Development of Regional Airports

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Development of Regional Airports

Theoretical Analyses and Case Studies

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Introduction
Regional airports development: background

The importance of the air transport system is widely recognized not only as a mean to quickly cover long distances, but also as an economic engine for all communities. Aeronautical industries, airports and airlines are some of the main actors that, each one in its own field, compete for the air transport market.

The capability to cover long distances in reduced time with respect to other means of transport is one of the most successful factors that have contributed to the growth of the air transport system; as an example, the technological developments and the increase of civilian routes between Europe and North America have caused the end of intercontinental travels by ships, that at the beginning of the 21st century represented the only means of transport to go from the old to the new continent.

The continuous development and the results obtained by the aeronautical industries have increased the level of safety, the comfort and the efficiency of the system.

Today, the air transport system provides the only means that can be used to reach remote or inaccessible areas, or regions not well served by land transport systems; it is irreplaceable for medical emergencies and humanitarian assistance; it is a source of integration between different communities as well as a source of economic development for the region served by air carriers.

In short, the air transport system plays not only an important role as means of transport but also as a social connector and economic engine.

The main actors of the air system are airport planners, air companies (mainly grouped in full carriers vs. low-cost companies) and users (passengers and/or freights) that can produce important demand levels at airports, thanks to their travel choices.

In the air transport system, airports are the nodes of the system, while routes are the links among nodes. In many countries, and especially in European countries, location and characteristics of the airports are defined at central level, while links are established thanks to the services offered by the air carriers.

Airports are important elements of the air transport system because they represent interchange nodes among land transport systems and the air transport system, and also because they are the air traffic control centres. The main characteristics of an airport depend on the expected number of passengers and movements, the performed function and the kind of routes being offered.

In terms of passengers and movements, airports can be defined as:

- primary, if the number of yearly passengers is greater than five million per year;
- regional, otherwise.

The EU also classifies airports as:

- community airports, if the number of passengers is greater than ten million per year;
- national, if the number of passengers ranges from five to ten million per year;
- large regional, if the number of passengers ranges from one to five million per year;
- small regional, if the number of passengers is less than one million per year.

Furthermore, according to ANNEX 14 (ICAO), an airport can be classified depending on the airport traffic density as:

- light: if the number of movements during the peak hour is less than 15 for each runway, or if for all the runways it is less than 20;
- medium: if the number of movements during the peak hour ranges from 16 to 25 for each runway, or if for all the runways it ranges from 20 to 35;
- heavy: if the number of movements during the peak hour is greater than 26 for each runway, or if for all the runways it is greater than 35.

Depending on the performed function, an airport can be classified as:

- hub
- feeder.

A hub is an interchange node for an air carrier that offers a hub-and-spoke service. Particularly, flights coming from multiple origins converge into the airport (hub) from which new flights start toward multiple destinations (spokes). The hub-and-spoke structure has been used to increase the number of served destinations (in fact, starting from a generic origin one can reach whichever destination going through the hub) and to obtain greater load factors for each aircraft (in fact, point-to-point services to guarantee the same number of destinations from each origin could not have a satisfactory level of demand from the point of view of economic convenience). In this way, the production costs can be reduced while the quality of offered services can be increased.

Then a hub airport is not necessarily a primary airport (following the previous definition), but an airport where an air carrier has established the hub of its hub-and-spoke service.

The choice of an air carrier to locate its own hub at a given airport depends on different factors as:

- key position with respect to the potential users;
- location near a big city or a metropolitan area able to generate high volumes of traffic flows other than those in transit;

– airport high capacity and efficient management in terms of take-off and landing systems, in order to reduce delays and congestion effects;
– passenger terminals able to guarantee an efficient transfer from an aircraft to another one.

The management of the airport is crucial for the success of a hub-and-spoke system; in fact, when airports are not able to support and manage the more and more increasing volume of traffic, users experience negative effects as delays, flight cancellation and baggage loss.

A feeder can be defined as an airport supporting the hub or in other words as the spoke of a hub-and-spoke system; however, flights can also be guaranteed by other companies, thanks to the alliances and code-sharing networks. Nowadays, feeder services at many airports classified as 'regional' are flanked by point-to-point services often offered by low-cost companies both toward national and international destinations.

Inside the hub vs. feeder airport classification, another distinction can be made between mega-hubs (as in Europe, London-Heathrow, Paris Charles de Gaulle, Frankfurt am Main), with a large catchment area that makes them attractive also for point-to-point trips but are too expensive for many low-cost companies; and secondary hubs (as in Europe, Barcelona, Copenhagen, Lisbon, Manchester, Rome, Vienna, and so on) which operate as both feeder airports for mega-hubs and smaller hubs for certain regions.

Finally, depending on the kind of routes being offered, airports can be classified as:

– first level airports: intercontinental and international links covering distances greater than 3,000 km; airports supporting this kind of routes are equipped to work with high traffic levels and are generally hubs for many companies;
– second level airports: international links covering distances less than 2,000–3,000 km;
– third level airports: national and international links covering distances in the range of 500–700 km.

A particular characteristic of the air system is its continuous development both in terms of aircraft technology (larger and faster aircrafts, greater flight autonomy also for smaller aircrafts, lower fuel consumption, large use of computer and automatic systems to guarantee both the efficiency and the safety during the flight, and so on) and service organization (hub-and-spoke rather than point-to-point service, air company alliances, frequent flyer programs, business models, and so on).

Among these factors, low-cost companies and regional jets (a kind of aircraft used for medium-short distances, characterised by high cruise speed as regards to the aircraft class, low pollution level and reduced landing/take-off distances) have characterized the air transport system in the last years.

They have as a common aspect the potential re-evaluation of regional (third level) airports. In fact, low-cost carriers prefer to use regional airports providing point-to-point links rather than hub-and-spoke services, changing thus the

tendency of the last decades. Similarly, regional jets can be considered the preferential kind of aircraft for regional airports, because they are characterized by low capacity in terms of offered seats per aircraft (and therefore they are competitive as loading factors in low-level demand areas) and by reduced distances required for landing/take-off operations; low-level demand and short runways are common factors of regional airports.

The main differences among low-cost carriers and full service (or traditional or flag) carriers are the following:

- low-cost carriers do not use Computer Reservation Systems (CRS) as selling channel, but they prefer internet or phone calls;
- check-in, handling and maintenance are generally outsourced services;
- on-board services (as meals, magazines, and so on) have been reduced or eliminated (for this reason low-cost companies are also called 'no-frills');
- fleet is generally formed by the same kind of aircraft (most low-cost companies use Boeing 737 aircraft);
- the offered routes are generally medium-short and point-to-point inside a continent (e.g., EU or USA);
- low-cost companies are independent air carriers, i.e. any network/code sharing among companies;
- they often operate at regional airports where airport fees are low, capacity is generally high and there are attractive slots; then, air companies can reduce operational costs, avoid delays and maintain short turn-round times.

A general consequence of the low-cost business model used by the different air carries has been the reduction of the air fare and the re-evaluation of some less classical destination areas, which have thus improved their attraction as tourist destinations. Furthermore, in most cases they have helped the development of regional airports as well as the development of the nearest territory and the reduction of congestion at some hubs due to the different distribution of the traffic volumes.

The considerable increase of the air transport demand, mainly inside Europe and the USA, but also nowadays in some Eastern countries as China and India – where more low-cost companies started successfully their services – produces congestion problems both along the routes and above all at the main airports.

In fact, it is well known that mega-hubs and hubs gather the most part of the traffic volumes while the remaining airports have a lot of residual capacity that can also be used to reduce hub congestion. Congestion is a significant, negative consequence of the hub-and-spoke structure because it produces an increase of the overall trip time (both for users and air companies); higher probability of baggage loss; delayed or cancelled flights; and higher values of pollution due to the aircraft and land vehicle movements, as well as to the induced land traffic to and from the airport.

On the other hand, the development of regional airports can have as a consequence not only a reduction of congestion at the main hubs but also the socio-economic development of the areas close to the airport.

In this context, and in order to re-evaluate the role of regional airports, the understanding of both the demand characteristics from/to regional airports and the techniques of the air transport supply simulation is a fundamental step to verify the effectiveness and efficacy of the system structure as regards to the different involved actors (air companies, users, and society).

The overall framework taking into account the different aspects of the air transport system simulation is depicted in Figure 1.

Air transport demand depends on air services that in turn are offered at a given airport depending on the number of passengers, i.e. the demand level at the airport.

There is an evident feedback between the future level of air services and the passenger airport choice. The airlines will provide air services at airports only if there is a financial convenience; this means a sufficient number of passengers choosing that airport in order to make feasible a given level of air services. Similarly, the number of passengers choosing a given airport depends on the air service level at that airport. The explicit simulation of this interaction is important to verify the airport development potential (within a larger airport system) and then which are the more suitable policies to support such development.

When demand at an airport and offered services are mutually consistent, the system reaches an equilibrium that can then be evaluated in order to obtain the system performances as regards airport managers, passengers, airlines and society.

The simulation of the demand–supply interactions and then the demand distribution among the various available airports should take into account the (limited) capacity of the system (Figure 2) and the possible constraints that can exist and contain the capacity (prescriptive or physical constraints, urban areas in the neighbourhood, and so on).

A first case is when the predicted demand/supply values and the corresponding traffic flows (in terms of passengers, and thus aircraft movements) do not satisfy the current airport capacity. If the airport capacity can be increased (consistently with possible external constraints as urban areas in the neighbourhood, noise constraints, available space to physically extend the airside, and so on) a new situation can be simulated and evaluated by taking into account the monetary costs required to increase the capacity.

A second case is when the predicted demand/supply values and the corresponding traffic flows do not satisfy the current airport capacity as before, but the airport capacity cannot be increased as required because the necessary interventions are inconsistent with the external constraints. In this case, the realization of a new airport can be considered and the evaluation should take into account the overall airport system in terms of demand, supply and interactions between airports.

Because the passenger's airport choice depends on the air services at that airport and because the airlines services are linked to the profitability of their services, modifications of the cost structure, the available services and the operational rules can modify the passengers' choices to use a given airport and the choices of airlines to provide a given service.

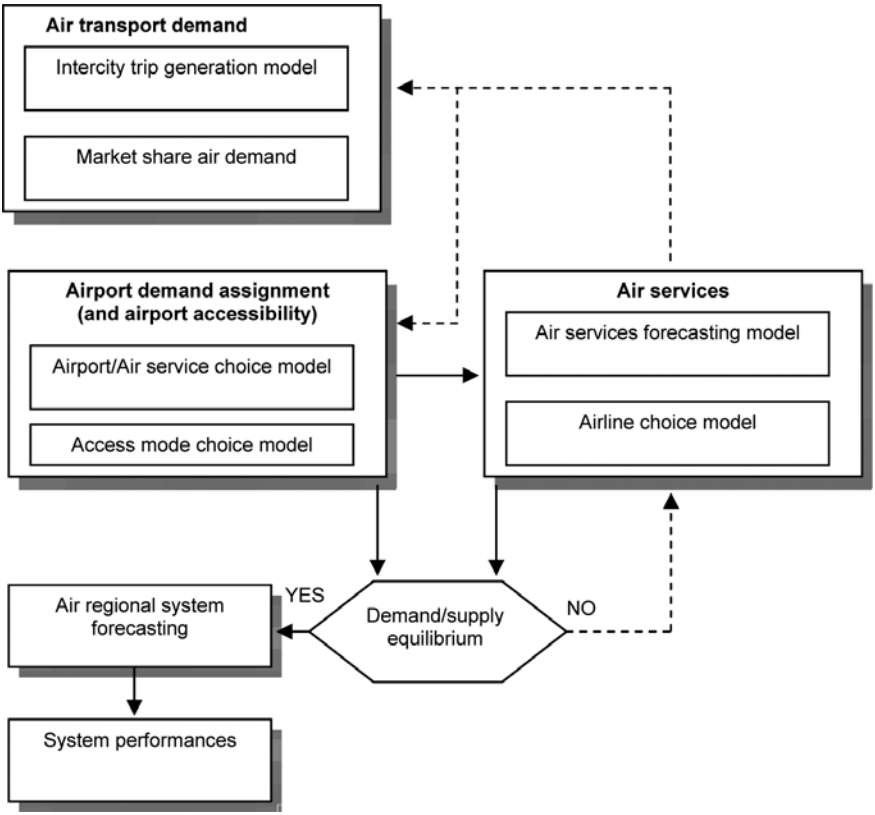

Figure 1: Layout of the air transport system simulation.

Then, a suitable model should be able to simulate how a given set of policies can influence, on the whole, traffic levels at each airport. This means, to an increasing level of detail, the simulation of the future scenarios in terms of economic activities and land use, as well as the development of land transport systems and the consequences in terms of traffic distribution. Particularly, high-speed trains are expected to be competitive with the air transport services for medium-distance trips and they should be taken into account because of the effects they produce on the overall traffic levels at a given airport. For example, high-speed train services between a medium-size city, also served by a regional airport, and a main urban area served by a hub airport will have a great influence on the air traffic level at the regional airport, both in terms of direct trips and transfer trips, especially if the high-speed train also serves the hub airport at the main urban area. In fact, passengers can use railway instead of air services for city-to-city trips (direct trips), but also to reach the hub and then choose the best airlines to complete the travel (transfer trip). The regional model should take into account this kind of effects and interactions between competitive modes both in terms of predicted demand levels and airport distribution in a given region.

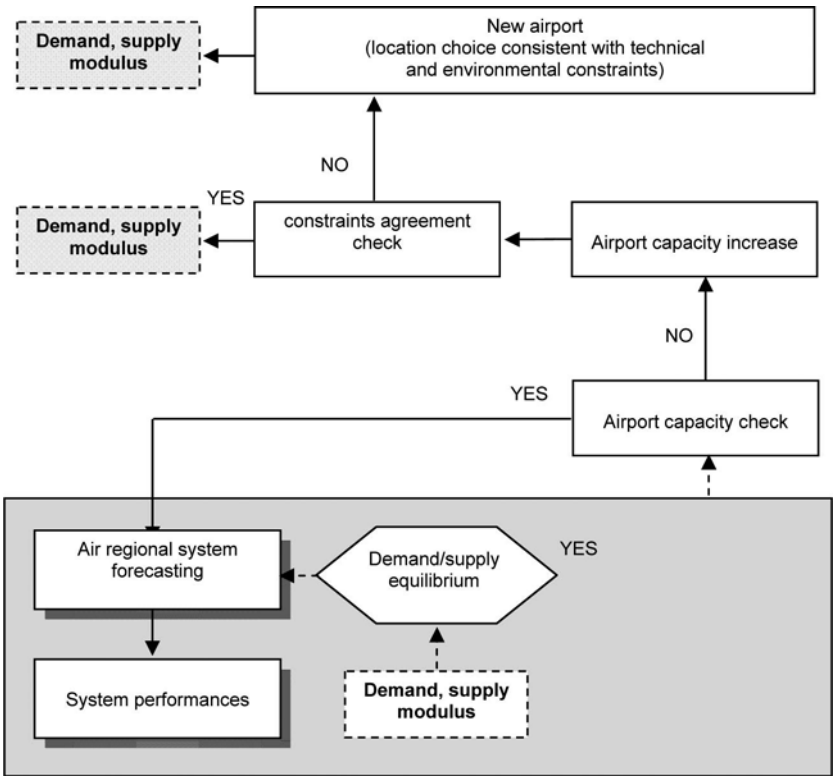

Figure 2: Capacity constraints and possible limits to airport development.

The above description, also depicted by Figures 1 and 2, provides a theoretical modelling background; actually, many problems can arise when the different parts have to be modelled; for example, air service at airports is an airline decision; the hypothesis of boundary condition stability to simulate future developments can be unrealistic in some contexts; modelling of the airport user choice process as well as relationships between air supply and demand to simulate equilibrium is a really complex task; and so on.

Following the previous considerations, the main goal of this book is to provide a summary of the key aspects related to the simulation and analysis of the potential development of regional airports.

In order to give an outline of the main tendencies and policies in many countries, the EU (Chapter 1) and Asian (Chapter 2) situations are described. Then, after an overview concerning the main economic aspects linked to the development of regional airports (Chapter 3), several approaches used in the literature to simulate the air demand at airports are described, with an application to a regional airport in South Italy (Chapter 4). Air demand at airports is the result of a choice process involving also the choice of airlines operating at the airport itself and the choice of the access mode, depending on the airport accessibility characteristics:

these aspects are discussed in Chapter 5, together with a case study conducted in Greater London. An operational methodology, developed and applied in the Netherlands to simulate the air demand–supply equilibrium at airports, is described in Chapter 6, thus facing practical and theoretical aspects. Finally, the crucial role that can be played by low-cost carriers is explored for the Australian regional airports (Chapter 7), by considering key factors as air fares and number of competitors on each route.

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