

FAST project



m3 SYSTEMS

Future Airport Strategies

WP3: Impacts of airport strategies on traffic distribution





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WP3 SUMMARY

FAST is a methodological approach aiming at identifying the most relevant strategic options of any airport for 5-8 year time horizon and at identifying the potential changes in the airport route network resulting from these strategic options. These options are based on a three dimensions airport typology tailored to the particular environments in which the airports operate.

The developed approach in FAST can be broken down as follows:

1. Presentation of the past strategies of the analysed airport:
2. Identification of the future strategic options of the analysed case study airport by applying the methodology developed in WP2 (Ref 10):
3. Identification of a reference airport which has developed similar strategies in the past to the analysed airport:
4. Analysis of the past route network evolution of the reference airport following its developed strategy:
5. Use of this past route network evolution for the reference airport to make predictions on the future route network evolution of the analysed airport:

Added value of the FAST methodology

FAST is obviously not the first method developed to study the future evolution of airport traffic and route network but presents the advantage of being complementary to existing methodologies as illustrated in the two following reference studies:

- The STATFOR/ Challenges of Growth 2008 study (Ref 5) providing European airport traffic forecasts
- The Nigel Dennis' study (University of Westminster) (Ref 3) developing a methodology for assessing the future route network and flight schedule at a medium-sized European airport.

FAST can complement these two studies by:

- Being able to consider all airport type
- Identifying new destinations which could potentially develop in the future at the airport.
- Giving the ability to identify the conditions of achievement of the current airport plans
- Addressing airports and markets in the new member states.

Table 0-1 provides more details on the main added value of the FAST methodology compared to both studies.



Reference studies	Added value of the FAST methodology
<p><u>Challenges of growth study:</u></p> <ul style="list-style-type: none"> • Focus on current airport plans to expand capacity • Highlighting of <i>“the difficulties of achieving the plans reported by airports should not be underestimated”</i> (CG08, p. 22). • Mitigation analysis performed in CG08 = using alternative airports to reduce unaccommodated demand. 	<p>Conditions for airports to achieve their current plans:</p> <ul style="list-style-type: none"> • Ability to Identify the most relevant strategic options of airports considered in CG08 • Ability to identify the conditions of achievement of the current airport plans. • The FAST methodology = open framework for any airport, including alternative ones. • FAST in combination with the CG08 methodology on alternative airports => a more precise assessment of mitigation potential
<p><u>Challenges of growth study:</u></p> <ul style="list-style-type: none"> • CG08 provides traffic forecasts on existing routes but does not consider potential evolutions of the route network. • Need for ATM to be ready to manage a highly congested air traffic network => Importance of the evolution of the air transport route network • Urgent Issue in the emerging part of the European aviation market <p><u>Dennis study:</u></p> <ul style="list-style-type: none"> • Dennis predicts future air flows on existing origin – destinations (through a direct or indirect route) • Prediction of new origin-destination development is neglected in Dennis’ study 	<p>Potential changes in airport route networks</p> <ul style="list-style-type: none"> • FAST identifies new origin-destinations pairs which could potentially develop in the future at the airport. • FAST identifies the most probable development strategy of airports in emerging aviation markets within the present EU as well as after possible enlargement • This issue is of extreme importance in the European Union, particularly in East – West relation
<p><u>Dennis study:</u></p> <ul style="list-style-type: none"> • Use of GDP growth as demand determinant • Dennis highlights that <i>“it is necessary to consider any special or local issues that may apply to the base airport”</i> 	<p>Ability to take in consideration a set of demand determinants</p> <ul style="list-style-type: none"> • FAST provides a more complex analysis of demand determinants, such as foreign direct investments, tourism flows, foreign trade flows, household spending, regional GDP levels etc.
<p><u>Dennis study:</u></p> <ul style="list-style-type: none"> • The Dennis’ methodology works with “any” (page 313) small or medium-sized European airports • Methodology less suitable for large airports 	<p>Ability to consider all airport sizes</p> <ul style="list-style-type: none"> • The methodology developed within FAST covers all airports type in Europe

Table 0-1: Added value of the FAST methodology



Methodology application to case study airports

The FAST approach is used to identify the future route network evolution of two case study airports: Bordeaux and Bucharest airports.

Bordeaux airport is a small regional airport with an available capacity in a single-till context. The airport is in a monopoly situation but may be in strong competition with the high-speed train in the future, caused by a reduction of one hour in the journey time between Bordeaux and Paris (two hours journey time in 2016 instead of three hours). In addition, the airport has a high potential for growth in capacity (with the possibility of building a new runway and a new terminal) and a medium potential for growth in demand (by taking into consideration the population around the airport (1.5 million within 1 hour's drive) and the region's attractiveness for tourism and business purposes).

1. The **methodology developed in the WP2** of the FAST project (Ref 10) has been applied to **Bordeaux airport**, so as to identify its **future strategic options** (strategies of specialisation and strategies of diversification). This analysis leads us to conclude that the airport has two main objectives:

- Securing the loyalty of passengers and airlines
- Attracting additional low cost airlines to the platform

To reach these objectives, we identify the following future strategic options for Bordeaux airport in a 5-8 year time horizon:

Future strategies of specialisation of Bordeaux airport:

Airport accessibility improvement
Development of commercial policies to airlines
Investments in communication and marketing
Investment in a low cost terminal

Future strategies of diversification of Bordeaux airport:

Development of commercial activities
Development of services to passengers

2. **Marseille airport** which has many similarities with Bordeaux airport is identified as "**Airport B**":
 - Strong competition with the high-speed train for both airports
 - Same objectives for Marseille airport in the past as for Bordeaux airport in the future
 - Future strategic options of Bordeaux airport developed by Marseille airport in the past
3. The **analysis of the past route network evolution of Marseille airport** between 2003 and 2007 provides the following results:
 - Only 6 abandoned routes to Southern Europe, North Western Africa and West Africa
 - Main changes in the route network concern Northern Europe:
 - o Germany: 6 new routes, 3 existing routes in 2003 with a high traffic increase
 - o United-Kingdom: 4 new routes, 1 existing route in 2003 with a high traffic increase
 - o Sweden: 2 new routes, 1 existing route in 2003 with a high traffic increase



- Other changes in the route network concern southern Europe, especially with the 3 new routes to Croatia (not served in 2003)
 - Only two non-scheduled routes in 2003 become mainly scheduled in 2007
4. Assumptions are then made on the **potential route network evolution of Bordeaux airport** in a 5-8 year time horizon
- Several new routes could potentially appear in the future to Germany, Sweden, Croatia and Italy
 - At least one additional route could potentially be created in the future to Belgium, Norway, Netherlands and/or Spain
 - A potential transfer from non-scheduled to scheduled traffic on the Agadir destination could occur
 - The comparison with Marseille does not allow us to make assumptions on the potential traffic evolution on the current routes with a low traffic level

Bucharest airport is a medium-sized airport (5 millions passengers in 2007) with available capacity in a single-till context. The airport has no strong competitor but there is a growing secondary airport with low cost traffic: Baneasa airport.

In addition the airport has a high potential for growth in capacity (with the possibility of building a new runway and a new terminal) and a high potential for growth in demand (by taking into consideration the population around the airport (3 million within 1 hour's drive) and the region's attractiveness for tourism and business purposes).

1. The methodology developed in the WP2 of the FAST project (Ref 10) has been applied to Bucharest airport so as to identify its future strategic options (strategies of specialisation and strategies of diversification). This analysis leads us to conclude that the airport has two main objectives:
 - Attracting new airlines to the platform
 - Attracting new customers to the platform

To reach these objectives, we identify the following future strategic options for Bucharest airport in a 5-8 year time horizon:

Future strategies of specialisation of Bucharest airport:

Improvement of the airport accessibility
Investment in terminal capacity
Development of commercial policies to airlines
Investment in communication

Future strategies of diversification of Bucharest airport:

Development of commercial activities
Development of services to passengers

2. **Prague airport** which has many similarities with Bucharest airport is identified as "**Airport B**":
 - Both airports serve capitals and have hardly any competition in the catchment area where they act as a local hub for the based national flag carriers



- Prague is the main Czech tourist destination for short breaks, while Bucharest is emerging cultural center
 - Same objectives for Prague airport in the past as for Bucharest airport in the future
 - Future strategic options of Bucharest airport developed by Prague airport in the past
3. An analysis of the past route network evolution of Prague airport between 2000 and 2007 provides the following results:
- Twenty four abandoned routes: 8 in Northern Europe, 13 in Southern Europe, 3 in Russia and South Asia
 - Overall diversification in the airport's destinations with 34 new routes: 28 in Europe and 6 in Arab World, USA and West Africa
 - Main changes in the Northern European route network concerned the 15 new routes to the United-Kingdom mainly opened by Low cost carriers
 - New routes in the Southern European route network mainly concerned Spain (4 new routes) and Greece (5 new routes)
 - Transfer from non-scheduled to scheduled traffic on 20 routes in Germany, Greece, Spain, Portugal and Canaries Isles
 - Three Southern Europe routes (to Portugal and France) had highly developed: less than 5,000 passengers in 2000 and more than 40,000 passengers in 2007 Prague airport which presents many similarities to Bucharest airport is identified as "Airport B":
4. Assumptions are then made on the potential route network evolution of Bucharest airport in a 5-8 year time horizon
- At least 15 new routes could potentially appear in the future to Germany, United-kingdom, Greece and Spain
 - A potential transfer from non-scheduled to scheduled traffic could occur on two Spanish destinations (Palma de Mallorca and Ibiza) and/or four Greek destinations (Rhodes, Skiathos, Corfu and Iraklion)
 - The comparison with Prague does not allow us to make assumptions on the potential traffic evolution on the current routes with a low traffic level

Impacts of future changes in route network on ATM

The FAST methodology applied to two airports, Bordeaux and Bucharest, which have different characteristics and different future strategic options, helps to highlight that both airports may develop transverse new routes, i.e. routes not linking hub airports. If this trend is generalised to other European airports, the future changes in the European network may come from these new transverse routes often operated by low cost carriers, especially new Western-Eastern Europe routes.

To identify what could be the potential impacts on ATM of such future changes in air traffic distribution, we chose to interview ATM experts from several countries: France, Slovakia and the Czech Republic.

These experts were first interviewed on the past impacts of the changes in the route network (due to new routes development) on ATM. Then they were interviewed on the potential impacts of future changes in the route network on the future ATM.

They explained us the difficulty to be able giving figures on past impacts on ATM since, to their knowledge, no study assessing these impacts had been made. Nevertheless their large experience in ATM allowed them to give intuitions on the potential impacts of changes in the route network may have on ATM. These intuitions concern airport ATM as well as en-route ATM.



According to interviewed experts, new transverse routes operated by low cost carriers, may have moderate impacts on airport ATM since **this additional traffic may not be the highest generator of ATFM delays**. There are three main reasons explaining this intuition:

1. Lower contribution of medium-sized and small airports in the total European ATFM delay:

EUROCONTROL (Ref 5) explains that if the delay per flight at medium-sized to small airports is up to 50% longer than the delay per flight at large airports, delayed flights are less frequent in medium-sized or small airports. As a consequence, while additional traffic at medium-sized and large airports may have an impact on their level of ATFM delay, it should not be the main generator of ATFM delays at a European level

2. Lower increase in ATFM delays at non-hub airports:

The share of ATFM delays in the total airport delay tends to be higher at hub airports, even in case of non-congested airport. For instance, the total ATFM delay in 2007 of Clermond-Ferrand, which has a hub activity, is 47% higher than the total ATFM delay at Beauvais airport, which is a non-hub airport with flights operated by Low cost carriers.

3. Additional flights mostly operated at non-peak hours:

Low cost carriers often choose to operate flights at non peak-hours. These flights do not a priori increase the airport congestion level and consequently may have a low impact on the level of ATM delays. Between 2005 and 2009, low cost carriers strongly developed at the Lyon airport (the Air France regional hub): two flights per day operated by LCCs in 2005 and 16 in 2009 (Source OAG). However, their departure flights times are generally not at peak hours: no flights operated by low cost carriers are operated between 08:00 and 09:00 neither between 15:00 and 16:00.

The low cost carriers trend of operating flight at non-peak hours also exist at non-hub airports. For at Marseille airport, which attracted new low cost airlines between 2005 and 2009 thanks to a low cost terminal, 70% of the LCCs flights are operated at non-peak hours while this percentage only reaches 45% for Air France and 58% for other FSCs.

Combining the answers of these different ATM experts also lead to the intuitions that **new transverse routes may increase the complexity of the en-route air traffic management** if they increase the number of crossing points with large traffic flows.

The various arrows put on **Figure 0-1** and Figure 0-2 provide a rough representation of the new future destinations that could develop at 5-8 year time horizon from Bordeaux and Bucharest airports. The objective is to identify if new destinations served to and from Bordeaux and Bucharest airports may cross areas with a dense traffic level and consequently may impact the en-route ATM. Impacts on ATM could come from the increase in the volume of traffic in these dense areas and/or the increase in the number of intersections with existing traffic flows.

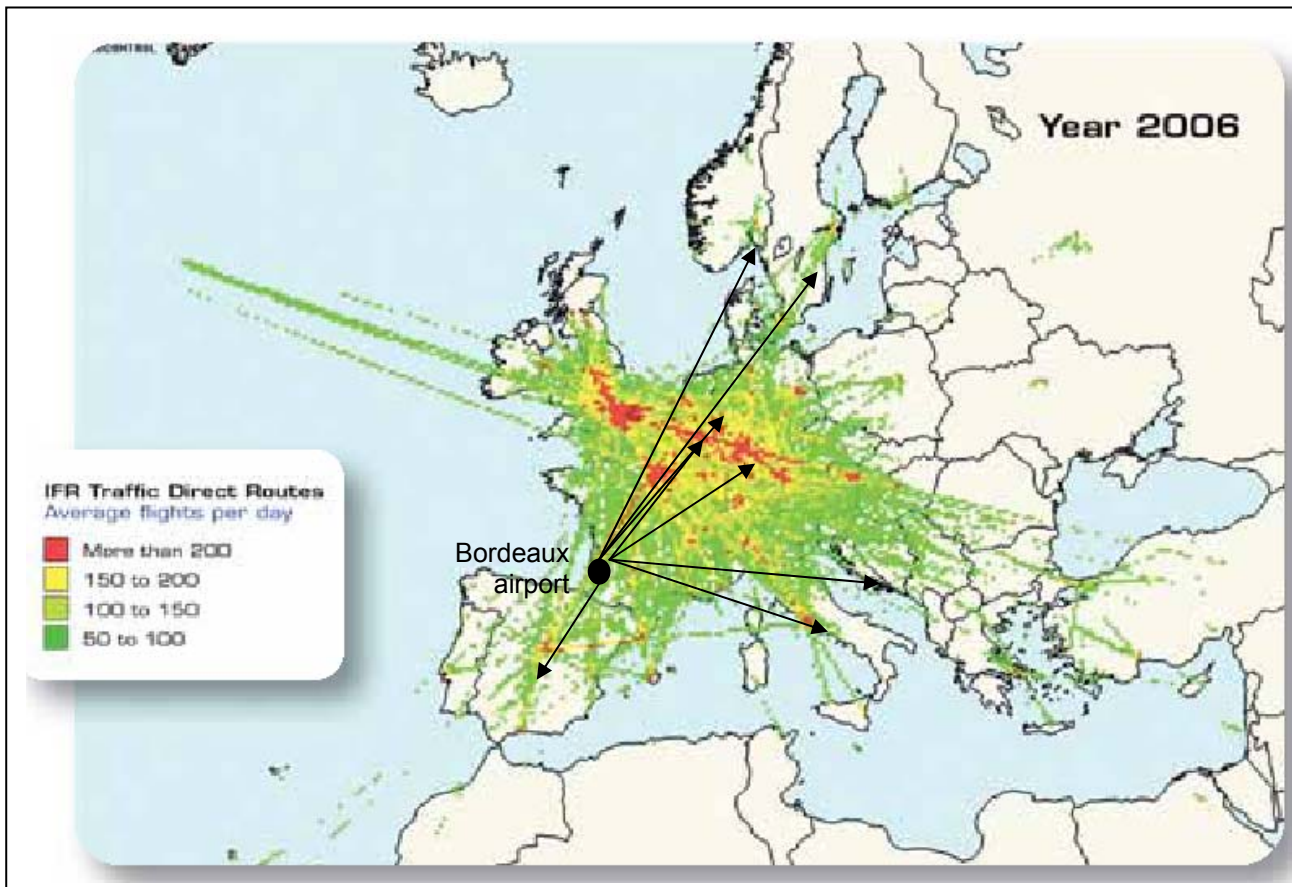


Figure 0-1: New potential destinations of Bordeaux airport
(Source EUROCONTROL/STATFOR (Ref 6))

Observation of Figure 3-6 and Figure 3-7 shows that for Bordeaux as well for Bucharest airport, new **destinations to Northern European destinations may cross areas with a dense traffic volume**. For Bordeaux airport these new destinations to Northern Europe would concern Germany, Sweden, Belgium, Norway and Netherlands. For Bucharest airport they would concern Germany and the United-Kingdom.

In addition, it is important to note that the **number of crossed areas with a dense volume of traffic could be more numerous for new traffic from Bucharest** than for Bordeaux airport. Such Eastern/ Western Europe flows may not only increase the volume of traffic in already dense traffic areas but may also significantly increase the number of intersections with numerous Northern/Southern Europe traffic flows.

One main consequence of an increase in the number of existing traffic flows intersections in areas with dense traffic volume may then be a **potential increase in the complexity of air traffic management**. This complexity increase may however be mitigated by flights operated at non-peak hours and by the volume of traffic on these new destinations.

Nevertheless, this analysis for Bucharest airport tends to highlight the fact that a **future development of Eastern/Western Europe traffic flows may impact the en-route ATM** by not only increasing the volume of traffic to be controlled but mainly by adding numerous intersections with the Northern/Southern Europe dense traffic volume flows.

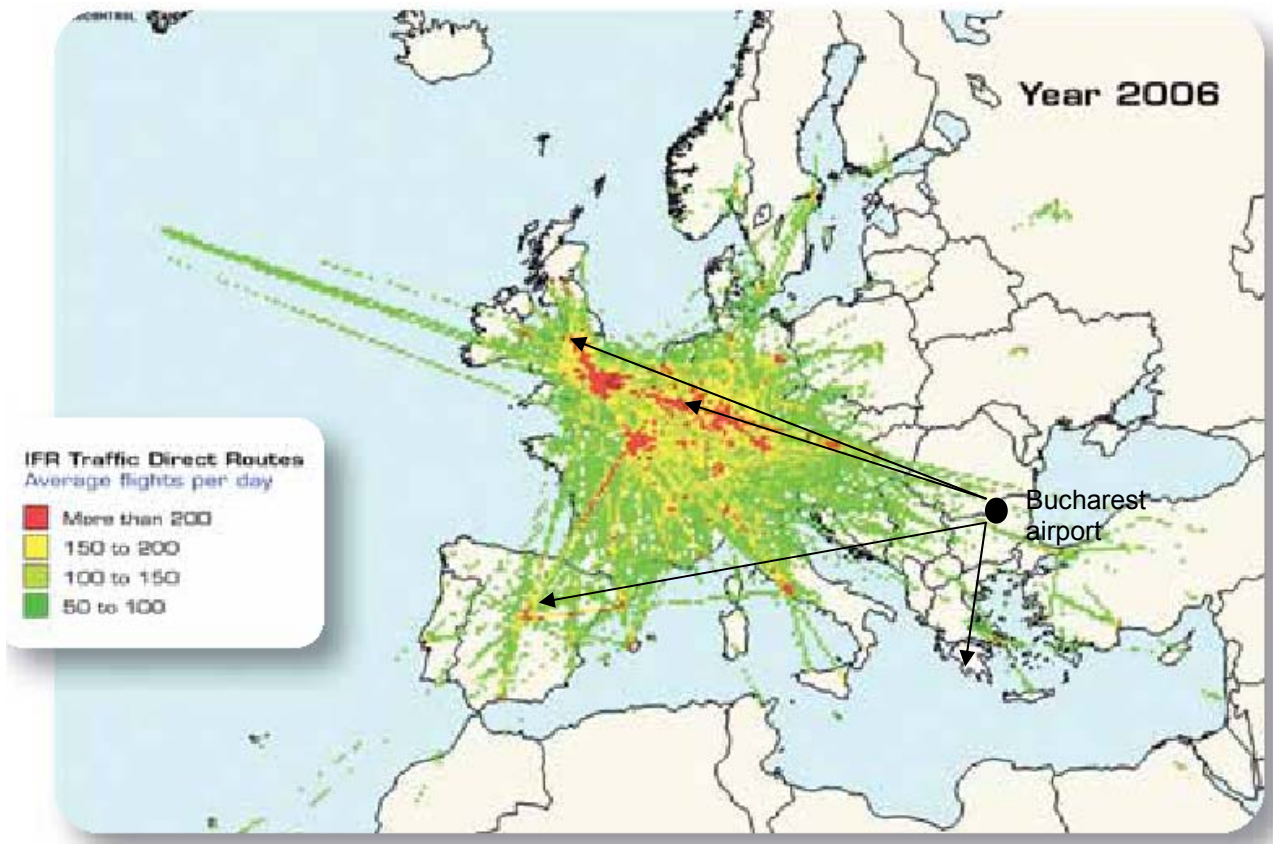


Figure 0-2: New potential destinations of Bucharest airport
(Source EUROCONTROL/STATFOR (Ref 6))

Concluding remarks

By developing an innovative methodology which allows to identify the potential route network evolution of an airport following changes in its airport strategy, the FAST project provides a complementary way to air traffic forecasts to handle the future of air transport and air traffic management.

The conceptual framework developed by the FAST project can be a very useful tool for:

- Identifying the potential strategic options which could be developed by a competing airport as well as the future network evolution of this airport. Both elements are an essential source of information **to be competitive during negotiations with airlines**. This relates to the competing airports with overlapping catchment areas as well as to the competing hub - airports.
- And more generally for **identifying the future strategic options** and assessing the network evolution of the airport and possibly of its complementary airports in case of **multi-airport management** as well as in case of **complementarity between hub and secondary airports**.

In other words, the FAST methodology is a useful tool in forecasting future network developments of many airports in Europe. By using comparisons with reference airports, network and capacity developments can be forecasted for many airports within Europe. This methodology can be used for the airport of various sizes, with various potential for growth in capacity and demand and also respecting contextual surroundings (competition, ownership and management regulation etc...).

The FAST methodology proves very useful by providing complementary information to traffic forecasts (on the future trends for air transport) and by helping to identify the potential new routes development. The usefulness of the FAST approach was confirmed by the positive feedbacks received from air transport market stakeholders, as in particular airport managers or aircraft manufacturers, during the Eurocontrol INO workshop in December 2008.



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1. Introduction

1.1 Context

During the last decade the air transport market was marked by the emergence and development of low cost carriers (LCCs). The LCCs market share in Europe was indeed multiplied by 3 in 4 years, going from 5% in 2002 to 16% in 2006.

The strong increase in LCCs market share helped to legitimate their specific requests in terms of cost and services. In particular some airports such as Marseille, Lyon or Geneva have chosen to develop low cost terminals aiming at fitting with LCCs needs as well in terms of operation as in terms of airport charges level. In other words, these airports chose to differentiate their service to airlines by proposing them to operate from terminals with different quality of service.

In the future, it could be thought that competition amongst airports will push airports to attract LCCs by reducing their charges by differentiating levels of quality for passengers. In return, LCCs may change their operation strategies: they may prefer to operate from larger airports proposing substantial charges decreases rather than smaller airports with their current airport charges. The airport passengers and airline services differentiation may therefore have an impact not only on the air transport market share but also on its structure and stakeholders: airports, airlines, passengers, Air Navigation Service Providers (ANSP), etc.

That is why it is particularly interesting and useful to focus on airport strategies so as to determine how airport strategies will evolve in the future. Will the development of differentiation strategies be amplified in the future? Which type of airport will be concerned by these strategies? Will new trends in airport strategies appear? What could be the impact of airport strategies development on the traffic distribution at airports?

The FAST project aims at providing answers to these questions by analysing the potential evolution of airport strategies in the next decade according to a defined typology of airports and by analysing the potential impacts of such future strategies of traffic distribution at airports.

1.2 Purpose and scope of the document

The present document constitutes **the final version** of the deliverable “WP3: Impacts of airport strategies on traffic distribution” for the FAST project. Work-package 3 has two main objectives:

- Determining the impacts of potential airport strategies identified in WP2 on traffic distribution at airport
- Identifying basic influence (possibly consequences) on the airport air traffic management

To reach both objectives, the analysis focuses on two case study airports on which we apply the methodology of identification of future strategic options developed in WP2 (Ref 10): Bordeaux and Bucharest. A methodology based on comparisons with other airports having developed in the past similar strategies is then developed in the scope of this Work-package 3 so as to identify the potential changes in both airport route network.

The last step of the analysis consisting in identifying basic influence (possibly consequences) on the airport air traffic management.

1.3 Structure of the document

The present document is structured as follows :

- Section 2 analyses the potential impacts of airport strategies on route networks and highlights the added value of the FAST methodology
- Section 3 identify the basic influence of changes in route network to airport air traffic management (section not filled in this draft version)



- Section 4 concludes this report

1.4 Applicable and reference documents

Ref 1 ACI Europe (2007) “ACI Europe Position on Airport Charges, ACI Europe », March 2007

Ref 2 Nigel Dennis (2007) “Low Cost Carriers and Secondary Airports”, University of Westminster, Research Paper, 2007

Ref 3 Nigel Dennis (2002) “Long-term route traffic forecasts and flight schedule pattern for a medium-sized European airport”, Transport Studies Group, University of Westminster, Journal of Air Transport Management, Vol. 8, pp. 313–324

Ref 4 DGAC (2008) “Observatoire des retards du transport aérien: Bilan de l’année 2007 », Direction des affaires stratégiques et techniques, April 2007

Ref 5 EUROCONTROL (2008) “Challenges of Growth 2008, Summary Report”, EUROCONTROL, STAFOR, November 2008

Ref 6 EUROCONTROL (2007) “A Place to Stand: Airports in the European Air Network”, EUROCONTROL Trends in Air Traffic, Volume 3

Ref 7 Geneva airport (2008) “Statistiques du trafic 2007”

Ref 8 Helios Technology Ltd (2009) “European Regional Airports Study”

Ref 9 M3 Systems, ENAC, University of Zilina (2008) “WP1: Actual air transport situation and market environment”, FAST project, EUROCONTROL CARE INO project, June 2008

Ref 10 M3 Systems, ENAC, University of Zilina (2008) “WP2: Airport strategic options and future tendencies”, FAST project, EUROCONTROL CARE INO project, December 2008

Ref 11 Thurat P.E (2008) “Comment évaluer le potentiel de développement d’un aéroport ? », Travail de fin d’étude, ENTPE, VA Transports et Territoires, Promotion 53, 23 Juin 2008

Ref 11 Transport Studies Group, University of Westminster, London (2004): Evaluating the true cost to airlines of one minute of airborne or ground delay Final Report, Edition 4



2. Airport strategies and route network

In the second work-package of the FAST project, we developed an innovative methodology allowing the identification of the future strategic options of any airport case study. Once having identified these strategic options one remaining question concerns the potential impacts of these strategies on the airport route network.

We therefore develop in this section complementary steps to the methodology presented in WP2. These complementary steps are based on comparisons between airports, which allows the predictions of the future evolutions of airport route networks.

2.1 Detailed methodology

The developed approach to make predictions of the future evolution of airport route networks can be broken down as follows:

1. Presentation of the past strategies of the analysed airport:
 - Past traffic evolution
 - And identification of the past strategies of the airport
2. Identification of the future strategic options of the analysed case study airport) by applying the methodology developed in WP2 (Ref 10):
 - Identification of the airport type according to the three-dimensional typology developed in WP1 (Ref 2)
 - First identification of the most relevant strategic options according to the airport type
 - Last refinement of the strategic options according to congestion level, competition level, airport status, regulation type, etc. to finally get the future strategic options of the airport
3. Identification of a reference airport having developed similar strategies in the past than the analysed airport:
 - Presentation of the past strategies of this reference airport
 - Presentation of the similarities between the past strategies of the reference airport and the future strategies of the analysed airport
4. Analysis of the past route network evolution of the reference airport following its developed strategy:
 - Identification of the abandoned routes, new routes, routes originally non-scheduled which became partly or fully scheduled, routes with a high level of development
5. Use of this past route network evolution for the reference airport to make predictions of the future route network evolution of the analysed airport:
 - By making comparisons with the past route network evolution of the reference airport it is possible to make assumptions for the new potential routes, for non-scheduled routes which could become partly or fully scheduled as well as for routes which could have a high level of development in the future.



This approach is used to identify the future route network evolution of two case study airports: **Bordeaux and Bucharest airports**.

2.2 Added values of the FAST methodology

FAST is a methodological approach aiming at identifying the most relevant strategic options of any airport during a 5 to 8 years time frame and at identifying the potential changes in the airport route network resulting from these strategic options. These options are based on a three dimensions airport typology tailored to the particular characteristics of an airport.

FAST is obviously not the first method developed to study the future evolution of airport traffic and route network but presents the advantage of being complementary to existing methodologies.

Sections 2.2.12.2.2 present comparisons of the FAST methodology with two reference studies:

- The STATFOR/ Challenges of Growth 2008 study (Ref 5) providing European airport traffic forecasts
- The university of Westminster study (Ref 3) developing a methodology for assessing the future route network and flight schedule at a medium-sized European airport.

2.2.1 Added value of FAST for the STATFOR / Challenges of Growth study

Making a comparison between the FAST methodology and the STATFOR/ Challenges of Growth 2008 (CG08) (Ref 5) helps to highlight the strong complementarity of the studies.

CG08 provides airport traffic forecasts in order to identify the challenges of growth for the European air transport market. The objective is to *“provide decision-makers with up-to-date assessments of the challenges presented by the increasing demand for air transport”* (CG08 (Ref 5), p1). The FAST project also aims at supporting airport decision-makers with good approaches when airport strategy is planned respecting individual local and regional contextual factors, on one side, as well as overall trends and challenges expected by Challenges of Growth 2008, on the other side.

The FAST outputs are fully in line with the CG 2008 methodological approach. The added value of FAST for CG08 in the identification of these challenges of growth concerns:

- The conditions for airports to achieve their current plans or to potentially change them in the future
- The potential changes in airport route networks which may impact congestion problems

2.2.1.1 Conditions for airports to achieve their current plans

The CG08 study focuses on current airport plans to expand capacity but highlights that *“the difficulties of achieving the plans reported by airports should not be underestimated”* (CG08, p. 22).

FAST provides an overview of the most decisive contextual factors in the airport strategic choice (ownership, management, economic regulation, competition, capacity and demand indicators) which can all influence the achievement of an airport's plan. In addition, the FAST methodology focuses on future development strategy of airports. It enables to assess the most probable shift in the airport development strategy through which airports can react on future demand.

Applying the FAST methodology to airports considered in CG08 would lead to **first of all the identification of the most relevant strategic options** of these airports and secondly the identification of the **conditions of achievement of the current airport plans**.

In addition, these conditions may also help in the mitigation analysis performed in CG08 and consisting of the use of alternative airports to reduce unaccommodated demand. FAST provides three – dimensional airports typology matrix defining airports development strategies according to the airport type. The FAST methodology is therefore an open framework for any airport, including alternative ones. The FAST method would then help with the identification of their most relevant strategic options and at the same the conditions of achievement of their current plans. By applying the FAST methodology on alternative airports (in



combination with the CG08 methodology), a **more precise assessment of mitigation potential** could be achieved in this respect.

2.2.1.2 Potential changes in airport route networks

CG08 provides traffic forecasts on existing routes but does not consider potential evolutions of the route network. Nevertheless one of the challenges of growth identified in CG08 is the need for ATM to be ready to manage a highly congested air traffic network. Evolution of the air transport route network may potentially impact on congestion levels and is one of the challenges of growth for ATM.

The FAST methodology provides a way to **identify new destinations** which **could potentially develop** in the future at the airport.

The issue of identifying potential airports route network development seems to be urgent particularly in the emerging part of the European aviation market (impacts on the rest of the market included). CG08 stresses the significant source of growth for the air transport market coming from the expansion of the European Union: *“The air transport markets of Eastern Europe are growing rapidly and have a long way to grow before maturity”* (CG08 (Ref 5), p. 7).

The FAST methodology enables the identification of the most probable development strategy of airports in emerging aviation markets within the present EU as well as after possible enlargement. Changes in an airport's development strategy can be expected with higher probability here, taking into account high potential for growth in demand. Identified airport strategic options and comparisons with pertinent airports are then used to identify potential new destinations.

2.2.2 Added value of FAST for the Nigel Dennis' study on medium-sized European airports

The study “long-term route forecasts and flight schedules pattern for a medium-sized European Airport” (Nigel P.-S. Dennis, Ref 3), aims at assessing the future route network and flight schedule at a medium-sized European airport up to 20 years ahead. The approach developed within the study is appropriate to any small or medium-sized European airport up to 20 million passengers per annum.

This study – similarly to FAST – stresses the importance of route network development and airport strategy: *“in airport planning with its long-time horizons, it is often desirable to obtain a **disaggregated forecast of aircraft movements and passenger flows**”*(page 313). Comparing both these studies, we find that although the aim is similar, the methodology is quite different. .

This difference comes down to a complementarity between both studies. The added value of FAST for Dennis' study concerns:

- The ability to take in consideration additional demand determinants than GDP
- The ability to identify new origin-destinations
- The ability to consider all airport sizes

2.2.2.1 Ability to take in consideration a set of demand determinants

In FAST we identify future airports strategies and explain the role of diverse strategic choices including the “soft” ones – such as supply of commercial policies towards airlines, customers loyalty programs etc. According to the current status of our knowledge, **FAST is one of the few methodological approaches based not only on “hard” elements of airports strategic development**, particularly on capacity - runway and terminal development.

As for the demand side of airports development, **FAST provides a more complex analysis of demand determinants**, such as foreign direct investments, tourism flows, foreign trade flows, household spending, regional GDP levels etc.

This is a conceptually different approach from Nigel Dennis' paper where *“growth rates are produced using historic relationship between air travel and gross domestic product for each country and each region in the*



rest of the world".(page 314) . Although this is fully in line with methodological refinement required by Nigel Dennis (*"it is necessary to consider any special or local issues that may apply to the base airport"* or *"...incorporating the specific adjustment for the base airport and destinations have then been applied to each market to produce an estimate of total origin and destination demand"*), he mentions only verbal examples of such issues without an attempt to cope with it in a more systematic way.

2.2.2.2 Ability to identify new origin-destinations

Dennis predicts future air flows on existing origin – destinations (through a direct or indirect route), not analyzing changes in air transport flows due to new origin- destinations. He uses data on real origin destinations of passengers obtained from airport surveys or ticket census His study is dependent upon country-pair forecasts used to predict the origin destination traffic increase. He assumes that if the forecasted traffic on an Origin –Destination is above 8000 passengers per year, a direct route will be opened.

Prediction of new origin-destination development is neglected in Dennis' study: *"The future origin and destination demand is then converted into route traffic, subject to a threshold for direct service." Where demand falls below this level, traffic is reallocated via various appropriate hubs."* The Westminster study suggests that *origin and destination demand is increased, resulting in an enlarged network of routes."*

FAST provides an approach using comparative analysis to derive new (the most probable) origin-destination pairs. FAST **helps to identify new origin-destination pairs** through which network grid is enlarged. **This issue is of extreme importance in the European Union** in which a distinct fragmentation between European regions can be observed taking into account different stage of maturity of air transport markets, particularly in East – West relation.

2.2.2.3 Ability to consider all airport sizes

The Dennis' methodology works with "any" (page 313) small or medium-sized European airports not taking into account some other airports types as well as some of contextual factors that are extremely relevant in current European aviation market: *"The approach ...is less suitable for large airports with a mature local market, substantial volume of existing traffic or capacity constraints. It does not examine diversion of surface movements to and from neighbouring airports and hence small airports in the traffic shadow of a larger airport would not be adequately represented"* (page 313). FAST – on the other hand – identifies airports typology on the base of overall European airports development and strategic airports plans strengthening the main factors relevant for the most probable airport strategy that will be followed in future. Thus, the **methodology developed within FAST covers all airports type in Europe.**

An additional strong contrast with many conventional forecasting approaches in which current trends are projected into the future. **FAST methodology can be applied not only in growth periods, but also in crisis periods** – comparing airports strategic development in various regions, various market and various circumstances.

Nigel Dennis paper and FAST can complement each other. **If data is available, Dennis' approach enables to make forecast on existing origin-destinations, while FAST enables to go further, and identify new routes resulting from formerly non existing origin-destinations.**



2.3 Case study 1: Bordeaux Merignac airport

2.3.1 Past strategies of Bordeaux Merignac airport

In order to find a way to revitalize the traffic that decreased by 8% between 2001 and 2003 (following the 11th September crisis) the airport decided to develop a volunteer strategy from 2004. The aim was to secure the loyalty of airlines and to attract new airlines (especially low cost airlines) on the platform by guaranteeing them graduated discounts on passenger fees during a three years period. This strategy proved successful since the airport traffic grew by 18% between 2004 and 2007. This large growth was mainly due to the low cost traffic increase that was multiplied by three in three years, to represent 11% of the total traffic in 2007 (source www.usinenouvelle.com).

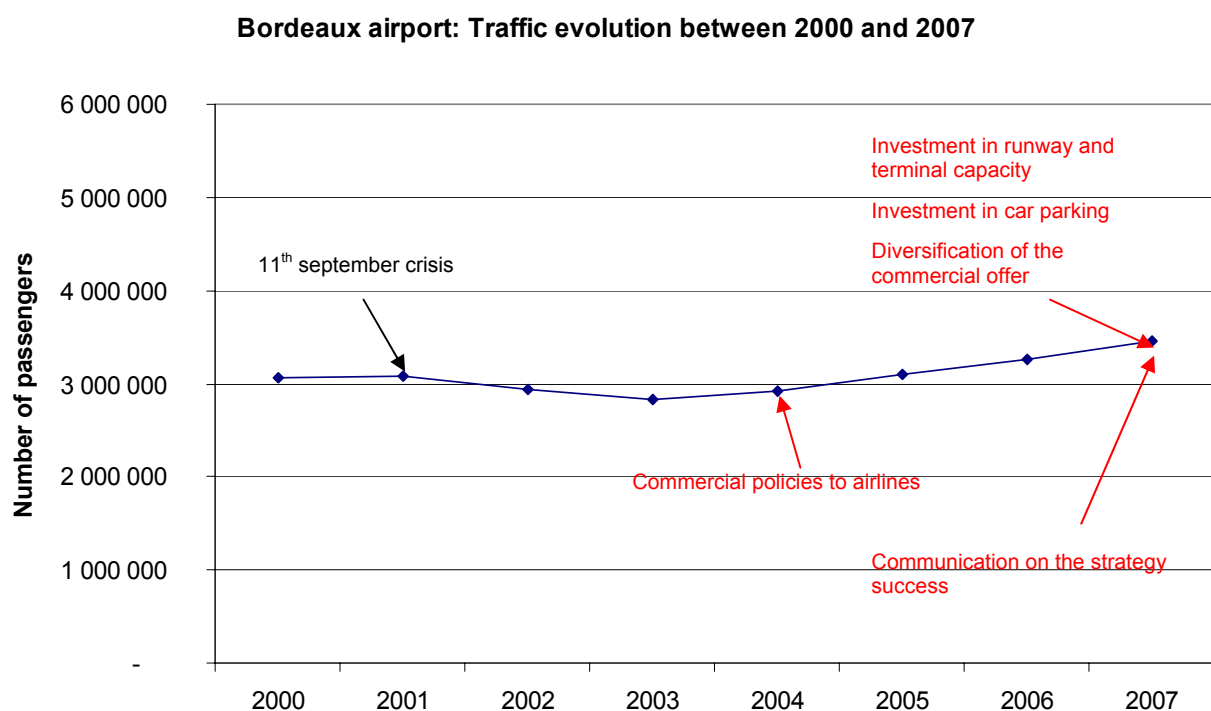


Figure 2-1: Bordeaux airport: Traffic evolution between 2000 and 2007
(Source: ENAC air transport database and Albatross Airports database)

The airport then chose to communicate on the success of this strategy and about future investments relative to runway and terminal capacity increase, as well as on the improvement of the airport accessibility thanks to investments on car parking. Other investments by the airport concerned their development of the commercial activities. The airport indeed decided to diversify its commercial offer in the airport area by building hotels and offices.

2.3.2 Future strategies of Bordeaux Merignac airport

Bordeaux airport is a regional small airport with **available capacity** in a **single-till context**. The airport is in a **monopoly situation** but may be in **strong competition with the high-speed train in the future** with a reduction of one hour in the journey time between Bordeaux and Paris (two hours journey time in 2016 instead of three hours).



The methodology developed in the WP2 of the FAST project (Ref 10) has been applied to Bordeaux airport so as to identify its future strategic options (strategies of specialisation and strategies of diversification). This methodology is broken down into 4 steps:

1. **Identification of the airport type** according to the three-dimensional typology developed in WP1 (Ref 9):). Bordeaux airport has a **high potential for growth in capacity** (with possibilities of building a new runway and a new terminal) and a **medium potential for growth in demand** (by taking in consideration the population around the airport (1.5 millions within 1 hour's drive) and the region attractiveness for tourism and business purposes).
2. **Strategies of specialisation by airport type:**
 - I. We are first of all able to make a **first identification** of the most relevant **strategies of specialisation** for airports with a high potential for growth in capacity and a medium potential for growth in demand by using Table 2-1:
 - Airport accessibility improvement
 - Development of commercial policies to airlines
 - Investments in communication and marketing
 - Investment in terminal capacity
 - Investment in a low cost terminal
 - Investment in runway capacity

POTENTIAL FOR GROWTH		CAPACITY		
		HIGH	MEDIUM	LOW
DEMAND	HIGH	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines - Communication and marketing - Terminal capacity - Low-cost terminal - Runway capacity - Infrastructure efficiency - Intermodality 	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines - Communication and marketing 	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines
	MEDIUM	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines - Communication and marketing - Terminal capacity - Low-cost terminal - Runway capacity 	<ul style="list-style-type: none"> - Terminal capacity - Low-cost terminal 	
	LOW	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines - Communication and marketing 		

Table 2-1: Strategies of specialisation by potential for growth in capacity and in demand

- II. **A check of the most relevant strategies of specialisation according to airport size** must then be made. These strategies are summarized in Figure 2-2. Bordeaux airport being a small airport all the strategies of specialisation identified in the step 1 are also consistent with the relevant strategies by airport size.

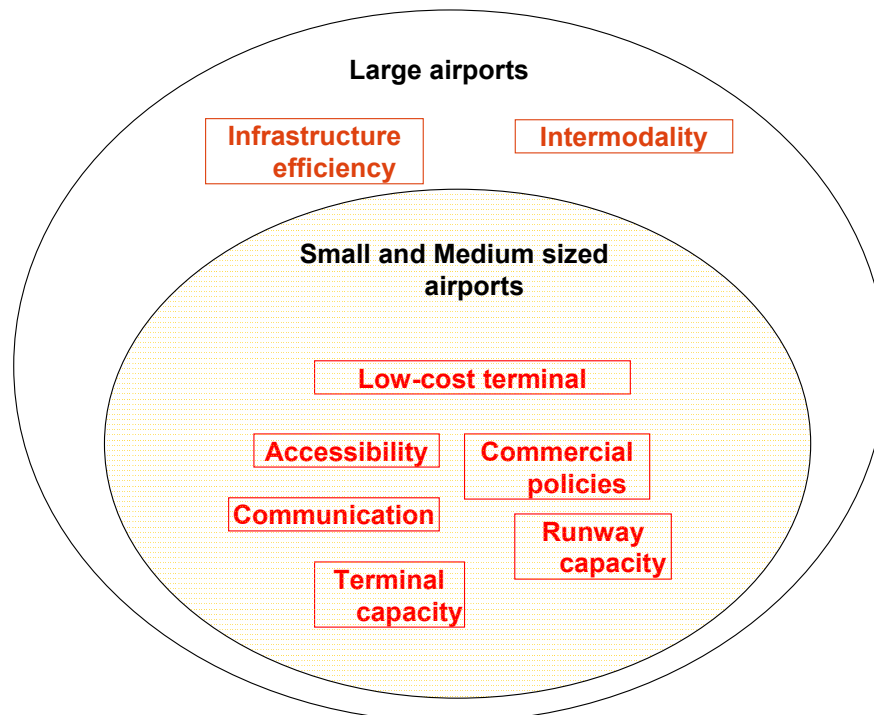


Figure 2-2: Relevant strategies of specialisation according to the airport size

3. **Strategies of diversification by airport type:** These strategies shown in Figure 2-3 that summarizes the most relevant strategies of diversification according to the airport size. Bordeaux which is a small airport, is only able to develop two strategies of diversification:
- The development of commercial activities
 - The development of services to passengers (independently from the airline chosen by the passenger)

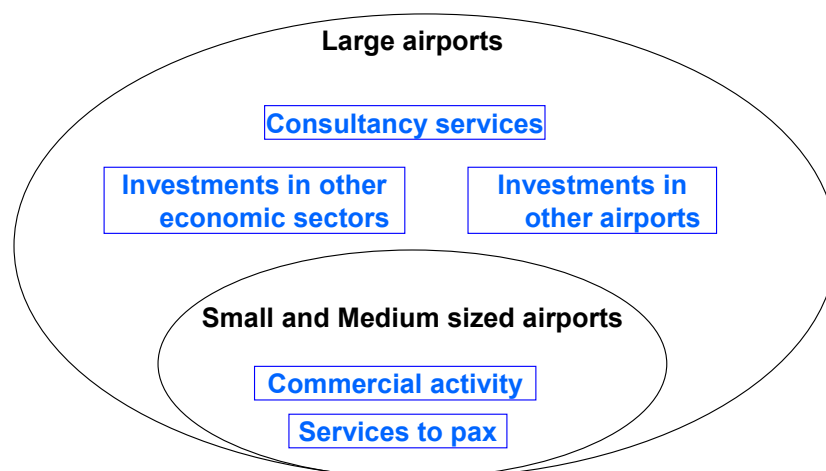


Figure 2-3: Strategies of diversification by airport group size

4. **Last refinement of the strategic options:** A last refinement of the identified strategies of specialisation and diversification is then made by taking into consideration other factors: congestion level, competition level, airport status, regulation type, etc.



- I. **Refinement of strategies of specialisation:** The information from Figure 2-4 and Figure 2-5 shows that Bordeaux airport, which will be in strong competition with the high-speed rail in the future and which has available capacity, will mainly have incentives to develop the following strategies of specialisation:
- Improvement of the airport accessibility
 - Investment in a low cost terminal
 - Development of commercial policies to airlines
 - Investment in communication and marketing

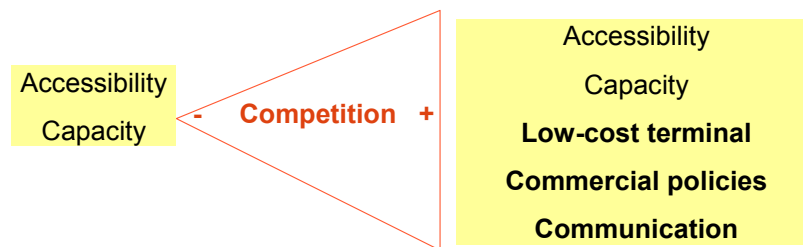


Figure 2-4: Specialisation strategies relevancy according to the level of competition

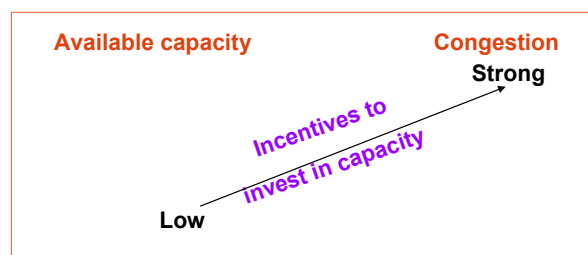


Figure 2-5: Strategy of investment in capacity relevancy according to the level of congestion

- II. **Refinement of strategies of diversification:** The information summarized in Figure 2-6 helps to identify that Bordeaux airport, which is publicly owned and managed, will mainly have incentives to develop the following strategies of diversification:
- Development of commercial activities
 - Development of services to passengers

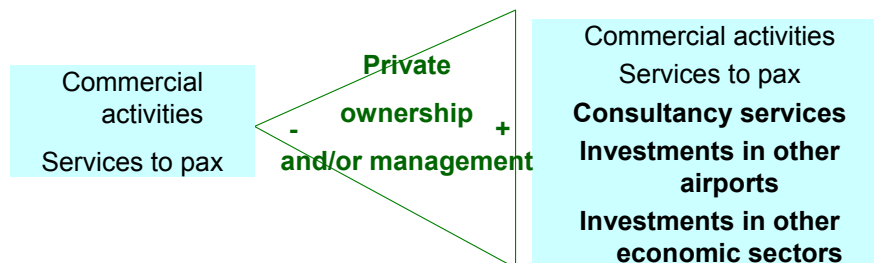


Figure 2-6: Diversification strategies relevancy according to the airport status

5. **Future strategic options of Bordeaux airport:** This analysis leads us to conclude that the airport, which may want to anticipate the future released capacity du to the strong competition with the high-speed train in the future, has two main objectives:
- Securing the loyalty of passengers and airlines



- Attracting additional low cost airlines on the platform

To reach such objectives, we identify the following future strategic options for Bordeaux airport in a 5-8 year time horizon:

Future strategies of specialisation of Bordeaux airport:

Airport accessibility improvement
Development of commercial policies to airlines
Investments in communication and marketing
Investment in a low cost terminal

Future strategies of diversification of Bordeaux airport:

Development of commercial activities
Development of services to passengers

2.3.3 Similarities with Marseille airport

2.3.3.1 Past strategies of Marseille airport

The traffic level at Marseille airport grew by 27% between 1997 and 2007. Between 2001 and 2003 the airport faced a traffic decrease due to the strong competition with the Marseille-Paris high-speed train and the Airlib Express bankruptcy (which mainly operated flights to Paris). The Easyjet arrival at the airport helped to limit the traffic decrease in 2003. In 2004, the airport, aware of the necessity to increase its attractiveness for airlines and passengers announced its idea of building a low cost terminal. Investments in this low cost terminal were made in 2005 which enabled the opening of the MP² low cost terminal in 2006. This period a strong collaboration with Easyjet first, and then Ryanair, helped the airport in its low cost terminal conception.



Marseille airport: Traffic evolution between 2000 and 2007

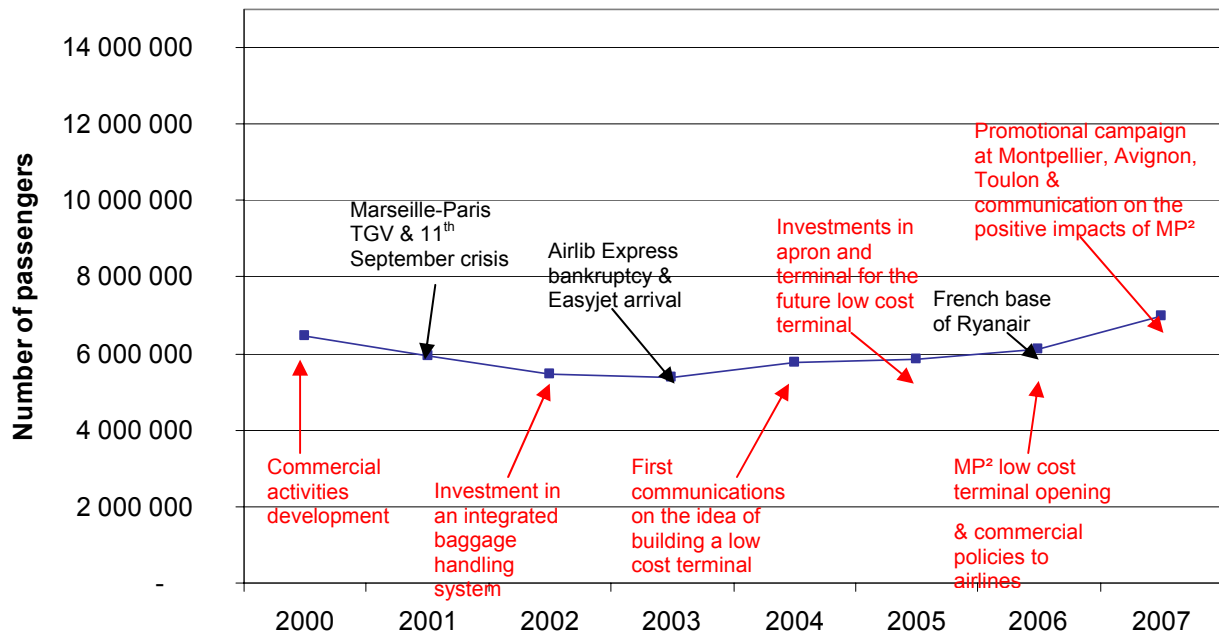


Figure 2-7: Marseille airport traffic evolution between 2000 and 2007

(Source: ENAC air transport database and Albatross Airports database)

The MP² opening had the expected impacts on the traffic that increased by 14% between 2006 and 2007. Marseille airport then chose to communicate this success by highlighting the non cannibalisation of the traffic by low cost carriers. The airport indeed stressed that the traffic increase came from MP² as well as from MP¹ (the traditional terminal). The objective of this communication was to reassure Full Service carriers of this non cannibalisation of traffic and to attract new air carriers by proposing commercial policies: 90% discount on landing, lighting and parking charges during the first year, 50% discount on the second year (Source Albatross Airports database).

In addition to this communication operation in Marseille, the airport organized promotional campaigns in neighbouring cities: Montpellier, Avignon and Toulon, so as to increase its catchment area.

An important communication action of the airport was also the association with Marseille Tourism information and the Departmental Tourism Committee to set up joint direct communication operations. The aim was to promote the region and to communicate the importance of the development of low cost airlines tickets in tourism agencies.

Besides the strong development of its strategy of communication, the airport also invested in runway capacity and developed the commercial activities. Between 2006 and 2007, the airport increased its non-aeronautical revenues by 19.3% mainly due to the spending of passengers using MP². In particular, revenues coming from the car rental activity increased by 26.8% over the period due to the increase of incoming passengers renting cars (Source Albatross Airports database). At the same time, other increases in non aeronautical revenues were:

- +16.4% on food and beverage
- +14.3% on shops
- +12.5% on other services (hotel, advertising, etc.)



2.3.3.2 Similarities between Bordeaux and Marseille airport

The current situation of Bordeaux airport presents similarities with the past situation of Marseille airport. In fact aware of the future strong competition with the high-speed train and encouraged by its attractiveness for low cost carriers, Bordeaux airport should develop a future strategy aiming at **increasing the low cost market** share at the airport while **securing the loyalty of full-service carriers**. This objective was also the same for Marseille airport.

The same strategic tools as Marseille airport could be used by Bordeaux airport to reach similar objectives than Marseille airports. One important strategic option is the building of a low cost terminal that should be opened in 2009 at Bordeaux airport and that already opened in 2006 at Marseille airport.

Same strategies of specialisation:

- Airport accessibility improvement
- Development of commercial policies to airlines
- Investments in communication and marketing
- Investment in a low cost terminal

Same strategies of diversification:

- Development of commercial activities
- Development of services to passengers

2.3.4 Past route network evolution of Marseille airport

Between 2003 and 2007 while the Marseille airport traffic (in number of passengers) increased by 30% the number of routes served by air carriers to and from the airport grew from 81 to 108 routes (Source ENAC air transport database).

Between 2003 and 2007, 6 routes ceased to operate to and from the airport while 25 new routes were opened. In total the number of routes operated to and from Marseille airport increased by 33% between 2003 and 2007.

Abandoned routes

Among the 6 routes abandoned between 2003 and 2007, 3 concern Southern Europe, while 2 routes concern West Africa and 1 North western Africa.

Region	Country	Destination
Northwestern Africa	Morocco	TANGIER
Southern Europe	Greece	CORFU
	Hungary	BUDAPEST
	Italy	BRINDISI
West Africa	Algeria	BISKRA
	Burkina Faso	OUAGADOUGOU
Total		6

Table 2-2: Routes abandoned to and from Marseille airport between 2003 and 2007



New routes

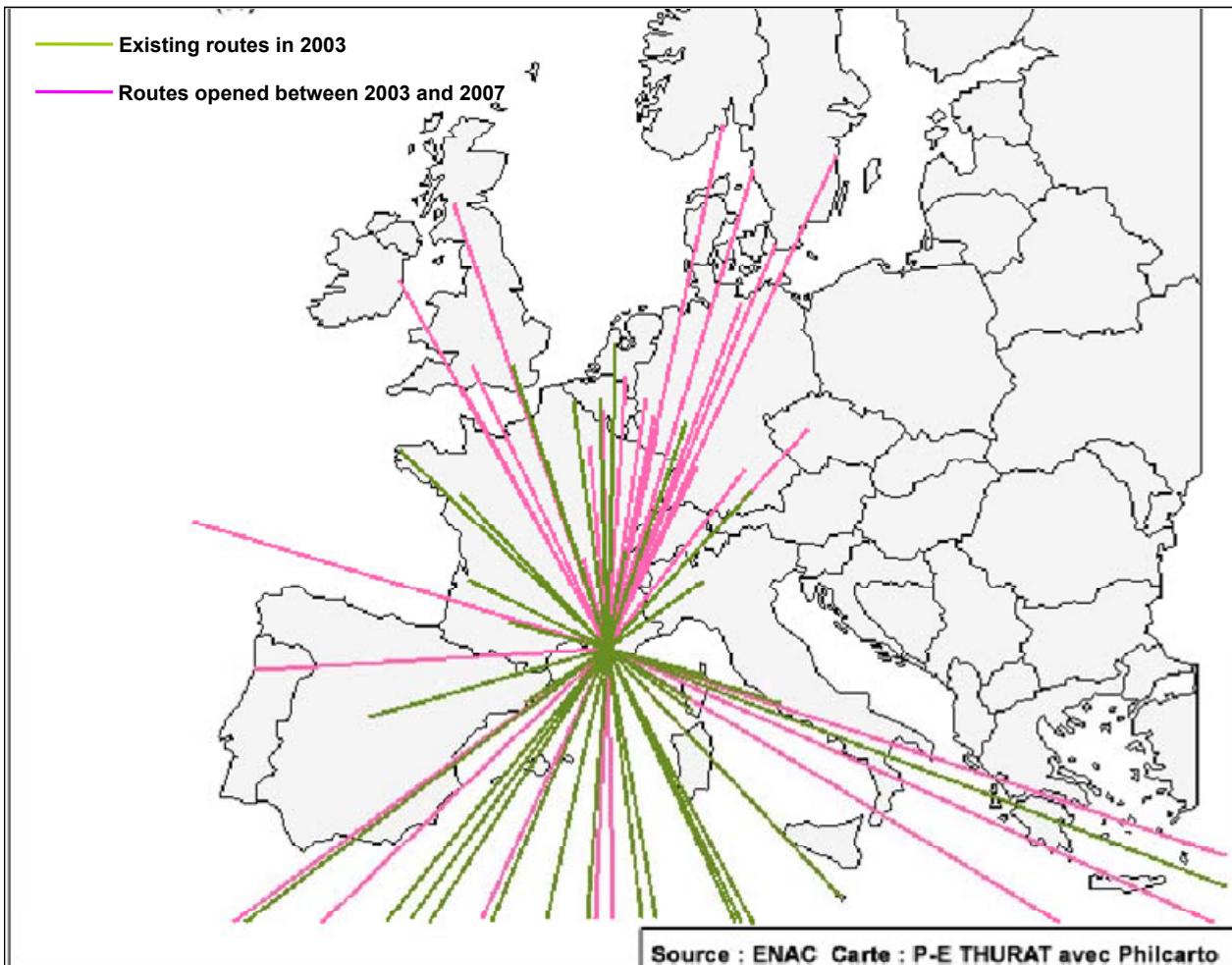


Figure 2-8: Evolution of the Marseille airport route network between 2003 and 2007

(Source P.E. Thurat (Ref 11))

Thirteen among the 25 new routes opened at Marseille airport concern **Northern Europe**. It is also interesting to note that the traffic level on these new destinations represents **78% of the total traffic on the 25 new routes**. This shows the importance of these new northern European destinations for the airport. More precisely, 8 of these new routes are for **Germany** and **United-Kingdom**.

New non domestic destinations to southern Europe tend to be less numerous and less developed in terms of traffic. Three of these new non domestic routes to Southern Europe are for **Croatia**, a country **not previously served** by Marseille airport.

New routes outside Europe also concern countries already served in 2003 by the airport, such as **Egypt, Morocco and Algeria** as well as new countries: **Madagascar and Dominican Republic**.



REGION	COUNTRY	DESTINATION	2007 TRAFFIC
ARABIAN WORLD	SAUDI ARABIA	MEDINA	1 527
CENTRAL AMERICA	DOMINICAN REPUBLIC	LA ROMANA	4 562
NORTHEASTERN AFRICA	EGYPT	HURGHAD	11 888
NORTHWESTERN AFRICA	MOROCCO	TETOUAN	1 931
SOUTHERN AFRICA	MADAGASCAR	ANTANANARIVO	12 621
WEST AFRICA	ALGERIA	SETIF	11 164
	NIGER	AGADES	1 966
NORTHERN EUROPE	BELGIUM	CHARLEROI	55 419
	GERMANY	CHLEF	21 552
		HAHN	16 579
		KARLSRUHE/ BADEN BADEN LUBECK	12 003
	UNITED-KINGDOM	BIRMINGHAM	40 000
		BOURNEMOUTH	17 755
		GLASGOW LIVERPOOL	13 711
	NETHERLANDS	GLASGOW	24 242
		LIVERPOOL	2 913
	NETHERLANDS	EINDHOVEN	103 093
NORWAY	SANDEFJORD	35 045	
SWEDEN	MALMO	27 132	
	NYKOPING	34 604	
SOUTHERN EUROPE	CROATIA	DUBROVNIK	6 379
		SPLIT	4 603
		ZADAR	6 493
	ITALY	BARI	2 205
TOTAL	25		469 387

Table 2-3: New routes to and from Marseille airport between 2003 and 2007

(Source: ENAC air transport database)

Non-scheduled routes

Between 2003 and 2007 only the Montreal destination, that was fully non-scheduled in 2003, become fully scheduled in 2007. An additional route faced a large transfer from non-scheduled to scheduled traffic: the Marrakech route with 78% of scheduled traffic in 2007.

A lower transfer to scheduled traffic also appeared on Monastir, Dakar and Djerba destinations.

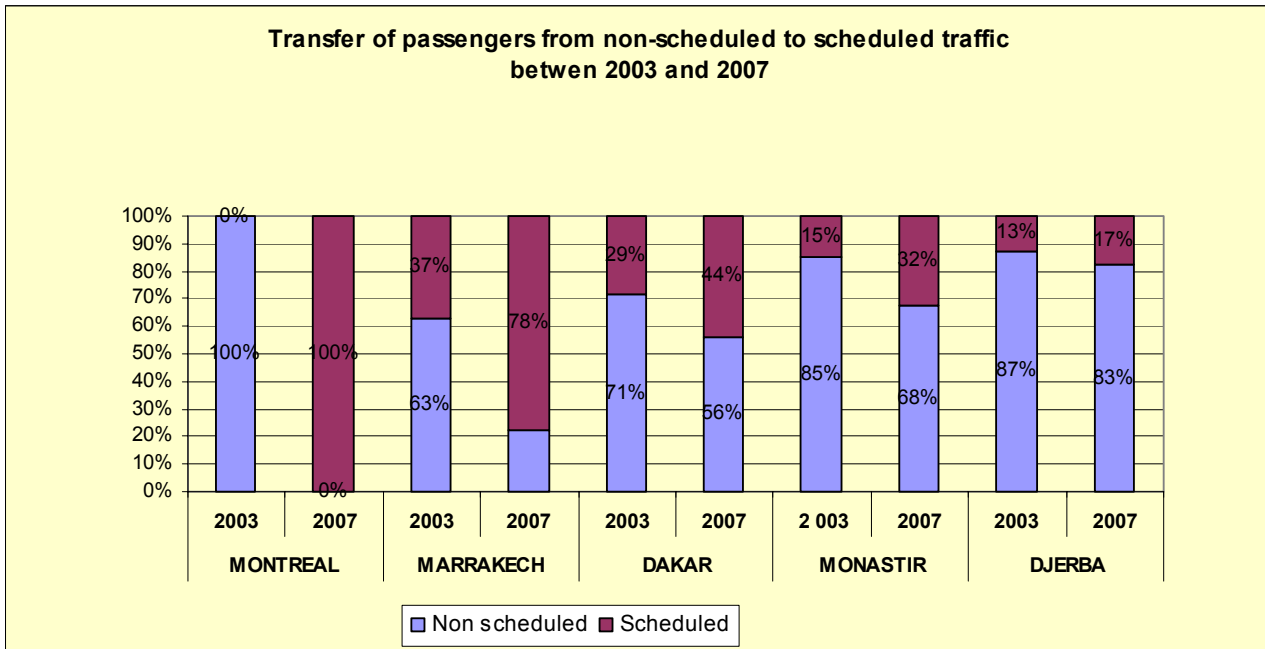


Figure 2-9: Transfer of passengers from non-scheduled to scheduled traffic between 2003 and 2007 at Marseille airport

Routes with a high level of development

Some routes with a low traffic level in 2003 (<5,000 passengers a year) had become highly developed by 2007 to exceed 10,000 passengers a year.

Except for the Fez destination, all the destinations with such a high development between 2003 and 2007 are European. In particular, many routes to **northern Europe** had become highly developed over the period. These routes are for **Germany, the Irish Republic, Sweden and the United-Kingdom**.

Southern European routes that strongly developed over the period are for **Portugal and Spain**.

Region	City	Traffic 2007
SOUTHERN EUROPE	PORTO	64 539
NORTHERN EUROPE	DUBLIN	64 448
	GOTEBORG	44 622
NORTHWESTERN AFRICA	FEZ	38 209
NORTHERN EUROPE	DUSSELDORF	15 171
SOUTHERN EUROPE	BARCELONA	15 164
NORTHERN EUROPE	STUTTGART	14 049
	BRISTOL	12 534
	INGOLSTADT	10 800

Table 2-4: Marseille routes with a strong development between 2003 and 2007

(Source: ENAC air transport database)

Summary of past route network evolution of Marseille airport between 2003 and 2007



- Only 6 abandoned routes to southern Europe, North western Africa and west Africa
- Main changes in the route network concern **Northern Europe**:
 - Germany: 6 new routes, 3 existing routes in 2003 with a strong traffic increase
 - United-Kingdom: 4 new routes, 1 existing route in 2003 with a strong traffic increase
 - Sweden: 2 new routes, 1 existing route in 2003 with a strong traffic increase
- Other changes in the route network concern **southern Europe**, especially with the 3 new routes to Croatia (not served in 2003)
- Only two non-scheduled routes in 2003 become mainly scheduled in 2007

2.3.5 Future route network of Bordeaux airport

In 2007 the Bordeaux airport route network could be broken down into 60 routes where 49 of these routes were European. Only 14 of these 49 routes were for northern Europe.

World regions	Number of routes from Bordeaux in 2007
Canada	1
Northwestern Africa	4
West Africa	6
Southern Europe	35
Northern Europe	14
Total	60

Table 2-5: Number of routes from Bordeaux airport in 2007

(Source: ENAC air transport database)

New potential routes

By 2016, the journey time between Bordeaux and Paris by high-speed train should decrease from 3 to 2 hours. This strong competition with the high-speed train should lead to a significant decrease in the air traffic between both cities. In other words, the share of air traffic level between Bordeaux and Paris that represents 44% of the total Bordeaux traffic in 2007, should strongly decrease in the future.

This comparison with Marseille airport leads us to assume that most of the changes in the Bordeaux airport route network, following the future strategy of development of a low cost terminal, should concern Northern Europe.

A brief comparison of the number of routes to various northern European countries between Marseille and Bordeaux tends to confirm a potential increase in the number of routes to this European region. In particular we can assume that, as it was for Marseille airport, several **new routes** could potentially appear in the future to **Germany and Sweden**. In addition, we can assume that **at least one additional route** could potentially be created in the future to **Belgium, Norway and/or Netherlands**.



Region	Country	Number of Marseille routes in 2007	Number of Bordeaux routes in 2007
Northern Europe	Belgium	2	1
	Germany	9	2
	Ireland	2	2
	United-Kingdom	6	7
	Netherlands, The	2	1
	Norway	2	1
	Sweden	3	1
Southern Europe	Austria	1	1
	Bulgaria	1	1
	Croatia	3	1
	Czech Republic	1	0
	Greece	2	2
	Italy	7	5
	Malta	1	0
	Portugal	2	2
	Spain	5	4
	Switzerland	1	1
	Turkey	3	2

Table 2-6: Comparison of the number of routes to European countries at Marseille and Bordeaux airports

(Source: ENAC air transport database)

As with the Marseille route network development toward southern Europe, we can assume that as in Marseille airport **additional routes to Croatia** should develop in the future at Bordeaux airport. We can also assume that, as for Marseille airport, **additional routes to Italy** could also be operated in the future.

In addition, it shouldn't be ignored that at least one additional route could develop in the future to other southern European countries such as Spain, for instance.

Non-scheduled routes

The past transfer at Marseille airport from non-scheduled to scheduled traffic on Morocco destinations leads us to assume a **future transfer to scheduled traffic** on the **Agadir** destination (which represents 14,200 non-scheduled passengers in 2007) at Bordeaux airport.

Routes with a high level of development

While strong traffic increase on Marseille airport routes mainly concerned Northern Europe countries, Only Waterford, the Irish destination, currently has a low traffic level (<5,000 passengers a year). Unfortunately, the comparison with Marseille airport does not help us to make a prediction of the potential development of this route.

More generally, it appears **difficult** to use the Marseille experience **to make predictions** of the potential traffic evolution on the current routes with a low traffic level.



Routes with a very low traffic in 2007 (<5 000 pax)			
Region	Country	City	2007 traffic
Northern Europe	Ireland	WATERFORD	1 780
Southern Europe	Austria	VIENNA	1 150
	Bulgaria	VARNA	1 235
	Montenegro	TIVAT	1 448
	Spain	IBIZA	2 211
	Turkey	ANTALYA	4 291
West Africa	Ivory Coast	ABIDJAN	1 676
	Algeria	ORAN	2 221

Table 2-7: Existing routes at Bordeaux airport with a low traffic level in 2007

(Source: ENAC air transport database)

Assumptions on the potential route network evolution of Bordeaux airport in a 5-8 year time horizon

- Several new routes could potentially appear in the future to **Germany, Sweden, Croatia and Italy**
- At least one additional route could potentially be created in the future to **Belgium, Norway, Netherlands and/or Spain**
- A potential transfer from non-scheduled to scheduled traffic on the **Agadir** destination could occur
- The comparison with Marseille does not allow us to make assumptions on the potential traffic evolution on the current routes with a low traffic level



2.4 Case study 2: Bucharest Otopeni airport

2.4.1 Past traffic evolution and strategies of Bucharest Otopeni airport

Bucharest Henri Coanda International Airport served as a military base of the IIIrd Reich (between 1940 – 1944). Military aviation was using the infrastructure until 1965. Thanks to increasing traffic and inadequate infrastructure of Baneasa Airport (former civil airport of Bucharest) the military infrastructure of Airport in Otopeni was transformed to be used for civilian passenger air transport. The existing runway was modernised, extended up to 3500 m, making it even longer than that of Paris' Orly Airport at that time (1965). Also, a new passenger terminal was constructed for domestic and international flights.

The airport slowly become more and more used by airlines, with a growing number of passengers, and in 1986, it entered a new phase of development. A second 3500-metre runway was constructed, as well as related taxiways. The airport lighting system was improved and the capacity was increased to 35-40 airport movements per hour. In 1992, Otopeni Airport became a regular member of Airports Council International (ACI). In 1997 a new international departures lounge with a capacity of 1000-1200 passengers per hour was opened, as well as five modern airbridges. In 2000, Phase II of the development initiative continued, and the International Arrivals Terminal was improved.

Currently the airport has one terminal divided into three halls (sometimes referred as distinct terminals) (*International Departures Hall*, *International Arrivals Hall* and the *Domestic Flights Hall* - at the ground level of the Arrivals Hall). The International Departures Hall consists of 36 check-in desks, one finger with 10 gates (5 equipped with jetways), while the Domestic Hall has an extra four busgates. Today's International Arrivals Hall is actually the old Otopeni terminal, while the new Departures Hall, including the finger and the airbridges was built and inaugurated in 1997. A second finger with 7 jetways is under construction and a new building terminal on the east side is in project phase.

Thanks to the fact that Romania has a well developed airport infrastructure compared to other countries in Eastern Europe, airports in the country have been experiencing steady growth of air traffic. There are 17 commercial airports in service today, most of them opened for international traffic. Four of the airports (OTP, BBU, TSR, CND) have runways of over 3,200 m (10,500 ft) in length and are capable of handling wide-body aircraft. Three of the airports (BCM, CRA, SUJ) have runways of 2,500 m in length, while the rest of them have runways of 1,800 to 2,000 m.

Good airport infrastructure and the fact that Romania is well-known tourist destination make the country a popular destination for air travelers. Bucharest is considered "a pearl of East" by many and natural attractiveness of the town is one of the major driving forces of increasing Otopeni airport traffic. While the traffic had been increasing slightly more than 14 % a year from 2003 to 2006, the traffic has rocketed up after the accession of Romania to the European Union in 2007 (almost 42 % increase in number of passengers).

Both low cost and regular airlines have seen their air traffic increase by at least 10% in the wake of Romania's EU integration. The number of passengers has increased on the Bucharest-UK route (Bucharest – London), as a result of the elimination of foreign visas for Romanian citizens travelling to fellow EU countries. Also low cost operators boosted the highest growth rates. Most of the airlines operating in Romania have introduced new destinations in 2007 or increased the frequency of existing destinations, which helped the growth. Carpatair, the second biggest domestic airline, has recorded an 22 % increase in 2007. Also the number of passengers on the Bucharest-Zurich route operated by SWISS airline rose by 10% in the first two months of 2007. Air France also reported considerable growth on its routes to and from Romania



Bucharest Otopeni Airport traffic evolution 2003 - 2007

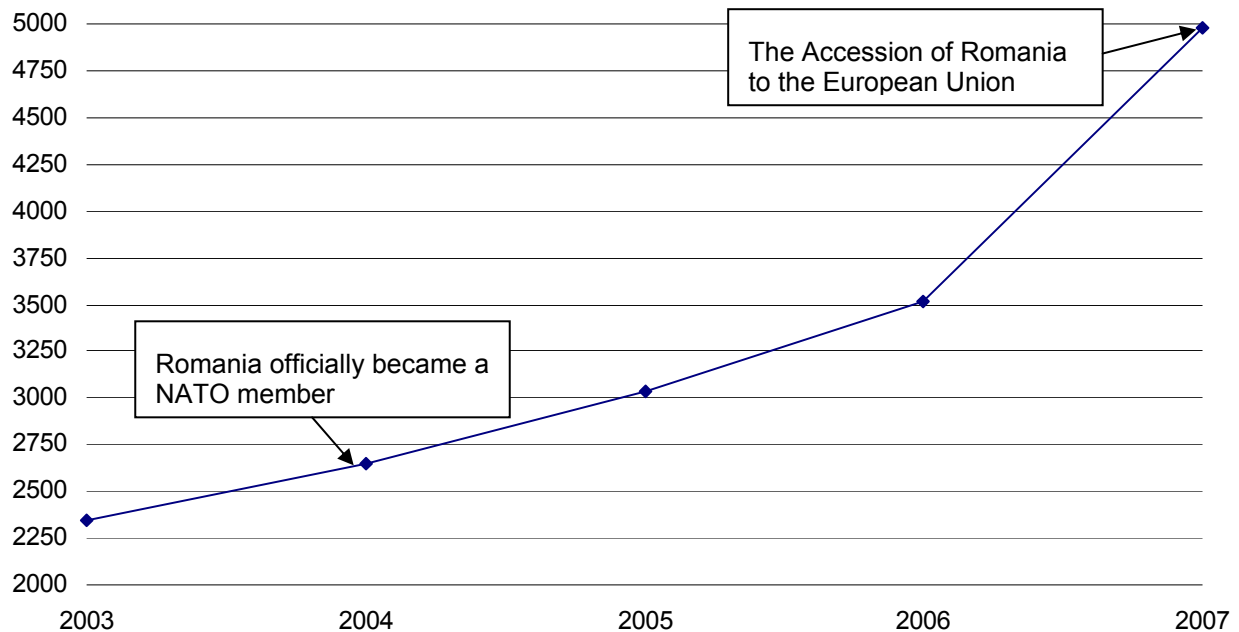


Figure 2-10 Bucharest Otopeni Airport traffic evolution 2003 - 2007

(Source: Air Transport Intelligence database)

Year	Total PAX (thousands)	Annual Change in %	Number of Aircraft Movements	Annual Change in %
2003	2347		37473	
2004	2644	12,65	42468	13,33
2005	3036	14,83	53496	25,97
2006	3514	15,74	58053	8,52
2007	4979	41,69	70588	21,59

Table 2-8 Bucharest Otopeni Airport passengers and Aircraft Movements 2003 – 2007

(Source: Air Transport Intelligence database)

In the first nine months of 2008, the International Airport Henri Coanda Bucharest has recorded a passengers traffic of 3,913,516, which represents an increase of approximately 17% compared to the same period of 2007. The number of aircraft movements (takeoffs and landings) in the period from January the 1st to September the 30th 2008 was 53,802 (9% increase compared to the same period of 2007).

The domestic passengers traffic in the first 9 months of the year recorded a growth of approximately 27%. There is also 15-20 % growth predicted for total number of passengers in 2008.



2.4.2 Future strategies of Bucharest Otopeni airport

Bucharest airport is a medium-sized airport (5 million passengers in 2007) with **available capacity** in a **single-till context**. The airport has no strong competitor but there is a growing secondary airport with low cost traffic: Baneasa airport.

In addition the airport has a **high potential for growth in capacity** (with possibilities of building a new runway and a new terminal) and a **high potential for growth in demand** (by taking in consideration the population around the airport (3 million within 1 hour's drive) and the region's attractiveness for tourism and business purposes).

The methodology developed in the WP2 of the FAST project (Ref 10) is then applied to Bucharest airport so as to identify its future strategic options (strategies of specialisation and strategies of diversification). This methodology is broken down into 5 steps:

1. Strategies of specialisation by airport type:

- I. First of all, we are able to make a **primary identification** of the most relevant **strategies of specialisation** for airports with a high potential for growth in capacity and a high potential for growth in demand, by using Table 2-1:
 - Airport accessibility improvement
 - Development of commercial policies to airlines
 - Investments in communication and marketing
 - Investment in terminal capacity
 - Investment in a low cost terminal
 - Investment in runway capacity
 - Investment in the infrastructure efficiency
 - Development of intermodality



POTENTIAL FOR GROWTH		CAPACITY		
		HIGH	MEDIUM	LOW
DEMAND	HIGH	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines - Communication and marketing - Terminal capacity - Low-cost terminal - Runway capacity - Infrastructure efficiency - Intermodality 	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines - Communication and marketing - Terminal capacity - Low-cost terminal 	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines
	MEDIUM	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines - Communication and marketing - Terminal capacity - Low-cost terminal - Runway capacity 	<ul style="list-style-type: none"> - Terminal capacity - Low-cost terminal 	
	LOW	<ul style="list-style-type: none"> - Accessibility - Commercial policies to airlines - Communication and marketing 		

Table 2-9: Strategies of specialisation by potential for growth in capacity and in demand

II. **A check with the most relevant strategies of specialisation according to the airport size** must then be made. These strategies are summarized in Figure 2-2. For Bucharest airport, being a medium-sized airport, some of the strategies of specialisation identified in the step 1 are not consistent with the relevant strategies by airport size. Both strategies of investment in **infrastructure efficiency and development of intermodality** are **not relevant** for Bucharest airport.

At this stage, relevant strategies of specialisation are:

- Airport accessibility improvement
- Development of commercial policies to airlines
- Investments in communication and marketing
- Investment in terminal capacity
- Investment in a low cost terminal
- Investment in runway capacity

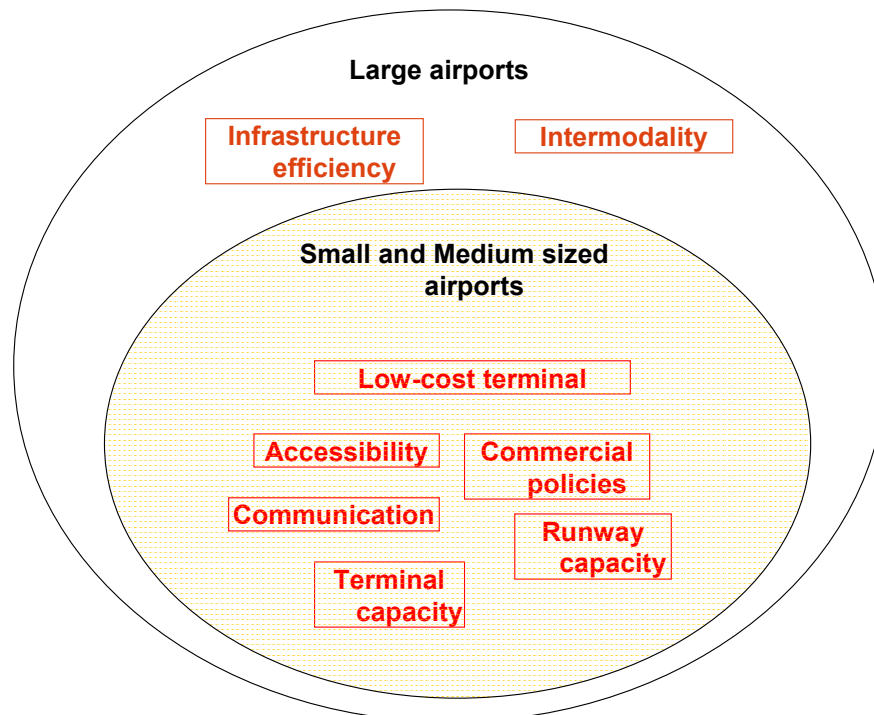


Figure 2-11: Relevant strategies of specialisation according to the airport size

2. **Strategies of diversification by airport type:** These strategies are highlighted in Figure 2-3 that summarizes the most relevant strategies of diversification according to the airport size. Bucharest which is a medium-sized airport, is only able to develop two strategies of diversification:
- The development of commercial activities
 - The development of services to passengers (independently from the airline chosen by the passenger)

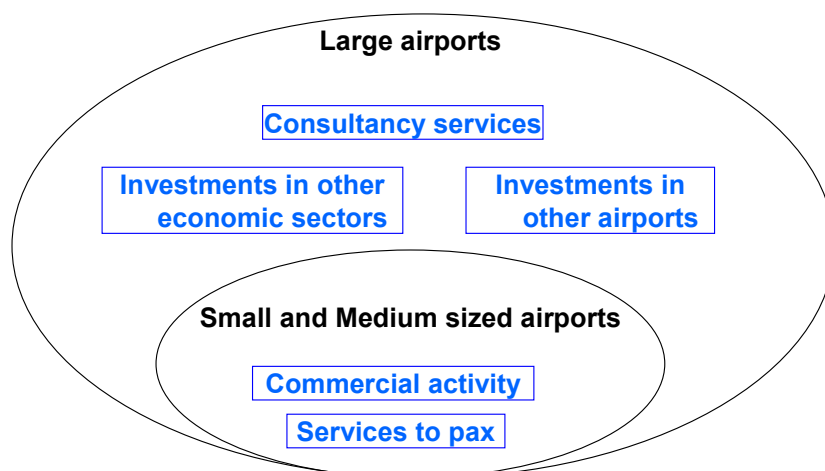


Figure 2-12: Strategies of diversification by airport group size

3. **Last refinement of the strategic options:** A last refinement of the identified strategies of specialisation and diversification is then made by taking in consideration other factors: congestion level, competition level, airport status, regulation type, etc.



I. Refinement of strategies of specialisation: Bucharest airport will remain the main airport of the region but the competition level with Baneasa airport (its secondary airport) increase. In addition, the airport has terminal capacity problems, its terminals' capacity is already saturated at peak hours). With these facts in mind and by looking at Figure 2-4 and Figure 2-5, we can deduce that the airport will mainly have incentives to develop the following strategies of specialisation:

- Improvement of the airport accessibility
- Investment in terminal capacity
- Development of commercial policies to airlines
- Investment in communication

Although the competition level with Baneasa airport will increase, but should not be strong in the future. The low cost terminal strategy, which is only relevant in case of strong competition with another airport or another mode of transport, is therefore not relevant for Bucharest airport

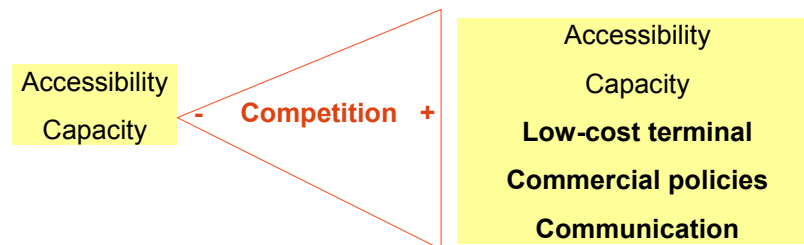


Figure 2-13: Specialisation strategies relevancy according to the level of competition

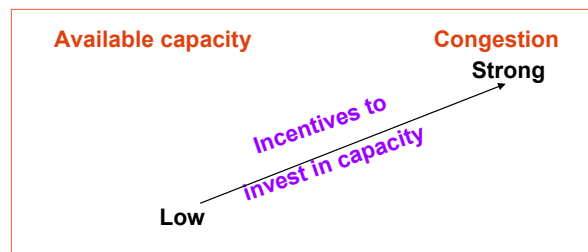


Figure 2-14: Strategy of investment in capacity relevancy according to the level of congestion

II. Refinement of strategies of diversification: The information shown in Figure 2-6 helps to identify that Bucharest airport which is in situation of public ownership and management, will mainly have incentives to develop the following strategies of diversification:

- Development of commercial activities
- Development of services to passengers

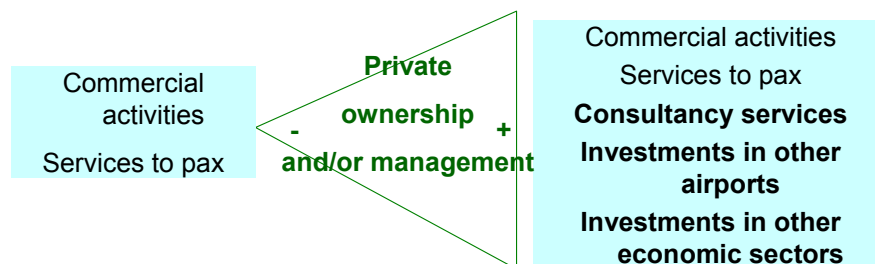


Figure 2-15: Diversification strategies relevancy according to the airport status



4. **Future strategic options of Bucharest airport:** This analysis leads us to conclude that the airport has two main objectives:
- Attracting new airlines on the platform
 - Attracting new customers on the platform

To reach such objectives, we identify the following future strategic options for Bucharest airport in a 5-8 year time horizon:

Future strategies of specialisation of Bucharest airport:

Improvement of the airport accessibility
Investment in terminal capacity
Development of commercial policies to airlines
Investment in communication

Future strategies of diversification of Bucharest airport:

Development of commercial activities
Development of services to passengers

2.4.3 Similarities with Prague airport

2.4.3.1 Past strategies of Prague airport

Prague/Ruzyně airport has been experiencing a steady growth in regards to the number of serviced passengers since its launch of operations in 1937. Prague Ruzyně airport enjoyed remarkable traffic growth after the Velvet Revolution in 1989 and the growing tendency was especially dynamic in the second half of the 90s. The traffic was boosted by fast and steady economic growth, political stability, significant foreign investments but also Prague attractiveness for all categories of tourists

In 2000, the airport handled a record five million passengers, a volume that was doubled in the course of the next five years and the volumes thus reached 10 million serviced passengers in 2005. The year of the highest performance in the airport's history has so far been the year 2007 with 12.5 million handled passengers. Estimates indicate that this pace of Prague Airport's growth of volumes should continue. 15 million handled passengers a year could thus be reached in 2012; 20 million in 2019.

It is thus a striking paradox, that since 1963 when the airport handled 1 million passengers a year, its runway system remained virtually unchanged despite the fact that the number of handled passengers grew more than 12 times and the number of aircraft movements almost four times the 1963 amount. The current runway system at Prague Airport has already reached its maximum operational capacity and without its extension, the airport will not be able to cope with the future travel demand.



Year	Total PAX	Annual Change in %	Number of Aircraft Movements	Annual Change in %
2000	5 553 532	-	96 552	-
2001	6 098 742	9,8	97 542	1,0
2002	6 276 918	2,9	103 904	6,5
2003	7 463 120	18,9	115 756	11,4
2004	9 696 413	29,9	144 962	25,2
2005	10 777 020	11,1	160 213	10,5
2006	11 581 511	7,5	166 346	3,8
2007	12 436 254	7,4	174 662	5,0

Table 2-10: Prague Airport Passengers and Aircraft Movements 2000 - 2007

Source: Praha Ruzyně Traffic statistics

Very fast, but unstable growth in the 2003 – 2005 period weakened during last two years but was still above the European average. Comparing 2007 and 2001 performance, the growth + 103, 9 % was recorded.

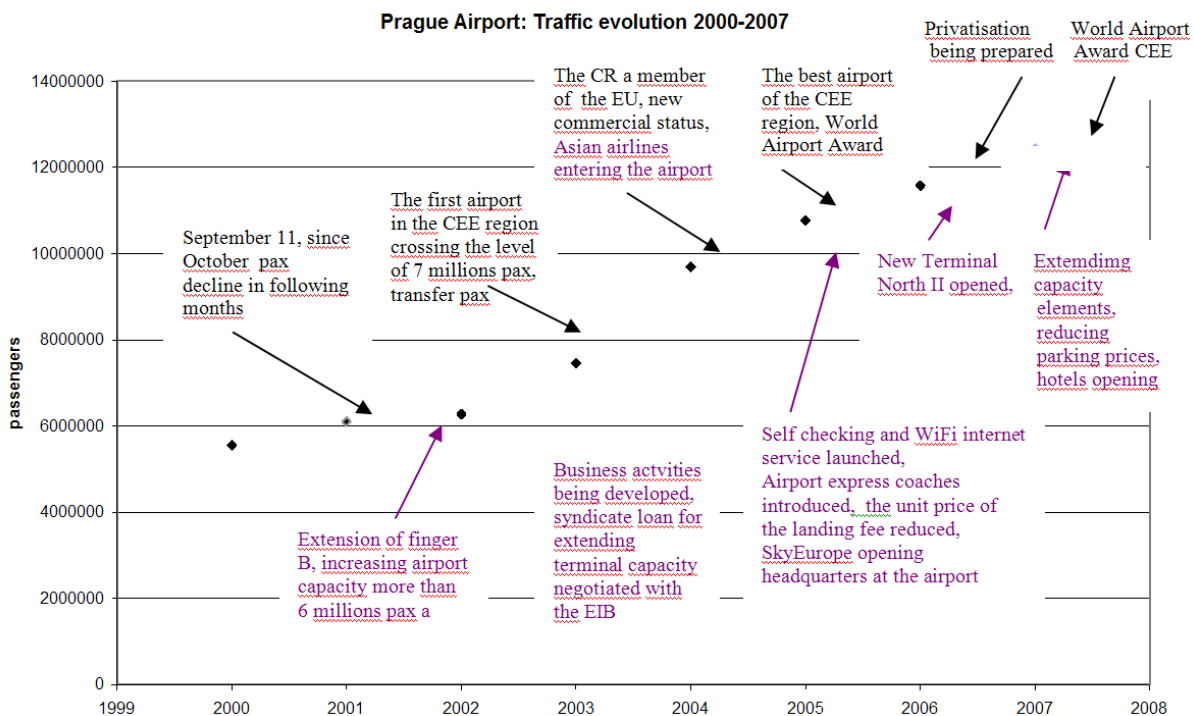


Figure 2-16: Prague Airport: Traffic evolution and strategy 2000 – 2007

Remarkable traffic growth has been actively supported by the strategy of airport development. After introducing a new, more independent commercial status, an increased interest of non-core activities is being observed. The airport started with flexible prices policy in both, aeronautical and non-aeronautical parts of its business. Full service carriers, low cost carriers and charter carriers are considered to be crucial for



aeronautical business of the airport. Increase in the airport capacity by building of Terminal II North (together with further induced capacity investments) was financed privately however the airport remained state-owned. The viability of the airport confirms a sound financial condition of Prague Ruzyně generating 1 445 mil. CZK profit before tax in 2007 (52,04 mil. EUR according to ECB annual reference exchange rate, Czech koruna/Euro).

Although the demand for air transport is rapidly growing in Prague region and in the whole country, the weakest point in the quest to assure further development of Prague Airport seems to be the runway system capacity. At the beginning of 2006, the new Terminal 2 launch of operations represented an instant capacity increase in regards to passenger check-in; it is expected that the capacity will suffice, at least, for the next 10 years. On the other hand, the airport runway system has for some time not been sufficient for operations at peak times and without its further development will become the main obstacle to the planned growth of Prague/Ruzyne airport.

2.4.3.2 Similarities between Bucharest and Prague airports

It is astonishing how many similarities could be found between the past situation of Prague Ruzyně airport and today's Bucharest Otopeni. First it is necessary to point out on similar market situation. Both airports serve the capitals and have hardly any competitor in the catchment area where they act as a local hub for the based national flag carriers. They serve similar catchment area. Prague metropolitan area is estimated to have a population of over 1.9 million (Eurostat: "Urban Audit 2004") while metropolitan area of Bucharest has a population of 2.6 million people (XIX Meeting of METREX Network, Nürnberg, 15-18 June 2005. "Bucharest: Few expectations for urban development", page 29").

Besides the fast growing Czech economy after the 1989 Velvet revolution the main attractor was the Prague as the main Czech tourist destination for short breaks.

Bucharest is important cultural center with an eclectic mixture of elements from traditionally Romanian buildings to buildings that are influenced by French architects. It is because of this French influence that Bucharest was once called "the Paris of the East" or "Little Paris." Bucharest was not discovered by tourists yet but it is just matter of time when it will be invaded by the low cost tourist segments as Prague started to be 10 years backwards.

Bucharest should walk the same way as the Prague did about 10 years ago. That time Prague made heavy capacity (passenger terminal) investments so as improved the airport accessibility. Bucharest must meet fast growing market needs. Actual terminal is approaching its maximum capacity and only limited expansion is possible on the current location a new terminal building is in the planning phase. The new terminal will be built on the east end. It will consist of four halls, each one of them capable of handling 5 million passengers annually; by 2015 the terminal 2 alone will be able to handle the estimated annual traffic of 20 million passengers.

Airport should also improve commercial activities and airport accessibility (terminal will be connected to the future A3 Bucharest - Braşov motorway) in the next few years.

Certainly there are also some differences. Bucharest former main airport - Băneasa or Bucharest City Airport situated closer to the city center serves now as a low cost airport. There is no such as alternative in Prague but Vodochody airport will take this role within a few years.

2.4.4 Past route network development of Prague airport

The Prague market was and still is dominated by the Full Service Carriers against Low Costs Carriers (62.81 % / 22.40 % in 2007) but this share is slowly changing with growing importance of the LCC (65.37 % / 19.75 % in 2006). The dominance of the Full Service Carriers is partially caused by the Czech Airlines base in Prague which is being used as a local hub. Scheduled traffic is prevailing against charters (85.21 / 14.79 %) and this ratio is being stabile. New 9 airlines entered passenger traffic market at the Prague airport in 2007, increasing the total number of airlines operating at the airport passenger market by 4. Thus, airlines are entering and leaving the market continuously.

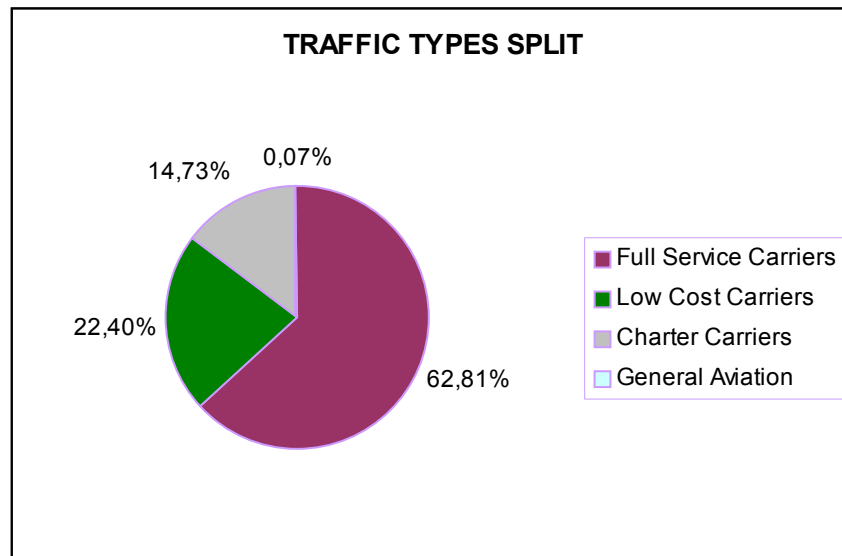


Figure 2-17: Geographical split - Prague Ruzyně airport 2007

Source: Praha Ruzyně Traffic statistics

Prague serves typically European market. This stems from the long - term political orientation of the country and non – existent historical links to some distant territories.

Top 15 destinations

Region	Total PAX	Market Share
Europe	11 190 895	89.99%
Africa	682 974	5.49%
North America	276 203	2.22%
Far East	92 119	0.74%
Middle East	52 804	0.42%

Table 2-11: Prague Ruzyně traffic split by regions - 2007

Source: Praha Ruzyně Traffic statistics

During the 2007 summer there were 119 destination served by scheduled services and 15 new destination were opened during the 2007 summer season (Atlanta, Blackpool, Bournemouth, Burgas, Catania, Florence, Kaliningrad, London/Luton, Malaga, Rimini, Stavanger, Turin, Venice/Treviso, Verona, Voronezh). On the other hand ten destinations were not flown any more. This fluctuation is caused mainly by the LCC operators who were able to open or withdraw destination within one month. The most important PAX stream is heading to UK (1 950 029 total PAX 2007). This is mainly to open UK policy on the labour market. However, it could be expected that the recent crisis will be negatively reflected on the routings. The second most important is Germany (1 127 128 total PAX 2007) underlining the most important economic links of the Czech Republic.

Although there is some data inconsistency in the Table of TOP 15 destinations (2001 data are based on destination town/city, 2007 data are based on destination airports), some observations about route development can be made. New destinations - Rome, Barcelona and Dublin - penetrated into TOP 15



destinations in 2007. Tel Aviv did not keep its position in 2007 being together with New York out – of Europe representatives in TOP 15 2001. Similarly, Vienna, Budapest and Helsinki included in TOP 15 destinations in 2001 are not listed among the airport TOP 15 destinations in 2007. Except of London/LGW all other TOP 15 2007 destinations were listed among the airport's destinations in 2001.

	TOP 15 2001	PASSENGERS (share in %)	TOP 15 2007	PASSENGERS (share in %)
1.	London	660 254 (10,8)	Paris CDG	571 041 (4,59)
2.	Frankfurt	380 512 (6,2)	Frankfurt	452 501 (3,64)
3.	Tel Aviv	366 307 (6,0)	London LHR	418 904 (3,37)
4.	Paris	348 757 (5,7)	Amsterdam	407 010 (3,27)
5.	Amsterdam	275 285 (4,5)	Moscow SVO	337 856 (2,72)
6.	Zurich	251 829 (4,1)	Milan MXP	312 384 (2,51)
7.	Copenhagen	161 111 (2,7)	Rome FCO	290 723 (2,34)
8.	Moskva	159 788 (2,6)	Madrid	283 403 (2,28)
9.	Brussels	150 108 (2,5)	Brussels	274 596 (2,21)
10.	Vienna	132 576 (2,2)	London LGW+	247 609 (1,99)
11.	Budapest	122 291 (2,0)	Copenhagen	245 649 (1,97)
12.	New York	115 209 (1,9)	Dublin	235 212 (1,89)
13.	Milan	114 929 (1,9)	London STN	234 150 (1,88)
14.	Helsinki	98 836 (1,6)	Zurich	233 378 (1,88)
15.	Madrid	98 430 (1,6)	Barcelona	226 655 (1,82)
	TOP 15 TOTAL	3 440 222 (56,2)	TOP 15 TOTAL	4 771 071 (38,36)
	OTHER TOTAL	2 658 520 (43,8)	OTHER TOTAL	7 665 183 (61,64)

Table 2-12: TOP 15 Destinations (Total by PAX) in 2001 and 2007

Source: Praha Ruzyně Traffic statistics



In the TOP 15 2007 there is none out-of Europe destination reflecting the importance of European destinations for Prague airport route development. On the other side TOP 15 total sums and the respective shares (in spite of inconsistency in the data included) indicates a distinct diversification in the airport's destinations and routes development as well. In the following tables TOP 15 destination in 2007 are analyzed according to traffic type.

FULL SERVICE CARRIERS	PASSENGERS 2007
Paris/CDG	495 481
Frankfurt	452 144
London/LHR	418 330
Amsterdam	327 078
Moscow/SVO	326 354
Brussels	244 458
Madrid	237 760
Zurich	232 570
Milan/MXP	221 675
Dublin	215 593
Rome/FCO	182 677
Copenhagen	174 164
Budapest	173 924
Vienna	155 003
Munich	149 812
TOP 15 DESTINATION FULL SERVICE CARRIERS	4 007 023

LOW COST CARRIERS	PASSENGERS 2007
London/STN	194 633
London/LGW	193 976
Nottingham	166 954
Barcelona	141 910
Manchester	126 319
Bristol	98 685
Geneva	94 857
Newcastle	90 356
Milan/MXP	87 618
Dortmund	81 745
Cologne	79 330
Birmingham	79 032
Milan/BGY	72 430
Leeds	71 370
Oslo	71 363
TOP 15 DESTINATION LOW COST CARRIERS	1 650 578

Table 2-13: TOP 15 Destinations in 2007 per Traffic Type (Charters not Included)

Source: Praha Ruzyně Traffic statistics

TOP 15 full service carriers destinations shared 32.2 % of the passengers handled in 2007 and TOP 15 low cost carriers destination 13.5 % of the volume. Thus TOP 15 destinations for both carriers represented 45.5 % of the total passengers volume (29 destinations together), keeping more than 50 % market share for other destinations in scheduled and non-scheduled segments. The both TOP 15s are located in European destinations. Twelve of the TOP 15 full service carriers destinations are identical with the total TOP 15 airport's destinations as well as 4 of the TOP 15 low cost carriers destinations. Only one within TOP 15 destinations (Milan/MXP) is shared commonly (low cost carriers with 28 % share and full service carriers with 71 % share). Eight of TOP15 low cost carriers destinations (marked by + in the table) are destinations which did not exist in 2001. Moreover, one of these new destinations London/LGW as the second most important LCC's destination penetrated into the airport's TOP 15 in 2007 (78.3 % share of low cost carriers of the total London/LGW value).



Increase in air transportation demand as well as expansion in route network of the airport influenced flight frequencies at the airport respectively. Calculating impacts of the changes mentioned on departure flights frequencies at the airport most important lines on one week comparison base, only on one line a slight decrease has been recorded (-1). The total change in departure flights frequencies gives more than 69 % increase comparing 2007 to 2001.

DESTINATION	TOP 15 POSITION 2007			DEPARTURE	DEPARTURE	VARIATION
	AIRPORT TOTAL TRAFFIC	AIRPORT FCS TRAFFIC	AIRPORT LCC TRAFFIC	FLIGHTS PER WEEK 2001	FLIGHTS PER WEEK 2007	
PARIS/CDG	Yes	Yes	No	42	62	+20
FRANKFURT	Yes	Yes	No	41	46	+5
LONDON/HTW	Yes	Yes	No	35	41	+5
AMSTERDAM	Yes	Yes	No	37	47	+10
MOSCOW/SVO	Yes	Yes	No	21	32	+9
BRUSSELS	Yes	Yes	No	33	48	+15
MADRID	Yes	Yes	No	10	26	+16
ZURICH	Yes	Yes	No	34	40	+6
MILAN/MPX	Yes	Yes	Yes	14	33	+19
DUBLIN	Yes	Yes	No	11	21	+10
ROME/FCO	Yes	Yes	No	10	28	+18
COPENHAGEN	Yes	Yes	No	30	36	+6
BUDAPEST	No	Yes	No	30	35	+5
VIENNA	No	Yes	No	42	45	+3
MUNICH	No	Yes	No	29	52	+23
LONDON/STN	Yes	No	Yes	21	20	-1
LONDON/LGW	Yes	No	Yes	0	18	+18
NOTHINGHAM	No	No	Yes	0	15	+15
BARCELONA	Yes	No	Yes	9	32	+23
MANCHESTER	No	No	Yes	6	26	+20
BRISTOL	No	No	Yes	0	7	+7
GENEVA	No	No	Yes	0	24	+24
NEW CASTLE	No	No	Yes	0	7	+7
DORTMUND	No	No	Yes	0	7	+7
COLOGNE	No	No	Yes	11	18	+7
BIRMINGHAM	No	No	Yes	5	7	+2
MILAN/BGM	No	No	Yes	0	+5	+5
LEEDS	No	No	Yes	0	+7	+7
OSLO	No	No	Yes	5	+21	+16
TOTAL (29)				+476	+806	+328

Table 2-14: TOP 29 Destination Departure Frequencies per Week

Source: Praha Ruzyně Traffic statistics



Note: Based on one week departure flights comparison 21. 6. – 27. 6.

Abandoned routes

Among the 24 routes abandoned between 2003 and 2007, 8 concern Northern Europe, 13 Southern Europe, 2 Russia and 1 to South Asia.

Region	Country	City
Northern Europe	Belgium	BRUSSELS
	Denmark	COPENHAGEN
	Norway	OSLO
	Poland	WARSAW
	Latvia	RIGA
Southern Europe	Bulgaria	BURGAS
	Bulgaria	SOFIA
	Croatia	DUBROVNIK
	France	BEAUVAIS
	Hungary	BUDAPEST
	Italy	BOLOGNA
	Italy	NAPOLI
	Israel	TEL AVIV
Turkey	ISTANBUL	
Russia and former Soviet States	Ukraine	KIEV
	Russian Federation	MOSCOU
South Asia	Thailand	BANGKOK
Total abandoned routes		17

Table 2-15: Abandoned routes to and from Marseille airport between 2000 and 2007

New routes

Between 2000 and 2007, there was a diversification in Prague airport's destinations with a large number of routes opened. In total 34 routes were opened over the period, 28 of which were European. The most marked development in routes can be observed in Europe.

New northern Europe routes were a large percentage in the total new routes opened by Prague airport, representing 65% of the total traffic of all new routes in 2007. The significant fact relative to the new Northern Europe routes mostly concern the United-Kingdom, since 15 of the 17 new Northern Europe routes concern this country. The four Low cost carriers, Bmi Baby, Easyjet, Jet2.com and Ryanair played an essential role in the opening of these new routes.

New routes to Southern Europe mainly concern Spain and Greece with 4 new destinations to Spain and 5 to Greece. However, in 2007, the traffic level of these new Southern Europe routes only represents 18% of the total traffic on all the new routes opened by Prague.

It is also interesting to note that 4 of the 6 new routes to other world regions than Europe concern Tunisia and represent 12% of the total traffic of all the new Prague routes in 2007.



REGION	COUNTRY	CITY	2007 TRAFFIC
Arabian World	Lebanon	BEIRUT	40727
USA	USA	ATLANTA	50042
West Africa	Tunisia	TUNIS	10082
		TABARKA	12079
		MONASTIR	116502
		JERBA	86903
Northern Europe	United-Kingdom	NEWCASTLE	90244
		MANSTON	240
		LUTON	65253
		LONDON	249039
		LEEDS	71601
		GLASGOW	20100
		EDINBURGH	49932
		EAST MIDLANDS	168104
		DONCASTER	55669
		CARDIFF	16544
		BRISTOL	99524
		BOURNEMOUTH	44040
		BLACKPOOL	13878
BIRMINGHAM	78762		
BELFAST	60526		
	Germany	DORTMUND	81413
	Estonia	TALLINN	99185
Southern Europe	Spain	ZARAGOZA	1562
		VALLADOLID	1459
		SANTIAGO DE COMPOSTELA	3804
		MAHON	3975
	Italy	MILANO	311858
	Greece	THIRA (SANTORIN)	4242
		SKIATHOS	3289
		MITILINI	4090
		KARPATHOS	3848
		KALAMATA	3876
France	MULHOUSE	74777	
TOTAL NEW ROUTES		34	1 997 169

Table 2-16: Number of new routes to and from Prague airport between 2000 and 2007

Non scheduled-routes

Between 2000 and 2007, 20 routes changed from fully non-scheduled to partly scheduled. More precisely, 15 routes to Canary Isles, Portugal and Spain which were fully non-scheduled in 2000 became partly scheduled over this period. In 2007, only half of the traffic on these 12 routes remained non-scheduled. One Greek destination, which was also 90% non-scheduled in 2000 became 50% non-scheduled in 2007.

In addition, 4 routes to Germany with half of the traffic non-scheduled in 2000 became fully scheduled in 2007.



COUNTRY	CITY	2000	2007
Canary Isles	LAS PALMAS	100% non-scheduled	50% non-scheduled
	PUERTO DEL ROSARIO		
Portugal	ARRECIFE		
	TENERIFE		
Spain	FARO		
	PORTO LISBON		
	MALAGA		
	BILBAO		
	ALICANTE		
	IBIZA		
Greece	GERONA	90% non-scheduled	50% non-scheduled
	SEVILLE		
Germany	VALENCIA	50% non-scheduled	100% scheduled
	THESSALONIKI		
	BERLIN WEST		
	COLOGNE		
	HAMBURG		
	HANOVER		

Table 2-17: Transfer from non-scheduled to scheduled traffic between 2000 and 2007

Routes with a high level of development

Three Prague airport routes with a very low traffic level in 2000 (less than 5,000 passengers a year) had become highly developed by 2007, with a traffic level exceeding 40,000 passengers a year. These 3 routes concern countries of Southern Europe: Portugal and France.

Country	City	2000 traffic	2007 traffic
Portugal	LISBON	102	40 865
France	MULHOUSE	2 318	74 777
	LYON	4 426	46 821

Table 2-18: Routes with a strong traffic development between 2000 and 2007

Summary of past route network evolution of Prague airport between 2000 and 2007

- Twenty four abandoned routes: 8 in Northern Europe, 13 in Southern Europe, 3 in Russia and South Asia
- **Overall diversification** in the airport's destinations with 34 new routes: 28 in Europe and 6 in Arab World, USA and West Africa
- Main changes in the **Northern European** route network concern the 15 new routes to the United-Kingdom mainly opened by Low cost carriers
- New routes in the **Southern European** route network mainly concern Spain (4 new routes) and Greece (5 new routes)
- **Transfer from non-scheduled to scheduled** traffic on 20 routes in Germany, Greece, Spain, Portugal and Canaries Isles
- **Three Southern Europe routes** (to Portugal and France) with a **high level of development**: less than 5,000 passengers in 2000 and more than 40,000 passengers in 2007



2.4.5 Future route network evolution of Bucharest airport

In 2007, the Bucharest airport route network was broken down into 83 routes, 72 of these routes were European. Only 16 among these 72 routes are for Northern Europe.

World regions	Number of routes from Bucharest in 2007
Arabian World	4
Northeastern Africa	3
Northwestern Africa	1
West Africa	1
USA	1
Russia and former Soviet States	1
Northern Europe	16
Southern Europe	56
Total	83

Table 2-19: Number of routes from Bucharest airport in 2007

(Source: ENAC air transport database)

New potential routes

This comparison with Prague airport leads us to assume that most of the changes in the Bucharest airport route network, following its future strategic options, should concern Northern Europe.

A brief comparison of the number of routes to various Northern European countries between Prague and Bucharest tends to confirm a potential increase in the number of routes to this European region. In particular, we can assume that, as for Prague airport, numerous **new routes** could potentially appear in the future to **Germany and the United-Kingdom**.

This comparison with the Prague route network toward southern Europe leads us to assume that, as in Prague airport, **additional routes to Greece** should develop in the future at Bucharest airport. We can also assume that, as for Prague airport, **additional routes to Spain** could also be operated in the future.

It would therefore not be surprising if **at least 15 new routes** opened at Bucharest airport in the future if the airport choose to apply a similar strategy as the one developed by Prague airport in the past.



Region	Country	Number of Prague routes in 2007	Number of Bucharest routes in 2007
Northern Europe	Estonia	1	0
	Finland	1	1
	Germany	9	6
	United-Kingdom	18	4
	Netherlands, The	1	1
	Sweden	2	0
Southern Europe	Austria	1	1
	France	8	8
	Greece	18	6
	Italy	3	12
	Malta	1	1
	Portugal	2	1
	Romania	1	10
	Spain	14	6
	Switzerland	2	1

Table 2-20: Comparison of the number of routes to European countries at Prague and Bucharest airports

(Source: ENAC air transport database)

Non-scheduled routes

In 2007, 15 routes served by Bucharest airport were at least 75% non-scheduled. The comparison of these routes with the ones becoming partly scheduled at Prague airport leads us to assume a **potential transfer from non-scheduled to scheduled** traffic at Bucharest airport for:

- **Two routes to Spain:** Palma de Mallorca and Ibiza
- **Four routes to Greece:** Rodos, Skiathos, Corfu and Iraklion

Routes with a high level of development

In 2007, 14 routes at Bucharest airport had a low traffic level (less than 5,000 passengers a year). Unfortunately, the comparison with Prague airport does not help us to make a prediction of the potential development of this route.

In other words, it appears **difficult** to use the Prague experience **to make predictions** of the potential traffic evolution on the current routes with a low traffic level.

Assumptions on the potential route network evolution of Bucharest airport in a 5-8 year time horizon

- **At least 15 new routes** could potentially appear in the future to **Germany, United-Kingdom, Greece and Spain**
- A **potential transfer from non-scheduled to scheduled traffic** could occur on two Spanish destinations (*Palma de Mallorca and Ibiza*) and/or four Greek destinations (*Rhodes, Skiathos, Corfu and Iraklion*)
- The comparison with Prague does not allow us to make assumptions on the potential traffic evolution on the current routes with a low traffic level

2.5 Concluding remarks



The application of the developed methodology presented in section 2.1 on two airport case studies does not allow to make general conclusions on the potential evolution of the European route network between airports. However, we can observe both airports may develop transverse new routes, i.e. routes not linking hub airports.

Hence, there are in Europe at least two airports, and probably more, from/to which transverse routes could develop at 5-8 years time horizon.

The future changes in the European network may come from these new transverse routes often operated by low cost carriers, especially new Western-Eastern Europe routes.



3. Impacts of changes in traffic distribution on ATM

3.1 Past trends

The emergence of LCCs in Europe already led to the development of new routes. The analysis of the network evolution of the two leading LCCs in Europe (Easyjet and Ryanair) and the comparison with two major airlines (Air France and Lufthansa), show that LCCs have contributed to the evolution of the intra-European network, by adding more frequencies to existing routes, and mostly by opening previously unexploited routes. (see Table 3-1)

	2000	2001	2002	2003	2004	2005	2006	2007
Easyjet	28	26	44	98	144	191	226	249
Ryanair	45	55	76	125	152	226	304	441
Lufthansa	361	316	303	283	340	326	354	365
Air France	177	130	220	228	212	213	229	230

Table 3-1: Routes on intra-European network of majors and LCCs

(Source OAG)

From the point of view of seats offered, the LCCs have also been the major drivers of growth. While majors increased their capacity a little on the intra European network, LCCs grew strongly. For example, while Air France increased only its supply by 6.3 million seats between 2000 and 2007, and Lufthansa by 13.4 million seats, Easyjet increased by 29.3 million seats and Ryanair by 51.3 million seats.

	2000	2001	2002	2003	2004	2005	2006	2007
Easyjet	7 679 424	8 281 488	12 778 380	24 110 976	28 083 228	31 586 640	33 908 448	36 981 360
Ryanair	10 035 540	12 694 200	17 559 324	27 909 588	32 448 504	42 210 588	51 000 516	61 342 596
Lufthansa	77 651 676	72 172 680	70 851 372	67 635 744	85 145 160	86 235 828	87 441 516	91 065 504
Air France	47 790 372	43 506 372	53 864 628	55 363 044	53 657 664	52 955 856	53 601 000	54 060 408

Table 3-2: Seats on intra-European network of majors and LCCs

(Source OAG)

The LCC routes connect major cities in Europe, but also medium-sized urban center by direct connections (for example Ryanair operates flights between Dublin and medium-sized centers like Nantes and La Rochelle in France, Pisa and Venice in Italy, Liverpool in England, etc). In this respect they constitute a change from the polarized hub system which prevailed before inside Europe. By offering direct routes at low prices, the LCCs have contributed to traffic growth between regions of Europe.

Airports, by being partners of low cost airlines, have a strategic role in this evolution. By choosing to attract LCCs, they are active in the development of new routes that do not go to major cities or hubs.

3.2 Future trends

Major tendencies

If we compare development in Asia, Europe and North America the biggest problems coupled with future developments could be identified in Europe. Even though there is a high focus on providing sufficient airspace capacity (i.e. SESAR) we will face serious runway capacity constraints in the future.



According to EUROCONTROL, ACI Europe and also other organisations, most major European airports will be capacity constrained after 2025. Over 60 European airports will be congested and the top 20 European airports will be saturated at least eight to ten hours a day (Ref 1). This means that about 260 million passengers would potentially be affected (Ref 5).

Capacity increases of contemporary airport runway systems in Europe is mostly limited by environmental concerns, local residents protest and public opposition in general. It takes years to acquire building permission for new runway development at major hubs (e.g. Heathrow third runway, Frankfurt, etc.). These tendencies limit not only hub airport capacity but in an accelerating global economy create larger limits for European economy in the time horizon of 20 – 30 years. The latest edition of the EUROCONTROL report describes the most-likely future scenario for 2030. In this report traffic is expected to be 1.8 times greater, but demand is 2.3 million flights higher than that, so 11% of the actual demand will not be accommodated even if airports have correctly adapted their plans for the future level of demand (Ref 8).

There are no such limits in Asia and more secondary airports alternatives available in the USA which could also accommodate wide body aircraft.

In this picture the regional or secondary airports infrastructure have more influence. In our study “investment in capacity” at some of secondary (or low costs) airports could be considered as vital future investment and should be supported in particular when creating extra runway capacity able to accommodate large aircraft. Secondary airports “investment in capacity” coupled with high speed rail network development could ease situations at major hubs, provide required services and also reduce environmental impacts in the most congested areas. More complementary roles for air and rail services is expected in the future. But even extending the high-speed train network to a further 200 city-pairs which are linked by frequent, short-range flights (compared to 100 city-pairs that are affected by existing plans) would not help to mitigate the future situation (Ref 8).

However, the intermodality concept is significantly dependent on the customer willingness to transfer between the air and rail. No research has not yet been performed to explore this fast developing area yet. The major problem is also the high costs of the infrastructure and the very long time horizon for the HST net accomplishment.

Limits and challenges

At present the net of secondary or regional airports provides two functions:

- Serves as hub feeders
- Serves for point-to-point services provided mainly by low cost airlines.

Recent increases in the segment of low cost carriers in the EU market, where they gained approximately 30 % share (and nearly 50 % in the UK and Ireland) causes overestimates of the LCC importance in the market. In the US it is still only 30 % and it took more than 30 years to achieve this market share, as pointed out by (Ref 2). The LCC effect on the ATM is mostly in reduction of the hub traffic; which does not mean that hubs will stop expanding, but will have a small effect on the upper airspace as majority of LCC is using B 737 /A 320 aircraft which is operated above the FL 330.

Low cost carrier operation with no other competition at small secondary airports with throughput at about 0,5 mil. passenger a year creates very unstable and volatile market environment. It also usually has negative impact on the airport economy as the LCC is able to dictate operation conditions to continue the services. Rapid termination of LCC services can have fatal consequences on the airport business and also on the regional economy. Described “strategy of diversification” is the most appropriate of this category of airports. From this point of view feeder hub traffic could be important factor for market balancing. It is also difficult to predict what the effect of the financial crisis will be on the air transport industry but certainly the small airports will be hit the first.

From this point of view, full orientation of small airports on the LCC segment i.e. LCC terminal “capacity investment”, could not be recommended in this case. It is also necessary to further explore the costs of low



cost terminal operation and compare it with the “traditional ones”. In some cases it might be just better to offer preferential conditions for LCCs.

One of the important future trends is also expected growth in the regional aircraft market. Manufacturers jointly confirm that regional carriers will continue to grow and order new regional aircraft and that the overall trend is towards larger regional aircraft (70 Vs 50 passenger) with lower unit costs. Turboprops and regional jets are highly efficient and well adapted to serve lower density markets. The popularity of turboprops especially has grown recently. ATR aircraft orders, for example, have significantly increased over the last 10 years. Lufthansa also expects big carriers to leave 50 passenger segments and to give regional airlines a bigger niche .

The impact of this trend could be important for the overall capacity of ATM systems. The bulk of this aircraft operates in the lower airspace which can relieve the upper airspace limits or more precisely may slow down the upper airspace congestion pace.

Described as “investment in capacity” on the regional or secondary airports, combined with the HST net expansion, can offer essential relief to major hubs and absorb part of the expected increase in air transport demand. Some of the secondary airports can also develop from LCC bases to local “pseudo” hubs by increasing the share on the feeder lines. The largest ATM impact will be on the segment of the new RWY capacity and in the case of LCC much less in the upper airspace. On the other hand growth of the turboprop and the small regional jets segment in the regional airports can not be underestimated for the ATM capacity contribution.

3.3 Potential impact on airport ATM

The FAST methodology applied to two airports, Bordeaux and Bucharest, which have different characteristics and different future strategic options, helps to highlight that both airports may develop transverse new routes, i.e. routes not linking hub airports. If this trend is generalised to other European airports, the future changes in the European network may come from these new transverse routes often operated by low cost carriers, especially new Western-Eastern Europe routes.

To identify what could be the potential impacts on ATM of such future changes in air traffic distribution, we chose to interview ATM experts from several countries: France, Slovakia and the Czech Republic.

These experts were first interviewed about the past impacts of the changes in the route network on ATM (due to new routes development). Then they were interviewed about the potential impact of future changes in the route network on the future ATM.

They explained to us the difficulty in giving figures on past impacts on ATM since, to their knowledge, no study assessing these impacts had ever been made. Nevertheless their large experience in ATM allowed them to give predictions for the potential impacts of changes in the route network may have on ATM. These predictions concern airport ATM as well as en-route ATM.

In addition, situation in the Central European airspace has changed considerably with respect to the financial and economic crisis. Some of the new member states were hit by the crisis considerably and the development on the market in future 5 – 8 years is uncertain. The forecast effect of the new routes expansion will, according to the ATM experts, come but with some delay. This will create certain “time buffer” and allow to prepare the infrastructure for future traffic growth provided the investment plans are meet.

According to the interviewed experts, new transverse routes operated by low cost carriers, may have moderate impacts on airport ATM since **this additional traffic may not be the highest generator of ATFM delays**. This is proved by the fact that even past traffic evolution did not generate an increase in the proportion of ATFM delays. In 2002, delays were reported by the Performance Review Commission as still being high, with 21% of departures being delayed more than 15 minutes (Ref 11). But in terms of primary delays, only 26% were attributed to air traffic flow management (ATFM), while around 43% were due to airline operational reasons. There are three other reasons explaining this prediction.

1. Lower contribution of medium-sized and small airports in the total European ATFM delay:

EUROCONTROL (Ref 5) explains that if the delay per flight at medium-sized to small airports is up to 50% longer than the delay per flight at large airports, delayed flights are less frequent in medium-sized or



small airports. As a consequence, while additional traffic at medium-sized and small airports may have an impact on their level of ATFM delay, it should not be the main generator of ATFM delays at a European level

2. Lower increase in ATFM delays at non-hub airports:

The share of ATFM delays in the total airport delay tends to be higher at hub airports, even in case of non-congested airport. Figure 3-1 illustrates this by comparing two airports with excess capacity and close number of departure flights in 2007: Clermont-Ferrand and Beauvais airports. The total ATFM delay in 2007 of Clermont-Ferrand, which has a hub activity, is 47% higher than the total ATFM delay at Beauvais airport, which is a non-hub airport with flights operated by Low cost carriers. This comparison between both airports illustrates the hub impact on ATFM delays especially as the traffic level at Clermont-Ferrand airport is lower than at Beauvais airport.

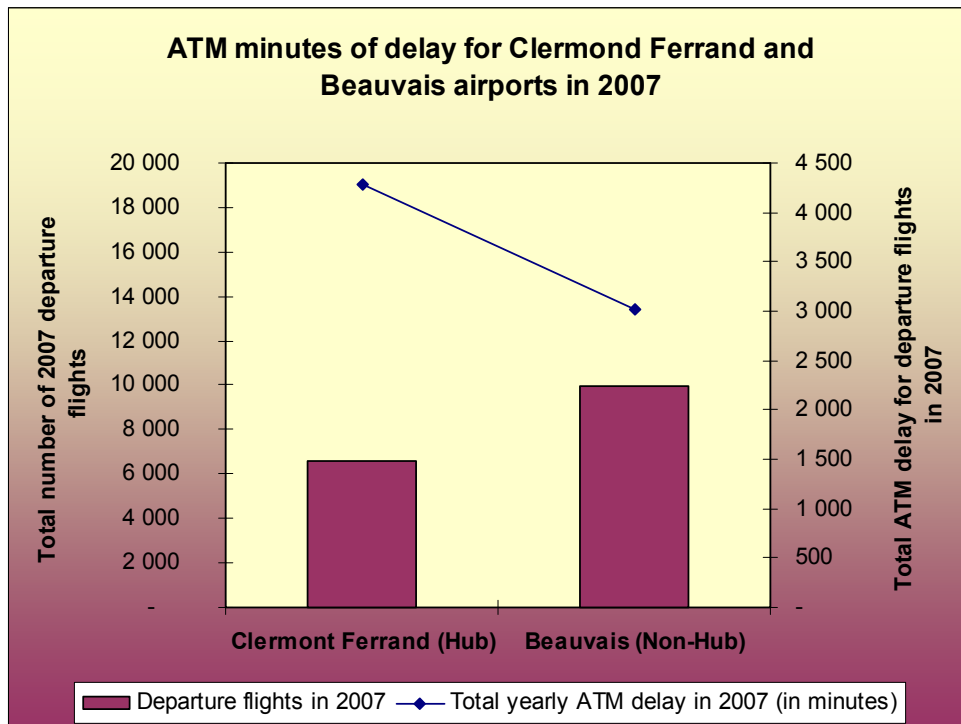


Figure 3-1: ATFM minutes of delay for Clermont Ferrand and Beauvais airports in 2007

(Source of figures: DGAC (Ref 4))

3. Additional flights mostly operated at non-peak hours:

A third reason which can explain that the additional traffic on transverse routes operated by low cost airlines, is the fact that Low cost carriers often choose to operate flights at non peak-hours. These flights do not a priori increase the airport congestion level and consequently may have a low impact on the level of ATM delays. The comparison between Figure 3-2 and Figure 3-3 which represent the departure flights distribution over the day, at Lyon airport (the Air France regional hub), in 2005 and 2009 respectively, illustrates the low cost carriers behaviour. Between 2005 and 2009, low cost carriers highly developed at the airport: two flights per day operated by LCCs in 2005 and 16 in 2009. However, as shown in Figure 3-3, their departure flights times are generally not at peak hours: no flights operated by low cost carriers are operated between 08:00 and 09:00 nor between 15:00 and 16:00.

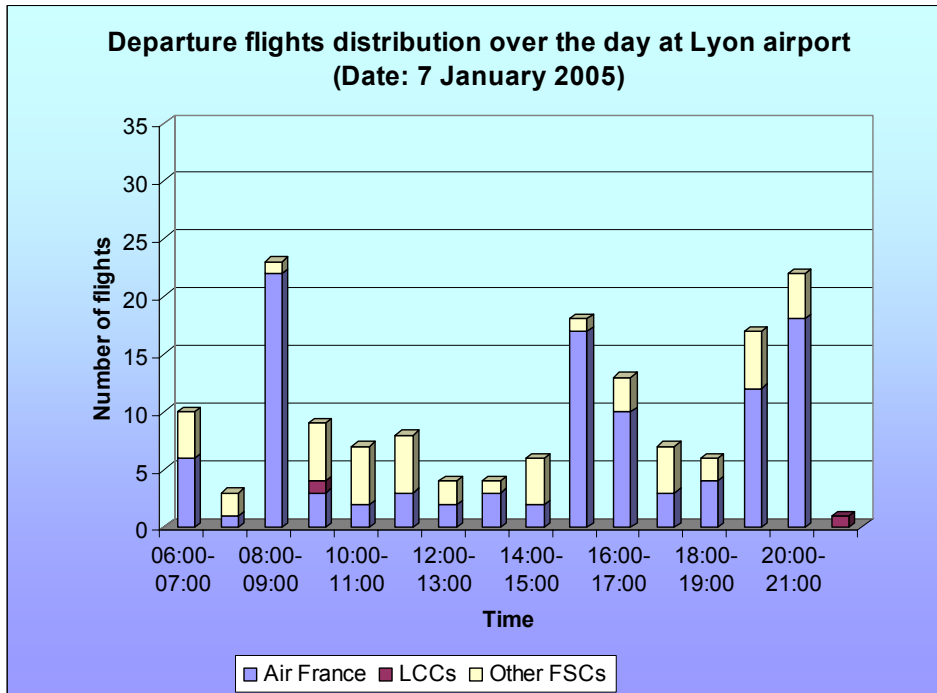


Figure 3-2: Departure flight distribution over the day at Lyon airport , date: 7 January 2005
(Source OAG, date: 7 January 2005)

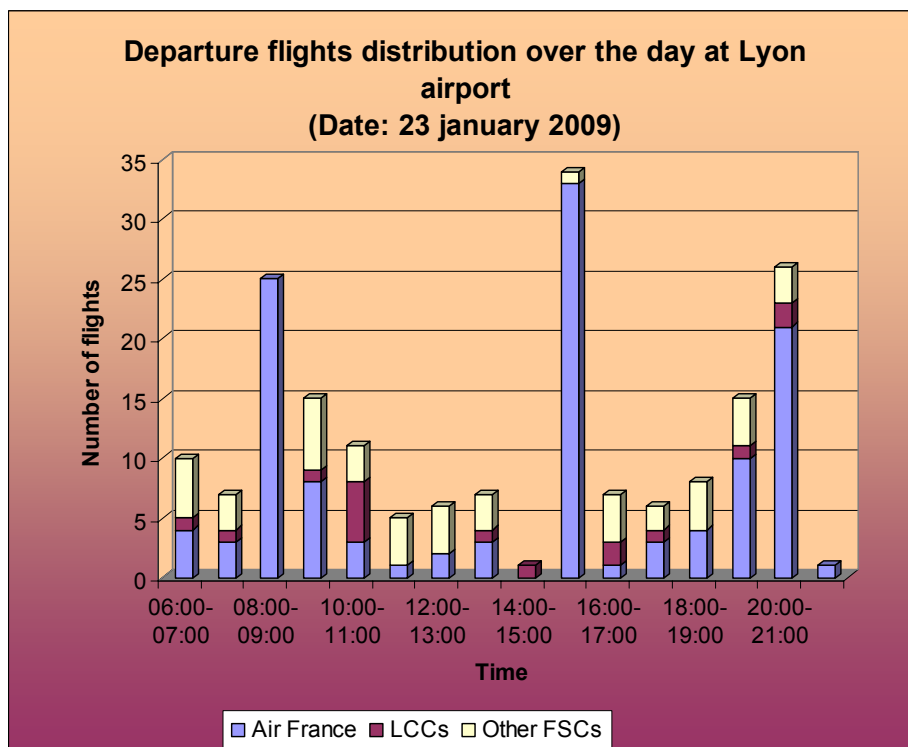


Figure 3-3: Departure flight distribution over the day at Lyon airport, date 23 January 2009
(Source OAG, date: 23 January 2009)

The low cost carriers trend of operating flights at non-peak hours also exists at non-hub airports. Let us for instance consider Marseille airport which attracted new low cost airlines between 2005 and 2009 thanks to a low cost terminal. The number of low cost flights was multiplied by 6.5 between 2005 and 2009 (2 LCCs



flights a day in 2005 and 13 in 2009). Figure 3-4 shows the LCCs flights distribution over the day at Marseille airport in January 2009. As Marseille is not a hub airport, there are no connection waves. Nevertheless, the distribution of the number of flights over the day shows 5 peak periods: between 06:00 and 07:00, between 08:00 and 09:00, between 12:00 and 13:00, between 17:00 and 18:00 and between 20:00 and 21:00. It is particularly interesting to observe that no LCCs flights are operated in three of these five peak periods. Moreover, 70% of the LCCs flights are operated at non-peak hours while this percentage only reaches 45% for Air France and 58% for other FSCs.

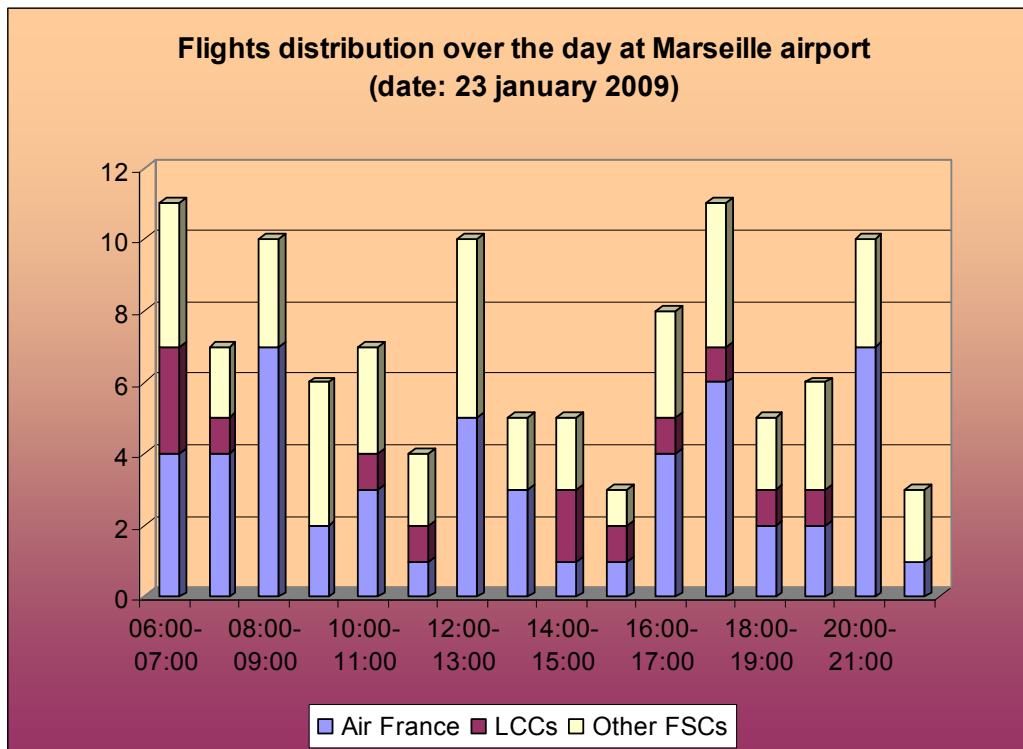


Figure 3-4: Flights distribution over the day at Marseille airport (date 23 January 2009)

(Source OAG, date: 23 January 2009)

3.4 Potential impacts on en-route ATM

Combining the answers of these different ATM experts also lead to the predictions that **new transverse routes may increase the complexity of the en-route air traffic management**, if they increase the number of crossing points with large traffic flows.

Illustrations of this prediction can be obtained by observing the potential crossing of areas with dense traffic that may generate the potential new routes at Bordeaux and Bucharest airports (as identified in sections 2.3 and 2.4). Such observations can be made by using Figure 3-5 which shows the dense air traffic in Europe and which is a significant challenge for Air traffic management (see EUROCONTROL (Ref 6)). More precisely, the objective is to have a rough idea of the possibility of new future routes from Bordeaux and Bucharest airport to cross areas with a dense air traffic represented in a red colour on Figure 3-5..

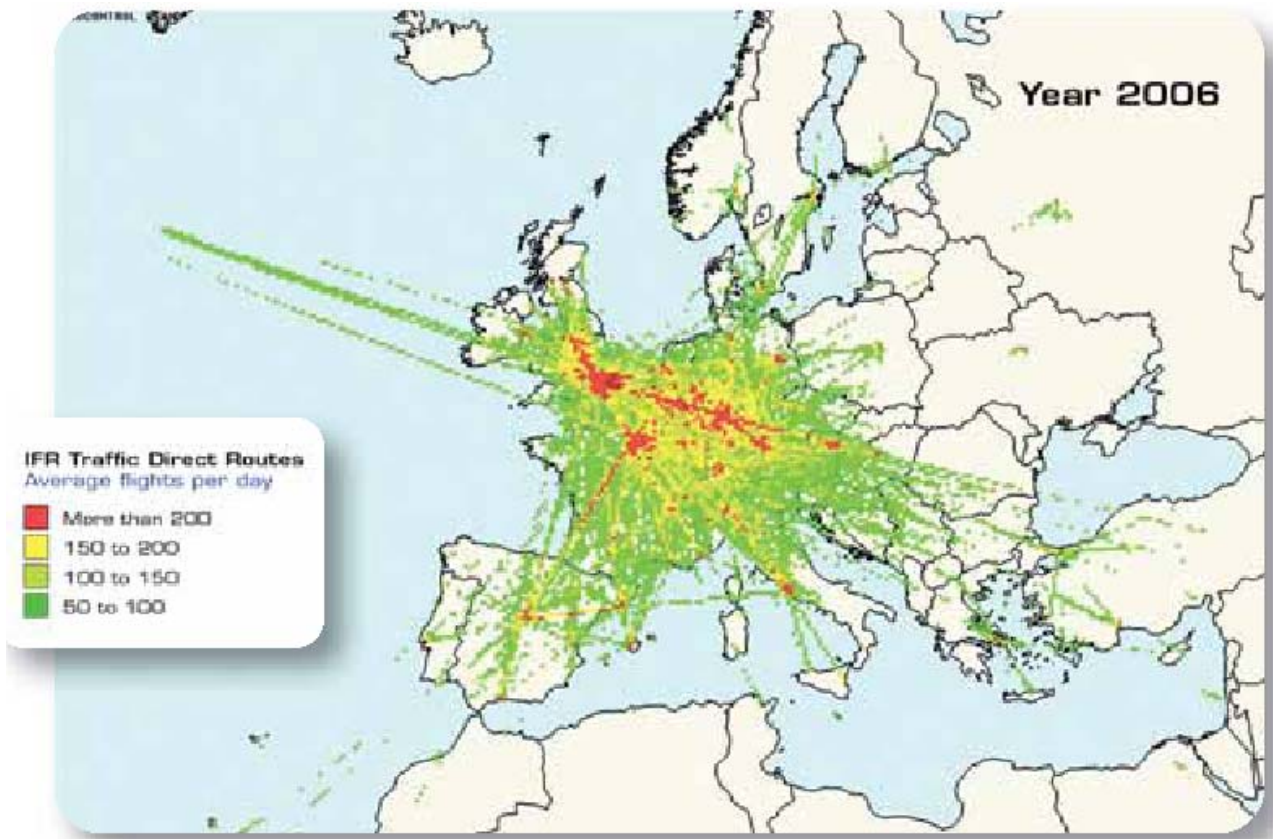


Figure 3-5: Traffic density in the airspace above Europe mirrors the concentration of major airports
(Source EUROCONTROL/STATFOR (Ref 6))

The various arrows put on **Figure 3-6** and Figure 3-7 provide a rough representation of the new future destinations that could develop over a 5-8 year time horizon from Bordeaux and Bucharest airports. The objective is to identify if new destinations served from Bordeaux and Bucharest airports may cross areas with a dense traffic level and consequently may impact the en-route ATM. Impacts on ATM could come from the increase in the volume of traffic in these dense areas and/or the increase in the number of intersections with existing traffic flows.

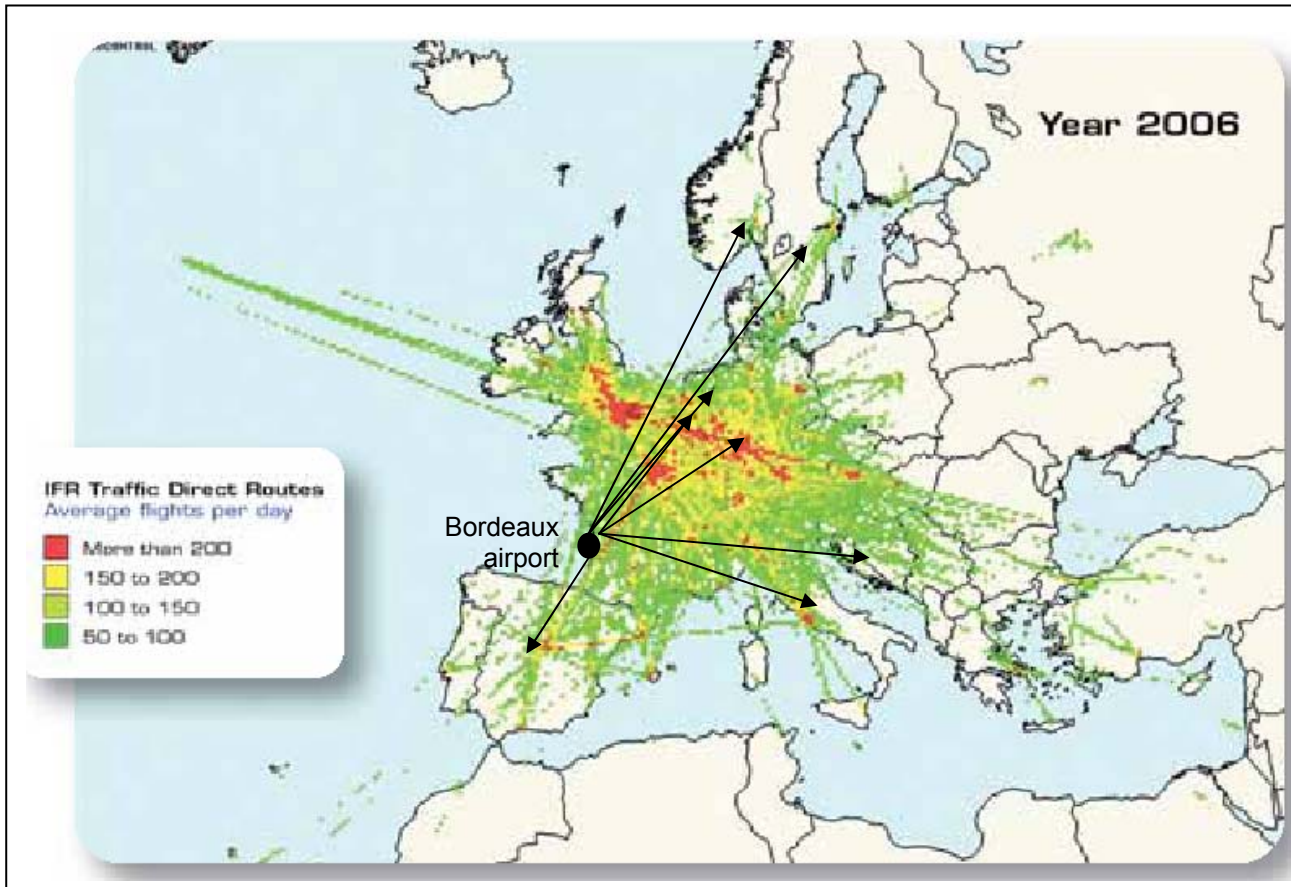


Figure 3-6: New potential destinations of Bordeaux airport
(Source EUROCONTROL/STATFOR (Ref 6))

Observation of Figure 3-6 and Figure 3-7 shows that for Bordeaux as well for Bucharest airport, new **destinations to Northern Europe may cross areas with a dense traffic volume**. For Bordeaux airport these new destinations to Northern Europe would concern Germany, Sweden, Belgium, Norway and the Netherlands. For Bucharest airport they would concern Germany and the United-Kingdom.

In addition, it is important to note that the **number of crossed areas with a dense volume of traffic could be more numerous for new traffic from Bucharest** than for Bordeaux airport. Such Eastern/ Western Europe flows may not only increase the volume of traffic in already dense traffic areas but may also significantly increase the number of intersections with numerous Northern/Southern Europe traffic flows.

One main consequence of an increase in the number of existing traffic flow intersections in areas with dense traffic volume may then be a **potential increase in the complexity of air traffic management**. This complexity increase may however be mitigated by flights operated at non-peak hours and by the volume of traffic on these new destinations.

Nevertheless, this analysis for Bucharest airport tends to highlight the fact that a **future development of Eastern/Western Europe traffic flows may impact the en-route ATM** by not only increasing the volume of traffic to be controlled, but mainly by adding numerous intersections with the Northern/Southern Europe dense traffic volume flows.

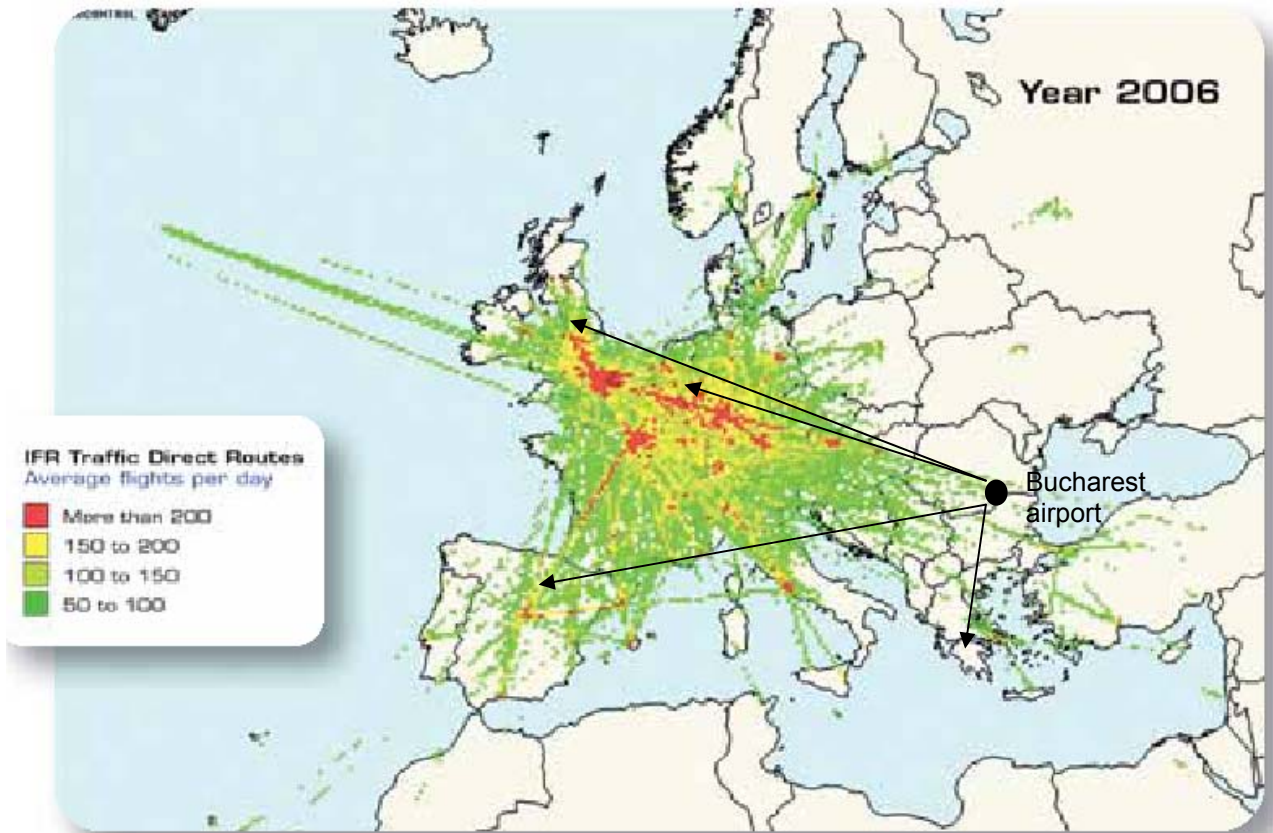
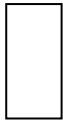


Figure 3-7: New potential destinations of Bucharest airport
(Source EUROCONTROL/STATFOR (Ref 6))





4. Conclusion

FAST is a methodological approach aiming at identifying the most relevant strategic options of any airport for 5-8 year time horizon and at identifying the potential changes in the airport route network resulting from these strategic options. These options are based on a three dimensions airport typology tailored to the particular environments in which the airports operate.

The developed approach in FAST can be broken down as follows:

1. Presentation of the past strategies of the analysed airport:
2. Identification of the future strategic options of the analysed case study airport by applying the methodology developed in WP2 (Ref 10):
3. Identification of a reference airport which has developed similar strategies in the past to the analysed airport:
4. Analysis of the past route network evolution of the reference airport following its developed strategy:
5. Use of this past route network evolution for the reference airport to make predictions on the future route network evolution of the analysed airport:

Methodology application to case study airports

The FAST approach is used to identify the future route network evolution of two case study airports: Bordeaux and Bucharest airports.

Bordeaux airport is a small regional airport with an available capacity in a single-till context. The airport is in a monopoly situation but may be in strong competition with the high-speed train in the future, caused by a reduction of one hour in the journey time between Bordeaux and Paris (two hours journey time in 2016 instead of three hours). In addition, the airport has a high potential for growth in capacity (with the possibility of building a new runway and a new terminal) and a medium potential for growth in demand (by taking into consideration the population around the airport (1.5 million within 1 hour's drive) and the region's attractiveness for tourism and business purposes).

1. The **methodology developed in the WP2** of the FAST project (Ref 10) has been applied to **Bordeaux airport**, so as to identify its **future strategic options** (strategies of specialisation and strategies of diversification). This analysis leads us to conclude that the airport has two main objectives:
 - Securing the loyalty of passengers and airlines
 - Attracting additional low cost airlines to the platform

To reach these objectives, we identify the following future strategic options for Bordeaux airport in a 5-8 year time horizon:

Future strategies of specialisation of Bordeaux airport:

Airport accessibility improvement
Development of commercial policies to airlines
Investments in communication and marketing
Investment in a low cost terminal



Future strategies of diversification of Bordeaux airport:

Development of commercial activities
Development of services to passengers

2. **Marseille airport** which has many similarities with Bordeaux airport is identified as “**Airport B**”:
 - Strong competition with the high-speed train for both airports
 - Same objectives for Marseille airport in the past as for Bordeaux airport in the future
 - Future strategic options of Bordeaux airport developed by Marseille airport in the past
3. The **analysis of the past route network evolution of Marseille airport** between 2003 and 2007 shows that the main changes in the route network concern Northern Europe, with several new routes to Germany, The United-Kingdom and Sweden. New routes to Southern Europe were also developed to Croatia
4. Assumptions are then made on the **potential route network evolution of Bordeaux airport** in a 5-8 year time horizon
 - Several new routes could potentially appear in the future to Germany, Sweden, Croatia and Italy
 - At least one additional route could potentially be created in the future to Belgium, Norway, Netherlands and/or Spain

Bucharest airport is a medium-sized airport (5 millions passengers in 2007) with available capacity in a single-till context. The airport has no strong competitor but there is a growing secondary airport with low cost traffic: Baneasa airport.

In addition the airport has a high potential for growth in capacity (with the possibility of building a new runway and a new terminal) and a high potential for growth in demand (by taking into consideration the population around the airport (3 million within 1 hour's drive) and the region's attractiveness for tourism and business purposes).

1. The methodology developed in the WP2 of the FAST project (Ref 10) has been applied to Bucharest airport so as to identify its future strategic options (strategies of specialisation and strategies of diversification). This analysis leads us to conclude that the airport has two main objectives:
 - Attracting new airlines to the platform
 - Attracting new customers to the platform

To reach these objectives, we identify the following future strategic options for Bucharest airport in a 5-8 year time horizon:

Future strategies of specialisation of Bucharest airport:

Improvement of the airport accessibility
Investment in terminal capacity
Development of commercial policies to airlines
Investment in communication



Future strategies of diversification of Bucharest airport:

- Development of commercial activities
- Development of services to passengers

- Prague airport** which has many similarities with Bucharest airport is identified as “**Airport B**”:
 - Both airports serve capitals and have hardly any competition in the catchment area where they act as a local hub for the based national flag carriers
 - Prague is the main Czech tourist destination for short breaks, while Bucharest is emerging cultural center
 - Same objectives for Prague airport in the past as for Bucharest airport in the future
 - Future strategic options of Bucharest airport developed by Prague airport in the past
- An analysis of the past route network evolution of Prague airport between 2000 and 2007 shows that the main changes in the Northern European route network concerned the 15 new routes to the United-Kingdom mainly opened by Low cost carriers. New routes in the Southern European route network mainly concerned Spain (4 new routes) and Greece (5 new routes)
- Assumptions are then made on the potential route network evolution of Bucharest airport in a 5-8 year time horizon
 - At least 15 new routes could potentially appear in the future to Germany, United-kingdom, Greece and Spain
 - A potential transfer from non-scheduled to scheduled traffic could occur on two Spanish destinations and/or four Greek destinations

Impacts of future changes in route network on ATM

The FAST methodology applied to two airports, Bordeaux and Bucharest, which have different characteristics and different future strategic options, helps to highlight that both airports may develop transverse new routes, i.e. routes not linking hub airports. If this trend is generalised to other European airports, the future changes in the European network may come from these new transverse routes often operated by low cost carriers, especially new Western-Eastern Europe routes.

To identify what could be the potential impacts on ATM of such future changes in air traffic distribution, we chose to interview ATM experts from several countries: France, Slovakia and the Czech Republic.

These experts were first interviewed on the past impacts of the changes in the route network (due to new routes development) on ATM. Then they were interviewed on the potential impacts of future changes in the route network on the future ATM.

They explained us the difficulty to be able giving figures on past impacts on ATM since, to their knowledge, no study assessing these impacts had been made. Nevertheless their large experience in ATM allowed them to give intuitions on the potential impacts of changes in the route network may have on ATM. These intuitions concern airport ATM as well as en-route ATM.

According to interviewed experts, new transverse routes operated by low cost carriers, may have moderate impacts on airport ATM since **this additional traffic may not be the highest generator of ATFM delays**. There are three main reasons explaining this intuition:

- Lower contribution of medium-sized and small airports in the total European ATFM delay:**



2. Lower increase in ATFM delays at non-hub airports:

3. Additional flights mostly operated at non-peak hours:

Combining the answers of these different ATM experts also lead to the intuitions that **new transverse routes may increase the complexity of the en-route air traffic management** if they increase the number of crossing points with large traffic flows.

The analysis of potential crossed European areas by the new new destinations served to and from Bordeaux and Bucharest airports shows that for Bordeaux as well for Bucharest airport, new **destinations to Northern European destinations may cross areas with a dense traffic volume**. For Bordeaux airport these new destinations to Northern Europe would concern Germany, Sweden, Belgium, Norway and Netherlands. For Bucharest airport they would concern Germany and the United-Kingdom.

In addition, it is important to note that the **number of crossed areas with a dense volume of traffic could be more numerous for new traffic from Bucharest** than for Bordeaux airport. Such Eastern/ Western Europe flows may not only increase the volume of traffic in already dense traffic areas but may also significantly increase the number of intersections with numerous Northern/Southern Europe traffic flows.

One main consequence of an increase in the number of existing traffic flows intersections in areas with dense traffic volume may then be a **potential increase in the complexity of air traffic management**. This complexity increase may however be mitigated by flights operated at non-peak hours and by the volume of traffic on these new destinations.

Nevertheless, this analysis for Bucharest airport tends to highlight the fact that a **future development of Eastern/Western Europe traffic flows may impact the en-route ATM** by not only increasing the volume of traffic to be controlled but mainly by adding numerous intersections with the Northern/Southern Europe dense traffic volume flows.

Concluding remarks

By developing an innovative methodology which allows to identify the potential route network evolution of an airport following changes in its airport strategy, the FAST project provides a complementary way to air traffic forecasts to handle the future of air transport and air traffic management.

The conceptual framework developed by the FAST project can be a very useful tool for:

- Identifying the potential strategic options which could be developed by a competing airport as well as the future network evolution of this airport. Both elements are an essential source of information **to be competitive during negotiations with airlines**. This relates to the competing airports with overlapping catchment areas as well as to the competing hub - airports.
- And more generally for **identifying the future strategic options** and assessing the network evolution of the airport and possibly of its complementary airports in case of **multi-airport management** as well as in case of **complementarity between hub and secondary airports**.

FAST is obviously not the first method developed to study the future evolution of airport traffic and route network but presents the advantage of being complementary to existing methodologies as illustrated in the two following reference studies:

- The STATFOR/ Challenges of Growth 2008 study (Ref 5) providing European airport traffic forecasts
- The Nigel Dennis' study (University of Westminster) (Ref 3) developing a methodology for assessing the future route network and flight schedule at a medium-sized European airport.

FAST can complement these two these studies by:



- Being able to consider all airport type
- Identifying new destinations which could potentially develop in the future at the airport.
- Giving the ability to identify the conditions of achievement of the current airport plans
- Addressing airports and markets in the new member states.

In other words, the FAST methodology is a useful tool in forecasting future network developments of many airports in Europe. By using comparisons with reference airports, network and capacity developments can be forecasted for many airports within Europe. This methodology can be used for the airport of various sizes, with various potential for growth in capacity and demand and also respecting contextual surroundings (competition, ownership and management regulation etc...).

The FAST methodology reveals very useful by providing complementary information to traffic forecasts (on the future trends for air transport) and by helping to identify the potential new routes development. The usefulness of the FAST approach was confirmed by the positive feedbacks received from air transport market stakeholders, as in particular airport managers or aircraft manufacturers, during the Eurocontrol INO workshop in December 2008.