through development and efficient management of the airport infrastructure, maintaining the highest quality of service and safety standards. Air photo of the airport is in Figure 1.
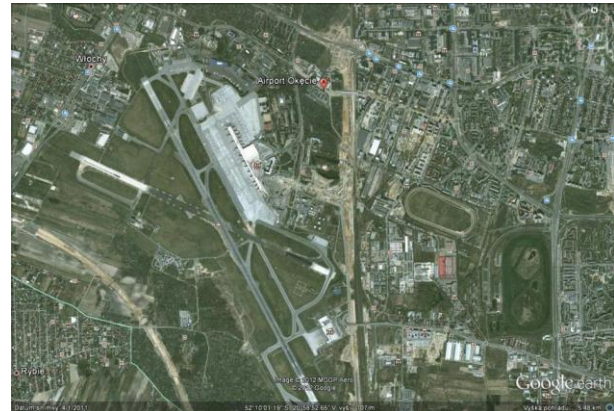

Fig. 1: Airport of F. Chopin Warsaw [1]

The vision of airport is to become a leading East Central European airport with respect to the quality of service, number of passengers and performance by 2020.

Table 1 Capacity statistics of the Warsaw Airport [2]

	Operation through the year		
	Number of passengers	**Change to previous year**	**Total Aircraft movement**
2005	7,071,881		115,320
2006	8,101,827	▲14.6%	126,534
2007	9,268,476	▲ 14.4%	133,146
2008	**9,460,606**	▲ 2%	129,728
2009	8,320,927	▼ 12%	117,353
2010	8,712,384	▲ 4.7%	116,691
2011	9,337,456	▲ 7.2%	116,693

3 THEORETICAL OPERATING EFFICIENCY OF THE WARSAW AIRPORT

3.1 Theoretical operating efficiency of Warsaw airport of check –in desks

- **average time of check-in is 3÷5 min. /PAX (Passengers)**
- number of check-in desks: **114**

According to these facts we can define:

- operating efficiency per hour of one **check-in = 12 ÷ 20 PAX/hour** (60min/ 3 ÷ 5)
- operating efficiency per hour of all check-in desks = 1.368 ÷ 2.280 PAX/hour
- operating efficiency per day of all check-in desks = 32.832 ÷ 54.720 PAX/day
- operating efficiency per month of all check-in desks = 984.96 ÷ 1,6mil. PAX/month

3.2 Theoretical operating efficiency of gates

- average time of check-in is **30 seconds ÷ 1 min. /PAX**
- number of check-ins : **45**

According these facts we can define:

- operating efficiency of 1 gate per hour **= 60 ÷ 120 PAX/hour**
- operating efficiency of all the gates per hour = 2.700 ÷ 5.400 PAX/hour
- 45 x (60 ÷ 120)
- daily operating efficiency of all gates = 64.900 ÷ 129.600 PAX/day
- operating efficiency of all gates per month = 1,94mil ÷ 3,8mil. PAX/month

3.3 Theoretical operating efficiency of runways

Runways and taxiways enable maximum **34 operating movements of aircraft per hour.**
When we expect that arrivals and departures are the same, than arrival operating efficiency is **17 aircraft per hour.**

According these facts we can define:

- medium aircraft 150 PAX = 2.550 PAX/hour → 61.200 PAX/hour → 1,8mil PAX/month
- big aircraft 250 PAX = 4.250 PAX/hour → 102.000PAX/day → 3,2mil PAX/month
- jumbo aircraft 400 PAX = 6.800 PAX/hour → 163.200PAX/day → 5 mil PAX/month

Operating efficiency of runways

Chopin Airport has two intersecting asphalt-concrete runways, which can accommodate all types of passenger and cargo aircraft (e.g. Boeing 747-400 or C5A-Galaxy).
The Airport is also equipped with an instrument landing aid system (ILS Cat. II), ensuring safe landing of aircraft in low visibility conditions (fog, blizzard etc.).

Disadvantage of intersecting runways is in the need to have both closed in case of necessary repairs or reconstructions, which results in capacity constraints. This constraints were set for the Warsaw Airport, when it was necessary to reconstruct the intersection and reduce the air traffic during four days over a specific period of time.

3.4 Comparison of the theoretical and objective operating efficiency

We will compare objective and maximum theoretical capacity of Warsaw Airport in the year 2008 according the obtained and available information. In that year the number of passenger movements was 9.460.606 and the number of aircraft movements was 129.728 – which was the top of movements up to now. We suppose that number of arriving and departing aircraft is the same, so number of passengers is 4.730.303 and number of aircraft movements is 64.864.

It then follows that:

- 12.960 PAX/day a 178 movements/day
- 540 PAX/hour a 7 movements/hour
- Average seat occupation of aircraft: $\frac{9460606}{129728} \equiv 72{,}92$
- average capacity utilization of aircraft is 72 PAX/aircraft

Theoretical capacity utilization in percentage is only 40%, when we take into consideration the lowest capacity per hour 1.348 PAX/hour. But on the other side, during peak hours, the capacity was fully utilized even exceeded what resulted in waits and delays.

3.5 Capacity of parking places and airport accessibility

Airport Warsaw offers for passengers 3700 parking places, has 4 parking areas, and two of them are storied parking lots. Airport is accessible by car, bus and until the summer of the year 2012 by underground railway.

3.6 Capacity of slots coordinating

The capacity of slots was exceeded especially in cargo transportation during night hours. These capacity limits of slots were exceeded permanently, so it was necessary to ensure coordination of cargo aircraft arrivals and departures.

4 CONCLUSION

When comparing theoretical maximal capacities of each airport Warsaw segments, it follows that the critical factor is in the operational efficiency of check–ins and with not a big distance of runways capacity, supposing the movement of departing little and medium aircraft up to 150 PAX.

This values reflect the fact of volatility of demand that airport management has to take into account. It is up to the operative management how the reserves can be utilized during peak hours.

The problem of ensuring the required capacity is not inadequate capacity but in improper organization in terms of capacity utilization.

The main reason to airline delays in peak hours consists in insufficient check-in and handling of passengers and aircraft on aprons during the peak times. We can identify two main solutions to the problem of airline peaks. The first is shifting or distributing traffic peaks over other periods of time during the day. The next approach to solving the capacity requirements is building or innovation the runways, aprons, terminals, to look for investments to buy the new technical equipments for handling, etc.

The airports have to develop such capacity models, which will guarantee reasonable and effective operation, thus fulfilling the needs of airlines, and maximally satisfying the passengers´ needs and ensure high level of convenience of transport.

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