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CHAPTER VIII

AIRPORTS*

SYNOPSIS

* Portions of this Chapter were adapted from Paul Stephen Dempsey, *Airport Planning & Development* (McGraw-Hill 2000), and Paul Stephen Dempsey, Andrew Goetz & Joseph Szyliowicz, *Denver International Airport: Lessons Learned* (McGraw-Hill 1997).

I. AIRPORT PLANNING

A. THE PLANNING PROCESS

The capacity of an airport is constrained by the weakest link in the chain of (1) airway capacity, (2) runway capacity, (3) apron capacity, (4) terminal capacity, or (5) surface access capacity.[1] Bottlenecks anywhere along the path of the aircraft, the surface transportation vehicle, the pedestrian, the freight or mail create obstructions to efficiency and impose economic and non-economic costs. An airport's maximum capacity is defined by the maximum capacity of its runways, gates, terminal facilities, baggage handling capacity, trains, curb space, roads, or parking, for example. Congestion at any point along the path can back up movements at any earlier point along the path. What good is a prompt landing if there is no gate at which to park the aircraft? What good is a prompt departure from a gate if the queue at the runway is 30 aircraft? What good is a timely arrival if the bags take an hour to work their way to the carousel? What good is an expeditious airport if the roads leading to and from it are mired in bumper-to-bumper automobile gridlock?

Airports therefore must plan to meet capacity requirements with infrastructure growth, and they must do so from a comprehensive perspective, taking into account all the elements of movement, any one of which can destroy the efficiency of the whole. Unfortunately, where demand for new airport infrastructure is high, the physical and environmental impediments, as well as political opposition for

[1] Peter Trautmann, The Need for New Airport Infrastructure (paper delivered before International Conference on Aviation & Airport Infrastructure, Denver, Colorado, Dec. 5, 1993).

expansion or new airport development tend also to be high.[2] Congested airports tend to be located in crowded metropolitan areas. Thus, urban areas typically need additional airport capacity to satiate passenger and cargo demand, but urban airports are hemmed in by development, making it particularly difficult to expand beyond their existing boundaries, at least in terms of land-consumptive runways, taxiways, terminals, hangars and cargo warehouses.

Airport planning must also be flexible, recognizing that the evolution in demand and technology will mandate changes in the airport's design. New airports typically have long planning horizons. A mere decade was consumed between Denver's decision to build a new airport and its completion. Osaka's Kansai International Airport opened 26 years after initial site selection for a new airport had begun. Munich's Franz Josef Strauss Airport opened 38 years after it was originally conceived. More than four decades after the need for a second airport at Bangkok was recognized, the new Bangkok International Airport was opened. Thus, planning must evolve as demand and technology evolves. And planning must incorporate modular designs and sufficient space to accommodate demand and technological driven expansion once the airport is open, or new infrastructure has been built.

An airport first should attempt to identify what it is -- an origin-and-destination facility, or a connecting hub, or an international gateway, or a regional end point -- and develop the facilities to support the needs so identified. Airport planning must be performed within a strategic framework, requiring strategic planning rather than tactical reactions. Most importantly, the organization must reflect the cornerstones of the airport business:

- Safety and security;
- Customer service;
- Environmental sensitivity; and
- Financial responsibility.[3]

Systems planning examines the need for and relationships between various kinds and sizes of airports serving the overall aviation transport system. This may require coordination by national, state and local

[2] Peter Trautmann, The Need for New Airport Infrastructure (paper delivered before International Conference on Aviation & Airport Infrastructure, Denver, Colorado, Dec. 5, 1993).
[3] Address of Louis Turpen Before the Annual Meeting of the Canadian Transport Lawyers' Association, Montreal, Canada (Dec. 4, 1998).

governmental institutions, each assessing their respective geographic dimensions of the total equation. In the United States, the Federal Aviation Administration issues a periodic National Plan of Integrated Airport Systems.[4]

B. PUBLIC INPUT & ACCEPTANCE

In most communities, airport planning transcends technical engineering and design issues. It is a complex and politically sensitive public process. Many different airport users and diverse interests must be accommodated. Legal (principally environmental) restrictions influence decision making. Political considerations must be accommodated. The business community and the press can also be highly influential in molding governmental and public opinion.[5] Several constituencies must be involved early and throughout -- the politicians, the various governmental agencies, the tenants, the business community and the general public.[6] Their involvement avoids unnecessary surprises, and helps build consensus.[7] Therefore, the airport planning process should be characterized by consultation and cooperation between various constituencies.

The planning organization should seek the advice and input of interest groups prior to and during the preparation of the airport master plan.[8] A *master plan* is the comprehensive and detailed concept for the ultimate development of an airport, both in terms of aviation and non-aviation uses, and the use of land adjacent to it.[9] The process should be undertaken in a way that ensures that the plan thereby produced will receive acceptance by the appropriate governmental officials and the general public.[10]

C. THE PLANNING ORGANIZATION

In the preplanning stage, an organization is established to undertake the study, develop a work program, and provide a means for

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[4] James Spensley, Airport Planning in Airport Regulation, Law & Public Policy 63, 64 (R. Hardaway ed. 1991).
[5] See generally, James Spensley, Airport Planning in Airport Regulation, Law & Public Policy 63 (R. Hardaway ed. 1991).
[6] International Civil Aviation Organization, Airport Planning Manual 1-1 (1987).
[7] Federal Aviation Administration, Airport Master Plans 5 (1985).
[8] International Civil Aviation Organization, Airport Planning Manual 1-7 (1987).
[9] Robert Horonjeff & Francis McKelvey, Planning & Design of Airports 184 (4th ed. 1994).
[10] International Civil Aviation Organization, Airport Planning Manual 1-3, 1-5 (1987).

financing the project.[11] The organization should establish policy that is acceptable to the airport community, bring together for advisory and coordinating purposes the relevant aviation and non-aviation interests, and provide a process that is both technically sound and responsive to aviation policy and the coordination of the various constituencies. Thus, the planning organization should perform three principal functions: (1) policy formulation; (2) advice and coordination; and (3) technical planning.[12] Failure to do this properly may result in fragmented public support for the master plan's recommendations, unrealistic recommendations unacceptable to the aviation community, and a completed study of little utility and difficult to implement.[13] For complex projects, formal policy, technical and review committees meet regularly. Ideally, they open their meetings to the public. Frequently, once the project has been properly scoped, consultants are hired to provide data, plan development, alternatives assessment and other assistance.[14]

In 1944, New York Mayor LaGuardia wrote a letter inviting several airline presidents (including Pan Am's Juan Trippe, TWA's Jack Frye, United's Bill Patterson, and Eastern's Eddie Rickenbacker) to a planning meeting in his office to discuss runway layouts:

> I have heard some grousing about the present layout which I know is not justified. If you have any cockeyed ideas on tangent runways that have not yet been tried out, keep them for some other time.
>
> I am willing to hear constructive criticisms and to receive helpful suggestions. I cannot compete against white tablecloths and soft pencils. Anyone who gets two drinks under his belt is now designing runway layouts on restaurant tables. . . .
>
> You may bring anyone you desire from your engineering, technical and piloting staff. Lawyers cannot contribute anything. This is not a legal matter.[15]

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[11] Federal Aviation Administration, Airport Master Plans 13 (1985).
[12] International Civil Aviation Organization, Airport Planning Manual 1-9 (1987).
[13] International Civil Aviation Organization, Airport Planning Manual 1-9 (1987).
[14] Federal Aviation Administration, Airport Master Plans 14-15 (1985).
[15] Letter from F. M. LaGuardia to O.M. Kemp et al., Jan. 29 1944.

D. NEEDS ASSESSMENT & DEMAND FORECASTING

Needs assessment usually requires forecasting of anticipated aviation activity. *Forecasting* requires an expert judgment, or estimate, of future air traffic and demand. Such forecasts are based on the assumption that assessment of historical data and trends (e.g., aircraft operations, enplaning passengers) may have a predictive relationship vis-à-vis events in the future. An array of aviation, socioeconomic and demographic information will form the basis of the forecast.[16] Forecasters must analyze such information as historical trends in aircraft movements, passenger and cargo volume, population and economic growth characteristics of the region, national and international traffic, geographic factors, and airline industry dynamics, including competition with respect to pricing and frequency, and government regulation.[17] More airline competition typically translates into lower fares, and because of the price elasticity of demand for air travel, more demand. Conversely, less airline competition typically translates into higher fares, and less demand for air travel.[18] Also examined are demand/delay relationships, and the capability of existing airports to satiate present and projected future demand with existing capacity.[19] Projections of the mix and type of aircraft and volume of movements are essential to identify the aircraft which will drive the geometric and structural design of the runways, taxiways, tarmacs and terminals, and the navigational aid requirements of the airport.[20]

Though forecasting is an extremely difficult task, airport authorities, central governments, commercial airlines, and aircraft manufacturers rely on their forecasts for planning purposes.[21] The purpose of forecasting is not to predict the future with precision, but to provide data that can be useful in reducing uncertainty. If overly optimistic forecasts prompt investments in airport infrastructure too early, then premature capital costs and unnecessary operating expenses can be incurred. On the other hand, if overly pessimistic forecasts

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[16] Federal Aviation Administration, Airport Master Plans 17 (1985).
[17] Robert Horonjeff & Francis McKelvey, Planning and Design of Airports (McGraw Hill, 4th ed. 1994); Paul Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 34 (McGraw Hill 1997).
[18] Paul Dempsey and Laurence Gesell, Airline Management: Strategies for the 21st Century (Coast Aire 1997); Paul Dempsey and Andrew Goetz, Airline Deregulation and Laissez Faire Mythology (Quorum 1992).
[19] James Spensley, Airport Planning in Airport Regulation, Law & Public Policy 63, 69 (R. Hardaway ed. 1991).
[20] Robert Horonjeff & Francis McKelvey, Planning & Design of Airports 215 (4th ed. 1994).
[21] Norman Ashford & Paul Wright, Airport Engineering (John Wiley & Sons, 3rd ed. 1992).

dissuade infrastructure expansion, efficiency costs can be high. Thus, the purpose of forecasting is to provide a framework for gauging the timing of airport investments in a way which minimizes forecasting error costs in either the excessively optimistic or pessimistic direction.[22]

Though historical annual and seasonal data are useful, peak demand defines capacity needs.[23] Thus, the annual capacity capability of an airport measured in passengers or volumes of cargo and mail is a relatively less helpful number than the airport's capacity on a peak day at a peak hour. Therefore, forecasts are most useful when converted into peak period data (defined by ICAO as the "typical peak hour," or the 30th or 40th busiest hour) for aircraft movements, and passenger, cargo and mail throughput. Aircraft movements are a useful point of departure in assessing runway, taxiway, apron and air traffic requirements. When coupled with airline and airport employee and accompanying visitor ("meeters and greeters") data, passenger, cargo and mail throughput define terminal and intermodal transport requirements.[24] Specifically, the following data are useful predictors of requisite airport capacity:

1. Annual throughput of international and domestic passengers, cargo and mail, categorized by scheduled and non-scheduled airlines, and general and military aviation, and by arrivals, departures, transit and transfer/trans-shipment;
2. Typical peak hour aircraft movements and throughput of passengers, cargo and mail;
3. Average day of peak month throughput of passengers and aircraft movements;
4. Number of airlines serving the airport, their local and network size, and route structure;
5. Types of aircraft serving the airport;
6. Number of aircraft to be based at the airport, and their base and line maintenance requirements;
7. Intermodal surface transportation connections between the airport and the surrounding metropolitan area;
8. Number of visitors and airline and airport employees by category, including segregation of passengers into origin-and-destination and connecting categories;
9. Historic trends in passenger, freight, mail, and aircraft traffic

[22] Federal Aviation Administration, Airport Master Plans 21-22 (1985).
[23] International Civil Aviation Organization, Airport Planning Manual 1-17 (1987).
[24] International Civil Aviation Organization, Airport Planning Manual 1-13 (1987).

volume;
10. Demographic, population and economic growth characteristics of the region, including the types and levels of business activities, and hotel and motel registrations;
11. Geographic factors affecting transport requirements, including distance from other population centers; and
12. Intra-modal and intermodal competition.[25]

Numerous forecasting techniques have emerged, including forecasting by judgment, trend extrapolation, market share models, econometric models such as multiple regression or logit models for trip generation, trip distribution and modal choice analysis, trend projection and linear, exponential and logistic curve extrapolation.[26] Nonetheless, forecasting remains an extremely subjective process that can result in widely differing predictions depending on the assumptions made and techniques used.[27]

Forecasting is more of an art form than a science, and as an art form, more impressionism or surrealism than realism. During the first two decades following World War II, aviation forecasters tended to underpredict actual passenger volumes, for the enormous growth in air traffic during the 1950s and 1960s emerged as a result of unanticipated technological advances, particularly the emergence of jet aircraft, which enhanced speed and capacity, and lowered costs. But since 1970, forecasters have tended to overpredict demand.[28] Moreover liberalization of economic regulation (e.g., international "open skies") and deregulation of airlines have made the task of predicting air transport trends enormously more difficult.[29] Forecasting air transport demand is a little like predicting the weather -- the weather man is right more often than not, but the variables are too many for him to be able to predict the future with precision, and the further out on the horizon the weather man attempts to look, the less likely he is to be right.

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[25] International Civil Aviation Organization, Airport Planning Manual 1-15 (1987), supplemented with criteria developed in Paul Stephen Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 34 (McGraw Hill 1997), Robert Horonjeff & Francis McKelvey, Planning & Design of Airports 216-17 (4th ed. 1994) and Federal Aviation Administration, Airport Master Plans 22-23 (1985).

[26] Robert Horonjeff & Francis McKelvey, Planning and Design of Airports (McGraw Hill 4th ed. 1994).

[27] Paul Stephen Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 35 (McGraw Hill 1997).

[28] Norman Ashford & Paul Wright, Airport Engineering (John Wiley & Sons, 3rd ed. 1992).

[29] See e.g., Paul Dempsey & Andrew Goetz, Airline Deregulation & Laissez-Faire Mythology (Quorum Books 1993); Paul Dempsey, Law & Foreign Policy in International Aviation (Transnational Publishers 1987).

One must also recognize the exceptionally fluid and fickle nature of air travel demand. Air travel is a derived demand product, meaning that people consume air travel as a means to an end -- people travel to an airport to fly to a business meeting, a vacation, or a visit to friends and relatives. Demand is highly cyclical depending on the time of day, day of week, and season, and broader macroeconomic market fluctuations.[30] International, regional and local air traffic is influenced by economic, demographic, technological, commercial and political forces; freight traffic is also influenced by tariff and quota changes, as well as currency fluctuations.[31] Hence, macro-economic trends, and the nature and composition of the local traffic mix (business and pleasure) must also be integrated into the forecast. Among those broader economic factors affecting demand forecasting are:

1. *Economic Growth and Changes in Industrial Activity.* In addition to national and regional economic activity, forecasting should be tailored to local economic characteristics and trends.
2. *Demographic Patterns.* The size and composition of the area's population, including its population, age, educational and occupational distribution is important.
3. *Disposable Personal Income.* The higher the disposable personal income, the greater likelihood that the area will enjoy higher levels of consumer spending on air travel.
4. *Geographic Attributes.* The geographic distribution and distances between population centers may affect the type of transportation services required.
5. *Other External Factors.* These include such things as changes in fuel prices, the regulatory environment, taxes, fees and currency restrictions.
6. *Local Aviation Actions.* Demand for aviation can be effected by such locally determined factors as ground access, support services, user charges, and plans for future development.[32]

One must also be concerned about issues of capacity and delay. *Capacity* refers to the processing capability of a facility over a period of time. When capacity becomes saturated by demand, delays occur. Alternative concepts of capacity includes *practical capacity*, which

[30] Paul Stephen Dempsey, Airline Management: Strategies for the 21st Century 31-59 (Coast Aire 1997).
[31] International Civil Aviation Organization, Airport Planning Manual 1-18, 1-19 (1987).
[32] Federal Aviation Administration, Airport Master Plans 23-24 (1985).

corresponds to tolerable or reasonable levels of delay, and *ultimate capacity*, which is the maximum number of aircraft, passengers, cargo or mail the facility can process. Runway capacity is typically defined in terms of flight arrivals and departures per hour. Factors that determine ultimate capacity include the number, layout and design of the runway system, air traffic control procedures, and environmental and regulatory conditions of the airport.[33] Terminal capacity is typically defined in terms of the number of passengers it can reasonably accommodate per hour. Cargo and mail capacity is defined in terms of the number of parcels the facility can reasonably process per hour.

E. FACILITIES ASSESSMENT

Facilities assessment involves comparing the forecasts of future demand with existing capacity. It should attempt to determine the capacity of the aircraft, passenger, cargo and ground vehicular infrastructure.[34] The facilities assessment process should produce an inventory of the existing physical plant, its condition and useful life, and land use on and near the airport.[35]

When demand exceeds capacity, delay results, causing airlines and their passengers to lose productivity and efficiency. The concept of *practical capacity* corresponds to "reasonable" and "tolerable" levels of delay, while *ultimate* or *saturation capacity* refers to the maximum number of aircraft an airport can handle given constant demand.[36] As noted above, capacity typically is calculated in units of operations (flight arrivals and departures) per hour. Factors that most strongly influence capacity are number, layout and design of runways, air traffic control procedures, and environmental controls.[37] An assessment of the existing infrastructure may involve an inventory of such things as:

- Runways, taxiways and aprons and related marking and signing;
- Passenger and cargo buildings and other terminal buildings and areas, by function;
- General aviation buildings and areas, by function; fire fighting and rescue buildings; Federal facilities;

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[33] Paul Stephen Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 36 (McGraw Hill 1997).
[34] International Civil Aviation Organization, Airport Planning Manual 1-9 (1987).
[35] Federal Aviation Administration, Airport Master Plans 17 (1985).
[36] Norman Ashford & Paul Wright, Airport Engineering (John Wiley & Sons 3rd ed. 1992).
[37] Paul Stephen Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 36 (McGraw Hill 1997).

- Surface access to the airport, including vehicular circulation and surface access;
- Aviation fuel and aircraft servicing systems;
- Utilities, including water, gas, electric, telephone, drainage and sewage; and
- Proximity of airports to one another, and their influence on flight patterns.[38]

Land use on the airport and real estate adjacent to it must also be reviewed, particularly to determine airway obstructions and compatibility of use to noise levels above the 65 day-night average sound level (Ldn) contour.[39] If projected demand exceeds capacity, decisions must be made as to whether, and how, the existing airport can be expanded, or whether, and where, a new airport will be located.[40]

Where more than a single airport serves the community, or where a new airport is being developed, their aggregate capacity should also be evaluated. For example, the Frankfurt Airport Company entered negotiations for purchase of the former U.S. Air Force base at Hahn, located about 100 kilometers west of Frankfurt Main Airport, as a potential site for capacity to relieve demand at Main.[41]

F. ENVIRONMENTAL ASSESSMENT

Also important are *environmental considerations*, which mandate developing an airport plan that is compatible with surrounding land use and developmental objectives. Most developed States, and some developing States, have promulgated environmental legislation which affects the airport planning process. For example, in the United States, the National Environmental Policy Act of 1969 injected environmental factors as an essential function of airport planning, requiring an Environmental Assessment and Environmental Impact Statement for most major airport projects using federal funding, requiring that environmental impacts be considered early and throughout the planning process.[42] Among the elements to be considered are:

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[38] Federal Aviation Administration, Airport Master Plans 18 (1985); Robert Horonjeff & Francis McKelvey, Planning & Design of Airports 192 (4th ed. 1994).
[39] Federal Aviation Administration, Airport Master Plans 18-19 (1985).
[40] See James Spensley, Airport Planning in Airport Regulation, Law & Public Policy 63, 72 (R. Hardaway ed. 1991).
[41] Weber Demands New Runway At Frankfurt, Flight International (Dec. 2, 1997), at 8.
[42] 43 U.S.C. § 4321. Federal Aviation Administration, Airport Master Plans 2 (1985).

- air and water quality;
- solid waste generation and disposal;
- floodplains, wetlands;
- endangered/threatened flora and fauna;
- biotic communities;
- parklands/recreational areas;
- historic/architectural/archaeological/cultural resources, and prime and unique farmland.[43]

G. FACILITIES DESIGN

Facilities design requires the preparation of an airport layout plan, which is a graphic depiction to scale of the existing and ultimate airfield configuration, schematic terminal design, land use plan, and the intermodal transport connections.[44] Objectives of the plan include optimization of efficient aircraft operations and passenger flows, accommodating surface transport connections, and avoiding environmental degradation.[45]

Designing an airport is like designing a city, for it must have all the essential functions of a city. Typically, an airport must be designed to include the following facilities and functions:

- Runways
- Taxiways
- Aprons
- Aircraft hangars and maintenance facilities
- Aeronautical navigation facilities
- Aviation lighting facilities
- Aircraft fuel facilities
- Passenger terminals
- Customs facilities
- Immigration facilities
- Quarantine facilities
- Catering facilities
- Airline offices
- Meteorological facilities

[43] Federal Aviation Administration, Airport Master Plans 19 (1985).
[44] James Spensley, Airport Planning in Airport Regulation, Law & Public Policy 63, 73 (R. Hardaway ed. 1991); Federal Aviation Administration, Airport Master Plans 57-58 (1985).
[45] Paul Stephen Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 288 (McGraw Hill 1997).

- Communications facilities
- Electric power supply facilities
- Gas supply facilities
- Heat and cooling facilities
- Sewage treatment facilities
- Waste disposal facilities
- Water supply facilities
- Baggage handling facilities
- Air cargo facilities
- Postal facilities
- Rescue and fire fighting facilities
- Police facilities
- Automobile parking facilities
- Automobile rental facilities
- Taxi, bus and van plazas
- Rail terminals
- People mover systems
- Hotels

H. FINANCIAL PLANNING

Financial planning involves assessing the capital needs of the project, identifying public and private sources of capital, and projecting the revenue streams necessary to cover such costs. Sound forecasting of anticipated traffic development and infrastructure capacity are essential to any airport development project and its financing.[46] Once forecasts have been made and facility requirements determined, capital costs and subsequently recurrent costs can be estimated. Traffic forecasts can also be useful in predicting income from both primary sources (e.g., landing fees, gate rentals, hangar rents) and secondary sources (e.g., concessions).[47] Revenue streams typically are landing and parking fees, gate and hangar rentals, ground handling charges, aviation fuel and oil concessions, fixed based operator rentals, and various terminal concessions (including shops, restaurants, and hotels).[48] Economic feasibility should be determined for each component of the airport.

Economic impact surveys consist of traffic forecast information, and the growth in economic activity -- direct, indirect, and induced --

[46] International Civil Aviation Organization, Airport Economics Manual 61 (1991).
[47] International Civil Aviation Organization, Airport Planning Manual 1-13 (1987).
[48] Federal Aviation Administration, Airport Master Plans 20 (1985).

anticipated therefrom. Such surveys are important in securing financing from foreign governmental sources, particularly development banks and funds, which weigh the impact of infrastructure development on national economic development. Direct economic impacts result from airport related activities, such as services provided to airport users (e.g., freight forwarders, taxis and hotels). Indirect economic impacts arise from the purchase of goods and services and investments made by those enterprises which produce direct impacts. Induced economic impacts result from the purchase of goods and services and investments made by individuals employed by enterprises linked directly to airport activity. The five key indicators of direct, indirect and induced activity are employment, personal incomes, business revenue, tax revenue, and capital investment.[49]

I. ALTERNATIVE PLANNING METHODOLOGIES

The International Civil Aviation Organization recommends a somewhat different planning process. It suggests that the initial planning process begin with development of general policy objectives (e.g., designation of time frame, planning horizon and geographic limits of the planning area) and a study design. After these are completed, technical planning begins with an inventory of existing infrastructure. Then a forecast of demand is made in order to ascertain future capacity requirements, with alternatives to expansion also examined.[50] Major airlines also engage in a sophisticated strategic planning process that assesses where they are and where they want to be, including which airports they want to serve.[51]

At the heart of any planning process is the assembly of sufficient, comprehensive and objective data upon which rational decision making can be based. According to ICAO:

> One of the problems of airport planning is that basic facts and principles have not been presented comprehensively. This is especially true in respect to passenger facilities. Formal analysis is essential for any reasonably satisfactory future development. Therefore, basic facts need to be stated so that they can be challenged and tested throughout the

[49] International Civil Aviation Organization, Airport Economics Manual 62 (1991).
[50] International Civil Aviation Organization, Airport Planning Manual 1-11, 1-12 (1987).
[51] Paul Stephen Dempsey, Airline Management: Strategies for the 21st Century 179-87 (Coast Aire 1997).

> world and, if found incorrect, replaced by others which can be similarly tested until a faultless body of data is compiled. The deductions made and the principles established should be similarly arrived at by analysis so that the present situation of conflicting "options" is replaced by data. . . .[52]

The master plan should evolve through consideration of all the factors which affect air transport and which will influence or impinge on the development and use of the airport throughout its working life.[53]

The data collected should not only address the airport's physical facilities, it should also measure utilization, volume and composition of traffic, the price of transportation, the financial condition of the airlines using the airport, and government transport and environmental policy, law and regulation.[54]

Finally, the objectives of the planning process should include providing for the orderly and timely development of an airport adequate to meet the present and future air transportation, safety, efficiency and environmental needs of a region, integrating aviation into a comprehensive seamless intermodal transportation system, and promoting the establishment of an effective governmental organization capable of implementing the master plan in a systematic fashion.[55]

J. THE AIRPORT MASTER PLAN

An airport *master plan* consists of a comprehensive conception of the long-term development of an existing airport, or creation of a new airport and land adjacent thereto.[56] It should reflect a current assessment of what exists and what is required, and the research and logic which served as the foundation for plan development. The basic documents consist of a plan report and set of drawings.[57] As noted above, the process for its creation involves collecting data, forecasting demand, predicting facility requirements, and determining plans and schedules.[58]

Using demand-capacity analysis, airside capacity should be

[52] International Civil Aviation Organization, Airport Planning Manual 1-4 (1987).
[53] International Civil Aviation Organization, Airport Planning Manual 1-9 (1987).
[54] International Civil Aviation Organization, Airport Planning Manual 1-7 (1987).
[55] See International Civil Aviation Organization, Airport Planning Manual 1-11 (1987).
[56] Laurence Gesell, the Administration of Public Airports 144-51 (3rd ed. 1992).
[57] Federal Aviation Administration, Airport Master Plans 11 (1985).
[58] Federal Aviation Administration, Airport Master Plans 2, 5 (1985).

calculated and compared with aircraft demand forecasts, and landside capacity should be calculated and compared with passenger demand forecasts to determine the need, identity and timing of infrastructure investment.[59] The master plan should be a guide for development of both the aviation and non-aviation physical facilities of the airport, the development of adjacent land areas, the determination of environmental effects of construction and operation, and the establishment of access requirements.[60] The plan itself will be of considerable interest to a wide spectrum of groups, including for example, private citizens, interest groups, airport users, airlines, concessionaires, governmental agencies, and the press.[61]

The essential components of a master plan are:

1. An inventory of the physical facilities of the airport and airspace infrastructure and nearby airport-related land uses;
2. A demand forecast for short, intermediate and long-terms to determine the necessary capacity for airport facilities;
3. An assessment of the capacity of the airport to satiate projected demand in terms of airside capacity (e.g., number and dimensions of runways, taxiways and aprons) and landside capacity (e.g., terminal building space, parking and surface access), and the delay imposed by inadequate capacity;
4. When the capacity of the existing airport is inadequate, or where a decision has been made to build a new airport, site selection must be undertaken;
5. Existing and potential environmental impacts must be considered as well as appropriate mitigating measures;
6. Simulation (sometimes with computer models) of airport operations in order to assess the merits of development alternatives;
7. The cost effectiveness and financial feasibility of various alternative concepts and solutions must be evaluated;
8. Preparation of drawings of an Airport Layout Plan (consisting of the airport boundary, runway configuration and areas reserved for landside facilities), a Land Use Plan (showing areas reserved for terminals, maintenance, cargo facilities, general aviation and other areas within the airport boundary, as well as recommended off-airport land uses, based on considerations of

[59] See Federal Aviation Administration, Airport Master Plans 30 (1985).
[60] International Civil Aviation Organization, Airport Planning Manual 1-2 (1987).
[61] International Civil Aviation Organization, Airport Planning Manual 1-7 (1987).

safety and noise), a Terminal Area Plan (revealing the various terminal area components and their relationships), and Access Plans (showing major highway and rail routes from the airport to the Central Business District); and

9. Plan implementation, which includes schedules, costs of, and sources of revenue for airport development.[62]

Master plans typically begin with a statement of strategic goals or objectives, providing general direction. Ideally, planning attempts to identify issues from the perspective of both the airport in a system, and the airport as a system. The Master Plan for Salt Lake City International Airport sets forth several objectives which would be appropriate for any major airport:

1. Develop an integrated airport system that balances airfield capacity with terminal, parking, access, cargo, and other airport facilities' capacities (including development of an on-airport land use plan that effectively uses all airport property, and a plan for access/curb layout that minimizes terminal area congestion).
2. Plan an airport system which balances the Authority's responsibility to develop facilities to meet aviation demand with local and State transportation and environmental needs (including encouraging the use of HOV modes and rail service, if appropriate).
3. Plan for a world-class terminal complex that is easily adaptable to changing airline service patterns (including a concept that is adaptable to expansions or reductions in airline hub and point-to-point service).
4. Maintain the high level of compatible land use that exists around the Airport today (including minimization of adverse noise impacts).
5. Develop an airport that supports local and regional economic goals while providing the flexibility to accommodate new opportunities and shifts in development patterns (including keeping costs within acceptable limits, and establishing an efficient airport layout integrated with existing transportation infrastructure).[63]

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[62] Federal Aviation Administration, Airport Master Plans 10-11 (1985); Robert Horonjeff & Francis McKelvey, Planning & Design of Airports 187-88 (4th ed. 1994).
[63] Salt Lake City International Airport, Airport Master Plan 1 (1996).

Among the issues which will likely surface during this process are growth in air operations and passengers, the potential need for a new airport, the role of existing and contemplated airports, the possibility of capacity expansion, ground access needs, relocation of roads, power lines and buildings, and air space obstructions and landfill problems.[64] If a new commercial airport is to be built, decisions must be made regarding the role of the existing airport: (1) will it supplement the existing airport, emphasizing a specific type of traffic (as Montreal's Mirabel supplements Dorval Airport, or Washington's Dulles supplements National Airport); (2) will it fully replace the existing airport (as Denver International replaced Stapleton Airport); or (3) will it replace the existing airport for all but general aviation operations. Moreover, if current demand does not warrant building a new airport, the new site can be selected and preserved, or land banked, for future use.[65]

Finally, decisions on the timing of airport infrastructure expansion should undergo a cost/benefit analysis and alternatives assessment. A comparison of annual delay with or without the proposed infrastructure improvement produces a theoretical delay reduction in units of time. When multiplied by aircraft operating costs and passenger opportunity costs, this total can be compared with the cost of annual debt amortization, and the maintenance and operational costs of the new infrastructure investment to arrive at a cost/benefit assessment.[66] A review of alternatives should include an assessment of the consequences of doing nothing, the provision of reliever airports for general aviation, and the investigation of potential sites for a new airport.[67]

K. THE BUSINESS PLAN

An airport is a business. Actually, an airport is an amalgamation of 20 or more separate and distinct businesses. Prudent airport managers focus on developing a comprehensive business plan which attempts to improve product lines, satiate consumer needs, and thereby maximize revenue. Airport managers should also be prepared to invest economic and human resources in those lines of business with the highest potential gains. In other words, airport managers need to understand that an airport is a business (actually a combination of

[64] Federal Aviation Administration, Airport Master Plans 18 (1985).
[65] Federal Aviation Administration, Airport Master Plans 42 (1985).
[66] Federal Aviation Administration, Airport Master Plans 30 (1985).
[67] Federal Aviation Administration, Airport Master Plans 33 (1985).

businesses), and run the enterprise as such. Because airports are natural monopolies, and have historically tended to be government-owned enterprises, they have tended not to think in these terms.

Privatization of airports, of course, naturally induces this process, as the airport owners come to grips with the fact that their facilities must turn a profit. Maximization of shareholder value is the predominant motive among privately-owned enterprises. Even publicly owned airports which may wish to avoid privatization may seek to improve the efficiency and economy of their operations, while maximizing revenue with new and innovative marketing and business investments.

At most airports, the potential for increased revenues is vast. An essential ingredient of its realization is airport management which understands the potential benefits of revenue enhancement, understands how it can be accomplished, and is willing to invest the human and economic resources to achieve it. It may be useful to supplement internal resources with fresh market ideas by bringing in entrepreneurial management personnel from the private sector whose acumen and skills have been honed by a competitive environment. Of course, government pay scales are such that this may be difficult to achieve, for salaries of skilled managers tend to be bid up by competition. Public enterprise usually skirts around the problem by hiring a consultant team to address specific issues, though this can be less than satisfactory, since consultants do not have to live with the results of what they recommend.

The first step in the process of developing a business plan should be to identify the customers served by the airport, and determine how they might be served better. Some airports think of airlines as their customers. Airlines are actually tenants, while airports are landlords. The true customer is the passenger, or the shipper of goods, rather than the transport provider.

Airport management should identify the businesses which operate, or should operate, on the airport property. Airlines lease gates, hangars, baggage space, offices, employee lounges, business and frequent/flyer lounges, ticket counters, and so on. Aircraft maintenance, de-icing, and catering facilities on the airport property may serve several different airlines, or be airline-dedicated. Fuel facilities typically serve several different airlines. Facilities typically exist for air cargo and postal collection, storage and distribution. Hangars and service facilities may exist for general aviation airplanes and jets. On the landside, the

terminal may house a multitude of concessions, from news stands, pharmacies, food courts, restaurants, pubs, souvenir stands, and tax and duty free shops. Many are in the entertainment business, with movie theaters, museums, gambling, kids' play sets, and panoramic viewing lounges in their facilities. Some airports have whole hotels in or adjacent to their main terminals. Parking garages may be a significant source of revenue. Fees may be imposed on buses, vans, limousines and taxis which serve the airport. Space typically is leased in the terminal and on the airport property to automobile rental firms. Space may also be dedicated to security operations and government services such as customs and immigration.

Once the existing business lines are identified, the second task is to sort through them and determine which are providing the highest profit margins, and which have the potential to provide higher margins if better managed or expanded. Benchmarking with other lessors of space in the city, or other airports, allows a determination of whether the revenue derived per square foot or as a percentage of sales is at an appropriate level. Any particular lessee or concessionaire may be over- or under-charged by the airport. Appropriate adjustments should be made as the leases expire. Moreover, as concession leases expire, alternative lessors which may provide more revenue, or enhance customer service, should be explored.

The volume of passengers, "meeters and greeters", vehicles, cargo and mail should provide some rough sense of the revenue potentially realizable with more astute marketing. In its market analysis, the airport should evaluate what services other airports provide as a benchmark against which to measure whether a different blend of concessionaires and lessees should be recruited, to enhance its smorgasbord of services to the traveling public. Actually, since airports are becoming more and more like shopping centers, airports should also look to them to determine what types of goods and services might be offered passengers passing through the terminal and its concourses. In a sense, an airport is much like the lessor at a shopping center, though providing more services than a typical real estate developer. Nonetheless, viewing the opportunity as a potential real estate development is an appropriate way to view the airport property. Passengers who use the airport, and the airport's tenants should be surveyed to determine what additional services they would like to have.

Passengers, visitors and employees should be surveyed to

determine their income levels, needs, preferences, and factors influencing their purchases. What types of facilities do they prefer, what do they think of the quality and price of goods and services offered? Past, current and projected traffic volumes, including a breakdown into origin-and-destination, connecting, domestic and international passengers, the number of "meeters and greeters," as well as the average time spent by each of these categories in the airport, all are useful marketing data that can be used to find the optimum mix of concessionaires and airport provided services.[68]

From all that, the airport should be able to determine the markets it is not serving or underserving. Providing more service usually requires an expenditure of capital. An evaluation of space should be made to determine whether existing space is being dedicated to highest value use, and whether additional revenue could be realized in excess of cost by the creation of more space for additional business lines. For example, where space in a terminal or concourse is limited, it may be possible to consolidate the food court and move it up a level to make room for other concessions. People who are hungry usually have no difficulty finding vendors, feel little inconvenience in moving up an escalator, and appreciate an amalgamation of food choices in one space. In contrast, someone passing through an airport is less likely to move up an escalator to another floor to purchase a post card or a souvenir key chain or T-shirt. Thus, food services need not be placed in heavy traffic corridors, while other vendors may need to be if sales are to be sufficient to cover leases.

In determining where to invest its resources, an airport should identify the most promising markets not being served or inadequately served, the cost to capture those markets, and calculate potential returns on investment. This will allow it to prioritize investments. Ultimately, these can be incorporated into the airport Master Plan and capital improvement program.[69]

L. AIRPORT CERTIFICATION

Airports the world over are usually either owned or certified by

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[68] International Civil Aviation Organization, Airport Economics Manual 54 (1991). See also, Salt Lake City International Airport, Airport Master Plan, chapter 3 (1996).

[69] Interview With Denver International Airport Aviation Director Bruce Baumgartner at Denver, Colorado (Oct. 15, 1998). For an analysis of the strategic planning process more generally, see Paul Dempsey & Laurence Gesell, Airline Management: Strategies for the 21st Century 179-87 (1997).

their federal governments. U.S. airports serving aircraft having more than 30 seats must be certified by the FAA under Part 139. The regulations require that the airport develop a certification manual which sets forth comprehensive operating procedures. The FAA provides oversight on airport safety, security, hazardous materials, aircraft fire fighting and rescue.[70]

The U.N. International Civil Aviation Organization [ICAO] also issues international standards and recommended practices which influence airport design and operation. ICAO's Annex 14 ("Aerodromes") sets forth international standards for airport certification, operation and safety.[71]

M. ALTERNATIVES TO AIRPORT EXPANSION

Of course construction of additional land-side or air-side capacity is not the only solution to capacity inadequacy. Other alternatives to building new airport infrastructure to accommodate demand includes enhancing use of existing facilities via better rationing (e.g., peak period landing fees, to move demand to less congested parts of the day), and improvements in navigational and aircraft technologies (e.g., larger and STOL aircraft, as well as the introduction of the Future Air Navigation System).[72]

More efficient use of airport resources can be achieved if the large peaks and valleys of aircraft takeoffs and landings are spread more evenly throughout the day, particularly at congested hub airports. One could argue that it is not an inadequacy of poured concrete that creates congestion, it is the decision of airlines to schedule takeoffs and landings in banks, particularly at hub airports. As an analogy, patrons of fine restaurants often have long waits for tables during supper, while the restaurant has empty tables most of the rest of the day. Many restaurants offer a discounted lunch menu to fill that capacity during the noon hour. However, efforts to impose *peak period pricing* (imposing higher landing charges during periods of highest demand, and lower fees during periods of lower demand) of airport resources to flatten the

[70] For a comprehensive review of these requirements, see Jalal Haidar, Operations and Certification, in Airport Regulation, Law & Public Policy 107 (R. Hardaway ed. 1991).
[71] Jalal Haidar, Operations and Certification, in Airport Regulation, Law & Policy (R. Hardaway 107-08 1991).
[72] Paul Stephen Dempsey & Kevin O'Connor, Air Traffic Congestion and Infrastructure Development in the Pacific Asia Region, in Asia Pacific Air Transport: Challenges and Policy Reforms 23, 35 (Institute of Southeast Asia Studies 1997).

demand curve somewhat have met with fierce political resistance from the general aviation community. That constricts the menu of remedies, most often requiring billions of dollars for incremental improvements in airport capacity.

Moreover, airports which have *common-use facilities*, which require airlines to share as common ticket counters and gates, need build fewer infrastructures than airports with *dedicated ticket counters and gates*. Thus, a particular airport ticket counter or gate might serve Lufthansa at 9:00 a.m., Singapore Airlines at 10:30 a.m., Varig at 12:00 p.m., and Delta Air Lines at 1:30 p.m. Though many airlines prefer dedicated facilities, the result is that such facilities go vacant for long periods of the day. At major U.S. hub airports, one could roll a bowling ball down a concourse after a hub rotation and hit nary a soul. Such vacancy is wasteful of limited public resources.

Yet another means of reducing airport and airway demand is to shift passengers to surface modes, particularly for relatively short-hauls. Busses, railroads, and ocean and river ferries ought to be examined as alternatives to air transport in congested corridors.[73] Such alternative modes should be linked to the airport in a way to allow seamless intermodal transfers.

N. PLANNING: SUMMARY

Airport planning is a little like science fiction. It requires creativity and vision tempered by objectivity and prudence. It involves amassing data from every conceivable source and then, based on this data, offering a best guestimate of future events. The size and cost of these projects define the importance of the planning phase. A new airport must be capable of meeting the immediate and future needs of the air industry, the passengers, and the community it serves.

The planning process should be characterized by the open, transparent flow of information between all parties. Due to the size of the project, consultation and cooperation between the community and the planners are imperative if the plan is to receive general acceptance. Another component of the planning process, demand forecasting, reduces uncertainty by providing estimates to be used as a timetable for

[73] Paul Stephen Dempsey & Kevin O'Connor, Air Traffic Congestion and Infrastructure Development in the Pacific Asia Region, in Asia Pacific Air Transport: Challenges and Policy Reforms 23, 34 (Institute of Southeast Asia Studies 1997).

future construction and a framework around which the airport master plan is developed. Planning also aids operations at the regional and national level, by providing input in the development and subsequent revises of an integrated air traffic system.

The mantra for airport planning should be: Practical, Functional, Flexible. A new airport must be practical. It must meet the needs' of those it serves. It must be functional and efficient, capable of handling increases in air traffic during peak periods, while weathering the fiscal storms that invariably come. And finally, it must be flexible. The airport master plan should consider everyone's interests. It should provide for the community's present needs, while preparing for its' future exigencies.

Several overriding considerations should govern airport planning. A cost/benefit analysis must be made to determine whether public resources should be devoted to airport development rather than alternative public projects, and if an airport is to be built, that economic resources are wisely spent. Airports must be designed to ensure sufficient flexibility and expandability to meet evolving needs, and airport plans should be tailored to emphasize local problems and prospects. As an example, opening in 1994 with five runways and three remote concourses, Denver International Airport was designed in modular form to accommodate twelve runways, five concourses, and a two-fifths expansion of its main terminal as traffic growth warrants infrastructure expansion.[74] According to ICAO, "The most efficient plan for the airport as a whole is that which provides the required capacity for aircraft, passenger, cargo and vehicle movements, with maximum passenger, operator and staff convenience and at lowest capital and operating costs."[75]

Finally, it must be remembered that a master plan is nothing more than a guide for airport development. It should not provide mandates for specific improvements; it should only set forth the alternative improvements which may be undertaken. While setting forth a direction of development, it should not detail precisely how the development should be manifested.[76] Flexibility is necessary to guard against the negative consequences of change in uncertain environments, for the only

[74] Paul Stephen Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 291 (McGraw Hill 1997).
[75] International Civil Aviation Organization, Airport Planning Manual 1-1 (1987).
[76] International Civil Aviation Organization, Airport Planning Manual 1-3 (1987).

constant is change. Given the fact that human affairs create unexpected events, and therefore unanticipated difficulties, the relative inflexibility of major infrastructure projects such as airports inevitably increase their risk. Preparing for the unexpected in airport development might be addressed by developing a series of "go/no go" checkpoints, whereby at specific points in the decision process the situation will be re-evaluated and decisions made on the basis of new information and existing conditions.[77]

II. INTRODUCTION TO AIRPORT FINANCE

A. GENERAL PRINCIPLES OF AIRPORT FINANCE

Understanding revenue diversion requires a basic understanding of general principles of airport cost and revenue, and their subcomponents – capital and operating expenditures, and the various sources of revenue.[78] Thus, we evaluate financial issues at two levels.

First, an airport seeking to expand its facilities, or a governmental entity seeking to build a new airport, must raise sufficient capital to finance such infrastructure development from public or private sources, or a combination of both. *Capital costs* consist of the component costs (e.g., labor, materials and equipment) of construction of the airport and its component parts. Funds come from a variety of public (including Federal) and private (including municipal general obligation and revenue bonds [GARBs]) sources.[79] Existing airports also may have retained earnings building in a capital development account.

Second, once built, an airport must earn sufficient revenue to pay its operating expenses and retire its debt. Revenue comes from a number of sources, including rents, aeronautical fees, concessions and parking.[80] Such *operating costs* include expense items as interest and depreciation or amortization on debt, taxes, and maintenance and administrative costs, including salaries, power, and repairs.

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[77] Paul Stephen Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 475, 484, 486 (McGraw Hill 1997).
[78] See generally, Paul Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 183-228 (McGraw Hill 1997); Paul Dempsey, Airport Planning & Development: A Global Survey 178-80 (McGraw Hill 2000); and Alexander Wells, Airport Planning & Management 159-69 (3rd ed. 1996).
[79] Paul Dempsey, Robert Hardaway & William Thoms, Aviation Law & Regulation § 7.06 (Butterworths 1992).
[80] Regis Doganis, The Airport Business 57 (Routledge 1992).

B. SOURCES OF CAPITAL

Sources of capital for airport development include governmental or international organization loans and grants, commercial loans from financial institutions, equity or debt (typically, bonds) from commercial capital markets, including private investors, banks investment houses, or fund pools, and the extension of credit from contractors and suppliers. Commercial loans typically incur the highest interest rates, though such rates may be reduced by governmental loan guarantees. Airports must also evaluate the amount of foreign capital needed, for debt often will be needed to repaid in that foreign currency, and therefore subject to both competitive internal needs for foreign currency, and currency valuations, favorable and unfavorable.[81]

Foreign governments may be willing to provide capital to airport projects in less developed States, out of a sense of altruism, or with the purpose of promoting trade and commercial relations between the two nations, or exporting technology and equipment from firms domiciled in the lender nation. Some States have developed economic and social development programs in various parts of the world, providing loans on preferential terms, or supplies, equipment and technology. Examples include the following:

- Belgium - Administration generale de la Cooperation au Developpement
- Canada - Canadian International Development Agency
- Czechoslovakia - Ministry of Foreign Affairs
- Denmark - Danish International Development Agency
- France - Caisse centrale de Cooperation economique
- Germany - Ministry of Economic Cooperation
- Italy - Department of Cooperation
- Japan - Overseas Economic Co-operation Fund
- Netherlands - Foreign Ministry
- Norway - Norwegian Agency for International Development
- Russian Federation - Ministry of External Economic Relations
- Spain - Cooperacion Internacional
- Sweden - Swedish International Development Administration
- United Kingdom - Overseas Development Administration
- United States - U.S. Agency for International Development[82]

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[81] See generally, International Civil Aviation Organization, Airport Planning Manual 1-23 to 1-25 (1987).
[82] International Civil Aviation Organization, Airport Economics Manual 76 (1991).

Specialized export-promoting agencies (e.g., the Export Development Corporation of Canada, the Export Credits Guarantee Department of the United Kingdom, or the Export-Import Banks of Japan and the United States, COFACE of France, HERMES of Germany, and the Export Credits Guarantee Department of the United Kingdom) may also be able to make direct loans or guarantee private loans, or insure the risk assumed by its domestic firms providing goods and services for airport development.[83]

Several international bank and fund organizations have been established to aid developing States by assisting in financing and execution of projects, particularly infrastructure projects, which foster economic development. These include the following:

- International Bank for Reconstruction and Development and its affiliates, the International Development Association and the International Finance Corporation
- African Development Bank
- Asian Development Bank
- Caribbean Development Bank
- Inter-American Development Bank
- European Union European Development Fund
- Japan Overseas Economic Cooperation Fund
- Organization of Petroleum Exporting Countries Fund for International Development
- Arab Bank for Economic Development in Africa
- Islamic Development Bank
- Saudi Fund For Development
- Abu Dhabi Fund for Arab Economic Development
- Kuwait Fund for Arab Economic Development
- Arab Fund for Economic and Social Development[84]

In each instance, a loan or grant will be made to a governmental agency, or to a private entity having the support and guarantee of the government. Hence, the government must designate the project as a high priority for development in order to receive such assistance.[85]

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[83] See generally, International Civil Aviation Organization, Airport Planning Manual 1-25 to 1-26 (1987).
[84] International Civil Aviation Organization, Airport Economics Manual 68 (1991).
[85] International Civil Aviation Organization, Airport Planning Manual 1-26 (1987).

The United Nations Development Programme [UNDP] provides developing nations with expertise in planning and executing airport projects, including feasibility and cost-benefit analyses, master planning, and construction. Funding for minor equipment may also be obtained from UNDP, though the principal role of the agency is to provide expertise rather than capital.[86]

C. FUNDING FOR AIRPORT INFRASTRUCTURE

1. CASH FLOW

In order to understand airport finance, one must comprehend not only where the revenue goes, but from where it originates. Air side revenue streams include landing fees, fuel taxes, and maintenance and cargo facility leases. Land side revenue streams include terminal rents and gate leases, concessions, parking fees, and in the United States, Passenger Facility Charges. All revenue generated by a public airport, as well as local fuel taxes, should be used for legitimate airport purposes -- the capital or operating costs that directly and substantially relate to air transport.

In addition to government grants and subsidies, the airport turns to its tenants -- the airlines, concessionaires, parking -- and the passengers they serve to finance its maintenance and operating costs, and debt service. Airports derive revenue streams from rents, charges and fees imposed upon airlines, various concessionaires, such as car rental companies, restaurants, newsstands, taxi and van services, catering and baggage services, fuel providers, and parking. Most large airports are self-sustaining, with revenue collected from businesses (concessionaires), passengers and airlines covering most airport operating expenses associated with operating the airport. Airport concessionaires (such as restaurants, news stands, auto rental companies) typically pay rent for the space they occupy, while some pay a gross-receipts fee. These revenues, in turn, finance operating and maintenance expenses, principal and interest debt service, and various "pay as you go" infrastructure, such as terminal or runway expansions or improvements.[87]

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[86] International Civil Aviation Organization, Airport Planning Manual 1-26 (1987).
[87] National Civil Aviation Review Commission, Airport Development Needs and Financing Options (June 4, 1997), reproduced at: http://www.faa.gov/ncarc/whitepaper/airports

Airlines pay rental charges for the space they occupy at ticket counters, gates, baggage handling, maintenance, and catering facilities, and also pay takeoff and landing fees, parking fees, and fuel fees.[88] Two methodologies dominate computation of airline fees and charges under airport use agreements – the residual method, and the compensatory method.[89]

In a *residual agreement*, the signatory airlines accept the financial risk, and guarantee to provide the airport with sufficient revenue to cover its operating and debt-service costs. Under this approach, the airport deducts an agreed amount of non-airline (concession) revenue from its expenses, leaving the airlines responsible for the remaining (residual) amount.[90] Airline rates then are set accordingly. Airlines bear the risk that their fees will be increased should concession revenue fall short. Airports using residual methodology typically give airlines majority-in-interest power to veto new major capital expenditures.[91]

Compensatory agreements usually exist at mature airports that have achieved successful revenue generation, whereby the airport undertakes the risk of meeting its costs. Under the compensatory method, an airport is divided into various cost centers (such as airfield, terminals, parking areas), and airlines pay a share of those costs, based on the amount of space they occupy (at, for example, ticket counters, gates, and baggage

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[88] Air Transport Ass'n of America, Airline Handbook Ch. 7 (available at http://members.airlines.org/about/d.aspx?nid=7951

[89] One source notes:

> At most commercial service airports, the financial and operational relationship between an airport and the airlines it serves is defined in legally binding agreements that specify how the risks and responsibilities of airport operations are to be shared between the two parties. Commonly referred to as "airport use agreements," these contracts generally specify the methods for calculating the rates airlines must pay for use of airport facilities and services, as well as identify the airlines' rights and privileges, which in some cases include the right to approve or disapprove any major proposed airport capital development projects (which the airlines are required to finance).

National Civil Aviation Review Commission, Airport Development Needs and Financing Options (June 4, 1997), reproduced at http://www.faa.gov/ncarc/whitepaper/airports

[90] Airlines typically stand behind the revenue bonds with "use and lease agreements", pledging to make up the difference in revenue shortfalls by paying higher landing fees. The quid-pro-quo for the residual funding agreement historically has been a long-lease term for gates, and a "majority-in-interest clause" giving airlines a say (often an effective veto) over airport expansion, and a return of excess revenue collected, often in the form of lower landing fees. Alexander Wells, Airport Planning and Management 181 (1992). As of 1990, majority-in-interest clauses were in effect at 36 of the 66 largest U.S. airports. Kenneth Mead, Airline Competition (testimony on passenger facility charges before the House Subcomm. on Aviation, June 19, 1990). About half of the largest airports in the U.S. rely on airlines to back airport revenue bonds.

[91] Nancy Kessler, Airport-Airline Fee Disputes and Privatization of Airports (address before the 117th Summer Meeting of the Virginia Bar Assn, July 21, 2007).

sorting and catering facilities), landing and departing aircraft, and other measures of airline use.[92] The airport retains concession revenue for discretionary capital improvement projects.

2. COMMERCIAL DEBT (BONDS)

Historically, in the United States funding for airport capital infrastructure, such as runways, taxiways, and terminals, has come from two primary sources: (1) Federal ticket taxes (or Airport Improvement Program [AIP] funds) from the Airport Trust Fund collected on every airline ticket purchased in the U.S.; and (2) tax-free General Airport Revenue Bonds [GARBs] issued by municipalities. Often, 80% of the capital for the airport project comes from AIP grants, while the remaining 20% is raised by municipalities in GARBs.[93] In the half century between 1946 and 1996, the U.S. government granted more than $24 billion in grants to airports.[94] In 1990, Congress also passed the *Aviation Safety and Capacity Expansion Act,* creating a federally-authorized but locally-collected program of airport Passenger Facility Charges [PFCs] to supplement public airport capital needs.[95]

Early airport construction was financed by *general obligation bonds* backed by the "full faith and credit" of a governmental unit and secured by taxes collected by it.[96] The industry was in its infancy, and airports were not capable of generating sufficient revenue to finance infrastructure costs.

Since World War II, GARBs have replaced general obligation bonds as the preferred means of financing new airport construction, expansion or improvement. In fact, since 1982, more than 95% of airport

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[92] Air Transport Association of America, Airline Handbook, Ch. 7 (available at http://members.airlines.org/about/d.aspx?nid=7951.

[93] Henry Hyde & Jesse Jackson, Jr., The Partnership for Metropolitan Chicago's Airport Future 30 (Oct. 1997).

[94] U.S. General Accounting Office, Airport Privatization 8 (Feb. 29, 1996).

[95] 49 U.S.C. § 40177. See Village of Bensenville v. FAA, 376 F.3rd 1114 (D.C. Cir. 2004).

[96] One source notes:

> In the 1950's and early 1960's, general obligation (GO) bonds were more widely used than revenue bonds for airport development. GO bonds were backed by the taxing authority of the issuer. Since the 1960's, airport revenue bonds have been the major financing mechanism for capital improvements at large, medium, and some small hub airports. These financial instruments pledge the airport's revenue streams to repay bond holders. The ability of an airport to utilize revenue bonds depends on a number of factors, including: debt structure; airport management, administration and scope of operations; revenue structure and financial operations, economic base; and plant.

National Civil Aviation Review Commission, Airport Development Needs and Financing Options (June 4, 1997), reproduced at http://www.faa.gov/ncarc/whitepaper/airports.

debt, exceeding some $50 billion, has been in the form of GARBs.[97] GARBs are paid off by revenue generated by the facility they finance.[98] Although GARBs have been the primary source of debt financing, special facility bonds secured by revenue from the indebted facility (e.g., hangar or maintenance facility) are sometimes issued.[99] Both GARBs and general obligation bonds historically have been tax-exempt (as Industrial Revenue Bonds), allowing States, municipalities and airport authorities to lower the long-term costs of capital financing.[100] GARBs typically run for a 25-30 year term (as opposed to general obligation bonds which run for 10-15 years) and usually pay higher interest than general obligation bonds.[101]

Bond underwriters have a fiduciary responsibility to exercise "due diligence" on the issuance of bonds, taking reasonable care that all material facts are disclosed, and having a reasonable belief that the bonds will meet their assigned interest rate. Theoretically, highly speculative projects should not find financing because of the enormous legal risk underwriters assume. In reality, however, the bond market does not function in that manner because the securities industry has been largely unregulated and driven by commissions and transactions -- in a word, profit. Municipal bond issuance is a tremendously profitable multibillion dollar business. Companies which issue them earn profits in two ways -- commissions on sales, and capital appreciation on bonds purchased at a discount and later sold at the market. Thus, deals get done, not because they should be, but because they can be.[102] Moreover,

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[97] Air Transport Association of America, Airline Handbook, Ch. 7 (available at http://members.airlines.org/about/d.aspx?nid=7951.

[98] Paul Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 186 (McGraw Hill 1997).

[99] U.S. General Accounting Office, Airport Financing: Funding Sources for Airport Development 38 (Mar. 1998).

[100] Michael Bell, Airport Financing, in Airport Regulation, Law & Public Policy 93-95 (R. Hardaway ed. 1991).
The availability of tax-exempt bonds is estimated to save airports and airlines over $1 billion a year in interest costs. (Airports and airlines also make extensive use of Special Facility bonds which are revenue bonds that are usually secured by the guarantee of an airport tenant. Also, airports continue to make use of GO bonds that are secured by the taxing authority of the issuer, but there is heavy competition to use such bonds for other municipal purposes.)
National Civil Aviation Review Commission, Airport Development Needs and Financing Options (June 4, 1997), reproduced at http://www.faa.gov/ncarc/whitepaper/airports.

[101] The cost of private capital typically is higher than public capital, though interest rates can be ameliorated by governmental guarantees and insurance. The competitiveness of airport bonds in the market can be gauged by the bond ratings by the major investment houses, the interest rate, and the default ratio. Tax exemptions on the bond's purchase price or interest can also stimulate investor interest in airport bonds. International Civil Aviation Organization, Airport Economics Manual 69 (1991).

[102] Paul Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport:

while municipalities and airport authorities tend to issue construction contracts on the basis of competitive bidding, the issuance of bond underwriting agreements tends not to be handled on a competitive bidding basis. This incentivizes bond underwriters to express their appreciation for the business in the form of political contributions to the elected officials of cities who steer business their way. In a largely unregulated environment, elected officials effectively can extort campaign contributions under a "pay to play" philosophy.[103] The U.S. Securities and Exchange Commission has adopted rules attempting to circumscribe campaign contributions by financial institutions which float municipal bonds.

Scrutiny of debt by the credit-rating agencies, such as Moody's and Standard & Poors, and investors encourages airports to be efficient and market oriented in their operating and investment decisions.[104] Ratings assess the financial soundness of the project -- the ability of projected cash flow to meet the financial obligation that has been incurred. The higher the rating the lower the cost of capital.[105] The exemplary financial performance of airport bonds has earned them the status of premium-grade investments in the tax-exempt municipal bond market, thereby reducing the cost of capital.[106] Ultimately, the institutional investors drive the market, for they have enormous amounts of cash to invest.[107]

Another private sector funding mechanism is the Build-Operate-Transfer [BOT] approach, whereby the contractor commits to financing, construction, operations and maintenance for a specified number of years (known as the "free use period"), after which it transfers the facility over to the government.[108] That leads us to a discussion of privatization.

D. PRIVATIZATION

Lessons Learned 187, 190 (McGraw Hill 1997).

[103] For example, in Denver, the underwriters who floated Denver International Airport's bonds contributed about 10% of Mayor Webb's contributions to his two mayoral campaigns, and made significant donations to key city councilmen as well. Paul Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 214-20 (McGraw Hill 1997).

[104] U.S. General Accounting Office, Airport Privatization 1 (Feb. 29, 1996).

[105] Paul Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 190 (McGraw Hill 1997).

[106] National Civil Aviation Review Commission, Avoiding Aviation Gridlock & Reducing the Accident Rate II-44 (Dec. 1997).

[107] Paul Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 204 (McGraw Hill 1997).

[108] International Civil Aviation Organization, Airport Economics Manual 66 (1991).

Harvard economist John Kenneth Galbraith observed, "In all countries the economic system depends on and develops from the State financing of highways, airports, postal services and urban infrastructure of the most diverse and essential sort."[109] Traditionally, many national governments have provided infrastructure services that were too complex and expensive for the local authorities to provide. Such services include airports and air navigation, meteorological, and communications systems. State oversight satisfied the need for a high degree of uniformity and standardization.[110] Governments also provided the services of health, immigration, customs and the protection and security of civil aviation.

Most of the world's airports are owned and operated by their national governments. In the United States, airports are owned and operated by municipal, local or state governments or regional airport authorities. Though publicly owned, many airports long have had some measure of private operation. As noted above, private capital finances various levels of airport development throughout the world, which itself encourages market-driven management. In many States, private companies perform essential airport services, including private airlines, caterers, concessionaires, and contractors.

Relatively recently, several States have embraced private enterprise and competition, rather than government oversight, to provide essential transport, and have "corporatized" various portions of the infrastructure, such as airports and air traffic control services.[111] In the 21st century, the trend toward corporatization or privatization is robust. Airports have been sold to private investors or turned over to private operators in States as diverse as the Argentina, Australia, Austria, Bolivia, Canada, Chile, Columbia, Denmark, Ecuador, Germany, Greece, Mexico, South Africa, and the United Kingdom. But actually, privatization is a generic term which means different things to different people -- to some, it is the outright sale of assets, while to others, it is

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[109] Bev Desjarlais, Doug Young's Defection Shows His True Colors, Hill Times, June 5, 2001, at 16.

[110] Unlike the global paradigm of nationally owned and operated, or more recently, corporatized or privatized airports, most airports in the United States are owned and operated by local (city, county, regional, and in some instances State) governments. Despite local government ownership, the U.S. Federal government provides much of the funding for these airports, and oversees local airports directly, through Titles 14 and 49 of the Code of Federal Regulations, and indirectly, in the form of conditions imposed in Grant Agreements.

[111] See e.g., Paul Dempsey et al, The McGill Report on Governance of Commercialized Air Navigation Services (McGill 2006), reproduced at: http://www.mcgill.ca/files/iasl/ANS_Report_final.pdf.

turnkey or joint venture arrangements, the lease of assets, private investment, private management and/or corporatization.[112] In recent years, more than 50 States have moved toward further privatization, from selling minority shares in individual airports, to inviting private investors to build runways or terminals, or selling major airports outright.[113]

The motivations for privatization are varied. Privatization offers governments a short term alternative to raise capital for new airport infrastructure, or to cash out the public investment. States with a high social welfare burden and a declining ratio of taxpayers to recipients are enjoying a one-time benefit by "cashing out" their investment in major infrastructure industries -- telecommunications, broadcasting, energy and transportation -- thereby postponing the day of reckoning when either taxes must be raised, social welfare programs cut, or both. Elsewhere, free market ideology dominates, with the privatization, liberalization and deregulation of airlines taking governments into uncharted territory.[114] Privatization also relieves governments of the burden of heavy capital investment, giving airports direct access to the market for debt and capital.[115]

While private developers usually bear a higher cost of capital vis-à-vis the government, and lack the government's eminent domain powers, private firms, driven by a profit motive, often produce a product (here, airport services) with fewer employees, enhanced innovation and marketing acumen, and greater economy and efficiency.[116] The privatized British Airports Authority has proven that real estate and concessions can be developed into a significantly enhanced revenue stream. Nonetheless, airports are a monopoly bottleneck, and unless regulated, have the ability to extort monopoly rents from their customers (primarily the airlines).[117]

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[112] Eliot Lees, Airport Privatization: Latest Trends From Around the World, in ACI World Economic Specialty Conference Proceedings, Airport Economics in a Technological Age 148 (Denver, Colorado, April 6-9, 1997); Norman Ashford & Clifton Moore, Airport Finance (Von Nostrand Reinhold 1992).

[113] U.S. General Accounting Office, Airport Privatization 1, 5 (Feb. 29, 1996).

[114] See Paul Stephen Dempsey, The Social & Economic Consequences of Deregulation (Quorum Books 1989).

[115] International Civil Aviation Organization, Airport Economics Manual 8 (1991).

[116] Paul Stephen Dempsey & Kevin O'Connor, Air Traffic Congestion and Infrastructure Development in the Pacific Asia Region, in Asia Pacific Air Transport: Challenges and Policy Reforms 23, 36 (Institute of Southeast Asia Studies 1997).

[117] Paul Dempsey, Andrew Goetz & Joseph Szyliowicz, Denver International Airport: Lessons Learned 191 (McGraw Hill 1997).

Sir Walter Raleigh observed that he who controls the seas, controls the trade; he who controls the trade controls the wealth; and he who controls the wealth controls the world. These days, airways have replaced the oceans, and airports have replaced seaports in importance. Airlines are too numerous to be profitable in mature markets. But airports are the bottlenecks through which passengers and high-valued cargo must flow. Some would argue that they are "monopolies" whose infrastructure cannot be replicated to provide a competitive alternative, because of cost, land, and environmental restrictions.[118] Thus, it would be imprudent to privatize them without regulatory supervision of rates and charges imposed upon carriers.

Antitrust law reflects the normative conclusion that large firms or corporations that dominate particular industries, as bastions of enormous concentrations of wealth and power, are undesirable.[119] Antitrust law attempts to prevent monopolies from forming, or once formed, may be exerted to break them apart.

But a number of industries in our economy are deemed to be natural monopolies. Here, the economies of scale are so pervasive that a single firm can offer the product or service most efficiently and economically. The fixed costs of operation may be so large that duplicative services are uneconomical. John Stuart Mill was among the first to recognize the problem, while reviewing the inefficiencies of competing gas and water systems in London:

> It is obvious, for example, how great an economy of labor would be obtained if London were supplied by a single gas or water company instead of the existing plurality . . . . Were there only one establishment, it could make lower charges consistently with obtaining the rate of profit now realized.[120]

By the late 19th Century, Richard Ely had identified a number of industries as natural monopolies, including railroads, and express, telegraph,

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[118] Paul Dempsey, Market Failure & Regulatory Failure As Catalysts for Political Change: The Choices Between Imperfect Regulation and Imperfect Competition, 46 Wash. & Lee L. Rev. 1 (1989).
[119] Hazlett, The Curious Evolution of Natural Monopoly Theory, in Unnatural Monopolies 3 (R. Poole, Jr., ed. 1985).
[120] John Stuart Mill, Principles of Political Economy 13 (1926).

streetcar, gas and water companies.[121] Other examples of natural monopolies include gas and oil pipelines, electricity transmission, and local distribution utilities such as telephone service, gas, water, electricity, and cable television.[122]

Henry Carter Adams was the first to see natural monopolies in terms of economies of scale. Natural monopolies have marginal costs which are both lower than their average costs at the level of quantity demanded, and which decline over a long level of output. Where the cost per unit of output falls until a single producer can most efficiently satisfy market demand, competition may not be sustainable.[123]

The justification for regulating natural monopolies is both cost and price based. Once a single firm has sunk costs in providing sufficient capacity for all users, the cost per unit will be lower if that single firm satisfies all demand. The economies of scale are so significant that the unit costs of service would increase significantly if more than a single firm satisfies consumer needs in the region. Hence, it will consume less of society's resources if a single firm provides the product or service. For example, if one pipeline has unused capacity, it would be wasteful to allow a competitor to lay a parallel line.[124]

In most cities, airports are natural monopoly bottlenecks (with declining costs over a long range of output).[125] This is true until airside or landside capacity exceeds demand, for expansion of airport infrastructure can be politically difficult and financially challenging. Many airports are "hemmed in" by surrounding development, and opposed by residents fed up with noise and congestion. Congestion imposes the need for landside and airside expansion, yet land constraints and local political opposition to the construction of new airports or expansion of existing ones impose severe financial and political barriers

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[121] Richard Ely, The Future of Corporations, Harpers 260 (July 1887).
[122] Study on Regulation, supra at xiii.
[123] U.S. Senate Comm. on Government Affairs, Study on Federal Regulation, 96th Cong., 1st Sess. 9 (1978) [hereinafter Study on Regulation].
[124] "[T]otal pipeline construction costs are roughly proportional to the circumference of the pipe and therefore to its radius, while the volume of gas or oil the pipeline can transmit is proportional to the pipeline's cross-sectional area and therefore to the square of its radius. Since the square of the radius increases more rapidly than the radius, it follows that cost per unit decreases continuously as the pipeline's capacity increases. Indeed, this understates the economies of large diameter pipe because friction in transmitting oil and gas is also reduced as capacity grows, and because the amount of right-of-way needed is practically the same regardless of pipe capacity." Id. at 10.
[125] See Int'l Air Transport Ass'n, Airport Privatization, in http://www.iata.org/NR/rdonlyres/473F5695-12A6-4071-8C64-2141913373B6/0/airport_privatisation.pdf.

to economical expansion. Some have insisted that a large amount of fixed and immovable plant is another essential characteristic of a natural monopoly, although as we see from the local utility examples, the size and scope of the natural monopoly need not be large.[126] Airports clearly are fixed and immovable, large and expensive, and in many cities, monopolies. Airline economies of scope dictate concentration of operations and creation of hub-and-spoke networks that focus on a single airport in a major city. In a few major cities, secondary airports are available for use by low cost carriers to provide competition for the hub-dominant network carriers. But many cities do not have the luxury of such competition.

As large and essential infrastructure investments, airports are an integral part of the national air transportation system – in essence, one leg of the stool held up by airports, air navigation service providers, and airlines. Distortions in airport pricing can create distortions in interstate and foreign commerce. Whatever the reasons for the existence of a monopoly, to maximize wealth, a monopolist will have an incentive to restrict output below, and raise prices above, competitive levels. Consumers, receiving false price signals, respond by consuming other goods and services it costs society more to produce. Thus can *laissez-faire* result in a misallocation of resources.

The United Kingdom became the first major entrant into the land of airport privatization, with its sale of British Airports Authority [BAA] which controls seven major airports, including London's Heathrow, Gatwick and Stansted in 1987, in a $2.5 billion public share offering. The government continued to provide oversight of airline access, airport charges, safety, security and environmental protection, and veto power over airport investment or divestiture. BAA has been consistently profitable. Despite fee caps and $782 million in infrastructure

[126] But note that emerging technology has created new competitive opportunities in those sectors of the economy which have traditionally been deemed natural monopolies. For example, while the early railroads may have been natural monopolies, the development of the gasoline engine and the pneumatic tire made motor carriage a viable competitor for the movement of most industrial products. Similarly, microwave and satellite communications provide an alternative to the long-line wire of Ma Bell, at least in long-distance service. Conversely, the new technology of fiber optics, which has almost infinite capacity for long distance telecommunications, may have the characteristics of a natural monopoly; if so, an investment in parallel fiber optics lines is wasteful. See generally, Paul Dempsey, Market Failure and Regulatory Failure As Catalysts for Political Change: The Choice Between Imperfect Regulation and Imperfect Competition, 46 Wash. & Lee L. Rev. 1 (1989), and Paul Dempsey, Adam Smith Assaults Ma Bell With His Invisible Hands: Divestiture, Deregulation, and the Need for a New Telecommunications Policy,"11 HASTINGS COMM. & ENT. L.J. 527 (1989).

improvements, it earned a profit of $455 million in 1995.[127]

In 1995, the Mexican government passed laws allowing private operations of its 58 airports, including 50-year renewable leases.[128] One group won the right to operate nine airports in southeast Mexico for US$116 million. It plans to invest $160 million upgrading runways and terminals over five years.[129] Among the new "green field" airports being built around the world, Berlin Brandenburg International Airport is the first to depend almost entirely on private funding, with a 74.9% private stake in Berlin Brandenburg Flughafen.

With the proposed privatization of Amsterdam's Schiphol Airport, officials recognized a need to establish an independent regulator to approve landing fees. Allowing the private owners of the airport to set fees at will would likely encourage them to maximize the wealth interest of shareholders, to the injury of the airlines and their customers. Regulating fees would encourage airport owners to develop non-aeronautical revenue sources.[130]

Governments which have privatized airports have adopted one of four regulatory approaches -- rate of return regulation (e.g., Spain, France, Greece and the Netherlands), rate of return price caps (e.g., the United Kingdom), aeronautical price caps (e.g., Australia, Austria, Denmark and Mexico), and limited governmental oversight (e.g., Canada, New Zealand, and the United States).[131] The general principles in the United States which govern airport fees, rates and charges require that they be "fair and reasonable," not "unjustly discriminatory" and make the airport "as self-sustaining as possible."[132] As revealed in Table 7.1, Simat, Hellieson & Eichner, Inc., assessed the strengths and weaknesses of each of the four alternatives.

Table 7.1

STRENGTHS AND WEAKNESSES OF AIRPORT REGULATORY APPROACHES				
	Rate of	*Rate of*	*Aeronautical*	*Government*

[127] U.S. General Accounting Office, Airport Privatization 5-6 (Feb. 29, 1996).
[128] U.S. General Accounting Office, Airport Privatization 5 (Feb. 29, 1996).
[129] Joel Millman, Mexican Airport Auction Reignites Asset Sales, Wall St. J., Dec. 9, 1998, at A14.
[130] Dutch Think About Selling Schiphol Interest, World Airport Week (July 15, 1997), at 3.
[131] Eliot Lees, Airport Privatization: Latest Trends From Around the World, in ACI World Economic Specialty Conference Proceedings, Airport Economics in a Technological Age 152 (Denver, Colorado, April 6-9, 1997).
[132] 61 Fed. Reg. 31,994 (June 21, 1996).

	Return	*Return Price Cap*	*Price Cap*	*Oversight*
Predictable Aeronautical Prices	moderate	moderate	strong	weak
Predictable Airport Profits	strong	moderate	weak	weak
Improving Airport Operating Efficiency	weak	moderate	strong	weak
Ability to Attract Investment Capital	strong	moderate	moderate	strong

From the perspective of the airport owner or operator, revenue can be subject to high levels of market and regulatory risk. Government regulation always poses the risk that owners will not be allowed to earn a reasonable return on investment, even where increases in fees have been contractually agreed. One potential remedy to the vulnerability of airport revenue streams to changing economic and regulatory conditions is to have the airport company enter into a management contract with the local government, allowing the government to collect the revenues and pay the company a set management fee (adjusted for inflation and currency revaluations).[133]

E. OPERATING COSTS & REVENUE

1. ICAO REGULATION OF AIRPORT CHARGES

At the outset, the template of lawful rates and charges must be understood. The principle of nondiscrimination in charges is derived in international law from Article 15 of the Convention on International Civil Aviation [Chicago Convention],[134] and the Standards and Recommended Practices [SARPs] promulgated thereunder by the International Civil Aviation Organization [ICAO].[135] Hence,

[133] Jonathan Lemberg, Xiaohu Ma & James Zimmerman, Financing and Investing In China's Airport Development, China (1998).
[134] Convention on International Civil Aviation, done December 7, 1944, 61 Stat. 1180, T.I.A.S. No. 1591, U.N.T.S. 295 [hereinafter cited as Chicago Convention], ICAO Doc. 7300/8, reprinted in XXX Annals of Air & Space L. 17 (2005).
[135] Under Article 28 of the Chicago Convention, each State undertakes, so far as it finds

international treaty obligations also influence airport and navigation rates and charges.[136]

The Chicago Convention provides that among the principal purposes of ICAO is to "avoid discrimination between contracting States."[137] More specifically, Article 15 of the Chicago Convention requires that "every airport in a contracting State which is open to public use by its national aircraft shall likewise . . . be open under uniform conditions to the aircraft of all the other contracting States" and that airport and air navigation charges imposed on foreign aircraft shall be no higher than those imposed upon domestic aircraft.[138] Though a State may recover its costs by assessing fees for air navigation, it may not charge a fee solely for the privilege of flying into, out of, or over its territory. All charges should be published and communicated to ICAO.[139] Airport and air navigation charges and fees may be reviewed by the ICAO Council upon complaint of a contracting State.[140]

ICAO's Council has issued a series of recommendations dealing with various aspects of airport and user charges.[141] ICAO has expressed

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practicable, to provide air navigation services (i.e. to provide air navigation facilities within its territory) in accordance with the Standards and Recommended Practices [SARPS] set forth in the Annexes to the Convention. Article 15 of the Chicago Convention requires:
uniform conditions shall apply to the use of airports and air navigation facilities by aircraft of every contracting State;
airport and air navigation charges shall not be higher for scheduled foreign aircraft than national aircraft engaged in similar international operations;
no charge may be imposed solely for the right of transit over, entry into, or exit from its territory;
charges imposed shall be published and communicated to the ICAO Council; and if a contracting State so requests, the ICAO Council may review such charges and report and make recommendations thereon to the concerned State(s).

[136] See Paul Dempsey, et al, Governance of Commercialized Air Navigation Services, XXXI Annals of Air & Space Law 213 (2006).

[137] Convention on International Civil Aviation, done December 7, 1944, 61 Stat. 1180, T.I.A.S. No. 1591, U.N.T.S. 295 [hereinafter cited as Chicago Convention], Art. 44.

[138] Chicago Convention, Art. 15.

[139] International Civil Aviation Organization, Airport Economics Manual 1-2 (1991).

[140] Chicago Convention, Art. 15. See Paul Dempsey, Flights of Fancy and Fights of Fury: Arbitration and Adjudication of Commercial and Political Disputes in International Aviation, 32 Ga. J. Int'l & Comp. L. 231 (2004).

[141] In establishing a charging system for airports and air navigation services, ICAO recommends that it contain several requirements, including that: (1) it be simple, equitable, and suitable for general application; (2) charges not discourage the use of facilities and services necessary for safety; (3) charges be according to sound accounting principles; (4) charges be non-discriminatory; (5) any under-recovery of costs properly allocable to certain users not be borne by other users; (6) charges take into account the cost of providing the services and the effectiveness of the services provided, and also take account of the economic condition of users and that of the provider; (7) there be no double-charging for services; (8) general aviation charges should be reasonable and related to the cost of facilities used. Int'l Civil Aviation Org., ICAO's Policies on Charges for Airports and Air Navigation Services § 41 (ICAO Doc. 9082/7 7th ed. 2004).

a general principle in favor of assessing fees in a manner in which "users shall ultimately bear their full and fair share of the cost of providing the airport." Cost should include the full economic cost, including depreciation and interest, but allowing for all revenue, aeronautical and non-aeronautical. In setting the fees, airlines are not to be charged for facilities and services they do not use, or otherwise not properly allocable to them. Landing charges should be based on aircraft maximum permissible take-off weight. ICAO has also approved a cost-based formula based on separate en-route/in-flight and terminal/approach charges, adjusted for aircraft weight and distance flown. Others have suggested additional factors should be considered, such as the time of day, level of airport congestion, and airspace utilized.[142] Two types of charges -- security charges and noise-related charges -- should be designed to recover no more than the relevant costs of providing security and noise-abatement equipment and services. In contrast, other charges may produce sufficient revenue to exceed direct and indirect costs by a reasonable margin.[143] Of course, airport and air navigation fees and charges may not discriminate between domestic and foreign carriers.[144]

2. FINANCE METHODOLOGIES

In covering operating costs, airports tend to use one of three approaches. The most popular is the *Residual Cost*, or "cash register," approach, which seeks to balance total costs with total revenue. Once the airport's costs have been determined, non-airline revenue is subtracted from total expenditures to determine what additional revenue is needed to break even. Airline specific fees are then set to make up the remaining deficit.

A second approach is the *Cost of Service*, or "multiple cost center" method. The airport is divided into cost centers, and fees and charges for each cost center is set at a level to cover the costs allocated to it. A third method is the *Public Subsidy* approach, under which the difference between cost and revenue is subsidized by the airport.[145]

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[142] National Civil Aviation Review Commission, Avoiding Aviation Gridlock & Reducing the Accident Rate II-29 (Dec. 1997).
[143] International Civil Aviation Organization, Airport Economics Manual 3 (1991).
[144] For an explanation of these principles, see Paul Stephen Dempsey, Law & Foreign Policy in International Aviation 286-88 (Transnational Publishers 1987).
[145] Paul Stephen Dempsey & Laurence Gesell, Air Transportation: Foundations for the 21st Century 450-51 (1997).

Once an airport is operating, it must generate sufficient revenue to retire debt and cover operating expenses. Airports generate revenue from landing fees and terminal leases, concessions (e.g., parking fees), departure taxes and passenger facility charges, and other sources (e.g., advertising and fuel sales). Airport operating revenue funds the airport's operating expenses, debt service, and sometimes non-operating expenses, such as capital development (under a "pay-as-you-go" financing scheme).[146]

Airport revenue falls into two broad categories -- revenue derived from air traffic operations, and revenue derived from ancillary (non-aeronautical) operations.[147] Air traffic operations are a major revenue stream. These include aircraft landing and parking charges, passenger and cargo charges, and leases of airline hangars and gates. User charges account for between 50-65% of total revenue for an airport.

Ancillary, or *non-aeronautical activities* include concession fees (e.g., rentals and profit-sharing arrangements with concessionaires such as restaurants and shops), revenue derived from rental of land, premises and equipment (e.g., hotels, and airline cargo space, kitchens and office space rent), income derived from the airport's shops and services (e.g., baggage handling, and parking), and various fees charged to the public.[148] At the largest airports in the United States, 20% of revenue is derived from airline landing fees, 40% from parking and concessions, 20% from terminal leases, and 20% other sources.[149] A worldwide survey of airports conducted by Airports Council International revealed that 54% of airport revenues come from aeronautical sources (such as landing fees, aircraft parking, lighting and airbridge charges) and 46% is derived from non-aeronautical sources (such as concessions, parking, rental car facilities, and advertising).[150]

Fees imposed upon airport concessions may be based upon (a) bids by tender, (b) assessment of market value, (c) the annual costs of the building and land, or (d) a combination of the above. The primary basis used by most airports for selecting concessionaires is by public tender, though some airports do not necessarily accept the highest bid, allowing

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[146] U.S. General Accounting Office, Airport Financing: Funding Sources for Airport Development 41 (Mar. 1998).
[147] International Civil Aviation Organization, Airport Planning Manual 1-27 (1987).
[148] See generally, International Civil Aviation Organization, Airport Planning Manual 1-27 (1987).
[149] U.S. General Accounting Office, Airport Privatization 4 (Feb. 29, 1996).
[150] Rise Before the Fall, Asia Airports (Nov. 1998), at 55.

such factors as standards of service and competitive prices to play a role in the selection process. In determining market value, airport operators often compare the value of premises of similar character in the vicinity, taking into account the nature of the activity, the size of the market, and the volume of transactions. In determining the costs of the building and land, full costs are usually taken into account, including maintenance, operating and administrative expenses and capital costs (depreciation and interest).[151]

Concession fees may be variable or fixed. Variable fees are usually stated as a percentage of sales, or less commonly (because of difficulties of monitoring and auditing profit), a percentage of net profit. Some airports impose an increasing percentage as the volume of business increases. Most airport that use variable fees also stipulate a minimum payment. Fixed concession fees are usually applied to those activities likely to yield only modest profits (e.g., barber, book, flower, newspaper, photo slot-machines, and taxis). Some airports divide space into different zones, charging higher fees for more desirable locations.[152] Airports should take care to ensure that retail prices charged by concessionaires are fair and competitive.[153] Some do so by placing a ceiling of no more than, say 10% higher than, prices charged in the central business district of the city the airport serves.

F. AIRPORT ACCOUNTING & CONTROL PRACTICES

Each airport should establish appropriate financial accounting and control practices (in accordance with recognized accounting rules, standards or conventions) not only to ensure that its economic resources are properly and lawfully deployed, but to give management essential data to operate the airport, and existing or potential lenders a basis on which to make their investment.

Financial accounting refers to the system in which income and expenses are recorded to present a comprehensive financial picture.[154] Typically, the airport will periodically (monthly, quarterly and annually) produce a profit and loss statement and a balance sheet. The profit and loss statement summarized the revenue and expenses over the period, with the difference being the profit or loss. The balance sheet

[151] International Civil Aviation Organization, Development of Non-Aeronautical Revenues At Airports 7-10 (1979).
[152] Id.
[153] International Civil Aviation Organization, Airport Economics Manual 55 (1991).
[154] International Civil Aviation Organization, Airport Economics Manual 13 (1991).

summarizes the assets and liabilities, with the difference being an increase or decrease in the airport's net worth over the period.[155] The airport should also produce a periodic budget, with a subsequent explanation of positive or negative variances from budget.[156]

Financial control refers to the system of monitoring financial performance to ensure that expenses comport with plan, and income flows correspond to budget. Financial control is a three-step process: (1) comparing actual income and expenses with plan; (2) determining whether income or expense variances from plan are a problem of the budget, management of the airport, or external factors; and (3) what corrective action should be, and can be, taken.[157] Careful accounting and control can also thwart fraud or embezzlement, assuring that the public's resources are well spent. Internal and external auditing should be performed to assure that the financial data is accurate, and to identify waste and embezzlement. Law enforcement should be vigorously pursued against corruption.

G. FINANCE: SUMMARY

The capital requirements needed to finance airport projects are enormous. More than $300 billion in airport projects are underway or contemplated around the world. Typically, airport projects are financed with a mix of debt and equity, the equity usually coming from the government treasury. Airline financial instability created by deregulation and liberalization enhances airport financial risk. Though there is a movement to airport privatization and corporatization in certain parts of the world, local and national governments typically occupy center stage. Privatization also potentially poses problems of monopolistic abuse if unregulated.

Airports must generate sufficient revenue to cover operating expenses and service debt. The modern trend is to reduce reliance on aeronautical charges imposed upon airlines, and seek improved concession and rental revenue streams. It is here that privatization offers its most promising contribution. Increasingly, the potential financial opportunities are turning airports into shopping centers with runways.

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[155] International Civil Aviation Organization, Airport Planning Manual 1-28 (1987). Airports and airlines employ similar accounting practices. See Paul Stephen Dempsey & Laurence Gesell. Airline Management: Strategies for the 21st Century 130-38 (Coast Aire 1997).

[156] International Civil Aviation Organization, Airport Planning Manual 1-33 (1987).

[157] International Civil Aviation Organization, Airport Economics Manual 13 (1991).

III. AIRPORT DESIGN

Early airports were built away from the cities they served, on inexpensive land, and where a minimum number of obstructions allowed maximum flexibility and safety in flight operations. Small aircraft flying infrequently posed little objection on grounds of noise. But the growth of air transport in terms of size and range of aircraft, thrust of engines, and frequency of takeoffs and landings, coupled with the expansion of cities to engulf airports, has caused the airport's needs for land and the aircraft's bombardment of noise to collide with the interests of surrounding landowners. As Edward Gervais, chief of airport planning at Boeing put it, "Most current airports have grown up from the DC-3 days, and now they're surrounded by residences and businesses."[158] Airports are therefore challenged by the need to acquire sufficient airspace for access, sufficient land for ground operations, all within a potentially hostile political environment.[159] The problem is exacerbated by the fact that aviation is the fastest growing mode of transport. That has raised the profile of environmental issues such as noise, land use, air and water pollution, climate change, and energy efficiency.[160]

Building a new airport, and selecting a venue for it, stems from a decision that the existing airport cannot be expanded adequately to accommodate anticipated aviation demand.[161] In determining whether a new airport should be built, and assessing which of the potential sites should be chosen, the U.S. Federal Aviation Administration has summarized the salient criteria as these:

> The principal considerations for comparison of new sites to the existing airport will be airspace and airspace capacity, airfield and ground access costs (including value of time), aircraft operational costs, environmental impacts, financial feasibility, and long-term viability. Considerations also must be given to alternative roles for the existing airport and alternative transfer times to a hypothetical new

[158] Nisid Hajari, A Walk In The Clouds, Time (June 22, 1998).
[159] See generally, Robert Horonjeff & Francis McKelvey, Planning & Design of Airports 181-83 (4th ed. 1994).
[160] Jennifer Stenzel & Jonathan Trutt, Flying Off Course: Environmental Impacts of America's Airports 4 (Natural Resources Defense Council 1996).
[161] Federal Aviation Administration, Airport Master Plans 41 (1985).

airport.[162]

A. TERMINAL & AIR FIELD CONFIGURATION: A MULTI-GENERATIONAL ANALYSIS

Many of the first-generation airports were military facilities, which after the Great War (World War I) were wholly or partially converted to civilian operations, with airlines operating out of former military hangars and barracks. For example, the city of Amsterdam purchased a military air field to serve passengers arriving for the 1928 Olympics, in what later became Schiphol Airport.[163] In Asia, many of the first generation airports were also post-war military facilities, but of World War II vintage, though this happened in Europe as well.[164] Between the world wars, Orly Airport near Paris had been the site of dirigible hangars, more than 300 meters long. Orly was taken over by the U.S. Army during World War II, then returned to the French government in 1946. By the end of that year, a wooden air terminal had been erected. Today, Orly is France's second busiest airport.[165] Similarly, London's Stansted Airport was originally George Washington Field, built by U.S. Army 817th Engineer Aviation Battalion in 1942.[166] At each of these former military air fields, additional purpose-built passenger and freight facilities gradually were added to house the different airport functions -- administration, passports and immigration, customs, weather, communications, and airlines.[167]

Crossing vast oceans in nascent aeronautical technology, the original transcontinental commercial aircraft were flying boats, capable of landing on water should the aircraft experience engine failure. Thus, another type of first generation landing field was water. Flying boats typically landed on bays. At New York's LaGuardia Airport a marine terminal was built to serve arrivals and departures of Pan Am "Clipper" aircraft, named after the Clipper ships of an earlier era. Pan American World Airways was expanding its operations across oceans, and flying boats were then the safest means of transport. At Wake Island, a barren rock between Midway and Guam, the airline dynamited the lagoon to

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[162] Federal Aviation Administration, Airport Master Plans 33 (1985).
[163] Amsterdam Airport Schiphol, Balancing Environment and Economics (1997).
[164] Paul Stephen Dempsey & Kevin O'Connor, Air Traffic Congestion and Infrastructure Development in the Pacific Asia Region, in Asia Pacific Air Transport: Challenges and Policy Reforms 23, 29 (Institute of Southeast Asian Studies 1997).
[165] Aeroports de Paris, Orly, Mastering the Future (1997).
[166] John Hamlin, The Stansted Experience 7 (1997).
[167] Wolfgang Voigt, From the Hippodrome to the Aerodrome, From the Air Station to the Terminal, in Building for Air Travel 31-32 (John Zukowsky ed. 1996).

rid it of coral so its flying boats could land safely.[168]

The second generation of airports was characterized by the arrangement of buildings around an air field according to a recognizable plan. The runways were grassy fields drained of moisture, with only the area immediately adjacent to the terminal and hangar (the apron) paved. A few airports in this era were illuminated, to allow flying at night.[169] The first municipal airport and terminal was built by the German government at Konigsburg (now Kalingrad) in East Prussia, to allow it to be connected via air to the rest of Germany after East Prussia became geographically isolated as a result of ceding Danzig to Poland at the end of World War I. Berlin's Templehof Airport was built the following year.[170]

By the 1930s, it became apparent that airports were being boxed in by buildings located along the periphery, leaving inadequate room for expansion. The French engineer A. B. Duval developed a concept of a wedge-shaped building zone projecting from the edge to the center of the airport, so that 80% of the airport periphery could remain undeveloped. That concept was adopted in the 1930s at Lyon, France, Birmingham, England, and Helsinki, Finland.[171]

The fourth generation is represented by London's Heathrow and Paris' Orly airports, where the passenger buildings were located on an island in the central part of the airport, with runways grouped in constellations around the terminal. The island is dominated by a passenger terminal building allowing aircraft direct access, and a central core of buildings, roads, automobile parking garages, with a tunnel or underpass giving access to the island.[172]

Adopted in the 1950s, when gate concourses were added to central terminal buildings,[173] the fifth generation airport is typified by London's Gatwick or Amsterdam's Schiphol airports, with a rectangular "landside" building with "pier fingers" jutting from it.[174] Moveable sidewalks

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[168] Nisid Hajari, A Walk In The Clouds, Time (June 22, 1998).
[169] Wolfgang Voigt, From the Hippodrome to the Aerodrome, From the Air Station to the Terminal, in Building for Air Travel 34 (John Zukowsky ed. 1996).
[170] John Zukowsky, Introduction, in Building for Air Travel 14 (John Zukowsky ed. 1996).
[171] Id. at 44.
[172] Koos Bosma, European Airports, 1945-1995, in Building for Air Travel 54 (John Zukowsky ed. 1996).
[173] International Civil Aviation Organization, Airport Planning Manual I-83 (2d ed. 1987).
[174] David Brodherson, An Airport In Every City, in Building for Air Travel 81 (John Zukowsky ed. 1996).

transport passengers long distances from the ticketing area in the central terminal, out along the concourses to their gates, where they enter the aircraft (parked in rows on the aprons at the edge of the airside) via a jetway which protrudes from the fingers. The fundamental concept was to minimize distances between landside and airside.[175]

The sixth generation airport emerged in the late 1950s and early 1960s, and is typified by New York Kennedy and Los Angeles International Airports, where independent satellite unit terminal buildings, typically dominated by a single airline, with a single multiple use international terminal at one end, are located around a central highway corridor in the middle of the airport surrounded by runways, and connected together by bus or rail lines.[176] This airport design is efficient for intra-carrier connections, but creates inconvenience for passengers needing to transfer between carriers.

The seventh generation airport, the "O&D Airport," is typified by Dallas/Ft. Worth International, Kansas City International, and Rio de Janeiro airports, with terminal buildings placed within convenient proximity of parking. In each case, curved terminals wrap around parking areas, while aircraft are parked around the outside of the curved buildings. Thus, minimum walking distance is required between parking, check-in, and departure gates. While of great convenience to origin-and-destination [O&D] passengers, the design is deficient for the connecting passenger, who must often walk vast distances between his or her arrival and departure gates. Efforts have been made to resolve this difficulty by providing people mover systems (pioneered at Tampa in 1970), typically below-ground trams moving between clusters of gates.

The eighth generation airport, the "hub connecting airport", is typified by Atlanta Hartsfield are Denver International airports, whereby remote satellite concourses are surrounded by the air field and connected to the main terminal building (surrounded on both sides by car parks) via a below-ground people mover system. Orlando International Airport reflects another derivation of this approach, with circular pods connected to the main terminal by above-ground monorails. Many airports use below-ground trams to link terminals and concourses, including Atlanta, Birmingham, Dallas/Ft. Worth, Denver, Gatwick,

[175] Koos Bosma, European Airports, 1945-1995, in Building for Air Travel 55, 57 (John Zukowsky ed. 1996).
[176] David Brodherson, An Airport In Every City, in Building for Air Travel 86-87 (John Zukowsky ed. 1996).

Hong Kong, Houston, Las Vegas, Miami, Newark, Pittsburgh and Sea-Tac.[177] Tampa's and Orlando's trams are above-ground. Trams at Dallas/Ft. Worth and Kuala Lumpur are partly above ground and partly subterranean. Washington Dulles tried another innovation, though mercifully not followed elsewhere -- access to the remote mid-field concourse is via oversized bus-like elevated lounges built by Chrysler.[178] Chicago O'Hare International Airport added an underground moveable sidewalk showered in pastel lights and tinkle-bell music between its landside terminal and United Airlines' remote concourse. Many airports transport passengers from the terminal to remote parked aircraft in busses which roll across the tarmac, or by busses from one terminal pier to another, such as Detroit's Wayne Airport.

Configuring the airport requires assessing the number and orientation of the runways relative to the terminal. The number of runways is dictated by the volume of aircraft movements, while the orientation of runways is driven largely by prevailing winds, the size and shape of the perimeter of the airport property, and land use restrictions in the airport's vicinity. The terminal building should be located as close to the runways as possible to provide for efficient aircraft movements between them.[179]

B. AIR FIELD DESIGN

Known as "landing fields," the original airports were simply grass fields, allowing landing and takeoff from any direction within 360 degrees. The original aircraft were so light in weight that their pilots had to point them directly into the wind in order to effectuate a safe take off or landing; hence, 360° radius flexibility was imperative. Cinders were added at Chicago Municipal Airport (later renamed Midway) in 1926 to reduce the problem of water and mud on the field. Elsewhere, gravel, crushed rock and ashes were later added to the airfield.

These were followed by hard-surfaced runways, initially in the shape of a cross. As aircraft became heavier, they became less affected by crosswinds, and more likely to sink into the mud on unsurfaced air fields. In Europe, the Halle-Leipzig Airport added a concrete runway for

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[177] Mark Bouman, Cities of the Plane, in Building for Air Travel 186 (John Zukowsky, ed. 1995).
[178] David Brodherson, An Airport In Every City, in Building for Air Travel 93 (John Zukowsky ed. 1996).
[179] Robert Hornojeff & Francis McKelvey, Planning & Design of Airports 249 (McGraw Hill 4th ed. 1994).

takeoffs in 1926, the world's first hard surface runway. Newark built the first hard-surfaced runway in the United States in 1928. The first concrete runway was built the following year at Dearborn, Michigan. In 1936, Stockholm's Brumma Airport became Europe's first airport to utilize a full system of hard-surfaced runways. Influenced by the advent of the DC-3 in 1936, New York's LaGuardia Airport, built in 1939, and Washington National Airport, built in 1941, were two of the first U.S. airports in which the layout of the runways and taxiways was considered as important as the design of the terminal building. LaGuardia was originally designed with four runways, allowing takeoffs and landings from eight directions. Washington's Dulles International Airport, opened in 1962, was the first airport designed for modern jet transports. Paris' Charles de Gaulle Airport, opened in 1974, would be designed with the jumbo jets in mind, with widely separated staggered runways, allowing parallel approaches at different altitudes. The Brisbane Airport, opened in 1988, Denver International Airport, opened in 1995, and Hong Kong International Airport, opened in 1998, all were designed for the next generation of super jumbo aircraft not even yet then built.[180]

As aircraft technology matured, air fields had to be designed to accommodate the larger, heavier aircraft, with higher-thrust engines capable of lifting increased weight off the ground. This generally required longer runways built with a surface capable of withstanding the loads, though more advanced aircraft have abated the trend toward longer runways somewhat.[181] As air travel demand increased and airlines responded with more flights, runway saturation required more runways, spaced farther apart, allowing simultaneous takeoffs and landings from multiple directions.

Forecasts should attempt to predict the number of aircraft movements, type of aircraft, nature of the traffic, and other essential criteria essential in determining the number, layout and dimensions of runways, taxiways and aprons. Because of the vast amounts of land which runways, taxiways and aprons consume, as well as the land use restrictions on nearby real estate necessary to assure safe and environmentally inoffensive takeoffs and landings, the runways and taxiways are the essential starting point for designating the airport

[180] Wood Lockhart, A Pilot's Perspective on Airport Design, in Building for Air Travel 215-16, 222, 224 (John Zukowsky ed. 1996).
[181] Robert Horonjeff & Francis McKelvey, Planning & Design of Airports 89 (4th ed. 1994).

layout.[182] In other words, in designing an airport, the runway and air field layout should be done first. However, these air field components, and their possible alternative layouts, cannot be considered in isolation. They should be considered in conjunction with the other essential infrastructure of an airport (e.g., passenger terminals, cargo buildings, aircraft maintenance hangars, parking) to select the optimum integrated schemes essential for efficient operations, and identify those areas where compromise may be required.[183] Moreover, as always, sufficient land should be set aside to accommodate future growth, including adequate space for adding or lengthening runways as demand increases or technology changes. Clearly, airports are land consumptive endeavors.

Runways and taxiways should be located so as to provide adequate separation between flying aircraft and reduce delay in landing, taxiing, and takeoff. They should be staggered, so that parallel aircraft approaches can be made at different altitudes. Taxiways should be placed so as to provide the shortest possible distance from the terminal to the ends of the runways, and be sufficiently abundant, adequately sized and at proper angles so as to allow landing aircraft to exit the runway as quickly as possible. Adequately sized aprons should be located adjacent to runways to allow several aircraft to park in a queue while awaiting takeoff, with sufficient space to bypass a parked plane. The terminal itself should be located to minimize distances to the takeoff ends of the runways, and to shorten taxiing distance for landing aircraft as much as possible.[184]

Alternative airport layout plans are also developed to enhance efficiency of airline operations, keeping taxi distance and runway crossings to a minimum given meteorological conditions, capacity requirements, noise and land use constraints, and air traffic restrictions. The air field should be designed with an eye on to terminal configuration and intermodal transport rights-of-way and their location.[185]

In designing an air field, several alternative runway configurations assist planners in assessing noise and other environmental impacts on surrounding land.[186] Computer models can graphically identify noise

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[182] International Civil Aviation Organization, Airport Planning Manual I-47 (2d ed. 1987).
[183] International Civil Aviation Organization, Airport Planning Manual I-46 (2d ed. 1987).
[184] Robert Hornojeff & Francis McKelvey, Planning & Design of Airports 249, 256 (McGraw Hill 4th ed. 1994).
[185] See James Spensley, Airport Planning, in Airport Regulation, Law & Public Policy 73 (R. Hardaway ed. 1991).
[186] James Spensley, Airport Planning, in Airport Regulation, Law & Public Policy 72 (R.

contours to identify areas which will be saturated with noise, thereby enabling planners to avoid flights over residential areas. For example, airport planners in Hong Kong evaluated 120 runway configurations before coming up with a runway design capable of handling 47 flights per hour in Phase I, compared with Kai Tak's low 30s maximum capacity per hour.[187]

C. RUNWAYS, TAXIWAYS & APRONS

Runways have several essential elements -- structural pavement sufficient to support projected aircraft loads, shoulders capable of resisting erosion due to jet blasting and capable of handling maintenance equipment, a runway strip which surrounds the runway and shoulder, the blast pad adjacent to the runway ends, the runway end safety area, stopway, and clearway consisting of an undeveloped zone beyond the blast pad to protect against aircraft over-or under-shots.[188] *Taxiways* are designed to provide aircraft with surface egress and ingress to runways. Exit taxiways should be designed to minimize runway occupancy time by aircraft which have landed. Rapid end taxiways are those which have an angle of 25 to 45 degrees, allowing high-speed exit from the runways.[189] Taxiways are designed to facilitate efficient aircraft movements between runways and terminals or hangars.[190] *Aprons* are paved airside areas in which aircraft are parked for lading and unloading passengers, mail or cargo, fueling, parking or maintenance.[191]

Runway configuration must be planned to integrate with existing air space limitations imposed by existing air uses (such as air traffic patterns created by nearby airports), and obstructions to navigation such as topography, buildings or other urban structures (such as radio or water towers), and prevailing meteorological conditions (e.g., wind, fog, rain) and electromagnetic interference.[192] Hong Kong's Kai Tak Airport had numerous physical and Man-Made obstacles standing in the straight-line flight path, over an extremely dense population base. This

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Hardaway ed. 1991).
[187] Brent Hannon, Gateways To Growth, Asia, Inc. (Nov. 1995), at 62.
[188] International Civil Aviation Organization, Airport Planning Manual I-47, I-48 (2d ed. 1987).
[189] International Civil Aviation Organization, Airport Planning Manual I-49, I-50 (2d ed. 1987).
[190] Robert Hornojeff & Francis McKelvey, Planning & Design of Airports 249 (McGraw Hill 4th ed. 1994).
[191] International Civil Aviation Organization, Airport Planning Manual I-59 (2d ed. 1987); See Laurence Gesell, The Administration of Public Airports 65-84 (3rd ed. 1991).
[192] Federal Aviation Administration, Airport Master Plans 34 (1985).

required serious circuitry and banking in the approach flight path, including a 47° turn to line up with the runway. Mercifully, Kai Tak was closed in 1998 when Hong Kong International Airport opened. The new airport has straight approaches over the ocean, and adequate safety areas at the ends of the runways to provide a margin of safety should an aircraft over- or under-shoot the runway.

Runways should also be spaced so that they are sufficiently apart to accommodate parallel instrument landings during periods of inclement weather. The FAA prefers spacing of 4,300 feet between runways for simultaneous instrument landings. At airports such as Cleveland Hopkins and San Francisco International Airport, the parallel runways are simply too close together to allow simultaneous parallel landings during periods of inclement weather. At San Francisco, there is only 750 feet between the runways.[193]

Runways, taxiways, aprons and terminals must be designed to accommodate the aircraft which will use them. In addition to volume of movements, consideration also must be given to aircraft weight and mass (which determines the thickness of pavement), wingspan and fuselage length (which influences the width of runways, taxiways, and aprons, and the configuration of the passenger building), aircraft turning radii (the distance from the center of the rotation to the wing tips, nose and tail of the aircraft), passenger and cargo capacity (which influences the size and design of the passenger terminal), and takeoff length (which determines the length of runways). Runway length is also effected by temperature (the higher the temperature, the longer the runway required), altitude (the higher the airport, the longer the runway required), surface wind (headwinds shorten necessary runway length; tailwinds lengthen it), slope (an uphill grade required longer runways than a downhill grade), and surface condition (water, snow and slush make longer runways necessary).[194] Drainage and slope must be adequate to remove water, snow and slush from the surface. To reduce the potential for hydroplaning and improve braking, the runway surface is typically grooved in a transverse direction.[195]

Safety, noise, topography and land availability are among the

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[193] Address of Wood Lockhart Before the National Aerospace Conference, Dayton, Ohio (Oct. 2, 1998).
[194] International Civil Aviation Organization, Airport Planning Manual I-51, I-53 (2d ed. 1987). See also Robert Horonjeff & Francis McKelvey, Planning & Design of Airports (4th ed. 1994).
[195] Robert Horonjeff & Francis McKelvey, Planning & Design of Airports 124 (4th ed. 1994).

principal concerns in runway layout. To the extent possible, runways should be oriented so that aircraft do not fly over heavily populated areas, both for safety and environmental reasons. They should also be oriented toward the prevailing wind when it blows consistently from a particular direction. Aircraft have difficulty taking off and landing when the *crosswinds* (winds at right angles to the aircraft) are excessive.[196] The maximum allowable crosswind depends on the size of the aircraft, its wind configuration, and the condition of the runway surface.[197] The standard minimum usability of a runway with respect to crosswinds, as established in ICAO's Annex 14, must be 95% with crosswind of 20 knots on runways of 1,500 meters or longer, 13 knots on runways between 1,200 and 1,500 meters, and 10 knots on runways less than 1,200 meters long. The determination of the appropriate direction of a runway is performed by using a *wind rose*, a series of concentric circles cut by radial zones drawn to the scale of wind magnitude on polar coordinated graph paper.[198] Additional runways, laid at different angles, may be necessary to accommodate aircraft during periods of strong crosswinds, though, since they are only to be used under high headwinds, their length may be shorter than the primary runway.[199] Aircraft use of runways and airspace adjacent thereto must include sufficient separation so that smaller aircraft are not caught up in the wake turbulence or wake vortex of larger aircraft.[200]

Airports should also be located away from concentrations of birds, such as nesting estuaries or garbage dumps. For example, Israeli aviation officials had to place a curfew at Tel Aviv's Ben Gurion International Airport between 1:00-3:00 p.m. because the number of birds feeding at the nearby dump is heaviest during the early afternoon.[201]

There are essentially four types of runway configurations -- single runway, parallel runways, intersecting runways, and open-V runways. The simplest is a single runway, which can handle between 50 and 100 aircraft movements per hour under visual flight rule [VFR] conditions, and between 50 and 70 movements per hour under instrument flight rule [IFR] conditions, depending upon the types of aircraft and navigational

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[196] International Civil Aviation Organization, Airport Planning Manual I-35 (2d ed. 1987).
[197] Robert Hornojeff & Francis McKelvey, Planning & Design of Airports 259 (McGraw Hill 4th ed. 1994).
[198] Robert Hornojeff & Francis McKelvey, Planning & Design of Airports 265-66 (McGraw Hill 4th ed. 1994).
[199] International Civil Aviation Organization, Airport Planning Manual I-39 (2d ed. 1987).
[200] Robert Horonjeff & Francis McKelvey, Planning & Design of Airports 109 (4th ed. 1994).
[201] Birds Force Israel To Close Airport, Denver Post, Jan. 17, 1998, at 9A.

technology available. The capacity of parallel runways depends upon their spacing. Some runways are only 700 feet apart. Where the distance between them exceeds 4,300 feet, they can be operated independently under IFR conditions. Parallel runways can handle between 60 and 200 operations per hour under VFR conditions, and between 60 to 125 operations under IFR conditions, depending upon runway spacing and navigational equipment. Intersecting runways are usually built when strong crosswinds come from more than a single direction, or when the air field land perimeter will not permit parallel runways. When wind is light, both runways can be used simultaneously. The farther the intersection is located from the takeoff end of the runway, the lower its capacity. Open-V runways are those which, from the air, resemble the letter "V", and these too are often built because of shifting strong crosswinds. When winds are light, both runways can be used. Maximum capacity is enjoyed when operations are directed away from the base of the V (this is called a *diverging pattern*), and are minimized when operations are toward the base of the V (this is called a *converging pattern*).[202]

Generally speaking, a parallel runway layout is preferred to intersecting runways, though terrain, noise constraints or flight obstacles may make parallel runways infeasible. London's Heathrow Airport, originally a military airfield on the outskirts of London, and opened to commercial aviation in 1946, is laid out with six runways in a "Star of David" configuration, so as to provide simultaneous takeoffs and landings from as many as six different directions, depending upon the wind.[203] In contrast, Ronald Reagan Washington National Airport, build on landfill in the Potomac River, has three crossing runways. San Francisco International has four. Intersecting runways create both capacity limitations and potential safety problems.

Larger airports include parallel one-way taxiways to alleviate air field congestion and delay. Taxiways should be laid out in a way to minimize distance between the terminal and the ends of the runway. Taxiways should also be placed at several points along the runway, and angled, so as to facilitate high-speed exit by landing aircraft -- these are known as *exit taxiways* or *turnoffs*. This frees the runway up for another landing.[204]

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[202] Robert Hornojeff & Francis McKelvey, Planning & Design of Airports 250-55 (McGraw Hill 4th ed. 1994).
[203] Wood Lockhart, A Pilot's Perspective on Airport Design, in Building for Air Travel 221 (John Zukowsky ed. 1996).
[204] Robert Hornojeff & Francis McKelvey, Planning & Design of Airports 250 (McGraw Hill

Aprons serve terminals, and therefore must be planned in conjunction with them. Among the objectives to be taken account of in siting aprons are: (1) providing minimum distance between runways and aircraft stands; (2) allowing freedom of aircraft movement to avoid delay; (3) reserving adequate area for demand-based expansion and advances in aircraft technology; (4) achieving maximum efficiency, safety and user convenience; and (5) minimizing adverse environmental effects.[205] The apron size is influenced by the number of aircraft stands it needs to accommodate, the present and future aircraft mix, their dimensions and parking configuration, as well as ground service and service road requirements.[206] Ideally, an apron will be sufficiently large to allow an aircraft to back out and turn without blocking a taxiway.

Several methods of deplaning passengers exist, from parking the aircraft on the apron and walking the passengers across the tarmac to the terminal building (where they are processed through immigrations or customs, and retrieve their baggage) at smaller airports, to having the aircraft pull up to a jetway which connects to the aircraft for convenient passenger "de-planing":

1. *Simple concept*. Aircraft are parked on the apron either angled nose-in or nose-out, for self-taxi in and out. Passengers walk across the tarmac to the terminal building. Though perhaps appropriate for small, low-density airports, having passengers walking around the tarmac creates security and safety concerns, and is less convenient for passengers and their baggage.
2. *Linear concept.* Aircraft are parked side-by-side nose-in along one side of the terminal. When fully boarded, they are pushed out, consuming less apron space aside either wing of the aircraft, but more at its tail.
3. *Pier (finger) concept.* Aircraft are parked side-by-side nose-in along both sides of a terminal pier which juts in to the apron area. This can be an efficient means of boarding connecting passengers, for walking distances between gates is shortened. However, the pier finger concept creates inefficiency for aircraft as it restricts movements into and out of dead ends.
4. *Satellite concept.* Aircraft are parked all the way around a satellite terminal remote from the main terminal, and connected to it by

4th ed. 1994).
[205] International Civil Aviation Organization, Airport Planning Manual I-59 (2d ed. 1987).
[206] International Civil Aviation Organization, Airport Planning Manual I-59 (2d ed. 1987).

surface or underground transport. The remote terminal concept allows for more efficient air field movements by taxiing aircraft.

5. *Transporter concept.* Aircraft are parked at a remote apron (sometimes called a remote stand), and passengers board buses to take them to the terminal. The advantage is that aircraft may be parked closer to the runway, reducing taxiing and improving aircraft flexibility. However, passengers, baggage and cargo must be moved longer distances.
6. *Hybrid concept.* A hybrid consists of any combination of the above. For example, some international airports use the transporter concept to augment capacity during peak periods when all gates are occupied.[207] An example of the hybrid concept is the new Kuala Lumpur International Airport, which uses the linear and pier (finger) concepts at its main terminal, and the satellite concept at its remote terminal, with the two linked together by an above- and below-ground rail line.

Nose-in parking coupled with passenger loading bridges (jetways) appears to be the preferred parking configuration for most modern high-volume airports, for it consumes less apron area and less aircraft ground time due to efficient movement of passengers and efficient positioning of ground service equipment. It is also superior in terms of passenger safety, convenience and comfort, and security, than its alternatives. Its major drawback is that it often requires a tractor (or fuel-consumptive reverse engine thrust) for departure.[208] Additional aprons must be designed for the airport to accommodate such areas as the cargo terminal, maintenance terminal, parking, holding and de-icing bays, general aviation, and helicopters.[209]

Runways, taxiways and aprons are paved with layers of concrete and/or asphalt with different densities, strength and smoothness. For example, at Kansai International Airport, the runways and taxiways are comprised of an asphalt concrete pavement, while aprons are comprised of a pre-stressed concrete pavement, and other areas are comprised of plain concrete pavement. Each includes several layers to ensure durability and longevity.

Runways and taxiways were fitted with lateral and axis beacons

[207] International Civil Aviation Organization, Airport Planning Manual I-64 (2d ed. 1987).
[208] International Civil Aviation Organization, Airport Planning Manual I-61 (2d ed. 1987).
[209] International Civil Aviation Organization, Airport Planning Manual I-66, I-67 (2d ed. 1987).

and lights to guide the pilot from touchdown to the gate. In accordance with ICAO standards, the taxiways were equipped with blue lateral beacons and red stop bars (at angles perpendicular to the direction of air travel) at intersections, and green beacons on the axis lines. By lighting up only the beacons relevant to an aircraft's navigation of the air field, the pilot can be led step-by-step from touchdown to the gate under a 'Follow the Greens' system. To provide night time illumination, floodlights were installed atop masts surrounding the concourses.

D. AIRPORT TOWER & CONTROL CENTER

The airport control tower should have a clear and unobstructed view of the entire movement area, including runways, taxiways, aprons, and parking spaces, and of air traffic in its vicinity. Shorter towers may be useful to manage aircraft ground traffic around aprons. The area control, or flight information center, should be in reasonably close proximity to the airport control tower and sufficiently large to accommodate its personnel and equipment.[210]

E. SAFETY INFRASTRUCTURE

Though at most airports, de-icing of aircraft is performed at the gates, aircraft de-icing pads should be located as close to the departure runways as possible, so that aircraft can take off immediately after de-icing fluid is applied. De-icing fluids typically include glycols, thickener, and corrosion inhibitors, which present low-level environmental concerns if they contaminate the soil or ground or surface water. Therefore, the de-icing pads should collect and recycle the de-icing fluid, so that it does not become an environmental hazard. Fire, crash and rescue facilities should be located on the air field, as close to the center of the runways as possible, so as to minimize response time during emergencies.[211]

F. AIRCRAFT FUEL FACILITIES

Commercial aircraft consume vast quantities of fuel. The design and location of fuel facilities should adhere to the highest principles of safety, environmental prudence, and aircraft service efficiency. Fuel should be stored close to the aircraft fueling area as possible, which is

[210] International Civil Aviation Organization, Airport Planning Manual I-71, I-72 (2d ed. 1987).
[211] Federal Aviation Administration, Airport Master Plans 33 (1985).

usually at their parking position at stands near the terminal building, located near the fuel intakes on the wings of the aircraft. Pipelines running from a central storage area linking pits at the aircraft stand avoid both excessive storage near the passenger terminal, and fuel trucks on the tarmac.[212]

G. CARGO & MAIL FACILITIES

Cargo and mail are transported in the belly of passenger aircraft, in combination aircraft (frequently in containers) and in all-cargo carrier freighters. It is recommended that all-cargo aircraft be separated from combination aircraft. Typically, combination aircraft are parked on the aprons adjacent to the passenger terminal building, while all-cargo aircraft are parked near cargo terminals. The flow of cargo and accompanying documents to and from, and between, aircraft should be smooth and cover the shortest possible distance.[213] To facilitate intra-line cargo connections between cargo and combination carriers, cargo facilities should be located in reasonable proximity to the passenger terminal.[214]

[212] International Civil Aviation Organization, Airport Planning Manual I-131, I-132 (2d ed. 1987).
[213] International Civil Aviation Organization, Airport Planning Manual I-129, I-130 (2d ed. 1987).
[214] Federal Aviation Administration, Airport Master Plans 33 (1985).

IV. APPENDIX

A. DADE COUNTY v. AEROLINEAS PERUANASA

307 F.2d 802 (5th Cir. 1962)

GRIFFIN B. BELL.

These consolidated appeals are from final decrees of the District Court holding that appellant may not charge the foreign airlines according to its usual schedule of charges for landing and other aviation fees and for fees paid concessionaires by the appellees and in turn paid to appellant, but must give then the benefit of lower charges to which four others are entitled by virtue of contracts . . . .

Appellant owns and operates the Miami International Airport. Appellees are ten Latin American airline corporations and have made substantial use of the airport facilities in international operations during recent years. Their cause of action is premised on Article 15 of the provisions of the [Chicago] Convention. . . .

The dispute centers around the fact that two separate schedules of charges were effective at the airport; one schedule being based on contracts made at or near the time the airport opened for business in 1946, and the other being based on Resolution No. 56 of appellant setting charges applicable to all aircraft except those of the companies who entered into the contracts. . . .

At the close of World War II, Pan American Airways, Inc. owned the 36th Street Airport near the City of Miami in Dade County, Florida, embracing 223 acres of land. The United States of America owned the adjacent Convair property consisting of 102 acres and both tracts were improved by various airport facilities. Eastern Airlines, Inc., Delta C & S Airlines, Inc. and National Airlines, Inc. were using the facilities of the 36th Street Airport under an arrangement with Pan American. Only Pan American was flying internationally.

The Board of County Commissioners of Dade County was authorized by the Florida Legislature in 1945 to establish airport facilities to be financed by ad valorem taxation on property within the county, and by revenue bonds payable solely from the revenues of any facility established. Pursuant to this statutory authority, the county commissioners acting as the Dade County Port Authority issued twenty year bonds in the municipal amount of $2,500,000 payable only from anticipated revenues. These were exchanged with Pan American Airlines, Inc. for a deed to the 36th Street Airport. Appellant simultaneously borrowing $700,000 from Eastern Airlines with which to purchase the Convair property. This vested title to an existing 325 acre airport in appellant with no cash outlay. At the same time appellant entered into contracts with Pan American and Eastern whereunder Pan American leased a portion of the airport for the term of the revenue bonds and Eastern leased the Convair property for the same term. Pan American and Eastern, because of the indebtedness of the Authority, were committed to the airport from the beginning but leases were also tendered to other airlines at the same time. National, Delta, and Taca Airways Agency, Inc., a

corporation of El Salvador engaged in international service, all accepted identical twenty year leases with the amount of rent depending on space taken. Each lease contract provided that appellant and the lessees would share in the profits of the airport, and sustain it in losses for as long as appellant desired to be so sustained. The contracts required appellants to provide without expense to lessees the necessary facilities for governmental agencies such as the weather bureau, health services, and immigration and customs. Each lease set forth the same schedule of aviation fees to be charged, based on a graduated scale for flights scheduled, plus landing weight of the aircraft. . . .

Appellant commenced operations at the airport on March 23, 1946 with a small staff, offering domestic service only. A schedule of charges applicable to airlines who did not commit themselves to the long term contract was published at that time. On September 24, 1956 appellant adopted Resolution No. 56 setting forth a permanent schedule of charges applicable to all aircraft using the facilities except aircraft of the lessees under the contracts. Appellees commenced using the facilities thereafter, one as early as 1948, and another as late as 1960, and were charged on the basis of Resolution No. 56. These charges exceeded those paid by the lessees in respect to landing charges and included the following, none of which were required of the twenty year lessees . . . .

The clear purpose of the [Chicago Convention] here was to develop international civil air transport services on the basis of equality of opportunity. The contracting nations agreed to apply their laws and regulations to the aircraft of all contracting states without distinction as to nationality. A permanent organization was established under the treaty to further its purposes, including the avoidance of discrimination between the contracting nations. Each airport in the contracting nations open to public use for aircraft of its nationals was to be open under uniform conditions to the aircraft of the other contracting nations.

There is nothing whatever in the treaty that would deprive the contracting airlines here of the fruits of their bargain, made before the treaty became effective, nor that would require appellant to afford the same bargain to appellees.[215] Appellees, on the other hand, have at all times been afforded uniform conditions. The same charges were made against them as against Braniff, an American national flying internationally. They were a part of the same class for the purpose of charges and the contracting airlines, upon the expiration of the twenty year contracts, will join that class. The present separate classifications of the two groups will then cease to exist and Article 15 of the treaty will become fully effective.

That this is a clear import of the treaty is demonstrated by Article 82 thereof which recognizes outstanding inconsistencies, and requires the use of best efforts by the contracting states to secure the termination of any such inconsistency:

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[215] Although it is not a point urged, we note that these contracts were executed after the negotiation of the treaty in 1944 but before it became effective in 1947. With respect to private rights, unlike rights of the governments involved, a treaty is effective only from the exchange of ratifications and does not relate back to effect private rights vested prior to that date.

> 'The contracting States accept this Convention as abrogating all obligations and understandings between them which are inconsistent with its terms, and undertake not to enter into any such obligations and understandings. A contracting State which, before becoming a member of the Organization has undertaken any obligations toward a non-contracting State or a national of a contracting State or of a non-contracting State inconsistent with the terms of this Convention, shall take immediate steps to procure its release from the obligations. If an airline of any contracting State has entered into any such inconsistent obligations, the State of which it is a national shall use its best efforts to secure their termination forthwith and shall in any event cause them to be terminated as soon as such action can lawfully be taken after the coming into force of this Convention.'

Of course, the treaty was effective immediately except as to these inconsistencies but its terms, insofar as applicable here, would not become completely effective until the termination of these outstanding contracts, either at the instance of this government or upon the expiration of the terms of the contracts. . . .

Appellees cannot rely in the courts on what was to be done in the future by this government to remove infra-territorial inconsistencies such as these contracts. This is a matter that addresses itself to the political branch of the government. . . . Thus, it is that appellees will have no cause of action under the treaty until the contracts in question are terminated, or until they expire by their own terms.

But there is yet another reason why this cause fails. Favored nation clauses may be inapplicable in situations where exceptions are made for valuable consideration. . .

Such is the case here. The five airlines with the original contracts joined with appellant to establish and sustain the airport in its infancy. By hindsight it can be said that they received a bargain, but the facts nevertheless show ample consideration. The contracts subsist and so long as they do, appellees cannot complain. . . .

Judgments should have been entered in the District Court for appellant. We reverse and remand so that this may be done.

B. AERLINTE EIREANN TEORANTA v. CANADA

Federal Court of Canada
Trial Division

9 F.T.R. 29 (1987)

MULDOON, J.:

The plaintiffs . . . assert that they are subjected to discrimination and illegal overcharging for landing fees in regard to every transoceanic flight, which

the defendants, by certain Air Services Fees Regulations, define to be a flight which crosses an imaginary line described (approximately) as a line which passes through or near Cape Spear, Newfoundland and, to the south, passes through the equator at 45 &degrees West Longitude. . . . The plaintiffs [assert that the regulations are] null and void because they are unlawfully discriminatory. . . .

It is quite true, of course, that the transoceanic landing fees prescribed in the various Air Services Fees Regulations . . . are discriminatory in that [they discriminate] between domestic flights, international flights and transoceanic flights, with an increasing scale of quantum of fees prescribed respectively for each category of flights. . . .

In Constitutional Law of Canada, Hogg (2nd Ed. 1985), Carswell, Toronto . . . the author states:

> "Canada's constitutional law, derived in this respect from the United Kingdom, does not recognize a treaty as part of the internal (or 'municipal') law of Canada. Accordingly, a treaty which requires a change in the internal law of Canada can only be implemented by the enactment of a statute which makes the required change in the law. Many treaties do not require a change in the internal law of the states which are parties. This is true of treaties which do not impinge on individual rights, nor contravene existing laws, nor require action outside the executive powers of the government which made the treaty. For example, treaties between Canada and other states relating to defence, foreign aid, the high seas, the air, research, weather stations, diplomatic relations and many other matters, may be able to be implemented simply by the executive action of the Canadian government which made the treaty. But many treaties cannot be implemented without an alteration in the internal law of Canada. For example, treaties between Canada and other states relating to patents, copyrights, taxation of foreigners, extradition, and many other matters, can often be implemented only by the enactment of legislation to alter the internal law of Canada. . . ."

The essence of Article 15 [of the Chicago Convention] is nondiscrimination on the basis of the nationality of foreign aircraft vis-à-vis the contracting State's own national aircraft. No evidence was adduced to indicate even the slightest degree of discrimination between any of the plaintiffs and Air Canada, or as between the Canadian plaintiffs and the foreign plaintiffs. In promulgating the impugned Air Services Fees Regulations, the defendants have behaved legally and honourably in contemplation of Article 15 of the Chicago Convention.

From time to time the Council of ICAO has issued statements on charges for airports and route air navigation facilities . . . . In 1974, the Council expressed such a statement . . . contained these pertinent proposed principles:

> "10. Charging systems at international airports should be chosen in accordance with the following principles:
> (iii) The charges must be nondiscriminatory both between foreign

> users and those having the nationality of the State of the airport and engaged in similar international operations, and between two or more foreign users." . . .
>
> [T]he ICAO statement of 1974 . . . appears to countenance a certain degree of real preferential treatment, no less. Among the principles enunciated in section §9 there appears:
>
> "(viii) Where any preferential charges, special rebates, or other kinds of reduction in the charges normally payable in respect of airport facilities are extended to particular users [that which is not repudiated herein] governments should ensure as far as practicable that any resultant under-recovery of costs properly allocable to the users concerned is not shouldered onto other users." . . .
>
> [T]he Minister's statutory authority to prescribe charges for the use of any facility or service at whatever airports is a pricing authority which is not fettered by cost considerations. In the event of incompatible principles being enunciated by ICAO and the Chicago Convention on one side, and by the Aeronautics Act with it's wholly *intra vires* Regulations on the other side, the Court would be bound to respect the Act and the Regulations, since the international involvements are not specifically incorporated into Canadian law. But, although not obliged to apply the civil aviation association's principles slavishly, or with mathematical precision, or at all, the Minister has managed to abide pretty closely by them.
>
> Indeed ICAO's stated principles are so general and qualified as to be serviceable only as guidelines, but hardly as legislation . . . .
>
> The weight and preponderance of credible evidence indicates that although Parliament conferred a broad pricing authority upon the Minister to prescribe charges for use of facilities and services, the transoceanic landing fees prescribed by him evince negligible, if any, departure from ICAO's suggested principles. So, even if the defendants' adherence, or not, to those principles were justiciable in this Court, the evidence discloses that the Minister's effort in prescribing the impugned landing fees is good enough. It did not violate the principles. Strict arithmetical accuracy is not necessary . . . .
>
> Action dismissed.

C. THE CONVENTION ON INTERNATIONAL CIVIL AVIATION ANNEXES RELEVANT TO AIRPORTS

(Adapted from the summary prepared by the International Civil Aviation Organization)

1. ANNEX 9: FACILITATION

The Standards and Recommended Practices (SARPs) on Facilitation (FAL) are derived from several provisions of the Chicago Convention. Article 37 obliges ICAO to adopt and amend from time to time international standards and recommended practices and procedures dealing with, inter alia, customs and

immigration procedures. Article 22 obliges each Contracting State to adopt all practicable measures to facilitate and expedite navigation by aircraft between the territories of Contracting States, and to prevent unnecessary delays to aircraft, crews, passengers, and cargo, especially in the administration of the laws relating to immigration, quarantine, customs and clearance. Article 23 of the Convention expresses the undertaking of each Contracting State to establish customs and immigration procedures affecting international air navigation in accordance with the practices established or recommended pursuant to the Convention.

A number of other articles have special pertinence to the provisions of the FAL Annex and have been taken into account in its preparation. These include: Article 10, which requires all aircraft entering the territory of a Contracting State to land at, and depart from, an airport designated by that State for customs and other examination; Article 13, which require compliance of a Contracting State's entry, clearance, immigration, passports, customs and quarantine laws and regulations, by or on behalf of passengers, crew or cargo; Article 14, which obliges each Contracting State to take effective measures to prevent the spread by means of air navigation of communicable diseases; and Article 24 (customs duty), Article 29 (documents carried in aircraft) and Article 35 (cargo restrictions).

These provisions of the Convention find practical expression in the SARPs of Annex 9, the first edition of which was adopted in 1949. The SARPs pertain specifically to facilitation of landside formalities for clearance of aircraft and commercial traffic through the requirements of customs, immigration, public health and agriculture authorities. The Annex is a wide-ranging document which reflects the flexibility of ICAO in keeping pace with international civil aviation. ICAO is recognized as being the first international body to make a real start on facilitation by developing Standards which bind its Contracting States.

The Annex provides a frame of reference for planners and managers of international airport operations, describing maximum limits on obligations of industry and minimum facilities to be provided by governments. In addition, Annex 9 specifies methods and procedures for carrying out clearance operations in such a manner as to meet the twin objectives of effective compliance with the laws of States and productivity for the operators, airports and government inspection agencies involved.

Initially, the main thrust of the Annex consisted of efforts to reduce paperwork, standardize internationally the documents that were to accompany traffic between States, and simplify the procedures required to clear aircraft, passengers and cargo. It was—as it still is—recognized that delays due to cumbersome formalities must be reduced, not just because they are unpleasant but, in practical terms, because they are costly to all of the "customer groups" in the community and because they interfere with the success of everyone.

Over the years, traffic volumes grew. States' resources for inspection regimes could not keep pace. The facilitation of landside clearance formalities became a much more complex issue. The focus of Annex 9 therefore changed. In its 11th edition (2002), the Annex 9 retained its original strategies, carried forward in all editions since the first, of reducing paperwork, standardizing

documentation and simplifying procedures. However, it shifted its focus to inspection techniques based on risk management, with the objectives to increase efficiency, reduce congestion in airports and enhance security; to control abuses such as narcotics trafficking and travel document fraud; and to support the growth of international trade and tourism. In addition, new SARPs and guidance material were introduced to address certain high-profile issues of public interest such as the treatment of persons with disabilities.

More recently, the face of facilitation has been further shaped by major developments in the civil aviation environment which have occurred during the last ten years (the mid-1990s and beyond). These phenomena include: technological progress, with the universal proliferation of the use of computers and electronic data interchange systems; massive increases in illegal migration which have become worldwide immigration and national security problems, with civil aviation the transport mode of choice and passport fraud a frequent tactic; and ongoing political and social upheaval, which has given rise to increased use of terrorism, in which unlawful interference with civil aviation is still a powerful technique for pursuing an objective.

These topics formed the basis of the agenda of the 12th Session of the Facilitation Division that was held in Cairo in early 2004 with the theme, "Managing Security Challenges to Facilitate Air Transport Operations." Discussions on the essential role that facilitation measures play in the improvement of security led to the Division making recommendations on the security of travel documents and border control formalities, on modernized provisions for facilitation and security in air cargo service operations, on controlling travel document fraud and illegal migration and on international health regulations and hygiene and sanitation in aviation.

The consequent 12th edition of Annex 9 reflects ICAO's contemporary FAL strategy. This is to advocate and support action by Contracting States in three principal areas: the standardization of travel documents, the rationalization of border clearance systems and procedures, and international cooperation to tackle security problems related to passengers and cargo. While the primary motivation of Annex 9 will continue to carry out the mandate in Article 22 of the Chicago Convention, ". . .to prevent unnecessary delays to aircraft, passengers and cargo. . ..", numerous provisions, developed with the intent to increase efficiency in control processes, support also the objective to raise the level of general security.

Enhancing the security of travel documents and tackling illegal migration are among the major changes introduced into Annex 9 through its 12th edition. Most of the existing Chapters and Appendices of the Annex remain more-or-less unchanged from the 11th edition. Two Chapters, in particular, have been substantially amended to reflect new international realities.

Chapter 3, which deals with the entry and departure of persons and baggage, now contains a Standard obliging Contracting States to regularly update security features in new versions of their travel documents, to guard against their misuse and to facilitate detection of cases where such documents have been unlawfully altered, replicated or issued.

Another Standard requires States to establish controls on the lawful creation and issuance of travel documents. States are also now obliged to issue separate passports to all persons, regardless of age, and to issue them in machine readable form, in accordance with ICAO's specifications. States and airlines are required to collaborate in combatting travel document fraud. As for crew members, States are obliged to place adequate controls on the issuance of crew member certificates and other official crew identity documents.

Finally, an entirely new Chapter 5 is devoted to the growing problem of inadmissible persons and deportees. The SARPs of this Chapter set out in clear terms the obligations of States and airlines vis-à-vis transport of potentially illegal migrants and similar "problem" cases that the international air transport industry comes across in ever greater numbers daily. Strict adherence by Contracting States of the obligations to remove from circulation fraudulent travel documents or genuine documents used fraudulently will greatly help to constrict the flow of illegal migrants the world over.

2. ANNEX 14: AERODROMES (VOLUMES I AND II)

A distinction of Annex 14 is the broad range of subjects it contains. It extends from the planning of airports and heliports to such details as switch-over times for secondary power supply; from civil engineering to illumination engineering; from provision of sophisticated rescue and fire fighting equipment to simple requirements for keeping airports clear of birds. The impact of these numerous subjects on the Annex is compounded by the rapidly changing industry which airports must support. New aircraft models, increased aircraft operations, operations in lower visibilities and technological advances in airport equipment combine to make Annex 14 one of the most rapidly changing Annexes.

In 1990, after 39 amendments the Annex was split into two volumes, Volume I dealing with aerodrome design and operations and Volume II dealing with heliport design.

Annex 14, Volume I, is also unique: it is applicable to all airports open to public use in accordance with the requirements of Article 15 of the Convention. Historically, it came to life in 1951 with 61 pages of Standards and Recommended Practices and 13 additional pages on guidance for their implementation. That edition included specifications for water aerodromes and aerodromes without runways; specifications that no longer appear. Today over 180 pages of specifications and additional pages of guidance material set forth the requirements for international airports around the world.

The contents of Volume I reflect, to varying extents, the planning and design, as well as operation and maintenance, of aerodromes. The heart of the airport is the vast movement area extending from the runway, along the taxiways and onto the apron. Today's large modern aircraft require a more exacting design of these facilities. Specifications on their physical characteristics, i.e. width, surface slope and separation distances from other facilities, form a principal part of this Annex. Specifications for new facilities, unheard of at the

beginning of ICAO, such as runway end safety areas, clearways and stopways, are all set forth. These facilities are the building blocks for airports which define its over-all shape and size and permit engineers to lay out the skeleton that forms the airport's basic structure.

Along with defining the ground environment of an airport, specifications are also required to define its airspace requirements. Airports must have airspace free from obstacles in order for aircraft to approach and depart safely from the airport. It is also important that the volume of this space be defined so that it may be protected to ensure the continued growth and existence of the airport or, as stated in the Annex, ". . . to prevent the aerodromes from becoming unusable by the growth of obstacles . . . by establishing a series of obstacle limitation surfaces that define the limits to which objects may project into the airspace". The requirements to provide a particular obstacle limitation surface and the dimensions of the surfaces are classified in the Annex by runway type. Six different types of runway are recognized: non-instrument approach runways, non-precision approach runways, precision approach runways categories I, II and III, and takeoff runways.

A striking feature of airports at night are the hundreds, sometimes thousands of lights used to guide and control aircraft movements. In contrast to flight, where guidance and control are done through radio aids, movements on the ground are primarily guided and controlled through visual aids. Annex 14, Volume I, defines in detail numerous systems for use under various types of meteorological conditions and other circumstances.

As these visual aids must be immediately understandable by pilots from all over the world, standardization of their location and light characteristics is highly important. Recent advances in lighting technology have led to great increases in the intensity of lights. Also in recent years, the development of small light sources has facilitated the installation of lights in the surface of pavements that can be run over by aircraft. Modern high intensity lights are effective for both day and night operations and, in some day conditions, simple markings may be highly effective. Their uses are defined in the Annex as well. Airport signs are a third type of visual aid. At large airports and airports with heavy traffic it is important that guidance be provided to pilots to permit them to find their way about the movement area.

The objective of most specifications is to improve the safety of aviation. One section of Annex 14, Volume I, is devoted to improving the safety of equipment installed at airports. Particularly noteworthy are specifications concerning the construction and siting of equipment near runways. This is to reduce the hazard such equipment might pose to aircraft operations. Requirements for secondary power supply are also specified, along with the characteristics of light circuit design and the need to monitor the operation of visual aids.

In recent years more attention has been given to the operation of airports. The current edition of Annex 14, Volume I, includes specifications on maintenance of airports. Particular emphasis is given to pavement areas and visual aids. Attention is also given to eliminating features of airports which may

be attractive to birds that endanger aircraft operation. Of critical importance to the operation of any airport is the rescue and fire fighting service which, according to Annex 14, all international airports are required to have. The Annex sets forth the agents to be used, their amounts and the time limits in which they must be delivered to the scene of an aircraft accident. To take off and land safely and routinely today's aircraft require accurate information on the condition of facilities at airports. Annex 14, Volume I, sets forth: what information is to be provided; how it is to be determined; how it is to be reported; and to whom it is to be reported. (Specifications for the transmittal of this information through AIPs and NOTAMs are set out in Annex 15 — Aeronautical Information Services.) Typical of the type of information to be reported are elevation of different parts of the airport, strength of pavements, condition of runway surfaces and the level of airport rescue and fire fighting services.

Provisions for heliports are included in Volume II of Annex 14. These specifications complement those in Volume I which, in some cases, are also applicable to heliports. The provisions address the physical characteristics and obstacle limitation surfaces required for helicopter operations from surface level and elevated on-shore heliports and helidecks, under both visual and instrument meteorological conditions. Material dealing with the marking and lighting of heliports, as well as rescue and fire fighting requirements for heliports, also have been included in Volume II. Although specifications on marking and lighting of heliports are only applicable to operations in visual meteorological conditions, work is under way on the development of appropriate visual aids for helicopter operations in instrument meteorological conditions.