CRANFIELD INSTITUTE OF TECHNOLOGY

COLLEGE OF AERONAUTICS

PhD THESIS

Academic Years 1989-92

SAED AL-SULIAMAN

THE FEASIBILITY OF LIBERALISATION OR DEREGULATION OF AIR TRANSPORT IN THE GCC

Supervisor A.N.Hofton

May, 1992

This thesis is dedicated to the "Gulf Falcon", Sheikh Hamad Bin Ali Al-Thani, who was the first Arabian pilot to fly around the World in a small Seneca II aircraft, and who broke sixteen aeronautical world speed records. It is dedicated to him for providing guidance and encouragement in all my academic studies, from flight training to flight instructor, Bachelor, Masters and Doctoral degrees.

ABSTRACT

Many nations worldwide have been influenced by the experience of the USA in airline deregulation and have begun to consider the reform of their own governmental regulations. However, airline deregulation has both advantages and disadvantages for consumers, individual airlines, shareholders, the airline industry and governments.

Western Europe has been under pressure to relax its regulations and introduce a liberalisation process. This pressure came partly from the outside as a result of the USA experience and the challenge from low cost Asian carriers. However, pressure also came from the inside from the European Commission and consumer organisations.

In May 1981, the Gulf Cooperation Council (GCC) was established between Saudia Arabia, Qatar, U.A.E., Kuwait, Bahrain and Oman. One of the ways to achieve the GCC's goal of confederation is through economic integration, which means the establishment of a Gulf Common Market.

The main objective of this thesis is to research the feasibility of airline liberalisation in the GCC, taking into consideration the US experience and the European expectation in this particular field.

To accomplish that objective, this thesis is divided into three parts. The first part analyses and studies the GCC air transport market, the development and impact of the US Airline Deregulation Act and the European liberalisation process.

The second part develops a feasibility model for air transport liberalisation in the GCC. This model involves modelling demand for domestic GCC scheduled air services, fleet planning and aircraft selection, financial analysis and the possibility of a new GCC network.

Finally, the third part sets out the conclusions from this theoretically based feasibility study of air transport liberalisation in the GCC, the main findings of the thesis and

lessons that were learned from the USA and Europe.

Its principal conclusion that liberalisation is both feasible and desirable is backed up with an outline of a possible first step that could be adopted for introducing an airline liberalisation process to the GCC market. This process starts by liberating intra-GCC services using aircraft of less than 70 seats capacity.

On a practical level, the thesis also recommends that the Air Transport Section of the GCC Department of Transportation should co-ordinate changes to GCC institutions and infrastructure and should propose further changes to regulation as the liberalisation process moves ahead. It recommends that the Air Transport Section should use developments of this model to evaluate additional changes to the framework of regulation.

ACKNOWLEDGEMENTS

I would like to express my sincere thanks to my supervisor, Mr.Andy Hofton for his constructive guidance, help and encouragement throughout every stage of this thesis. In addition, I would like to thank Professor Rigas Doganis for his useful discussions, suggestions and support.

My special thanks to Sheikh Hamad Bin Ali Al-Thani for the encouragement and guidance provided throughout this thesis.

To Mr.Abulaziz Al-Naemi my great thanks for discussions, raising important issues and suggestions during this work.

To Tricia Forrest-Holden my sincere thanks for typing this thesis, and to Ann Soden and Marie Breen for helping her.

I should also like to thank the staff and my friends in the College of Aeronautics, especially Ian Stockman, Pedro Pinto, Rod Fewings, Peter Morrell, Bob Golding, Peter Obeyesekere, Ralph Anker, Frances Creckendon, Maralyn Bryson, Sveinin Gudmundsson and Rafael Echevarne for their help and support.

CONTENTS

CHAPTER EIGHT - MODELLING AIR TRAFFIC DEMAND FOR DOMESTIC GCC SCHEDULED AIR SERVICES 168

CHAPTER NINE - FLEET PLANNING AND AIRCRAFT SELECTION 200

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

The framework for the regulation of domestic air transport varies from one country to another depending on many contributing factors such as political ideology, economic strategy and commercial philosophy.

The US Airline Deregulation Act which was passed in 1978 has changed airline strategies and has had an impact on efficiency, structure and services. This initial movement towards airline reform has encouraged many regions to adopt new philosophies including the European Community, Canada and Australia.

In 1986, the European Community agreed to move towards the creation of a single European market by adapting the Single European Act. The single market was defined as "an area without internal frontiers in which the freedom of movement of goods, persons, services and capital is ensured".[1]

The aim of establishing the Gulf Cooperation Council (GCC) is to create a confederation. It is recognised that one way to achieve that aim is by economic integration which means the establishment of a Gulf Common Market which includes "the right of nationals to move freely with the same duties and privileges as those provided to nationals of the receiving Member State. Economic integration also means the removal of barriers, custom tariffs and the emergence of one unified tariff on imported commodities".[2]

1.1 SCOPE

This thesis sets out to research and analyse the GCC air transport market and the experience of the USA and Europe in deregulation and liberalisation. In addition, it proposes a feasibility model that examines the possibility of liberalisation in the GCC. However, this thesis will also attempt to answer the following questions:

1. **What is the current GCC air transport market in relation to GCC concepts, airline operations and ownership, airports and regulatory environment? In addition, what are the objectives of the GCC airline liberalisation plan?**
2. **What can be learned for the GCC liberalisation plan from the development and impact of both the USA and European liberalisation processes?**
3. **By developing a feasibility model for air transport liberalisation in the GCC it attempts to examine and answer the following questions:**
   - **Is the domestic passenger demand large enough for a liberalised market?**
   - **Which types of aircraft could serve the GCC market taking account of total costs and quality of service?**
   - **Are there new potential routes?**
   - **Are the new routes commercially attractive to new carriers to operate them?**
   - **What is the form of an operational network?**
4. **If the model establishes that liberalisation in the GCC is feasible, then what plan could be adopted to provide for an airline liberalisation process in the GCC?**

1.2 METHODOLOGY

The objectives of this thesis are accomplished through analysis and research. Data were gathered and collected from different books, journals, theses, reports, papers, discussions and interviews. However, some data relating to GCC air transport, especially airlines and airport activities, were hard or impossible to obtain because they are unavailable or unclassified as to whether the data is confidential, restricted or for the general public.

This thesis discusses and analyses the feasibility of airline liberalisation in the GCC, taking into account the USA and European experiences and expectations in that specific field.

It is for the purpose of this thesis that a feasibility model is developed which is based

on a fundamental theory, justifiable assumptions and is statistically valid. In addition, to accomplish the objectives of the thesis, this study is divided into three parts as illustrated in Figure 1.1.

The first part of this study covers the background and the experiences of other nations of deregulation and liberalisation. This part provides a review of the current GCC air transport industry, and it discusses and analyses the development and impact of US deregulation and European liberalisation. Such an analysis raises many policy questions and lessons for the GCC. This part consists of five chapters, and it starts with Chapter Two.

The second part is the feasibility model of air transport liberalisation in the GCC. This part models and researches the GCC domestic market through traffic demand, new routes, fleet planning and aircraft selection, financial analysis and scheduling on a possible new network. This part provides the main answer to the question of the feasibility of liberalisation in the GCC from an airline operation perspective. It consists of five chapters which start with Chapter Seven.

The third part is the conclusion (Chapter Twelve). This part provides a clear answer about the possibility and feasibility of air transport liberalisation in the GCC. It outlines a proposal for a liberalisation plan that could be adopted and a summary of findings and recommendations.

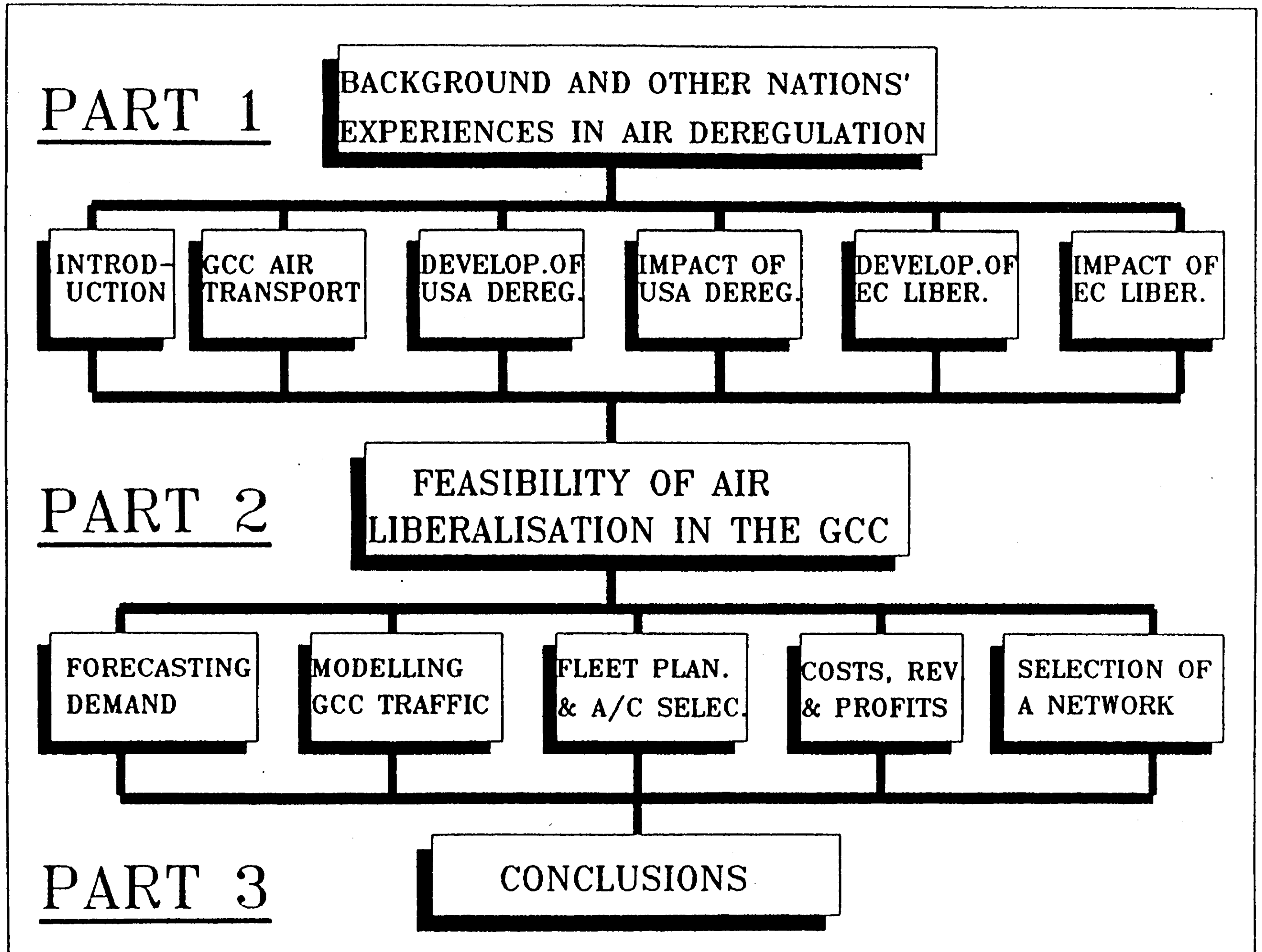


FIGURE 1.1. THESIS STRUCTURE

1.3 THESIS OBJECTIVES

The objective of this thesis is to develop a feasibility model that can examine the possibility of successful liberalisation in the GCC. This air transport feasibility model should be capable of simulating the prospects for carriers' operations as in a real situation. In addition, this quantitative feasibility model should as noted above be based on a fundamental theory, justifiable assumptions and be statistical validity.

Studying and analysing the development and impact of the US deregulation and European liberalisation allows lessons to be drawn from these experiences and expectations. This should avoid their mistakes. It allows the thesis to propose a liberalisation plan for the GCC.

Finally, the thesis can draw conclusions about whether liberalisation is feasible or not in the GCC.

1.4 OBJECTIVES OF THE CHAPTERS

CHAPTER TWO - The GCC Air Transport Market

The main objective of this chapter is to study the GCC air transport market through the GCC's concepts, objectives and structure. In addition, it analyses the international and domestic airports, airline operations and ownership, and the regulatory environment in the GCC. Finally, the objectives of liberalisation in the GCC are covered in this chapter.

CHAPTER THREE - US Airline Deregulation.

The objective of this chapter is to review the history of regulation and deregulation. It discusses and analyses the development of the US Airline Deregulation Act, and finally draws lessons for the GCC.

CHAPTER FOUR - The Impact of the US Airline Deregulation Act.

This chapter's objective is to study the impact of the US Airline Deregulation Act on the airlines, consumers, shareholders, aviation industry and governments. In addition, this study of the USA's experience of deregulation leads to a discussion of what might form

the basis for a liberalisation policy that would be applied in the GCC.

CHAPTER FIVE - The Development of European Liberalisation.

The objective of this chapter is to review the development of liberalisation within the European Community air transport market and draw lessons for the GCC market.

CHAPTER SIX - The Impact of European Liberalisation

The objective of this chapter is to study the EC air transport market, types of European carriers, infrastructure, congestion, mergers and consolidation, CRS and code sharing, hub concentration and airline strategies.

CHAPTER SEVEN - Forecasting Demand

The objective of this chapter is to explain the main problems of forecasting in a real situation and identifies those techniques most appropriate for use in examining traffic flows in the GCC. In addition, it gives the basis for selecting a forecasting model that could be used to predict and forecast passenger demand on domestic GCC routes.

CHAPTER EIGHT - Modelling Air Traffic Demand for Domestic GCC Scheduled Air Services.

A gravity model was selected in the previous chapter to examine traffic demand in the GCC. However, the objective of this chapter is to model the scheduled air traffic demand in the GCC especially for new routes taking into consideration distance, fares and quality of service.

CHAPTER NINE - Fleet Planning and Aircraft Selection.

The main objective of this chapter is to review and study different aircraft for domestic air service. The candidate aircraft should be commercially attractive with regard to the assessment of operating costs and quality of service. To accomplish this objective, fleet planning and aircraft selection are studied and analysed in detail.

CHAPTER TEN - Estimating the Costs and Revenues of New Routes.

The objective of this chapter is to estimate the level of profitability of new routes

operated by candidate aircraft. Therefore, this chapter complements the theory and results outlined in the preceding chapters and explains in more detail the concept of route planning.

CHAPTER ELEVEN - Scheduling on a Possible New GCC Network

Using all the data from the previous chapters, the objective of this chapter is to propose a possible new network in the GCC. However, an analysis and discussion of airline scheduling such as its concepts, methodology and profitability are part of the process of exploring new opportunities in the GCC.

CHAPTER TWELVE - Conclusion

The objective of this chapter is to conclude whether air transport liberalisation is feasible or not in the GCC. It proposes a plan for liberalisation in the GCC with recommendations for its implementation. It also proposes further developments of the model.

REFERENCES

1. **Stephen Wheatcroft and Geoffrey Lipman, European Liberalisation and World Air Transport (England: The Economist Intelligence Unit, 1990) p.4.**

2. **Facts and Figures (Riyadh: The GCC) p.14.**

CHAPTER TWO

THE GCC AIR TRANSPORT MARKET

2.1 INTRODUCTION

The main objective of this chapter is to study the GCC air transport market through the GCC's concepts, objectives and structure. In addition, it analyses the status of international and domestic airports, airline operations and ownership, and the regulatory environment in the GCC. Finally, the objectives of liberalisation in the GCC will be covered in this chapter.

Air transportation has contributed to the development and advancement of the economic prosperity and social life of all countries worldwide. The GCC countries have benefitted from their strategic geographical location where they are in the main air transit routes from Asia to Europe, Africa and the Pacific. Large numbers of transit passengers stop in many of its airports, especially in UAE, Qatar and Bahrain. However, a decrease in this type of transit passenger is possible due to advanced technology aircraft allowing direct flights to be flown from the West to the East, and vice versa, without stopping.

Since the GCC countries are very rich in oil, it is now a focal point for business. Moreover, although the GCC population is eighteen million, which is relatively small compared to the world's population, the average GNP per head of the GCC countries is one of the highest in the world. Table 2.1 illustrates selected economic indicators for the GCC states which were published by ICAO Bulletin in 1989.[1] In addition, the distance travelled by GCC passengers and cargo per flight is similar to those of Europeans and higher than the world's average.[2]

2.2 THE GULF COOPERATION COUNCIL

The concept for the creation of the GCC was initiated in 1979 during a Summit Conference held in Amman, Jordan when H.H. the Amire of Kuwait contacted the Majesties and Highnesses of the GCC countries and briefed them on the philosophy of establishing unity between the six Gulf states which include Saudia Arabia, Qatar, UAE, Kuwait, Bahrain and Oman. However, in 1980, an official debate took place in Riyadh between the leaders of the GCC countries.[3]

In February 1981, the Foreign Ministers met in Riyadh. In April of the same year they met again in Muscat, Oman and proposed a paper which forms the basis of the Charter. Finally, the Gulf State leaders met officially in Abu-Dhabi on May 25, 1981 and signed the basic Charter for the creation and establishment of the GCC.[4]

The goal of the GCC is confederation, however the following are steps on the way to achieving this goal:[5]

1. Political coordination
2. Economic integration (Gulf Common Market).
3. Defence cooperation
4. Security complementarity
5. Social, cultural and educational approximation.

2.2.1 <u>The GCC Objectives</u>

The basic objectives of the GCC as indicated in Article Four are as follows:

"1. To effect coordination, integration and interconnection between Member States in all fields in order to achieve unity between them.
2. To deepen and strengthen relations, links and areas of cooperation now prevailing between their peoples in various fields.
3. To formulate similar regulations in various fields including the following:
    a. Economic and financial affairs.
    b. Commerce, customs and communications.
    c. Education and culture.
    d. Social and health affairs.
    e. Information and tourism.
    f. Legislative and administrative affairs.
4. To stimulate scientific and technological progress in the fields of industry,

mining, agriculture, water and animal resources; to establish scientific research; to establish joint ventures and encourage cooperation by the private sector for the good of their peoples."[6]

2.2.2 The GCC Organisations

The main organisations of the GCC are as follows:[7]

1. The Supreme Council which is the highest authority of the Cooperation Council and formed of Heads of member states. The Supreme Council holds one regular session every year.
2. The Ministerial Council is formed of the Foreign Ministers of the member states or other delegated Ministers, and they regularly convene every three months.
3. The Secretariat-General is composed of a Secretary-General who is appointed by the Supreme Council. The Secretary-General nominates the Assistant Secretaries-General, and he appoints the Secretariat-General's staff. In addition, he is directly responsible for the work of the Secretariat-General.

In addition, each of the top organisations may establish sub-agencies as may be necessary.

2.3 REGULATORY ENVIRONMENT

The regulatory system for air transportation in the GCC countries is based on the international rules and laws (i.e. ICAO) which regulate civil aviation and air transportation services. Therefore, airline operation between the GCC states is basically through a bilateral agreement which is mainly negotiated by the civil aviation authorities of each state.

One of the main objectives of civil aviation authorities when negotiating bilaterals is the protection of national carriers. The GCC national airlines are well protected by the bilateral agreements especially in their domestic markets. For example, Gulf Air is the only carrier which provides air services between four states which are Qatar, Bahrain, Oman and UAE (except Dubai). In addition, Saudia Airline has full monopoly in air

services inside Saudia Arabia.

However, the rules and laws which regulate the movement of passengers and cargo in the GCC airports are as follows:[8]

1. **Rules and laws of air navigation which are the international regulations for air safety and meteorology which have been accepted by the international organisations and agencies.**
2. **Rules and laws for air transport which regulate the GCC national airlines and foreign carriers. This is accomplished through bilaterals between the GCC governments themselves and foreign governments.**
3. **Rules, regulations and procedures for passenger and cargo movements. This is regulated through the administrative regulation which is mostly through customs, immigration and health.**

2.3.1 Air Transport and the GCC Secretariat General

The air transport activities in the GCC are coordinated through permanent committees, subcommittees and Department of Transportation, Air Transport Section.

2.3.1.1 The Permanent Committees

The permanent committees include the following:[9]

1. **The Ministers Committee which includes ministers who are responsible for civil aviation matters. This committee would be in charge of and make recommendations on the following:**
   - **Reviewing the air transport rights which are given now for the protection of the national carriers.**
   - **The necessity of establishing bilateral agreements to organise the air transport services between the GCC members.**
   - **Flight co-ordination between the GCC capitals.**
   - **Studying the possibility of establishing an airline that would serve the GCC domestic market.**

- **A company in London has already been established for ground air services for the GCC countries.**

2. The Operational Committee which consists of the GCC airline chairmen and the directors of civil aviation departments. The following are some examples of the work and recommendations of this committee:

- **Discussion of air transport rights which are given to foreign airlines.**
- **Discussion of bilateral agreements to organise the air transport services between the GCC countries.**
- **Studying the proposal from GCC carriers to exclude them from over-flying charges within the GCC countries, and to reduce fuel prices for them at GCC airports.**

2.3.1.2 The Subcommittees

The subcommittees are specialists in studying subjects which are related to civil air transport. The subcommittees have taken many decisions such as the following:[10]

1. **The decision to co-ordinate flights between the GCC capitals.**
2. **The decision not to establish a cargo airline between the GCC countries.**
3. **Reduction by 35% in cargo fares for national products.**

2.3.1.3 Department of Communications - Air Transport Section

The Air Transport Section in the Department of Transportation is responsible for monitoring the decisions and recommendations of the committees. However, the monitoring is only done through operational practices without interfering with the field practices or related matters.

2.4 AIRPORTS

There are 12 international airports in the GCC which all have runways of at least 3000 meters. Nevertheless, Al-Fujera is the smallest. In addition, there are two more international airports under construction, one in Saudia Arabia and the other in Abu Dhabi. These airports have been designed and built with the latest technology such as navigation equipment, lighting systems, transportation and communication facilities.

In 1986, the total passengers using GCC international airports reached 26 million. In addition, there were 6 million transit passengers. However, the total transported cargo was 670,000 tons and aircraft movements were 385,000. Table 2.2 illustrates the air transport movements between GCC airports.[11]

It is important to mention that air cargo transportation in the GCC has increased at a faster rate than passengers. This increase in cargo is due to the sea-air transport method where products are shipped to some GCC airports by sea from Asia, especially from the Far East and then transported by air to other countries especially to Europe.

However, it is very important to consider that most of the international GCC airports have significant spare capacity. Table 2.2 shows the actual passengers received in 1986 compared with the estimated airport capacities. From Table 2.3 a conclusion could be made that in 1985-86 most of the international GCC airports received only 46% of their estimated capacity. This high level of capacity includes buildings, runways, terminals and ground handling facilities.

Nevertheless, the GCC published a study in 1987 of air transport. An estimation was made of an annual increase in passenger movements in the GCC international airports of 2.5-5% per year between 1990-2000. However, other forecasts indicate 4-6% increase especially from mid to late 1990s. Table 2.4 illustrates traffic forecasts and estimated saturation traffic year for the GCC airports.[12]

In addition to the 12 international airports, there are 21 domestic airports in Saudia Arabia and one domestic airport in Oman giving an overall total of 33 airports. Two more international airports are under construction. Figure 2.1 shows all the GCC airports.

2.5 AIRLINES

There are four major airlines in the GCC: Kuwait Airways, Saudia Airlines, Gulf Air and Emirates. These carriers play an important role in both domestic and international air transport services. However, with regard to GCC airlines:

1. **Table 2.5 shows the GCC airlines fleet.**
2. **Table 2.6 illustrates the GCC airlines operations.**
3. **Table 2.7 highlights the GCC airlines net profit or loss.**

2.5.1 Kuwait Airways

It was formed by a number of businessmen in 1954 under the name of National Kuwait Airline Limited. They operated two DC-3s. In 1958, the Kuwait government bought half of the ownership and in 1962 it became fully state owned.[13]

During the Gulf War all the airlines Airbus aircraft, two Boeing 767s, one 727, two Gulfstream G111s and two BAe 125s, were seized by Iraq. However, the carrier's London insurers paid out $300million to cover the carrier's loss.[14]

Kuwait Airways serves 10 GCC airports and 33 other worldwide international airports. In general the daily aircraft utilisation is low especially when comparing the usage of Kuwait aircraft with other international airlines. Kuwait Airways also lease their own aircraft to other carriers such as leasing them to Egypt Air and Emirates.

Between 1982 and 1986, Kuwait Airways was faced with operating losses, however, in 1986 additional investments covered the operation losses. Nevertheless, Kuwait Airways received many subsidies from the Kuwaiti government such as $58 million in 1985 and $83 million in 1986.[15]

2.5.2 Saudia Airlines

It was formed during 1945 by the Kingdom of Saudia Arabia with a fleet of DC-3s. At the present time, Saudia Airline is the biggest airline in the Arab world and provides a wide range of domestic and international air services. Saudia Airlines links domestic services in its 24 international and domestic airports. On the other hand, international service is provided to 44 cities in the Middle East, North Africa, Southern and Eastern Asia, the USA, East and West Africa and Europe.[16]

It is important to mention that Saudia Arabia carried 3,366,402 passengers on their international flights in 1988. However, 6,891,991 passengers were carried on their domestic flights in the same year. The number of domestic passengers carried by Saudia Airlines is approximately double that of international passengers.[17]

Saudia Airlines have been facing continuous net losses on their operations for the last 12 years except in 1983 and 1984. The Kingdom of Saudia Arabia has given many subsidies to Saudia Airlines such as $107 million in 1983 and 1984, $99 million in 1985 and $185 million in 1986.[18]

Finally, although Saudia has a very large and advanced fleet, its daily utilisation is less than other international carriers who have similar aircraft.

2.5.3 Gulf Air

Gulf Air was formed in 1950 as Gulf Aviation Co.Ltd through financial backing from Bahrain. In 1974 the company's ownership was restructured to be multinationally owned. Equal shares which are held by the states of Qatar, UAE, Bahrain and Oman.[19]

Gulf Air has full monopoly of providing air services to these four states (except Dubai which is one of the UAE states). In addition, it flies to 24 cities in the Middle East, North Africa, Southern and Eastern Asia, and Europe.

Gulf Air achieved a net profit between 1982 and 1985. However, in 1986 and 1987 a net loss was recorded which is mainly because of the loss to Emirates of long distance routes from Dubai.

2.5.3.1 Cost Comparison

Gulf Air (GF) carried out a cost comparison study in January 1987 using data from the AEA and Orient Airlines Association (OAA). Table 2.8 illustrates the cost comparison of Gulf Air versus AEA and OAA airlines using 1985 data.

However, the conclusion of the study is that GF's cost is higher than both the AEA and

OAA especially in maintenance. In addition, it concluded that it would be hard for GF to be a "low cost carrier" and GF must compete in quality of service terms.[20]

2.5.4 <u>Emirates</u>

It was established by the government of Dubai (UAE) in May 1985, however, it started operation in October the same year.

Emirates was formed as a result of Dubai being unhappy with the services provided by the multinational airline (GF). The Dubai government believed that it could best fulfil the need for services to and from Dubai through the development of its own carrier.

Emirates started operation with two leased aircraft from Pakistan International Airways, and now the carrier operates 8 aircraft. Emirates is considered to be one of the newest and fastest growing airline in the world.[21]

Emirates achieved a net profit of $3.3 million in the first year of operation. However, since then Emirate's net profit or (loss) has been considered to be confidential by the carrier management. As a result, their financial operation status is now mysterious.

2.6 OBJECTIVES OF THE GCC AIR LIBERALISATION

Having reviewed EC experience[22] this thesis believes that the main objectives of the GCC air liberalisation plan should be:

1. **For the GCC governments:**
   - **Accomplishing air liberalisation as part of the GCC Common Market.**
   - **Saving government expenditure on subsidies to airlines.**
   - **Maintaining safety standards.**
   - **Maintaining air services to smaller communities.**
   - **Allowing certain level of competition between the airlines.**
2. **For the aviation industry:**
   - **Promoting the aviation industry and increasing travel by air transport.**
   - **Opening certain level of competition between the airlines.**

- **Increasing productivity in air transport.**
- **Efficient utilisation of resources (personnel, aircraft and airports).**

3. For the consumer:

- **Variety of products**
- **Establishing reasonable fares and rates.**
- **Convenient air travel.**
- **Avoidance of excess airline profit especially in the GCC domestic market.**

4. For the airlines:

- **Maximising market opportunities and innovations.**
- **Increasing airline efficiency and productivity.**
- **Providing the opportunity to make higher profits.**
- **Improving economic viability of airlines.**

2.7 CONCLUSION

After studying the GCC air transport market, there are a number of basic factors which encourage liberalisation in the GCC which can be identified. These are as follows:

1. **One of the ways to achieve the GCC goal of confederation is by economic integration which means establishing a Gulf Common Market.**
2. **The GCC is economically stable.**
3. **The GCC average GNP is relatively high.**
4. **The existing highly regulated GCC domestic air transport market has resulted in monopolistic markets which does not have many advantages for consumers. In addition, the uncompetitive markets have resulted in some airlines having high operating costs and low efficiency and productivity.**
5. **The GCC countries have very advanced international airports with high capacity where some of them could at the present time double the received annual number of passengers.**
6. **The GCC airlines own some of the most advanced fleets in the world. However, some of the GCC carriers are not utilising their aircraft very efficiently. Generally, all the GCC carriers have high operating costs, as a result some of the carriers make large operating net losses and receive large government subsidies.**

7. There is essentially good demand for domestic air transport in the GCC. The number of domestic passengers that are carried annually by Saudia Airlines, which has the largest domestic market and airline fleet, is approximately double the number carried on their international flights.

8. Air transport services is the most convenient and best method of travelling between the GCC countries. In addition, there are no train service between GCC countries.

TABLE 2.1: Selected Economic Indicators for the GCC States

	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDI ARABIA	UNITED ARAB EMIRATES
Population mid-year (000)	431	1,775	1,291	334	12,011	1,429
Area in km2 (000)	621	18	212	11	2,150	84
Population density (per km^2)	694	99	6	30	6	17
GROSS NATIONAL PRODUCT						
Total (millions of dollars)	3,670	24,650	6,440	4,180	83,270	20,590
Per capita ($)	8,530	13,890	4,990	12,520	6,930	14,410
Growth rate (per capita 1973-86) (%)	n/a	-0.3	2.1	-9.0	0.4	-0.3
Industrial output as % of GNP (%)	n/a	58	n/a	n/a	60	67
Average annual rate of inflation 1973-84(%)	n/a	9.2	16.4	n/a	14.1	8.7
EXTERNAL TRADE						
VOLUME						
Exports(millions of dollars)	2,863	10,126	4,900	3,541	32,900	14,337
Imports(millions of dollars)	2,597	6,614	3,000	1,200	27,000	7,590
REAL GROWTH						
Exports 1975-85 (%)	11.0	1.2	15.7	9.0	2.3	8.0
Imports 1975-85 (%)	9.7	10.7	17.9	7.8	19.3	10.9

(Data are for 1986 unless otherwise indicated; monetary values are expressed in U.S. dollars)

n/a - Data not available. * - Data are for years other than specified.

Source: ICAO Bulletin, Special Air Transport Report: International Air Passengers and Freight in the Middle East (Canada: ICAO, 1989) p.60.

TABLE 2.2: Air Transport Traffic between the GCC Airports x1000 (1986).

AIRPORT	PAX. TO FINAL DEST.	TRANSIT	% OF TRANSIT PAX OF FINAL DEST PAX	FREIGHT (TONS)	AEROPLANE TRAFFIC
ABU DHABI	1163	957	45.1	31	36
DUBAI	2224	1550	41.1	99	54
SHARJA	152	12	7.4	-	-
RAS-ALKHAIMAH*	36	38	51.4	-	-
BAHRAIN	998	1026	50.7	36	41
JEDDAH	7197**	323	4.5	149	70**
RIYADH	6128**	455	6.9	92	58**
DHAHRAN	3140**	424	11.9	73	35**
MUSCAT	1826	404	28.3	23	32
DOHA	864	419	32.6	25	20
KUWAIT	2337	298	11.3	77	25
TOTAL	26065	5906	18.5		371

* 1985
** Including domestic Saudia Arabian flights
(-) Information not available.

Source: Transportation Methods in the GCC countries (Riyadh: The GCC, 1989) p.2.3

TABLE 2.3: Comparison between the estimated airports buildings capacity and the number of passengers traffic for 1986 (x1000).

AIRPORT	ESTIMATED AIRPORT CAPACITY	PASSENGER TRAFFIC	% USED AIRPORT CAPACITY
DUBAI	5250	3774	71.9
MUSCAT	2750	1430	52.0
ALSHARJAH	2500	164*	6.6
RAS-ALKHAIMAH	2750	74*	2.7
BAHRAIN	2250**	2024	90.0
JEDDAH	15000	7250	48.3
RIYADH	20000	6583	32.9
DHAHRAN	5000	3564	71.3
KING FAHAD AIRPORT	15000	-	-
KUWAIT	5000	2941	58.8
TOTAL	60500***	27804	46

* 1985

** 4.5 million after 1990

*** Without King Fahad Airport

Source: Transportation Methods in the GCC Countries (Riyadh: The GCC, 1989) p.2.6

Table 2.4: Traffic Forecast and Estimated Saturation. Traffic Year for the GCC Airports Capacity.

AIRPORT	The Estimated Capacity (1000 pax a year)*	TRAFFIC VOLUME (1000 pax a year)					**THE SATURATION YEAR	
		The Established Year 1986	Low 1990	Forecast 2000	High 1990	Forecast 2000	For The Lower Forecast	For The Higher Forecast
Abu Dhabi	2800	2250	2485	3180	2735	4455	1994	1990
Dubai	5250	3774	4165	5335	4590	7475	2000	1993
Sharjah	2500	164	180	230	200	325	+2010	+2010
Ras-Alkhaimah	2750	74	85	105	90	150	+2010	+2010
Bahrain	4500	2024	2235	2860	2460	4005	+2010	2003
Jedda	15000	7520	8300	10625	9140	14890	+2010	2001
Riyadh	2000	6583	7270	9300	8000	13035	+2010	2009
Dhahran	15000	3564	3935	5035	4335	7055	+2010	+2010
Muscat	2750	1430	1580	2020	1740	2830	+2010	2000
Doha	1750	1310	1445	1850	1590	2590	1998	1992
Kuwait	5000	2941	3245	4155	3575	5825	2008	1997
TOTAL	77300	31634	34925	44695	38455	62640		

* The capacity of the airport buildings without regarding the traffic, seasonal changes or the possibility of capacity that are outside the airport buildings.

** The year which the volume passengers traffic approaches to the maximum capacity of the airport.

Source: Transportation Methods in the GCC Countries (Riyadh: The GCC, 1989) p. 2.15

TABLE 2.5: The GCC Airlines Fleets.

Type of Aircraft	Emirates	Kuwait Airway	Gulf Air	Saudia	
A300-600		5*		11	
A300-600R	4 + 1*				
A310-300	4 + 4*	3*			
A310-304		5^			
A302-200		4*	3*		
A340		3*			
B-747-5B				3	
B-747-100				8	
B-747-200F				1	
B-747-269ER		4			
B-747-300				11	
B-747-400		3*			
B-767-269ER		1			
B-767-300ER					
B-727-200	3		9 + 4*		
B-727-269		4			
B-707-200C				2	
B-737-200				20	
DC-8			10	1	
DC-8-63F				1	
L-1011-200					
L-1011-300			8	17	
L-1011-500				1	
Dassault Falcon 900				1	
Beach King-Air-A100				2	
Cessna Citation II				2	
Gulf Stream IV				1	
GII				4	
GIII				5	
Total without on orders	9	14	27	91	141
Total with on orders	14	32	34	91	141

* On orders
^ one leased

Source: **Flight International, World Airline Directory (UK: Flight International, 25-31 March 1992) pp.79, 85-86, 95, 114-115. In additional, mail contacts with Gulf Air through C. White (UK/Northern Europe, Passenger Marketing Manager).**

Table 2.6: The GCC Airlines Operations, 1989.

Revenue Flights	KUWAIT AIRWAYS Kuwait International Only	SAUDI ARABIAN AIRLINES Saudi Arabia International			GULF AIR Bahrain/Oman/ Qatar/UAE International Only	EMIRATES United Arab Emirates International Only
		International	Domestic	Total		
Scheduled Services						
Kilometres Flown (thousands)	27,882	57,995	42,966	100,961	44,978	14,354
Aircraft Departures (number)	15,550	23,025	66,844	89,869	40,019	5,961
Hours Flown (number)	44,143	81,631	85,370	167,001	75,606	20,113
Passengers Carried (number)	1,640,556	3,471,080	6,516,926	9,988,006	3,011,018	728,900
Freight Tonnes Carried (number)	67,305	134,922	54,252	189,174	55,433	25,206
Passenger-Kilometres Flown (thousands)	3,892,806	10,646,756	5,047,899	15,694,655	5,967,914	1,858,598
Available Seat-Kilometres (thousands)	6,112,623	17,794,445	7,566,945	25,361,390	9,161,548	2,550,434
Passenger Load Factor (%)	63.7%	59.8%	66.7%	61.9%	65.1%	72.9%
Tonne-Kilometres Performed (thousands)						
Passenger (incl baggage)	358,400	958,208	454,311	1,412,519	562,862	188,713
Freight (incl express)	233,432	535,618	69,094	604,712	160,034	77,752
Mail	5,593	16,292	4,288	20,580	9,806	1,859
TOTAL	597,425	1,510,118	527,693	2,037,811	732,702	268,324
Available Tonne-Kilometres (thousands)	1,059,047	2,995,395	1,027,372	4,022,767	1,193,218	383,303
Weight Load Factor (%)	56.4%	50.4%	51.4%	50.7%	61.4%	70.0%
Length of Scheduled Route Network (kms)	103,455	277,971	34,665	312,636	174,400	39,259
All-Cargo Flights (included above)						
Kilometres Flown (thousands)	2,350	4,507	285	4,792	–	–
Aircraft Departures (number)	800	1,085	387	1,472	–	–
Hours Flown (number)	3,512	6,004	581	6,585	–	–
Freight Tonnes Carried (number)	15,326	41,788	2,640	44,428	–	–
Tonne-Kilometres Performed (thousands)						
Freight (incl. express)	58,353	228,472	9,337	237,809	–	–
Mail	–	215	8	223	–	–
TOTAL	58,353	228,687	9,345	238,032	–	–
Available Tonne-Kilometres (thousands)	82,075	423,025	26,192	449,217	–	–
Weight Load Factor (%)	71.1%	54.1%	35.7%	53.0%	–	–

Source: **IATA, World Air Transport Statistics (Canada: IATA, 1989).**

TABLE 2.6: Continued

Charter Services						
Kilometres Flown (thousands)	449	7,083	3,026	10,109	530	-
Aircraft Departures	423	3,272	4,039	7,311	602	-
Hours Flown (number)	875	10,593	6,080	16,673	904	-
Passengers Carried (number)	4,111	231,362	59,833	291,195	26,229	-
Freight Tonnes Carried (number)	45	3,885	126	4,011	80	-
Passenger-Kilometres Flown (thousands)	6,690	497,281	46,123	543,404	55,528	-
Available Seat-Kilometres (thousands)	24,239	1,202,459	192,737	1,395,196	117,557	-
Passenger Load Factor (%)	27.6%	41.4%	23.9%	38.9%	47.2%	-
Tonne-Kilometres Performed (thousands)						
Passenger (incl. baggage)	602	44,755	4,151	48,906	5,305	-
Freight (incl. express)	84	13,218	188	13,406	162	-
Mail	-	67	-	67	-	-
TOTAL	686	58,040	4,339	62,379	5,467	-
Available Tonne-Kilometres (thousands)	4,859	188,312	24,496	212,808	15,747	-
Weight Load Factor (%)	14.1%	30.8%	17.7%	29.3%	34.7%	-
Fleet and Utilization ■ Fleet: all aircraft in service and available for operation at 31 December, including equipment leased in from other organisations but excluding aircraft leased out to other operators on that date. ■ Utilization: average block time flown (in terms of hours and minutes) per aircraft per day.	3 B747-200B 9:21 3 B727-200 5:19 3 B767-200ER 6:28 5 A310-200 8:10 1 A300-600 8:06 *1 B707-320C 9:23 2 BAe125-700 1:04 18 * Leased in	11 A300-620 6:13 20 B737-268 7:59 8 B747-168 8:37 3 B747SP 5:48 11 B747-368 9:04 1 B747-200F 10:16 17 L-1011 4:41 2 Cessna Citation II 2:02 4 Gulfstream II 1:42 5 Gulfstream III 2:52 1 Gulfstream IV 1:28 1 Falcon 900 1:09 2 Beechcraft A100 0:13 6 Beechcraft A36 8 Piper 1 DC-8 1 L-1011-500 2 B707 1 DHC-6 1 Cessna-207 * 1 B747F 9:09 * 1 DC-8F 8:47 * 1 DC-8F 1:54 109 TOTAL * Leased in			9 L-1011-1/200 10:54 6 B767-300ER 12:18 9 B737-200 9:30 24	2 A310-300 11:48 1 A300-600 9:42 2 B727-200 9:06

Sources: IATA, Ward Air Transport Statistics (Canada: IATA, 1989)

Table 2.7: The GCC Airlines Net Profits or (Losses) in ($000)

	1981	1982	1983	1984	1985	1986	1987	1988
Saudia Airlines		(887,74)	130,753	206,452	(116,989)	(170,667)	(133,902)	(177,454)
Gulf Air		308,54	528,22	518,54	371,11	(756,8)	(737,3)	485,9
Kuwait Airways	(409,72)	Jan 82 – June 83* 214,9	July 83 – June 84 756	July 84 – June 85 616	July 85 – June 86 533	537	821	11,728
Emirates					(-)	(-)	(-)	(-)

* 18 months period
(-) not available
Note: Some considerations should be given to the differences of currency exchange.

Sources: Transportation Methods in the GCC Countries (Riyadh: The GCC, 1989), Top World Airlines (UK: Avimar* Data Ltd, 1991), and IATA World Air Transport Statistics.

TABLE 2.8: Cost Comparison of Gulf Air versus AEA and OAA

COSTS/ATK	OAA	AEA	GF
DOC/ATK			
- Flight Deck Crew	1.78	2.40	2.46
- Fuel & Oil	9.05	8.84	11.72
- Flight Equipment Insurance	0.23	0.24	0.52
- Maintenance & Overhaul	2.77	3.81	7.40
- Flight Equipment Deprec.	4.72	2.39	3.15
- Rentals	0.48	0.44	1.13
- Landing Charges	1.09	1.98	1.85
- En-route Charges	0.49	0.91	0.76
- SUB-TOTAL	20.61	21.00	28.99
IOC/ATK			
- Station & Ground	3.18	4.77	3.92
- Cabin Attendants	1.97	2.41	2.31
- Passenger Services	2.40	2.31	3.54
- Ticket/Sales/Promotion	7.83	8.49	7.06
- General & Admin.	1.95	1.94	4.03
- SUB-TOTAL	17.39	19.92	20.87
TOTAL OPERATING COST/ATK	37.94	40.92	49.86

Note that the two studies are not directly comparable at cost category levels. The GF figures used are from the AEA comparison.

Source: Study done by Gulf Air (Corporate Planning, June 1987).

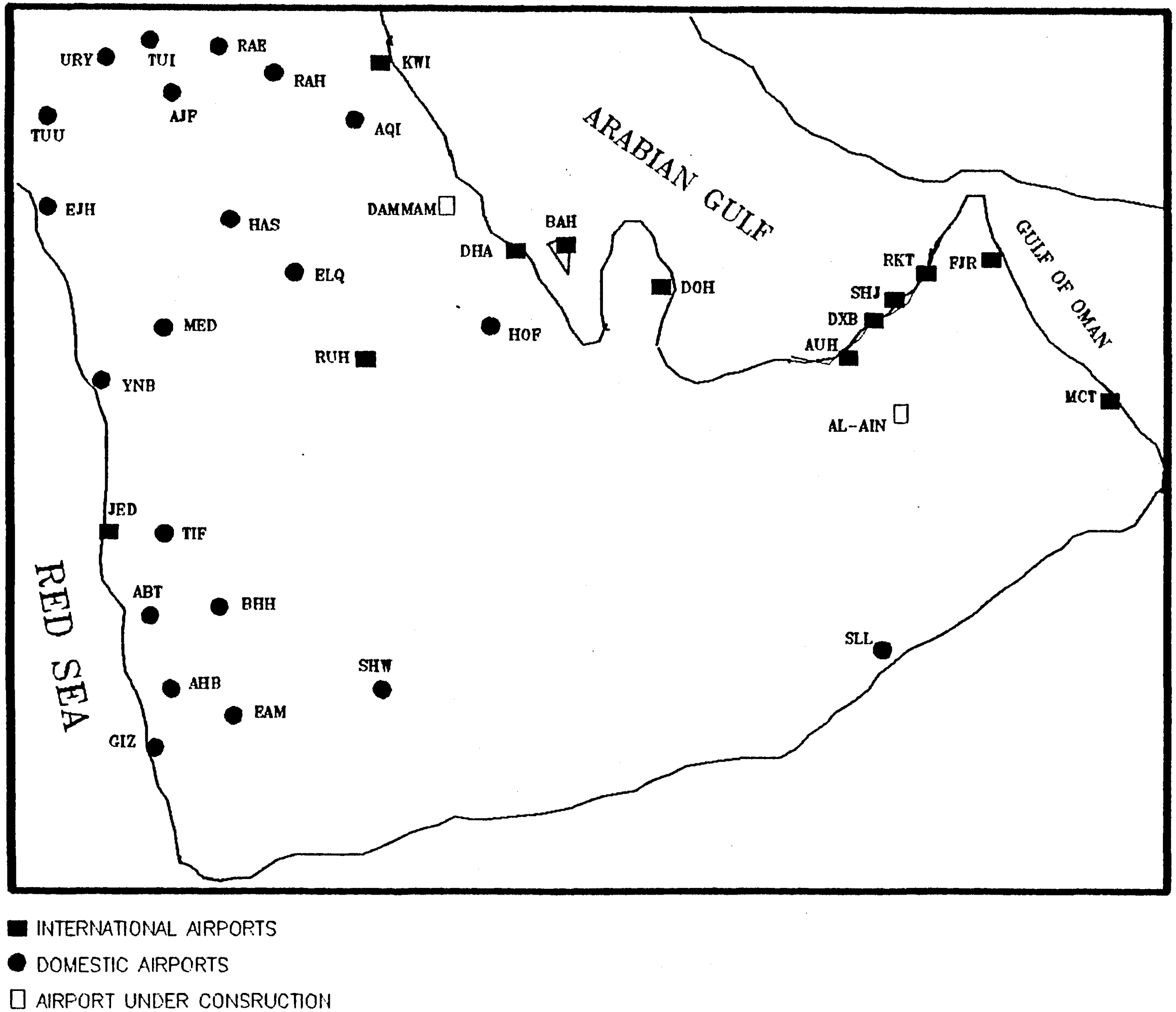


FIGURE 2.1: **The GCC International and Domestic Airports.**

REFERENCES

1. ICAO Bulletin, Special Air Transport Report: International Air Passengers and Freight in the Middle East (Canada: ICAO, 1989) pp.59-79.

2. Transportation Methods in the GCC Countries (Riyadh: The GCC, 1989) pp.1.1 - 1.2

3. Facts and Figures (Riyadh: The GCC) p.14.

4. Ibid, p.14.

5. Ibid, pp.4 - 5

6. Cooperation Council for the Arab States of the Gulf (Riyadh: The GCC) p.2.

7. Ibid, pp.2-3.

8. Transportation Methods in the GCC Countries, p.5.11.

9. Ibid, pp.5.8 - 5.10.

10. Ibid, p.5.10.

11. Ibid, pp.0.1 - 0.2.

12. Ibid, pp. 0.12 - 0.15.

13. The Edinburgh Institute of Aviation Studies, Top World Airlines (UK: Avimar Data Limited, 1991) pp.172 - 173.

14. Flight International, World Airline Directory (UK: Flight International, 25-31 March 1992) p.95.

15. Transportation Methods in the GCC Countries, pp.3.1 - 3.4.

16. Top World Airlines, pp. 234 - 235.

17. Transportation Methods in the GCC Countries, p.3.13.

18. World Air Transport Statistics (Canada: IATA, 1988) p.84.

19. Top World Airlines, pp. 143 - 144.

20. Cost Comparisons between Gulf Air, AEA and OAA (UK: The Association of European Airlines, 1987).

21. Interavia, April 1989, p.312.

22. Stephen Wheatcroft and Geoffrey Lipman, Air Transport in a Competitive European Market (England: The Economist Intelligence Unit, 1986).

<u>OTHER REFERENCES</u>

Nawal K.Taneja, The International Airline Industry. (USA: Lexington Books, 1988).

GCC Survey, The Economist (UK: The Economist, February 8, 1986) p.52.

Arab Air Transport, Interavia, July 1985, pp.755 - 760.

CHAPTER 3

U.S.AIRLINE DEREGULATION

3.1 INTRODUCTION

The objective of this chapter is to review the history of regulation and the subsequent deregulation and liberalisation in the airline industry. In addition, it discusses the development of the US Airline Deregulation Act and draws lessons for the GCC.

The domestic regulation of air transport varies from one country to another depending on many contributing factors such as political ideology, economic strategy and commercial philosophy. The USA is often the initiator of economic ideas and reforms particularly where a combination of demonstration and "bandwagon" effects, both domestically and internationally, cause changes in the home market and encourage other countries to imitate.

For example, competition within the US aviation industry was formerly very limited, because of the rigid control of the Civil Aeronautics Board (CAB) on entry and exit, capacity, fare structure and price. On the other hand, the USA aviation industry is unique at present because of its size and the speed and level of liberalisation, and the nature of airline competition.

The Airline Deregulation Act which was passed in 1978 has changed airline management strategies, and has had an impact on efficiency, structure and services. Under the control of the CAB, airlines relied mainly on flight frequency for competition which made carriers engage in schedule rivalry. However, in the present deregulation environment, airlines have to be very efficient and have the capability to offer low fares, various marketing strategies and most important of all the need to compete and generate profits or face financial failure and market exit.

3.2. REGULATORY VIEWS

3.2.1 Regulation and the Economists

Traditionally economists have favoured regulation of both international and domestic air transport for the following reasons:[1]

1. Regulations are required because under 'unregulated competitive market forces may have adverse consequences for the public at large' (Richmond, 1971). In addition, it has been argued that the absence of any regulation in an oligopolistic industry such as air transport would lead to wasteful competition. New entrants would undercut fares which could lead to price wars with adverse consequences for all participants (Wheatcroft, 1964).
2. To ensure that the external benefits of civil aviation are not jeopardized, air transport has to be regulated because it is a public utility.
3. Regulation is necessary to protect scheduled services from non-scheduled operators in international air transport because they have "public service" features and they are vulnerable to price competition. (HMSO, 1969).

However, economists during the 1960s in the USA and other countries started to question the benefits of regulation with the following arguments:[2]

1. Regulation limited pricing freedom, product variety, stopped new entrants and restricted capacity.
2. With less regulation, competition would exist which would benefit the consumer by providing lower fares, innovative pricing, more product variety, higher efficiency and productivity.
3. The economics of the air transport industry did not suggest that freer competition would lead to economic instability.

3.2.2 Regulatory Performance

It is most notably said in US literature that regulatory agencies are unnecessary, slow and inefficient, unfair and unpredictable, prone to industry-orientation and politically anomalous.

3.2.2.1 Regulation is unnecessary.

The House of Commons Industry and Trade Committee of 1981 concluded with a response to regulation which is now commonly heard:

> **"... it is our firm opinion that no regulatory body - however enlightened its policies or however good its intentions - will produce a more satisfactory service for the air passenger than will fair competition in the market place"[3].**

However, the British CAA's main arguments in favour of regulation could be summarized as follows:

> **"(a) without regulation, network benefits may be lost; competition may not produce a reasonable balance between concentration and dispersal;**
>
> **(b) free competition may not produce a regular scheduled service available for off-peak as well as peak periods;**
>
> **(c) given the absence of price competition, the scarcity of traffic on UK routes and, given conditions favouring the larger operators, it may be difficult for new carriers to enter markets. Lack of regulation might therefore produce, at best, imperfect competition, at worst, monopoly;**
>
> **(d) there is some evidence, particularly on North Atlantic scheduled services, that where competition does exist it tends to be wasteful or destructive. A tendency exists for the over-provision of capacity at peak periods. The scope for predatory pricing or over-stressing short-run revenue maximization is considerable;**
>
> **(e) experience suggests serious grounds for expecting excess capacity in a competitive environment"[4].**

Nevertheless, the main principle arguments against regulation made in the document are listed below:

"(a) civil aviation is a naturally competitive industry: there are minimal economies of scale and airlines cannot derive significant advantages over competitors by virtue of size; aviation technology is freely available; entry into the industry is easy; there is flexibility in operating aircraft capacity; neither the broad network operator nor the specialist has a preponderant advantage over the other;

(b) free competition is preferable to regulation: competition would produce regular services in order to attract traffic; off-peak periods would be utilized and, given pricing freedom, off-peak traffic would be generated; networking would be in the interests of the carrier;

(c) regulation is inherently undesirable: it purchases stability at the cost of inefficiency; a quasi-judicial system favours the easily-justified status quo; it blunts innovation and responsiveness to consumer needs; price regulation limits competition, innovation and new entry; it blunts the incentive to efficiency and cost-consciousness."[5]

Overall, the CAA did not completely relax regulation in the UK aviation industry because of the following reasons:

1. Small scale of the domestic industry.
2. Limited number of routes able to support more than one airline.
3. The limited effectiveness of competition from surface transport on longer routes.
4. BA produces three-quarters of total domestic seat-kilometres, and airport policy restrained growth at Heathrow in favour of Gatwick.
5. Price reduction would not be expected.
6. BA would dominate the market in absence of effective rail competition.

Having considered the above reasons, the CAA concluded:

> **"All these considerations suggest that complete deregulation of domestic services is simply not feasible. It should, however, be possible to move significantly further to meet some of the objections to a highly regulated system while taking advantage of the positive aspects of relaxation. This policy would aim to let the market work to the maximum feasible extent consistent with the limitations which have been described. Such an approach might look slightly untidy; slightly different solutions might be appropriate to the different types of route"[6]**

Therefore, the Authority searched for alternative strategies rather than full deregulation:

> **"In a market where few city pairs can support the services of the two airlines, direct competition cannot be the sole tool of regulatory policy. A more effective tool may be the possibility of substituting one operator for another where standards of service have been allowed to decline or costs have been allowed to get out of control ... it may be more important to ensure that more than one operator is available than to insist that two operators compete."[7]**

Criticism of the CAA by advocates of the free market at consultations, hearings and submissions by the following principles:[8]

1. **It is too protective of existing operators.**
2. **It favours the status quo.**
3. **It is not consumer oriented.**
4. **It does not offer any incentive towards cost-consciousness.**
5. **It impedes innovation because of the slowness of the licensing process and the creation of planning obstacles for the airlines when building efficient network or services.**

3.2.2.2 Regulation is slow and inefficient.

Regulation is slow because it creates large volumes of paper, in addition it fails to react to industrial needs. Recently, especially in USA, there has been the desire to search for ways of regulating industries by methods that would be much less restrictive to the industries concerned than resort to bureaucracies.[9]

3.2.2.3 Regulation is unfair and unpredictable.

An agency usually has to negotiate a narrow path between accusations of capriciousness and complaints that it is inflexible or short-sighted.

However, the US agencies have been condemned for failure to develop standards, and rigid adherence to rapidly outdating rules.

Judge Henry Friendly[10] wanted standards to ensure like treatment, to aid policy formulation, to limit discretion, to allow planning and prediction, to maintain agency independence where he argued that the CAB and FCC were subject to political pressure and those most lacking in standards.

Len Fuller indicated that the FCC and CAB had not succeeded in developing standards because they had over-emphasized case law. Fuller believed that:

> "The reason for this failure lies ... in the nature of the tasks assigned to these agencies: they are trying to do through adjudicative form something that does not lend itself to accomplishment through these forms.
> ... tasks of economic allocation cannot be effectively performed within the limits set by the internal morality of law. The attempt to accomplish such tasks through adjudicative forms is certain to result in inefficiency, hypocracy, moral confusion and frustration."[11]

3.2.2.4 The Regulatory Agency is Industry-Oriented.

The main criticism of the agencies of the USA is that they do not tend to serve the public as much as the interests of the regulated industries.

Gabriel Kolko and George Strigler[12] argue that the industry input into the design of regulatory legislation and into the continuing politics of regulation means that regulation is really organized to benefit existing industrial interests in the first place.

However, there are three main arguments with reference to regulation and industry which are listed below:[13]

1. **Agency decisions are based on information supplied by the industry and only industrial interests are usually represented at formal proceedings.[**]**
2. **Individuals appointed to high regulatory office identify with industry interests with a view to past or future employment.**
3. **Industry control over agencies' policies is exerted by threat.**

3.2.2.5 Regulatory Agencies are Politically Anomalous.

Herbert Morrison[14] who was on the London Passenger Transport Board indicated that the best form of public corporation was one in which members did not represent vested interests but acted as detached experts.

However, Marver H.Bernstein[15] classified that every agency passes through stages of development in a "life cycle" which responded to predictable changes in its political environment which are the following:

1. **Gestation - in which concern about a problem resulted in the creation of the agency.**
2. **Youth - inexperienced agency which is operated and manoeuvred by the regulatees, and it managed with a crusading zeal. However, gradually the political objectives died away.**
3. **Maturity - devitalization set in.**
4. **Old age - final period of debility and decline.**

****In the UK, the Air Transport Users Committee has a formal role to play in bringing to the attention of the CAA the views of consumers.**

5. Senescence - the agencies take different periods to reach it, however when this happened, the public interest would be lost in quasi-judicialities. The agency would aim to protect the industry on lines laid down by the regulated group.

Louis L.Jaffe[16] stated in 1956 that an agency would not develop a new policy once it established itself. In addition, as E.Pendleton Herring said in 1934:

> "... the control of business remains too controversial and too vital a political issue to be relegated successfully to a Commission independent of close control by the policy-formulating agencies of government."[17]

3.3 REGULATORY DEVELOPMENT

A philosopher once said "Transportation is civilization"[18], on the basis that civilization depends upon transportation for its existence. The aviation industry is considered one of the youngest, fastest developing, and biggest economic and political influences on any economy making contributions both domestically and internationally. Nevertheless, the Post Office in the USA was responsible for the start of commercial air transportation and the airline industry. Therefore, the Post Office is the father of US commercial air transportation.

Pricing policies under regulation went through the following stages:[19]

1. Prior to WWII the Board did not set the prices. They were established at the prevailing first-class rail fare.
2. After 1942 the Board approved across the board fare increases but without studying the level of earning of the industry.
3. In the General Passenger Fare Investigation (Docket 8008) in 1960, the Board set fares to achieve an average of 10.5% rate of return for the industry based on actual industry operating costs.
4. In the Domestic Passenger Fare Investigation (U.S.CAB 1974) the Board set fares to yield a 12% return based on load factors and seating density.

However, in all the four phases the Board focused on industry profitability rather than on relationship between fares and costs in a particular market.

To fully understand the coming of deregulation, the following are the major regulatory acts and administrative decisions which led to the Airline Deregulation Act:[20]

1. **AIRMAIL ACT OF 1925 (KELLY ACT). It started the commercial air transport by enabling scheduled air transport to be a permanent service for the first time. It is "An Act to encourage commercial aviation and to authorize the Postmaster General to contract for the mail service."[21]**
2. **AIR COMMERCE ACT OF 1926 - Its purpose was to promote air commerce.[22]**
3. **AIRMAIL ACT OF 1930 (McNary-Waters Act). It gave the power to the Postmaster to unify and restructure the industry.**
4. **AIRMAIL ACT OF 1934 (Black-McKellar Act). It introduced a bureaucratic system of control involving not less than three separate regulatory bodies.**
5. **CIVIL AERONAUTICS ACT OF 1938. It led to the establishment of the Civil Aeronautics Agency (CAA). However, economic and safety regulation of that Act was administered by three original agencies which consisted of the Civil Aeronautics Authority, an Administration of Aviation and an Air Safety Board.**
6. **The CAA was reorganized in 1940 to be the Civil Aeronautics Board (CAB).**
7. **The FEDERAL AVIATION ACT of 1958 separated safety regulation from economic regulation.[23]**
8. **AIRPORT AND AIRWAY DEVELOPMENT ACT OF 1970 provided for the expansion, development and improvement of the airports and airway systems of the United States.[24]**
9. **In 1970 the CAB re-examined fares as part of its Domestic Passenger Fare Investigation (DPFI) which led to the adoption of a rigid formula that set fares strictly.[25]**
10. **Newly-appointed CAB chairman John Robson in the Spring of 1975 proposed an experiment to allow new and existing airlines to enter and exit selected routes.[26]**

11. During 1975-76 the CAB relaxed some restrictions on charter carriers. As a result they operated frequent low-fare services in direct competition with regulated carriers.[27]

12. The chairman of the CAB Roy Pulsifer in 1976 issued a report supporting deregulation rather than reform, proposing to relax entry and exit and fare regulation over a three-to-five year period.[28]

13. In 1977, the CAB proposed to allow carriers to reduce fares as much as 70% below the DPFI fare without approval.[29]

14. The chairman of CAB Alfred Kahn in 1978 made a persuasive case both to Congress and the US public in support of reform.

15. However, the following illustrate the main political economy of deregulation:[29]
    - By mid 1970s economists believed that regulation was not needed.
    - In October of 1974 President Ford asked Congress to form a National Commission on Regulatory Reform.
    - President Kennedy asked Breyer to investigate government economic regulation by federal regulatory agencies (CAB was the prime target).
    - On October 28, 1978, President Carter signed the Airline Deregulation Act.

3.4 COMPARISON OF AIRLINE REGULATION AND DEREGULATION

3.4.1 Regulation before 1978

The Civil Aeronautics Board (CAB) was the US regulatory authority which controlled airlines in the following ways:[30]

1. It regulated fares on overall industry profitability rather than on the relationship between price and costs.

2. It controlled entry and exit of carriers as listed below:
    - Routes granted to existing carriers.
    - Board rejected applications to start new airlines.
    - Competitive routes were only awarded when it was determined that entry would not effect the incumbent carrier's profits.

3. It controlled mergers and inter-carrier agreements which prevent the consolidation to form a new carrier that would divert traffic and revenues from competing carrier.
4. The CAB's regulatory authority extended only over interstate carriers, however many studies indicated that unregulated intrastate carriers were operating at lower fares than airlines operating at similar interstate routes.[31]

3.4.2 Deregulation after 1978

The Airline Deregulation Act of 1978 applied a drastic reduction in the CAB's regulation of the aviation industry. The following highlight the major reduction of regulation:[32]

1. FARES AND RATES
   - An upper limit of reasonableness became operational on July 1, 1979.
   - The CAB ended authority over domestic fares on January 1, 1984.
2. ROUTES
   - Automatic market entry programme was effective between January and April of 1979, 1980 and 1981, however the CAB's authority over routes ended on December 31, 1981.
3. Subsidy programme after the Airline Deregulation Act went through the following phases:
   - Eligibility for essential air service established on October 24, 1979
   - Criteria for eligibility under Section 419(a) had to be established on January 1, 1980.
   - Criteria for eligibility under Section 419(b) had to be established on January 1, 1982.
   - Denied boarding rule took effect on January 1, 1983.
   - Subsidy programme transferred to DOT on January 1, 1985.
   - Section 406 terminated subsidy programme, however it continued until 1988.
4. MERGERS
   - Agreements, domestic mergers and interlock authority transferred to DOT on January 1, 1985.

- **Foreign mergers, agreements and foreign interlocks transferred to DOT on January 1, 1986.**
- **However, DOT's authority over powers to grant immunity and mergers expired in 1989.**

Nevertheless, the CAB ceased all regulatory operations at the end of 1984.

However, the following are the major provisions that took immediate effect after the passing of the Airline Deregulation Act:[33]

1. **No need to prove that entry is required by passenger convenience and necessity.**
2. **No CAB review of approval of entry while the Airline Deregulation Act only provided for a limited degree of automatic market entry.**
3. **Allowed carriers to obtain dormant route authority for routes which were not flown by the carriers which had been certificated to fly them.**
4. **Fares were to be adjusted as airline costs changed, and they could vary without the permission of the CAB.**
5. **Route and merger cases were set with tight procedural deadlines which resulted in a reform of Board procedures.**
6. **Established notice procedures for airlines who desired to terminate services to a community.**
7. **Established a ten year Essential Air Service Program to small communities, and local service subsidies to phase out within six years.**
8. **Set employee protection measures for dislocated workers.**

3.5 DEREGULATION AND THE INTERNATIONAL PERSPECTIVE

During the Carter administration, the White House identified in January 1977 three key factors which would lead to a new policy:[34]

1. **'Consumerism' which aimed to reduce fares, open new routes and facilitate access to air services.**

2. 'Competition' which appeared to be successful in reducing fares in the early domestic stages of deregulation, and was also thought to be beneficial internationally.
3. 'U.S.market share'. Because US airlines only had 40% market share on routes between USA and Europe, it was thought that more liberal bilateral air service agreements and the entry of new USA carriers to the market would be beneficial.

Subsequently, President Carter signed an international air transport negotiation policy the aim of which was "to provide the greatest possible benefit to travellers and shippers". In addition, it suggested that "maximum consumer benefits can best be achieved through the preservation and extension of competition between airlines and the market place". In negotiations or renegotiations of bilateral agreements, it was decided that the USA would have the following objectives:

"(a) "creation of new and greater opportunities for innovative and competitive pricing that will encourage and permit the use of new price and service options to meet the needs of different travellers and shippers." This would be achieved by ensuring that tariffs were determined by airlines on the basis of competitive considerations. Government involvement should be the minimum necessary to prevent predatory or discriminatory pricing, to prevent monopolistic practices and to protect competitors from prices that are artificially low as a result of government subsidies;

(b) "liberalization of charter rules and the elimination of restrictions on charter operations";

(c) "expansion of scheduled services through the elimination of restrictions on capacity, frequency and route operating rights";

(d) "elimination of discrimination and unfair competitive practices faced by US airlines in international transportation." In particular, charges for providing en route and airport facilities should be related to the costs created by airline operations and should not discriminate against US airlines;

(e) "flexibility to designate multiple US airlines in international air markets";

(f) encouragement of maximum traveller and shipper access to international markets by authorizing more US cities for nonstop direct service, and by improving the integration of domestic and international airline services; and

(g) "flexibility to permit the development and facilitation of competitive air cargo services."[35]

However, most countries which negotiate with the USA have only one airline or one scheduled airline which is usually state owned. Therefore, most countries have the following objectives when negotiating with the USA:[36]

1. Capacity control especially a control or reduction in US scheduled capacity rather than any increase. Examples of such countries were Japan and Italy.
2. Limiting USA fifth freedom rights. For example, by the UK and France.
3. Since many countries had only one major international airline, most of them did not favour 'multiple designation'.

However, during the renegotiation process applied to bilaterals between 1977-80, the USA introduced some new concepts into international regulation which are as follows:[37]

1. COUNTRY OF ORIGIN RULES FOR CHARTERS - the right to establish whatever condition for charter services originating from its own territory, at the same time leaving the other party in the bilateral free to do the same.
2. COUNTRY OF ORIGIN RULES FOR TARIFFS - it includes the following rights:
   - The right to approve or disapprove tariff levels or conditions only for traffic originating from its own territory.
   - DOUBLE DISAPPROVAL - a tariff cannot be refused by one government only, however, both governments have to reject it together.

In addition, the following are not entirely new concepts but they have now become more widespread in USA bilaterals:[38]

1. **MULTIPLE DESIGNATION - the right of each party to designate more than one airline to operate on the agreed routes.**
2. **BREAK OF GAUGE - "The right to change from a larger to smaller aircraft in the other country's territory on a through service that is going beyond the other country, usually, but not necessarily, with fifth freedom."**
3. **COMBINATION RIGHTS - the right to have both the third and fourth freedom traffic on a single stopping service.**

3.6 GENERAL CONCLUSIONS

Traditionally, economists have argued in favour of the regulation of the air transport industry, but during the 1960s economists in the USA and other countries started to question the benefits of regulation. In addition, it is noted in the USA literature that regulatory agencies are unnecessary, slow and inefficient, unfair and unpredictable, prone to industry-orientation and politically anomalous.

The Airline Deregulation Act was signed by President Carter on October 28, 1978. However, to fully understand the coming of the Airline Deregulation Act, a review of the major regulatory acts and administrative decision should be considered.

Before the Airline Deregulation Act, the CAB controlled entry and exit, fares, capacity, subsidies and mergers. The Airline Deregulation Act applied a rapid reduction on those controls and it brought to an end all the CAB's regulatory operation in 1984. (The so-called CAB "sunset").

When considering the change of regulatory perspective, it is important to differentiate between domestic and international markets and to consider their impacts. Nevertheless, there were new concepts that the USA introduced when negotiating or renegotiating bilaterals such as country of origin rules for charters and double

disapproval for tariffs. In addition, multiple designation, break gauge and combination rights have now become widespread in US bilaterals.

Although the US aviation industry accounts for approximately one third of the world's output, it is controlled by only one government which had many reasons to pass the Airline Deregulation Act including:

1. **Economists had marshalled evidence that regulation was not needed.**
2. **Federal agencies were believed to increase costs.**
3. **The need to improve economic conditions through lower prices for customers and higher profits for the industry.**
4. **There was a belief that government regulation was interfering with productivity.**

3.7 LESSONS FOR THE GCC

Air transport in the GCC is very tightly and rigidly regulated and this has resulted in a monopolistic market. As a result, competition between the airlines is very limited on some routes, and does not exist in others. In addition, although the present GCC regulatory policies protect their national carriers, airlines generally have high operating costs, low productivity and efficiency and some make high net operating losses. Furthermore, GCC consumers are not provided with variety of products, cheaper fares and better quality of services in the monopolistic routes. Airlines losses and unsatisfactory consumer service do not help to improve the economy, especially in the long run. Most importantly, these factors are some of the major forces and pressures which led to the deregulation of the US airline industry.

After analysing the regulatory environment of the GCC air transport market based on the data and findings of this chapter, the following are the main results:

1. **GCC air transport regulation has succeeded in providing stability at the cost of inefficiency.**
2. **These regulations are too protective of the GCC carriers.**
3. **They are not consumer oriented.**

4. Due to these regulations, combined with the uncommercial operation objectives of some GCC carriers, the networks have proved not to be in the interest of the carriers. Some of the problems include slowness of the licensing process, with the creation of obstacles when building an efficient network For example, some GCC airlines have to operate unprofitable routes.
5. If price freedom were to be introduced, off-peak traffic could be attracted and utilised.[40]

The factors that led to US airline deregulation and its subsequent success are the involvement of one government to deregulate or regulate, the volume of the US market and the private ownership of airlines which are operated under private and commercial managerial principles.

However, the GCC air transport market is closer in character to that of the EC than that of the USA because of the involvement of several governments and national carriers which are mostly state-owned. As a result, the decision to liberalise the GCC or EC air transport requires acceptance and approval of all members. This means a long and complicated process to establish an air transport liberalisation policy that satisfies all the members with respect to political issues and economic feasibility. At the same time, the policy is likely to contain a certain degree of protection for the member's national carriers to avoid bankruptcy.

It is relevant that the UK CAA decided not to adopt full US style deregulation in the UK, due to factors such as the small scale of the domestic industry and thinness of most UK routes. For these reasons EC liberalisation is studied in Chapters 5 and 6.

REFERENCES

1. Rigas Doganis, Flying off course (London, Harper Collins Publishers, 1991) pp.46-47.

2. Ibid, pp.47-48

3. Robert Baldwin, Regulating the Airline (Oxford: Oxford University Press, 1985) p.205, also see (1980-1; H.C. 4341), para.13.

4. Ibid, pp.206-207

5. Ibid, p.207

6. Ibid, p.208, also see CAP 420, para.3.33.

7. Ibid, p.208, also see CAP 420, para.4.3.

8. Ibid, p.212.

9. E.G.Breyer and R.B.Stewart, Regulation Innovation and Administrative Law (Calif: L.Rev.1256) pp.1277-1311.

10. Baldwin, p.215, also see H.Friendly, The Federal Administrative Agencies (USA: Harvard, 1962).

11. L.L.Fuller, The Morality of Law (USA: Yale, 1964) p.46.

12. Baldwin, p.220, also see Royal Commission on Transport 1929-1930, Cmd.3365, 3416, 3751.

13. Baldwin, pp.220-231

14. Baldwin, p.231, also see H.Morrison Socialization and Transport, (London, 1933)

15. Baldwin, pp.232-235

16. American Political Science, Politics, Personalities and the Federal Trade Commission (USA: Rev.28,1934) p.1016.

17. Baldwin, also see The Independent Regulatory Agency - A New Scapegoat (USA: Yale, (1956)65) p.1068.

18. Robert M.Kane and Allen D.Vose, Air Transportation (Iowa: Kendall/Hunt Publishing Company, 1975) pp.26-28.

19. E.E.Bailey, D.R.Graham, and D.P.Kaplan, Deregulating the Airlines (USA: MIT Press, 1986) pp.16-17.

20. George Williams, Establishing An Effective Economic Regulatory Policy for the Airline Industry (England: PhD thesis, CIT, 1990) pp.23-24.

21. Vose, pp.26-28.

22. Ibid, pp.28-30

23. Ibid, pp.38-39

24. Kaplan, p.11.

25. Donald Pickrell, edited by Kenneth Button, Airline Deregulation (England: David Fulton Publishers,1991) pp.6-9

26. Ibid, p.9

27. Ibid, pp.6-9

28. Ibid, pp.6-13

29. Kaplan, pp.29-34

30. Economic Co-operation and Development (OEDC), Deregulation and Airline Competition (Paris, OECD. 1988) pp.105-106.

31. Kaplan, pp.26-28

32. Ibid, pp.27-33

33. Ibid, pp.34-36

34. Doganis, pp.52-53

35. Ibid, p.54.

36. Ibid, pp.56-57

37. Ibid, pp.55-57

38. Ibid, pp.55-56.

39. OEDC, p.105.

40. F.Alamdari, Airline Deregulation: An Analysis under Different Regulatory and Operating Environment (England: PhD thesis, CIT, 1989) p.22.

CHAPTER FOUR

THE IMPACT OF THE US AIRLINE DEREGULATION ACT

4.1 INTRODUCTION

The objective of this chapter is to review and study the impact of the US Airline Deregulation Act on the airlines, consumers, shareholders, aviation industry and governments. In addition, it aims to draw lessons for the GCC.

The US airline industry was regulated for 40 years before the application of the Airline Deregulation Act in 1978. During the period of regulation, competition between scheduled carriers was constrained, which resulted in the incumbent airlines being increasingly favoured as time passed.

However, the rapid transformation of the US airline industry during the period since the passing of the Deregulation Act has been the product of many important forces other than the passing of the Act itself. These include:[1]

1. Substantial operational and marketing advantages of more flexible thinking.
2. Marketing innovations such as hub and spoke networks, computer reservation systems (CRS), frequent flyer programs and code-sharing alliances which may have come anyway.
3. Continuing growth in the demand for intercity travel.
4. Sharp fluctuations in the costs of the main inputs used by the airlines forcing dynamic changes.
5. Recently, difficulties co-ordinating pricing and investment policies.
6. Because of congestion airport and airspace capacity has increasingly effected airline service patterns and fare levels.

4.2 THE EFFECTS OF THE AIRLINE DEREGULATION ACT ON AIRLINES

The structure of the US airline industry has changed significantly especially with the entrance (and subsequent exit) of new airlines and the rapid expansion of carriers which were previously constrained by rigid regulation. Table 4.1 illustrates a comparison between new entrants and the already established airlines.

However, before deregulation, the generally accepted classification of the status of airlines was of trunk, local, intrastate, commuter and charter airlines. The nature of the airline business and the limitation of their operating certificate used to be defined. On the other hand, since deregulation, certificated airlines have not been limited in their field of operation, but now are classified as follows:[2]

1. MAJOR AIRLINES - with a turnover of over $1 billion.
2. NATIONAL AIRLINES - with a turnover of $75 million - $1 billion.
3. REGIONAL AIRLINES - with a turnover of under $75 million. In addition, regionals are subdivided. If they only operate aircraft of 60 seats or less they are referred to as commuter airlines.

Nevertheless, all the trunk airlines and a few of the old locals have become majors, and the remaining locals and intrastate have become nationals. In addition, many of the commuters have acquired larger jet aircraft and become regionals. Finally, some charter airlines operate scheduled services as nationals, at the same time, they carry out some charter work.

Table 4.2 indicates airlines providing interstate jet services during the era immediately after deregulation and their present status.

4.2.1 <u>The Airline Deregulation Act Advantages for Airlines</u>

The following are the main post-deregulation advantages for the airlines:

1. Freedom of entry and exit from the market.

2. **Freedom of price setting.**
3. **Freedom of scheduling, capacity and equipment.**
4. **The development of hub and spoke networks where they are advantageous for the reasons listed below:[3]**
   - **More production because of the following:**
     - **They facilitate the utilization of larger aircraft which offers lower unit operating costs on most routes (Viton, 1986).**
     - **They allow the maximization of airport facilities.**
   - **Better marketing because of the following:**
     - **More frequent departures to many cities.**
     - **Allow carriers to charge higher fares than competition would otherwise permit.**
     - **Enhance the recent marketing innovations such as frequent flyer bonuses which raises the load factors.**
   - **Such system provides an airline with certain degree of protection from competition, especially from less developed airline networks.**
5. **When viewing the major US hub airports, most departure and arrival slots are occupied by one major carrier. As a result, it gives that major carrier more control over the traffic flow to and from that hub (such as Piedmont which controls 92% of the traffic at Charlotte Airport). Table 4.3 provides details of the proliferation of USA domestic hubs between 1979 and 1988.**
6. **The freedom from regulation of the route network has allowed the carriers to expand and tailor their route networks to match traffic flows.**
7. **Efficiency of an airline network may be defined in general as "the degree to which the system satisfies the needs of its passengers at the lowest possible economic cost"[4] However, deregulation has accelerated the improvement in the efficiency of the airline industry. Managers have had to search for ways to use their resources very efficiently, and they have generally succeeded. As efficiency has been improved, costs and expenses of the airline operations have been lowered as a result of controlling labour costs and increasing productivity.**
8. **Most airlines adopted initially the two-tier pay structure where new recruits may receive half the pay of the established staff.**

9. After deregulation, larger airlines were allowed to withdraw from services that were not commercially attractive or they no longer wished to provide.
10. New entrant airlines had the advantage of having costs of more than one third lower than the established airlines because of the following:[5]
    - Lower labour costs
    - Streamlined operation
    - Second-hand aircraft utilization
    - The "unbundling" of services*** offered which are charging separately unlike for other traditional services.

4.2.2 <u>The Airline Deregulation Act Disadvantages for Airlines</u>

The following are the main disadvantages of the Airline Deregulation Act for the airlines:

1. The level of competition between the airlines increased at first when measured by the number of airlines in each market. This increased because of the ease of market access.
2. Some airlines could not adapt to the new deregulated marketing strategies, as a result, they declared bankruptcy, such as Braniff in 1982.
3. There is an argument that some airlines made short cuts in maintenance or flight operations to reduce costs.
4. Access to critical airports, especially to gates and slots, has become a crucial issue because of some of the following:[6]
    - Unfair or exclusionary practices by airlines with market power.
    - Allocating slots is based partly on market principles and partly on "grandfather rights" both of which favour large airlines.
    - Prominent airlines at some airports have the power to block construction of expanding facilities intended to provide access to new competitors.[7]
    - Airport congestion.

***This concept was pioneered by People Express, but is no longer on offer.

5. Carriers' net profit decreased in the years following deregulation because of recession, fare wars and increases in the price of aviation fuel.[8]
6. Several of the established airlines have taken the following steps to offset competition[9]
   - the creation of non-unionised subsidiary companies;
   - the use of chapter ll of the Bankruptcy Code to escape from wage agreements which financially troubled airlines found onerous; and
   - the extraction of concessions from employees in collective bargaining.

4.3 THE EFFECTS OF THE AIRLINE DEREGULATION ACT ON CONSUMERS

One of the main objectives of the Airline Deregulation Act was to create competition between the airlines in the belief that passengers would benefit.

4.3.1 The Advantages of the Airline Deregulation Act for Consumers

The following are the major advantages of the Airline Deregulation Act for consumers:

1. A wider variety of products are available to passengers. Some new operators such as People Express provided a very cheap (by offering fares of one-third of the incumbent airlines level), no-frills service and/or are based at secondary airports, but People Express failed in 1986.
2. Although there was a recession and an increase in fuel prices, the average fare fell by 14% between 1977 and 1983 due to open competition between carriers.[10] Overall, the industry average fare per mile declined from 1976 to 1986 by 28.5%[11] and then rose and then fell again until the end of 1987. Since then they have gone up.
3. Convenience of air services has not changed very much under deregulation.[12]
   - Convenience declined slightly in non-hub market categories, and it increased slightly in the hub market categories.
   - It improved in those small communities where locals and trunks have suspended operation because of the freedom of airlines to choose services to run.

- There has been a 7% improvement of service convenience to small cities.

4. When comparing the level of service in 1987 with that before deregulation, industry output in terms of available seat miles has risen by 65%. Nevertheless, the growth was due to a higher service frequency (26%), an increase in the number of points served (6%) and due to an increase in total mileage covered by the airlines.[13]
5. The removal of entry and exit control led to increase in flight departures on more profitable routes.

4.3.2 The Disadvantages of the Airline Deregulation Act for Consumers

There are a number of disadvantages of the Airline Deregulation Act for passengers which are listed below:

1. Higher prices for short routes.
2. Lower services on board the aircraft because of the attempt to reduce costs by airlines.
3. By the end of 1987, fare wars disappeared. In addition, yields and fares increased and signs of an emergence of oligopolistic stability in USA domestic market could be seen.[14] Wheatcroft and Lipman concluded that in 1986 "there is no evidence that the airlines will find ways to avoid destructive price competition except through industry concentration which is likely to be anti-competitive"[15] Surprisingly, it is happening now.
4. The hub and spoke operation created quasi-monopolistic powers which in the long term may be a development resulting in a major disadvantage to the public interest. Table 4.4 shows that some airports from which the major airlines carried more than half of the total traffic in 1988. At three of these hubs, the dominant airlines carried more than 75% of the total traffic.[16]

4.4 THE EFFECTS OF THE AIRLINE DEREGULATION ACT ON SHAREHOLDERS

The rate of return of the major US carriers between 1970 and 1975 was only 8.8%, while it was 12.5% for all non-financial corporations in the USA. However, airlines

attracted investors and were able to raise capital because of the CAB regulations which provided the following:

1. **The CAB awarded new routes to unprofitable airlines to strengthen their finances.**
2. **Industry fares were based on average costs.**
3. **The CAB restriction on entry protected existing carriers from the entry of more efficient carriers.**
4. **The Board protective policies prevented financial ruin for inefficient airlines.**
5. **The CAB route rights made a troubled airline an attractive merger prospect for a healthy carrier.**

The industry paid enough dividends to satisfy investors, it had debt-to-equity ratio of 50:50, while the ratio for manufacturing was only 30:70. However, the following occurred between 1976 and 1978 which was the stage before deregulation:[17]

1. **The operating surplus rose from $575 million to $1 billion.**
2. **This rise occurred because deregulation improved load factors.**
3. **The improved load factor could be attributed to the sale of discount tickets.**
4. **Discount fares appear to reduce profitability because:**
   - **The decrease in yield per RPM was as large or larger than the increase in the volume of traffic.**
   - **The extra traffic led to an increase in expenditure.**

Figure 4.1 illustrates the profitability of USA scheduled airline industry, the following should be considered:[18]

1. **Between 1976-1978, profitability was rapidly increasing, however, it steeply deteriorated in 1979 until 1980.**
2. **Between 1981-1983, the industry recorded a loss in every year.**
3. **Between 1984-1989, the industry recorded fluctuating profitability every year.**

There are four contributory factors for the loss between 1981 and 1983 which are listed below:[19]

1. **100% increase in the price of fuel between 1979-1983.**
2. **The US economy was depressed until 1983. In the USA every 1% increase in real personal disposable income will result in a rise of 1.4% in the number of passenger miles flown.**
3. **The main reason was that the trunk airlines had too many wide-bodied jets and too few narrow-bodied jets which resulted in the following:**
   - **Price wars for the long-haul markets.**
   - **The trunk airlines had difficulty in competing in short-haul routes both with old carriers and the new entrants.**
   - **Stage length routes**

     - Below 500 miles - Operating profit of $125 million.

     - Between 500-600 miles - Loss of $50 million

     - Longest haul - Deficit of $640 million.
4. **The PATCO strike and the resulting capacity restriction which started in August 1981 had contributed to the loss in 1981 and 1982.**

Figure 4.2 illustrates the rate of return on investment of the US scheduled airline industry for the period between 1972-1989. The rapid increase and decrease of the rate of return are caused by the profitability of scheduled airline industry as plotted in Figure 4.1.[20]

Some airlines faced financial problems that led them to bankruptcy as a result of deregulation. The first airline to cease operations due to bankruptcy was Braniff in May 1982. The list below is a background about Braniff and the reasons for its failure:

1. **It was the nation's tenth largest airline.**
2. **It was relatively profitable through most of the 1970's.**

3. Braniff expanded aggressively following the passage of Airline Deregulation Act. It increased its routes by 60%. Some of the markets were overpopulated with competitors.
4. Low load factor.
5. Introductory discount fares.
6. High cost for training personnel and providing new ground facilities.
7. Resumed limited service operation in 1984, however it went bankrupt again in 1989.

Continental followed Braniff into bankruptcy in September 1983 because it failed to control costs, and their operating expenditure per capacity tonne-mile had increased faster than any major airline.

However, the financially troubled airlines (especially Eastern, People Express, Frontier, Muse and PanAm) which became bankrupt, had valuable assets such as aircraft, takeoff and landing slots at congested airports, and long term leases on airport facilities. Considering the previous assets in depressed values, other airlines found them attractive takeover targets.[21]

Overall, Figure 4.3 indicates that improved revenue yields of 1987 continued in 1988-1989 regardless of the decrease of 1.7% in 1988 in traffic growth, the ratio of revenue to expenditure improved appreciatively to 105.[22]

4.5 EFFECTS OF THE AIRLINE DEREGULATION ACT ON EMPLOYMENT

Wages in the airline industry appear to be substantially higher even for jobs that do not require skills. Pay at the American trunks between 1957 and 1977 was 45% more than the other manufacturing industry for comparable jobs. The following provides some comparisons of airline wages in 1980:[23]

1. Keypunch operators earned 31% more than the average elsewhere.
2. Typists were paid 41% more than the market rate.

3. Computer operators were paid 38% more than the market rate.
4. Air freight agents earned 58% more than shippers.
5. Aircraft cleaners (interior) earned about 82% more than janitors.
6. Aircraft mechanics earned about 28% more than the average motor vehicle mechanics.
7. Aircraft inspectors earned 48% more than the average for blue collar supervisors.
8. Flight attendants earned about the same as nurses or school teachers.
9. Pilots for the major airlines earned substantially more than either military or corporate pilots. For example, Captains were paid 59% more than the captains of company-owned aircraft.

However, the reduction in costs achieved between 1978 and 1984 seem to have resulted from the following:[24]

1. Amended labour contracts and lower pay.
2. General tightening up of operations.
3. Higher productivity from employees.
4. The contribution of new aircraft.

The airline employees have been affected by the Airline Deregulation Act for the following reasons:[25]

1. The Airline Deregulation Act required higher productivity from the staff in order for their airline to compete. The following are the major changes in employment and worker productivity between 1977-1989.[26]
   - Between 1977 and 1981:
     - Trunks did not experience rapid labour growth, but the locals did.
     - ATM per employee increased 3% for the trunks and 27% for the locals.
     - Employment was increasing about 5.2% per year for the trunks and 42% for the locals.

- **Between 1981 and 1983:**
  - **Both the trunks and the locals experienced a substantial improvement in employee productivity.**
  - **ATM per employee improvement of 3% for trunks and 12% for locals.**
  - **Employment was decreasing at about 6.5% per year for the trunks and 4.7% for the locals.**
- **Between 1983 and 1989, Figure 4.4 shows that employment of US scheduled airline industry increased every year. However, Figure 4.5 indicates an increase of worker productivity in 1983-84, but it decreased in 1985, and then it made progress every year.**

2. **From the previous data a conclusion can be made that an average of 5.6% of the airlines employees lost their jobs between 1981 and 1983 because some airlines allowed their management to break existing employment contracts to reduce costs. So, airline employees seemed to have benefitted from CAB regulation in the past and suffered under deregulation.**
3. **One of the major provisions that took immediate effect with the Airline Deregulation Act was to provide employee protective measures for dislocated employees. "In the labour arena the Act provided temporary federal assistance payments and hiring rights to protected former employees in cases where deregulation was found to be the major cause of a significant air carrier contraction. In practice, the compensation provisions have never been funded"[27]**
4. **Adoption of the two-tier pay structures which new recruits receive as little as half the wages of already established staff.**
5. **However, it is not certain whether deregulation really directly caused employees to lose their jobs especially between 1982-83 which recorded the highest drop in airline employment after passing the Airline Deregulation Act. Given the following:**
   - **Total labour costs in the USA airline industry is more than one-third of total operating costs.[28]**

- New entrant airlines were able to hire labour at costs of one-half of those of established carriers which gave them a cost advantage of one-sixth of total costs.
- Strong competition between the airlines.
- 100% increase in the oil prices and the depression of the economy until 1983.
- At almost the same period that employees were reduced in the USA and in the deregulated environment, British Airways which was not in a deregulated environment cut its staff between 1979 and 1983 by almost one-third, although labour costs at British Airways were 25% of the total operating costs in 1982.[29]

4.6 THE EFFECTS OF THE AIRLINE DEREGULATION ACT ON THE AVIATION INDUSTRY.

In the early years of deregulation, the US airline industry was influenced by several factors besides deregulation. These are as follows:[30]

1. Between November 1978 and March 1981, aviation fuel rose by approximately 237%.
2. General economic recession where real gross national product increased by only 4% between 1979 and 1982, and the volume of air travel was adversely affected.
3. The Air Traffic Controller's strike which occurred in 1981 disrupted the air traffic control system and prevented entry into the most attractive markets.

However, passenger demand for air travel decreased between 1979 and 1983 due mainly to the recession, but after economic improvement in 1983, the traffic volume continued to rise. It was 55% higher in 1987 compared to 1978. This increase in passenger demand was due to decreases in average fare and the accessibility to passengers of a wider range of destinations via hubs in addition to the effects of economic growth.

4.6.1 The Advantages of Deregulation for the Aviation Industry

Listed below are the main advantages of the Airline Deregulation Act for the aviation industry:

1. The number of airlines has more than doubled since deregulation. The growth of the airlines could be attributed to the removal of entry and exit control.
2. The average unit cost for the airlines decreased by 20% between 1981 and 1985. This reduction in costs was due to reduced labour costs, changes in the airlines' employee work rules, the move towards hub and spoke operations.[31]
3. Dramatic technological advances in the aviation industry.
4. Both trunks and locals have increased productivity since deregulation as follows:[32]
   - Raised load factor.
   - Improved utilization of aircraft.
   - Increases seating density.
   - Increased stage length.
   - Accelerated retirement of inefficient aircraft.
   - Improved worker productivity. Trunk airlines have improved by 3% and locals by about 27%.
5. Development and exploitation of the new marketing strategies such as hub and spoke networks and Computer Reservation Systems.
6. After deregulation there was a demand for efficient and smaller aircraft to reduce operating costs and provide more flexibility. On the other hand, with the recent airport congestion constraints, demand for larger aircraft seems to be more favourable. In addition, many airlines retired and changed their fleet early for new aircraft to gain efficiency and lower operating costs.
7. Opening new airports, expanding and developing the old ones.
8. Air fares and rates changed as follows:
   - Prices became more cost related.
   - Increased use of peak-load pricing which had improved load factors.
   - Pricing innovation such as quantity discounts, corporate discounts, and frequent flyer discounts.

- **There are two basic pricing strategies to come out of deregulation:**
  - **Restricted discounts.**
  - **Low unrestricted fares (most notably by the new entrant carriers).**
- **Lower prices occurred for two reasons:**
  - **Tourist markets could be served with higher load factors.**
  - **Aircraft could serve these markets during off-peak hours where the demand for business travellers was relatively low.**

9. **Deregulation did not effect air transport safety. Considering the number of accidents before and after deregulation, accident rates fell in the mid 1970s and after 1980. This improvement was greater in the USA than in most other countries.[33]**
10. **Manufacturers benefitted from the Airline Deregulation Act by selling more aircraft and equipment.**

4.6.2 <u>Disadvantages for the Aviation Industry</u>

The following are the main Airline Deregulation Act disadvantages for the aviation industry:

1. **Due to the increased level of competition between the airlines, especially in 1986, many carriers merged with others for some of the reasons listed below:**
   - **The less successful carriers with high costs, large debts or uncompetitive services, merged with the big successful carriers in order to survive.**
   - **Weak carriers wanted the financial safety of strong carriers.**
   - **Other carriers have merged for strength and mutual protection.**

As a result of many mergers in recent years, the aviation industry has become more concentrated. The trunk carriers market share has increased and nine airlines controlled 94% of the US market in 1987. In addition, Figure 4.6 illustrates that only eight airlines in 1989 carried more than 90% of US domestic passenger traffic. Alfred Kahn complained about mergers and consolidations:

"The reconcentration of the industry reflects in part the deplorable failure of the Department of Transportation to disallow even one merger or, in all but one case, even to set conditions to mitigate possible competitive consequences. In most cases there were positive arguments in favour of the mergers. I find it impossible to believe, however, that our traditional anti-trust agencies would have permitted all of them. The DOT seems to have no appreciation whatever of the dangers our anti-trust laws were set up almost a century ago to forestall"[34]

2. Services to small communities decreases slightly between 1978 and 1981. However, as the economy recovered since 1981, services to small communities have improved.
3. The two-tier employment structure could be a disadvantage for airline employees.
4. Carriers in concentrated markets are able to charge higher prices than carriers in less concentrated markets.
5. There have been some concerns in 1985 that deregulation was affecting safety standards, however, there has not been a causal link, but the media and high political interest that led to publicised congressional hearings on the subject. Some of the main concerns were as follows:[35]
   - The large number of accidents and incidents especially in 1985 which the FAA reported an increase of 31.9% in near collisions over 1984. In addition, there was an unfortunate record number of deaths in international aviation.
   - Lower standards of maintenance, training and inspection where Eastern received $9.5 million fine and American Airlines a $1.5 million fine for breaching FAA safety procedures. However, John Enders, the President of the Flight Safety Foundation, mentioned that the traditional industry standards for maintenance, repair, record keeping and so on had been higher than the minimum standards of the FAA.
   - There is a likelihood that carriers under pressure cut corners to reduce costs.

4.7 THE EFFECTS OF THE AIRLINE DEREGULATION ACT ON THE US GOVERNMENT

The following are the main Airline Deregulation Act effects of interest to the US government:

1. **Less governmental control on the airlines which requires less governmental staff and budget.**
2. **Improving the economy by increasing the use of air transport by passengers, airlines, airports, manufacturers, hotels, rental cars companies and so on.**
3. **Boosting and improving the aviation industry in both managerial and technical areas.**
4. **Spreading air transport to many cities and small towns that did not have air transport services before the Act.**
5. **Opening new jobs and requiring more employees by the increased use of air transport which reduces unemployment.**
6. **The US government achieved what they aimed for from deregulation:**
   - **It did boost the aviation industry and air transport in general.**
   - **It did reduce fares and rates. Although fares in the US have increased recently, they are still half those of Europe for comparable services.**
   - **New routes and new facilities have been accomplished.**
   - **Safety improvement is among the most rapid in the world.**
   - **Economic conditions have been improved.**
7. **The US government is now the most experienced in the area of airline deregulation.**

However, the following are the major disadvantages of the Airline Deregulation Act from the point of view of the US government:

1. **Finding solutions to the problems that arose from deregulation for the airlines, especially the financial problems.**
2. **Congestion created problems for air traffic control because of:**
   - **The increased number of aircraft and busy airports as deregulation**

boosted air transport.

- President Reagan's decision to dismiss air traffic controllers who went on strike.

3. The airline employees appear to have benefitted from the previous CAB regulations. Some airline managements broke established contracts with their own employees.

4.8 ISSUES RAISED BY US AIRLINE DEREGULATION.

4.8.1 Hub and Spoke Networks

Nonstop flights can be less than cost-effective. Airlines established hub and spoke operations where various services stop at an intermediate point to change aircraft to continue to their ultimate destinations. An airline can maximize the average number of passengers per flight and decrease costs by combining passengers with different origins and destinations.

However, deregulation has accelerated the development of hub and spoke networks because of their importance in multiplying by permutation the number of city pair services whilst flying the same number of aircraft miles. In addition, they provide a quasi-monopolistic market for airlines at a particular hub. Some 19.9% of passengers landed and 15.6% departed from hubs in 1977 compared with 31% and 24.5% in 1984.[36]

Nevertheless, with the increased use of hubs in the USA domestic air transport, passengers like to make their connections with a single airline to reduce the risk of lost baggage, missed connections and to avoid walking between terminals. In addition, passengers and travel agents tend to book a flight with a carrier that provides the highest number of frequencies which usually charge higher than others with small frequencies. Baily, Graham and Kaplan estimated that a carrier with 50% of departures from an airport would charge 7% more than a carrier with 25% of departures.[37]

4.8.2 Computer Reservation Systems (CRS)

The initial idea of the CRS was to raise the number of passengers that could be handled,

but now they are very highly effective marketing tools. United was the first airline to install a CRS in a travel agent in 1976. However, within a year it was overtaken by American who succeeded in signing up 90 of the top 100 companies.

Deregulation maximized the strength, role and importance of travel agents. There are a variety of products available at different prices which make passengers think that travel agents would advise them on the best available option. Before the Airline Deregulation Act, 45% of airline ticket sales were bought from travel agents. This doubled by 1987, and increased to more than 95% in 1990.

CRS became one of the most powerful marketing tools for the US domestic industry and 95% of the travel agents were equipped with them by 1990. CRS made the airlines compete aggressively to link travel agents with their own system. Airlines have to pay travel agents high commissions which had tripled per passenger between 1978 and 1987. Some airlines used illegal ways to get some travel agencies to install their own CRS. For example, Feldman reported a case cited by a Northwest Congressional hearings in 1985 where United had offered an agent $500,000 in cash, 10% additional commission on each ticket sale, five years free use including all telephone calls, if that particular travel agent would replace Sabre with Apollo.[38]

Table 4.5 illustrates the share of agency generated revenue for all CRS's in 1985. American Airlines with Sabre and United with

Apollo had accounted together for 74% of the US market share in 1985.

An Economist Intelligence Unit report published in 1987 noted that between 70% and 90% of airline booking through travel agents are made from the first CRS availability screen displayed. Such practice resulted in some CRS vendors having more flights booked due to their name appearing first on the screen.[39]

4.8.3 Frequent Flyer Programmes

These programmes were first introduced by American Airlines in 1980, since then they have become very important marketing tools. However, the high level of competition between the airlines in the last quarter of 1987, frequent flyer programmes got out of hand, especially when Delta offered triple mileage if a passenger purchased a Delta ticket with an American Express Card. Other airlines rapidly offered the same and some airlines added other incentives in their programmes. It was estimated in 1988 that the eight major airlines had potential revenue loss of $940 million due to the triple mileage programmes which raised the annual cost to about $1.24 billion a year.[40]

Toh and Hu have outlined three main motives for operating frequent flyer programmes which are as follows:[41]

1. Establishing loyalty for an airline regardless of its efficiency.
2. Achieving product differentiation which smaller, low-cost, newer airlines could not offer.
3. Compiling demographic profiles and travel patterns of their members.

Frequent flyer benefits have reduced other forms of fare competition which pushed United and American to restructure their frequent flyer programmes by reducing the number of available seats, making it harder to earn free tickets, prohibiting free travel at peak times, and establishing expiry dates for free travel. These leads made other airlines follow them.[42]

4.8.4 Airline Consolidation

Many airlines grew rapidly after the passage of the Air Deregulation Act and started to provide strong competition especially for the smaller trunk airlines. In addition, they were joined by a host of new competitors during the early 1980's. Nevertheless, the number of jet-equipped airlines which provided sufficient frequencies-services doubled by 1984. However, between 1984-1986, some airlines were faced with financial failure or mergers. This reduced the number of viable competitors in the market. By 1988, approximately 10 carriers left with sufficient of regional or national competitors remained in business. Figure 4.6 illustrates how 24 airlines consolidated since 1978 to produce 8 major airlines in 1989.

However, there are many factors that pushed airlines to merge together, some of them are:

1. Some airlines had financial problems even before deregulation, and numbers reduced from 16 carriers in 1938 to 11 carriers in 1978. After deregulation, some airline consolidation was due to financial distress such as Eastern, People Express, Frontier, Muse and PanAm.
2. The economic logic behind mergers or acquisition was to possess a large network which enabled them to be very strong competitors.
3. Control over airports and obtaining slots and facilities.
4. Their operations are complementary such as feeding traffic to each other.

4.9 CONCLUSION

There are many advantages and disadvantages of the Airline Deregulation Act for the airlines, consumers, shareholders, airline employees, the aviation industry and governments. However, deregulation of the US air transport succeeded in improving efficiency and productivity, providing lower fares, lower costs, more product variety, many marketing innovations, higher demand and number of airlines, and less governmental control and budget. On the other hand, the industry is moving towards concentration which could lead to a few giant airlines controlling the US market. Other problems such as airline financial instability, congested skies and airports, and control of slots and gates.

Conclusions about the American experience identified by Wheatcroft and Lipman included:[43]

1. Deregulation produced a wide variety of products for consumers.
2. Competition from new entrant carriers improved efficiency and lowered costs.
3. Due to fares being lower than costs, airlines faced financial instability and

3. Due to fares being lower than costs, airlines faced financial instability and inadequate profitability.
4. There were indications that a few large airlines would dominate the market.
5. The main reduction on airline operating costs was derived from the pay of employees.
6. There was widespread concern - misplaced - that deregulation had reduced safety standards, and that closer supervision of airline operational performance was needed.

Michael Levine indicated a surprising development which was inconsistent with the concept of perfect contestability which Wheatcroft and Lipman used in their 1990 study. The development included:

> "a wave of mergers and consolidations; a higher than expected degree of vertical integration, particularly with feeder airlines; the domination of hub and spoke systems; a much more complicated fare structure; the importance of frequent flier programmes; the increased importance of travel agents; the dominant role of major computerised reservation systems (CRS); the importance of controlling airport slots and gates; the persistence and success of predatory pricing; and the high casualty rate of new entrant airlines"[44]

In addition, Dr.George James identified the characteristics that would make an airline successful in the deregulation environment which are "hub and spoke route structure; yield (pricing) management; capacity (aircraft) management; low labour costs; computerized reservation system; and ability to take advantage of size"[45]

However, Sir Leon Brittan, EC Commissioner for Competition summed up the importance of lessons from the US for Europe:

"Deregulation in the United States has been on balance a success. Liberalisation in the European Community is in its early stages and will, I am convinced, in the end be an even greater success. The challenge for the Community will be to learn from the US experience and avoid the pitfalls encountered there. This means that we must liberalise fast but smoothly, without causing unwarranted turbulence. We must also ensure that this liberalisation is accompanied by a rigorous application of the competition rules and merger control."[46]

4.10 Lessons For The GCC

The comparison of the US and GCC air transport industries in Table 4.6, and the analysis of this chapter and the previous two suggest that the level of airline competition in the GCC will be difficult and will never reach that of the USA under a deregulated environment. However the following are the major lessons for the GCC:

1. The main lesson is that competition from new entrants has lowered costs and prices, and improved efficiency and productivity throughout the industry. These elements cover some of the objectives for the liberalisation of the GCC air transport industry.
2. The US airline types of operation have changed after passing the Deregulation Act which suggests a possibility of forming new types of airlines in the GCC if liberalisation is applied.
3. Freedom from route network regulation has allowed the US carriers to expand and tailor their route network to match traffic flows. The GCC airlines operation of unprofitable routes is one of the major reasons for net losses.
4. A wider variety of products and reasonable fares are available to US consumers, which is considered to be one of the main reasons to liberalise GCC air transport.
5. The average unit cost of US airline operation has been reduced. This factor is one of the major ways for the GCC airlines to reduce their net losses.

6. **Air transport is considered the main method of transportation in both GCC and USA.**

7. **Pressures from the US air deregulation assisted in opening new airports and expanding and developing the old ones. Since the GCC international airports have high estimated capacity, therefore, if liberalisation is permitted in the GCC, a better use of the facilities of these airports and an expansion and development of the domestic airports will probably occur.**

8. **Airline mergers and consolidations were disadvantages of US deregulation. These issues should be considered very carefully when establishing a GCC liberalisation policy.**

Overall, there are considerable differences between the USA and GCC air transport industries, especially in the areas of regulation, airline and airport ownership and operations, the volume of the domestic traffic and the involvement of several states in the GCC. Because of this, a sudden reform such as the US Airline Deregulation Act is not feasible or advisable for the GCC.

However, the US deregulation experience is very useful for the liberalisation of the GCC domestic air transport market especially in terms of freedom to enter/exit the market and to set prices. However, the application of these two freedoms should be introduced smoothly, gradually and carefully to a certain level of freedom and to specific markets only. The level of air transport liberalization in the GCC will be proposed after studying the experience and expectations of the liberalisation of the European Community's air transport market.

TABLE 4.1: A comparison between new entrants and already established airlines.

	OLD CARRIERS - 1981-1984	NEW ENTRANTS - 1981-1984
1.	Costly labour and restricted work rules	Largely free from such constraints.
2.	Costly equipment errors which were made by past management.	Free from such errors.
3.	Name recognition, amenities, and service convenience especially at their hub airports.	Cost advantages where they can earn profits at prices that are not compensatory to incumbent carriers.
4.	High range of services offered under congested conditions, and they are able to get peak time take off and landing slots	They were unable to obtain these advantageous factors, as a result they were excluded from the more lucrative business traffic.
5.	After establishing large and many hubs, big airlines have been having the advantage of benefit from them.	Did not help them as much.
	ESTABLISHED AIRLINES 1984-1991	NEW ENTRANTS 1984-1991
-	Advantages of controlling airport slots and facilities because of being a major airline or feeding to one	- Not applicable (n/a)
-	Advantages of having CRS	- Not applicable
-	Advantages of offering frequent flyer programs	- Not applicable
-	Advantages of code sharing airlines.	- Not applicable

TABLE 4.2: Airline providing inter-state jet service during the deregulation era.

Origin and name	Began Service*	Date	Status
Trunk carriers(11)			
American	pre-1978	1989	1st ranking carrier**
Braniff	pre-1978	1982	Ceased operation due to bankruptcy
		1984	Resumed limited service
		1989	Ceased operation due to bankruptcy
Continental	pre-1978	1989	6th ranking carrier (under Texas Air Corp)
Delta	pre-1978	1989	2nd ranking carrier
Eastern	pre-1978	1989	Declared bankruptcy; conducting limited operations (under Texas Air Corp)
National	pre-1978	1980	Acquired by Pan Am
Northwest	pre-1978	1989	5th ranking carrier
Pan Am	pre-1978	1989	12th ranking carrier
TWA	pre-1978	1989	8th ranking carrier
United	pre-1978	1989	3rd ranking carrier
Western	pre-1978	1986	Acquired by Delta
Local service carriers(8)			
Frontier	pre-1978	1985	Acquired by People Express
Hughes Airwest	pre-1978	1980	Acquired by Republic
North Central	pre-1978	1979	Merged within Southern to form Republic
		1986	Republic acquired by Northwest
Ozark	pre-1978	1986	Acquired by TWA
Piedmont	pre-1978	1987	Acquired by USAir
Southern	pre-1978	1979	Merged with North Central to form Republic
		1986	Republic acquired by Northwest
Texas International	pre-1978	1982	Acquired by Continental
USAir	pre-1978	1989	4th ranking carrier
Intra-state carriers(5)			
Alaska	pre-1978	1989	15th ranking carrier
AirCal	1979	1987	Acquired by American
Air Florida	1979	1984	Ceased operation due to bankruptcy
		1985	Acquired by Midway
PSA	1979	1987	Acquired by USAir
Southwest	1979	1989	9th ranking carrier
Charter carriers(2)			
Capitol	1979	1984	Ceased operation due to bankruptcy
World	1979	1985	Ceased operation due to bankruptcy
Commuter carriers(3)			
Air Wisconsin	1982	1989	18th ranking carriers
Empire	1980	1986	Acquired by Piedmont
Horizon	1983	1986	Acquired by Alaska
New carriers(17)			
Air Atlanta	1984	1986	Ceased operation due to bankruptcy
Air One	1983	1984	Ceased operation due to bankruptcy
American International	1982	1984	Ceased operation due to bankruptcy
American West	1983	1989	11th ranking carrier
Florida Express	1984	1988	Acquired by Braniff
Frontier Horizon	1984	1985	Ceased operation due to bankruptcy
Hawaii Express	1982	1983	Ceased operation due to bankruptcy
Jet America	1982	1986	Acquired by Alaska
Midway	1979	1989	16th ranking carrier
Muse (Transtar)	1981	1985	Acquired by Southwest
New York Air	1980	1985	Acquired by Continental
Northeastern	1982	1984	Ceased operation due to bankruptcy
Pacific East	1982	1984	Ceased operation due to bankruptcy
Pacific Express	1982	1984	Ceased operation due to bankruptcy
People Express	1981	1986	Acquired by Continental
Presidential	1985	1987	Became feeder carrier for United
Sunworld	1983	1988	Ceased operation due to bankruptcy

* Date carrier began interstate service with jet aircraft.

** Size ranking based on passengers carried during 12 months ended September 1989.

Source: Donald Pickrell, "Airline Deregulation"

TABLE 4.3: Proliferation of USA Domestic Hubs

AIRPORT	AIRLINES HUBBING IN 1979	AIRLINES HUBBING IN 1988*
Atlanta	Delta/Eastern	Delta(58%)/Eastern(36%)
Baltimore	-	Piedmont
Charlotte	-	Piedmont(92%)
Chicago (Midway)	-	Midway
Chicago (O'Hare)	American/United	United(51%)/American(29%)
Cincinatti	-	Delta
Dallas/FtWorth	American/Braniff	American(64%)/Delta(26%)
Dallas (Love)	Southwest	Southwest
Dayton	-	Piedmont
Denver	Frontier/United	United(44%)/Contin'l(43%)
Detroit	-	Northwest(59%)
Houston	-	Continental(77%)
LaGuardia	-	Eastern(23%)
Memphis	-	Northwest(84%)
Miami	-	Eastern(45%)
Minneapolis	Northwest	Northwest(78%)
Nashville	-	American
New York (JFK)	-	Pan Am(29%)/TWA(27%)
Newark	-	Continental(43%)
Philadelphia	-	USAir(37%)
Phoenix	-	American West(44%)
Pittsburgh	USAir	USAir(85%)
Raleigh-Durham	-	American
Salt Lake City	-	Delta(79%)
San Francisco	United	United(40%)
Seattle	United	United(31%)/Alaska(21%)
St Louis	TWA/Ozark	TWA(83%)
Washington (Dulles)	-	United

[* - First six months. %'s refer to enplanements.]

Source: G Williams, "Establishing An Effective Economic Regulatory Policy for the Airline Industry"

TABLE 4.4: The Major US Hubs in 1988

Hub City	Dominant Airline	Market Share (%)
Pittsburgh	USAir	85
St.Louis	TWA	83
Salt Lake City	Delta	80
Minneapolis	Northwest	78
Houston	Continental	77
Dallas	American	64
Detroit	Northwest	60
Nashville	American	59
Atlanta	Delta	58
Chicago	United	51

Source: Wheatcroft and Lipman, "European Liberalisation and World Air Transport".

TABLE 4.5: CRS Market Share in 1985

System	Vendor(s)	% of Locations	% of Agency Generated Revenue
Sabre	American	35	46
Apollo	United	24	28
Pars	TWA/Northwest	13	10
SystemOne	Texas Air	17	10
Datas II	Delta	10	5

Source: Airline Business, January 18, 1988.

TABLE 4.6: Comparison between the GCC and USA Markets

	USA	GCC
Domestic/International traffic split	Deregulated market is domestic	High percentage are international
The non-scheduled market	Was not very high prior to deregulation	Extremely low
Market size	Large domestic market	Significantly smaller than the USA domestic market
Average Route Length	1300km	753km
Scheduled airlines costs	Lower	Higher
Productivity	Higher	Lower
CRS	Owned by the largest airlines (eg United owns Apollo and American owns Sabre)	They belong to different world international airlines which have CRS systems
Ownership of the major airlines	All of them are privately owned	All government owned
Passenger traffic by rail	Less than 0.05%	Extremely low, and it does not exist between the GCC countries
Airport ownership	Private	Government owned and operated
Airport congestion	Lower	Does not exist
ATC facilities problems	Low	Lower

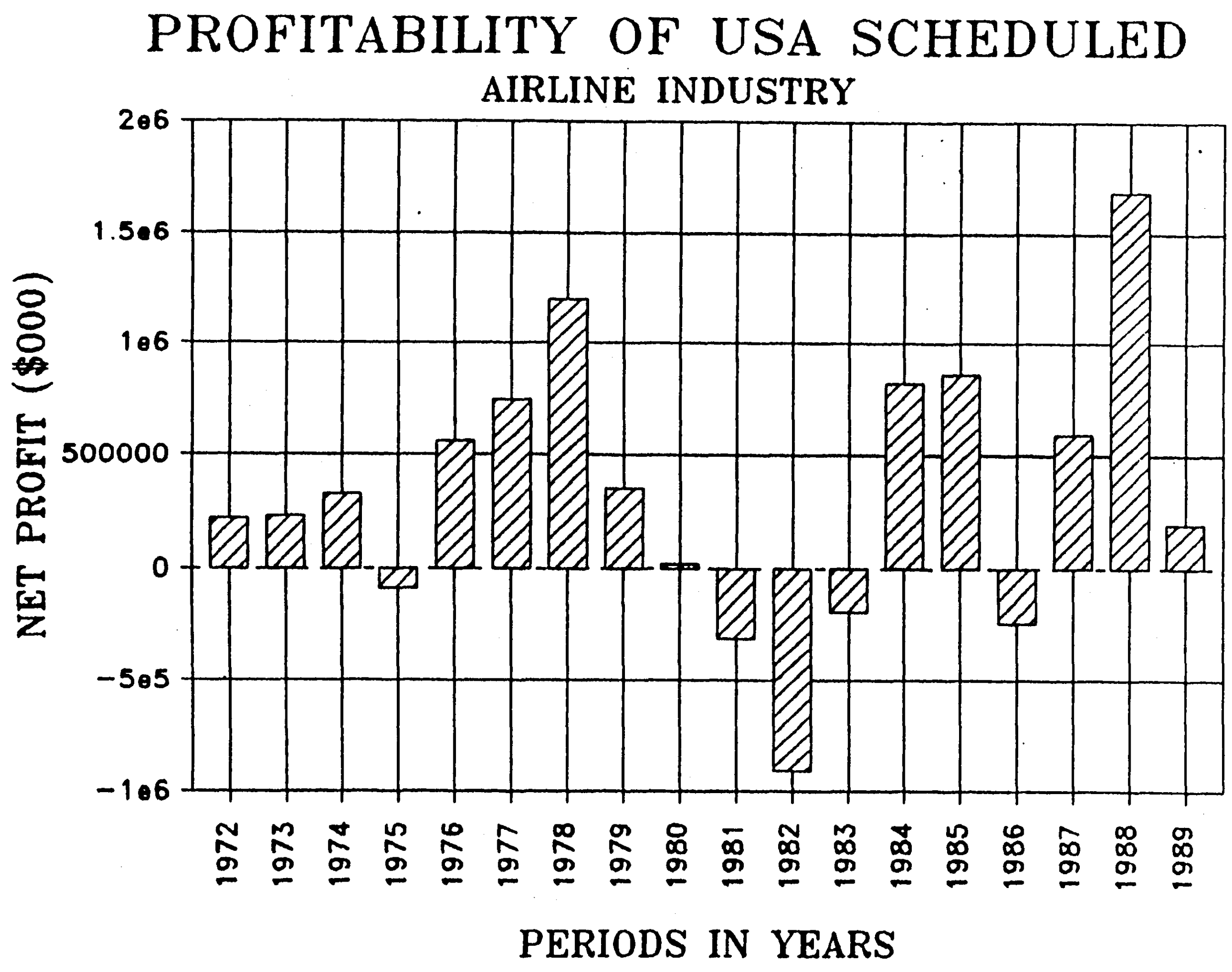


FIGURE 4.1: Profitability of USA Scheduled Airline Industry

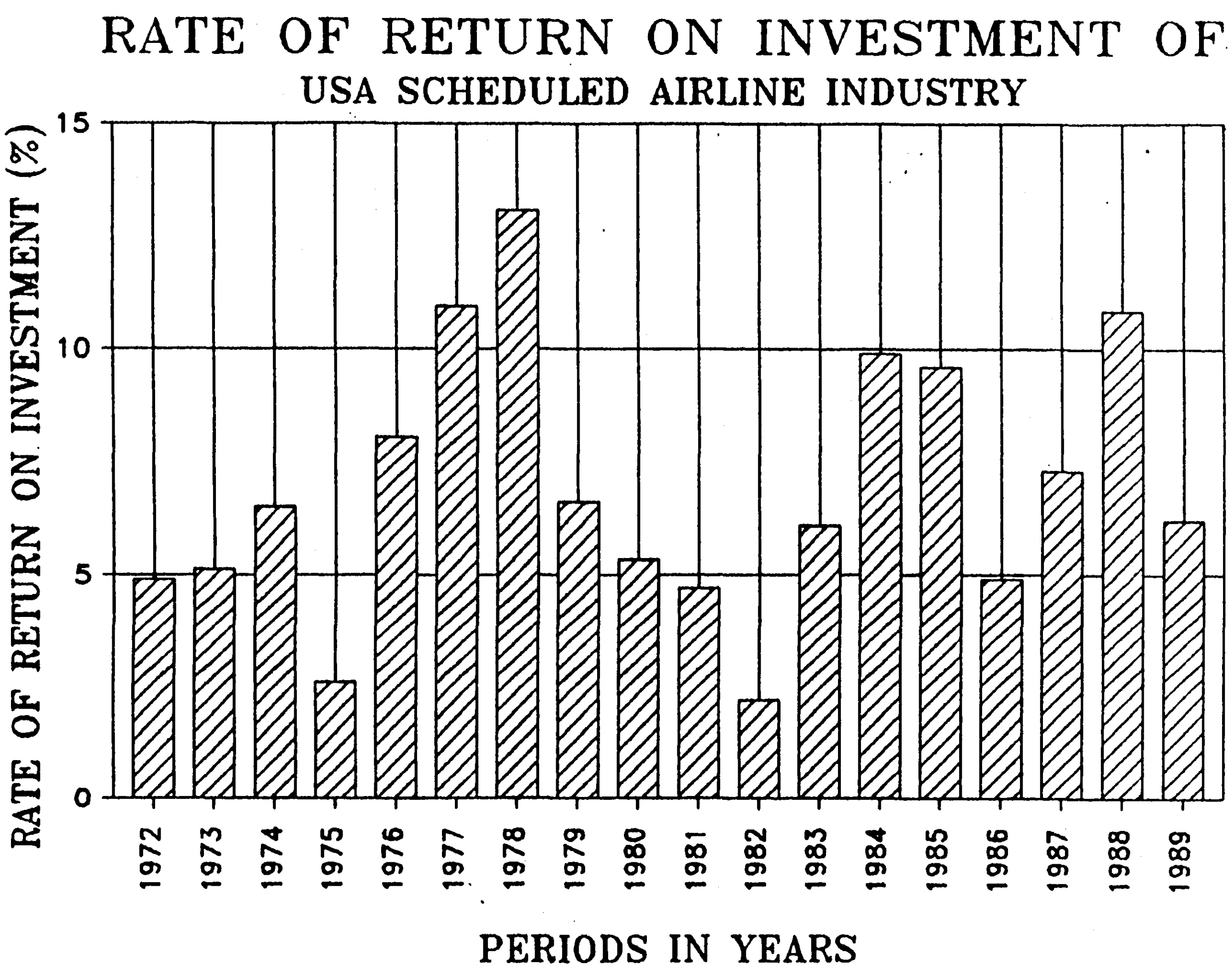
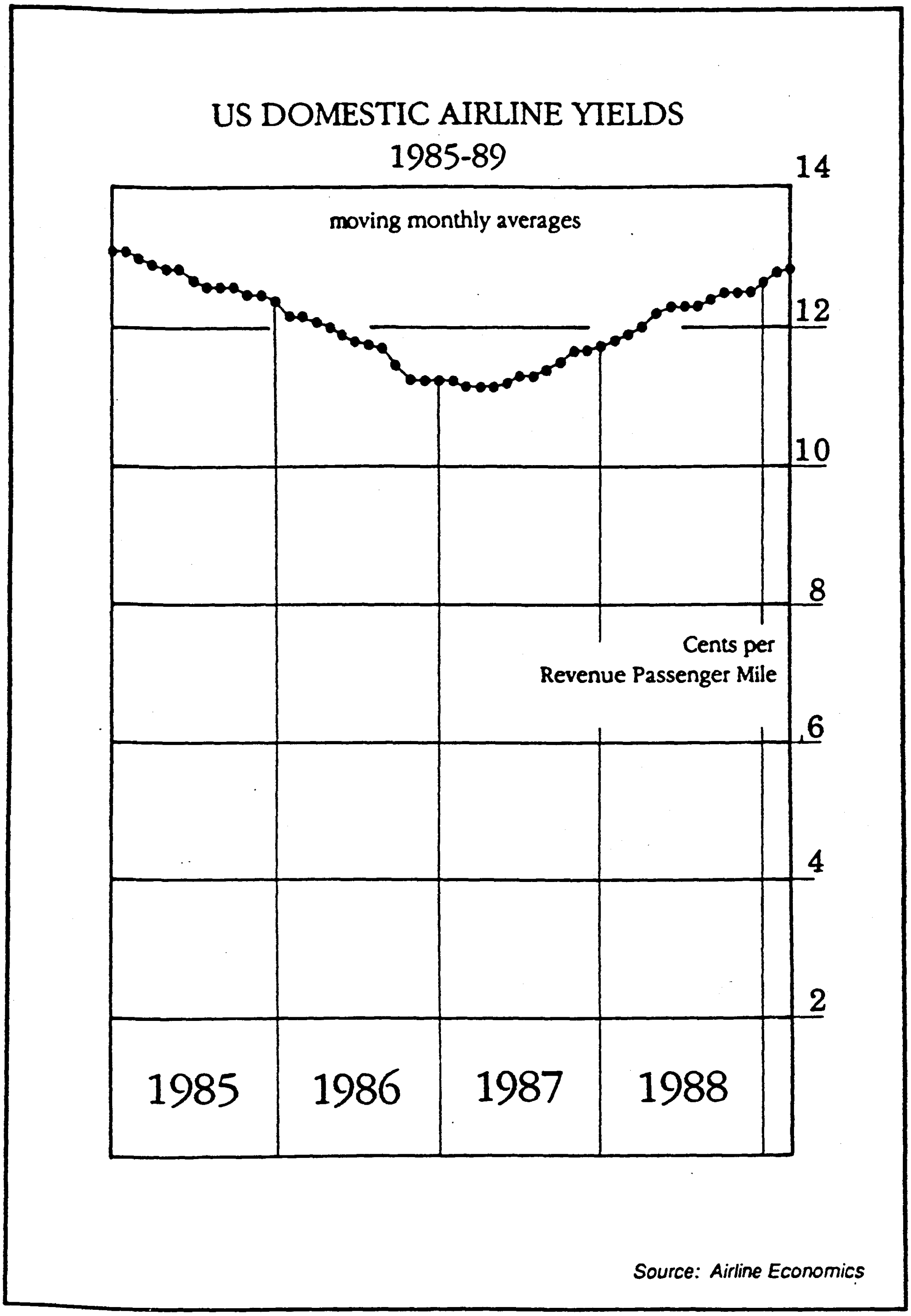


FIGURE 4.2: Rate of Return on Investment of USA Scheduled Airline Industry.

FIGURE 4.3: USA Domestic Airline Yields



Source: Wheatcroft and Lipman, 1990, p.14

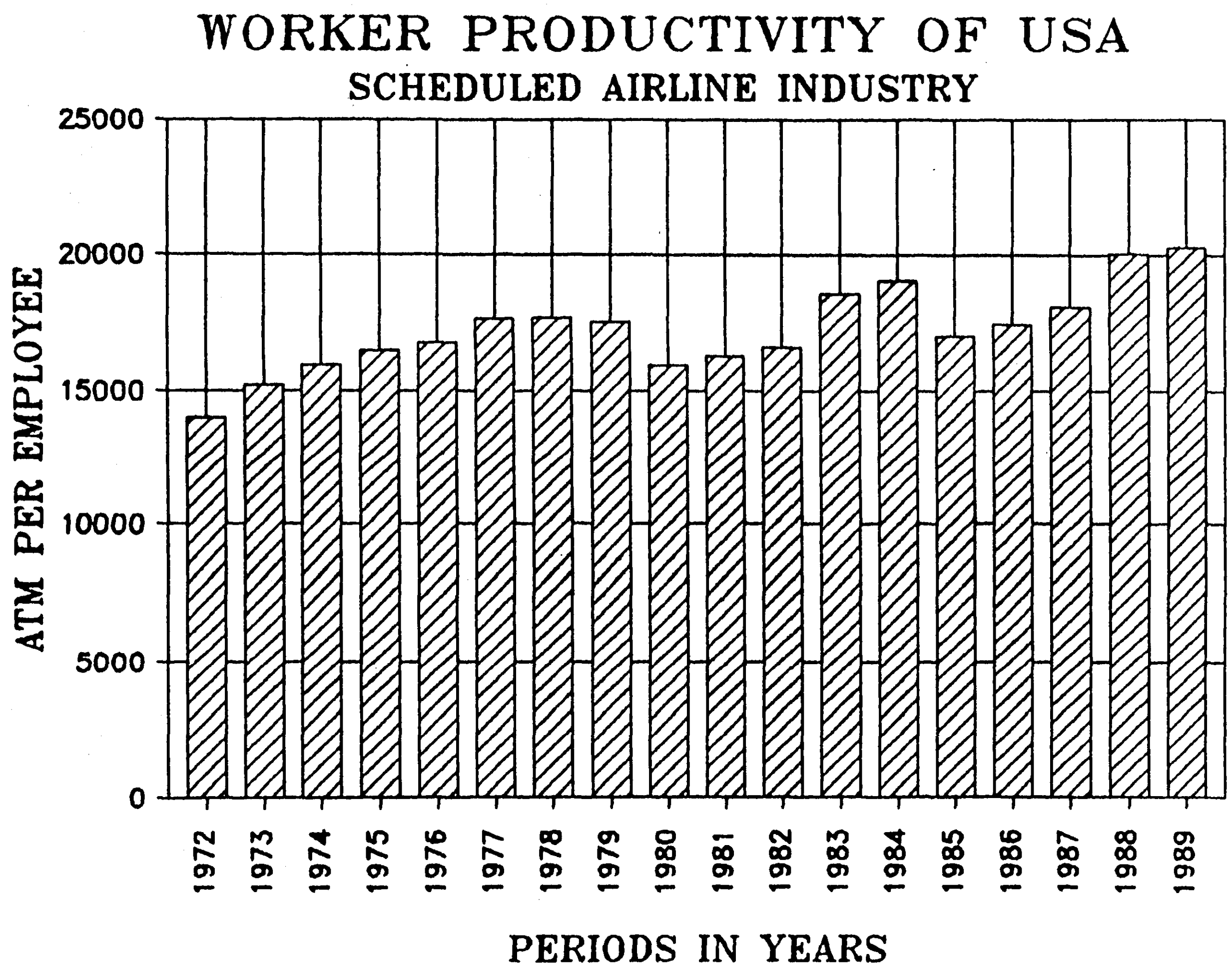


FIGURE 4.4: **Worker Productivity of USA Scheduled Airline Industry.**

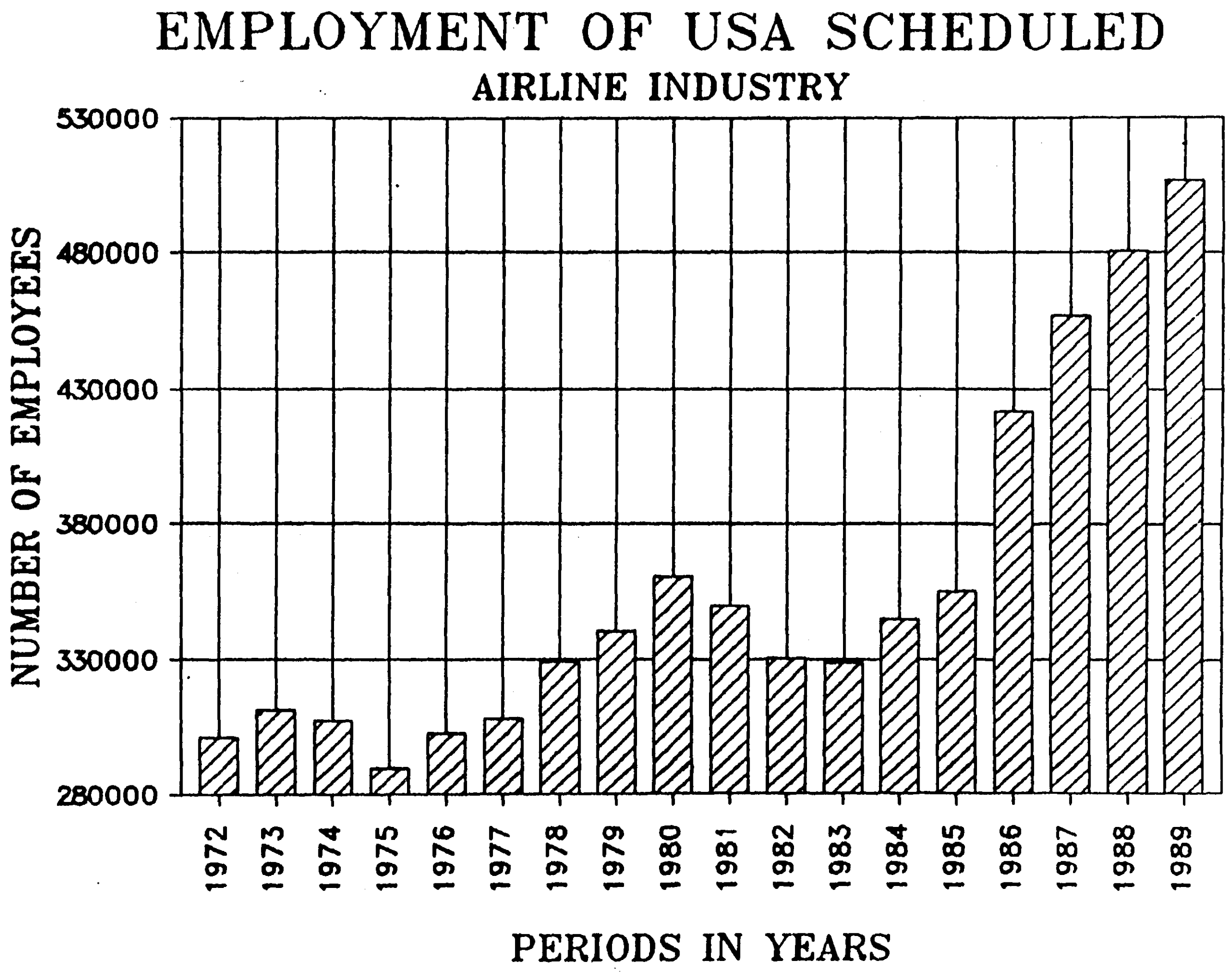
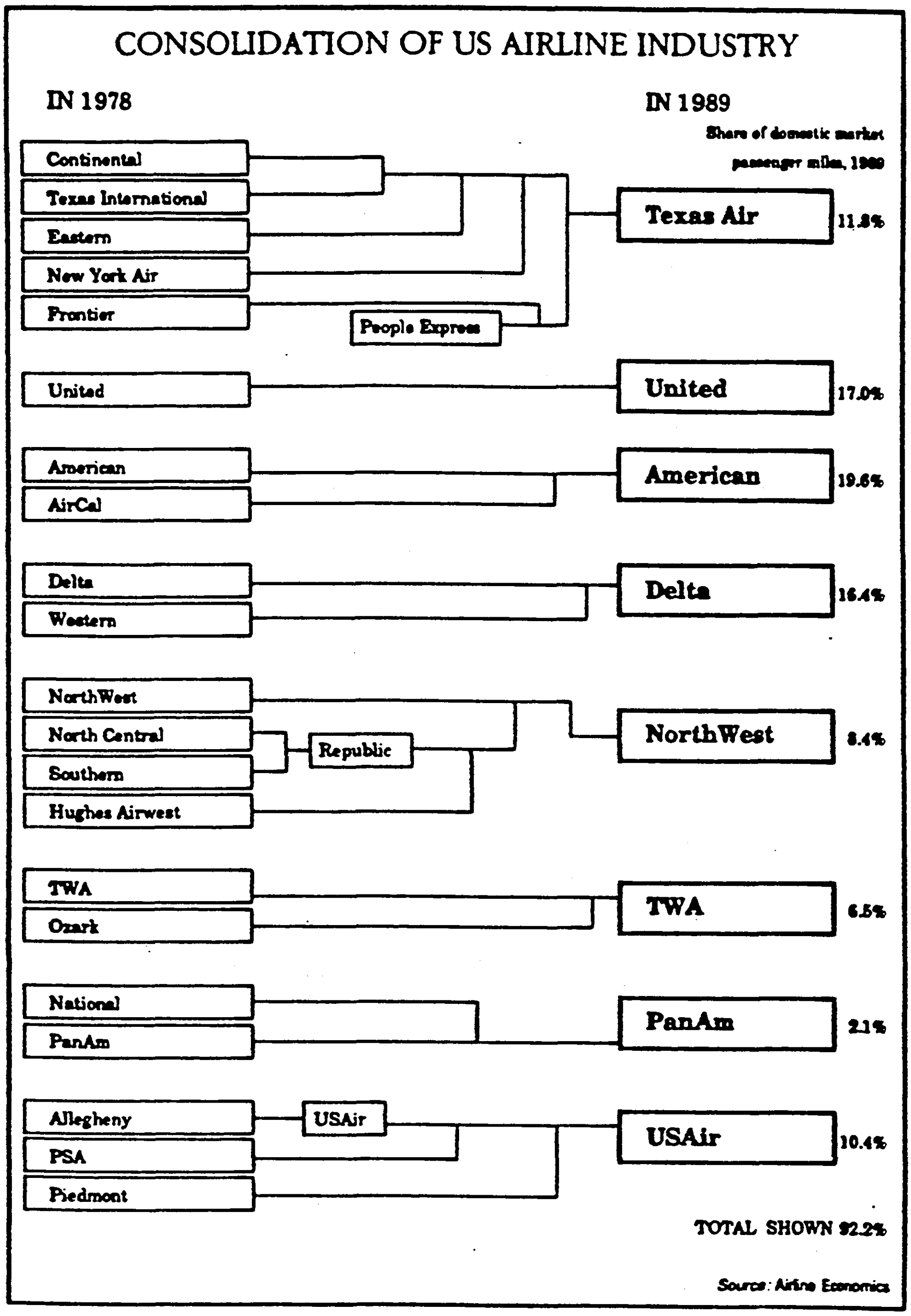


FIGURE 4.5: Employment of USA Scheduled Airline Industry.

FIGURE 4.6: Consolidation of USA Airline Industry



Source: Wheatcroft and Lipman, 1990, p.17.

NOTE: Since this figure was drawn up by these authors, PanAm has ceased operation and both Texas Air (Continental) and TWA have become financially very weak. The Eastern part of Texas Air has closed. Parts of PanAm and TWA have been absorbed into Delta, American and United.

REFERENCES

1. Donald Pickrell, edited by Kenneth Button, Airline Deregulation (England: David Fulton Publishers, 1991) p.10.

2. CAA Paper 84009, Deregulation of Air Transport (England, CAA, 1984) p.47.

3. Pickrell, pp.10-11

4. CAA Paper 84009, p.17.

5. Stephen Wheatcroft and Geoffrey Lipman, Air Transport in a Competitive European Market (England: The Economist Intelligence Unit, 1986) p.84.

6. Economic Co-operation and Development (OECD), Deregulation and Airline Competition (Paris, OECD, 1988) pp.75-76.

7. Pickrell, pp.41-42.

8. F.Alamdari, Airline Deregulation : An Analysis under Different Regulatory and Operating Environments (England: PhD Thesis, CIT, 1989) p.47.

9. Wheatcroft and Lipman, p.85.

10. Richard Pryke, Competition Among International Airlines (London: Trading Policy Research, 1987).

11. A.E.Khan, Surprises of Airline Deregulation (USA: American Economic Review, 1988) pp.316-322, and see also Alamdari p.35.

12. E.E.Baily, D.R.Graham, and D.P.Kaplan, Deregulation The Airlines (USA: MIT Press, 1986) pp.16-17.

13. Alamdari, pp.46-47.

14. Wheatcroft and Lipman, European Liberalization and World Air Transport (England: The Economist Intelligence Unit, 1990) p.13.

15. Wheatcroft, Air Transport in a Competitive European Market

16. Wheatcroft, 1990, p.20.

17. Pryke, pp.57-58.

18. Air Transport Association of America, The Annual Report of the U.S.Scheduled Airline Industry (USA: ATA, 1978-1990).

19. Pryke, pp.58-60.

20. Air Transport Association of America, The Annual Report of the U.S.Scheduled Airline Industry (Washington, D.C.: ATA, 1980-90)

21. Pickrell, pp.18-20.

22. Wheatcroft, 1990, p.13.

23. David Sawers, Competition in the Air (England: The Institute of Economic Affairs, 1987) pp.19-21.

24. Ibid, pp.17-43.

25. Kaplan, pp.142-149.

26. Air Transport Association of America, 1980-90.

27. Kaplan, p.37.

28. ICAO Digest of Statistics, Airline Annual Reports (Canada: ICAO, 1982-83).

29. Ibid, 1982.

30. Alamdari, p.24.

31. Ibid, p.47.

32. Kaplan, pp.135-151.

33. Sawers, pp.27-29.

34. Wheatcroft, 1990, p.16.

35. Wheatcroft, 1986, p.91.

36. Ibid, p.88.

37. Alamdari, pp.40-41.

38. George Williams, Establishing An Effective Economic Regulatory Policy for the Airline Industry (England: PhD thesis, CIT, 1990) pp.63-64.

39. Alamdari, pp.42-43.

40. Wheatcroft, 1990, p.21.

41. Alamdari, pp.43-44.

42. Wheatcroft, 1990, p.21.

43. Ibid, p.12.

44. Ibid, pp.15-16.

45. Ibid, p.23.

46. Ibid, p.23.

CHAPTER FIVE

THE DEVELOPMENT OF EUROPEAN LIBERALISATION

> **"We believe that the growing acceptance of 1992 as a focal point for the achievement of a single internal European market will have significant benefits for the development of air transport and tourism"**
>
> **(Wheatcroft and Lipman, 1990)[1]**

5.1 INTRODUCTION

Article 1 of the Chicago Convention of 1944 reaffirmed the concept of sovereignty over airspace, and it has been the keystone of aviation nationalism ever since. In addition, the Chicago Convention recognised the rights which protect any state within its own territory from foreign competition. International routes are established on the basis of bilateral air service agreements which are operated only by an airline "substantially owned and effectively controlled" by its own nationals[2].

Furthermore, the Treaty of Rome created more constraints on a common air transport policy within the European Community by its initial exclusion of air and sea transport from the general provisions dealing with Community transport policies.

In the 1980's, the focus of airline deregulation changed to the European market. In 1986, the Community agreed to move towards the creation of a single European market, by adopting the Single European Act which was defined as "an area without internal frontiers in which the freedom of movement of goods, persons, services and capital is ensured"[3]

However, pressures for air transport liberalisation in the Community came on the one hand from outside as a result of the US experience in deregulation and the challenge from low cost Asian carriers. On the other hand, pressures for liberalisation came from the Community itself through the Directorate General Transport (DGVII) and the Directorate General for Competition (DGIV), accepting the rules of the Treaty. Other

factors included consumer organizations, general liberal bilaterals being signed, and multilateral liberalisation through the Commission or European Court of Justice. The overall aviation objectives of the European governments are illustrated in Table 5.1.

The objective of this chapter is to review the development of liberalisation within the European air transport market and to draw lessons for the GCC market.

5.2 MAIN EVENTS WHICH LED TO THE CURRENT STATUS

In order to understand the development of the EEC air transport legislation, it is important to review the main events that led to the current status. These are as follows:[4]

1957	Treaty of Rome establishing the European Economic Community (EEC)
1960	A Memorandum was published raising the issue of the applicability of the competition rules to air transport.
1961	Memorandum adopted on the basic approach to a common transport policy.
1962	"Air transport was exempted from the competition rules"[5]
1972	Draft Council decision was issued on the first measures of a common approach to air transport.
1975	Report and draft decision were published regarding an action programme for the European aeronautical sector.
1974-1978	The European Court of Justice decided that transport rules do not apply to air and sea transport. However, they come under the General Rules of the EEC Treaty.
1977	A special working party was established to research future actions that could be necessary in the field of Community air transport.
1978	A priority list of nine issues approved by the Council for air transport covering economic, social and technical matters.
1979	A consultation procedure was proposed by the Commission on relations between member States and third countries in air transport.
	The Commission issued Memorandum No.1, "Air Transport: A Community Approach" which outlines the Commissioner's objectives.

1980	Proposal was made by the Commission regarding the authorization of scheduled inter-regional air services. However, after modification it was adopted in 1983 as Inter-Regional Air Services Directive which was a historically important step.
1981	A proposal was issued for a Council Regulation which applies Articles 85 and 86 to air transport.
	A report was published by the Commission on the level of scheduled passenger air fares and the procedures for fixing these fares.
	A proposal was issued for a Council Directive on tariffs for scheduled air transport between Member States.
1984	A second Memorandum (No.2) was issued by the Commission on "Progress towards the development of Community air transport Policy".
1986	Reaffirmation of the competition rules of air transport by the judgement of the European Court of Justice in the Nouvelle Frontiers case.
1987	A package of legislation was introduced which is known as Phase 1 of liberalization of air transport in the EC.
1988	The Commission introduced a regulation concerning Article 85(3) to coordinate revenue sharing, capacity, slot allocation at airports, ground handling services, consultation on tariffs and computer reservation systems which are known as the block exemptions.
1989	The Commission issued a report on the first year (1988) of implementation of the aviation policy approved in December 1987 (Phase 1).
	A proposal by the Commission was submitted for Phase 2 which covers market access, fares, capacity and the application of Article 85(3).
1990	The Ministers agreed the details of the second package (Phase 2).
1991	Proposal was published for the third package (Phase 3)[6]
1992	It is anticipated that the third package will be agreed by the end of 1992.

5.3 TREATY OF ROME

The Treaty of Rome was signed on 25 March 1957 by six governments, Belgium, France, Italy, Luxembourg, Netherlands and W.Germany, and it established the European Economic Community (EEC). The aim was to remove constraints and barriers to trade between the Member States in order to establish a "Common Market". Nevertheless, the six members were joined by Denmark, Ireland and the UK in 1973, Greece in 1981 and Portugal and Spain in 1986.[7]

The structure of the Treaty is divided into six main parts which are as follows:[8]

Part 1 - Principles (Articles 1-8)
Part 2 - Foundation of the Community (Articles 9-84)
Part 3 - Policy of the Community (Articles 85-130)
Part 4 - Association of the Overseas Countries and Territories (Articles 131-136)
Part 5 - Institution of the Community (Articles 137-209)
Part 6 - General and Final Provisions

Additional parts such as Setting up of the Institutions, Final Provisions, Annexes and Protocols are included.

However, Article 84 of the Treaty of Rome allows special provisions for air transport and it gives the Council a lot of freedom to decide how to regulate air transport.

In addition, the Treaty lays down only general and a large amount of secondary legislation, in the form of regulation, directives and decisions, which are needed to interpret and enforce these basic rules. The liberalisation process, therefore, depends on the introduction of legislation which enables the liberal policies of the Treaty to be applied to air transport.

5.4 THE EUROPEAN COMMUNITY PROCESS

The decision making processes in the EC distinguishes between the "consultation procedures" and the "cooperation procedure" as illustrated in Figure 5.1. Policy proposals start from the Commission, which is divided into 23 General Directorates headed by 17 commissioners who are politicians nominated by the Member States. Staff members, who are the civil service of the Community, serve the Commissioners[9].

The Council of Ministers make decisions in the form of Directives, Regulations, Decisions or Recommendations as illustrated in Figure 5.2. If matters of great importance are on the agenda, the Council of Ministers is attended by heads of government, but when special subjects are under consideration, attendance of departmental ministers of each Member State is more normal. The Council of Ministers decisions following the adoption of the Single European Act are made by a qualified vote (Article 148 of the Treaty) instead of the unanimity rule[10].

The Commission's proposals go through an extensive process of consultation involving the Economic and Social Committee and the European Parliament before going to the Council of Ministers for decisions. Lobbying in Brussels is important and many industry sectors have established "Euro-lobbies" to influence the final form of the proposals given to the Council of Ministers. Finally, the European Court of Justice in Luxembourg is responsible for the interpretation and implementation of Community law[11].

5.5 MEMORANDUM NO.1 AND NO.2.

The Commission has issued two Memoranda that outline its objectives. Memorandum No.1 is "Air Transport: A Community Approach" which was published in 1979 to outline the Commission's objectives in civil aviation and suggesting measures to be taken to achieve these objectives. Memorandum No.2 is "Progress towards the Development of a Community Air Transport Policy" which was published in March 1984. It re-stated and expanded the initial objectives, under four main headings:[12]

1. Balancing of interests without airline deregulation.
2. Flexibility and more competition within the current regulatory system.
3. Restriction to intra-community transport
4. Other important guidelines for the common air transport policy.

Nevertheless, Memorandum No.2 rejected the USA style of deregulation and advocated the following:

"- harmonisation of bilaterals between Community states to reduce government and airline constraints on market forces, most noticeably in respect of tariffs and capacity;

- application - at least initially - to intra-Community traffic; and

- introduction of the competition rules of the Treaty, but with exceptions for certain activities exempted".[13]

However, the following are the main proposals of the Memorandum:[14]

1. Adoption of fare zones or "zones of reasonableness" for greater pricing flexibility.
2. Introduction of a zone of free capacity with safety net of 25% of the market before any state intervenes to protect its own airlines.
3. Encouraging competition through allowing revenue-pooling agreements only if the transfer limits are extremely tight.

Nevertheless, from this Memorandum and from several speeches by officials of the Directorate General, the Commission's long-term air transport objectives could be summarised as follows:

"- Community airlines should be free to operate between any airports in the 12 member states.

- Until the creation of the single internal market on 1 January 1993, fifth freedom rights should be available for members' airlines on intra-Community services, but with some limits on the capacity offered.

- Multiple or double designation of airlines on all routes once traffic surpasses certain threshold levels.

- No capacity controls on air services.

- Cabotage (that is, the right to carry traffic between two points in the same country) should be available within limits.

- Fares to be set freely by airlines, but states should have powers to control predatory pricing. In time, a 'double disapproval' regime should be introduced.

- Airlines of one state (A) should have the same rights in another state (B) as airlines of that state (B).

- Anyone meeting the technical and economic standards required for establishing an airline in any Community state should have the right to set up an airline in that state without hindrance.
- Negotiations of traffic rights with non-community states should be carried out by the Community rather than bilaterally as previously"[15]

5.6 THE 1983 INTER-REGIONAL AIR SERVICE DIRECTIVE.

This was the first step towards the liberalisation of European air transport. However, the Council viewed the Directive to be of an experimental nature. The purpose of the Directive was to widen the scope of carriers, to develop markets, to contribute to increasing the intra-Community network, and to aid the development of the regions.

The Directive included the following restrictions:[16]

1. Between second major provincial airports (Category 2 airports) and smaller airports with international flight facilities (Category 3 airports).
2. Aircraft of 70 seats or less or maximum take-off weight of not more than 30 tons.
3. Maximum stage length of 400 kilometres, and shorter over mountains or sea.
4. Tariffs on inter-regional services had to be approved by both stages in consideration of "reasonable proportion of the costs of the air carrier's operation".

The basic principles of the Directive were as follows:-

1. The rules and regulations do not affect the relationship between the Home State and its airlines.
2. It applies to scheduled transport of passengers, or in combination with cargo and/or mail between Community airports.
3. It applies to Community airlines
4. Fares and rates should be based on a fair cost to price ratio and a fair return on capital.

5. Member states can, if they want, apply conditions that are less restrictive than the Directive.

5.7 BILATERAL LIBERALISATION

The UK-Netherlands renegotiation in June 1984 was the first major breakthrough in EC bilateral liberalisation. The key features introduced were free entry of new airlines, access by designated airlines to any destination in either country, a "double disapproval" regime for fare and no capacity controls[17]. Table 5.2 illustrates the traditional and new-style European air services agreements.

However, the UK-Netherlands agreement established the pattern for liberalised renegotiation of European bilaterals. Since then, the UK government has made agreements with West Germany in December 1984, Luxembourg in March 1985, Belgium in October 1985, Switzerland in December 1985 and the Irish Republic, and some relaxing of bilateral agreements with France in September 1985. The UK renegotiations with Netherlands, Luxembourg and Belgium were more liberal than the others[18]. Table 5.3 shows the main features of those bilateral agreements with regard to the liberalisation of route access, capacity constraints and tariff constraints.

The impact of bilateral liberalisation is the encouragement of more airlines to serve the international market. A good example is the UK-Netherlands where in June 1984 there were only four airlines flying between Amsterdam and London airports. However, by 1990, there were 10 airlines flying Amsterdam/Rotterdam-London routes[19]. There was a significant jump in available capacity between the previous routes which traffic growth did not match despite the drop in the level of promotional fares[20]. Since then the number of carriers has fallen significantly, largely through merger or failure and is now reduced to six and the two major players, British Airways and KLM, are considering some form of merger.

5.8 THE 1987 PACKAGE

The Council of Ministers adopted its first "package" on December 17, 1987. It is considered a major step in European aviation policy and the first step towards air

transport liberalization as a whole within the Community. It covers a much wider range of issues than the Inter-Regional Directive. The package consisted of the following:[21]

1. **Two regulations which dealt with the application of the competition rules to air transport (Council Regulation No.3975/87) and the procedures for exemptions (Council Regulation No.3976/87) permitted by Article 85(3) of the Treaty of Rome.**
2. **A directive (Council Directive 87/601) which dealt with scheduled air fares.**
3. **A decision (Council Decision 87/602) which dealt with market access and capacity sharing.**

Overall, the package introduced a more liberal fares regime which includes the concept of fare zones. In addition it abandoned the 50:50 sharing of capacity by air carriers of each state, and it facilitated the entry of new carriers by opening up market access[22]. Table 5.4 illustrates the first phase compared with the second phase of the European Liberalisation.

Karel van Miert, the EC Commissioner for Transport, described the first package as "A modest success". He summed up the 1987 package in June 1989 when he was speaking at an IATA Aviation Symposium in the following way:

> **"In my view the first phase of the package is proving a modest success. In traffic between member states a variety of more flexible arrangements have been made -some under bilateral agreements but many stemming directly from the December 1987 package. New routes have been created, especially between hub and regional airports, and airlines have been availing themselves of the fifth freedom possibilities created by the package. Scheduled passenger traffic has increased, and it would appear that in general airline yields have also improved. However, there is cause for concern since the fully flexible economy fare appears to have gone up slightly on intra-Community routes"[23].**

However, the Commissioner's views are given in detail about the first phase of liberalisation in the Report on the First Year (1988) of the Implementation of the Aviation Policy Approved in December 1987 which was published in 1989. This report was based on replies to Commission's questionnaire that was sent to all Member States. Wheatcroft and Lipman summarised the main conclusions of the report as follows:

"- Community airlines have made good use of favourable macroeconomic trends which have generated traffic increases.
- Unit operating costs of AEA airlines have been reduced, although fuel prices have played a key role in this development.
- The majority of airlines experienced a substantial increase in their load factors between 1986 and 1988.
- The general level of fares has followed the rate of inflation.
- Profitability has improved.
- There has been little change in the distribution of bilateral capacity shares within the Community.
- No requests have been made for exemptions from the application of the liberalised capacity sharing rules.
- The establishment of new routes between hubs and regional airports has developed favourably.
- In three instances applications for fifth freedom rights have been turned down but, in general, there has been a significant re-emergence of fifth freedom routings"[24].

Nevertheless, some states were reluctant to accept the implications of the 1987 package such as the following[25]:

1. France did not allow Belgian carrier Sobelair to operate a charter flight between Brussels and the French Antilles, and it refused to grant route rights in Europe to UTA.
2. Italy did not grant fifth freedom rights to Aer Lingus between Manchester and Milan or to British Airways between Lyons and Milan.

The Council of Ministers agreed further liberalisation measures should be taken in order to complete the internal market for air transport by 1992. The Commission had to produce a proposal, the second "package", before November 1989, and an agreement had to be accomplished on the next policy by June 30, 1990.

5.9 THE 1990 PACKAGE (Phase 2)

The Brussels meeting of the Council of Transport Ministers in December 1989 prepared a new package of measures. However, in June 1990 in Luxembourg, the Ministers agreed the details of the second package and to the longer-term objectives which are as follows:[26].

1. The zonal fare system was replaced with a "more liberal and effective" zonal system.
2. An increase of a further 7.5% of capacity points was allowed in each of the subsequent two years for any member state whose air carrier(s) had already reached a 60% share of total capacity on a country-to-country basis.
3. Allowing multiple designation to increase market access in all Community air routes with more than 140,000 passengers per year, by opening all intra-Community points (with some exceptions) to third and fourth freedom airlines and through increasing fifth freedom rights up to 50% of the seats on a through service.
4. By 1 January 1993, all bilateral limits on capacity shares will be abolished. Approval by double disapproval** of all intra-Community air fares may be established by that date.
5. By June 1992, the Council of Ministers plans to agree a common specification licensing system for the establishment of new airlines.

Overall, air transport services will be covered by a very liberal regulatory regime by 1993 if all these developments and proposals are implemented. Air carriers will be very

---

**In early 1992 it seemed unlikely that double disapproval will be a feature of the third package.

free to operate on any route from their State to any destination in the Community with extensive fifth freedom rights, but without any capacity control and very few tariff controls, given that double disapproval* is unlikely to block any fare proposals[27].

5.10 THE 1991 PROPOSALS

The European Commission has proposed the third and final package on air transport liberalisation approved in July 1991. Most of the remaining restrictions on competition should be abolished by January 1993.[28] The following are the 1991 proposals in regard to licensing of carriers:

1. Simple and clear minimum standards regarding financial structure, liquidity, insurance, licence duration and monitoring methods.
2. New airlines should have a minimum Ecu 100,000 of starting up capital, and they have to show that they can meet actual and potential obligations for two years.
3. Airlines should be owned by the majority of EC nationals, and the board should consist of a majority of EC nationals, too.

The following are the main fifth freedom and cabotage proposals:

1. Fifth freedom and cabotage should be fully implemented from January 1993 which means EC-licensed airlines have the freedom to fly anywhere within the Community without capacity limitations.
2. Essential but uneconomic air services to national development regions and between regional airports should survive in the single market.
3. Routes with less than 30,000 seats per year can be protected by limiting access to only one carrier or restricting aircraft size to a maximum of 80 seats.
4. Safeguard measures to deal with financially troubled airlines due to the absence of capacity restrictions.
5. The Commission decided against phasing the introduction of cabotage rights.

The Commission proposes that a double disapproval air fare regime will prevail from January 1993, in addition the Commission gave it three years to take effect. From 1996

automatic approval should be possible. The Commission seeks to restrict procedures where government and others can appeal against fares to only routes where competition is limited and to fully flexible fares.

The Commission proposes to integrate scheduled and charter air services because it could not find good reasons to introduce different rules for basically the same product. The Commission proposed also that all the unused slots should be pooled and then at least half of them allocated to new entrant carriers.

However, the EC Transport Ministers met in Brussels on 26 March 1992, and they came down in favour of free fare pricing with safeguards to stop fares being too high or too low. In addition, the AEA said that double disapproval will not be applied. The EC ministers will meet in June 1992 to pass the third and final set of resolutions on air transport liberalisation. Furthermore, the Commission is to investigate additional subjects such as tax breaks, route subsidy, waiving landing charges and duty-free trade concessions to state-owned airlines.[29]

5.11 ACTIONS INITIATED BY THE EUROPEAN COURT OF JUSTICE

The European Court of Justice made its first historical decision in the Nouvelles Frontieres case in 1986, which arose from a French Court. The Court declared that air transport is subject to the Competition Rules of the Treaty of Rome[30].

In addition, there are two European Court of Justice decisions which enforce the extra-territorial nature of the Community rules which are as follows:[31]

1. **The "Pulp Paper Case" in 1988, in which the Court upheld a decision of the Commission to fine 36 USA, Canadian and Scandinavian pulp paper companies for price fixing.**
2. **The "Ahmed Saeed" judgement in 1989, the Court re-endorsed the view of the previous case. Two Frankfurt travel agencies sold cheap Frankfurt-Tokyo tickets that were bought very cheaply from Portugal as Lisbon-Frankfurt-Tokyo tickets.**

After throwing away the Lisbon-Frankfurt coupon, the agencies resold these tickets which was contrary to IATA and German regulations. The Court decided that this was not contrary to Community Law.

5.12 CONCLUSIONS

The Commission has developed four main areas of policy which are listed below:[32]

1. Liberalisation, which includes the following:
   - Air transport policy which contains air fares, market access, capacity control and licensing of air carriers.
   - Protection against anticompetitive behaviour.
   - Protection against unfair behaviour.
2. Harmonisation which covers the following areas:
   - Safety for accident investigation, common airworthiness requirements, common licences requirements, and for flight-time limitations.
   - Fair competition through a code of conduct for computer reservation systems, allocation of slots, and regular consultation between airports and users.
   - Consumer protection through rules for denied boarding compensation, common rules for liability and a code of conduct for travel agents.
   - Environment (noise limitations).
3. Infrastructure issues, which relate to serious problems in the European aviation system, such as capacity problems arising from unsatisfactory air traffic control systems and from insufficient runway capacity.
4. External policy which covers agreements between a Member State and a third country especially in matters such as air fares, capacity control and market access.

5.13 LESSONS FOR THE GULF CO-OPERATION COUNCIL STATES

Lessons can be learned from the European Community air transport liberalisation process by the GCC, given that the GCC does not have any infrastructure problems especially at its major airports. On the other hand, most of the GCC market is very

regulated. For example, monopolistic markets exist in Saudia Arabia controlled by Saudia Airways and in four Gulf States (except Dubai) controlled by Gulf Air.

The main lesson from the European liberalisation for the GCC is that the GCC has initially to define the level of freedom they are aiming for, and what would be best for the GCC consumers, airlines and governments. The second important and main lesson is that the liberalisation process in the GCC has to be smooth and gradual following the example of what happened within the European Community.

The third lesson is that the GCC has to establish a Court of Justice, such as the European Court of Justice, to be responsible for implementing the Community law.

The fourth lesson is that there is a need to establish consumer organizations in the GCC in which consumers views and problems related to air transport could be sent to officials who have the power to regulate, deregulate and re-regulate the market.

The fifth important lesson is that the GCC governments do protect their national carriers which are mostly governmental-owned airlines. Therefore, the 1983 Inter-Regional Air Services Directive, with some modification, is a very suitable model for the GCC to follow as a first step because it does not cause major threats to the national carriers.

TABLE 5.1: Aviation Objectives of European Governments

1. **ON BEHALF OF THE CONSUMER**
    - 1.1 **Reasonableness of tariffs:**
        - a. **A range of market oriented products**
        - b. **No need to pay for unwanted product features**
        - c. **Cost related fares**
    - 1.2 **Simple, comprehensible tariff structure**
    - 1.3 **Convenient interlining arrangements**

2. **ON BEHALF OF AIRLINES**
    - 2.1 **Economic viability of airlines**
    - 2.2 **Improvements in airline efficiency**
    - 2.3 **Maximisation of market opportunities for their airlines**

3. **ON BEHALF OF OTHER PARTS OF THE AIR TRANSPORT SYSTEM**
    - 3.1 **Avoidance of capacity problems (e.g.airport congestion, air traffic control delays)**

4. **ON BEHALF OF OTHER ASPECTS OF THE PUBLIC INTEREST**
    - 4.1 **Maintenance of services to smaller communities**
    - 4.2 **Protection of tax payers against airline subsidies**
    - 4.3 **Avoidance of excess airline profits**
    - 4.4 **Benefits for the tourist industry**
    - 4.5 **National economic, prestige and cultural objectives**
    - 4.6 **Environmental protection (e.g. noise)**
    - 4.7 **Efficient use of resources (e.g. energy)**
    - 4.8 **A balance between air and surface transport**
    - 4.9 **Maintenance of safety standards**

Source: Wheatcroft and Lipman, 1986.

TABLE 5.2: Traditional and new-style European air services agreements.

	Traditional bilateral	New-style bilateral[a]
Airlines	One per route from each state - in most cases this was the national carrier	Multiple designation
Routes	Only to points specified in bilateral	Open route access - airlines can fly on any route between two states.
Capacity	Shares 50:50 - between airlines of two states	No capacity control
Fares	Approval of both governments needed - but negotiated through IATA	Double disapproval - fares can be rejected only if both governments disapprove.

[a] e.g. UK-Netherlands as negotiated in 1984 and amended 1985.

Source: Rigas Doganis, "Flying Off Course", 1991.

TABLE 5.3: Liberalised UK Bilateral Agreements with other European Countries.

Country	Route Access Freedom	Capacity Freedom	Tariff Freedom
Netherlands (1985)	Yes	Yes	Yes
Ireland (II)	Yes	Yes	Yes
West Germany	Yes	Yes	Limited
Luxembourg	Yes	Yes	Yes
Belgium	Yes	Yes	Yes
Switzerland	Yes	Yes	Limited
France	Limited	Limited	No
Spain	Limited	Limited	No
Italy	Limited	Limited	No

Source: R.Doganis, 1991, pp.80-81, K.Button, 1991, p.95, and F.Alamdari, 1989, p.59.

TABLE 5.4: Second Phase of Euroliberalisation Compared with First Phase.

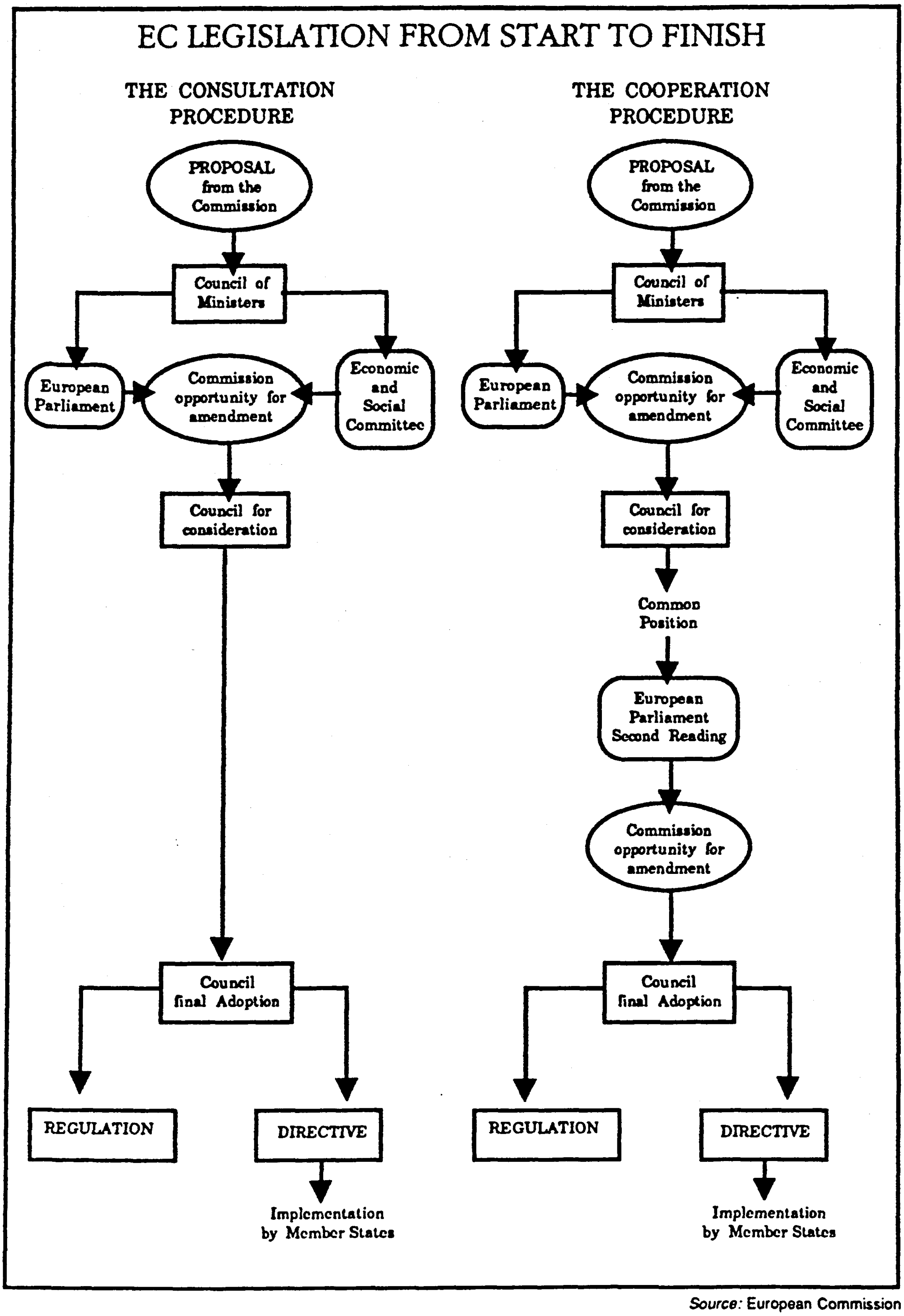
SECOND PHASE OF EUROLIBERALISATION
COMPARED WITH FIRST PHASE

	Council Agreement December 1987	Commission Proposals July 1989
COMPETITION RULES	To be enforced unless block exemptions agreed for intra-European agreements.	Block exemptions to be extended to domestic and third country agreements.
FARES	Pricing controls relaxed by zonal systems.	Double disapproval rule proposed.
CAPACITY CONTROLS	"Safety net" reduced to 60/40 from October 1989.	"Safety net" further reduced to 75/25 from April 1992.
MARKET ACCESS	New encouragement for regional services but no obligation to give double designation to own airlines.	States obliged to grant licences for own airlines if conditions are met.
MULTIPLE DESIGNATION	"Trigger levels" reduced from 250,000 passengers in 1988 to 180,000 in 1990.	"Trigger levels" further reduced to 100,000 passengers in 1992.
FIFTH FREEDOM	Agreed but limited to 30% of seats.	Limit increased to 50% with no limit for regional services.
CABOTAGE	Not included	Allowed on intra-European routes with 30% limit.

Source: European Commission

Source: Wheatcroft and Lipman, 1990

FIGURE 5.1: EC Legislation from Start to Finish



Source: European Commission, and Wheatcroft 1990.

FIGURE 5.2: Community Actions

COMMUNITY ACTIONS

REGULATIONS

Regulations have general application. They are binding in their entirety and directly applicable in all Member States.

DIRECTIVES

Directives are binding on Member States, as to the results to be achieved, but leave the implementation to Member States through their own legislation.

DECISIONS

Decisions are binding on those to whom they are addressed and no national legislation is needed.

RECOMMENDATIONS

Recommendations are not laws and have no binding effects.

Source: European Commission

Source: European Commission, and Wheatcroft, 1990.

REFERENCES

1. Stephen Wheatcroft and Geoffrey Lipman, European Liberalization and World Air Transport. (England: The Economist Intelligence Unit, 1990).

2. Ibid, p.1

3. Ibid, p.3

4. Michelle L.Gregory, Progress Towards a Liberalised Air Transport Industry in Europe (England: MSc Thesis, Cranfield, 1990) pp.7-11.

5. Ibid, p.7

6. Commission of the European Communities, Completion of the Civil Aviation Policy in the European Communities Towards Single Market Condition (Brussels, EEC, 1991).

7. George Williams, Establishing an Effective Economic Regulatory Policy for the Airline Industry (England: PhD thesis, CIT, 1990) p.126.

8. Gregory, pp.22-23

9. Wheatcroft, pp.5-6

10. Ibid, pp.5-7

11. Ibid, p.5

12. Gregory, pp.17-20

13. Stephen Wheatcroft and Geoffrey Lipman, Air Transport in a Competitive European Market (England: The Economist Intelligence Unit, 1986) p.51.

14. Rigas Doganis, Flying Off Course (England: Harper Collins Academic, 1991) p.82. Also see Wheatcroft, 1990, pp.52-57.

15. Doganis, pp.82-83

16. R.Kaze, European Regional Services (UK: Travel and Tourism Analyst Survey, Dec.1987).

17. Doganis, pp.79-80.

18. F.Alamdari, Airline Deregulation: An Analysis under Different Regulatory and Operating Environments (England: PhD thesis, CIT, 1989) pp.58-59.

19. Doganis, p.81.

20. Ibid, p.82.

21. Wheatcroft, 1990, pp.36-37.

22. Doganis, p.87

23. Wheatcroft, 1990, p.41.

24. Ibid, p.42.

25. Ibid, p.42.

26. Doganis, pp.88-89.

27. Ibid, p.89.

28. The Avmark Aviation Economist, Third Package proposals (England: The Avmark, July/August 1991) pp.2-3

29. Flight International, European Ministers back lower air fares (England: Flight International 1-7 April, 1992) p.11.

30. Wheatcroft, 1990, p.5.

31. Doganis, p.90.

32. Commission of the European Communities, 1991, pp.2-7.

CHAPTER SIX

THE IMPACT OF EUROPEAN LIBERALISATION

6.1 INTRODUCTION

The objective of this chapter is to study the impact of the European Community's liberalisation process on the airline industry, and to draw lessons for the GCC. This objective will be achieved through analyzing the European air transport market, types of European carriers, infrastructure, congestion, mergers and consolidation, CRS and code sharing, hub concentration and airline strategies.

The US experience of deregulation attracted the European policy makers for the following reasons:

1. Lower fares, where the House of Lords Select Committee on the European Communities (1980) pointed out that the fares in Europe are double those of comparable services in the USA[1].
2. Cost-benefit terms, i.e. the US government paid fewer subsidies.
3. US airlines yielded a positive rate of return.

However, it was recognised that the European Community's commercial environment in a liberalised atmosphere would be very different from that in the deregulated USA because Europe has the opportunity to learn from the USA experience. In addition, the USA had few previous examples and references on deregulation on which to gauge the effect. As a result, the USA carrier did not have any modern examples of appropriate strategies and commercial behaviour to adopt in a deregulated environment. On the other hand, Europe has the US experience of deregulation, and a knowledge of other industry sectors within Europe.

Overall, with regard to European liberalisation, the following are important points to consider:[2]

1. The move towards European liberalisation, no matter how gradual, is now reaching a conclusion.
2. Many European carriers have changed their strategies and now are planning on the assumption of a free European market.
3. Global factors that have an impact on European liberalisation are US deregulation, strong competition from Asian and North American carriers, and increased pressure from pro-liberalisation forces within Europe.

6.2 THE EUROPEAN AIR TRANSPORT MARKET

The European Community's air transport market is different from the USA and other countries in the world. Table 6.1 illustrates a comparison between the European and the USA markets.

In addition, the following are the main characteristics of inter-European competition:[3]

1. All EC carriers have less than 17% of the intra-Community scheduled market.
2. Competitors range from fully private to fully government-owned.
3. Newcomers to scheduled service do not really represent a threat in the intra-European market in the coming economic upturn.
4. High speed rail might capture 4-7% of the short haul high yield O&D markets by 1995-97.
5. Except in the UK, most of the national domestic markets are at present monopolies.
6. Incremental capacity will not be available in the future at the main European airports.
7. All Euro majors have less than 46% market share of their home intra-EEC hub traffic flows.
8. There is a 8-10 cents high/low range difference from the average in terms of operating costs per ASK within the European scheduled carriers group.
9. There is much less momentum for charters to move to scheduled services after the failure of Air Europe and TEA.

10. Charters have cost advantages over Major carriers.
11. Many forecasts, such as those of the Eurocontrol and ECAC, suggest that the demand within Europe will double by the end of the century. However, the European single market would generate more intra-European business class passengers[4].

With regard to liberalisation, Europe has the following characteristics which will tend to increase stability:[5]

1. Most of the European carriers are not privatised.
2. Europe did not suffer a single unified economic downturn in the early 1990s.
3. Most of the American and Asian foreign competitors are in the early 1990s faced with economic downturns in their own countries.
4. The UK air transport domestic market is the only liberalised market in Europe.
5. The European airlines have not been involved in permanent yield-depressing fare wars.
6. Most of the European carriers have until now been able to avoid massive infrastructural investment.

On the other hand, Europe has the following disadvantages:[6]

1. No fast recovery is forecast for the European economies.
2. There are strong signs of stronger USA "mega" competition which is already changing market shares on the Atlantic.
3. European airlines have made limited gains in decreasing absolute costs and optimising organisational structure.
4. The European social/labour laws will limit the European-majors ability to compete with USA-majors on an absolute cost basis.
5. There is only marginal growth in intra-European air travel.

6.3 TYPES OF EUROPEAN CARRIERS

The European airlines based in ECAC countries (European Civil Aviation Conference) are not all Community airlines. However they can be considered as "European" and can be divided into the following categories (Organisation for Economic Cooperation and Development, 1988):[7]

1. There are 22 ECAC states and the same number of flag carriers such as British Airways and Air France. However there are 12 Euro-majors - essentially the major airlines of the EC - which are illustrated in Table 6.2. In addition, Table 6.3 presents the Euro-majors rankings by passengers carried, passenger yield and passenger load factor.
2. Charter carriers which provide non-scheduled services such as Britannia in the UK and Air Charter in France.
3. Regional carriers which serve non-schedule and regional markets such as Air UK in the UK and TAT in France.
4. There are approximately 60 small airlines with less than 250 employees which serve charter, local and minor cargo operations.

There are factors which influence the growth of Euro-majors such as fare wars, their use of charter affiliates to take traffic from the Euro-charters, mergers and alliances and establishing multi-hub networks.[8]

However, factors that reduce the growth of the Euro-majors include infrastructure constraints, Euro-charter airlines moving to scheduled services, increasing competition from US mega carriers, and ground transport competition such as rail (especially after the opening of the Channel Tunnel).[9]

Since at least half of the intra-European traffic is carried on non-scheduled services, in order for the Euro-majors to expand at a faster pace, they have to increase their market share by gaining from non-affiliated charter traffic. In addition, they have to fight between themselves. Therefore, the EC has to establish relevant competition legislation that prohibits unfair competition and the abuse of dominant position.

The US experience showed that after deregulation, the major US charter carriers expanded into scheduled services where one by one they collapsed. Furthermore, all the US charter carriers which entered the scheduled market in the early 1980s are not in business today. World Airways tried to survive by becoming a pure charter airline,but this too failed. [10]

There are many reasons behind the decision by some European charters to enter scheduled services. They include the following:[11]

1. To increase yields by carrying higher fare business and independent leisure market.
2. Selling blocks of seats on their scheduled flights to tour operators.
3. Scheduled services attract passengers in winter when charter operations are very low.
4. Scheduled operations have priority over charters on allocating runway slots at congested airports.
5. To expand the total market base profitably.
6. Charter carriers have lower operating costs which makes them feel that they will be in a good competitive position compared with the scheduled carriers.

However, air transport in Western Europe has been unique because large percentages of holiday passengers have been carried by charter flights operated by privately owned airlines. Figure 6.1 indicates that 65% of total passenger-km in 1988 on international services within ECAC Europe was carried by charters. Nevertheless, this fraction of the airline industry will change in the next decade for the following reasons:[12]

1. The decreasing demand for "sun and sand" holidays.
2. The major scheduled airlines will have greater freedom in the holiday travel market due to liberalisation.
3. The major scheduled airlines have some marketing advantages with respect to their large size.

Finally, the European Regional Airline Organisation (ERA) is estimated that regional air traffic increased by 20% in both 1990 and 1991. This success by the regional airlines has attracted the major airlines to invest in some of them so that they could be used as feeders. The two main problems that face the regional airlines are airport congestion and impending shortages of skilled personnel (particularly engineers) [13].

6.4 INFRASTRUCTURE CONGESTION

Infrastructure congestion is one of the biggest constraints facing liberalisation in the European Community. However, Wheatcroft and Lipman in 1990 indicated the seven most important facets:

"- Demand, in terms of passenger numbers and aircraft movements, is increasing much faster than forecast.
- Air traffic control equipment in key locations needs to be modernised and coordination between control centres needs to be improved.
- There are shortages of trained ATC staff and entrenched industrial relations problems.
- The planning, decision and financial appropriations process for infrastructure enhancement can be extremely long due to complex government procedures and political impediments.
- Liberalisation accentuates the difficulties, accelerating the dynamics of change and encouraging hub concentration.
- Governments and airlines are considering radical solutions to avoid the waste and delays, like privatisation of airports and streamlining of ATC management. They are speeding up development of new technology like satellite communication and collision avoidance systems.
- Increasing environmental consciousness is placing new limits on aircraft operation and airport expansion"[14]

However, the key congestions in Europe with regard to liberalisation are constrained air traffic control facilities, airport constraints, and the traditional method of national control of aviation infrastructure ownership operation and financing.[15]

Furthermore, Susan Carey described the European congestion problems in the Wall Street Journal in December 1987 as:

> "Quite simply Western Europe doesn't have enough runways, airports, airspace or air traffic controllers to handle the existing aviation demand. That has serious implications for the European Community's plan to begin limited, gradual deregulation of the air travel industry on January 1".[16]

6.5 MERGERS AND CONSOLIDATION

Deregulation has produced strong pressure for concentration and globalisation in the airline industry. The US experience of deregulation has led the airlines into mergers and concentration. By 1989, the six largest USA airlines carried 84% of the US domestic passenger-km.[17] US experience showed that large size airlines have the following benefits:

"- Attractions of large and widespread network.
- Ability to dominate operations at a hub(s)
- Control of distribution especially through CRS (Computer Reservation System).
- Ability to exercise price leadership.
- Value of network size in 'loyalty' marketing schemes e.g. 'Frequent Flyer'.
- Range of markets allows cross-subsidising of competitive pricing on particular routes.
- Marketing power of large scale advertising"[18]

The first of the modern mergers in Europe took place in 1988 when British Airways merged and took over British Caledonian, KLM with NederLines and Lufthansa acquired the majority shareholding in DLT. Furthermore, in 1990, Air France bought 55% of the shares of UTA.[19]

In addition, there is growing concentration among tour operators within the European travel industry which means that the inclusive tour market, which accounts for more than half of the intra-European air travel, will be controlled by few "mega" tour operators.[20]

It should be noted that some analysts believe that the only consolidations that will survive in the long term are the true mergers or joint ventures which involve operation under the same management, name and ownership.

However, the following are the barriers to mergers:[21]

1. The traditional concept of ownership and control.
2. Human nature of managers especially when nationalism and cultural differences existed.
3. Conservatism to believe that "Our way of doing things is best".
4. Government efforts to preserve competition.

Nevertheless, the European Commission will attempt to stop larger carriers from abusing their dominant position by the application of Articles 85 and 86 of the Rome Treaty and by applying strict conditions on further take overs or mergers.[22]

However, there are many indications from the US experience and from recent European mergers and consolidations that in the future the European airline industry will be dominated by a few giant companies.

6.6 CRS AND CODE SHARING

The ownership of powerful CRS and participation in global CRS distribution channels will be an important element of the competitive strategy of the mega carriers. Super CRS would provide an airline with the ability:

"- to cope with rapidly changing product and price information;
- to manage yields and inventory;

- to hook up travel agency networks;
- to distribute their products electronically;
- to protect national and regional markets;
- to penetrate foreign markets;
- to support a growing global market presence;
- to make money from fees and limit their own costs;
- to prepare for automation"[23]

However, in July 1989 the Council of Ministers approved the following code of conduct for the use of CRS:[24]

1. The system must be available to all airlines without discrimination and on an equal basis.
2. Participating airlines should have the right to join other systems.
3. Flight operations must be ranked on the following basis:
   First non-stop direct flights between two cities ranked by departure time.
   Second direct flights with stops but without changing aircraft.
   Third connecting flights with aircraft changing.
4. Code-sharing flights should be treated as connecting flights.
5. Excessive screen exposure should not be given to certain options nor discriminate against others.

Code-sharing and blocked space arrangements are another form of cooperation between the airlines. Code sharing is where some airlines use the same flight number for connecting flights to gain a higher priority positions on CRS displays for regional feeder operations. However, blocked space is where an airline leases a block of seats on another airline on a route that it does not itself offer.[25]

6.7 HUB CONCENTRATION

Dominant hubs and distribution control is one of the main strategic priorities for the major carriers to succeed in and dominate certain markets. Nevertheless, it is very difficult for Europe to reach the level of hubbing reached in the US for the following reasons:[26]

1. The traditional concept of ownership and control where many European airports are government-owned.
2. ATC problems.
3. Runway congestion at busy airports.
4. European railway systems offer an alternative travel mode.
5. USA average route is 1300km, and the European is 750km which indicates that Europe has less scope for hubbing where most Western European scheduled air transport sectors are less than 2 hours, on most of these sectors non-stop and high speed trains are available.
6. The European Commission is very likely to take action to stop potential abuse of dominant airlines at hub airports.

6.8 AIRLINE STRATEGIES

European liberalisation is going through a period during which many airlines' financial fortunes are declining as a result of the Gulf War and economic recession. Liberalisation would be easier and more acceptable in a period of high growth and profitability than in a period of relative decline.[27]

However, Wheatcroft and Lipman highlight the major considerations which the airlines need to take into account in order to survive in a liberalised market. These are as follows:[28]

1. Corporate structure and strategy.
2. Quality of service and product control.
3. Cost, yield and inventory control.
4. Appropriate equipment.
5. Human resource management.

In addition, Rigas Doganis indicated that most of the European airlines have followed three main approaches to the challenge of liberalisation:[29]

1. They have bought into, or bought out, the smaller and the feeder airlines in their own countries.
2. They have purchased shareholdings in other European airlines, and in a few cases in non-European airlines.
3. They have established marketing alliances with other large airlines.

In addition, he indicated that the main objectives of airline strategies in a deregulated environment is by obtaining the full marketing advantages of large scale and size to survive profitably. These objectives could be reached by one of the following strategies:[30]

1. Growing faster than other European airlines which requires dominance of national market, low cost effective hubbing, two European hubs, frequent flyer programme and entering high growth markets.
2. Growing faster through alliances/mergers which requires similar brand/product image, compatible management, real integration, effective hubbing, two compatible hubs and low costs, OR
3. Becoming a specialist niche carrier.

Furthermore, Louis Gialloreto indicated that the Euro-majors need the following in a liberalised market:[31]

1. Achieving an annual increase in capacity of 12-18% in the peak and upturn of the cycle, steady or 2-3% in troughs.
2. If the product brand is good, then the cost structure should be among the bottom five. However, for the lower quality brands, it should be in the lowest two.
3. Establishing a multi-hub operation with minimum of two. One of them should be strongly dominated on intra-Europe traffic.
4. Pursuing the charter carriers and their leisure traffic.

In addition, he indicated the following which are the main strategic objectives for other carriers:[32]

1. **Avoiding network overlaps.**
2. **For an airline with a good product, the cost structure should be among the lowest eight. However, it should be among the lowest five or six for the lowest perceived brands.**
3. **Implementing frequent flyer programmes for intra-Europe air travel.**

However, the following are some of the European major carriers strategies:[33]

1. **British Airways (BA) is using all three of Doganis' approaches. Recently BA and KLM have discussed a joint venture.**
2. **KLM has planned to establish a worldwide system.**
3. **Air France is ensuring the dominance of its home market.**
4. **Swissair is establishing alliances with Delta and SIA.**
5. **SAS has linked international airlines into their concept of a global travel alliance. This linking of the worldwide networks included charters, hotels, tour operations and ground services.**
6. **Lufthansa agreed to work together with Air France and Iberia in the following areas:**
   "- harmonisation of aircraft purchasing policies;
   - **rationalisation of marketing and sales activities;**
   - **establishment of a jointly owned catering company;**
   - **joint pilot training;**
   - **increased collaboration in CRS developments;**
   - **a new joint computer system for cargo operations;**
   - **joint scheduling of European services;**
   - **joint operation of some long haul routes."[34]**

6.9 CONCLUSION

As a result of the process of European liberalisation, there is a tendency for the airlines to form so-called "multi-mega" carriers, establishing aligned airline groups to ensure geographical coverage, global market share, financial leverage and product and brand excellence.[35]

Nevertheless, the following are the main changes in the European airline industry as a result of the liberalisation process:[36]

1. **There have been some mergers and transnational alliances.**
2. **A tendency for charter carriers to move towards scheduled markets.**
3. **Increasing concentration among tour operators.**
4. **Listed below are some of the operational changes:**
   - **Entry of a few small airlines into scheduled services such as Ryanair and Hamburg Airlines. Others have expanded operations such as Crossair and British Midland.**
   - **As a result of the December 1983 package, which allowed the new fifth freedom rights, two airlines in particular have taken advantage of this freedom (Aer Lingus and Air Portugal).**
   - **Another result of the 1987 package was the abandonment of most of the revenue pooling agreements. As a consequence, airlines have started to bunch up frequencies at the more popular times. Previously frequencies on pooled routes had been distributed throughout the day.**
5. **Decreasing yields on some routes.**

However, the overall impact of European liberalisation up to 1990 is less dramatic than US deregulation with regard to traffic growth, fare reductions, new entrants and new airlines for the following reasons:

1. **The European liberalisation has been slow and gradual rather than taking place over a short period of time.**
2. **There have been no large and aggressive new entrants or expansions, such as Braniff up to 1982, due to the gradual process and the existence of barriers to new entrants in many European countries.**

In addition, the real competition in the European airline market can be generated only from the existing carriers. Given that those airlines have mutual shareholdings, share swops and marketing alliances, it is very hard to identify where the new competitors to

the incumbent European airlines will come from.

6.10 LESSONS FOR THE GULF CO-OPERATION COUNCIL STATES

The main lessons for the GCC from the impact of European air transport liberalisation are as follows:

1. **The European Community - and the wider group of 22 ECAC states - had the opportunity to learn from the US deregulation experience, and the GCC can learn from both the US and Europe.**
2. **The key element in the European liberalisation process was that it could succeed only by applying it using a gradual and smooth process.**
3. **Since there is no infrastructure nor airway congestions in the GCC, these governments will face fewer problems than the Europeans in planning and applying air transport liberalisation. In addition, the GCC carriers will not have the troubles of the EC carriers in dealing with airport and airway congestion.**
4. **Since the only type of carriers flying within the GCC domestic market are the national carriers, the GCC national carriers will have fewer problems than the European carriers in facing competition.**
5. **Since there are no train services between the GCC countries, the airlines will have no surface competition.**
6. **The European and the GCC governments are similar in respect of the traditional way of national control of aviation infrastructure, ownership, operation and financing. However, this characteristic is one of the key constraints to growth in Europe especially with regard to expansion and liberalisation. The GCC governments should draw lessons to avoid future congestion.**
7. **There is less opportunity for the GCC carriers to merge because of their governmental ownership, the consideration of being flag carriers and the availability of one type (i.e. scheduled) of airline in the GCC. However, if regulatory reform is to occur, the GCC should have powers similar to those of the European Commission under Articles 85 and 86 of the Rome Treaty to apply stricter conditions on take overs and mergers.**

8. Since there are no regional carriers and a very small number of charter flights between the GCC countries, new entrants in the GCC are more likely to enter the market than in Europe - possibly as charters and regionals.

9. Saudia Airlines will have the advantage of being the largest airline in the GCC. However, it has a disadvantage in having high operating costs. It can enter the Gulf Air domestic market and move freely to/from Kuwait and Dubai.

10. Gulf Air will have the advantage of being able to enter the Saudia domestic market and move freely into Kuwait and Dubai.

11. Kuwait will have the advantage of being able to enter the Saudia and Gulf domestic market, and move freely into Dubai.

12. Emirates will have the advantage of low costs and being able to enter the Saudia and Gulf domestic markets and move freely into Kuwait.

TABLE 6.1: Comparison between the European and USA Markets

	USA	Europe
Domestic/International traffic split	Deregulated market is domestic	80% of flights are international
The non-scheduled market	Was not very high prior to deregulation	Substantial charter market
Market size	Large domestic market	Significantly smaller than the US domestic market
Average Route Length	1300km	750km (which indicates less scope for hubbing)
Scheduled airlines costs	Lower	Higher
Productivity	Higher	Lower
CRS	Owned by the largest airlines (eg United owns Apollo and American owns Sabre)	They are owned by a number of airlines (eg Galileo is owned by BA, KLM and several other airlines)
Ownership of the major airlines	All of them are privately owned	Most of them are government owned
Passenger traffic by rail	Less than 0.05%	13% of passenger -kilometres
Airport ownership	Private	Mostly governmental
Airport congestion	Lower	Very high
ATC facilities problems	Low	Very high
Strength of labour unions	Low	Medium
Strength of labour laws	Low	Very high

TABLE 6.2: The Ownership of Major European Communities Airlines in 1988.

Airline	Stake in company (%)	Participation in other airlines (%)
Aer Lingus	government (100)	Aer Turas Toeranta (maj.)
		Air Charter (80)
Air France	government (100)	Air Inter (36)
		Air Guadeloupe (45)
		Euskal Air-via Air Charter (29)
Alitalia	government (67)	
	private (33)	British Caledonian (100)
British Airways	private (100)	British Airtours (100)
		Cal Air International (100)
		Aviaco (67)
		Martinair (25)
		Transavia (40)
Iberia		NLM Cityhopper (100)
KLM	government (100)	Netherlines (100)
	government (36.9)	Air UK (14.9)
	private (63.1)	Condor (100)
		DLT (40)
		Cargolux (24.5)
Lufthansa		Luxair Commuter SA (100)
	government (74.31)	Cargolux (33)
	public inst.(7.85)	
Luxair	private (17.84)	Sobeliar (71.08)
	government (100)	
		Linjeflyg (50)
Olympic AW		Greenlandair (25)
Sabena	government (100)	Wideroe (22)
	government (54.72)	Scanair (maj.)
SAS	private (45.28)	Air Atlantic (100)
	government (50)*	
	private (50)	
TAP Air Portugal		
	government (100)	

*** Including that of other Scandinavian governments.**

Source: Kenneth Button, Airline Deregulation, p.88.

TABLE 6.3: Euro-major Intra-European Market Rankings

EURO-MAJORS

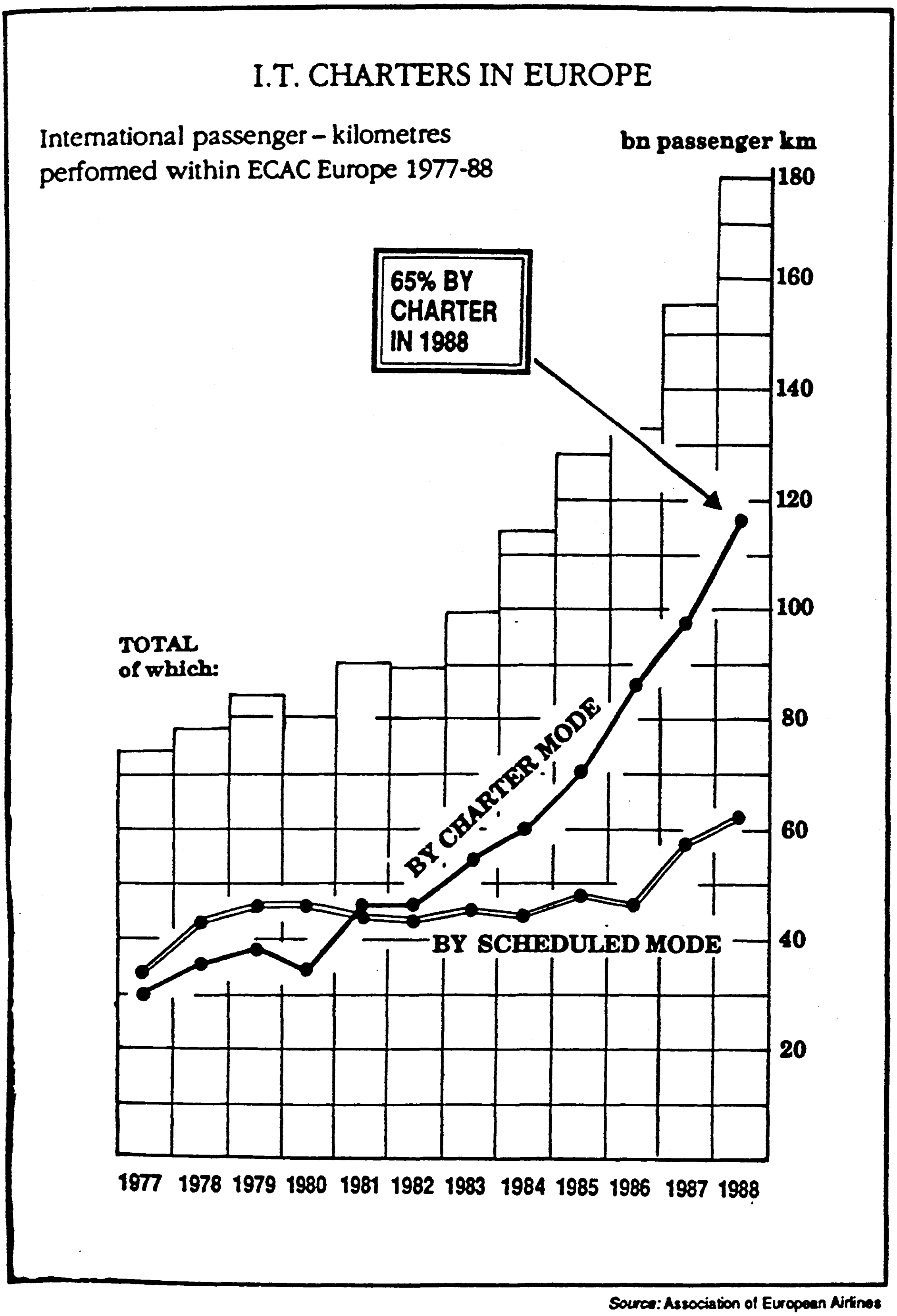
INTRA-EUROPEAN MARKET RANKINGS

By passengers carried	By passenger yield	By passenger load factor
1. British Airways	7	2
2. Lufthansa	3	6
3. Air France	4	5
4. SAS	2	8
5. Iberia	8	1
6. Swissair	1	7
7. Alitalia	5	4
8. KLM	6	3

Note: Based on 1990 Data

Source: Louis Gialloreto, The Avmark Aviation Economist, January 1992. p.19.

FIGURE 6.1: I.T.Charters in Europe



Source: Wheatcroft and Lipman, 1990. p.139.

REFERENCES

1. Kenneth Button, Airline Deregulation (England: David Fulton Publishers Ltd,1991). p.100.

2. Louis Gialloreto, Evolution of the Industry (England: The Avmark Aviation Economist, May 1988) pp.13-18

3. Louis Gialloreto, Ill-prepared for Euro-liberalisation (England: The Avmark Aviation Economist, December 1991) pp.20-21.

4. Button, p.98

5. Gialloreto, December 1991, p.19.

6. Ibid, p.19.

7. Button, pp.86-89.

8. Gialloreto, December 1991, p.18.

9. Ibid, pp.18-19.

10. Rigas Doganis, Flying Off Course (England: Harper Collins Academic, 1991). pp.100-101

11. Ibid, pp.99-100

12. Stephen Wheatcroft and Geoffrey Lipman, European Liberalisation and World Air Transport (England: The Economist Intelligence Unit, 1990) p.141.

13. Ibid, pp.142-145

14. Ibid, p.52.

15. Ibid, pp.54-56.

16. Ibid, p.54 and also The Wall Street Journal by Susan Carey.

17. Doganis, p.95

18. Rigas Doganis, World Commercial Air Transport After 1992 (England: Paper presented in Dubai, 1991) p.6. also see Second IATA Deregulation Watch Report, Geneva, June 1985.

19. Wheatcroft, p.146.

20. Doganis, p.102

21. **Wheatcroft, pp.162-163**

22. **Doganis, Dubai, p.7.**

23. **Wheatcroft, p.91.**

24. **Doganis, p.94**

25. **Wheatcroft, p.148**

26. **Craig Jenks, Can Europe Replicate US Hubbing? (The Avmark Aviation Economist, Nov/Dec 1990) pp.10-12 also see Doganis, pp.263-269.**

27. **Doganis, Dubai, p.16.**

28. **Wheatcroft, pp.190-195**

29. **Doganis, Dubai, p.5.**

30. **Rigas Doganis, Strategies for Deregulated Air Transport (England, Cranfield Institute of Technology, 1992)**

31. **Louis Gialloreto, Who will survive Euro-deregulation? (England: The Avmark Aviation Economist, January 1992) p.22.**

32. **Ibid, p.22.**

33. **Wheatcroft, pp.150-152 and Doganis pp.96-99**

34. **Wheatcroft, p.152**

35. **Gialloreto, December 1991, p.18.**

36. **Doganis, pp.95-106.**

PART II

THE FEASIBILITY MODEL OF AIR TRANSPORT LIBERALISATION IN THE GULF CO-OPERATION COUNCIL

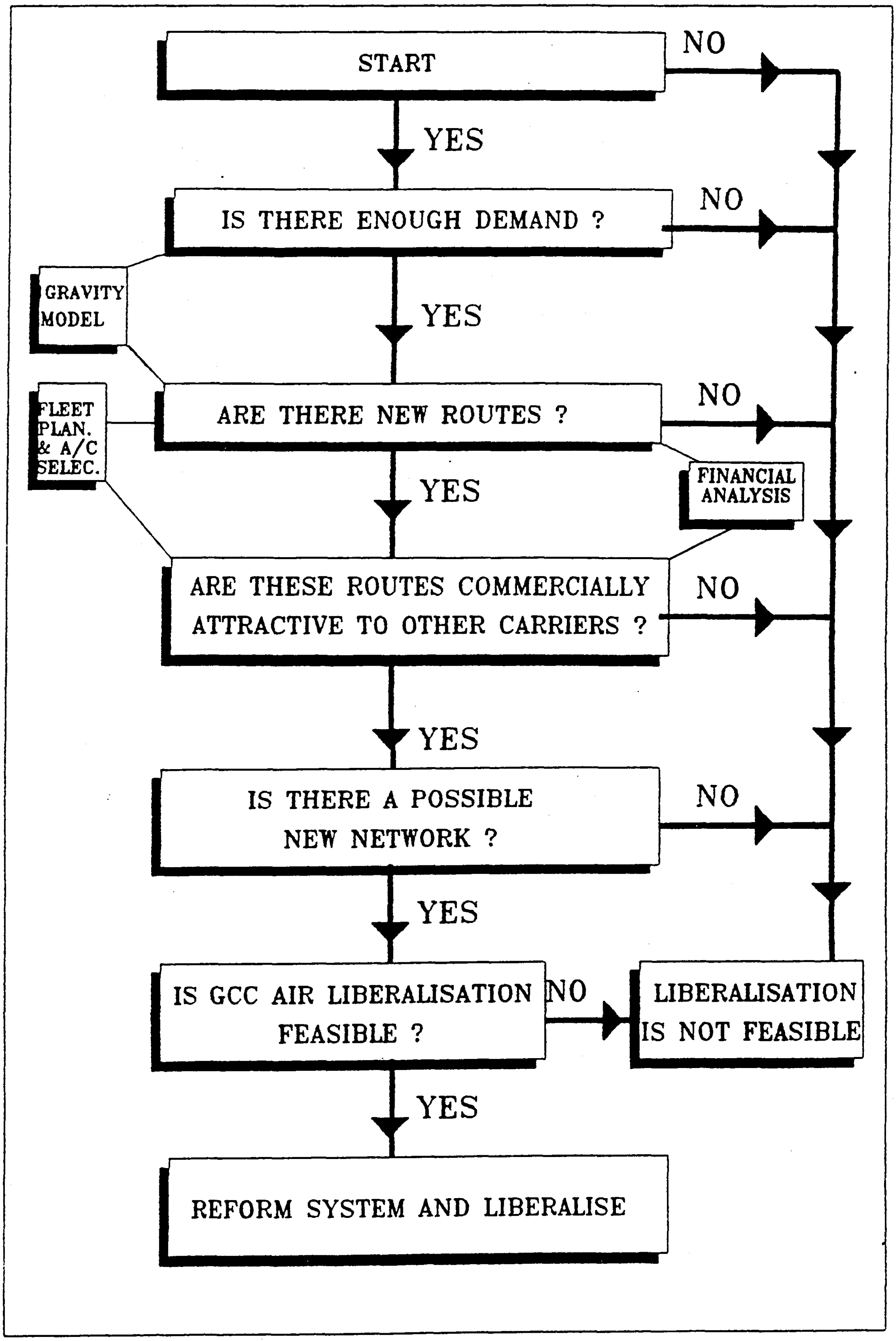
The feasibility model of air transport liberalisation in the GCC models and researches the GCC domestic market through traffic demand, new routes, fleet planning and aircraft selection, financial analysis and scheduling on a possible new network. This part provides the main answer to the question of the feasibility of liberalisation in the GCC from an airline operation perspective.

The feasibility model figure illustrates the basic framework of the model and the process of its major structure and development. The model answers the following main questions which are directly essential and important for establishing the feasibility of air transportation in the GCC:

1. Is domestic passenger demand large enough to support a liberalised air transport market?
2. Which types of aircraft could serve the GCC market according to total costs and quality of service?
3. Are there new potential routes?
4. Are the new routes commercially attractive to new carriers to operate them?
5. What is the form of an operational network?

The feasibility model can examine the possibility of successful liberalisation in the GCC, capable of simulating the prospects for carriers' operations as in real situations. In addition, this quantitative feasibility model is based on fundamental theories, justifiable assumptions and is statistically valid.

The Feasibility Model of Air Transport Liberalisation in the GCC.



CHAPTER SEVEN

FORECASTING DEMAND

7.1. FORECASTING IN GENERAL

Forecasting is one of the most challenging topics faced by human beings and has been so for thousands of years. It is as old as mankind. Predicting the future is one of the miracles featured in most practised religions and prediction (or prophesy) is one of the criteria which make some people believe in them. There are some arguments about whether forecasting is a science, art, magic, or logic.

This chapter explains the main problems of forecasting in a real situation and identifies those techniques most appropriate for use in examining traffic flows in the Gulf Cooperation Council (GCC).

Forecast can be defined as "A process of estimating a future event by casting forward past data. The past data are systematically combined in a predetermined way to obtain the estimate of the future".[1] However, a prediction can be defined as, "A process of estimating a future event based on subjective considerations other than just past data".[2]

The modern scientific foundations of the field of forecasting were laid in the 1930s. The following which date back over a century, however, were instrumental to all subsequent work[3]:

1. The least squares estimation by Gauss and Legendre (Abbe, 1871).
2. Hidden periodicities by Schuster (1906).
3. The development of autoregression by Yale (1927).
4. Moving average models by Slusky (1937).
5. Decomposition of time series by McLanley (1930).
6. The application regression techniques to real life data by Galton (1877); Pearson (1896); Snedecor (1937).

Forecasting is an important process in social, economic, and technological planning. Forecasting does not only decide where, when, and how billions of dollars will be spent, but also establishes and commits national policies and regulations far into the future. At the same time, there is no forecast that is a 100 percent free of errors, and it is very difficult to know how to judge the reliability of forecasts. Was it possible to predict the price of a barrel oil could increase from $2 in 1973 to $39 in 1979?

Forecasting provides a range of possible future scenarios which are conditional upon the policy enacted. So, there is no single future, but several possible futures which are supported by social, political and economic leverages. Planning for the future is no longer just desirable but essential.

The following are the main correlations of forecast accuracy[4]:

1. **The most important factor in forecasting is its time horizon.**
2. **Different results are acquired by different institutional scenes or projection effects, primarily in relation to systematic biases rather than absolute accuracy.**
3. **The choice of methodology in implementation is not linked to differences in accuracy.**
4. **Forecasts which are less accurate than others might suffer from the following:**
   - **They are based on old information, or**
   - **They have been influenced by dominant events in the development of the trend in a way not completely anticipated by the forecaster.**
5. **Mathematical methods with correlation to official measured economy.**

7.1.1. <u>Forecasting Perspectives</u>

There are many forms of forecasts, nevertheless, the rest of this section will concentrate on technological, transportation, and energy forecasts because these have most relevance to the thesis.

7.1.2. Technological Forecasts

All forecasts usually include technological components such as communication, energy, transportation, weaponry, agriculture, and other fields. So, it is important to define technological forecasts (TF) which focus primarily on the changes in technology rather than efforts to estimate other types of trends even if they include a technological change. The term TF came into prominence in the early 1960s, and it was appreciated and took its lead from the US government through its funding of major projects.[5] Marvin Cetron expressed his conception about TF with the general statement, "Future technical possibilities are not hard to project, but forecasters find their most difficult job is getting planners to use the predictions effectively".[6]

There are three main problems facing the appraiser of TF which are listed below:

1. Few specific technologies have captured attention as much as transportation, energy, population,warfighting and economics.
2. Few independent forecast were made to allow good comparisons.
3. Most TF predictions have yet to reach reality. Therefore, accuracy could not be tested using the benefit of hindsight. As a result, concentration has focused on nuclear energy and the development of computer capabilities.

7.1.2. Transportation Forecasting

Transportation forecasters usually search for more basic economic, social, and technological clues for predicting the future which would include great variability in transportation forms such as air, sea, or land and in the configuration of individual or mass transport. Gershuny suggested in relation to transport projections that "We must not think of the future, but of the alternative possible futures".[7]

Transportation forecasting is a complex task because of its derivatives, and they are usually required to perform many more operations than other types of forecasting to transform core assumptions on basic trends into projections. There are two technical problems arising from transportation plans which are listed below[8]:

1. **They are often expressed in terms of their usefulness for policy-makers, but are not consistent with official statistics available for evaluating the forecasts.**
2. **They focus on somewhat different trends even overlapping ones. Forecasting may have the effect of "fixing the future" for two different reasons[9]:**
   - **The continual complication of forecasting methods. The difficulty could result from complexity of the social system and the models themselves. On the other hand, the complexity might be intentional on behalf of the forecaster to hide, mystify or disguise his assumptions and methods.**
   - **The exclusion of specific policy options and other alternatives from consideration. For example, if in the context of circumstances in a road building programme are excluded in traffic forecast making the projection relatively conditional instead of unconditional. Figure 7.1. pictures the process of "fixing the future" for a road building project.**

It has traditionally been difficult to make air transport forecasts accurate and reliable. The following are some characteristics which have to be taken into account when considering passenger forecasting demand models[10]:

1. **Mathematical models could follow rules or procedures that represent only some important aspects of a real process.**
2. **They translate from individuals to the aggregate actions of people.**
3. **Travel decision by people include psychological inputs such as where, when, how to go which are extremely hard to distinguish.**
4. **The data base is often bad.**
5. **The model is frequently applied to some cases not representative of the data base.**
6. **The investigator should have judgement skills besides mathematical proficiency. Makridakis,[11] listed the advantages and disadvantages of both statistical and judgement forecasting methods in Table 7.1.**
7. **Overall, until investigators are able to collect a big enough data base, the transportation demand modelling will still continue to be more of an art than a science.**

7.1.4. Energy Forecasting

Energy forecasting is a very difficult task that has become a mixture of science, art, and politics especially after the electricity shortage in the beginning of 1960s, the oil crisis and gas shortages, the chronic problem of energy related to pollution and the Chernobyl accident in 1987. However, energy forecasting and modelling became a competent industry after the oil crisis of 1973-74. It is influenced by economic interests, ideological bias, and political needs at all level of the modelling process starting from estimation of the parameters and the utilisation of the results. Politics has become a big part of this modelling process, eventually, making the usage of energy forecasts mostly for political and institutional purposes.

The International Institute for Applied System Analysis (IIASA) researched a world energy model which began in 1973 and took seven to eight years, 225 person-years of effort to complete, and cost approximately $10 million. The IIASA model is widely considered as the most comprehensive, and it has achieved recognisable impact. It combined mathematics, scenario, and judgement to analyse over a fifty-year period of the possible transition in world energy system. The followings are the main criticisms of the IIASA model[12]:

1. Lack of recognition of diverse levels of decision making.
2. Lack of recognition of decentralized methods of deciding on energy supply.
3. Keepin and Wynne criticised the method with the following terms," ...the models are analytically empty, have had no real iteration or sensitivity analysis, and when so tested are extremely brittle to minor changes in important variables".[13]

7.2 OTHER ASPECTS OF FORECASTING

Forecasting has very extensive utilisation. However, the following are some of the main abuses of forecasting[14]:

1. Most projections are of one interest or another, serve a single interest, and by supporting these interests they either try to change the world in some way or

preserve it from certain changes. So, images of the forecast tend to be presented in ways that serve certain benefits.

2. **The exigency for value changes. Mesarovic and Pestel stated, "Man must be ready to trade benefits to the next generation for the benefits to himself".[15] Therefore, one of the immediate purposes of the exercise is to influence public values and attitudes.**
3. **Sam Col supported an argument that projections could be used as propaganda, "Suggested changes in value systems are often associated with proposals for or against the reform of political structure".[16]**
4. **Most predictions might be considered solely advertising accomplishments to promote specific political, commercial enterprise or other more personal interests. Wink E. commented about that controversy that the elected politician perceives his planning as not a long term. His policies should show effects during his period of control, especially if he should seek to be reelected, etc. All these factors might reflect in the forecast he selects or uses[17].**
5. **All forecasters aim to influence public and official perspective, and the ones who work outside official agencies are vulnerable to exaggeration and to jumping to overstatements. Mesarovic and Pesal argue that "People will not grasp danger unless personally and seriously affected".[18]**
6. **Confusion is intended and encouraged on purpose to some extent to discredit other forecasts or to promote their own.**
7. **Many authors demand a dramatic institutional changes. Herman Khan for instance, suggested that a great relaxation of government control of private enterprise is needed, at the same time, others lobbied for a considerable increase.**
8. **There are two methods in which forecasting relate to policy:**
   - **Service to the present policy makers (Blackaby, F.).**
   - **Service to the broader debate about policy goals and objectives.**

The following points should be considered in relation to the use of complex mathematical models:

1. **Complex mathematical models are used more and more, but believed less and less[19].**
2. **"...the whole point about models is their formalism, which should allow mathematically rigorous consistency, discrimination, and testability to be achieved, to the benefit of policy".[20]**
3. **" Formal models are first, testable, and second, documented, so that the assumption are clear and you can examine the data being used".[21]**
4. **"Models should be designed for insight and understanding[22]".**

The following list displays the main issues of the advantages and disadvantages of the independent projections in comparison with in-house work[23]:

1. **The following are the main advantages:**
   - **Increasing the need for the independent plans to expose a wider discussion and to provide pluralism in forecasting.**
   - **Formulated by individuals or group who may have no direct political power and interests.**
   - **In-house forecasting may lead to what Gershuny believes to be " fixing the future".**
2. **The following are the main disadvantages:**
   - **One-sided independent forecasts should be balanced with or corrected with others.**
   - **They may reflect a certain degree of irresponsibility and or lack of data.**
   - **In-house forecasting may reduce uncertainty in the policy makers minds about the future.**
   - **In-house staff gain less expertise in thinking about assumptions and conditions.**

Makridakis suggests some issues that should not be attempted in forecasting for specified reasons listed in Table 7.2.

7.2. AIR TRANSPORT FORECASTING

Forecasting is an important task for the civil aviation industry where the researcher utilizes it as an analytical process which involves economic theories, statistics and mathematics. At an industry wide level it should involve technological forecasting, transportation forecasting and energy forecasting.

In the past, air transport forecasting has usually ignored external constraints. However, for the users as airlines, airports, manufacturers, and governmental authorities forecasting is only a tool to be used for a specific task given infrastructure, technical and financial constraints.

Traffic forecasting is one of the most critical areas of air transport planning and management because every decision taken within an airline flows from it. However, forecasting is a process in which mistakes are very often made, and there is no absolute truth nor optimum method which is 100 percent error free. There are advantages and disadvantages for each technique of forecasting, but none of them can provide consistent accuracy. At the same time, forecasts should be made since many decisions stem from them.

A simple way to go bankrupt is to develop a rigid, fixed plan and then follow it. The implication is that the plan should be able to deal with changing conditions. The airline industry is more complicated than most others because of the regulatory nature of the industry where it is not completely free nor fully regulated. Another reason for its complexity is that it must deal with economic variables which often are perplexing.

A forecast's time horizon could be summarized as the following:

1. **Short term traffic forecast: From 1 to 18 months or so. They are for planning operations and budgeting such as scheduling process which include flights, crew, maintenance, advertising and sales campaigns.**
2. **Medium term traffic forecast: From 2 to 5 years. They are for forecasts such as opening up new routes, planning marketing policy and investment in new**

maintenance facilities.

3. Long term traffic forecasting: From five years and over. Such forecasts are for airport building, aircraft construction and fleet planning.

Table 7.3 analyses areas and aspects that can and can not be forecasted and implications involved under different time horizons.

There are many factors that influence the passenger's choice to travel by air, and they may be grouped as the following:

1. Destination
2. Safety.
3. Price.
4. Reliability.
5. Quality of service which probably include the following:
   - Frequency of service.
   - Quality of in-cabin and on-ground services.
   - Block travel time.
   - Time of departure and arrival.
   - Type of aircraft.
   - Number of stops.
6. Biased advise.
7. Customer loyalty programmes.

7.4 FACTORS INVOLVED IN FORECASTING DEMAND

7.4.1 Use of Forecasting

Forecasting is a very essential instrument for planning and marketing development in the air transportation industry, however, forecasting in general is important for the following reasons:

1. Planning company resources, priorities and efforts.

2. Seeking market opportunities and knowing the relevant parameters which influence the market development in the future.
3. Projecting a reliable picture of the traffic development for the future with consideration of quantity and structure.
4. Controlling performance and efficiency.
5. Preparing contingency plans.

7.4.2. Purpose Of Forecasting

Due to the planning horizon for the decision makers, forecasting can be classified as the following[24]:

1. Infrastructure Planning which are listed below:
   - Short Term Forecasting
     - Modifying within the existing terminal and buildings.
     - Handling new traffic procedures.
   - Medium Term Forecasting
     - Extension of runway system and terminal area at the airports.
     - Planning new hangers, parking areas, and public transport.
   - Long Term Forecasting
     - Planning new airports and new airports buildings.
     - Revision of airway system.
2. Air Traffic Operation
   - Short term traffic which are listed below:
     - Planning airline budgeting, scheduling, marketing development, and pricing policy.
     - Planning airport operators' budgeting and aircraft manufactures' deliveries.
   - Medium Term Forecasting
     - Planning new routes, aircraft requirement, workshops and hangers.
     - Forecasting aircraft manufactures' production plan.

- **Long Term Forecasting**
  - **Determining the environmental influences of air traffic.**
  - **Forecasting the future of air traffic control capacity, noise carpets, and performance requirements of future aircraft.**

All the above subjects are the main sectors of and purposes of forecasting in air transport, however, there are others that were not included. It should be considered that particularly for marketing development forecast, a view of the total travel market including all means of transportation beside air transport may be needed.

7.4.3 Forecast results

There are many techniques for forecasting, but choosing the right one depends on the following:

1. **The purpose of the forecast and what exactly is being forecast.**
2. **The availability of the resources and data.**
3. **The precision required, the time horizon and the risk of operating upon the forecast results.**
4. **The scale of the results required.**

Every organization require different results. Airlines may be more interested in passenger-Kms, on the other hand, passenger numbers will be of more interest to airports. Overall, a forecast might need to provide a combination of results, including volume, rate of change, a market share, timescale, probability, assumption and sensitivity.

The scale of the results is related to the type and purpose of forecasting required which includes the following:

1. **Global traffic growth on an existing route, specific market, or geographical area with the assumption of conditions.**

2. The share of a particular airline or an airport of the global traffic, considering the competitive environments.
3. Forecast of segmental demand and entirely new markets.
4. Responsiveness of traffic to changes such as fares, aircraft type, frequency, airport pricing policy, or the change of the government on entry and exit regulations.

7.5 FACTORS INFLUENCING DEMAND

There are many variables which have been researched by analysts to explain the demand for air transport. Demand factors are generally categorised into two main groups which are socioeconomic and transport factors.

7.5.1 Socioeconomic factors

They are known as exogenous factors because they are determined independently of the transport process which include the following:

1. INCOME : It is the key element considered by economists. It is measured by statistics such as GNP, GDP, National Income and National Income per head, Personal Income, Personal Disposal Income and Corporate Profits before taxes. In the case of leisure travel, the Survey Research Centre Of The University Of Michigan[25], found that the higher the family income, the higher is the percentage spent on travel. On the other hand, business travel demand is not sensitive to personal income but depends on GNP, imports, exports, level of investment abroad and industry structure. It increases when an economy expands and decreases when an economy recesses.
2. OCCUPATION : This is a good indicator of income levels. Travellers with higher level occupations are usually more educated, earn higher incomes, and belong to higher social classes.
3. EDUCATION : Educated people have the desire to know about new things and new places which make them potential travellers. According to the USA National Travel Survey[26], 66 percent of the adult passengers over the North Atlantic had some college education, and 94 percent of them had high school training.

4. **SOCIAL STRUCTURE : Many studies found that the life cycle, family structure and conformism have influences on air travel. As researched by Taneja[27], the likelihood of travel is influenced by the social class of the traveller.**
5. **POPULATION : Travel volume is directly proportional to the size of the population, and the demand for air travel increases in proportion to population growth.**
6. **POLITICAL FACTORS : They have strong influence on air travel through government regulations such as visas and permits, political crisis, wars and strikes.**
7. **COST OF LIVING : The relationship between the price of goods and services in one country versus another is an explaining factor of specific market growth. This can be influenced by exchange rate.**
8. **INTERSPATIAL RELATIONSHIPS : Bojorkman derived a conclusion in his study that a correlation exists between scheduled air passenger traffic and telex traffic (See Figure 7.2)[28]. Brown and Watkind took the number of long distance telephone calls as a proxy for community of interest[29].**
9. **GEOGRAPHICAL FACTORS : Leisure traffic is influenced by climate and landscape.**

7.5.2 <u>Transport factors</u>

These are known also as endogenous factors because they are determined by the transport service itself. They generally respond to the simple economic law that the demand increases when the price is low, and it decreases when the price is high. So in general, the demand for travelling will increase when prices decrease.

According to R.Simpson's theory[30] of USA domestic airline economics, so-called generalised travel costs, take into account all costs in addition to the fare, and cover the following:

1. **Total trip time.**
2. **Trip reliability.**
3. **Trip comfort and cost.**

4. Trip convenience.

7.6 FORECAST METHODOLOGY

7.6.1 Qualitative Methods

7.6.1.1 Executive Judgement

This method is based upon the experience of the analyst/forecaster. The more experience the forecaster has in the matter to be forecast, the more accurate is the technique. Overall, this approach is basically subjective, crude and unscientific. On the other hand, this technique is one of the most widely used. Table 7.5 describes the common biases in judgemental forecasting and proposes ways to reduce their negative impact. The more long-term the forecast is, the more it will prove inadequate. However, this approach is useful for the following reasons:

1. Cases where no relevant data exists.
2. Cases when forecasting new market penetration.
3. The forecaster might know extraneous factors which other techniques would not pick up.
4. It is quick.
5. It can be cheap.
6. It is confidential.

7.6.1.2 Delphi Technique

This method is often used to overcome the subjective weaknesses of executive judgement. The process of this technique is usually done in two steps. First, a selected group of experts are given a questionnaire and asked to give their forecasts of growth in a market or region. Sometimes they are asked for their opinion on influencing factors such as fuel prices, technology or political development. This is consolidated and the composite response returned to all the contributors who wish to revise their original forecast of what other experts forecast. From the second round of consultation, an agreed forecast can be taken. The Delphi technique is usually not suitable for individual route forecasts as much as for regional or market growth. IATA use the Delphi technique for their regional forecast.

7.6.1.3 Market Research

This technique includes surveys of passengers, travel agents and business houses. In addition,it analyses of trade flows, and other business factors. It also involves studies of hotels, tourism facilities and fashions. The market research technique is useful for the following reasons:

1. Understanding the variation between the demand for air transport and different sectors of population.
2. Forecasting new routes or routes from developing countries where past traffic data is not enough or does not exist.
3. Forecasting demand (market share) for the airlines with different supply (product or price) conditions.

7.6.2 Time Series Forecasting

They are also known as trend models which are based on the assumption that what happened in the past will occur in the future. Although they assume that the internal changes in structure of the traffic will not affect the total traffic. This technique usually uses either linear trend, which suggests constant increase of traffic with each unit of time, or a declining percentage growth each year. The formula for the linear or straight line is given as[31]:

$$Rn = Ra\,(1 + b * t)$$

Where	Rn	Traffic volume at year (n)
	Ra	Actual traffic
	b	Average annual growth
	t	Forecast period in years

The other technique is exponential which suggests traffic grows by a constant percentage each year, having in consideration, the growth of every year in absolute term is higher than the one for the previous year. The equation which used for the exponential curve is expressed as[32]:

$$Rn = Ra\,(1 + b)^{t}$$

There are other more sophisticated time series analyses such as Box Jenkins, Spectral and the S-shaped logistic trend. Time series techniques are best used for forecasting on actual routes and for the short term projections where reasonably accurate data can be achieved. However, the following are some of the disadvantages of this method:

1. Considering time as the only variable that affects traffic growth.
2. Depending on the assumption of "What occurred in the past would occur in the future," and ignoring the reasoning of the occurrences such as why it happened. At the same time, that assumption may be critical as we are living in a very changing world with changing attitudes, evolutions, economics, regulation and politics.
3. Ignores resources or logistical constraints.

The typical time series methods would include the following:

1. Exponential Forecasts
   - Average rate of growth
   - Moving average annual rate
   - Exponential smoothing
2. Linear Trend Projections
   - Simple tend linear
   - Moving average trend

7.6.3 <u>Causal Models</u>

Causal models develop mathematical relationship between demand and the factors which influence it such as time, economics, supply or social changes. The process of the causal models is usually done by the following:

1. Identifying and selecting the independent variables which would lead to the dependent variables.

2. Determining the functional relationship between the independent and dependent variables and identifying the model to be used.
3. Calibrating and testing the mathematical expression of the relationship between the independent and dependent variables.

Causal analysis include a complex calculation in the form of regression models/multi variant analyses. However, most econometric forecasts of air traffic tend to use simple or multi regression models.

Causal forecasting has an advantage of being logical. Although logic and mathematics are inherent in this model, judgement is involved at all stages. The following are some of the weaknesses of the causal model:

1. Dependant on historical data and accurate statistics for the past many years. In the case of third world countries, adequate data is often either unavailable or may be unreliable.
2. Using logic in this approach, the forecaster transposes his problem in to one where he has to use somebody else's forecast for the independent variables or making his own in a situation where they are not available.
3. The frequent assumption of market homogeneity and using the average values that are influenced by the arbitrary choice of component such as income, fare or inflation.

Gravity models were developed in the 19th century by analogy with Newton's gravity equation. This model assumes that travel demand between two cities is directly proportional to the product of the two populations and inversely proportional to the square of the distance between them. However, this has been modified to include fare or time rather than distance. More detailed explanation of gravity models will be included in section 8.5.1.

7.6.4 Simulation/System Dynamics

These methods are based on the process of developing and building up a complex computer-based model to simulate the demand under different interacting factors. Such a model is largely used by big airlines or manufacturers to simulate fleet planning, scheduling, traffic and resource allocation. It has the advantage of being able to simulate the interaction of supply and demand.

7.6.5 Scenario Approach

It is a combination of judgemental techniques with econometric modelling in a series of possible future "scenarios" where it could be used to develop a forecast.

7.7 SELECTING A MODEL

It is obvious that there is no forecasting technique that can guarantee the accuracy of its prediction. However, in evaluating or starting any model, one should determine the purpose of the forecast (see Table 7.5) and comprehend the different empirical types, methods and time horizons of forecasting as they are illustrated in Table 7.6 and Table 7.7. The ICAO approach of building a model include the following[33]:

1. Selecting relevant causal factors
2. Collecting data over an appropriate time
3. Identifying the relationship between the dependent and independent variables
4. Evaluating the proposed form of the statistics
5. Forecasting the independent variables which will lead to the dependent variables.

According to Taneja, a model validity should have the following guide-lines[34]:

1. The model should be based upon a fundamental theory.
2. Its specification should be dynamic reflecting the time difference between a change in the independent variable and the response of the dependent variable.
3. The assumption should be justifiable.
4. The model and the calibration must be statistically valid.

7.8 CHAPTER CONCLUSIONS

Bearing in mind all the points made in this chapter, it was decided that the most appropriate forecasting model for use in the thesis was the Gravity Model for the following reasons:

1. **One of the objectives of the feasibility model is to forecast the demand on new routes where gravity model is considered to be good at that specific type of forecasting.**
2. **The gravity model is based on a fundamental theory, justifiable assumptions and is statistically valid.**
3. **It is simple to use and apply where simple, automatic and inexpensive forecasting methods produce realistic forecasts.**
4. **Empirical evidence has shown that the gains in accuracy of sophisticated methods are usually small. Furthermore, complexity or statistical sophistication does not seem to improve forecasting accuracy.**

The gravity model characteristics and the application of the technique to the GCC market are explained in the next chapter.

FIGURE 7.1: Fixing The Future For A Road Building Programme.

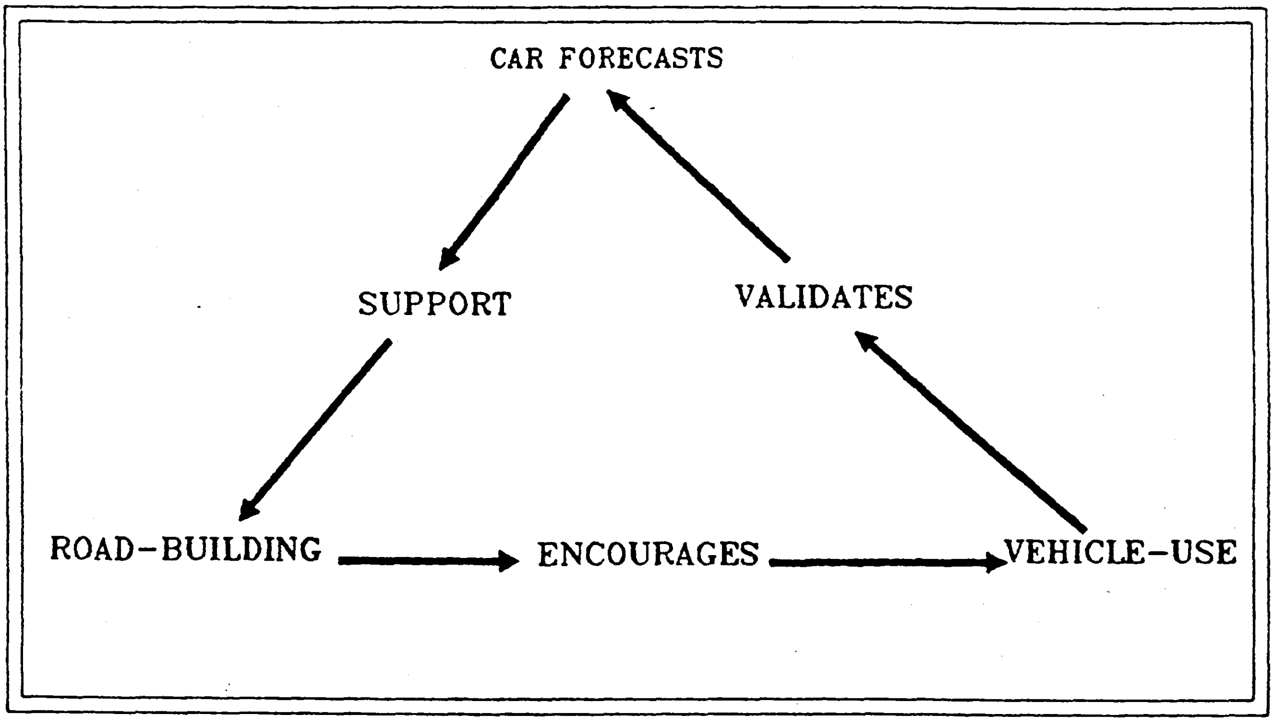
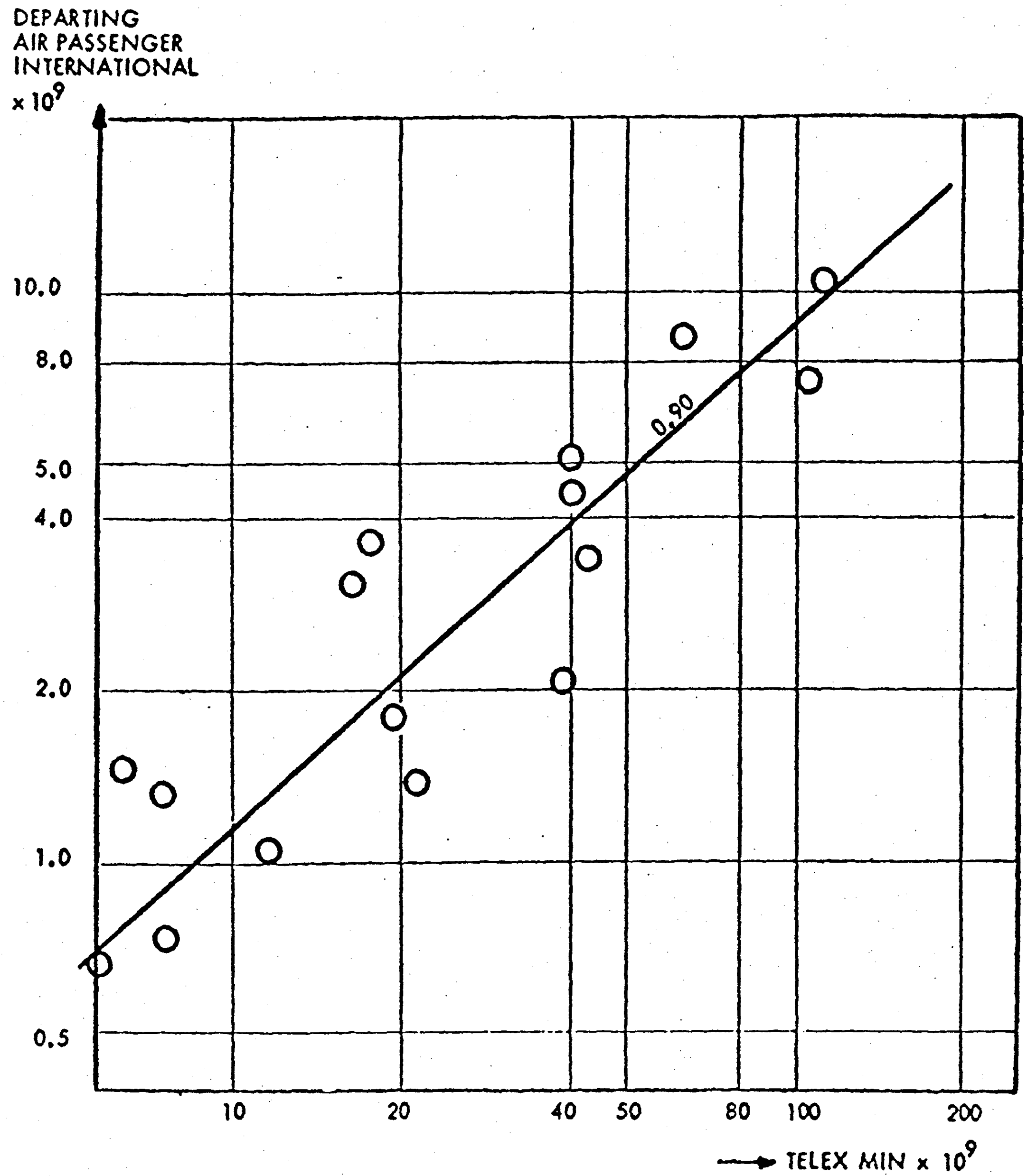


FIGURE 7.2: Number Of Departing International Air Passengers By Country Versus Telex Traffic For The European Countries.



Source: Bjorkman,B." Estimating Potential Air Traffic Flows."

TABLE 7.1: Statistical Methods Versus Judgemental Forecasts.

	STATISTICAL METHODS	JUDGMENTAL FORECASTS
CHANGES IN ESTABLISHED PATTERNS AND/OR RELATIONSHIPS	CANNOT BE PREDICTED	COULD BE PREDICTED BUT CAN ALSO BE IGNORED OR PEOPLE CAN OVER-REACT TO THEM.
UTILIZING AVAILABLE INFORMATION/DATA	NOT ALL INFORMATION IN PAST DATA IS USED	PEOPLE ARE SELECTIVE, BIASED & INCONSISTENT
OBJECTIVITY	BASED ON SOME SPECIFIC SELECTION CRITERION/CRITERIA	DEPENDS UPON PERSONAL & POLITICAL CONSIDERATIONS, & UNDUE OPTIMISM PESSIMISM
UNCERTAINTY	GROSSLY UNDERESTIMATED	GROSSLY UNDERESTIMATED MOSTLY ON THE OPTIMISTIC SIDE
COST	CHEAP TO USE	EXPENSIVE TO USE

Source: Makridakis, S. "Metaforecasting: Ways of Improving Forecasting, Accuracy and Usefulness."

TABLE 7.2. The Do and Do Not of Forecasting

If large forecasting errors, or other problems exist, do not attempt to solve them by the following:	REASONS
Abandoning forecasting	Dealing with planning and strategy will be even more problematic if no formal forecasting is done.
Substituting people instead	People do not necessarily produce more accurate forecasts than methods. At the same time, their forecasts are usually more expensive.
Using more sophisticated methods	Empirical evidence has shown that gains in accuracy from sophisticated methods are usually small.
Subscribing to more expensive newsletters, or several forecasting services	Empirical evidence has shown that forecasting accuracy is not improved by buying more expensive forecasts.
Assuming that present economic conditions will continue for ever	History has shown that cyclical factors have always influenced business and economic series.

Source: Makridakis, S. "The Art and Science of Forecasting: Assessment and Future Directions."

Time Horizon of Forecasting	Major areas/aspects that can be forecasted with a reasonable degree of accuracy	Major benefits from accurate forecasting	Major sources of surprise or unexpected forecasting errors
Short Term (less than 3 months)	- Seasonality in sales - Promotional and advertising actions - Required level of inventories - Impact of price changes - Cash inflows and outflows - Raw and other material requirements - Workforce, personnel needs	- Improved customer satisfaction - Better production and/or service scheduling - Fewer inventories - More effective advertising/promotion policies - More effective pricing policies - More profitable cash management - Better material and personnel management	- Unexpected events (eg a fire, a major machine breakdown) - Special events (eg a big snowstorm, a strike) - Special competitive actions (eg an advertising campaign, a price decrease by a competitor) - Sales of new products
Medium Term (3 months to 2 years)	- Established trends/patterns - Average length of recovery and expansion of business cycle - Average length of recession - Length of a recession - Average number of months between a change in the index of leading indicators and a change in the level of economic activity - The theoretical effects of fiscal/monetary policies on the economy - Estimation of existing relationships	- Better financial management - Improved allocation of resources - Reduced levels of inventories - Improved profits or reduced losses - Better competitive position	- Booms continued longer than average or longer than expected - Recessions started shorter than average or unexpected - Business climate and consumer attitudes were different than expected - Changes in relationships - Sales of new products

TABLE 7.3. Areas and Aspects that can and cannot be forecast and implications involved.
Source: Makridakis, S. "Metaforecasting: Ways of Improving Forecasting, Accuracy and Usefulness".

Time Horizon of Forecasting	Problems/difficulties caused by surprises and unexpected forecasting errors	Typical mistakes (found through the empirical evaluation of past forecasts) that caused surprises and unexpected errors	Improving the forecasting process and the utilization of forecasts
Short Term (less than 3 months)	- High inventories - Under utilized workforce - Lost sales, loss of market share - Liquidity squeeze - Opportunity losses - Decreased profits or losses	- Inconsistency while forecasting - Unreserved optimism - Underestimating effects of uncertainty - Ignoring possible occurrence of unexpected or unusual events - Ignoring influence of special events/actions	- Systematization and making objective the forecasting process - Keeping track of forecasting errors to determine systematic deviation - Becoming prepared to deal, if necessary, with unusual events - Taking into consideration the possibility of special actions - Regarding effects of special events/actions to improve forecasting of future similar cases
Medium Term (3 months to 2 years)	- Under utilization of personnel - High inventories - Lost sales - Lost market share - Serious financial problems - Opportunity losses - Decreased profits or losses - Decreased in long term competitive position	- Forgetting that booms or recessions do not last forever - Under optimism and unwillingness to consider undesirable situations - Over pessimism during periods of bad economic or business conditions - Underestimating uncertainty	- Maintaining adequate liquidity - Understanding and taking into account the fact that economic/business conditions are cyclical - Accepting that recessions cannot be predicted - Creating a recession fund - Building adequate financial flexibility - Diversifying in non-cyclical industries - Better monitoring of economic/business conditions

TABLE 7.3 Continued.

Time Horizon of Forecasting	Problems/difficulties caused by surprises and unexpected forecasting errors	Typical mistakes (found through the empirical evaluation of past forecasts) that caused surprises and unexpected errors	Improving the forecasting process and the utilization of forecasts
Long Term Emerging (2 years to 5 years)	- Inability to introduce change - Inability to harness advantages of new technologies - Inability to deal with major environmental changes - Loss of competitive advantages - Losses from getting involved in Fads whose demand dries out - Opportunity losses	- Ignoring obvious changes - Believing the effects of change to come much later - Conservatism - Over-optimism - Thinking that competitive advantages (and other barriers to entry) are adequate to guard against competition - Under-estimating uncertainty - Being over-dazzled by technological discoveries and their profit making potentials	- Having financial flexibility - Identification of major emerging technologies and their influence - Effective strategy that accepts and can deal with the uncertainty in long term forecasting - Considering the effects of environmental change on the fundamentals (customers, markets, products, competition, prices) - Identifying major problems/opportunities in the future
Long Term Distant (5 years to 15 years)	- Losses from getting involved in unsuccessful projects involving untested technologies or projects	- Automatically accepting economic advantages and ability of new technologies - Believing that the time between a discovery and its practical utilization to be short, and easy - Accept that barriers to entry, cartels, oligopolies, and monopolies can protect status quo	- Maintaining financial strength - Dynamic and flexible objectives - Evolving strategy - Considering economic advantage of new technologies (do <u>not</u> be dazzled by advocated technological wonders) - Spreading risks
Long Term Far Away (15 years or more)	- Wasting resources to make forecasts whose usefulness is dubious	- Unwillingness to accept that the future can be different to the past - Unwillingness to understand that radically new technologies, nobody envisions today, are possible in the future	- Better understanding the future and the forces that shape it - Being flexible to deal with a radically changing environment - Being willing to accept future uncertainty and take calculated risks

TABLE 7.3 Continued.

Time Horizon of Forecasting	Major areas/aspects that can be forecasted with a reasonable degree of accuracy	Major benefits from accurate forecasting	Major sources of surprise or unexpected forecasting errors
Long Term Emerging (2 years to 5 years)	- Established trends - Technological changes and their implications - Changes in attitudes and their implications - Demographic changes and their implications - Economic and political realities - Competitive realities - Financial resources and requirements	- More effective strategy formulation - Introducing changes in the organisation - Identifying promising areas for capital investments, realising, however, that competitors might have access to similarly accurate forecasts - Promising R & D projects - Improve (or maintain) competitive position	- Underestimating effects of emerging technologies and their implications on organisations or society - Unwillingness to consider flattening or negative trends - Unwillingness to accept effects of possible major environmental changes - Assuming that fads will continue
Long Term Distant (5 years to 15 years)	- Established trends - Some technological innovations - Some demographic changes - Basic economic, competitive, and financial realities	- Building consensus - Initiation of feasibility studies for promising R & D projects - Establishing strategic directions	- Over-estimating applicability of new technologies (eg nuclear power, artificial intelligence) - Over emphasising ability of forecasting new technologies and their impact or usefulness

Long Term Far Away (15 years or more)	- Established trends
	- General tendencies in:
	   - Technology
	   - Societal attitudes
	   - Economic environment
	   - Demography
	   - Political environment
		- General strategic directions	- Inability to forecast major technological innovations and their impact on business/society (eg growth and importance of computers)

TABLE 7.3 Continued

TABLE 7.4. Common Biases in Judgemental Forecasting and Proposed Ways of Reducing their Negative Impact.

Type of Bias	Description of Bias	Ways of reducing the negative impact of bias
Optimism, wishful thinking	People's preference for future outcomes affect their forecast of such outcomes	- Have the forecasts made by a third, uninterested party. - Have more than one person independently make the forecasts
Inconsistency	Inability to apply the same decision criteria in similar situations	- Formalize the decision making process - Create decision making rules to be followed.
Recency	The importance of the most recent events dominates those in the less recent past which are downgraded or ignored	- Realize that cycles exist and that not all ups and downs are permanent - Consider the fundamental factors that affect the event of interest.
Availability	Ease with which specific events can be recalled from memory	- Present complete information - Present information in a way that points out all sides of the situations be considered
Anchoring	Predictions are unduly influenced by initial information which is given more weight while forecasting	- Start with objective forecasts - Ask people to forecast in terms changes from statistical ones and demand the reasons for doing so
Illusory correlations	Belief that patterns exist and/or two variables are causally related when it is not true	- Verify statistical significance of patterns - Model relationships, if possible, in terms of changes
Conservatism	Failure to change (or changing slowly) one's own mind in light of new information/evidence	- Monitor systematic changes and build procedures to take actions when systematic changes are identified
Selective perception	People tend to see problems in terms of their own background and experience	- Ask people with different backgrounds and experience to independently prepare the forecasts
Regression effects	Persistent increases or decreases might be due to random reasons which, if true, would increase the chance of a change in trend.	- Explain that when errors are random the changes of a negative error increases when several positive ones have occurred.

Source: Makridakis, S. "Metaforecasting: Ways of Improving Forecasting, Accuracy and Usefulness."

TABLE 7.5: Types of Forecasts.

ATTRIBUTE	QUALITATIVE METHODS			TIME SERIES PROJECTIONS				CAUSAL MODEL
	Executive Judgement	Market Research	Delphi	Annual Average Growth	Exponential Smoothing	Linear Trend	Linear Trend on Moving Average	Regression Analysis
<u>ACCURACY</u>								
0-6 Months	Good	Good	Fair/Good	Fair/Good	Good	Fair/Good	Good	Good
6-24 Months	Fair	Good	Fair/Good	Poor/Fair	Fair/Good	Poor/Fair	Fair	Fair/Good
5 Years	Poor	Poor/Fair	Fair	Poor	Poor/Fair	Poor	Poor/Fair	Poor/Fair
<u>SUITABILITY FOR FORECASTING</u>								
Traffic Growth	Good	Good	Good	Good	Good	Good	Good	Good
Traffic Reaction	Fair	Good	Fair		n.a.	n.a.	n.a.	Good
Traffic New Routes	Poor	Fair	Poor	n.a.	n.a.	n.a.	n.a.	Fair
ABILITY TO IDENTIFY TURNING POINTS	Poor/Fair	Fair/Good	Fair/Good	Poor	Fair	Poor	Poor/Fair	Good
READY AVAILABILITY OF INPUT DATE	Good	Poor/Fair	Poor	Good	Good	Good	Good	Poor/Fair
DAYS REQUIRED TO PRODUCE FORECAST	1-2	90+	30-180	1-2	1-2	1-2	1-2	30-90
COST	Very Low	High	Low	Low	Low	Low	Low	High

Source: Doganis, R. "Flying Off Course"

TABLE 7.6: Comparisons of Different Methods of Forecasting

Type of findings	Summary of Results	References
Judgmental Versus Quantitative Forecasting	Judgmental forecasts are not necessarily more accurate than quantitative ones. An exception is the forecasting of corporate earnings where analysts do better than models in the majority of published studies	Dawes (1986); Goldberg (1970) Hogarth and Makridakis (1981); Armstrong (1983)
Econometric Versus Time Series Methods	Econometric models are not necessarily more accurate than time series (extrapolative) models. It is not clear whether or not econometric models are more accurate for longer term forecasting horizons while time series methods for short term.	Nelson (1972); Naylor (1972); Armstrong (1978)
Complex or Sophisticated Versus Simpler Models	Complexity or statistical sophistication does not seem to improve post sample forecasting accuracy	Armstrong (1978); Makridakis and Hibon (1979); Makridakis et al (1982) Eihorn & Hogarth (1975); Armstrong (1985).
More Data or Information Versus Less Data or Information	Larger sample size does not improve post-sample forecasting accuracy. More information does not necessarily improve predictive accuracy. However, it increases one's confidence of the accuracy of his or her predictions.	Slovic (1972); Oskamp (1965); Alpert and Raifa (1982).
Best Method of Forecaster Versus Combining	No forecasting method or forecaster has been found to consistently out-perform others. Instead it has been shown that combining the forecasts of methods or people increases forecasting accuracy and outperforms the individual methods or forecasters.	Newbold & Granger (1974); Makridakis and Winkler (1983); Mahmoud (1984); Zarnowitz (1984); Schnaars (1986).
Least Squares Versus Discounted Least Squares	Forecasting methods utilising the discounted least squares method of estimation (giving more weight to more recent observations) outperforms least square methods (giving equal weight to <u>all</u> observations).	Makridakis and Hibon (1979); Makridakis et al (1982).

TABLE 7.6: Comparisons of Different Methods of Forecasting (continued).

Type of findings	Summary of Results	References
Fixed Parameter Versus Adaptive Methods	Fixed parameter and/or model methods out-perform adaptive ones.	Gardner and Dannenbring (1980); Makridakis et al (1982).
Aggregate Versus Disaggregate Series	The less the level of aggregation the higher the level of randomness (noise) and the better the accuracy of simpler methods.	Makridakis et al (1982); Schnaars (1986).
Forecasting Errors before 1973 Versus After 1973	No differences in the size of forecasting errors before and after 1973 were found	Daub & Peterson (1981); Daub (1981); Makridakis et al (1982).
Linear Versus Non-Linear Accuracy Measures	The relative performance of forecasting methods varies according to the type of accuracy measure (loss function) employed.	
Short Versus Long Forecasting Horizons	The relative performance of forecasting methods varies depending upon the length of forecasting horizon. For longer horizons methods which dampen the trend extrapolation outperforms methods which do not.	Makridakis and Hibon (1979); Makridakis et al (1982); Schnaars (1986).

Source: Makridakis, S. "The Art and Science of Forecasting: Assessment and Future Directions".

TABLE 7.7 Major Empirical Evidence and Its Implications

Major findings	Empirical Evidence	Implications
1. Simple methods	Simple, automatic and inexpensive methods give realistic forecasts	Use simple methods to a greater extent unless specific reasons that can be sunstantiated by concrete empirical evidence exists. For instance, use exponential smoothing methods.
2. Seasonality	Seasonality can be predicted accurately no matter what approach is being used	Deseasonalize the data to develop a model and forecast. Then re-seasonalize forecasts.
3. Combining	Combining different methods (by a simple arithmetic average) improves forecasting accuracy and reduces the variance of errors.	No matter what the approach utilized use several methods and combine their forecasts. Choose methods in such a way as their forecasts will be as complementary (therefore independent) as possible.
4. Short versus long term	Some models are more accurate for the short term (e.g.single exponential smoothing) others are more accurate for the long term (e.g. long memory ARARMA models)	In addition to traditional methods also use an AR(p) model where the length of p is large. Such AR(p) (called long memory) is appropriate for capturing and extrapolating the long term trend.
5. Dampening the trend	Dampening the trend improves forecasting accuracy.	Dampen the trend extrapolation using a dampen-trend exponential smoothing model.

Source: Makridakis, S. "New Approach to Statistical Forecasting".

REFERENCES

1. Colin Lewis, Business Forecasting In A Lotus 1-2-3 Environment (England: John Wiley & Sons Ltd, 1989) P.2

2. Ibid, P.2.

3. Spyros Makridakis, The Art And Science Of Forecasting (France: European institute of Business Administration, 1985) PP.3-6.

4. William Ascher, Forecasting:An Appraisal For Policy-Makers And Planners (London: The Johns Hopkins Press, 1978) PP.199-214.

5. Harry Jones and Brian C Twiss, Forecasting Technology For Planning Decisions (Hong Kong: Shanghai Printing Press, 1978) PP.3-6.

6. Ascher,P.165.

7. Tom Whiston, The Uses And Abuses Of Forecasting (GB: Billing And Sons Ltd, 1979) P.64.

8. Ascher, PP.147-149.

9. Gershuy, PP.64-66.

10. Ascher, PP.142-164.

11. Spyros Makridakis, Metaforecasting: Ways Of Improving Forecasting, Accuracy And Usefulness.(France: European Institute of Business Administration, 1985).

12. Ibid, PP.33-54.

13. Ibid, P.35.

14. Whiston, PP.323-433.

15. Ibid, P.327.

16. Ibid, P. 328.

17. Ibid, PP.330-332.

18. Ibid, P.332.

19. Greenberger, M, Models In The Policy Process (New York: Russel Sage Foundation,1981) P.27.

20. Thomas Baumgartner and Atle Midttun The Politics Of Energy Forecasting (USA: Oxford University Press, 1987) P.33.

21. Ibid, P.33.

22. Ibid, P.41.

23. Ibid, PP.344-350.

24. Bjorkman,B., Methodology In Air Traffic Forecasting (Paris: Civil Aviation Forecasting Workshop, ICAO, 1974) PP.1-2.

25. Taieb Cherif, Air Travel Demand Forecasting Model (England: Flight Division, CIT, 1978) P.14.

26. Ibid, P.15.

27. Nawal K. Taneja, Model For Forecasting Future Air Travel Demand On North Atlantic (USA: Flight Transportation Laboratory, M.I.T., January 1976).

28. Bjorkman,B., Estimating Of Potential Air Traffic Flows (Hogskolan: Institute For Tranfikplanering Kungl, Tekniska, 1978).

29. Richard, S.B. International Relationships Affecting Air Travel (Land Economics, 1957).

30. Simpson,R.W. Theory Of Domestic Airline Economics (USA: Flight Transportation Laboratory, M.I.T., 1974).

31. Rigas Doganis, Flying Off Course (London: Unwin Hyman Inc, 1985) PP.185-189.

32. Ibid, PP.185-189.

33. ICAO, Manual On Air Traffic Forecasting (Canada: ICAO, 2nd, 1985).

34. Nawal K. Taneja, Airline Competition Analysis(USA: Flight Transportation Laboratory, MIT, Memo FLT-M68-2, 1968).

CHAPTER EIGHT

MODELLING AIR TRAFFIC DEMAND FOR DOMESTIC GCC SCHEDULED AIR SERVICES

8.1. BACKGROUND

The gravity model was selected in the previous chapter to examine traffic demand in the GCC. However, the objective of this chapter is to model the scheduled air traffic demand in the GCC especially for new routes with consideration of distance, fares and quality of service.

The technique for traffic forecasting that is used in this study is the gravity model which was first formulated by Henry Cary in 1885 by analogy with Newtonian physics of matter. It has since become known as the " Gravity of concept of human interactions." Cary[1] indicated the idea that social phenomena are based on the same fundamental law as physical phenomena and that "gravitation is here, as everywhere else, and is in proportion to mass and in the inverse one of the distance".

The gravity concept was partially used by E.G.Ravenstein[2] in an explanation of migration in the 1805. However, its first application to transport was by Lill[3] when he incorporated it into a "travel law" during analyses of movement on the Austrian State Railways in 1889.

In 1951, D'Arcey Harvey while doing work for the Civil Aeronautics Board, suggested that the gravity model with little modification could be used to evaluate traffic flow between two communities[4]. The route traffic will be roughly proportional to:

$$P1 * P2/D$$

Where	**P1&P2**	**The populations of the two cities**
	D	**The distance between them**

In 1956 Stephen Wheatcroft modified it in his book The Economics Of European Air Transport[5] on acceptance of the proposition that

Traffic Potential = a (P1*P2) / D

Where a The community of interest factor

The simple gravity concept makes a basic assumption that all populations have the same generative force. At the same time, market variation exists in the volume of air traffic such as structure of the population and quality of service provided at airports. So, a more effective method was used by Rigas Doganis in 1966[6]. He used the total air traffic rather than population, and he raised the distance to a power other than unity. As a result, the air traffic between two communities will be proportional to the product of their total air traffic with the following formula

Route Traffic = K (T1*T2/D^P)

where	**T1&T2**	**=**	**Total airport traffic of the cities.**
	D^P	**=**	**Distance between them raised to a power p.**
	K	**=**	**A constant.**

8.2. SCOPE OF THE STUDY

The scope of the study detailed in this chapter is to model the scheduled air traffic demand in the GCC especially for new routes that do not have services at the current time. After researching many techniques for the purpose of this study, the gravity model was found to be the most successful for forecasting new air routes, in addition, these routes are in developing countries. This model is the starting stage to model the GCC air traffic flows under various air liberalisation environments.

8.3. DATA COLLECTION AND CALIBRATION

The data which are obtained for this model are mostly from The ICAO Digest Of Statistics[7] such as On-Flight Origin and Destination, Airport Traffic and Statistics, and Traffic by Flight Stage. The ABC World Airways Guide has been used as well[8]. The flight route Bahrain-Dhahran-Bahrain was excluded from all stages of the model because it was always very far away from the regression line and clearly has different characteristics to the other routes. There are many reasons to explain this occurrence, some of which are the following:

1. It was the most dense route where the total O/D traffic was reported in 1987 to be 82,007 passengers. On the other hand, the mean of the O/D routes amongst the GCC was 20,760 passengers. Although in 1986 a causeway was opened between Saudia Arabia (Alkober which is very close to Dhahran) and Bahrain, that route still has the highest total of O/D passengers in the GCC.
2. It is the route with the shortest distance. The mean distance of all the GCC routes is 925 Kms and the distance between BAH-DHA is only 45 Kms.

8.4. MODEL METHODOLOGY

Already in 8.1 above the forecasting methodology has been touched on as to the Newton's formulation of the gravity model and Doganis's modifications to the model. However, the building up process of the model and the selection of the formulation options are illustrated in Figure 8.1 which will include the following alternatives:

1. The Basic Airport Traffic-Distance Model.
2. The Basic Airport Traffic-Distance Model With Distance Modifications.
3. The Basic Airport Traffic-Fare Model.
4. The Airport Traffic, Fare And Quality Of Services Model.
5. Modelling Saudia Arabia Domestic Market.
6. Modelling All the GCC Traffic (Domestic and International Airports)
7. Selection of a model giving best results.

8.5. THE BASIC AIRPORT TRAFFIC-DISTANCE MODEL

8.5.1. Data Calibration

The traffic routes of Bahrain-Doha-Bahrain and Bahrain-Kuwait-Bahrain have been excluded from this part of the model for the following reasons:

1. BAH-DOH-BAH routes reported the second highest number of O/D passengers (77,229 pax) of all the GCC routes.
2. BAH-KWI-BAH route reported the third highest one with a total of 75,005 passengers, and the mean of all the O/D routes at that region, as mentioned before, was 20,760 passengers.

3. The previous routes were very far from the regression line when they were plotted.

8.5.2. Model Results

At the first part of the study, the basic airport traffic-distance technique has been used and modified for different powers of distance. The formula which is applied is expressed as

Route Traffic = A1 A2 /D^P

Where	A1&A2	The total annual traffic of the first and second airports.
	D^P	The distance between the two airports to the power of (P).
	K	A constant.

The following are some of the various distance power values that produced different regression coefficients:

DISTANCE POWER	CORRELATION COEFFICIENTS PRODUCED
P=0	0.741
P=0.5	0.727
P=1	0.529
P=1.5	0.421
P=2	0.331

When using P at a value of 2, this gave the lowest result for correlation coefficient. However, replacing P with 0.0 produced the most successful results. The correlation coefficients improved as we lower the value of P. A conclusion under this technique can be derived that the interactions in terms of air traffic diminish with distance more than the physical situations.

Figure 8.2 plots the route traffic against A1A2/D^0, and Figure 8.3 plots it against A1A1/D^0.5 which is the second best result giving a correlation coefficient of 0.727. When looking at both of these figures, we notice that each one tends to have two regression lines which give us the idea of dividing the data to obtain better results. Table 8.1 lists the actual and fitted traffic for The Basic Gravity Model.

8.6. THE BASIC AIRPORT TRAFFIC-DISTANCE MODEL WITH DISTANCE MODIFICATIONS

8.6.1. Data Calibrating

There are five routes that were not included in this part of the model. However if these routes were grouped together, the correlation coefficients between the route traffic and A1A2/D^1.9 will produce a regression coefficient of 0.997. The following are the five routes with their fitted values of route traffic:

		Distance	Actual Traffic	Fitted Traffic
1.	BAH-KWI	432	73145	73200
2.	KWI-BAH	432	75005	74320
3.	BAH-AUH	436	31557	28778
4.	DOH-KWI	576	19634	19019
5.	KWI-DOH	576	16114	19019

At this model the traffic routes will be divided according to the distances between them which will include the following three divisions:

1. Less than 400 Kms.
2. Less than 790 Kms and more than 400 Kms.
3. More than 790 Kms.

8.6.2. Less Than 400 Kms

This is the smallest division which includes only four routes. Taking distance to the power of 0.5 produces a value of correlation coefficient which is 0.9998. The following contain those routes and their fitted traffic values:

	Distance	Actual Traffic	Fitted Traffic
BAH-DOH	146	77229	76347
DOH-BAH	146	75464	76397
DOH-DHA	180	12437	12277
DHA-DOH	180	12116	12277

The following are the resulting correlation coefficients between route traffic and A1A2/D^P:

DISTANCE POWER	REGRESSION COEFFICIENTS
P=0	0.9998
P=.5	0.9998
P=1	0.9998
P=1.5	0.9998

The regression coefficients were almost the same for the various powers. This means that the distance variable at this stage of the model does affect traffic demand specifically for those routes.

8.6.3. More Than 400 Kms & Less Than 790 Kms

The correlation between the route traffic and A1A2/D^P (where D is less than 790 Kms and more than 400 Kms) has been analysed to different values of P. The following are the results which have been obtained:

DISTANCE POWER	REGRESSION COEFFICIENTS
P=0	0.950
P=.5	0.977
P=1	0.975
P=1.5	0.954
P=2	0.921

Substituting a distance power of 0.5 produces the best correlation coefficient. When decreasing the value of P, the regression results decrease more than increasing P to above 0.5. Taking distance to the power of 0.5 is therefore the best interaction with distance, the interactions diminish more towards P to be 0 rather than to be 1. This means that at this division of distance calibration, the interactions increase more slowly than with distance in the physical situation.

Table 8.2 shows the data used, the actual traffic and the fitted traffic of the best results obtained in this section. Figure 8.4 plots the 1987 route traffic against A1A2/D^0.5.

8.6.4. More Than 790 Kms

This section analyses the route traffic and A1A2/D^P where D is more than 790 Kms. The following are the correlation coefficients which were produced for the various distance powers:

DISTANCE POWER	REGRESSION COEFFICIENTS
P=0	0.819
P=.5	0.854
P=1	0.879
P=1.5	0.897
P=2	0.908

As can be seen, the most successful results were obtained when P is 2, and the interactions increase slowly with distance which make the formula A1A2/D^2 is the best for the long distance routes division.

Figure 8.5 plots the route traffic against A1A2/D^2, and Table 8.3 exhibits the data and fitted values for this division.

8.7. REPLACEMENT OF DISTANCE WITH FARE

The correlation between the fare and distance for GCC routes have been analysed and were plotted in Figure 8.6. This produces a correlation coefficient of 0.911 which indicates a strong relationship between fare and distance. Table 8.4 shows the calculated fitted values of fares against distances where disproportional fares and distances can be seen. The fares that are used in this model are in Qatari Riyals (QR). Full fares for the economy class were used. The business class fares were assumed to be in a constant ratio to the economy fares.

8.7.1. Data Calibration

There are four routes that were not included in this part of the study which are the following:

1. BAH-DOH
2. BAH-KWI
3. DOH-BAH
4. KWI-BAH

These routes were not included because of their high annual number of O/D passengers in relation with the mean of the other routes which was explained in detail earlier.

8.7.2. Results Obtained

The correlation coefficients produced between route traffic and A1A2/F^P were approximately similar to the ones which were produced in the basic airport traffic-distance model. This means again, the interactions decrease more slowly with fare than in the physical situation. The following are the results obtained:

FARE POWER	REGRESSION COEFFICIENTS
P=0	0.741
P=.5	0.732
P=1	0.596
P=1.5	0.524
P=2	0.422

Surprisingly, the best value of P is (0.0) which is exactly the same as the previous basic airport traffic-distance model produced under the same power of (0.0).

8.8. ESTIMATING THE DEMAND WITH QUALITY OF SERVICE VARIABLE

Recent models of regulation suggest that the quality of service could play an important, but hitherto ignored, variable for setting prices and fares by the regulators, and these models have recently been used very widely in regulated airline environments[9].

Empirical models usually assume that demand is insensitive to the level of quality. However, DeVany incorporated flight frequency as a quality of service variable affecting demand in his econometric models.

A study by Richard A.Ippolito[10] succeeded in estimating a model of airline demand that incorporates a level of service. He chose monopoly flight segments for the following reasons:

1. Excluding potential competitive problems.
2. Avoiding being sensitive to the arbitrary specification of oligopoly models.

8.8.1. Data Calibrating

The following routes have been excluded in this part of the model:

1. BAH-DOH-BAH
2. BAH-KWI-BAH
3. BAH-RUH-BAH

As before, the first two routes were included in the model, however, the third route is being excluded in this part of the model only because it was out of scale.

8.8.2. Method Of Calculations

Since the airline industry in the GCC is mostly based on national monopolies, quality of service measurement could be applied to the gravity model with replacement of distance with fare. The measurement of quality of service in this study is done by calculating the number of frequencies and considering whether the flight is direct or transfer. Since all the flights that are contained in this study are jets, the type of aircraft is excluded in this model. Differences between wide bodied and standard bodied types were ignored. The level of quality of service will be as follows:

1. Direct flights	Weighting
■ Non-stop	1,000
■ One stop	0.750
■ Two stops	0.625
2. Transfer Connection Flights	
■ One connection none-stop	0.500
■ One connection one stop	0.350
■ Two connections, one stop or others	0.250

The formula which is used is expressed as

Route Traffic = K (A1A2Q^n/F^p)

Where Q^n Quality of service to the power of n

K A constant

The best correlation coefficient between the route traffic and A1A2Q^n/F^P produced a regression coefficient of 0.87 under P=2 and n=0.4. However, this regression coefficient is the highest that include all the airports without divisions. Figure 8.8 plots route traffic against A1A2Q^2/F^0.4. Table 8.6 presents the data used, the quality of services weights, Y class fares, actual route traffic and the fitted values.

8.9 MODELLING SAUDIA ARABIA DOMESTIC MARKET

This section analyses the Saudia Arabia domestic market where 125 routes were studied and analysed. In this chapter, the Saudia domestic routes gave the best regression results without applying any distance division, deleting any routes, or including any fare or quality of service variables. The correlation coefficient between the route traffic and (A1*A2/D^P) produced the following results:

DISTANCE POWER	REGRESSION COEFFICIENTS
P = 0	0.936
P = 0.5	0.960
P = 1	0.926
P = 1.5	0.790
P = 2	0.561

Figure 8.9 plots the route traffic against (A1*A2/D^0.5).

8.10 MODELLING ALL THE GCC TRAFFIC (Domestic and International Airports)

This part of the forecasting model analyses all the GCC traffic which includes domestic and international airports. There are 166 routes that have been involved at this part. The following results have been obtained:

DISTANCE POWER	REGRESSION COEFFICIENTS
P = 0	0.785
P = 0.4	0.804
P = 0.5	0.803
P = 1	0.758
P = 1.5	0.631
P = 2	0.443

Figure 8.10 plots the actual route traffic against the estimated (A1*A2/D^0.4).

8.11 OTHER ATTEMPTS TO FORECAST ALL GCC TRAFFIC

The following are the attempts to forecast all the GCC traffic:

1. **The basic traffic-distance with distance modification gave the following results:**
   - **Distance less than 250nm (includes 34 routes)**

DISTANCE POWER	REGRESSION COEFFICIENT
P = 0	0.249
P = 0.5	0.164
P = 1	0.085
P = 1.5	0.078
P = 2	0.076

- **Distance more than 250nm and less than 500nm (includes 56 routes)**

DISTANCE POWER	REGRESSION COEFFICIENT
P = 0	0.213
P = 0.5	0.199
P = 1	0.184
P = 1.5	0.169
P = 2	0.154

- **Distance more than 500nm (includes 76 routes)**

DISTANCE POWER	REGRESSION COEFFICIENT
P = 0	0.881
P = 0.5	0.915
P = 1	0.937
P = 1.5	0.950
P = 2	0.957

2. **Replacement of distance with fare produced the following results (includes 63 routes)**

FARE POWER	REGRESSION COEFFICIENT
P = 0	0.108
P = 0.5	0.087
P = 1	0.051
P = 1.5	0.069
P = 2	0.072

Although previously this technique produced good results when analysing the GCC traffic (international airports only), when mixing the international and domestic airports the regression results were poor.

3. **Estimating demand with fare and quality of service variables, the following are the best results produced under these variables (includes 63 routes).**

FARE POWER	QUALITY OF SERVICE POWER (n)	REGRESSION COEFFICIENT
P = 0	n = 0.5	0.814
P = 0	n = 1	0.811
P = 0	n = 0	0.792
P = 0	n = 1.5	0.781
P = 0.5	n = 0.5	0.739
P = 1	n = 0	0.597

Although previously this method produced the best results when analysing the GCC traffic (international airports only), when analysing all the GCC traffic (international and domestic airports) it only produced reasonably good results, based on 63 routes only.

8.12 SELECTION OF THE FINAL MODEL

When reviewing the various options that have been explained, we find the following:

1. The Basic Airport Traffic-Distance Model and the one with replacement of distance with fare, produced almost the same correlation coefficient of 0.714 when both distance and fare were raised to the same power of (0.0). Both these parts are for the GCC traffic between international airports only.
2. The Basic Airport Traffic-Distance With Distance Modifications Model which is between international airports only produced the following correlation coefficients:
   - Distance less than 400 Kms

     P=0.5 r=0.9998
   - Distance less than 790 Kms and more than 400 Kms

     P=0.5 r=0.977
   - Distance more than 790 Kms

     P=2.0 r=0.908
3. Estimating demand with quality of service variable gave a regression coefficient of 0.87 when P=2 and n=0.4 for the GCC traffic between international airports only.

4. Saudia domestic traffic produced a regression coefficient of (0.960) when the distance was raised to (0.5). This part includes 125 routes.
5. All GCC traffic including international and domestic airports produced a regression coefficient of (0.804) when the distance was raised to (0.4). This part involves 166 routes.
6. Other attempts were made to model all the GCC traffic including international and domestic airports. Such methods included basic distance method with distance modification, replacement of distance with fare, and fare and quality of service variables. However most of the regression results obtained from these results were not satisfactory.

The model which was chosen is the Basic Airport Traffic-Distance for all GCC traffic for the following reasons:

1. It involves all the GCC traffic including international and domestic airports.
2. It includes the highest number of O/D routes of 166 routes without any modification or divisions.
3. It produced a relatively good regression coefficient of (0.804).
4. It is simple to use.
5. For the purpose aimed, this model can forecast new routes based on distances which are already known rather than fares or quality of services that are not available for new routes.

8.13 CHAPTER CONCLUSIONS

As mentioned earlier in this chapter, the purpose of this model is to establish a good technique that can forecast the scheduled air traffic demand in the GCC, especially on new routes that do not have services at the present time. Having that purpose in consideration and checking the chosen model with the ICAO approach to building-up a model, the following are significant:

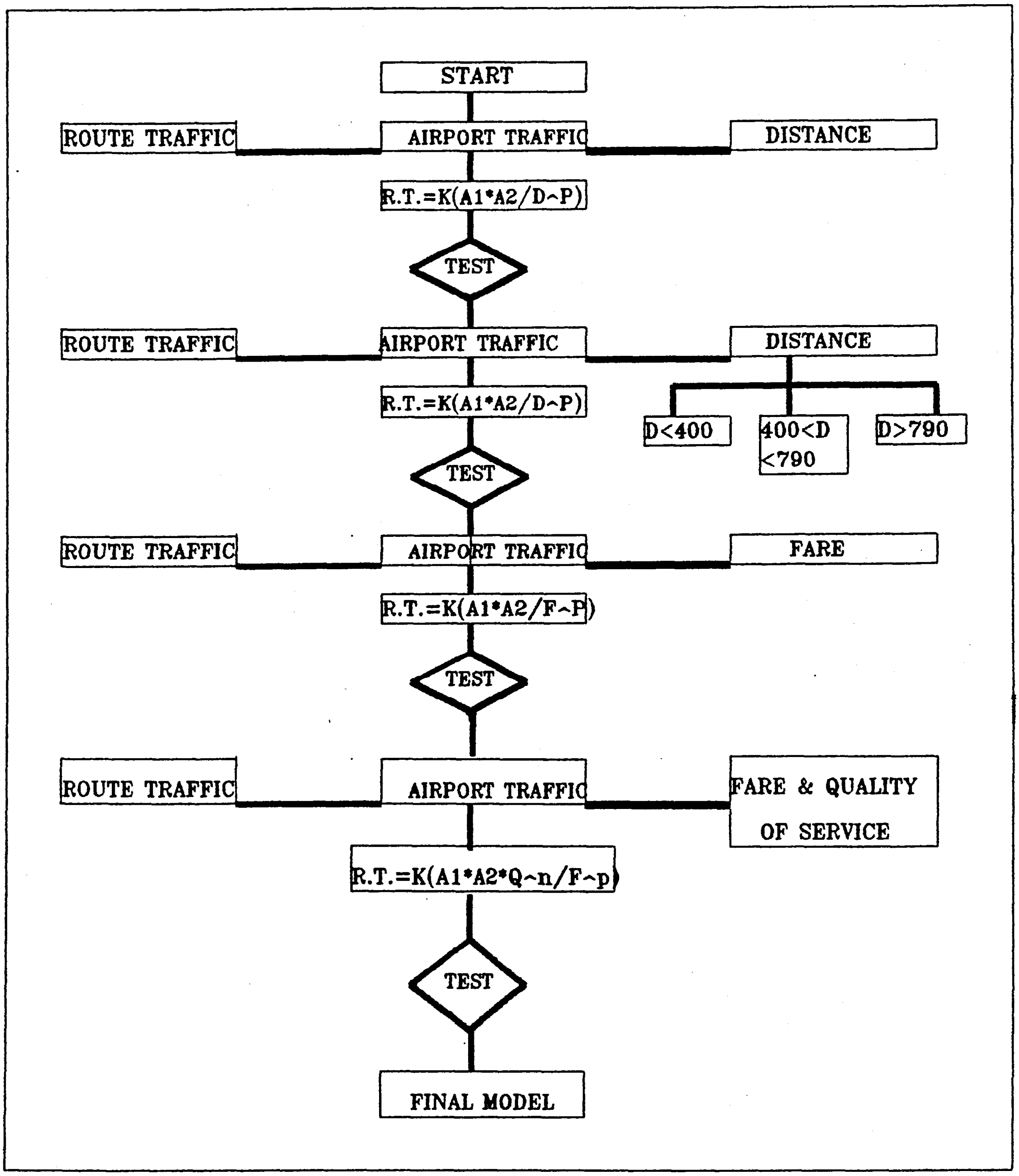
1. Relevant causal factors were selected such as distances, fares, quality of services, total airport traffic, and total O/D passengers.

2. Data was collected for the years of 1987 and 1988.
3. The independent variables were forecast such as total annual O/D passengers, fares and quality of services which led to forecast the dependent variables such as the route traffic.
4. The following three formulae identify the relationship between the dependent and independent variables:
   - Route Traffic = K(A1A2/D^P)
   - Route Traffic = K(A1A2/F^P)
   - Route Traffic = K(A1A2Q^n/F^P)
5. Tests and evaluations at all the stages of the model have been done to get the best results in term of fitted values of air traffic in regression formulations, and the results of the chosen model have been tested and compared with the actual values which were obtained for 1987 and 1988.

When validating the chosen model with Taneja's model of validity we find the following:

1. The chosen model is based upon a fundamental theory which is Newton's gravity formula.
2. The assumptions that have been used in this model are justifiable according to Doganis's modifications of the old gravity model where he used the annual total passengers at airports instead of the population of the cities and raised the distance to a power.
3. Statistically this model is valid. All the formulae are mathematically valid and the regression formulations were used to calculate the correlation coefficients.

FIGURE 8.1: The Process Of Building-Up And The Formulation Alternatives.



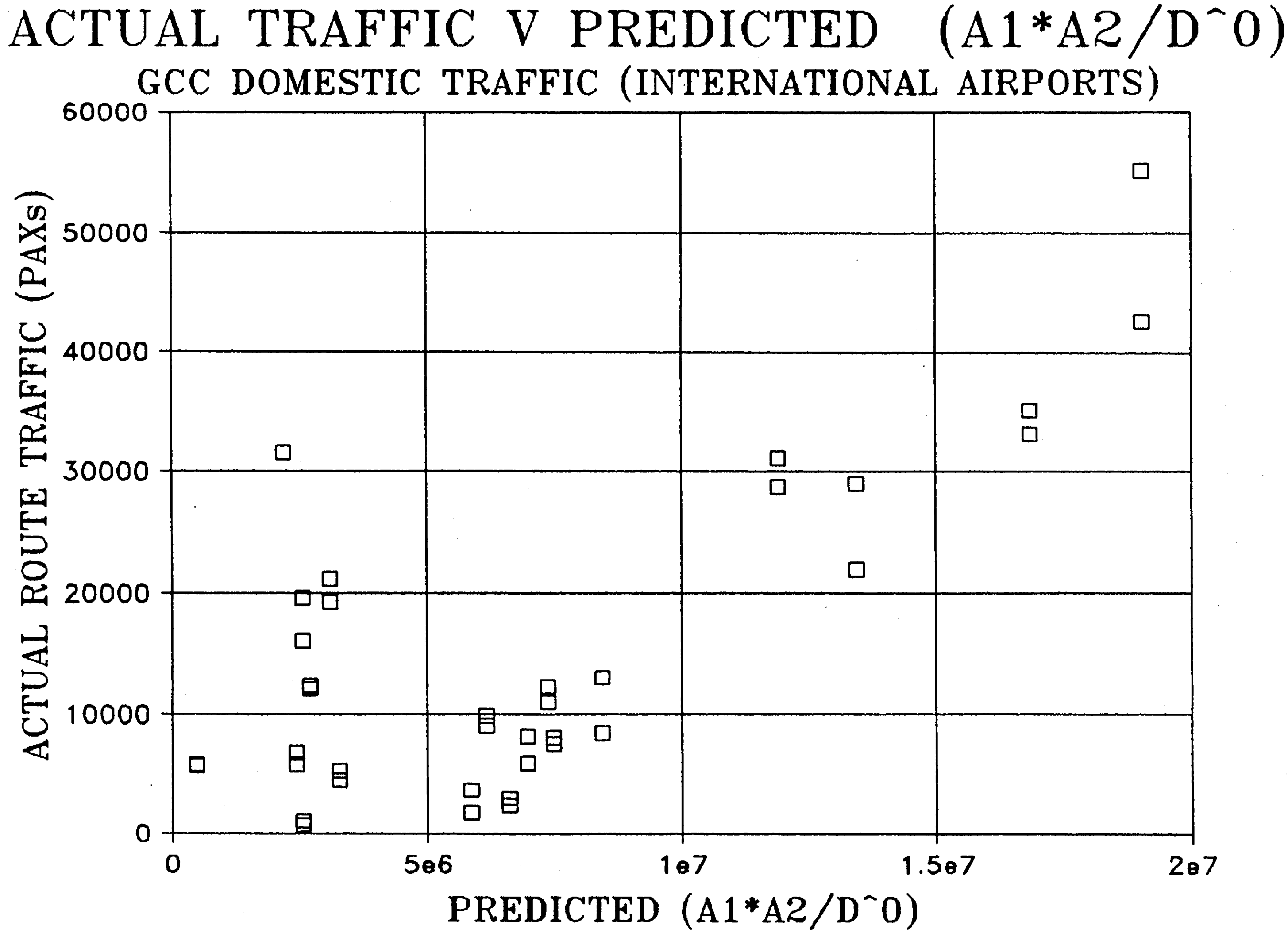


FIGURE 8.2: **Actual Route Traffic Versus Predicted (A1*A2/D^0) For The GCC Domestic Traffic Between The International Airports.**

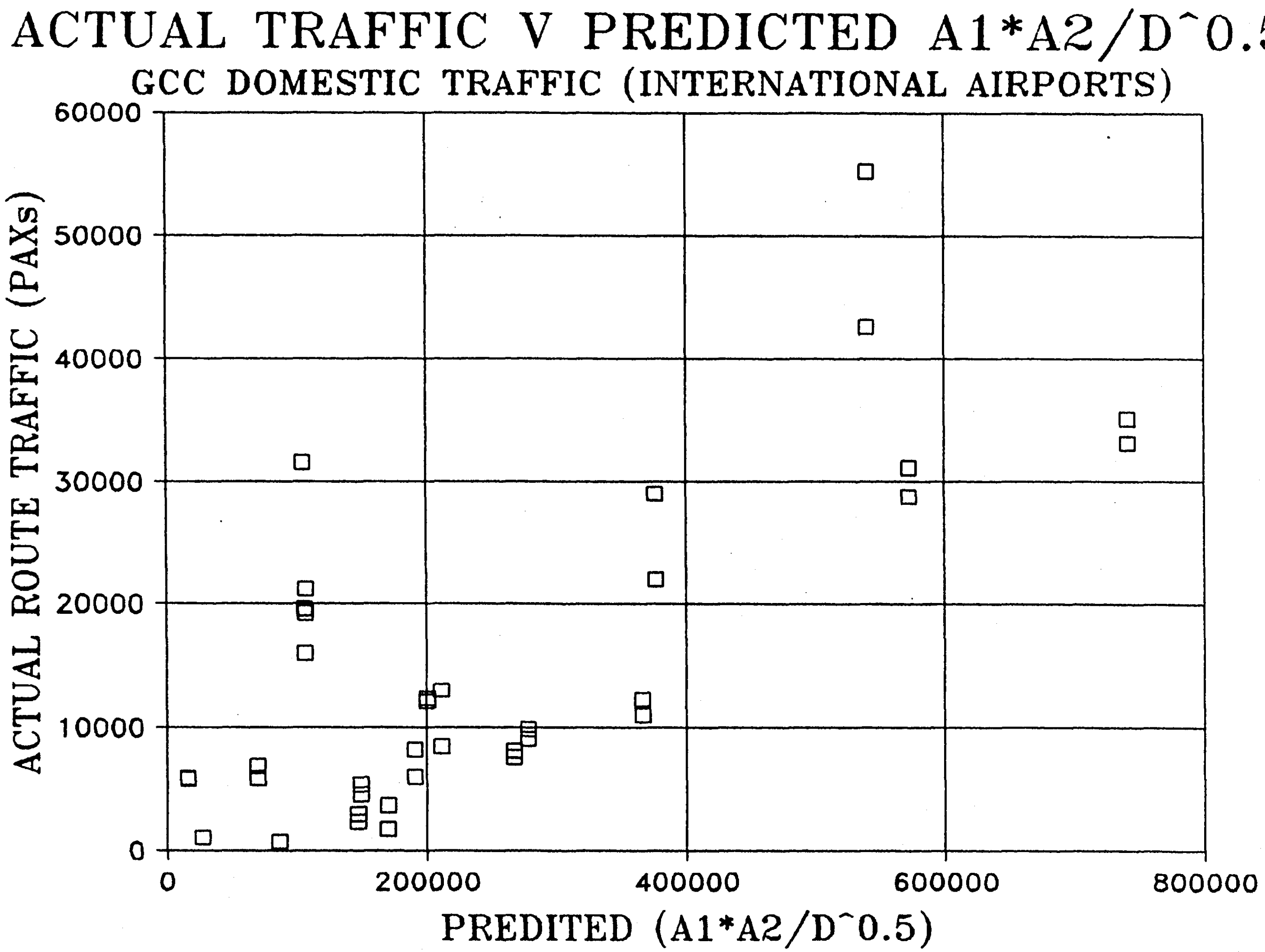


FIGURE 8.3: **Actual Route Traffic Versus Predicted (A1*A2/D^0.5) For The GCC Domestic Traffic Between The International Airports.**

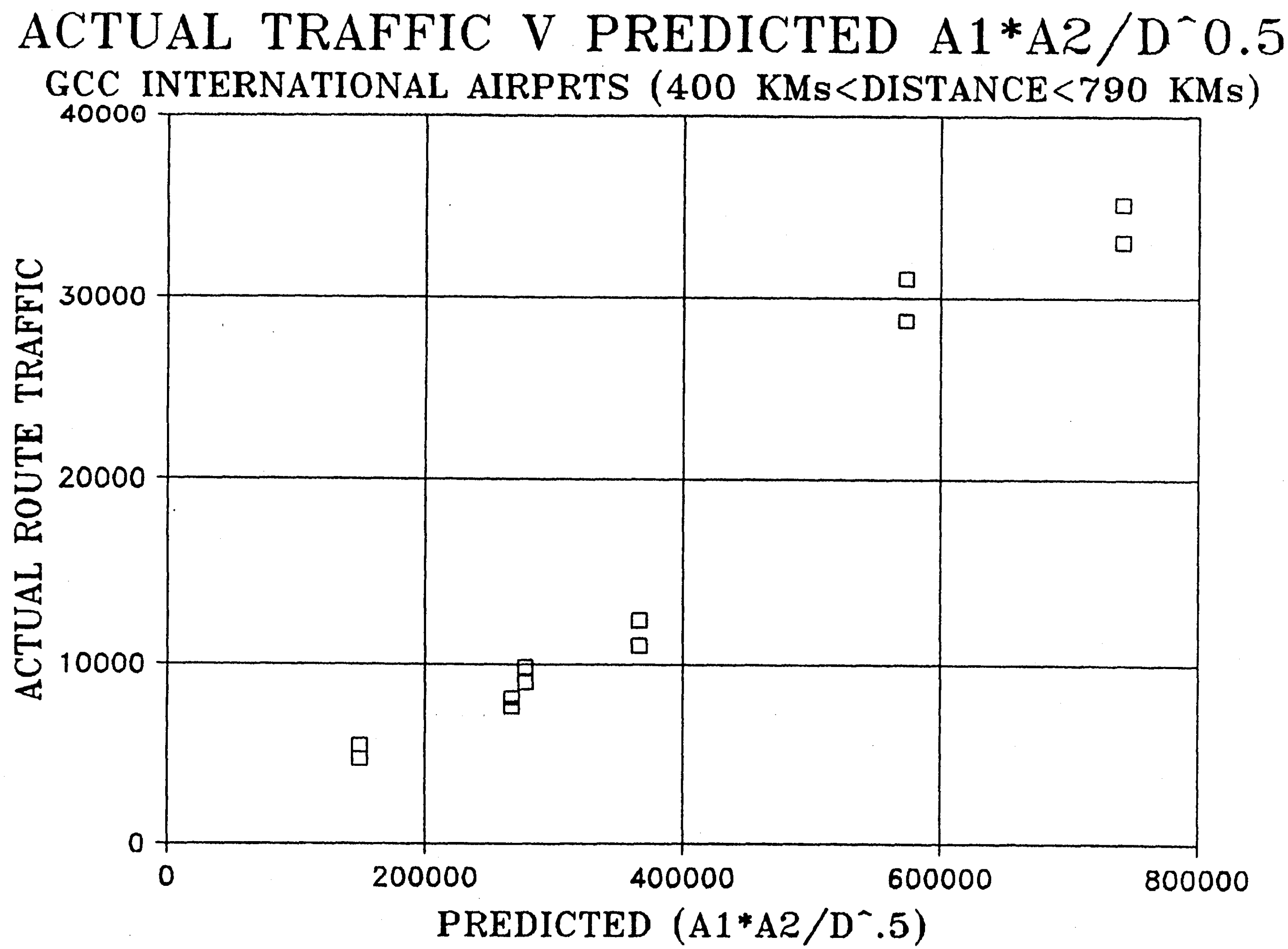


FIGURE 8.4: **Actual Route Traffic Versus Predicted (A1*A2/D^0.5) For The GCC Domestic Traffic Between The International Airports. Distance Modification (400 Kms < Distance < 790 Kms)**

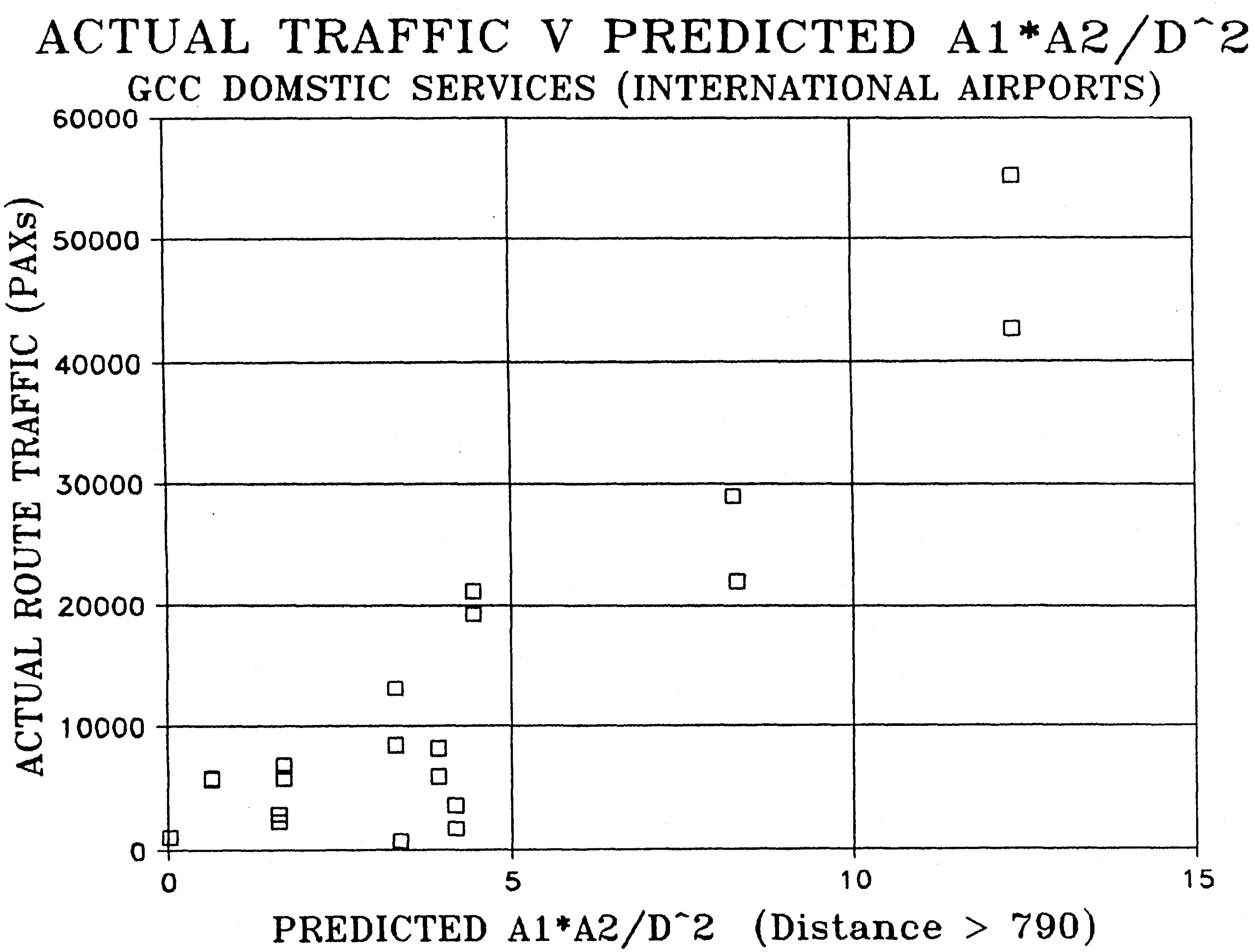


FIGURE 8.5: **Actual Route Traffic Versus Predicted (A1*A2/D^2) For The GCC Domestic Traffic Between The International Airports. (Distance > 790 Kms).**

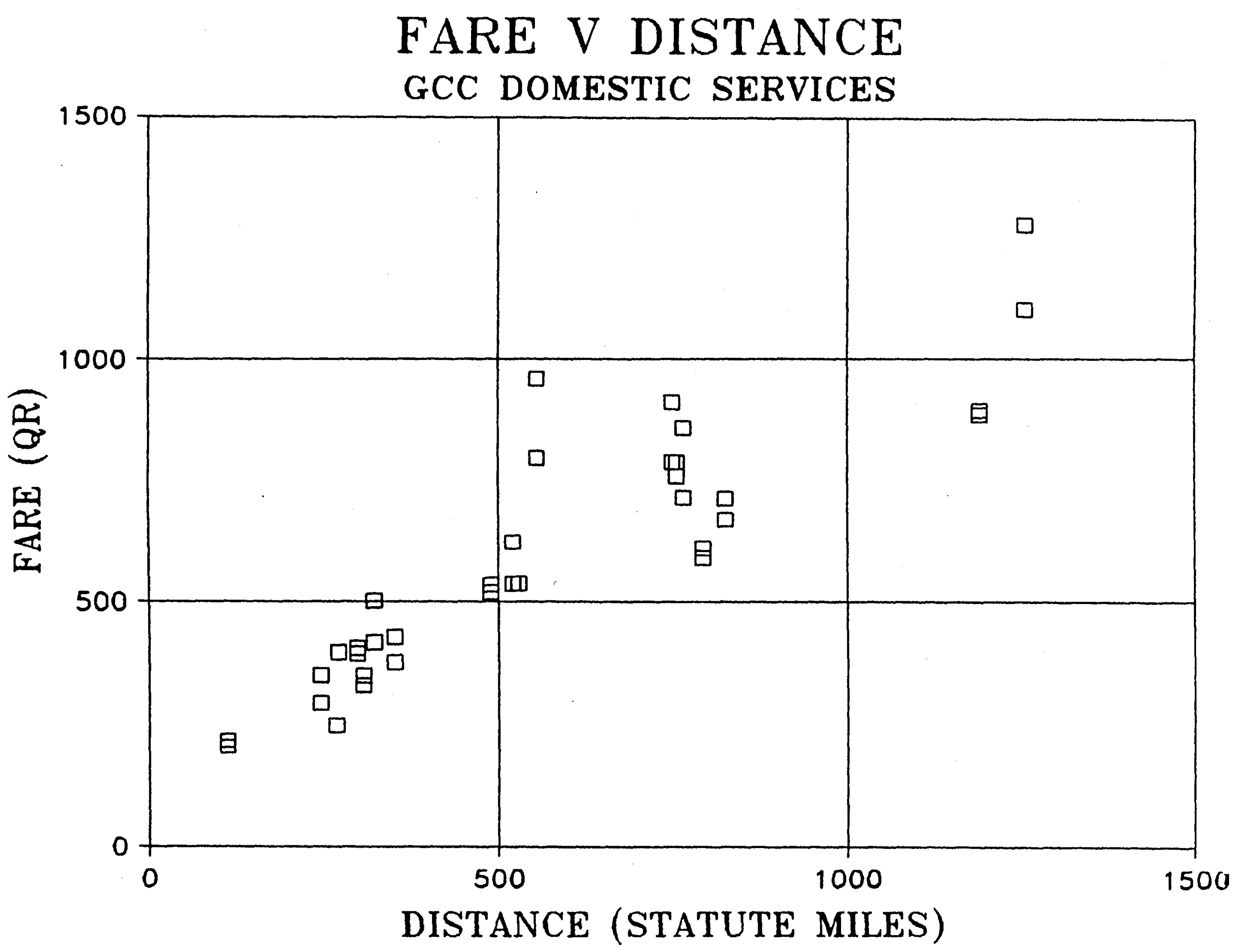


FIGURE 8.6: Fare Versus Distance For The GCC Domestic Traffic Between The International Airports.

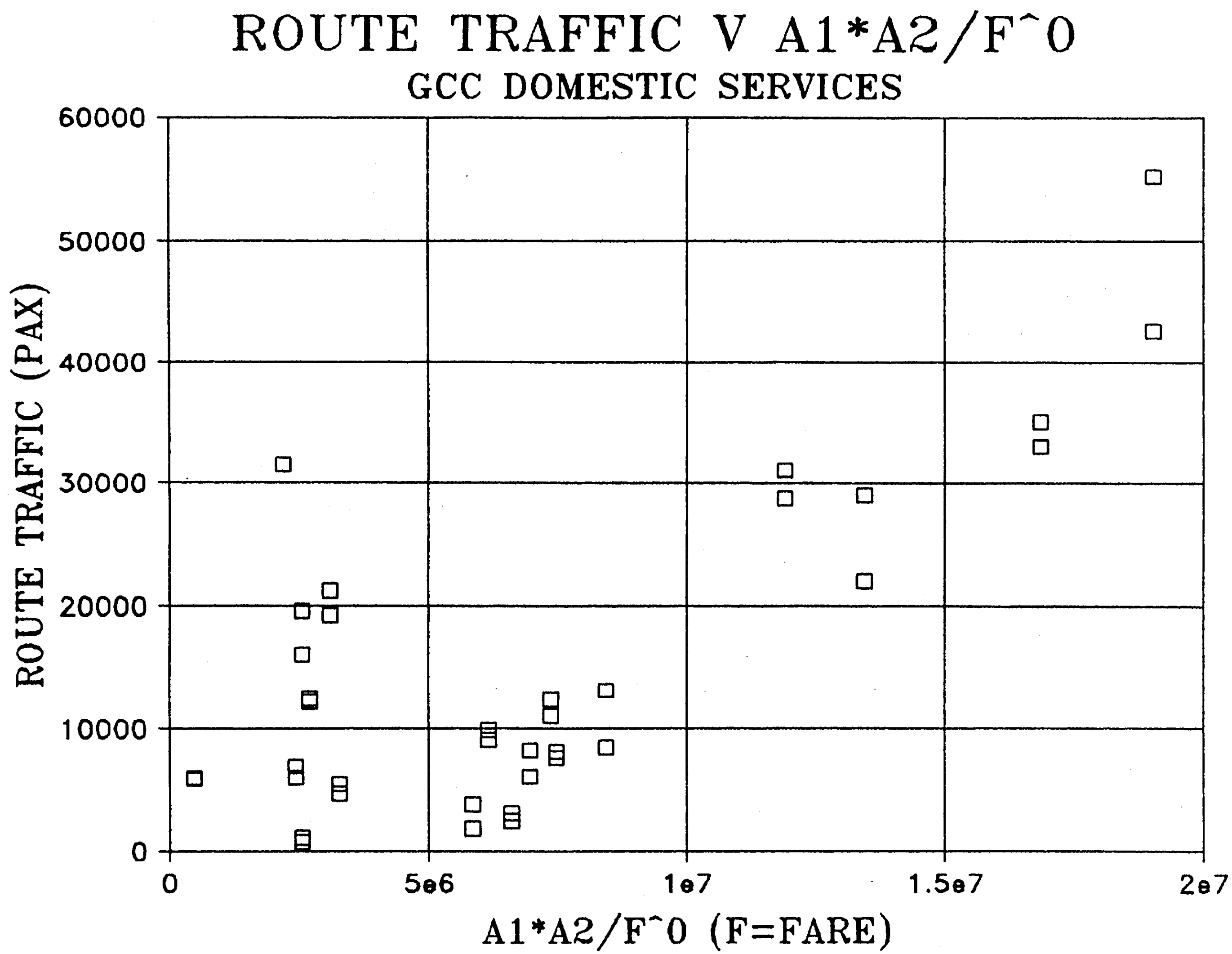


FIGURE 8.7: Actual Route Traffic Versus Predicted (A1*A2/F^0) For The GCC Domestic Traffic Between The International Airports.

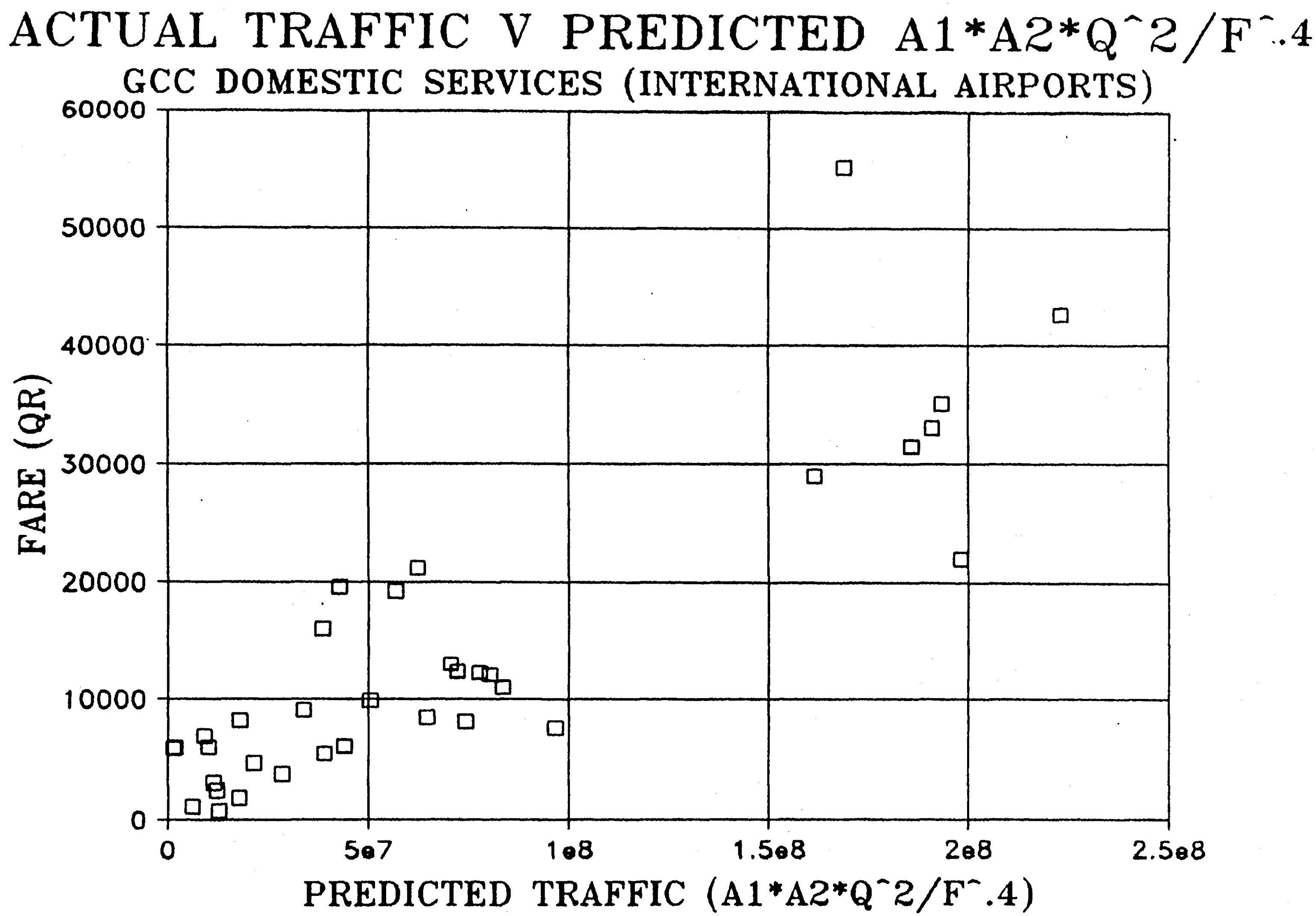


FIGURE 8.8: **Actual Route Traffic Versus Predicted (A1*A2*Q^2/F^0.4) For The GCC Domestic Traffic Between The International Airports.**

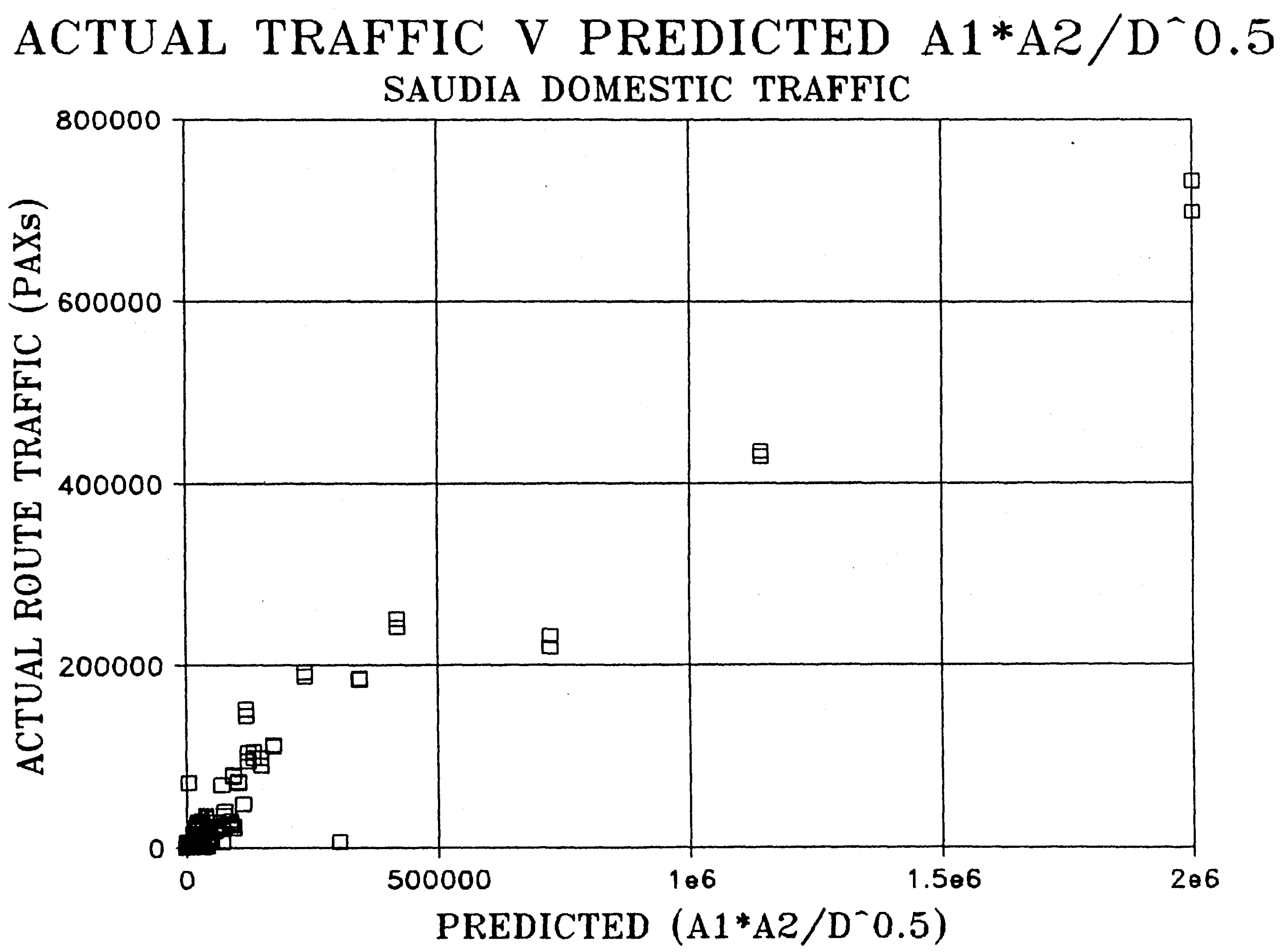


FIGURE 8.9: **Actual versus Predicted (A1*A2/D^0.5) for Saudia Arabia Domestic Traffic**

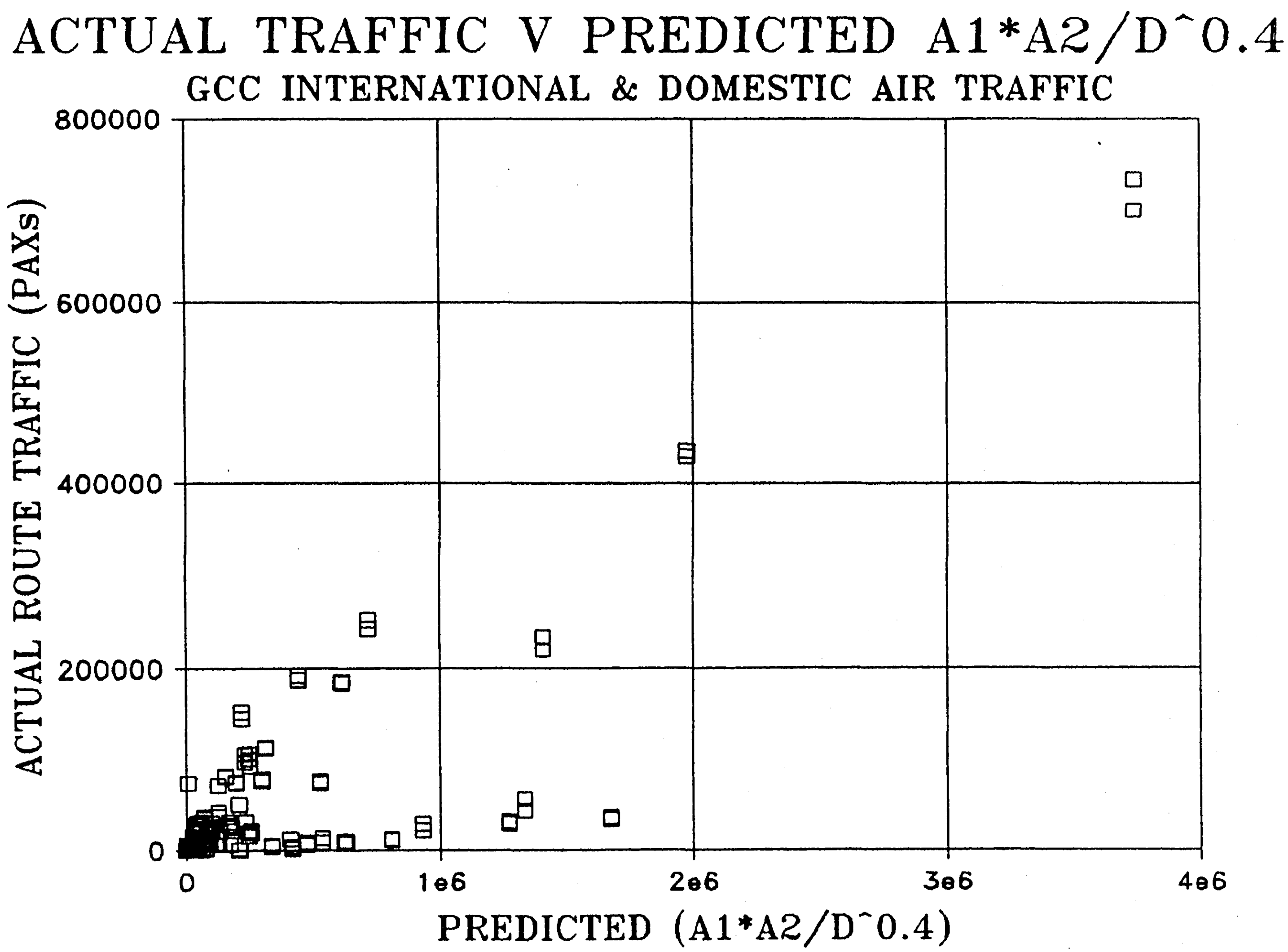


FIGURE 8.10: The Actual Route Traffic versus (A1*A2/D^0.4) for All GCC Traffic (Domestic and International Airports)

TABLE 8.1: Actual And Fitted Traffic For The Basic Gravity Model for the GCC Domestic Traffic Between the International Airports.

ORIGIN CITIES [A1]	DESTINATION CITIES [A2]	@DIST [KM]	[A1] [1000 PAXs]	[A2] [1000 PAXs]	ACTUAL TRAFFIC [1000 PAXs]	FITTED TRAFFIC [1000 PAXs] A1*A2/D^0	FITTED TRAFFIC [1000 PAXs] A1*A2/D^.5
ABU DHABI	*BAHRAIN	436	1173	1867	31557	6008	7798
	DHAHRAN	478	1173	2786	4564	8026	9976
	JEDDAH	1595	1173	7197	8485	17710	12999
	KUWAIT	835	1173	2644	19291	7714	7918
	RIYADH	782	1173	6373	8156	15901	15731
BAHRAIN	JEDDAH	1272	1867	7197	22030	27058	21075
	RIYADH	432	1867	6373	31092	24179	30632
DHAHRAN	ABU DHABI	478	2786	1173	5359	8026	9976
	DOHA	180	2786	967	12116	6577	12483
	KUWAIT	404	2786	2644	12364	15696	20573
	MUSCAT	870	2786	918	766	6696	6911
DOHA	DHAHRAN	180	967	2786	12437	6952	12483
	JEDDAH	1330	967	7197	5975	14935	11996
	KUWAIT	576	967	2644	19634	6695	7879
	RIYADH	492	967	6373	9051	13444	16244
JEDDAH	ABU DHABI	1595	7197	1173	13078	17710	12999
	BAHRAIN	1276	7197	1867	29012	27058	21046
	DOHA	1330	7197	967	8241	14935	11996
	KUWAIT	1241	7197	2644	55238	37524	29055
	MUSCAT	2020	7197	918	3017	14275	9855
KUWAIT	ABU DHABI	835	2644	1173	21197	7714	7918
	DHAHRAN	404	2644	2786	11021	15696	20573
	DOHA	576	2644	967	16114	6695	7879
	JEDDAH	1241	2644	7197	42654	37524	29055
	MUSCAT	1200	2644	918	5910	6452	6098
	RIYADH	517	2644	6373	33118	33447	38866
	SHARJAH	861	2644	180	5840	2800	3468
MUSCAT	DHAHRAN	8709	918	2786	1088	6696	4015
	JEDDAH	2020	918	7197	2406	14275	9855
	KUWAIT	1200	918	2644	6882	6452	6098
	RIYADH	1183	918	6373	1753	12859	10983
RIYADH	ABU DHABI	782	6373	1173	7595	15901	15731
	BAHRAIN	432	6373	1867	28724	24179	30632
	DOHA	492	6373	967	9838	13444	16244
	KUWAIT	517	6373	2644	35155	33447	38866
	MUSCAT	1183	6373	918	3704	12859	10983
SHRJAH	KUWAIT	861	180	2644	5892	2800	3468

A1=Annual Scheduled Passenger Traffic (1987) of the first airport
A2=Annual Scheduled Passenger Traffic (1987) of the second airport
@Distance between the two airpots (Kms)
*For year ending 30 June 1988

TABLE 8.2: Calibrated Data For The Basic Gravity Model With Distance Modification (400 Kms < Distance < 790 Kms) for the GCC Domestic Traffic Between the International Airports.

CALIBRATED DATA FOR THE BASIC GRAVITY MODEL WITH DISTANCE MODIFICATION
(400 Kms < DISTANCE < 790 Kms)

ORIGIN CITIES [A1]	DESTINATION CITIES [A2]	* DIST [KM]	[A1] [1000 PAXs]	[A2] [1000 PAXs]	ACTUAL TRAFFIC [1000 PAXs]	FITTED TRAFFIC [1000 PAXs]
ABU DHABI	DHAHRAN	478	1173	2786	4564	2738
	RIYADH	782	1173	6373	8156	9245
BAHRAIN	RIYADH	432	1867	6373	31092	26091
DHAHRAN	ABU DHABI	478	2786	1173	5359	2738
	KUWAIT	404	2786	2644	12364	14719
DOHA	RIYADH	492	967	6373	9051	9825
KUWAIT	DHAHRAN	404	2644	2786	11021	14719
	RIYADH	517	2644	6373	33118	35400
RIYADH	ABU DHABI	782	6373	1173	7595	9245
	BAHRAIN	432	6373	1867	28724	26091
	DOHA	492	6373	967	9838	9825
	KUWAIT	517	6373	2644	35155	35400

A1 ANNUAL PASSENGER TRAFFIC OF THE FIRST AIRPORT (1987)
A2 ANNUAL PASSENGER TRAFFIC OF THE SECOND AIRPORT (1987)
* DISTANCE BETWEEN THE TWO AIRPORTS

TABLE 8.3: Calibrated Data For The Basic Gravity Model With Distance Modification (Distance > 790 Kms) for the GCC Domestic Traffic between the International Airports.

ORIGIN CITIES [A1]	DESTINATION CITIES [A2]	@DIST [KM]	[A1] [1000 PAXs]	[A2] [1000 PAXs]	ACTUAL TRAFFIC [1000 PAXs]	FITTED TRAFFIC [1000 PAXs] A1*A2/D^2
ABU DHABI	JEDDAH	1595	1173	7197	8485	9738
	KUWAIT	835	1173	2644	19291	14002
BAHRAIN	JEDDAH	1272	1867	7197	22030	28531
DHAHRAN	MUSCAT	870	2786	918	766	9964
DOHA	JEDDAH	1330	967	7197	5975	12040
JEDDAH	ABU DHABI	1595	7197	1173	13078	9738
	BAHRAIN	1276	7197	1867	29012	28342
	DOHA	1330	7197	967	8241	12040
	KUWAIT	1241	7197	2644	55238	43852
	MUSCAT	2020	7197	918	3017	3323
KUWAIT	ABU DHABI	835	2644	1173	21197	14002
	JEDDAH	1241	2644	7197	42654	43852
	MUSCAT	1200	2644	918	5910	3587
	SHARJAH	861	2644	180	5840	376
MUSCAT	DHAHRAN	8709	918	2786	1088	2678
	JEDDAH	2020	918	7197	2406	3323
	KUWAIT	1200	918	2644	6882	3587
	RIYADH	1183	918	6373	1753	12983
RIYADH	MUSCAT	1183	6373	918	3704	12983
SHRJAH	KUWAIT	861	180	2644	5892	376

A1=Annual Scheduled Passenger Traffic (1987) of the first airport
A2=Annual Scheduled Passenger Traffic (1987) of the second airport
@Distance between the two airpots (Kms)

TABLE 8.4: The Relationship Between Fares & Distances For The GCC Traffic Routes.

CITY (A1)	CITY (A2)	DISTANCE	ACUAL FARE Y CLASS	PREDICTED FARE
ABU DHABI	BAHRAIN	271	398	365
	DHAHRAN	298	396	386
	JEDDAH	1191	886	1058
	KUWAIT	520	623	478
	RIYADH	489	519	530
BAHRAIN	DOHA	91	210	230
	JEDDAH	794	589	759
	KUWAIT	262	342	359
	RIYADH	268	240	363
DHAHRAN	ABU DHABI	298	407	386
	DOHA	112	216	246
	KUWAIT	245	353	346
	MUSCAT	555	797	579
DOHA	BAHRAIN	91	207	230
	DHAHRAN	112	204	246
	JEDDAH	826	671	783
	KUWAIT	352	428	426
	RIYADH	307	332	393
JEDDAH	ABU DHABI	1191	895	1058
	BAHRAIN	794	610	759
	DOHA	826	714	783
	KUWAIT	766	859	738
	MUSCAT	1255	1279	1106
KUWAIT	ABU DHABI	520	536	553
	BAHRAIN	262	295	359
	DHAHRAN	245	295	346
	DOHA	352	379	426
	JEDDAH	766	717	738
	MUSCAT	756	761	730
	RIYADH	322	417	404
	SHARJAH	529	536	560
MUSCAT	DHAHRAN	555	960	579
	JEDDAH	1255	1105	1106
	KUWAIT	756	789	730
	RIYADH	750	788	726
RIYADH	ABU DHABI	489	535	530
	BAHRAIN	268	248	363
	DOHA	307	353	393
	KUWAIT	322	502	404
	MUSCAT	750	911	726
SHARJAH	KUWAIT	529	536	560

A1 ANNUAL SCHEDULED PASSENCER TRAFFIC OF THE FIRST AIRPORT (1987)
A2 ANNUAL SCHEDULED PASSENCER TRAFFIC OF THE SECOND AIRPORT (1987)
Y ECONOMY CLASS

TABLE 8.5: Actual And Fitted Traffic For The Basic Fare Model for the GCCDomestic Traffic Between the International Airports.

ORIGIN CITIES [A1]	DESTINATION CITIES [A2]	[A1] [1000 PAXs]	[A2] [1000 PAXs]	FARE (QR) Y CLASS	ACTUAL TRAFFIC [1000 PAXs]	PREDICTED TRAFFIC [1000 PAXs]
ABU DHABI	BAHRAIN	1173	1867	398	31557	5984
	DHAHRAN	1173	2786	396	4564	8005
	JEDDAH	1173	7197	886	8485	17704
	KUWAIT	1173	2644	623	19291	7693
	RIYADH	1173	6373	519	8156	15892
BAHRAIN	DOHA	1867	967	210	1867	967
	JEDDAH	1867	7197	589	22030	27066
	KUWAIT	1876	262	342	1867	2644
	RIYADH	1867	6373	240	31092	24183
DHAHRAN	ABU DHABI	2786	1173	407	5359	8005
	DOHA	2786	967	216	12116	6929
	KUWAIT	2786	2644	353	12364	15687
	MUSCAT	2786	918	797	766	6673
DOHA	BAHRAIN	967	1867	207	967	1867
	DHAHRAN	967	2786	204	12437	6929
	JEDDAH	967	7197	671	5975	14925
	KUWAIT	967	2644	428	19634	6672
	RIYADH	967	6373	332	9051	13431
JEDDAH	ABU DHABI	7197	1173	895	13078	17704
	BAHRAIN	7197	1867	610	29012	27066
	DOHA	7197	967	714	8241	14925
	KUWAIT	7197	2644	859	55238	37548
	MUSCAT	7197	918	1279	3017	14263
KUWAIT	ABU DHABI	2644	1173	536	21197	7693
	BAHRAIN	75005	262	295	2644	1867
	DHAHRAN	2644	2786	295	11021	15687
	DOHA	2644	967	379	16114	6672
	JEDDAH	2644	7197	717	42654	37549
	MUSCAT	2644	918	761	5910	6429
	RIYADH	2644	6373	417	33118	33465
	SHARJAH	2644	180	536	5840	2772
MUSCAT	DHAHRAN	918	2786	960	1088	6674
	JEDDAH	918	7197	1105	2406	1429
	KUWAIT	918	2644	789	6882	6429
	RIYADH	918	6373	788	1753	12846
RIYADH	ABU DHABI	6373	1173	535	7595	15892
	BAHRAIN	6373	1867	248	28724	24182
	DOHA	6373	967	353	9838	13431
	KUWAIT	6373	2644	502	35155	33464
	MUSCAT	6373	918	911	3704	12846
SHARJAH	KUWAIT	180	2644	536	5892	2772

A1=Annual Scheduled Passenger Traffic (1987) of the first airport
A2=Annual Scheduled Passenger Traffic (1987) of the second airport

TABLE 8.6: Actual And Fitted Traffic For The Quality Of Service And Fare Model for the GCC Domestic Traffic for the International Airports.

ORIGIN CITIES	DETINATION CITIES	[A1] [1000 PAXs]	[A2] [1000 PAXs]	Q.S.	FARE (QR) Y CLASS	ACTUAL TRAFFIC [1000 PAXs]	PREDICTED TRAFFIC [1000 PAXs]
ABU DHABI	BAHRAIN	1173	1867	31	398	31557	33821
	DHAHRAN	1173	2786	9	396	4564	6255
	JEDDAH	1173	7197	11	886	8485	13477
	KUWAIT	1173	2644	16	623	19291	12168
	RIYADH	1173	6373	11	519	8156	15086
BAHRAIN	JEDDAH	1867	7197	14	589	22030	35880
DHAHRAN	ABU DHABI	2786	1173	12	407	5359	9191
	DOHA	2786	967	16	216	12116	16115
	KUWAIT	2786	2644	11	353	12364	15677
	MUSCAT	2786	918	9	797	766	4776
DOHA	DHAHRAN	967	2786	15	204	12437	14757
	JEDDAH	967	7197	9	671	5975	10030
	KUWAIT	967	2644	14	428	19634	9821
	RIYADH	967	6373	8	332	9051	8339
JEDDAH	ABU DHABI	7197	1173	11	895	13078	14462
	BAHRAIN	7197	1867	13	610	29012	29727
	DOHA	7197	967	6	714	8241	5669
	KUWAIT	7197	2644	12	859	55238	30954
	MUSCAT	7197	918	6	1279	3017	4551
KUWAIT	ABU DHABI	2644	1173	16	536	21197	13089
	DHAHRAN	2644	2786	11	295	11021	16648
	DOHA	2644	967	13	379	16114	9122
	JEDDAH	2644	7197	13	717	42654	40055
	MUSCAT	2644	918	8	761	5910	4355
	RIYADH	2644	6373	11	417	33118	34678
	SHARJAH	2644	180	6	536	5840	2886
MUSCAT	DHAHRAN	918	2786	6	960	1088	3666
	JEDDAH	918	7197	6	1105	2406	4666
	KUWAIT	918	2644	7	789	6882	4170
	RIYADH	918	6373	7	788	1753	5625
RIYADH	ABU DHABI	6373	1173	13	535	7595	4253
	DOHA	6373	967	9	353	9838	11102
	KUWAIT	6373	2644	12	502	35155	35089
	MUSCAT	6373	918	9	911	3704	7417
SHARJAH	KUWAIT	180	2644	7	536	5892	2950

Q.S. QUALITY OF SEVICE
QR QATARI RIYAL

REFERENCES

1. Carey, H.C.,Principles Of Social Science (Philadelphia : Volume 1, 1885)PP.41-43.

2. Ravenstein,E.G., Laws of Migration (Journal of the Royal Statistics Society, June 1885 and June 1889).

3. Flight International, The Longest Queues are for the Shortest Routes (England: Flight International, 1966) pp.159-160.

4. Rigas Doganis, Traffic Forecasting and the "Gravity Model" (England: Flight International, 1966) pp.547-549.

5. Stephen Wheatcroft, The Economics of European Air Transport (Manchester: Manchester University Press, 1956).

6. Doganis, pp.547-549.

7. ICAO Digest Flight O/D, Airport Traffic and Statistics, and Traffic by Flight Stage (Canada: ICAO, 1987-1988).

8. ABC World Airways Guide (UK: Reed Telepublishing Ltd, 1987-1988).

9. Richard A.Ippolito, Estimating Airline Demand with Quality of Service Variables (Journal of Transport Economics and Policy) pp.7-15.

10. Ibid, pp.9-15.

OTHER REFERENCES

D'Arcey Harvey, Airline Passenger Traffic Patterns within the United States (USA: Journal of Air Law and Commerce, 1951).

Lill "Die Grundgesatze des Personanverkehrs, Zeitschrift fur Eisenbahnen und Dampshiffsfart der Osterreichisungarischen Monarchie, No.35-6, 1888.

CHAPTER NINE

FLEET PLANNING AND AIRCRAFT SELECTION

9.1 INTRODUCTION

The main objective of this chapter is to review and study different aircraft for intra-GCC air services. The candidate aircraft should be commercially attractive with regard to the assessment of the operating costs and quality of service. To accomplish this objective, fleet planning and aircraft selection are studied and analysed in detail.

Air transport can be considered to be one of the youngest of the world's major industries. It is still faced with constant changes within the technical, economic, regulatory and political spheres. However, until the 1970s those changes were progressive and evolutionary. In the last two decades, changes have been radical, dynamic and overlapping. For example, sudden changes in fuel prices after 1973 and again after 1979 brought rapid increases in costs and changes in traffic patterns. The passing of the Deregulation Act in October 1978 in the United States, which has almost one third of the world's fleet, opened up a new type of competitive environment amongst its airlines. Recently, there has been a large variation in the capacity and quality of services, which is forecast to increase in the coming years. Any new airline based in the GCC would have to take this environment into account and the purpose of this chapter is to set the fleet planning process in context.

There is no straightforward definition of fleet planning, but for the purposes of this chapter it can be defined as "The process of choosing the fleet, or fleet mix, which brings the optimum economic results for the airline when the differences between costs and revenues on the one hand, and total investment on the other, are taken into account." (see also 9.3 below).

Unfortunately, some airline management were not adequately equipped with planning concepts, philosophies or processes to cope effectively and efficiently with the fundamental changes that will continue to shake the air transport industry.[1] This has led to a number of bankruptcies.

According to Holloway in a recent Cranfield MPhil submission, a successful planning process in this changing environment requires total commitment from the top management, a concern with long-term results, a team approach, a reward system, effective organisational structure and appropriate analytical tools.[2]

9.2 AIRCRAFT SELECTION

Aircraft selection is a very complex process in which much expertise, analysis, planning, consultation and evaluation are very likely to be required. In a regulated environment, the aircraft selection process is not as complicated as in a deregulated environment where the freedom of entry, exit, fares, capacity and frequency are permitted. With all these freedoms, aircraft selection is more challenging with more variables so that failure of the process could lead the airline to suffer from many financial problems. On the other hand, the success of the process determines an airline's power in a competitive industrial environment. As Mr James[3] described the importance of that selection in an airline,

> "The 1990's will be the decade when the modernity of aircraft fleets largely dictates the ability of individual carriers to maintain and strengthen their dominance".

The final choice of an aircraft could be influenced by technical performance, financing costs, contribution to overall profitability in the light of certain route structures, and external factors such as government pressure. However, the escalation of fuel prices and aircraft noise requirements have changed airline priorities in aircraft selection.

9.2.1 Re-equipment Factors

Airlines usually tend to re-equip their fleets due to different factors. The more important are likely to emerge from the following listed reasons:[4]

1. **Expected growth in traffic.**
2. **Changes (particularly upwards) in the price of aviation fuel.**
3. **Environment regulation such as aircraft noise.**
4. **Lower unit costs of operation (such as cost per Seat-Km).**
5. **International route proliferation and new routes authority.**
6. **Life expectancy such as the regulation of retirements of civil air transport and cases of re-engining.**
7. **Operational factors which could emerge from the following:**
   - **The desire to improve efficiency which includes fuel consumption, speed, range and required man hours of maintenance labour.**
   - **The desire to increase frequency, capacity and market share.**
   - **The desire to improve aircraft configuration such as type of engines, maximum take off gross weight, maximum landing weight, maximum zero-fuel weight, operator's empty weight, fuel capacity, containers and pallets, bulk volume and total volume.**
8. **Roll over policy - a number of airlines are adopting this policy where they always attempt to operate new equipment to have an image of having a new fleet, selling their older fleet at an early age to make best use of depreciation allowances and to get the optimum price for that age, and finally to avoid all the problems associated with elderly aircraft types. Such airlines which have this policy are Singapore Airlines and Delta Airlines.**
9. **Improve the quality of service (such as frequency or non-stop capability) where it is important for two reasons:**
   - **Attract more passengers especially first and business class**
   - **Position the airline in a better competition status.**
10. **Fleet rationalization which it could possibly follow a merger.**
11. **Financial hardship that could be facing an airline where they have to sell some of their fleet to generate cash and using it for many purposes beside buying better replacement aircraft.**
12. **External or internal politics. External politics stem from government pressure especially in state-owned airlines. This pressure influences the airline to purchase specific manufacturer's aircraft from certain nations regardless of the**

results of the airline's evaluation process. Internal politics come from within an airline to buy specific brand aircraft.

13. Financial condition of an airline and the availability of investment climate for funding new fleets.
14. Possibly realising book profit in an active second-hand market.

9.2.2. Pre-Purchasing Considerations

The decision to procure an aircraft is a complex task; however it is beneficial to consider the following before attempting that task:[5]

1. Reviewing forecasts of traffic and the operating environments such as political, socio-economic, environmental and bilateral.
2. The current existing fleet and flow of passengers and freight within the operation.
3. Technological trends and types available and provided from the manufacturers.
4. Manufacturers' reputation especially in performance, reliability and product support.
5. Preliminary performance data in terms of runway compatibility, block speeds, payload - range and noise characteristics.
6. Finally, the study structure such as involving certain departments, using consultants, and the possible timescale and deadlines.

9.3 THE GENERAL FLEET PLANNING PROCESS

Fleet planning is an essential part of any airline corporate or strategic planning process, and it is the first step towards successful operations. According to the Dictionary of Air Transport[6], fleet planning process is "a mathematical computer simulation model of an airline system which has the objective of finding the optimum balance between projected market demand, fleet size and competition".

An airline's major assets are its routes and its aircraft, however, a great deal of thinking, analysis, consultations and planning should be done before an airline makes an investment in either of these items. It is necessary to consider both routes and aircraft jointly because these two assets are the foundations of profitability.

Because of the wide variety of aircraft types available with theoretically attractive economics, fleet planning is a disciplined process rather than listing the characteristics of new types of aircraft. Overall, the financial success of an airline follows optimum fleet planning that matches the supply of seats and cargo capacity provided by the aircraft with the pattern of demand generated by customers.

9.3.1 Fleet Planning Process

The US Airline Deregulation Act of 1978 effected this country's airlines immediately, but it has had a knock-on effect on carriers throughout the world. It has made aircraft selection and the fleet planning process more complicated and a critical management planning function, not least because of uncertainty.

Historically, the fleet planning process used to be carried out without the aid of computer. However, in recent years, it has become very sophisticated where analytical computer models have been developed, and they are updated wherever changes occur in the internal and external environment.

A fleet planning model is normally a computer-based mathematical simulation of an airline system with the object of planning the optimum balance between forecast market demand and fleet size and composition. When inputs are entered such as existing fleet, route structure, fare structure and costs, a fleet planning model would determine the following over the planning horizon:[7]

1. Future fleet acquisition requirements
2. Fleet assignment requirements
3. Financial requirements
4. Operating conditions.

Figure 9.1 outlines the general framework of fleet planning models. The four main inputs are as follows:[8]

1. Airline resources which are aircraft and route authority.
2. The forecast of market demand with respect to passengers and cargo.
3. Financial policies and cost structure.
4. Corporate strategy with respect to management objectives.

The model itself is ideally one of the linear programming type. A mathematical statement of the objectives of carrier management with numerous constraints are established in the model.

The fleet planning problem is quite sizeable, however, the following are some of the common techniques to reduce the size of the problem:

1. Decomposition technique which divides the constraints into two groups.
2. Grouping the aircraft and routes into categories.

The output from a fleet planning model is usually the following:

1. Future aircraft requirements.
2. Fleet assignment. However if the time period, the schedule, the fleet and the demand are fixed, then Figure 9.2 shows how to determine the optimum frequency pattern.
3. Financial requirements.
4. System output with respect to financial and operating criteria.
5. Schedule data.

Fleet planning models are very useful, nevertheless the comments below are related to these models:

1. Some of the assumptions in the models are often fairly crude.

2. They can be very beneficial in analysing the impact of various policies, and quite profitable for performing sensitivity analysis.
3. They are restrictive mainly because they have been presented to upper-level management.
4. The availability of these models are restricted because of the confidentiality of their developers who are mainly the manufacturers and the more analytically oriented carriers.

There are mainly four approaches to fleet planning which are listed below:[9]

1. Schedule evaluation (simulation).
   Simulation can be used to assist the decision-making process at an airline's corporate, functional or operational level. It is necessary to provide data on schedules, traffic, operating and non-operating costs.
2. Fleet-Assignment Models.
   When the object is to determine the optimum frequency pattern, given that the time period, the schedule, the fleet and the demand are known.
3. The Capacity-Gap Approach.
   This is a macro approach where forecast traffic growth is converted to required capacity, and then current equipment is subtracted to find out capacity to be filled by new equipment.
4. Cell-Theory Fleet Planning Models.
   Requires aggregation and classification of the airline routes into cells to identify the long-term mission and composition of fleet.

9.4 THE CORPORATE PLANNING PROCESS

Aircraft selection and fleet planning is closely integrated with many other activities within an airline. Nevertheless, to highlight the role of aircraft selection and fleet planning, corporate planning needs to be understood.

Corporate planning in an airline requires the identification and analysis of alternative corporate strategies and the development of plans or activities which are all integrated.

The most useful definition for corporate planning is[10]

> **"It is a complete way of running a business - under it, the future implications of every decision are evaluated in advance of implementation - standards are set for performance beyond the time horizon of the annual budget - a continual study is made of the environment in which the company operates so that the changing patterns are seen in advance and incorporated into the company's decision process and the strategy it adopts."**

The timescale for corporate planning is usually five years, however, a longer view would be taken for long term plans such as aircraft selection. It is usually to "roll the plan forward every successive year, taking into consideration all the new events that have occurred"[11]. Overall, corporate planning results in an on-going process in which the objectives are never reached. The following points are the typical five stages in the corporate long-range planning cycle:[12]

1. **Establishing objectives.**
2. **Establishing the current status through the position audit and environmental audit.**
3. **Developing a strategy with consideration of all alternatives.**
4. **Implementing the chosen plan.**
5. **Monitoring, updating and feedback of the plan.**

Historically, corporate planning efforts often tend to fail because of the lack of one or more of these ingredients:[13]

1. **Planning was (and normally still is) separate from other perspectives of the management process.**
2. **Top management has been too concerned with short-term problems and not giving enough time for long-time corporate planning.**

3. Top management and planning groups usually worked with goals that were undefined, unrealistic, or inconsistent.
4. Some airlines treat the plan as a bible without monitoring and feed back especially to changes of external and internal variables.
5. Top management usually rewards executives for positive short-term results despite questionable operating results in the long run.

9.4.1. Corporate Planning Audits

The process of corporate planning is illustrated in Figure 9.3 The top of the hierarchy is corporate strategic planning which develops, formulates and updates the corporate objectives and policies. There are many techniques used to develop corporate strategies and plans which are as follows:[14]

1. Position Audit - an assessment of an airline's internal strength and weakness.
2. Environmental Audit - an assessment of the external opportunities and threats.
3. SWOT - is the combination of A and B above.

The second level in the hierarchy diagram is the corporate resources planning which mainly includes a development of coordinated plans for the use, acquisition and disposal of the basic airline resources which include finance, marketing, fleet and route.

The third level is the operational planning which contains two types of planning. The first is the technical and scheduling which includes the basic airline resources in addition to the operational items. The second is sales and marketing which involves product, price, promotion and distribution. At this level, information will be received from the resource planning and implementation of the plans would occur as far as final operational planning or using, requisitioning and disposing of the required resources in a timely manner. Monitoring and feedback will happen frequently.

There is a continuous data-exchange process among the planning levels and strong interactions between fleet planning (second level) and the following:

1. **Strategic planning (first level).**
2. **Operational planning (third level).**
3. **The other three basic airline resources (finance, marketing and route).**
4. **The external community which includes:**
   - **The airframe and engine manufacturer by influencing them to compromise the design to satisfy airlines' requirements.**
   - **Airports**
   - **Financial community.**

Airline corporate planning is relatively straightforward in an regulated air transport environment because routes and fares are mainly controlled by the government, as a result, corporate planning would concentrate on cost reduction and selection of optimum aircraft. However, in a deregulated environment, corporate planning changed the following:

1. **Aircraft selection and fleet planning are much more important, and they are an integral part of the whole corporate planning.**
2. **Regained a sophisticated analysis within the process itself.**
3. **Strong interactions among the four elements of resource planning, and among the three planning levels.**

9.5 AIRCRAFT SELECTION PROCESS IN DETAIL

There are many factors that influence the airline fleet planner to select a particular aircraft among all the available alternatives. It is one of the hardest decisions that an airline would approach since, as mentioned before, aircraft and routes are the airlines' main assets. Figure 9.4 is a common aircraft selection process that an airline would go through, many stages which are corporate objectives, current resources, aircraft selection, traffic operation, costs and revenue models, ranking candidates, risk and sensitivity test, negotiation and final decision process.

9.5.1 Corporate Objectives

Analysis of the corporate objectives should be very carefully studied and clearly defined. Clarifications of the reasons behind acquiring an aircraft, or several aircraft should be made. Some of the corporate objectives for an airline are listed below:-

1. **Economic objectives based on profitability.**
2. **Financial objectives based upon business and market strategies.**
3. **Market objectives based upon forecast traffic and market share.**
4. **Political objectives which are set by governments for many airlines as their national carriers.**

9.5.2 Selection Criteria

There are three main aircraft selection criteria which are the following:

1. **Operating cost criteria with emphasis on direct operating costs related to aircraft including interest factor. DOC should be found per aircraft/sector, per seat/sector, per seat-Km, per passenger/sector, per passenger-Km with addition of cargo effects.**
2. **Basic financial criteria such as cash flow, payback, contribution analysis profits, return on investment, net present value and internal rate of return.**
3. **Common sense criteria which could include the following:**
   - **Flexibility.**
   - **Exposure such as revenue/traffic, resource costs, interest, and forex.**
   - **Liquidity/cash flow.**
   - **Self financing ratio.**
   - **Debt : Equity gearing.**
   - **Cash flow ratio.**

9.5.3 Current Resources

This stage will examine all corporate objectives if they can be met with the current airline resources. If the answer is yes, then no additional aircraft or change of fleet is

needed. If the answer is no, then a number of aircraft will be calculated to meet the corporate objectives.

9.5.4 Aircraft Selection

There are usually constraints which should be considered at this stage such as runway length, noise limits, if the airline credit limits the choice to used or leased aircraft, or if the candidate aircraft are unavailable. Stating the constraints, market data and aircraft mission, evaluation of candidates of aircraft and alternative engines should be processed. If the evaluation process rejects all the candidates, then a final decision will be made. If it succeeds with some candidates, then the analysis should continue on to the next step.

9.5.5. Aircraft Configuration

Aircraft configuration could include the following:

1. **Type of engine (fuel burn)**
2. **Maximum take off gross weight**
3. **Maximum landing weight**
4. **Maximum zero-fuel weight**
5. **Fuel capacity**
6. **Operator's empty weight**
7. **Cargo and baggage provisions such as containers and pallets.**
8. **Bulk volume and total volume**
9. **Accommodation in relation to seat pitch for economy, business and first class.**
10. **Toilet provision**

However, it is a hard and complex process to compare the alternative aircraft availability because each one can have multiple configuration options.

9.5.6. Traffic, Operational, Costs, Revenues Models

This stage is considered to be the longest* with many tests and models which include the following:-

1. **Traffic Model**

   The candidate aircraft will be examined according to the forecast traffic growth analysis. The aim is to meet this predicted demand with the best candidate. Part of the problem is to determine how traffic will react to different aircraft types, comfort levels or capacity afford, to changes in frequencies or routings or to different levels of price.

2. **Operational Model**

   This model evaluates the aircraft performance which enables the aircraft to perform its task - some of them are listed below:

   - **Route performance**

     Before buying an aircraft, the purchaser always needs to know the maximum payload of the aircraft, the range and the time in which this payload can be carried.

   - **Maintenance**
     - **Spare parts**
     - **Fleet compatibility**
     - **Product support**
     - **Technical record**
     - **Maintenance costs**

   - **Runway requirement**
     - **such as runway length, height above sea level and hot climate, or mountains, cliffs and water.**

   - **Noise performance**

     Airline priorities with respect to equipment decision continue to change with aircraft noise regulations.

   - **ETOPS (Extended-range twin-engined operation)**

***The question of individual routes and their viability is the primary focus of Chapter 5.**

3. Cost Model

It is important to consider the financial costs (economic costs) of acquisition of an aircraft, which includes mainly the total operating cost (including direct and indirect costs). These costs require a knowledge of the capital costs of the aircraft. This will include:

- **Aircraft price (including engines)**
- **Spare parts**
- **Ground equipment**
- **Maintenance**
- **Training**
- **Cost of the money with alternative financial arrangements available.**

In addition, evaluation of candidates should be done on the basis of total operating costs (direct and indirect).

4. Revenue Model

Airline revenue is mostly generated from carrying passengers, freight and mail which is mostly dependent on traffic flow and composition, existing and forecast traffic volumes, seating density, load factor and utilization.

In this model, an evaluation of the candidates will be made on the basis of revenue that they could make in terms of money, given the total costs and expected sales.

9.5.7 Ranking Candidates

Ranking of all aircraft candidates is made at this stage based upon the analysis and evaluation of all the above stages.

9.5.8 Risk Sensitivity Tests

A problem could occur if the forecasts of external variables are wrong, such as forecast traffic, fuel prices, yields, interest rates, the Dollar value and currency exposure, or internal variables such as strategy change. "What if?" questions should be considered in aircraft selection.

9.5.9 Negotiation

After management review of the above process of evaluation, negotiation with the manufacturer could serve and help in the following areas:-

1. Price and price-related factors such as training, stage payments, guarantees (including deficiency or residual value guarantees).
2. It could be risk reduction by negotiation of options rather than firm orders.
3. Reaching an agreement on possible firm delivery slots, possible delivery positions, defined and deadline.

9.5.10 Final Decision

A committee of senior staff may be established to oversee the evaluation exercise because of its complexity and its broad nature. In addition, a common practice is to ask the aircraft manufacturer for advice, but remembering that the expertise they give is directed to bring up the advantages for their product. In developing countries where most of the airlines are governmental owned, a great stress and strain between the airline and government can happen. However, in the developed world, the manufacturer can use every possible way to win the order especially if it sensed that the deal will be a trend setter.

The final decision should actually be taken with discipline, accuracy, faith and honesty (illegal commissions which are never written about are often heard of). The evaluation process should run effectively and accurately to make the right decision by the end of the evaluation.

The final decision may be influenced by barter, counter-trade, off-sets or wider trade issues.

9.6 AMERICAN AIRLINES AIRCRAFT PURCHASING PROCESS

The decision to purchase an aircraft is obviously one of the largest, longest term and hardest process an airline ever makes. It determines much of the risk, cost structure, operational flexibility and related investment for the airline. There is no definite

method for aircraft selection that all the airlines go through, however, every major carrier has its own, and the smaller carriers depend to a large extent, on the advice of private consultants to choose the best aircraft for their network, given all the data needed. American Airlines is one of the largest airlines in the world; their aircraft purchasing strategy process is accomplished by three stages which are listed below and provides a useful case study:[15]

PART ONE: IDENTIFYING AIRFRAME AND ENGINE ALTERNATIVES

This process consists mostly of questions that should be answered such as:

1. **How many? Which ones?**
   - **How big the airline should be?**
   - **What kind of aircraft should make up the fleet?**
2. **The airline growth decision.**
   - **Was growth competitively necessary?**
   - **Could it be accomplished profitably?**
3. **Aircraft Selection.**
   - **What do we want this aircraft to do?**
   - **How will we use it?**
   - **What alternatives do we have?**
   - **How do we value different aircraft sizes?**
   - **What is each aircraft's relative operating efficiency?**
   - **What other investment must we make beside the aircraft itself?**
   - **Given the above questions -**
     - **How much should we be willing to pay?**
     - **Can we construct a deal whose total cost will allow us to make a return on investment?**
4. **The aircraft mission.**
   - **How big should this aircraft be?**
   - **What kind of passengers and cargo loads will need to be accommodated?**
   - **How far do we want it to fly?**
   - **Does it need international overwater capability?**

- **Why do we need this aircraft?**

5. What various airframe and engine alternatives are there?

6. Engine selection and spare parts, the following should be considered:

- **They are more influenced by the engineering assessments than financial analysis**
- **The main engine manufacturers are**
  - **GE (General Electric - USA)**
  - **Pratt & Whitney (USA)**
  - **Rolls-Royce (UK)**
- **What is the engine's price and efficiency sorted by thrust range grouping?**
- **Over 15-20 years, the purchaser will spend three to six times an engine's original cost for spare parts.**

PART TWO: COMPARING THE CHOICES ON THE BASIS OF REVENUE IMPACT AND OPERATING COSTS

1. Revenue Analysis

It involves the most guess work and requires the most creativity. The following questions should be carefully predicted:

- **How fast will traffic grow and how much will capacity grow to meet that demand?**
- **Will load factors be high or low?**
- **Will an endless succession of new entrants and cash starved carriers keep yields permanently depressed?**

However, there are four key concepts to estimate revenue impact which are listed below:

- **Spill analysis - it allows American Airlines to estimate the number of passengers that they can accommodate on a larger aircraft or conversely, the number of passengers they will spill off a smaller aircraft order and various demand conditions. In addition, it allows them to take observed load factors (average passengers on board) and convert them into a distribution of demand.**

- **Recapture.**

  This concept is to regain the passenger who was turned away using the spill concept. However, they use the recapture concept to dampen the impact of spill.

- **Upline/Downline.**

  In a hub and spoke system, there is a high probability that a passenger gained or lost has come upline from, or will go downline to, another flight on American Airlines.

- **Push down/Push up.**

  This effect is created from delivery of new aircraft and the redeployment of the existing fleet to the best alternative possibilities.

2. **Operating Costs**

   This process includes calculating the operating cost impact of the candidate aircraft.

PART THREE: THE PROCESS OF RANKING ALTERNATIVES, SENSITIVITIES, CONSIDERATIONS AND NEGOTIATION

1. **Ranking the alternatives/setting the price. After having done the following:-**
   - **Defined the aircraft mission.**
   - **Established aircraft engine alternatives.**
   - **Placed a value on the difference in a number of seats.**
   - **Estimated the operating cost differentials.**

   A comparison on the candidate aircraft can now be done over a defined service period. Calculation of the net present value of the future cash flows with each candidate aircraft will allow the following:
   - **Rank the various alternatives.**
   - **Establish an acceptable all-in price for each candidate after considering costs of spare parts, ground equipment and training.**

2. **Sensitivities.**

   Aircraft selection has obvious risk such as forecasting fuel price, future traffic growth, and yields, especially when comparing aircraft with disparity in seats or

technology. Therefore, aircraft are compared under different future scenarios using a matrix approach and calculating the point at which the decision would change.

3. Structure of the deal.
Further negotiations with the manufacturer over the aircraft price are probably worthwhile. There are many ways to reduce the all-in cost of a new aircraft without destroying the manufacturer's price structure.

9.7 MANUFACTURERS' PROSPECTIVES

The fleet planning process for a manufacturer is more complex than for an airline, and it is more macro in nature. Competition between the airlines required both human and equipment efficiency. Forecasting fleet status by the manufacturer such as Airbus Industrie is done through predicting the average aircraft size required through two parameters which are the following:[16]

1. Traffic volume (passenger, freight).
Based on a number of global economic and industry parameters which include-
   - Economic growth (GDP)
   - Fares (influences of liberalisation)
   - International trade (influences long-haul and direct flights)
   - Demographics (world-wide population)
   - Disposable income (air travel is part of leisure activities)
   - Vacation habits
   - Alternative to air travel (such as high-speed trains)
2. Aircraft movement (schedule, charter).
Depends on frequency growth which includes -
   - Airline fleet (existing fleet operations)
   - Legislation (competition and curfews)
   - Traffic rights (regulated and deregulated environments)
   - Airport/ATC capacity (congestion)
   - Network development (such as direct flights or hub-and-spoke)

- **Travel distance (the longer the distance the lower the demand)**

Overall, traffic and frequency growth influence each other, for example offering more direct flights or opening up new routes will increase travel demand.

As an example, manufacturers and other aviation forecasters predict that the airline traffic will be more than double between now and 2005, as a result aircraft demand will be doubled too. Given the constraints of congested airports and airspace then the demand for larger sized aircraft will be increased over the next 14 years.

The manufacturer has to go through in-depth thinking, analysis, planning, study and research. The manufacturer has to consider the following before producing a new type of aircraft:[17]

1. **Consider the trade-offs for airlines of various technical features.**
2. **The need and requirements of domestic and international airlines.**
3. **The manufacturer's existing and planned aircraft.**
4. **The manufacturer's competitor and planned aircraft.**
5. **Combine the requirements of a sufficient number of airlines to start the production run, otherwise, it will be beyond the manufacturer's investment capability. For a new design, it could be even beyond all the manufacturer's financial capability combined.**
6. **New aircraft programs are effective when -**
   - **Existing aircraft face technical, economic, or regulatory problems.**
   - **The improvements required are not economical on the existing aircraft.**
   - **The new design offers sufficient competitive advantages for both the manufacturer and the airlines.**

Figure 9.5 illustrates Boeing's methodology to determine the required aircraft. The number of aircraft needed to satisfy air travel demand was forecast by range and size category. To determine the new aircraft to order, the current airline fleet was subtracted. The world fleet mix and delivery forecast were derived by model type.[18]

Manufacturers have to consider all aspects of the airline industry and its attitude towards selecting a new aircraft before attempting to build any new aircraft type. From a manufacturer's point of view, success of a certain design is mainly measured by the number which can be purchased. For example, the Concorde programme was an economic failure, with the reasons being partially political and partially technical. The failure to convert options int sales by the American carriers, especially Pan Am and TWA, virtually wrecked the programme altogether. The British and French took the decision to continue mainly for political reasons, whereas the US Government was hostile because it wanted to ensure its industry retained its world domination. On the other hand, the Americans justified their rejection using technical factors, such as the point that Concorde's operating cost was at least 30% higher than the B747's, it had less range and payload, and for the same price, an airline could acquire two and a half B747s with 950 seats, or three DC-10s or L-1011s with 600-700 seats, versus the 100 seats in the Concorde.

9.7.1. Aircraft Production Considerations

There are a number of major points about civil air transport which should be considered with regard to aircraft production as follows:

1. **Aircraft are very expensive and the number produced is relatively small.**
2. **It is not possible to have an aircraft or even a small number of aircraft tailor-made, even for a large carrier. Therefore, each aircraft should serve various markets in order to obtain an economically viable level of sales.**
3. **The break-even for a manufacturer is between 200-500 depending on the requirement relative to existing technology and the number of carriers interested in that particular design.**
4. **The major aircraft manufacturers are few, namely Boeing, McDonnell Douglas and Airbus. In addition, the major engine manufacturers are General Electric, Pratt & Whitney and Rolls-Royce. Therefore, the air transport industry is unique because of the oligopolistic number of manufacturers.**
5. **Politics which certainly exist, often favour one particular manufacturer, country or airline.**

6. American Airlines tried several years ago to convince competitors to acquire a pool of standard aircraft with the same paint colours, interior design, seat upholstery, cockpit configuration and other items. However manufacturers make a large margin of profit on customisation and do not encourage a standard approach. Secondly it is hard to convince the airlines to settle for one specification.

7. There is considerable governmental regulation with regard to aircraft design, production, certification and sales, which concern a wide range of issues from safety and a clean environment to foreign policy.[19]

9.7.2. Political Considerations involving Manufacturers and Airlines

Unfortunately, politics is more argumentative than factual. Nevertheless, political influences are common practice in aircraft selection where interactions exist among airlines, manufacturers, and governments. The following political considerations have been taken from various air transport journals:

1. "Aircraft sales are often more about politics than the aircraft themselves" (Avmark, June 1986, p6)

2. "There is a grey area in the aviation business where manufacturers' selling strategies, airlines' negotiating ploys and governments' policies interact" (Avmark, March 1986,p6)

3. In the war of words between the European and USA aircraft manufacturers, some of the accusations are listed below:-

    - Boeing accused Airbus of having a captive market amongst state-controlled European carriers. However, this accusation comes from Boeing which itself enjoys dominance over the US airline. Nevertheless, when Alitalia purchases MD-80s instead of Airbus A320s in November 1983, the French Trade Minister accused his Italian counterpart of "not keeping his word".
    - Boeing accuses Airbus of using "political muscle or cheap finance to achieve sales". It gives the examples of Kuwait Airways decision to buy Airbus aircraft in return for landing rights at Paris, and Thai

International's acquiring A300s after a threat to its exports.

- Airbus accuses Boeing of using unfair tactics in its sales. As an example, Boeing replaced three new A310s with B767s at Kuwait Airways.

All the above accusations may not be 100% true, however, and the truth may lie somewhere in the middle. (Avmark, June 1986, pp 5-7).

4. Manufacturers suffer, to a certain extent, from governmental restrictions on sales of their equipment to specific nations, the following are two examples of such prohibition trades.

   - Modern Western jets.
     Modern Western jets are treated as such high- technology equipment that their sales are monitored and controlled by a Coordinating Committee for Multilateral Control of exports (an organisation representing the NATO countries minus Spain). This applies if they are to be exported to the Communist Countries (belonging to the Warsaw Pact military alliance). This is to prevent militarily-useful technology falling into the hands of the West's adversaries. That monitoring continued until 1988 when Airbus sold A310-300s to East Germany's Interflug. (Interavia 2/1989, p125)
   - France urged the USA in 1984 not to let Airbus Industrie's A320 aircraft "become a political airplane". The director of the civil aviation programme in France said that Airbus was not allowed to deliver the A300 to some customers because of the US restriction on exports. These included the prohibition on sales of components from the US to Airbus for later delivery to countries that were considered to be "unfriendly by the US".(Aviation Week & Space Technology April 30,1984)

5. It is believed that US major carriers can obtain US manufactured aircraft at the lowest unit price. On the other hand, foreign carriers end up paying premium prices. (Avmark, February 1989, p6).

9.8 ANALYSIS OF TOTAL AIRCRAFT OPERATING COSTS

Having reviewed in detail the fleet planning process in the first part of this chapter, the next step is to apply this knowledge to the question of aircraft selection on less dense

routes within the GCC. An analysis of various types of aircraft has therefore been made in the following part of the chapter on the basis of total operating costs over a range of sector lengths according to the GCC operational environment. These aircraft were initially chosen based on the analysis of traffic forecasts which were accomplished in previous chapters. The objective in this process is to find the optimum aircraft which satisfies the predicted demand on routes not currently served. The following figures are the total operating costs of different aircraft* over a spread of sector distances:**

1.	**ATR-42**	**(Turboprop)**	**———**	**Table 9.1**
2.	**ATR-72**	**(Turboprop)**	**———**	**Table 9.2**
3.	**ATP**	**(Turboprop)**	**———**	**Table 9.3**
4.	**F-50**	**(Turboprop)**	**———**	**Table 9.4**
5.	**Dash-8-300**	**(Turboprop)**	**———**	**Table 9.5**
6.	**Dash-8-400**	**(Turboprop)**	**———**	**Table 9.6**
7.	**Saab S-2000**	**(Turboprop)**	**———**	**Table 9.7**
8.	**DO-328**	**(Turboprop)**	**———**	**Table 9.8**
9.	**Canadair RJ**	**(Jet)**	**———**	**Table 9.9**
10.	**EMB 145**	**(Jet)**	**———**	**Table 9.10**
11.	**146-100**	**(Jet)**	**———**	**Table 9.11**
12.	**146-2 00**	**(Jet)**	**———**	**Table 9.12**
13.	**F100**	**(Jet)**	**———**	**Table 9.13**
14.	**B-737-300**	**(Jet)**	**———**	**Table 9.14**
15.	**B-737-500**	**(Jet)**	**———**	**Table 9.15**

It is important to look at the specification of each aircraft in order to understand the results behind the variation of total operating costs over a range of sector lengths. Aircraft specification such as basic price, number of seats and fuel consumption will be explained in this chapter, concentrating on the methods and formulae that were used to calculate each figure.

*****After all the data was collected and the calculations made, DHC decided not to build the Dash-8-400 and Embraer decided to freeze development of the EMB 145.**

9.8.1. Data Obtaining

Data was obtained for this analysis mainly from different aircraft brochures, aircraft journals, ICAO Digest of Statistics Financial Data, papers and theses.

9.8.2. Process of the Analysis

In order to understand the results of the process, every operational cost will be explained in detail in three stages. The first stage includes basic cost, number of seats, maximum take-off weight, block fuel, block time, aircraft hours/year and aircraft cycles/year. The second stage includes depreciation, interest, insurance, fuel cockpit and cabin crew, user charges and maintenance. The third stage finds the indirect cost per sector.

9.9 FIRST STAGE IN DIRECT OPERATING COSTS

9.9.1. Basic Price

Aircraft price is considered to be one of the strongest influences on operating costs. In this study, the basic aircraft price does not include a provision for spares, extra equipment or training. It is based on 1990 figures and expressed in millions of US dollars. Those prices have been obtained from the manufacturers, aviation journals, aircraft leasing companies and aircraft traders.

9.9.2. Number of Seats

The number of seats in an aircraft could be changed according to the airline's requirements. The information has been obtained from manufacturers brochures and aircraft journals. However, this number is recorded in standard seat pitch of 31/32". This is followed by baggage volume which is stated as the standard figure supplied by the manufacturer.

9.9.3. Maximum Take-Off Weight (MTOW)

MTOW is given in metric tonnes, and is obtained from the manufacturers. It is included in this study because of its use to calculate some direct costs.

9.9.4. Block Fuel

The quantity of fuel consumed per block is measured from the manufacturers' tables given 14 minutes for engine start up and taxi time. A conversion of fuel weight from pounds to gallons was made to calculate the cost of block fuel. Fuel costs were taken as being US $0.70 per gallon which is the average cost in the GCC states.

9.9.5. Block Time

Estimated flying time over the range of sector lengths was calculated from tables from the manufacturers given the same 14 minutes for engine start up and taxi time. Block times in the tables are both expressed in minutes and hours.

9.9.6. Annual Aircraft Utilisation***

Operating cost models usually assume uniform levels of utilisation for different sector lengths. However, there is a limit to the number of hours an aircraft can work during the year in the actual operation environment. The general assumption in this study is for an annual utilisation of 4,200 hours per year for each aircraft. Given another assumption of 40 minutes for a turnaround time.

9.9.6.1 Aircraft Cycles per year

These figures are found as shown below:

Cycles per year = 4200/(Block time + 0.67)

*** 4200 - is estimated annual utilisation in hours**

0.67 - is turnaround time in hours (40 minutes)

9.9.6.2 Aircraft hours/year

The main importance of both aircraft cycles per year and aircraft hours per year that will be used in maintenance cost. Nevertheless, aircraft hours/year were calculated in this study as follows:

Hours/year = cycles per year x block time

*****Note a more detailed analysis of utilisation, taking into account a realistic schedule, is the main focus of Chapter 11.**

9.9.6.2 Aircraft hours/year

The main importance of both aircraft cycles per year and aircraft hours per year that will be used in maintenance cost. Nevertheless, aircraft hours/year were calculated in this study as follows:

Hours/year = cycles per year x block time

9.10 SECOND STAGE IN DIRECT OPERATING COST

There are seven elements which contribute in the direct operating costs at this stage which are the following:

1. **Depreciation**
2. **Interest**
3. **Hull insurance**
4. **Fuel**
5. **Cockpit and cabin crew**
6. **User charges**
7. **Maintenance**

9.10.1 Depreciation

There are several methods available to calculate aircraft finance and depreciation costs. However, in this study depreciation is found according to the formula below:

(cost value + 10% of cost for spares) /
(10 years (to be zero at the end of the 10 years /

[number of yearly hours] * [Block time in hours]

9.10.2 Interest

Interest was forecast in this analysis as shown below:

Average Interest = [12% * (book value)] * [flight time in hours]
[number of hours per year]

where

Average book value = 55% * (cost value + 10% of cost for spares)

9.10.3 Aircraft Insurance

Many airlines calculate their aircraft insurance by different methods, and they usually get different insurance policies according to many variables such as an airline network, annual utilisation, types of covers and pilot expertise.

However, a common method to calculate aircraft insurance is by adding the following items:

1.	**Hull insurance**	**=**	**1.3% of basic aircraft price**
2.	**Liability**	**=**	**flat rate of £7,500 (sterling) per annum and a further £100 per seat.**
3.	**Terrorist risk**	**=**	**10% of the annual figure for liabilities**
4.	**Deductible payments**	**=**	**flat rate of US$ 15,000**

However, a consultant calculated aircraft insurance for a GCC report using the following formula:[20]

$$\frac{1.5\% * (\text{cost price} + \text{spare})}{\text{number of hours per year}} \times \frac{\text{Flight time of the}}{\text{sector in hours}}$$

The consultant's method was chosen to estimate the aircraft insurance for this study because of its simplicity. It is not a large contribution among the operating costs, and the value of insurance of this method is higher than the general method which makes it more specialised in the GCC environment.

9.10.4 Fuel Costs

Aircraft fuel accounts for approximately one third of the total operating costs for most airlines. Fuel cost in this study was calculated as shown below:

Fuel costs = BLOCK FUEL in gallons x US$ 0.70

*** 1lb = 0.1472 gallons**

9.10.5 Cockpit and Cabin Crew

Flight and cabin crew salaries are grouped into captains, first officers and flight attendants. The formulae of their salaries are as follows:

1. **Captain's hourly cost** $= \frac{\$3562 \times 1.5 \times 12^{*}}{700} = \$91.6$

   where

   expected basic salary = \$3562/month

   allowances = 50% of salary (1.5)

   expected yearly working hours = 700 hours

   *** 12 months**

2. **First officer hourly cost** $= \frac{\$2740 \times 1.5 \times 12}{700} = \$70.5$

3. **Flight attendant hourly cost = One third of a first officer cost.**

   $= 1/3 \times \$70.5 = \$23.5$

Total flight and cabin crew cost per sector was found by adding the above three items (considering the number of flight attendants needed for each aircraft type) then multiplying that figure with flight time required to finish each sector.

9.10.6 User Charges

User charges include both landing and navigation costs. Landing costs were found by averaging most of the GCC airports landing fees per one kg of aircraft weight, and then multiplying that figure by the MTOW for each aircraft.

Navigation charges = $1.05 x number of NM x √MTOW/50

where 1.05 is an average standard charge

9.10.7 Aircraft Maintenance Costs

There are two main components in aircraft maintenance costs which are hourly and cyclical costs. Usually, operating cost formulae for maintenance costs should be in proportion to the square root of MTOW divided by 50 tons. The following formulae were taken from research carried out by GPA Ltd:

1.	**Hourly maintenance costs ($)**	**= $365 x √MTOW/50 - $104**
2.	**Cyclical maintenance cost for turboprops ($)**	**= $44 x √MTOW/50 + $23.50**
3.	**Cyclical maintenance costs for jets ($)**	**= $510 x √MTOW/50 - $195**

The above formulae should be treated with caution as they are accurate for application to a range of aircraft weights. On the other hand, for cyclical turboprop costs, the formulae should not be applied to those without pressurisation with significantly lower weights.

9.11 INDIRECT COST PER SECTOR

Indirect costs usually include administrative costs, rents, etc. For this analysis, the indirect cost per sector was found by the following formulae:

Indirect cost per sector = [Number of seats x number of]
[NMs x 0.025]

+ [Number of seats x number of]
[NMs x 0.5 x 0.05]

The 0.5 in the second contribution is a load factor effect and in more accurate evaluations would be adjusted (to 0.6, for example, with a 60% passenger load factor). In this analysis it was taken as a constant 0.5.

However, IDOC formula was modified based on a knowledge of Gulf Air's 1990 IDOC for its B-737s for average distance of 248 Nm (555 Km). This choice was based on the availability of a Gulf Air budget report.

When adding Gulf Air IDOC, ground handling, ground engineering and catering, they came up to be 30.9% of the total operating costs.

The modification was applied to the IDOC of the earlier analysis to include ground handling and engineering and catering. It was then found to be 29% of TOC. In the calculation an allowance was made because the Gulf Air budget was for 1990 and the thesis analysis was for 1987-88. In addition, this modification was corrected for this analysis for B-737 at 248 Nm and then the formula obtained is applied for the rest of the aircraft at all length sectors. The final formula is:

[number of seats * number of Nm * 0.03] +

[number of seats * number of Nm * 0.5 * 0.0613]

9.10 CHAPTER CONCLUSIONS

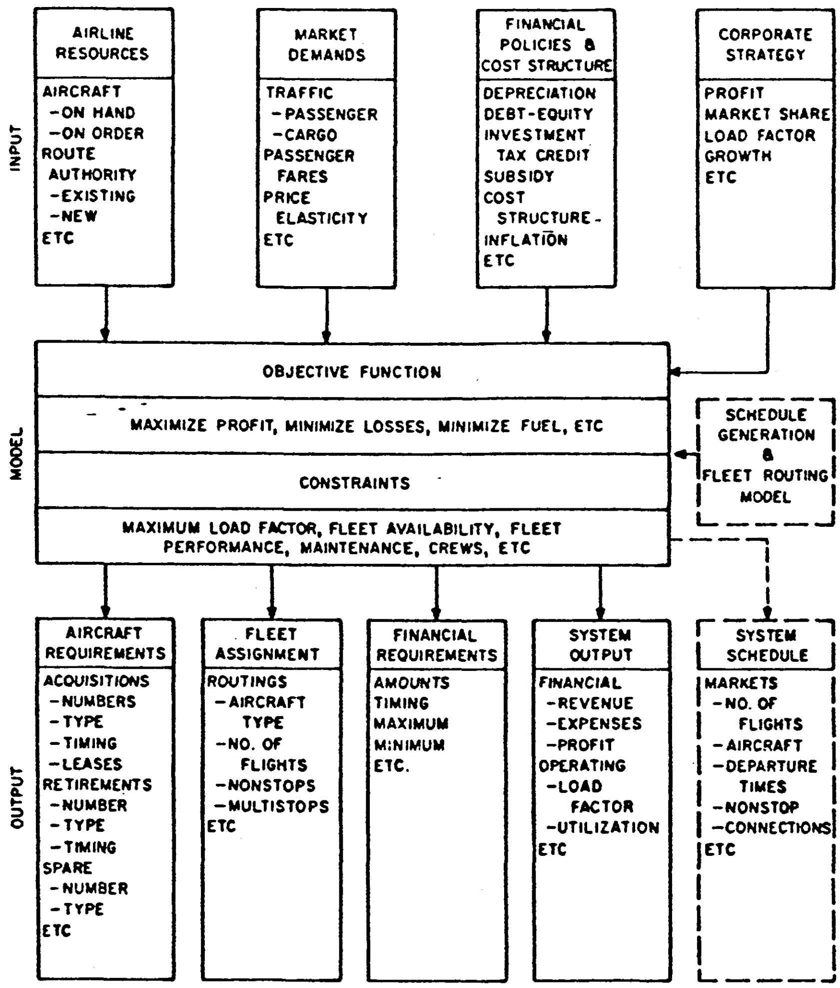
This chapter starts by examining corporate planning and fleet planning and ends with a detailed assessment of the operating costs of candidate aircraft. On this basis the following aircraft appear attractive on a low density network within the GCC:

1.	**ATR-42**	**Turboprop**
2.	**ATR-72**	**Turboprop**
3.	**ATP**	**Turboprop**
4.	**F-50**	**Turboprop**
5.	**D-8-3**	**Turboprop**
6.	**D-8-4**	**Turboprop**
7.	**S-2000**	**Turboprop**
8.	**DO-328**	**Turboprop**
9.	**RJ**	**Jet**
10.	**EMB 145**	**Jet**

11.	**146-1**	**Jet**
12.	**146-2**	**Jet**
13.	**F.100**	**Jet**
14.	**B-737-300**	**Jet**
15.	**B-737-500**	**Jet**

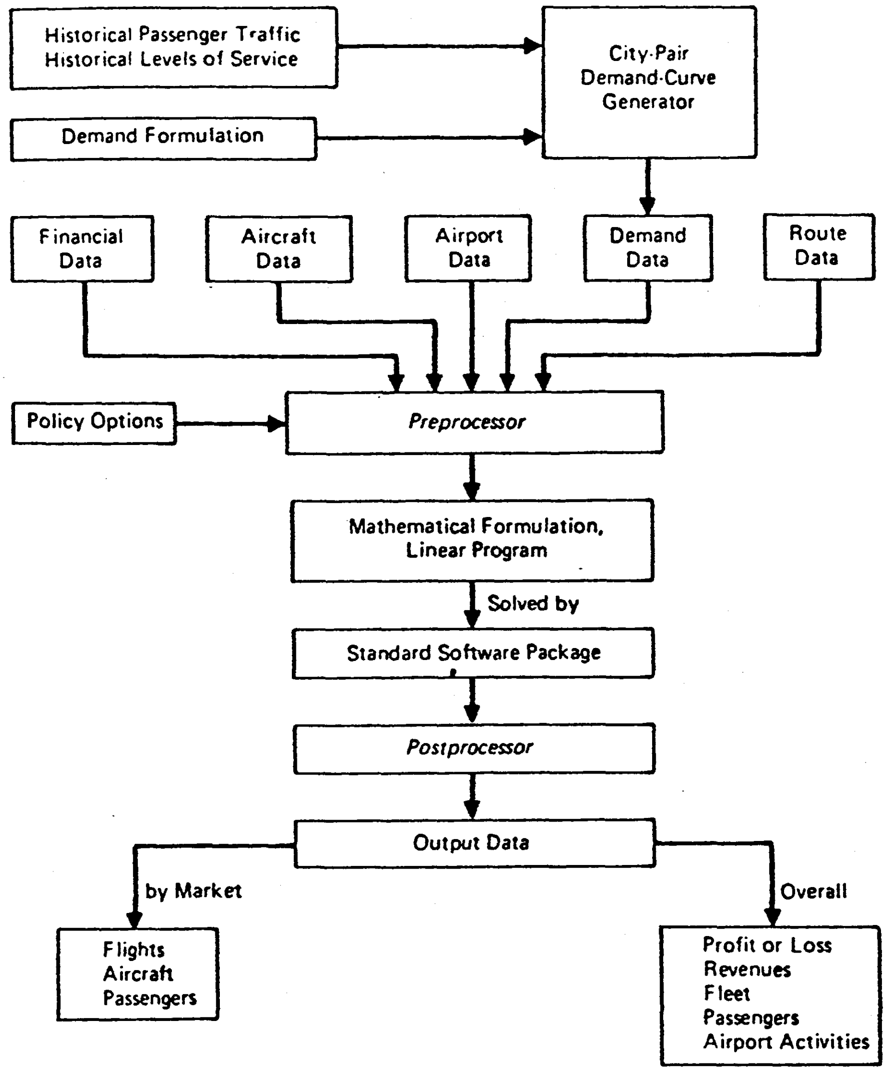
However, the final selection decision will be made after studying and assessing the total revenues of these aircraft, operating on some of the forecasted new routes, in the next chapter. This will be accomplished through analysis of these aircraft in a realistic operational environment within the GCC states.

FIGURE 9.1: General Frame Work Of Fleet Planning Models



SOURCE : Taneja, N. " The Commercial Airline Industry "

FIGURE 9.2: Fleet-Assignment Modelling Process



SOURCE : Taneja, N. " Airline Planning "

FIGURE 9.3: General Corporate Planning Process Model

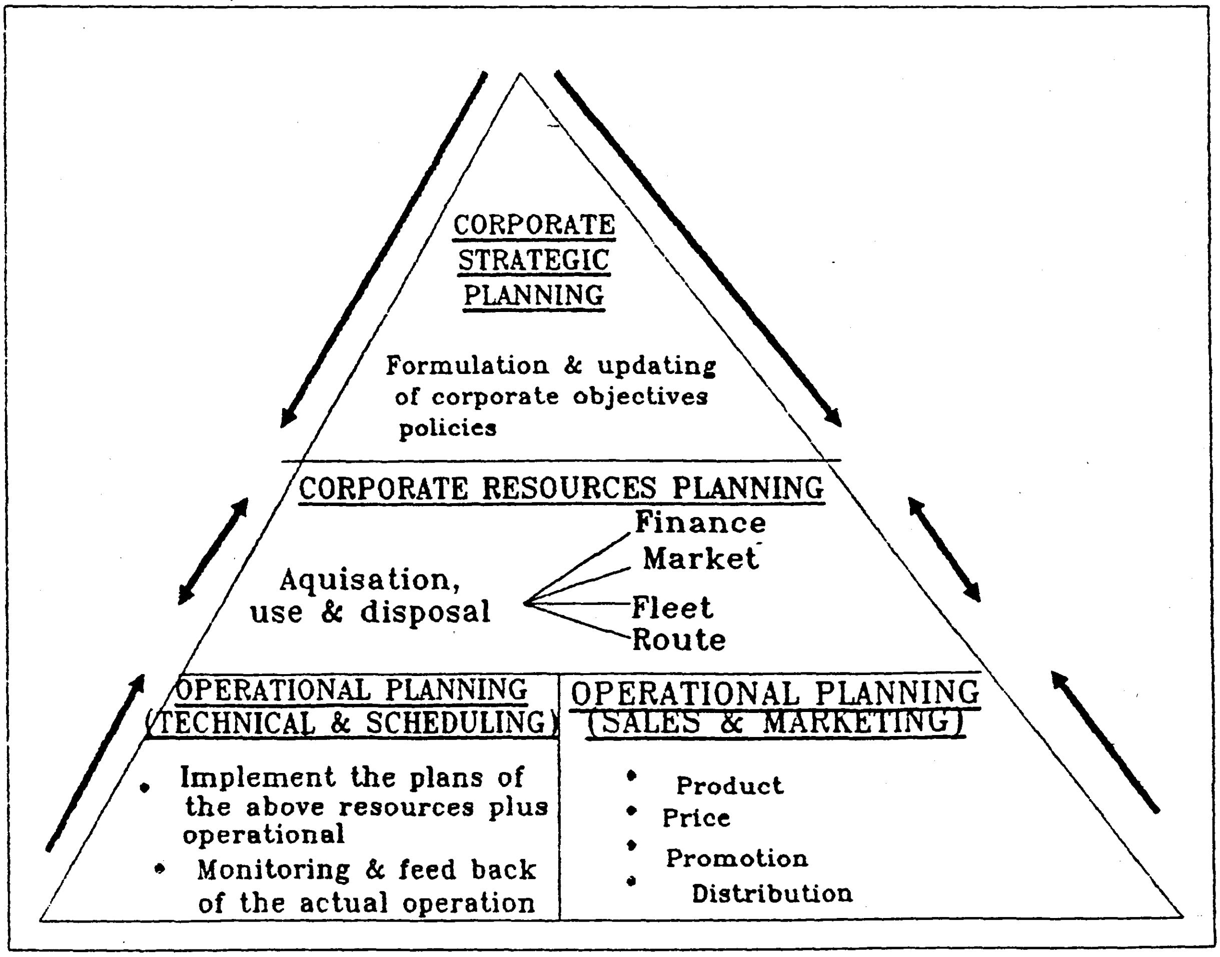


FIGURE 9.4: General Aircraft Selection Process Model

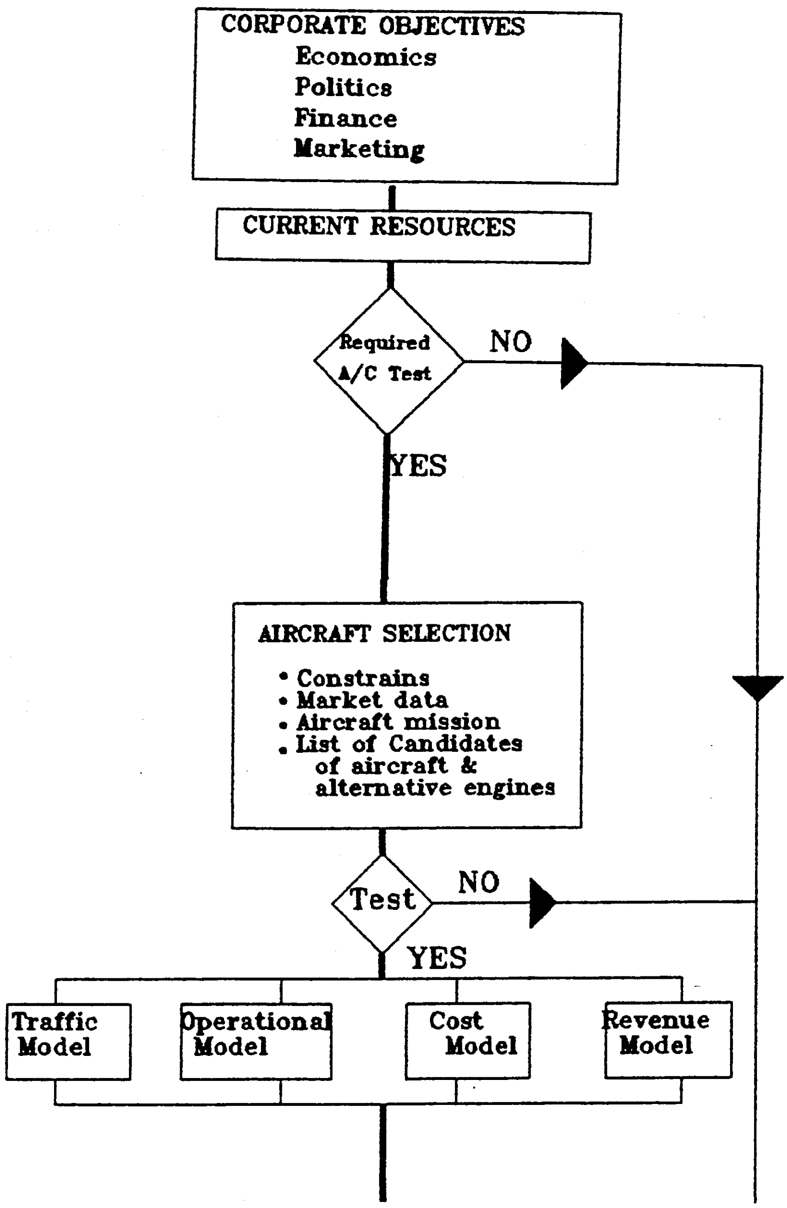


FIGURE 9.4 (Continued) General Aircraft Selection Process Model

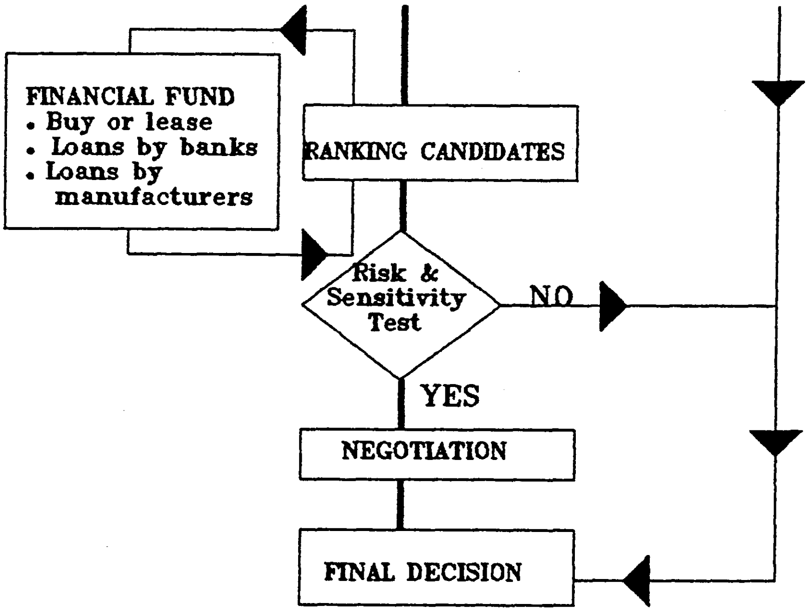
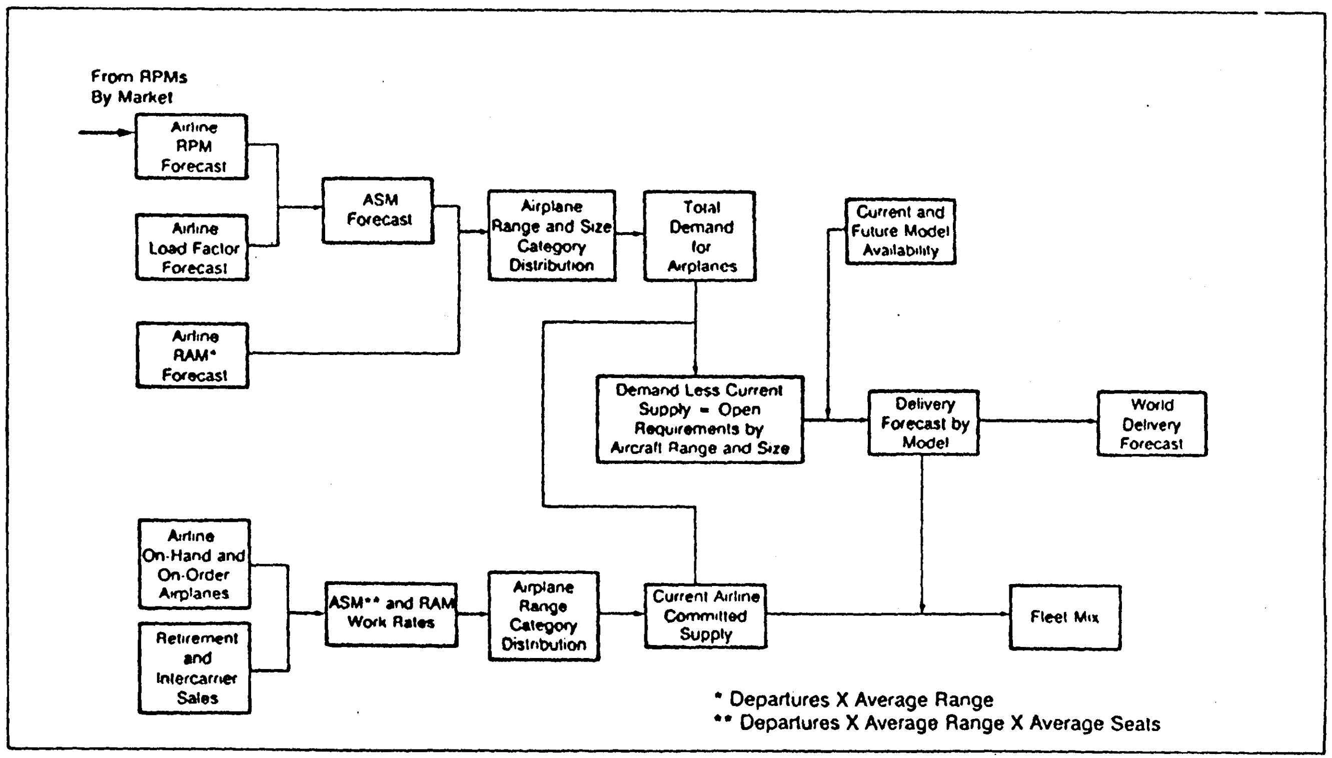


FIGURE 9.5: **Boeing's Methodology To Determine Required Aircraft.**



SOURCE : Boeing Industry Forecast

AIRCRAFT TYPE : ATR-42 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1
NUMBER OF SEATS	46	46	46	46	46	46	46	46	46
MAX. TAKE-OFF WEIGHT (KG)	17	17	17	17	17	17	17	17	17
BLOCK FUEL (lbs) [1 lb=.147 GAL]	124	178	234	287	343	398	453	508	563
BLOCK TIME (MIN)	39	67	91	115	138	161	184	207	230
(HRS)	.65	1.12	1.52	1.92	2.30	2.68	3.07	3.45	3.83
AIRCRAFT HOURS/YEAR	2,068	2,625	2,913	3,112	3,253	3,361	3,447	3,517	3,575
AIRCRAFT CYCLES/YEAR	3,182	2,351	1,921	1,624	1,414	1,252	1,124	1,019	933
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	315	426	521	616	708	799	891	982	1,073
INTEREST	208	281	344	407	467	527	588	648	708
HULL INSURANCE	47	64	78	92	106	120	134	147	161
FUEL	87	125	164	201	240	278	317	355	394
COCKPIT & CABIN CREW ($209/HR)	136	233	317	401	481	561	641	721	801
USER CHARGES	129	190	251	311	372	433	493	554	615
MAINTENANCE	118	168	211	254	295	336	377	418	459
INDIRECT COST PER SECTOR (US$)	279	558	837	1,116	1,395	1,674	1,953	2,232	2,511
TOTAL COSTS	1,319	2,045	2,723	3,399	4,063	4,728	5,393	6,057	6,722
TOTAL COST/AIRCRAFT/N.M. (US$)	13.2	10.2	9.1	8.5	8.1	7.9	7.7	7.6	7.5
TOTAL COST/SEAT/SECTOR (US$)	28.7	44.5	59.2	73.9	88.3	102.8	117.2	131.7	146.1
TOTAL COST/SEAT/N.M. (CENTS)	28.7	22.2	19.7	18.5	17.7	17.1	16.7	16.5	16.2

TABLE 9.1: ATR-42 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : ATR-72 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3
NUMBER OF SEATS	64	64	64	64	64	64	64	64	64
MAX. TAKE-OFF WEIGHT (KG)	20	20	20	20	20	20	20	20	20
BLOCK FUEL (lbs) [1 lb=.147 GAL]	130	195	262	323	390	457	524	591	658
BLOCK TIME (MIN)	38	62	85	109	131	153	175	197	219
(HRS)	.63	1.03	1.42	1.82	2.18	2.55	2.92	3.28	3.65
AIRCRAFT HOURS/YEAR	2,041	2,548	2,851	3,068	3,214	3,326	3,415	3,488	3,549
AIRCRAFT CYCLES/YEAR	3,223	2,466	2,013	1,689	1,472	1,304	1,171	1,062	972
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	384	502	615	733	841	949	1,057	1,165	1,273
INTEREST	253	331	406	484	555	626	697	769	840
HULL INSURANCE	58	75	92	110	126	142	159	175	191
FUEL	91	137	184	226	273	320	367	413	460
COCKPIT & CABIN CREW ($209/HR)	132	216	296	380	456	533	610	686	763
USER CHARGES	148	214	280	347	413	479	545	612	678
MAINTENANCE	131	182	230	281	327	373	420	466	512
INDIRECT COST PER SECTOR (US$)	388	776	1,164	1,553	1,941	2,329	2,717	3,105	3,493
TOTAL COSTS	1,586	2,433	3,267	4,112	4,931	5,751	6,571	7,391	8,210
TOTAL COST/AIRCRAFT/N.M. (US$)	15.9	12.2	10.9	10.3	9.9	9.6	9.4	9.2	9.1
TOTAL COST/SEAT/SECTOR (US$)	24.8	38.0	51.1	64.2	77.1	89.9	102.7	115.5	128.3
TOTAL COST/SEAT/N.M. (CENTS)	24.8	19.0	17.0	16.1	15.4	15.0	14.7	14.4	14.3

TABLE 9.2: ATR-72 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : ATP TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1
NUMBER OF SEATS	64	64	64	64	64	64	64	64	64
MAX. TAKE-OFF WEIGHT (KG)	23	23	23	23	23	23	23	23	23
BLOCK FUEL (lbs) [1 lb=.147 GAL]	119	202	281	354	433	513	593	673	754
BLOCK TIME (MIN)	39.0	67.0	91.0	115.0	138.0	161.0	184.0	207.0	230.0
(HRS)	.65	1.12	1.52	1.92	2.30	2.68	3.07	3.45	3.83
AIRCRAFT HOURS/YEAR	2,068	2,625	2,913	3,112	3,253	3,361	3,447	3,517	3,575
AIRCRAFT CYCLES/YEAR	3,182	2,351	1,921	1,624	1,414	1,252	1,124	1,019	933
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	418	566	693	820	941	1,063	1,184	1,306	1,427
INTEREST	276	374	457	541	621	701	782	862	942
HULL INSURANCE	63	85	104	123	141	159	178	196	214
FUEL	83	142	197	248	303	359	415	471	528
COCKPIT & CABIN CREW ($209/HR)	136	233	317	401	481	561	641	721	801
USER CHARGES	165	236	307	378	450	521	592	663	734
MAINTENANCE	146	213	270	328	383	437	492	547	602
INDIRECT COST PER SECTOR (US$)	388	776	1,164	1,553	1,941	2,329	2,717	3,105	3,493
TOTAL COSTS	1,676	2,626	3,511	4,391	5,260	6,130	7,001	7,871	8,741
TOTAL COST/AIRCRAFT/N.M. (US$)	16.8	13.1	11.7	11.0	10.5	10.2	10.0	9.8	9.7
TOTAL COST/SEAT/SECTOR (US$)	26.2	41.0	54.9	68.6	82.2	95.8	109.4	123.0	136.6
TOTAL COST/SEAT/N.M. (CENTS)	26.2	20.5	18.3	17.2	16.4	16.0	15.6	15.4	15.2

TABLE 9.3: ATP Operating Costs In The GCC Environment.

AIRCRAFT TYPE : F-50 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3
NUMBER OF SEATS	50	50	50	50	50	50	50	50	50
MAX. TAKE-OFF WEIGHT (KG)	19	19	19	19	19	19	19	19	19
BLOCK FUEL (lbs) [1 lb=.147 GAL]	117	184	246	310	375	446	517	589	660
BLOCK TIME (MIN)	38.0	62.0	85.0	109.0	131.0	153.0	175.0	197.0	219.0
(HRS)	.63	1.03	1.42	1.82	2.18	2.55	2.92	3.28	3.65
AIRCRAFT HOURS/YEAR	2,041	2,548	2,851	3,068	3,214	3,326	3,415	3,488	3,549
AIRCRAFT CYCLES/YEAR	3,223	2,466	2,013	1,689	1,472	1,304	1,171	1,062	972
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	384	502	615	733	841	949	1,057	1,165	1,273
INTEREST	253	331	406	484	555	626	697	769	840
HULL INSURANCE	58	75	92	110	126	142	159	175	191
FUEL	82	129	172	217	262	312	362	412	462
COCKPIT & CABIN CREW ($209/HR)	132	216	296	380	456	533	610	686	763
USER CHARGES	143	207	272	337	401	466	531	596	660
MAINTENANCE	127	176	222	270	315	359	403	448	492
INDIRECT COST PER SECTOR (US$)	303	607	910	1,213	1,516	1,820	2,123	2,426	2,729
TOTAL COSTS	1,482	2,243	2,985	3,743	4,473	5,207	5,941	6,676	7,410
TOTAL COST/AIRCRAFT/N.M. (US$)	14.8	11.2	9.9	9.4	8.9	8.7	8.5	8.3	8.2
TOTAL COST/SEAT/SECTOR (US$)	29.6	44.9	59.7	74.9	89.5	104.1	118.8	133.5	148.2
TOTAL COST/SEAT/N.M. (CENTS)	29.6	22.4	19.9	18.7	17.9	17.4	17.0	16.7	16.5

TABLE 9.4: F-50 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : D-8-3 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
NUMBER OF SEATS	56	56	56	56	56	56	56	56	56
MAX. TAKE-OFF WEIGHT (KG)	19	19	19	19	19	19	19	19	19
BLOCK FUEL (lbs) [1 lb=.147 GAL]	118	192	258	320	386	451	516	581	646
BLOCK TIME (MIN)	38.0	62.0	85.0	109.0	131.0	153.0	175.0	197.0	219.0
(HRS)	.63	1.03	1.42	1.82	2.18	2.55	2.92	3.28	3.65
AIRCRAFT HOURS/YEAR	2,041	2,548	2,851	3,068	3,214	3,326	3,415	3,488	3,549
AIRCRAFT CYCLES/YEAR	3,223	2,466	2,013	1,689	1,472	1,304	1,171	1,062	972
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	358	468	574	684	785	886	986	1,087	1,188
INTEREST	237	309	379	451	518	584	651	718	784
HULL INSURANCE	54	70	86	103	118	133	148	163	178
FUEL	83	134	181	224	270	315	361	406	452
COCKPIT & CABIN CREW ($209/HR)	132	216	296	380	456	533	610	686	763
USER CHARGES	141	205	269	333	397	461	525	589	653
MAINTENANCE	126	173	219	266	310	353	397	441	484
INDIRECT COST PER SECTOR (US$)	340	679	1,019	1,359	1,698	2,038	2,377	2,717	3,057
TOTAL COSTS	1,470	2,255	3,022	3,799	4,551	5,303	6,056	6,808	7,560
TOTAL COST/AIRCRAFT/N.M. (US$)	14.7	11.3	10.1	9.5	9.1	8.8	8.7	8.5	8.4
TOTAL COST/SEAT/SECTOR (US$)	26.2	40.3	54.0	67.8	81.3	94.7	108.1	121.6	135.0
TOTAL COST/SEAT/N.M. (CENTS)	26.2	20.1	18.0	17.0	16.3	15.8	15.4	15.2	15.0

TABLE 9.5: Dash-8-3 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : D-8-4 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	13	13	13	13	13	13	13	13	13
NUMBER OF SEATS	66	66	66	66	66	66	66	66	66
MAX. TAKE-OFF WEIGHT (KG)	24	24	24	24	24	24	24	24	24
BLOCK FUEL (lbs) [1 lb=.147 GAL]	165	249	343	439	534	629	724	819	914
BLOCK TIME (MIN)	36.0	55.0	75.0	94.0	111.0	128.0	145.0	162.0	179.0
(HRS)	.60	.92	1.25	1.57	1.85	2.13	2.42	2.70	2.98
AIRCRAFT HOURS/YEAR	1,984	2,426	2,734	2,942	3,083	3,196	3,288	3,365	3,430
AIRCRAFT CYCLES/YEAR	3,307	2,647	2,188	1,878	1,667	1,498	1,361	1,246	1,150
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	432	540	654	762	858	954	1,051	1,147	1,244
INTEREST	285	357	431	503	566	630	694	757	821
HULL INSURANCE	65	81	98	114	129	143	158	172	187
FUEL	115	174	240	307	374	440	507	573	640
COCKPIT & CABIN CREW ($209/HR)	125	192	261	327	387	446	505	564	624
USER CHARGES	169	241	313	385	457	529	601	674	746
MAINTENANCE	142	188	237	283	325	367	408	450	491
INDIRECT COST PER SECTOR (US$)	400	801	1,201	1,601	2,001	2,402	2,802	3,202	3,603
TOTAL COSTS	1,734	2,573	3,435	4,283	5,097	5,911	6,726	7,540	8,354
TOTAL COST/AIRCRAFT/N.M. (US$)	17.3	12.9	11.5	10.7	10.2	9.9	9.6	9.4	9.3
TOTAL COST/SEAT/SECTOR (US$)	26.3	39.0	52.1	64.9	77.2	89.6	101.9	114.2	126.6
TOTAL COST/SEAT/N.M. (CENTS)	26.3	19.5	17.4	16.2	15.4	14.9	14.6	14.3	14.1

TABLE 9.6: Dash-8-4 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : S-2000 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
NUMBER OF SEATS	50	50	50	50	50	50	50	50	50
MAX. TAKE-OFF WEIGHT (KG)	21	21	21	21	21	21	21	21	21
BLOCK FUEL (lbs) [1 lb=.147 GAL]	134	212	284	352	424	496	568	640	712
BLOCK TIME (MIN)	35.0	54.0	74.0	92.0	109.0	126.0	143.0	160.0	177.0
(HRS)	.58	.90	1.23	1.53	1.82	2.10	2.38	2.67	2.95
AIRCRAFT HOURS/YEAR	1,955	2,408	2,722	2,923	3,068	3,184	3,278	3,357	3,423
AIRCRAFT CYCLES/YEAR	3,351	2,675	2,207	1,906	1,689	1,516	1,376	1,259	1,160
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	377	473	573	664	749	834	920	1,005	1,090
INTEREST	249	312	378	438	494	551	607	663	720
HULL INSURANCE	57	71	86	100	112	125	138	151	164
FUEL	94	148	199	246	297	347	398	448	499
COCKPIT & CABIN CREW ($209/HR)	122	188	258	320	380	439	498	557	617
USER CHARGES	156	225	293	362	430	499	567	636	704
MAINTENANCE	131	173	218	258	296	334	372	410	449
INDIRECT COST PER SECTOR (US$)	303	607	910	1,213	1,516	1,820	2,123	2,426	2,729
TOTAL COSTS	1,489	2,197	2,915	3,601	4,275	4,949	5,623	6,297	6,971
TOTAL COST/AIRCRAFT/N.M. (US$)	14.9	11.0	9.7	9.0	8.5	8.2	8.0	7.9	7.7
TOTAL COST/SEAT/SECTOR (US$)	29.8	43.9	58.3	72.0	85.5	99.0	112.5	125.9	139.4
TOTAL COST/SEAT/N.M. (CENTS)	29.8	22.0	19.4	18.0	17.1	16.5	16.1	15.7	15.5

TABLE 9.7: Saab-2000 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : DO-328 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
NUMBER OF SEATS	31	31	31	31	31	31	31	31	31
MAX. TAKE-OFF WEIGHT (KG)	13	13	13	13	13	13	13	13	13
BLOCK FUEL (lbs) [1 lb=.147 GAL]	89	141	182	224	276	318	364	409	454
BLOCK TIME (MIN)	36	52	72	89	107	123	140	157	174
(HRS)	.60	.87	1.20	1.48	1.78	2.05	2.33	2.62	2.90
AIRCRAFT HOURS/YEAR	1,984	2,369	2,695	2,893	3,053	3,165	3,263	3,344	3,412
AIRCRAFT CYCLES/YEAR	3,307	2,733	2,246	1,950	1,712	1,544	1,398	1,278	1,176
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	238	288	350	403	459	509	562	615	669
INTEREST	157	190	231	266	303	336	371	406	441
HULL INSURANCE	36	43	53	60	69	76	84	92	100
FUEL	62	99	127	157	193	223	255	286	318
COCKPIT & CABIN CREW ($209/HR)	125	181	251	310	373	428	488	547	606
USER CHARGES	104	156	209	261	314	366	419	471	524
MAINTENANCE	93	114	140	162	185	206	229	251	273
INDIRECT COST PER SECTOR (US$)	188	376	564	752	940	1,128	1,316	1,504	1,692
TOTAL COSTS	1,003	1,447	1,925	2,372	2,836	3,274	3,724	4,173	4,623
TOTAL COST/AIRCRAFT/N.M. (US$)	10.0	7.2	6.4	5.9	5.7	5.5	5.3	5.2	5.1
TOTAL COST/SEAT/SECTOR (US$)	32.3	46.7	62.1	76.5	91.5	105.6	120.1	134.6	149.1
TOTAL COST/SEAT/N.M. (CENTS)	32.3	23.3	20.7	19.1	18.3	17.6	17.2	16.8	16.6

TABLE 9.8: DO-328 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : RJ (JET) TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	15	15	15	15	15	15	15	15	15
NUMBER OF SEATS	48	48	48	48	48	48	48	48	48
MAX. TAKE-OFF WEIGHT (KG)	21	21	21	21	21	21	21	21	21
BLOCK FUEL (lbs) [1 lb=.147 GAL]	177	255	339	427	520	612	705	798	891
BLOCK TIME (MIN)	34	49	63	76	90	104	118	132	146
(HRS)	.57	.82	1.05	1.27	1.50	1.73	1.97	2.20	2.43
AIRCRAFT HOURS/YEAR	1,375	1,648	1,831	1,962	2,074	2,164	2,238	2,300	2,352
AIRCRAFT CYCLES/YEAR	2,426	2,018	1,744	1,549	1,382	1,248	1,138	1,045	967
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	680	818	946	1,065	1,194	1,322	1,450	1,579	1,707
INTEREST	449	540	624	703	788	872	957	1,042	1,127
HULL INSURANCE	102	123	142	160	179	198	218	237	256
FUEL	124	178	237	299	364	429	494	558	623
COCKPIT & CABIN CREW ($209/HR)	118	171	219	265	314	362	411	460	509
USER CHARGES	157	225	294	363	432	500	569	638	707
MAINTENANCE	215	163	194	223	255	286	318	349	381
INDIRECT COST PER SECTOR (US$)	291	582	873	1,164	1,456	1,747	2,038	2,329	2,620
TOTAL COSTS	2,136	2,799	3,530	4,242	4,979	5,717	6,454	7,191	7,929
TOTAL COST/AIRCRAFT/N.M. (US$)	21.4	14.0	11.8	10.6	10.0	9.5	9.2	9.0	8.8
TOTAL COST/SEAT/SECTOR (US$)	44.5	58.3	73.5	88.4	103.7	119.1	134.5	149.8	165.2
TOTAL COST/SEAT/N.M. (CENTS)	44.5	29.2	24.5	22.1	20.7	19.8	19.2	18.7	18.4

TABLE 9.9: Canadair RJ Operating Costs In The GCC Environment.

AIRCRAFT TYPE : EMB145 (JET) TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
NUMBER OF SEATS	45	45	45	45	45	45	45	45	45
MAX. TAKE-OFF WEIGHT (KG)	17	17	17	17	17	17	17	17	17
BLOCK FUEL (lbs) [1 lb=.147 GAL]	134	221	316	381	450	520	589	658	728
BLOCK TIME (MIN)	34	51	67	82	97	112	127	142	157
(HRS)	.57	.85	1.12	1.37	1.62	1.87	2.12	2.37	2.62
AIRCRAFT HOURS/YEAR	1,925	2,349	2,625	2,818	2,969	3,091	3,190	3,273	3,344
AIRCRAFT CYCLES/YEAR	3,396	2,763	2,351	2,062	1,837	1,656	1,507	1,383	1,278
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	415	510	599	683	767	850	934	1,018	1,102
INTEREST	274	336	395	451	506	561	617	672	727
HULL INSURANCE	62	76	90	102	115	128	140	153	165
FUEL	93	155	221	267	315	364	412	461	509
COCKPIT & CABIN CREW ($209/HR)	118	178	233	286	338	390	442	495	547
USER CHARGES	128	188	249	309	369	430	490	550	611
MAINTENANCE	158	188	216	242	269	295	322	348	374
INDIRECT COST PER SECTOR (US$)	273	546	819	1,092	1,365	1,638	1,910	2,183	2,456
TOTAL COSTS	1,521	2,176	2,822	3,431	4,043	4,655	5,268	5,880	6,492
TOTAL COST/AIRCRAFT/N.M. (US$)	15.2	10.9	9.4	8.6	8.1	7.8	7.5	7.3	7.2
TOTAL COST/SEAT/SECTOR (US$)	33.8	48.4	62.7	76.2	89.9	103.5	117.1	130.7	144.3
TOTAL COST/SEAT/N.M. (CENTS)	33.8	24.2	20.9	19.1	18.0	17.2	16.7	16.3	16.0

TABLE 9.10: EMB-145 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : 146-100 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5
NUMBER OF SEATS	88	88	88	88	88	88	88	88	88
MAX. TAKE-OFF WEIGHT (KG)	38	38	38	38	38	38	38	38	38
BLOCK FUEL (lbs) [1 lb=.147 GAL]	363	488	613	757	902	1,047	1,192	1,337	1,482
BLOCK TIME (MIN)	35	52	69	84	99	114	129	144	159
(HRS)	.58	.87	1.15	1.40	1.65	1.90	2.15	2.40	2.65
AIRCRAFT HOURS/YEAR	1,955	2,369	2,654	2,841	2,987	3,105	3,202	3,283	3,352
AIRCRAFT CYCLES/YEAR	3,351	2,733	2,308	2,029	1,810	1,634	1,489	1,368	1,265
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	706	865	1,025	1,166	1,306	1,447	1,588	1,729	1,869
INTEREST	466	571	676	769	862	955	1,048	1,141	1,234
HULL INSURANCE	106	130	154	175	196	217	238	259	280
FUEL	254	342	429	530	632	733	835	936	1,038
COCKPIT & CABIN CREW ($209/HR)	122	181	240	293	345	397	449	502	554
USER CHARGES	248	340	431	523	614	706	798	889	981
MAINTENANCE	375	436	497	551	604	658	712	765	819
INDIRECT COST PER SECTOR (US$)	534	1,067	1,601	2,135	2,669	3,202	3,736	4,270	4,803
TOTAL COSTS	2,811	3,932	5,054	6,141	7,229	8,316	9,404	10,491	11,579
TOTAL COST/AIRCRAFT/N.M. (US$)	28.1	19.7	16.8	15.4	14.5	13.9	13.4	13.1	12.9
TOTAL COST/SEAT/SECTOR (US$)	31.9	44.7	57.4	69.8	82.1	94.5	106.9	119.2	131.6
TOTAL COST/SEAT/N.M. (CENTS)	31.9	22.3	19.1	17.4	16.4	15.8	15.3	14.9	14.6

TABLE 9.11: 146-100 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : 146-200 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
NUMBER OF SEATS	106	106	106	106	106	106	106	106	106
MAX. TAKE-OFF WEIGHT (KG)	42	42	42	42	42	42	42	42	42
BLOCK FUEL (lbs) [1 lb=.147 GAL]	432	580	728	898	1,070	1,241	1,413	1,584	1,756
BLOCK TIME (MIN)	35	52	69	84	99	114	129	144	159
(HRS)	.58	.87	1.15	1.40	1.65	1.90	2.15	2.40	2.65
AIRCRAFT HOURS/YEAR	1,955	2,369	2,654	2,841	2,987	3,105	3,202	3,283	3,352
AIRCRAFT CYCLES/YEAR	3,351	2,733	2,308	2,029	1,810	1,634	1,489	1,368	1,265
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	739	906	1,073	1,220	1,367	1,514	1,662	1,809	1,956
INTEREST	487	598	708	805	902	1,000	1,097	1,194	1,291
HULL INSURANCE	111	136	161	183	205	227	249	271	293
FUEL	302	406	510	629	749	869	989	1,109	1,229
COCKPIT & CABIN CREW ($209/HR)	122	181	240	293	345	397	449	502	554
USER CHARGES	269	366	462	559	655	752	848	944	1,041
MAINTENANCE	408	474	539	597	655	713	771	828	886
INDIRECT COST PER SECTOR (US$)	643	1,286	1,929	2,572	3,214	3,857	4,500	5,143	5,786
TOTAL COSTS	3,082	4,352	5,621	6,857	8,093	9,329	10,565	11,801	13,037
TOTAL COST/AIRCRAFT/N.M. (US$)	30.8	21.8	18.7	17.1	16.2	15.5	15.1	14.8	14.5
TOTAL COST/SEAT/SECTOR (US$)	29.1	41.1	53.0	64.7	76.3	88.0	99.7	111.3	123.0
TOTAL COST/SEAT/N.M. (CENTS)	29.1	20.5	17.7	16.2	15.3	14.7	14.2	13.9	13.7

TABLE 9.12: 146-200 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : F-100 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
NUMBER OF SEATS	107	107	107	107	107	107	107	107	107
MAX. TAKE-OFF WEIGHT (KG)	43	43	43	43	43	43	43	43	43
BLOCK FUEL (lbs) [1 lb=.147 GAL]	412	574	745	907	1,060	1,295	1,457	1,619	1,716
BLOCK TIME (MIN)	38	57	72	84	99	115	120	140	155
(HRS)	.63	.95	1.20	1.40	1.65	1.92	2.00	2.33	2.58
AIRCRAFT HOURS/YEAR	2,041	2,463	2,695	2,841	2,987	3,112	3,146	3,263	3,335
AIRCRAFT CYCLES/YEAR	3,223	2,593	2,246	2,029	1,810	1,624	1,573	1,398	1,291
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	768	955	1,102	1,220	1,367	1,524	1,573	1,770	1,917
INTEREST	507	630	727	805	902	1,006	1,038	1,168	1,265
HULL INSURANCE	115	143	165	183	205	229	236	265	288
FUEL	289	402	521	635	742	907	1,020	1,133	1,201
COCKPIT & CABIN CREW ($209/HR)	132	199	251	293	345	401	418	488	540
USER CHARGES	274	372	469	567	664	762	859	956	1,054
MAINTENANCE	427	502	560	607	666	729	748	826	885
INDIRECT COST PER SECTOR (US$)	649	1,298	1,947	2,596	3,245	3,894	4,543	5,192	5,841
TOTAL COSTS	3,161	4,499	5,743	6,905	8,136	9,450	10,436	11,799	12,991
TOTAL COST/AIRCRAFT/N.M. (US$)	31.6	22.5	19.1	17.3	16.3	15.8	14.9	14.7	14.4
TOTAL COST/SEAT/SECTOR (US$)	29.5	42.1	53.7	64.5	76.0	88.3	97.5	110.3	121.4
TOTAL COST/SEAT/N.M. (CENTS)	29.5	21.0	17.9	16.1	15.2	14.7	13.9	13.8	13.5

TABLE 9.13: F-100 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : B737-300 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	29	29	29	29	29	29	29	29	29
NUMBER OF SEATS	135	135	135	135	135	135	135	135	135
MAX. TAKE-OFF WEIGHT (KG)	57	57	57	57	57	57	57	57	57
BLOCK FUEL (lbs) [1 lb=.147 GAL]	558	798	963	1,155	1,300	1,446	1,591	1,737	1,882
BLOCK TIME (MIN)	35	50	64	78	89	101	112	124	135
(HRS)	.58	.83	1.07	1.30	1.48	1.68	1.87	2.07	2.30
AIRCRAFT HOURS/YEAR	1,955	2,328	2,580	2,772	2,893	3,004	3,091	3,172	3,253
AIRCRAFT CYCLES/YEAR	3,351	2,794	2,418	2,132	1,950	1,785	1,656	1,535	1,414
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	952	1,142	1,319	1,496	1,636	1,787	1,927	2,079	2,256
INTEREST	628	754	871	988	1,079	1,180	1,272	1,372	1,489
HULL INSURANCE	143	171	198	224	245	268	289	312	338
FUEL	391	559	674	809	910	1,012	1,114	1,216	1,317
COCKPIT & CABIN CREW ($209/HR)	122	174	223	272	310	352	390	432	481
USER CHARGES	346	458	570	682	794	906	1,018	1,131	1,243
MAINTENANCE	516	588	654	721	773	830	883	940	1,007
INDIRECT COST PER SECTOR (US$)	819	1,638	2,456	3,275	4,094	4,913	5,731	6,550	7,369
TOTAL COSTS	3,916	5,483	6,965	8,467	9,842	11,249	12,624	14,031	15,499
TOTAL COST/AIRCRAFT/N.M. (US$)	39.2	27.4	23.2	21.2	19.7	18.7	18.0	17.5	17.2
TOTAL COST/SEAT/SECTOR (US$)	29.0	40.6	51.6	62.7	72.9	83.3	93.5	103.9	114.8
TOTAL COST/SEAT/N.M. (CENTS)	29.0	20.3	17.2	15.7	14.6	13.9	13.4	13.0	12.8

TABLE 9.14: B737-300 Operating Costs In The GCC Environment.

AIRCRAFT TYPE : B737-500 TOTAL OPERATING COST									
SECTOR DISTANCE (NM)	100	200	300	400	500	600	700	800	900
FIRST COST (US$ MN)	30	30	30	30	30	30	30	30	30
NUMBER OF SEATS	119	119	119	119	119	119	119	119	119
MAX. TAKE-OFF WEIGHT (KG)	53	53	53	53	53	53	53	53	53
BLOCK FUEL (lbs) [1 lb=.147	581	830	1,002	1,202	1,352	1,503	1,655	1,806	1,958
BLOCK TIME (MIN)	39	55	70	85	98	110	123	135	146
(HRS)	.65	.92	1.17	1.42	1.63	1.83	2.05	2.25	2.60
AIRCRAFT HOURS/YEAR	2,068	2,426	2,668	2,851	2,978	3,076	3,165	3,236	3,339
AIRCRAFT CYCLES/YEAR	3,182	2,647	2,287	2,013	1,823	1,678	1,544	1,438	1,284
DIRECT COST PER SECTOR (US$)									
DEPRECIATION	1,037	1,247	1,443	1,640	1,810	1,967	2,137	2,294	2,569
INTEREST	685	823	952	1,082	1,194	1,298	1,411	1,514	1,696
HULL INSURANCE	156	187	216	246	271	295	321	344	385
FUEL	407	581	701	841	946	1,052	1,159	1,264	1,371
COCKPIT & CABIN CREW ($209	136	192	244	296	341	383	428	470	543
USER CHARGES	325	434	542	650	758	866	974	1,082	1,190
MAINTENANCE	507	579	647	715	774	828	887	942	1,037
INDIRECT COST PER SECTOR (US	722	1,443	2,165	2,887	3,609	4,330	5,052	5,774	6,496
TOTAL COSTS	3,974	5,485	6,911	8,357	9,704	11,020	12,369	13,685	15,287
TOTAL COST/AIRCRAFT/N.M. (US$)	39.7	27.4	23.0	20.9	19.4	18.4	17.7	17.1	17.0
TOTAL COST/SEAT/SECTOR (US$)	33.4	46.1	58.1	70.2	81.5	92.6	103.9	115.0	128.5
TOTAL COST/SEAT/N.M. (CENTS)	33.4	23.0	19.4	17.6	16.3	15.4	14.8	14.4	14.3

TABLE 9.15: B737-500 Operating Costs In The GCC Environment.

REFERENCES

1. Louis Gialloreto, Strategic Airline Management (London : Pitman Publishing, 1989) PP.188-203

2. D.S.T.Holloway, A Systems Approach to the Modelling of Airline Creditworthiness, (England, M.Phil thesis, CIT, 1990)

3. G. James, Financial Performance And Future Prospects Of U.S. Airlines, (U.S. : EIU Travel And Tourism Analyst No.2, 1989) PP.6-15

4. Andy Hofton, Lecture Notes delivered at Cranfield Institute of Technology, 1990/91

5. Ibid

6. E.Ocrane, Dictionary Of Air Transport And Air Traffic Control, 1982

7. Nawal K. Taneja, Airlines In Transition (USA : Lexington Books, 1981)PP.191-222

8. Ibid, PP.97-102

9. Nawal K. Taneja, Airline planning (USA : Lexington Books, 1982) PP.85-110

10. Hofton, Lecture Notes.

11. Ibid

12. Ibid

13. Taneja, Airline planning,PP.1-9

14. Hofton

15. Lloyd's Aviation Economist, Aircraft Purchasing, August and September 1985

16. Airbus Industrie, Market Prospectives For Civil Jet Aircraft (US: Airbus Industrie, 1990) PP.10-13

17. Taneja, Airline In Transition, PP.204-212

18. E.H. Boullious, Earning and Quality of Service, in corporate planning under deregulation: The case of the airlines (Evanston,Ill.: Northwestern University, June 1979)PP.11-12

19. Boeing Commercial Airplane Group, Current Market Outlook (U.S. : Boeing, 1990) PP.51-65

20. Transportation Methods In GCC (Riyadh : Gulf Cooperation Council, March 1989)

CHAPTER TEN

ESTIMATING THE COSTS AND REVENUES OF NEW ROUTES

10.1 INTRODUCTION

The objective of this chapter is to estimate the level of profitability of new routes operated by candidate aircraft. Therefore this chapter has been written to complement the theory and results outlined in the preceding chapter and explains in more detail the concept of route planning.

Route development should exist within the framework of a corporate or strategic business plan. While Chapters 7-9 looked at planning at a macro level, this chapter considers planning at a micro, i.e. route by route level. However, route selection depend in general on profit motives and service motives. Profit motivated routes are those which generate maximum revenue for the lowest costs. On the other hand, routes which are motivated by service forces are underserved, inaccessible by other modes of transport, have significant trading or cultural links, or provide benefits to other sectors of the economy.

For the purposes of this thesis, route planning is defined as "the process of choosing a route, or network of routes, which optimises the economic benefit to the airline". The definition is very similar to the one given for fleet planning in Chapter 9.

The following are the most important criteria which are used to judge the suitability of a proposed new route:

1. Regulatory access to the market.
2. Economic and political stability.
3. Potential for market growth.
4. Acceptable business environment.
5. Ability to utilise existing aircraft types.
6. Synergy with existing operations.

10.2 ROUTE PLANNING PROCESS

It is important to have the best quality of information for any evaluation of route potential. Many world wide markets are well documented and there is no shortage of data covering Europe, North America, Japan, Australia, and parts of the Far East. On the other hand, there is less information available for the Middle East, Africa, South America, and parts of Asia. This underlines some of the difficulties facing the study of GCC routes.

The following are the main sources of information for new route evaluation:

1. **Political and economic backgrounds. General information can be found through the following:**
   - **Embassies.**
   - **Banks.**
   - **Government departments.**
   - **Libraries.**
   - **Academic bodies.**
2. **Specific information on economic trends and forecasts of GDP, consumer expenditure and inflation could be obtained through:**
   - **Banks and financial institution.**
   - **Professional forecasting companies.**
   - **Broader-based organisations such as OECD and IMF.**
3. **Air traffic data can be obtained through the following:**
   - **Departments of Civil Aviation.**
   - **Airlines.**
   - **Airports.**
   - **Immigration statistics.**
   - **Organizations such as ICAO, IATA and etc.**

Figure 10.1 is a general framework of the planning process for new routes, and consists of four phases which are first: political, economic and strategic scenarios. Second: marketing, forecasting, finance, risk and sensitivity considerations. Third: committee

meetings and evaluation. Fourth is the final decision.

10.2.1 Political, Economic and Strategic Scenarios

10.2.1.1 Political Scenario

This involves considering the current political stability and future governmental changes that could affect economic conditions such as travel patterns, trade, foreign exchange, bilaterals and competition.

10.2.1.2 Economic Scenario

This covers studying the structure of the economy, and identifying the main components with regard to their future development such as industrial base, the country's commodity trade (such as, oil, gas, and coffee), economic diversification, trade and tourism.

10.2.1.3. Strategic Scenario

Company's strategic objectives should be carefully considered in regard to route opportunities. The vision of where an airline wants to be, should be analysed in depth with strategic plan. Such considerations should be looked at are the following:

1. Prospects for improving profits.
2. Need to defend against other airlines.
3. Generation of foreign exchange.
4. Feed to current network.
5. Make better use of resources (such as aircraft and route rights).
6. Long term views of traffic growth.

10.2.2. Marketing

10.2.2.1 Market Share

Market share is determined by the frequency and capacity that an airline operates compared to the competition and by overall competitiveness and attractiveness in the market place which is influenced by factors such as price, product range and standards, quality of services , market awareness, level of marketing power and size of overall

network. Overall, frequency is generally the determinant for business markets, and capacity and low price are more closely related to the leisure market.

The relationship between capacity or frequency share that can be expected for new route is often referred as the Competitive Performance Index (CPI) which relates either to capacity share or frequency share. In any market, the CPI for all the carriers combined will be equal to 1, being the ratio of 100% of the market to 100% of the frequency of capacity.[1]

10.2.2.2 Market Research

Market research is useful for the following two reasons:

1. **Analyse the characteristics of demand for passengers via different methods of transportation through travel agents, hotels, tourism facilities, embassies and companies.**
2. **They are very useful especially when past traffic data is inadequate or non-existent.**

10.2.2.3 Traffic Market

Identify the major traffic flows such as city-pair if possible or country-pair. It is then desirable to segment the market by area of sale, by reason for travel, and specify ethnic flows. In addition, segment the market into origin and destination traffic, inter lining, and direct and indirect traffic. Finally, identify revenue passengers (excluding free and discounted passengers) only when evaluating route profitability or planning capacity.

10.2.2.4 Integration

This section should analyse the airline's aircraft availability for the proposed new routes or for additional frequencies. Benefits of the new routes to and from the existing routes should be considered. Finally, schedule integration of the new routes with the already existing routes should be carried out to form an excellent network that would effectively use the resources of the airlines, serve in a competitive structure, operate under the lowest costs and generate the maximum revenues.

10.2.3. Forecasting

10.2.3.1. Traffic Forecasting

Forecasting must take into account the future traffic growth with upper and lower limits, taking into consideration that the actual answer could exceed or fall short of expectations. Traffic demand should also be forecasted under the bases of price elasticity and different levels of quality of services which determines the sensitivity of the demand on a particular market. As a result, attempts could be made to increase passenger demand. However, it should be noted that there is no "right answer" in forecasting. The successful forecaster is the one who has the ability and experience to analyse a complex set of market conditions and make consistent judgements (see Chapter 7).

10.2.3.2 Economic Forecasting

Bearing in mind the remarks about technological and energy forecasts of Chapter 7, economic forecasting involves predicting future levels of inflation, GDP, consumer expenditure, exchange rates, interest rates, oil prices, and trade. Most of these factors affect the rate of growth and the composition of the markets.

10.2.3.3 Costs and Revenue Forecasts

Costs are usually determined by the efficiency of the airline and their ability to keep them low. In a deregulated environment, keeping costs to the minimum is a major factor enabling an airline to remain in the air transport business. On the other hand, revenues are dependent upon the traffic structure, the market mix and segmentation, the inter-relationship of exchange rates and the levels of commission payable .

10.2.4. Finance

When considering new routes, financial analysis should be very carefully plan matters such as airline finance status, finance costs, acceptable financial return, and earning before tax or operating ratio. These should be defined within the strategic objectives of the decision to start a new route. If positive results have been accomplished, then it would be important to determine what is acceptable and decide on the level of investment for growth.

10.2.5. Risk and Sensitivity Considerations

There is always a risk that the forecasted data will change. This is true of the traffic demand forecast where they are mostly made by mathematical formulae. In addition, the decision to travel is not always taken by mathematical formulae - such as where and when to travel. They are made by emotion influenced by many factors, some of which are quite unpredictable. Wars, hijacking, terrorism and natural disasters are all recently phenomena that could throw the best forecasts off track. Recently, the Gulf war which caused many airlines to suffer from financial problems, and caused a sharp decrease in passenger demand even with regions thousands of miles away from the Gulf area.

The level of risk and exposure to political and economic uncertainty should always be considered in planning for new routes. Important issues are exchange rates/remittance volatility, and the sensitivity of the results to changes in forecasts assumptions in terms of growth potential, market stability, strength of competition.

10.2.6. Committee Meeting, Evaluation and Final Decision

Normally an airline will have many meetings evaluating all the data obtained in the previous stages of the new route planning process. Consideration should be given to whether the airline can withstand substantial net losses during the start up stage in opening a major new route.

Following the committee meetings and evaluation, a final decision will be taken whether a new route would be opened or not.

10.3 THE REGULATORY ASPECTS OF AIRLINE ROUTE DEVELOPMENT

The route structure is probably the most essential element in an airline's formula for success because of its importance to normal business operations. In a regulated environment route rights are amongst an airlines' most valuable assets.

It is important to consider the separation of domestic routes from the international routes, and the trunk line services from the local carrier services. A conflict occurs to whether a certain route would be better served by local carrier or by trunk carrier. International routes usually involve politics through the foreign ministry of foreign country involved. Principally, international routes involve the following:

1. **Bilateral agreements.**
2. **Pooling agreements (Commercial arrangements to share frequency, capacity and revenue).**
3. **The requirement for a national airline to fly a politically desirable route.**

Before considering the case of the GCC it is interesting to note the origin of the USA domestic route system. This system goes back to the late 1920s when the Hoover administration granted American, TWA and United transcontinental mail contract authority.[2]

By 1958 the system had been much refined and the Federal Aviation Act of that year Title IV, Section 401 suggested the granting of certification on new routes to a carrier if it "....finds that the applicant is fit, willing, and able to perform such transportation properly, and that transportation is required by the public convenience and necessity ....".[3] However, when an application was made for new routes or for an extension of already established routes, the Board took the following into consideration:

1. **Can the applicant usefully serve the public need?**
2. **Could this need be fulfilled adequately by the existing carriers?**
3. **Will the proposed service by the applicant damage the operations of the already existing carriers contrary to the public interest?**
4. **Does the costs of the proposed service overshadow the benefits?**
5. **Does the financial and economic need of the applicant carrier justify the certification of the new route?**

In addition, before any carrier was selected to offer the service, the Board had to establish the public's need to such a service which will include the following considerations:

1. **Analysing the past traffic data carried between the points.**
2. **Studying the operating performance of the already serving carrier if the service is not new (such as frequency and load factor).**
3. **Speculating the potential growth of traffic.**

Overall, the following are some of considerations which were taken by the Board in route proceedings:[4]

1. **The need for the proposed service.**
2. **The fitness of the applicant.**
3. **Diversionary effects.**
4. **The historical interest of the applicant in the route.**
5. **The integration of the proposed route in the applicant's network.**
6. **The need for carrier strengthening.**
7. **Finally, the applicant's route structure.**

Although this thesis is concerned with liberalisation in the GCC, and the above rules for the US were swept away by deregulation in 1978, rules such as these might be useful on some routes within the GCC even after liberalisation.

10.4 IDENTIFYING FEASIBLE NEW ROUTES IN THE GCC

Forecasting passenger demand for new routes is a very long and hard process that requires mathematical formulae and judgemental decisions at every phase. Nevertheless, the gravity model was chosen in chapters seven and eight to model the GCC domestic air services traffic. Previous data and analysis results will be applied in this chapter to forecast traffic on new and potential routes in that part of the world.

It should be noted that although new routes are not served at the present time as direct services, connections are available via one or several flight stops.

10.5 COSTS AND REVENUES OF THE NEW ROUTES

Data from chapter nine were used as the basis of the financial analysis of the new routes. Such data included the total costs of different aircraft per N.M. However, the objective of this financial analysis was to find the costs and revenues of different aircraft on each of the possible new routes. Every route was analysed financially to find whether that specific route was commercially operational for other carriers. Revenues on every new route were analysed when operated by different aircraft under the following conditions:

1. Revenues per sector per maximum number of forecasted passengers or aircraft capacity.
   Profit of that particular route operated by a specific aircraft.
   Percentage of profit with regard to total costs.
2. Revenues at 100% load factor for a specific aircraft.
3. Revenues at 75% load factor for a specific aircraft.
4. Revenues at 65% load factor for a specific aircraft.
5. Revenues at 50% load factor for a specific aircraft.

The following city-pairs are the new routes which were evaluated. For each the daily forecast number of passengers is given as well as the table numbers for the detailed calculation:

	CITY-PAIR	THE DAILY FORECAST NUMBER OF PASSENGERS	TABLE NUMBERS
1.	ABU DHABI-ABHA	28	Table 10.1
2.	ABU DHABI-MEDINAH	28	Table 10.2
3.	BAHRAIN-ABHA	47	Table 10.3
4.	BAHRAIN-ALQASSAIM	24	Table 10.4
5.	BAHRAIN-GIZAN	26	Table 10.5
6.	BAHRAIN-MEDINAH	49	Table 10.6

7.	BAHRAIN-TABUK	23	Table 10.7
8.	BAHRAIN-TAIF	23	Table 10.8
9.	DOHA-ABHA	25	Table 10.9
10.	DOHA-MEDINAH	25	Table 10.10
11.	DUBAI-ABHA	97	Table 10.11
12.	DUBAI-ALQASSAIM	82	Table 10.12
13.	DUBAI-GIZAN	53	Table 10.13
14.	DUBAI-MEDINAH	96	Table 10.14
15.	DUBAI-TABUK	44	Table 10.15
16.	DUBAI-TAIF	46	Table 10.16
17.	KUWAIT-ABHA	63	Table 10.17
18.	KUWAIT-ALQASSIAM	36	Table 10.18
19.	KUWAIT-GIZAN	35	Table 10.19
20.	KUWAIT-MEDINAH	72	Table 10.20
21.	KUWAIT-TABUK	34	Table 10.21
22.	KUWAIT-TAIF	32	Table 10.22
23.	MUSCAT-ABHA	21	Table 10.23
24.	MUSCAT-MEDINAH	20	Table 10.24
25.	SHARJAH-DHARAN	21	Table 10.25
26.	SHARJAH-JEDDAH	34	Table 10.26
27.	SHARJAH-RIYADH	39	Table 10.27

All routes are from one GCC country member to another one. As a result, both GCC member states (origin and destination) will benefit from the services.

The distance between every route was measured as great circle in nautical miles. Some of the routes are assumed to support one or two flights per day, as indicated in the top of every table. As is noted from the previous tables, revenues vary with aircraft types which indicates that certain aircraft would be far better than others with regard to profit making on certain routes. It should also be noted that there are no corporate income taxes in the GCC countries, and the profit an airline or a company generates every year is not subjected to taxation.

The forecast results which have been used in this analysis are purely dependent on the gravity model. However, from the analysis of Chapters seven and eight, the best forecast results are a combination of two methods, for example statistical and judgemental prediction. In this analysis, a judgemental forecast method has not been applied. However, judgement suggests that the quantitative forecasts made using the gravity model are conservative.

There are many routes which were really under estimated, such as Medinah and Taif. Medinah is a very holy city and Taif is very close to the most holy position for all Muslim nations - Mecca. In addition, Taif is considered to be a nice tourist city. However, since these airports are mainly considered domestic airports, most of the traffic they received is via Jeddah airport. The gravity model does not recognise this variable. When applying judgemental forecast especially to these two airports, daily passenger forecast would probably treble.

10.6 CHAPTER CONCLUSIONS

This chapter used the results of the analysis in chapters seven and eight which forecast passenger demand, and from chapter nine for aircraft selection and evaluation, to predict new routes and to consider certain aircraft operating on them. This estimated their level of profitability. As a result, most of the routes were found to be remarkably profitable especially with the absence of tax regulation in that part of the world. This chapter proved that the feasible routes, which were researched in the previous chapters, are attractive and can be operated commercially by new carriers. The following elements summarise the research conclusions reached at the end of this chapter.

1. **There is an attractive level of passenger demand for the domestic airline services within the GCC countries.**
2. **There are potential new routes that could be operated efficiently and beneficially to passengers by providing direct services.**
3. **Fifteen different aircraft were analysed and evaluated on the feasible new routes. Some of aircraft were proven to be very attractive commercially on these new routes.**

4. **These new routes were proven to be remarkably attractive and should encourage new carriers to enter the market.**

FIGURE 10.1: General Framework of New Route Planning Process

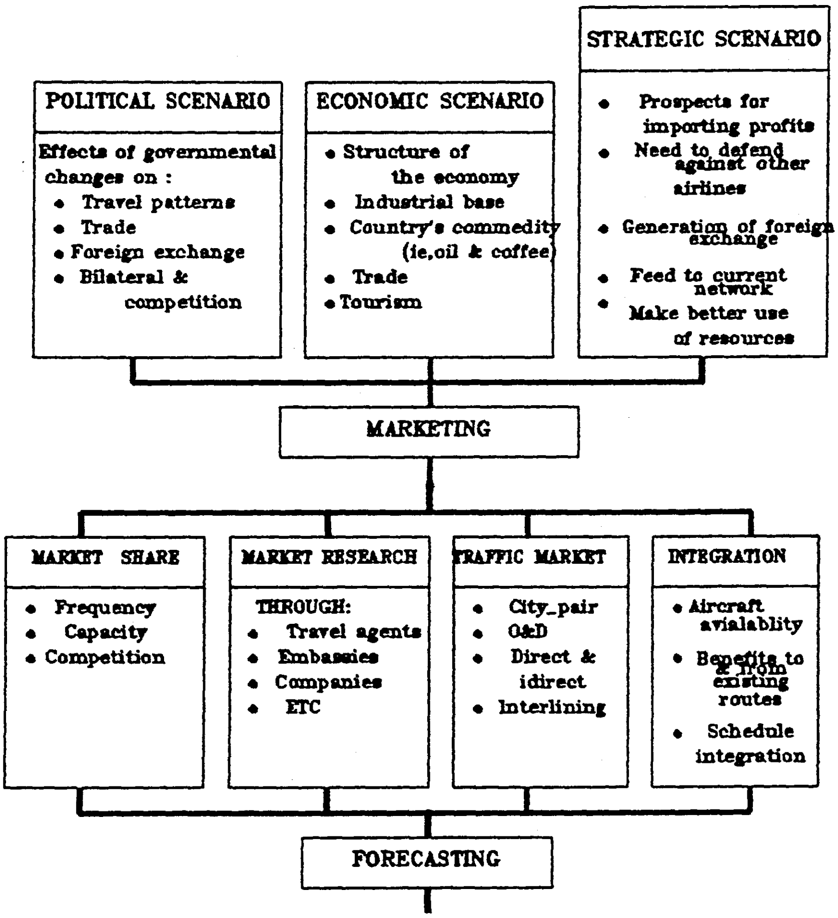
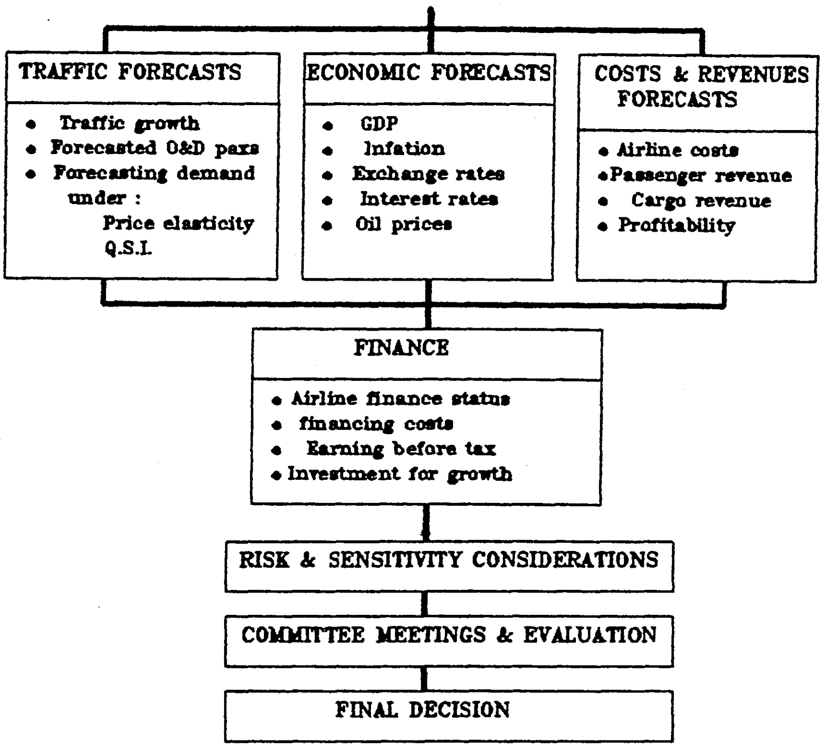


FIGURE 10.1 (Continued): General Framework of New Route Planning Process



SECTOR : ABU DHABI-ABHA			DISTANCE : 766 NM 883 SM						FORECASTED NUMBER OF PASSENGERS : 57 PAXs PER TWO DAYS						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	489	568	646	565	559	786	616	394	766	635	1,288	1,526	1,564	1,687	1,755
BLOCK TIME (MIN)	199.2	189.5	199.2	189.5	189.5	156.2	154.2	151.2	127.2	136.9	138.9	138.9	133.2	119.9	130.9
(HRS)	3.32	3.16	3.32	3.16	3.16	2.60	2.57	2.52	2.12	2.28	2.32	2.32	2.22	2.00	2.18
AIRCRAFT HOURS/YEAR	3,493	3,463	3,493	3,463	3,463	3,339	3,330	3,316	2,279	3,245	3,256	3,256	3,223	3,144	3,212
AIRCRAFT CYCLES/YEAR	1,055	1,099	1,055	1,099	1,099	1,285	1,298	1,319	1,077	1,425	1,409	1,409	1,458	1,576	1,474
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	951	1,128	1,264	1,128	1,053	1,115	976	597	1,535	990	1,681	1,759	1,703	2,027	2,241
INTEREST	628	745	834	745	695	736	644	394	1,013	653	1,109	1,161	1,124	1,338	1,479
HULL INSURANCE	143	169	190	169	158	167	146	90	230	148	252	264	255	304	336
FUEL	342	397	452	395	391	551	431	275	536	444	902	1,068	1,095	1,181	1,228
COCKPIT & CABIN CREW ($209/HR)	694	660	694	660	660	544	537	527	443	477	484	484	464	418	456
USER CHARGES	533	589	639	574	568	649	613	453	614	530	858	912	923	1,092	1,045
MAINTENANCE	404	450	529	433	426	436	398	243	339	339	747	809	800	921	923
INDIRECT COST PER SECTOR (US$)	2,137	2,973	2,973	2,323	2,602	3,066	2,323	1,440	2,230	2,091	4,088	4,925	4,971	6,272	5,528
TOTAL COSTS	5,831	7,112	7,575	6,426	6,552	7,263	6,068	4,020	6,941	5,672	10,122	11,381	11,335	13,552	13,237
TOTAL COST/AIRCRAFT/N.M. (US$)	7.6	9.3	9.9	8.4	8.6	9.5	7.9	5.3	9.1	7.4	13.2	14.9	14.8	17.7	17.3
TOTAL COST/SEAT/SECTOR (US$)	126.8	111.1	118.4	128.5	117.0	110.0	121.4	129.7	144.6	126.0	115.0	107.4	105.9	100.4	111.2
TOTAL COST/SEAT/N.M. (CENTS)	16.6	14.5	15.5	16.8	15.3	14.4	15.9	16.9	18.9	16.5	15.0	14.0	13.8	13.1	14.5
REVENUE PER SECTOR PER MAX. 57 PAXs OR A/C CAPACITY ($223/PAX)	10,258	12,711	12,711	11,150	12,488	12,711	11,150	6,913	10,704	10,035	12,711	12,711	12,711	12,711	12,711
PROFIT	4,427	5,599	5,136	4,724	5,936	5,448	5,082	2,893	3,763	4,363	2,589	1,330	1,376	-841	-526
PERCENTAGE OF PROFIT	75.9	78.7	67.8	73.5	90.6	75.0	83.8	71.9	54.2	76.9	25.6	11.7	12.1	-6.2	-4.0
REVENUE AT 100% L.F. OF AN A/C	10,258	14,272	14,272	11,150	12,488	14,718	11,150	6,913	10,704	10,035	19,624	23,638	23,861	30,105	26,537
PROFIT	4,427	7,160	6,697	4,724	5,936	7,455	5,082	2,893	3,763	4,363	9,502	12,257	12,526	16,553	13,300
PERCENTAGE OF PROFIT	75.9	100.7	88.4	73.5	90.6	102.6	83.8	71.9	54.2	76.9	93.9	107.7	110.5	122.1	100.5
REVENUE AT 75% L.F. OF AN A/C	7,694	10,704	10,704	8,363	9,366	11,039	8,363	5,185	8,028	7,526	14,718	17,729	17,896	22,579	19,903
PROFIT	1,862	3,592	3,129	1,936	2,814	3,776	2,295	1,164	1,087	1,855	4,596	6,348	6,560	9,026	6,666
PERCENTAGE OF PROFIT	31.9	50.5	41.3	30.1	43.0	52.0	37.8	29.0	15.7	32.7	45.4	55.8	57.9	66.6	50.4
REVENUE AT 65% L.F. OF AN A/C	6,668	9,277	9,277	7,248	8,117	9,567	7,248	4,493	6,958	6,523	12,756	15,365	15,510	19,568	17,249
PROFIT	836	2,165	1,702	821	1,565	2,304	1,180	473	17	851	2,634	3,984	4,174	6,016	4,012
PERCENTAGE OF PROFIT	14.3	30.4	22.5	12.8	23.9	31.7	19.4	11.8	.2	15.0	26.0	35.0	36.8	44.4	30.3
REVENUE AT 50% L.F. OF AN A/C	5,129	7,136	7,136	5,575	6,244	7,359	5,575	3,457	5,352	5,018	9,812	11,819	11,931	15,053	13,269
PROFIT	-702	24	-439	-851	-308	96	-493	-564	-1,589	-654	-310	438	595	1,500	31
PERCENTAGE OF PROFIT	-12.0	.3	-5.8	-13.2	-4.7	1.3	-8.1	-14.0	-22.9	-11.5	-3.1	3.8	5.2	11.1	.2

TABLE 10.1: Costs, Revenues and Profitability of Abu Dhabi - Abha Sector

SECTOR : ABU DHABI-MADINAH			DISTANCE : 816 NM 940 SM							FORECASTED NUMBER OF PASSENGERS : 56 PAXs PER TWO DAYS					
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	517	601	686	600	591	834	652	416	813	669	1,361	1,612	1,635	1,760	1,830
BLOCK TIME (MIN)	211	201	211	201	201	165	163	160	134	144	146	146	142	126	137
(HRS)	3.51	3.34	3.51	3.34	3.34	2.75	2.71	2.66	2.24	2.41	2.44	2.44	2.37	2.10	2.31
AIRCRAFT HOURS/YEAR	3,526	3,498	3,526	3,498	3,498	3,375	3,367	3,355	2,308	3,285	3,294	3,294	3,275	3,185	3,253
AIRCRAFT CYCLES/YEAR	1,006	1,048	1,006	1,048	1,048	1,231	1,243	1,262	1,033	1,366	1,352	1,352	1,381	1,515	1,414
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	997	1,182	1,325	1,182	1,103	1,163	1,019	624	1,599	1,031	1,751	1,833	1,793	2,107	2,338
INTEREST	658	780	875	780	728	767	672	412	1,055	681	1,156	1,210	1,184	1,391	1,543
HULL INSURANCE	149	177	199	177	165	174	153	94	240	155	263	275	269	316	351
FUEL	362	421	480	420	414	584	456	291	569	469	952	1,128	1,144	1,232	1,281
COCKPIT & CABIN CREW ($209/HR)	734	698	734	698	698	574	567	556	468	503	510	510	496	440	482
USER CHARGES	564	622	674	606	600	685	647	480	649	560	904	960	972	1,149	1,099
MAINTENANCE	424	473	556	455	448	456	417	254	354	352	774	838	836	951	957
INDIRECT COST PER SECTOR (US$)	2,277	3,167	3,167	2,475	2,771	3,266	2,475	1,534	2,376	2,227	4,355	5,246	5,295	6,681	5,889
TOTAL COSTS	6,164	7,522	8,010	6,793	6,928	7,670	6,405	4,245	7,309	5,978	10,665	11,999	11,990	14,266	13,941
TOTAL COST/AIRCRAFT/N.M. (US$)	7.6	9.2	9.8	8.3	8.5	9.4	7.9	5.2	9.0	7.3	13.1	14.7	14.7	17.5	17.1
TOTAL COST/SEAT/SECTOR (US$)	134.0	117.5	125.2	135.9	123.7	116.2	128.1	136.9	152.3	132.8	121.2	113.2	112.1	105.7	117.2
TOTAL COST/SEAT/N.M. (CENTS)	16.4	14.4	15.3	16.7	15.2	14.2	15.7	16.8	18.7	16.3	14.9	13.9	13.7	13.0	14.4
REVENUE PER SECTOR PER MAX.56 PAXs															
OR A/C CAPACITY ($238/PAX)	10,948	13,328	13,328	11,900	13,328	13,328	11,900	7,378	11,424	10,710	13,328	13,328	13,328	13,328	13,328
PROFIT	4,784	5,806	5,318	5,107	6,400	5,658	5,495	3,133	4,115	4,732	2,663	1,329	1,338	-938	-613
PERCENTAGE OF PROFIT	77.6	77.2	66.4	75.2	92.4	73.8	85.8	73.8	56.3	79.2	25.0	11.1	11.2	-6.6	-4.4
REVENUE AT 100% L.F. OF AN A/C	10,948	15,232	15,232	11,900	13,328	15,708	11,900	7,378	11,424	10,710	20,944	25,228	25,466	32,130	28,322
PROFIT	4,784	7,710	7,222	5,107	6,400	8,038	5,495	3,133	4,115	4,732	10,279	13,229	13,476	17,864	14,381
PERCENTAGE OF PROFIT	77.6	102.5	90.2	75.2	92.4	104.8	85.8	73.8	56.3	79.2	96.4	110.3	112.4	125.2	103.2
REVENUE AT 75% L.F. OF AN A/C	8,211	11,424	11,424	8,925	9,996	11,781	8,925	5,534	8,568	8,033	15,708	18,921	19,100	24,098	21,242
PROFIT	2,047	3,902	3,414	2,132	3,068	4,111	2,520	1,288	1,259	2,055	5,043	6,922	7,110	9,832	7,300
PERCENTAGE OF PROFIT	33.2	51.9	42.6	31.4	44.3	53.6	39.3	30.3	17.2	34.4	47.3	57.7	59.3	68.9	52.4
REVENUE AT 65% L.F. OF AN A/C	7,116	9,901	9,901	7,735	8,663	10,210	7,735	4,796	7,426	6,962	13,614	16,398	16,553	20,885	18,409
PROFIT	952	2,379	1,890	942	1,735	2,540	1,330	550	116	984	2,948	4,399	4,563	6,619	4,468
PERCENTAGE OF PROFIT	15.5	31.6	23.6	13.9	25.0	33.1	20.8	13.0	1.6	16.5	27.6	36.7	38.1	46.4	32.1
REVENUE AT 50% L.F. OF AN A/C	5,474	7,616	7,616	5,950	6,664	7,854	5,950	3,689	5,712	5,355	10,472	12,614	12,733	16,065	14,161
PROFIT	-690	94	-394	-843	-264	184	-455	-556	-1,597	-623	-193	615	743	1,799	220
PERCENTAGE OF PROFIT	-11.2	1.3	-4.9	-12.4	-3.8	2.4	-7.1	-13.1	-21.9	-10.4	-1.8	5.1	6.2	12.6	1.6

TABLE 10.2: Costs, Revenues and Profitability of Abu Dhabai - Medinah Sector

SECTOR : BAHRAIN-ABHA				DISTANCE : 654 NM 754 SM						FORECASTED NUMBER OF PASSENGERS : 47 PAXs A DAY					
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	427	493	556	485	486	680	535	343	662	557	1,126	1,334	1,383	1,524	1,585
BLOCK TIME (MIN)	173.4	164.9	173.4	164.9	164.9	137.2	135.2	132.2	111.6	120.1	122.1	122.1	117.7	106.9	117.0
(HRS)	2.89	2.75	2.89	2.75	2.75	2.29	2.25	2.20	1.86	2.00	2.04	2.04	1.96	1.78	1.95
AIRCRAFT HOURS/YEAR	3,407	3,374	3,407	3,374	3,374	3,246	3,235	3,218	2,204	3,144	3,157	3,157	3,130	3,051	3,124
AIRCRAFT CYCLES/YEAR	1,183	1,232	1,183	1,232	1,232	1,424	1,440	1,465	1,189	1,576	1,556	1,556	1,596	1,715	1,606
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	849	1,007	1,128	1,007	940	1,007	880	538	1,391	896	1,523	1,594	1,551	1,863	2,059
INTEREST	560	665	745	665	620	664	581	355	918	591	1,005	1,052	1,024	1,229	1,359
HULL INSURANCE	127	151	169	151	141	151	132	81	209	134	228	239	233	279	309
FUEL	299	345	389	339	340	476	375	240	464	390	788	934	968	1,067	1,110
COCKPIT & CABIN CREW ($209/HR)	604	574	604	574	574	478	471	460	389	418	425	425	410	373	408
USER CHARGES	465	515	559	501	496	568	536	395	537	462	756	804	814	967	924
MAINTENANCE	358	398	467	383	377	389	355	218	303	310	687	744	739	859	860
INDIRECT COST PER SECTOR (US$)	1,825	2,539	2,539	1,983	2,221	2,618	1,983	1,230	1,904	1,785	3,491	4,205	4,244	5,355	4,720
TOTAL COSTS	5,087	6,194	6,600	5,604	5,710	6,351	5,313	3,517	6,115	4,986	8,903	9,997	9,982	11,991	11,748
TOTAL COST/AIRCRAFT/N.M. (US$)	7.8	9.5	10.1	8.6	8.7	9.7	8.1	5.4	9.4	7.6	13.6	15.3	15.3	18.4	18.0
TOTAL COST/SEAT/SECTOR (US$)	110.6	96.8	103.1	112.1	102.0	96.2	106.3	113.4	127.4	110.8	101.2	94.3	93.3	88.8	98.7
TOTAL COST/SEAT/N.M. (CENTS)	16.9	14.8	15.8	17.2	15.6	14.7	16.3	17.4	19.5	17.0	15.5	14.4	14.3	13.6	15.1
REVENUE PER SECTOR PER MAX.47 PAXs OR A/C CAPACITY ($198/PAX)	9,108	9,306	9,306	9,306	9,306	9,306	9,306	6,138	9,306	8,910	9,306	9,306	9,306	9,306	9,306
PROFIT	4,021	3,112	2,706	3,702	3,596	2,955	3,993	2,621	3,191	3,924	403	-691	-676	-2,685	-2,442
PERCENTAGE OF PROFIT	79.0	50.2	41.0	66.1	63.0	46.5	75.2	74.5	52.2	78.7	4.5	-6.9	-6.8	-22.4	-20.8
REVENUE AT 100% L.F. OF AN A/C	9,108	12,672	12,672	9,900	11,088	13,068	9,900	6,138	9,504	8,910	17,424	20,988	21,186	26,730	23,562
PROFIT	4,021	6,478	6,072	4,296	5,378	6,717	4,587	2,621	3,389	3,924	8,521	10,991	11,204	14,739	11,814
PERCENTAGE OF PROFIT	79.0	104.6	92.0	76.7	94.2	105.8	86.3	74.5	55.4	78.7	95.7	110.0	112.2	122.9	100.6
REVENUE AT 75% L.F. OF AN A/C	6,831	9,504	9,504	7,425	8,316	9,801	7,425	4,604	7,128	6,683	13,068	15,741	15,890	20,048	17,672
PROFIT	1,744	3,310	2,904	1,821	2,606	3,450	2,112	1,087	1,013	1,697	4,165	5,744	5,907	8,056	5,923
PERCENTAGE OF PROFIT	34.3	53.4	44.0	32.5	45.6	54.3	39.8	30.9	16.6	34.0	46.8	57.5	59.2	67.2	50.4
REVENUE AT 65% L.F. OF AN A/C	5,920	8,237	8,237	6,435	7,207	8,494	6,435	3,990	6,178	5,792	11,326	13,642	13,771	17,375	15,315
PROFIT	833	2,043	1,636	831	1,498	2,143	1,122	473	63	806	2,422	3,646	3,789	5,383	3,567
PERCENTAGE OF PROFIT	16.4	33.0	24.8	14.8	26.2	33.7	21.1	13.4	1.0	16.2	27.2	36.5	38.0	44.9	30.4
REVENUE AT 50% L.F. OF AN A/C	4,554	6,336	6,336	4,950	5,544	6,534	4,950	3,069	4,752	4,455	8,712	10,494	10,593	13,365	11,781
PROFIT	-533	142	-264	-654	-166	183	-363	-448	-1,363	-531	-191	497	611	1,374	33
PERCENTAGE OF PROFIT	-10.5	2.3	-4.0	-11.7	-2.9	2.9	-6.8	-12.7	-22.3	-10.6	-2.1	5.0	6.1	11.5	.3

TABLE 10.3: Costs, Revenues and Profitability of Bahrain - Abha Sector

SECTOR : BAHRAIN-MEDINAH				DISTANCE : 601 NM 693 SM						FORECASTED NUMBER OF PASSENGERS : 48.5 PAXs A DAY					
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	398	457	514	447	451	630	497	319	613	520	1,049	1,243	1,297	1,447	1,505
BLOCK TIME (MIN)	161.2	153.2	161.2	153.2	153.2	128.2	126.2	123.2	104.1	112.2	114.2	114.2	115.1	101.1	110.1
(HRS)	2.69	2.55	2.69	2.55	2.55	2.14	2.10	2.05	1.74	1.87	1.90	1.90	1.92	1.69	1.84
AIRCRAFT HOURS/YEAR	3,362	3,327	3,362	3,327	3,327	3,197	3,185	3,166	2,164	3,092	3,106	3,106	3,112	3,005	3,077
AIRCRAFT CYCLES/YEAR	1,251	1,303	1,251	1,303	1,303	1,497	1,515	1,543	1,247	1,654	1,633	1,633	1,623	1,783	1,676
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	800	950	1,064	950	887	955	835	510	1,323	851	1,449	1,516	1,525	1,789	1,969
INTEREST	528	627	702	627	585	631	551	337	873	562	956	1,001	1,006	1,181	1,299
HULL INSURANCE	120	142	160	142	133	143	125	76	198	128	217	227	229	268	295
FUEL	279	320	360	313	316	441	348	223	429	364	734	870	908	1,013	1,053
COCKPIT & CABIN CREW ($209/HR)	562	534	562	534	534	446	439	429	363	391	398	398	401	352	384
USER CHARGES	433	480	521	467	462	530	499	367	501	430	707	753	762	907	867
MAINTENANCE	336	374	438	359	354	367	335	207	287	295	659	713	729	831	829
INDIRECT COST PER SECTOR (US$)	1,677	2,333	2,333	1,823	2,041	2,406	1,823	1,130	1,750	1,640	3,208	3,864	3,900	4,921	4,338
TOTAL COSTS	4,735	5,759	6,139	5,214	5,311	5,919	4,956	3,278	5,724	4,662	8,327	9,341	9,460	11,262	11,034
TOTAL COST/AIRCRAFT/N.M. (US$)	7.9	9.6	10.2	8.7	8.8	9.8	8.2	5.5	9.5	7.8	13.9	15.5	15.7	18.7	18.4
TOTAL COST/SEAT/SECTOR (US$)	102.9	90.0	95.9	104.3	94.8	89.7	99.1	105.8	119.3	103.6	94.6	88.1	88.4	83.4	92.7
TOTAL COST/SEAT/N.M. (CENTS)	17.1	15.0	16.0	17.4	15.8	14.9	16.5	17.6	19.8	17.2	15.7	14.7	14.7	13.9	15.4
REVENUE PER SECTOR PER MAX. 48.5 PAXs															
OR A/C CAPACITY ($186/PAX)	8,556	9,021	9,021	9,021	9,021	9,021	9,021	5,766	8,928	8,370	9,021	9,021	9,021	9,021	9,021
PROFIT	3,821	3,262	2,882	3,807	3,710	3,102	4,065	2,488	3,204	3,708	694	-320	-439	-2,241	-2,013
PERCENTAGE OF PROFIT	80.7	56.6	46.9	73.0	69.9	52.4	82.0	75.9	56.0	79.6	8.3	-3.4	-4.6	-19.9	-18.2
REVENUE AT 100% L.F. OF AN A/C	8,556	11,904	11,904	9,300	10,416	12,276	9,300	5,766	8,928	8,370	16,368	19,716	19,902	25,110	22,134
PROFIT	3,821	6,145	5,765	4,086	5,105	6,357	4,344	2,488	3,204	3,708	8,041	10,375	10,442	13,848	11,100
PERCENTAGE OF PROFIT	80.7	106.7	93.9	78.4	96.1	107.4	87.7	75.9	56.0	79.6	96.6	111.1	110.4	123.0	100.6
REVENUE AT 75% L.F. OF AN A/C	6,417	8,928	8,928	6,975	7,812	9,207	6,975	4,325	6,696	6,278	12,276	14,787	14,927	18,833	16,601
PROFIT	1,682	3,169	2,789	1,761	2,501	3,288	2,019	1,046	972	1,616	3,949	5,446	5,467	7,570	5,567
PERCENTAGE OF PROFIT	35.5	55.0	45.4	33.8	47.1	55.5	40.7	31.9	17.0	34.7	47.4	58.3	57.8	67.2	50.5
REVENUE AT 65% L.F. OF AN A/C	5,561	7,738	7,738	6,045	6,770	7,979	6,045	3,748	5,803	5,441	10,639	12,815	12,936	16,322	14,387
PROFIT	827	1,978	1,598	831	1,459	2,060	1,089	469	79	779	2,312	3,474	3,476	5,059	3,354
PERCENTAGE OF PROFIT	17.5	34.4	26.0	15.9	27.5	34.8	22.0	14.3	1.4	16.7	27.8	37.2	36.7	44.9	30.4
REVENUE AT 50% L.F. OF AN A/C	4,278	5,952	5,952	4,650	5,208	6,138	4,650	2,883	4,464	4,185	8,184	9,858	9,951	12,555	11,067
PROFIT	-457	193	-187	-564	-103	219	-306	-395	-1,260	-477	-143	517	491	1,293	33
PERCENTAGE OF PROFIT	-9.6	3.3	-3.0	-10.8	-1.9	3.7	-6.2	-12.1	-22.0	-10.2	-1.7	5.5	5.2	11.5	.3

TABLE 10.4: Costs, Revenues and Profitability of Bahrain - Alqassaim Sector

SECTOR : BAHRAIN-GIZAN					DISTANCE : 719 NM 828 SM					FORECASTED NUMBER OF PASSENGERS : 52 PAXs PER TWO DAYS					
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	463	536	608	531	528	742	582	372	723	602	1,220	1,446	1,488	1,619	1,684
BLOCK TIME (MIN)	188	179	188	179	179	148	146	143	121	130	132	132	124	114	125
(HRS)	3.14	2.99	3.14	2.99	2.99	2.47	2.44	2.39	2.01	2.16	2.20	2.20	2.06	1.90	2.09
AIRCRAFT HOURS/YEAR	3,460	3,429	3,460	3,429	3,429	3,303	3,293	3,278	2,249	3,206	3,218	3,218	3,168	3,106	3,179
AIRCRAFT CYCLES/YEAR	1,104	1,150	1,104	1,150	1,150	1,339	1,353	1,376	1,120	1,484	1,466	1,466	1,540	1,633	1,524
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	908	1,077	1,207	1,077	1,005	1,069	936	572	1,475	950	1,615	1,690	1,611	1,956	2,167
INTEREST	599	711	797	711	664	706	618	378	973	627	1,066	1,115	1,063	1,291	1,430
HULL INSURANCE	136	162	181	162	151	160	140	86	221	143	242	253	242	293	325
FUEL	324	375	426	372	370	519	407	261	506	421	854	1,012	1,042	1,133	1,179
COCKPIT & CABIN CREW ($209/HR)	656	624	656	624	624	516	509	499	420	452	459	459	431	398	436
USER CHARGES	505	558	605	543	537	615	580	429	582	501	815	866	878	1,040	995
MAINTENANCE	385	428	503	412	405	416	380	233	324	327	722	782	763	894	898
INDIRECT COST PER SECTOR (US$)	2,006	2,791	2,791	2,180	2,442	2,878	2,180	1,352	2,093	1,962	3,837	4,622	4,666	5,887	5,189
TOTAL COSTS	5,519	6,727	7,166	6,081	6,198	6,880	5,751	3,809	6,594	5,384	9,610	10,800	10,695	12,891	12,619
TOTAL COST/AIRCRAFT/N.M. (US$)	7.7	9.4	10.0	8.5	8.6	9.6	8.0	5.3	9.2	7.5	13.4	15.0	14.9	17.9	17.6
TOTAL COST/SEAT/SECTOR (US$)	120.0	105.1	112.0	121.6	110.7	104.2	115.0	122.9	137.4	119.6	109.2	101.9	100.0	95.5	106.0
TOTAL COST/SEAT/N.M. (CENTS)	16.7	14.6	15.6	16.9	15.4	14.5	16.0	17.1	19.1	16.6	15.2	14.2	13.9	13.3	14.8
REVENUE PER SECTOR PER MAX. 52 PAXs															
OR A/C CAPACITY ($212/PAX)	9,752	11,024	11,024	10,600	11,024	11,024	10,600	6,572	10,176	9,540	11,024	11,024	11,024	11,024	11,024
PROFIT	4,233	4,297	3,858	4,519	4,826	4,144	4,849	2,763	3,582	4,156	1,414	224	329	-1,867	-1,595
PERCENTAGE OF PROFIT	76.7	63.9	53.8	74.3	77.9	60.2	84.3	72.5	54.3	77.2	14.7	2.1	3.1	-14.5	-12.6
REVENUE AT 100% L.F. OF AN A/C	9,752	13,568	13,568	10,600	11,872	13,992	10,600	6,572	10,176	9,540	18,656	22,472	22,684	28,620	25,228
PROFIT	4,233	6,841	6,402	4,519	5,674	7,112	4,849	2,763	3,582	4,156	9,046	11,672	11,989	15,729	12,609
PERCENTAGE OF PROFIT	76.7	101.7	89.3	74.3	91.5	103.4	84.3	72.5	54.3	77.2	94.1	108.1	112.1	122.0	99.9
REVENUE AT 75% L.F. OF AN A/C	7,314	10,176	10,176	7,950	8,904	10,494	7,950	4,929	7,632	7,155	13,992	16,854	17,013	21,465	18,921
PROFIT	1,795	3,449	3,010	1,869	2,706	3,614	2,199	1,120	1,038	1,771	4,382	6,054	6,318	8,574	6,302
PERCENTAGE OF PROFIT	32.5	51.3	42.0	30.7	43.7	52.5	38.2	29.4	15.7	32.9	45.6	56.1	59.1	66.5	49.9
REVENUE AT 65% L.F. OF AN A/C	6,339	8,819	8,819	6,890	7,717	9,095	6,890	4,272	6,614	6,201	12,126	14,607	14,745	18,603	16,398
PROFIT	820	2,093	1,653	809	1,518	2,215	1,139	463	20	817	2,516	3,807	4,050	5,712	3,780
PERCENTAGE OF PROFIT	14.9	31.1	23.1	13.3	24.5	32.2	19.8	12.1	.3	15.2	26.2	35.2	37.9	44.3	30.0
REVENUE AT 50% L.F. OF AN A/C	4,876	6,784	6,784	5,300	5,956	6,996	5,300	3,286	5,088	4,770	9,328	11,236	11,342	14,310	12,614
PROFIT	-643	57	-382	-781	-262	116	-451	-523	-1,506	-614	-282	436	647	1,419	-5
PERCENTAGE OF PROFIT	-11.7	.9	-5.3	-12.8	-4.2	1.7	-7.8	-13.7	-22.8	-11.4	-2.9	4.0	6.1	11.0	.0

TABLE 10.5: Costs, Revenues and Profitability of Bahrain - Gizan Sector

SECTOR : BAHRAIN-ALGASSIM			DISTANCE : 369 NM 426 SM							FORECASTED NUMBER OF PASSENGERS : 48 PAXs PER TWO DAYS					
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MM)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	271	304	332	290	301	409	331	211	400	361	713	845	857	1,095	1,140
BLOCK TIME (MIN)	108	102	108	102	102	88	86	84	72	77	79	79	80	74	80
(HRS)	1.79	1.69	1.79	1.69	1.69	1.47	1.44	1.40	1.20	1.29	1.32	1.32	1.34	1.23	1.34
AIRCRAFT HOURS/YEAR	3,050	3,001	3,050	3,001	3,001	2,878	2,860	2,832	1,922	2,758	2,783	2,783	2,796	2,712	2,795
AIRCRAFT CYCLES/YEAR	1,716	1,789	1,716	1,789	1,789	1,974	1,999	2,042	1,610	2,152	2,115	2,115	2,096	2,221	2,098
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	587	696	780	696	650	728	636	387	1,028	657	1,122	1,174	1,183	1,441	1,579
INTEREST	387	459	515	459	429	481	420	255	679	433	740	775	781	951	1,042
HULL INSURANCE	88	104	117	104	97	109	95	58	154	99	168	176	177	216	237
FUEL	190	213	232	203	211	286	232	148	280	253	499	592	600	767	798
COCKPIT & CABIN CREW ($209/HR)	375	354	375	354	354	307	301	292	251	269	276	276	280	257	280
USER CHARGES	292	326	356	317	313	363	340	245	342	290	494	529	536	647	616
MAINTENANCE	241	265	310	255	252	269	246	155	214	234	534	579	593	700	694
INDIRECT COST PER SECTOR (US$)	1,029	1,432	1,432	1,119	1,253	1,477	1,119	694	1,074	1,007	1,969	2,372	2,395	3,021	2,663
TOTAL COSTS	3,189	3,850	4,118	3,508	3,558	4,020	3,388	2,233	4,021	3,242	5,804	6,474	6,545	8,001	7,909
TOTAL COST/AIRCRAFT/N.M. (US$)	8.7	10.5	11.2	9.5	9.7	10.9	9.2	6.1	11.0	8.8	15.8	17.6	17.8	21.8	21.6
TOTAL COST/SEAT/SECTOR (US$)	69.3	60.2	64.3	70.2	63.5	60.9	67.8	72.0	83.8	72.1	66.0	61.1	61.2	59.3	66.5
TOTAL COST/SEAT/N.M. (CENTS)	18.9	16.4	17.5	19.1	17.3	16.6	18.4	19.6	22.8	19.6	18.0	16.6	16.7	16.1	18.1
REVENUE PER SECTOR PER MAX. 48 PAXs OR A/C CAPACITY ($127/PAX)	5,842	6,096	6,096	6,096	6,096	6,096	6,096	3,937	6,096	5,715	6,096	6,096	6,096	6,096	6,096
PROFIT	2,653	2,246	1,978	2,588	2,538	2,076	2,708	1,704	2,075	2,473	292	-378	-449	-1,905	-1,813
PERCENTAGE OF PROFIT	83.2	58.3	48.0	73.8	71.3	51.6	79.9	76.3	51.6	76.3	5.0	-5.8	-6.9	-23.8	-22.9
REVENUE AT 100% L.F. OF AN A/C	5,842	8,128	8,128	6,350	7,112	8,382	6,350	3,937	6,096	5,715	11,176	13,462	13,589	17,145	15,113
PROFIT	2,653	4,278	4,010	2,842	3,554	4,362	2,962	1,704	2,075	2,473	5,372	6,988	7,044	9,144	7,204
PERCENTAGE OF PROFIT	83.2	111.1	97.4	81.0	99.9	108.5	87.4	76.3	51.6	76.3	92.6	107.9	107.6	114.3	91.1
REVENUE AT 75% L.F. OF AN A/C	4,382	6,096	6,096	4,763	5,334	6,287	4,763	2,953	4,572	4,286	8,382	10,097	10,192	12,859	11,335
PROFIT	1,192	2,246	1,978	1,255	1,776	2,266	1,374	719	551	1,044	2,578	3,623	3,647	4,858	3,426
PERCENTAGE OF PROFIT	37.4	58.3	48.0	35.8	49.9	56.4	40.6	32.2	13.7	32.2	44.4	56.0	55.7	60.7	43.3
REVENUE AT 65% L.F. OF AN A/C	3,797	5,283	5,283	4,128	4,623	5,448	4,128	2,559	3,962	3,715	7,264	8,750	8,833	11,144	9,823
PROFIT	608	1,433	1,165	620	1,064	1,428	739	326	-59	472	1,460	2,277	2,288	3,143	1,915
PERCENTAGE OF PROFIT	19.1	37.2	28.3	17.7	29.9	35.5	21.8	14.6	-1.5	14.6	25.2	35.2	35.0	39.3	24.2
REVENUE AT 50% L.F. OF AN A/C	2,921	4,064	4,064	3,175	3,556	4,191	3,175	1,969	3,048	2,858	5,588	6,731	6,795	8,573	7,557
PROFIT	-268	214	-54	-333	-2	171	-213	-265	-973	-385	-216	257	250	571	-352
PERCENTAGE OF PROFIT	-8.4	5.6	-1.3	-9.5	-.1	4.3	-6.3	-11.9	-24.2	-11.9	-3.7	4.0	3.8	7.1	-4.5

TABLE 10.6: Costs, Revenues and Profitability of Bahrain - Medinah Sector

SECTOR : BAHRAIN-TABUK			DISTANCE : 756 NM 871 SM						FORECASTED NUMBER OF PASSENGERS : 45 PAXs PER TWO DAYS						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	483	561	638	557	552	777	609	389	757	628	1,274	1,509	1,548	1,673	1,740
BLOCK TIME (MIN)	197	187	197	187	187	155	153	150	126	135	137	137	131	119	130
(HRS)	3.28	3.12	3.28	3.12	3.12	2.58	2.54	2.49	2.10	2.26	2.29	2.29	2.19	1.98	2.16
AIRCRAFT HOURS/YEAR	3,486	3,456	3,486	3,456	3,456	3,331	3,322	3,308	2,272	3,237	3,248	3,248	3,212	3,136	3,205
AIRCRAFT CYCLES/YEAR	1,065	1,110	1,065	1,110	1,110	1,297	1,310	1,331	1,086	1,438	1,421	1,421	1,475	1,588	1,485
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	942	1,117	1,252	1,117	1,043	1,105	967	592	1,522	981	1,667	1,744	1,683	2,012	2,225
INTEREST	622	737	826	737	688	729	638	391	1,005	648	1,100	1,151	1,111	1,328	1,469
HULL INSURANCE	141	168	188	168	156	166	145	89	228	147	250	262	253	302	334
FUEL	338	393	447	390	386	544	426	272	530	439	892	1,056	1,084	1,171	1,218
COCKPIT & CABIN CREW ($209/HR)	686	652	686	652	652	538	531	521	438	472	479	479	457	414	452
USER CHARGES	527	582	632	567	561	642	606	448	608	524	849	902	914	1,081	1,035
MAINTENANCE	400	445	523	428	421	431	394	241	335	336	742	803	792	915	918
INDIRECT COST PER SECTOR (US$)	2,109	2,934	2,934	2,293	2,568	3,026	2,293	1,421	2,201	2,063	4,035	4,860	4,906	6,190	5,456
TOTAL COSTS	5,765	7,030	7,488	6,353	6,477	7,181	6,000	3,976	6,867	5,610	10,013	11,257	11,199	13,412	13,106
TOTAL COST/AIRCRAFT/N.M. (US$)	7.6	9.3	9.9	8.4	8.6	9.5	7.9	5.3	9.1	7.4	13.3	14.9	14.8	17.8	17.4
TOTAL COST/SEAT/SECTOR (US$)	125.3	109.8	117.0	127.1	115.7	108.8	120.0	128.2	143.1	124.7	113.8	106.2	104.7	99.3	110.1
TOTAL COST/SEAT/N.M. (CENTS)	16.6	14.5	15.5	16.8	15.3	14.4	15.9	17.0	18.9	16.5	15.1	14.1	13.8	13.2	14.6
REVENUE PER SECTOR PER MAX. 45 PAXs															
OR A/C CAPACITY ($218/PAX)	9,810	9,810	9,810	9,810	9,810	9,810	9,810	6,758	9,810	9,810	9,810	9,810	9,810	9,810	9,810
PROFIT	4,045	2,780	2,322	3,457	3,333	2,629	3,810	2,782	2,943	4,200	-203	-1,447	-1,389	-3,602	-3,296
PERCENTAGE OF PROFIT	70.2	39.5	31.0	54.4	51.5	36.6	63.5	70.0	42.9	74.9	-2.0	-12.9	-12.4	-26.9	-25.1
REVENUE AT 100% L.F. OF AN A/C	10,028	13,952	13,952	10,900	12,208	14,388	10,900	6,758	10,464	9,810	19,184	23,108	23,326	29,430	25,942
PROFIT	4,263	6,922	6,464	4,547	5,731	7,207	4,900	2,782	3,597	4,200	9,171	11,851	12,127	16,018	12,836
PERCENTAGE OF PROFIT	73.9	98.5	86.3	71.6	88.5	100.3	81.7	70.0	52.4	74.9	91.6	105.3	108.3	119.4	97.9
REVENUE AT 75% L.F. OF AN A/C	7,521	10,464	10,464	8,175	9,156	10,791	8,175	5,069	7,848	7,358	14,388	17,331	17,495	22,073	19,457
PROFIT	1,756	3,434	2,976	1,822	2,679	3,610	2,175	1,093	981	1,747	4,375	6,074	6,295	8,661	6,351
PERCENTAGE OF PROFIT	30.5	48.9	39.7	28.7	41.4	50.3	36.2	27.5	14.3	31.1	43.7	54.0	56.2	64.6	48.5
REVENUE AT 65% L.F. OF AN A/C	6,518	9,069	9,069	7,085	7,935	9,352	7,085	4,393	6,802	6,377	12,470	15,020	15,162	19,130	16,862
PROFIT	753	2,039	1,581	732	1,459	2,171	1,085	417	-65	766	2,457	3,763	3,963	5,718	3,757
PERCENTAGE OF PROFIT	13.1	29.0	21.1	11.5	22.5	30.2	18.1	10.5	-1.0	13.7	24.5	33.4	35.4	42.6	28.7
REVENUE AT 50% L.F. OF AN A/C	5,014	6,976	6,976	5,450	6,104	7,194	5,450	3,379	5,232	4,905	9,592	11,554	11,663	14,715	12,971
PROFIT	-751	-54	-512	-903	-373	13	-550	-597	-1,635	-705	-421	297	464	1,303	-135
PERCENTAGE OF PROFIT	-13.0	-.8	-6.8	-14.2	-5.8	.2	-9.2	-15.0	-23.8	-12.6	-4.2	2.6	4.1	9.7	-1.0

TABLE 10.7: Costs, Revenues and Profitability of Bahrain - Tabuk Sector.

SECTOR : BAHRAIN-TAIF			DISTANCE : 623 NM 718 SM						FORECASTED NUMBER OF PASSENGERS : 46 PAXs PER TWO DAYS						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	410	472	531	462	466	651	513	329	634	536	1,081	1,281	1,333	1,479	1,538
BLOCK TIME (MIN)	166	158	166	158	158	132	130	127	107	115	117	117	116	104	113
(HRS)	2.77	2.63	2.77	2.63	2.63	2.20	2.17	2.12	1.79	1.92	1.96	1.96	1.94	1.73	1.88
AIRCRAFT HOURS/YEAR	3,381	3,347	3,381	3,347	3,347	3,217	3,206	3,188	2,181	3,114	3,127	3,127	3,120	3,024	3,096
AIRCRAFT CYCLES/YEAR	1,223	1,274	1,223	1,274	1,274	1,467	1,484	1,511	1,223	1,622	1,601	1,601	1,612	1,755	1,647
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	820	974	1,091	974	909	977	854	522	1,351	870	1,480	1,548	1,536	1,819	2,006
INTEREST	541	643	720	643	600	645	564	344	892	574	976	1,022	1,013	1,201	1,324
HULL INSURANCE	123	146	164	146	136	146	128	78	203	130	222	232	230	273	301
FUEL	287	330	372	324	326	455	359	230	444	375	757	897	933	1,036	1,077
COCKPIT & CABIN CREW ($209/HR)	579	551	579	551	551	459	453	442	373	402	409	409	405	361	394
USER CHARGES	447	494	537	481	476	546	515	378	516	443	727	774	784	932	891
MAINTENANCE	345	384	450	369	363	376	343	212	293	301	670	726	733	843	842
INDIRECT COST PER SECTOR (US$)	1,738	2,418	2,418	1,889	2,116	2,494	1,889	1,171	1,814	1,700	3,325	4,005	4,043	5,101	4,496
TOTAL COSTS	4,881	5,940	6,331	5,376	5,476	6,099	5,104	3,377	5,886	4,796	8,566	9,613	9,677	11,565	11,330
TOTAL COST/AIRCRAFT/N.M. (US$)	7.8	9.5	10.2	8.6	8.8	9.8	8.2	5.4	9.5	7.7	13.8	15.4	15.6	18.6	18.2
TOTAL COST/SEAT/SECTOR (US$)	106.1	92.8	98.9	107.5	97.8	92.4	102.1	108.9	122.6	106.6	97.3	90.7	90.4	85.7	95.2
TOTAL COST/SEAT/N.M. (CENTS)	17.0	14.9	15.9	17.3	15.7	14.8	16.4	17.5	19.7	17.1	15.6	14.6	14.5	13.8	15.3
REVENUE PER SECTOR PER MAX. 46 PAXs OR A/C CAPACITY ($190/PAX)	8,740	8,740	8,740	8,740	8,740	8,740	8,740	5,890	8,740	8,550	8,740	8,740	8,740	8,740	8,740
PROFIT	3,859	2,800	2,409	3,364	3,264	2,641	3,636	2,513	2,854	3,754	174	-873	-937	-2,825	-2,590
PERCENTAGE OF PROFIT	79.1	47.1	38.1	62.6	59.6	43.3	71.2	74.4	48.5	78.3	2.0	-9.1	-9.7	-24.4	-22.9
REVENUE AT 100% L.F. OF AN A/C	8,740	12,160	12,160	9,500	10,640	12,540	9,500	5,890	9,120	8,550	16,720	20,140	20,330	25,650	22,610
PROFIT	3,859	6,220	5,829	4,124	5,164	6,441	4,396	2,513	3,234	3,754	8,154	10,527	10,653	14,085	11,280
PERCENTAGE OF PROFIT	79.1	104.7	92.1	76.7	94.3	105.6	86.1	74.4	54.9	78.3	95.2	109.5	110.1	121.8	99.6
REVENUE AT 75% L.F. OF AN A/C	6,555	9,120	9,120	7,125	7,980	9,405	7,125	4,418	6,840	6,413	12,540	15,105	15,248	19,238	16,958
PROFIT	1,674	3,180	2,789	1,749	2,504	3,306	2,021	1,040	954	1,616	3,974	5,492	5,571	7,673	5,627
PERCENTAGE OF PROFIT	34.3	53.5	44.1	32.5	45.7	54.2	39.6	30.8	16.2	33.7	46.4	57.1	57.6	66.3	49.7
REVENUE AT 65% L.F. OF AN A/C	5,681	7,904	7,904	6,175	6,916	8,151	6,175	3,829	5,928	5,558	10,868	13,091	13,215	16,673	14,697
PROFIT	800	1,964	1,573	799	1,440	2,052	1,071	451	42	761	2,302	3,478	3,538	5,108	3,366
PERCENTAGE OF PROFIT	16.4	33.1	24.9	14.9	26.3	33.7	21.0	13.4	.7	15.9	26.9	36.2	36.6	44.2	29.7
REVENUE AT 50% L.F. OF AN A/C	4,370	6,080	6,080	4,750	5,320	6,270	4,750	2,945	4,560	4,275	8,360	10,070	10,165	12,825	11,305
PROFIT	-511	140	-251	-626	-156	171	-354	-432	-1,326	-521	-206	457	488	1,260	-25
PERCENTAGE OF PROFIT	-10.5	2.4	-4.0	-11.6	-2.9	2.8	-6.9	-12.8	-22.5	-10.9	-2.4	4.8	5.0	10.9	-.2

TABLE 10.8: Costs, Revenues and Profitability of Bahrain - Taif Sector

SECTOR : DOHA-ABHA				DISTANCE : 652 NM 751 SM					FORECASTED NUMBER OF PASSENGERS : 51 PAXs PER TWO DAYS						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MM)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	426	491	555	483	484	678	534	342	661	556	1,123	1,331	1,380	1,521	1,582
BLOCK TIME (MIN)	173	164	173	164	164	137	135	132	111	120	122	122	118	107	117
(HRS)	2.88	2.74	2.88	2.74	2.74	2.28	2.25	2.20	1.85	2.00	2.03	2.03	1.96	1.78	1.95
AIRCRAFT HOURS/YEAR	3,406	3,373	3,406	3,373	3,373	3,244	3,233	3,216	2,202	3,142	3,156	3,156	3,130	3,049	3,122
AIRCRAFT CYCLES/YEAR	1,186	1,235	1,186	1,235	1,235	1,427	1,443	1,468	1,191	1,578	1,559	1,559	1,597	1,718	1,608
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	847	1,005	1,126	1,005	938	1,005	879	537	1,389	894	1,520	1,591	1,550	1,860	2,055
INTEREST	559	663	743	663	619	663	580	354	916	590	1,003	1,050	1,023	1,227	1,357
HULL INSURANCE	127	151	169	151	141	151	132	81	208	134	228	239	232	279	308
FUEL	298	344	388	338	339	475	373	239	462	389	786	931	966	1,065	1,107
COCKPIT & CABIN CREW ($209/HR)	602	573	602	573	573	477	470	459	388	417	424	424	410	372	407
USER CHARGES	464	513	558	500	494	567	534	394	536	461	754	802	812	965	922
MAINTENANCE	357	397	466	382	376	388	354	218	303	309	686	743	739	858	859
INDIRECT COST PER SECTOR (US$)	1,819	2,531	2,531	1,977	2,214	2,610	1,977	1,226	1,898	1,779	3,480	4,192	4,231	5,338	4,706
TOTAL COSTS	5,074	6,177	6,583	5,589	5,695	6,335	5,299	3,508	6,100	4,974	8,882	9,972	9,963	11,964	11,721
TOTAL COST/AIRCRAFT/N.M. (US$)	7.8	9.5	10.1	8.6	8.7	9.7	8.1	5.4	9.4	7.6	13.6	15.3	15.3	18.4	18.0
TOTAL COST/SEAT/SECTOR (US$)	110.3	96.5	102.9	111.8	101.7	96.0	106.0	113.2	127.1	110.5	100.9	94.1	93.1	88.6	98.5
TOTAL COST/SEAT/N.M. (CENTS)	16.9	14.8	15.8	17.2	15.6	14.7	16.3	17.4	19.5	17.0	15.5	14.4	14.3	13.6	15.1
REVENUE PER SECTOR PER MAX. 51 PAXs OR A/C CAPACITY ($196/PAX)	9,016	9,996	9,996	9,800	9,996	9,996	9,800	6,076	9,408	8,820	9,996	9,996	9,996	9,996	9,996
PROFIT	3,942	3,819	3,413	4,211	4,301	3,661	4,501	2,568	3,308	3,846	1,114	24	33	-1,968	-1,725
PERCENTAGE OF PROFIT	77.7	61.8	51.8	75.3	75.5	57.8	84.9	73.2	54.2	77.3	12.5	.2	.3	-16.4	-14.7
REVENUE AT 100% L.F. OF AN A/C	9,016	12,544	12,544	9,800	10,976	12,936	9,800	6,076	9,408	8,820	17,248	20,776	20,972	26,460	23,324
PROFIT	3,942	6,367	5,961	4,211	5,281	6,601	4,501	2,568	3,308	3,846	8,366	10,804	11,009	14,496	11,603
PERCENTAGE OF PROFIT	77.7	103.1	90.6	75.3	92.7	104.2	84.9	73.2	54.2	77.3	94.2	108.3	110.5	121.2	99.0
REVENUE AT 75% L.F. OF AN A/C	6,762	9,408	9,408	7,350	8,232	9,702	7,350	4,557	7,056	6,615	12,936	15,582	15,729	19,845	17,493
PROFIT	1,688	3,231	2,825	1,761	2,537	3,367	2,051	1,049	956	1,641	4,054	5,610	5,766	7,881	5,772
PERCENTAGE OF PROFIT	33.3	52.3	42.9	31.5	44.6	53.2	38.7	29.9	15.7	33.0	45.6	56.3	57.9	65.9	49.2
REVENUE AT 65% L.F. OF AN A/C	5,860	8,154	8,154	6,370	7,134	8,408	6,370	3,949	6,115	5,733	11,211	13,504	13,632	17,199	15,161
PROFIT	787	1,976	1,571	781	1,440	2,074	1,071	442	15	759	2,330	3,533	3,669	5,235	3,439
PERCENTAGE OF PROFIT	15.5	32.0	23.9	14.0	25.3	32.7	20.2	12.6	.2	15.3	26.2	35.4	36.8	43.8	29.3
REVENUE AT 50% L.F. OF AN A/C	4,508	6,272	6,272	4,900	5,488	6,468	4,900	3,038	4,704	4,410	8,624	10,388	10,486	13,230	11,662
PROFIT	-566	95	-311	-689	-207	133	-399	-470	-1,396	-564	-258	416	523	1,266	-59
PERCENTAGE OF PROFIT	-11.2	1.5	-4.7	-12.3	-3.6	2.1	-7.5	-13.4	-22.9	-11.3	-2.9	4.2	5.3	10.6	-.5

TABLE 10.9: Costs, Revenues and Profitability of Doha - Abha Sector

SECTOR : DOHA-MADINAH					DISTANCE : 647 NM 745 SM					FORECASTED NUMBER OF PASSENGERS : 51 PAXs PER TWO DAYS					
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	423	488	551	480	481	673	530	340	656	552	1,116	1,322	1,371	1,514	1,574
BLOCK TIME (MIN)	172	163	172	163	163	136	134	131	111	119	121	121	117	106	116
(HRS)	2.86	2.72	2.86	2.72	2.72	2.27	2.23	2.18	1.84	1.98	2.02	2.02	1.96	1.77	1.94
AIRCRAFT HOURS/YEAR	3,401	3,368	3,401	3,368	3,368	3,240	3,228	3,211	2,198	3,137	3,151	3,151	3,128	3,045	3,118
AIRCRAFT CYCLES/YEAR	1,192	1,242	1,192	1,242	1,242	1,434	1,450	1,476	1,196	1,586	1,566	1,566	1,600	1,724	1,615
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	842	1,000	1,120	1,000	933	1,000	874	534	1,382	890	1,513	1,584	1,547	1,853	2,047
INTEREST	556	660	739	660	616	660	577	353	912	587	999	1,045	1,021	1,223	1,351
HULL INSURANCE	126	150	168	150	140	150	131	80	207	133	227	238	232	278	307
FUEL	296	342	385	336	337	471	371	238	459	387	781	925	960	1,060	1,102
COCKPIT & CABIN CREW ($209/HR)	598	569	598	569	569	474	467	456	385	415	422	422	409	370	404
USER CHARGES	461	510	554	497	491	563	531	391	533	458	749	797	807	959	917
MAINTENANCE	355	395	463	380	374	386	352	217	301	308	683	740	738	855	856
INDIRECT COST PER SECTOR (US$)	1,805	2,511	2,511	1,962	2,197	2,590	1,962	1,216	1,884	1,766	3,453	4,159	4,199	5,297	4,670
TOTAL COSTS	5,040	6,136	6,540	5,552	5,657	6,294	5,266	3,485	6,063	4,943	8,827	9,910	9,913	11,895	11,654
TOTAL COST/AIRCRAFT/N.M. (US$)	7.8	9.5	10.1	8.6	8.8	9.7	8.1	5.4	9.4	7.6	13.7	15.3	15.4	18.4	18.0
TOTAL COST/SEAT/SECTOR (US$)	109.6	95.9	102.2	111.0	101.0	95.4	105.3	112.4	126.3	109.8	100.3	93.5	92.6	88.1	97.9
TOTAL COST/SEAT/N.M. (CENTS)	17.0	14.8	15.8	17.2	15.6	14.8	16.3	17.4	19.5	17.0	15.5	14.5	14.3	13.6	15.2
REVENUE PER SECTOR PER MAX. 51 PAXs OR A/C CAPACITY ($191/PAX)	8,786	9,741	9,741	9,550	9,741	9,741	9,550	5,921	9,168	8,595	9,741	9,741	9,741	9,741	9,741
PROFIT	3,746	3,605	3,201	3,998	4,084	3,447	4,284	2,436	3,105	3,652	914	-169	-172	-2,154	-1,913
PERCENTAGE OF PROFIT	74.3	58.7	49.0	72.0	72.2	54.8	81.4	69.9	51.2	73.9	10.4	-1.7	-1.7	-18.1	-16.4
REVENUE AT 100% L.F. OF AN A/C	8,786	12,224	12,224	9,550	10,696	12,606	9,550	5,921	9,168	8,595	16,808	20,246	20,437	25,785	22,729
PROFIT	3,746	6,088	5,684	3,998	5,039	6,312	4,284	2,436	3,105	3,652	7,981	10,336	10,524	13,890	11,075
PERCENTAGE OF PROFIT	74.3	99.2	86.9	72.0	89.1	100.3	81.4	69.9	51.2	73.9	90.4	104.3	106.2	116.8	95.0
REVENUE AT 75% L.F. OF AN A/C	6,590	9,168	9,168	7,163	8,022	9,455	7,163	4,441	6,876	6,446	12,606	15,185	15,328	19,339	17,047
PROFIT	1,549	3,032	2,628	1,610	2,365	3,161	1,897	955	813	1,503	3,779	5,275	5,414	7,444	5,393
PERCENTAGE OF PROFIT	30.7	49.4	40.2	29.0	41.8	50.2	36.0	27.4	13.4	30.4	42.8	53.2	54.6	62.6	46.3
REVENUE AT 65% L.F. OF AN A/C	5,711	7,946	7,946	6,208	6,952	8,194	6,208	3,849	5,959	5,587	10,925	13,160	13,284	16,760	14,774
PROFIT	670	1,809	1,406	655	1,295	1,900	942	363	-104	644	2,098	3,250	3,371	4,865	3,120
PERCENTAGE OF PROFIT	13.3	29.5	21.5	11.8	22.9	30.2	17.9	10.4	-1.7	13.0	23.8	32.8	34.0	40.9	26.8
REVENUE AT 50% L.F. OF AN A/C	4,393	6,112	6,112	4,775	5,348	6,303	4,775	2,961	4,584	4,298	8,404	10,123	10,219	12,893	11,365
PROFIT	-647	-24	-428	-777	-309	9	-491	-525	-1,479	-646	-423	213	305	997	-289
PERCENTAGE OF PROFIT	-12.8	-.4	-6.5	-14.0	-5.5	.1	-9.3	-15.1	-24.4	-13.1	-4.8	2.1	3.1	8.4	-2.5

TABLE 10.10: Costs, Revenues and Profitability of Doha - Medinah Sector

SECTOR : DUBAI-ABHA					DISTANCE : 824 NM 949 SM						FORECASTED NUMBER OF PASSENGERS : 97 PAXs A DAY				
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	521	607	693	606	596	842	658	420	820	675	1,372	1,626	1,643	1,772	1,842
BLOCK TIME (MIN)	213	202	213	202	202	166	164	161	135	146	148	148	144	127	138
(HRS)	3.54	3.37	3.54	3.37	3.37	2.77	2.73	2.68	2.26	2.43	2.46	2.46	2.39	2.12	2.33
AIRCRAFT HOURS/YEAR	3,531	3,503	3,531	3,503	3,503	3,381	3,372	3,360	2,312	3,290	3,300	3,300	3,280	3,191	3,261
AIRCRAFT CYCLES/YEAR	999	1,041	999	1,041	1,041	1,223	1,235	1,254	1,026	1,358	1,343	1,343	1,373	1,506	1,401
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	1,004	1,191	1,335	1,191	1,111	1,171	1,025	628	1,609	1,038	1,762	1,844	1,805	2,121	2,360
INTEREST	663	786	881	786	734	773	677	415	1,062	685	1,163	1,217	1,191	1,400	1,558
HULL INSURANCE	151	179	200	179	167	176	154	94	241	156	264	277	271	318	354
FUEL	365	425	485	424	417	589	460	294	574	472	961	1,138	1,150	1,240	1,290
COCKPIT & CABIN CREW ($209/HR)	740	705	740	705	705	579	572	561	472	507	514	514	500	444	488
USER CHARGES	568	627	680	611	605	691	652	484	654	565	911	968	980	1,157	1,108
MAINTENANCE	428	477	560	458	451	460	420	256	357	354	778	842	841	956	964
INDIRECT COST PER SECTOR (US$)	2,299	3,198	3,198	2,499	2,799	3,298	2,499	1,549	2,399	2,249	4,398	5,297	5,347	6,747	5,947
TOTAL COSTS	6,217	7,587	8,080	6,852	6,988	7,735	6,459	4,281	7,368	6,027	10,752	12,098	12,085	14,383	14,069
TOTAL COST/AIRCRAFT/N.M. (US$)	7.5	9.2	9.8	8.3	8.5	9.4	7.8	5.2	8.9	7.3	13.1	14.7	14.7	17.5	17.1
TOTAL COST/SEAT/SECTOR (US$)	135.2	118.6	126.2	137.0	124.8	117.2	129.2	138.1	153.5	133.9	122.2	114.1	112.9	106.5	118.2
TOTAL COST/SEAT/N.M. (CENTS)	16.4	14.4	15.3	16.6	15.1	14.2	15.7	16.8	18.6	16.3	14.8	13.9	13.7	12.9	14.4
REVENUE PER SECTOR PER MAX.97 PAXs															
OR A/C CAPACITY ($240/PAX)	11,040	11,640	11,640	11,640	11,640	11,640	11,640	7,440	11,640	11,640	11,640	11,640	11,640	11,640	11,640
PROFIT	4,823	4,053	3,560	4,788	4,652	3,905	5,181	3,159	4,272	5,613	888	-458	-445	-2,743	-2,429
PERCENTAGE OF PROFIT	77.6	53.4	44.1	69.9	66.6	50.5	80.2	73.8	58.0	93.1	8.3	-3.8	-3.7	-19.1	-17.3
REVENUE AT 100% L.F. OF AN A/C	11,040	15,360	15,360	12,000	13,440	15,840	12,000	7,440	11,520	10,800	21,120	25,440	25,680	32,400	28,560
PROFIT	4,823	7,773	7,280	5,148	6,452	8,105	5,541	3,159	4,152	4,773	10,368	13,342	13,595	18,017	14,491
PERCENTAGE OF PROFIT	77.6	102.4	90.1	75.1	92.3	104.8	85.8	73.8	56.3	79.2	96.4	110.3	112.5	125.3	103.0
REVENUE AT 75% L.F. OF AN A/C	8,280	11,520	11,520	9,000	10,080	11,880	9,000	5,580	8,640	8,100	15,840	19,080	19,260	24,300	21,420
PROFIT	2,063	3,933	3,440	2,148	3,092	4,145	2,541	1,299	1,272	2,073	5,088	6,982	7,175	9,917	7,351
PERCENTAGE OF PROFIT	33.2	51.8	42.6	31.3	44.2	53.6	39.3	30.3	17.3	34.4	47.3	57.7	59.4	68.9	52.2
REVENUE AT 65% L.F. OF AN A/C	7,176	9,984	9,984	7,800	8,736	10,296	7,800	4,836	7,488	7,020	13,728	16,536	16,692	21,060	18,564
PROFIT	959	2,397	1,904	948	1,748	2,561	1,341	555	120	993	2,976	4,438	4,607	6,677	4,495
PERCENTAGE OF PROFIT	15.4	31.6	23.6	13.8	25.0	33.1	20.8	13.0	1.6	16.5	27.7	36.7	38.1	46.4	31.9
REVENUE AT 50% L.F. OF AN A/C	5,520	7,680	7,680	6,000	6,720	7,920	6,000	3,720	5,760	5,400	10,560	12,720	12,840	16,200	14,280
PROFIT	-697	93	-400	-852	-268	185	-459	-561	-1,608	-627	-192	622	755	1,817	211
PERCENTAGE OF PROFIT	-11.2	1.2	-4.9	-12.4	-3.8	2.4	-7.1	-13.1	-21.8	-10.4	-1.8	5.1	6.2	12.6	1.5

TABLE 10.11: Costs, Revenues and Profitability of Dubai - Abha Sector

SECTOR : DUBAI-ALGASSIM			DISTANCE : 630 NM 725 SM						FORECASTED NUMBER OF PASSENGERS : 43 PAXs A DAY						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	414	477	537	467	470	657	518	332	640	540	1,091	1,293	1,344	1,490	1,549
BLOCK TIME (MIN)	167.9	159.6	167.9	159.6	159.6	133.1	131.1	128.1	108.2	116.5	118.5	118.5	116.5	104.3	113.9
(HRS)	2.80	2.66	2.80	2.66	2.66	2.22	2.19	2.14	1.80	1.94	1.98	1.98	1.94	1.74	1.90
AIRCRAFT HOURS/YEAR	3,387	3,353	3,387	3,353	3,353	3,224	3,212	3,195	2,186	3,121	3,134	3,134	3,122	3,030	3,103
AIRCRAFT CYCLES/YEAR	1,214	1,264	1,214	1,264	1,264	1,457	1,474	1,500	1,215	1,611	1,591	1,591	1,609	1,746	1,638
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	827	981	1,099	981	916	983	860	525	1,360	876	1,489	1,559	1,539	1,829	2,018
INTEREST	546	648	725	648	604	649	568	347	898	578	983	1,029	1,016	1,207	1,332
HULL INSURANCE	124	147	165	147	137	148	129	79	204	131	223	234	231	274	303
FUEL	290	334	376	327	329	460	362	232	448	378	764	905	941	1,043	1,084
COCKPIT & CABIN CREW ($209/HR)	585	556	585	556	556	464	457	446	377	406	413	413	406	363	397
USER CHARGES	451	499	542	486	480	551	519	382	521	448	734	781	791	940	898
MAINTENANCE	348	387	454	372	367	379	346	213	296	303	674	730	734	846	846
INDIRECT COST PER SECTOR (US$)	1,758	2,445	2,445	1,910	2,140	2,522	1,910	1,184	1,834	1,719	3,362	4,050	4,088	5,158	4,547
TOTAL COSTS	4,928	5,997	6,392	5,427	5,529	6,156	5,151	3,409	5,938	4,839	8,642	9,700	9,746	11,661	11,425
TOTAL COST/AIRCRAFT/N.M. (US$)	7.8	9.5	10.2	8.6	8.8	9.8	8.2	5.4	9.4	7.7	13.7	15.4	15.5	18.5	18.2
TOTAL COST/SEAT/SECTOR (US$)	107.1	93.7	99.9	108.5	98.7	93.3	103.0	110.0	123.7	107.5	98.2	91.5	91.1	86.4	96.0
TOTAL COST/SEAT/N.M. (CENTS)	17.0	14.9	15.9	17.2	15.7	14.8	16.4	17.5	19.7	17.1	15.6	14.5	14.5	13.7	15.3
REVENUE PER SECTOR PER MAX. 43 PAXs OR A/C CAPACITY ($198/PAX)	8,514	8,514	8,514	8,514	8,514	8,514	8,514	6,138	8,514	8,514	8,514	8,514	8,514	8,514	8,514
PROFIT	3,586	2,517	2,122	3,087	2,985	2,358	3,363	2,729	2,576	3,675	-128	-1,186	-1,232	-3,147	-2,911
PERCENTAGE OF PROFIT	72.8	42.0	33.2	56.9	54.0	38.3	65.3	80.1	43.4	75.9	-1.5	-12.2	-12.6	-27.0	-25.5
REVENUE AT 100% L.F. OF AN A/C	9,108	12,672	12,672	9,900	11,088	13,068	9,900	6,138	9,504	8,910	17,424	20,988	21,186	26,730	23,562
PROFIT	4,180	6,675	6,280	4,473	5,559	6,912	4,749	2,729	3,566	4,071	8,782	11,288	11,440	15,069	12,137
PERCENTAGE OF PROFIT	84.8	111.3	98.3	82.4	100.5	112.3	92.2	80.1	60.1	84.1	101.6	116.4	117.4	129.2	106.2
REVENUE AT 75% L.F. OF AN A/C	6,831	9,504	9,504	7,425	8,316	9,801	7,425	4,604	7,128	6,683	13,068	15,741	15,890	20,048	17,672
PROFIT	1,903	3,507	3,112	1,998	2,787	3,645	2,274	1,195	1,190	1,843	4,426	6,041	6,144	8,386	6,247
PERCENTAGE OF PROFIT	38.6	58.5	48.7	36.8	50.4	59.2	44.1	35.0	20.0	38.1	51.2	62.3	63.0	71.9	54.7
REVENUE AT 65% L.F. OF AN A/C	5,920	8,237	8,237	6,435	7,207	8,494	6,435	3,990	6,178	5,792	11,326	13,642	13,771	17,375	15,315
PROFIT	993	2,240	1,845	1,008	1,678	2,339	1,284	581	240	952	2,683	3,942	4,025	5,713	3,891
PERCENTAGE OF PROFIT	20.1	37.3	28.9	18.6	30.4	38.0	24.9	17.0	4.0	19.7	31.0	40.6	41.3	49.0	34.1
REVENUE AT 50% L.F. OF AN A/C	4,554	6,336	6,336	4,950	5,544	6,534	4,950	3,069	4,752	4,455	8,712	10,494	10,593	13,365	11,781
PROFIT	-374	339	-56	-477	15	378	-201	-340	-1,186	-384	70	794	847	1,704	356
PERCENTAGE OF PROFIT	-7.6	5.7	-.9	-8.8	.3	6.1	-3.9	-10.0	-20.0	-7.9	.8	8.2	8.7	14.6	3.1

TABLE 10.12: Costs, Revenues and Profitability of Dubai - Alqassiam Sector

SECTOR : DUBAI-GIZAN						DISTANCE : 873 NM 1005 SM					FORECASTED NUMBER OF PASSENGERS : 53 PAXs A DAY				
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	548	639	732	641	628	888	693	442	866	709	1,443	1,710	1,690	1,843	1,917
BLOCK TIME (MIN)	223.8	213.1	223.8	213.1	213.1	174.4	172.4	169.4	142.2	153.0	155.0	155.0	151.0	132.0	143.0
(HRS)	3.73	3.55	3.73	3.55	3.55	2.91	2.87	2.82	2.37	2.55	2.58	2.58	2.52	2.24	2.51
AIRCRAFT HOURS/YEAR	3,559	3,532	3,559	3,532	3,532	3,412	3,405	3,393	2,338	3,325	3,334	3,334	3,316	3,231	3,312
AIRCRAFT CYCLES/YEAR	956	997	956	997	997	1,176	1,187	1,204	988	1,306	1,293	1,293	1,320	1,447	1,326
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	1,049	1,244	1,394	1,244	1,161	1,218	1,067	654	1,672	1,079	1,831	1,917	1,877	2,208	2,495
INTEREST	692	821	920	821	766	804	704	432	1,104	712	1,209	1,265	1,239	1,457	1,647
HULL INSURANCE	157	187	209	187	174	183	160	98	251	162	275	287	282	331	374
FUEL	384	448	512	449	440	622	485	309	606	496	1,010	1,197	1,183	1,290	1,342
COCKPIT & CABIN CREW ($209/HR)	780	742	780	742	742	608	601	590	495	533	540	540	526	468	524
USER CHARGES	598	660	715	643	636	726	686	510	688	594	956	1,015	1,028	1,212	1,161
MAINTENANCE	448	500	587	480	472	480	438	267	372	367	804	871	869	989	1,011
INDIRECT COST PER SECTOR (US$)	2,436	3,389	3,389	2,647	2,965	3,495	2,647	1,641	2,541	2,383	4,659	5,612	5,665	7,148	6,301
TOTAL COSTS	6,543	7,989	8,506	7,212	7,356	8,134	6,789	4,502	7,730	6,327	11,285	12,704	12,669	15,103	14,854
TOTAL COST/AIRCRAFT/N.M. (US$)	7.5	9.2	9.7	8.3	8.4	9.3	7.8	5.2	8.9	7.2	12.9	14.6	14.5	17.3	17.0
TOTAL COST/SEAT/SECTOR (US$)	142.2	124.8	132.9	144.2	131.4	123.2	135.8	145.2	161.0	140.6	128.2	119.8	118.4	111.9	124.8
TOTAL COST/SEAT/N.M. (CENTS)	16.3	14.3	15.2	16.5	15.1	14.1	15.6	16.6	18.5	16.1	14.7	13.7	13.6	12.8	14.3
REVENUE PER SECTOR PER MAX. 53 PAXs OR A/C CAPACITY ($248/PAX)	11,408	13,144	13,144	12,400	13,144	13,144	12,400	7,688	11,904	13,144	13,144	13,144	13,144	13,144	13,144
PROFIT	4,865	5,155	4,638	5,188	5,788	5,010	5,611	3,186	4,174	6,817	1,859	440	475	-1,959	-1,710
PERCENTAGE OF PROFIT	74.4	64.5	54.5	71.9	78.7	61.6	82.6	70.8	54.0	107.8	16.5	3.5	3.7	-13.0	-11.5
REVENUE AT 100% L.F. OF AN A/C	11,408	15,872	15,872	12,400	13,888	16,368	12,400	7,688	11,904	11,160	21,824	26,288	26,536	33,480	29,512
PROFIT	4,865	7,883	7,366	5,188	6,532	8,234	5,611	3,186	4,174	4,833	10,539	13,584	13,867	18,377	14,658
PERCENTAGE OF PROFIT	74.4	98.7	86.6	71.9	88.8	101.2	82.6	70.8	54.0	76.4	93.4	106.9	109.5	121.7	98.7
REVENUE AT 75% L.F. OF AN A/C	8,556	11,904	11,904	9,300	10,416	12,276	9,300	5,766	8,928	8,370	16,368	19,716	19,902	25,110	22,134
PROFIT	2,013	3,915	3,398	2,088	3,060	4,142	2,511	1,264	1,198	2,043	5,083	7,012	7,233	10,007	7,280
PERCENTAGE OF PROFIT	30.8	49.0	39.9	28.9	41.6	50.9	37.0	28.1	15.5	32.3	45.0	55.2	57.1	66.3	49.0
REVENUE AT 65% L.F. OF AN A/C	7,415	10,317	10,317	8,060	9,027	10,639	8,060	4,997	7,738	7,254	14,186	17,087	17,248	21,762	19,183
PROFIT	873	2,328	1,810	848	1,671	2,505	1,271	495	8	927	2,900	4,384	4,579	6,659	4,328
PERCENTAGE OF PROFIT	13.3	29.1	21.3	11.8	22.7	30.8	18.7	11.0	.1	14.7	25.7	34.5	36.1	44.1	29.1
REVENUE AT 50% L.F. OF AN A/C	5,704	7,936	7,936	6,200	6,944	8,184	6,200	3,844	5,952	5,580	10,912	13,144	13,268	16,740	14,756
PROFIT	-839	-53	-570	-1,012	-412	50	-589	-658	-1,778	-747	-373	440	599	1,637	-98
PERCENTAGE OF PROFIT	-12.8	-.7	-6.7	-14.0	-5.6	.6	-8.7	-14.6	-23.0	-11.8	-3.3	3.5	4.7	10.8	-.7

TABLE 10.13: Costs, Revenues and Profitability of Dubai - Gizan Sector

SECTOR : DUBAI-MADINAH					DISTANCE : 853 NM 983 SM						FORECASTED NUMBER OF PASSENGERS : 96 PAXs A DAY				
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	537	626	716	627	615	869	679	433	847	695	1,414	1,675	1,671	1,814	1,887
BLOCK TIME (MIN)	219	209	219	209	209	171	169	166	139	150	152	152	148	130	141
(HRS)	3.65	3.48	3.65	3.48	3.48	2.85	2.82	2.77	2.32	2.50	2.53	2.53	2.47	2.19	2.44
AIRCRAFT HOURS/YEAR	3,548	3,520	3,548	3,520	3,520	3,399	3,392	3,380	2,328	3,311	3,320	3,320	3,301	3,215	3,291
AIRCRAFT CYCLES/YEAR	973	1,015	973	1,015	1,015	1,195	1,207	1,224	1,004	1,327	1,313	1,313	1,341	1,471	1,357
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	1,030	1,222	1,370	1,222	1,141	1,199	1,050	644	1,647	1,062	1,803	1,887	1,848	2,172	2,440
INTEREST	680	807	904	807	753	791	693	425	1,087	701	1,190	1,246	1,220	1,434	1,610
HULL INSURANCE	155	183	206	183	171	180	158	97	247	159	270	283	277	326	366
FUEL	376	438	501	439	431	608	475	303	593	487	990	1,173	1,169	1,270	1,321
COCKPIT & CABIN CREW ($209/HR)	764	727	764	727	727	596	589	578	486	522	529	529	515	458	509
USER CHARGES	586	647	701	630	623	712	672	499	674	582	938	996	1,008	1,190	1,139
MAINTENANCE	440	490	576	471	464	472	431	263	366	362	794	859	858	975	992
INDIRECT COST PER SECTOR (US$)	2,380	3,311	3,311	2,587	2,897	3,414	2,587	1,604	2,483	2,328	4,553	5,484	5,536	6,984	6,156
TOTAL COSTS	6,410	7,825	8,332	7,065	7,206	7,971	6,654	4,412	7,582	6,204	11,068	12,456	12,431	14,809	14,534
TOTAL COST/AIRCRAFT/N.M. (US$)	7.5	9.2	9.8	8.3	8.5	9.3	7.8	5.2	8.9	7.3	13.0	14.6	14.6	17.4	17.0
TOTAL COST/SEAT/SECTOR (US$)	139.3	122.3	130.2	141.3	128.7	120.8	133.1	142.3	158.0	137.9	125.8	117.5	116.2	109.7	122.1
TOTAL COST/SEAT/N.M. (CENTS)	16.3	14.3	15.3	16.6	15.1	14.2	15.6	16.7	18.5	16.2	14.8	13.8	13.6	12.9	14.3
REVENUE PER SECTOR PER MAX.96 PAXs OR A/C CAPACITY ($253/PAX)	11,638	12,144	12,144	12,144	12,144	12,144	12,144	7,843	12,144	12,144	12,144	12,144	12,144	12,144	12,144
PROFIT	5,228	4,319	3,812	5,079	4,938	4,173	5,490	3,431	4,562	5,940	1,076	-312	-287	-2,665	-2,390
PERCENTAGE OF PROFIT	81.6	55.2	45.7	71.9	68.5	52.3	82.5	77.8	60.2	95.7	9.7	-2.5	-2.3	-18.0	-16.4
REVENUE AT 100% L.F. OF AN A/C	11,638	16,192	16,192	12,650	14,168	16,698	12,650	7,843	12,144	11,385	22,264	26,818	27,071	34,155	30,107
PROFIT	5,228	8,367	7,860	5,585	6,962	8,727	5,996	3,431	4,562	5,181	11,196	14,362	14,640	19,346	15,573
PERCENTAGE OF PROFIT	81.6	106.9	94.3	79.0	96.6	109.5	90.1	77.8	60.2	83.5	101.2	115.3	117.8	130.6	107.1
REVENUE AT 75% L.F. OF AN A/C	8,729	12,144	12,144	9,488	10,626	12,524	9,488	5,882	9,108	8,539	16,698	20,114	20,303	25,616	22,580
PROFIT	2,319	4,319	3,812	2,422	3,420	4,552	2,833	1,470	1,526	2,335	5,630	7,657	7,872	10,807	8,046
PERCENTAGE OF PROFIT	36.2	55.2	45.7	34.3	47.5	57.1	42.6	33.3	20.1	37.6	50.9	61.5	63.3	73.0	55.4
REVENUE AT 65% L.F. OF AN A/C	7,565	10,525	10,525	8,223	9,209	10,854	8,223	5,098	7,894	7,400	14,472	17,432	17,596	22,201	19,570
PROFIT	1,155	2,700	2,192	1,157	2,003	2,882	1,568	686	312	1,196	3,404	4,975	5,165	7,392	5,036
PERCENTAGE OF PROFIT	18.0	34.5	26.3	16.4	27.8	36.2	23.6	15.6	4.1	19.3	30.8	39.9	41.6	49.9	34.6
REVENUE AT 50% L.F. OF AN A/C	5,819	8,096	8,096	6,325	7,084	8,349	6,325	3,922	6,072	5,693	11,132	13,409	13,536	17,078	15,054
PROFIT	-591	271	-236	-740	-122	378	-329	-490	-1,510	-512	64	953	1,105	2,268	520
PERCENTAGE OF PROFIT	-9.2	3.5	-2.8	-10.5	-1.7	4.7	-4.9	-11.1	-19.9	-8.2	.6	7.6	8.9	15.3	3.6

TABLE 10.14: Costs, Revenues and Profitability of Dubai - Medinah Sector

SECTOR : DUBAI-TABUK					DISTANCE : 1019 NM	1174 SM					FORECASTED NUMBER OF PASSENGERS : 44 PAXs A DAY				
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	628	737	849	745	723	1,027	798	508	1,001	810	1,655	1,960	1,832	2,055	2,139
BLOCK TIME (MIN)	257	245	257	245	245	199	197	194	163	175	177	177	173	148	159
(HRS)	4.29	4.09	4.29	4.09	4.09	3.32	3.29	3.24	2.71	2.91	2.95	2.95	2.88	2.58	3.02
AIRCRAFT HOURS/YEAR	3,644	3,621	3,644	3,621	3,621	3,507	3,501	3,493	2,415	3,428	3,435	3,435	3,421	3,349	3,462
AIRCRAFT CYCLES/YEAR	829	865	829	865	865	1,035	1,043	1,056	873	1,153	1,142	1,142	1,163	1,271	1,101
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	1,182	1,401	1,572	1,401	1,308	1,359	1,192	732	1,860	1,202	2,037	2,132	2,092	2,467	2,897
INTEREST	780	925	1,037	925	863	897	787	483	1,227	793	1,344	1,407	1,381	1,628	1,912
HULL INSURANCE	177	210	236	210	196	204	179	110	279	180	306	320	314	370	434
FUEL	440	516	594	522	506	719	559	356	701	567	1,158	1,372	1,282	1,438	1,497
COCKPIT & CABIN CREW ($209/HR)	897	854	897	854	854	694	687	677	567	609	616	616	602	539	630
USER CHARGES	687	757	819	737	730	831	786	586	788	682	1,090	1,156	1,170	1,376	1,319
MAINTENANCE	508	567	667	545	536	541	494	300	418	406	883	955	955	1,086	1,150
INDIRECT COST PER SECTOR (US$)	2,843	3,955	3,955	3,090	3,461	4,079	3,090	1,916	2,967	2,781	5,439	6,551	6,613	8,343	7,354
TOTAL COSTS	7,513	9,186	9,777	8,284	8,454	9,323	7,773	5,158	8,806	7,220	12,873	14,508	14,410	17,247	17,194
TOTAL COST/AIRCRAFT/N.M. (US$)	7.3	9.0	9.6	8.1	8.3	9.1	7.6	5.0	8.6	7.1	12.6	14.2	14.1	16.8	16.8
TOTAL COST/SEAT/SECTOR (US$)	163.3	143.5	152.8	165.7	151.0	141.3	155.5	166.4	183.5	160.5	146.3	136.9	134.7	127.8	144.5
TOTAL COST/SEAT/N.M. (CENTS)	16.0	14.0	14.9	16.2	14.8	13.8	15.2	16.3	17.9	15.7	14.3	13.4	13.1	12.5	14.2
REVENUE PER SECTOR PER MAX.89 PAXs OR A/C CAPACITY ($288/PAX)	12,672	12,672	12,672	12,672	12,672	12,672	12,672	8,928	12,672	12,672	12,672	12,672	12,672	12,672	12,672
PROFIT	5,159	3,486	2,895	4,388	4,218	3,349	4,899	3,770	3,866	5,452	-201	-1,836	-1,738	-4,575	-4,522
PERCENTAGE OF PROFIT	68.7	38.0	29.6	53.0	49.9	35.9	63.0	73.1	43.9	75.5	-1.6	-12.7	-12.1	-26.5	-26.3
REVENUE AT 100% L.F. OF AN A/C	13,248	18,432	18,432	14,400	16,128	19,008	14,400	8,928	13,824	12,960	25,344	30,528	30,816	38,880	34,272
PROFIT	5,735	9,246	8,655	6,116	7,674	9,685	6,627	3,770	5,018	5,740	12,471	16,020	16,406	21,633	17,078
PERCENTAGE OF PROFIT	76.3	100.7	88.5	73.8	90.8	103.9	85.3	73.1	57.0	79.5	96.9	110.4	113.9	125.4	99.3
REVENUE AT 75% L.F. OF AN A/C	9,936	13,824	13,824	10,800	12,096	14,256	10,800	6,696	10,368	9,720	19,008	22,896	23,112	29,160	25,704
PROFIT	2,423	4,638	4,047	2,516	3,642	4,933	3,027	1,538	1,562	2,500	6,135	8,388	8,702	11,913	8,510
PERCENTAGE OF PROFIT	32.2	50.5	41.4	30.4	43.1	52.9	38.9	29.8	17.7	34.6	47.7	57.8	60.4	69.1	49.5
REVENUE AT 65% L.F. OF AN A/C	8,611	11,981	11,981	9,360	10,483	12,355	9,360	5,803	8,986	8,424	16,474	19,843	20,030	25,272	22,277
PROFIT	1,098	2,795	2,204	1,076	2,029	3,032	1,587	645	180	1,204	3,601	5,335	5,621	8,025	5,083
PERCENTAGE OF PROFIT	14.6	30.4	22.5	13.0	24.0	32.5	20.4	12.5	2.0	16.7	28.0	36.8	39.0	46.5	29.6
REVENUE AT 50% L.F. OF AN A/C	6,624	9,216	9,216	7,200	8,064	9,504	7,200	4,464	6,912	6,480	12,672	15,264	15,408	19,440	17,136
PROFIT	-889	30	-561	-1,084	-390	181	-573	-694	-1,894	-740	-201	756	998	2,193	-58
PERCENTAGE OF PROFIT	-11.8	.3	-5.7	-13.1	-4.6	1.9	-7.4	-13.5	-21.5	-10.3	-1.6	5.2	6.9	12.7	-.3

TABLE 10.15: Costs, Revenues and Profitability of Dubai - Tabuk Sector

SECTOR : DUBAI-TAIF					DISTANCE : 846 NM 975 SM					FORECASTED NUMBER OF PASSENGERS : 46 PAXs A DAY					
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	533	621	710	622	611	862	673	430	840	690	1,404	1,663	1,664	1,804	1,876
BLOCK TIME (MIN)	218	207	218	207	207	170	168	165	138	149	151	151	147	129	140
(HRS)	3.63	3.45	3.63	3.45	3.45	2.83	2.80	2.75	2.31	2.48	2.52	2.52	2.45	2.17	2.41
AIRCRAFT HOURS/YEAR	3,544	3,516	3,544	3,516	3,516	3,395	3,387	3,375	2,324	3,306	3,315	3,315	3,296	3,209	3,284
AIRCRAFT CYCLES/YEAR	980	1,021	980	1,021	1,021	1,202	1,213	1,231	1,009	1,335	1,321	1,321	1,349	1,479	1,368
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	1,024	1,215	1,362	1,215	1,134	1,192	1,044	640	1,638	1,057	1,793	1,877	1,838	2,160	2,421
INTEREST	676	802	899	802	748	787	689	422	1,081	697	1,184	1,239	1,213	1,426	1,598
HULL INSURANCE	154	182	204	182	170	179	157	96	246	158	269	282	276	324	363
FUEL	373	435	497	435	427	604	471	301	588	483	983	1,164	1,165	1,263	1,313
COCKPIT & CABIN CREW ($209/HR)	758	721	758	721	721	592	585	574	482	519	526	526	512	454	504
USER CHARGES	582	642	696	625	619	707	667	495	669	578	932	989	1,001	1,182	1,132
MAINTENANCE	437	487	573	468	461	469	428	261	364	360	790	855	853	971	985
INDIRECT COST PER SECTOR (US$)	2,360	3,284	3,284	2,565	2,873	3,386	2,565	1,591	2,463	2,309	4,515	5,439	5,490	6,927	6,106
TOTAL COSTS	6,363	7,768	8,271	7,014	7,153	7,914	6,607	4,380	7,530	6,161	10,992	12,370	12,347	14,706	14,422
TOTAL COST/AIRCRAFT/N.M. (US$)	7.5	9.2	9.8	8.3	8.5	9.4	7.8	5.2	8.9	7.3	13.0	14.6	14.6	17.4	17.1
TOTAL COST/SEAT/SECTOR (US$)	138.3	121.4	129.2	140.3	127.7	119.9	132.1	141.3	156.9	136.9	124.9	116.7	115.4	108.9	121.2
TOTAL COST/SEAT/N.M. (CENTS)	16.4	14.4	15.3	16.6	15.1	14.2	15.6	16.7	18.6	16.2	14.8	13.8	13.6	12.9	14.3
REVENUE PER SECTOR PER MAX.91 PAXs															
OR A/C CAPACITY ($244/PAX)	11,102	11,102	11,102	11,102	11,102	11,102	11,102	1,411	11,102	10,980	11,102	11,102	11,102	11,102	11,102
PROFIT	4,739	3,334	2,831	4,088	3,949	3,188	4,495	-2,970	3,572	4,819	110	-1,268	-1,245	-3,604	-3,320
PERCENTAGE OF PROFIT	74.5	42.9	34.2	58.3	55.2	40.3	68.0	-67.8	47.4	78.2	1.0	-10.2	-10.1	-24.5	-23.0
REVENUE AT 100% L.F. OF AN A/C	11,224	15,616	15,616	12,200	13,664	16,104	12,200	7,564	11,712	10,980	21,472	25,864	26,108	32,940	29,036
PROFIT	4,861	7,848	7,345	5,186	6,511	8,190	5,593	3,184	4,182	4,819	10,480	13,494	13,761	18,234	14,614
PERCENTAGE OF PROFIT	76.4	101.0	88.8	73.9	91.0	103.5	84.7	72.7	55.5	78.2	95.3	109.1	111.4	124.0	101.3
REVENUE AT 75% L.F. OF AN A/C	8,418	11,712	11,712	9,150	10,248	12,078	9,150	5,673	8,784	8,235	16,104	19,398	19,581	24,705	21,777
PROFIT	2,055	3,944	3,441	2,136	3,095	4,164	2,543	1,293	1,254	2,074	5,112	7,028	7,234	9,999	7,355
PERCENTAGE OF PROFIT	32.3	50.8	41.6	30.5	43.3	52.6	38.5	29.5	16.6	33.7	46.5	56.8	58.6	68.0	51.0
REVENUE AT 65% L.F. OF AN A/C	7,296	10,150	10,150	7,930	8,882	10,468	7,930	4,917	7,613	7,137	13,957	16,812	16,970	21,411	18,873
PROFIT	932	2,383	1,879	916	1,728	2,553	1,323	536	82	976	2,965	4,442	4,623	6,705	4,452
PERCENTAGE OF PROFIT	14.7	30.7	22.7	13.1	24.2	32.3	20.0	12.2	1.1	15.8	27.0	35.9	37.4	45.6	30.9
REVENUE AT 50% L.F. OF AN A/C	5,612	7,808	7,808	6,100	6,832	8,052	6,100	3,782	5,856	5,490	10,736	12,932	13,054	16,470	14,518
PROFIT	-751	40	-463	-914	-321	138	-507	-598	-1,674	-671	-256	562	707	1,764	96
PERCENTAGE OF PROFIT	-11.8	.5	-5.6	-13.0	-4.5	1.7	-7.7	-13.7	-22.2	-10.9	-2.3	4.5	5.7	12.0	.7

TABLE 10.16: Costs, Revenues and Profitability of Dubai - Taif Sector

SECTOR : KUWAIT-ABHA				DISTANCE : 721 NM 830 SM					FORECASTED NUMBER OF PASSENGERS : 63.5 PAXs A DAY						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	469	544	617	539	535	752	590	377	733	610	1,236	1,464	1,506	1,635	1,700
BLOCK TIME (MIN)	191	182	191	182	182	150	148	145	122	132	134	134	126	116	127
(HRS)	3.18	3.03	3.18	3.03	3.03	2.50	2.47	2.42	2.04	2.19	2.23	2.23	2.10	1.93	2.11
AIRCRAFT HOURS/YEAR	3,468	3,437	3,468	3,437	3,437	3,311	3,302	3,287	2,256	3,215	3,227	3,227	3,181	3,115	3,187
AIRCRAFT CYCLES/YEAR	1,093	1,138	1,093	1,138	1,138	1,326	1,341	1,362	1,110	1,470	1,453	1,453	1,521	1,619	1,512
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	918	1,089	1,221	1,089	1,017	1,080	945	578	1,489	959	1,630	1,706	1,632	1,972	2,184
INTEREST	606	719	806	719	671	713	624	382	983	633	1,076	1,126	1,077	1,302	1,442
HULL INSURANCE	138	163	183	163	152	162	142	87	223	144	245	256	245	296	328
FUEL	328	381	432	377	375	527	413	264	513	427	865	1,025	1,054	1,144	1,190
COCKPIT & CABIN CREW ($209/HR)	665	633	665	633	633	523	516	505	426	458	465	465	439	403	441
USER CHARGES	511	565	613	550	544	623	588	435	590	508	825	877	888	1,052	1,086
MAINTENANCE	389	433	509	417	410	421	384	235	327	330	728	788	772	900	904
INDIRECT COST PER SECTOR (US$)	2,037	2,834	2,834	2,214	2,479	2,922	2,214	1,373	2,125	1,992	3,896	4,693	4,737	5,977	5,269
TOTAL COSTS	5,592	6,817	7,262	6,162	6,281	6,970	5,825	3,859	6,675	5,451	9,730	10,936	10,845	13,046	12,763
TOTAL COST/AIRCRAFT/N.M. (US$)	7.7	9.3	10.0	8.4	8.6	9.6	8.0	5.3	9.2	7.5	13.3	15.0	14.9	17.9	17.5
TOTAL COST/SEAT/SECTOR (US$)	121.6	106.5	113.5	123.2	112.2	105.6	116.5	124.5	139.1	121.1	110.6	103.2	101.4	96.6	107.3
TOTAL COST/SEAT/N.M. (CENTS)	16.7	14.6	15.6	16.9	15.4	14.5	16.0	17.1	19.1	16.6	15.2	14.1	13.9	13.2	14.7
REVENUE PER SECTOR PER MAX. 63.5 PAXs OR A/C CAPACITY ($213/PAX)	9,798	13,526	13,526	10,650	11,928	14,058	10,650	6,603	10,224	9,585	13,526	13,526	13,526	13,526	13,526
PROFIT	4,206	6,709	6,264	4,488	5,647	7,088	4,825	2,744	3,549	4,134	3,796	2,590	2,681	480	762
PERCENTAGE OF PROFIT	75.2	98.4	86.3	72.8	89.9	101.7	82.8	71.1	53.2	75.8	39.0	23.7	24.7	3.7	6.0
REVENUE AT 100% L.F. OF AN A/C	9,798	13,632	13,632	10,650	11,928	14,058	10,650	6,603	10,224	9,585	18,744	22,578	22,791	28,755	25,347
PROFIT	4,206	6,815	6,370	4,488	5,647	7,088	4,825	2,744	3,549	4,134	9,014	11,642	11,946	15,709	12,584
PERCENTAGE OF PROFIT	75.2	100.0	87.7	72.8	89.9	101.7	82.8	71.1	53.2	75.8	92.6	106.5	110.2	120.4	98.6
REVENUE AT 75% L.F. OF AN A/C	7,349	10,224	10,224	7,988	8,946	10,544	7,988	4,952	7,668	7,189	14,058	16,934	17,093	21,566	19,010
PROFIT	1,756	3,407	2,962	1,826	2,665	3,574	2,162	1,094	993	1,738	4,328	5,998	6,249	8,520	6,247
PERCENTAGE OF PROFIT	31.4	50.0	40.8	29.6	42.4	51.3	37.1	28.3	14.9	31.9	44.5	54.8	57.6	65.3	48.9
REVENUE AT 65% L.F. OF AN A/C	6,369	8,861	8,861	6,923	7,753	9,138	6,923	4,292	6,646	6,230	12,184	14,676	14,814	18,691	16,476
PROFIT	777	2,044	1,599	761	1,472	2,168	1,097	433	-30	779	2,454	3,740	3,969	5,645	3,712
PERCENTAGE OF PROFIT	13.9	30.0	22.0	12.3	23.4	31.1	18.8	11.2	-.4	14.3	25.2	34.2	36.6	43.3	29.1
REVENUE AT 50% L.F. OF AN A/C	4,899	6,816	6,816	5,325	5,964	7,029	5,325	3,302	5,112	4,793	9,372	11,289	11,396	14,378	12,674
PROFIT	-693	-1	-446	-837	-317	59	-500	-557	-1,563	-659	-358	353	551	1,332	-90
PERCENTAGE OF PROFIT	-12.4	.0	-6.1	-13.6	-5.0	.8	-8.6	-14.4	-23.4	-12.1	-3.7	3.2	5.1	10.2	-.7

TABLE 10.17: Costs, Revenues and Profitability of Kuwait - Abha Sector

SECTOR : KUWAIT-ALGASSIM				DISTANCE : 283 NM 327 SM					FORECASTED NUMBER OF PASSENGERS : 73 PAXs PER TWO DAYS						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	225	251	268	235	247	327	272	175	324	300	592	703	716	935	973
BLOCK TIME (MIN)	87	81	87	81	81	72	71	69	61	64	66	66	69	62	67
(HRS)	1.45	1.35	1.45	1.35	1.35	1.19	1.18	1.14	1.01	1.07	1.10	1.10	1.16	1.03	1.12
AIRCRAFT HOURS/YEAR	2,864	2,800	2,864	2,800	2,800	2,682	2,668	2,640	1,800	2,578	2,605	2,605	2,656	2,537	2,627
AIRCRAFT CYCLES/YEAR	1,994	2,090	1,994	2,090	2,090	2,266	2,286	2,329	1,791	2,421	2,380	2,380	2,305	2,482	2,348
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	505	596	671	596	556	634	556	340	924	584	998	1,044	1,077	1,289	1,410
INTEREST	333	393	443	393	367	419	367	224	610	385	658	689	711	851	930
HULL INSURANCE	76	89	101	89	83	95	83	51	139	88	150	157	162	193	211
FUEL	157	176	188	165	173	229	190	123	227	210	414	492	501	654	681
COCKPIT & CABIN CREW ($209/HR)	303	282	303	282	282	249	246	239	211	224	230	230	242	215	235
USER CHARGES	240	269	295	261	258	301	281	200	282	238	416	446	453	551	523
MAINTENANCE	204	222	261	214	211	229	210	135	189	211	487	528	550	643	636
INDIRECT COST PER SECTOR (US$)	790	1,098	1,098	858	961	1,133	858	532	824	772	1,510	1,819	1,837	2,317	2,043
TOTAL COSTS	2,608	3,126	3,360	2,859	2,891	3,289	2,793	1,843	3,406	2,712	4,863	5,406	5,532	6,713	6,669
TOTAL COST/AIRCRAFT/N.M. (US$)	9.3	11.1	11.9	10.2	10.3	11.7	9.9	6.6	12.1	9.7	17.3	19.3	19.7	23.9	23.8
TOTAL COST/SEAT/SECTOR (US$)	56.7	48.8	52.5	57.2	51.6	49.8	55.9	59.5	71.0	60.3	55.3	51.0	51.7	49.7	56.0
TOTAL COST/SEAT/N.M. (CENTS)	20.2	17.4	18.7	20.3	18.4	17.7	19.9	21.1	25.3	21.5	19.7	18.2	18.4	17.7	20.0
REVENUE PER SECTOR PER MAX.73 PAXs OR A/C CAPACITY ($97/PAX)	4,462	6,208	6,208	4,850	5,432	6,402	4,850	3,007	4,656	4,365	7,081	7,081	7,081	7,081	7,081
PROFIT	1,854	3,082	2,848	1,991	2,541	3,113	2,057	1,164	1,250	1,653	2,218	1,675	1,549	368	412
PERCENTAGE OF PROFIT	71.1	98.6	84.8	69.7	87.9	94.7	73.7	63.1	36.7	60.9	45.6	31.0	28.0	5.5	6.2
REVENUE AT 100% L.F. OF AN A/C	4,462	6,208	6,208	4,850	5,432	6,402	4,850	3,007	4,656	4,365	8,536	10,282	10,379	13,095	11,543
PROFIT	1,854	3,082	2,848	1,991	2,541	3,113	2,057	1,164	1,250	1,653	3,673	4,876	4,847	6,382	4,874
PERCENTAGE OF PROFIT	71.1	98.6	84.8	69.7	87.9	94.7	73.7	63.1	36.7	60.9	75.5	90.2	87.6	95.1	73.1
REVENUE AT 75% L.F. OF AN A/C	3,347	4,656	4,656	3,638	4,074	4,802	3,638	2,255	3,492	3,274	6,402	7,712	7,784	9,821	8,657
PROFIT	739	1,530	1,296	779	1,183	1,513	845	412	86	561	1,539	2,306	2,253	3,108	1,988
PERCENTAGE OF PROFIT	28.3	49.0	38.6	27.2	40.9	46.0	30.2	22.3	2.5	20.7	31.6	42.7	40.7	46.3	29.8
REVENUE AT 65% L.F. OF AN A/C	2,900	4,035	4,035	3,153	3,531	4,161	3,153	1,955	3,026	2,837	5,548	6,683	6,746	8,512	7,503
PROFIT	293	910	675	294	639	872	360	111	-379	125	685	1,278	1,215	1,799	834
PERCENTAGE OF PROFIT	11.2	29.1	20.1	10.3	22.1	26.5	12.9	6.0	-11.1	4.6	14.1	23.6	22.0	26.8	12.5
REVENUE AT 50% L.F. OF AN A/C	2,231	3,104	3,104	2,425	2,716	3,201	2,425	1,504	2,328	2,183	4,268	5,141	5,190	6,548	5,772
PROFIT	-377	-22	-256	-434	-175	-88	-368	-340	-1,078	-530	-595	-265	-342	-166	-897
PERCENTAGE OF PROFIT	-14.4	-.7	-7.6	-15.2	-6.1	-2.7	-13.2	-18.4	-31.6	-19.5	-12.2	-4.9	-6.2	-2.5	-13.5

TABLE 10.18: Costs, Revenues and Profitability of Kuwait - Alqassiam Sector

SECTOR : KUWAIT-GIZAN DISTANCE : 796 NM 917 SM FORECASTED NUMBER OF PASSENGERS : 69 PAXs PER TWO DAYS

AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	505	588	670	586	578	815	637	407	794	656	1,332	1,578	1,613	1,731	1,800
BLOCK TIME (MIN)	206	196	206	196	196	161	159	156	131	141	143	143	139	124	135
(HRS)	3.43	3.27	3.43	3.27	3.27	2.69	2.66	2.61	2.19	2.36	2.39	2.39	2.32	2.06	2.24
AIRCRAFT HOURS/YEAR	3,514	3,485	3,514	3,485	3,485	3,362	3,354	3,341	2,297	3,270	3,280	3,280	3,258	3,168	3,233
AIRCRAFT CYCLES/YEAR	1,024	1,067	1,024	1,067	1,067	1,251	1,263	1,283	1,049	1,388	1,373	1,373	1,405	1,540	1,443
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	978	1,161	1,301	1,161	1,083	1,144	1,002	613	1,573	1,015	1,723	1,803	1,762	2,072	2,288
INTEREST	646	766	859	766	715	755	661	405	1,038	670	1,137	1,190	1,163	1,368	1,510
HULL INSURANCE	147	174	195	174	162	172	150	92	236	152	258	270	264	311	343
FUEL	354	412	469	410	405	570	446	285	556	459	932	1,104	1,129	1,212	1,260
COCKPIT & CABIN CREW ($209/HR)	718	683	718	683	683	562	555	545	458	493	500	500	485	430	469
USER CHARGES	552	609	660	593	587	671	633	469	635	548	886	941	953	1,126	1,078
MAINTENANCE	416	464	545	446	439	448	409	250	348	347	763	826	823	938	939
INDIRECT COST PER SECTOR (US$)	2,221	3,090	3,090	2,414	2,704	3,186	2,414	1,497	2,317	2,172	4,248	5,117	5,166	6,517	5,745
TOTAL COSTS	6,031	7,358	7,836	6,647	6,777	7,507	6,270	4,155	7,162	5,855	10,448	11,752	11,744	13,975	13,632
TOTAL COST/AIRCRAFT/N.M. (US$)	7.6	9.2	9.8	8.4	8.5	9.4	7.9	5.2	9.0	7.4	13.1	14.8	14.8	17.6	17.1
TOTAL COST/SEAT/SECTOR (US$)	131.1	115.0	122.4	132.9	121.0	113.7	125.4	134.0	149.2	130.1	118.7	110.9	109.8	103.5	114.6
TOTAL COST/SEAT/N.M. (CENTS)	16.5	14.4	15.4	16.7	15.2	14.3	15.8	16.8	18.7	16.3	14.9	13.9	13.8	13.0	14.4
REVENUE PER SECTOR PER MAX. 69 PAXs OR A/C CAPACITY ($230/PAX)	10,580	14,720	14,720	11,500	12,880	15,180	11,500	7,130	11,040	10,350	15,870	15,870	15,870	15,870	15,870
PROFIT	4,549	7,362	6,884	4,853	6,103	7,673	5,230	2,975	3,878	4,495	5,422	4,118	4,126	1,895	2,238
PERCENTAGE OF PROFIT	75.4	100.1	87.8	73.0	90.0	102.2	83.4	71.6	54.2	76.8	51.9	35.0	35.1	13.6	16.4
REVENUE AT 100% L.F. OF AN A/C	10,580	14,720	14,720	11,500	12,880	15,180	11,500	7,130	11,040	10,350	20,240	24,380	24,610	31,050	27,370
PROFIT	4,549	7,362	6,884	4,853	6,103	7,673	5,230	2,975	3,878	4,495	9,792	12,628	12,866	17,075	13,738
PERCENTAGE OF PROFIT	75.4	100.1	87.8	73.0	90.0	102.2	83.4	71.6	54.2	76.8	93.7	107.5	109.5	122.2	100.8
REVENUE AT 75% L.F. OF AN A/C	7,935	11,040	11,040	8,625	9,660	11,385	8,625	5,348	8,280	7,763	15,180	18,285	18,458	23,288	20,528
PROFIT	1,904	3,682	3,204	1,978	2,883	3,878	2,355	1,192	1,118	1,907	4,732	6,533	6,713	9,313	6,895
PERCENTAGE OF PROFIT	31.6	50.0	40.9	29.8	42.5	51.7	37.6	28.7	15.6	32.6	45.3	55.6	57.2	66.6	50.6
REVENUE AT 65% L.F. OF AN A/C	6,877	9,568	9,568	7,475	8,372	9,867	7,475	4,635	7,176	6,728	13,156	15,847	15,997	20,183	17,791
PROFIT	846	2,210	1,732	828	1,595	2,360	1,205	479	14	872	2,708	4,095	4,252	6,208	4,158
PERCENTAGE OF PROFIT	14.0	30.0	22.1	12.5	23.5	31.4	19.2	11.5	.2	14.9	25.9	34.8	36.2	44.4	30.5
REVENUE AT 50% L.F. OF AN A/C	5,290	7,360	7,360	5,750	6,440	7,590	5,750	3,565	5,520	5,175	10,120	12,190	12,305	15,525	13,685
PROFIT	-741	2	-476	-897	-337	83	-520	-590	-1,642	-680	-328	438	561	1,550	53
PERCENTAGE OF PROFIT	-12.3	.0	-6.1	-13.5	-5.0	1.1	-8.3	-14.2	-22.9	-11.6	-3.1	3.7	4.8	11.1	.4

TABLE 10.19: Costs, Revenues and Profitability of Kuwait - Gizan Sector

SECTOR : KUWAIT-MEDINAH DISTANCE : 523 NM 603 SM FORECASTED NUMBER OF PASSENGERS : 72 PAXs A DAY

AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	355	405	451	391	400	556	441	285	541	466	936	1,109	1,114	1,334	1,387
BLOCK TIME (MIN)	143.3	136.1	143.3	136.1	136.1	114.9	112.9	110.7	93.2	100.5	102.5	102.5	102.7	91.8	100.8
(HRS)	2.39	2.27	2.39	2.27	2.27	1.92	1.88	1.84	1.55	1.67	1.71	1.71	1.71	1.53	1.68
AIRCRAFT HOURS/YEAR	3,277	3,240	3,277	3,240	3,240	3,109	3,095	3,079	2,094	2,997	3,014	3,014	3,016	2,919	3,001
AIRCRAFT CYCLES/YEAR	1,377	1,433	1,377	1,433	1,433	1,628	1,649	1,673	1,352	1,795	1,770	1,770	1,767	1,912	1,790
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	729	866	969	866	808	880	769	471	1,223	786	1,339	1,401	1,403	1,670	1,846
INTEREST	481	571	640	571	533	581	507	311	807	519	884	925	926	1,102	1,218
HULL INSURANCE	109	130	145	130	121	132	115	71	183	118	201	210	210	251	277
FUEL	249	284	316	274	280	389	308	200	379	326	655	777	780	934	971
COCKPIT & CABIN CREW ($209/HR)	499	474	499	474	474	400	393	386	325	350	357	357	358	320	351
USER CHARGES	386	428	466	416	412	474	446	326	447	383	636	677	686	820	783
MAINTENANCE	304	338	395	325	320	335	305	190	262	275	617	668	680	786	787
INDIRECT COST PER SECTOR (US$)	1,459	2,030	2,030	1,586	1,776	2,094	1,586	983	1,523	1,427	2,791	3,362	3,394	4,282	3,775
TOTAL COSTS	4,216	5,120	5,460	4,641	4,724	5,284	4,430	2,937	5,149	4,184	7,479	8,377	8,438	10,165	10,007
TOTAL COST/AIRCRAFT/N.M. (US$)	8.1	9.8	10.5	8.9	9.0	10.1	8.5	5.6	9.9	8.0	14.3	16.0	16.2	19.5	19.2
TOTAL COST/SEAT/SECTOR (US$)	91.7	80.0	85.3	92.8	84.4	80.1	88.6	94.7	107.3	93.0	85.0	79.0	78.9	75.3	84.1
TOTAL COST/SEAT/N.M. (CENTS)	17.5	15.3	16.3	17.8	16.1	15.3	17.0	18.1	20.5	17.8	16.3	15.1	15.1	14.4	16.1
REVENUE PER SECTOR PER MAX.72 PAXs OR A/C CAPACITY ($160/PAX)	7,360	10,240	10,240	8,000	8,960	10,560	8,000	4,960	7,680	7,200	11,520	11,520	11,520	11,520	11,520
PROFIT	3,144	5,120	4,780	3,359	4,236	5,276	3,570	2,023	2,531	3,016	4,041	3,143	3,082	1,355	1,513
PERCENTAGE OF PROFIT	74.6	100.0	87.5	72.4	89.7	99.8	80.6	68.9	49.2	72.1	54.0	37.5	36.5	13.3	15.1
REVENUE AT 100% L.F. OF AN A/C	7,360	10,240	10,240	8,000	8,960	10,560	8,000	4,960	7,680	7,200	14,080	16,960	17,120	21,600	19,040
PROFIT	3,144	5,120	4,780	3,359	4,236	5,276	3,570	2,023	2,531	3,016	6,601	8,583	8,682	11,435	9,033
PERCENTAGE OF PROFIT	74.6	100.0	87.5	72.4	89.7	99.8	80.6	68.9	49.2	72.1	88.3	102.5	102.9	112.5	90.3
REVENUE AT 75% L.F. OF AN A/C	5,520	7,680	7,680	6,000	6,720	7,920	6,000	3,720	5,760	5,400	10,560	12,720	12,840	16,200	14,280
PROFIT	1,304	2,560	2,220	1,359	1,996	2,636	1,570	783	611	1,216	3,081	4,343	4,402	6,035	4,273
PERCENTAGE OF PROFIT	30.9	50.0	40.7	29.3	42.2	49.9	35.4	26.7	11.9	29.1	41.2	51.8	52.2	59.4	42.7
REVENUE AT 65% L.F. OF AN A/C	4,784	6,656	6,656	5,200	5,824	6,864	5,200	3,224	4,992	4,680	9,152	11,024	11,128	14,040	12,376
PROFIT	568	1,536	1,196	559	1,100	1,580	770	287	-157	496	1,673	2,647	2,690	3,875	2,369
PERCENTAGE OF PROFIT	13.5	30.0	21.9	12.0	23.3	29.9	17.4	9.8	-3.0	11.9	22.4	31.6	31.9	38.1	23.7
REVENUE AT 50% L.F. OF AN A/C	3,680	5,120	5,120	4,000	4,480	5,280	4,000	2,480	3,840	3,600	7,040	8,480	8,560	10,800	9,520
PROFIT	-536	0	-340	-641	-244	-4	-430	-457	-1,309	-584	-439	103	122	635	-487
PERCENTAGE OF PROFIT	-12.7	.0	-6.2	-13.8	-5.2	-.1	-9.7	-15.6	-25.4	-14.0	-5.9	1.2	1.4	6.2	-4.9

TABLE 10.20: Costs, Revenues and Profitability of Kuwait - Medinah Sector

SECTOR : KUWAIT-TABUK					DISTANCE : 598 NM 689 SM					FORECASTED NUMBER OF PASSENGERS : 34 PAXs A DAY					
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MM)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	396	455	511	445	449	627	495	317	610	518	1,045	1,238	1,291	1,443	1,500
BLOCK TIME (MIN)	161	153	161	153	153	128	126	123	104	112	114	114	115	101	110
(HRS)	2.68	2.54	2.68	2.54	2.54	2.13	2.09	2.04	1.73	1.86	1.90	1.90	1.91	1.68	1.83
AIRCRAFT HOURS/YEAR	3,359	3,324	3,359	3,324	3,324	3,194	3,182	3,163	2,162	3,088	3,103	3,103	3,110	3,002	3,074
AIRCRAFT CYCLES/YEAR	1,256	1,308	1,256	1,308	1,308	1,502	1,520	1,547	1,251	1,659	1,638	1,638	1,627	1,788	1,681
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	797	947	1,060	947	883	953	833	508	1,319	849	1,444	1,512	1,521	1,784	1,964
INTEREST	526	625	700	625	583	629	550	336	871	560	953	998	1,004	1,178	1,296
HULL INSURANCE	120	142	159	142	133	143	125	76	198	127	217	227	228	268	295
FUEL	278	319	358	311	314	439	346	222	427	363	731	867	903	1,010	1,050
COCKPIT & CABIN CREW ($209/HR)	559	531	559	531	531	445	438	427	361	389	396	396	399	351	382
USER CHARGES	431	478	519	465	460	528	497	365	499	428	704	750	760	904	864
MAINTENANCE	335	372	436	358	353	366	334	206	286	295	657	712	727	829	827
INDIRECT COST PER SECTOR (US$)	1,668	2,321	2,321	1,813	2,031	2,394	1,813	1,124	1,741	1,632	3,192	3,844	3,881	4,896	4,316
TOTAL COSTS	4,715	5,735	6,113	5,192	5,288	5,895	4,935	3,265	5,702	4,643	8,294	9,304	9,424	11,221	10,994
TOTAL COST/AIRCRAFT/N.M. (US$)	7.9	9.6	10.2	8.7	8.8	9.9	8.3	5.5	9.5	7.8	13.9	15.6	15.8	18.8	18.4
TOTAL COST/SEAT/SECTOR (US$)	102.5	89.6	95.5	103.8	94.4	89.3	98.7	105.3	118.8	103.2	94.3	87.8	88.1	83.1	92.4
TOTAL COST/SEAT/N.M. (CENTS)	17.1	15.0	16.0	17.4	15.8	14.9	16.5	17.6	19.9	17.3	15.8	14.7	14.7	13.9	15.5
REVENUE PER SECTOR PER MAX. 34 PAXs OR A/C CAPACITY ($205/PAX)	6,970	6,970	6,970	6,970	6,970	6,970	6,970	6,355	6,970	6,970	6,970	6,970	6,970	6,970	6,970
PROFIT	2,255	1,235	857	1,778	1,682	1,075	2,035	3,090	1,268	2,327	-1,324	-2,334	-2,454	-4,251	-4,024
PERCENTAGE OF PROFIT	47.8	21.5	14.0	34.2	31.8	18.2	41.2	94.6	22.2	50.1	-16.0	-25.1	-26.0	-37.9	-36.6
REVENUE AT 100% L.F. OF AN A/C	9,430	13,120	13,120	10,250	11,480	13,530	10,250	6,355	9,840	9,225	18,040	21,730	21,935	27,675	24,395
PROFIT	4,715	7,385	7,007	5,058	6,192	7,635	5,315	3,090	4,138	4,582	9,746	12,426	12,511	16,454	13,401
PERCENTAGE OF PROFIT	100.0	128.8	114.6	97.4	117.1	129.5	107.7	94.6	72.6	98.7	117.5	133.5	132.8	146.6	121.9
REVENUE AT 75% L.F. OF AN A/C	7,073	9,840	9,840	7,688	8,610	10,148	7,688	4,766	7,380	6,919	13,530	16,298	16,451	20,756	18,296
PROFIT	2,358	4,105	3,727	2,495	3,322	4,253	2,752	1,501	1,678	2,276	5,236	6,993	7,027	9,536	7,303
PERCENTAGE OF PROFIT	50.0	71.6	61.0	48.1	62.8	72.1	55.8	46.0	29.4	49.0	63.1	75.2	74.6	85.0	66.4
REVENUE AT 65% L.F. OF AN A/C	6,130	8,528	8,528	6,663	7,462	8,795	6,663	4,131	6,396	5,996	11,726	14,125	14,258	17,989	15,857
PROFIT	1,415	2,793	2,415	1,470	2,174	2,900	1,727	866	694	1,353	3,432	4,820	4,834	6,768	4,863
PERCENTAGE OF PROFIT	30.0	48.7	39.5	28.3	41.1	49.2	35.0	26.5	12.2	29.1	41.4	51.8	51.3	60.3	44.2
REVENUE AT 50% L.F. OF AN A/C	4,715	6,560	6,560	5,125	5,740	6,765	5,125	3,178	4,920	4,613	9,020	10,865	10,968	13,838	12,198
PROFIT	0	825	447	-67	452	870	190	-88	-782	-31	726	1,561	1,544	2,617	1,204
PERCENTAGE OF PROFIT	.0	14.4	7.3	-1.3	8.5	14.8	3.8	-2.7	-13.7	-.7	8.7	16.8	16.4	23.3	10.9

TABLE 10.21: Costs, Revenues and Profitability of Kuwait - Tabuk Sector.

SECTOR : KUWAIT-TAIF			DISTANCE : 614 NM 707 SM						FORECASTED NUMBER OF PASSENGERS : 32.5 PAXs A DAY						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	405	466	524	456	460	642	506	325	625	529	1,068	1,265	1,318	1,466	1,524
BLOCK TIME (MIN)	164	156	164	156	156	130	128	125	106	114	116	116	116	103	112
(HRS)	2.74	2.60	2.74	2.60	2.60	2.17	2.14	2.09	1.77	1.90	1.94	1.94	1.93	1.71	1.86
AIRCRAFT HOURS/YEAR	3,373	3,339	3,373	3,339	3,339	3,209	3,197	3,179	2,174	3,105	3,119	3,119	3,117	3,016	3,088
AIRCRAFT CYCLES/YEAR	1,234	1,286	1,234	1,286	1,286	1,479	1,497	1,524	1,233	1,635	1,614	1,614	1,617	1,767	1,659
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	812	964	1,080	964	900	968	846	517	1,340	862	1,467	1,535	1,531	1,807	1,991
INTEREST	536	636	713	636	594	639	559	341	884	569	968	1,013	1,011	1,193	1,314
HULL INSURANCE	122	145	162	145	135	145	127	78	201	129	220	230	230	271	299
FUEL	284	326	367	319	322	449	354	227	438	371	747	886	923	1,026	1,067
COCKPIT & CABIN CREW ($209/HR)	572	544	572	544	544	454	447	437	369	397	404	404	403	357	390
USER CHARGES	441	488	531	475	470	539	508	374	510	438	719	765	775	922	881
MAINTENANCE	342	380	445	365	360	372	340	210	291	299	665	721	731	838	837
INDIRECT COST PER SECTOR (US$)	1,713	2,383	2,383	1,862	2,085	2,458	1,862	1,154	1,787	1,676	3,277	3,947	3,985	5,027	4,431
TOTAL COSTS	4,821	5,866	6,252	5,310	5,409	6,025	5,043	3,337	5,820	4,741	8,468	9,502	9,588	11,441	11,209
TOTAL COST/AIRCRAFT/N.M. (US$)	7.9	9.6	10.2	8.7	8.8	9.8	8.2	5.4	9.5	7.7	13.8	15.5	15.6	18.6	18.3
TOTAL COST/SEAT/SECTOR (US$)	104.8	91.7	97.7	106.2	96.6	91.3	100.9	107.6	121.2	105.4	96.2	89.6	89.6	84.7	94.2
TOTAL COST/SEAT/N.M. (CENTS)	17.1	14.9	15.9	17.3	15.7	14.9	16.4	17.5	19.8	17.2	15.7	14.6	14.6	13.8	15.4
REVENUE PER SECTOR PER MAX. 32.5 PAXs OR A/C CAPACITY ($208/PAX)	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,448	6,760	6,760	6,760	6,760	6,760	6,760	6,760
PROFIT	1,939	894	508	1,450	1,351	735	1,717	3,111	940	2,019	-1,708	-2,742	-2,828	-4,681	-4,449
PERCENTAGE OF PROFIT	40.2	15.2	8.1	27.3	25.0	12.2	34.0	93.2	16.2	42.6	-20.2	-28.9	-29.5	-40.9	-39.7
REVENUE AT 100% L.F. OF AN A/C	9,568	13,312	13,312	10,400	11,648	13,728	10,400	6,448	9,984	9,360	18,304	22,048	22,256	28,080	24,752
PROFIT	4,747	7,446	7,060	5,090	6,239	7,703	5,357	3,111	4,164	4,619	9,836	12,546	12,668	16,639	13,543
PERCENTAGE OF PROFIT	98.5	126.9	112.9	95.9	115.4	127.8	106.2	93.2	71.5	97.4	116.1	132.0	132.1	145.4	120.8
REVENUE AT 75% L.F. OF AN A/C	7,176	9,984	9,984	7,800	8,736	10,296	7,800	4,836	7,488	7,020	13,728	16,536	16,692	21,060	18,564
PROFIT	2,355	4,118	3,732	2,490	3,327	4,271	2,757	1,499	1,668	2,279	5,260	7,034	7,104	9,619	7,355
PERCENTAGE OF PROFIT	48.8	70.2	59.7	46.9	61.5	70.9	54.7	44.9	28.7	48.1	62.1	74.0	74.1	84.1	65.6
REVENUE AT 65% L.F. OF AN A/C	6,219	8,653	8,653	6,760	7,571	8,923	6,760	4,191	6,490	6,084	11,898	14,331	14,466	18,252	16,089
PROFIT	1,398	2,787	2,400	1,450	2,162	2,898	1,717	854	670	1,343	3,429	4,829	4,878	6,811	4,880
PERCENTAGE OF PROFIT	29.0	47.5	38.4	27.3	40.0	48.1	34.0	25.6	11.5	28.3	40.5	50.8	50.9	59.5	43.5
REVENUE AT 50% L.F. OF AN A/C	4,784	6,656	6,656	5,200	5,824	6,864	5,200	3,224	4,992	4,680	9,152	11,024	11,128	14,040	12,376
PROFIT	-37	790	404	-110	415	839	157	-113	-828	-61	684	1,522	1,540	2,599	1,167
PERCENTAGE OF PROFIT	-.8	13.5	6.5	-2.1	7.7	13.9	3.1	-3.4	-14.2	-1.3	8.1	16.0	16.1	22.7	10.4

TABLE 10.22: Costs, Revenues and Profitability of Kuwait - Taif Sector

SECTOR : MUSCAT-ABHA			DISTANCE : 933 NM	1075 SM					FORECASTED NUMBER OF PASSENGERS : 42 PAXs PER TWO DAYS						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	581	680	780	684	667	945	736	469	921	750	1,530	1,813	1,748	1,930	2,008
BLOCK TIME (MIN)	238	226	238	226	226	185	183	180	151	162	164	164	160	139	150
(HRS)	3.96	3.77	3.96	3.77	3.77	3.08	3.04	2.99	2.51	2.70	2.73	2.73	2.67	2.38	2.72
AIRCRAFT HOURS/YEAR	3,594	3,569	3,594	3,569	3,569	3,451	3,444	3,434	2,370	3,367	3,375	3,375	3,359	3,279	3,373
AIRCRAFT CYCLES/YEAR	904	942	904	942	942	1,118	1,128	1,143	941	1,243	1,231	1,231	1,256	1,374	1,234
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	1,103	1,309	1,467	1,309	1,221	1,276	1,118	686	1,749	1,129	1,916	2,005	1,966	2,314	2,440
INTEREST	728	864	968	864	806	842	738	453	1,154	745	1,265	1,323	1,297	1,527	1,756
HULL INSURANCE	166	196	220	196	183	191	168	103	262	169	287	301	295	347	399
FUEL	407	476	546	479	467	662	515	328	645	525	1,071	1,269	1,224	1,351	1,406
COCKPIT & CABIN CREW ($209/HR)	828	788	828	788	788	643	636	626	525	564	571	571	557	497	568
USER CHARGES	635	700	757	682	675	769	727	541	729	630	1,011	1,073	1,066	1,280	1,226
MAINTENANCE	472	527	620	507	499	505	461	280	391	383	837	905	904	1,029	1,068
INDIRECT COST PER SECTOR (US$)	2,603	3,622	3,622	2,829	3,169	3,735	2,829	1,734	2,716	2,546	4,980	5,998	6,055	7,639	6,734
TOTAL COSTS	6,941	8,481	9,029	7,653	7,808	8,623	7,193	4,772	8,172	6,694	11,938	13,445	13,384	15,984	15,816
TOTAL COST/AIRCRAFT/N.M. (US$)	7.4	9.1	9.7	8.2	8.4	9.2	7.7	5.1	8.8	7.2	12.8	14.4	14.3	17.1	16.9
TOTAL COST/SEAT/SECTOR (US$)	150.9	132.5	141.1	153.1	139.4	130.6	143.9	153.9	170.2	148.8	135.7	126.8	125.1	118.4	132.9
TOTAL COST/SEAT/N.M. (CENTS)	16.2	14.2	15.1	16.4	14.9	14.0	15.4	16.5	18.2	15.9	14.5	13.6	13.4	12.7	14.2
REVENUE PER SECTOR PER MAX. 42 PAXs															
OR A/C CAPACITY ($267/PAX)	11,214	11,214	11,214	11,214	11,214	11,214	11,214	8,277	11,214	11,214	11,214	11,214	11,214	11,214	11,214
PROFIT	4,273	2,733	2,185	3,561	3,406	2,591	4,021	3,505	3,042	4,520	-724	-2,231	-2,170	-4,770	-4,602
PERCENTAGE OF PROFIT	61.6	32.2	24.2	46.5	43.6	30.1	55.9	73.5	37.2	67.5	-6.1	-16.6	-16.2	-29.8	-29.1
REVENUE AT 100% L.F. OF AN A/C	12,282	17,088	17,088	13,350	14,952	17,622	13,350	8,277	12,816	12,015	23,496	28,302	28,569	36,045	31,773
PROFIT	5,341	8,607	8,059	5,697	7,144	8,999	6,157	3,505	4,644	5,321	11,558	14,857	15,185	20,061	15,957
PERCENTAGE OF PROFIT	76.9	101.5	89.3	74.4	91.5	104.4	85.6	73.5	56.8	79.5	96.8	110.5	113.4	125.5	100.9
REVENUE AT 75% L.F. OF AN A/C	9,212	12,816	12,816	10,013	11,214	13,217	10,013	6,208	9,612	9,011	17,622	21,227	21,427	27,034	23,830
PROFIT	2,270	4,335	3,787	2,360	3,406	4,594	2,819	1,436	1,440	2,317	5,684	7,781	8,042	11,050	8,014
PERCENTAGE OF PROFIT	32.7	51.1	41.9	30.8	43.6	53.3	39.2	30.1	17.6	34.6	47.6	57.9	60.1	69.1	50.7
REVENUE AT 65% L.F. OF AN A/C	7,983	11,107	11,107	8,678	9,719	11,454	8,678	5,380	8,330	7,810	15,272	18,396	18,570	23,429	20,652
PROFIT	1,042	2,626	2,079	1,025	1,911	2,832	1,484	608	158	1,116	3,335	4,951	5,185	7,445	4,837
PERCENTAGE OF PROFIT	15.0	31.0	23.0	13.4	24.5	32.8	20.6	12.8	1.9	16.7	27.9	36.8	38.7	46.6	30.6
REVENUE AT 50% L.F. OF AN A/C	6,141	8,544	8,544	6,675	7,476	8,811	6,675	4,139	6,408	6,008	11,748	14,151	14,285	18,023	15,887
PROFIT	-800	63	-485	-978	-332	188	-518	-633	-1,764	-686	-190	706	900	2,038	71
PERCENTAGE OF PROFIT	-11.5	.7	-5.4	-12.8	-4.2	2.2	-7.2	-13.3	-21.6	-10.3	-1.6	5.2	6.7	12.8	.4

TABLE 10.23: Costs, Revenues and Profitability of Muscat - Abha Sector

SECTOR : MUSCAT-MEDINAH				DISTANCE : 1019 NM 1174 KM						FORECASTED NUMBER OF PASSENGERS : 42 PAXs PER TWO DAYS					
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	628	737	849	745	723	1,027	798	508	1,001	810	1,655	1,960	1,832	2,055	2,139
BLOCK TIME (MIN)	257.4	245.2	257.4	245.2	245.2	199.2	197.2	194.2	162.7	174.9	176.9	176.9	172.9	148.1	159.1
(HRS)	4.29	4.09	4.29	4.09	4.09	3.32	3.29	3.24	2.71	2.91	2.95	2.95	2.88	2.58	3.02
AIRCRAFT HOURS/YEAR	3,644	3,621	3,644	3,621	3,621	3,507	3,501	3,493	2,415	3,428	3,435	3,435	3,421	3,349	3,462
AIRCRAFT CYCLES/YEAR	829	865	829	865	865	1,035	1,043	1,056	873	1,153	1,142	1,142	1,163	1,271	1,101
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	1,182	1,401	1,572	1,401	1,308	1,359	1,192	732	1,860	1,202	2,037	2,132	2,092	2,467	2,897
INTEREST	780	925	1,037	925	863	897	787	483	1,227	793	1,344	1,407	1,381	1,628	1,912
HULL INSURANCE	177	210	236	210	196	204	179	110	279	180	306	320	314	370	434
FUEL	440	516	594	522	506	719	559	356	701	567	1,158	1,372	1,282	1,438	1,497
COCKPIT & CABIN CREW ($209/HR)	897	854	897	854	854	694	687	677	567	609	616	616	602	539	630
USER CHARGES	687	757	819	737	730	831	786	586	788	682	1,090	1,156	1,170	1,376	1,319
MAINTENANCE	508	567	667	545	536	541	494	300	418	406	883	955	955	1,086	1,150
INDIRECT COST PER SECTOR (US$)	2,843	3,955	3,955	3,090	3,461	4,079	3,090	1,916	2,967	2,781	5,439	6,551	6,613	8,343	7,354
TOTAL COSTS	7,513	9,186	9,777	8,284	8,454	9,323	7,773	5,158	8,806	7,220	12,873	14,508	14,410	17,247	17,194
TOTAL COST/AIRCRAFT/N.M. (US$)	7.3	9.0	9.6	8.1	8.3	9.1	7.6	5.0	8.6	7.1	12.6	14.2	14.1	16.8	16.8
TOTAL COST/SEAT/SECTOR (US$)	163.3	143.5	152.8	165.7	151.0	141.3	155.5	166.4	183.5	160.5	146.3	136.9	134.7	127.8	144.5
TOTAL COST/SEAT/N.M. (CENTS)	16.0	14.0	14.9	16.2	14.8	13.8	15.2	16.3	17.9	15.7	14.3	13.4	13.1	12.5	14.2
REVENUE PER SECTOR PER MAX. 42 PAXs OR A/C CAPACITY ($198/PAX)	12,054	12,054	12,054	12,054	12,054	12,054	12,054	8,897	12,054	12,054	12,054	12,054	12,054	12,054	12,054
PROFIT	4,541	2,868	2,277	3,770	3,600	2,731	4,281	3,739	3,248	4,834	-819	-2,454	-2,356	-5,193	-5,140
PERCENTAGE OF PROFIT	60.4	31.2	23.3	45.5	42.6	29.3	55.1	72.5	36.9	66.9	-6.4	-16.9	-16.3	-30.1	-29.9
REVENUE AT 100% L.F. OF AN A/C	13,202	18,368	18,368	14,350	16,072	18,942	14,350	8,897	13,776	12,915	25,256	30,422	30,709	38,745	34,153
PROFIT	5,689	9,182	8,591	6,066	7,618	9,619	6,577	3,739	4,970	5,695	12,383	15,914	16,299	21,498	16,959
PERCENTAGE OF PROFIT	75.7	100.0	87.9	73.2	90.1	103.2	84.6	72.5	56.4	78.9	96.2	109.7	113.1	124.6	98.6
REVENUE AT 75% L.F. OF AN A/C	9,902	13,776	13,776	10,763	12,054	14,207	10,763	6,673	10,332	9,686	18,942	22,817	23,032	29,059	25,615
PROFIT	2,388	4,590	3,999	2,478	3,600	4,884	2,989	1,514	1,526	2,466	6,069	8,308	8,622	11,812	8,421
PERCENTAGE OF PROFIT	31.8	50.0	40.9	29.9	42.6	52.4	38.5	29.4	17.3	34.2	47.1	57.3	59.8	68.5	49.0
REVENUE AT 65% L.F. OF AN A/C	8,581	11,939	11,939	9,328	10,447	12,312	9,328	5,783	8,954	8,395	16,416	19,774	19,961	25,184	22,199
PROFIT	1,068	2,753	2,162	1,043	1,992	2,989	1,554	625	148	1,174	3,543	5,266	5,551	7,937	5,006
PERCENTAGE OF PROFIT	14.2	30.0	22.1	12.6	23.6	32.1	20.0	12.1	1.7	16.3	27.5	36.3	38.5	46.0	29.1
REVENUE AT 50% L.F. OF AN A/C	6,601	9,184	9,184	7,175	8,036	9,471	7,175	4,449	6,888	6,458	12,628	15,211	15,355	19,373	17,077
PROFIT	-912	-2	-593	-1,109	-418	148	-598	-710	-1,918	-763	-245	703	945	2,125	-117
PERCENTAGE OF PROFIT	-12.1	.0	-6.1	-13.4	-4.9	1.6	-7.7	-13.8	-21.8	-10.6	-1.9	4.8	6.6	12.3	-.7

TABLE 10.24: Costs, Revenues and Profitability of Muscat - Medinah Sector

SECTOR : SHARJAH-DHAHRAN			DISTANCE : 294 NM 340 SM						FORECASTED NUMBER OF PASSENGERS : 43 PAXs PER TWO DAYS						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	231	259	277	243	255	338	280	180	334	311	607	721	736	955	993
BLOCK TIME (MIN)	89.8	83.9	89.8	83.9	83.9	74.0	73.0	71.0	62.3	66.2	68.2	68.2	71.3	63.3	69.3
(HRS)	1.50	1.40	1.50	1.40	1.40	1.23	1.22	1.18	1.04	1.10	1.14	1.14	1.19	1.06	1.15
AIRCRAFT HOURS/YEAR	2,899	2,836	2,899	2,836	2,836	2,719	2,706	2,679	1,822	2,611	2,640	2,640	2,684	2,567	2,656
AIRCRAFT CYCLES/YEAR	1,942	2,035	1,942	2,035	2,035	2,210	2,230	2,270	1,758	2,371	2,329	2,329	2,263	2,437	2,305
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	516	609	687	609	569	648	568	347	940	594	1,017	1,064	1,095	1,310	1,433
INTEREST	341	402	453	402	375	428	375	229	620	392	671	702	722	865	946
HULL INSURANCE	77	91	103	91	85	97	85	52	141	89	153	160	164	197	215
FUEL	162	181	194	170	178	237	196	126	234	218	425	504	515	668	695
COCKPIT & CABIN CREW ($209/HR)	313	292	313	292	292	258	254	247	217	231	237	237	248	220	241
USER CHARGES	247	277	304	269	266	309	290	206	291	246	427	457	464	564	536
MAINTENANCE	209	228	268	220	216	235	216	138	192	215	494	536	557	651	644
INDIRECT COST PER SECTOR (US$)	823	1,145	1,145	895	1,002	1,181	895	555	859	805	1,574	1,897	1,914	2,415	2,129
TOTAL COSTS	2,689	3,226	3,466	2,948	2,983	3,392	2,879	1,901	3,494	2,790	4,998	5,558	5,681	6,891	6,840
TOTAL COST/AIRCRAFT/N.M. (US$)	9.1	11.0	11.8	10.0	10.1	11.5	9.8	6.5	11.9	9.5	17.0	18.9	19.3	23.4	23.3
TOTAL COST/SEAT/SECTOR (US$)	58.5	50.4	54.2	59.0	53.3	51.4	57.6	61.3	72.8	62.0	56.8	52.4	53.1	51.0	57.5
TOTAL COST/SEAT/N.M. (CENTS)	19.9	17.1	18.4	20.0	18.1	17.5	19.6	20.8	24.7	21.1	19.3	17.8	18.0	17.4	19.5
REVENUE PER SECTOR PER MAX.43 PAXs OR A/C CAPACITY ($109/PAX)	4,687	4,687	4,687	4,687	4,687	4,687	4,687	3,379	4,687	4,687	4,687	4,687	4,687	4,687	4,687
PROFIT	1,998	1,461	1,221	1,739	1,704	1,295	1,808	1,478	1,193	1,897	-311	-871	-994	-2,204	-2,153
PERCENTAGE OF PROFIT	74.3	45.3	35.2	59.0	57.1	38.2	62.8	77.8	34.2	68.0	-6.2	-15.7	-17.5	-32.0	-31.5
REVENUE AT 100% L.F. OF AN A/C	5,014	6,976	6,976	5,450	6,104	7,194	5,450	3,379	5,232	4,905	9,592	11,554	11,663	14,715	12,971
PROFIT	2,325	3,750	3,510	2,502	3,121	3,802	2,571	1,478	1,738	2,115	4,594	5,996	5,982	7,824	6,131
PERCENTAGE OF PROFIT	86.5	116.3	101.3	84.9	104.6	112.1	89.3	77.8	49.8	75.8	91.9	107.9	105.3	113.5	89.6
REVENUE AT 75% L.F. OF AN A/C	3,761	5,232	5,232	4,088	4,578	5,396	4,088	2,534	3,924	3,679	7,194	8,666	8,747	11,036	9,728
PROFIT	1,072	2,006	1,766	1,140	1,595	2,003	1,208	634	430	889	2,196	3,108	3,066	4,145	2,888
PERCENTAGE OF PROFIT	39.9	62.2	50.9	38.7	53.5	59.0	42.0	33.3	12.3	31.9	43.9	55.9	54.0	60.2	42.2
REVENUE AT 65% L.F. OF AN A/C	3,259	4,534	4,534	3,543	3,968	4,676	3,543	2,196	3,401	3,188	6,235	7,510	7,581	9,565	8,431
PROFIT	570	1,309	1,068	595	984	1,284	663	296	-93	398	1,237	1,952	1,900	2,674	1,591
PERCENTAGE OF PROFIT	21.2	40.6	30.8	20.2	33.0	37.8	23.0	15.6	-2.7	14.3	24.7	35.1	33.4	38.8	23.3
REVENUE AT 50% L.F. OF AN A/C	2,507	3,488	3,488	2,725	3,052	3,597	2,725	1,690	2,616	2,453	4,796	5,777	5,832	7,358	6,486
PROFIT	-182	262	22	-223	69	205	-154	-211	-878	-337	-202	219	151	466	-354
PERCENTAGE OF PROFIT	-6.8	8.1	.6	-7.6	2.3	6.0	-5.4	-11.1	-25.1	-12.1	-4.0	3.9	2.7	6.8	-5.2

TABLE 10.25: Costs, Revenues and Profitability of Sharjah - Dharan Sector

SECTOR : SHARJAH-JEDDAH			DISTANCE : 926 NM 1067 SM						FORECASTED NUMBER OF PASSENGERS : 68 PAXs PER TWO DAYS						
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	577	675	775	679	663	938	731	466	915	746	1,520	1,801	1,742	1,920	1,998
BLOCK TIME (MIN)	236	225	236	225	225	183	181	178	150	161	163	163	159	138	149
(HRS)	3.93	3.75	3.93	3.75	3.75	3.06	3.02	2.97	2.49	2.68	2.72	2.72	2.65	2.36	2.49
AIRCRAFT HOURS/YEAR	3,590	3,564	3,590	3,564	3,564	3,447	3,440	3,429	2,366	3,362	3,370	3,370	3,354	3,274	3,366
AIRCRAFT CYCLES/YEAR	910	949	910	949	949	1,125	1,135	1,150	946	1,251	1,238	1,238	1,263	1,383	1,244
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	1,097	1,301	1,459	1,301	1,214	1,269	1,112	682	1,740	1,124	1,906	1,995	1,955	2,302	2,641
INTEREST	724	859	963	859	801	838	734	450	1,149	742	1,258	1,317	1,291	1,519	1,743
HULL INSURANCE	165	195	219	195	182	190	167	102	261	169	286	299	293	345	396
FUEL	404	472	542	475	464	657	512	326	640	522	1,064	1,260	1,219	1,344	1,398
COCKPIT & CABIN CREW ($209/HR)	822	783	822	783	783	639	632	621	521	560	567	567	554	493	562
USER CHARGES	630	695	752	677	670	764	722	537	724	626	1,005	1,066	1,079	1,272	1,218
MAINTENANCE	470	524	616	504	496	502	458	279	389	381	833	901	900	1,024	1,061
INDIRECT COST PER SECTOR (US$)	2,583	3,594	3,594	2,808	3,145	3,707	2,808	1,741	2,696	2,527	4,942	5,953	6,009	7,582	6,683
TOTAL COSTS	6,895	8,423	8,968	7,601	7,755	8,566	7,146	4,740	8,120	6,651	11,862	13,359	13,301	15,881	15,704
TOTAL COST/AIRCRAFT/N.M. (US$)	7.4	9.1	9.7	8.2	8.4	9.2	7.7	5.1	8.8	7.2	12.8	14.4	14.4	17.1	17.0
TOTAL COST/SEAT/SECTOR (US$)	149.9	131.6	140.1	152.0	138.5	129.8	142.9	152.9	169.2	147.8	134.8	126.0	124.3	117.6	132.0
TOTAL COST/SEAT/N.M. (CENTS)	16.2	14.2	15.1	16.4	14.9	14.0	15.4	16.5	18.3	16.0	14.5	13.6	13.4	12.7	14.2
REVENUE PER SECTOR PER MAX.68 PAXs OR A/C CAPACITY ($261/PAX)	12,006	16,704	16,704	13,050	14,616	17,226	13,050	8,091	12,528	11,745	17,748	17,748	17,748	17,748	17,748
PROFIT	5,111	8,281	7,736	5,449	6,861	8,660	5,904	3,351	4,408	5,094	5,886	4,389	4,447	1,867	2,044
PERCENTAGE OF PROFIT	74.1	98.3	86.3	71.7	88.5	101.1	82.6	70.7	54.3	76.6	49.6	32.9	33.4	11.8	13.0
REVENUE AT 100% L.F. OF AN A/C	12,006	16,704	16,704	13,050	14,616	17,226	13,050	8,091	12,528	11,745	22,968	27,666	27,927	35,235	31,059
PROFIT	5,111	8,281	7,736	5,449	6,861	8,660	5,904	3,351	4,408	5,094	11,106	14,307	14,626	19,354	15,355
PERCENTAGE OF PROFIT	74.1	98.3	86.3	71.7	88.5	101.1	82.6	70.7	54.3	76.6	93.6	107.1	110.0	121.9	97.8
REVENUE AT 75% L.F. OF AN A/C	9,005	12,528	12,528	9,788	10,962	12,920	9,788	6,068	9,396	8,809	17,226	20,750	20,945	26,426	23,294
PROFIT	2,110	4,105	3,560	2,186	3,207	4,354	2,641	1,328	1,276	2,158	5,364	7,391	7,644	10,545	7,591
PERCENTAGE OF PROFIT	30.6	48.7	39.7	28.8	41.4	50.8	37.0	28.0	15.7	32.4	45.2	55.3	57.5	66.4	48.3
REVENUE AT 65% L.F. OF AN A/C	7,804	10,858	10,858	8,483	9,500	11,197	8,483	5,259	8,143	7,634	14,929	17,983	18,153	22,903	20,188
PROFIT	909	2,434	1,890	881	1,745	2,631	1,336	519	23	983	3,068	4,624	4,852	7,022	4,485
PERCENTAGE OF PROFIT	13.2	28.9	21.1	11.6	22.5	30.7	18.7	11.0	.3	14.8	25.9	34.6	36.5	44.2	28.6
REVENUE AT 50% L.F. OF AN A/C	6,003	8,352	8,352	6,525	7,308	8,613	6,525	4,046	6,264	5,873	11,484	13,833	13,964	17,618	15,530
PROFIT	-892	-71	-616	-1,076	-447	47	-621	-695	-1,856	-778	-378	474	663	1,736	-174
PERCENTAGE OF PROFIT	-12.9	-.8	-6.9	-14.2	-5.8	.6	-8.7	-14.7	-22.9	-11.7	-3.2	3.6	5.0	10.9	-1.1

TABLE 10.26: Costs, Revenues and Profitability of Sharjah - Jeddah Sector

SECTOR : SHARJAH-RIYADH					DISTANCE : 480 NM 553 SM						FORECASTED NUMBER OF PASSENGERS : 39 PAXs A DAY				
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	332	376	417	362	373	515	410	265	501	436	873	1,036	1,029	1,271	1,322
BLOCK TIME (MIN)	133	127	133	127	127	108	106	103	87	94	96	96	96	87	95
(HRS)	2.22	2.11	2.22	2.11	2.11	1.79	1.76	1.72	1.45	1.57	1.60	1.60	1.60	1.45	1.59
AIRCRAFT HOURS/YEAR	3,224	3,185	3,224	3,185	3,185	3,055	3,039	3,021	2,051	2,939	2,958	2,958	2,958	2,869	2,953
AIRCRAFT CYCLES/YEAR	1,456	1,515	1,456	1,515	1,515	1,709	1,732	1,760	1,416	1,882	1,854	1,854	1,854	1,987	1,861
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	690	819	917	819	765	839	732	448	1,168	750	1,278	1,338	1,338	1,608	1,776
INTEREST	455	541	605	541	505	554	483	296	771	495	844	883	883	1,061	1,172
HULL INSURANCE	103	123	138	123	115	126	110	67	175	112	192	201	201	241	266
FUEL	232	263	292	253	261	360	287	186	351	305	611	725	720	890	925
COCKPIT & CABIN CREW ($209/HR)	465	441	465	441	441	375	368	360	304	327	334	334	334	302	332
USER CHARGES	360	400	435	388	384	443	417	303	418	357	596	636	645	772	736
MAINTENANCE	287	318	372	306	301	317	289	181	248	264	594	643	654	763	762
INDIRECT COST PER SECTOR (US$)	1,339	1,863	1,863	1,456	1,630	1,921	1,456	902	1,397	1,310	2,562	3,086	3,115	3,930	3,444
TOTAL COSTS	3,930	4,767	5,086	4,327	4,401	4,934	4,140	2,744	4,832	3,921	7,011	7,846	7,890	9,567	9,435
TOTAL COST/AIRCRAFT/N.M. (US$)	8.2	9.9	10.6	9.0	9.2	10.3	8.6	5.7	10.1	8.2	14.6	16.4	16.5	20.0	19.7
TOTAL COST/SEAT/SECTOR (US$)	85.4	74.5	79.5	86.5	78.6	74.8	82.8	88.5	100.7	87.1	79.7	74.0	73.7	70.9	79.3
TOTAL COST/SEAT/N.M. (CENTS)	17.8	15.5	16.6	18.1	16.4	15.6	17.3	18.5	21.0	18.2	16.6	15.5	15.4	14.8	16.6
REVENUE PER SECTOR PER MAX. 39 PAXs															
OR A/C CAPACITY ($155/PAX)	6,045	6,045	6,045	6,045	6,045	6,045	6,045	4,805	6,045	6,045	6,045	6,045	6,045	6,045	6,045
PROFIT	2,115	1,278	959	1,718	1,644	1,111	1,905	2,061	1,213	2,124	-966	-1,801	-1,845	-3,522	-3,390
PERCENTAGE OF PROFIT	53.8	26.8	18.8	39.7	37.4	22.5	46.0	75.1	25.1	54.2	-13.8	-23.0	-23.4	-36.8	-35.9
REVENUE AT 100% L.F. OF AN A/C	7,130	9,920	9,920	7,750	8,680	10,230	7,750	4,805	7,440	6,975	13,640	16,430	16,585	20,925	18,445
PROFIT	3,200	5,153	4,834	3,423	4,279	5,296	3,610	2,061	2,608	3,054	6,629	8,584	8,695	11,358	9,010
PERCENTAGE OF PROFIT	81.4	108.1	95.0	79.1	97.2	107.3	87.2	75.1	54.0	77.9	94.6	109.4	110.2	118.7	95.5
REVENUE AT 75% L.F. OF AN A/C	5,348	7,440	7,440	5,813	6,510	7,673	5,813	3,604	5,580	5,231	10,230	12,323	12,439	15,694	13,834
PROFIT	1,417	2,673	2,354	1,486	2,109	2,738	1,672	860	748	1,310	3,219	4,477	4,549	6,127	4,399
PERCENTAGE OF PROFIT	36.1	56.1	46.3	34.3	47.9	55.5	40.4	31.4	15.5	33.4	45.9	57.1	57.7	64.0	46.6
REVENUE AT 65% L.F. OF AN A/C	4,635	6,448	6,448	5,038	5,642	6,650	5,038	3,123	4,836	4,534	8,866	10,680	10,780	13,601	11,989
PROFIT	704	1,681	1,362	711	1,241	1,715	897	380	4	613	1,855	2,834	2,890	4,035	2,555
PERCENTAGE OF PROFIT	17.9	35.3	26.8	16.4	28.2	34.8	21.7	13.8	.1	15.6	26.5	36.1	36.6	42.2	27.1
REVENUE AT 50% L.F. OF AN A/C	3,565	4,960	4,960	3,875	4,340	5,115	3,875	2,403	3,720	3,488	6,820	8,215	8,293	10,463	9,223
PROFIT	-365	193	-126	-452	-61	181	-265	-341	-1,112	-433	-191	369	403	896	-212
PERCENTAGE OF PROFIT	-9.3	4.0	-2.5	-10.4	-1.4	3.7	-6.4	-12.4	-23.0	-11.1	-2.7	4.7	5.1	9.4	-2.2

TABLE 10.27: Costs, Revenues and Profitability of Sharjah - Riyadh Sector

REFERENCES

1. Jorg Hartenstein, Application of a market share model to the fleet planning process of a long-haul airline. (England: MSc thesis, CIT, 1991).

2. Baily, Graham and Kaplan, Deregulating the Airlines, (USA: mit, 1985) P.11.

3. Nawal K.Taneja, The Commercial Airline Industry, (USA: Lexington Books, 1976) pp.166-167.

4. Ibid, p.186.

OTHER REFERENCES

Jonathan L.S.Byrnes, Diversification Strategies for Regulated and Deregulated Industries (USA: Lexington Books, 1985).

Stephen Shaw, Airline Marketing and Management (London: Pitman Publishing, 1990)

Nawal K.Taneja, Airlines in Transition (USA: Lexington Books, 1981).

Andy Hofton, Classes and Seminar Notes (England: Cranfield Institute of Technology, 1991).

Rigas Doganis, Flying Off Course (England: Unwin Hyman Inc., 1985).

CHAPTER ELEVEN

SCHEDULING ON A POSSIBLE NEW GCC NETWORK

11.1 INTRODUCTION

Using all the data from the previous chapters, the objective of this chapter is to propose a possible new network in the GCC. However, an analysis and discussion of airline scheduling, such as its concepts, methodology and profitability, are part of the process of exploring new opportunities in the GCC.

Scheduling is one of the most critical and complex tasks in the airline industry and is directly related to the fleet planning and route planning processes explained in the previous Chapters. Its complexity stems from the conflicting objectives of needing to satisfy the passengers' requirements, economic efficiency, airline aims, operational feasibility, numerous constraints, and governmental demands (especially for government owned airlines). However, airline scheduling is critical because the timetable represents one of the primary product features and one of the main factors in the passenger's choice of a particular carrier. As a result, financial leverage and profitability depends on it.

A comprehensive definition could be mathematical, but for the purposes of this thesis, the essence of the main objective of scheduling in a financially motivated airline "is to balance the conflicting demand of maximising attractiveness and revenues gains against minimising costs".

Airline scheduling is as important as forecasting, fleet planning, pricing, or financing. However, it is processed in conjunction with market planning and fleet planning decisions. Nevertheless, since airline schedules are at the core of the product that is being offered to the passenger, they are ideally market driven processes and the resources should be provided accordingly.

Overall, airline scheduling could be defined as " the art of designing system-wide flight patterns that provide optimum public service, in both quantity and quality, consistent with the financial health of the carrier"[1]

11.2 DETERMINANTS OF PASSENGERS' CHOICE TO TRAVEL

Johnston et al[2] evaluated the choice of air carrier on routes in Canada made by 150 passengers. The results ranked reasons with order. These are flight schedule, safety, air fare, aircraft characteristics, the reservation system, services in the aircraft and at the airport.

Overall, the main factors that determine a passenger's choice of an air carrier appeared to be the following:

1. **Travel outlays**
2. **Travel time of different modes of transport**
3. **Flight frequency**
4. **Aircraft departure and arrival times**
5. **Bus and train departure schedules**
6. **Respecting departure schedules (punctuality)**

Although the most important factors are flight frequency and departure times, Simpson[3] notes that the effects of flight frequency and schedules on transportation demand are very rarely examined.

Table 11.1 gives the results of a study made by Fletcher[4] in a M.Sc. thesis of the basic factors that influenced 61 business passengers in their choice of a certain airline on the North Atlantic routes. Ranking each service feature with a range of 1-9, punctuality, comfort on board, legroom, safety, and schedule scored between 82-90%. However, cabin crew, food, and check-in scored between 71-76%. Finally, entertainment, immigration, airline image, cheap fare and advertisement scored between 34-63%. However, personal benefits were analysed in the same study and listed in the same table, resulting in a wider range of views because of the personal benefits gained in each

factor.

In a monopolistic situation, low or inadequate flight frequency or high load factor will result in an increase in the number of passengers refused carriage and a rise in the number who turn to other modes of transportation. On the other hand, if there are many carriers on the same route, it is even more important to accurately plan flight frequency and departure times to maximize the airline's market share.

11.3 AIRLINE SCHEDULING METHODOLOGY

11.3.1 Methods of Airline Scheduling

There are two main methods in airline scheduling. These are the following:

1. **FIXED AIRLINE SCHEDULING - this is the oldest and most widely used method. It is prepared in advance by the airline and valid for a certain period of time. Departure and arrival times are known for all the routes on these networks, printed in publications and given to the transportation market. However, Simpson[5] concluded that the main defect of this type of scheduling is "static" and not really adjusted sufficiently to passenger needs which vary with time.**
2. **DYNAMIC SCHEDULING - based on a theory introduced towards the end of 1960's. The objective is to adjust aircraft departure times as much as possible to passenger requests to increase the quality of service. The problem is that frequent changes in timetable are confusing and slot limits prevent its application in the real world.**

11.3.2. Approaches to Airline Schedule Design

Since scheduling involves complex process and numerous constraints, computer techniques are very much involved in scheduling models. Etschmaier and Mathaisel[6] noted the following two approaches to airline schedule design:[7]

1. **THE DIRECT APPROACH - this employs various heuristic procedures. It is clear particularly in recent years that an optimum airline schedule could not be**

accomplished using the classical mathematical programming because of the various factors that could not be adequately quantified. As a result, in order to produce an optimum airline schedule, an attempt to optimize the carrier's overall activities is definitely not possible.

2. **THE STEP-BY-STEP APPROACH - the process of scheduling in this approach is made using the following steps:**
   - **Determining the flight frequency on individual routes.**
   - **Determining the possible departure times and having considered the following:**
     - **Passenger requests**
     - **Convenient times of arrival**
     - **Convenient transfer points, planning short transfer waiting times for connecting passengers.**
   - **When departure times are established, the proposed schedule is tested with regard to operational constraints.**
   - **When departure times are adopted, fleet assignment will occur where each aircraft is given specific flight schedule over a certain period of time.**
   - **When aircraft have been routed, an analysis of the schedule's flexibility is made to find the possibility of decreasing the number of aircraft needed.**

11.3.3. Types of Airline Schedule

The following are the four basic schedule types used for assigning airline equipment:[8]

1. **NONSTOP - this type of scheduling is used more by major and national carriers as an alternative to hub and spoke. The main advantage of this type is to provide fast service between terminal points, and the disadvantage is that no intermediate stations receive service on these flights.**
2. **SKIP STOP - is providing one service and skipping one or more intermediate cities, with service provided by other carriers. For example, if an airline has service to points A, B, C, D, and E, skip stop scheduling will provide services A, C, and E, however, services to B and D will be provided by other flights. The**

advantage of this type of scheduling is to provide fast services to intermediate cities, but the disadvantage is the service is not provided to consecutive cities.

3. LOCAL SERVICE - a shorter range, small aircraft operates on a segment and connects at a larger airport to or from long-range, larger aircraft. The advantage of this type of scheduling is to provide fast service between small intermediate stations and terminals, however, the disadvantage is the need to change aircraft.
4. CROSS-CONNECTIONS - this type is the most frequently used in airline scheduling. It is similar to a hub system, bringing traffic to one city (hub) and connecting to other cities. As a result, it provides more daily service between points and has the advantage that one flight serves several markets. However, the disadvantage is the change of aircraft and traffic congestion.

These four schedule or network types have developed into complex patterns and more sophisticated arrangements. The most important of these is the hub and spoke which is based on the local service and cross connection arrangement. In the successful hub and spoke waves or banks of flights are synchronised to arrive and then depart to maximise connection possibilities (see Section 4.8). Other arrangements include the 'developed line' (i.e. line with branches) and the multi-hub (i.e. hubs with co-ordinated connecting services).

11.4 PRODUCT PLANNING

As regulation decreases (leaving aside the problem of airport and airspace congestion) the airlines should have a wider range of product choices. Product planning is " deciding what product features to offer in each market segment in which an airline is hoping to sell its services or products."[10]

Product planning is crucial in the following aspects:

1. It is a linkage to match potential demand with actual supply in the market it serves.
2. It has a direct impact on operating costs.

An airline's product centres on the schedule which is offered to customers. The scheduler has to consider very carefully which features are necessary to attract and satisfy the potential passengers in different market segments. This means that the scheduler has to understand the needs and requirements of the different market segments.

The following should be considered by schedulers because they influence an airline's potential customers:[11]

1. The schedule-based features of services being offered such as the number of frequencies operated, departure and arrival times, aircraft type, whether the flight is direct, stopping or require transfer connection. The scheduler has to understand that different market segments have different schedule requirements such as the following:
   - Short-haul business markets normally require a morning flight and an early evening flight in each direction in weekdays, so business trips can finish in a day.
   - For example, Scandinavian Airlines[12] SAS found from their passengers that two thirds of them care about departure and arrival time for their choice of an airline, and two third claimed that direct non-stop flights are also important.
   - Table 11.2 shows the results[13] of a survey made in 1987 by the International Federation of Airline Passenger Associations of more than 25,000 passengers, most of whom are likely to be business travellers. It identifies the most important features when choosing an airline.
   - North American passengers are more concerned about low fares (moderately important elsewhere), and frequent flyer program.

   Overall, fares and schedule-based features are the most important product components because they can be seen and objectively quantified.
2. The fares and fare conditions charged for different alternative routings.
3. Comfort-based product features. Liberalisation opened the doors for competition on comfort which intensified the need for product innovation. However, there are

three main aspects determine passenger perceptions:

- **The layout and configuration of the aircraft which include:**
  - **Width and pitch of each seat.**
  - **Number of separate classes of cabin and services.**
  - **The type of seats installed.**
  - **The number of toilets.**
  - **Interior design and colours.**
- **In-flight service and catering standards which could include the following:**
  - **Variety and quality of food and beverages**
  - **The number of cabin staff**
  - **The range of newspapers and magazines**
  - **Give-away gifts for first and business class and children**
  - **In-flight films**
- **Quality and variety of services on ground which could include the following:**
  - **Quality of handling staff**
  - **The provision of check-in desks to reduce the queuing time**
  - **Special ground facilities for first class such as**
    - **Special lounges**
    - **Office services**
    - **Car parking valets**
    - **Limousine service to collect and deliver passenger to and from their homes or offices**
    - **The speed of check-in time especially involving baggage**

4. **The convenience of access to an aircraft service which is usually reached through the following:**
   - **Layout and location of the sales offices**
   - **The availability of telephone lines for reservations**
   - **The assistance and helpfulness of counter or telephone staff**
   - **The role of travel agents in airline distribution**
5. **Airline image which could be improved or reduced through:**
   - **Reputation for consistent on-time performance and product delivery**

- **Promotion and advertising**
- **Airline logo**
- **Aircraft's colour schemes**
- **Aircraft's interior design**
- **Airport lounges and sales offices**
- **The quality of service from staff both in the air and on the ground.**

11.5 PRINCIPLES OF PROFITABILITY BASED ON THE SCHEDULE

An airline schedule determines the profitability and utilization of the airline's resources. It effects efficiency and costs. The following are eleven principles which must be addressed to achieve profitability, according to Mort Beyer. He believes that they are applicable in almost all situations:[14]

1. **Usually the dominant airline offers the greatest frequency and maximum seats and enjoys higher load factor and yields than its competitors.**
2. **Normally airlines dissipate their resources by spreading them too thinly trying to serve too many markets.**
3. **Frequently airline schedulers chase the load factor and down-size aircraft used on routes, which results in losing more passengers than offsetting any gain in load factor.**
4. **Most of the scheduling decisions are made by top executives on an impulse basis and end up bringing unpleasant results.**
5. **If a new route does not mature in two months, the airline should cut it out because it will never mature profitably.**
6. **Few international carriers schedule the same flight number through their hubs. A through flight normally flies five times more passengers over the hub than a connection.**
7. **Many airlines utilize all types of aircraft they own on a given route.**
8. **Many non-USA airlines do not care about establishing self-feed.**
9. **Many airlines resist changing their schedule. They offer traditional routes at specific times regardless of the other benefits in terms of connections, and through routing.**

10. **Many airlines enjoy blaming the scheduling department first for inefficient operations, low load factor and high costs.**
11. **With many and fast changes in the airline industry, an airline's scheduling should be flexible to meet those competitive changes. These include hubs replacing linear routes in the USA, business class dominating long-haul routes, frequent flyer programs, CRS systems, and discounted fares.**

11.6 THE SCHEDULING PROCESS

The scheduling department is one of the most important in an airline because it is responsible for the airline product on offer to the customers. In addition, scheduling increases its importance in a liberalised market where competition also exists on fares and quality of service. There is no perfect airline scheduling process because of the conflicting objectives, complexity and serious constraints involved.

Figure 11.1 is a general framework for the scheduling process. It involves corporate strategy, fleet planning, marketing planning, scheduling inputs, computer models, committee meetings, scheduling outputs, and finally agreeing the final schedule.

The scheduling department will receive data from inside and outside the airline, and it should consider external and internal factors very carefully because they consist of constraints, objectives and requirements.

11.6.1. Corporate Strategy

Airline schedulers should be aware and very well informed about corporate strategy especially in the four areas which are listed below:

1. **Financial objectives including gaining the best return for shareholders.**
2. **Economic objectives to make the best overall use of resources.**
3. **Market growth which will define the route expansion strategy of an airline through for example, the bilateral agreement between countries for international flights and expanding in the current market.**
4. **The competition which is currently effecting an airline's market. Schedulers**

should be knowledgeable about corporate strategy regarding competition and measures and plans to react in the marketplace.

11.6.2. Marketing Planning

Data will be received from marketing planning covering information about the marketing strategy that the airline is adopting, its marketing objectives, traffic growth, new markets and routes and market shares.

A schedule planner should consider the following marketing factors:

1. **The size of a given market and forecasting its future growth.**
2. **The effect of the planned product changes on the airline's own share of the total market.**
3. **Planning actions to meet competition.**
4. **The need to deny opportunities to competitors.**
5. **Estimating revenues and costs of the alternative plans and deciding which will be more profitable.**
6. **Other factors such as trip length, time zones, and proximity of the airport to the market served.**

The following are the main external factors with respect to marketing:

1. **Hotel check-in and check-out**
2. **Travel agents requirements in terms of consistency**
3. **Freight forwarders need for end of day, end of week departures**
4. **Rental car availability**

Many airline marketing problems are unique for the following reasons:

1. **The financial leverage of load factors.**
2. **The problem of traffic flow between sectors.**
3. **The operational constraints to accomplish schedule adjustments as desired**

because of problems of time zones, equipment turn-around, station personnel, and chain reaction effect.

4. **The sensitivity of schedule saleability to even small differences in departure and arrival times or other factors.**

11.6.3. Fleet Planning

Information will be fed to the scheduling department from the fleet planning department. Information such as the number of aircraft in the fleet in the present and future, their physical performance, maintenance needs and most important operating costs.

11.6.4. External Factors

The external factors include mainly airport and ATC controls, marketing and insurance policies (i.e. overnighting in high risk areas).

11.6.4.1 Controls

The external controls include the following points:

1. **Airport controls - This involves the two factors:**
   - **Capacity restriction. The important airports of Europe and the USA are congested at peak times. Therefore, a bargaining process is necessary between the airlines for use of the available runway, apron and terminal capacity. Schedules have to be co-ordinated well in advance.**
   - **Night flying restrictions. Many airports close at certain times at night for departures and arrivals.**
2. **Airspace controls - The imposition of "flow control" has been increasing in recent years as a method of making demand match available capacity.**
3. **Regulatory controls - They effect scheduling freedom for the following reasons:**
   - **The bilateral agreements may limit the capacity and sometimes the timing which can be flown by airlines from each country.**
   - **Even in domestic flights, airlines may enter into pooling and capacity agreements among themselves.**

- **Transit/overflight rights could be difficult to obtain.**

4. **Time zones - This is an important factor affecting schedule action. The airline scheduler should plan departure and arrival times with regard to time zones differences and the times passengers prefer to travel.**

11.6.4.2. Insurance Policies

Insurance policies usually do not cover night stops in war zones. In addition, political or military instability could close vital airspace from time to time which would force airlines to re-plan in the short or longer term. Such cases occurred during the Gulf crisis when the airlines changed their flight schedules involving that part of the world. The new schedules required longer time to travel between stations to avoid the new restricted areas, and fares had to rise to cover the increase in insurance.

11.6.5. Internal Factors

The internal factors affecting scheduling usually include maintenance requirements, aircraft availability, flight operations, hub connection, ground equipment and facilities requirements.

11.6.5.1 Maintenance Requirements

Maintenance requires that certain stations be provided with personnel and facilities for periodic checks. The schedule should allow the aircraft to arrive in the correct time and location for maintenance, especially under a "progressive" system. However, the main maintenance efficiency goals are the following:

1. **Minimum aircraft out-of-service time.**
2. **Utilize maximum time allowable on aircraft and parts between overhauls.**
3. **Optimum utilization of personnel and workload.**
4. **Maximum utilization of facilities.**

11.6.5.2 Aircraft Availability

Successful airlines utilize their aircraft and personnel efficiently, however, airline schedulers are faced with problems with the availability of aircraft due to maintenance,

additional frequencies or more routes.

11.6.5.3 Flight Operations

Once flight schedules are published, they should be flown within the limits of safe and efficient operation. However, the following are the important operational factors in schedule planning:[15]

1. **Airport runway lengths**
2. **Aircraft fleet capacity**
3. **Adverse weather**
4. **Routing and air traffic control**
5. **Crew flight time limits**
6. **Employee agreements**

11.6.5.4 Ground and Facilities Requirements

The objective of ground service is "to accommodate as many flights as possible and as efficiently as possible, consistent with physical limitations and prudent utilization of personnel and equipment". However, the schedule planner should consider the following:[16]

1. **Providing enough gate positions for a large number of aircraft simultaneously.**
2. **Providing adequate ticket-counter space to handle the passengers speedily, and efficiently making best use of a number of ticket counter, ramp, and food services personnel.**
3. **Allowing sufficient time for on-line or interline transfer of passengers, baggage, cargo and mail.**
4. **Providing the right ground equipment such as baggage vehicles, aircraft starter units, fork-lift trucks, cargo conveyors and tow tractors.**

Overall the schedule planner is faced with a variety of challenges in ground operations, many of which are conflicting.

11.6.6. Computer Model

Most airlines except the smallest utilize computer-based techniques which model the effects of frequency, routing, capacity, timing and load factor on the overall levels of traffic especially on market shares and revenue gains compared with costs and investments.

11.6.7. Objective

The objective of the airline computer model is to maximize attractiveness, revenues, and minimize costs.

The following objective functions are the most frequent (Simpson):[17]

1. Maximising the airline's profit
2. Minimizing the fleet size
3. Minimizing the operating costs
4. Maximizing the total benefits to the airline and society

11.6.8. Committee Meeting

In many airlines, a committee meeting will be held to consider the outputs of the computer model. Senior executives provide comments and consultations before proceeding to the final scheduling decisions. Alterations could be made to the scheduling inputs and the computer model program.

11.6.9. Scheduling Outputs

The computer model should give numerous outputs, and the listed below are the main scheduling outputs:

1. Flight times and routings
2. Crew schedules.
3. Fleet schedules.
4. Gates schedules.
5. Fuel requirements.
6. Maintenance schedules.

Particular care must be taken to ensure that the proposed schedule can accept the inevitable changes in internal and external factors otherwise poor on-time performance will result. This flexibility and ability to recover from problems is often known as "robustness".

11.7 A POSSIBLE NEW GCC NETWORK

The new network proposed in this thesis contains 16 possible routes that can be operated profitably in the GCC. These routes have been selected according to the forecast given in the previous chapters. In addition, this network is only a sample of what could be viable financially and operationally. Other new routes were found feasible but the sample of 16 was used as an example.

Table 11.3 shows the proposed network together with number of frequencies on each route, and forecasted daily passengers.

The Challenger RJ jet aircraft with 50 seats capacity was selected in the previous chapter for its speed, capacity, comfort, total costs and profit potential. In addition, according to the forecasted demand on each route and the number of frequencies which are planned to be provided, six Challenger RJ aircraft were found to be the right figure to start the new network. If more than six aircraft were scheduled, it would cost more. If the number of aircraft were reduced, the quality of service would decrease and the punctuality will suffer.

The main objective of this flight schedule is to provide a high quality of service which the GCC market is sensitive to (Chapter 8). A confirmation of the quality of service results in Chapter 8 was made during an interview with the executive vice president of the corporate planning department of Gulf Air in January, 1991.[18]

The quality of service of this network will be maximised by:

1. **Providing direct flights only.**
2. **Jet aircraft services only.**

3. The departure and arrival times are those desired by the public with an earliest morning flight at 07:00 and latest night flight at 21:00.
4. Business travellers are provided with morning and evening flights on the same day on the same routes.
5. The plan would be to supply excellent services on board aircraft and on the ground.

This new airline would have a strong probability of offering the best services, most competitive fares, most efficient operating costs and one of the highest profits for the reasons indicated below:

1. Most of the present airlines are government owned and usually have high operating costs.
2. Most of the competitive airlines do not consider the quality of service factors very carefully because they enjoy a full monopoly in their markets.
3. There is no income taxes in the GCC countries.
4. There are no labour unions in the GCC market.

Figure 11.2 shows the scheduling plan for the whole network with origin and destination stations which are Kuwait, Bahrain, Abha, Taif, Dubai and Medinah. The average utilization of each aircraft is 8 block hours per day. Table 11.4 illustrates comparative utilization and load factors for a cross section of world carriers.

Table 11.5 is the timetable for the network. It indicates for each route the departure and arrival times, flight numbers, and aircraft registration code.

11.8 FINANCIAL STATUS OF THE NEW NETWORK

As a rule, the only factor that will allow a commercially based organization to stay in business in a free enterprise environment is by making profit. Otherwise, such an organization will get into difficulty and may go out of business.

One of the main objectives of this research is to prove that a new carrier in the GCC airline industry could operate profitably.

Table 11.6 exhibits the total costs of the new airline. Detailed explanations about the total costs (direct and indirect) of the routes were made in the previous chapter.

However, Table 11.7 shows for each route revenues per sector, maximum forecasted traffic, aircraft capacity, profit, and percentage of profit (i.e. profitability). These revenue figures are calculated separately in the following different cases:

1. **Using forecasted sector traffic.**
2. **Using 100% load factor.**
3. **Using 75% load factor.**
4. **Using 65% load factor.**
5. **Using 50% load factor.**

The above cases were analysed so a wider financial view could be projected for better planning results. Nevertheless, the average percentage of profit for the whole network is 42% for the forecasted sector traffic case, and an average of 2% for 65% load factor. The prices which were used in this analysis are similar to the prices of the other airlines. It should be noted that the revenues which indicated above are from passengers only. Table 11.7 shows some routes which are more profitable than others. On the other hand, revenues from freight, excess baggage and mail were disregarded in this study. Gulf Air, Saudia and Kuwait Airways generate the following percentages of operating revenues:[19]

Type of Revenue	**Gulf Air**	**Kuwait Airways**	**Saudia**	**Average**
Passengers (%)	**86.9**	**80.7**	**84.1**	**83.9**
Excess baggage (%)	**3.9**	**4.4**	**2.8**	**3.7**
Freight (%)	**8.4**	**14.1**	**11.6**	**11.4**
Mail (%)	**0.8**	**0.8**	**1.5**	**1.0**

If the averages of these different revenues of the three carriers are applied to the financial analysis of the proposed network, the following results will be obtained:

		Percentage Profitability
1.	**Total daily percentage of profitability from passengers only:**	
	■ **As per forecasted passengers**	**38%**
	■ **As per 65% load factor**	**1.9%**
2.	**Total daily percentage of profitability from passengers, excess baggage and mail (Table 11.8):**	
	■ **As per forecasted passengers**	**45%**
	■ **As per 65% load factor**	**7%**
3.	**Total daily percentage of profitability from passengers, freight, excess baggage and mail (Table 11.9):**	
	■ **As per forecasted passengers**	**65%**
	■ **As per 65% load factor**	**21%**

11.9 CHAPTER CONCLUSIONS

Airline scheduling is crucial to a carrier's success because it is the key to the product that is offered to the passengers. On the other hand, the airline scheduling process is complex and critical because of the involvement of conflicting objectives.

As a result, a balancing of those conflicting objectives should be carried out very carefully. Such objectives are airline aims, economic efficiency and operational feasibility and public service requirements. The main scheduling objective is to balance the conflicting demand of maximising attractiveness and revenues gains against minimizing costs. It should be considered that there is no schedule that satisfies everyone, however, a compromise should be made amongst all the conflicting objectives.

A new pattern of GCC routes which complement the existing network has been analysed and presented in this chapter. The network involves Kuwait, Abha, Madinah, Taif,

Bahrain, and Dubai with total daily of 24 frequencies between those stations. Six Challenger RJ jet aircraft have found to be the right figure, giving an average daily utilisation of 8 block hours per aircraft.

This new network has been analysed and proven to be financially feasible. All the routes make an attractive profit for any new carriers operating them. The percentage of profit of the whole network is calculated and is commercially attractive for at least one new regional airline.

However, if this new network is introduced in real life, changes and alterations to this planned schedule would be likely to occur after a certain period of time. This is because of the feedback that will be received from each route.

Because these new routes do not exist at the present time in the form of direct services, the actual carrier would have to dynamically decide alterations to frequencies and departure and arrival times. Mr Al-Maskary[29] indicated that forecasting new routes could produce the unexpected, giving an example of opening a new route by Gulf Air from Nairobi. It was not forecasted that it would attract first and business passengers flying to and from the Far East. In practice the route was a success.

The previous Chapter noted the merits of judgemental forecasts as a complement to a gravity model. Judgement suggests that traffic to certain cities on the proposed network, especially Medinah and Taif, could be much higher than the gravity model suggests. This is because of their important locations for religious visitors. (Medinah is a holy city, and Taif is located close to the holy city of Mecca, in addition, Taif is also a tourist city). In practice any new airline would be able to adjust its schedule accordingly.

FIGURE 11.1: General Process of Airline Scheduling.

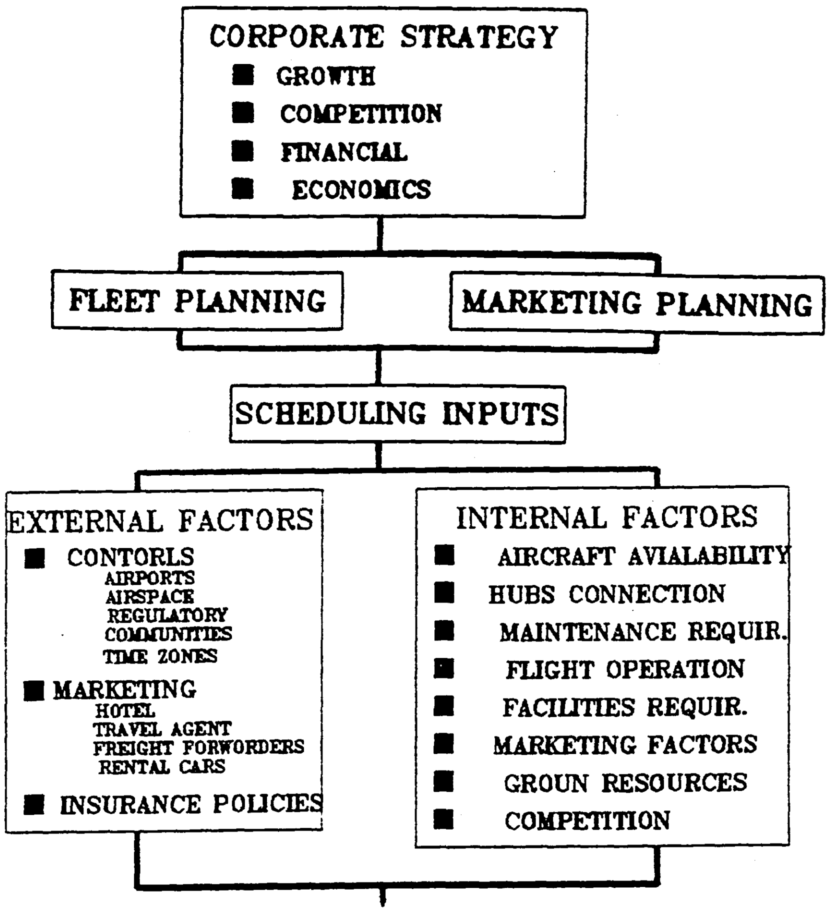
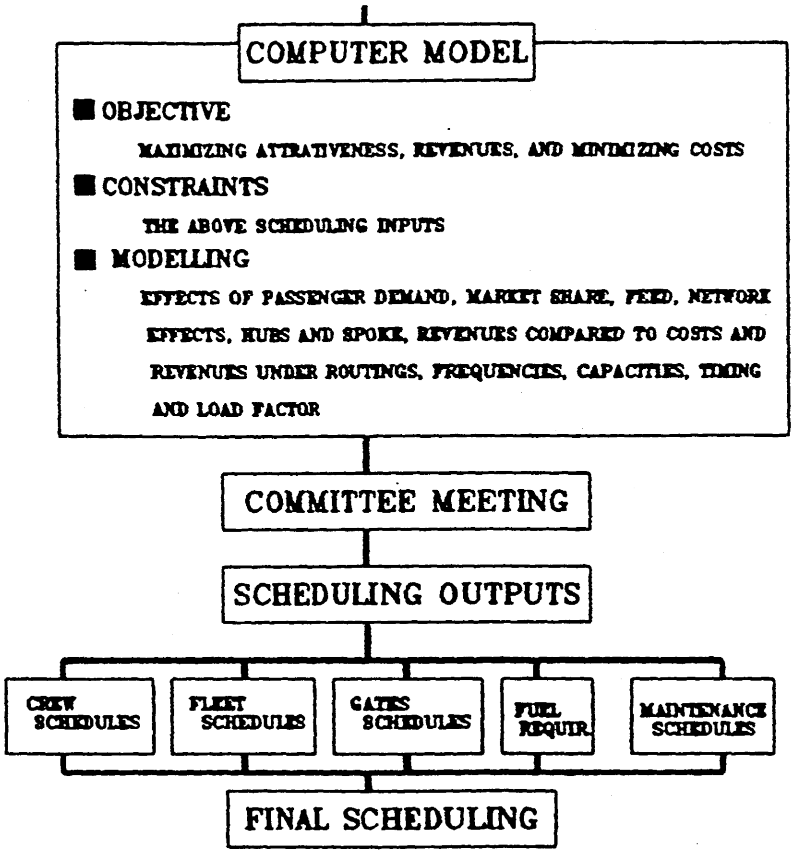


FIGURE 11.1 (Continued): General Process of Airline Scheduling



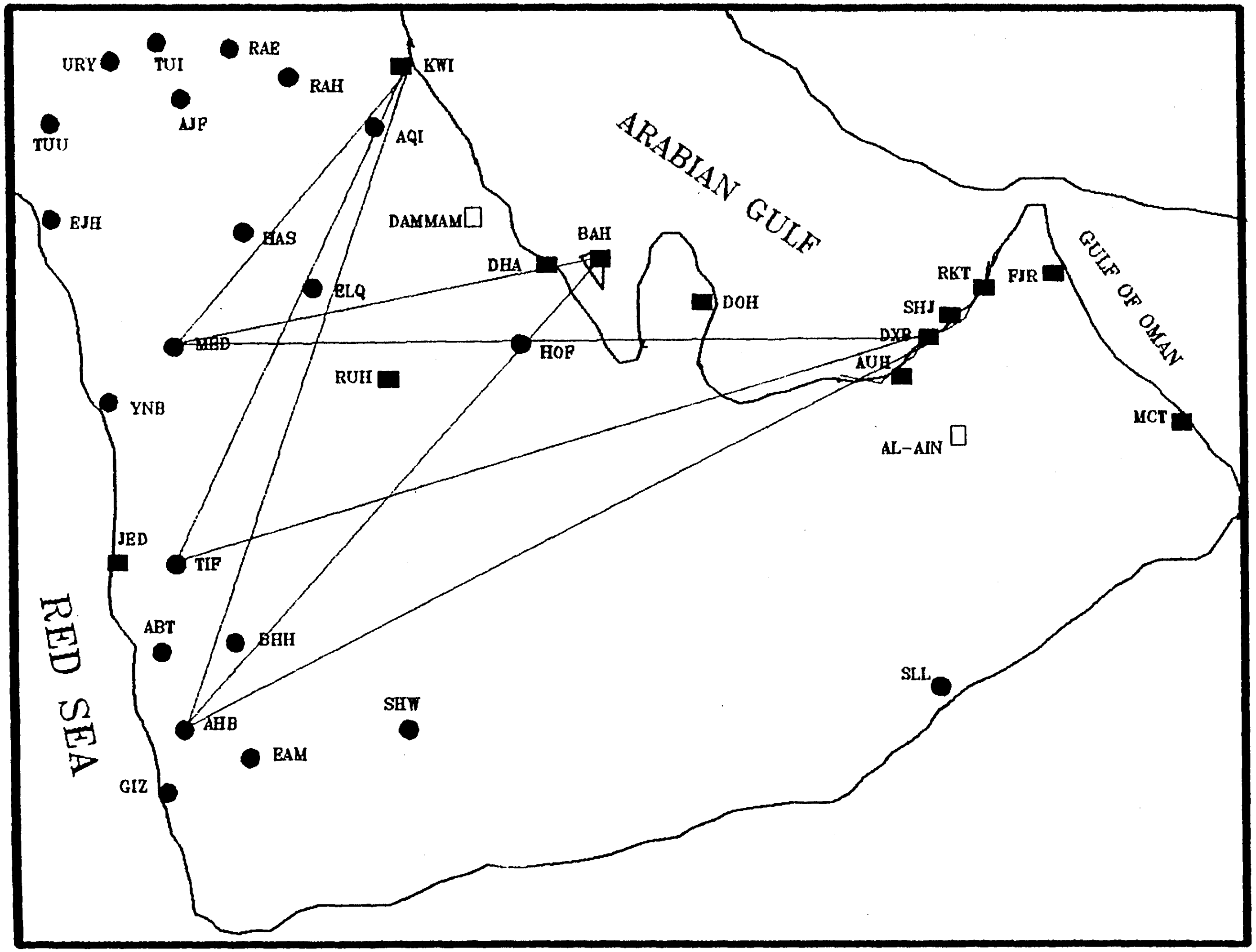


FIGURE 11.2: The GCC Scheduling Plan.

TABLE 11.1: Basic Factors Influencing Business Passenger's Choice of an Airline on North Atlantic Routes.

SERVICE FEATURES	RANK	PERCENTAGE
Punctuality	1	90
Comfort on Board	2	89
Legroom	3	87
Safety	4	86
Schedule	5	82
Cabin Crew	6	76
Food	7	71
Check-In	8	71
Entertainment	9	63
Immigration	10	63
Airline Image	11	60
Cheapest Fares	12	56
Advertisement	13	34
PERSONAL BENEFITS		
Separate Check-In	1	83
Sleeper-Recliner Seat	2	83
Extra Space on Board	3	81
Complimentary Travel	4	79
Priority Boarding and Embarkation	5	73
Lounge Facilities	6	72
Free Standby Ticket	7	69
Menu/Wine Selection	8	64
Frequent Flyer Scheme	9	63
On-Board Communication	10	39

SOURCE : COMPILED FROM FLETCHER'S M.Sc. THESIS

TABLE 11.2: The Survey Results of 25,000 Respondents on the Importance of Product Features in Airline Choice.

FEATURE	The three features identified as most important when choosing an airline: Under 2-hour flight %	Under 2-hour flight Rank	2-5 hour flight %	2-5 hour flight Rank
SCHEDULE-BASED FEATURES:				
Punctuality	54	1	36	4
Convenient schedules	48	2	42	1=
Frequency	45	3	21	6
Aircraft Type	9	11=	12	8
COMFORT-BASED FEATURES				
Seating comfort	18	5=	42	1=
Check-in & boarding	15	7	9	9=
In-flight service	12	8=	33	5
Carry-on baggage space	12	8=	6	12
Reassigned seats	9	11=	9	9=
OTHERS:				
Safety and security	33	4	39	3
Low fares	18	5=	15	7
Efficient reservations	12	8=	9	9=

Compiled from IFAPA (1988)

SOURCE : RIGAS DOGANIS, FLYING OFF COURSE

TABLE 11.3: The New Routes of the Proposed Network.

CITYPAIR	NUMBER OF FREQUENCIES	DAILY FORECASTED TRAFFIC
1. Kuwait-Medinah	2	72
2. Kuwait-Abha	2	63
3. Kuwait-Taif	1	35
4. Medinah-Kuwait	2	72
5. Medinah-Bahrain	1	49
6. Medinah-Dubai	2	96
7. Bahrain-Medinah	1	49
8. Bahrain-Abha	1	47
9. Abha-Kuwait	2	63
10. Abha-Bahrain	1	47
11. Abha-Dubai	2	97
12. Taif-Kuwait	1	35
13. Taif-Dubai	1	53
14. Dubai-Medinah	2	96
15. Dubai-Abha	2	97
16. Dubai-Taif	1	53

TABLE 11.4: Comparative Utilizations and Load Factors

COMPARATIVE UTILISATIONS

	Average daily utilisation (hrs)	No. of aircraft
UTA	10.6	10
Cruzeiro	10.5	14
Air India	10.3	17
Lufthansa	10.0	110
Qantas	10.0	26
Sabena	9.9	24
American	9.6	290
Aeromexico	9.5	43
Pan Am	9.5	109
JAL	9.1	82
TWA	9.0	165
Swissair	8.9	50
CPAir	8.9	37
Eastern	8.8	289
Mexicana	8.6	46
KLM	8.5	52
Vasp	8.3	30
BCal	8.2	29
Iberia	8.2	85
United	8.2	325
Air France	8.2	99
British Airways	8.0	136
Alitalia	8.0	86
Air Canada	7.9	121
Continental	7.9	131
Air New Zealand	7.8	33
Egyptair	7.8	27
Philippine	7.7	32
TAA	7.7	29
Gulf Air	7.5	20
Finnair	7.3	32
Flying Tiger	7.3	34
Alia	7.3	16
PIA	7.3	36
JAT	7.3	27
Indian Airlines	7.2	48
Icelandair	7.1	11
Austrian	7.1	17
Royal Air Maroc	7.1	18
Avianca	7.0	25
Braathens	6.9	16
SAS	6.8	95
Tunis Air	6.7	15
Air Algerie	6.7	25
Saudia	6.6	85
Aer Lingus	6.5	22
Inex Adria	6.5	11
Trans Brasil	6.5	21
Ansett	6.4	36
Aviaco	6.4	30
Kuwait	6.3	18
Varig	6.2	65
Kenya	5.9	10
TAP	5.9	28
British Midland	5.9	20
AeroPeru	5.7	10
Garuda	5.7	74
SAA	5.6	40
Iran Air	5.6	27
Air UK	5.5	24
THY	5.5	31
Olympic	5.3	53
Lloyd Aero Boliviano	4.8	11
Quebecair	4.7	16
Crossair	4.3	15
MEA	4.2	14
Ethiopian	4.0	28
Air Queensland	4.0	16
Malev	3.9	22
LOT	3.8	40
Air Zimbabwe	3.5	12
Syrian Arab	3.4	14
Libyan Arab	3.1	31
Cubana	2.7	41
CSA	2.4	42
Air Zaire	2.3	10

COMPARATIVE SCHEDULED LOAD FACTORS

	Load Factor (%)	Average length of haul (km)
Cubana	77.5	1,135
Iran Air	76.5	951
Icelandair	76.1	1,075
LOT	74.9	921
Indian Airlines	74.3	566
Ansett	74.1	800
Philippine	74.0	882
TAA	73.8	781
Air New Zealand	71.0	633
CP Air	69.8	1,639
Aer Lingus	69.3	650
TAP	68.8	1,565
UTA	68.7	3,185
British Airways	68.6	1,279
Air Algerie	68.1	1,344
JAL	68.0	2,436
Air France	67.9	1,384
KLM	67.5	1,733
SAS	67.4	687
Air Zimbabwe	66.7	887
PIA	66.3	1,023
Iberia	66.2	944
TWA	66.0	1,531
Olympic	66.0	687
Sabena	65.7	1,216
Air India	65.5	2,504
Tunis Air	65.3	1,065
Air Canada	64.9	1,240
Varig	64.9	1,251
Continental	64.8	1,336
Alitalia	64.7	875
American	64.6	1,337
Swissair	64.6	1,127
Lloyd Aero Boliviano	64.6	732
CSA	64.4	1,079
Avianca	64.1	737
Cruzeiro	64.1	743
JAT	63.9	717
Trans Brasil	63.9	691
United	63.3	1,230
Pan Am	63.0	1,974
Qantas	62.8	4,149
Lufthansa	62.0	1,059
Aeromexico	62.0	887
Kenya	61.9	1,188
VASP	61.8	668
SAA	61.6	1,211
Braathens	61.2	264
BCal	61.0	1,440
Aviaco	61.0	442
Saudia	60.7	1,105
Eastern	60.3	961
THY	59.5	856
Malev	58.8	1,145
Mexicana	58.6	1,005
Libyan Arab	58.3	990
Royal Air Maroc	58.3	1,951
Syrian Arab	57.7	1,642
Alia	57.7	1,713
Air Queensland	57.6	248
British Midland	57.3	394
Gulf Air	57.1	887
Egyptair	56.7	1,200
Aeroperu	55.1	778
Kuwait	55.0	1,837
Air UK	54.8	291
Garuda	54.6	681
Air Zaire	53.2	1,254
Ethiopian	52.7	774
Quebecair	51.2	330
Inex Adria	49.7	417
Austrian	49.3	849
Crossair	47.7	272
MEA	46.4	1,487

Source: Iata World Air Transport Statistics 1985.
Note: Only carriers with fleets of over 10 aircraft reporting to Iata have been included.

TABLE 11.5: The Timetable of the Proposed Network

CITY PAIR	DEP/ARR	FLIGHT NUMBER	AIRCRAFT REGISTRATION NUMBER
Kuwait-Medinah	0930-1110	001	Q01
	1610-1750	002	Q06
Kuwait-Abha	0700-0910	003	Q03
	1620-1830	004	Q04
Kuwait-Taif	1300-1446	005	Q05
Medinah-Kuwait	0700-0840	006	Q01
	1830-2010	007	Q06
Medinah-Bahrain	1010-1200	008	Q02
Medinah-Dubai	1150-1410	009	Q01
	1600-1820	010	Q02
Bahrain-Medinah	1300-1500	011	Q02
Bahrain-Abha	0700-0900	012	Q05
Abha-Kuwait	0950-1200	013	Q05
	1310-1520	014	Q06
Abha-Bahrain	1900-2100	015	Q03
Abha-Dubai	0700-0920	016	Q06
	0950-1210	017	Q03
Taif-Kuwait	1320-1506	018	Q04
Taif-Dubai	0700-0919	019	Q04
Dubai-Medinah	0700-0920	020	Q02
	1800-2020	021	Q01
Dubai-Abha	1000-1420	022	Q06
	1600-1820	023	Q03
Dubai-Taif	1010-1229	024	Q04

TOTAL OPERATING COSTS OF THE PROPOSED NETWORK (PART ONE)										
	KUWAIT-MADINAH-KUWAIT			KUWAIT-ABHA-KUWAIT			KUWAIT-TAIF-KUWAIT		BAHRAIN-MADINAH-BAHRAIN	
SECTOR ORIGIN AND DESTINATION / NUMBER OF AIRCRAFT	KWI-MED ONE A/C	KWI-MED TWO A/C	KWI-MED-KWI FOUR A/C	KWI-AHB ONE A/C	KWI-AHB TWO A/C	KWI-AHB-KWI FOUR A/C	KWI-TIF ONE A/C	KWI-TIF-KWI TWO A/C	BAH-MED ONE A/C	BAH-MED-BAH TWO A/C
FIRST COST (US$ MN)	15	30	60	15	30	60	15	30	15	30
NUMBER OF SEATS	48	96	192	48	96	192	48	96	48	96
MAX. TAKE-OFF WEIGHT (KG)	21	43	86	21	43	86	21	43	21	43
BLOCK FUEL (lbs) [1 lb=.147 GAL]	541	1,082	2,164	725	1,449	2,898	625	1,251	613	1,227
BLOCK TIME (MIN)	93.2	186.4	372.9	120.9	241.9	483.8	106.0	211.9	104.1	208.3
(HRS)	1.55	3.11	6.21	2.02	4.03	8.06	1.77	3.532	1.74	3.47
AIRCRAFT HOURS/YEAR	2,094	4,189	8,378	2,251	4,501	9,003	2,174	4,348	2,164	4,329
AIRCRAFT CYCLES/YEAR	1,352	2,703	5,406	1,118	2,237	4,473	1,233	2,466	1,247	2,494
DIRECT COST PER SECTOR (US$)										
DEPRECIATION	1,223	2,446	4,892	1,477	2,954	5,908	1,340	2,680	1,323	2,646
INTEREST	807	1,614	3,229	975	1,950	3,900	884	1,769	873	1,747
HULL INSURANCE	183	367	734	222	443	886	201	402	198	397
FUEL	379	757	1,515	507	1,014	2,029	438	875	429	859
COCKPIT & CABIN CREW ($209/HR)	325	649	1,299	421	843	1,685	369	738	363	726
USER CHARGES	447	895	1,790	583	1,167	2,334	510	1,020	501	1,002
MAINTENANCE	262	524	1,048	324	649	1,297	291	581	287	573
INDIRECT COST PER SECTOR (US$)	1,523	3,045	6,090	2,099	4,198	8,396	1,787	3,575	1,750	3,499
TOTAL COSTS	5,149	10,298	20,596	6,609	13,218	26,435	5,820	11,640	5,724	11,448
TOTAL COST/AIRCRAFT/N.M. (US$)	9.9			9.2			9.5		9.5	
TOTAL COST/SEAT/SECTOR (US$)	107.3			137.7			121.2		119.3	
TOTAL COST/SEAT/N.M. (CENTS)	20.5			19.1			19.8		19.8	

TABLE 11.6: The Total Costs of the New Network.

TOTAL OPERATING COSTS OF THE PROPOSED NETWORK (PART TWO)										
	BAHRAIN-ABHA-BAHRAIN		DUBAI-MADINAH-DUBAI			DUBAI-ABHA-DUBAI			DUBAI-TAIF-DUBAI	
SECTOR ORIGIN AND DESTINATION NUMBER OF AIRCRAFT	BAH-AHB ONE A/C	BAH-AHB-BAH TWO A/C	DXB-MED ONE A/C	DXB-MED-DXB TWO A/C	DXB-MED-DXB FOUR A/C	DXB-AHB ONE A/C	DXB-AHB TWO A/C	DXB-AHB-DXB FOUR A/C	DXB-TIF ONE A/C	DXB-TIF-DXB TWO A/C
FIRST COST (US$ MN)	15	30	15	30	60	15	30	60	15	30
NUMBER OF SEATS	48	96	48	96	192	48	96	192	48	96
MAX. TAKE-OFF WEIGHT (KG)	21	43	21	43	86	21	43	86	21	43
BLOCK FUEL (lbs) [1 lb=.147 GAL]	662	1,325	847	1,694	3,388	820	1,640	3,280	840	1,681
BLOCK TIME (MIN)	112	223	139	279	558	135	271	541	138	277
(HRS)	1.9	3.7	2.3	4.6	9.3	2.3	4.5	9.0	2.3	4.6
AIRCRAFT HOURS/YEAR	2,204	4,407	2,328	4,655	9,310	2,312	4,625	9,249	2,324	4,648
AIRCRAFT CYCLES/YEAR	1,189	2,377	1,004	2,007	4,015	1,026	2,053	4,106	1,009	2,018
DIRECT COST PER SECTOR (US$)										
DEPRECIATION	1,391	2,782	1,647	3,293	6,586	1,609	3,219	6,437	1,638	3,275
INTEREST	918	1,836	1,087	2,173	4,347	1,062	2,124	4,249	1,081	2,162
HULL INSURANCE	209	417	247	494	988	241	483	966	246	491
FUEL	464	927	593	1,186	2,372	574	1,148	2,296	588	1,177
COCKPIT & CABIN CREW ($209/HR)	389	777	486	971	1,943	472	943	1,886	482	964
USER CHARGES	537	1,075	674	1,348	2,697	654	1,309	2,617	669	1,339
MAINTENANCE	303	606	366	732	1,464	357	714	1,427	364	727
INDIRECT COST PER SECTOR (US$)	1,904	3,808	2,483	4,967	9,933	2,399	4,798	9,595	2,463	4,926
TOTAL COSTS	6,115	12,230	7,582	15,164	30,328	7,368	14,737	29,473	7,530	15,061
TOTAL COST/AIRCRAFT/N.M. (US$)	9.4		8.9			8.9			8.9	
TOTAL COST/SEAT/SECTOR (US$)	127.4		158.0			153.5			156.9	
TOTAL COST/SEAT/N.M. (CENTS)	19.5		18.5			18.6			18.6	

TABLE 11.6 (Continued): The Total Costs of the New Network.

TOTAL OPERATING REVENUE OF THE PROPOSED NETWORK (PART ONE) (REVENUE GENERATED FROM PASSENGERS ONLY)										
	KUWAIT-MADINAH-KUWAIT			KUWAIT-ABHA-KUWAIT			KUWAIT-TAIF-KUWAIT		BAHRAIN-MADINAH-BAHRAIN	
SECTOR ORIGIN AND DESTINATION NUMBER OF AIRCRAFT	KWI-MED ONE A/C	KWI-MED TWO A/C	KWI-MED-KWI FOUR A/C	KWI-AHB ONE A/C	KWI-AHB TWO A/C	KWI-AHB-KWI FOUR A/C	KWI-TIF ONE A/C	KWI-TIF-KWI TWO A/C	BAH-MED ONE A/C	BAH-MED-BAH TWO A/C
FORECASTED PASSENGERS	36.0	72.0	144.0	31.5	63.0	126.0	32.5	65.0	48.5	97.0
FARE PER PASSENGER (US$)	160	160	160	213	213	213	208	208	186	186
REVENUE PER SECTOR PER MAX. FORECASTED TRAFFIC OR A/C CAPACITY	5,760	11,520	23,040	6,710	13,419	26,838	6,760	13,520	9,021	18,042
PROFIT	611	1,222	2,444	101	201	403	940	1,880	3,297	6,594
PERCENTAGE OF PROFIT	11.9	11.9	11.9	1.5	1.5	1.5	16.2	16.2	57.6	57.6
REVENUE AT 100% L.F. OF AN A/C	7,680			10,224			9,984		8,928	
PROFIT	2,531			3,615			4,164		3,204	
PERCENTAGE OF PROFIT	49.2			54.7			71.5		56.0	
REVENUE AT 75% L.F.OF AN A/C	5,760			7,668			7,488		6,696	
PROFIT	611			1,059			1,668		972	
PERCENTAGE OF PROFIT	11.9			16.0			28.7		17.0	
REVENUE AT 65% L.F.OF AN A/C	4,992			6,646			6,490		5,803	
PROFIT	-157			37			670		79	
PERCENTAGE OF PROFIT	-3.0			.6			11.5		1.4	
REVENUE AT 50% L.F.OF AN A/C	3,840			5,112			4,992		4,464	
PROFIT	-1,309			-1,497			-828		-1,260	
PERCENTAGE OF PROFIT	-25.4			-22.6			-14.2		-22.0	

TABLE 11.7: Revenues of the New Network. Revenues generated from passengers only.

TOTAL OPERATING REVENUE OF THE PROPOSED NETWORK (PART TWO) (REVENUE GENERATED FROM PASSENGERS ONLY)										
	BAHRAIN-ABHA-BAHRAIN		DUBAI-MADINAH-DUBAI			DUBAI-ABHA-DUBAI			DUBAI-TAIF-DUBAI	
SECTOR ORIGIN AND DESTINATION NUMBER OF AIRCRAFT	BAH-AHB ONE A/C	BAH-AHB-BAH TWO A/C	DXB-MED ONE A/C	DXB-MED-DXB TWO A/C	DXB-MED-DXB FOUR A/C	DXB-AHB ONE A/C	DXB-AHB TWO A/C	DXB-AHB-DXB FOUR A/C	DXB-TIF	DXB-TIF-DXB
FORECASTED PASSENGERS	47.0	94.0	48.0	96.0	192.0	48.5	97.0	194.0	45.5	91.0
FARE PER PASSENGER (US$)	198	198	253	253	253	240	240	240	244	244
REVENUE PER SECTOR PER MAX. FORECASTED TRAFFIC OR A/C CAPACITY	9,306	18,612	12,144	24,288	48,576	11,640	23,280	46,560	11,224	22,204
PROFIT	3,191	6,382	4,562	9,124	18,248	4,272	8,543	17,087	3,694	7,143
PERCENTAGE OF PROFIT	52.2	52.2	60.2	60.2	60.2	58.0	58.0	58.0	49.0	47.4
REVENUE AT 100% L.F. OF AN A/C	9,504		12,144			11,520			11,712	
PROFIT	3,389		4,562			4,152			4,182	
PERCENTAGE OF PROFIT	55.4		60.2			56.3			55.5	
REVENUE AT 75% L.F.OF AN A/C	7,128		9,108			8,640			8,784	
PROFIT	1,013		1,526			1,272			1,254	
PERCENTAGE OF PROFIT	16.6		20.1			17.3			16.6	
REVENUE AT 65% L.F.OF AN A/C	6,178		7,894			7,488			7,613	
PROFIT	63		312			120			82	
PERCENTAGE OF PROFIT	1.0		4.1			1.6			1.1	
REVENUE AT 50% L.F.OF AN A/C	4,752		6,072			5,760			5,856	
PROFIT	-1,363		-1,510			-1,608			-1,674	
PERCENTAGE OF PROFIT	-22.3		-19.9			-21.8			-22.2	

TABLE 11.7 (Continued): Revenues of the New Network. Revenues generated from passengers only.

TOTAL OPERATING REVENUE OF THE PROPOSED NETWORK (PART ONE)
(REVENUE GENERATED FROM PAXs,EXCESS BAGGAGE AND MAIL)

	KUWAIT-MADINAH-KUWAIT			KUWAIT-ABHA-KUWAIT			KUWAIT-TAIF-KUWAIT		BAHRAIN-MADINAH-BAHRAIN	
SECTOR ORIGIN AND DESTINATION NUMBER OF AIRCRAFT	KWI-MED ONE A/C	KWI-MED TWO A/C	KWI-MED-KWI FOUR A/C	KWI-AHB ONE A/C	KWI-AHB TWO A/C	KWI-AHB-KWI FOUR A/C	KWI-TIF ONE A/C	KWI-TIF-KWI TWO A/C	BAH-MED ONE A/C	BAH-MED-BAH TWO A/C
FORECASTED PASSENGERS	36.0	72.0	144.0	31.5	63.0	126.0	32.5	65.0	48.5	97.0
FARE PER PASSENGER (US$)	160	160	160	213	213	213	208	208	186	186
REVENUE PER SECTOR PER MAX. FORECASTED TRAFFIC OR A/C CAPACITY	6,044	12,088	24,176	7,040	14,081	28,162	7,093	14,187	9,466	18,932
PROFIT	895	1,790	3,580	432	863	1,726	1,273	2,547	3,742	7,484
PERCENTAGE OF PROFIT	17.4	17.4	17.4	6.5	6.5	6.5	21.9	21.9	65.4	65.4
REVENUE AT 100% L.F. OF AN A/C	8,059			10,728			10,476		9,368	
PROFIT	2,910			4,119			4,656		3,644	
PERCENTAGE OF PROFIT	56.5			62.3			80.0		63.7	
REVENUE AT 75% L.F.OF AN A/C	6,044			8,046			7,857		7,026	
PROFIT	895			1,437			2,037		1,302	
PERCENTAGE OF PROFIT	17.4			21.7			35.0		22.7	
REVENUE AT 65% L.F.OF AN A/C	5,238			6,973			6,810		6,089	
PROFIT	89			365			990		365	
PERCENTAGE OF PROFIT	1.7			5.5			17.0		6.4	
REVENUE AT 50% L.F.OF AN A/C	4,029			5,364			5,238		4,684	
PROFIT	-1,120			-1,245			-582		-1,040	
PERCENTAGE OF PROFIT	-21.7			-18.8			-10.0		-18.2	

TABLE 11.8: **Revenues of the New Network. Revenues generated from passengers, excess baggage and mail.**

TOTAL OPERATING REVENUE OF THE PROPOSED NETWORK (PART TWO) (REVENUE GENERATED FROM PAXs, EXCESS BAGGAGE AND MAIL)										
	BAHRAIN-ABHA-BAHRAIN		DUBAI-MADINAH-DUBAI			DUBAI-ABHA-DUBAI			DUBAI-TAIF-DUBAI	
SECTOR ORIGIN AND DESTINATION NUMBER OF AIRCRAFT	BAH-AHB ONE A/C	BAH-AHB-BAH TWO A/C	DXB-MED ONE A/C	DXB-MED-DXB TWO A/C	DXB-MED-DXB FOUR A/C	DXB-AHB ONE A/C	DXB-AHB TWO A/C	DXB-AHB-DXB FOUR A/C	DXB-TIF	DXB-TIF-DXB
FORECASTED PASSENGERS	47.0	94.0	48.0	96.0	192.0	48.5	97.0	194.0	45.5	91.0
FARE PER PASSENGER (US$)	198	198	253	253	253	240	240	240	244	244
REVENUE PER SECTOR PER MAX. FORECASTED TRAFFIC OR A/C CAPACITY	9,765	19,530	12,743	25,486	50,972	12,214	24,428	48,856	11,650	23,299
PROFIT	3,650	7,300	5,161	10,322	20,643	4,846	9,692	19,383	4,119	8,238
PERCENTAGE OF PROFIT	59.7	59.7	68.1	68.1	68.1	65.8	65.8	65.8	54.7	54.7
REVENUE AT 100% L.F. OF AN A/C	9,973		12,743			12,088			12,290	
PROFIT	3,858		5,161			4,720			4,759	
PERCENTAGE OF PROFIT	63.1		68.1			64.1			63.2	
REVENUE AT 75% L.F.OF AN A/C	7,480		9,557			9,066			9,217	
PROFIT	1,365		1,975			1,698			1,687	
PERCENTAGE OF PROFIT	22.3		26.0			23.0			22.4	
REVENUE AT 65% L.F.OF AN A/C	6,482		8,283			7,857			7,988	
PROFIT	367		701			489			458	
PERCENTAGE OF PROFIT	6.0		9.2			6.6			6.1	
REVENUE AT 50% L.F.OF AN A/C	4,986		6,371			6,044			6,145	
PROFIT	-1,128		-1,211			-1,324			-1,386	
PERCENTAGE OF PROFIT	-18.5		-16.0			-18.0			-18.4	

TABLE 11.8 (Continued):Revenues of the New Network. Revenues generated from passengers, excess baggage and mail.

TOTAL OPERATING REVENUE OF THE PROPOSED NETWORK (PART ONE) (REVENUE GENERATED FROM PAXs, FREIGHT, EXCESS BAGGAGE AND MAIL)										
	KUWAIT-MADINAH-KUWAIT			KUWAIT-ABHA-KUWAIT			KUWAIT-TAIF-KUWAIT		BAHRAIN-MADINAH-BAHRAIN	
SECTOR ORIGIN AND DESTINATION NUMBER OF AIRCRAFT	KWI-MED ONE A/C	KWI-MED TWO A/C	KWI-MED-KWI FOUR A/C	KWI-AHB ONE A/C	KWI-AHB TWO A/C	KWI-AHB-KWI FOUR A/C	KWI-TIF ONE A/C	KWI-TIF-KWI TWO A/C	BAH-MED ONE A/C	BAH-MED-BAH TWO A/C
FORECASTED PASSENGERS	36.0	72.0	144.0	31.5	63.0	126.0	32.5	65.0	48.5	97.0
FARE PER PASSENGER (US$)	160	160	160	213	213	213	208	208	186	186
REVENUE PER SECTOR PER MAX. FORECASTED TRAFFIC OR A/C CAPACITY	6,865	13,731	27,461	7,997	15,994	31,988	8,057	16,114	10,752	21,504
PROFIT	1,716	3,433	6,865	1,388	2,776	5,553	2,237	4,475	5,028	10,056
PERCENTAGE OF PROFIT	33.3	33.3	33.3	21.0	21.0	21.0	38.4	38.4	87.8	87.8
REVENUE AT 100% L.F. OF AN A/C	9,154			12,186			11,900		10,641	
PROFIT	4,005			5,577			6,080		4,917	
PERCENTAGE OF PROFIT	77.8			84.4			104.5		85.9	
REVENUE AT 75% L.F.OF AN A/C	6,865			9,139			8,925		7,981	
PROFIT	1,716			2,531			3,105		2,257	
PERCENTAGE OF PROFIT	33.3			38.3			53.4		39.4	
REVENUE AT 65% L.F.OF AN A/C	5,950			7,921			7,735		6,917	
PROFIT	801			1,312			1,915		1,193	
PERCENTAGE OF PROFIT	15.6			19.9			32.9		20.8	
REVENUE AT 50% L.F.OF AN A/C	4,577			6,093			5,950		5,321	
PROFIT	-572			-516			130		-403	
PERCENTAGE OF PROFIT	-11.1			-7.8			2.2		-7.0	

TABLE 11.9: Revenues of the New Network. Revenues generated from passengers, freight, excess baggage and mail.

TOTAL OPERATING REVENUE OF THE PROPOSED NETWORK (PART TWO) (REVENUE GENERATED FROM PAXs, FREIGHT, EXCESS BAGGAGE AND MAIL)										
	BAHRAIN-ABHA-BAHRAIN		DUBAI-MADINAH-DUBAI			DUBAI-ABHA-DUBAI			DUBAI-TAIF-DUBAI	
SECTOR ORIGIN AND DESTINATION NUMBER OF AIRCRAFT	BAH-AHB ONE A/C	BAH-AHB-BAH TWO A/C	DXB-MED ONE A/C	DXB-MED-DXB TWO A/C	DXB-MED-DXB FOUR A/C	DXB-AHB ONE A/C	DXB-AHB TWO A/C	DXB-AHB-DXB FOUR A/C	DXB-TIF	DXB-TIF-DXB
FORECASTED PASSENGERS	47.0	94.0	48.0	96.0	192.0	48.5	97.0	194.0	45.5	91.0
FARE PER PASSENGER (US$)	198	198	253	253	253	240	240	240	244	244
REVENUE PER SECTOR PER MAX. FORECASTED TRAFFIC OR A/C CAPACITY	11,092	22,184	14,474	28,949	57,897	13,874	27,747	55,495	13,232	26,465
PROFIT	4,977	9,954	6,892	13,785	27,569	6,505	13,011	26,022	5,702	11,404
PERCENTAGE OF PROFIT	81.4	81.4	90.9	90.9	90.9	88.3	88.3	88.3	75.7	75.7
REVENUE AT 100% L.F. OF AN A/C	11,328		14,474			13,731			13,959	
PROFIT	5,213		6,892			6,362			6,429	
PERCENTAGE OF PROFIT	85.3		90.9			86.3			85.4	
REVENUE AT 75% L.F.OF AN A/C	8,496		10,856			10,298			10,470	
PROFIT	2,381		3,274			2,930			2,939	
PERCENTAGE OF PROFIT	38.9		43.2			39.8			39.0	
REVENUE AT 65% L.F.OF AN A/C	7,363		9,408			8,925			9,074	
PROFIT	1,248		1,826			1,557			1,543	
PERCENTAGE OF PROFIT	20.4		24.1			21.1			20.5	
REVENUE AT 50% L.F.OF AN A/C	5,664		7,237			6,865			6,980	
PROFIT	-451		-345			-503			-551	
PERCENTAGE OF PROFIT	-7.4		-4.5			-6.8			-7.3	

TABLE 11.9 (Continued):Revenues of the New Network. Revenues generated from passengers, freight, excess baggage and mail

REFERENCES

1. Alexander T. Wells, Air Transportation (USA : Wadsworth, Inc., 1989) P.340

2. Dusan Teodorovic, Airline Operations Research (London : Gordon and Breach Science Publishers, 1988) PP.82-83

3. Ibid P84

4. Sue Fletcher, Airline Selection By Business Passengers On The North Atlantic Routes (England : Cranfield Institute Of Technology, 1991) PP.30-38

5. Teodorovic, PP.178-182

6. Ibid, PP.180-181

7. Ibid, PP.180

8. Wells,PP.364-365

9. Andy Hofton, Lecture Notes (England : Cranfield Institute Of Technology, 1991)

10. Rigas Doganis, Flying Off Course (London : Harper Collins Academic, 1991)P.259

11. Ibid, PP.259-279

12. Ibid,P.261

13. Ibid,P.262

14. Morten S. Beyer, Airline Scheduling (England : The Avmark Aviation Economist, November 1986) PP.8-9

15. Wells,P.346-347

16. Ibid,P.348-351

17. Teodorovic, PP.131-132

18. Muhammad Al-Maskary, Gulf Air executive vice president of corporate planning (An interview held in Jan. 1991)

19. Gulf Air, Revenue And Cost (Bahrain : Gulf Air, 1990)

20. Al-Maskary, January 1991.

CHAPTER TWELVE
CONCLUSIONS AND RECOMMENDATIONS

12.1 CONCLUSIONS

The principal conclusion of this thesis is that limited air transport liberalisation is feasible and possible as a first step towards wider reform amongst the GCC group of countries. This conclusion is based upon the results obtained from the study of the background and experiences of other nations of liberalisation contained in Part One of this research, and from the feasibility model detailed in Part Two. The answers to each of the five questions listed at the start of Part Two and illustrated in the model were found to be positive and to support the concept of liberalisation.

When reviewing the GCC air transport market at the initial stage of this research, it was found that there are basic factors which encourage liberalisation in the GCC countries which should be considered very carefully. These factors are as follows:

1. One of the ways for the GCC to achieve its goal of confederation is by economic integration, which means establishing a Gulf Common Market.
2. The GCC is economically stable.
3. The GCC average GNP per head is relatively high.
4. The existing highly regulated GCC domestic air transport market has resulted in monopolistic tendencies which do not have many advantages for consumers. In addition, the uncompetitive markets have resulted in some airlines having high operating costs, low efficiency and productivity.
5. The GCC countries have very advanced international airports which have a high level of unused capacity where some of them, at the present time, could double the received annual number of passengers without incurring problems of congestion.
6. The GCC airlines own some of the most advanced fleets in the world. However, some of the GCC carriers are not utilising their aircraft very efficiently. Generally, all the GCC carriers have high operating costs. As a result, some of

the carriers make high operating net losses and receive high governmental subsidies.

7. The GCC air carriers are government-owned, as a result, they are not operated with commercial objectives, nor under private and commercial managerial principles.
8. There is essentially strong demand for domestic air transport in the GCC. For example, the number of domestic passengers carried annually by Saudia Airlines, which has the largest domestic market and fleet, is approximately double the number it carries on international flights.
9. Air transport services are the most convenient and best method of travelling between the GCC countries. For example, there are no train services between the GCC countries.

Economists in 1960 started to question the benefits of governmental regulations. In 1978, the USA passed the Airline Deregulation Act which freed carriers to establish their own fares and rates and to enter and exit routes. The Act was justified for the following reasons:

1. Economists had marshalled evidence that regulation was not needed.
2. Federal agencies were believed to increase costs.
3. There was a need to improve economic conditions through lower prices for customers and higher profits for the industry.
4. There was a belief that government regulation was interfering with productivity.

After comparing the GCC air transport regulatory environment with that of the USA and EC, it was found to be closer to that of the EC than that of the USA because of the involvement of several governments and national carriers which are mostly state-owned. As a result, the decision to liberalise the GCC or EC air transport requires acceptance and approval by all members. This means a long and complicated process is needed to establish a liberalisation policy that satisfies all the members with consideration to political issues and economic feasibility. At the same time, the policy is likely to contain a certain degree of protection for the member's national carriers to avoid bankruptcy.

In addition, one similarity between the GCC aviation industry and that of the USA is that air transport is considered to be by far the most important mode of passenger transportation for all but the shortest journeys. By way of contrast, in the EC countries ground transportation is relatively competitive with air transport.

However, there were many advantages and disadvantages of the US Airline Deregulation Act for air carriers, consumers, shareholders, airline employees, the aviation industry and the government. Deregulation in the USA succeeded in improving efficiency and productivity, providing lower fares, lower costs, more variety of products, many marketing innovations, and higher demand. It resulted in less governmental control and a lower Federal budget. On the other hand, the industry moved towards concentration, which could lead to a few giant airlines controlling the US market. Other problems include airline financial instability, congested skies and airports, and control of slots and gates.

Since the GCC has tight and rigid air transport regulation, full deregulation such as that of the USA is not feasible nor applicable. The main lesson that can be learned from the US experience for the GCC is that competition from new entrants initially lowered costs and prices, and improved efficiency throughout the industry. In addition, deregulation produced a wider range of products for consumers.

Most of the GCC airlines which serve the domestic market at the present time have high fares and rates, high operating costs, low efficiency and provide a very narrow range of products for consumers. Therefore, if regulation is relaxed carefully for new private and commercial entrants in the domestic GCC market, it could create a certain level of competition which would lead to a more efficient industry.

In addition, some airlines in the GCC are faced with financial instability and difficulties, but due to their governmental ownership, those airlines are subsidised by the governments. An important question asks for how long would these governments support, or even can support, their airlines financially, given that some of these airlines have low productivity and efficiency and a high level of complaints from consumers.

Western European countries (the EC) adopted a different methodology from that of the USA in the application of airline reform. The European liberalisation process has been developing as a slow and gradual process rather than over a short time. Nevertheless, Europe has serious infrastructural problems such as airport and airspace congestion. However, the overall impact of European liberalisation up to 1992 has been less dramatic than US deregulation with regard to traffic growth, fare reduction, and new airlines. It has however brought benefits to consumers.

The EC aviation industry is similar to that of the GCC in the following areas:

1. **More than one government contributes to the establishment of regulation.**
2. **Most of the large airlines are government owned.**
3. **The national carriers, to a certain level, have to stay in business to represent their countries as "flag carrier".**
4. **There is a more traditional concept towards the ownership and control of the infrastructure, such as airports and air traffic control.**

However, lessons can be learned from the development of the European air transport liberalisation process by the GCC, given that the GCC does not have any infrastructure problems, especially at its major airports. On the other hand, most of the GCC market is very regulated and monopolistic markets exist in Saudia Arabia operated by Saudia Airways and in four Gulf States operated by Gulf Air. The main lessons from the EC experience for the GCC are as follows:

1. **The GCC has initially to define the level of freedom it is aiming for, and what would be best for the GCC consumers, airlines and governments.**
2. **Liberalisation in the GCC has to be a smooth and gradual process like that of EC.**
3. **The GCC has to establish a Court of Justice such as the European Court of Justice which is responsible for implementing Community law.**
4. **There is a need to establish consumer organisations in the GCC in which consumers views and problems related to air transport can be co-ordinated and**

can then be sent to those officials who regulate, deregulate and re-regulate the market.

5. **The GCC governments do protect their national carriers which are mostly government-owned airlines.**

Bearing all these points in mind, the 1983 EC Inter-Regional Air Services Directive with some modification is a very suitable model for the GCC because it does not cause major threats to the national carriers.

When studying the impact of the European liberalisation process on the airline industry, the following are the main changes:

1. **There have been some mergers and transnational alliances.**
2. **There has been a tendency for charter carriers to move towards scheduled markets.**
3. **Increasing concentration among tour operators.**
4. **Listed below are some of the operational changes:**
   - **Entry of a few small airlines into scheduled services such as Ryanair and Hamburg Airlines. Others have expanded operations such as Crossair and British Midland.**
   - **As a result of the December 1983 package which allowed new fifth freedom opportunities, two airlines in particular have taken advantage of the freedom (Aer Lingus and Air Portugal).**
   - **Another result of the 1987 package has been the abandonment of most of the revenue pooling agreements. As a consequence, airlines have started to "bunch up" at the more popular times where previously schedules on pooled routes had been distributed throughout the day.**
5. **Decreasing yields on some routes.**

It appears that real competition in the European airline market can be generated only by the existing carriers. Many of these airlines have mutual shareholdings, share swops and marketing alliances. Overall, it is very hard to observe where the new competitors

to the incumbent European airlines will come from.

However, the following are the main lessons for the GCC from the impact of the European liberalisation process:

1. **Europe had the opportunity to learn from the USA deregulation experience, and the GCC can learn from both the USA and Europe.**
2. **The key element in the European liberalisation process was that it could succeed only by applying it in a gradual and smooth way, starting with inter-regional services.**
3. **Since there is no infrastructure nor airway congestion in the GCC, then the GCC governments will face less problems than the Europeans in planning and applying air transport liberalisation. The GCC carriers will not have the troubles of the European carriers in dealing with airport and airway congestion.**
4. **Since the only type of carriers between the GCC domestic market are the national scheduled carriers, then the GCC national carriers will have less problems than the European carriers when facing competition (i.e. there is no charter industry).**
5. **Since there are no train services between the GCC countries, the airlines do not face the threat of intermodal competition.**
6. **The European and the GCC governments are similar in the traditional way of national control of aviation infrastructure, ownership, operation and financing. However, this characteristic is one of the reasons for congestion in Europe, especially following liberalisation. The GCC governments should draw lessons to avoid future congestion.**
7. **There is less opportunity for the GCC carriers to merge because of their government ownership, the consideration of being flag carriers, and they are the only type of carriers available However, if such a thing is to occur, the GCC should have powers similar to those of the European Commission under Articles 85 and 86 of the Rome Treaty to apply harder conditions to discourage further take overs and mergers.**

8. **Since there are no regional carriers and a very small number of charter flights between the GCC countries, then new entrants in the GCC are more likely to come in to the market than in Europe, especially as regionals.**

9. **Saudia Airlines will have the advantage of being the largest airline in the GCC. However, it has a disadvantage in having high operating costs. It can enter the Gulf Air domestic market and move freely to/from Kuwait and Dubai.**

10. **Gulf Air will have the advantage of being able to enter the Saudia domestic market and move freely in Kuwait and Dubai.**

11. **Kuwait will have the advantage of being able to enter the Saudia and Gulf domestic markets and move freely to/from Dubai.**

12. **Emirates will have the advantage of lower costs. It will be able to enter the Saudia and Gulf domestic markets and move freely to/from Kuwait.**

13. **Since there are no income taxes, nor labour unions, in the GCC, commercial organisations have good opportunities to generate profits.**

At the beginning of Part Two of this thesis (the Feasibility Model), research was carried out on different types of forecasting methods in order to select the most appropriate model that could be used to predict passenger demand on domestic GCC routes. A gravity model was chosen for the following reasons:

1. **One of the objectives of the feasibility model is to forecast the demand on new routes where a gravity model is considered to be amongst the most appropriate.**

2. **The gravity model is based on a fundamental theory, justifiable assumptions and is statistically valid.**

3. **It is simple to use and apply and produces realistic answers.**

4. **Empirical evidence has shown that the gains in accuracy of more sophisticated methods are usually small. Furthermore, complexity or statistical sophistication does not seem to improve forecasting accuracy.**

The development of the gravity model passed through the following stages:

Part One: **The Basic Model using Traffic and Distance for GCC International Airports. This part of the analysis produced the following results:**

Distance Power	Correlation Coefficients
P = 0	0.741
P = 0.5	0.727
P = 1	0.529
P = 1.5	0.421
P = 2	0.331

Part Two: The Basic Model for GCC International Airports with Distance Modifications. This part produced the following results:

1. For less than 400kms

Distance Power	Correlation Coefficients
P = 0	0.9998
P = 0.5	0.9998
P = 1	0.9998
P = 1.5	0.9998
P = 2	0.9998

2. For more than 400kms and less than 790kms.

Distance Power	Correlation Coefficients
P = 0	0.950
P = 0.5	0.977
P = 1	0.975
P = 1.5	0.954
P = 2	0.921

3. For more than 790kms.

Distance Power	Correlation Coefficients
P = 0	0.819
P = 0.5	0.854
P = 1	0.879
P = 1.5	0.897
P = 2	0.908

Part Three **The Replacement of Distance with Fare for GCC International Airports. This part of the study produced the following results.**

Fare Power	**Correlation Coefficients**
P = 0	**0.741**
P = 0.5	**0.732**
P = 1	**0.596**
P = 1.5	**0.524**
P = 2	**0.422**

Part Four **Estimating the Demand with Fare and Quality of Service variables for GCC International Airports. This part of the analysis produced relatively good results without any modifications or divisions by distance. The highest correlation coefficient was (0.87). It was produced when fare power was raised to (2) and quality of service power to (0.4).**

Part Five **The Basic Traffic-Distance Model calibrated on Saudia Arabia Domestic Traffic and the analysis of 125 routes. The results of this part are as follows:**

Distance Power	**Correlation Coefficients**
P = 0	**0.936**
P = 0.5	**0.960**
P = 1	**0.926**
P = 1.5	**0.790**
P = 2	**0.561**

Part Six **The Basic Traffic-Distance Model calibrated using all GCC Domestic and International Airports. 166 routes were involved in this part of the study, which produced the following results:**

Distance Power	Correlation Coefficients
P = 0	0.785
P = 0.4	0.804
P = 0.5	0.803
P = 1	0.758
P = 1.5	0.631
P = 2	0.443

In addition, the following analyses have been attempted based on all GCC traffic (International and Domestic airports):

1. **The Basic Traffic-Distance Model with distance modifications did not produce good results, except for the division of routes with a distance of more than 500nm.**
2. **The replacement of distance with fare produced poor results.**
3. **The fare and quality of service variables produced reasonably good results, but was only based on 63 routes.**

Considering the six stages in the development of the gravity model, and the above three attempts, the basic traffic-distance (all GCC airports) method was selected to forecast traffic on new domestic routes within the GCC. Furthermore, that part of the model produced reasonably good results. It was based on 166 routes. The formula was simple to use.

An analysis of various types of aircraft was then made using total operating costs over different ranges of sector lengths with relation to the GCC operational environment. This aircraft analysis included ATR-42, ATR-72, ATP, F-50, Dash 8-300, Dash 8-400, Saab-2000, DO-328, Challenger RJ, EMB 145, 146-100, 146-200, F-100, B-737-300 and B-737-500. Some of the operating cost results of this aircraft study are illustrated in Table 12.1 over a sector length of 500nm.

Viable new routes were identified from the data and results obtained from the gravity model. Some of these routes are as follows:

CITY-PAIR		CITY-PAIR	
1. Abu-Dhabai	**- Abah** **- Madinah**	**5. Kuwait**	**- Abha** **- Al-Qassim** **- Gizan** **- Tabuk** **- Taif**
2. Bahrain	**- Abha** **- Al-Qassim** **- Madinah** **- Tabuk** **- Taif**	**6. Muscat**	**- Abha** **- Madinah**
3. Doha	**- Abha** **- Madinah** **- Al-Qassim**	**7. Sharjah**	**- Dharan** **- Jeddah** **- Riyadh**
4. Dubai	**- Gizan** **- Tabuk** **- Taif** **- Madinah** **- Abha**		

AIRCRAFT OPERATING COSTS OVER 500 NM UNDER GCC OPERATIONAL ENVIRONMENT															
AIRCRAFT TYPE	ATR-42	ATR-72	ATP	F-50	D-8-3	D-8-4	S-2000	DO-328	RJ	EMB-145	146-100	146-200	F-100	B737-3	B737-5
FIRST COST (US$ MN)	9.1	11.3	12.1	11.3	10.5	13.0	11.5	7.2	15.0	12.8	21.5	22.5	22.5	29.0	30.0
NUMBER OF SEATS	46	64	64	50	56	66	50	31	48	45	88	106	107	135	119
MAX. TAKE-OFF WEIGHT (KG)	17	20	23	19	19	24	21	13	21	17	38	42	43	57	53
BLOCK FUEL (lbs) [1 lb=.147 GAL]	343	390	433	375	386	534	424	276	520	450	902	1,070	1,060	1,300	1,352
BLOCK TIME (MIN)	138	131	138	131	131	111	109	107	90	97	99	99	99	89	98
(HRS)	2.30	2.18	2.30	2.18	2.18	1.85	1.82	1.78	1.50	1.62	1.65	1.65	1.65	1.48	1.63
AIRCRAFT HOURS/YEAR	3,253	3,214	3,253	3,214	3,214	3,083	3,068	3,053	2,074	2,969	2,987	2,987	2,987	2,893	2,978
AIRCRAFT CYCLES/YEAR	1,414	1,472	1,414	1,472	1,472	1,667	1,689	1,712	1,382	1,837	1,810	1,810	1,810	1,950	1,823
DIRECT COST PER SECTOR (US$)															
DEPRECIATION	708	841	941	841	785	858	749	459	1,194	767	1,306	1,367	1,367	1,636	1,810
INTEREST	467	555	621	555	518	566	494	303	788	506	862	902	902	1,079	1,194
HULL INSURANCE	106	126	141	126	118	129	112	69	179	115	196	205	205	245	271
FUEL	240	273	303	262	270	374	297	193	364	315	632	749	742	910	946
COCKPIT & CABIN CREW ($209/HR)	481	456	481	456	456	387	380	373	314	338	345	345	345	310	341
USER CHARGES	372	413	450	401	397	457	430	314	432	369	614	655	664	794	758
MAINTENANCE	295	327	383	315	310	325	296	185	255	269	604	655	666	773	774
INDIRECT COST PER SECTOR (US$)	1,395	1,941	1,941	1,516	1,698	2,001	1,516	940	1,456	1,365	2,669	3,214	3,245	4,094	3,609
TOTAL COSTS	4,063	4,931	5,260	4,473	4,551	5,097	4,275	2,836	4,979	4,043	7,229	8,093	8,136	9,842	9,704
TOTAL COST/AIRCRAFT/N.M. (US$)	8.1	9.9	10.5	8.9	9.1	10.2	8.5	5.7	10.0	8.1	14.5	16.2	16.3	19.7	19.4
TOTAL COST/SEAT/SECTOR (US$)	88.3	77.1	82.2	89.5	81.3	77.2	85.5	91.5	103.7	89.9	82.1	76.3	76.0	72.9	81.5
TOTAL COST/SEAT/N.M. (CENTS)	17.7	15.4	16.4	17.9	16.3	15.4	17.1	18.3	20.7	18.0	16.4	15.3	15.2	14.6	16.3

TABLE 12.1: AIRCRAFT OPERATING COSTS OVER 500NM UNDER GCC OPERATIONAL ENVIRONMENT

These new routes were analyzed under the operation of different types of aircraft in order to find their total costs, revenues, net profits or losses, and profit as a percentage of total costs. The financial results showed that most of these routes are commercially attractive for new carriers. Nevertheless, the percentage profitability differs with aircraft type.

Finally, a possible new network was selected which involved the following routes:

	Forecasted Daily Passengers	Number of Frequencies
1. Bahrain-Madinah-Bahrain	98	2
2. Bahrain-Abha-Bahrain	94	2
3. Dubai-Abha-Dubai	194	4
4. Dubai-Gizan-Dubai	106	2
5. Dubai-Madinah-Dubai	192	4
6. Kuwait-Abha-Kuwait	126	4
7. Kuwait-Gizan-Kuwait	70	2
8. Kuwait-Madinah-Kuwait	144	4

The Canadair Challenger RJ aircraft was selected for operation on this new possible network because of its attractive total operating costs, seating capacity, range and quality of service factors. The jet was attractive because some of the distances are relatively great and because it was felt that passenger expectations would be high. Six RJ aircraft were found to be suitable for meeting both passenger demand and generating reasonable profits. The average aircraft utilisation on the proposed new possible network was 8 hours per day.

The following are the marginal percentage of daily profitability, based on total operating revenues divided by total operating expenses, on the proposed network under different revenue characteristics:

		% profitability
1.	**With forecasted passengers and aircraft capacity.**	
	■ **Revenues from passengers only**	**38%**
	■ **Revenues from passengers, excess baggage and mail**	**45%**
	■ **Revenues from passengers, plus estimates for freight, excess baggage and mail.**	**65%**
2.	**With 65% load factor**	
	■ **Revenues from passengers only**	**1.9%**
	■ **Revenues from passengers, excess baggage and mail**	**7.0%**
	■ **Revenues from passengers, freight, excess baggage and mail**	**21%**

Based on the results of using the model, the following are the major conclusions:

1. **There is enough passenger demand for viable operation on intra-GCC markets not currently served.**
2. **There are patterns of new routes that could be used efficiently by new carriers.**
3. **These new routes are commercially attractive and will be to the benefit of new carriers and to consumers by offering direct services to/from these new destinations.**
4. **The possible network as proposed was found to be profitable under the operation of six Canadair RJs.**

Based on the above conclusions and the lessons from the development and impact of US deregulation and the European liberalisation process, liberalisation is feasible in the GCC countries.

However, liberalisation in the GCC should not follow the US style. It should adopt the European methodology. It should be slow, gradual and smooth rather than carried out over a short time.

Rules similar to those of the European 1983 Inter-Regional Air Services Directive are proposed, with modification for the GCC, for the following reasons:

1. **It would be the first step towards liberalisation, and could be agreed upon by the governments involved.**
2. **It does not cause major threats to the national carriers, but would encourage them to increase efficiency and profitability.**
3. **It widens the scope for new carriers to develop markets to contribute to increasing the intra-GCC network.**
4. **It aids the development of the regions.**
5. **It increases the quality of services for consumers by having direct services to and from smaller airports.**

However, the following restrictions included in the 1983 EC Inter-Regional Directive should be considered and modified before application in the GCC:

1. **Liberalisation should be between any domestic and any international airport in the GCC instead of only between secondary provincial airports (Category 2) and smaller airports with international flight facilities (Category 3). Listed below are reasons for such modifications:**
   - **Most of the major European airports have congestion problems; such problems do not exist at GCC international airports.**
   - **Europe does suffer from airspace congestion problems, which do not exist in the GCC.**
   - **Most of the GCC international airports have the capability to increase their annual traffic by at least one third of what they receive at the present time.**

- **The majority of the GCC domestic airports are located in one country, and air services to/from most of them are provided by only one carrier. Competition will be more effective if the airport classification rules of the EC Directive are omitted.**
- **The GCC has only one type of carrier, which is the scheduled national airlines. On the other hand, Europe had many types of carriers such as majors, charters and regionals. The freedom to use any airport under GCC liberalisation would encourage the entry of new types of carriers such as regionals.**

2. The international and domestic airports which are liberalised should not be located in only one state for the following reasons:

- **This modification will make the liberalisation more acceptable to the GCC states and airlines, especially from Saudia Arabia whose national airline generates most of its traffic from the domestic market.**
- **It would encourage travel and movement of passengers and goods between the GCC domestic and international airports.**

3. The maximum stage length restriction of 400kms included in the 1983 EC rules should be disregarded for the GCC for the following reasons:

- **The average distance between the GCC domestic and international airports is 1,300kms much longer than in the EC.**
- **Ground transportation in Europe is relatively competitive, however, air transportation in the GCC is the main method of travelling. So, disregarding the distance restriction allows wider scope for providing air services to smaller cities without harming other types of transportation.**
- **Approximately half of air travel in Europe is by charter services. On the other hand, most (if not all) of the GCC air services are provided by regular scheduled services only. So, dropping the distance restriction does not affect other types of air services in the GCC.**
- **Europe is much more populated per square kilometre than the GCC.**

The following are the main rules and principles of the European 1983 Inter-Regional Air Services Directive with modifications which are proposed for the GCC. A service will be liberalised under the following conditions:

1. **It is performed between any domestic and international airports in the GCC states.**
2. **The origin and destination airports which are liberalised need not be located in the same state.**
3. **There is no maximum nor minimum stage length restriction.**
4. **It is performed by aircraft of 70 seats or less or maximum take-off weight of not more than 30 tons.**
5. **Tariffs on inter-regional services should be approved by both states, and fares and rates should be based on a fair cost to price ratio and a fair return on capital.**
6. **The rules and regulations do not affect the relationship between the Home State and its national carrier.**
7. **It applies to scheduled transport of passengers, or in combination with cargo and mail.**
8. **It applies to GCC airlines only.**
9. **Member states can, if they desire, apply conditions that are less restrictive than this proposed modified Directive.**

The following are the major grounds for the destination state to refuse an application for an inter-regional air service:

1. **The air route that is applied for is already satisfactorily served with consideration to quality, quantity and price by existing direct air services between the two airports concerned.**
2. **The destination airport does not have sufficient facilities to accommodate the service.**
3. **The navigational aids in the destination state are inadequate to accommodate the service.**

12.2 RECOMMENDATIONS

If liberalisation based on the ideas of the European 1983 Inter-Regional Air Services Directive with modifications is acceptable for adoption by the GCC countries, the following recommendations should be considered. Some of these could be considered as institutional or organisational changes. Others involve facilitation and infrastructure modifications and improvements. All have to be co-ordinated and planned and it may be appropriate to set up a small specialist team within the GCC Department of Transportation, Air Transport Section to plan for the first step in the liberalisation process. The details of this team's terms of reference are beyond the scope of this thesis, although the points outlined in Section 2.6 and the lessons of Sections 4.10, 5.13 and 6.10 provide starting points. The timescale for implementation could be relatively short and it is recommended that moves to liberalise and the formation of smaller carriers should be encouraged even before all the details of institutional and infrastructure changes are in place. New services would act as a catalyst for change. Detailed recommendations are:

1. **Travel visas for foreigners between the GCC states should be very easy to obtain to encourage temporary visitors.**
2. **The major GCC domestic airports should be developed to receive intra-GCC flights. Although all the major domestic airports receive jet services, the development would be mostly in customer service and immigration facilities.**
3. **GCC governments should draw up clear rules to identify if certain airline operations are not provided on a commercial basis but are provided as a social service. If airlines are not operating under commercial principles, airline subsidies will probably continue to be paid by governments, but the objective should be to phase them out.**
4. **GCC Governments should consider certain levels of privatisation for their airlines.**
5. **GCC airlines should improve their efficiency and productivity which would have direct benefits for total operating costs.**
6. **There is a strong need to establish consumer organisations in the GCC in which consumer views and problems related to air transport could be sent to officials**

who regulate, deregulate and re-regulate the market.

7. The GCC has to establish a Court of Justice such as the European Court of Justice which is responsible for implementing the community law.

8. The GCC civil aviation authorities have to establish a firm system for imposing airline fines to maintain the standard of airline operations, maintenance and consumer services.

9. A better classification of data should be established, (i.e. confidential, restricted or general).

10. Regular and adequate data such as airport traffic, on flight O/D and financial statistics should be available for effective planning and forecasting.

12. GCC airlines and airports should cooperate in regular exchanges of information on traffic trends and forecasts to ensure realistic future assessments.

13. The adoption of more liberal rules, possibly like the "open skies" airport policy in operation in Dubai and Sharjah, should be considered for some GCC airports.

14. The strong demand for trained personnel in all areas of air transport needs to be recognised now. Trained staff will be required in greater numbers when a competitive air transport policy is adopted. Therefore, GCC governments and airlines should cooperate and coordinate to determine training requirements and appropriate training facilities to ensure not only the most efficient use of existing personnel, equipment and facilities, but also to prepare for future expansion.

The Air Transport Section would have to monitor all these changes and build up its own expertise. Its objective would be to see that liberalisation was a success and that benefits for consumers, governments, the airline industry and individual airlines were achieved. The objective would be to keep bureaucracy to a minimum for the reasons given in Chapter 3 and it would be hoped that individual GCC states could reduce some of their regulatory functions.

12.3 EXPECTATIONS

If the proposed liberalisation within the GCC is allowed to take place, initially restricted to aircraft of 70 seats or less, it is not expected that the survival of the existing large carriers would be threatened. Saudia, Gulf Air, Emirates and Kuwait Airways would

retain their identities and independence. It is possible that three or four new regional airlines would be established. Rules may have to be laid down to ensure that they remained independent of the major airlines so that the competition and innovation that they introduced helped to improve the efficiency and profitability of the existing large carriers.

Furthermore, many new routes would probably be served by direct services. In general, air services in the GCC are expected to be improved especially in the quality of service, variety of products, fares and rates. Rules and regulations are necessary to ensure that the new originated carriers are owned by the GCC states or nationals. There is probably a tendency for foreign carriers to come to the GCC regional market under cover of national name and ownership. It is expected that most of the new originated regional carriers will be successful in their operations, and they will probably apply to extend their services to routes which are already served by national carriers. Major domestic airports are expected to develop more. As time passes, some of these airports will probably be changed to international airports that receive international flights from worldwide airports. The 70 seat limit will have to be reviewed after three to four years and increases in the limit considered. Benefits are expected to reach other industries such as tourism, hotels and car rental companies.

The role of the GCC Air Transport Section would be to keep all these developments under review and to propose adjustments and changes as appropriate.

12.4 SUGGESTIONS FOR FUTURE RESEARCH

Future study and research should be considered in the following areas. Some of these matters would have to be considered by the GCC Air Transport Section.

1. **The feasibility model developed in this Thesis could be extended to research routes that are already receiving direct air services and the possibility of increased passenger demand through fare and quality of service factors.**
2. **The feasibility model could be extended to involve airline competition variables to forecast passenger demand under various competitive environments with**

consideration to the GCC atmosphere.

3. **The research could be continued to propose an ultimate air transport liberalisation process model that could be applied in the GCC with consideration to time span. For example, if the proposed European 1983 Inter-Regional Air Service Directive with modifications is acceptable to the GCC, future work should research many models that are applicable to the GCC at various time sequences, considering the GCC air transport industry and the experience of other nations in liberalisation, especially the European Community. This research would allow the planning of changes to the initial liberalisation rules to be proposed by the GCC Air Transport Section on the basis of rational analysis and might lead to a second or third package of liberalisation measures. Such measures would also have to take into account changes in the international environment and are beyond the scope of this thesis.**

Every stage of the researched air liberalisation process model should be based on academic principles as well as practical results from the initial phase of liberalisation. It should ask questions such as why, when and how a particular new package of liberalisation should be implemented.

BIBLIOGRAPHY

ABC WORLD AIRWAYS GUIDE (UK: Reed Telepublishing Ltd. 1987-1988).

AIRBUS INDUSTRIE. Market Prospectives For Civil Jet Aircraft. (US: Airbus Industrie,1990).

AIR TRANSPORT ASSOCIATION OF AMERICA. The Annual Report of the US Scheduled Airline Industry. (USA: ATA, 1978-1990).

AL-MASKARY,M. Gulf Air Executive Vice President of Corporate Planning. (An interview held in January 1991).

ALAMDARI,F. Airline Deregulation: An Analysis under Different Regulatory and Operating Environment (England: PhD thesis, CIT, 1989).

AMERICAN POLITICAL SCIENCE. Politics, Personalities and the Federal Trade Commission (USA: Rev.28, 1934).

ASCHER,W. Forecasting:An Appraisal For Policy-Makers And Planners. (London: The Johns Hopkins Press, 1978).

AVIATION WEEK & SPACE TECHNOLOGY. France Asks A320 Exemption From Politics. (USA: AW, April 30, 1984).

AVMARK AVIATION ECONOMIST. Third Package Proposals (England: Avmark, July/August 1991).

BAILEY,E.E., GRAHAM,D.R. and KAPLAN,D.P. Deregulating the Airlines (USA: MIT Press, 1986).

BAILEY,E.E. Price and Productivity Changes Following Deregulation: The US Experience (USA: The Economic Journal, March 1986).

BALDWIN,R. Regulating the Airlines (Oxford: Oxford University Press, 1985).

BARRETT,S.D. Flying High: Airline Prices and European Regulation (UK: Adam Smith Institute, 1987).

BARRETT,S.D. Sky High, Airline and European Deregulation (UK: Economics Department, Trinity College, Dublin, 1985).

BAUMGARTNER,T. and MIDTTUN,A. The Politics Of Energy Forecasting. (USA: Oxford University Press, 1987).

BEYER,M.S. Airline Scheduling (England: The Avmark Aviation Economist, November 1986).

BJORKMAN B. Methodology In Air Traffic Forecasting. Paris: Civil Aviation Forecasting Workshop, ICAO, 1974.

BJORKMAN,B. Estimating Of Potential Air Traffic Flows. (Hogskolan: Institute For Tranfikplanering Kungl, Tekniska, 1978).

BOEING COMMERCIAL AIRPLANE GROUP, Current Market Outlook. (U.S. : Boeing, 1990).

BOULLIOUS,E.H.. Earning and Quality of Service, in corporate planning under deregulation: The case of the airlines. (Evanston,Ill.: Northwestern University, June 1979).

BREYER,E.G. and STEWART,R.B. Regulation Innovation and Administrative Law (Calif. L.Rev.1256).

BYRNES,J.L.S. Diversification Strategies for Regulated and Deregulated Industries: Lessons from the Airlines (USA: Lexington Books, 1985).

CAREY,H.C. Principles of Social Science (Philadelphia: Vol.1, 1985) pp.41-43.

CHERIF,T. Air Travel Demand Forecasting Model. (England: Flight Division, CIT, 1978).

CIVIL AVIATION AUTHORITY. Comparison between European and United States Air Fares (London: CAA, Paper 83006, 1983).

COMMISSION OF THE EUROPEAN COMMUNITIES. Completion of the civil aviation policy in the European Communities towards single market condition (Brussels: EEC, 1991).

D'ARCEY,H. Airline Passenger Traffic Patterns within the United States (USA: Journal of Air Law and Commerce, 1951).

DAGANZO,C.F. Multinomial Probit: The Theory and its Application to Demand Forecasting (New York: Academic Press, 1979).

DOGANIS,R. Flying Off Course (London: Harper Collins Academic, 1991).

DOGANIS,R. How Good are Long Term Traffic Forecasts? (Air Finance Journal, January 1989).

DOGANIS,R. Traffic Forecasting and the Gravity Model (UK: Flight International, 29 September 1966).

DOGANIS,R. Strategies for Deregulated Air Transport (England: Cranfield Institute of Technology, 1992).

DOGANIS,R. Traffic Forecasting and the "Gravity Model" (England: Flight International, 1966).

DOGANIS,R. World Commercial Air Transport After 1992 (England: Paper presented in Dubai, 1991) p.6 also see Second IATA Deregulation Watch Report, Geneva, June 1985.

DUBAI INTERNATIONAL AIRPORT. Annual Report (U.A.E.: Dubai Department of Civil Aviation, 1986-89).

ECONOMIC CO-OPERATION AND DEVELOPMENT. Deregulation and Airline Competition (Paris, OECD, 1988).

EDINBURGH INSTITUTE OF AVIATION STUDIES. Top World Airlines (UK: Avimar Data Limited, 1991).

EUROPEAN COMMUNITY. Commission Proposals for a Council Directive on Tariffs for Scheduled Air Transport between Member States (Brussels: EC, CoM (81) 590, 27 October 1981).

EUROPEAN COMMUNITY. Commission Proposals for a Council Regulation Concerning the Authorisation (Brussels: EC, CoM (80) 624, 26 August 1980).

EUROPEAN COMMUNITY. Inter-Regional Air Services (EC, Council Directive, July 1983).

EUROPEAN COMMUNITY. Civil Aviation Memorandum No.2, Progress Towards the Development of a Community Air Transport Policy (Brussels: EC, 1984).

EUROPEAN COMMUNITY. Civil Aviation Memorandum No.1. The Contribution of the European Communities to the Development of Air Transport Services (Brussels: EC, 1979).

EUROPEAN COMMUNITY. Treaty Establishing the European Economic Community (Rome: EC, 1957).

FELDMAN,J. CRS in the USA (Travel & Tourism Analyst, September 1987).

FELDMAN,J. CRS and Fair Airline Competition (Travel & Tourism Analyst, 1988).

FLETCHER,S. Airline Selection by Business Passengers on the North Atlantic Routes (England: Cranfield Institute of Technology, 1991).

FLIGHT INTERNATIONAL, The Longest Queues are for the Shortest Routes (England: Flight International, 1966).

FLIGHT INTERNATIONAL. European Ministers back lower air fares (England: Flight International 1-7 April 1992). p.11.

FLIGHT INTERNATIONAL. World Airline Directory (Flight International, 25-31 March 1992).

FRIENDLY,H. The Federal Administrative Agencies (USA: Harvard, 1962).

FULLER,L.L. The Morality of Law. (USA: Yale, 1964).

GCC. Transportation Methods in the GCC Countries (Riyadh: The GCC, 1989).

GCC. Cooperation Council for the Arab States of the Gulf (Riyadh, The GCC).

GCC. Facts and Figures (Riyadh: Gulf Cooperation Council).

GIALLORETO, L. Strategic Airline Management. (London : Pitman Publishing, 1989).

GIALLORETO,L. Evolution of the Industry (England: Avmark Aviation Economist, May 1988).

GIALLORETO,L. Who will survive Euro-deregulation? (England: Avmark Aviation Economist, January 1992).

GIALLORETO,L. Ill-prepared for Euro-liberalisation (England: Avmark Aviation Economist, December 1991)

GREENBERGER,M. Models In The Policy Process. (New York: Russel Sage Foundation,1981).

GREGORY,M.L. Progress towards a Liberalised Air Transport Industry in Europe (England: MSc Thesis, Cranfield, 1990).

GULF AIR. Revenue and Cost (Bahrain: Gulf Air, 1990).

GULF AIR. Cost Comparison between Gulf Air, AEA and OAA (Bahrain: Gulf Air, 1989).

HARTENSTEIN,J. Application of a market share model to the fleet planning process of a long haul airline (England: CIT, MSc, 1991).

HOFTON,A.N. Classes and Seminar Notes (England: Cranfield Institute of Technology, 1991).

HOFTON,A.N. Lecture Notes delivered at Cranfield Institute of Technology. 1990/91

HOLLOWAY, D.S.T. A Systems Approach to the Modelling of Airline Creditworthiness, (England: MPhil thesis, CIT, 1991).

IATA. World Air Transport Statistics. (Canada: IATA, 1988).

ICAO DIGEST OF STATISTICS. Traffic by Flight Stage (Canada: ICAO, 1987-1988).

ICAO DIGEST OF STATISTICS. Airport Traffic and Statistics (Canada: ICAO, 1987-1988).

ICAO DIGEST OF STATISTICS. Financial Data (Canada: ICAO, 1987-1988).

ICAO DIGEST OF STATISTICS. Airline Annual Reports (Canada: ICAO, 1982-83).

ICAO DIGEST OF STATISTICS. Flight Origin and Destination (Canada: ICAO, 1987-1988).

ICAO BULLETIN. Special Air Transport Report: International Air Passengers and Freight in the Middle East (Canada: ICAO, 1989).

ICAO. Manual On Air Traffic Forecasting. (Canada: ICAO, 2nd, 1985).

INDEPENDENT REGULATORY AGENCY. A New Scapegoat (USA: Yale, 1956/65)

INTERAVIA. April 1989.

INTERAVIA. Arab Air Transport (Interavia, July 1985).

IPPOLITO,R.A. Estimating Airline Demand with Quality of Service Variables (Journal of Transport Economics and Policy) pp.7-15.

JAMES,G. Financial Performance And Future Prospects Of U.S. Airlines. (U.S. : EIU Travel And Tourism Analyst No.2, 1989).

JENKS,C. Can Europe Replicate US Hubbing? (England: Avmark Aviation Economist, Nov/Dec.1990).

JONES,H. and TWISS,B.C. Forecasting Technology For Planning Decisions. (Hong Kong: Shanghai Printing Press, 1978).

JORDAN,W.A. Problems stemming from Airline Mergers and Acquisitions (USA: American Economics Association, 1987).

KANAFANI,A. Transportation Demand Analysis (McGraw Hill Book Company, 1983).

KANE,R.M. and VOSE,A.D. Air Transportation (Iowa: Kendall/Hunt Publishing Company, 1975).

KAZE,R. European Regional Services (UK: Travel and Tourism Analyst Survey, Dec.1987).

KHAN,A.E. Surprises of Airline Deregulation (USA: American Economic Review, 1988).

LEVINE,M.E. Is Regulation Necessary? (USA: California Air Transportation and National Regulatory Policy, Yale Law Journal, 4 July 1965).

LEWIS,C. Business Forecasting In A Lotus 1-2-3 Environment. (England: John Wiley & Sons Ltd, 1989).

LILL. "Die Grundgesatze der Personanverkehrs, Zeitschrift fur Eisenbahnen und Dampshiffsfart der Osterreichisungarischen Monarchie, No.35-6, 1888.

LLOYD'S AVIATION ECONOMIST, Aircraft Purchasing, (August and September 1985).

LLOYD'S AVIATION ECONOMIST. Possible Connections. (Feb./Mar. 1986).

LLOYD'S AVIATION ECONOMIST. Price Convolution. (Feb. 1989).

LLOYD'S AVIATION ECONOMIST. How Big Will Aircraft Get? (Oct.1989).

LLOYD'S AVIATION ECONOMIST. Escalation In The Manufacturer's War Of Words. (June 1986).

MAKRIDAKIS,S. The Art And Science Of Forecasting. (France: European Institute of Business Administration, 1985).

MAKRIDAKIS,S. Metaforecasting: Ways Of Improving Forecasting, Accuracy and Usefulness (France: European Institute of Business Administration, 1985).

MEYER,J.R., CLINTON,V. and OSTER,J.R. Deregulation and the New Airline Entrepreneurs (USA: The MIT Press, 1984).

MORRISON,S.A. and WISTON,C. The Economics Effects of Airline Deregulation (The Brooking Institution, 1986).

OCRANE,E.B. Dictionary Of Air Transport And Air Traffic Control, (UK: Granada Publishing Ltd. 1984).

PICKRELL,D. Airline Deregulation (Ed.K.Button. England: David Fulton Publishers, 1991).

PRESIDENCY OF CIVIL AVIATION. PCA Statistical Yearbook (Saudia Arabia: Ministry of Defence and Aviation, 1987-88).

PRYKE,R. European Air Transport Liberalisation. (UK: EIU Travel and Tourism Analyst, No.1, 1989).

RAVENSTEIN,E.G. Laws of Migration (Journal of the Royal Statistics Society, June 1885 and June 1889).

REK,B. Comecon Airlines Look To West For New Jets. (Interavia, Feb. 1989).

RICHARD.S.B. International Relationships Affecting Air Travel. (Land Economics, 1957).

ROYAL AIR FORCE. Flight Information Publication, En Route Supplement, Africa and Southern Asia (UK: By 1 AIDU (RAF), 8 April 1988).

SAWERS,D. Competition in the Air (England: The Institute of Economic Affairs, 1987).

SHAW,S. Airline Marketing and Management (London: Pitman Publishing, 1990).

SHAW,S. Air Transport : A marketing Perspective. (London : Pitman Publication Inc,1982).

SIMPSON,R.W. Theory Of Domestic Airline Economics. (USA: Flight Transportation Laboratory, M.I.T., 1974).

TANEJA,N.K. Airline planning (USA : Lexington Books, 1982).

TANEJA,N.K. The Commercial Airline Industry (USA : Lexington Books, 1976).

TANEJA,N.K. Airline Competition Analysis. (USA: Flight Transportation Laboratory, MIT, Memo FLT-M68-2, 1968).

TANEJA,N.K. Airlines in Transition (USA: Lexington Books, 1981).

TANEJA,N.K. The Commercial Airline Industry (USA: Lexington Books, 1976) pp.166-167.

TANEJA,N.K. The International Airline Industry (USA: Lexington Books, 1988).

TANEJA,N.K. Airlines In Transition. (USA : Lexington Books, 1981).

TANEJA,N.K. Model For Forecasting Future Air Travel Demand On North Atlantic. (USA: Flight Transportation Laboratory, M.I.T., January 1976).

TEODOROVIC,D. Airline Operations Research (London: Gordon and Breach Science Publishers, 1988).

THE ECONOMIST. GCC Survey (UK: The Economist, February 8, 1986).

WELLS,A.T. Air Transportation (USA: Wadsworth Inc., 1989).

WHEATCROFT,S and LIPMAN,G. Air Transport in a Competitive European Market (London: Economist Intelligence Unit, 1986).

WHEATCROFT,S. and LIPMAN,G. European Liberalisation and World Air Transport (London: Economist Intelligence Unit, 1990).

WHEATCROFT,S. The Economics of European Air Transport (Manchester: Manchester University Press, 1956).

WHISTON,T. The Uses And Abuses Of Forecasting. (GB: Billing And Sons Ltd, 1979).

WILLIAMS,C. An Analysis of Competitive Advantage amongst Regional Aircraft Types within the Liberalised European Air Transport Market. (England: MSc thesis, CIT, 1990).

WILLIAMS,G. Establishing an Effective Economic Regulatory Policy for the Airline Industry (England: PhD thesis, CIT, 199O).