Priorities for the Mexico City International Airport Under Privatization

by

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Abstract

In the last decade, an important world tendency has developed: the participation of private entities in the ownership and local management of airports. This thesis analyzes the priorities for Mexico City International Airport in this fast moving trend. This airport is owned by the federal government and has been operated and managed for the last 30 years by a government agency.

This thesis can be divided into two sections. The first section consists of an analysis of the different types of airport ownership and management and trends all around the world. The results of this section are that there are successful privatizing schemes and local management of airports all around the world. From this section it is also concluded that Mexico City International Airport would benefit from some changes in its management organization. Specifically, it is recommended that Mexico City International Airport have a local airport management structure, keep the generated revenues to cover cost and use the generated profits for facilities expansion, be client-oriented, and improve medium and long-term planning.

The second section of this thesis describes Mexico City International Airport and benchmarks it with 32 world-class airports in America, Europe and Asia. This analysis is one of the few airport benchmarking studies of its type with current data including airports worldwide. It is recommended that Mexico City International Airport increase airport capacity, mainly in the passenger building and improve passenger convenience and quality of service.

Thesis Supervisor: Dr. Richard de Neufville.
Title: Professor, Department of Civil and Environmental Engineering.
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Aéroports de Paris
Aeropuerto de Madrid/Barajas
Aeropuertos y Servicios Auxiliares, México
Airport Authority Flughafen Zürich
Airports Authority of Thailand
Amsterdam Airport Schiphol
British Airport Authority
Charlotte/Douglas International Airport
City of Houston, Department of Aviation
City of Phoenix, Sky Harbor International Airport
Civil Aviation Authority of Singapore
Civil Aviation Department, Hong Kong
Colegio de Pilotos Aviadores de México
Department of Transportation, State of Hawaii
Detroit Metropolitan Wayne County Airport
Federal Airports Corporation, Australia
Flughafen Düsseldorf GmbH
Fukuoka Airport Building. Co., Ltd
Greater Orlando Aviation Authority
Lambert-St. Louis International Airport

Luftfartsverket Swedish Civil Aviation Administration
Massport
McCarran International Airport, Las Vegas
Metropolitan Airports Commission, Minneapolis-Saint Paul International Airport
Metropolitan Washington Airports Authority
New Tokyo International Airport Authority
Philadelphia International Airport
Pittsburgh International Airport
Port of Seattle, SEA-TAC International Airport
Salt Lake City Airport Authority
The Port Authority of N.Y. & N.J.
Transport Canada, Airports

To my parents

Contents

List of Figures

List of Tables

Chapter 1

Introduction

This study is motivated by the world trend regarding the participation of private entities in the ownership and local management of airports, by the policies taken by the Mexican government after the economic crisis of 1994, and by the need to improve and modernize the air transportation infrastructure of Mexico City.

The Mexican government developed an emergency program following the Mexican economic crisis of December 1994. This program states, as one of its main issues, that the rights to install and operate ports and airports terminals in México will be sold at auction. The purpose of this plan is to decentralize and privately operate the majority of these facilities within a year (Sosa, 1994).

The Mexican federal government did not consider airport infrastructure a priority prior to 1965. Public investment in the communication sector focused mainly on the development of the road system and the maintenance of railroads; meanwhile, air infrastructure and aviation were left behind. Airports owned by the states or by private entities were constructed and expanded to meet local needs without a global vision.

It was not until 1965 that an Airport Planning Commission was created with the main objective of analyzing the priority needs of aviation in México. In this period other organisms such as the General Direction and Aeropuertos y Servicios Auxiliares, ASA, (Airports and Auxiliary Services) were also created.

ASA was born in June 1965 with an inheritance of 34 airports, including the Aeropuerto Internacional de la Ciudad de México Lic. Benito Juárez, AICM (Mexico City International Airport). As a decentralized public organism, formed from the Communications and Transports sector, it is in charge of carrying out the norms and politics that the Ministry of Communications and Transports dictates. For the past thirty years, ASA has managed, operated, maintained and built runways, terminal buildings, platforms, parking lots, and hangars. In 1995 ASA owns 58 airports, and this is considered to be one of the largest systems of its type in the world.

After the Mexican economic crisis in the 1980's, an economic restructuring program was developed. From 1982 to 1992 more than 900 state owned enterprises were divested. As a consequence of this crisis, state governments and private entities participated in the expansion of several airports in 1989. The share accounted for by the private sector has grown from 4% in 1989 to 76% in 1994. In 1994, expected airports investments amounted to US $ 230 million, of which US $ 170 million, or about 75%, were supposed to come from the private sector. Airports in Mexico City, Cancún, Guadalajara, Puerto Vallarta and Tijuana as well as small general aviation airports all have facilities built by private companies. The Mexican government has been seeking foreign and national investors to fund airport development. In the last six years, US $ 400 millions in private funds were invested in Mexican airports (Schwartz, 1994a). In the Mexico City International Airport, for example, the new U.S. $ 100 million international terminal was privately funded (Wilson, 1994).

For various reasons, the air transportation infrastructure in Mexico City has not been modernized at the required levels. Apart from the new terminal, no long term projects have been performed at the AICM during the past decades. Yet it is important to observe that the AICM is the most important airport in México because it comprises 40%

of the total air activity in the country (Gerencia General de Comunicación Social, 1993). One of the main reasons for this lag in the infrastructure modernization has been the high economic cost for the federal government. However in 1989, ASA, SENEAM, (Servicios a la Navegación en el Espacio Aéreo Mexicano, Mexican Air Space Navigation Services), and TAF, (Transporte Aéreo Federal, Federal Air Transport) returned to the Federal Government 279 billion pesos, (about US $ 105 million at that time) representing 50 percent of their gross receipts. In the following year they expected to return 488 billion pesos (See Table 1.1.) Table 1.2 gives a summary of the financial data of the AICM in 1991.

Today, the modernization of México's infrastructure is undoubtedly a priority for the Mexican Government; however, Mexican finance ministry officials state that they do not expect to spend more money, but rather to get more for the money they spend (Torres, 1994).

Given this scenario, the main objective of this study is to provide alternative options in management and recommendations for the improvement of the air transportation infrastructure in Mexico City.

Table 1.1

1990 Financial Data on Mexican Airport System
(ASA, SENEAM & TAF 57 Airports)

	$ Pesos (billions)	US $ (millions)
Revenue from service sales and use of airports	921	318
States Governments Investments	6	2
Private Enterprises	66	23
TOTAL	993	343
Revenue expenditure	335	116
Capital expenditure	170	59
Amount to be returned to the Ministry of Finance	**488**	**168**
TOTAL	993	343

Source: Unomasuno, 1990

Table 1.2

1991 Financial Data on Mexico City International Airport

	$ Pesos (billions)	US $ (millions)
Income	394	130
Expenses	190	63
Investments	84	28

Source: Digest of Statistics, 1991

Thesis Scope

- **Chapter 2** analyzes the most important types of management and ownership structures in airports worldwide. It also discusses the privatization evolution of some of the most important airports and the history of privatization in México.
- **Chapter 3** describes the Mexico City International Airport. It includes the history, location, studies made since 1965 regarding the expansion of the air transportation infrastructure for Mexico City, and a brief analysis of the problems.
- **Chapter 4** analyzes 33 world-class airports including examples in America, Europe and Asia. The information is presented in a series of tables and graphs.
- **Chapter 5** presents the conclusions and recommendations for improving the air transportation infrastructure in Mexico City.

Chapter 2

Airport Ownership and Management Structures Worldwide

This chapter analyzes two important issues regarding the operation of airports. The first refers to the types of ownership structures, which vary according to the percentage owned by the government, and the second contemplates the degree of local management of these facilities. Data collected from airports around the world demonstrate broad trends in the last decade toward a higher level of private participation and an increase of local airport management. It can be concluded from these trends that if different countries with different political and socio-economic structures are moving in the same direction, this must represent some sort of advantages and benefits for governments, private entities, and users.

2.1 Types of Ownership and Management Structures

Some of the most important airport ownership and management structures world-wide are:

1. Ownership by a governmental department. Airports are centrally owned. They are operated by a specialized department such as a Ministry of Civil Aviation. (Department established under the Ministry of Transport and or Civil Aviation).

2. Ownership by a governmental agency. Airports are centrally owned. They are operated by an entity separate from the Department of Transport and or Civil Aviation, (division of the overall Ministry of Transport), but still accountable to the government.

3. Quasi-governmental organization. Airport ownership and operation by public corporations created by the government for this specific purpose.

4. Authorities for group of airports authorized by:

consortium of state units

provincial units

local government units.

5. Authorities for individual of airports authorized by:

consortium of state units

provincial units

local government units.

6. Individual authorities. Airports run by individual authorities on behalf of one local authority.

7. Department of local authority.

8. Corporatisation or Public Enterprise. Airports are under a separate entity established by the legislature as a company with explicit statutory and financial objectives.

9. Lease. Lease of the assets to a company for a period of time. The company pays a rental charge to the owner of the airport and takes all revenues and fees.

10. Joint Venture arrangement. Sale of a certain percent stake in a company set up to own assets, rights and liabilities.

11. Franchise or management contract. Transfer of assets, rights and liabilities to a private sector management group for a fee or share of the revenues.

12. Private organizations.

(Ashford and Wright, 1992; Wambugu, 1992)

Examples

United Kingdom. Most large and medium sized airports in the U.K. were owned by the British Airport Authority (BAA) or by local authorities prior to 1986. The profits from the profitable airports were used to cross-subsidize the operation of less profitable airports. In 1986, as part of the Thatcher government's political goal of denationalization, all airports with an annual turnover of more than L 1 million became private companies and BAA plc was floated on the London Stock Exchange as a quoted company (Ashford and Moore, 1992).

France. Aéroports de Paris owns Charles de Gaulle and Orly airports in Paris, Le Bourget, and eleven general aviation airports. Aéroports de Paris is owned by the French government.

Italy. Rome, Milan, and Turin airports are owned by the Italian government.

Holland. Schiphol Amsterdam is a public corporation, the shares of which are owned by the national government and municipalities.

United States. Almost all significant airports are owned by local governments: counties and municipalities, and some by the states themselves. The federal government only exceptionally, owns civil airports; private ownership of airports is mainly limited to general aviation facilities.

2.2 Airport Ownership and Management Evolution

As stated in the introduction, during the past decade important changes have developed in the way in which airports are managed and owned. Sir Norman Payne, Chairman of the British Airports Authority, BAA, from 1987 to 1991, stated in 1994: "Moves toward the private sector will vary in type and content" [sic] around the world, but "[sic] the trend is clear. The move to the private sector is the major influence" [sic] on airport operation today" [my quotation mark] (Schwartz, 1994a).

Table 2.1 below provides information about airports in 17 countries in Africa, America, Asia, and Europe, which have changed their ownership and management structure to a privatized one or will do so in the near future. The description of the changes in each country is broken down into two sections. The first section refers to the characteristics of the airport ownership and management structure before privatization and the second refers to the privatization trend. Whenever possible, the dates of these changes are included. In many countries, this description applies to many airports; such is the case, for example, for Australia, where 17 airports were corporatized before the privatizing of 22 facilities. It is also true of México, where ASA is in charge of 58 airports and the rights to install and operate them will be sold at auction in the near future. In other countries the description applies only to a single airport; such is the case for Vienna Airport in Austria, for Kansai Airport in Japan, and for Caracas International Airport in Venezuela just to mention some of them. As can be seen, in a number of cases, some of the data before privatization was simply not obtainable. In almost all these cases, airports were previously owned and managed by the government.

The airport ownership and the management trend is clearly observable in the 2-D chart. Figure 2.1 identifies the degree of state ownership and local management of

airports a few decades ago. As can be seen in this figure, a few decades ago almost all airports were totally owned by governments and did not have a local management authority. The notable exception were the Port Authority of New York and New Jersey, the Port of Seattle, and MASSPORT which were locally managed and some airports in México which were privately owned.

Figure 2.2 identifies the degree of state ownership and local management of airports today. Many airports are now partially owned by private entities and have a less centralized management structure. The Port Authority of New York and New Jersey, the Port of Seattle, MASSPORT, airports in New Zealand, and some in Canada are among those entities with a local management structure today. In some countries and cities such as Russia and Rome the trend is not well defined. In general, it can be said that the trend is clear: airports tend to have a combination of private-state ownership and a less centralized management structure. This means they have private entities as partners and a local management. The only exception in Figure 2.2 is Terminal 3 in Toronto Airport, which is totally owned by private entities and has a local management structure. The majority of the airports tend to be grouped in the center of the figure.

Table 2.1

Ownership and Management Evolution of Airports

Country	Before Privatization	Privatization Trend
Australia	**Government** **Department of Transport and Communications** (Prior to 1989) **Federal Airport Corporation** Ownership and overall control of management and development. Responsible for all commercial activities and letting concessions of 17 airports. (January 1989)	**Privatization** 22 facilities may be sold to private business interests. (1995 or later)
Austria		**Partial Privatization of Vienna Airport** Airport Operating Company controlled jointly by: • Austrian Government (50%) • Province of Lower Austria (25%) • City of Vienna (25%) Ownership 27% of the share capital is owned by private investors. (January - June 1992)

Country	Before Privatization	Privatization Trend
Belgium		**Partial Privatization of Brussels Airport Terminal Company** • Régie des Voies Aériennes (47.5%) • Six private organizations (52.5%) Plans to finish with the situation of dual responsibility of the two airport operators. (Endres, 1995)
Canada	**Transport Canada** (Government agency which owns and operates the nation's large airports) 138 airports. (Prior to 1991) **Control Transfer to local authorities** Vancouver, Calgary and Montreal. (July 1991)	Mirabel, Dorval, Edmonton and Calgary under local authority. Commercial entities. Transport Canada retains responsibility for safety and security matters. (May 1992) (Njio, 1994)
Denmark	**State sole owner Copenhagen Airport** Plans to sell 25% to 49% of the capital. (Prior to 1990)	**Shares listed on the city's stock exchange** (April 1994)
Indonesia		**Semi-autonomous Public Limited Companies** Indonesian Government has transformed the two organizations that run the country's airports. PT Angkasa Pura I 7 airports PT Angkasa Pura II 2 airports (March 1993)

Country	Before Privatization	Privatization Trend
India		Government encouraged privately financed airport development offers in Shiridi, Calicut and Cochin Airports. (1994) (Mama, 1994)
Italy		**Aeroporti de Roma Airport Authority** Included in the list of state enterprises to be privatized by the Italian Government. (December 1993)
Japan		**Kansai Airport** Kansai International Airport Corp. Owner and operator.
Malaysia	**Malaysian Government** Studies ways of privatizing the country's 20 largest airports. (October 1990)	**Airports Malaysia** State-run trading company took over management of the country's airports from the department of civil aviation. This company will eventually be privatized. (November 1992)
México	**Private and State ownership** (Prior to 1960) **Government** **Aeropuertos y Servicios Auxiliares, ASA** (June 1965) 34 airports in 1965 58 airports in 1995	**Privatization** Rights to install and operate airports in México will be sold at auction. The purpose of this plan is to decentralize and privately operate the majority of these facilities within a year. (1995)

Country	Before Privatization	Privatization Trend
New Zealand	**Government Agencies** (Prior to 1988)	**Corporatization** 7 largest airports Profit oriented corporations owned by the communities they serve. (1988) (Schwartz, 1994b)
Russia	**Russia Federation Aeroflot** 70 airports (Prior to 1992)	**Privatization** 70 airports to be privatized Capital of the airport companies: • Russian State 30% • Local authorities 30% • Employees and outside shareholders 40% (November 1992)
South Africa	**State Owned Airports** 9 airports	**Privatization** **South African Airports Co.** Initial five year phase. This commercial enterprise will try to make each of its nine facilities profitable. (July 1993) Privatization of the nation's airports has been good for South Africa. (Yates, 1994)
United Kingdom	**British Airport Authority BAA** (Prior to 1987)	**Privatization BAA plc** 7 airports Operating responsibilities were transferred from BAA headquarters to each of the 7 airports that it owns. (July 1987)

Country	Before Privatization	Privatization Trend
U.S.A.		The Reason Foundation Study recommends the privatization of the 50 largest U.S. airports. (March 1990) Federal Executive Order on Infrastructure Privatization removes legal obstacles to the privatization of facilities, including airports, owned by the federal or local government. (April 1992) AOPA, Aircraft Owners and Pilots Association opposes privatization of airports. (November 1992)
Venezuela		**Partial Privatization of Caracas International Airport** Call for tenders responsible for the management, administration and development of the airport. (November 1993)

Source: ITA Press, various issues

Degree of State Ownership and Local Management of Airports a Few Decades Ago

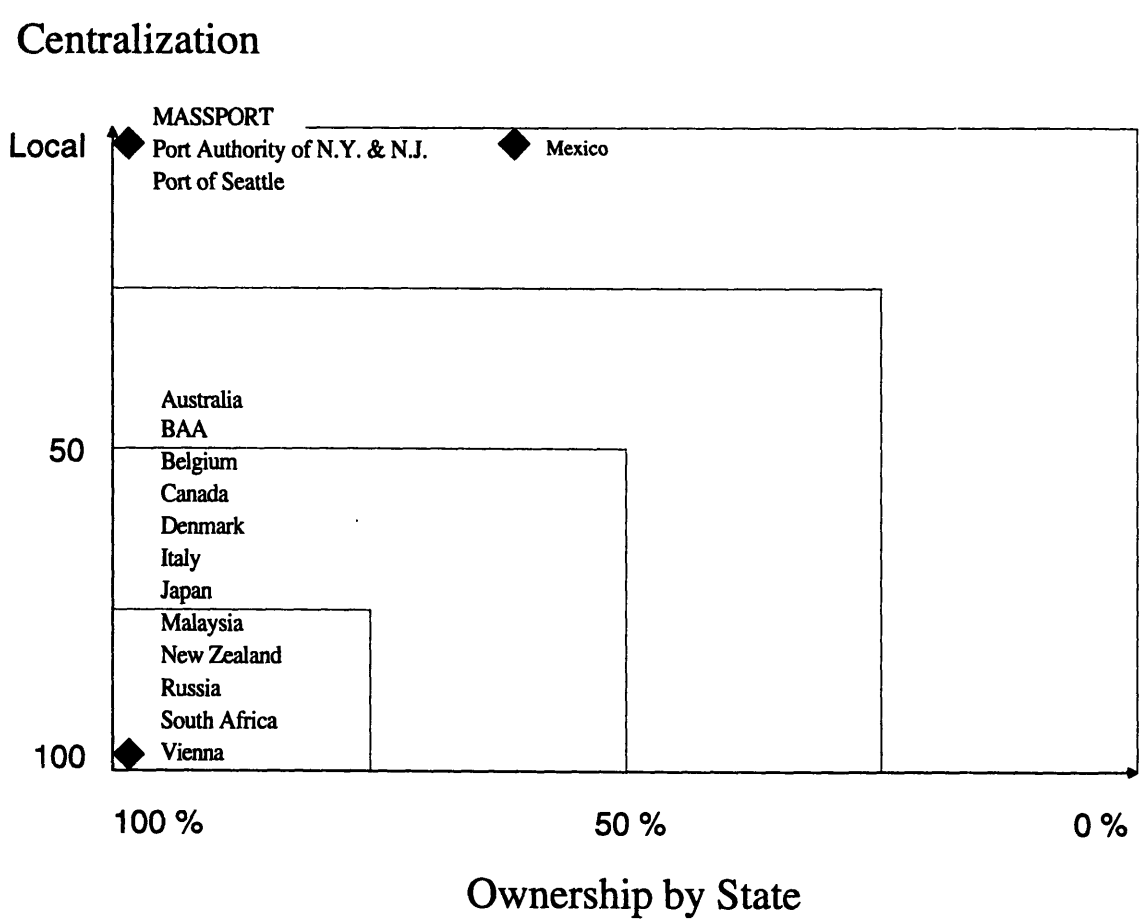

Figure 2.1

Degree of State Ownership and Local Management of Airports Today

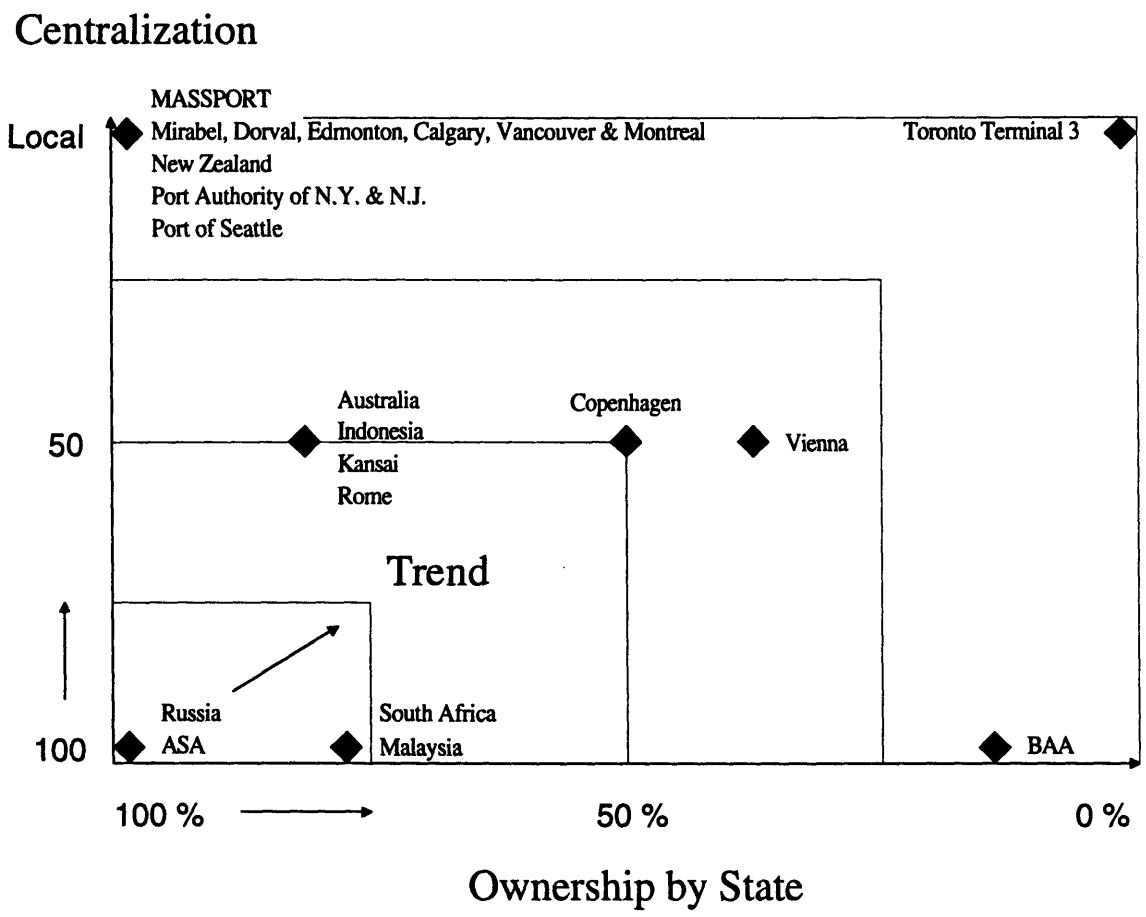

Figure 2.2

2.3 Privatization

The word privatization has been used to designate a large variety of policies and ideas. It is difficult to find a definition which includes all the different variables. In each country privatization has a different meaning and a different form. Privatization is not necessarily contrary to state ownership. It must be made clear that in many cases of state owned enterprise partial privatization, governments can have access to private sources of capital and initiatives without losing control of the enterprise. Public offerings is an example of this case, especially when large state owned enterprises or natural monopolies are involved. Privatization is also used to mean activities other than divestiture such as the "non-sale" privatization, also called "privatization of management" (management contracts and leases) (Vuylsteke, 1988; Ramamurti, 1993).

The following definitions of privatization come from different countries:

1. Movement of an entity from the federal government to a local or quasi-government agency where a private sector model would be used.

2. Political policy of the national government.

3. Government entity which is partially owned by the private sector.

4. Transfer of state owned enterprises to private economic agents in order to gain the benefits occurring under private ownership (Haririan and Vasigh, 1994).

5. Contracting out of service delivery to a private organization.

6. Policy or structural change that might cause state owned enterprises to behave like private firms (Haririan and Vasigh, 1994).

The participation of the private sector, or the partnership of public and private sectors in infrastructure development, is increasing in developing countries. Among the multiple objectives are: reduction of public sector borrowings, promotion of foreign

investments in infrastructure projects, improvement of government's cash flow, increase in the efficiency of the state owned enterprise sector, and redistribution of income and rents within society.

According to the World Bank, 571 state owned enterprises were privatized in 57 developing countries by 1987. (Sub-Saharan Africa, Asia, Pacific Countries, North Africa and Middle East, and Latin America and the Caribbean) (Vuylsteke, 1988).

The most important types of privatization transactions and schemes all around the world are:

a) Public Offering of Shares: The state sells to the general public stocks it holds (all of them or large blocks) in a totally or partially owned state owned enterprise, which is assumed to be a going concern set up as a public limited company.

b) Private Sale of Shares: The state sells its share-holding (all or part of them) in a totally or partially owned state owned enterprise to a pre-identified single purchaser or group of purchasers. It is assumed that the state owned enterprise is a going concern set up in the form of a corporation represented by shares.

c) Sale of assets: The state sells its assets. They may be sold individually or together as a new corporate entity. In some cases the assets are not technically sold, but are part of a new company formed with the private sector.

d) Leases and Management contracts: These two types of contracts are arrangements where a private sector management, technology and skills are provided under a contract to a state owned enterprise or in respect of a state owned assets for a determined period of time and compensation. In these cases there is no transfer of ownership. These arrangements can possibly increase the efficiency and effective use of the state assets.

f) Build-operate-transfer (BOT): In this scheme, a contractor undertakes the construction of a given infrastructure facility, including financing, operations, and maintenace. The contractor operates the facility for a fixed period of time during which it is allowed to charge the facility users tolls, fees, rentals, and charges sufficient to recover its costs with a rate of return. Among the more common variants in this public-private partnership are:

Build-transfer	(BT)
Build-operate-own	(BOO)
Build-lease-transfer	(BLT)
Built-transfer-operate	(BTO)
Rehabilitate-own-operate	(ROO)
Develop-operate-transfer	(DOT)
Contract-add-operate	(CAO)

(Kim and Landy, 1994; Ramamurti, 1993; Vuylsteke, 1988)

Pros and Cons of Privatization

The privatization of airports or any other state owned enterprise has many possible advantages, as well as disadvantages. Among the most important advantages that could be achieved with airport privatization are the following:

The private sector flexibility could mobilize resources with greater speed than governments and could allow for better management techniques. This sector is also less bureaucratic and has fewer restrictions; besides that, the decision-making process is much shorter (Schwartz, 1994b).

In those cases when more than one airport is owned and operated by the same entity it is possible to reduce costs through the use of economies of scale, (these are the advantages that allow large firms to provide cheaper services than small ones), and

economies of scope, (these are the reductions of costs that firms experience when they provide two or more services together instead of providing each service separately).

Governments could benefit financially because privatized entities represent a large source of capital unavailable through public initiatives (Haririan and Vasigh, 1994). The transfer of an airport from a public to a private enterprise would convert it into a tax-paying corporate entity and land would be taxable.

Airport managers and employees performance could be improved with a profit-driven and customer-oriented structure. This can be done with incentives, better salaries and remuneration, and training.

Many political issues affecting the development of the entity could be set aside allowing it to have clearer goals and directions.

Although there are many benefits associated with the privatization of the airports many people think that privatization would do more harm than good (Haririan and Vasigh, 1994). Payments for privatization, especially in the cases of sale of assets and private sale, could be financed only with high increases in rents. Heathrow Airport in the U.K. is an example of a privatized airport with higher charges.

Among the most common reasons against airport privatization are that operators could increase fares with the final objective of increasing profits, could reduce investment in maintenance and improvement of airport facilities, and could create monopolies. In order to avoid many of these negative activities when privatizing any type of services or facilities, there most be a special state organism responsible for the regulatory and supervisory framework ensuring the safety and security of the privatized facilities.

In many countries, specially in developing nations, the recovery of investments and costs are not pursued because the airports as public institutions provide services whose social benefits compensate for any internal losses.

2.4 Privatization in México

At the beginning of the 1980's the Mexican economy was seriously affected by the unexpected collapse of the international oil prices and the increase in interest rates. This event completely changed government policies.

The financing of the government budget deficits and the negative growth rates combined with the other events severely increased the inflation problem. As a response to these budgetary constraints, president Miguel de la Madrid Hurtado (1982-1988) started an economic restructuring program which was followed by president Carlos Salinas de Gortari (1988-1994) (Gómez-Ibañez and Meyer, 1993).

México was the second big economy in Latin America to move in this direction following Chile's massive privatization program which started in 1974.

The immediate goal of the Mexican program was to reduce the size of the public sector through the sale or liquidation of state enterprises which were losing money. The project also included the opening of the economy and incentives through regulations for private sector growth (Petrazzini, 1993). Table 2.2 below shows the evolution of the state owned enterprises in México from 1920 to 1992. Figure 2.3 shows this same data in the form of a bar chart. As can be seen, from 1983 to 1992, almost 930 state owned enterprises were divested from the public sector.

The main objectives of the divestiture of state owned enterprises in México were:

1. Reduction in size of its structure and improvement of the government efficiency as an economic regulator.
2. Generation of savings through the elimination of government subsidies and related expenditures.

Table 2.2

Evolution of State Owned Enterprises in México

Period	Number of firms incorporated in the public sector	Cumulative number at the end of the period
1920 1934	15	15
1935 1940	21	36
1941 1954	108	144
1955 1962	62	206
1963 1970	66	272
1971 1975	232	504
1976 1982	651	1 155
1983	-81	1 074
1984	-25	1 049
1985	-108	941
1986	-204	737
1987	-120	617
1988	-205	412
1989	-33	379
1990	-99	280
1991	-41	239
1992	-12	227

Source: Secretaría de Hacienda y Crédito Público, 1992; Aspe, 1994

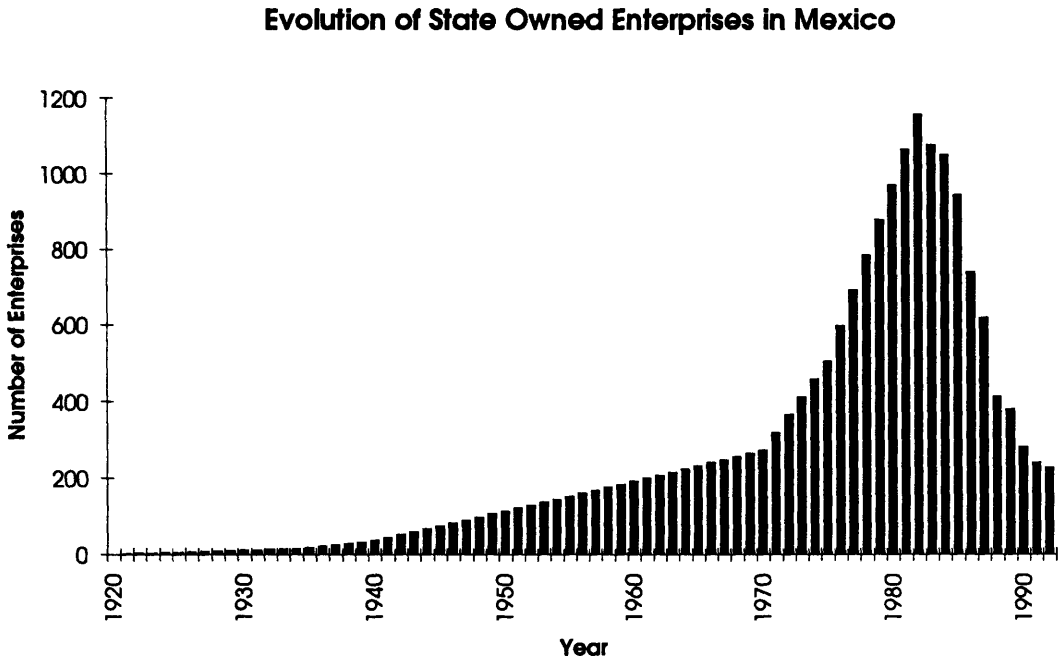

Figure 2.3

Source: Secretaría de Hacienda y Crédito Público, 1992; Aspe, 1994

3. Promotion of higher productivity by shifting the task of production to the private sector in order to:

a) Meet the new strategy for industrial reconversion

b) Open markets to foreign competition (Petrazzini, 1993).

Liquidation, extinction, merger, transfer, sale, and State Owned Enterprises Federal Law are all among the different procedures used for the divestiture of the state owned enterprises in México.

As of 1995, the Mexican government has virtually completed the privatization of about 80% of state owned enterprises.

The next phase of state owned privatization focuses on the Mexican infrastructure (water resources, housing, ports and airports) (Airports,1992b). Even though the review of airport privatization was in its early stages in 1992, the Mexican Government was approached by national and international firms interested in operating the AICM. These companies were Grupo Industrial Hakim, which recently finished the New International Terminal Building of the AICM (1993), Dutch airport operator Amsterdam Airport Schiphol, and the Mexican construction company Tribasa (Airports, 1992a).

According to Airports (1992a), the profitable airports in México include the AICM, Cancún, Guadalajara, and Monterrey among the large ones, and Hermosillo, La Paz, Mérida, Mexicali, Oaxaca, and Zihuatanejo among the smaller ones. The major unprofitable small airports are Campeche, Chetumal, El Bajío, Morelia, Cuernavaca, Puebla, San Luis Potosí, Tepic, Tlaxcala, Toluca, and Villahermosa.

Chapter 3

Mexico City International Airport

This chapter examines the Mexico City International Airport. It includes the history, location, studies made since 1965, the year when ASA was born, present problems, and a brief summary of this Mexican Airport. Table 3.1 shows some general characteristics of Mexico City International Airport.

3.1 Background / History

Balbuena Fields located in East Mexico City, the first airfield in México, was built in 1910. (Since 1921, Compañía Mexicana de Transporte Aéreo used Balbuena Military Airbase in Mexico City for commercial operations). The construction of the first civil airport in Mexico City began in 1928 at a site close to the present location of the Mexico City International Airport. The first airport, designed by the Secretaría de Comunicaciones y Obras Públicas and the Departamento de Aeronáutica Civil (Ministry of Communications and Public Works and the Department of Civil Aeronautics), included a domed terminal building for passengers that was connected by a bridge to the headquarters buildings. Aircraft would pick up and leave passengers from the platform between the terminal building and the headquarters building where they were protected from the sun or rain by the bridge. Two runways were built, runway 05-23 and 10-28.

Table 3.1

General Characteristics of Mexico City International Airport (AICM)

Airport: Mexico City International Airport Lic. Benito Juárez
Code: MEX
Owner: Federal Government
Operator: Aeropuertos y Servicios Auxiliares, ASA.
Airlines: 46 carriers (9 mexican, 5 charters & 32 foreign)
Elevation: 2 237 meters, 7 339 feet above mean sea level

Runways:

	Length		Width	
	(meters)	(feet)	(meters)	(feet)
5L-23R	3 846	12 618	45	148
5R-23L	3 900	12 795	45	148

Taxiways:
Alfa, Bravo, Coca, Delta and Eco

Passenger Building:
Single Linear Terminal Building

Positions:
21 fully enclosed loading gates and 44 remote positions
Total 65

Parking Spaces:
1 300 stall covered garage adjacent International Bldg.
1 980 stall covered garage adjacent Domestic Bldg.
3 280 Total

Sources: Aeropuertos y Servicios Auxiliares, 1993; Gerencia General de Comunicación Social, 1994

As the result of a tragic accident in 1930, the airfield was redesigned (Enciclopedia de México, 1977). Unfortunately, this project was never completed because the earthquake of 1933 destroyed the dome and seriously damaged the passenger building.

A new building was erected on the same site and was finally inaugurated in 1938 with runway 05-23 only. This new building included a restaurant, two commercial stores, a balcony, office for air traffic operations and a control tower in the highest part of the building (Aeropuertos y Servicios Auxiliares, 1980).

Given the great increase in passenger movement, a new platform was constructed this same year, 1938. In 1948 it was plain that another runway was necessary to handle the air traffic, and construction of runway 05R-23L was started.

The number of passengers using the airport continued to increase. In 1948 more than 900 thousand passengers were using the airport.

In 1951, the construction of the third completely new terminal building started on the site of today's airport. This terminal building was 280 meters (920 feet) long and had 24 gates. Three years later it started operating. Since then, several changes have been made to this building. The most important ones were made in 1966, 1970, 1974, 1979 and 1993.

In 1965, Aeropuertos y Servicios Auxiliares (ASA), a decentralized public organism, was created by presidential decree to manage and operate the airports in México.

In 1966 and in the following year, the international passenger section was expanded. Four years later, in 1970, 15 loading gates with loading bridges were inaugurated. In 1974, the first vertical parking building in the airport was built and in 1979 the entire airport was revamped. In 1993 a new building for international passengers

including stores and restaurants and a vertical parking building for 1 300 vehicles was constructed (Gerencia General de Comunicación Social, 1994).

3.2 Location

Mexico City International Airport is located 8 kilometers (5 miles) east of downtown Mexico City. It is situated at an altitude of 2 237 meters (7 329 feet) in a valley surrounded by mountains ranging up to well over 5 200 meters (17 000 feet) above sea level.

Mexico City is walled by the Cerro del Tepeyac and the Sierra de Guadalupe to the north, Sierras of Ajusco and Chichinautzin to the south, and Sierra de las Cruces to the southeast. Toward the east, Mexico City ends in a plain that joins the Popocatepetl (5 451 meters, 17 883 feet) and the Ixtacihuatl (5 286 meters, 17 342 feet) volcanoes, otherwise named the Sierra Nevada, and to the west it is walled in by the Sierras of Monte Alto and Monte Bajo (Encyclopaedia Britannica, 1992).

The range lowers to around 3 000 meters (9 800 feet) in the northeast. This is why almost all flights entering or leaving Mexico City International Airport fly over these lower mountains, even though there is a smaller and higher pass to the south (de Neufville and Keeney, 1972).

3.3 Airport Studies Made Since 1965

It was not until 1965 that large scale studies were conducted concerning the construction of a new international airport that could meet Mexico City's increasing demands.

The **SOP** (Secretaría de Obras Públicas) study, done between 1965 and 1967, recommended the construction of a new airport beyond the Zumpango Lake (Secretaría de Obras Públicas, 1967).

The **SCT** (Secretaría de Comunicaciones y Transportes) recommended in 1970 a master plan called "Ampliación del AICM" (Expansion of the AICM). This project included the addition of a new runway and terminal facilities (IPESA Consultores and the Secretaría de Comunicaciones y Transportes, 1970).

The **MIT** study, finished in 1971, suggested the acquisition of land for the Zumpango airport and the construction of a major runway and modest terminal facilities. It was proposed that the government wait five more years to come to a more detailed decision on how to continue developing the airport facilities (de Neufville and Keeney, 1972).

The **SAHOP** (Secretaría de Asentamientos Humanos y Obras Públicas) study made in 1980, recommended the construction of a new international airport in the Texcoco area, and the expansion of the Santa Lucía Military Base (Colegio de Pilotos Aviadores de México, 1992).

At the same time, the **SCT** prepared a new study recommending the expansion of the AICM and the use of Santa Lucía Military Base for both civil and military aircraft.

These studies were not put into effect or carried out for different political, social and economic reasons.

In 1984 the Government of the Estado de México constructed an airport in Toluca with its own resources and presented it as a possible solution to the capacity problems that the AICM was facing. At this point a comparative study among several locations close to Mexico City was done. (See Table 3.2) After analyzing these options, it was decided that the best solution would be to expand the AICM, mainly to increase the number of runways

in the airport. Even so, this project was not carried out (Colegio de Pilotos Aviadores de México, 1992).

The **SAM** Project: In 1992 the Aeronautical Authorities in Mexico continued studying the feasibility of the "Sistema Aeroportuario Metropolitano" (Metropolitan Airport System) or SAM project. This consists of the distribution of some of the AICM traffic to airports close to Mexico City.

In 1993, Hidalgo State government started the studies for the construction of a new international airport in the Zapotlán Valley. This new international airport would feature among other facilities, four runways in an area of 3 000 hectares (7 400 acres). It would be located 60 kilometers (37 miles) from Mexico City and would service commercial and cargo aviation. Among the entities working in the airport master plan were Koll International and HNTB. The approximate cost of these facilities would be of US $ 3,500 and would be constructed in 8 years. See Table 3.3 for the distribution of service demand for the AICM (Matus, 1994).

On September 1st, 1994, the first step of the SAM project was given when the AICM's General Aviation (more than 60 companies including air taxis and executive aircraft rental) was sent to Toluca Airport. According to Aguirre, 1994, that day, only three companies were operating and less than 45% of the airport facilities were completed. The week before, only the hangars of Taesa, Sacsa, and Sae, out of a total of 36, were operating.

Because of the great distance between these airports, the extremely high cost for developing a multi-airport system with the characteristics of the SAM (infrastructure), and the orography of this region, the SAM project is not a feasible option under any circumstances.

According to de Neufville, 1994, "The development of second airports to serve a metropolitan region must, to be effective, be part of a long-term strategy of dealing with the uncertainties of future aviation traffic, especially as regards hubbing operations. Because of these risks, the most reasonable strategy may be to expand at primary hub airports while simultaneously establishing and encouraging the option of developing secondary airports to serve some of the traffic originating from the region".

Table 3.2

Locations Analyzed for Possible Additional Airport Capacity for Mexico City

Location	State
AICM	MEXICO CITY
Texcoco and Toluca	ESTADO DE MEXICO
Pachuca, Zumpango and Santa Lucía	HIDALGO
Cuautla	MORELOS
Huejotzingo	PUEBLA
Tlaxcala	TLAXCALA

Source: Colegio de Pilotos Aviadores de México, 1992

Table 3.3

Redistribution of Mexico City Service Demand According to the Metropolitan Airport System (SAM) Project 1994

Airport	Use
AICM (Primary Airport)	Commercial Aviation Mainly National flights
Cuernavaca	General Aviation and Cargo
Puebla	Mainly Cargo
Toluca	General Aviation
Pachuca (Major New Airport)	Commercial Aviation and Cargo International flights

Source: Matus, 1994

3.4 Problems

The problems that the AICM has been facing for a long time can be divided into three main groups:

economic and political problems
capacity of the airport
natural environment

Economic and political problems

The cost for the Federal Government and the lack of long term projects and studies are some of the reason why the restructuring of the airport system in México has been delayed. Besides this, the public sector expenditure in the Communications and Transportation area has been reduced in the last few years, from 3.3% of the total Public Sector expenditure in 1988, to 3.0% in 1993 (Salinas, 1993).

Capacity of the Airport

The geometry of the AICM was not designed for today's use. The AICM's passenger building is a Linear. This type of building is frequently used in airports with low airline activity (Ashford and Wright, 1992). In this concept the aircraft are parked facing the passenger building. In the case of airports such as the AICM, with high airline activity, the linear terminal concept is no longer an adequate option. Today the AICM has only 21 loading gates with fully enclosed loading bridges and 44 remotely located positions. Figure 3.1 shows the evolution of passenger traffic from 1967 to 1993 at Mexico City International Airport and Figure 3.2 shows the national and the international passenger traffic for these same years. Figure 3.3 shows the aircraft operations from 1967 to 1993 at the AICM.

Figure 3.4 shows a high and low passenger forecast up to 2010. This forecast was elaborated by ASA based on a very detailed analysis. It includes several variables such as economic, demographic, financial, tourism and commercial aviation variables (see Aeropuertos y Servicios Auxiliares, 1994); even though, this forecast seems to be excessive. The increasing commercial activity from the North America Free Trade Agreement, NAFTA, and an expected rising standard of living could have been some of the factors that motivated such a high forecast. According to Wilson, 1994, "The North America Free Trade Agreement, NAFTA, has placed México on the verge of a new industrial age that is expected to increase air transport needs for North America's third largest nation".

The separation between the center lines of the AICM parallel runways is 310 meters (1 017 feet). According the FAA (Federal Aviation Administration), for simultaneous landings and takeoffs under VFR (Visual Flight Rules) operations, the minimum separation between the centerlines of the runways is 366 meters (1 200 feet) for airplane design groups V and VI (Boeing 747-400 and Lockheed C5A respectively). The FAA specifies a minimum separation of 1 311 meters (4 300 feet) for simultaneous precision instrument approaches, provided specific electronic navigational aids and monitoring equipment, air traffic control, and approach procedures (Ashford and Wright, 1992). Therefore, although Mexico City International Airport has two runways, its capacity is much less than that.

The facilities for servicing commercial aircraft in the AICM are concentrated in the apron gate area which is parallel to the passenger building. Between the apron gate area and runway 05L-23R lies taxiway Bravo. This taxiway connects the apron gate area with other taxiways, runways, and the North and South remote positions. The present number of aircraft and vehicles that use this taxiway is much greater than its design capacity.

Besides that, Bravo Taxiway is used by all the ground vehicles that support the airport services such as maintenance units, mobile lounges, air kitchen vehicles, and official units (Colegio de Pilotos Aviadores de Mexico, 1992).

Different areas of the AICM have already exceeded its design capacity. These areas include the ticket counters lobbies, circulation areas with fast food stands, waiting lounges, curb front, and the airport ground access system.

The number of aircraft that need to land in an alternate airport because of the congested airspace near the AICM has increased in the last few years (Colegio de Pilotos Aviadores de Mexico, 1992).

The number of "almost collision incidents" also seems to have increased. In 1992 seven cases were reported. According to the statistics of the Colegio de Pilotos Aviadores de México, only 30% of this type of incidents are reported. This may mean that approximately 23 almost collision incidents have occurred in the Mexico City area in that year.

Natural Environment

Because Mexico City lies in the bed of a former lake, both runways, 05L-23R and 05R-23L, need to be leveled and resurfaced periodically because they sink rapidly at different rates and in different locations according to the applied loads. Every time this work is done, half of the airport is closed down.

There are considerable restrictions on the usable airspace in the Mexico City area and surroundings. Because of the low maneuverability of aircraft at this high altitude and the hot climate, the flight patterns of all aircraft need to be broader than usual and this prevents the aircraft from safely threading their way through the mountainous region (de Neufville and Keeney, 1972).

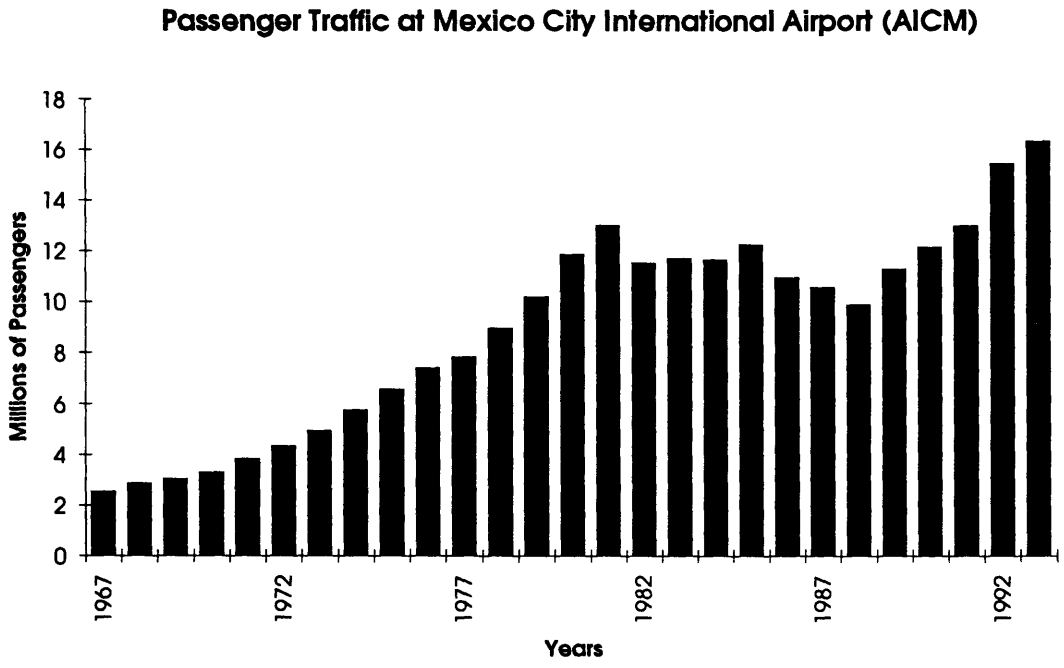

Figure 3.1

Source: Aeropuertos y Servicios Auxiliares, 1994

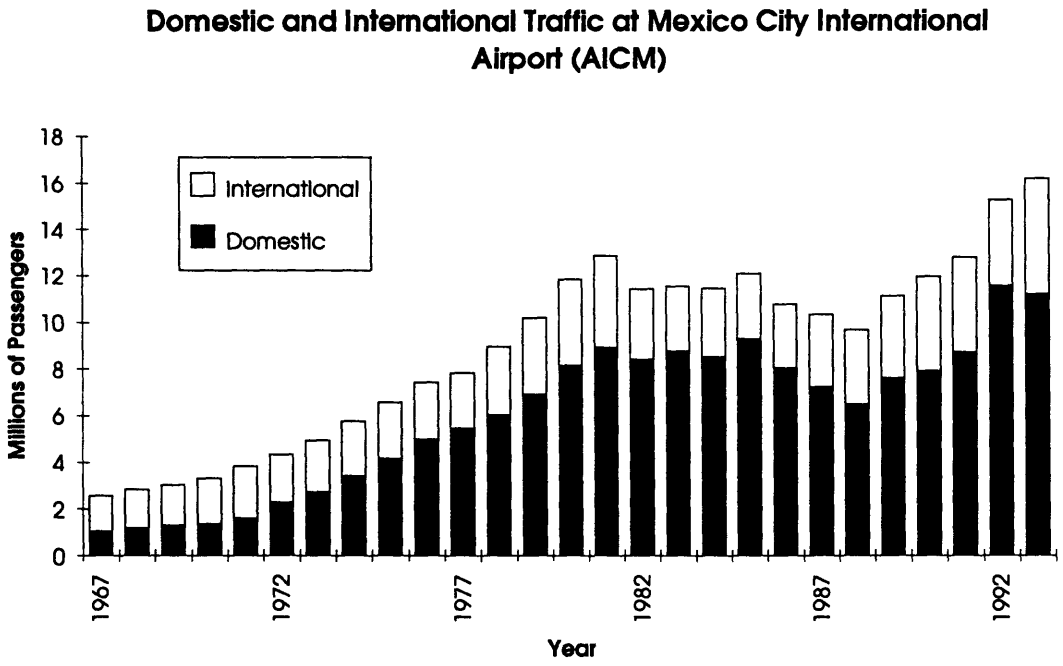

Figure 3.2

Sources: Aeropuertos y Servicios Auxiliares, 1994

Figure 3.3

Source: Aeropuertos y Servicios Auxiliares, 1994

Figure 3.4

Source: Aeropuertos y Servicios Auxiliares, 1994

Chapter 4

Benchmarking of Large International Airports

This chapter benchmarks 33 comparable international airports which handled between 12 and 26 million passengers in 1992. Examples in America, Europe, and Asia are included in this study. The benchmarking of the airports' performance and facilities is valuable because it both provides data on elements and, most significantly, gives guidance for improving them.

4.1 Benchmarking Definition

Benchmarking, in the business sector, refers to the process of comparing the performance of any enterprise with that of others considered to be the best of the kind.

Benchmarking is applicable to any organizational process and is the first step in many general problem solving processes because it helps to find the areas where attention needs to be focused.

In commercial aviation, it is not common to benchmark airports facilities and performance. This is true among countries and also among airports located in the same country, which have different authorities in charge of operating and managing them. As a

consequence, there are very few detailed comparisons of airports. In the few studies available to the general public in libraries or transportation department offices, the data is not updated and is incomplete.

For this study detailed and updated information was required. The research for information was started from scratch and was a slow process. It took more than eight months to gather the information included in this benchmark analysis.

4.2 Benchmarking Steps

Benchmarking in this study can be summarized in the following four steps:

1) Key Measures
2) Selecting which airports to benchmark
3) Research Process
4) Data Analysis

(This section is based on: Chang and Kelly, 1994; Greene, 1993)

1. Key Measures

Given the complexity of benchmarking airports located all around the world, it was decided to use quantitative measures instead of qualitative ones. Clear and standardized measures critical for this specific study were selected. These measures are:

General

- Origin & Destination and Transfer Passengers
- Domestic and International Passengers
- Aircraft Operations
- Airport Area

Airside Facilities

- Runways
- Positions with and without Bridge

Landside Facilities

- Baggage Claim Devices
- Ticket Counters
- Peoplemovers
- Parking Spaces
- Employees

2. Selecting which airports to benchmark

The criterion for selecting the airports to be benchmarked was the number of passengers that use these facilities per year. This parameter is highly representative of the type of operation management and infrastructure at an airport. Given that a main objective of this study is to rank Mexico City International Airport, the selection of the airports was based in terms of the number of annual passengers that this airport handles: more than 16 million. The 40 airports selected include all those worldwide which handled between 12 and 26 million passengers in 1992 (Airports Council International, 1992; 1994). It was considered that airports handling less than 12 or more than 26 million passengers per year were not compatible with this research because of their different types of characteristics.

3. Research Process

The research process can be divided in three main phases. In the first phase within the U.S.A., airports were contacted by mail; 42% of the airports responded. In the second phase additional airports were included. Almost all the airports within the U.S.A. were initially contacted by phone in order to learn the name of the public relations director in charge, so that he could be addressed directly and first phase problems avoided. All the other airports in America, Europe and Asia were contacted by mail only and the number of

responses was dramatically higher. The total number of responses, 33, represented 83% of the contacted airports. In general, it can be said that the required documents from these airports were a copy of their latest annual report and a map of their airport. The third phase included faxes and phone calls to fill in the missing data. This research process (three phases) took more than eight months to complete. Unfortunately, in some cases some of the required updated data for this study was simply not obtainable; information used to complete some of the missing data came from different sources. Table 4.1 lists the 33 airports included in this benchmarking analysis. This list includes the country, city and code of each of the 33 airports. Table 4.2 lists the 7 non-repondent airports out of the 40 selected.

4. Data Analysis

In order to benchmark these airports and make this data comparable under the same terms, the information was transformed into ratios. Two different groups of ratios were developed, one referring to the number of passengers and the other referring to the number of operations. The 33 airports were ranked using these values.

For the overall ranking of these airports, only selected measures were used. These selected measures were those having the largest amount of data such as runways, total positions, airport area, and parking spaces and not those considered to be the most important or representative of an airport. Those airports which had missing data in any of these measures were not included in this overall ranking.

Overall Ranking Formulas:

Airside Ranking = Ranking [Sum individual airside normalized ratios]

Landside Ranking = Ranking [Sum individual landside normalized ratios]

Total Ranking = Ranking [Sum individual airside and landside normalized ratios]

For example: AICM

Airside Ranking = Ranking [(Runways/Op + Position/Op + Area/Op) Normalized ratios]

= Ranking [9/24 + 302/668 + 8972/81061]

Landside Ranking = Ranking [(Parking Spaces/Pax + Area/Pax) Normalized ratios]

= Ranking [203/2367 + 118/699]

Total Ranking = Ranking [(Runways/Op + Position/Op + Area/Op + Parking Spaces/Pax + Area/Pax) Normalized ratios]

= Ranking [9/24 + 302/668 + 8972/81061 + 203/2367 + 118/699]

As can be seen, even though this is a logical commonly used criterion to analyze data, the obtained airport ranking gives the rank of the airport in terms of the capacity of only some facilities and not the capacity or the quality of service of the whole airport. Besides that, there are many other variables that are not considered in this study. For example: Airports handling high percentages of wide body aircraft require fewer runways to handle the same number of passengers than airports handling a mix of aircraft. In this study the type and mix of aircraft handled by each airport is not considered. Car ownership per passenger is low in some countries; a low capacity of parking spaces per passenger is not representative of the quality of service in the parking area. This is also true for airports with a high percentage of foreigner passengers. For all U.S. airports, the number of operations showed is that of certificated route air carriers only. In all other cases, except for the AICM, this data was not available. It is considered that general aviation and air taxis operations are not directly related with many of the airport facilities included in this study.

As a conclusion, it can be said that there is not a single "correct" criterion for ranking these airports and that the results would vary dramatically according to the criterion used, the assumptions made, and the available data.

Table 4.1

Airport Benchmarking Index

	Country	City	Code
America	Canada	Toronto	YYZ
	México	Mexico City	MEX
	U.S.A.	Boston	BOS
	U.S.A.	Charlotte	CLT
	U.S.A.	Detroit	DTW
	U.S.A.	Honolulu	HNL
	U.S.A.	Houston/Intercontinental	IAH
	U.S.A.	Las Vegas	LAS
	U.S.A.	Minneapolis / St. Paul	MSP
	U.S.A.	New York/Newark	EWR
	U.S.A.	New York/Laguardia	LGA
	U.S.A.	Orlando	MCO
	U.S.A.	Philadelphia	PHL
	U.S.A.	Phoenix	PHX
	U.S.A.	Pittsburgh	PIT
	U.S.A.	Salt Lake City	SLC
	U.S.A.	Seattle	SEA
	U.S.A.	St. Louis	STL
	U.S.A.	Washington/National	DCA
Asia	Australia	Sydney	SYD
	Hong Kong	Hong Kong	HKG
	Japan	Fukuoka	FUK
	Japan	Tokyo	NRT
	Singapore	Singapore	SIN
	Thailand	Bangkok	BKK
Europe	France	Paris/Roissy	CDG
	France	Paris/Orly	ORY
	Germany	Düsseldorf	DUS
	Netherlands	Amsterdam	AMS
	Spain	Madrid	MAD
	Sweden	Stockholm	ARN
	Switzerland	Zurich	ZRH
	United Kingdom	London/Gatwick	LGW

Table 4.2

Airports not included in this bencharking study
(non-respondent)

	Country	City	Code
America	U.S.A	Miami	MIA
Asia	Japan	Osaka	OSA
	Japan	Sapporo	CTS
	South Korea	Seoul	SEL
Europe	Denmark	Copenhagen	CPH
	Italy	Rome	FCO
	United Kingdom	Manchester	MAN

4.3 Tables Explanation

The following tables are a compendium of the comparative data from the 33 world airports. All these tables show in their left side a column listing the airports alphabetically by city. The only exception is Mexico City International Airport which is listed as "AICM" and is the first one in all the tables.

Table 4.3 refers to passenger traffic. This table shows the percentage of origin & destination and transfer passengers at each airport as well as the number of passengers in this category. It also includes the number of domestic, international and total passengers. Except for these percentage values, all other values are expressed in millions of passengers.

Table 4.4 lists the number of aircraft operations and airside measures, and Table 4.5 lists the landside measures. The number of aircraft operations and employees in these tables are expressed in thousands. For all U.S. airports and for the AICM, the number of operations showed is that of certificated route air carriers only.

Tables 4.6 and 4.7 show the operation and passenger ratios. These ratios are obtained by dividing the airside and landside measures by the number of operations or passengers. In the case of landside facilities, the number of passengers used to obtain these ratios is the origin & destination and not transfer passengers because this last group of passengers does not make use of the landside facilities such as ticket counters, parking lots, and baggage claim devices. In order to make all these values easier to read and compare, the zeros were omitted by multiplying the ratios by one million (1x10^6). To obtain the actual values, it is necessary to divide the ratios by one million (1x10^6). For the purpose of these arithmetic analysis it is not necessary to work with the actual numbers.

Tables 4.8 and 4.9 rank all these airports in an ascending order for each different ratio. The airport with the highest capacity value in each different ratio is ranked number 1. The ranking process used in these tables gives the same rank to duplicated numbers. In these cases, the rank of the subsequent numbers will be affected. For example: if the number 145 is listed twice and is ranked 12, the next ranking value would be 14 and no number will have a rank of 13.

Table 4.10 is a global ranking of the airports according to the operation and passenger ratios. Included in the airside measures are runways and total positions and in the landside measures are parking spaces and the total airport area. This global ranking includes only these few measures which had the least missing data. Those airports which had missing data were not included in this global ranking. Table 4.11 lists the first three airports with the highest capacity values.

Tables 4.12 and 4.13 are the references codes for the data included in tables 4.3, 4.4, and 4.5. The first number in each cell indicates the reference number and the second, when available, indicates the page. Following these tables is the list of all these references grouped by country.

Table 4.3

Passenger Traffic in Millions Annual Passengers

	Origin & Destination (estimated) %	Transfer (estimated) %	Origin & Destination (M)	Transfer (M)	Domestic (M)	International (M)	Total (M)
AICM	99	1	16.14	0.16	11.3	5.0	**16.3**
Amsterdam	60	40	12.78	8.52	0.6	20.7	**21.3**
Bangkok	70	30	13.02	5.58	4.1	14.5	**18.6**
Boston	85	15	19.98	3.53	19.9	3.6	**23.5**
Charlotte	60	40	10.32	6.88	16.8	0.4	**17.2**
Detroit	50	50	12.10	12.10	22.1	2.1	**24.2**
Düsseldorf	85	15	11.14	1.97	3.3	9.8	**13.1**
Fukuoka	65	35	9.04	4.87	12.0	1.9	**13.9**
Houston/Interc	60	40	12.12	8.08	17.6	2.6	**20.2**
Hong Kong	50	50	12.25	12.25	0.0	24.5	**24.5**
Honolulu	60	40	13.74	9.16	17.2	5.7	**22.9**
Las Vegas	80	20	18.00	4.50	22.0	0.5	**22.5**
London/LGW	75	25	15.15	5.05	1.2	19.0	**20.2**
Madrid	85	15	14.96	2.64	8.8	8.8	**17.6**
Minneapolis	50	50	11.70	11.70	22.9	0.5	**23.4**
New York /Newark	75	25	19.35	6.45	22.4	3.4	**25.8**
New York/LGA	80	20	15.84	3.96	18.6	1.2	**19.8**
Orlando	80	20	16.80	4.20	18.5	2.5	**21.0**
Paris/CDG	80	20	20.88	5.22	2.9	23.2	**26.1**
Paris/ORY	80	20	20.32	5.08	15.4	10.0	**25.4**
Philadelphia	70	30	11.55	4.95	15.3	1.2	**16.5**
Phoenix	50	50	10.80	11.80	23.5	0.1	**23.6**
Pittsburgh	40	60	7.36	11.04	18.0	0.4	**18.4**
Salt Lake	60	40	10.50	7.00	17.3	0.2	**17.5**
Seattle	60	40	11.28	7.52	17.4	1.4	**18.8**
Singapore	65	35	13.00	7.00	0.0	20.0	**20.0**
St. Louis	50	50	10.00	10.00	19.7	0.3	**20.0**
Stockholm	90	10	11.25	1.25	6.2	6.3	**12.5**
Sydney	75	25	12.53	4.18	10.3	6.4	**16.7**
Tokyo	65	35	14.30	7.70	3.0	19.0	**22.0**
Toronto	75	25	15.38	5.13	9.7	10.8	**20.5**
Washington/Natl	70	30	11.41	4.89	16.3	0.0	**16.3**
Zurich	70	30	9.52	4.08	7.8	5.8	**13.6**

Sources: See details on tables 4.12 and 4.13

Table 4.4

Aircraft Operations and Airside Measures

	Operations Annual (K)	Runways	Positions with Bridge	Positions without Bridge	Positions Total
AICM	215	2	21	44	65
Amsterdam	260	5	66	36	102
Bangkok	133	2	34	39	73
Boston	310	5			84
Charlotte	246	3			64
Detroit	284	5	75	14	89
Düsseldorf	167	2	28	38	66
Fukuoka	96	1			28
Houston/Interc	229	4	82	0	82
Hong Kong	135	1	8	30	38
Honolulu	164	4	37	6	43
Las Vegas	193	4			65
London/LGW	186	1			
Madrid	187	2	22	103	125
Minneapolis	264	3			81
New York/Newark	272	3			95
New York/LGA	272	2			73
Orlando	181	3			99
Paris/CDG	283	2			
Paris/ORY	201	3	56	30	86
Philadelphia	218	3			
Phoenix	289	2	81	13	94
Pittsburgh	259	4	75	25	100
Salt Lake	169	3	44	20	51
Seattle	280	2	71	4	75
Singapore	150	2	36	36	72
St. Louis	372	2			88
Stockholm	226	2	44	15	59
Sydney	224	3			26
Tokyo	121	1	53	10	63
Toronto	306	3	83	22	105
Washington/Natl	194	3			82
Zurich	197	3	27	18	45

Sources: See details on tables 4.12 and 4.13

Table 4.5

Landside Measures

	Baggage Claim Devices	Ticket Counters	People-Mover	Parking Spaces	Employees (K)	Area (acres)
AICM	13	212	0	3280	24	1929
Amsterdam	17	302	0	16581	2	2000
Bangkok	11	114	0	2700	15	1211
Boston	27	266	0	10215	15	2400
Charlotte			0	7000		5000
Detroit	13		0	12000	12	6700
Düsseldorf	23	107	0	6104		1515
Fukuoka			0	932		865
Houston/Interc	23		1	12094	15	9000
Hong Kong	6	184	0			
Honolulu	20	164	0	6050	15	2200
Las Vegas	15	162	0			2820
London/LGW			1			
Madrid	22	187	0	10500	11	2936
Minneapolis			0			
New York/Newark			1	17000	17	2300
New York/LGA			0	9565	10	650
Orlando			1	7725		14672
Paris/CDG			1	11177		
Paris/ORY			1	14330		3835
Philadelphia			0			
Phoenix	14		0	9565	20	2032
Pittsburgh	16	142	1	17420	15	12080
Salt Lake	9	536	0	13786	10	7500
Seattle	14	111	1	18000		2433
Singapore	16	258	1	3800	27	3212
St. Louis			0			
Stockholm			0		1	
Sydney		126	0	4700	30	2075
Tokyo			1	8400		1680
Toronto			0	15324	15	4428
Washington/Natl			0			
Zurich			0	4400	17	1790

Sources: See details on tables 4.12 and 4.13

Table 4.6

Airside Ratios per Million Annual Operations

	Runways/ Operation	Positions with Bridge/ Operation	Positions Total/ Operation	Area/ Operation	Baggage Claim Devices/ Operation
AICM	9	98	302	8972	60
Amsterdam	19	254	392	7692	65
Bangkok	15	256	549	9105	83
Boston	16	n/a	271	7742	87
Charlotte	12	n/a	260	20325	n/a
Detroit	18	264	313	23592	46
Düsseldorf	12	168	395	9072	138
Fukuoka	10	n/a	292	9010	n/a
Houston/Interc	17	358	358	39301	100
Hong Kong	7	59	281	n/a	44
Honolulu	24	226	262	13415	122
Las Vegas	21	n/a	337	14611	78
London/LGW	5	n/a	n/a	n/a	n/a
Madrid	11	118	668	15701	118
Minneapolis	11	n/a	307	n/a	n/a
New York/Newark	11	n/a	349	8456	n/a
New York/LGA	7	n/a	268	2390	n/a
Orlando	17	n/a	547	81061	n/a
Paris/CDG	7	n/a	n/a	n/a	n/a
Paris/ORY	15	279	428	19080	n/a
Philadelphia	14	n/a	n/a	n/a	n/a
Phoenix	7	280	325	7031	48
Pittsburgh	15	290	386	46641	62
Salt Lake	18	260	302	44379	53
Seattle	7	254	268	8689	50
Singapore	13	240	480	21413	107
St. Louis	5	n/a	237	n/a	n/a
Stockholm	9	195	261	n/a	n/a
Sydney	13	n/a	116	9263	n/a
Tokyo	8	438	521	13884	n/a
Toronto	10	271	343	14471	n/a
Washington/Natl	15	n/a	423	n/a	n/a
Zurich	15	137	228	9086	n/a

Table 4.7

Landside Ratios per Million Annual Passengers

	Ticket Counters/ Passenger (O&D)	Parking Spaces/ Passenger (O&D)	Area/ Passenger	Baggage Claim Devices/ Passenger (O&D)
AICM	13	203	118	0.8
Amsterdam	24	1297	94	1.3
Bangkok	9	207	65	0.8
Boston	13	511	102	1.4
Charlotte	n/a	678	291	n/a
Detroit	n/a	992	277	1.1
Düsseldorf	10	548	116	2.1
Fukuoka	n/a	103	62	n/a
Houston/Interc	n/a	998	446	1.9
Hong Kong	15	n/a	n/a	0.5
Honolulu	12	440	96	1.5
Las Vegas	9	n/a	125	0.8
London/LGW	n/a	n/a	n/a	n/a
Madrid	13	702	167	1.5
Minneapolis	n/a	n/a	n/a	n/a
New York/Newark	n/a	879	89	n/a
New York/LGA	n/a	604	33	n/a
Orlando	n/a	460	699	n/a
Paris/CDG	n/a	535	n/a	n/a
Paris/ORY	n/a	705	151	n/a
Philadelphia	n/a	n/a	n/a	n/a
Phoenix	n/a	811	86	1.2
Pittsburgh	19	2367	657	2.2
Salt Lake	51	1313	429	0.9
Seattle	10	1596	129	1.2
Singapore	20	292	161	1.2
St. Louis	n/a	n/a	n/a	n/a
Stockholm	n/a	n/a	n/a	n/a
Sydney	10	375	124	n/a
Tokyo	n/a	587	76	n/a
Toronto	n/a	997	216	n/a
Washington/Natl	n/a	n/a	n/a	n/a
Zurich	n/a	462	132	n/a

Table 4.8

Airside Ranking, Capacity per Million Annual Operations

	Runways/ Operation	Positions with Bridge/ Operation	Positions Total/ Operation	Area/ Operation	Baggage Claim Devices/ Operation
AICM	24	18	18	19	11
Amsterdam	3	10	9	23	9
Bangkok	12	9	2	15	7
Boston	8	n/a	22	22	6
Charlotte	17	n/a	27	7	n/a
Detroit	5	7	16	5	15
Düsseldorf	18	15	8	17	1
Fukuoka	22	n/a	20	18	n/a
Houston/Interc	6	2	11	4	5
Hong Kong	27	19	21	n/a	16
Honolulu	1	13	25	13	2
Las Vegas	2	n/a	14	10	8
London/LGW	32	n/a	n/a	n/a	n/a
Madrid	21	17	1	9	3
Minneapolis	19	n/a	17	n/a	n/a
New York/Newark	20	n/a	12	21	n/a
New York/LGA	28	n/a	23	25	n/a
Orlando	7	n/a	3	1	n/a
Paris/CDG	30	n/a	n/a	n/a	n/a
Paris/ORY	13	5	6	8	n/a
Philadelphia	14	n/a	n/a	n/a	n/a
Phoenix	31	4	15	24	14
Pittsburgh	10	3	10	2	10
Salt Lake	4	8	19	3	12
Seattle	29	11	24	20	13
Singapore	16	12	5	6	4
St. Louis	32	n/a	28	n/a	n/a
Stockholm	25	14	26	n/a	n/a
Sydney	15	n/a	30	14	n/a
Tokyo	26	1	4	12	n/a
Toronto	23	6	13	11	n/a
Washington/Natl	9	n/a	7	n/a	n/a
Zurich	11	16	29	16	n/a

Table 4.9

Landside Ranking, Capacity per Million Annual Passengers

	Ticket Counters/ Passenger (O&D)	Parking Spaces/ Passenger (O&D)	Area/ Passenger	Baggage ClaimDevices/ Passenger (O&D)
AICM	7	24	15	15
Amsterdam	2	4	19	7
Bangkok	14	23	23	13
Boston	6	17	17	6
Charlotte	n/a	12	5	n/a
Detroit	n/a	7	6	11
Düsseldorf	12	15	16	2
Fukuoka	n/a	25	24	n/a
Houston/Interc	n/a	5	3	3
Hong Kong	5	n/a	n/a	16
Honolulu	9	20	18	5
Las Vegas	13	n/a	13	14
London/LGW	n/a	n/a	n/a	n/a
Madrid	8	11	8	4
Minneapolis	n/a	n/a	n/a	n/a
New York/Newark	n/a	8	20	n/a
New York/LGA	n/a	13	25	n/a
Orlando	n/a	19	1	n/a
Paris/CDG	n/a	16	n/a	n/a
Paris/ORY	n/a	10	10	n/a
Philadelphia	n/a	n/a	n/a	n/a
Phoenix	n/a	9	21	10
Pittsburgh	4	1	2	1
Salt Lake	1	3	4	12
Seattle	11	2	12	8
Singapore	3	22	9	9
St. Louis	n/a	n/a	n/a	n/a
Stockholm	n/a	n/a	n/a	n/a
Sydney	10	21	14	n/a
Tokyo	n/a	14	22	n/a
Toronto	n/a	6	7	n/a
Washington/Natl	n/a	n/a	n/a	n/a
Zurich	n/a	18	11	n/a

Table 4.10

Overall Ranking
Airside and Landside based on selected measures

	Airside				Landside			
	Runways/ Operation	**Positions Total/ Operation**	**Area/ Operation**	**R**	**Parking Spaces/ Passenger (O&D)**	**Area/ Passenger**	**R**	**TOTAL RANKING**
AICM	24	18	19	20	24	15	22	21
Amsterdam	3	9	23	11	4	19	9	7
Bangkok	12	2	15	7	23	23	23	13
Boston	8	22	22	14	17	17	16	18
Charlotte	17	27	7	15	12	5	8	11
Detroit	5	16	5	10	7	6	6	5
Düsseldorf	18	8	17	13	15	16	14	16
Fukuoka	22	20	18	19	25	24	24	23
Houston/Interc	6	11	4	3	5	3	4	4
Hong Kong	27	21	n/a	n/a	n/a	n/a	n/a	n/a
Honolulu	1	25	13	6	20	18	20	10
Las Vegas	2	14	10	n/a	n/a	13	n/a	n/a
London/LGW	32	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Madrid	21	1	9	5	11	8	10	6
Minneapolis	19	17	n/a	n/a	n/a	n/a	n/a	n/a
New York/Newark	20	12	21	17	8	20	12	17
New York/LGA	28	23	25	24	13	25	21	24
Orlando	7	3	1	1	19	1	2	2
Paris/CDG	30	n/a	n/a	n/a	16	n/a	n/a	n/a
Paris/ORY	13	6	8	9	10	10	11	8
Philadelphia	14	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Phoenix	31	15	24	21	9	21	13	20
Pittsburgh	10	10	2	2	1	2	1	1
Salt Lake	4	19	3	4	3	4	3	3
Seattle	29	24	20	23	2	12	5	14
Singapore	16	5	6	8	22	9	18	9
St. Louis	32	28	n/a	n/a	n/a	n/a	n/a	n/a
Stockholm	25	26	n/a	n/a	n/a	n/a	n/a	n/a
Sydney	15	30	14	22	21	14	19	22
Tokyo	26	4	12	12	14	22	17	15
Toronto	23	13	11	16	6	7	7	12
Washington/Natl	9	7	n/a	n/a	n/a	n/a	n/a	n/a
Zurich	11	29	16	18	18	11	15	19

Ranking

As stated in the section explaining tables, table 4.11 lists the first three airports with the highest capacity values under the selected airside and landside measures. It also shows the results from the overall ranking.

This ranking is only representative of the selected measures and is not a ranking of the airports as a whole. Rankings can vary dramatically according to the criterion used, the assumptions made, and the available data as was stated in the data analysis section of this chapter.

4.4 Figures Explanation

Figures 4.1 through 4.6 show the relations between pair of airport measures such as number of passengers, runways, areas, positions and operations. From these figures and from the linear regression analysis, it can be concluded that the mutual relations between airports performance and facilities is very low. For example, Figure 4.2 shows that some airports with only one runway, handle more passengers than many other airports with 2, 3, 4, or even 5 runways. All correlation coefficients range between 0.11 and 0.39 with an average of 0.28 .

Figure 4.1 Runways - Operations

a)	Standard Deviation (n)	$\sigma x = 1.11$ $\sigma y = 61.74$
b)	Standard Deviation (n-1)	$\sigma x = 1.13$ $\sigma y = 62.70$
c)	$y = mx + b$	$y = 21.9x + 160.9$
d)	Correlation coefficient	$r = 0.39$

Figure 4.2 Passengers - Runways

a)	Standard Deviation (n)	$\sigma x = 3.71$ $\sigma y = 1.11$
b)	Standard Deviation (n-1)	$\sigma x = 3.77$ $\sigma y = 1.13$
c)	$y = mx + b$	$y = 0.07x + 1.3$
d)	Correlation coefficient	$r = 0.24$

Figure 4.3 Passengers - Area

a)	Standard Deviation (n)	$\sigma x = 3.48$ $\sigma y = 3464.44$
b)	Standard Deviation (n-1)	$\sigma x = 3.55$ $\sigma y = 3535.88$
c)	$y = mx + b$	$y = 108.3x + 1749.2$
d)	Correlation coefficient	$r = 0.11$

Figure 4.4 Runways - Positions

a)	Standard Deviation (n)	$\sigma x = 1.11$ $\sigma y = 23.13$
b)	Standard Deviation (n-1)	$\sigma x = 1.13$ $\sigma y = 23.53$
c)	$y = mx + b$	$y = 6.4x + 56.0$
d)	Correlation coefficient	$r = 0.31$

Figure 4.5 Positions - Passengers

a)	Standard Deviation (n)	$\sigma x = 23.13$ $\sigma y = 3.66$
b)	Standard Deviation (n-1)	$\sigma x = 23.53$ $\sigma y = 3.73$
c)	$y = mx + b$	$y = 0.06x + 15.7$
d)	Correlation coefficient	$r = 0.35$

Figure 4.6 Passengers - Operations

a)	Standard Deviation (n)	$\sigma x = 3.71$ $\sigma y = 61.74$
b)	Standard Deviation (n-1)	$\sigma x = 3.77$ $\sigma y = 62.70$
c)	$y = mx + b$	$y = 4.97x + 122.25$
d)	Correlation coefficient	$r = 0.30$

Table 4.11

Airports with the highest capacity values based on selected measures

	Airside Ranking	Landside Ranking	Overall Ranking
1st	Orlando	Pittsburgh	Pittsburgh
2nd	Pittsburgh	Orlando	Orlando
3rd	Houston/Interc	Salt Lake	Salt Lake

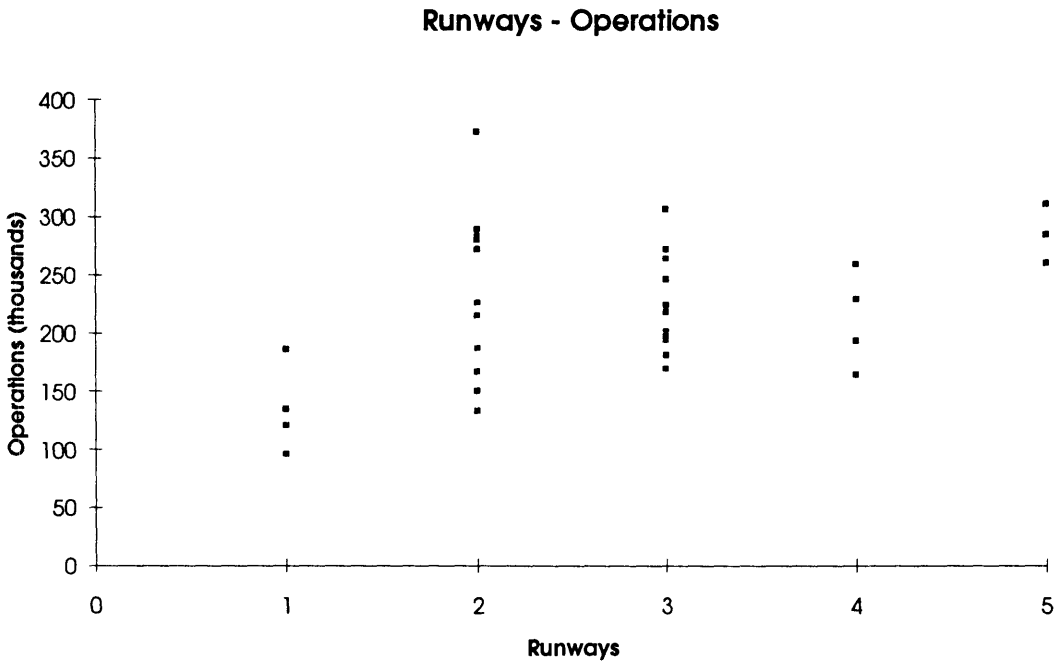
Runways - Operations
Operations (thousands)
400
350
300
250
200
150
100
50
0
0
1
2
3
4
5
Runways

Figure 4.1

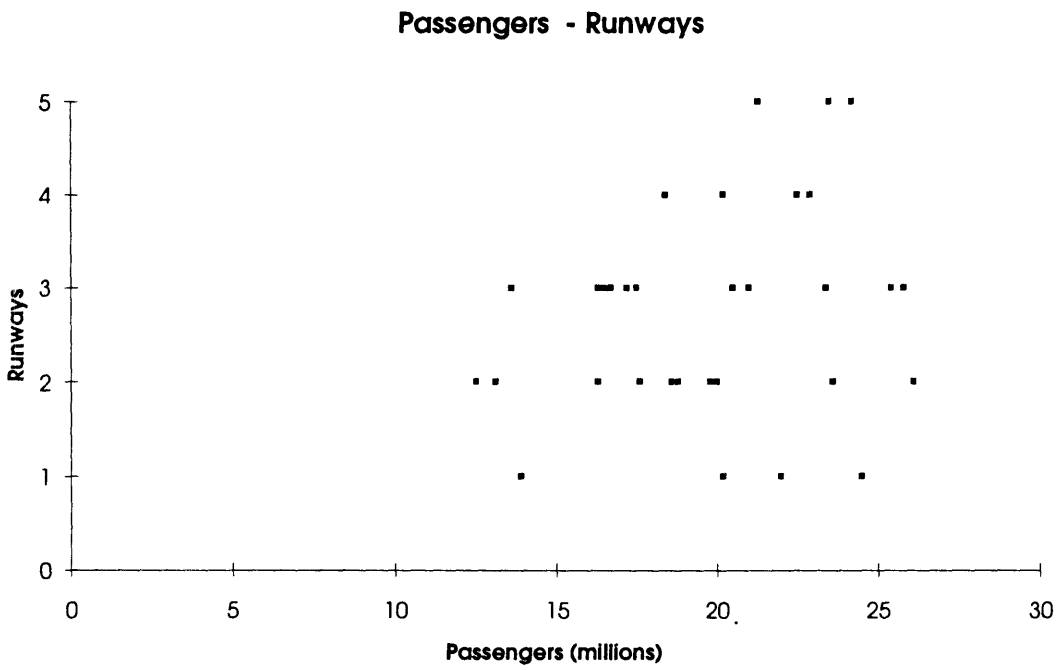
Passengers - Runways
Runways
0
1
2
3
4
5
0
5
10
15
20
25
30
Passengers (millions)

Figure 4.2

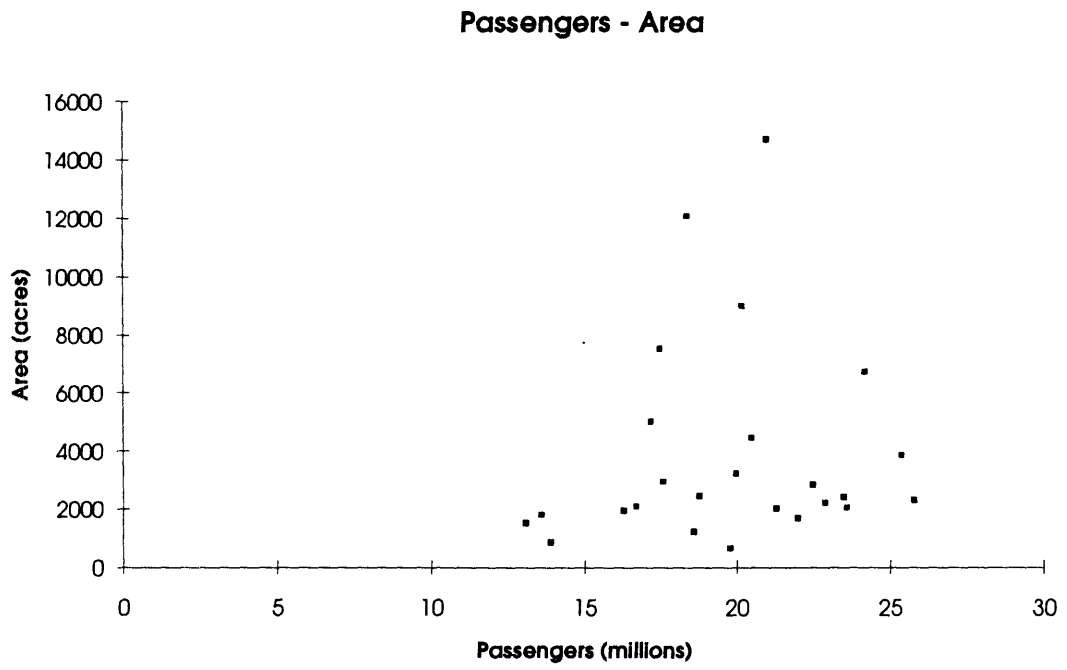
Passengers - Area
16000
14000
12000
10000
8000
6000
4000
2000
0
Area (acres)
0
5
10
15
20
25
30
Passengers (millions)

Figure 4.3

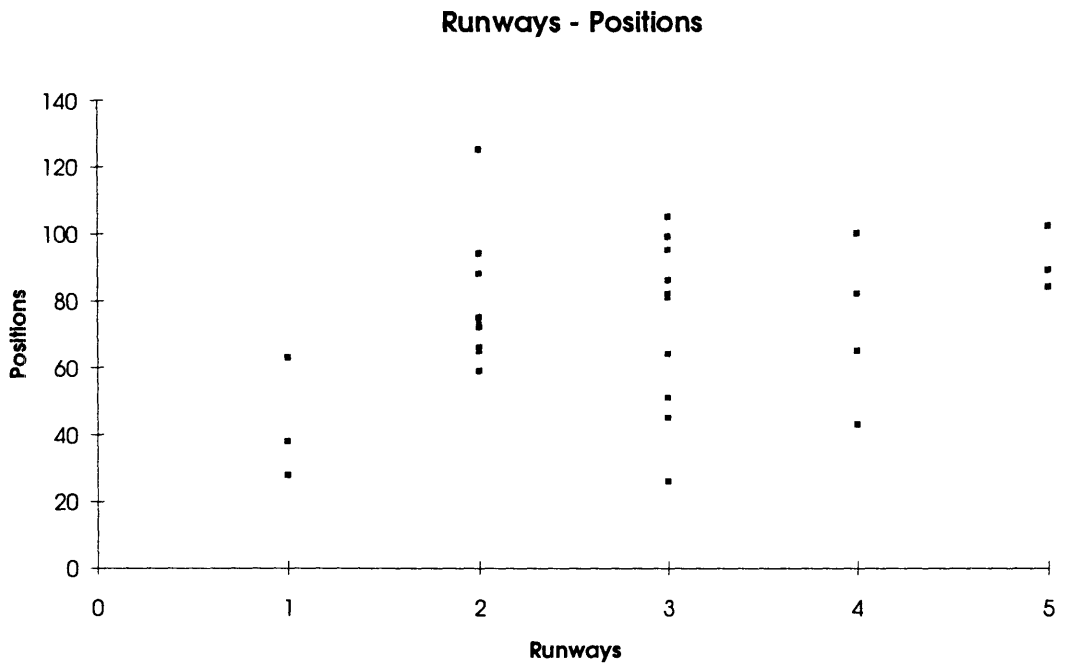
Runways - Positions
140
120
100
80
60
40
20
0
Positions
0
1
2
3
4
5
Runways

Figure 4.4

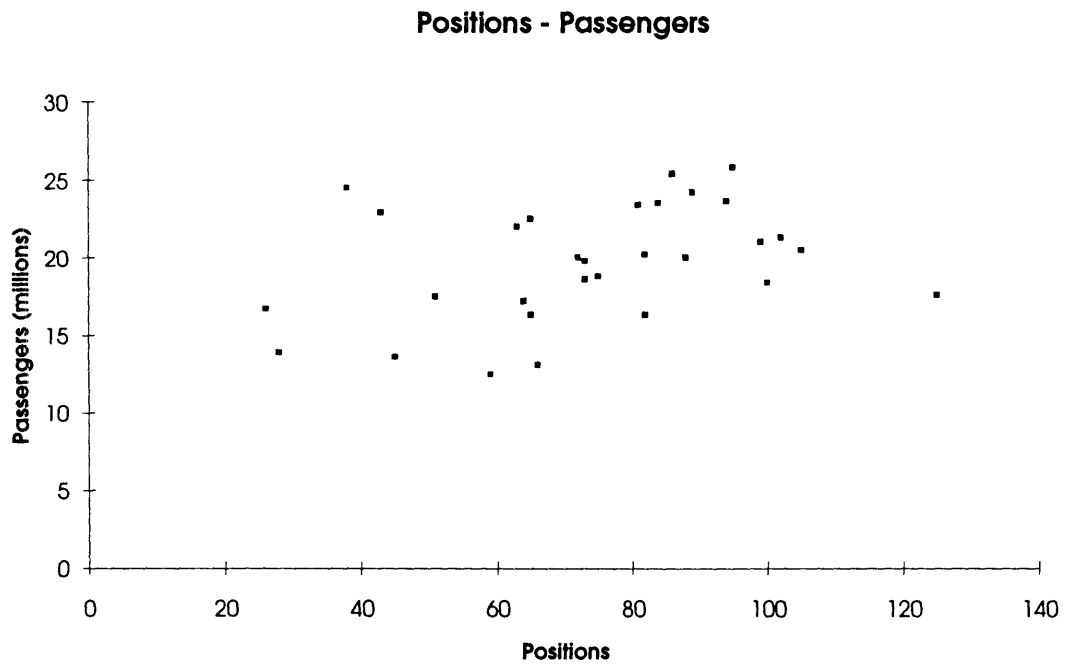
Positions - Passengers
Passengers (millions)
30
25
20
15
10
5
0
0
20
40
60
80
100
120
140
Positions

Figure 4.5

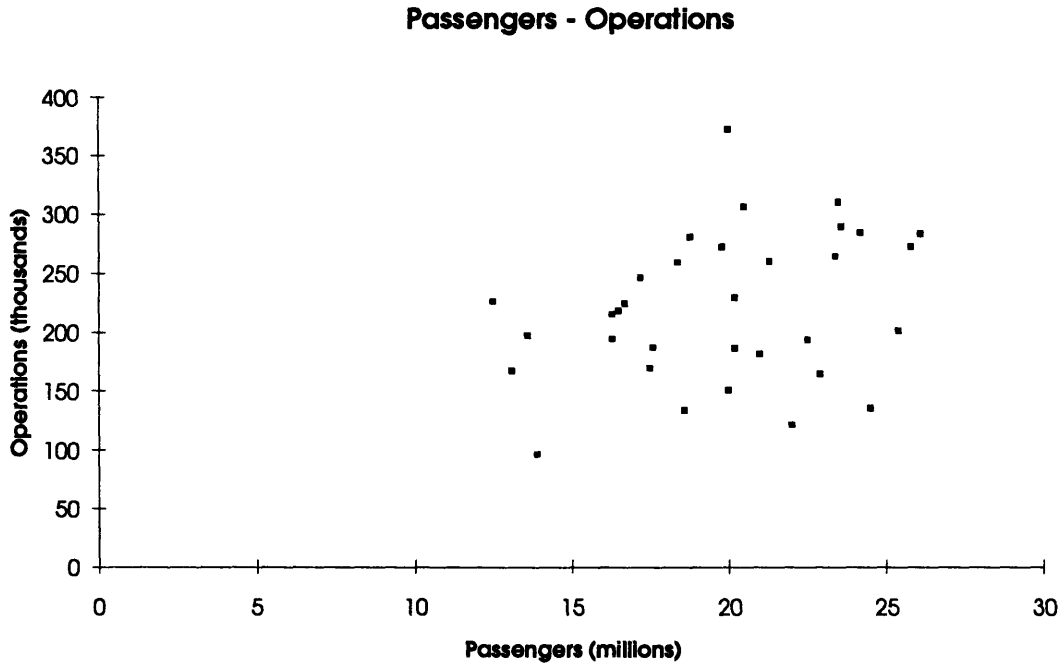
Passengers - Operations
Operations (thousands)
400
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30
Passengers (millions)

Figure 4.6

Table 4.12

References

	Origin & Destination Passengers	Domestic/ International Passengers	Passengers Total	Operations	Run-ways	Positions with Bridge	Positions without Bridge
AICM	1-198	1-198	1-198	1-197	1-195	1-195	1-195
Amsterdam	@	2-244*	1-19	1-19	3	4	4
Bangkok	@	1-11	1-3	1-10	2	2	2
Boston	@	1-36	1-36	2	3-1		
Charlotte	@	1-5	1-5	2	1-5		
Detroit	@	2	1	3	1	2	2
Düsseldorf	@	2-177*	1-6	1-6	1-27	1-27	1-27
Fukuoka	@	1	1	2	3		
Houston/Interc	@	1-2	1-2	2	3	4	4
Hong Kong	@	1	1	2	1	3	3
Honolulu	@	1	1	2	3	1	1
Las Vegas	@	2-468*	1	3	4		
London/LGW	@	2-401*	1	2			
Madrid	@	1-12	1-12	1-12	2	2	2
Minneapolis	@	2-477*	1-5	3	4		
New York/Newark	@	1-15	1-15	2	3-4		
New York/LGA	@	1-22	1-22	2	3-3		
Orlando	@	2-493*	1-9	3	4		
Paris/CDG	@	2-156*	1-5	1-13	3		
Paris/ORY	@	2-157*	1-5	1-13	3-24	3-24	3-24
Philadelphia	@	2-497*	1-14	3	4		
Phoenix	@	2-498*	1	3	4	5	5
Pittsburgh	@	2-499*	1-11	3	4	5	6
Salt Lake	@	1	1	2	3	1	1
Seattle	@	1-2	1-2	2	3-2	3-2	3-2
Singapore	@	1	1	1	1	1	1
St. Louis	@	2-523*	1-14	3	4		
Stockholm	@	1-17	1-17	1-17	2	2	2
Sydney	@	1-6	1-6	1-6	1-3		
Tokyo	@	2-226*	1-4	1-4	1-7	3-3	3-3
Toronto	@	2-110*	1	1	1	1	1
Washington/Natl	@	1	1-22	2	3		
Zurich	@	1-24	1-9	1-9	2	2	2

Table 4.13

References

	Positions Total	Baggage Claim Devices	Ticket Counters	People Mover	Parking Spaces	Employees	Area
AICM	1-195	1-195	1-195	1-195	2	3	1-195
Amsterdam	4	4	4	4	4	4	4
Bangkok	1-4	2	2	2	2	2	2
Boston	3-3	4	4	4	3-6	3-1	3-1
Charlotte	1-5				1-5		1-5
Detroit	1	2		2	4	5	1
Düsseldorf	1-27	1-27	1-27		1-27		1-27
Fukuoka	3				3		3
Houston/Interc	3	4		3	3	4	5
Hong Kong	1	1	1				
Honolulu	4	1	1	1	1	1	1
Las Vegas	4	4	5				6
London/LGW							
Madrid	2	2	2	2	2	2	2
Minneapolis	4						
New York/Newark	3-2			3-1	3-2	3-1	3-1
New York/LGA	3-1				3-2	3-1	3-1
Orlando	5			1-7	6		1-7
Paris/CDG					1-18		
Paris/ORY	3-24				1-17		3-24
Philadelphia							
Phoenix	5	5			5	5	5
Pittsburgh	6	5	5	4	4	5	4
Salt Lake	3	1	1		1	1	4
Seattle	3-2	3-2	4	3-2	3-2		3-2
Singapore	1	1	1	1	1	1	1
St. Louis	5						
Stockholm	2					1-17	
Sydney	1-7		1-7		1-10	1-10	1-2
Tokyo	3-3			3-28	1-7		1-7
Toronto	1				1	1	1
Washington/Natl	4						
Zurich	2				2	2	2

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1-23	Reference number - page
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Chapter 5

Recommendations and Conclusions

5.1 General Recommendations

This chapter presents recommendations and conclusions drawn for improving the air infrastructure servicing Mexico City. As can be seen from the description of the AICM in Chapter 3, the problems that this airport is facing today are very complex in the present environment. A solution should be found as soon as possible in order to:

1. Increase the quality of service given by these facilities to its users, passengers and airlines.

2. Reduce the probability that a fatality could occur as a consequence of the reduction of aeronautical operation safety.

The recommendations in this study are divided in two groups; the first refers to the management organization and ownership of the airport and the second refers to the facilities.

Immediate Actions

Now that general aviation has been sent to Toluca, (September 1st, 1994), all the activities, equipment, and facilities which are not required in the AICM or are not related to it, should be taken out of the airport area. The same should be done with all the aircraft not compatible with commercial aviation and those that are abandoned, if any.

5.2 Recommendations from the airports management and ownership structure analysis

The following recommendations, based on the previous analysis of the different management and ownership structures available worldwide, can be drawn for the air infrastructure servicing Mexico City.

In order to improve its service, it is recommended that the authority responsible for the airport keep the generated revenues to cover costs and the generated profits for expansion. In order to do that, medium term and long term plans need to be elaborated and studied by the airport authority in advance. This means that the authority in charge needs to have a strategic planning approach as to where the profits should be invested. The adoption of a this approach permits flexibility according to traffic variations (de Neufville, 1990). From the data presented in Chapters 1 and 3, it can be seen that with the present organization and government policies the airport will not be able to keep revenues and profits to cover costs and expansions. One of the ways in which this can be achieved is by changing the present administration to a local one where the authority in charge can manage the airport with a certain degree of autonomy, in a business-like environment that is client-oriented.

Another recommendation for the improvement of the air transportation infrastructure in Mexico City is the development of medium and long term projects based on actual needs. It was stated by Jorge de la Madrid Virgen, deputy director in charge of the construction and maintenance for all Mexican airports, that the New International Building will only be able to keep pace for about five years. (Blears, 1994).

It is also very important to ensure that the adequate value in the transaction is received when a state owned enterprise is privatized. This is to avoid future claims that

the government has given away the national public patrimony to entities who then enjoy great profits. Valuation of state owned enterprises can be determined in several ways such as: reference to earnings, recent and future potential, adjusted value of assets, dividend paying capacity, or different combinations of the above (Vuylsteke, 1988).

The AICM is a very profitable airport. As seen in the introduction, the AICM comprises 40% of the total air activity in the country, making it the most important airport of the whole system. Total revenues could be increased dramatically with "client-oriented" non-airline sources within the passenger building. Among these sources are: restaurants and bars, duty and tax free shops, and travel related services and facilities. The location and the way in which these concessions are managed are important factors for being successful and profitable.

Table 5.1 is a summary of the recommendations for the improvement of the air transportation infrastructure in Mexico City.

Table 5.1

Recommendations for the Improvement of the Air Transportation Infrastructure in Mexico City

Sector	Activities	Benefits
Management	Reduce government activities as much as possible in the airport infra-structure. Its main activity should be regulatory and supervisory only.	Freedom to conduct business commercially and financial improvement. The government needs to ensure that users, clients, and airlines' interests are respected by the private entities in charge of the airport.
Customer Service Passengers and Airlines	Facilities according to users' actual needs.	Better service, aeronautical operation safety improvement.
Revenues	Reinvestment in the airport.	Financially self-sufficient for expansion projects.
Commercial Activities	Improve through expansion and diversification.	High increase in airports revenue.
Employees	Training and higher remuneration.	Increased employee productivity and cost reduction.
Projects	Long term projects based on the air transportation infrastructure actual needs.	Avoid capacity problems on time, improve safety, and maintain a high level of service.
Facilities	Modernization and expansion. Construction of a new airport	Higher level of service and increased safety.

5.3 Recommendations from the benchmarking analysis

From the benchmarking analysis it can be concluded that the AICM requires much more capacity in many areas in order to keep a World Class Airport level of service. Table 5.2 is a summary of the results obtained from the benchmarking analysis. As can be seen from these results, the three areas with the highest need for increased capacity are:

1) Parking spaces
2) Aircraft positions with connecting bridges
3) Baggage claim devices.

Some others areas in the AICM, that were not included in this study, also require increased capacity. For instance, the longitudinal passenger flows along the axis of the passenger building conflict with the transverse flows in the ticket counter areas. The number of fast food stands in the public areas also reduce this space.

Table 5.2

Results from the Benchmarking Analysis

Ratio	% airports below AICM	% airports above AICM
Ticket counters / Passenger	50	50
Parking spaces / Passenger	4	96
Area/Passenger	40	60
Baggage claim devices / Passenger	6	94
Runways / Operation	27	73
Positions with bridge / Operation	5	95
Positions total / Operation	40	60
Area / Operation	24	76
Baggage claim devices / Operation	31	69
Average	**25**	**75**

5.4 Conclusions

Throughout the previous chapters this thesis has analyzed different types of airport ownership and management trends all around the world, described Mexico City International Airport, benchmarked 33 world class airports, and drawn some recommendations for the improvement of the Mexico City air infrastructure with this information.

The purpose of this thesis was to analyze the priorities for Mexico City International Airport under the privatization and local management trends of airports worldwide. The given recommendations are based on the results from the airports' ownership and management experiences and from the benchmarking analysis.

Certainly, many conclusions can be drawn from this study; however, the two most important ones are:

First, the Mexico City airport infrastructure will benefit, as well as the government and the customers, with a restructuring of the airport administration and with the participation of private entities.

The second conclusion is that Mexico City International Airport requires a lot of attention from the airport authority in order to maintain a world class airport level of service. The most important concern is passenger convenience in the airport passenger building.

To improve the quality of service is the main need of Mexico City airport infrastructure.

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