

Airport Systems

Planning, Design, and Management

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CHAPTER 1

The Future of the Airport and Airline Industry

Airport systems exist in the context of their major clients, the airlines. To build airport facilities that will perform effectively over the 30 to 50 years of their lifetime, it is necessary to appreciate this context. Understanding the state of the airport/airline industry in the early twenty-first century gives a perspective on its future. This is the starting point for a forward-looking text on airport systems planning.

Three trends dominate the airport/airline industry in the early twenty-first century:

1. *Long-term growth*, which has been about 4 percent per year worldwide. This implies a doubling of traffic about every 15 to 20 years and drives the demand for expansion and improvement. It also leads to the development of new airports, of multiple airport systems in metropolitan areas, and of niche airports serving leisure traffic or cargo.
2. *Organizational change*, as economic and political deregulation continues to spread worldwide. Economic deregulation creates opportunities for low-cost and integrated cargo airlines to grow, impels governments to privatize their airlines and airports, and leads traditional airlines to consolidate. Political deregulation, such as open-skies agreements, enables new markets, changes in traffic patterns, and increases competition. These ongoing changes in airport clients and their needs make for an uncertain, instable future. Airports will consequently have to plan flexibly so that they can adapt easily as required.

3. *Technical change*, most obviously in aircraft and air traffic control, but also contextually, particularly as regards information technology that continues to redefine the way we do business. These developments increase the efficiency and the capacity of airport facilities and processes. Airports need to adapt to these new opportunities as they occur.

Taken together, these trends are substantially changing the context, objectives, and criteria of excellence and efficiency for airport systems planning and design.

1.1 The Airport Industry in the Early Twenty-First Century

Airports and air transport continue their exciting long-term growth. The industry is large, innovative, and has excellent prospects. We need to appreciate this historical base before launching into the future. Moreover, the industry is in the midst of substantial organizational and technical changes that are redefining the practice of airport systems planning and design.

The industry is large. As of 2012, it involves about 2.5 billion airline passengers worldwide plus large amounts of cargo. Its annual revenues are more than U.S. \$0.5 trillion (one million million dollars). The world airlines operate approximately 12,400 major jet aircraft, valued in the hundreds of billions of dollars. The annual investments in airport infrastructure come to about \$10 billion a year. To put these figures in perspective, the industry moves the equivalent of well over a third of the world's population every year, and its revenues are close to 40 percent of the gross domestic product of the United States. By any measure, this is an important activity.

The industry is actively growing. From 1990 to 2012, the worldwide long-term growth rate in the number of airline passengers has been about 4 percent a year—averaging periods of stagnation and boom. During that period, global passenger traffic grew by 120 percent; it more than doubled. As of 2012, this growth was mostly occurring in Asia, where air transportation is becoming increasingly affordable to its large populations. In the first decade of the twenty-first century, annual passenger traffic grew at an average of 9 percent in Asia, 5 percent in Europe, and 1 percent in North America.

Airport planners thus routinely have to deal with the possibility of 25 to 100 percent increments in demand. This is because the planning horizon for large-scale infrastructure projects is normally between 10 and 15 years, because of the need to create the designs, assemble financing, and proceed successfully through political and environmental reviews.

The growth in air transport translates into major airport projects. About a dozen major programs for airport development, costing over

| City | Project |
|----------------------|---|
| Athens | New international airport |
| Atlanta | New runway, new international building |
| Bengaluru | New international airport |
| Bangkok/Suvarnabhumi | New international airport |
| Barcelona/El Prat | New terminal and new runway |
| Beijing | New terminal, runway, and rail link to city |
| Berlin/Schönefeld | Complete airport overhaul |
| Chicago/O'Hare | New runways, terminals |
| Dallas/Fort Worth | New automated people mover |
| Delhi | Complete airport overhaul |
| Dubai | New passenger terminal, cargo terminal |
| Hyderabad | New international airport |
| London/Heathrow | \$7 billion Terminal 5, Terminal 2 |
| Nagoya/Chubu | New international airport |
| New York/Kennedy | JetBlue terminal and railroad connection |
| Madrid/Barajas | New terminals and a runway |
| Paris/de Gaulle | New terminals |
| Seoul/Incheon | New international airport |
| Singapore | New Terminal 3 and low-cost terminal |
| Shanghai/Pudong | New international airport |
| Toronto/Pearson | Complete airport overhaul |
| Tokyo/Haneda | New runways, terminals |

TABLE 1.1 Some Billion-Dollar-Plus Airport Projects of 2002–2012

a billion dollars each, are typically under way at any time. Table 1.1 illustrates the situation. Naturally, many smaller projects are ongoing simultaneously.

Airline/airport traffic has been concentrated in the United States. It is the locus of close to half the worldwide air transportation and airport activity. U.S.-based airports and airlines dominate their competitors in size. In 2011, U.S.-based airlines accounted for 7 of the top 10 airlines (Table 1.2). Likewise, many of the busiest airports in the world in terms of the number of passengers have been in the United States. In 2011, U.S. airports occupied 7 of the 20 top spots (Table 1.3). The U.S. share of the world traffic has, however, been decreasing as traffic grows in Europe, the Middle East, and Asia. Its market share fell from about 40 percent in 1990 to around 30 percent in 2011.

| Major Airlines | Associated Airlines | Aircraft |
|---------------------------|-------------------------------------|------------|
| American | American Eagle | 861 |
| Delta | | 762 |
| Southwest/Air Tran | | 716 |
| United/Continental | | 703 |
| FedEx | Includes charters | 654 |
| Lufthansa | Austrian, CityLine, Brussels, Swiss | 539 |
| UPS | Includes charters | 526 |
| Air France | KLM, Cityhopper | 422 |
| US Airways | US Airways Express | 382 |
| China Southern | | 377 |
| British Airways | Iberia, Iberia Express | 343 |

Sources: www.airfleets.net; www.fedex.com; www.pressroom.ups.com.

TABLE 1.2 U.S.-Based Airlines Were the Largest in the World in 2011 (ranked by size of fleet)

The United States has been a leader in the development of mass air transport. As of 2011, people in the United States on average took 2.3 trips by air every year. This rate was about triple that of Europe and 10 times that in the rest of the world. Historically, average fares in the United States were considerably less expensive than elsewhere.

The air transport industry in the United States faced the challenges of high volumes of traffic well ahead of the rest of the world. It has correspondingly led in the development of major innovations that continue to transform, commercial aviation and airport planning and design worldwide. Table 1.4 indicates some of them. These innovations, together with the trends discussed in the following sections, have been radically changing the concept of airport systems planning and design. Indeed, airport systems planning and design in the United States has differed significantly from that in the rest of the world. Therefore, to the extent that countries follow American examples, they will be introducing significant changes.

Airlines in the United States have always been private. Elsewhere, however, governments usually owned and operated airlines and airports. It was only around the 1990s that Britain, the Netherlands, Germany, and Japan began to privatize their airlines, setting off a worldwide trend.

Airports in the United States generally operate in an implicit public-private partnership. Public entities own the land and are responsible for the runways and other airside facilities. Private companies design, build, and operate much of terminals, hangers, and other

| | Airport | Passengers (millions) | Movements (thousands) |
|-----------|----------------------------------|----------------------------------|----------------------------------|
| 1 | Atlanta | 92 | 950 |
| 2 | Beijing/International | 77 | 518 |
| 3 | London/Heathrow | 69 | 455 |
| 4 | Chicago/O'Hare | 67 | 883 |
| 5 | Tokyo/Narita | 62 | 343 |
| 6 | Los Angeles/International | 62 | 667 |
| 7 | Paris/de Gaulle | 61 | 500 |
| 8 | Dallas/Fort Worth | 58 | 652 |
| 9 | Frankfurt/International | 56 | 464 |
| 10 | Hong Kong/Chek Lap Kok | 53 | 316 |
| 11 | Denver | 53 | 630 |
| 12 | Jakarta/Soekarno-Hatta | 52 | 310 |
| 13 | Dubai/International | 47 | 307 |
| 14 | Amsterdam/Schiphol | 50 | 402 |
| 15 | Madrid/Barajas | 50 | 434 |
| 16 | Bangkok/Suvarnabhumi | 48 | 270 |
| 17 | New York/Kennedy | 48 | 400 |
| 18 | Singapore | 47 | 369 |
| 19 | Guangzhou/Baiyun | 45 | 329 |
| 20 | Las Vegas/McCarran | 41 | 506 |

Source: Airports Council International, 2012.

TABLE 1.3 Busiest Airports in the World in 2011 (ranked by number of passengers)

landside facilities. Most important, private sources provide much of the money for airport infrastructure.¹ Airports in the United States have therefore traditionally paid close attention to the returns on investments and ways to make the facilities pay. In this, the United States contrasts with other countries whose airports were almost all owned, designed, financed, built, and operated by government employees until the trend toward airport privatization began in the 1990s.

¹Major airports in the United States raise capital to build passenger buildings, hangars, garages, and the like through bonds offered to private investors or through fees charged to passengers [the Passenger Facility Charge (PFC)]. The U.S. government, through its Federal Aviation Administration, pays a share of the cost for runways, air traffic control, and safety measures. The government contributions are most significant at smaller airports but less important at established major airports.

| Innovation | Implications and Effects |
|---------------------------------------|---|
| Economic deregulation | Airlines can fly where they want and charge any fare. Spread to Canada, Australia, European Union, etc. |
| “Southwest” model of low-cost airline | Copied worldwide (Westjet in Canada, Ryanair in Europe, AirAsia in Asia, etc.) |
| U.S. “open-skies” policy | Deregulation of airline routes between the United States and over 100 other countries |
| Airline alliances | Coordination of flights, frequent flyer benefits, etc. (Oneworld, SkyTeam, Star Alliance) |
| Integrated air cargo services | Simplification of small cargo service, strong impulse on e-tail (FedEx, UPS, etc.) |
| Transfer hubs | Airline efficiency, higher flight frequency (Atlanta, Chicago/O’Hare, Dallas/Ft. Worth, Denver, etc.) |
| Midfield concourses | Rapid, efficient transfer of connecting passengers (airports above, also in England, Spain, Malaysia, etc.) |
| Automated people movers | Wide use at transfer hubs (Tampa, midfield concourses, between terminals) |
| Global positioning system | Reduces needs for ground navigation facilities, enables more direct and economical airline routings |

TABLE 1.4 Organizational Innovations in Air Transport from the United States

The preceding means that the context, objectives, and criteria of excellence for airport planning, management, and design are fundamentally changing. Rapid changes in the industry require strategic thinking and the flexibility to adapt to new circumstances. Increased commercialization and privatization of airports calls for an appreciation of the economic and financial aspects of airport operation. Narrow technical excellence is not sufficient to deliver good value for money for airports. Airport professionals need to create dynamic, strategic plans that incorporate flexible designs and enable airport operators to manage their risks.

The current environment for airport planning and design requires a systems approach. This contrasts with traditional airport engineering that has tended to focus narrowly on technical matters to the exclusion of issues such as costs and revenues, volatile traffic and risks, and operations and management. Government and international agencies have set fixed design standards that did not allow tradeoffs between cost and service. Textbooks followed the same vein. (See, e.g., FAA, 1988; IATA, 2004; ICAO, 1987; Horonjeff et al., 2010; Ashford et al., 2011.) Comprehensive systems planning and design has not been the norm.

In response to current needs, this text broadly considers the range of factors that shape the performance of the airport. It expands the concept of airport planning and design to include operations and long-term management through technical and economical measures. Correspondingly, it uses a wider range of tools for analyzing preferable solutions, as