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**AIR TRANSPORT LIBERALIZATION AND  
ITS IMPACTS ON AIRLINE COMPETITION  
AND AIR PASSENGER TRAFFIC**

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**Air Transport Liberalization and its Impacts on Airline Competition and Air  
Passenger Traffic**

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# **Air Transport Liberalization and its Impacts on Airline Competition and Air Passenger Traffic**

## **Executive Summary**

This study has attempted to review the major regulatory policy changes that have taken place for liberalizing continental and international air transport markets in the last 20 years, and to discuss and measure, where possible within the limit of study budget, the impacts of those regulatory liberalization policies on traffic and traffic flow patterns.

In the process, this study reviewed and discussed the following sub-topics:

- Review and summary of the literature on the economic effects of the past air transport liberalization events;
- Airline network development including hub-and-spoke network set up by full service airlines and point-to-point network being used by low cost carriers, and their effects on competition and air traffic
- Role of airports, airport-airline vertical relations and implications on competition
- Low cost carrier development and their impacts on airports, airline network, competition and liberalization
- A case discussion on how the prospects of future regulatory liberalization in the Northeast Asian region (China, Japan and South Korea) will influence their sub-continental airline network patterns
- Review of changes in past traffic volumes and pattern of shifting traffic among major continental and inter-continental markets (Asia Pacific (AP), Europe, North America (NA); AP-Europe, AP-NA, Europe-NA), and future traffic growth and shifting patterns of air traffic based on the long-term (18-20 years) Boeing, Airbus and ICAO traffic forecasts.
- Investigation of the effects of the current economic recession and the recent fuel price effects on the short-term air passenger demand until year 2010.

### **Overall conclusions are as follows:**

- The regulatory liberalizations that took place in United States starting from their 1978 domestic deregulation, and the international regulatory liberalization immediately following that (liberal bilateral Air Services Agreement (ASA) initiatives throughout 1980s, followed by the open skies ASA initiatives since 1992) has led the U.S. airlines to set up the most efficient continental networks although the airline industry is still going through another round of consolidation 30 years after their domestic deregulation. As a result of these early market and industry liberalizations, the US market grew faster than Europe during the 1980s. Therefore, we observe a slower growth of the US markets in the post-1990 period. In the

foreseeable future, the US market is expected grow slower than the European markets, and far slower than other continental markets including the Asia Pacific.

- The regulatory liberalization leading up to the creation of EU Single Aviation market (introduction of the three packages of EU liberalization in late 1980s through to 1993, and *cabotage* provision in 1997) and the subsequent industry developments in Europe and rest of the world are very encouraging. Although the emerging industry consolidation and dynamic expansion of low cost carriers in Europe have reduced airfares and increased passengers significantly since late 1990s, it will take a considerable amount of time (probably another decade) for the European airline industry to adjust to the dynamic changes that occurred since early 1990s. Eventually, the surviving network carriers will need to set up multiple hub networks throughout Europe, most likely using their current super-hub airport, and setting up secondary hubs in other parts of the continent, not necessarily invading someone else's super-hub airport. Most US carriers have avoided invading into other carrier's super-hub, and set up secondary hubs close to competitor's super-hub in order to steal connecting traffic from the same region. Such multiple hub networks are likely to be created via a combination of growth and mergers/acquisitions.
- Despite of the fact that many Asian governments have been claiming of their successes in air transport regulatory liberalization, most of the Asian countries have done largely lip services to their consumers, tourism and other industries of their economies by siding with and protecting their respective flag carriers, especially when they deal with international markets. Despite the impressive growth of passenger traffic in the intra-Asia Pacific and intercontinental markets linking the Asia-Pacific region, most of these passenger traffic growth is attributable to the growth of their real income (real GDP growth in our analysis), not much to air fare reductions and/or improved convenience of travel. Relaxing regulations on international tourism are another important factor that their air passenger traffic has been growing. However, we are not denying that there have been some significant movements towards liberalizing their domestic and/or international air transport regulations. What we are saying is such initiatives are being put into action because the needs of their failing full service (legacy) airlines and their needs, not necessarily because of the change in the hearts of the policy making officials or politicians towards consumers and/or the whole economy.
- The North Atlantic markets have been the role model for liberalization of international air transport for a long time. Also, the EU-US Open Aviation Area (OAA) Agreement which went into effect in March, 2008, and subsequent (on-going) negotiations on foreign ownership issue are expected to help the airlines both side of the Atlantic Ocean develop far more efficient intra-continental and inter-continental networks in the medium to long term. Without the resolution on the issue of citizen's control or ownership issue on airlines, most likely the network (legacy) carriers will

need to rely more on strategic alliance partners located in each other's continent in order to improve the combined efficiency of their intra- and inter-continental networks.

- In the Northeast Asian region, there are strong needs for sub-continental integration of economies and trade as well as existence of enough momentum for negotiating open skies agreements bilaterally among China, Japan and South Korea even in the short term. The bilateral open skies (with a limited access to fifth freedom route rights) may be of reality within the next three to five years. The sub-continental Open Aviation Area agreement may be possibility in the medium to long term. Because of the sheer size of China's population, rapid growth of China's air traffic, and the fact that China's surviving major network carriers will become top 10 airlines of the world within next five years, there are enough incentives and threat for Japanese and South Korean carriers to agree on most liberalization measures for helping integration of the Northeast Asian air transport market.
- At the moment, there is not a single true hub airport in Asia because Asian carriers (to the exception of Singapore Airlines, and to a less extent, Cathay Pacific) have not been focusing on connecting passengers via their major airports. For example, we were told by Chinese carriers or airport authorities (also Civil Aviation Authority of China, CAAC), they don't even keep track of connecting passenger statistics. This will likely to change in the medium to long term as the sub-continental air transport markets are liberalized, and the existing network carriers run out of growth opportunities. Air China has already set up substantial operational bases in Chengdu (Western China) and Shenzhen (Southern China) in addition to Beijing super-base airport.
- Our assessments on LCCs are as follows: LCCs have advantages due to their lower input prices and higher productivity of utilizing aircraft, crew and other labor. Most of these advantages diminish severely over time (as their labor get organized/unionize) and when expanding into long-haul routes. Although LCCs will continue to pose competition on short to medium haul routes (and has been very positive force for leading policy makers and official in charge of air transport regulation), it is not likely to have a sustained significant impact on inter-continental and long-haul air transport markets. It will continue to be friends of consumers and posing competition in the domestic and intra-continental markets. Especially in Asia, LCCs futures are bright and they are fast becoming the darling of consumer movement.

- In terms of future traffic development, our predictions are summarized below:
  - Asia-Pacific markets (including China, India, Southeast Asia) and other developing countries markets including South America will grow rapidly in the next 20 years mainly due to their high projected GDP (income per capita) growth;
  - European traffic is expected to grow significantly faster than the North American (Canada and US) markets primarily because of the two factors: the effects of deregulation are still taking place, and the EU single aviation market includes the fast growing eastern European countries.
  - Asia Pacific – Europe and Asia Pacific – North America intercontinental traffic are expected to grow faster than the North Atlantic market; However, the non-income effects of traffic growth (the residual traffic growth attributable to price reduction and service quality improvement due to regulatory liberalization and competition) will be the highest in the North Atlantic market.
  - Our investigation on the effect of the current global economic recession based on regression analysis on the aggregate time-series data on RPK is estimated to be as follows:
    - Optimistic Scenario: reduction of traffic by 0.02% per year in 2009 from the forecast RPK values for 2008 and 2009 (but will still have 4.6% increase in RPK in 2009 over 2008; 10.5% growth in 2010 as compared to the 2008 traffic level);
    - Pessimistic Scenario: reduction of traffic by 8.1% in 2009 from 2008 value; and by -2.8% in 2010 from the 2008 traffic;
    - Between (a) and (b): reduction of traffic by 3.7% in 2009 as compared to the 2008 forecast value; increase of traffic by 1.7% in 2010 as compared to the 2008 forecast traffic level.
  - Our investigation of the effect of fuel price on the passenger traffic measured in RPK show that the fuel price elasticity estimate of RPK is -0.058. This implies that 10% increase in fuel price reduce RPK by 0.58%. The reasons for this relatively small impacts on RPK is because airlines improve fuel productivity (RPKs/litre of fuel) by achieving higher load factor, and by retiring old and fuel inefficient aircraft faster when fuel price increases.

# Air Transport Liberalization and its Impacts on Airline Competition and Air Passenger Traffic

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# Air Transport Liberalization and its Impacts on Airline Competition and Air Passenger Traffic

## 1. Introduction and background

International air transport operates within the framework of the 1944 Chicago Convention on international air transportation, under which airlines' commercial rights on international routes are governed by a complex web of more than 10,000 bilateral air services agreements (ASAs) between each country-pair. These ASAs regulate a wide range of conditions related to the provision of international air services. The WTO Secretariat (WTO 2006) identified seven features of ASAs as relevant indicators of openness for scheduled air passenger services. They are: 1) Grant of rights (air freedoms allowing airlines to provide services over designated markets), 2) Capacity clause (regulation on volume of traffic, frequency of service and/or aircraft types), 3) Tariff approval (whether fares need to be approved before applied), 4) withholding (which defines the conditions for the foreign carrier to operate, such as ownership and effective citizen control requirements), 5) Designation (which governs the number of airlines allowed to serve the market between two countries and on specific routes), 6) Statistics (that requires the exchange of operational statistics between countries or their airlines, and 7) Cooperative arrangements (which regulate the cooperative marketing agreements between airlines). After reviewing 2,299 ASAs in ICAO and WTO databases, Piermartini and Rousova (2008) indicated that the regulations used most frequently are on pricing, capacity and cooperative arrangements. In addition, while 60% of the ASAs allow multiple designations, the remaining 40% permit only single designation.

Since the deregulation of its domestic airline industry, the U.S. government has also pushed for the liberalization of international air markets. In 1979, the U.S. enacted the International Air Transportation Competition Act, which formally laid down the principle of promoting liberalized bilateral ASAs with foreign countries. A major breakthrough was achieved when the first Open-Sky agreement was reached between the U.S. and the Netherlands in 1992, removing capacity and frequency constraints for aviation services between the two nations. As of 25 November 2008, the U.S. has open skies agreements with 94 countries in six continents, making it the open-skies hub nation of the world (US Department of State website, 2009).

During the period of 1988 to 1997, three air transport liberalization packages have been implemented by EU countries, which created eventually a single aviation market for the EU community carriers by adding *Cabotage* rights in 1997. As of 11 January 2007, a total of 66 countries in all continents have recognized EU common market in their ASAs, allowing European air carriers to operate flights between any EU member states and these countries. In April 2007, the EU-US Open Aviation Agreement (OAA) was signed and went into effect on 30 March 2008. While similar agreements are being negotiated with

other nations, efforts are made to further liberalize the international aviation market, which would remove remaining constraints such as ownership restriction.

Bilateral air services agreements remain the primary vehicles for liberalization of international air transport services for most countries. During the past decade, about one thousand bilateral air services agreements (including amendments and/or memoranda of understanding) were reportedly concluded. Over 70 percent of these agreements and amendments contained some form of liberalized arrangements, such as expanded traffic rights (covering Third, Fourth and in some cases Fifth Freedom traffic rights), multiple designations with or without route limitations, free determination of capacity, a double disapproval or free pricing regime, and broadened criteria of airline ownership and control. As the airline business evolves, some of the recent bilateral air services agreements have included provisions dealing with computer reservation systems (CRSs), airline codesharing, leasing of aircraft and intermodal transport. One notable development is the considerable increase in the number of bilateral “open skies” air services agreements, which provide for full market access without restrictions on Third, Fourth and Fifth Freedom traffic rights, designation, capacity, frequencies, codesharing and tariffs. As of February 2008, 142 bilateral “open skies” agreements have been reportedly concluded worldwide.

The evolving liberalization of international air transport regulation since the mid-1990s has played an important role in the growth of air transport industry by providing a favourable regulatory environment. Worldwide, the total number of annual passengers has grown by 46 percent in the past ten years, from 1.457 billion passengers to 2.128 billion per year (ICAO, 2007). It is estimated (ICAO Secretariat, 2007) that, in 2006, about 31 percent of the country-pairs with non-stop passenger air services and about 49 percent of the seat capacity offered occurred between countries that have embraced liberalization either by bilateral “open skies” ASAs or by regional / plurilateral liberalized agreements and arrangements (compared with less than 4 percent and about 20 percent respectively in 1995, and about 16 percent and about 42 percent respectively in 2000). Numerous reports and papers from academia, governments and industries, confirmed that the liberalization efforts had brought significant welfare gains and economic growth world wide.

Despite of the fact that many liberalization agreements have been reached over the years, liberalization of the international aviation market remains a formidable challenge. Even with strong political will, the negotiation of liberalizing ASAs remains to be a lengthy process full of disagreements and bargaining. Many of the difficulties in liberalization efforts can be ascribed to stakeholders’ different expectations on the effects of alternative policy / agreement scenarios. The resulting uncertainty of liberalization has prevented many governments from adopting substantial regulatory changes, and has

given certain interests groups including national flag carriers' strong influence over the negotiation process. Therefore, there is a need to review the **actual effects** brought by the liberalization process worldwide, and investigate the **mechanisms** leading to those changes. These efforts would, of course, facilitate policy makers in their efforts to address future liberalization initiatives.

This study aims to achieve the above objectives by investigating the following issues: Section 2 reviews the economic effects of liberalization on the air transport industry and economy. Section 3 studies the airline network competition and restructuring process with deregulation and liberalization, whereas Section 4 studies airports' competition, their vertical relations with airlines and the implications to liberalization. Section 5 examines the impacts of low cost carriers on fares, traffic, full-service airlines, airports and airline networks, as well as on aviation policy. A case discussion for the evolving regulatory liberalization in the Northeast Asian region is offered in Section 6. Empirical estimates of impacts of liberalization are offered in Section 7, with a focus on traffic volume stimulation effects. The last section summarizes and concludes the report.

## **2. Economic effects of air transport liberalization on the aviation industry and overall economy**

This section provides an overview of the economic effects of regulation and liberalization. A short summary of the origin and results of regulation is first given. We then review the major liberalization events in recent years, and discuss the economic impacts of air liberalization on the aviation industry. Finally, a discussion on the relationships between air transport liberalization and overall economy is provided. While this paper focuses on the liberalization of international market, the U.S. regulation / deregulation process has also been discussed where appropriate since the regulation / deregulation practice in this market had served much as a prototype in the industry. In addition, this market has been extensively studied such that rich results and findings have been obtained.

### **2.1. Rationale and the economic effects of air transport regulation**

After the World War I, some state-owned enterprises and private airlines began to offer commercial air transport services to the public. However, with low demand and high risk of operation, commercial air transport would not have been sustainable without government support. As a result, the Kelly Air Mail Act of 1925 was passed in the U.S., allowing the Post Office to subsidize private air mail carriage by awarding contracts with payment exceeding air mail revenue on the routes. To oversee such a system, the Civil Aeronautics Board (CAB) was created as a regulator by the Civil Aeronautical Act of 1938. Charged with "the promotion, encouragement and development of civil aeronautics", the CAB aims to eliminate "unfair or destructive competitive practice" by regulating entry,

rate levels and structures, subsidies and merger decisions (Caves 1962, Levine 1965, Borestein and Rose 2007).

Quite a few studies (Levine 1965, Jordan 1970 and Keeler 1972) found that the regulations imposed by CAB resulted in limited competition and high fares. Levine (1987) pointed out that fares in unregulated intrastate routes tend to have relatively high service level and load factors with remarkably lower fares. Such regulated high fares did not, however, lead to high industry profit, as airlines engage in non-price competitions with inefficiently higher service quality (e.g., flight frequency, in-flight amenities) and newer, larger aircraft. This reduced airlines' load factor while increased average costs. In the years just prior to deregulation, the average load factors fell below 50% (Borestein and Rose 2007). Despite of the good intentions and objectives laid down at the time regulation was first introduced, over time, policy makers found themselves drifting away from these original targets, with more and more regulations imposed to correct the undesirable effects.

Similar pattern has been observed in the international market. The regulatory system on international air transport was formalized in the 1944 Chicago Convention. The United States, which was effectively the only country with sufficient financial resources, a large aircraft fleet and expertise after the World War II, attempted to promote competition on a multilateral basis. However, such an effort was not successful. Following the precedent of the first US-UK bilateral agreement in 1946 ("Bermuda I"), ASAs generally regulate services (passenger, cargo) and routes to be operated between the two countries, and stipulate fare-setting mechanisms. They usually specify the airlines with the rights to fly on each route and determine the capacity that can be provided by each of those designated airlines. Most countries imposed very restrictive regulations on international travel in terms of destination and market entry, frequency and capacity, route allocation and fare levels. In one sense, this bilateral system was an interesting solution to a competition issue: that is, countries at the time feared unilateral application of monopoly power by a trading partner. However, it introduced another set of competition problems by constraining entry, especially to routes between countries (Warren and Findlay, 1998). At British insistence, the US-UK agreement was renegotiated in 1977 ("Bermuda II") with significantly more restrictive terms.

Such a situation began to change gradually with the passage of the 1979 US International Air Transportation Competition Promotion Act (IATCPA), after which the U.S. began to explicitly promote liberalized bilateral ASAs with foreign countries.

## **2.2. Major liberalization events on international air transport**

In the last three decades or so, several major air transport liberalization measures have been implemented in the world's major markets. They have

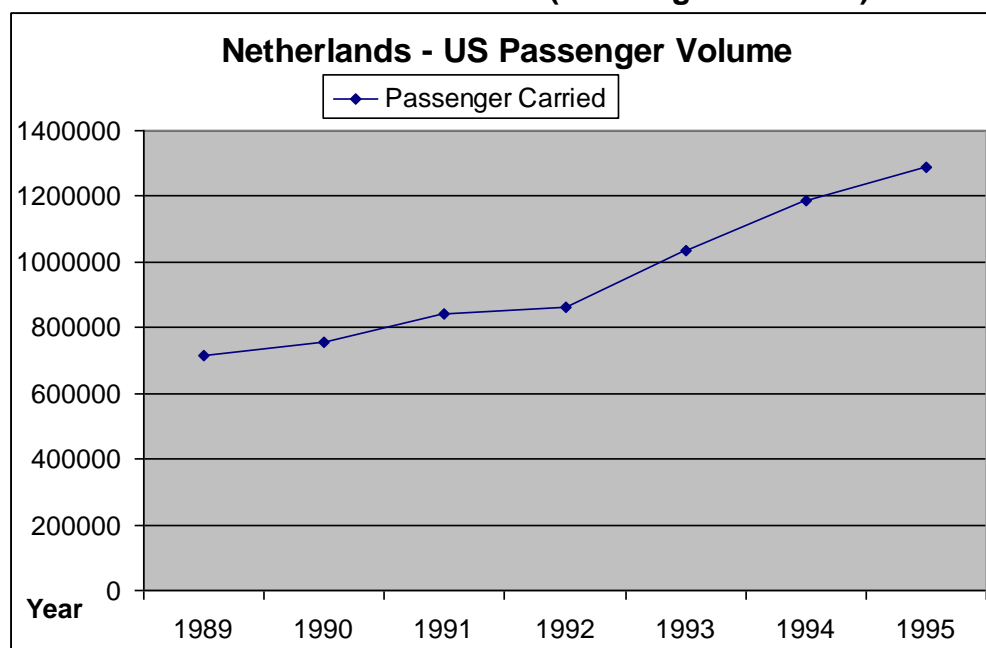
brought about significant and long lasting changes to the industry in terms of competition, pricing, traffic volume, productive efficiency and employments. In this sub-section, major international liberalization events in recent years are first reviewed, thus that the general effects of liberalization on international air transport can be summarized. The events we reviewed include the followings:

- US Open Skies with emphasis on the Canada-US Open Skies Agreement
- Australia - New Zealand Single Aviation Market
- The EU Single Aviation Market
- The US-US Open Aviation Area (OAA)

### 2.2.1. The US open skies agreements

The United States has led the drive towards fully liberalized markets with its Open Skies initiatives, beginning with the US-Netherlands Agreement in 1992. The agreement gave both countries unrestricted landing rights on each other's soil. The United States also granted anti-trust immunity to the alliance between Northwest Airlines and KLM Royal Dutch Airlines that started in 1989 (when Northwest and KLM agreed to code share on a large scale). Even though the aviation markets between the two countries have already been fairly liberalized before the Open Skies, the Open Skies Agreement still brought a significant traffic increase in the years followed, as shown in exhibit 2.1:

**Exhibit 2-1. U.S. – Netherlands Traffic (Passengers Carried) 1989-1995**



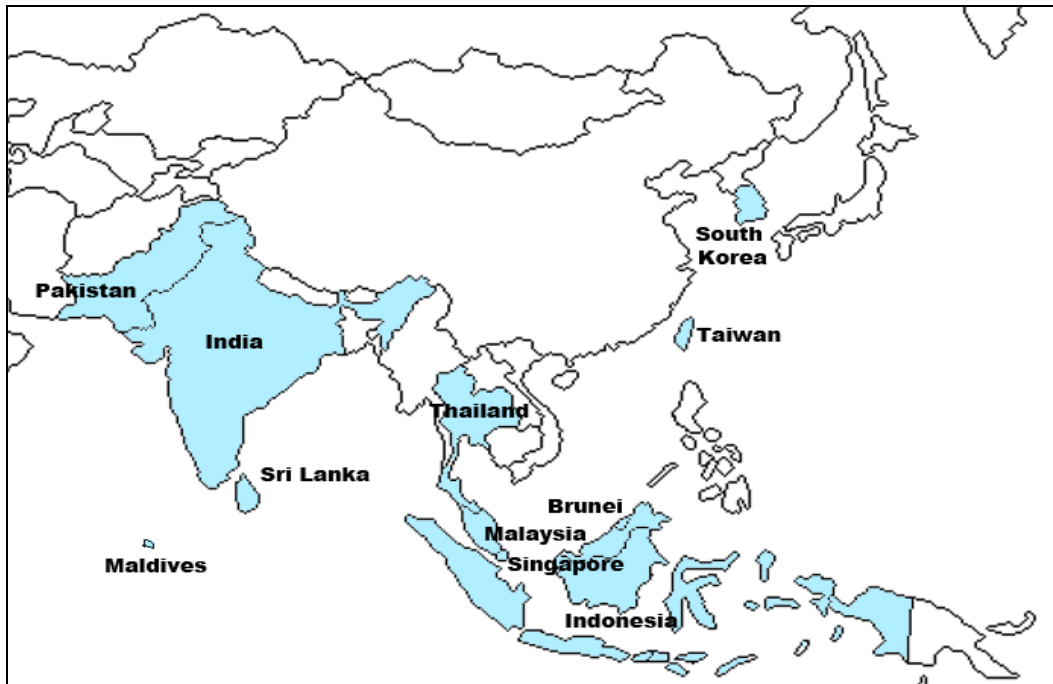
Data Source: ICAO Traffic by Flight Stage

As of 25 November, 2008, the United States has Open Skies agreements with 94 countries in six continents including 11 Asian countries (see Exhibit 2-2).

The most important recent development is the Open Aviation Area Agreement with the European Union that came into effect on March 30, 2008.

With the exception of the US-EU agreement, the US Open Skies agreements still follow the bilateral ASA framework agreed in the Chicago Convention (1944). **Cabotage**<sup>1</sup> rights are expressly removed from the coverage of air services agreements. And importantly, These agreements establish strong regulatory powers and obligations in the areas of safety and security, preserving the full ability of each country to apply national laws.

**Exhibit 2-2. U.S. Open Skies in Asia**



### 2.2.2. *The Canada-US 1995 transborder open skies agreement*

On February 24, 1995, the governments of Canada and the United States signed an “Open Skies” Agreement allowing both Canadian and American airlines to establish direct links between any pair of cities located on either side of the border. The agreement authorized any Canadian or US airline to offer transborder services without restriction in terms of fares, flight frequencies or aircraft types. It greatly facilitated business and leisure travel, providing consumers greater choice through a growing number of transborder routes. For example, there were only 9 non-stop US destinations from Vancouver in 1995 (Exhibit 2-3), but 28 in 2008 (Exhibit 2-4). Overall, the number of

1. **Cabotage** is the permission allowing one or more foreign airlines to carry commercial traffic between any two points in the same country.



Canadian cities with transborder air services has increased from 21 in 1994 to 27 in 2005, with smaller communities being the beneficiaries.

The number of transborder routes has nearly doubled from 90 in 1994 to 171 in 2005. The capacity of scheduled airline services between the two countries experienced strong growth – with a sharp increase of 25% in the first year alone. The average transborder seat capacity per day increased by about 49%, from 28,217 in 1994 to 41,968 in 2005. During the 1995-2005 period, the number of air carriers providing transborder services nearly doubled, increasing from 11 carriers in 1994 to 20 in 2005.

### Exhibit 2-3. Vancouver – U.S. Routes Before 1995



Source: YVR Airport Authority (2006)

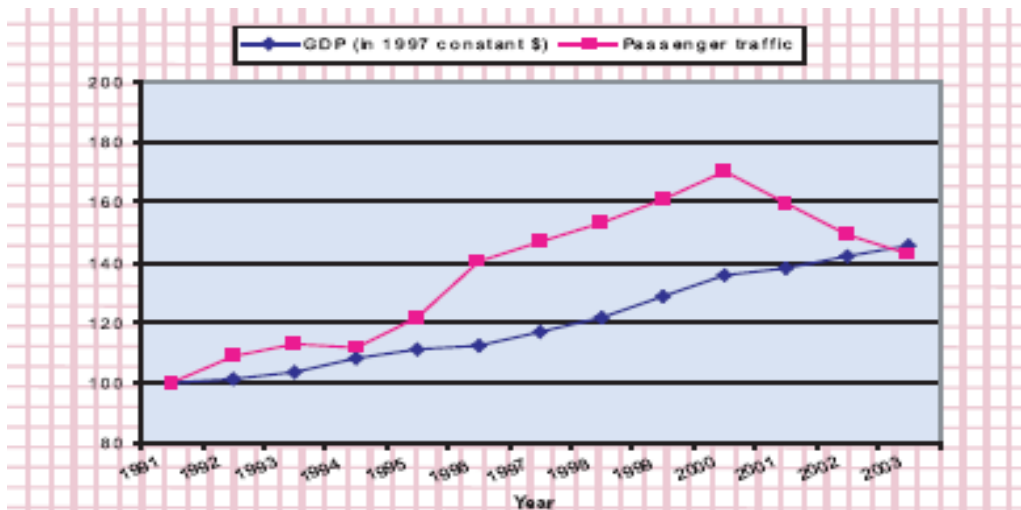
### Exhibit 2-4 Vancouver – US Routes 2008



Source: Supplied by YVR Airport Authority

The number of trips taken by Canadian and US residents between the two countries rose by 41% in the first five years following the agreement. Exhibit 2-5 shows that the growth in transborder passenger traffic was far greater than the growth in economic activity during the period of 1991- 2000, after which negative effects of the recession came in, the dot.com and high-tech bubbles burst, and 9/11 terrorist attacks and the SARS crisis occurred.

### Exhibit 2-5. Transborder Air Traffic and Canadian GDP



Source: Montreal Economic Institute (2005)



By allowing greater flexibility in fares, flight frequencies and aircraft size, the agreement greatly helped airlines to improve their efficiency. Load factors of the main carriers rose by 10% between 1994 and 2000. Labour productivity during this period, as measured in passenger-kilometers per employee, grew by 18%.

The growth in transborder air service has made significant contributions to Canada's economy. It is estimated that the "Open Skies" induced an increase in transborder air traffic, generated about 4,500 additional direct jobs per year, contributed almost \$300 million in GDP. Furthermore, new air services also stimulated other economic sectors such as tourism and export industries. It is estimated that a 5<sup>th</sup> freedom passenger service by a US carrier could generate as many as 105 direct aviation jobs, and about 1,300 direct jobs in the tourism industry (Vancouver Airport Authority, 2000).

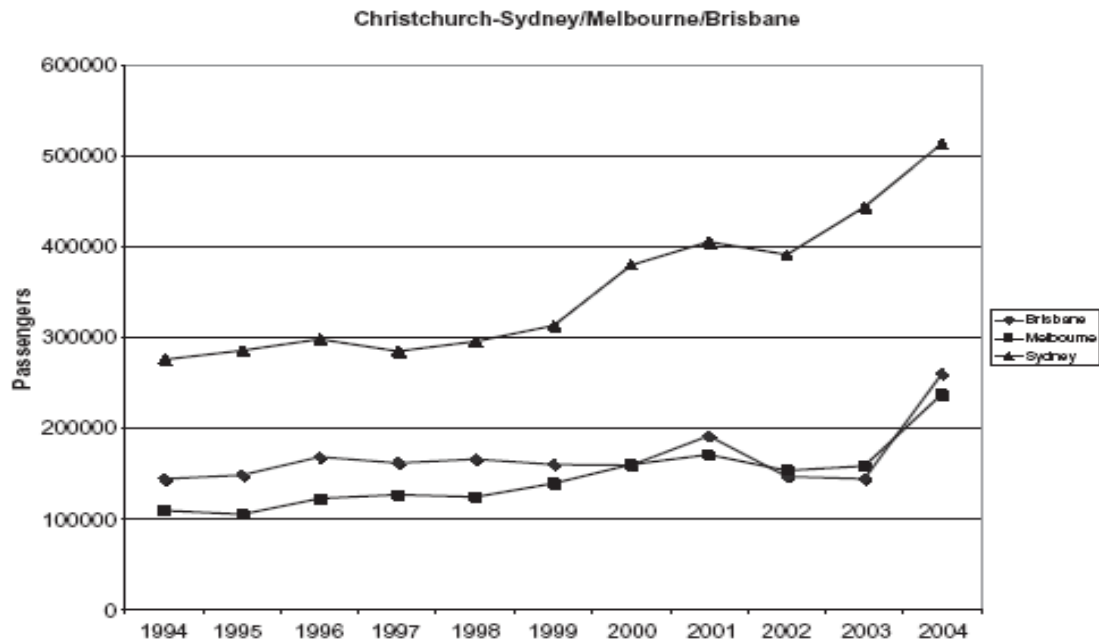
### **2.2.3. Australia – New Zealand Single Aviation Market (SAM)**

The "single aviation market" between Australia and New Zealand was first negotiated in 1992, completed four years later in 1996 and put into full operation in 2000 (Vowles and Tierney, 2007). The agreement allows Australian and New Zealand airlines to operate across the Tasman and beyond to third countries without restriction. Previously, beyond services were limited to 12 Boeing 747s per week to a maximum of 11 countries. This Single Aviation Market agreement not only liberalized air traffic between the two countries but also opened up the Australia-New Zealand market, known as the Trans-Tasman, to airlines from other countries. This turned the Trans-Tasman market into a dynamic competitive market, with 11 passenger airlines and four cargo airlines offering services between Australia and New Zealand. In 2004, there were over 4.6 million passengers in the market, up from nearly 3.3 million passengers in 2000, the year the "single aviation market" was first fully implemented.

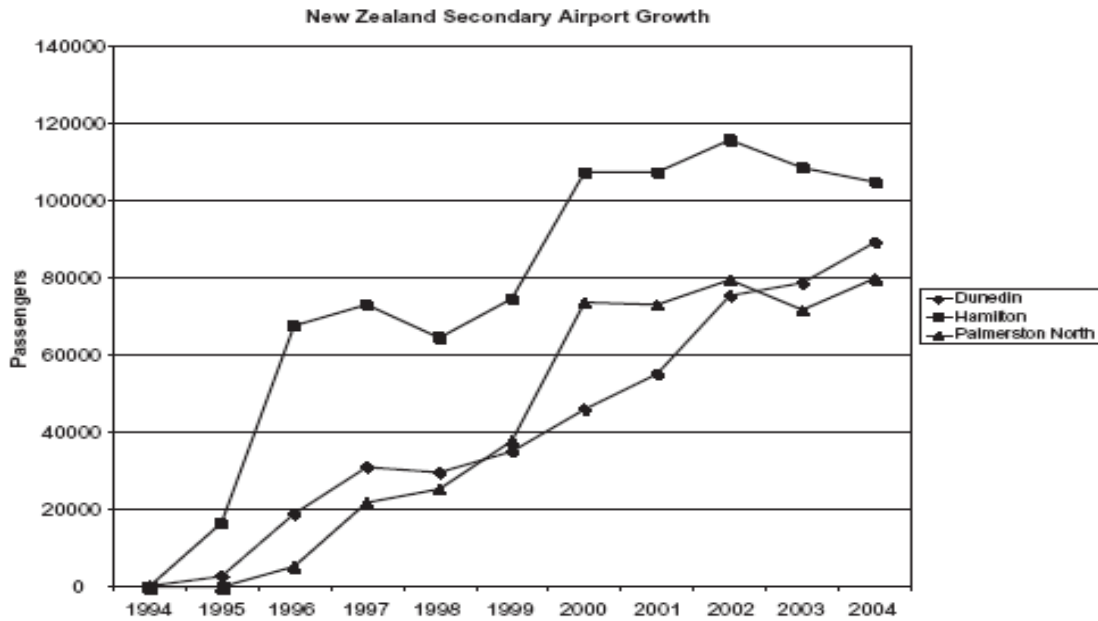
The Trans-Tasman routes can be classified into two distinct markets: 1). "Trunk" routes including Auckland –Australia and Christchurch–Australia, and 2). New Zealand Secondary Airports –Australia. In larger truck routes, liberalisation has brought third-country airlines into the market, with the national "flag carriers", Qantas and Air New Zealand respectively, continuing to dominate in terms of passengers carried. The largest market, Christchurch–Sydney, as shown in Exhibit 2-6, has two growth periods: the first was between 1999 and 2001, which can be attributed to the finalisation of the Single Aviation Market Agreement. The second growth spurt was between 2003 and 2004, which is attributable to the announcement and eventual entrance of the successful Australian-based carrier Virgin Blue. The number of passengers in the market has increased by over 25% over the 15 months from Virgin Blue's announced entry. In the New Zealand Secondary Airports–Australia market, the main issue is access rather than competition. Before the mid-1990s, the only cities had access to Trans-Tasman flights, such as Hamilton and Dunedin, were served via connecting flights through larger airports in Auckland and

Christchurch. The Single Aviation Market Agreement provides low-cost carriers the opportunity to serve some of the smaller destinations, creating a new network of direct international connections that did not previously exist. This creates a number of niche markets targeting leisure and visiting friends and family (VFR) travellers, which are both price-sensitive. Exhibit 2-7 shows a significant growth of passengers in these niche markets after year 2000.

**Exhibit 2-6. Christchurch Trans-Tasman markets**



## Exhibit 2-7 New Zealand Secondary Airport Growth



Source: Vowles and Tierney, 2007

### 2.2.4. The EU Single Aviation Market

The EU Single Aviation Market was created in 1992 within the then twelve Member States of European Economic Community (EEC)<sup>2</sup>. Following the creation of European Union (EU) in 1993, the number of member States in the Single Aviation Market increased to 15 in 1995, with Austria, Finland and Sweden joined the EU. The number of member states subsequently increased to 25 in 2004, and to 27 in 2007<sup>3</sup>. Full **cabotage** rights became effective on April 1, 1997. The liberalization package has been applied also to three member States<sup>4</sup> of the European Free Trade Association (EFTA) belonging to the European Economic Area (EEA) since 1994, as well as Switzerland through a bilateral agreement on air transport since 2002. The Single Aviation Market has evolved into a wider European Common Aviation Area (ECAA) involving 35 States<sup>5</sup> in 2006.

2 ECC includes 12 member states: Belgium, France, Germany, Italy, Luxemburg, Netherlands, Denmark, Ireland, United Kingdom, Greece, Spain, and Portugal. When the [European Union \(EU\)](#) was created in 1993, the EEC was transformed into the [European Community](#), one of [the EU's three pillars](#), with EEC institutions continuing as those of the EU.

3 EU members include Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom

4 Iceland, Liechtenstein, Norway

5 ECAA includes the 27 EU member states and eight South-East European partners (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the former Yugoslav Republic of Macedonia, Romania, Serbia and Montenegro and the U.N. Mission in Kosovo).

A significant impact of the Single Aviation Market is the development of the low cost airline services, and dramatic increase in competition and consumer choices. Intra-EU routes with more than 2 carriers have increased by 385% between 1992 and 2007. The number of cross-border Intra-EU routes has increased by 220% during the same period. Air travel in Europe tripled between 1980 and 2000 (Schipper, Rietveld and Nijkamp, 2002). In 2006 the EU air transport industry carried over 730 million passengers, of which 480 million were within the EU. Traffic volume is expected to double by 2020.

In 2002, European Court of Justice (ECJ) ruled on a case filed in 1998 by the European Commission against eight member States who concluded or amended bilateral ASAs (seven of which were Open Skies agreements) with the United States. The judgement affirmed member States' ability to enter into bilateral air services agreements with third countries, to the extent that these agreements do not affect Community rules on air transport. However, the judgement found that some of the provisions in these agreements infringed the Community's exclusive external competence as regards to air fares and computer reservation systems (CRS). ECJ also found that the clause regarding ownership and control of airlines infringed Community law on freedom of establishment.

Following the ECJ's judgement in 2003, the Council of EU conferred on the European Commission a mandate to negotiate a comprehensive ASA on behalf of all member States with the United States for the creation of an Open Aviation Area (OAA) between the two territories. Another so-called "horizontal" mandate is conferred on the Commission to negotiate with third countries to bring certain specific provisions in the existing bilateral ASAs in line with Community law. The Council subsequently granted additional negotiating mandates to the Commission for creation of a "common aviation area" (the integration of EU's neighbouring States into the single aviation market) with Morocco and the countries of the Western Balkans in 2004, Ukraine in 2006, Jordan in 2007, and the creation of an OAA with Canada in 2007<sup>6</sup>. In addition, the Commission has been asking the Council to grant negotiating mandates for a common aviation area with Israel and Russian Federation, and for OAAs with important global partners including Australia, Chile, China, India and New Zealand. The agreements, which have so far been concluded by the Commission under these mandates, are as follows:

- Multilateral Agreement on the Establishment of a European Common Aviation Area (ECAA) involving 35 States, i.e. all the EU member States, Iceland, Norway and the countries of Western Balkans (initialled in 2005, signed in 2006 and applied provisionally for some States);

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6 On November 27, 2007 Canada launched negotiations for an Open Skies-type air transport agreement between Canada and the European Union (EU) and its Member States. Canada currently has concluded bilateral air transport agreements with 19 of the 27 Member States of the (EU).

- Euro-Mediterranean Aviation Agreement with Morocco (initialized in 2005, signed and applied provisionally in 2006);
- Air Transport Agreement with the United States (a draft text of a first-stage comprehensive agreement was agreed to in 2005; an amended text was initialled in 2007 following the United States Department of Transportation (DOT)'s withdrawal of a proposal that would have changed rules governing international investment in U.S. airlines; applied provisionally in March 2008);
- “horizontal” agreements (initialled with 36 States since 2004; covering more than 550 ASAs); and
- 87 non-EU states have accepted Community designation, and nearly 700 Bilateral ASAs have been brought into conformity with Community law

### **2.2.5. The EU – US Open Aviation Area (OAA) Agreement**

The European Union and the United States are the two largest air transport markets in the world. Together they account for more than half of all global scheduled passenger traffic and 71.7 percent of the world's freighter fleet. On March 2, 2007, the United States and the European Union concluded a comprehensive air transport agreement involving all 27 EU countries. The agreement, coming into effect on March 30, 2008, extends Open Skies principles to 11 EU countries including Greece, Ireland, Spain, and the United Kingdom, with which the United States has had restrictive agreements or none at all. The agreement contains the following major provisions:

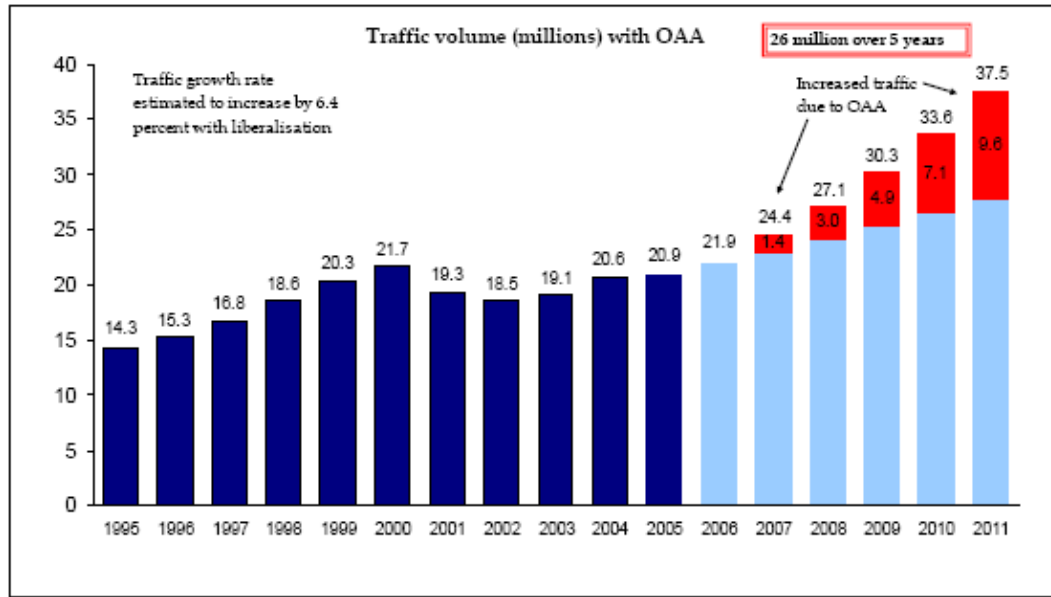
- Open Skies between the United States and all 27 member states of the EU;
- Broader entry into cooperative marketing arrangements for code sharing, franchising and leasing;
- Creation of a cooperative joint committee to further deregulate the aviation markets;
- Guarantees for US investors to participate as minority shareholders in any majority-EU-owned airline (effectively allows minority shares of state-owned firms);
- Investment in US airlines: Restatement of US policy (25 percent legislated cap on voting equity, 25 percent-minus-one-share regulatory cap on non-voting equity). The United States will consider foreign requests to hold larger shares of non-voting equity, including combinations in which the total of voting and non-voting equity exceeds 50 percent;
- For EU carriers, the ability to route flights between any EU member state and the United States without touching the home country (for example, a German Lufthansa flight can go from Paris to the United States, without having to pass through Germany);

- US agreement that purchase by an EU carrier or investor of a controlling share in a carrier (passenger or cargo) from third countries that have Open Skies agreements with the United States—such as Switzerland, Liechtenstein, members of the European Common Aviation Area (ECAA), Kenya, or African countries—would not jeopardize the acquired airlines' rights to operate in the United States;
- Authorization for EU carriers (scheduled and charter, passenger and cargo) to carry certain Fly America traffic, except for the Department of Defence; and
- For EU cargo carriers, the ability to route flights between third-party states and the United States without touching the home country, and between the United States and members of the ECAA.

It is estimated (Booz Allen Hamilton, 2007) that the US-EU Open Skies will result in new routes and new market entrants, generating 9.6 million additional annual passengers during the first five years (Exhibit 2-8), contributing €6.4 to €12 billion in consumer surplus over the five year period. In other words, OAA is expected to generate 43.8% passenger traffic growth during the first five years (9.6 million / 21.9 million base traffic in 2006 = 43.8%). Consequently, 80,000 jobs across the EU and US will be generated during the period. Airlines operating on EU-US services will face additional competition and pressure on costs. Moreover, the ability to restructure across national borders and to organise deeper cooperative alliances, gives the potential for significant gains in productivity and resulting cost savings. These factors are also expected to lead to lower fares, increased traffic, additional jobs and further economic benefits. For example, improved airline cooperation is estimated to result in €160 to €340 million per year in consumer benefits, and the pressure on airline cost reduction is estimated to generate as much as €3.8 billion per year in consumer surplus.



## Exhibit 2- 8. Predicted Increase in Passenger Traffic due to US-EU Open Skies



Source: Booz Allen Hamilton, 2007

As stated by James Devall (April, 2008), “--- the US-EU Air Transport Agreement should be considered one of the most significant developments in the international aviation regulatory scheme since the 1944 Chicago Convention”; and the US and EU should build on the great achievement of the US-EU Agreement in a way that leads to a more global liberalization of the international aviation industry.

EU and US negotiators opened the second round of Open Skies negotiations on May 15, 2008. EU’s main objectives are to lower investment hurdles and access restrictions for EU carriers in the US, which are strongly opposed by the US Congress. The US congress still imposes a 25% cap on voting rights of EU carriers investing in US airlines. On the other hand, US airlines are able to hold voting rights of up to 49% in European carriers. The United States has announced that they want to negotiate a multilateral agreement that would remove access restrictions on airlines from more than 60 nations.

The scope of the negotiations, though, will go beyond the ownership question. U.S. negotiators have voiced concerns that the proliferation of night flight curfews related to noise restrictions at EU airports could affect express delivery carriers such as DHL, FedEx and UPS, which operate most of their flights at night. The U.S. side has seen no evidence that airports in Brussels, Belgium, Frankfurt, and Porto (Portugal), which introduced such curfews, had considered alternative noise-reduction measures.

## 2.3. Economic effects of liberalization on the air transport industry

While the net effects of these major liberalization events vary across the markets, there are some common changes brought to the air transport industry:

### 2.3.1. Increased competition, reduced price and traffic stimulation:

Most of these liberalization efforts have brought in significant traffic growth. Such traffic growth was mainly driven by two factors: First, liberalization removes constraints on pricing, route entry, service capacity and cooperative arrangements among alliance members. This allows airlines to compete more effectively and operate more efficiently, which leads to reduced prices and increased service quality in terms of flight frequency, frequent flier programs, etc. As a result, passenger traffic can be stimulated substantially. Secondly, liberalization allows airlines to optimize their network configuration. The implementation of hub-and-spoke networks enabled carriers to link small markets with their hub airports, expanding air services to new destinations. Maillebiau et al (1995) developed a translog air travel demand function in a single aviation market in order to forecast the passenger increase between U.S. and five European countries: UK, France, West Germany, Netherlands and Italy. They estimated that the traffic growth from liberalization is 56% and of benefit of \$585/passenger. Their results also showed a decrease in airline yield of 35% and a 44% increase in accessibility.

This is not a surprising result. Button (1998) found that following the U.S. deregulation, during 1978-1988, passenger traffic increased by 55 percent while scheduled revenue passenger-miles grew by over 60 percent. The real costs of travel fell by about 17 percent on major routes.<sup>7</sup> Morrison and Winston (1986) estimated that the U.S. deregulation yield welfare gains of \$6 billion to passengers and profit gains about \$2.5 billion to stakeholders of carriers (including various labor unions). Exhibit 2-9 compares the changes in prices of air travel vs. other goods and services in the United States during the 1978-2006 period. It shows that both domestic and international air services are two of the four items with the lowest nominal price increases during the 28-year period: 1.5-1.6 times the price of 1978 for air travel while college tuitions (private and public) increased by the factor of 7.5-8.5 times the 1978 levels.

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7 Borenstein and Rose (2007) found that between 1976 and 1986, the U.S. average domestic passenger yield declined in real terms at a rate of 3.4% per year, while revenue passenger miles increased at a rate of 8.2% per year. However, they pointed out that the price effects of the U.S. deregulation may have been overestimated. Instead, a major change had been an increase in price dispersion. Price dispersion within carrier – routes more than doubled between 1979 and 2001.



### Exhibit 2-9, Price Changes of Air Travel versus Other Goods and Services

ITEM-U.S. Good or Service	Unit	1978	1990	2006	Growth
College Tuition: Public	Year	\$688	\$1,908	\$5,836	8.5x
College Tuition: Private	Year	\$2,958	\$9,340	\$22,218	7.5x
Prescription Drugs	Index	61.6	181.7	363.9	5.9x
New Single-Family Home	Home	\$55,700	\$122,900	\$246,500	4.4x
New Vehicle	Vehicle	\$6,470	\$15,900	\$28,450	4.4x
Unleaded Gasoline	Gallon	\$0.67	\$1.16	\$2.59	3.9x
<b>CPI (Urban-All Items)</b>	<b>CPI-U</b>	<b>65.2</b>	<b>130.6</b>	<b>201.6</b>	<b>3.1x</b>
Movie Ticket	Ticket	\$2.34	\$4.22	\$6.55	2.8x
First-Class Postage	Stamp	\$0.15	\$0.25	\$0.39	2.6x
Whole Milk	Index	81.0	124.4	181.6	2.2x
Grade-A Large Eggs	Dozen	\$0.82	\$1.01	\$1.31	1.6x
Air Travel: International	Mile	7.49¢	10.83¢	11.85¢	1.6x
Air Travel: Domestic	Mile	8.49¢	13.43¢	13.00¢	1.5x
Television	Index	101.8	74.6	22.3	0.2x

Sources: General Accountability Office (GAO, 2008), Airline Industry: Potential Mergers and Acquisitions Driven by Financial and Competitive Pressures, GAO-08-845 July 31, 2008.

InterVISTAS (2006) found that liberalization has promoted many new services (e.g., new schedules and direct routes), which in turn stimulated traffic. Exhibit 2-10 compares traffic levels in the year immediately preceding inauguration of new services to the volumes in the first full calendar year of operation. Most of the examples result from changes in bilateral ASAs, or from specific governmental decisions to relax the restrictive provisions of current agreements. Despite of the amazing growth reported, InterVISTAS (2006) pointed out that by using a strict “year before/year after” timeframe, the table understates the stimulation of new traffic into a market, since traffic usually requires several years to adjust fully to a new service.

### Exhibit 2-10. New International Services and Traffic Growth

City-Pair	Service	Liberalization Event	Gain
Vancouver-Phoenix	America West 1995	1995 Canada-U.S. Bilateral	146.4%
Toronto-Minneapolis	Air Canada 1995, Northwest	1995 Canada-U.S. Bilateral	55.3%
Toronto-New Orleans	Air Canada 1998	1995 Canada-U.S. Bilateral	41.2%
Ottawa-Chicago	Air Canada/ American 1995	1995 Canada-U.S. Bilateral	109.7%
Montreal-Atlanta	Delta 1995	1995 Canada-U.S. Bilateral	55.5%
Atlanta-San Jose CR	Delta 1998	1997 U.S.-Costa Rica	118.5%
Dallas/Fort Worth-Santiago	American 1996	Assignment of routes	336.6%
Chicago-Hong Kong	United 1996 (not daily)	U.S.-Hong Kong Bilateral	21.1%
Chicago-London	United 1995	U.S.-U.K Mini Deal, 1995	42.1%
Chicago-Sao Paulo	United 1997	U.S.-Brazil, 1996	80.4%
Chicago-Buenos Aires	United 1998	Reassignment of routes	41.1%
Houston-Sao Paulo	Continental 1999	U.S.-Brazil, 1997	120.5%
Atlanta-Guadalajara	Delta 1999	U.S.-Mexico, 1991	169.5%
Washington-Buenos Aires	United 2002	Reassignment of routes	208.7%
Washington-Sao Paulo	United 2002	Reassignment of routes	88.4%
Detroit-Beijing	Northwest 1996	U.S.-China, 1995	174.3%
Dallas/Fort Worth-Lima	American 1996	Assignment of routes	482.0%
Houston-Tokyo	Continental 1998	1998 U.S.-Japan	116.6%
Atlanta-Rome	Delta 1999	1998 U.S.-Italy	110.8%
Dallas/Fort Worth-Zurich	American 2000	1995 Open Skies	115.3%

Sources: United States Department of Transportation Databases 1B and 28IS; Statistics Canada Report 51-205, "Air Passenger Origin and Destination, Canada-United States Report," and InterVISTAS estimates.

#### 2.3.2. Productive efficiency improvement

Liberalization has improved the productive efficiency of the airlines industry via several ways: First, liberalization allows airlines to optimize their network and pricing strategy. This improves airlines' operation efficiency and average load factor. As a result, average costs have been reduced steadily. Secondly, the increased competition following liberalization forces airlines to relentlessly improve their productive efficiency. Less efficient airlines are either merged or bankrupted, while new business models and innovations are (e.g., low cost carriers, e-tickets and self service check-in) nurtured when firms drive to achieve competitive edge. Oum and Yu (1998) found that after deregulation, many remaining U.S. carriers have achieved global leadership in cost competitiveness. Fethi, Jackson and Weyman-Jones (2000) found that the EU liberalization have improved airlines' efficiency significantly.

#### 2.3.3. Effects on employment in the aviation industry:

As one would expect, the rapid growth brought by liberalization must lead to additional jobs in the aviation sector. Button (1998) estimated that with the substantial growth following the U.S. deregulation, the employment in the air

transport industry increased by 32 percent during the 1978-1988 period. InterVISTAS (2006) estimated that the creation of the Single European Aviation Market in 1993 produced about 1.4 million new jobs in aviation and related industries; the 1998 UK – UAE (United Arab Emirates) liberalization created over 18,700 full-time equivalent positions in the UK side; and the 1986 Germany – UAE liberalization created 745 new full time positions in UAE and 2,600 new jobs in Germany.

It should be noted that the job creation process sometimes is accompanied with job relocation, when firms outsource certain functions to more cost effective regions. For example, with the liberalization / formation of European single aviation market, Lufthansa (LH) began to outsource certain functions to Eastern European countries. In 2005, LH built a new shared customer services center in the Czech Republic, and set up maintenance facilities for heavy checks in Hungary. The airline also plans to move most of its accounting and purchasing operations to Poland. In addition to cost cutting, outsourcing strategies are likely driven by the company's desire to explore overseas opportunities. Outsourcing operations abroad will reduce domestic production. However, a more competitive airline in the global market will achieve more service export for the country (e.g., Clougherty and Zhang 2008).

#### **2.4. Air transport liberalization and overall economy**

There is a two-way relationship between air transportation and the overall economy. It has been well recognized that air transport and logistics, as other transport services, are so called “derived” demands. They are usually purchased as inputs or intermediate products for the consumption / production of some other services: passengers purchase air service because they need to go to the destination for business or leisure, whereas cargos are shipped such that they can be consumed / processed in the destination. Therefore, the demand for transport services is largely driven by the overall economy. Such a dependence on overall economy has been incorporated in virtually all forecast models used by major organizations:

- Boeing: Boeing has published an annual Current Market Outlook (CMO) since 1964. CMO offers a 20-year forecast for the world wide aviation market involving jet aircraft with 30 seats or more. Traffic forecaster applies GDP to a top-down traffic model, which found that on average, air travel approximates to 1% of GDP over time. The Boeing forecasts also recognize that as trade rises as a share of GDP, air travel rises as well. In particular, Boeing (2008) attributes about two-thirds of traffic growth to the GDP growth, and the rest to other factors such as increasing trade, lower costs and improved services. These overall forecasts are combined with other modeling techniques to deliver detailed forecasts for major markets in the world.

- Airbus: Airbus offers its own version of the 20-year forecast, the Global Market Forecast (GMF). The forecast model also utilizes GDP-trend regression for traffic forecasting, with other factors such as trade, unemployment rate, inflation, disposable income controlled in Airbus' econometric analysis. Statistical tests are conducted so that the model that best fits the historical traffic is selected for use. For market segments where classical econometric models are not sufficient, GMF uses "hybrid models" to take into account of the effects of other factors such as the presence of low cost carriers, fuel price, growth of emerging economies and inter-modal competition between air and other transport modes.
- ICAO: ICAO utilizes a GDP trend model with the consideration of air traffic price, in terms of yields, to predict air traffic up to 2025. In its forecast for 2025, the income elasticity for air travel is estimated to be 1.27. That is, ceteris-paribus, a 1-percent increase in GDP will lead to a 1.27-percent increase in air travel. ICAO further assumed that the world economy will grow at an average annual rate of 3.5% during 2005 to 2025, leading to a predicted growth rate for global air traffic at about 4.5 percent a year.

All these forecasts provide fairly consistent estimation as explained in details in Section 7. This is partly due to the fact that they all recognize economic activities to be the main determining factor for air traffic growth. This implies that:

- In the foreseeable future, aviation markets in the developed countries will maintain their lion's share of the global market. Therefore, aviation policy adopted by the developed economies, predominantly the OECD countries, will play a leading role in shaping the future global aviation industry. Economic activities determine the "potential" **demand** for aviation services. Government policy, airline competition and market liberalization, with their effects on the **supply** side, influence what "proportion" of such potential demands will be realized. The observed traffic growth rates following liberalization, as reported in Exhibit 2-10, are often 10 times higher than the average growth rate forecasted by major organizations<sup>8</sup>. This suggests that significant constraints are still present in the existing global market. Removal of such constraints would allow the aviation sector to achieve substantially higher growth rate.
- In deregulated markets (e.g. Canada-US, intra-EU, US-EU OAA markets), further liberalization will provide more moderate gains compared to emerging economies such as India and China, since much of the "potential" demand driven by economic activities has already been realized. The burgeoning economic growth in emerging economies produces good "potential" traffic demands. Nevertheless, bilateral ASAs involving those countries are still quite restrictive in general. Substantially higher growth rate

<sup>8</sup> Detailed forecasts by Boeing, Airbus and ICAO are discussed in Section 7.

in the aviation sector will be achieved if governments in these countries adopt a more liberalized approach. Therefore, liberalizing these markets should be of high priority in policy makers' agenda.

While air transport is, on one hand, driven by the global economy, it is, on the other hand, an important driver to the global economy. International Air Transport Association<sup>9</sup> (IATA) noted that air transport directly employs four million people worldwide and generates \$400 billion in output. In addition, the efficiency and quality improvements in air passenger services contribute to the growth in sectors such as hotel and tourism. The free flow of people and information, together with improved air cargo operations, promote trade and improve the efficiency of the overall economy. That is, the aviation sector imposes significant positive externalities to other industries, contributing to economic and employment growth. Button et al. (1999) examined the link between high-tech employment in a region and whether the region is served by a hub airport. Using data from 321 U.S. metropolitan areas in 1994, the analysis found that the presence of a hub airport increased high tech employment by an average of 12,000 jobs in a region. Irwin and Kasarda (1991) examined the relationship between the structure of airline networks and employment growth in 104 metropolitan areas in the United States. They found that expansion of the airline network serving a region had a significant positive impact on local employment. The effect was particularly significant in the service sector. Furthermore, analysis using nonrecursive models confirmed that increases in the airline network were a cause rather than a consequence of this employment growth. In addition to job creation, air transport facilitates commerce communication and labor mobility. Button (2006) pointed out that in United States and Europe, more than 40% of air travels are for business purposes. The remaining trips are either for leisure or for visiting friends and relatives. Leisure travel promotes the hotel and tourism sectors, while visiting friends and relative trips provide the basis upon which social ties are retained and, as such, allow for an efficient and integrated labour market.

Air transport is ideal for the coordination of global supply chains, and thereby, improves the overall efficiency of the economy. As firms source around the world for most favorable inputs such as labor, land, technology and capital, manufacturing and factory locations can be sparsely distributed. Hummels (2006) found that the elasticity of air shipping costs with respect to distance declined dramatically, from 0.43 in 1974 to 0.045 in 2004. That is, doubling distance shipped caused a 43% increase in air shipping costs in 1974, but only a 4.5% increase in air shipping costs in 2004. As a result, the average air shipment is getting longer and the average ocean shipment is getting shorter.<sup>10</sup> Recent papers by Aizenman (2004) and Schaur (2006) have argued that air

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9 IATA 2005 annual report.

10 Hummels (2006) pointed out that ocean shipped cargo traveled an average of 2919 miles in 2004, down from 3543 miles in 1975. In contrast, air shipped cargo traveled on average of 3383 miles in 2004, up from 2600 in 1975.



shipping may be an effective way to handle international demand volatility. Because air shipments take hours rather than weeks, firms can wait until the realization of demand shocks before deciding on quantities to be sold. That is, air shipping provides these firms with a real option to smooth demand shocks.

Same as other shipping modes, the efficiency and quality improvements of air transportation promote trade and economic growth. Two major barriers for trade are cost and time related to transportation. Limao and Venables (2001) find that a 10% increase in transport costs reduces trade volume by 20%. Recent studies find that a 10% increase in time reduces bilateral trade volumes by between 5% and 8% (Hausman et al., 2005; Djankov et al., 2005). While air transport is clearly superior to other shipping modes in terms of time, its perceived cost disadvantage has been reduced over the years. Swan (2007) found that since 1970, both price and production cost for air travel have been declining at about 1% annually. As shipments are of higher value and lighter weight, the *ad valorem* cost of air freight, i.e., the transport cost needed to move a dollar of goods, is also decreasing. Harrigan (2005) estimated that the relative cost of air transport has declined by 40% between 1990 and 2004. As a result, air cargo is of growing importance in cargo logistics, accounting for about 40% of international trade by value. Many countries have chosen to locate special economic zones and high tech parks near airports.

Some nations, such as the Netherlands and Singapore, achieved rapid economic developments by leveraging on their liberalized transport systems. Compared to its European neighbours such as France and Germany, Netherlands has a relatively small domestic market. Nevertheless, the country have been aggressive in liberalizing its transport sectors: in 1992 it signed the first open-sky agreement in the world with the U.S., promoting Schiphol airport as a major gateway for cross-Atlantic traffic, while facilitating its flag carrier at the time, KLM, to further expand its network coverage in Europe and North America. These efforts, together with its superior transport infrastructures,<sup>11</sup> have made the Netherlands not only a major European aviation hub nation, but also an ideal place to establish European Distribution Centers (Oum and Park, 2004). In terms of value, only 5% of the express cargo and retail logistics handled in the Netherlands are for local consumption (Datamonitor 2005). With the establishment of their European Distribution Centers, many companies have chosen to also locate their billing centers, service depots, research centers or even European headquarters in the country. The well developed transport and logistics sector in the Netherlands has clearly enhanced the overall competitiveness of its economy.

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11 The Netherlands has the largest marine port in Europe in Rotterdam, superior inland river shipping to Germany and France, and extensive high speed rail and road connections to Western Europe.

### 3. Airline network competition and liberalization

In markets not yet liberalized, there can be many constraints on airlines' network configuration. Bilateral air services agreements (ASAs) between two countries limit airports and route access, flight frequency and seat capacity. These regulations prevent carriers from optimizing their overall networks. The limitations imposed with a third country (i.e., limitations on beyond rights such as 5<sup>th</sup> freedom) will further constraint a carrier's network structure in a region. As many theoretical and empirical studies found, when these constraints are removed, airlines often choose to reconfigure their networks to achieve various objectives: to improve cost efficiency by exploiting "economies of traffic density"<sup>12</sup>, to enhance service quality by initiating direct flights and/or by increasing flight frequency<sup>13</sup>, to price more aggressively or to compete more strategically<sup>14</sup>. Many of these objectives are achieved by streamlining a carrier's multi-hub network.

#### 3.1. Effects of hub-and-spoke networks and airline network competition

The emergence and prevalence of hub-and-spoke network is one of the most common developments in deregulated markets, especially for airlines endowed with access rights to a single large market such as the United States and European Single Aviation Market. The formation of a hub-and-spoke network can affect both demand and cost.

The effect of hubbing on costs has been extensively studied in the literature (e.g., Caves et al. 1984, Brueckner and Spiller 1994, Hendricks, et al., 1995, 1999). Costs can go down due to higher traffic densities in hub-and-spoke (HS) operations than in fully connected (FC, or point-to-point) operations, although these cost savings might be offset by the travelers' circuitous routings via hubs.

Hubbing can also affect demand (which, in turn, affects revenues and profits) with its effect on passenger travel time and schedule delay time. One of the most important trade-offs an airline makes is the one between offering frequent service with hub connection, and infrequent but point-to-point (non-stop) service. Compared to non-stop services, an HS network increases the average passenger's travel time due to the extra connecting time at hubs and the circuitous routing of passenger trips. On the other hand, HS reduces a

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12 See, e.g., Caves et al. (1984) and Brueckner and Spiller (1994). Traffic density is calculated by dividing the total traffic volume by the carrier's network size. Network size is usually defined as the number of origin-destination pairs served by the carrier, or the number of nodes connected in its network.

13 ee, e.g., Morrison and Winston (1987), Berechman and Shy (1998), Brueckner and Zhang (2001), and Brueckner (2004)

14 Borenstein (1989), Spiller (1989), Berry (1990), Bittlingmayer (1990), Brueckner and Spiller (1991), Brueckner et al. (1992), Zhang and Wei (1993), Oum et al. (1995), Zhang (1996), and Hendricks et al. (1997 and 1999)

passenger's schedule delay time – i.e. the time between his desired departure and the actual departure time (Douglas and Miller, 1974) – by offering increased flight frequency. The overall effect on travel time is thus the difference between the time penalties (extra ascent/descent, connection time, extra cruise time) and the reduction in schedule delay. In addition, a HS network allows an airline to serve many additional city-pairs when a new spoke route is added to the network (Oum and Tretheway, 1990).

The hub-and-spoke network is an efficient way to serve destinations over large spatial distance. Airbus (2007) pointed out that, one source of connecting traffic is passengers who could in fact fly directly if they wanted to. For example, in 2006, 20% of those flying between Europe and Asia selected a connecting route, even though they could have taken a direct service. There are several reasons for this. Many passengers prefer connecting services to direct service due to the wider variety of schedules offered at major hubs, either in terms of flight frequency or number of destination cities. Airlines often offer lower prices for connecting services, which is a by-product benefit from global airline alliances (e.g., Oum et al., 2000). Passengers may also choose to fly via a hub to take advantage of a stay-over at an intermediate stop.

Airlines may form hub-and-spoke networks as a strategic response to competitors rather than to simply save costs. Oum, Zhang and Zhang (1995) show that hubbing can be used as both an offensive and a defensive strategy in airline network rivalry. Hubbing improves an airline's profit when the rival chooses a FC network. Hubbing also defends an airline when the rival engages in hubbing. In effect, under certain conditions such as reasonably similar cost structures of competing airlines, hubbing is the dominant strategy. Nevertheless, in the duopoly setting, two airlines together are not necessarily better off if they both choose HS networks as opposed to FC networks, especially if hubbing requires an additional investment at the hub airport, or passengers in the connecting market place a large premium on direct flight. Furthermore, if the network decision is not taken by the two airlines simultaneously, then hubbing may confer another positive strategic effect – entry deterrence.

Another major benefit of HS networks is associated with a carrier's dominance at its hub airports, which allows it to achieve substantially higher mark-up above costs. Such a benefit to the dominant carrier is referred to as the "hub premium" in the literature. Borenstein (1989) found that dominance of major airports by one or two carriers would result in higher fares for consumers who want to fly to or from these airports. Such strongholds insulate the dominant carrier from



competition<sup>15</sup>. This phenomenon has been confirmed by many subsequent studies (Dresner and Windle, 1992; Morrison and Winston, 1995; Lee and Prado, 2005, GAO, 1989, 1990; Lijesen, Rietveld and Nijkamp, 2004, DOT, 2001). Such a benefit gives airlines a strong incentive to dominate an airport. Exhibit 3-1 shows that during the fifteen years after the U.S. Domestic Airline Deregulation in 1978, all major network carriers have strengthened their market shares at their respective hubs.

In conclusion, the prevalence of HS networks after airline deregulation can be explained by cost advantages in production (economies of density) and/or revenue advantages achieved via demand stimulation (network complementarity). Even when there is neither cost nor revenue advantage, the threat of potential entry alone can give rise to an HS network as opposed to an FC network. Zhang (1996) further argues that, for strategic reasons, competing airlines would choose to develop HS networks using different hub airports.

**Exhibit 3-1, Increased Share of the Dominant Carriers at Concentrated Hub Airports, 1978-1993 Period**

Airport	1978		1993	
	Share	Carrier	Share	Carrier
Atlanta	49.7	Delta	83.5	Delta
Charlotte	74.8	Eastern	94.6	USAir
Cincinnati	35.1	Delta	89.8	Delta
Dayton	35.3	TWA	40.5	USAir
Denver	32.0	United	51.8	United
Detroit	21.7	American	74.8	Northwest
Greensboro	64.5	Eastern	44.9	USAir
Memphis	42.2	Delta	76.3	Northwest
Minneapolis-St. Paul	31.7	Northwest	80.6	Northwest
Nashville	28.5	American	69.8	American
Pittsburgh	46.7	Allegheny	88.9	USAir
Raleigh-Durham	74.2	Eastern	80.4	American
St. Louis	39.4	TAW	60.4	TWA
Salt Lake City	39.6	Western	71.4	Delta
Syracuse	40.5	Allegheny	49.5	USAir

Source: Morrison and Winston (1995)

Upon the deregulation in 1978, major US carriers began to strategically plan their networks to strengthen their dominance in existing hubs and to expand continental market coverage. Such a process was accompanied with massive

15 Borenstein (1989) found, *ceteris paribus*, a dominant airline on a route with a 70% share of the traffic might be able to charge from 2% to 12% higher prices than its rivals which only have 10% shares. Hub premium is even more evident for flights connecting two hubs of the same carriers. An airline with 50% of the traffic at each endpoint of a route is estimated to charge high-end prices about 12% above those of a competitor with 10% of the traffic at each endpoint.

mergers, acquisitions and liquidations. For example, many airlines based in Central and Eastern United States acquired carriers based in Western United States.<sup>16</sup> This resulted in a massive consolidation of the industry which reduced the number of trunk airlines from over 25 before the 1978 deregulation to 6+ major national network carriers. As a result, all of the national network carriers have built up multiple hub networks in the United States. Appendix A describes how fully connected airline networks were developed in the regulated era, and how the legacy carriers changed their networks to multiple hub networks. It also provides a summary of the major mergers and acquisitions in the U.S. aviation industry within a decade after the domestic deregulation.

While network carriers often utilize multiple hubs, they can not afford to have more than one hub in a region. Airneth (2005) observed that the closest distance between two major hubs in a successful dual-hub system in the United States is 900km, the case of Northwest's Minneapolis-St. Paul and Detroit. British Airways attempted to share hub functions of London-Heathrow airport with Gatwick airport, mainly to relieve the congested Heathrow airport. However, they soon realized that it was unworkable, and thus, decided to de-hub Gatwick as soon as more airport slots became available at the new Terminal 5 (O'Connell, 2008). BA found that long-haul routes could be much more profitable by moving them to Heathrow, and duplicating short-haul feed network from Gatwick was costly. It is an example of the failure of duplicating hubs in the same city. When Air France and KLM applied for merger, the Dutch government was concerned since it might be of the merged airline's interest to reduce hub functions in Amsterdam (AMS). In the long run, AMS is too close to Paris to be successful as a dual hub. In addition, Paris-CDG has much larger population base to support a Super-hub of the combined carrier. Therefore, Dutch government imposed the condition that the combined AF-KLM should maintain minimal of 42 major international key destinations from Amsterdam at least for the next 5 years. Consequently, the combined AF-KLM was not able to restructure their network involving international destinations or connecting services in any major way until 2010.

In 2008, Delta Airlines acquired Northwest, with a plan to reduce or close the hub functions of Memphis (NW's hub) and Cincinnati (Delta hub), since they are too close to Atlanta and Detroit hubs of the combined carrier. Such a restructuring would result in a network of four hubs in North America: Atlanta, Detroit, Minneapolis-St. Paul, and Salt Lake City. U.S Airways has also reduced drastically the hub functions of Pittsburg in the last five years since it is close to its own hub in Washington Reagan International Airport.

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16 For example, Delta acquired Western Airlines in order to expand their market coverage in western United States and to secure Salt Lake City as its western hub while American Airlines strengthened its Dallas –Ft Worth hub and acquired Air California. US Air acquired Piedmont and Pacific Southwest. On the other hand, Northwest acquired Republic in order to increase dominance of its Minneapolis-St. Paul hub and surrounding markets. Appendix C summarizes the consolidation process of the US airline industry.

### 3.2. Preview on future airline network development and policy implication

If domestic and international markets are both fully deregulated, and thus, there is no constraint on route entry, pricing (subject only to anti-trust regulation), capacity and/or frequency of services, then network carriers would be able to expand their multi-hub networks to global markets. Intercontinental mergers and acquisitions are likely to occur since they are usually cheaper and less time-consuming than developing a carrier's own network in other continents (Oum, Taylor and Zhang, 1993). The current discussions between European Commission and the U.S. on deregulating foreign ownership of airlines would have similar effects as a complete deregulation. In fact, such an agreement aiming to dismantle the limitations on foreign ownership may eventually lead to a complete dismantling of the bilateral ASA system.

Such a sweeping change described above is difficult to accomplish in the foreseeable future. The liberalization of international air transport is likely to take place gradually. However, intra-continental deregulation is likely to occur sooner. In fact, the United States and European Union have completely deregulated their intra-continental aviation markets. The ASEAN countries and Northeast Asian countries are also advancing their intra-continental liberalizations quite actively. It is likely that some intra-continental open skies can be delivered within the next 5-10 years.

Under the gradual liberalization scenario, where domestic markets are mostly deregulated, while an increasing proportion of inter-continental markets are liberalized

with some intra-continental open skies blocs formed, there will be several driving forces for airlines to restructure their networks. First, full service airlines (FSAs) will consolidate via merger and acquisitions in domestic and intra-continental market, in order to strengthen their network and market positions in a continent. Second, across different continents the next wave is to strengthen network and market linkages via global strategic alliances (Oum, Park and Zhang, 2000), as evidenced by the formation and growth of major airlines alliances such as STAR, SkyTeam and OneWorld. Since the airlines within each Strategic Alliance Group will retain their own identity, they will structure their networks in such a way to maximize their own profits. As a result, these airlines' international and intercontinental networks will be influenced heavily by the structure of their domestic/continental networks.

Previous alliance studies suggest that international alliances improved partners' operations and service quality, lowered fares and grew the market.<sup>17</sup> However,

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17 For instance, the global alliances have facilitated competition among alliance networks, which significantly improved the efficiency of the international interlining market. Brueckner and Whelen (2000) found that fares are about 18-20 percent lower on international alliance and interlining routes.

the future of these global alliances is not crystal clear. Since the existing alliances grew under a web of restrictive bilateral ASAs which barred cabotage and foreign ownership, they represented a “second best” approach to the realization of inter-firm synergies on both the cost and demand sides. (In effect, such realization is constrained by the existing restrictive international regimes; as a consequence, the observed benefits from alliances are lower than their full potential.). Therefore, the future growth of global airline alliances would be limited, if not approaching to zero, under a fully liberalized (both domestically and internationally) air transport market.

When restrictions on route entry, capacity and frequency are dropped in domestic and intra-continental markets, network reconfigurations are likely to be different among United States, Europe and Asia.

**United States:** The US carriers had complete freedom to restructure their domestic networks since 1978. With domestic traffic accounting for about 90% of their total carriage, it is safe to assume that the US airline networks have evolved to equilibrium, except that there may be further adjustments when airline merger and acquisition controls are relaxed. This is evidenced by the high connecting ratios in network carriers’ hub airports. Exhibit 3-2 shows that in 2005, Atlanta, Charlotte, Dallas-Ft Worth, Houston, Memphis, Mineapolis-St. Paul and Chicago all had over 50% connecting ratios. They are not just big airports, but perform truly hub functions (i.e., connect passengers from one flight to another). Consolidation or deeper alliance relationships are likely to occur between US carriers and Canadian carriers. At the moment, Air Canada is a close alliance partner of United Airlines, while Southwest Airlines and WestJet announced their alliance to begin in 2009.

**Europe:** Transborder open skies in Europe began in 1993, and the complete single market (including cabotage rights for all EU carriers) began in 1997. As a result, European airlines had less time to adjust their networks compared to their peers in the U.S. Therefore, further changes in European airline networks are likely to occur in the next five to ten years. As shown in Exhibit 3-2, only Frankfurt airport has more than 50% connecting ratio in Europe. All other airports including London, Amsterdam and Paris have less than 50% connecting ratios.

**Asia:** Most of the Asian carriers serve their principal city markets, rather than using their super airports as hubs. This is evident in Exhibit 3-2: even the most active hub airport in East Asia, Hong Kong, has only slightly higher than 30% connecting ratio. Many Asian carriers are taking advantage of the restrictive international regulatory regime: with capacity restricted, airlines are able to charge higher prices to local traffic. Therefore, they have less incentive to use the scarce intra-Asia capacity to attract connecting passengers. Exhibit 3-2 shows that, in 2007, Narita and Incheon have only 17% and 12% connecting ratios respectively. As the international liberalization advances further and

perhaps more rapidly in the future, Asian network carriers are likely to restructure their network and traffic routing patterns in such a way to increase hub functions of their major airports.

**Exhibit 3-2. Percentage of Connecting Passengers at Major Airports, 2007**

Airport	% Connecting Passenger	Airport	% Connecting Passenger
North America		Europe	
ATL	64.0%	AMS	41.3%
CLT	30.0%*	ARN	22.0%
DEN	43.0%	ATH	21.0%*
DFW	60.0%	CDG	32.0%**
DTW	48.4%	CPH	27.8%
EWR	30.6%	FRA	53.0%
IAD	20.7%*	LHR	36.0%**
IAH	51.2%	PRG	20.3%*
JFK	30.8%	VIE	31.9%
LAS	12.9%**	ZRH	33.8%*
LAX	3.9%		
MDW	25.0%**	Asia	
MEM	63.3%	CAN	20.1%
MIA	39.0%	HKG	33.3%
MSP	47.3%	ICN	12.1%
ORD	68.0%**	NRT	17.2%
PHL	37.0%*	PEK	n.a.
PIT	14.0%	PVG	16.3%
SEA	28.0%	TPE	11.0%
SFO	24.9%		
SLC	50.4%		
STL	23.9%		

Source: ATRS Airport Benchmarking Report, 2005-2007

\* 2006 data \*\* 2005 data

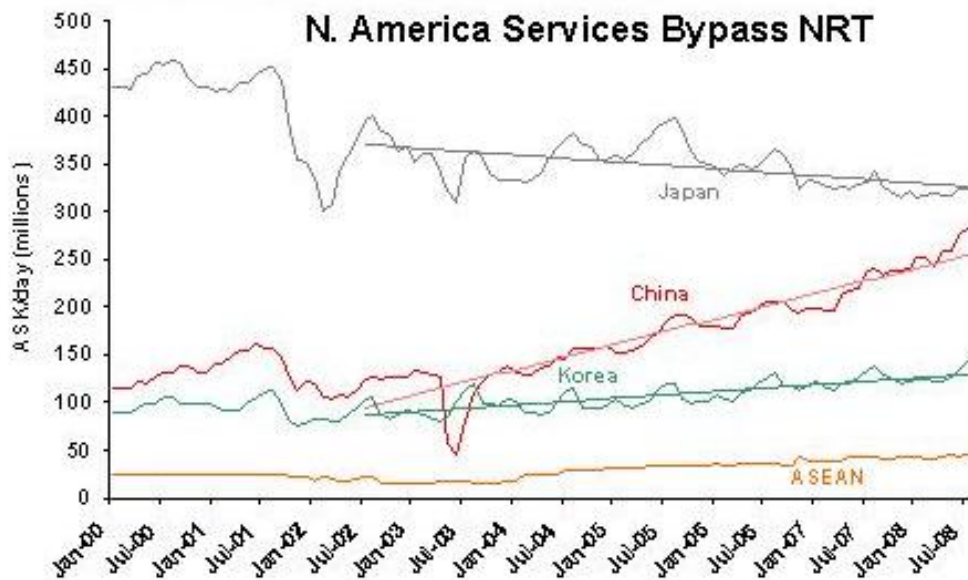
The varying stages of openness in global aviation market imply that airline networks, and accompanying traffic flows, will experience shift in spatial pattern and market power. For example, Hong Kong had been much more liberalized than the neighboring economies including mainland China, Taiwan, Thailand and Vietnam, etc. Together with its fast growing economy, Hong Kong had secured leaderships for its airport and marine port in the region. However, with the gradual liberalization of mainland China, Hong Kong airport's hub status is facing serious challenge from nearby airports such as Guangzhou and Shenzhen. Since South Korean air carriers lost most of their domestic markets to high speed rail (KTX), the country has no choice but to adopt Singapore style policy to promote open skies regimes internationally, especially with China,



Japan and Southeast Asian countries. It is noteworthy that South Korea has open skies ASA with the United States since 1998.

Due to historical reasons, Japan gave major bases of operations at Narita and other major Japanese airports to United, Northwest and Federal Express, and opened its markets to other US carriers substantially. However, Japanese government now realizes that the importance of economic integration with China and South Korea, and thus, the open skies regime in Northeast Asia is a more urgent task than signing open skies with the United States or Canada. Since both Tokyo-Narita and Tokyo-Haneda airports are expected to have substantially more slots in 2010, Japan expects to allocate a lion share of these increases to Asian carriers, especially carriers of Northeast Asian subcontinent. An issue that worries Japanese government a lot is that there has been an increasing trend that Northeast Asia - North America air traffic are bypassing Tokyo-Narita (NRT) as shown in Exhibit 3-3.

**Exhibit 3-3. North American – East Asian Traffic Diversion**



Source: Swan (2007)

China's current position is to have open skies with United States first, and then, to negotiate open skies with Japan and Korea although there is some sign recently that China's position is shifting towards closer ties with its Asian neighbors.

Even for countries with deregulated air transport markets, it is important to maintain their leadership in liberalization, thus that to keep their aviation sector competitive in the global market. Singapore, for example, has been working hard to maintain its leadership in the region in terms of air transport liberalization. As of 2006, Singapore has signed over 90 ASAs with other

countries, compared to the 57 ASAs signed by Hong Kong.<sup>18</sup> Singapore also reached open-skies agreements with the U.S., New Zealand and the United Arab Emirates. In June 2006, the country became the first Asian nation to sign an open-skies agreement with the EU, which allows Singapore Airlines to fly anywhere within the 27 EU-nation bloc. Such aggressive and determined liberalization policy had helped the nation to maintain the competitiveness of its airports and airlines.

#### **4. Airports competition, vertical relations with airlines and implications to liberalization**

While liberalizing the international market gives airlines the freedom to optimize their networks, such potential gains cannot be realized without the presence of an efficient and competitive airport industry. Availability of airport slots and other airside capacities affect directly the effectiveness of air transport liberalization on airline competition. The airline-airport vertical relationships also impact competition in airline markets. In particular, the recent changes in the airport industry may impose real challenges to the aviation industry as described in details below.

##### **4.1. Airport Capacity Constraint, Privatization and Regulation**

Airports provide essential inputs to airlines such as landing / take off slots, gate and terminal space, parking and refueling services etc. If airlines can not obtain sufficient supply of these inputs at reasonable costs, they won't be able to compete effectively.

Morrison and Winston (2000) and Dresner, Windle and Yao (2002), among others, found empirical evidence that a dominant airline's control over key airport facilities, such as slots and gates, is likely to impose significant entry barriers to other potential competitors. This problem is likely to be more serious in the near future. For most airports in metropolitan areas in Europe, U.S., and Asia, the current capacity and future expansion plan are generally not sufficient to meet the rising demand. Air passenger and freight transport demands increase at the average rates of 4-5% and 5-6% per year, respectively. This implies that air traffic will double in 15 years, and more than triple in 25 years. However, major airport expansion projects in metropolitan region are extremely expensive and difficult due to the large capital investment and increasingly stringent environmental review requirements. As a result, many airports are experiencing capacity shortage, leading to congestion and deterioration of service quality. Since a significant proportion of routes involve at least one hub airport, service deterioration at hub airports will have detrimental effects to the overall network. Most of the international air traffic is to/from/between these hub

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18 It should be noted that the number of ASAs signed is not the sole indicator of market openness, since some ASAs signed may not be active. In addition, compared to other Asian economies Hong Kong has much better access to mainland China, a large and fast growing market.

airports. Airbus (2007) report that 50% of the world's 100 fastest growing city pairs are between the 32 global hub cities, while almost all others involve a hub at one end or the other. This has important implications for air liberalization. First, the effectiveness of liberalization may be significantly reduced if airport capacities are not available. Second, even if competition is enhanced with the increased services and number of competitors, much of the welfare gains would be offset by the losses caused by congestion delays and other service quality deterioration.

While there are apparent needs to secure sufficient airport capacity, many governments are unable to or unwilling to bear such costs. In U.K, Australia, New Zealand, Canada and many other countries, airports are either privatized or corporatized, and thus, are required to be financially self-sufficient.<sup>19</sup> While privatization reduces the financial burden to governments, it does not solve the capacity issue entirely. When operated as private firms, airports' objective is to maximize their own profits rather than to enhance social welfare. In addition, many of these airports possess substantial market power. The limited competition in the market would be insufficient to discipline airports to do socially optimal pricing. Therefore, explicit price-cap or rate of return regulations are usually introduced in order to keep airport prices at reasonable level.<sup>20</sup> This does not come without a price: studies such as Oum, Zhang and Zhang (2004) confirmed that airports under rate-of-return regulation tend to over-capitalize their asset bases (Averch-Johnson effect), while airports under price-cap regulation, either single till or dual till, tend to under-invest in airport capacity. In addition, the direct costs of regulation are usually large and hidden, further reducing social welfare and industry's efficiency.

#### 4.2. Airport-Airline Vertical Relationship

Many airports in the U.S. and Europe have chosen to work with airlines for their financial needs. For example, certain carriers sign long term agreement with airports to become the so-called *signatory airline* of the airports. Those airlines become eventual guarantors of the airport's finance, bearing 'residual cost' of the airport after the revenues from non-signatory airlines and non-aviation sources have been deducted. In other cases, the main contribution from signatory airlines is service guarantee and usage commitment. This would reduce the uncertainty of future airport revenue, and thereby, allows the airport

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19 Example airports include the privatization of 7 airports in the UK, Rome's Leonardo Da Vinci Airport, Copenhagen Kastrup International Airport, Vienna International Airport, Brussels International Airport. All major Australian airports have been privatized while majority stakes of Wellington International Airports in New Zealand have been privatized. In Asia, fully and partly privatized airports include Mumbai and New Delhi airports in India, Beijing Capital International Airport and Shanghai Pudong Airport in China. Many airports in other Asian countries, South Africa, Argentina, and Mexico have also been and/or are in the process of being privatized partially or wholly.

20 New Zealand, Australia and some medium or small airports in UK are exceptions, where "light-handed" regulation or price monitor replaces formal regulation.



to reduce financing costs when issuing revenue bonds and/or securing long term bank loans. In return, signatory airlines are given varying degrees of influence over airport planning and operations including slot allocation, terminal usage, capacity expansion project, and exclusive or preferential facility usage.

Airlines may hold shares in airports or directly control airport facilities. For example, terminal 2 of Munich airport is jointly invested and owned by the airport operating company FMG (60%) and Lufthansa (40%), the dominant airline at the airport. Qantas owns terminals in both Sydney airport and Melbourne airport. In 1994, a consortium of four international airlines (Air France, Japan Airlines, Korean Air, and Lufthansa) invested in terminal 1 of JFK International Airport in New York. In other cases, airports issue Special Facility Revenue Bonds (SFRB) to finance specific capital improvement programs (e.g., fuel farms, maintenance facilities, terminals, etc.). Airports retain asset ownership but transfer the right for exclusive usage to the project sponsor under long-term lease agreements. Much of the risk associated with the project is transferred from airports to airlines. In turn, SFRB gives airlines preferential or exclusive rights over key airport facilities.

While airports benefits from such vertical cooperation, airlines also have strong incentive to obtain preferential terms from airports, which help them to achieve dominant status at a particular airport. Dominance at an airport further allows a carrier to achieve substantially higher mark-up above costs, a benefit referred as the “hub premium” in the literature. Such a phenomenon has been confirmed by numerous studies over the years<sup>21</sup>, indicating a carrier’s ability to “insulate” itself from competition with dominance status at an airport. Although virtually all previous studies have focused on the hub airports, there is evidence that low cost carriers (LCCs) also tend to establish their own fortress bases. For example, while Ryanair and Easyjet do locate some of their bases in the same metropolitan regions (e.g. London-Stansted), most of their operational bases in medium airports are not shared with other carriers.

In summary, both airports and airlines may have incentive to form vertical alliances. The airport secures its future revenue and financial needs, while the airline obtains essential facilities and favorable terms, helping it to achieve competitive advantage in related market. This is a “win-win” game for the airport and airlines involved, but could harm market competition. In 2004, for instance, the European Commission ruled against the agreement between Belgium’s Charleroi airport and Ryanair, claiming that the favorable terms offered by the airport constitute an illegal state aid. In the United States, the Charlotte/Douglas (CLT) airport authority believed that it had benefited from having a single dominant carrier (US Airways) – the carrier was regarded as a “partner” of the airport. The U.S. Federal Aviation Administration (FAA),

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21 Sample studies include Borenstein (1989), Dresner and Windle (1992); Morrison and Winston (1995), Lee and Prado (2005), GAO (1989, 1990); Lijesen et al. (2004), US Department of Transportation (DOT, 2001).

however, expressed concern that US Airways exercised too much control over airport facility and operations such as landing slot allocation and passenger terminal usage. The mayor of Charlotte appointed a task force to address the issues of airline competition. Additionally, the Aviation Department, pursuant to a directive from the City's Advisory Committee, hired a consultant to evaluate the competitive situation at Charlotte and to develop strategies for improvement (FAA 1999).

Virtually all the benefits associated with liberalization depend on increased competition across national borders. Since markets within Europe and North America are already fairly deregulated, much of the future growth will come from inter-continental markets, which usually involve major hub airports. Capacity constraints in those airports will surely limit the degree of competition in the long run. In addition, established network carriers in those airports have strong incentive to work with the airports in order to further strengthen their airport dominance. These hub airports, many of which have been privatized, are also likely to cooperate with their respective dominant carriers to secure future revenue and financial support. As a result, liberalization won't be effective unless policy makers make sure that the airport industry becomes sufficiently competitive and efficient. While such an objective requires comprehensive measures and coordinated efforts, past experiences suggested the following measures worth considering:

- *To promote the construction and conversion of non-exclusive airport facilities:* This would provide potential entrants the essential airports facilities, making it possible for them to compete with incumbents carriers. For example, FAA is against airports' practice of giving exclusive or preferential facility usage to particular airlines, and suggests airports to recover those exclusive facilities for public usage. Airports are allowed to levy Passenger Facility Charge (PFC) to finance non-exclusive facilities. In order to fully receive such revenue, large airports with a "dominant" carrier must submit to the U.S. Department of Transportation (DOT) a plan on how they intend to promote airport access, entry, and competition (FAA 1999).<sup>22</sup>
- *To promote competition among closely located airports:* closely located airports can be potential competitors to each other since their services are substitutable to each others. However, if they were under the common ownership / management, there would be insufficient competition. Such a conclusion has been suggested by the UK Competition Commission on BAA's control of major airports in UK. The common ownership and management of the three major airports in New York & New Jersey metropolitan area (John F. Kennedy (JFK), Newark (EWR) and LaGuardia

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22 The requirement of submitting competition plan was incorporated into the "Wendell H. Ford Aviation Investment and Reform Act for the 21st Century" legislated in 2000. According to this Act, large and medium airports that exceed a certain threshold of concentration are required to submit competition plans.

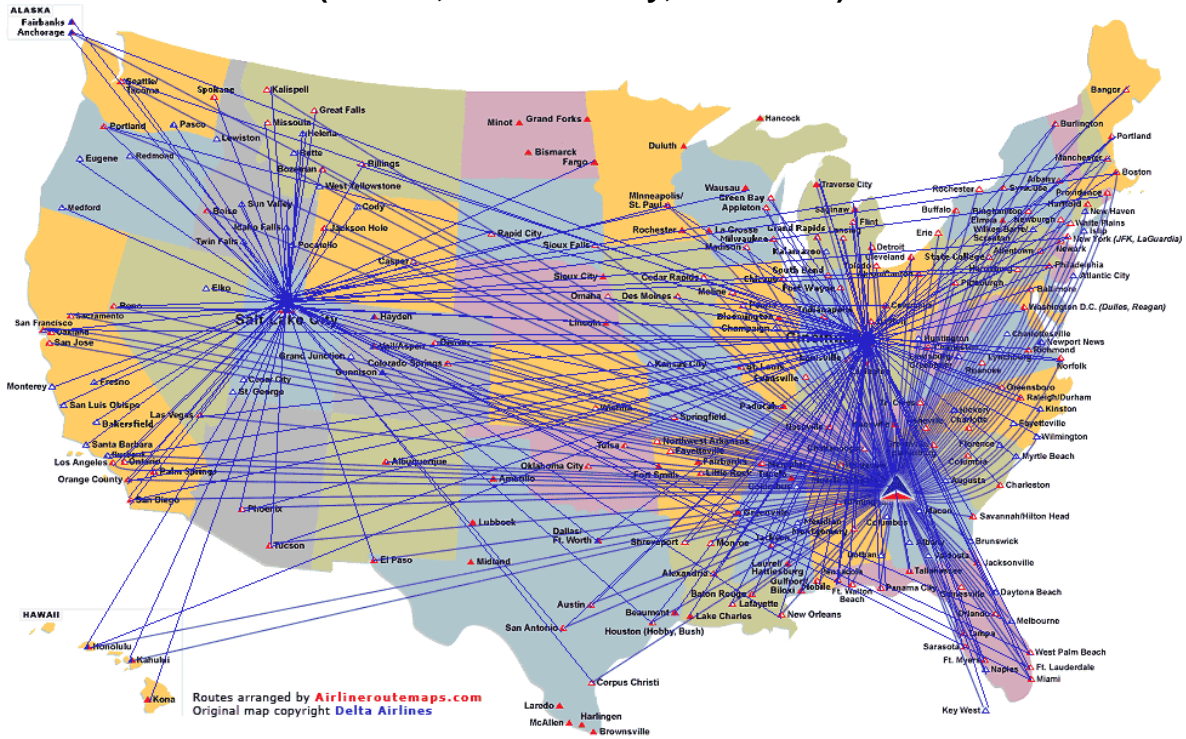
(LGA)) has caused similar problems for the US Department of Transportation (Oum, Yan and Yu, 2008). UK Competition Commission thus decided to order BAA plc. to divest Gatwick and Stansted, and either Edinburgh or Glasgow. In the U.S., city of Chicago leased the Midway Airport (MDW) for 99 years, which is certain to introduce competition with Chicago O'Hare airport (ORD), although the main motivation for this privatization came from the city's financial reasons.

- *To monitor exclusive contract between airlines and airports:* As explained, vertical cooperation between airlines and airports can be beneficial to the airports and airlines. Nevertheless, they may harm competition by strengthening dominant carrier's market power. Therefore, there may be a need for regulators to monitor exclusive contract / agreements between airlines and airports. EU has investigated several airports' exclusive treatments of particular carriers<sup>23</sup>. However, no perfect regulation has been proposed thus that the both airline competition and benefits of airline-airport cooperation can be retained. At current stage, probably the best choice for regulators is to intervene only when there is clear evidence of negative effects. A simple and effective way to deter bad behaviors is to require disclosure of exclusive contracts between airports and airlines. Transparency and public scrutiny are cost-effective alternatives to "immature" regulation.
- *To encourage competition between airline networks using different airports in the same region:* Although it is best to get multiple airports to compete in same airport in order to provide competition for the local traffic, as indicated earlier in this paper the airlines have every incentive to dominate its hub airports. When this happens, it is important to encourage competition from another airline using adjacent airports in the region. For example, until recently Northwest at Memphis hub provides some serious competition to Delta at Atlanta hub, while Delta at Cincinnati hub provided competition for Northwest's Detroit hub (See Exhibit 4 -1 and Exhibit 4 -2 for locations of these hub airports of the two carriers). Since Delta and Northwest are allowed to merge, the merged Delta (+Northwest) plans to dehub or reduce hubbing intensity at Memphis and Cincinnati, these airports should be encouraged to attract other carriers to hub at their airports.

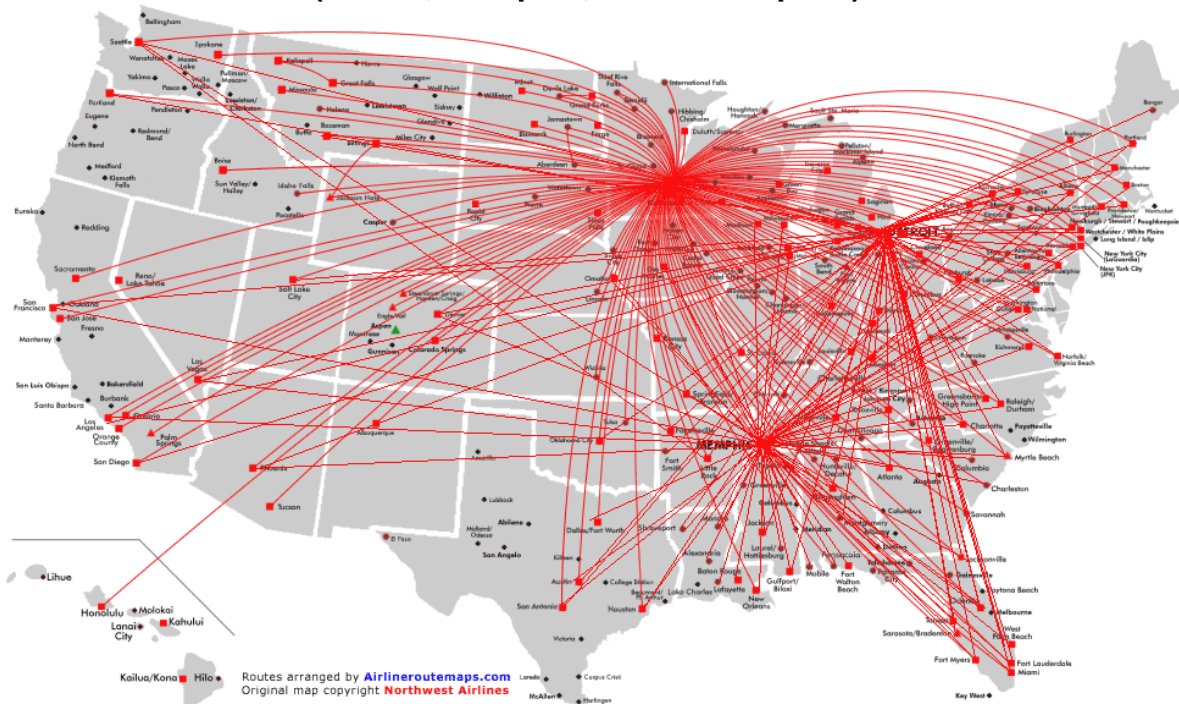
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23 For example, the European Commission have opened investigations to the possible state subsidy offered to EasyJet and Ryanair by airports such as Belgium's Charleroi airport, Berlin Schoenefeld and Luebeck Blankensee airports in Germany and Tampere Pirkkala Airport in Finland.

**Exhibit 4-1, Delta Airlines Hub Network  
(Atlanta, Salt Lake City, Cincinnati)**



**Exhibit 4-2, Northwest Airlines Hub Network  
(Detroit, Memphis, and Minneapolis)**





In order to fully realize the benefits brought by liberalization, policy makers need to make sure that there is sufficient infrastructure to accommodate increased traffic and new entrants in the aviation markets. Where airport capacity is a constraint, the provision of landing slots for foreign entrants may be negotiated in details. The increasingly important roles of airports should be recognized in liberalization initiatives. With more and more airports privatized, policy makers face increasing challenges to keep the airport industry competitive and efficient.

## 5. The impacts of Low Cost Carriers

A strong trend that emerged with deregulation and liberalization in the United States, Canada and Europe was the disappearance of weaker airlines through bankruptcies or mergers but at the same time the birth of upstart competitors. Well-established brands like PanAm, Eastern Airlines, TWA and Canadian Airlines International disappeared, while Southwest and several new brands (e.g., JetBlue, Westjet, Ryanair, EasyJet) emerged. These firms provide low-fare, no-frills air travel service, which was pioneered by Southwest Airlines in the early 1970s. Key features of the “original” Southwest model include a distinct low-cost service strategy; various “frills,” such as free meals and in-flight entertainment that were offered by full-service airlines (FSAs), were eliminated. Other main features include: single, unrestricted and point-to-point fare; direct, ticket-less sales (supplemented by travel agents); no seat assignment; high flight frequency; single aircraft type and high plane utilization; city pairs with distance less than 800 kilometers (500 miles); use of secondary or uncongested airports with 15-20 minute turnarounds; and competitive staff wages with profit-sharing arrangement.<sup>24</sup>

As pointed out by Transportation Research Board (1999), “Probably the most significant development in the U.S. airline industry during the past decade has been the continued expansion of Southwest Airlines and the resurgence of low-fare entry generally.”<sup>25</sup> In this section we discuss the impact of low-cost carriers (LCCs) on fares, air traffic, FSAs, aviation policy, airports and airline networks.

### 5.1. Impact on fares and traffic

The “Southwest effect” – i.e., a rapid increase in traffic volume and a simultaneous fall in fares on routes where, or close to where, Southwest Airlines operates – has become widely known (US DOT, 1993; Richards, 1996). The price effects of LCCs were empirically estimated by, among others, US DOT (1993), Windle and Dresner (1995), Dresner *et al.* (1996), and

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24 See, eg., Doganis (2001). It is noted by, e.g., Alamdari and Fagan (2005), that Southwest may not fully follow its own model at present.

25 This statement was also quoted at the beginning of Morrison (2001).

Morrison (2001).<sup>26</sup> US DOT found that routes served by Southwest have average fares 49-56 percent lower than similar length routes without Southwest service. Windle and Dresner computed changes in average fares for the four quarters before and after entry, and found that entry by Southwest reduces the average route fares by 48 percent and the fare remains close to that level over the ensuing four quarters. Furthermore, they found that the presence of Southwest and other LCCs on a route have a larger impact on lowering the route fares than the presence of FSAs. Route fares fell by 5 percent one year following entry of an FSA, whilst they fell by about 48 percent for Southwest's entry and 20% for entry of other LCCs.

In addition to the effect of actual route competition, Dresner *et al.* (1996) examined the possible spillover effect of Southwest's service on adjacent competitive routes that involve nearby airports. They found that fares are 41 percent lower when Southwest serves a route, and 8 to 36 percent lower when Southwest serves an adjacent route. Using data on route yields, they further found that entry by Southwest onto a route reduces average route yields by 53 percent and that overall, entry by an LCC reduces average route yields by 38 percent.

In an important follow-up study, Morrison (2001) further specified the (potential) impact of Southwest on a route's fares into the effects of actual, adjacent, and potential competition. The effect of actual competition arises when Southwest serves the route in question, whereas the effect of adjacent competition arises when Southwest serves an adjacent route which is viewed as a reasonable substitute for the route in question. The effect of potential competition arises when Southwest has a presence at one or both airports of the route or at nearby airports, but do not serve the route itself or an adjacent route. Using 1998 data Morrison estimated that when Southwest serves a route, fares are 46 percent lower than on otherwise comparable routes that it does not serve. If it serves an adjacent route, fares are from 15 to 26 percent below otherwise comparable routes. Potential competition from Southwest is most effective when it serves both ends of a route, lowering fares by 33 percent, least effective when it only serves one airport that is near one of the end airports, in which case fares are reduced by 6 percent.<sup>27</sup> Moreover, Morrison estimated that the savings due to competition from Southwest were \$12.9 billion, with Southwest's low fares being directly responsible for \$3.4 billion of these savings to passengers. The remaining \$9.5 billion represents the effect that the actual, adjacent and potential competition from Southwest had on other carriers' fares. The overall savings amount to more than half the fare reductions attributed to the US airline deregulation.

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26 See Tretheway and Kincaid (2005) for a literature review on the effect of LCCs on air fares in the US.

27 Vowles (2001) also shows, in the context of a multi-airport region, that entry of Southwest would increase competition between the airport it has entered and the nearby airports.



Thus, the studies show that the presence of an LCC has a dramatic and permanent negative impact on fares on the route, ranging from 20 percent to over 50 percent, depending on the studies and the LCCs under consideration, with Southwest's effect being in the up-end of the range. In addition, the fare effect is also present on routes close to where an LCC operates, ranging from 6 to 36 percent depending the nature of closeness of the LCC influence. The studies reviewed by Morrison (2001) are as the follows:

### Exhibit 5-1, Comparison of the Southwest Effects

<i>Study</i>	<i>Year of Data</i>	<i>Amount that Southwest Lowers Fares as a Percentage of Industry Domestic Passenger Revenue</i>	<i>Southwest's Share of Domestic Scheduled Revenue Passenger Miles</i>
Morrison and Winston (1995)	1988–92	8.5% on routes served	2.9% (1990)
Bennett and Craun (1993)	1992	5.6%–6.7% on routes served	4.0% (1992)
U.S. DOT (1996)	1995	8.4%–10.1% on routes served	5.9% (1995)
Morrison (2000)	1998	10.2% on routes served 4.7% on adjacent routes 5.2% from potential competition	6.9% (1998)

Source: Morrison (2001)

Franke (2004) suggested that Europe has a similar “Ryanair effect,” whereas Zhang, et al. (2009) suggested that the “Southwest effect” might also exist in Asia. These analyses are suggestive however, owing to the lack of data for rigorous empirical analysis. As pointed out by Tretheway and Kincaid (2005), outside of the U.S., publicly available data on individual ticket purchases (such as the U.S. DOT’s DB1A dataset) is hard to obtain. This lack of empirical LCC studies in other countries shows the urgent need for further research on the one hand, and the importance of knowledge gained from the U.S. studies on the other hand.

On the traffic side, LCCs have not only displaced significant market share from FSAs, but also stimulated demand from new market segments. Windle and Dresner (1995) for example showed that traffic levels on the routes where Southwest had entered increased by 200 percent, on average, one year following the entry, whereas traffic levels on the routes where other LCCs had entered increased by 50 percent. As a consequence, Southwest has been by far the largest domestic carrier in the U.S. since 2004. In 2006, for example, it had 96.3 million emplanements,<sup>28</sup> followed by American Airlines, at 76.3 million, and Delta Air Lines, at 63.4 million (de Neufville, 2008). See Exhibit 5-2 and Exhibit 5-3 for comparative passenger statistics of major North American carriers and major world LCCs. In Canada, the low-cost carrier WestJet began

28 Southwest’s traffic in 2007 exceeded 100 million passengers for the first time for any carrier in the world. Please Exhibit 5-2 for comparative passenger volumes.

flying in 1996. In the early 2000s, it grew at 50% per year while one of the two legacy FSAs went bankrupt (Canadian Airlines International), merged with the other FSA, Air Canada, which also filed protection from creditors and emerged later (Tretheway, 2004). The low-cost model has also been repeated in Europe since the 1990s when the European Union liberalized and integrated its internal market. Ryanair has overtaken Lufthansa to become the largest intra-European carrier in terms of number of passengers carried.

**Exhibit 5-2. Status of Low Cost Carriers 2006**

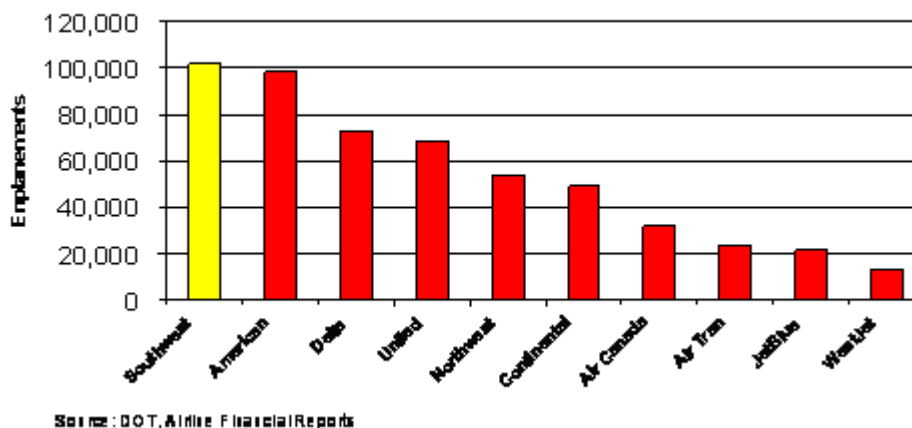
**The World's Leading Low-Cost Carriers**

In Operating Revenue			In Operating Profit			In Net Profit		
Rank	Airline	(\$, 000)	Rank	Airline	(\$, 000)	Rank	Airline	(\$, 000)
1	US Airways Group	\$11,557,000	1	Southwest	\$934,300	1	ATA Airlines *	\$1,321,747
2	Southwest	9,086,300	2	Ryanair <sup>1</sup>	628,155	2	Ryanair <sup>1</sup>	580,820
3	EasyJet <sup>1</sup>	3,073,400	3	US Airways Group	558,000	3	Southwest	499,100
4	Ryanair <sup>1</sup>	2,986,771	4	Gol	328,014	4	US Airways Group	304,000
5	JetBlue	2,363,000	5	EasyJet <sup>1</sup>	223,500	5	Gol	266,138
6	Air Berlin <sup>1</sup>	2,065,800	6	WestJet	170,500	6	EasyJet <sup>1</sup>	178,600
7	AirTran	1,893,400	7	JetBlue	127,000	7	WestJet	98,000
8	Gol	1,777,890	8	Virgin Blue <sup>1</sup>	92,100	8	Air Berlin <sup>1</sup>	65,900
9	WestJet	1,516,000	9	Air Berlin <sup>1</sup>	84,300	9	Virgin Blue <sup>1</sup>	63,300
10	Aer Lingus	1,430,500	10	AirTran	42,100	10	AirAsia <sup>1</sup>	34,700

In RPKs		In Passengers		In Load Factor		In Operating Fleet					
Rank	Airline	(mil.)	Rank	Airline	(000)	Rank	Airline	%	Rank	Airline	No. of Aircraft
1	Southwest	109,113	1	Southwest	96,349	1	Ryanair	83.0	1	Southwest	491
2	US Airways	59,763	2	Ryanair	40,532	2	SpiceJet	82.9	2	US Airways	224
3	JetBlue	37,539	3	US Airways	36,083	3	JetBlue	81.6	3	Ryanair	135
4	easyJet	27,608	4	easyJet	33,676	4	easyJet	81.5	4	AirTran	132
5	AirTran	22,273	5	AirTran	20,051	5	AirAsia	81.0	5	JetBlue	123
6	Air Berlin	21,703	6	JetBlue	18,565	6	Wizz Air	80.0	6	easyJet	120
7	Virgin Blue	16,932	7	Gol	17,447	7	Air Arabia	79.6	7	TAM	100
8	WestJet	15,763	8	Air Berlin	15,228	8	Air Berlin	79.5	8	Gol	69
9	Gol	14,819	9	Virgin Blue	14,643	9	Virgin Blue	79.1	9	Air Berlin	68
10	Frontier	13,401	10	WestJet	10,169	10	Norwegian	79.0	10	WestJet	65

**Exhibit 5-3. Passenger Enplanement 2007**



In Asia, LCCs are a much more recent phenomenon. For example, in 1998 the two low-cost carriers, Skymark Airlines and Air Do, entered, respectively, the Tokyo-Fukuoka route and the Tokyo-Sapporo route. Although limited in their scope, these were the first independent entries in Japan since the 1960s. Skymark offered normal fare at half the price, and Air Do at 36%, below incumbent FSAs' fares. The competitive forces resulted in an annual increase of 16.3% in air passengers on the Tokyo-Fukuoka route and 9.4% on the Tokyo-Sapporo route (Yamaguchi, 2005).

AirAsia, based in Malaysia, is the most active LCC in Asia. Its passenger count reached 14 million in 2007 as compared to 1.4 million in 2003 (Annual Reports of Air Asia, 2003, 2007). In Thailand, during the year 2004 when the LCCs began operation in the domestic market, overall traffic rose 39.3% over 2003. This dramatic growth was due partly to the discount fare promotion by Thai Airways – in response to the low fares charged by the LCCs – and partly to the fact that the LCCs grew the market themselves – they accounted for 19.1% of the overall traffic in 2004. The LCCs' market share rose to 42.1% in 2007 (Zhang, et al., 2009).

Overall, in terms of number of passengers carried the LCC shares reached 26% in North America, 30% in Western Europe, 20% in South America and 12% in Asia.

## **5.2. Impact on full-service airlines**

Southwest Airlines and a number of other LCCs have been very profitable. To illustrate, on 30 September 2008, the market capitalization of Southwest is US\$10.7 billion, which is greater than US\$10.6 billion – the sum of market capitalizations of the six largest FSAs in the U.S. (namely, American, Delta, Northwest, Continental, United, US Airways); whereas Westjet's market capitalization (US\$1.3 billion) is easily greater than Air Canada's (US\$0.8 billion) (Zhang, et al., 2009). LCCs have imposed significant competitive pressures on large FSAs, especially on the lower-end of the fare spectrum.

Ito and Lee (2003) examined incumbents' responses to LCC entry into routes to/from their hubs. Using the 1991-2002 data, they observed that, on average, the LCC entered a route with a fare 50 percent less than the incumbent's pre-entry fare and provided about one third the capacity of the incumbent. In general, the incumbent's response to LCC entry was modest: capacity was increased by 3-4 percent on average and fares declined by 15 percent. In particular, they found no strong evidence that the incumbent's capacity expansion or pricing decisions increased the probability that the LCC would exit the market.

In addition to lowering fares, FSAs have resorted to the launch of their own low-cost offshoots in response to low-cost competition. The earlier offshoots,

occurred mainly in North America (the US and Canada) and Europe, did not fare particularly well in their competition with the independent LCCs, and so the strategy has largely been abandoned. Recent offshoot attempts occurred mainly in Asia, including: Tiger Airways, the offshoot of Singapore Airlines, which started its operation in September 2004; Nok Air, a joint-venture LCC set in July 2004 by Thai International Airways, an FSA, to compete with the other two Thai LCCs, namely, Thai AirAsia and One-Two-Go; Jetstar Asia, established in December 2004 by Qantas Airways; and Jin Air, a subsidiary of Korean Air which just started its operation in July 2008. Their effectiveness remains to be seen. The two most successful LCCs in Asia, in terms of profitability, so far have been AirAsia and Spring Airlines (based in China), both being independent LCCs, rather than the FSAs' offshoots.<sup>29</sup>

Furthermore, using a very different business model, LCCs are driving conversion of some FSAs to LCCs, or modifying the FSA business model to be more LCC-like. AirAsia, the leading LCC in Asia, is an example of such conversion. The former loss-making FSA was taken over by new owners in late 2001 and was then re-launched as a LCC. Since its re-launch AirAsia has expanded rapidly and helped grow the domestic market. Similarly in North America, the bankrupt US Airways was taken over by American West, an LCC based in Phoenix and Las Vegas, and the combined company was named as US Airways. The new US Airways operates as a giant LCC.

### **5.3. Impact on aviation policy: deregulation and liberalization**

LCCs such as Southwest Airlines and Ryanair grew under a deregulatory domestic environment – after the EU integration in the mid-1990s, the EU internal market has become a “domestic” market. In Asia, entry of LCCs was facilitated by domestic deregulations as well. While deregulation and liberalization have facilitated the growth of LCCs, the LCC experience has also promoted policy reform and liberalization. Until 1978, the US airline industry was regulated by the Civil Aeronautics Board. It was mainly through the experience of unregulated Southwest Airlines – which offered lower fares for intra-state (Texas) services than comparable regulated services between states – that the deregulation of market entry commenced in 1978 with the passage of the “Airline Deregulation Act” (Levine, 1987; Morrison, 2001). This has in turn stimulated Southwest’s domestic expansion as the state borders did not matter any more.

Another case in which LCC experience stimulates policy liberalization is the ASEAN (the Association of Southeast Asian Nations) region where significant progress has been made lately. In July 2007, ASEAN countries reached an agreement under which unlimited flights between capital cities in ASEAN will start at the end of 2008. Furthermore, it is expected that ASEAN nations will

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29 Tiger Airways came out of the red only recently, recording a modest profit for the year ended March 2008.

sign an “open skies” agreement as early as December 2008 (Asia Times, 2008). These positive policy developments are due mainly to the positive effects of liberalization, both domestically and regionally, and of emerging LCCs. Consider the case of Malaysia. After maintaining strict a closed-skies aviation policy for many decades, more recently Malaysia has seen a boom in air traffic growth due to greater domestic competition led by AirAsia. This, together with the success of other regional LCCs, has prompted the Malaysian and other ASEAN governments to push for a more liberalized regulatory regime (Asia Times, 2008). Another major motivation for liberalization in these Southeast Asian countries is to boost tourism and business travel after the devastating Asian financial crisis of the late 1990s.<sup>30</sup> As a case of regional liberalization, consider the lucrative Singapore-Kuala Lumpur route. This route had for years been restricted by Malaysia to protect Malaysian Airlines, and was dominated by Malaysian Airlines and Singapore Airlines as a duopoly. In late 2007, the Malaysian government decided to allow AirAsia to operate on the route, paving the way for Tiger Airways (from the Singaporean side) to enter the route as well. The liberalization policy started with allowing two flights daily from each LCC, and then was extended to six daily flights in September 2008. As illustrated in Zhang, et al. (2009), the entry by AirAsia and Tiger Airways forced the two incumbent FSAs to significantly lower their fares, to the clear benefit of passengers.

Another important channel via which LCCs promote further policy liberalization is through the enhancement of the competitiveness of national carriers. Clougherty and Zhang (2008) identify three paths via which domestic rivalry (domestic competition) might influence international performance on the part of airlines. First, when there is an equivalence between the number of domestic and international competitors (that is, every domestic airline also serves international markets) then increasing the number of domestic competitors also increases the number of international competitors representing the nation. Accordingly, a strategic effect results as having multiple national competitors in world markets will enhance exports. Second, a “joint-economies of production” effect derives from the impact of domestic rivalry and entry on the size of an incumbent firm’s domestic operation, since size of domestic operation affects international performance in the airline industry (Clougherty, 2002, 2006). Third, domestic rivalry may also pressure firms to improve product quality and/or productivity, thus enhancing the competitiveness of home-nation airlines in international markets.

It is the “enhanced-performance of competitors” effect – what might be referred to as a pure rivalry effect – that Clougherty and Zhang (2008) pay particular attention to in their theoretical setup where they are able to model in a simple fashion the dynamic that domestic rivalry requires firms to innovate and

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30 It is also interesting to note that statistics from the Tourism Office of Macau Government shows that after Viva Macau, a LCC, flew to Indonesia, Australia and Japan, visitor arrivals by air from these three countries have grown by 71%, 290%, and 300%, respectively.



improve. Moreover, Clougherty and Zhang empirically test for the impact of domestic rivalry on airline performance while abstracting away from the number-of-competitors effect and holding constant any joint-economies of production effect. They find enhanced domestic competition to increase the market shares of airlines in international markets. In short, an additional rationale behind domestic deregulation and competition could well be the promotion of domestic carriers' competitiveness in international markets. Accordingly, the dramatic growth in domestic competition due to LCCs may significantly impact international competitive outcomes.

#### **5.4. Impact on airports and airline networks**

An important source of cost savings for LCCs in North America and Europe is from the use of uncongested secondary airports, leading to lower airport charges and shorter aircraft turnaround time. For instance, Francis, *et al.* (2003, 2004) analyzed the airport-airline relationship from the cases of European LCCs and airports, where most secondary airports exempt or reduce landing and other charges. These airports may nonetheless still benefit from having the presence of LCCs, owing to various non-aeronautical revenues and other aviation-related economic activities. As availability of secondary airports seems to be a key requirement for the implementation of the LCC business model, it is expected that the growth of LCCs will further promote the use and expansion of secondary airports when they are available.

Airports that are used by LCCs as their base airports can be categorized into three types: primary airports; secondary airports; and low-cost terminals inside the primary airports. As compared to North America and Europe, Asia has much less secondary airports in metro areas available for LCCs. If they do exist, they are themselves either primary airports used before the opening of new airports (e.g., Gimpo Airport in Seoul, Hongqiao Airport in Shanghai, and Don Muang Airport in Bangkok), or newly built airports (e.g., Kobe airport in the Kobe-Osaka area), or airports that belong to different jurisdictions. Examples for the latter include Macau airport or Shenzhen airport (in Mainland China) which may serve as a secondary airport for Hong Kong, and Johor Bahru Senai airport – located on the Malaysian side of the Malaysia/Singapore border – that may serve as a secondary airport for Singapore. As a result of these situations, these secondary airports can be expensive, or unprepared/ill-equipped for the LCC type of operation, or inconvenient owing to cumbersome border crossing and customs procedures. Due largely to this reason, Asian LCCs have so far relied mainly on primary airports for their base operation. For instance, Murakami (2008) pointed out that none of the low-fare carriers in Japan use secondary airports as their base airports.

In that case, some primary airports have made some operational adjustments so as to facilitate LCCs' operation. More dramatically, the primary airports may invest in so-called "low cost terminals," which are specifically designed to suit



for the LCC business model. For example, there may be no travelators, escalators and aerobridges in a low-cost terminal; this, together with other features, are to ensure a short turnaround time for aircraft. Several airport charges (landing, handling, etc.) are discounted for LCCs, and passenger facility service charge is usually half of the airport's main terminals (CAPA, 2008). The low-cost terminals include the low-cost carriers terminal (LCCT) at Kuala Lumpur International Airport and the budget terminal (BT) at Singapore Changi International Airport. LCCT is used by AirAsia, Cebu Pacific (an LCC based in the Philippines) and Tiger Airways, whereas BT is used by Tiger Airways and Cebu Pacific. JetBlue's new terminal at New York's JFK airport is also a low-cost terminal. Although affirmative assessment on low-cost terminals' impact and viability is difficult as almost all the low-cost terminals are newly built, preliminary evidence indicates that with lower airport charge and higher aircraft utilization, LCCT has contributed to AirAsia's cost reduction and output expansion (Zhang, et al., 2009). We believe that low-cost terminals will be further developed, along with the overall growth of LCCs, especially when secondary airports are unavailable in major metro areas.

A related issue is the LCCs' impact on airline networks. Unlike FSAs, LCCs in North America and Europe de-emphasize hub-and-spoke (HS) networks; instead, they tend to provide point-to-point services using secondary airports in a metro area (Tretheway, 2004; O'Connell and Williams, 2005). The Southwest's route network in Exhibit 5-4 clearly demonstrates the difference between an LCC network and a HS network. This tendency seems counterintuitive inasmuch as LCCs cater generally to passengers with lower values of time who put less emphasis on quick, direct flights. As indicated in Zhang, *et al.* (2008), there are several reasons why these LCCs prefer point-to-point networks over HS networks:

- In order to save airport charges, avoid congestion and avoid head-to-head competition with FSAs, the LCCs prefer the use of secondary airports, which are cheaper than central airports but less conducive to hub operations.
- The point-to-point operation facilitates fast turnaround time at airports and thereby improves aircraft utilization, a main feature of LCC business model as discussed earlier.
- LCCs have generally been the entrants over the past several years; as a consequence, suitable hub airports are in short supply. Further, the fixed costs of entering with a point-to-point network are much lower than a hub-and-spoke network.

- The lower frequencies of service involved with point-to-point networks, as compared to hub-and-spoke networks, match with the lower values of schedule delay LCC customers typically exhibit (direct flights do involve less time in travel, but LCC direct flights are often at a day's inconvenient times and come at lower frequencies during the day).<sup>31</sup>

As a consequence of this tendency, further growth of LCCs will open up potentially numerous secondary city-pair markets and promote use of secondary (regional, provincial) airports.

**Exhibit 5-4. Point-to-Point Network: Southwest Airlines 2003**



## 5.5. Final comment

If the experience in North America, Europe and elsewhere is any indication, LCCs are here to stay and provide a welcome, competitive stimulus in domestic and regional markets. These carriers provide a major challenge to the traditional full service operators – some of whom are government owned – while also helping more and more people with access to air transportation. The striking finding by Morrison (2001) – that the savings due to competition from a single LCC, in the name of Southwest Airlines, amount to more than half the fare reductions attributed to the U.S. airline deregulation – suggests that policies that encourage LCC entry and growth may have a significant impact on passenger welfare and national and regional economic development. Consequently, one of the most important aspects of today's – likely, future's as

31 That said, it should be pointed out that some LCCs have begun to experiment with hub-and-spoke networks (Southwest hubs 20% of its passengers now); hence, we may begin to see networks being increasingly employed by LCCs in the future.

well – airline industry is that of competition between FSAs and LCCs, and to a lesser extent (but gaining in importance), that of competition among LCCs.

The large economic benefits of LCCs are so visible that their further developments tend to speed up the deregulation / liberalization process of domestic and international airline markets. It would be, for instance, interesting to see what impacts Spring Airlines and other emerging LCCs will have in the Chinese airline market.

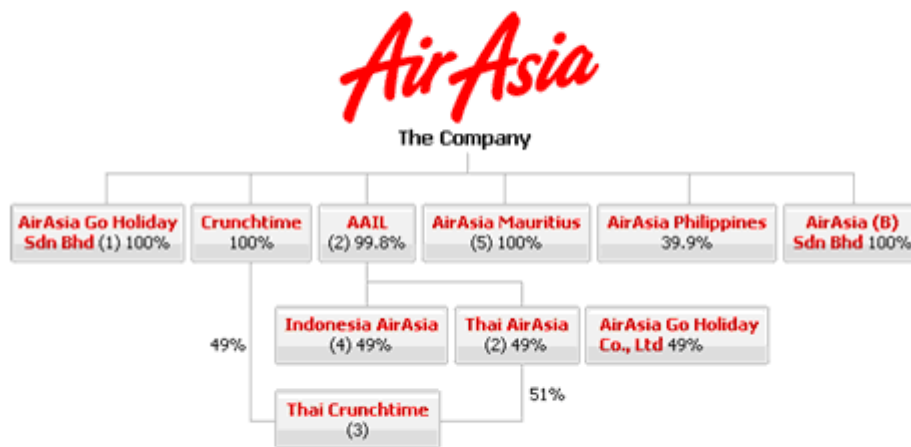
Of the three continents with a large amount of aviation activities (North America, Europe, and Asia), Asia appears to hold the most promise in realizing further benefits from LCC developments. There are several reasons for this. First, as discussed in Section 2, much of the future air traffic increase will be derived from emerging Asian markets, in parallel with the continued macro-economic expansion and trade liberalization in the region. Second, as part of this overall economic growth, a growing segment of middle-income population will start to switch from bus, rail and ferry to air transport for their domestic and intra-Asia international trips. These are the potential customers whom LCCs would likely target with their business model.

Third, Asia would have the largest room for LCC growth of LCCs if the regional market were liberalized. As discussed in Zhang, et al. (2009), there are still a large number of visible and invisible barriers acting against growth of LCC activities in Asia. The organizational structure of AirAsia, arguably the most successful LCC in Asia, shown in Exhibit 5-5 serves as a telling evidence of how restrictive for an Asian LCC to grow its services when the activities cross national boundaries. In particular, given the restricted aviation regime in the region, AirAsia could extend its network and enter a new regional market only through joint venture (JV) arrangements or alliances: Thai AirAsia in Thailand and Indonesia AirAsia in Indonesia are two JV examples in which AirAsia holds a 49 percent share, so as to abide the national ownership restrictions of Thailand and Indonesia respectively. More recently, Tiger Airways (of Singapore) tried to establish JVs, namely, Tiger Airways Australia and Incheon Tiger Airways, in an attempt to expand its services to Australia and South Korea, respectively. While the Australian JV is in operation, the Korean project was in late December 2008 called off after more than one-year planning, citing by the “regulatory uncertainty” in Korea and a weak global economy (The Straits Times, 2008). The project was to have been a tie-up with Incheon Metropolitan City, with the Singapore company taking a 49 percent stake. But from day one, the project faced local opposition. In August 2008, Korean LCCs (namely, Air Busan, Yeongnam Air, Jeju Air and Jin Air) jittery about the impending competition, filed a complaint with their country’s Ministry of Land, Transport and Maritime Affairs, and they urged the government to put the brakes on the launch of the new carrier, claiming that it would in effect be controlled and run by Tiger, since the other shareholders had no airline

experience. The airlines went so far as to say that the new airline would “attack Korea’s aviation sovereignty” (The Straits Times, 2008).

It would be interesting to see what impacts AirAsia, Tiger Airways and other LCCs will have on air transport liberalization in Asia, on the one hand, while on the other hand to see various efficiency benefits LCCs will bring. The experiences from North America and Europe suggest that these benefits are concrete, dramatic and lasting, and that they form a significant part of the gains from air transport liberalization.

**Exhibit 5-5 Operating Companies for Air Asia Group**



## 6. Case discussion of Northeast Asian aviation market

Most studies on air transport liberalization, either from the industry or academia, have focused on the route markets linking developed countries, especially those in North America and Europe. This is not surprising. In terms of number of passenger carried, in 2007, these two regions together (North America and Europe) accounted for more than 60% of the world traffic. In addition, many major liberalization events had involved countries in these two continents. However, emerging economies are playing increasingly important roles. For example, China has now become the world’s second largest aviation market, only behind the U.S. As explained in Section 2, much of the future traffic increase will be derived from the liberalization of these emerging markets. Therefore, there is a need to study the (potential) effects and approach of liberalization for these markets. This section aims to fill this gap by studying the evolving regulatory liberalization in the Northeast Asian market. We first review the past and present situation of the aviation market, and they



analyze the possible future development and policy challenges need to be addressed.

### 6.1. Past and Present Situation:

For the three principal countries in Northeast Asia (China, Japan, South Korea) air transport is a significant sector, and so considerable attention has been paid to the formation of “optimal” aviation policies in each country. Inspired further by the deregulation and liberalization experiences of North America and the European Union, significant effort has been extended to promoting domestic airline deregulation and competition by each Northeast Asia (NEA) country. In South Korea, Asiana Airlines, a trunk carrier, was allowed to enter the industry in 1988 to compete against the incumbent monopoly Korean Air. Major recent developments include the liberalization of fare setting for domestic routes in August 1999, and the signing of an open-skies agreement with the U.S. a year earlier. In Japan, the passage of the new “Civil Aeronautics Law” in 1999 represents a significant deregulatory step, as it substantially liberalized the operating license system, fare approval system and other regulatory provisions. The liberalization also allowed airlines to set air fares freely beginning in 2000. Finally, the Chinese market shifted from a monopoly to a more competitive market structure in the late 1980s, and China’s international aviation policy appears to have shifted away somewhat from the previous restrictive approach – motivated primarily for carrier protection – to a proactive regime that views aviation as a facilitator of national trade, foreign direct investment, tourism and economic development (Zhang and Chen, 2003). As argued further by Zhang and Chen, the liberalization efforts have contributed not only to a more competitive market place, but also to the industry’s productivity growth as well as helping dramatic traffic growth.

In 2007, Mainland China ranked 2<sup>nd</sup> in the world (behind the U.S.) in both passenger-kilometers and freight ton-kilometers, in comparison to its 33<sup>rd</sup> place in passenger-kilometers and 35<sup>th</sup> in ton-kilometers in 1980 (ICAO, 1981, 2008). Despite the important progress made *within* each NEA country, the air transport market for the region as a whole is fragmented and restricted, because of the restrictions set in the bilateral air service agreements (ASAs), an array of laws and regulations and other barriers that prohibit free flow of people, goods and services. As a result, the existing air transport system appears to be ill-equipped for providing efficient air transport services in Northeast Asia.

Recently the NEA countries have made significant efforts and progress for achieving overall regional economic cooperation and integration. Since the late 1990s, there has been an increasing interest in economic cooperation among the three NEA countries, thanks to a number of important political, economic and social developments. For example, the 1997-1998 Asia financial crisis triggered a sense of the East Asian regional identity, leading to the creation of “ASEAN+3 (China, Japan and South Korea)” as a formula for regional



integration. In November 1999, China, Japan and South Korea held a tripartite summit on the sidelines of the ASEAN summit in Manila, and agreed to conduct joint research to seek ways of institutionalizing economic cooperation. In particular, the three countries would commission their research institutes to identify ten areas, including commerce, shipping, fisheries and customs, as the target sectors for cooperation. At the 2002 ASEAN+3 Cambodia summit, the leaders of the three countries reached an agreement on launching a joint effort to study the feasibility of establishing a Northeast Asian free trade area (FTA). Early in 2004, the first meeting attended by senior officials was held under this agreement, where views and opinions were exchanged on the work program for the joint research. It was believed that the research would pave the way for, and eventually bring about, an official negotiation for the NEA FTA.

These efforts are certainly conducive to regional liberalization and integration in air transport. Meanwhile, air transport markets are being continentalized by the creation of the single aviation market in the EU, the US-Canada open-skies bloc (and an increasing call for creating a single aviation market in North America), and the Trans-Tasmanian “single aviation market” between Australia and New Zealand. Furthermore, the North American and EU experiences have demonstrated that significant benefits – e.g., from the emergence and growth of LCCs – can be gained from the regional liberalization and integration in air transport markets. These, together with the on-going negotiations for an “open aviation area” across the North Atlantic, have put pressure on Northeast Asia to respond.

In effect, there have been significant recent developments towards more liberal air transport arrangements in Northeast Asia including the adoption of bilateral “open skies” policies. In June 2006, South Korea signed an agreement with China for “open skies” with China’s Shandong province and Hainan province, which allows multiple designations of airlines on the routes as well as removing capacity restrictions and pricing control. As discussed in Lee (2008), the South Korea-Shandong open-skies agreement has reduced fares rather dramatically (from about \$500 to \$100+) while stimulating demands on open skies bilateral routes. Furthermore, somewhat surprisingly, Chinese carriers, which were perceived as weaker carriers, actually gained market shares at the expense of their Korean counterparts in those open skies bilateral markets. The two countries also signed a Memorandum of Understanding, in which they agreed to extend “open skies” (mainly liberalization of third-/fourth-freedom traffic rights) to all regions of China by 2010 (Lee, 2008). In addition, in August 2007 South Korea and Japan signed a ‘limited’ open-skies agreement (liberalization of third-/fourth-freedom traffic rights) with the exception of the routes involving Tokyo area airports (Narita and Haneda). Moreover, the triangular air shuttle services among the three airports (Shanghai’s Hongqiao, Seoul’s Gimpo and Tokyo’s Haneda airports) started in late 2006. These three airports are considered as the “domestic” airports in their respective countries.

An important source of gains from NEA liberalization is facilitation of LCC development. LCCs in Northeast Asia have not been very successful so far. Air Do and Skynet Asia in Japan have been operating at a loss while Skymark made a profit only in 2004 (Murakami, 2008), whereas in South Korea, both Hansung Airlines and Jeju Air have been operating at a loss (Lee, 2008). This is in contrast to LCCs in North America and Europe, as discussed in Section 5. One disadvantage of these NEA LCCs is the smaller geographic areas of domestic markets. China does have a large domestic airline market; nevertheless, as elaborated in Zhang, et al. (2009), its various regulatory barriers make entry and growth of LCCs difficult. In order to succeed and survive, therefore, the NEA LCCs need to expand their operation from domestic routes to intra-NEA regional routes.

## **6.2. Future development in Northeast Asian air network**

There have been substantial progresses in regulatory liberalization in Northeast Asia in both domestic and international markets over the last two decades. For now, the liberalisation that has taken place in Northeast Asia is entirely bilateral in nature, no multilateral agreement exists as yet to govern air services among the three economies.

Korea has been actively seeking open skies or liberalized bilateral ASAs with other countries since its 1998 Open Skies agreement with United States. Most of its bilateral ASAs include multiple designation and unrestricted (or “open” or highly relaxed) 3rd and 4th freedom rights between pairs of cities. Of the three NEA countries, Korea is the keenest to embark on air services liberalisation along a trilateral model, given its desire to develop Incheon Airport as a regional logistics hub, and the fact that it has the smallest domestic market among the three economies. In recent years, Korea has been actively leading efforts to bring about a trilateral cooperative mechanism for the region, with the eventual aim being a unified air transport market among the three economies. The Japanese domestic market has been liberalized to the extent that there is active competition on many domestic routes. In the international front, Japan always maintained a position that favors liberalization on a bilateral and reciprocal basis in the past. This was also the position with regard to Japan’s bilateral ASA with the US, which it has traditionally viewed to be one-sided, particularly as regards slots controlled by US airlines at Narita Airport. In April 2007, however, the Japanese Government unveiled its ‘Asia Gateway Plan’ aiming to remove restrictions on foreign airline access to its regional airports, to boost trade and tourism and to address the issue of increasing regional economic disparity. The Japanese government has opened up 23 regional airports to strengthen its gateway position for international traffic. Japan is pushing for the equivalent of an EU-US “open skies” agreement in Asia, to the exception of Tokyo area airports (Narita and Haneda airports).

Meanwhile, China has also shown the willingness to liberalize its international market. For example, the new China-US ASA has removed many of the restrictions, and the two countries have agreed to meet no later than 2010 to discuss full open skies. China is also in the process of negotiating liberalization of air transport with European Union. As they continue to grow, the Chinese carriers are gaining confidence that they can turn their lower unit costs into competitive advantages in open markets. Beijing Olympic Games and Shanghai Expo (2010) could become a turning point in China's international air policy.

At the regional level, APEC has been playing active role in promoting liberalization of air transport regulation in areas such as market access, air carrier ownership and control, tariffs, etc. A recent study by APEC (2007) found that more than half of its members' ASAs (53.9%) adopted open 3rd and 4th freedom capacity for passengers, 5th freedom access, open or otherwise, has become a relatively common component of the ASAs, and multiple designation of carriers is widely accepted across the APEC region (76.1% of the ASAs).

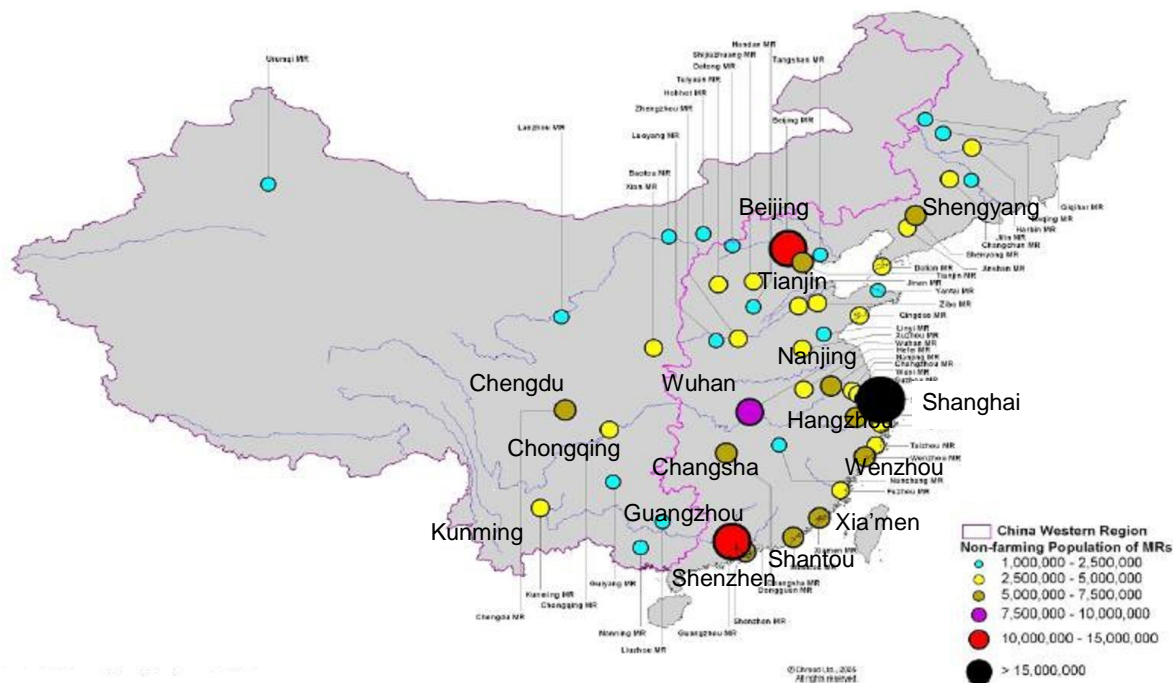
Liberalization of international air transport will continue, via bilateral and/or multilateral process; Time is ripe for negotiation to create NEA Open Skies bloc, especially in light of the fact that China, Japan, and Korea have all participated in the discussion with the ASEAN "common air agreement". **It is estimated that such open skies bloc would have the potential for incremental growth of 300 million short haul passengers. It is a massive aviation market waiting to be tapped – and now one step closer to reality.** It is highly likely that an open skies air transport bloc will be created in five to ten years in the region.

The Northeast Asian open skies bloc would induce major Asian carriers to set up multiple hub traffic collection and distribution networks in order to cover most of the major air transport markets in Asia as occurred in the United States after the 1978 domestic deregulation and as is happening in Europe. Since such Northeast Asian Open Skies bloc would not include 'cabotage' rights for foreign carriers, Japanese and South Korean carriers may have difficulty in establish one or more hubs in China. Furthermore, limitations on various 'doing business' conditions in China, and their limited ability to do marketing and sales may force Japanese and Korean carriers initially to expand direct services to/from their home country airports. This would lead to strengthening of their dominance at the super-hub airports in their respective home countries. However, such services would limit their ability to penetrate into the huge and rapidly growing airline markets in China, and at the same time, at least in the medium term Japanese and Korean carriers will not be able to compete with major Chinese carriers because of their disadvantages in terms of unit costs. In the long-run they will need to move their cost bases by creating secondary or mini-hubs in major population centers in China and/or Southeast Asia. This

may require deeper alliances with China's regionally based feeder carriers. Furthermore, direct investment by NEA carriers among one another should be encouraged and could be used to access the entire NEA market and the rest of Asian markets, which would also help rationalize and integrate the airlines' network in the region and provide an important impetus for the NEA Open Skies.

On the other hand, as it happened in the United States, China's three major carriers (or survival version of these three carriers: Air China, China Southern and China Eastern) would be very busy competing with each other in domestic markets. Each of the three major Chinese carriers will try to set up full coverage domestic network while trying to increase dominance in their current super-hubs (Beijing, Shanghai and Guangzhou). As the U.S. carriers' experiences show, attempts to invade directly into their competitors' hub airports may not be successful. They will need to build secondary hubs at major population centers like Chengdu and Wuhan or at underutilized airports near a competitor's hub (e.g., Shenzhen to steal traffic from Hong Kong and Guangzhou). While the race for national market coverage which has already begun continues, weaker airlines will be absorbed into stronger carriers. Exhibit 6-1 shows the domestic air travel market potential in western China.

**Exhibit 6-1, Location of major and mid-size cities in China**



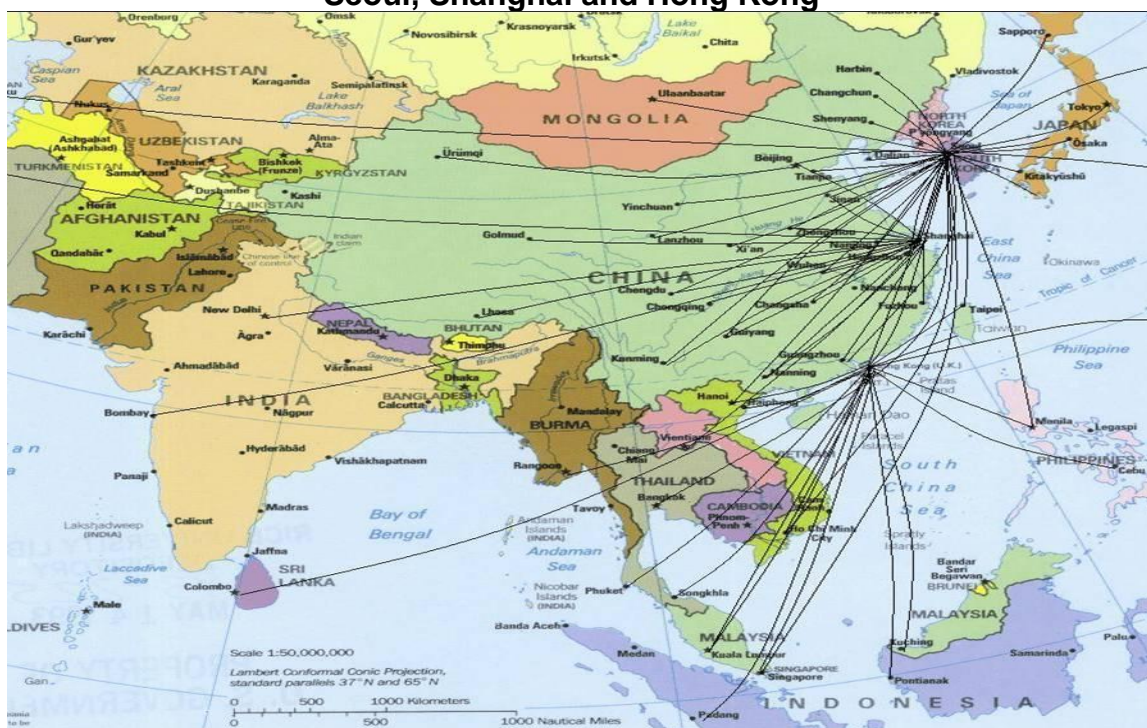
Recently Air China (and Shanghai Airlines) joined Star Alliance Group while China Southern joined SkyTeam Global Alliance Group. It would not be easy for China Eastern (or its successor) to join OneWorld Alliance as Cathay Pacific



(and Dragon Air) is an important member in the Alliance. China Eastern currently has code-sharing agreements with 9 airlines over 94 routes, including American Airlines, Japan Airlines, Qantas, Thai Airways, Air France-KLM, China Southern, Korean Air, Asiana Airlines, Shanghai Airlines.

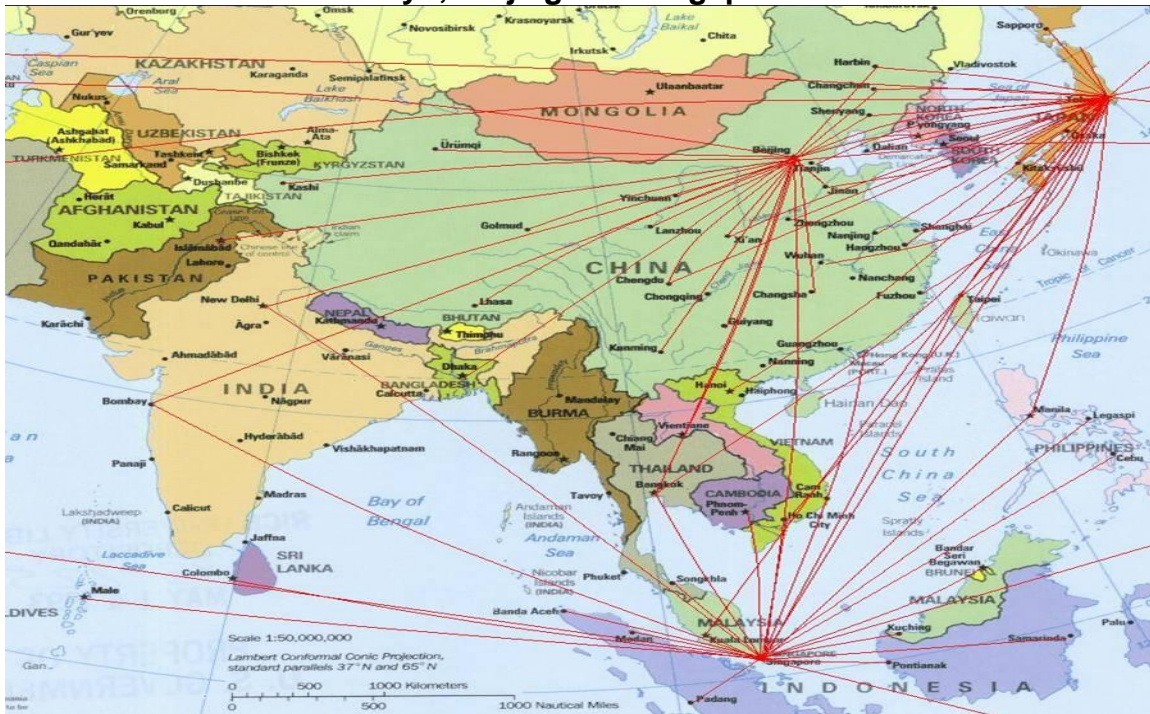
In short, under the NE Asian Open Skies Bloc arrangement, there will be intense competition among major carriers in the region as they attempt to set up multiple-hub network for continental market coverage. Chinese carriers will initially focus on set up multiple hubs in intra-China market before looking into any possibility of setting up gateway airports outside of China, while Japanese and Korean carriers will attempt to set up secondary or mini-hubs in other countries. Exhibits 6-3 and 6-4 provide examples of such multiple hub systems that would be set up by non-Chinese Asian carriers when NEA open skies bloc becomes a reality.

**Exhibit 6-2, Illustration - Asian Multiple Hub Carrier -1  
Seoul, Shanghai and Hong Kong**





### Exhibit 6-3, Illustration - Asian Multiple Hub Carrier -2 Tokyo, Beijing and Singapore



Eventually, there will be a limited number of, like in EU and NAFTA regions, mega-hubs emerging in the NEA Open Skies Bloc since major surviving carriers will want to have one super-hub, and several secondary hubs. With the large stake being involved, the process towards integration would see position juggling by airports and carriers and strategic trade policy negotiations by the governments. Governments of the three NEA countries would engage policies to channel traffic originating in the others' hinterland regions into their own hubs for onward carriage to Europe or North America in order to ensure their own hub airports to eventually emerge as the regional hubs. For example, the US-South Korea Open Skies accord in 1998 and new liberalized US-China ASA could be viewed as measures to ensure trans-Pacific traffic to be channeled through respective hubs. In the meantime, competition among the carriers have been intensifying and changing in nature. Low cost carriers have displaced significant market share from traditional network carriers (about 12% in East Asia), and have forced the network carriers to re-consider their business models. For example, Korean Air established a low cost carrier, Jin Air, in July 2008 to compete with rivals from China and Southeast Asia.

In summary, if an open skies bloc is formed in the NE Asian region (and eventually East Asian region) then each of the major surviving carriers are expected to form multiple hub network possibly with one super-hub at the their current hub location in order to set up efficient traffic collection and distribution

system covering all major parts of the sub-continent, similar to what has happened to the US carrier network and what is currently happening in Europe. But the specific shape of the network under the regional Open Skies will depend on strategic trade policies as well as airports/airlines' position joggling over the next 5-10 years.

## 7. Empirical estimates of the impacts of air transport liberalization

This section attempts to pull together the key findings of previous sections, and to quantify the impacts of the air transport liberalization on air passenger traffic.

### 7.1. Recent growth of air passenger traffic in key markets

In this sub-section, we review the recent traffic growth patterns of the six major air transport markets in the world: Intra-Asia Pacific Markets (since China is an important growth region, we will discuss the trends in domestic China market in more details), Intra-Europe, Intra-North America, Asia Pacific-Europe, Asia Pacific-North America and Europe-North America.

Exhibit 7-1 tabulates the air traffic growth and annual growth rates for the six key markets during the 2000-2007 period.

**Exhibit 7-1, Past Air Traffic Growth By Key Markets (in billion RPKs):  
2000-2007**

RPK in billion	2000	2001	2002	2003	2004	2005	2006	2007	% Per Year
Intra-Asia Pacific*	465.1	483.4	527.4	507.0	623.0	683.1	726.2	783.0	7.7%
Domestic China	76.7	86.9	101.5	106.9	143.8	163.8	182.4	209.5	15.4%
Intra-Europe	440.1	449.3	453.8	474.7	521.2	561.9	593.3	630.6	5.3%
Intra-North America	857.5	812.8	783.5	828.3	927.7	972.3	977.4	1,016.6	2.5%
Asia Pacific*-Europe	225.7	219.4	219.9	210.3	251.2	277.5	300.1	306.6	4.5%
Asia Pacific*-N. America	235.5	220.6	211.4	180.6	218.9	234.4	239.6	251.4	0.9%
Europe- N. America	420.0	373.8	346.0	349.5	375.7	390.7	403.4	418.2	-0.1%
Europe-North America (IATA data)	n.a	n.a	n.a	n.a	n.a.	434.9	457.9	482.2	5.25% (2005-07)
<b>World Total</b>	<b>3,381</b>	<b>3,290</b>	<b>3,279</b>	<b>3,304</b>	<b>3,754</b>	<b>4,026</b>	<b>4,234</b>	<b>4,513</b>	4.2%

Source: Boeing CMO 2008; \*Asia-Pacific includes Australia and New Zealand.

Exhibit 7-1 indicates that during the recent seven-year period (2000-2007), the worldwide air passenger traffic grew from 3.38 trillion Revenue-Passenger-Kilometers (RPKs) in 2000 to 4.51 trillion RPK in 2007, achieving an average annual growth of 4.2 percent, despite the fact that there was a substantial traffic reduction due to the 9/11 terrorist incident in 2001, and a significant slowdown in traffic growth due to the SARS incidence in 2003.

In terms of global patterns of traffic, intra-Asia Pacific traffic grew much faster (7.7% per year) than intra-European traffic (4.5%) or intra-North American traffic (2.5%). In the United States, most of the air liberalization occurred during the 1980s and the 1990s while in Europe, significant air liberalization has occurred since the creation of the single aviation market in Europe in 1997. In Asia, high growth has mainly been driven by high income growth in the region, as well as air transport liberalization started in late 1990s. China in particular has experienced a very high annual growth rate of 15.4%. Asia Pacific – North America traffic increased only by an average of 0.9% per year, while Europe – North American traffic decreased by 0.1% per year during the 2000-2007 period, partly due to the negative effects of 9/11 and SARS incidence in 2003.

## **7.2. Longer term past traffic growth and traffic forecasts**

Several organizations, such as Boeing Commercial Aircraft, Airbus, International Civil Aviation Organization (ICAO), and International Air Transport Association (IATA) publish regularly air traffic forecasts for the world's major markets. IATA provides only the short term forecasts, usually for three years into the future as the organization is interested in the performance prospects of its member airlines, mostly scheduled network carriers. Boeing, Airbus and ICAO provide long-term forecasts (18 to 20-year forecasts).

The details of these models have rarely been revealed to the public, and thus, have not been subject to any kind of public methodological review. However, it is clear that all of these agencies recognize the importance of the future state of overall economies. The size of GDP, or GDP per capita, is regarded as the most important driver for future air transport demand. As reported below, the traffic growth forecasts from these agencies are fairly consistent. The upper portion of Exhibits 7-2 reports the average passenger traffic growth rate by market for the 1990-2000, 2000-2007, and 1990-2007 periods. All markets other than the Intra-Asia Pacific (AP) market had higher average annual growth during the 1990s than the 2000-2007 period. The primary reason for higher growth during the 1990s is probably because of the long running economic (GDP) growth. The lower average annual growth for the intra-AP market may have been caused by the Asian Financial Crisis began in 1997.

The lower portion of Exhibit 7-2 reports Boeing's forecast of the average annual passenger traffic growth during the 2007-27 period. Boeing's passenger traffic forecast can be summarized as follows:

- The worldwide traffic is expected to grow by an average of 5.0% per year;
- Intra-AP market is expected to continue to grow much faster (7.0% per year) than the intra-Europe or intra-NA market, primarily driven by the higher GDP growth in Asian countries. The Intra-Europe market is expected to grow faster than the intra-NA market, probably because there is more room to further liberalize and deregulate the air transport markets in Europe than in NA. The integration of some Eastern European markets will provide some additional expansion opportunities.
- Overall, the inter-continental markets involving AP countries are expected to grow faster than the North Atlantic markets. Again, this is because international markets involving Asia will catch up with liberalization, while the North Atlantic markets have been much deregulated already.

Exhibits 7-3 compares graphically the forecast volumes of the world total RPKs across the three forecasting agencies. Exhibit 7-4 through to 7-9 compares graphically the forecast volumes of each of the six major intra-continental and inter-continental markets across the three forecasting agencies. These exhibits indicate the following:

- Boeing and Airbus forecast that in the next 20 years (2007-2027 for Boeing; 2007-2026 for AirBus) the world's total air passenger traffic measured in RPK will grow at an annual rate of 5.0% and 4.9%, respectively, as compared to an average of 4.2% and 4.0% annual growth during the 2000-2007 period. In comparison, ICAO forecasts that in the next 18 years (2007-2025), scheduled passenger traffic will grow at 4.6% per year.
- The comparative bar graphs in Exhibits 7-3 to 7-9 show that the ICAO and IATA data have substantially different traffic volume forecasts from those of Boeing and Airbus. This is because ICAO includes the scheduled passenger data of its member states. Similarly, IATA member airlines are also mainly scheduled airlines. Traffic carried by charter carriers and LCCs are not included in their traffic volumes. Since LCCs have been growing faster than scheduled network carriers, ICAO's somewhat lower growth forecast (4.6%) appears to be consistent with the forecasts provided by Boeing and Airbus (5.0% and 4.9% respectively). Therefore, for the market-specific forecasts we will only discuss Airbus and Boeing forecasts.
- Boeing forecasts the Intra-Asia Pacific traffic to grow at 7.0% per year in the next 20 years while Airbus forecasts at 6.1% per year. Past growth was 7.7% per year in the 2000-2007 period according to Boeing data. A significant difference exists between Airbus and Boeing forecasts on China's domestic traffic: Boeing expects it to grow at 9.0 percent per year in



the next 20 years while Airbus expects it to be 8.4% per year in the next 19 years. These compares with actual growth of 15.4% per year for China's domestic traffic in the last seven years.

- As for Intra-European traffic, Boeing expects that it will grow at 3.5% per year while Airbus's figure is 4.9% per year. The past seven-year growth rate is an average of 5.3% per year. A substantial portion of this relatively high increase in traffic in the last seven years comes from the explosive growth of LCC, and the creation of single aviation market which later included Eastern European countries. It is not clear that similarly higher growth will occur in the future since LCC penetration in European market has exceeded (30%) that of North America (26%).
- As for Intra-North American traffic, Boeing forecast an average growth of 2.8% per year while Airbus' number is 3.7% per year.
- Asia Pacific –North America Intercontinental Markets: Boeing expects this market to grow at 5.6% per year in the next 20-years, while Airbus put the growth rate 5.8% and ICAO at 6.0%. The actual growth rate was 0.9% per year in the 2000-2007 period which includes the effects of 9/11 in 2001 and SARS incidence in 2003. All of the forecasting agencies expect there will be robust growth of international traffic to/from Asia Pacific region.
- Asia Pacific-Europe Intercontinental Markets: Boeing's forecast is an average growth of 5.7% per year while Airbus and ICAO put 5.9% and 6.0%, respectively. The past growth rate in this market was 4.5% per year in the 2000-2007 period.
- Europe-North American Intercontinental Markets: Boeing's forecast for this market is 4.7% per year while Airbus and ICAO put their numbers at 4.8% and 4.5%, respectively. The traffic in this market was actually reduced by an average of 0.1% per year during the 2000-2007 period.

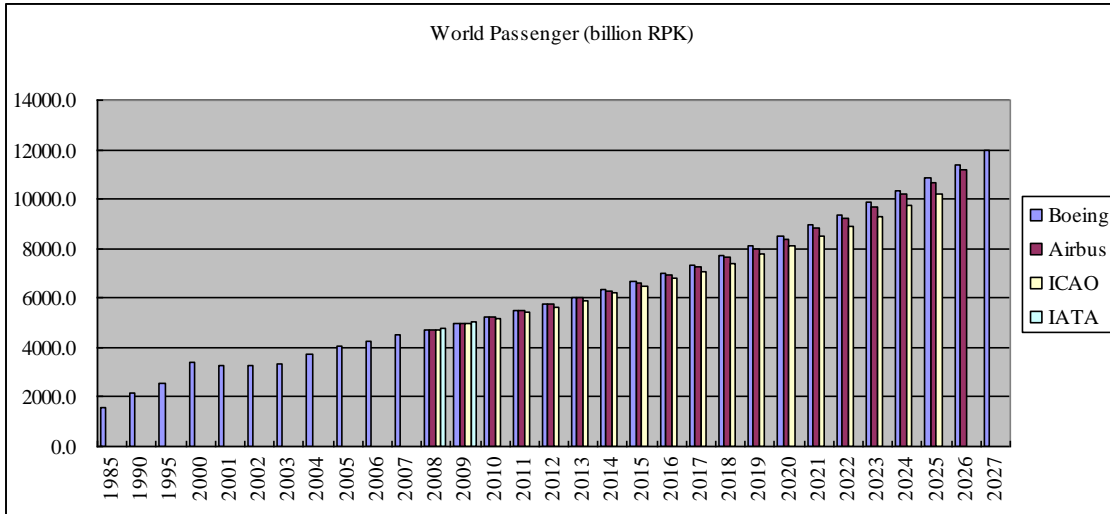


**Exhibit 7-2, Past Traffic Growth and Boeing Forecasts By Key Markets (2008-2027)**  
(in Billion RPK)

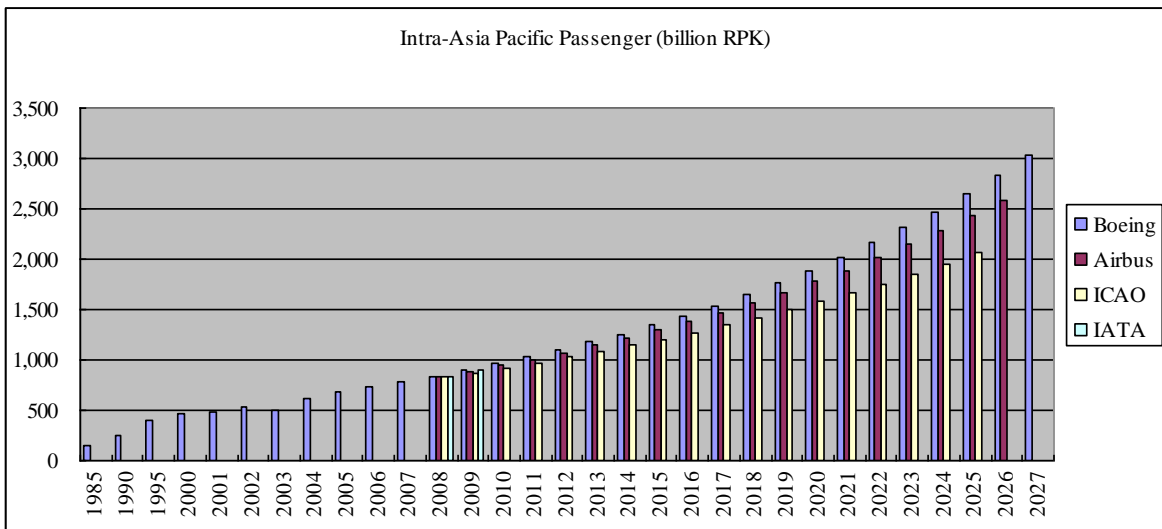
Year	Intra-Europe	Intra-N. America	Intra-Asia Pacific	Domestic China	Asia Pacific -Europe	Asia Pacific -N. America	Europe - N. America	World Total
Year 1990	258.0	589.0	243.0	18.3	110.0	143.0	231.0	<b>2181.5</b>
Year 2000	440.1	857.5	465.1	76.7	225.7	235.5	420.0	<b>3,381.0</b>
<b>Year 2007</b>	<b>630.6</b>	<b>1,016.6</b>	<b>783.0</b>	<b>209.5</b>	<b>306.6</b>	<b>251.4</b>	<b>418.2</b>	<b>4,513.0</b>
Ave. annual growth: 1990-2000	5.5%	3.8%	6.7%	15.4%	7.5%	5.1%	6.2%	<b>4.5%</b>
Ave. annual growth: 2000-2007	5.3%	2.5%	7.7%	15.4%	4.5%	0.9%	-0.1%	<b>4.2%</b>
<b>Ave. annual growth: 1990-2007</b>	<b>5.4%</b>	<b>3.3%</b>	<b>7.1%</b>	<b>15.4%</b>	<b>6.2%</b>	<b>3.4%</b>	<b>3.6%</b>	<b>4.4%</b>
<b>Ave. Annual growth rate forecast 2007-'27</b>	<b>3.5%</b>	<b>2.8%</b>	<b>7.0%</b>	<b>9.0%</b>	<b>5.7%</b>	<b>5.6%</b>	<b>4.7%</b>	<b>5.0%</b>
2012: 5-year	749.0	1,167.1	1,098.2	320.9	404.5	330.1	526.2	<b>5,759.9</b>
2017:10-year	889.5	1,339.9	1,540.3	491.4	533.7	433.5	662.0	<b>7,351.2</b>
2022::15-year	1,056.5	1,538.3	2,160.3	752.7	704.2	569.3	832.9	<b>9,382.2</b>
2027:20-year	1,254.8	1,766.1	3,030.0	1152.8	929.1	747.6	1,047.9	<b>11,974.3</b>

Source: Current Market Outlook 2008-2027 (Boeing, 2008)

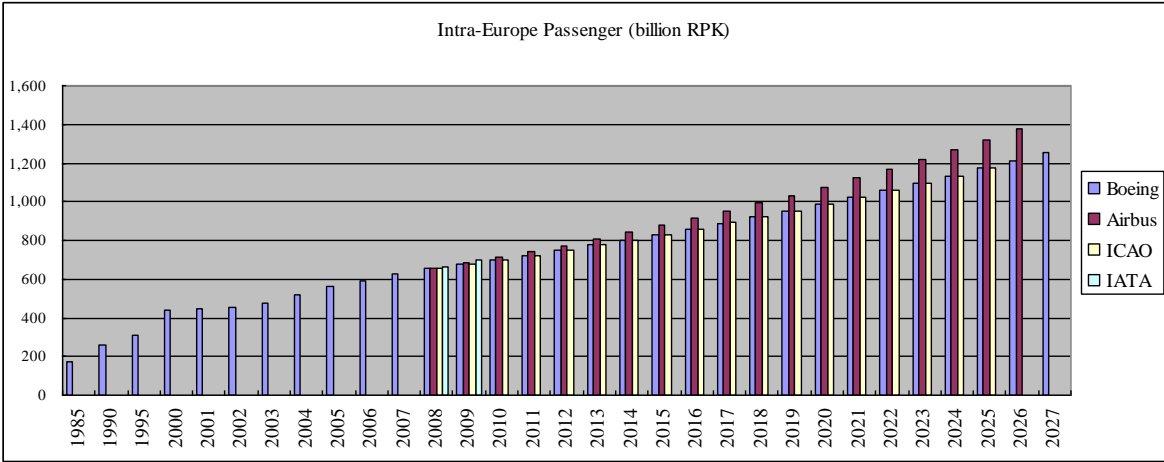
**Exhibit 7-3, Past Trend and the Future Traffic Forecast for the World**



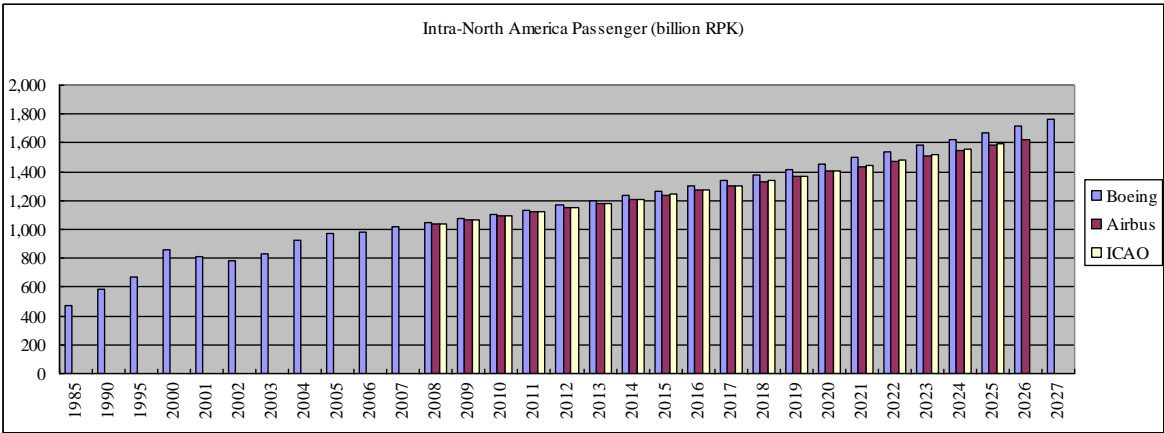
**Exhibit 7-4, Past Trend and Future Traffic Forecast for Intra-Asia Pacific Market**



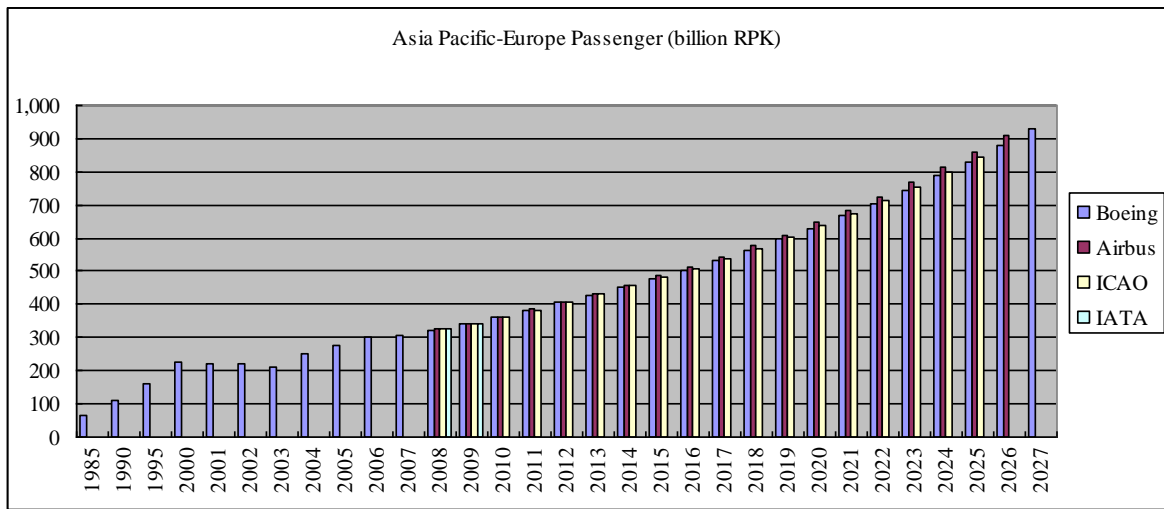
### Exhibit 7-5, Past Trend and Future Traffic Forecast for Intra-European Market



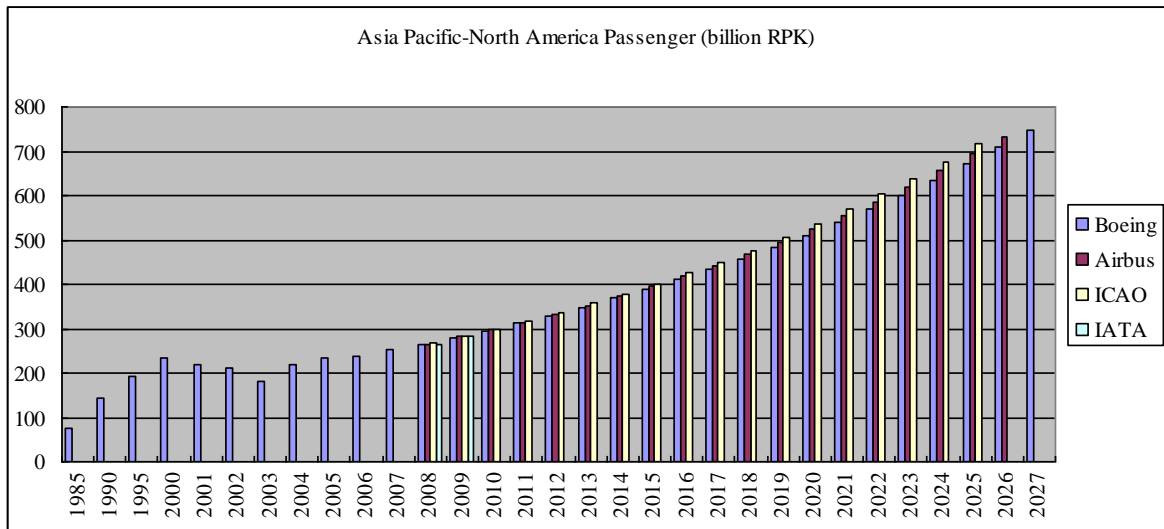
### Exhibit 7-6, Past Trend and Future Traffic Forecast for Intra-North America Market (US, Canada)



### Exhibit 7-7, Past Trend and Future Traffic Forecast for Asia Pacific – European Intercontinental Market



### Exhibit 7-8, Past Trend and Future Traffic Forecast for Asia Pacific – North American Intercontinental Market



### Exhibit 7-9, Past Trend and Future Traffic Forecast for Europe-North American Intercontinental Market

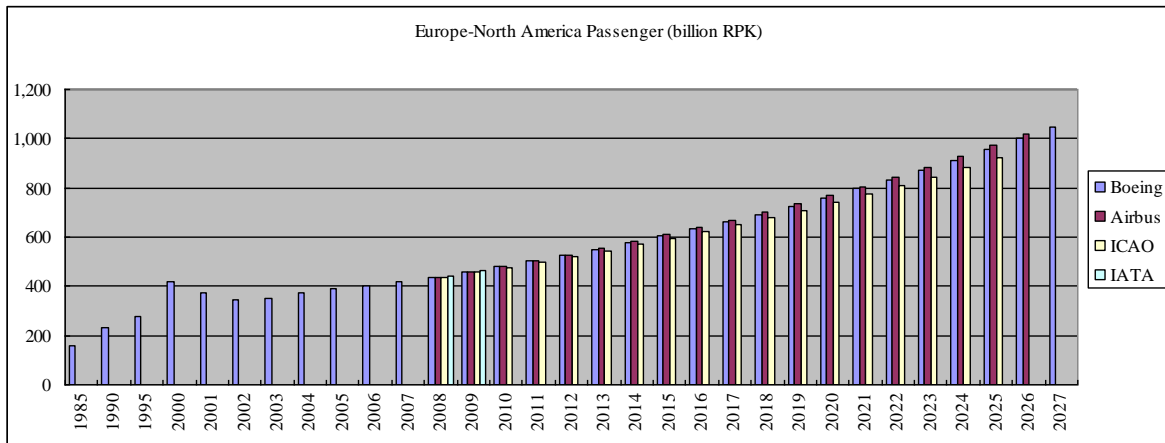


Exhibit 7-10 compares the forecast traffic growth rates by Boeing, Airbus and ICAO, and the average of the three traffic growth rates by market and the world total. Since ICAO forecasts do not include LCCs, charters and other non-scheduled services, it tends to under-forecast intra-continental traffic growth where most of LCC growth is expected to occur. Airbus is more optimistic about the growth of the intra-European and intra-NA markets than Boeing while Boeing is more optimistic about growth of the intra-AP market than Airbus. The average annual growth rates from the three forecasting agencies (Boeing, Airbus and ICAO) are 6.2%, 4.0% and 3.0% per year for the intra-Asia Pacific markets, intra-Europe and intra-North American markets, respectively.

In terms of intercontinental markets, the average annual growth rates are 5.8%, 5.8%, and 4.7% for Asia Pacific-European, Asia Pacific-North American and Europe-North American markets, respectively.



**Exhibit 7-10, Comparison of Traffic Growth Rate Forecasts by Boeing, Airbus and ICAO**

Agent	Intra-Europe	Intra-N. America	Intra-Asia Pacific	Domestic China	Asia Pacific-Europe	Asia Pacific – N. America	Europe - N. America	World Total
<b>Ave. annual growth (1990-2007)</b>	<b>5.4%</b>	<b>3.3%</b>	<b>7.1%</b>	<b>15.4%</b>	<b>6.2%</b>	<b>3.4%</b>	<b>3.6%</b>	<b>4.4%</b>
Boeing Forecast*	3.5%	2.8%	7.0%	9.0%	5.7%	5.6%	4.7%	5.0%
Airbus Forecast**	4.9%	3.7%	6.1%	8.4%	5.9%	5.8%	4.8%	4.9%
ICAO Forecast***	3.5%	2.5%	5.5%	n.a.	5.8%	6.0%	4.5%	4.6%
<b>Average Annual Growth (long-term)</b>	<b>4.0%</b>	<b>3.0%</b>	<b>6.2%</b>	<b>8.7%</b>	<b>5.8%</b>	<b>5.8%</b>	<b>4.7%</b>	<b>4.8%</b>

Source: Current Market Outlook 2008-2027\* (Boeing, 2008), Global Market Forecast 2007-2026\*\* (Airbus, 2007)  
 Outlook for Air Transport to the Year 2025\*\*\*(ICAO, 2007)

### 7.3. Effects of income growth and liberalization on passenger traffic in the key markets

As discussed previously, all air traffic forecasting agencies agree that per-capita income (or GDP) is the most important determinant of air passenger traffic. Therefore, it is important to investigate the relationship between the GDP growth and the air traffic growth. Exhibit 7-11 reports the real GDP per capita, and GDP growth rates for Europe, N. America, Asia-Pacific regions since 1990.

**Exhibit 7-11, Real GDP Growth Rates for Key Air Transport Markets**

	European Union	N. America	Asia-Pacific	China
<b>Per Capital Income 2007 (Current USD)</b>	<b>38,215</b>	<b>36,444</b>	<b>3,926</b>	<b>3,121</b>
<b>Ave Actual Growth Rate (1990-2000)</b>	<b>2.19%</b>	<b>3.12%</b>	<b>4.69%</b>	<b>9.85%</b>
<b>Ave Actual Growth Rate (2000-2007)</b>	<b>2.54%</b>	<b>2.53%</b>	<b>5.60%</b>	<b>9.98%</b>
Ave Actual Growth Rate (1990-2007)	2.25%	2.82%	5.05%	9.98%
IMF Forecast Growth 2008	1.65%	1.50%	5.55%	9.74%
" 2009	0.55%	0.15%	5.12%	9.25%
" 2010	1.88%	2.10%	6.01%	9.80%
" 2011	2.55%	3.20%	6.57%	10.00%
" 2012	2.70%	2.79%	6.68%	10.00%
" 2013	2.76%	2.33%	6.64%	10.00%
<b>5-year Ave Growth Rate (2008-2012)</b>	<b>1.87%</b>	<b>1.95%</b>	<b>5.98%</b>	<b>9.76%</b>
<b>6-year Ave Growth Rate (2008-2013)</b>	<b>2.02%</b>	<b>2.01%</b>	<b>6.09%</b>	<b>9.80%</b>

Source: IMF World Economic Outlook Database, Oct 2008

The following facts are noteworthy from Exhibit 7-11:

#### Per-capita GDP growth records:

- The 2007 average GDP per capita were US\$38,215, US\$36,444, and US\$3,926, respectively, for EU, North America, Asia-Pacific regions. (China had US\$3,121 per capita).

- Despite the presence of Japan, South Korea, Singapore, Australia and New Zealand in Asia-Pacific, for our purpose the Asia Pacific region is being classified as the developing region due to their relatively low average GDP per capita.
- The real GDP growth rates during the 1990-2000 are 2.19% for Europe, 3.12% for North America, and 4.69% for Asia Pacific (9.85% for China) while the annual GDP growth rates in the 2000-2007 period were 2.54% for Europe, 2.53% for North America, and 5.6% for Asia-Pacific (9.98% for China).

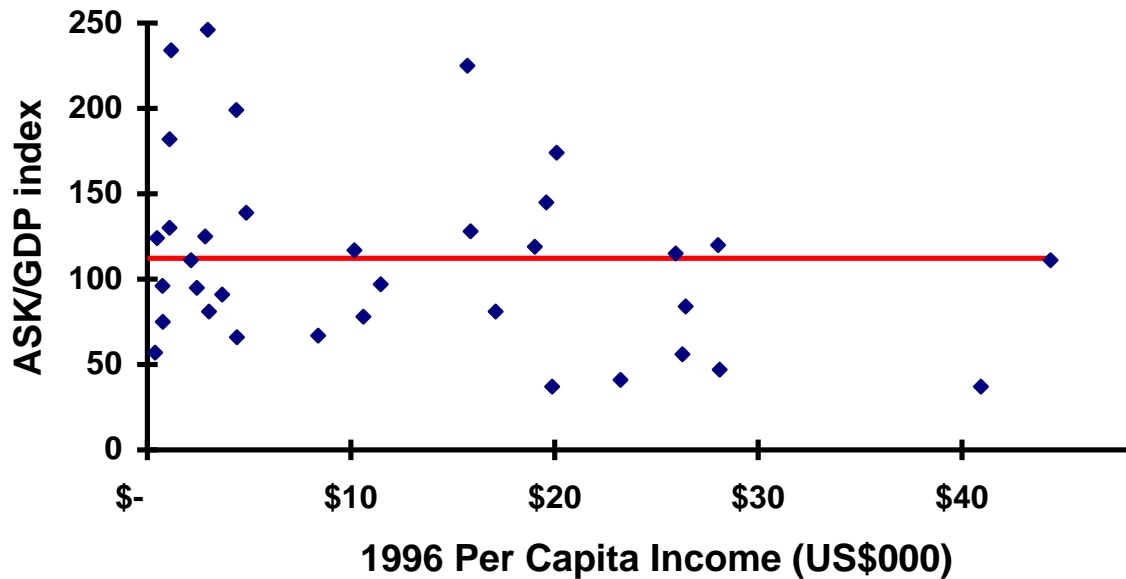
### **Income elasticity of air travel demand:**

Since economic growth has been recognized as the key driver for air transport demand, it is important to examine the magnitude of such stimulation effect, which is usually measured in terms of income elasticity. Several recent studies revealed that

- US Department of Transportation (DOT, 2006) estimated the income elasticity of air transport to be 1.74.
- UK Department for Transport (DfT, 2004) used a value of 1.5 for income elasticity. In their sensitivity tests, the value of 1.0 was used as lower value for low “market maturity”, while value of 2.0 was used for high “market maturity”
- Gillen, Morrison and Stewart (2008) surveyed 14 studies, and found the median income elasticity value of 1.39, with most estimates range between 0.5 and 2.5.

Swan (2008) conducted an in-depth review of alternative forecasting models. He concludes that economic growth is indeed the dominant driver for air transport demand. In the past 30 years, GDP growth accounted for at least 2/3 of air passenger traffic growth. However, the effects of economic growth have been overestimated. Swan argued that if income elasticity is indeed much larger than unity, e.g. close to 2, then over time, air transport will account for an increasingly higher proportion of the overall economy. This is, however, not true. As shown in Exhibit 7-12, the intensity of air traffic per unit of GDP (ASK/GDP) decreased slightly (instead of increasing as most academics expect) as per-capita income of the country increases. Swan claimed that *“Air travel as a share of country GDP runs from 0.5% to 2% with an average near 1%. Research shows that this value is not higher for rich countries nor lower for poor ones. Research also shows that countries who have had historically low values, tend to grow their air travel faster (catch up), while countries with high values tend to grow slowly or not at all.”* That is, in the long run, spending on air transport accounts for about 1% of GDP, developed and developing countries alike.

Exhibit 7-12, Relationship Between ASK/GDP and Per-capita Income



Source: Swan (2008)

Swan (2008) points out that income elasticity has been overestimated because of the followings:

- Some important factors such as liberalization, trade growth, price reduction and service quality are not modeled or underestimated. This implies that the effects of these factors are wrongly allocated to economic growth (GDP). If one includes a trend variable in forecasting models, the importance (as measured by the size of the coefficient) of GDP will decrease. The trend variable serves as a proxy for the omitted variables, which usually increase over time.
- In the short run, the demand for air travel is influenced by consumer confidence. Consumer confidence effect on air travel can be more volatile than the overall economy (e.g., at economic downturn, travel budget is often the first cost item to be cut by companies). This would indicate a larger than 1 income elasticity. In the long run, however, since consumer confidence averages out and thus, effect on income elasticity is not so large.

These observations and arguments are likely to be valid. The Chinese aviation market possesses every driving factor for aviation traffic growth: high economic growth, (on-going) deregulation and privatization of the airline industry, immature (developing) aviation market, explosive trade growth, aggressive investment in transport infrastructures (including airports, air traffic control and highway / railway linking airports). Even in such a market, during the period of 1978-2007, the average annual air traffic growth rate (15%) is just about 1.5 times of GDP growth (9.8%), implying an income elasticity of 1.5 alone would explain

away all of these air traffic growth in China. This suggests that for large market over a long period, 1.5 is probably an upper bound for income elasticity. As shown in Exhibit 3-17, if we apply a value of income elasticity value higher than 1 for advanced countries and 1.3 for developing countries again most of the past air traffic growth in Europe, North America and Asia-Pacific during the 1990-2007 period would be accounted for by their respective GDP growth alone, leaving no rooms for the effects of air fare reduction, improved convenience of travel, increased trade, etc.

Since we aim to investigate the traffic growth in large (intra-continental / inter-continental) aviation markets over a long period, we decided to use two sets of alternative values of GDP (income) elasticities. Since previous studies suggest air traffic will grow faster in “immature” markets, we decided to apply two alternative values of 1.0 and 1.2 for Europe and North America, while using higher values, 1.3 and 1.5 for the income elasticity for Asia-Pacific. With these two sets of values, we can decompose air traffic growth to GDP and all other (residual) factors as in exhibit 7-13:



**Exhibit 7-13, Traffic Growth Attributable to GDP and Other Factors**

	Traffic Growth	GDP growth	Residual Growth (1) (GDP elasticity: EU, NA =1; AP=1.3)	Residual Growth (2) (GDP elasticity: EU, NA=1.2; AP=1.5)
<b>Intra-Europe</b>				
1990-2000	5.50%	2.19%	3.31%	2.87%
2000-2007	5.30%	2.54%	2.76%	2.25%
2007-2012	3.50%	1.87%	1.63%	1.26%
2012-2017	3.50%	2.20%	1.30%	0.86%
2017-2022	3.50%	2.10%	1.40%	0.98%
<b>Intra-N. America</b>				
1990-2000	3.80%	3.12%	0.68%	0.06%
2000-2007	2.50%	2.53%	-0.03%	-0.54%
2007-2012	2.80%	1.95%	0.85%	0.46%
2012-2017	2.80%	2.50%	0.30%	-0.20%
2017-2022	2.80%	2.50%	0.30%	-0.20%
<b>Intra-Asia Pacific</b>				
1990-2000	6.70%	5.05%	0.14%	-0.88%
2000-2007	7.70%	5.55%	0.48%	-0.63%
2007-2012	7.00%	5.98%	-0.77%	-1.97%
2012-2017	7.00%	4.40%	1.28%	0.40%
2017-2022	7.00%	4.10%	1.67%	0.85%
<b>Asia Pacific - Europe</b>				
1990-2000	7.50%	3.61%	3.38%	2.66%
2000-2007	4.50%	4.03%	-0.10%	-0.91%
2007-2012	5.70%	3.90%	1.25%	0.47%
2012-2017	5.70%	3.29%	1.94%	1.29%
2017-2022	5.70%	3.10%	2.17%	1.55%
<b>Asia Pacific – N. America</b>				
1990-2000	5.10%	4.08%	0.45%	-0.37%
2000-2007	0.90%	4.03%	-3.69%	-4.50%
2007-2012	5.60%	3.95%	1.10%	0.31%
2012-2017	5.60%	3.45%	1.67%	0.98%
2017-2022	5.60%	3.30%	1.84%	1.18%
<b>Europe – N. America</b>				
1990-2000	6.20%	2.65%	3.55%	3.02%
2000-2007	-0.10%	2.53%	-2.63%	-3.14%
2007-2012	4.70%	1.91%	2.79%	2.41%
2012-2017	4.70%	2.35%	2.35%	1.88%
2017-2022	4.70%	2.30%	2.40%	1.94%

## Effects of Income Growth and Liberalization on Passenger Traffic (RPKs):

In Exhibit 7-13, we report the results of decomposition of the passenger traffic growth (actual traffic growth for the periods of 1990-2000 and 2000-2007, and the forecast traffic growth for the periods of 2007-2012, 2012-2017 and 2017-2022) into the GDP growth effect and the 'residual' (non-GDP) effects. The second last column is the 'residual' effect calculated by assuming that the GDP elasticities of passenger traffic are 1.0 for developed continents (Europe and N. America) and 1.3 for Asia+Oceania whereas the last column reports the residual effect calculated by assuming GDP elasticities of 1.2 for the developed continents and 1.5 for Asia+Oceania. The effect of GDP growth on air traffic can be obtained by subtracting the residual growth from the total traffic growth rate.

The "residual growth" captures the effects of all other factors such as price reduction, improved convenience of travel, service quality change, increasing international trade, etc. most of which are facilitated by regulatory liberalization on air transport. Boeing forecasts are used as the future traffic growth. As stated previously, Boeing and Airbus forecasts are, in general, consistent with each other. While the two sets of GDP elasticity assumptions yield different numbers, the trends revealed are similar. In particular, the results of our decomposition of traffic growth into GDP and non-GDP effects show the following patterns:

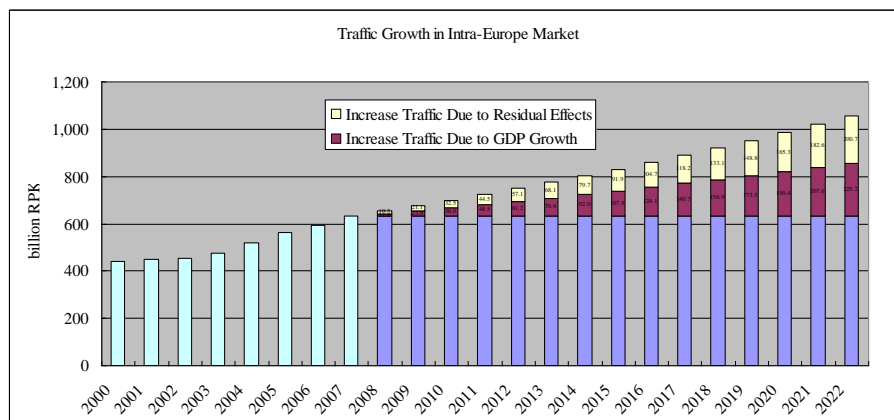
When GDP elasticity is assumed at 1.2 for developed continents the "residual growth" for North America becomes nearly zero (0.06%) for the 1990-2000 period and -0.54% for the 2000-2007 period. This makes little sense because real airfares have declined continuously from 1990 through to 2007. This led us believe that GDP elasticity for USA+Canada may be considerably lower than 1.2. Therefore, henceforth for the advanced continents (Europe and North America) we discuss mainly the results based on GDP elasticity of 1.0, the second last column in Exhibit 7-13.

- **Intra-Europe market:** Traffic in this market grew 5.5% per year during the 1990-2000 period while it grew at a slightly slower rate of 5.3% during 2000-2007 because of the negative effects of the global recession, and impacts of 9/11 in 2001 and SARS incidence in 2003. When we apply a GDP elasticity of 1.0 to both periods, the residual traffic growth in the intra-European market is 3.31% in the pre-2000 period while the value goes down slightly to 2.76% in the post-2000 period.

Compared to the intra-North America and Intra-Asia Pacific markets, the residual growth in Intra-Europe market is the largest. That is, compared to other regions, factors other than GDP contributed the highest proportion of traffic growth. However, the magnitude of residual traffic growth has been declining, and is expected to decline further in the future (e.g., 3.31% during 1990-2000 vs. 1.4% during 2017-2022). This is expected. The European aviation market started its deregulation/liberalization since the late 1980s when the three packages of liberalization measures began in Europe. The true single European market was formed in 1997 with the complete release of *cabotage* rights to all

carriers with EU registration. Such liberalization measures have caused drastic increase in competition and aggressive expansion of LCCs, which have brought substantial traffic increase in addition to the effect of GDP growth. However, given the fact that most of the European markets are already liberalized, traffic growth in the future will rely increasingly more on economic (GDP) growth, as shown in Exhibit 7-14.

**Exhibit 7-14, Expected Passenger Traffic Growth:  
Intra-Europe Market - GDP effect + Residual**  
(GDP elasticity assumed = 1.0)



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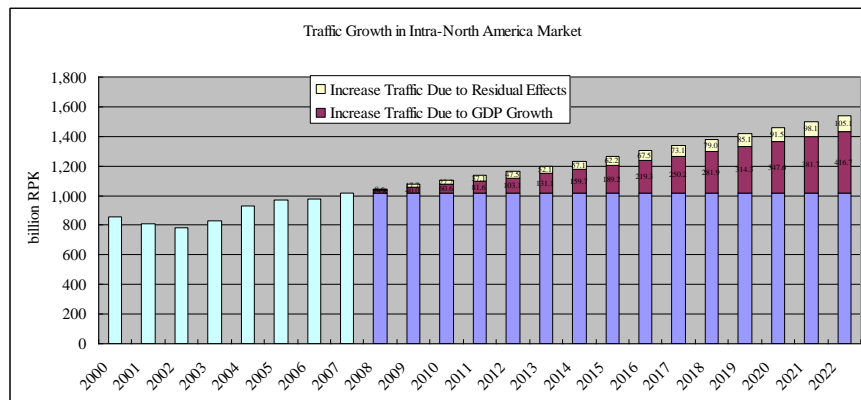
- **Intra-North American Market:** In this market, the passenger traffic grew by 3.8% per year during the 1990s, while it grew only by 2.5% per year in the 2000-2007 period. Even with an income elasticity of 1.0, the residual annual growth rate was merely 0.68% in the pre-2000 period, and was further reduced to -0.03% in the post-2000 period.

Such a growth pattern is the results of many factors: The US market has deregulated its aviation market as early as in 1978. Much of the welfare gains associated with deregulation and competition, has already been realized. In addition, as explained earlier, air transport spending accounts for about 1% of total GDP in the long run. For mature markets such as the U.S., demand for aviation services will grow slowly or not at all. Although the Canada – US liberalization has led to substantial growth, it does not change the whole picture given that the US domestic markets accounts for a lion’s share of the Intra-North American market.

A careful review of the recent traffic growth indicate that another main cause for the low residual traffic growth rate is the 9/11 incidence. There was a clear decrease in traffic during 2001 and 2002. Only by 2004 the total traffic in the intra-North American markets had barely recovered their 2000 traffic level (see Exhibit 7-6). The 9/11 incidence had made great impacts: security measures has tightened significantly, leading to increased

waiting time at airports, additional security fees and extra inconveniences. All of these have increased the “generalized costs” of flying. Many airlines were in poor financial condition, some eventually exited the market via bankruptcy or mergers. This reduced market supply as well as airline competition. The market began to stabilize only from 2004. Still, in this mature market, future growth will mainly be driven by economic growth as shown clearly in Ex. 7-15. Since intra-North American airline markets are already deregulated completely, and the effects of deregulation have already been realized, there is virtually no room for further deregulation in the future.

**Ex. 7-15, Expected Passenger Traffic Growth:**  
**Intra-North America Market - GDP effect +Residual**  
 (GDP elasticity assumed = 1.0)



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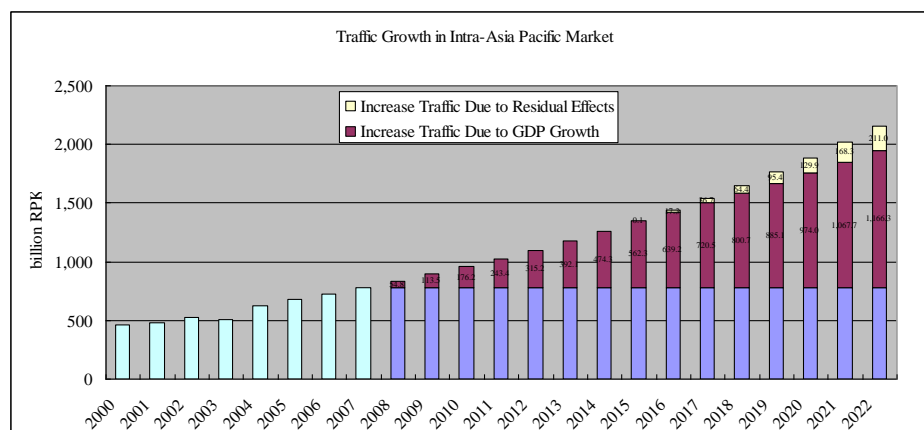
- o **Intra-Asia Pacific Market:** In this market, the passenger traffic grew by 6.7% and 7.7% per year in the pre-2000 and the post-2000 periods, respectively. When applying the GDP elasticity of 1.5, some of the residual growth of traffic would show up as negative (-0.88% pre-2000 and -0.63% post-2000). Such a growth pattern is caused by several reasons: First, the Asia-Pacific market includes a number of high income OECD countries such as Japan, Korea, Australia, New Zealand, etc. The GDP elasticity of 1.5 may be too high for such high income countries. As discussed previously, even for China, such high GDP elasticity would explain away all of the high traffic growth in the past 30 years!<sup>32</sup> Even when we apply GDP elasticity value of 1.3, the residual traffic growth rate is very small, 0.14% and 0.48% for the 1990-2000 and 2000-2007 periods, respectively. These very small residual traffic growth rates can be interpreted in two ways: (a) the GDP elasticity of air passenger traffic in the Asia-Pacific markets may be

32 Another likely cause is the over optimistic estimation for economic growth. Until early 2008, many agencies are still very optimistic about the future economic growth during the 2007-2012 period.

lower than 1.3; and/or (b) the regulatory relaxations undertaken during the 1990s were very minor relative to what happened in North America and Europe they did not have much impact for increasing passenger traffic, meaning that most of the rapid traffic growth in Asia-Pacific (mainly Asia) since 1990 is attributable mostly to the GDP growth in Asia, not regulatory relaxation. Despite the rhetoric about liberalization of air transport system in the region as a whole, the speed of liberalization and thus airline competition (price reduction, improved convenience of travel, increase in service quality, etc.) did not improve substantially. In fact, their regulatory restrictions may have prevented the full realization of potential aviation demand driven by economic growth. In addition, Asian countries appeared to have put too much weight on the carriers in bilateral ASA liberalization. Most of the international ASA liberalization measures, no matter how minor those measures are, may be traceable to the need for one or more of their flag carriers.

This has been a mixed blessing. While the slow liberalization process in Asia Pacific has put constraints on aviation growth in the past, relaxing such regulatory constraints in Asia has been largely influenced by the needs for their failing airlines, not necessarily for consumers or for their national economy as a whole. However, the future looks brighter than the past because residual traffic growth in the region is likely to increase, from 0.14% during the period of 1990-2000 to 1.67% during 2017 – 2022. Exhibit 7-16 shows that the tiny “residual growth” rate will continue to increase over time while the effect of GDP growth on air traffic will continue to dominate in the foreseeable future.

**Ex. 7-16, Expected Passenger Traffic Growth:  
Intra-Asia Pacific Market – GDP effect + Residual  
(GDP elasticity assumed = 1.3)**



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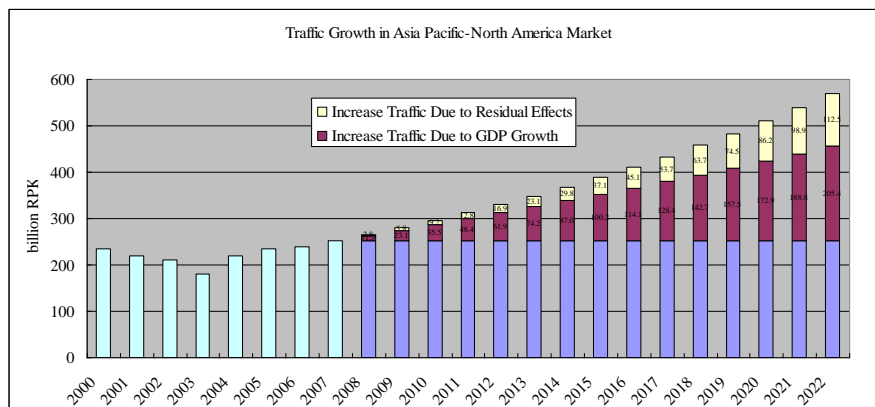


## Effects on Intercontinental Markets:

The inter-continental markets largely tell the same story as in the intra-continental markets:

- All inter-continental markets experienced negative residual growth during the 2000 – 2007 period. Markets involving North America (NA) were hurt more than Asia Pacific (AP) – Europe market. The annual residual growth rate under scenario-1 (GDP elasticity of 1.0 for Europe and NA and 1.3 for AP) was -3.69% for AP-NA and -2.63% for Europe–NA, as compared to -0.1% for AP–Europe. The same factors contributed to the slower residual growth rate in Intra-NA market discussed previously are likely to have contributed to this slower traffic growth in the inter-continental markets involving NA. In particular, the tightened security check and other travel restrictions may have contributed significantly to such slower growth. For example, even if US and China sign up their Open-skies agreement right now, the residual growth rate for this market is likely to be negative (i.e., potential demand driven by economic growth may not be fully realized) since it is difficult for ordinary Chinese citizens to obtain US entry visa.
- Exhibit 7-17 plots the future traffic growth and the decomposition result of the growth into the GDP growth effect and the residual growth effects for the AP-NA intercontinental market, while Exhibits 7-18 and 7-19 show the similar decomposition for the AP-Europe market and the North Atlantic (NA-Europe) market.

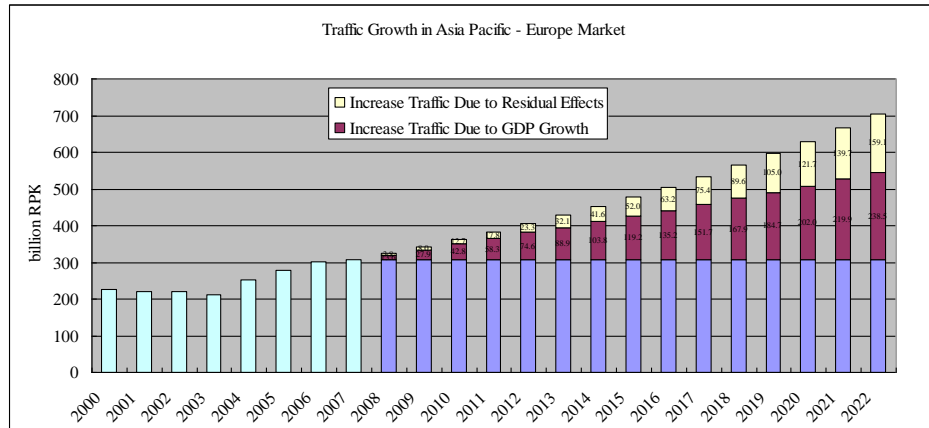
**Ex. 7-17, Expected Passenger Traffic Growth:  
AP-NA Market – GDP effect + Residual**



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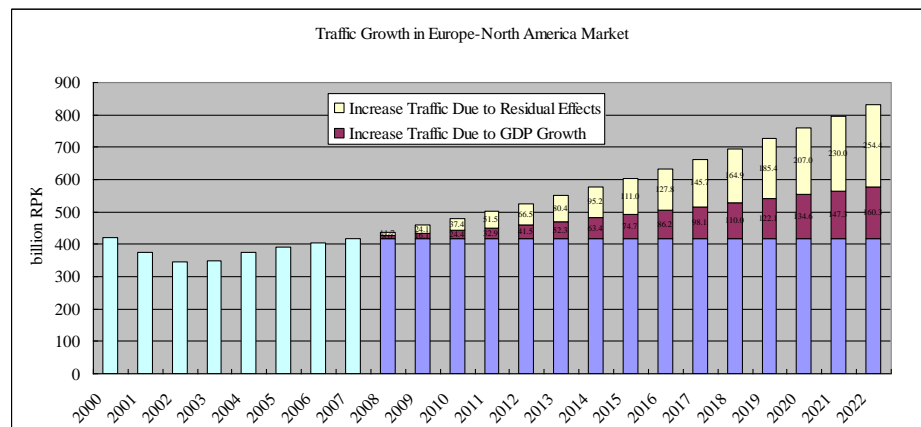
Ex. 7-18, Expected Passenger Traffic Growth:  
**AP-Europe Market - GDP effect + Residual**



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Ex. 7-19, Expected Passenger Traffic Growth:  
**North Atlantic Market - GDP effect + Residual**



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## Inter-Continental vs. Intra-Continental Markets:

- Because of the regional open skies agreements (e.g., the Canada – US open skies agreements, Single European Aviation market, Australia – New Zealand Single Aviation Market, ASEAN open skies agreements (negotiation on-going), North East Asian liberalization (discussion on-going), etc.) the intra-continental markets tend to be more liberalized as compared to the inter-continental markets. As a result, in the future, liberalization will likely to contribute more traffic growth in the inter-continental markets as compared to intra-continental market. As forecasted (in scenario-1), the residual traffic growth for inter-continental markets are all close to 2% during the periods of 2012-2017 and 2017-2022, which are significantly higher than those for the intra-continental markets for the same periods.

## Short Summary on the Decomposition Results of Traffic Growth:

In summary, the decomposition of future traffic growth forecast into the GDP effects and the residual traffic growth (which includes effects of changes in price and service quality) indicate the following:

- After removing GDP effects, the residual traffic growth in the intra-Asia Pacific market is negative (-0.77% per year) for the 2007-2012 period even when a low GDP elasticity value of 1.3 is used. This mean that traffic growth in intra-AP market is not likely to occur because of the relatively restrictive regulations exist in the market.
- On the other hand, intra-European market has the highest residual traffic growth rate (1.63% per year), meaning that the deregulation in single EU market will continue to reduce airfares and improve service quality, which in turn increase passenger traffic.
- As for inter-continental markets, the residual traffic growth will be highest in the North-Pacific (Europe-NA) market probably because this market has been deregulated most, especially with the EU-US Open Aviation Area (OAA) Agreement.

### 7.4. Impact of the current global recession

From September 2007, the US economy started to turn downwards, and that impact has now spread to other economies around the world. The overall outlook is unlikely to be cheerful in this year (2009) and might be negative for 2010 as well. The immediate impact of this global recession appears to be a significant cut-back of business travel. There has been a concern that the expected decline in consumer spending could further adversely affect leisure travel, as well as business travel, in the next two years. However, most discussions on the impact of the global recession on air passenger traffic remain impressionistic and speculative at this stage.

To assess the extent to which air travel is being affected, we conduct a regression analysis by employing data from the world airline industry. To ensure a sufficient number of observations, we use the data provided by ICAO, which contain annual revenue passenger kilometers (RPK) as far back as 1980. The numbers are based on aggregate data for all the world's airlines providing scheduled services, and the 1980-2008 series are used as observations for the dependent variable of our regression. As discussed above, all of the air traffic forecasting agencies agree that GDP is the most important determinant of air passenger traffic. So annual world GDP numbers over the 1980-2007 period, obtained from IMF, will be used as our principal explanatory variable. The other main explanatory variable is the fuel price, with the 1980-2007 series obtained from IMF. Although the IMF data contain the projected figures of GDP and fuel price, we searched the figures forecasted by other organization, which are given in Exhibit 7-20. We use the average numbers over these figures in 2008 for our 1980-2008 regression (i.e., \$107.25 for the 2008 fuel price, and a GDP value implied a 3.33 percent growth rate over 2007 for the 2008 GDP).

**Exhibit 7-20, Projected GDP growth rates and fuel prices, 2008-2010**

	2008	2009	2010
<b>GDP Growth (%)</b>			
IMF	3.91	3.03	4.21
USDA	2.48	0.44	2.61
Morgan Stanley	3.60	0.90	3.30
<b>Average</b>	<b>3.33</b>	<b>1.46</b>	<b>3.37</b>
<b>Fuel Price (US\$/barrel)</b>			
IMF	107.25	100.50	-
Goldman Sachs	-	45	70
Citigroup	-	75	-
<b>Average</b>	<b>107.25</b>	<b>73.50</b>	<b>70</b>

Source: IMF (International Monetary Fund); USDA (U.S. Department of Agriculture); Morgan Stanley Investment Group; Goldman Sachs Investment Group; Citigroup Investment Group.

Additionally, it is imperative to control for several major demand or/and supply shocks, including the Gulf-war dummy variable (which equals 1 for year 1991, 0 otherwise), the Asia-financial-crisis dummy (1998), the 9/11 dummy (2001-2002), the SARS dummy (2003), and the Global-recession dummy (2008). With the explanatory and two dependent variables taken the log form, the OLS regression results are reported in Exhibit 7-21.

**Exhibit 7-21, Regression analysis of revenue passenger kilometers, 1980-2008**

Log (RPK)	Coefficient	Std. Err.	t	P> t	[95% Conf. Interval]	
Log (GDP)*	*1.574	0.018	86.900	0.000	1.536	1.612
Log (FUEL PRICE)	-0.058	0.011	-5.340	0.000	-0.080	-0.035
Gulf-war Dummy	-0.025	0.022	-1.150	0.262	-0.071	0.020
Asia-financial-crisis Dummy	-0.020	0.023	-0.840	0.408	-0.069	0.029
9/11 Dummy	-0.070	0.022	-3.120	0.005	-0.116	-0.023
SARS Dummy	-0.104	0.022	-4.640	0.000	-0.150	-0.057
Global-recession Dummy	-0.021	0.026	-0.810	0.426	-0.076	0.033
Constant	-8.306	0.172	-48.330	0.000	-8.664	-7.947
<i>Adjusted R-square: 0.9975</i>						

\* Note that the coefficient for GDP variable should not be interpreted as GDP elasticity of air travel because (a) as discussed above this GDP coefficient is likely to have been confounded by our failure to include such variables as airfares, improved convenience of travel, increased international trade share of GDP, etc, all of which tend to improve during our sample period (1980-2008).

As can be seen from the Exhibit, a 1 percent increase in GDP implies a 1.57 percent increase in the revenue passenger kilometer (RPK), whereas a 1 percent increase in fuel price implies a 0.06 percent fall in the RPK, both of which are statistically significant different from zero. All the dummy variables have the expected negative signs, with the 9/11 dummy and SARS dummy statistically significant. The regression has an adjusted-square of 0.998, meaning almost the entire variations in the dependent variable (RPK) have been explained by those exploratory variables.

As indicated above, our main purpose of doing the regression is to forecast the impact of the current recession on air travel over the 2009-2010. For this purpose, we need the projected GDP growth rates and fuel prices for 2009 and 2010 provided in Exhibit 7-14. We also need an assessment of the “shock” impact of the recession event: that is, the impact in addition to the lower-than-normal GDP growth rates projected for those two years. Here we consider three such views: first, the impact will be the same as the effect captured by the “Global-recession dummy” in Exhibit 7-15, i.e., the occurrence of the recession implies a 0.02 percent fall in the RPK, other things being equal. With view, we shall then apply a downward-adjustment of 0.02 percent when forecasting for the 2009 and 2010 RPK. Nevertheless, since this variable captures only the effect in 2008 when the full impact of economic down-turn is yet seen, this might represent an “optimistic view” with respect to the severity of the current global recession.

The second view, the so-called “in-between view,” treats the global recession to have the same impact as the SARS effect, thereby applying a downward adjustment of 0.10 percent in the forecasts. Note that this downward adjustment is about 5 times of the optimistic adjustment. Finally, the “pessimistic view” considers the current global recession will have a 50 percent severer adverse impact on RPK than the SARS, implying a downward adjustment of 0.15 percent in the forecasts.

Applying these views and using the above regression results, we obtain the forecast results given in Exhibit 7-22. The “optimistic view” yields world RPK of 4,480.4 billion in 2009 and 4,733.7 billion in 2010, which represent 4.6 percent and 10.5 percent increases, respectively, over the 2008 RPK level. On the other hand, the “pessimistic view” yields world RPK of 3,938.9 billion in 2009 and 4,161.6 billion in 2010, both lower than the 2008 level. Finally, the “in-between view” yields a world RPK of 4,125.4 billion in 2009 – a 3.7 percent contraction over the 2008 level. Further, it implies a world RPK of 4,358.6 billion in 2010, which represent a 1.7% percent increase over the 2008 level. We consider that the forecasts between the in-between and pessimistic views (but closer to the in-between view) appear to be more sensible than those under the optimistic view, given the depth and width of the global recession under consideration.

**Exhibit 7-22. Forecasted World RPK for 2009-2010 (billion)**

	2009	2010
Optimistic view	4,480.4 (4.6%)	4,733.7 (10.5%)
In-between view	4,125.4 (-3.7%)	4,358.6 (1.7%)
Pessimistic view	3,938.9 (-8.1%)	4,161.6 (-2.8%)

Note: % changes over the 2008 RPK level are given in parentheses.

One possible bright spot for the industry might be that the Asian economy outside of Japan might turn out to be more resistant to the downturn. For instance, Chinese economic growth is as much led by investment and deregulation as through exports. Another important thing worth noting is that within the industry, low cost carriers (LCCs) will likely outpace full service airlines in terms of traffic growth and profitability in 2009 and 2010. The predicted tougher economic conditions and lower fuel prices will give the LCC sector a major advantage in the next year or two.

## 7.5. Impact of fuel price

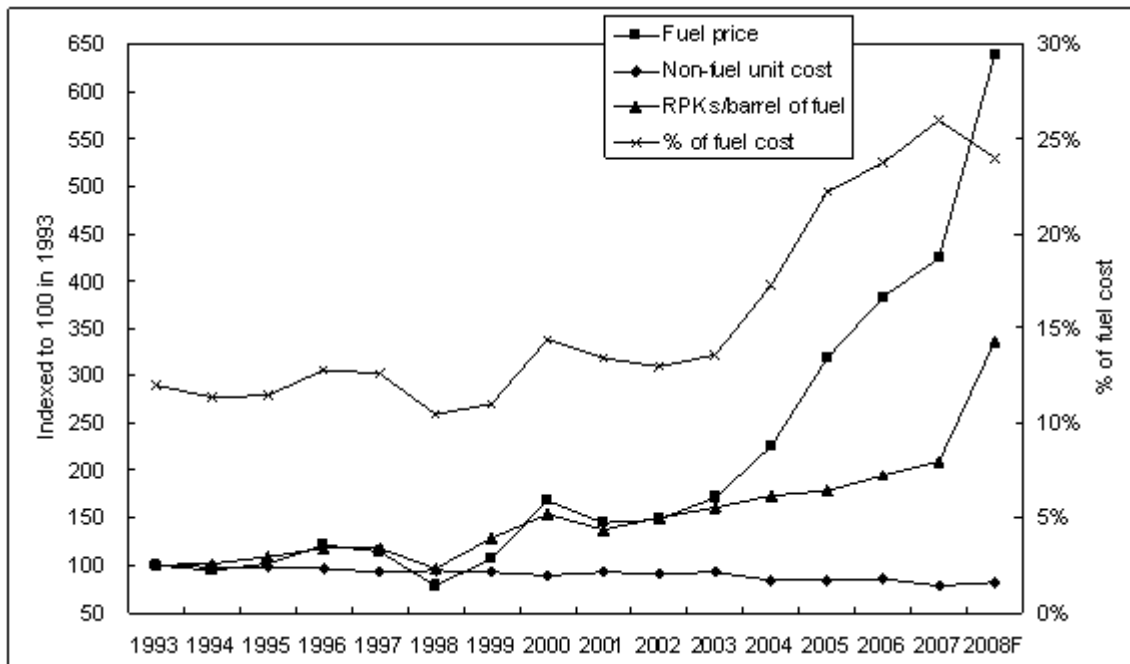
There have been unprecedented rises in costs of fuel since 2001. Exhibit 7-23 shows fuel prices over the 1993-2008 period.<sup>33</sup> The price of fuel has risen from an average of \$24.33 a barrel in 2001 to \$64.71 a barrel in 2006, to \$71.13 in 2007, and is \$107.25 in 2008

33. Consistent data used in generating the four series in Exhibit 7-17 are not available for the pre-1993 years.



(projected). This rise contrasts with the slight, gradual decline in non-fuel expenses, measured on an RPK basis (see the Exhibit). The result is that for international airlines, fuel costs that constituted 13.5% of operating costs in 2001 climbed to 26.0% by 2007.

**Exhibit 7-23: Fuel price, fuel productivity, share of fuel cost and non-fuel unit cost, 1993-2008**



Notes: 2008F = forecast figures for 2008.

Source: Calculation based on the ICAO database, <http://icaodata.com/>.

The airlines' response to escalating fuel prices is documented in the remaining two series in Exhibit 7-17. Fuel productivity (RPK per barrel of fuel) increases in step with the rising the fuel price, showing airline attempts to conserve fuel as it becomes more expensive. This productivity increase presumably arises from two separate adjustments as investigated in Brueckner and Zhang (2008): (i) the improving fuel efficiency of new aircraft, along with a shift in fleet composition toward such aircraft (retiring older aircraft) and with making efficient use of them, and (ii) higher load factors. Both adjustments lead to lower fuel usage per passenger kilometer, and together, they would serve to moderate the price-driven increase in fuel expenses as a share of operating cost. As can be seen in the fourth series of the Exhibit, the rate of increase in this share declines after 2005, with the share actually falling in 2008 (from 26 percent in 2007 to 24 percent in 2008) despite the large fuel-cost spike in that year. This is also consistent with the observation that beyond the fuel saving measures, airlines usually come up with other ways to save costs.

That the industry can adapt to high fuel price might also be shown by the fact that it managed to make fairly good profits in 2007, despite an average fuel price of \$71. This improvement in profitability has, of course, also been very much helped by strong global economic growth, which allowed extra fuel costs to be absorbed. Even in the first half of 2008 when the fuel price reached its historical highest point and when the global economy started to decline, some of the airlines managed to make profits; see Exhibit 7-24

**Exhibit 7-24. Airline Profits in the First Half of 2008 (million US\$)**

American Airlines	-1776.0
Delta Airlines	-137.0
United Airlines	-542.0*
Continental Airways	-110.0
Southwest Airlines	164.0
Air Canada	-166.0
Air France-KLM	519.8
Lufthansa	542.7
British Airways (Apr.-Sep.)	211.4
Cathay Pacific	-86.2
JAL	403.4
Air China	186.6
Korea Air	-460.8

Note: \*first three months profit

Source: Financial reports of individual airlines.

Nevertheless, the increase in fuel price does put financial pressures on the airlines to the extent that some have imposed fuel surcharges that have added on the fares paid by passengers, a fare-rise outcome predicted by Brueckner and Zhang (2008). This is consistent with our previous regression result: an increase in fuel price will, via an increase in fares, reduce air passenger traffic. The predicted lower fuel prices discussed above will, nevertheless, give the industry a much needed break in the next year or two.

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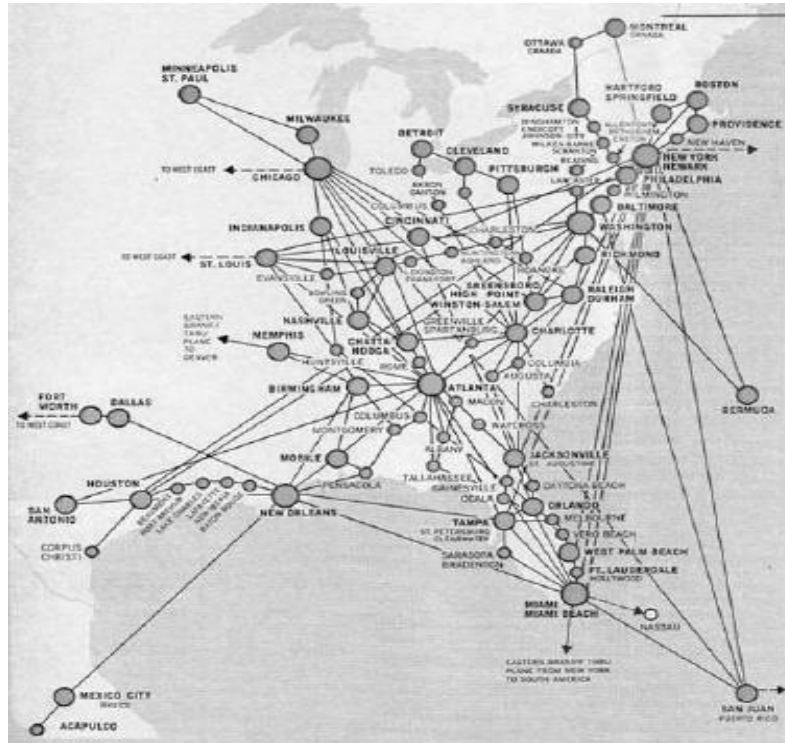
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## Appendix A. US airline network restructuring: from Point-to-Point network to Multi-hub networks

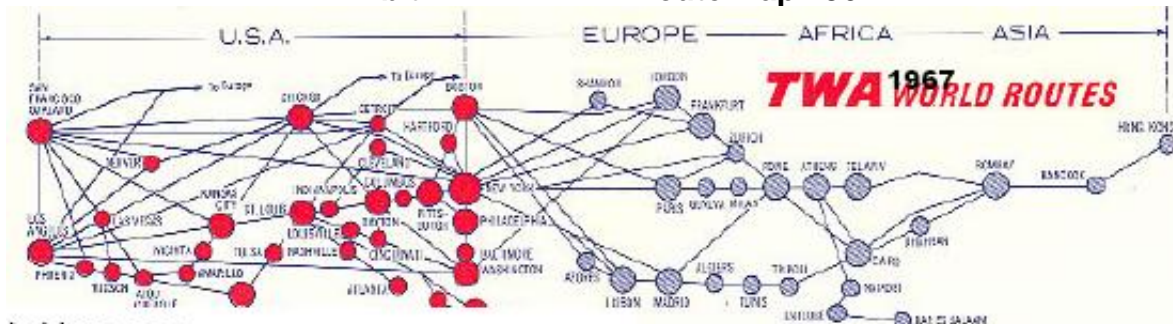
When regulations were introduced in the US market, the air carriers used the regulatory protection of CAB to cross-subsidize between lucrative high density trunk routes and thin money-losing routes. The resulting networks were generally “point-to-point” systems, as illustrated in a representative trunk carrier route maps in Exhibit A-1 and Exhibit A-2.

**Exhibit A-1 Eastern Airlines Route Network 1965**



Source: Boreinstein and Rose 2007

**Exhibit A-2. TWA Air Route Map 1967**



Source: Boreinstein and Rose 2007

Massive merger and acquisition were carried out after the U.S. deregulation in 1978. Morrison and Winston (1989) concisely summarized the key transactions as in Exhibit A-3:

**Exhibit A-3. Airline Industry Consolidation within  
a Decade After 1978 Deregulation**

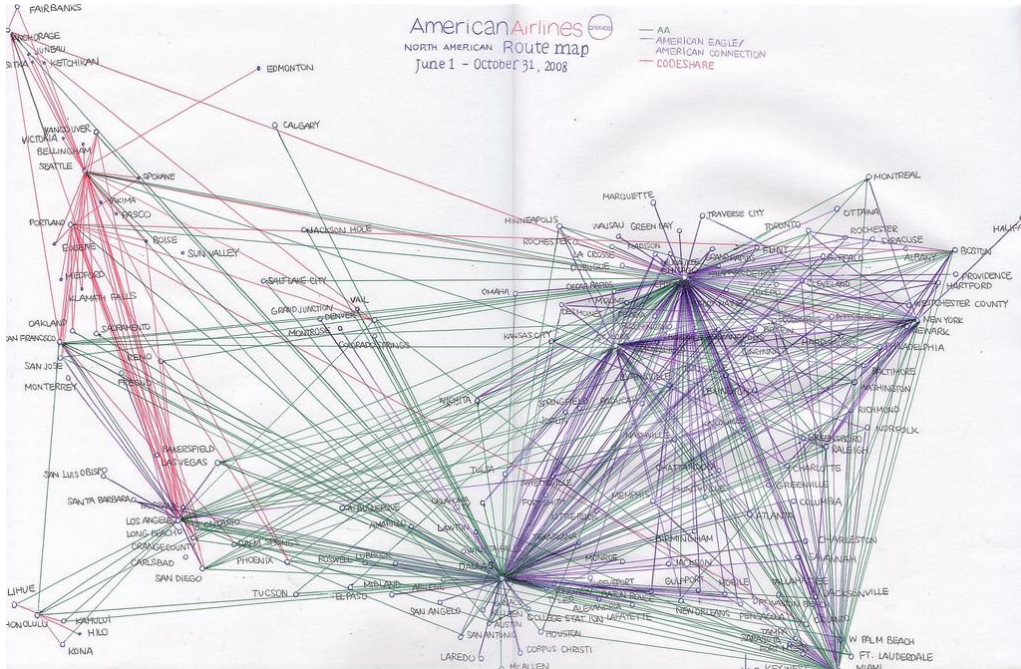
<i>Year</i>	<i>Carriers</i>	<i>Status<sup>a</sup></i>
1987	USAir-Piedmont	Approved by DOT
	American-Air California	Approved by DOT
	USAir-Pacific Southwest	Approved by DOT
1986	Delta-Western	Approved by DOT
	Texas Air-People Express	Not-anticompetitive finding by DOJ
		Approved by DOT
	Texas Air-Eastern	Approved by DOT after sale of slots to Pan Am Shuttle
	Trans World Airlines-Ozark	Opposed by DOJ
		Approved by DOT
1985	Northwest-Republic	Opposed by DOJ
		Approved by DOT
1985	United-Pan American <sup>b</sup>	Opposed by DOJ
		Approved by DOT
1982	Air Florida-Western	Approved by CAB
1981		Not consummated
	Continental-Western	Approved by CAB
		Not consummated
1980	Texas International-Continental	Approved by CAB
	Republic-Hughes Air West	Approved by CAB
1979	Pan American-National	Approved by CAB
	Texas International-National	Approved by CAB
		Not consummated
	Eastern-National	Anticompetitive finding by CAB
		Not consummated
	Continental-Western	Rejected by CAB
	North Central-Southern	Approved by CAB

Source: Morrison and Winston (1989)

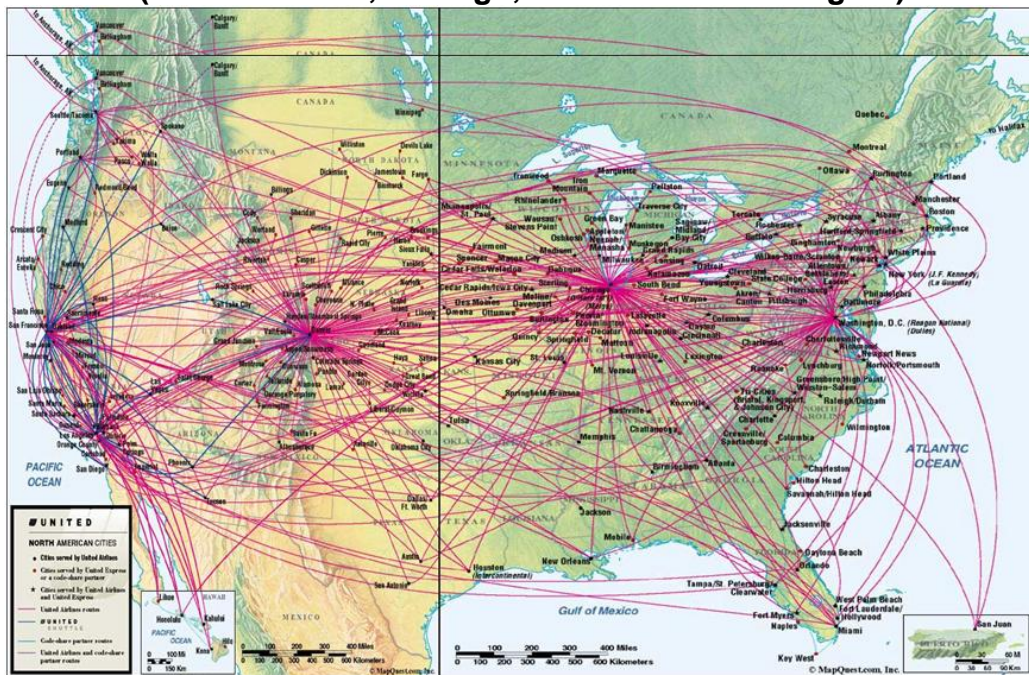
Accompanied with these market consolidation initiatives, six major U.S. network carriers formed their multiple hub network. The details are illustrated in the following network carriers' route maps and Exhibit 4-1 and Exhibit 4-2 for Delta and Northwest route network maps are presented in Section 4.



## Exhibit A-4. American Airlines Multiple Hub Network (Dallas, Chicago, Miami, Nashville, Raleigh-Durham, New York, and Los Angeles)



## Exhibit A-5. United Airlines Multiple Hub Network (San Francisco, Chicago, Denver and Washington)

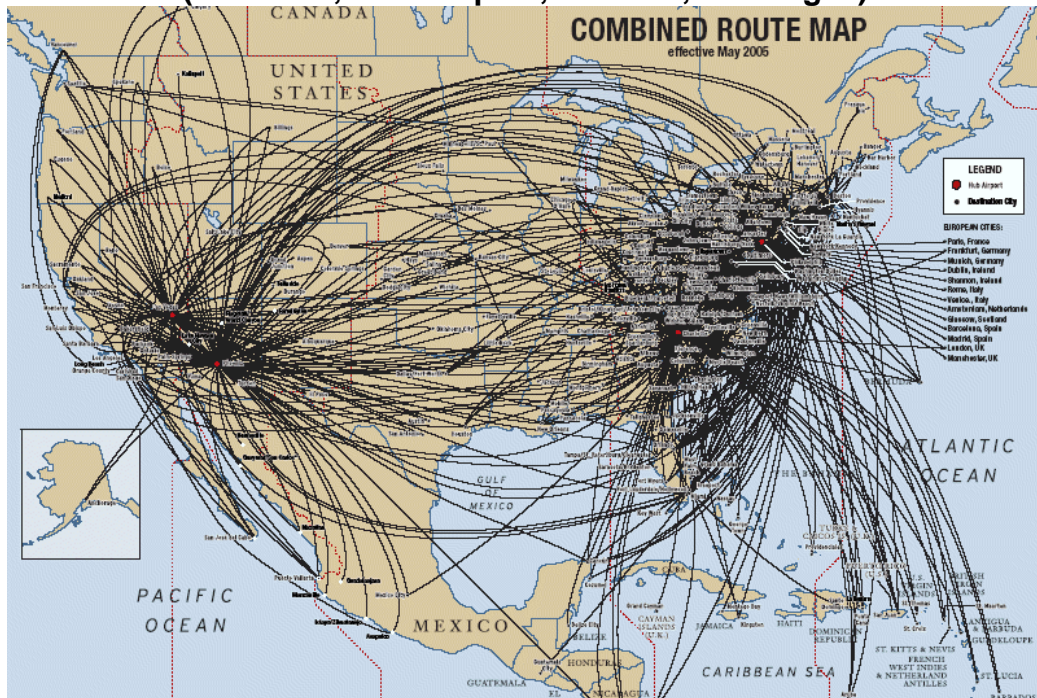




### Exhibit A-6, Continental Airlines Multiple Hub Network (Newark, Houston and Cleveland )



### Exhibit A-7, U.S. Airways Hub Network (After merger with America West) (Charlotte, Philadelphia, Phoenix, Las Vegas)



## Appendix B. List of Acronyms

ADS: Approved Destination Status  
ASA: air services agreement  
ATA: Air Transport Association of America  
CRS: Computer Reservation System  
CTA: Canadian Transportation Agency  
DFAIT: Foreign Affairs and International Trade Canada  
DfT: UK Department for Transport  
DOT: US Department of Transportation  
ECAA: European Common Aviation Area  
ECJ: European Court of Justice  
EEC: European Economic Community  
ETS: Emissions Trading Scheme  
EU: European Union  
FFP: frequent flyer program  
GATS: General Agreement on Trade in Services  
GATT: General Agreement on Tariffs and Trade  
GDP: Gross domestic product  
HKG: Hong Kong Airport  
IATCPA: International Air Transportation Competition Promotion Act  
ICAO: International Civil Aviation Organization  
ICN: Incheon (Seoul) Airport  
IATA: International Air Transport Association  
LAX: Los Angeles Airport  
MNL: Manila Airport  
MOU: Memorandum of Understanding  
NRT: Tokyo Narita Airport  
OAA : Open Aviation Area Agreement between EU and US  
OD: Origin and Destination  
PAX: Passengers  
PEK: Beijing Airport  
PVG: Shanghai Pudong Airport  
SFO: San Francisco Airport  
TILMA: Trade, Investment and Labour Mobility Agreement  
TWOV: Transit Without Visa  
UAE: United Arab Emirates  
WTO: World Trade Organization  
YVR: Vancouver Airport