MULTI-AIRPORT SYSTEMS
IN THE ERA OF NO-FRILLS AIRLINES

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Abstract

The development of no-frills airlines is promoting a remarkable expansion in the number of secondary airports in major metropolitan areas. These new carriers are creating a significant alternative to the traditional full-service carriers. In effect, they are establishing a parallel market and corresponding network of airports. This conclusion results from the analysis of a worldwide database on major metropolitan airports.

This effect supplements the "number of originating passengers", that has been the traditional significant factor that promotes the establishment of viable multi-airport systems. This factor maintains its importance, but no longer is as decisive as it has been.

Airlines and airport policies further reinforce the independent network of secondary airports. No-frills airlines that sell only through the web to customers effectively cause their services at secondary airports to disappear from the airline reservation systems. Airports that choose not to provide low-cost service to no-frills airlines likewise strengthen the role of the secondary airports. Such strategies, most visible in Europe, have led to a remarkable proliferation of secondary airports in unexpected areas.

This trend implies a traffic shift away from the expensive, congested airports toward the no-frills, inexpensive and uncongested airports in major metropolitan areas. If the current major airlines do shrink substantially, as could happen, this would greatly change the pattern of airport traffic in major metropolitan areas.

Key Words: Airports, multi-airport systems, airport planning; no-frills airlines, airline competition

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Introduction

It is useful to be precise about what a multi-airport system might be. The following definition is the starting point for this presentation:

> "…for the purposes of airport planners and operators, a <u>multi-airport system</u> is the set of significant airports that serve commercial transport in a metropolitan region, without regard to ownership or political control of individual airports." (de Neufville and Odoni, 2003, p. 132ff):

This definition involves several important points, as the above authors suggest. Paraphrasing their argument, the definition:

- focuses on airports serving commercial traffic (and leaves out military bases).
- refers to a metropolitan region rather than a city (and thus may contain several independent cities);
- looks at significant markets (and ignores those below some useful threshold, such as Houston/Ellington or Madrid/Torrejon, that serve only 0.1 million passengers or less); and
- concerns the total market (not just that portion managed by a specific operator, such as BAA).

It may be noted in passing that this definition does not correspond to that of the Airports Council International, whose data reflect their view that "a multi-airport system is an airport operator/authority managing more that one airport within a metropolitan area" (see, for example, ACI 2002). The ACI definition thus excludes London/Luton and London/City from the London multi-airport system. This reflects the fact that ACI obtains its data for member operator/authorities. From the perspective of the traveling public and of planners, airports such as London/Luton and London/City definitely do have to be taken into account, as they are here.

Thus defined, multi-airport systems are a significant feature of the airport/airline industry. "As of 2001, they catered to about 1 billion total passengers, well over half worldwide traffic." (de Neufville and Odoni, p. 134). Their development thus deserves our serious attention. This is particularly so since, as indicated in the next section, the untimely or inappropriate development of multi-airport systems has often led to important financial losses and political embarrassments.

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Until recently, multi-airport systems were predominantly a feature of metropolitan areas with the highest levels of originating traffic. Simply put, only the highest levels of locally originating traffic justified the creation of second or third airports. (Note that high levels of transfer traffic do not promote multi-airport systems, since transfers passengers want to have their connections at the airport at which they arrive.) Exceptions to this rule were few; they were mostly associated with situations in which the primary airport was incapable of handling international or intercontinental traffic, and thus a second airport with longer, wider runways was necessary.

Now, however, it appears that a new factor is driving the development of multi-airport systems. This is the development of no-frills airlines that connect specialized airports on a wide, sometimes continental scale. These innovative airlines are, in effect, creating parallel networks of airports, often largely independent of the traditional full-service airports. No-frills airlines such as Southwest, Ryanair, Easyjet, Buzz and Westjet seem to be the predominant builders of these new multi-airport systems. Integrated and cargo carriers are adding to this new momentum.

This development already appears to have major consequences for airport planning and development. This presentation attempts to define what is happening and to explore the possible consequences of this phenomenon.

Motivation: The Planning Problem

Worldwide, the airport planning profession has made many mistakes in planning and implementing the development of multiple airport systems. Typically, major second airports were built prematurely. This resulted in highly visible 'white elephants' embarrassing to their owners. These projects often did not earn enough to just their significant capital costs, and thus represented significant drains on the economy and losses to the owners and operators.

A few examples of the problematic development of multi-airport systems makes the point (see de Neufville, 1965a, for detailed discussions of some examples). Consider the following cases:

- Montreal: For this city with less than 10 million annual passengers, the Canadian national government built Montreal/Mirabel airport with the largest area in the world. It forced intercontinental carriers to use this facility while leaving domestic carriers at the in-town Montreal/Dorval airport. This policy deprived the intercontinental carriers of the possibility of easy onward domestic connections and gave them the incentive to relocate to Toronto. Montreal/Mirabel thus become the epitome of the underused second airport. Shortly after the Aéroports de Montréal took over the operation of the Montreal airports, it effectively

closed Montreal/Mirabel, allowed airlines to regroup at Montreal/Dorval, and effectively eliminated the Montreal multi-airport system.

- Washington, DC: Washington/Dulles airport was similarly built prematurely. Originally intended to supplant Washington/Reagan as the dominant airport for the capital, it was vastly underused for its first two decades. Over most of that period, it catered to about 3 million annual passengers, whereas both Washington/Reagan and Baltimore/Washington each had about 14 million annual passengers. Washington/Dulles only grew to that level after United Airlines established a transfer hub there in the mid 1990s. Before then, it represented an architectural masterpiece but a financial failure.

- London, UK: The UK British Airports Authority built London/Stansted to be a major reliever to the traffic pressures on the primary airport at London/Heathrow. It has not achieved that role. For most of its first decade, the traffic at this airport languished at around 5 million annual passengers or about 1/10th of the primary airport. More recently, as it has become a center for no-frills airlines (along with London/Luton airport), traffic at London/Stansted has grown considerably. Nonetheless, it is still largely underutilized and its mid-field concourses are empty fairly consistently. Meanwhile, traffic at the primary airport London/Heathrow has grown remarkably and is about 5 times as large as London/Stansted.

- Brazil: The national government built substantial international airports as replacements for the in-town airports of its major cities. These new airports, Sao Paulo/Congonhas, Rio de Janeiro/Galeao and Belo Horizonte/Confins, have not substituted for the older airports, however. The in-town and international airports at San Paulo and Rio de Janeiro have about as many annual passengers, while the international airport at Belo Horizonte only has about half a million passengers compared to the two and a half of Belo Horizonte/Pampulhas (INFRAERO, 2002).

- Similar accounts can be given of second airports at Buenos Aires, Edmonton, London, Milan, New York, Osaka, Paris, and San Francisco. The problem of premature, over-investment in secondary airports, with the associated big financial losses, exists worldwide.

Airport and aviation planners need to get their policies right on secondary airports. Poorly timed, poorly conceived major investments do not serve their regions well. We need to understand how and why second airports develop successfully.

The Concentration Model

Recognition of the two-way competition for market share between airlines and airlines, and between airports and airports is essential to the proper understanding of multi-airport systems. As Fruhan (1972) demonstrated empirically for aviation, the outcome of competition is non-linear: the airline with the higher frequency share gets a disproportionately higher market share. The

result is that airlines tend to match flights in any given market -- or to withdraw since the competition is so disadvantageous to them if they only represent a small fraction of the frequency offered. Airlines with low frequency shares on a route only remain active if they represent a special niche market, as might be defined by a national affinity group or special low-fare service. This dynamic that impels toward concentration or withdrawal is a specific manifestation of a general phenomenon widely apparent in location of economic activities (Lösch, 1967).

When airlines compete over several airports in a market, the concentration phenomenon extends to where they locate their flights. They tend to concentrate their flights at the primary airport in a market, as well as on a route (de Neufville and Gelerman, 1973). The phenomenon can be understood intuitively by considering how any airline might locate an extra flight in a market. The airline will get the most advantage from such a marginal flight by grabbing onto a larger share of a major market, so it will place this flight at the primary airport. Competitors will do the same, and thus the concentration.

This concentration model is fundamentally different from the common "catchment area" model that passengers and traffic simply flow to the most convenient airport. While it is obviously true that people choose convenient airports, there is a vast difference between the two models. The concentration model, that incorporates the competition between airlines for markets, stresses the importance of airline decisions that ultimately forces the passengers to go to the airports at which airlines concentrate their traffic. The catchment area model implies that passengers drive the frequency, such that the most convenient airports will have the most traffic. In fact, the catchment area model does not describe actual experience. Thus, although San Francisco/Oakland is more convenient than San Francisco/International for almost half the Bay Area passengers, it only has a fraction of this traffic. Similarly for Paris/Orly, for New York/Newark before 1980, and for Washington/Dulles until the mid 1990s.

The concentration model, that stresses the importance of airline behavior, has the further advantage of being able to account for frequent trend-breaking instances when airline decisions propel the sudden rapid growth of an airport. Thus Boston/Providence airport grew from about 1 to over 4 million passengers in only a few years because Southwest decided to open a new, low-fare market. Similar airline decisions account for the rapid changes in traffic at Washington/Dulles and Brussels/Charleroi (when United and Ryanair respectively established hubs at these sites).

The concentration model implies that secondary airports can gain importance when airlines no longer see further advantage in concentrating their flights. This occurs, for example, when the

local level of traffic is sufficiently high so that an airline has little to gain by placing an additional flight at the primary airport, and more to gain by serving the secondary airport. This prediction is in fact borne out by experience.

Current Status

Over the past generation, all metropolitan areas generating more than a threshold level of local originating traffic have significant secondary airports (See Table 1). This phenomenon has persisted over the last 30 years at least. What has changed is the level of the threshold. In the early 1970s it was around 8 million annual originating passengers. It has been steadily rising, along with the average size of the aircraft (see de Neufville 1986, 1990, 1994). A reasonable explanation for this observation is that, when airlines use larger aircraft, it takes more originating traffic to reach the level at which increased concentration is not worthwhile.

A few other metropolitan areas have significant second airports, as listed in Table 2. Until recently, these multi-airport systems owed their existence to one of two causes:

- Technical: the popular in-town airport did not have runways long enough to serve long-distance aircraft (Belfast, Belo Horizonte, Rio de Janeiro, Taipei);
- Political: Some political or military rationale required the development of two airports in a metropolitan region (Berlin, Köln/Bonn, and Moscow).

More recently, no-frills airlines have catalyzed the development of a number of secondary airports in metropolitan regions that otherwise would not feature such facilities. Table 2 lists these situations. In such cases, the concentration model does not apply because the no-frills airlines have created a separate market, distinct from that existing at the primary airports.

Table 1: Metropolitan Regions with Originating Traffic greater than the Threshold
have a significant Multi-Airport System (2001 data)

Metropolitan Region	Traffic in Millions		Multi-Airport System
	For Region	Originating (Est)	
London	114	43	Yes
Tokyo	84	36	Yes
Los Angeles	82	35	Yes
New York	84	30	Yes
Paris	71	30	Yes
Miami	54	21	Yes
San Francisco	59	20	Yes
Chicago	82	20	Yes
Washington/Baltimore	51	17	Yes
Seoul	38	17	Yes
Hong Kong	42	16	Yes
Osaka	35	16	Yes
Boston	33	15	Yes
Dallas/Fort Worth	62	13	Yes
Frankfurt	50	13	Yes
Sao Paulo	26	13	Yes
Brussels	25	13	Yes
Houston/Galveston	43	12	Yes
Shanghai	28	12	Yes
Milan	27	12	Yes
Las Vegas	36	12	
Amsterdam	40	11	
Madrid	34	11	
Orlando	30	11	
Toronto	29	11	

Source: de Neufville Multi-Airport Systems database drawn from various reports.

Estimated Originating passengers = (Total Passengers - Estimated Transfers) / 2

Table 2: Metropolitan Regions with Originating Traffic less than the Threshold having a significant Multi-Airport System (2001 data)

Metropolitan Region	Traffic in Millions		Second Airport	Reason for Second airport
	For Region	Originating (Est)		
Orlando	30	11	Sanford	Charter Flights
Taipei	24	11	Sung Shan	Technical
Manchester (UK)	24	11	Liverpool	Easyjet
Düsseldorf	21	11	Köln/Bonn	Political
Rome	26	11	Ciampino	Ryanair; Easyjet
Stockholm	20	9	Skvasta	Ryanair
Moscow	19	9	Domodedovo	Political
Oslo	15	7	Torp	Ryanair
Glasgow	14	7	Edinburgh	Political
Glasgow	14	7	Prestwick	Ryanair
Copenhagen	20	6	Malmo	Ryanair
Vancouver	17	6	Abbotsford	Westjet
Berlin	12	5	Schönefeld	Political
Rio de Janeiro	11	5	Santos Dumont	Technical
Buenos Aires	11	5	Aeroparque	Technical
Hamburg	10	5	Lübeck	Ryanair
Belfast	5	2	City	Technical
Belo Horizonte	3	2	Confins	Technical

Source: de Neufville Multi-Airport Systems database drawn from various reports.

Estimated Originating passengers = (Total Passengers - Estimated Transfers) / 2

Table 3: Metropolitan Regions with Secondary Airports significant due to the Traffic of No-Frills airlines.

Metropolitan Region	Secondary Airport)	No-Frills Airline
London	Stansted	Ryanair, Buzz
London	Luton	Easyjet
New York	Islip	Southwest
Paris	Beauvais	Ryanair
Miami	Fort Lauderdale	Southwest
San Francisco	Oakland	Southwest
Boston	Providence	Southwest
Boston	Manchester (NH)	Southwest
Dallas/Fort Worth	Love	Southwest
Frankfurt	Hahn	Ryanair
Brussels	Charleroi	Ryanair
Houston/Galveston	Hobby	Southwest
Milan	Orio al Serio	Ryanair
Toronto	Hamilton	Westjet
Manchester (UK)	Liverpool	Easyjet
Rome	Ciampino	Easyjet, Ryanair
Stockholm	Skvasta	Ryanair
Oslo	Torp	Ryanair
Glasgow	Prestwick	Ryanair
Copenhagen	Malmo	Ryanair
Vancouver	Abbotsford	Westjet
Hamburg	Lübeck	Ryanair

Source: de Neufville Multi-Airport Systems database drawn from various reports.

No-frills airlines have also developed secondary airports in the metropolitan areas with the highest levels of originating traffic, those that in any case can be expected to have significant multi-airport systems. Table 3 provides details. By documenting the number and distribution of these facilities, it also makes the point that no-frills airlines have been significant in the development of secondary airports on a continental scale. In the United States, the association between no-frills airlines and a network of secondary airports dates to the beginning of Southwest, when it began operations between Dallas/Love and Houston/Hobby in the mid 1970s. In Europe, this relationship started to become significant in the 1990s, with the development of no-frills airlines such as Ryanair and Easyjet.

New Phenomenon: Parallel Network of Airline Services
A parallel network of airline services seems to be developing in major markets worldwide. Alternative networks are coming into existence, alongside the traditional range of full-service airline operations that connect between the major airports of the world. No-frills airlines are deliberately developing nationwide systems of services based on smaller airports.

These parallel networks have several important features that distinguish them from the traditional airlines services:
- A distinct low-fare, no-frills product
- Almost total lack of connectivity with the traditional full-service airlines;
- Operations focussed on uncongested, low-cost airports; and thus
- Distinct geographical networks with links that traditional full-service airlines do not duplicate.

The no-frills airlines have established separate market niches for themselves. They are far from a cheaper-fare version of the conventional airlines, as Virgin appears to be. They offer specialized services that make no pretense of competing with business travelers and others that require flexible schedules, complicated routings and connections with other airlines. Their strength is low-cost, point-to-point travel. Although business travelers may use no-frills airlines, and many vacationers choose no-frills airlines once they have the opportunity, the no-frills airlines offer such a different service it is possible to say that they do not compete head to head with the full-service airlines. Most importantly from the perspective of secondary airports, the no-frills airlines appear to be immune to frequency competition with the full-service airlines, and are thus not subject to disproportionate market shares if they offer low frequency to their destinations.

The non-frills airlines are almost totally disconnected from the full-service airlines. Most obviously, they often simply do not exist in the standard airline reservation systems. To access their services, it is necessary to approach them directly, through the web. The no-frills save

money by eliminating commissions to travel agents and to the international airline reservations systems (from 5 to 10% of the ticket price, typically). Correspondingly, it is as if they did not exist to travel agents and all who use their services. For example, inquiries to a major travel agent in January 2003 about flights from London/Stansted to Amsterdam met with assurances that these did not exist. In fact, however, Buzz provides frequent daily direct flights. In short, in order to use the no-frills airlines, one has to access them by completely different portals. One has to enter a parallel travel universe with no travel agents, few paper tickets and no interconnections to other airlines.

In great part, no-frills airlines achieve low costs by operating out of low-cost, uncongested airports. Lack of congestion reduces aircraft delays and the immediate wasted costs of crew and other direct operating costs. It also reduces the padding of the schedules to allow for delays, thus enabling the airline to schedule more flying time per day. Low charges for airport services at uncongested secondary airports are of course immediately beneficial. This means that no-frills airlines consciously avoid showcase facilities such as Vancouver/International Oslo/Gardemoen or Milan/Malpensa, and prefer modest --even primitive -- facilities such as Vancouver/Abbotsford, Oslo/Torp and Milan/Orio al Serio. Conversely, a number of airports authorities consciously do not want to cater to the no-frills airlines, preferring to maintain an image as a full-service, up-market airport. The leaders of Hamburg airport, for example, have explicitly stated this position. They chose not to offer Ryanair low-cost facilities -- with the consequence that Ryanair now serves Lübeck instead.

All these factors lead the no-frills airlines to adopt a geographical network that parallels but is substantially different from the traditional networks of the conventional airlines. For example, Ryanair offers service between London, Brussels and Frankfurt via London/Stansted, Brussels/Charleroi and Frankfurt/Hahn instead of through London/Heathrow, Brussels/Zavantem and Frankfurt/Main. Likewise, Southwest will fly you from Boston to Washington, via Baltimore, Manchester or Providence.

Regional Cases

The evolution of the parallel airlines networks differs from region to region. This section sketches out these differences, paying greater attention to Brazil, which is less familiar to North American and audiences.

United States: Southwest Airlines is the acknowledged role model for no-frills airlines in the rest of the world. It began with service within Texas between two secondary airports that had been abandoned by the majors when moved to new world-class facilities at Dallas/Fort Worth and

Houston/Bush. Southwest served Dallas/Love and Houston/Hobby. They have maintained this pattern to the extent possible, as Table 3 indicates.

While Southwest has been a no-frills airline, it is far, far from insignificant. As of 2001 it was the 4th largest airline in the world in terms of passengers carried (IATA, 2002). At the end of 2002, it had a market capitalization of around 10 billion dollars, several times larger than any other passenger airline in the world.

Southwest is not the only no-frills airline in the United States. As of 2003, there are also AirTrain, Jet Blue and Spirit. One or more of these may emerge as a major regional or national force and offer substantial head-to-head competition to Southwest, of the kind it does not now experience.

Canada: Westjet is the Canadian version of Southwest. Indeed, the company models itself explicitly on the American prototype (Westjet, 2002). Founded in 1996 it has grown impressively. According to company press releases it has flown over 3.5 billion passenger seat miles in 2002. As with Southwest, it has pioneered the development of secondary airports in major markets, such as Vancouver/Abbotsford and Toronto/Hamilton.

European Community: Ryanair is the European version of Southwest Airlines. As of 2002, its market capitalization of about $4.5 billion was the second largest in the world (after Southwest) and almost twice that of British Airways. As indicated in Table 3, it focuses on secondary airports around all the major cities it serves. Although it is only about 10 years old and is thus not fully established, it looks as if it has a good chance to mimic the success of Southwest.

Easyjet is another major no-frills European airline. It serves somewhat different destinations than Ryanair. Although in England it operates out of secondary airports such as Manchester/Liverpool, London/Luton, and London/Stansted, on the Continent it chooses to offer service into major airports such as Munich, Paris/de Gaulle and Paris/Orly. So its network is more integrated into the established network. Yet, its operations are still quite distinct. For example, it sells tickets exclusively through the Internet. Perhaps its business model will be more effective than Ryanair's over the long term. In any event, it is clearly another form of parallel network compared to those of the established full-service airlines.

Brazil: The country features a triangular pattern of airports connected by domestic airlines distinct from the international services. The three most populous metropolitan areas in Brazil -- Sao Paulo, Rio de Janeiro and Belo Horizonte -- each have a substantial multi-airport system. Through the accidents of aeronautical and political evolution, each has a fairly similar structure: a

short runway 'downtown' airport complemented by an major international, intercontinental airport some distance away from the city. (See Table 4.) The situation for each city is similar to that of Washington/National and Washington/Dulles.

Table 4: Pairs of Airports serving the major cities of Brazil (2001 Data)

Metropolitan Area	Internat'l Distant Airport		Domestic Close-in Airport	
	Name	Traffic Millions	Name	Traffic Millions
Sao Paulo	Garulhos	13.0	Congonhas	11.7
Rio de Janeiro	Galeao	6.0	Santos Dumont	4.9
Belo Horizonte	Confins	0.8	Pampulha	2.5

Source: INFRAERO, 2002; Rabbani, 2002

Each of Brazil's multi-airport systems appears to have followed a similar development:

- The downtown airport developed in the 1930s and during World War II;

- The new international airports opened around 1985, and were largely seen as replacement airports; but

- Regional commercial and political pressures led to the award of routes between the downtown airports in the early 1990s; which unleashed

- Tremendous growth at the downtown airports to the point where, as of 2001, they rival and even surpass the international airports in terms of the number of passengers. Specifically, Sao Paulo/Confins grew 6 fold in the 7-year period from 1994 to 2001, going from around 2 to nearly 12 million passengers annually. Similarly, Belo Horizonte/Pampulha grew about 10-fold, from around 0.2 to 2.5 million, over the last decade.

The three downtown airports in these multi-airport systems constitute, in effect, a separate network of passenger traffic, independent of their complementary international airports. Moreover, the flows on this network of physically small airports dominates the domestic traffic in the country, as Table 5 indicates. By contrast, the domestic traffic from their complimentary international airports is not significant.

This is truly a remarkable situation: traffic between the major international gateways and the other large Brazilian cities is not significant. The only real way to connect between cities is by using the downtown airports. It is as if there were almost no flights between San Francisco/International and Los Angeles/International; as if the only way to travel between these cities was to fly between Oakland and Burbank, for example. However, while this situation is remarkable, it is not unique. A parallel situation exists in Japan, where there are virtually no domestic flights from the

international gateways of Tokyo/Narita and Osaka/Kansai, and all the air traffic between these cities was between Tokyo/Haneda and Osaka/Itami.

Table 5: Top Domestic Brazilian Markets (1st semester, 2002).
Downtown airports in Bold Face.

Airport Pair		Passengers, 1000s	Rank
Congonhas	**Santos Dumont**	1461	1
Congonhas	Brasilia	596	2
Congonhas	**Pampulha**	565	3
Congonhas	Curitiba	551	4
Congonhas	Porto Allegre	365	5
Garulhos	Salvador	364	6
Santos Dumont	Brasilia	325	7
Santos Dumont	**Pampulha**	312	8

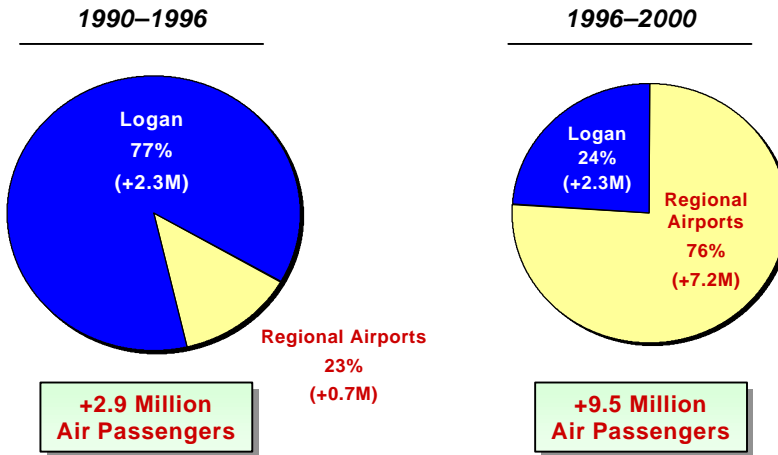Source: INFRAERO, 2002, Rabbani, 2002

Implications

The no-frills airlines have shown rapid growth and had great economic success. In contrast, many full-service airlines have stagnated and gone into bankruptcy. Their comparative trajectories imply that the parallel networks of aviation services of no-frills airlines are likely to become stronger. They may even go from being interesting but marginal networks to being a major if not dominant alternative over the next generation. This possibility might completely alter the trends in airport use and our expectations for the future of airport development and airport services.

If the parallel network for aviation services being developed by the no-frills airlines equal that of the full-service airlines, we could imagine some of the following scenarios:

- Passenger traffic in metropolitan areas would shift substantially, away from congested expensive facilities such as San Francisco/International and toward low-cost competitors such as San Francisco/Oakland. This has already occurred to some extent in New England (see Figures 1 and 2).
- The growth of major airports would decline or cease, as airlines and passengers demand lower cost facilities at alternative sites.
- Conversely, we could expect to see increased and rapid growth at many of the less significant airports, as other secondary airports experience rapid growth similar to that of Boston/Providence, or Miami/Fort Lauderdale.

**Figure 1: New England traffic growth shifted from Boston/Logan
to Regional Airports along with growth
of Southwest at Providence and Manchester (NH)**

1990–1996

Logan
77%
(+2.3M)

Regional Airports
23%
(+0.7M)

+2.9 Million
Air Passengers

1996–2000

Logan
24%
(+2.3M)

Regional
Airports
76%
(+7.2M)

+9.5 Million
Air Passengers

Regional airports include Providence, Manchester, Worcester, Bangor, Burlington, Hartford, New Haven, and Portland.
Source: Airport Records and US DOT, Form 41 schedules.

**Figure 2: The Boston/Logan traffic share dropped by a quarter over the
past 20 years; half of this occurred with the Southwest growth in the late
1990s at Providence and Manchester (NH)**

78%

59%

80%

70%

60%

50%

'80 '81 '82 '83 '84 '85 '86 '87 '88 '89 '90 '91 '92 '93 '94 '95 '96 '97 '98 '99 '00
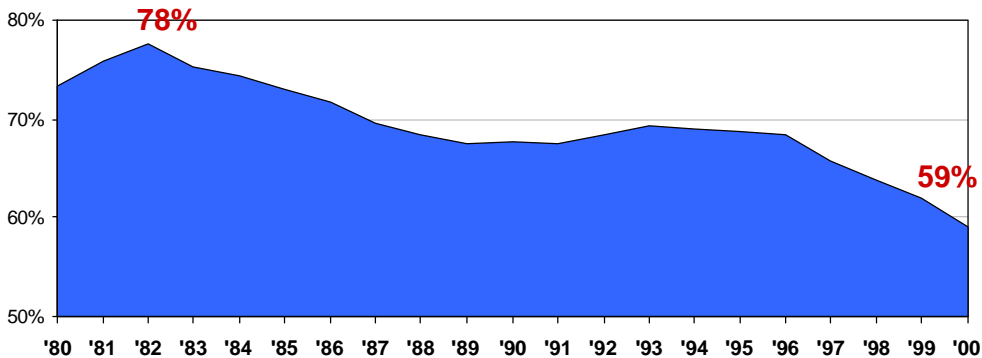
Note: Includes enplaned passengers at Logan, Hartford/Bradley, T.F. Green/Providence, Manchester, Portland,
Burlington, Bangor, Tweed New Haven, and Worcester.

Source: US DOT, Form 41 and Part 298/C. Airport records for Logan and various regional airports.

Note: Figures 1 and 2 extracted from Louis Berger (2002).

These scenarios are not what now appears to be the most likely outcome. However, they are entirely possible. They do not require extravagant projections from the current patterns of growth of Southwest and Ryanair, and collapses of airlines such as United, US Airways, Sabena and Olympic. Indeed, as Figures 1 and 2 illustrate, these scenarios may already be occurring.

Good planning should anticipate the possibility of such scenarios, and be prepared for them if they come. For example, if there is a substantial possibility that secondary airports in a region may grow, it would be important to safeguard their viability and make provision for possible future growth by securing suitable land and easements. These efforts could be seen as insurance against the development of the current parallel no-frills networks into a major pattern of airline operations.

Acknowledgement

References
Airports Council International, ACI (2002) *ACI World Report*, No.11/12, Nov./Dec. p.19.

Congonhas/Sao Paulo (2002), *Homepage do Aeroporto Internacional de Congonhas/Sao Paulo*, http://paginas.terra.com.br/turismo/congonhas/home.html

de Neufville, R. (1984a) "Multiairport Systems -- How do They Work Best?" *Airport Forum*, June pp. 55-59.

de Neufville, R. (1984b) "Planning for Multiple Airports in a Metropolitan Region," *Built Environment* (special issue), 10(3), pp. 159-167.

de Neufville, R. (1985a) "Systèmes Métropolitains d'Aeroports -- comment fonctionnent-ils le mieux?" *Cahiers de Transport*, 300, Jan., pp. 25-30.

de Neufville, R. (1986) "Multi-Airport Systems in Metropolitan Regions: A Guide for Policy," *Report to the US Federal Aviation Administration*, March, National Technical Information Service, Springfield, VA.

de Neufville, R. (1990) "Successful Siting of Airports; The Sydney Example," *ASCE Journal of Transportation Engineering*, 116, Feb., pp.37-48.

de Neufville, R. (1991) "Strategic Planning for Airport Capacity: An Appreciation of Australia's Process for Sydney," *Australian Planner*, 29(4), Dec., pp.174-180.

de Neufville, R. (1994) "Planning Multi-Airport Systems in Metropolitan Regions in the 1990's," Final Report for the US Federal Aviation Administration, DTFA01-92-P-012433, May.

de Neufville, R. (1995a) "Policy Guidelines for the Option of a Development of a Multi-Airport System, the basis of a Dynamic Strategic Plan to provide the capability for flexible response to future challenges," Report Prepared for Amsterdam Airport Schiphol, Netherlands, 1995. (Available at http://ardent.mit.edu/airports)

de Neufville, R. (1995b) "Management of Multi-Airport Systems: A Development Strategy," *Journal of Air Transport Management*, 2(2), June, pp. 99-110.

de Neufville, R. (1996) "Policy Guidelines for the Development of Multiple Airports Systems in Major Metropolitan Areas" (In Japanese) Issues and Direction of Transport Policy for the 21st Century, Proceedings of the International Symposium for the Commemoration of the Establishment of Institute for Transport Policy Studies, Tokyo, Aug., pp. 21-27.

de Neufville, R. and Gelerman, W. (1973) "Planning for Satellite Airports", *ASCE Transportation Engineering Journal*, 99(TE3), August, pp. 537-552.

de Neufville, R. and Odoni, A. (2003) *Airport Systems Planning, Design, and Management*, McGraw-Hill, New York, NY.

Fruhan, W. (1972) "The Fight for Competitive Advantage: A Study of the United States Domestic Trunk Air Carriers," Graduate School of Business Administration, Harvard University, Boston, MA.

IATA (2002) *World Air Transport Statistics*, Montreal, Canada.

INFRAERO (Empresa Brasileira de Infra-Estructura Aeroportuaria) (2002), http://www.infraero.gov.br

Lösch, A. (1967) *The Economics of Location* [translated from the German edition of 1939], Science Edition, Wiley, New York.

Louis Berger Group (2002) *New England Regional Aviation System Plan, DRAFT Technical Paper 3: Trends and Trend breakers*

Rabbani, F. (2002) "Airports located at Urban Areas: A Study of Congonhas and Pampulha Airports," term project, MIT Course on Airport Systems Planning and Design.

Westjet (2002) *About us*, http://c2dsp.westjet.com/internet/sky/about/index.jsp

Table 3A: European Metropolitan Regions with Secondary Airports significant due to the Traffic of No-Frills airlines.

Metropolitan Region	Secondary Airport)	No-Frills Airline
London	Stansted	Ryanair, Buzz
London	Luton	Easyjet
Paris	Beauvais	Ryanair
Frankfurt	Hahn	Ryanair
Brussels	Charleroi	Ryanair
Milan	Orio al Serio	Ryanair
Manchester (UK)	Liverpool	Easyjet
Rome	Ciampino	Easyjet, Ryanair
Stockholm	Skvasta	Ryanair
Oslo	Torp	Ryanair
Glasgow	Prestwick	Ryanair
Copenhagen	Malmo	Ryanair
Hamburg	Lübeck	Ryanair

Table 3B: North American Metropolitan Regions with Secondary Airports significant due to the Traffic of No-Frills airlines.

Metropolitan Region	Secondary Airport)	No-Frills Airline
New York	Islip	Southwest
Miami	Fort Lauderdale	Southwest
San Francisco	Oakland	Southwest
Boston	Providence	Southwest
Boston	Manchester (NH)	Southwest
Dallas/Fort Worth	Love	Southwest
Houston/Galveston	Hobby	Southwest
Toronto	Hamilton	Westjet
Vancouver	Abbotsford	Westjet