Development of regional airports in EU

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Abstract

A suitable development of regional airports in large areas, such as continental areas, can be obtained if there exist appropriate policies addressed to achieve this goal. In the specific case of the European Union, some specific programmes at European level, such as the Single European Sky and the Trans-European Network programmes, will have many implications for the development of regional airports as well as the relationships between regional airports and low-cost air carriers. Regional airports can play an important role to reduce the congestion peaks at main airports, particularly in the light of an integrated transport network where many modes coexist and can integrate or substitute each other. Particularly, high-speed rail can improve the airport accessibility by increasing its catchment area or represent an alternative to the air mode.

Keywords: airport capacity; high-speed rail; low-cost air carriers; regional airports; SESAR; TEN-T.

1 Introduction

In the last years, the air transport system has grown quickly and the planning policies had to be adjusted to guarantee a suitable development of both air services (as courses, frequencies, fares and airport services) and infrastructures (as airports and land transport access facilities).

The deregulation process, started in 1978 in the USA with the Deregulation Act, and then in Europe with the ‘Packet for aviation liberalization’, has led to a further reorganization in the air field and such a process is still in progress.

The relatively recent foundation of the European Union (EU) has given rise to a set of problems concerning the Air Traffic Control (ATC) system along routes that are some of the most congested in the world, mainly due to the lack of
homogenenous procedures among the several European Nations. To this aim, the EU has started an ambitious programme to create a Single European Sky (SESAR project) in order to have a good ATC along the routes and to identify Air Traffic Management (ATM) policies able to improve capacity and develop an efficient and sustainable European air transport system by maintaining a high level of safety. ATM environmental efficiency is one of the key objectives of the SESAR programme as the EU gives a great importance to the reduction of the environmental impact of aviation, in particular greenhouse gas emissions and noise. At the same time, safety is the other important goal to be achieved: in fact, although flying is one of the safest travel mode, as existing technical systems reach the limits of their capacity, the risk of accidents grows, thus making crucial the development of a new generation of ATM systems able to satisfy the needs of safety and efficiency of flight operations, in the air as well as on the ground.

Congestion and delays at the airports are another important problem, and environmental considerations on the really crowded European continent often prevent the larger airports from expanding. In fact, most important airports are quite near to cities and produce important negative effects due to both air services (as noise and pollution) and airport land accessibility (as road congestion). As air traffic in Europe is expected to increase substantially in the next 20 years, the above problems are also expected to worsen if suitable policies for a sustainable development are not implemented. Furthermore, as collected data show, the cost of the European ATC system increases as air traffic increases, and hence, all things being the same, also costs are expected to grow in the future.

In the USA, the harmonization of the aviation ATC procedures overcomes the EU problems, but the system is congested as well. In particular, the territorial extension of the USA as unique country and the significant development of the aviation sector with respect to alternative land systems (as railways services) have made the air transport system the most used in the country. Low-cost carriers have given a further impulse to its diffusion, thus making the air transport system the most preferred means of transport to move within the USA.

The great interest for regional airport development both in the EU and the USA is then mainly due to their potential role in reducing the congestion along the main used routes and also reducing the negative impacts at the hub airport nodes, both for the air transport users and the overall community.

The use of regional airports has many advantages: (1) satisfactory airport capacity availability; (2) opportunity to promote the socio-economic development of decentralized areas and regions; (3) reduction of negative impacts due to the less traffic levels; (4) development of a spreader air service network.

In this light, many policies have been introduced by the EU, specifically addressed to promote the re-valuation of regional airports in the several EU nations. As stated by the European Commission (EC), ‘Regional airports are important to the development of an integrated European air transport network. In this respect, it would be desirable to unlock existing latent capacity at regional airports provided that Member States respect Community legal instruments
relating to state aids. Global Navigation Satellite Systems could play a
significant role for increasing capacity and flexibility of operations at those
airports without increasing the cost of local infrastructure. Member States should
endeavour to improve the accessibility of such airports by rail and road to allow
them to act as reliever airports.’ (‘An action plan for airport capacity, efficiency
and safety in Europe’, Brussels, Jan 2007.)

At the same time, the continuous development of low-cost air carriers has
given a further impulse to the re-valuation of regional airports. In fact, low-cost
air carriers prefer to use regional airports for many reasons as follows: reduced
aviation costs at the airport, competitive taxi and turn-around times, availability
of airport capacity due to low traffic congestion and so on. Furthermore, they can
also benefit from start-up, within the rules of compatibility established by the
Articles 87–89 of the EC Treaties and the Community guidelines on financing of
airports and start-up aid to airlines departing from regional airports. Particularly,
Article 87(3)(a) and (c) apply in relation to undertakings established or investing
in disadvantaged regions. The Guidelines specifically refer to its application in
relation to aid for undertakings financing the building of a hangar in such
regions. However, Article 87(3)(c) cannot be used to justify operating aids
(except the case where an undertaking is established in an eligible region and the
measure counterbalances particular difficulties).

To summarize, the EC recognizes the importance of regional airports to
develop an integrated European air transport network because their existing
latent capacity can reduce the congestion peaks at main airports; anyway, in
order to design an effective air transport network the EC also recommends the
improvement of their accessibility (rail and road access).

Thus, the use of regional airports can bring many advantages not only to the
air companies, airports and users, but also to the whole community both in terms
of social benefits (increased accessibility from decentralized or peripheral
regions) and potential economic expansion.

In the following, after an overview of the European main transport policies,
addressed to assure quick and easy trips within the EU (Sections 2), the main
challenges of the European airports in terms of capacity, charges and state aids
are considered (Section 3); the main relationships between regional airports and
low-cost air carriers in the European context are also summarized (Section 4);
and finally, some main conclusions are discussed (Section 5).

2 Main transport policies to assure easy mobility within EU

As well known, the EU is a relatively recent institution: born in 1950 with only
six nations, today is formed by 25 nations within the European continent,
following a significant enlargement in 2004 (Figure 1). Furthermore, two nations
(Bulgaria and Romania) have already signed the Accession Treaty while another
two (Croatia and Turkey), and several others, have requested for the EU
membership.
Figure 1: The European Union.

The progressive enlargement of the EU has posed many questions concerning the way towards the harmonization of procedures and policies, mainly in the field of air transport where the integration of the existing control systems is crucial for the safety and efficiency of the air navigation.

Many transport policies have been implemented in order to define a Trans-European Transport Network (TEN-T) thus enabling European citizens to move along the EU in a quick and efficient way.

For the air transport system, key elements to meet the goals of safety and efficiency can be identified in the following: (1) better effective use of existing airport capacity; (2) improvement of the airport environmental capacity as well as the planning framework for new airport infrastructure; (3) integration among several transport modes (co-modality) to assure fast, efficient and safe trips; (4) development and implementation of cost-efficient technological solutions.

Two main transport policies are here discussed, concerning the air traffic development and the fast railway system. Following the EC design of an integrated, co-modal, spread transport system, they are related to each other because air transport and railway systems are competitive on some routes but complementary on some others. Improvement of co-modality is one of the basic targets recommended by the EC that can also be achieved thanks to available Community funds.

Before discussing the implication of competition-complementarities between high-speed lines and air transport, an overview of the airport capacity problem is presented and then the already recalled SESAR project and the Community multiannual TEN-T programme are briefly described, with particular reference to the implication for the development of regional airports.
2.1 The airport capacity problems

The airport capacity is an important matter for the EC, as it will not be able to meet the demand in the next future and then it could be the most constraining factor on the overall air transport chain. Furthermore, new problems concerning the sustainability of airports, particularly the airport noise management, will further constrain the capacity following the concept of environmental capacity as ‘the capacity of the receiving environment, both human and non-human, to tolerate the impacts of airport activity’ (Upham et al. [1, 2]). Given that acoustic impacts are the most relevant for the airport activities, the airport acoustical capacity is also defined as ‘the maximum number of aircraft movements, per RWY direction, within a specified lapse of time, generating a noise level at most equal to the one prescribed by laws for a particular area’. Then, aircraft noise is a major constraint to airport development.

To overcome the environmental constraints, noiseless aircraft are now operating to meet the government requirements of improving noise climate around airports (e.g. Directive 2002/30/EC), even if many airlines continue to use old noisy aircraft. Anyway, as air traffic is expected to increase significantly in the next future, this measure will soon be ineffective and then noise operating restrictions on aircraft should not be applied as a first alternative, but only after consideration of the benefits to be gained from other elements.

The Balanced Approach to Noise (as fixed during the ICAO Assembly in 2001) identifies an international approach to tackle airport aircraft noise problems in an environmentally reactive and economically responsible way. It includes four main elements:

- reduction of noise at source;
- land-use planning and management;
- noise abatement operational procedures;
- noise operating restrictions on aircraft.

Then, both the increase in demand and the restrictive constraints to guarantee environmental sustainability can decrease the efficiency of airports, often considered as one of the engines for the economic growth of a region, thus undermining the overall competitiveness of the European economy.

As recent traffic estimates report, over 60 European airports will be heavily congested and the top 20 airports will be saturated at least 8–10 hours per day by 2025, if any efficient policy to increase the capacity levels is undertaken. The worsening of the available capacity levels, mainly at hub airports, has serious impacts on the overall efficiency of the European air transport industry. In fact, critical congestion at airports means not only that airline schedules cannot be assured, but also that environmental and safety costs increase.

The actions that can be undertaken to overcome these problems can be identified in the more efficient use of the existing runways and the support for new infrastructures as well as a suitable balance between market-driven solutions (as market mechanisms for slot allocation) and regulatory measures (as Single European Sky and airport safety management). In any case, aviation security
must be always assured whichever the actions undertaken to increase airport capacity.

In this overall perspective, regional airports are a key element to the development of an integrated European air transport network, because they can benefit from existing unused capacity and, if well linked to the main land transport connections (both roads and railways), can be a suitable alternative to more congested main airports.

Furthermore, they can overcome the slot assignment problems, very crucial for coordinated airports. In the current EC Regulation – Article 2(a) [3], a ‘slot’ is defined as ‘the permission given by a coordinator in accordance with this Regulation to use the full range of airport infrastructure necessary to operate an air service at a coordinated airport on a specific date and time for the purpose of landing or take-off as allocated by a coordinator in accordance with this Regulation’. According to the Regulation, Community airports with a serious loss in capacity should be designated as ‘coordinated airports’ on the basis of objective criteria after a capacity analysis has been conducted, taking into account environmental constraints at the airport itself. In other words, in a coordinated airport time windows are assigned by a coordinator to airlines for taking-off/landing (slot allocation); so, air carriers can access airport facilities for landing and taking-off at specific dates and times for the duration of the period for which the permission is granted. Only emergency and humanitarian flights as well as government flights are excluded.

According to Article 3 of the EC Slot Regulation, in any specific time period coordinated airports identify the number of slots that are offered and they are divided into arrival and departure slots. Such a partition takes into account the impact of other operational constraints, such as aircraft size and capacity, and maximum possible passenger throughput. The slot management and assignment can have significant consequences on the capacity of coordinated airports, and such a process should be based on assignment criteria inspired by transparency and unbiased principles.

In congested airports, delays in arrival/departure of aircraft means that slot availability is no more assured and then delays can extend to several flights with increased costs both for users and airlines. Delays predictability is then crucial both for airlines and airports in their operation management. Generally, airlines consider in their schedule a ‘buffer time’ to take into account unexpected delays in arriving or departing aircraft. Anyway, this enlarged time means also an inefficient use of the time resource and then a worsening in the overall airport capacity. As an example, 5 minutes of buffer time means a cost of about €1000 million in the use of airline and airport resources.

In terms of slot allocation systems, at airports where capacity limits exist, a slot coordination committee allocates slots on the basis of some criteria, mainly on the basis of ‘grandfathering’ rights. It means that slots are assigned to incumbent airlines according to their prior use of these slots. This method has been strongly criticized and some countries have introduced the rule ‘use it or lose it’, that is airlines lose their slot if they do not use it above 80% of the time. This measure tries to avoid that incumbent airlines can take strategic action in
order to discourage the entry of new competitors. The ‘grandfathering’ slot allocation system perpetuates the market presence of an air carrier at an airport without ensuring that the air carrier will use them in the best way (i.e. offer competitive services to the largest possible number of passengers).

2.2 The Single European Sky (SESAR) project

As introduced before, the SESAR project is aimed at designing and implementing a single ATM Master Plan (including technology and operational aspects), based on the Interoperability Regulation; in fact, air transport is international by nature, so an ATM global interoperability is needed, for economic and technical reasons, and above all for safety reasons.

The SESAR programme consists of two phases:

- the definition phase (2005–2007);

The definition phase has been designed and co-funded by both the EC and Eurocontrol (the European organization for air navigation safety) in order to define a European ATM Master Plan. In turn, such a plan consists of:

- a technology roadmap, with target dates for development and introduction of specific systems;
- a proposed system architecture;
- a detailed funding and implementation plan.

The implementation phase will consist of two steps:

- during the first step (2008–2013) the technologies underlying the new generation of systems should be developed together with functional enhancements in areas such as evolution of automated support tools and task-sharing between ground and aircraft;
- during the second step (2014–2020) the new systems will be used at large scale as well as their enhanced functional capacities. It is expected that the new ATM system will treble current capacity, increase safety by at least a factor of ten and will have an operating cost significantly less than today.

In order to extend the potential of a single sky in a larger environment, SESAR is thought as a worldwide project. In fact, many agreements are expected with third countries and Partner States. Cooperation agreements with third countries will help to synchronize the SESAR technological and operational choices with other modernization initiatives. On the other hand, Partner States will be invited to become members of the SESAR Joint Undertaking, to contribute to the technological programme, as well as other potential Single Sky activities.

To reach the goal of a Single European Sky, the European technical and organizational infrastructure needs to evolve; the main aspects involved in the identification of a Single European Sky, particularly in what concerns the European ATM, are as follows:
• the separation of regulatory activities from service provision, and the possibility of cross-border ATM services;
• the integration of airspace into Functional Airspace Blocks (FABs), defined in line with operational traffic flows and no longer constrained by national borders;
• the crucial role of the EC in setting common rules and standards, covering a wide range of issues such as flight data exchanges and telecommunications.

The SESAR programme is also addressed to develop new technologies aiming at further increasing the safety and efficiency of airport operations. In particular, both goals are linked to the separation between aircraft and the related control devices that can help in assuring and monitoring such a separation.

Separation between aircraft depends on wake vortices that in turn depend on the aircraft dimensions. As well known, the increase in separation will increase the safety level, but will decrease the airport capacity. Then, an optimal agreement between safety and capacity exigencies has to be achieved. New wake vortex prediction and detection devices will enable to safely reduce separation minima between aircraft while new generations of airport airside management tools will enable the optimization of ground movements. Finally, new sensors will enable remote tower operations. Then, the final goal to achieve both safety and efficiency in airports can be obtained.

Furthermore, Advanced-Surface Movement Ground Control Systems (A-SMGCS) surveillance and control functions should be implemented throughout European airports, since safety for the aerodrome airside includes not only the infrastructure but also operations and management.

As known, a SMGCS can be used not only to control the ground circulation in order to guarantee suitable safety standards, but also to optimally manage the ground movement (Postorino et al. [4]), that is by reducing possible excessive spaces among aircraft and addressing the moving vehicles along the best path in order to optimize the whole system in terms of capacity. An A-SMGCS must also answer to requirements such as surveillance, routing, guidance and control functions.

Finally, to conclude this section a brief overview about Galileo is needed. Galileo is the future European satellite navigation system, planned to be operational by 2013 and is to be included in the Trans-European Network (TEN) (see Section 2.3) as a major technological project for the industry. It will be formed by a global constellation of 30 satellites, distributed over three planes in medium Earth orbit, and ground stations providing information concerning the positioning of users in many sectors. It is expected to give a great contribution to the development of technologies, organization methods and industrial components which can ensure the safety and fluidity of air transport in the next 20 years.

As the White Paper [5] (Part 4 ‘Managing the Globalisation of Traffic’) indicates, the Galileo programme represents a key need for global transport programming and for removing the European dependence on GPS (USA) and GLONASS (Russia) satellite navigation systems. Actually, Galileo is aimed at
ensuring interoperability with the previous two systems, but it is also an independent system, in the sense that it will not be subjected to any limitation as introduced in the other two systems because of military considerations.

Galileo will support Intelligent Traffic Systems, mainly in order to provide navigational functions, real time information to users and optimized control to urban and interurban transportation. Positive impacts of the provided navigation and information services are expected, particularly: decreased travel times, increased capacity of transport links and increased safety.

The availability of an additional satellite constellation offers significant benefits to aviation in terms of improved performance and robustness, particularly resistance to unplanned interferences, greater availability of satellites, robustness to control segment failures, improved availability and continuity.

2.3 Trans-European Network Transport project

The first plan of a TENs was born at the end of the 1980s, with the idea of making available a free movement of goods, persons and services among the Europe. This is possible only if the various regions and national networks that form the single market are suitably linked by modern and efficient infrastructure. The construction of a TEN-T (Figure 2) is an important element for the economic growth and the creation of employment in the EU (European Commission [6, 7]).

![Figure 2: Trans-European Transport Network (TEN-T).](source)

*Source: European Commission (ec.europa.eu/ten/transport/maps/axes_en.htm).*
Furthermore, as transport has always been a key element to guarantee economic and social cohesion, the identification of a TEN is crucial for the creation of the internal market. Given that the EU process towards the unification is still in progress, it is important to establish the interconnection and interoperability of national networks as well as access to such networks.

In this context, airports are not merely air transportation infrastructures, but rather they should be considered as inter-modal nodes in a larger multimodal transportation network. Actually, for the vast majority of travellers, airports are multimodal interchange nodes. Similarly, many freight transporters are using air transportation as one of the links of their trip chain and, again, airports are serving as modal interchange points.

As airports are generally located far from city centres, passenger or freight movements involving air travel require the use of other transportation modes to reach the airport. Generally, two secondary trips can be identified: the first one to access the airport to initiate the air transportation component of the overall trip, and the second one to move from the airport at the end of a flight to the final destination. In that sense, all airports are multimodal interchange nodes. Anyway, more in-depth analyses can prove different levels of complexity in the interchange role of an airport. In fact, in some cases the trip to/from the airport is simply the access and egress from the air transportation network, as air travel is the primary mode. In other cases, there may be more than one primary mode (e.g. local transportation to an airport, a flight, an intercity rail journey and local transportation to the destination).

Furthermore, the growth of low-cost air services at some secondary airports has significant implications for the local surface transportation. Many of the airports used by low-cost carriers are generally far from the final destination city (e.g. Frankfurt/Hahn is about 100 kilometres from Frankfurt). In a very small number of cases there are limited local train services but, in general, access and egress is by road transportation. This can lead to congestion on routes that do not have the capacity to cope with the additional traffic flows, cause road damage on pavements not originally designed for such flows and impose an environmental burden on areas that were previously relatively quiet.

In order to speed up the integration progress among the several EU nations and to improve accessibility, the EC has provided a large amount of specific funds that, together with the Structural and Cohesion Funds, could be used as leverage for national funding. Furthermore, specific attention has been addressed to cross-border projects in order to obtain a more effective integration among neighbouring nations.

The TEN-T actions are periodically revised to take into account new exigencies and projects already finished. Main important corridors have to link both Northern and Southern European regions as well as Eastern and Western countries. Together with the land network extension, both in terms of road and railway infrastructures, also the ‘Motorways of the Sea’ are key targets within the TEN-T framework. They should ensure regular, high-capacity ferry routes between the main ports in the EU, in order to improve the efficiency and reliability of freight transport and then provide suitable alternatives for congested
land routes on roads. Their benefits are expected in the economic and social fields in terms of improved cohesion between the involved countries: enhanced accessibility; reduction in transport costs and times; improvement of quality; creation of employment; access to new markets.

One of the most important consequences of the TEN-T actions is the expected increase in the accessibility among the several EU nations and, inside the same nations, among regions. Conventional accessibility indicators measure the total effect of both geographical location (periphery vs. centre) and quality of transport provided by the transport system. Decentralized regions have disadvantages linked to their geographical position, but the inhabitants of these areas should reach relevant destinations with the same travel speed as the people in the central regions.

The TEN-T’s actual effects on accessibility are still unknown, because some projects can increase the accessibility of some regions, but they do not improve the accessibility of other neighbouring regions. Anyway, a more integrated land network could be a successful element to increase the accessibility to airports, mainly regional airports, thus starting the development of such airports and a more effective distribution of demand over the EU territory.

Anyway, the land transport infrastructure facilities required for airports depend on how the airport network develops and then which is the more suitable European integrated network. Development of airports in turn depends on the development of the airline market and the policies adopted by local and national governments.

2.4 Air-rail competition/integration

As addressed by the EC, air and rail transport systems should become more complementary. Actually, there is a need for efficient co-modal infrastructures and modal split for airport access should also be improved. The EC exhibits particular attention towards projects concerning inter-modal infrastructures that are encouraged by means of the European Cohesion Policy and continue to be eligible for financing under the European Regional Development and Cohesion Funds, still available for the period 2007–2013. The Commission also invites Member States to support the development of inter-modal inter-changes at airports (rail links to and railway stations at airports), which promote efficiency of both rail and air transport.

Anyway, the point of view in most adopted policies (both at national and over-national levels) is to establish competing high-speed rail services to meet at least some of the current and future demands on some links, in order to substitute air services with rail services.

At least three interfaces between air and rail exist that can produce positive impacts on the environment:

- links to the city, that can produce decongestion of road traffic and better air quality around airports;
- links to the region, that can have the same benefits as above and the additional benefit of the airport catchment area expansion;
• link between the airport and major metropolitan areas by means of high-speed rail with the same benefits as above and additional potential for short haul slots to be freed for long-haul flights, which for airports and air carriers represent higher slot productivity.

At the moment, the railway European network can be classified as conventional rail and high-speed rail (Figure 3).

![The European main railway network (2008).](image)

Conventional rail can play an important role to connect secondary and regional airports; where such links lack, they should be planned by Member States and Community funding can also be done to realize these infrastructures.

As defined in the European Directive on Interoperability, high-speed rail is a system where trains run at a maximum speed of at least 250 kilometres/hour. The boundary between high-speed and conventional rail can also be unclear, as some conventional trains in the UK and Sweden achieve better average speeds than, for example, high-speed trains in Germany even though the latter achieve better maximum speeds.

The opening of high-speed lines, such as Paris-Lyon and Madrid-Seville, has enabled rail transport to obtain significant market shares on routes where time-sensitive passengers would previously have travelled by air. Anyway, due to the air liberalization process, the expansion of low-cost airlines has produced on some routes, particularly in Germany and the UK, prices for air transport similar to or below rail transport fares that could reverse the switch in market share. In addition, the construction and maintenance of high-speed rail lines require significant public
funding. But the role of high-speed lines is more complex, because they can act not only as competitors against air transport, but also as complementary mode to increase the catchment area of an airport, mainly hub or primary airports. Then, conventional rail can increase the connections between secondary and regional airports enabling them to split air traffic according to their policies; on the other hand, high-speed rail can be seen as a key factor to obtain significant decrease in air congestion, as they can replace air links on some routes. Finally, they can increase the accessibility at the main airports and provide additional demand from a larger catchment area mainly for long-haul trips, as for short trips high-speed trains can replace the air mode. As an example, two European airports, Frankfurt and Paris CDG, have high-speed rail stations at the airport and there is the potential for rail and air services to complement each other rather than compete. Instead of taking a short distance flight to the airport, in order to connect on a longer distance flight, passengers can travel by high-speed rail to/from the airport. As integrated transport system network should also provide fare integration, on some routes passengers can buy tickets which include both a rail sector and the air sector. However, the attractiveness of such an integrated system to air passengers is limited if they cannot check-in their luggage at the station and obtain a single electronic ticket for the combined journey, due to the severe measures undertaken by the EC in terms of security. On the other hand, the absence of integrated air–rail tickets can be seen as an obstacle to the further development of air/rail inter-modality in terms of services and passenger interest.

Finally, air/rail inter-modality cannot be considered as a primary way to decongest airports as the decongesting effect amounts to 1 or 2 years of air traffic growth. However, it is useful to achieve a greater efficiency of the transport system and in particular of airports where the environmental burden will be reduced.

To encourage rail as a complement for air, attention should be given on improving the attraction on the rail product for both point-to-point and transfer journeys.

The principal drivers for passengers when choosing a mode of transport are relatively stable and consistently important across Europe. As investigations on passenger behaviour show, users will choose a transport mode among a set of available modes that match their trip exigencies when time, fare, frequency, access and also information, ticketing, languages, service integration and other issues, offer them an advantage with respect to the alternative modes. Then, users will choose the rail option with respect to air if its characteristics are overall better. Inter-modal development should therefore understand the passenger market choices.

The main factors determining air and rail market share can be identified in the following:

- the operating costs of each mode;
- the expected trend in market share and operating costs in the next 5–10 years;
- the security aspects concerned with the introduction of through baggage handling and e-ticketing;
• reliability;
• terminal accessibility.

For the last two points, as an example, the excellent reliability of the high-speed trains in Spain was a key factor determining the high market share of the Madrid–Seville rail service. Similarly, the good location of the airports on the Madrid–Barcelona route contributed to high air market share; in contrast, the relatively poor location of the airports on the Paris–Marseille route contributed to high rail market share.

The choices of passengers between air and rail are then driven by the combination of the relevant attributes as times and costs, where times include trip time, waiting time at terminals, access/egress times and so on. In terms of costs (as air/rail fares, parking or bus tickets to reach the terminal and so on) the belief here is that rail is generally less costly than air. This is true in principle, mainly if the comparison is between conventional trains and full-service (or traditional) air carriers, while the difference is much less significant (and in some cases it is reversed) if the comparison is between high-speed rail services and low-cost air carriers.

For example, for the London–Paris and London–Edinburgh routes, the rail mode is on average the cheapest option (Steer Davies Gleave Report [8]). However, while rail fares on the London–Paris route were nearly as high as those of the main traditional operators, on the London–Edinburgh route, low-cost air carriers offer on average better fares than the rail operator. This could be the main reason for the low rail market share on this route, as airlines on the London–Edinburgh link offer relatively lower fares.

As investments in multimodal interchange nodes and the connecting road and rail links have a long time-horizon, then the actual potential for competitiveness vs. integration should be carefully evaluated.

To conclude this section, another important project that can further increase the land accessibility among neighbouring nations within the EU is the innovative European Rail Traffic Management System (ERTMS) that introduces digital technology for the European rail infrastructure. As for the air transport, there are different signalling systems in the cab of the train for the various national networks, but ERTMS standard train protection system will greatly simplify and speed up the technical interoperability of cross-border transports. Further advantages will be the increase in safety standards to a high common level throughout the EU as well as the increase in the capacity utilization of the existing rail network (ERTMS [9]).

3 Airports in the EU perspective

The role of airports in Europe is a matter of discussion, mainly because of their double nature: as important node of air network (but also as node of inter-modal networks) and as source of employment and potential economic engine for a region.

Solutions to increase airport safety, capacity and efficiency while remaining environmentally friendly are the main goals of the EUROCONTROL Airport
Operations Programme (APR), first launched in January 2002 and then, due to its success, in January 2007.

As recent data provide, in 2006 in Europe there were about 2100 airports, with a great part being regional and secondary airports. They are spread on the territory, so potential passengers can reach them on average in 90 minutes. The cities closest to European busiest airports have between 4 and 46 airfields within 100 kilometres from the city centre.

The largest European airports get 80% or more of all departures within 100 kilometres (EUROCONTROL [10]), the usual distance of these airports from the city centres being about 20–25 kilometres. In terms of distribution on the territory, large cities are far from large airports no more than 50–150 kilometres in Northern Europe, while in Southern Europe the separation among the main cities, and then large airports, is larger. As an example, the main airport serving Madrid is 13 km from the city centre, but the next airport with more than 100 departures/day is 290 kilometres away, at Valencia.

In terms of ownership, many airport types can be identified, due to different historical and political perspectives in the EU Member States and the Accession countries. Several ownership categories can be recognized, but there are also mixed ownership (public/private) whose difference is in the proportion of national and local government involvement. To give an overview, the airport ownership types can be identified in the following:

- national government;
- regional/local government owned;
- other state sector ownership;
- chamber of Commerce;
- privatized airport/airport group;
- mixed type: majority government ownership;
- mixed type: minority government ownership.

Within the different airport categories, regional airports are a potential challenge for the European air network. In fact, they can provide additional capacity in areas where major airports have become congested, but given their inherent small nature they may not be making sufficient revenue to cover their costs.

These two points are discussed in the following.

Regional airports have become progressively more important in the European aviation network as air demand has increased and many new airlines, particularly low-cost air carriers, have begun to operate at small airports. Then, from one hand regional airports have increased access to aviation markets for a larger proportion of the population that otherwise could not use the air mode. On the other hand, they have increased competition among airlines because of their attractive potential for many air carriers, thus leading to lower fares, increased frequencies and more served destinations. More factors can be identified as crucial for the progressive development of regional airports, as the growth and expansion of the number of regional carriers, the rise of the low-cost carrier, the conversion of military airfields into commercial service airports and the increased use of larger regional jets.
Anyway, the liberalization process has produced remarkable changes not only in the airline industry but also in the airport industry, although most of them have maintained their profitability from both location and, in some cases, monopoly rents. For regional airports, however, the question is more complex. Although the number of movements in such airports has increased significantly as well as the number of passengers and/or goods, however the absolute numbers are quite low and then they may have insufficient revenue to cover their costs.

According to the airport European data, there is significant variation across both cost and revenue performances. Some airports have high costs but also high operating revenues. Efficient airports can be considered those providing economically efficient levels of output; anyway, for airports the output is a combination of aircraft movements and handled passengers, so different airport rankings are obtained when comparing cost per passenger vs. cost per movement.

Another aspect concerns the potential competition among airports and then which is their effective role with respect to the air services generally they offer. As nodes of the air network, airports provide links between locations at given times and costs (also due to the airline offer) and they compete for passengers by competing for airlines and airline services. The passenger airport choices are based on the combination of airport and airline characteristics (see also Chapter 5). Airlines, in turn, will choose the airport where to start the service on the basis of many factors including network fitness and airline business model.

Regional airports will compete on comparable full price over their catchment area in order to attract a level of demand able to increase the revenue, both due to aviation and non-aviation services and, as some analyses show, there is an increasing level of competition between regional and secondary airports as well as between the secondary airports themselves.

To start a convenient process of airport competition, there should be effective available alternative airports and the willingness of airlines to compete with the air services offered at the current dominant airports. But also passengers should be willing to move from the dominant airport to the potential competitive one, on the basis of the air services they can obtain at the latter. Airport competition has the potential to expand further if factors such as attractiveness of the low-fare airlines and of the airports they serve combine together to become appealing for passengers.

The main attractive factors for airlines are:

- the reduced airport turnaround times (e.g. 25–30 minutes on average) that enable airlines to increase the productivity of planes and their crews when compared to the slot-constrained hub airports;
- the lower airport charges they can obtain at secondary and regional airports.

Other factors that encourage airlines to introduce air services for new city-pair markets are:

- potential traffic and yield at each end of route;
- availability of slots;
● existing competition offered by other airlines on route and indirect routings;
● operating costs not dependent on airport operators.

Attractive factors for passengers to move towards a new airport are not only reduced air fares (generally offered at secondary or regional airports), but also reduced delays (as these airports do not suffer from traffic congestion) and direct point-to-point services (that avoid waiting time for transfers at an intermediate hub airports). Finally, when a delay occurs at smaller airports it is generally worse than at larger airports, but delays at smaller airports are relatively infrequent (actually most of the total delay takes place at large airports) and this may represent a compensation for the lower frequencies generally offered to passengers.

The choice of passengers to move towards an airport and airlines to start new services can be helped by the airport that can play an important role in stressing the attractions of the airport infrastructure and surrounding area for business and leisure travellers, but also can influence such decisions directly by offering good facilities (parking, surface access, check-in, lounges, shopping, gates, and sometimes handling services), and suitable cost of landings and take-offs.

When two or more airports share a similar catchment area, the airline decision to introduce the service at all and to use a given airport will strongly depend on the airport offer. Airports close to the same urban area are in the best position to compete with each other, given their proximity to the commercial and residential centres of the city; in this case, great relevance assumes the identification of their overlapping catchment area, where two or more airports (or, better, airlines operating at those airports) compete for the same air demand (see also Chapter 4).

In terms of connection and frequency, scheduled traffic at an airport grows by adding connections and by increasing frequency on a small proportion of those connections. Two kinds of offered air services can be identified as hub-an-spoke vs. point-to-point.

The hub-and-spoke system is used by many full-service air carriers as the preferred one in order to increase the load factor on average and to gain a monopolistic power at airports. A hub-and-spoke system is characterized by a high spatial network concentration, a time coordination of flights at the hub, according to a ‘flight wave’ concept, and the integration of the air services at the hub (as baggage transfer). The coordination at hubs means that delays in only one flight can have consequences on many other flights (e.g. crew or aircraft unavailability). An airport can play the role of ‘hub’ for a hub-and-spoke network if it is centrally located with respect to the served market and there is a significant demand starting/ending trips at hubs. Furthermore, it should guarantee suitable facilities to accommodate large aircraft and the baggage transfer, as well as all the accessory facilities required by airlines in doing a hub-and-spoke service.

Point-to-point services are simply routes serving a given city-pair where there is a significant demand to guarantee the accomplishment of the break-even load factor. In this case, passengers can fly from an origin airport to a destination one without scheduled transfers at intermediate airports and then without loss of
accessories time (e.g. due to baggage recovery and waiting time). Generally, the
used aircraft are smaller at the first time and larger if demand increases after the
service has started; the flown distances are within 400 kilometres from medium-
sized airports, while smaller airports can still have shorter flights.

There is a general agreement that the trend is towards smaller aircraft for
intra-European services if market trends will continue. That could imply more
point-to-point services and the growth in the use of smaller, regional airports. A
point-to-point increase in passenger travel would require the extension and
upgrading of smaller airports and a redesign of the network.

Anyway, the question is whether the changes in the market structure
observed in the airline industry will be permanent, or they are simply transitory
stages on the path towards a different, long-run equilibrium. Two opposite
beliefs are proposed: some airport network planners state that the determinants of
the hub-and-spoke system are not set to decrease in the near future and the
current factors promoting the growth of point-to-point services may weaken in
the next future; on the contrary, some others seem convinced that point-to-point
services will predominate in the long run. This latter point of view is also
encouraged by some studies carried out in the USA on the development of the
US airport system that predict a huge increase of point-to-point links by 2020
with almost all passengers being offered direct flights to their destinations, an
improvement in services and a reduction in the number of takeoffs and landings
relative to the volume of transport services.

Some final considerations about the tendencies concerning the development
of airports in Europe, and mainly regional airports, is the question of State aids,
funding for transport links and regulation measures.

State aids are intended as local, regional or national government measures to
assist airports (and airlines), and they may fall within Article 87(3)(a) of the EC
Treaties if their location is within an eligible region, thus being particularly
relevant for regional airports. EC Guidelines on regional airport State aid affirm
that regional airport operators have to inform the Commission about any public
finance they receive from regional or national authorities, as well as by means of
the EU funds. Notified aid is then examined by the Commission and if there is
doubt that certain investment at a regional airport constituted unauthorized State
aid, the Commission can start a formal investigation against the concerned airport.

In the context of subsidies for airlines that realize a public service for some
specified routes which they would not normally operate on economic basis, there
are some specific indications. Such subsidies can be allowed in two cases:

- when other transport systems cannot guarantee a suitable accessibility to
  some regions, the local or central authority identify some scheduled air routes
to serve airports located in peripheral areas or developing regions, or
  alternatively low-demand routes provided that such measures can be
  considered crucial for the economic development of a given geographical
  area (public service obligation, as defined in Council Regulation 2408/92,
currently under revision); such subsidy then serves to reimburse a carrier selected by a public tender for performing the required public service;

• where the subsidy has a social character granted to specific categories of passengers on a route granted without discrimination on the grounds of the carrier operating the services.

Another aspect considered in the Guidelines concerns an airline that can receive significant financial advantages by obtaining from the public authority, or the entity that operates the airport on behalf of the authority, exclusive concessions for a market price lower than their actual market value. Although the exclusive concession may be given to an airline for a price lower than its market value, if the airline pays no fee for the exclusivity or the fee is lower than would be paid under normal commercial conditions, that should be considered an aid element.

State aids to airports may have as consequence a distortion in competition, both among airports and airlines. In fact, direct or indirect subsidization of airports can distort competition between airports themselves, while subsidization of the airports could indirectly benefit airlines, thus distorting competition between them as the aid enables airports to facilitate specific airlines by means of, for example, lower airport charges.

Funding for transport links, in order to connect airports to the land transport systems, falls within the EC Guidelines on finance for infrastructure, open to all potential users without discrimination. As already discussed, these improved transport connections may extend an airport catchment area, thus improving its competitiveness; funds from the Community TEN-T can also be used by airports for improving inter-modal links following the wide Community transport policy. This kind of funding does not constitute State aid as the funds derive from the central EU funding, and then the construction of a high-speed rail link, rail-air station or a people-mover link to an airport terminal is unlikely to be considered a State aid.

Finally, regulation should be confined to those activities in which the airport has constant monopoly power, as airport services essential for downstream users that cannot be duplicated without considerable costs. The airside system, included aprons, and the passenger and freight handling terminals are generally regarded as such services. On the contrary, non-aviation activities and ground handling are seen as activities in which, at a given extent, the airport might have some monopolistic power. As the air liberalization process extends to several features, also ground handling was liberalized in 1996, thus enabling third party providers to enter the market. Ground handling services should not be regulated, but central infrastructure services such as package handling systems should be part of the regulated activities. In countries where airports do not offer ground handling (as in the UK) this does not represent a problem, but in the majority of the European Nations (as Italy, Spain, France, Austria, Germany) airports provide ground handling services and then the way towards the effective liberalization will be longer.
4 Low-cost carriers and regional airports

The European deregulation has generated a massive expansion in a segment of the airline industry known as ‘no frills’ or ‘low-cost’ airlines. There has been a significant entry of new airlines offering single-class services on a point-to-point basis. Low-cost air carriers have risen quickly in the last years, thus making the air transport system more accessible to many users, mainly to young and low-income people, but today also businessmen are attracted by the competitive fares proposed by low-cost air carriers. While the market share of these low-cost carriers was still relatively low in 2000/2001, the number of successful carriers increased noticeably.

In Europe, the growth of low-cost and regional carriers has led to a greater use of secondary and local airports with few or no international connections prior to deregulation. On the other hand, it can be argued that the expansion of the low-cost carrier is mainly linked to the available overcapacity at regional airports.

The low-cost models adopted by air carriers to reduce their operational costs in order to maintain a high competitiveness in terms of air fares, can be different among the different companies (Gillen and Lall [11]), but some common factors can be identified, also with respect to full-service air carriers, mainly in the commercial, organizational and technical fields.

In terms of commercial aspects, low-cost carriers achieve significant savings by selling their tickets via Internet or in same cases by means of payment call-centres. Furthermore, the ticket is just a reference code (sent by e-mail after the flight has been purchased) that has to be presented at the check-in point together with the passport in order to receive a boarding card, often without seat reservation. Finally, low-cost air carriers generally do not adopt fidelity programmes (as frequent flier programmes).

In terms of organizational aspects, low-cost air carriers have reduced all the services not included in the transport function, as on-board meals, magazines and drinks that are not included in the fare and can be bought on the airplane during the flight. Cabin crew and ground staff are also reduced and many services considered unessential for the development of the company are outsourced. Furthermore, they offer medium distance flights, generally intra-EU for the European case: on average, flights cover about 800 kilometres. The service is organized on a point-to-point base, thus avoiding baggage and passenger transfers and maintaining a low turnaround time. In fact, smaller airports can offer only limited opportunities to transfer to other flights, while major airports may suffer from delays which can make connections unsure. Generally, frequencies are not high because low-cost air carriers frequently offer air services between low-demand, secondary airports, although, in many cases, with a great potentiality (as Hahn for Frankfurt, Beauvais for Paris, Charleroi for Brussels, Bergamo for Milan). In this light, secondary, or regional, airports have great advantages for low-cost air carriers and also for passengers in terms of reduced waiting time in the baggage claim area and walking time inside the terminal as well as less congestion inside the airport. The main disadvantages for
passengers of regional airports are the higher access/egress times between the city-centre of their actual destination and the airport itself.

In terms of technical aspects, low-cost carriers have low turnaround time in order to use more efficiently their aircraft. As an example, turnaround times for low-cost carriers are about 25–35 minutes, while for full-service carriers they range from 45 to 60 minutes. Then, generally low-cost carriers can use their aircraft 30% more than full-service carriers thus realizing more flights per aircraft. Furthermore, for intra-EU flights the number of flown hours per aircraft is on average 9 per day for full-service carriers and about 10–12 for low-cost carriers. Finally, full-service carriers generally use a mixed fleet while low-cost carriers use a unique type of aircraft (generally B-737). This enables the air carriers to spend less for crew training and to have significant savings in terms of aircraft maintenance.

The first significant example of low-cost air carrier in Europe is Ryanair. At the beginning, Ryanair tried to offer the same air services as the full-services airlines it faced (as British Airways and Aer Lingus), but with lower fares in order to be more attractive for passengers.

However, the high operational costs produced a significant loss in the period 1985–1991 (apart from 1987) by convincing the airline managers to transform Ryanair in a cash driven airline with a reduction of the offered services and the adoption of strategies to limit costs of the kind usually identified as ‘low-cost’ models. Among the different measures, Ryanair outsourced all the passenger services considered unessential for the mission of the company. Outsourced services have advantages and disadvantages: from one hand, they enable the company to obtain a quick economic expansion by offering services to passengers without taking on staff working only on that specific aspect; on the other hand, the relationships with the subcontractors are time consuming and source of stress for the company, because a problem with one of the subcontractors can produce discomfort to passengers. After, Ryanair adopted and improved the low-cost/low-fare business model originally developed in the US by Southwest Airlines, by going progressively towards a business model based on single fleet type, use of uncongested airports, low turnaround times, point-to-point services and on-line bookings.

As Ryanair started its services between the UK and Ireland as direct concurrent of Aer Lingus (see, e.g. Figure 4) and then between the British Isles (from airports such as Stansted, Luton, Manchester, Newcastle, Glasgow and Dublin) and continental Europe, the impact of the low-cost segment was greatest in UK, where the number of passengers carried by Easyjet, a new low-cost entry following a similar low-fare approach, and Ryanair was 84% of the total British Airways passenger.

The rise of further low-cost airlines gave (and still is giving) a higher profile to European secondary airports and created new markets for air travel. For example, within Britain congestion at London airports encouraged the growth of many regional airports. Scotland Edinburgh Airport, for instance, increased significantly its traffic after being identified as a low-cost destination by some low-cost carriers.
In contrast to Ryanair, EasyJet Airline has largely avoided secondary airports. Apart from Liverpool in northwest England and the airline home base at London Luton, EasyJet has concentrated on serving primary airports. Routes are guaranteed on major destinations as Barcelona, Nice, Paris, Zurich, Geneva and Amsterdam, and in the future of the company there could be a change towards higher fares as EasyJet managers expect that people will pay more to travel to main airports.

Nowadays, low-cost carriers are expanding services on continental Europe. Ryanair is developing Frankfurt-Hahn and Charleroi as bases while EasyJet is developing Geneva. The trend at the major airports has been towards a continued pressure for additional slots but in some cases there has been a contraction in the served destinations, perhaps because some airlines focused on their most profitable routes due to some current economic situations.

An important aspect that has promoted the use of regional airports is the opportunity for low-cost companies to obtain subsidies in the form of discounted airport charges. In fact, some regional airports have undertaken this way to stimulate traffic and then to increase the revenue. However, discounts offered to airlines by airport operators may be considered State aid if they discriminate against particular airlines. In some cases, the analysis of the circumstances by the EC have stated that ‘discounted landing fees would not constitute State aid where they were applied for a limited duration and were available to all airlines operating from the airport, subject to their fulfilling objective criteria (i.e. starting a new service to a new destination)’ (Manchester Airport case, EC). In other cases, agreements between airport operators and airlines or the independent application of a discriminatory policy by the airport operator have led to discounted airport charges and, therefore, Articles 81 and 82 of the EC Treaties, as opposed to Article 87, have been used to challenge discriminatory airport charges. Such situations distort competition for airports that cover their costs and may lead to inefficiencies for passengers and airlines. This was the key issue in the Charleroi Airport–Ryanair case, where, following the EC, aid was made
available only to Ryanair. Anyway, a recent sentence of the European Court has reversed the EC judgment.

One of the most controversial questions about the great success of Ryanair in Europe mainly concerns the negotiation of the airport charges realized by the managerial staff of the airline. Many Ryanair competing air carriers have denounced the application of advantage fees to Ryanair by airport operators and have asked the EC for a clarification. Actually, data for eight provincial airports in UK indicate that Ryanair has negotiated airport charges with at least a two-thirds discount on the Stansted charge.

Finally, regional airport development has been often associated with passenger traffic. However, the growth in the air freight transport has led to a similar re-valuation of the role of regional airports as the emergence of passenger low-cost carriers. In fact, smaller airports, some of them being the former military airports with only basic service functions, now serve as specialized freight airports. Compared to primary and secondary airports with freight and passenger services and international connections, they are located further away from the larger cities, with far fewer connections to the supra-regional railway and road network. But the same measures (and the same considerations), as for regional airports used by passengers, can be adopted for these freight-specialized airports.

5 Conclusions

Many policies have been undertaken by the EU to promote the development of the transport system within Europe, following an integrated approach as stated by the TEN-T project.

Significant progresses have also been realized in the air transport system, also due to the urgency to achieve integration and harmonization among the different aviation procedures in the several European Nations.

The considerable congestion at the main airports and the liberalization process, enabling low-cost carriers to offer passengers lower-fare services, are the main factors underlying the current development of regional airports. Available capacity and demand potential have been key factors for the progressive growth of more regional airports, also helped by the EU general policy addressed to environment friendly transport strategies.

The significant growth of point-to-point flights offered by low-cost carriers is also associated with the use of smaller airports, often far from metropolitan centres or even metropolitan areas.

Low-cost airlines have also played a determinant role for the growth of both air traffic and regional airports. At least to some extent, their expansion has been made possible by overcapacity at regional airports. Furthermore, as there is little extra cost involved in giving low-cost carriers access to unused capacity available at airports, airport charges might also be low.

The question that can be posed is whether this will be the tendency in Europe. In other words once spare capacity has been used up, airport costs in the regional airports might increase substantially. Then, additional capacity can be
provided on the basis of the demand for airport services at fares which cover the full costs.

On the other hand, spare capacity is also due to competition among airports; airports with larger capacities can obtain economies of scale while potentially competing airports may outperform one another. Anyway, without a right planning of the airport system the risk is to produce overcapacities often due to the authorities themselves that try to stop the development of other potential competing airports in order to attract business and the associated tax revenues. Overcapacities, in turn, require government subsidies thus creating uneconomical cycles. A right planning policy and a great coordination among local authorities can avoid over-investment at regional airports, even if this could produce higher airport costs for the carriers using these airports but also lower public expenditure on subsidizing them. Investment decisions require either greater centralization or mechanisms for cooperation between local authorities which would otherwise be in competition.

In any case, as statistical data provide, the growth of regional airports, also supported by the EU policies, seems unavoidable by now, but the increasing importance of smaller airports (often decentralized with respect to the actual destination city) in the overall airport network could lead to a general worsening of the road transport intensity of the surface transport deriving from air travel.

Then, it is fundamental that the EU faces the problem of the right integration among all the different transport modes, in order to achieve the expected result: a multimodal connectivity in a really integrated transport network.

References


