

# DYNAMICS OF PASSENGER TRAFFIC FLOW AT VILNIUS, RIGA, TALLINN AND KRAKOW AIRPORTS

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**Abstract.** The article contains the results of an analysis of the dynamics of passenger traffic flow at Vilnius, Riga, Tallinn and Krakow airports during a period of ten years. The variation in the number of take-off and landing operations in the airports is analyzed as well. The current situation and prospects for the technical development of the airports are presented. Subjective and objective reasons related to insufficient activities at Vilnius Airport are presented. Possibilities for changing the location of the main airport in Lithuania are mentioned.

**Keywords:** transport modes, air transport, runway, taxiway, traffic flow, take-off and landing operations.

## 1. Introduction

When in 2004 the Baltic States and Poland became members of the European Union, a tourism boom started in Eastern Europe. The new highway, Via Baltica, through Poland, Lithuania, Latvia and Estonia was constructed. The railway line “Rail Baltica”, designed according to the European gauge, is planned built soon. More and more cruise ships are seen in the seaport in Klaipėda, Lithuania. Air transport is trying to be competi-

tive with other transport modes as well [3, 2].

This article contains a review of the role of air transport at the three main airports in the Baltic States. The dynamics of passenger traffic at the airports is analysed. The municipalities of Vilnius and Krakow signed an agreement for technical and cultural cooperation in 2001. According to this agreement, Krakow Airport in Poland was included in this investigation as well. The authors share the conviction that cross-border cooperation, tourism, investment and transport are those fields that generate an impulse for the

rapprochement of neighboring countries in the European Union [1]. Airports with up to five million passengers per year are known as the Small and Medium-sized Airport Group (SMAG). Olivier. Jankovec, ACI (Airports Council International) EUROPE director general, stated: “One set of objectives is to share experiences, exchange best practice, and stimulate discussion on issues of common interest. A second set of objectives is to allow ACI EUROPE to gain in-depth knowledge of the issues and interests specific to small and medium-sized airports so as to enable a better representation of interests when lobbying the EU institutions. Conversely, SMAG should allow small and medium-sized airports to get information about EU affairs and access to EU institutions.”

## 2. General information about investigated airports in the Baltic States and Poland

The busiest airport in the Baltic States by passengers per year is located in Riga and is directly connected to 28 countries. Riga International Airport was built in 1973 at Skulte, 13 kilometers southwest of Riga [6]. The airport has a single asphalt-concrete runway that is 2.550 meters long and has an elevation close to the level of the Baltic Sea (10 meters), four taxiways, and eight terminal gates. Renovation and modernization of Riga International Airport was completed in 2001, coinciding with the 800th anniversary of the founding of the city. In 2006, the new north terminal extension was opened. This permits separation of passengers arriving at the airport from non-Schengen countries for the time after Latvia joins the Schengen Agreement. The Latvian government, being the owner of all shares, plans to build another terminal that will be capable of handling about 10 million passengers a year. The airport also plans to build new hotels, a business park, a second pier, new parking places, a second runway, a new control tower, a new high-speed tram link to the city center, and a new check-in hall by 2013. Riga International Airport's biggest air carrier is Air Baltic. In 2006, the airport served 2.5 million passengers.

Vilnius International Airport is the largest civil airport in Lithuania. It is located 7 kilometers south of Vilnius, the capital of Lithuania [7]. Operations began in

1944; the old terminal was built in 1954. In 1998, the modern terminal with eight terminal gates for departure was opened. The airport has a single asphalt-concrete runway that is 2.500 meters long and has an elevation of 197 meters. Vilnius International Airport is state owned and was established by the Lithuanian Ministry of Transportation in 1991. Vilnius International Airport is a fast growing airport that receives over one million passengers per year (1.45 million in 2006). It is the largest of the four major airports in Lithuania. A new terminal for separation of passengers arriving at the airport from non-Schengen countries will be opened in the first quarter of 2008.

Tallinn Airport is the largest airport in Estonia and the home base of the national airline Estonian Air [8]. Tallinn Airport is open to both domestic and international flights. It is located approximately 4 kilometers from the city center of Tallinn on the eastern shore of Lake Ulemiste. The airport has a single asphalt-concrete runway that is 3.070 meters long and 45 meters wide, four taxiways, and eight terminal gates. In 2006, 1.54 million passengers traveled via Tallinn Airport, an increase of 32 % from 2005.

John Paul II International Airport Krakow-Balice is an international (military/public) airport located near Krakow, 11 kilometers west of the city [5]. The airport has a single concrete runway that is 2.550 meters long and 60 meters wide and has an elevation of 241 meters. In 2006, the airport served approximately two million passengers.

## 3. Main activities at the airports of the Baltic States and Poland

Two characteristics related to the main activities of the airports were selected for further comparisons: one was passenger traffic flow and another was the number of take-off and landing operations [8, 7, 5, 6]. Comparisons of these characteristics were made for period of ten years, from 1997 to 2006. The investigation period for Tallinn Airport was one year shorter, i.e. 1998–2006. The passenger traffic flow over the past 10 years (1997–2006) in all airports is presented in figure 1.

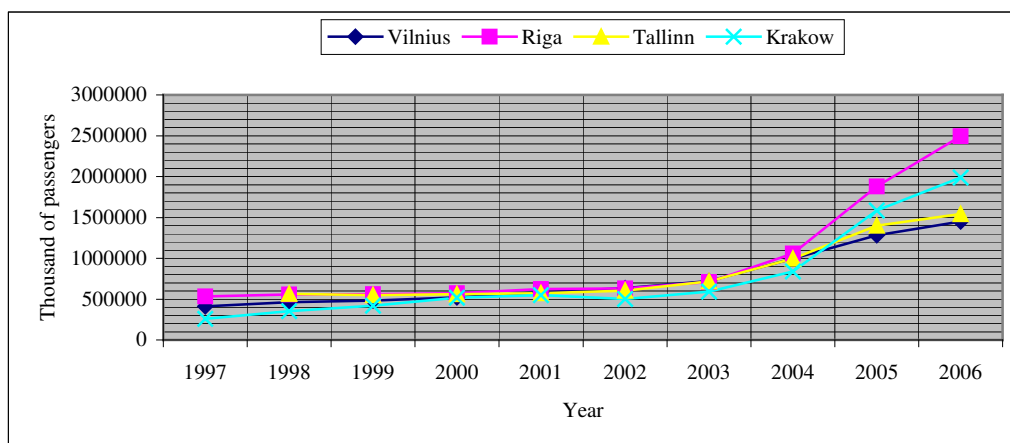
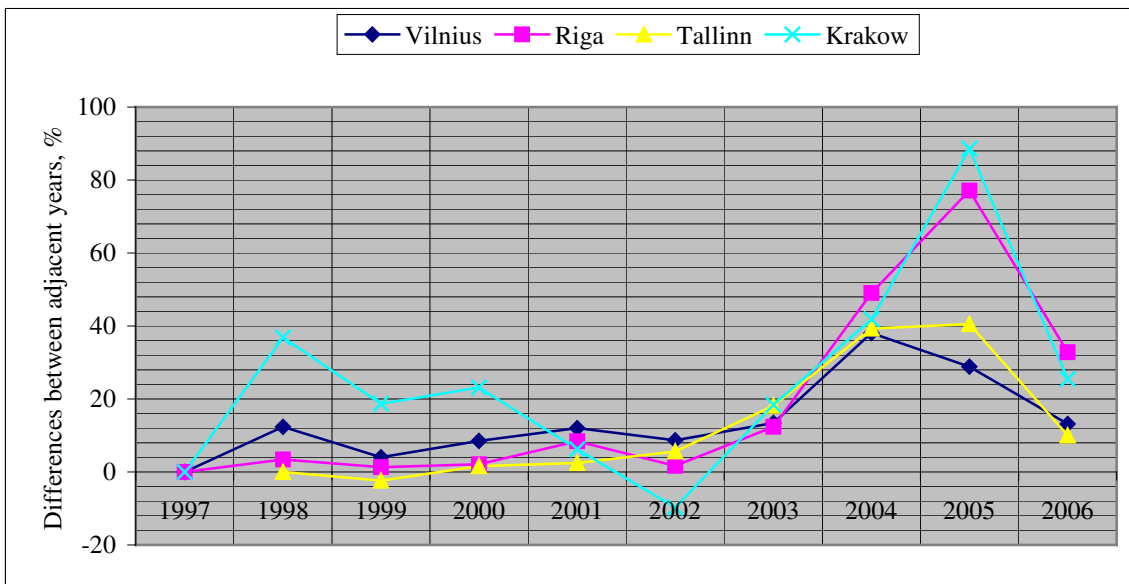


Fig 1. Passenger traffic flow at four investigated airports

Analysis of traffic flow during investigated the 10-year period (nine years for Tallinn airport) enabled the authors to observe such dependences (Figs 1, 2):



**Fig 2.** Passenger traffic flow differences between adjacent years at the airports investigated

Passenger traffic flows till 2002 increased slowly. In some cases, a decrease between adjacent years was observed (-2.4 % at Tallinn Airport in 1999 and -9.7 % at Krakow Airport in 2002). In 2003 passenger traffic flow started to increase about 15 % at all investigated airports (from 12.4 % in Riga to 18.4 % in Krakow). A considerably large increase at all airports was observed in 2004–2005 after the Baltic States and Poland joined the European Union. In 2006 the passenger traffic flow decreased but was still at a relatively high level (except Tallinn Airport). Analysis of passenger traffic flow growth trends during the 10-year period investigated (nine years for Tallinn Airport) showed that the highest level of growth was reached at Krakow Airport (7.7 times) and Riga (4.7 times) and lowest level of growth was observed at Vilnius Airport (2.5 times).

Analysis of aircraft movements (number of take-off and landing operations) was analyzed as well. The situation for this characteristic is presented in figure 3. Differences between the number of take-off and landing operations between adjacent years at the airports are presented in figure 4.

An analysis of the results presented in figures 3 and 4 enabled the authors to observe such dependences:

The number of take-off and landing operations until 2004 was increasing but in many cases negative trends between the adjacent years were observed as well. Variation from the lowest value of -9.1 % at Tallinn Airport in 2001 to the highest value of 21.2 % at Vilnius Airport in 1998 was observed. A considerably large increase related to the number of aircraft operations at all airports except Tallinn Airport was observed in 2004 after the Baltic States and Poland joined the European Union (from 29.0 % in Vilnius to 53.7 % in Krakow). The same situation was also observed at Tallinn Airport one year later (26.8 %). In 2006 the number of take-off and landing opera-

tions slowed down quite considerably. At one airport, a negative trend was observed (-1.9 % at Krakow Airport).

Analysis of the number of take-off and landing operations growing trends in the 10-year period investigated (nine years for Tallinn Airport) showed that the highest level of growth was reached at Krakow Airport (2.67 times) and Riga (2.37 times) and the lowest level of growth was observed at Tallinn Airport (1.36 times).

The degree of enlargement  $E$  for passenger traffic flow and number of take-off and landing operations every year was calculated using the following formula:

$$E = \frac{N_i - N_{i-1}}{N_{i-1}} \times 100\% \quad (1)$$

where:  $N_i$  – value of characteristic investigated in observed year,

$N_{i-1}$  – value of characteristic investigated in previous year.

A comparison of the results for passenger traffic flow and the number of aircraft operations in 2006 showed that the lowest values in both cases are for Vilnius Airport: passenger traffic flow is 1.72 times less than it is at Riga Airport and 1.06 times less than it is at Tallinn Airport, and the number of aircraft operations is 1.46 times less than it is at Riga airport and 1.22 times less than it is at Tallinn Airport. Such an unfavourable situation for Vilnius Airport is caused by some subjective and objective reasons. The main subjective reasons are related to a lack of information about Vilnius within the EU countries, the small number of cheap flights (Air Baltic proposes more than 80 cheap flights from Riga Airport and only about 20 cheap flights from Vilnius Airport, 18 air carriers operate in Riga and 12 carriers operate in Vilnius, and the slow implementation of the Safe Manage-

ment System as recommended by the ICAO [4]. The objective reasons are related to inconvenience of the geographical location of Vilnius Airport, its take-off trajectory that is under Vilnius, and strong competition from other airports in Lithuania. The inconvenience of the location of Vilnius Airport is related to the fact that the distance from the airport to the external border of the EU

countries with Belarus is too short (approximately 30 kilometers), influencing aircraft maneuvering when taking off and landing. The possibility of moving the location of the main airport of Lithuania to Kaunas, which is situated in the center of the country, should be analyzed in the future.

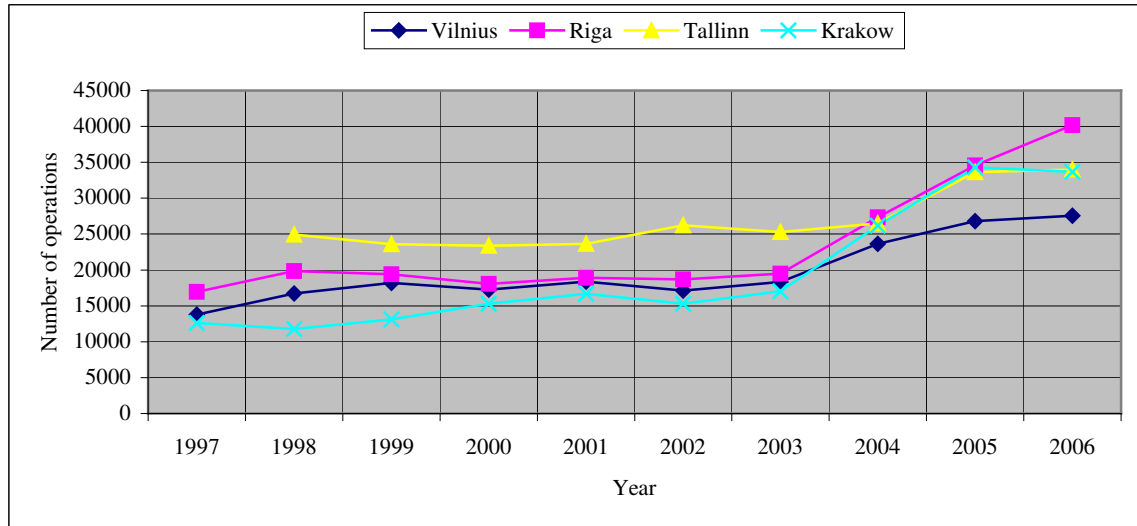


Fig 3. Number of take-off and landing operations at airports

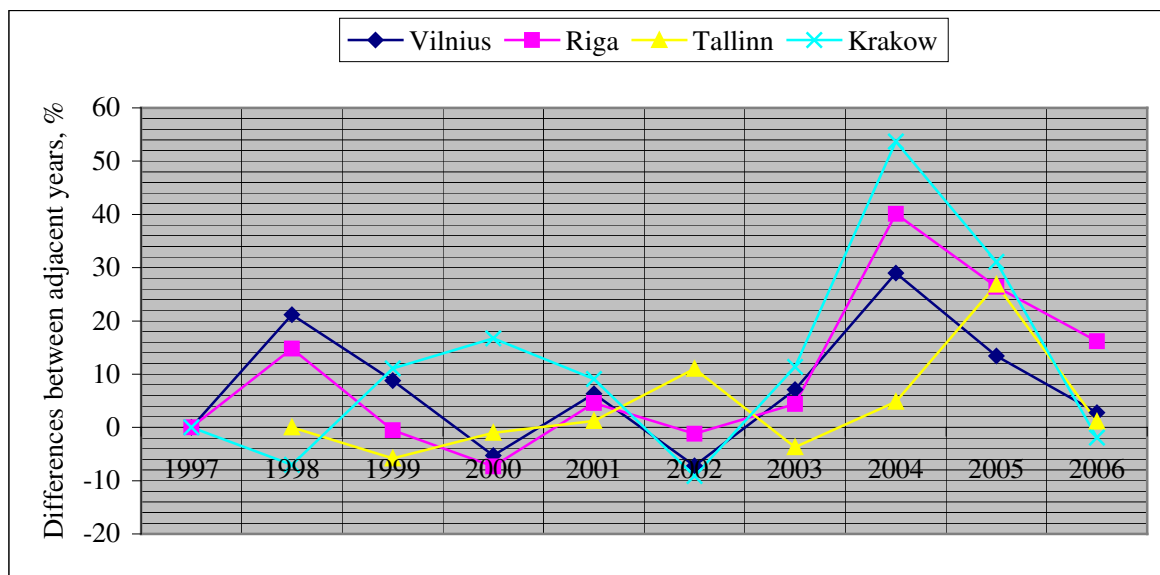


Fig 4. Number of take-off and landing differences between adjacent years at airports

#### 4. Conclusions

Analysis of passenger traffic flow growth trends in the 10-year period investigated (nine years for Tallinn Airport) showed that the highest level of growth was reached at Krakow Airport (7.7 times) and Riga (4.7 times) and lowest level of growth was observed at Vilnius Airport (2.5 times). Analysis of growth in the number of take-off and landing operations in the same period showed that the highest level of growth was reached at Krakow Airport (2.67 times) and Riga (2.37 times) and

that the lowest level of growth was observed at Tallinn Airport (1.36 times).

A comparison of the results for passenger traffic flow and the number of aircraft operations in 2006 showed that the lowest values in both cases are observed at Vilnius Airport: passenger traffic flow is 1.72 times less than it is at Riga Airport and 1.06 times less than it is at Tallinn Airport, and the number of aircraft operations is 1.46 times less than it is at Riga Airport and 1.22 times less than it is at Tallinn Airport.

The distance from Vilnius Airport to the external border of the EU countries with Belarus is relatively short (approximately 30 kilometers), creating an important inconvenience for aircraft maneuvering when making various movement operations. The possibility to move the location of the main airport in Lithuania to Kaunas should be analyzed.

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## VILNIAUS, RYGOS, TALINO IR KROKUVOS ORO UOSTŲ VEIKLOS TENDENCIJOS

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### Santrauka

Šiame tyrime keleivių srauto dinamikos palyginimui buvo pasirinktas Tarptautinis Krokuvos aerouostas ir trys Baltijos šalių oro uostai. Per paskutiniuosius trejus metus (2004–2006) daugiausia keleivių buvo aptarnauta Tarptautiniame Rygos oro uoste – 5 433 461 keleivis; Tarptautiniame Krokuvos oro uoste – 4 416 896 keleiviai. Talino oro uostas aptarnavo 3 940 366 keleivius ir galiausiai Tarptautiniame Vilniaus oro uoste buvo aptarnautas 3 727 501 keleivis. Taip pat straipsnyje analizuojamos keleivių ir lėktuvų srauto Tarptautiniame Vilniaus oro uoste gerinimo galimybės.

**Reikšminiai žodžiai:** transporto rūšys, oro transportas, kilimo ir tūpimo takas, riedėjimo takas, keleivių srautas, kilimo ir tūpimo intensyvumas.