DISSERTATION

ON

"FLIGHT DELAY ANALYSIS"

A Dissertation report submitted in partial fulfillment of the requirements for
Master of Technology (Petro Informatics)
of University of Petroleum & Energy Studies, India.

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DECLARATION BY THE GUIDE

This is to certify that the dissertation report on "Flight Delay Analysis" submitted to the University of Petroleum & Energy Studies, Gurgaon, by Sunpreet Kaur, in partial fulfillment of the requirement for the award of the degree of M.B.A. (Aviation Management) is a bonafide work carried out by her under my supervision and guidance.

Date: - 27/4/2007.

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TABLE OF CONTENT

ABSTRACT

Flight delay is one of the most pressing problems in the air transport because of the major economic and operational impact of flight delay, it is essential for us to understand the causes of flight delay and find out the measures to reduce delay. Delay is inherently stochastic phenomenon. One case study of Asia Pacific region is been discussed which tell about the financial losses occurred due to delay. Statistics on delay in India is being collected through primary source. Customer service is also one of significant concern to an airline passenger. The on-time performance of an airline is one of the important indicators of customer service. Analysis the measures related to delays like services to customers, compensation for delays, airlines irregular operations and so on. Analysis between flight delays and the financial loss of the airlines.

LIST OF TABLES

LIST OF FIGURES

OBJECTIVES

- To study about the flight delays globally
- To analyze the causes, impact of flight delays on airlines.
- To find out the measures to reduce the rate of flight delays.

RESEARCH METHODOLOGY

1) This paper involves the

Qualitative study i.e. the exploratory technique. Under this the theoretical aspect of aviation market is taken into account. The prospect of global market is being viewed would be defined in its own focused way. As this paper deals with the impact so there is no scope for the testing by various other tools. The graphical representation and percentage variation would bring out the clear picture of the impact on airlines and airport due to delays. Under this head various questionnaire would be prepared and filled up by various industry professionals. Especially by the people who are engaged in real time practical market related to aviation. The data presented in the paper is also backed up by various other facts and figures from web sourceS

The data collection is of the Indian scenario is being collected from Rajiv Gandhi Bhawan where we meet ED (Operations) , Mr. BK Arora helps us in providing data of congestion and delays. Also one day data flight delay is being collected in the month of December at DIAL.

CHAPTER-1

INTRODUCTION OF FLIGHT DELAYS IN GLOBAL SCENARIO

1.1 INTRODUCTION

Civil aviation has become an integral part of the economy. It is a key catalyst for economic growth and has a profound influence on the quality of life of populations around the globe. It integrates the world economy and promotes the international exchange of people, products, investments, and ideas. Indeed, to a very large extent, civil aviation has enabled small community and rural populations to enter the mainstream of global commerce by linking such communities with worldwide population, manufacturing, and cultural centers. Civil aviation products and services generate a significant surplus for the trade and are in the forefront in the development and use of advanced technologies. Fundamentally, civil aviation touches nearly every aspect of our lives, and its success will, to a great degree, shape society and the economy in the coming decades. The ability of civil aviation to foster economic growth and engender social mobility is not, however, guaranteed. By 2000, the economic and personal cost of delays caused by constrained airport and airway capacity and reduced aviation system efficiency reached unacceptable levels. The recent economic downturn and the decline in air transportation without swift and thorough intervention, the costs of delay will continue to rise, further harming the economy, the competitiveness of its industries, and all who rely on aviation in the conduct of their business and personal affairs. Conversely, additional investment in the nation's aviation infrastructure will facilitate economic growth and employment. This study provides causes and impacts of delays, the cost involved by the flight delays and measures for slowing the growth in delay globally.

1.1.1 UNITED STATES AND EUROPEAN SCENARIO

Delay is defined as " the difference between the actual and scheduled time at the referent location". The threshold for either arrival or departure flight delay is the period longer than 15 minutes behind the schedule. Delay has become common phenomenon at many airports in Europe and U.S. Delays at airports are commonly articulated as the average time per flight or the average time per delayed flight (the total delay divided by the number of all or by the number of only delayed flights per period). In addition, total delays are constantly segregated into the arrival and departure. Table 1(a) clearly indicated the percentage of delays of aircraft (arrival and Departure) at the two region selected airports. The study found out the maximum and minimum delay at the selected congested airports of U.S. and European regions.It is also revealed that the average delay per flight – either departure or arrival , has been generally longer at the U.S. than European airports.

TABLE 1(a): DELAYS AT SOME CONGESTED EUROPEAN AIRPORTS AND U.S. AIRPORTS

US AIRPORTS	% OF FLIGHT DELAYED		EUROPEAN AIRPORT	% OF FLIGHT DELAYED	
	ARRIVAL	DEPARTURE		ARRIVAL	DEPARTURE
PHILADELPHIA	40.4	37.9	FRANKFURT	30.8	18.9
NY- LA GUARDIA	40.1	28.9	BRUSSELS	29.8	27.7
NEWARK	38.4	31	AMSTERDAM	25.7	23.2
BOSTON LOGAN	37.7	29.3	PARIS- CDG	24.6	21.8
CHICAGO- O' HARE	33.6	29.9	ZURICH	23.2	23.8
SAN FRANCISCO	32.1	21.5	MADRID	19.6	20
ATLANTA	30.9	26.8	LONDON GATWICK	19.6	24.3
PHOENIX	29..6	30.8	COPENHAGEN	19	19
NY- JFK	28	19	LONDON HEATHROW	17.8	10.3
LOS ANGELES	26.1	20.8		17.4	21
DETROIT	24.6	26.3			
DALLAS- FT. WORTH	21.7	23.7			

SOURCE:EUROCONTROL/ECAC; FAA

FIGURE 2(a):FLIGHT DELAYS- U.S AIRPORTS

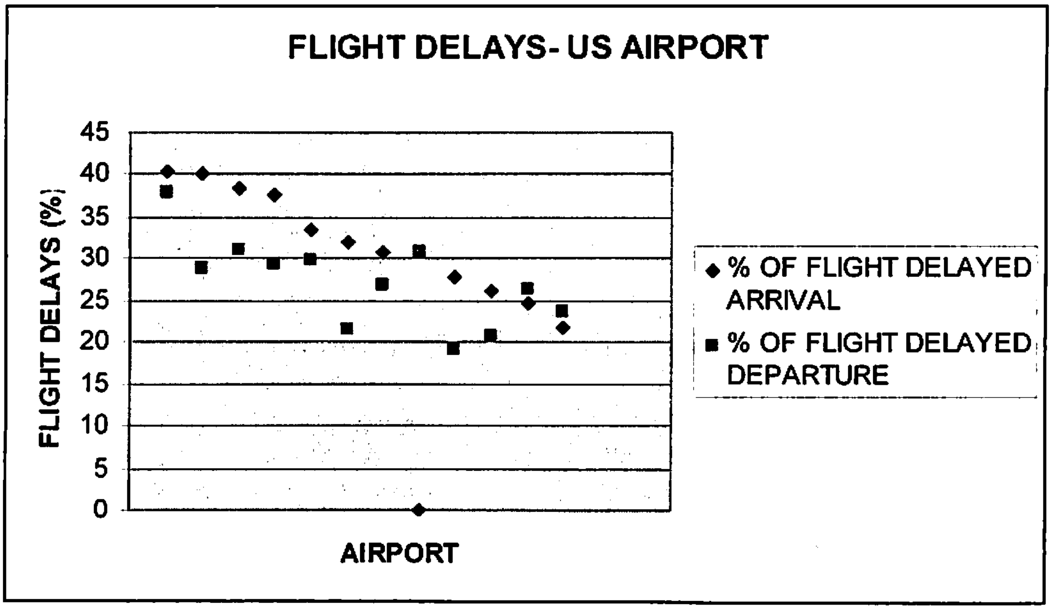


FIGURE 2(b): FLIGHT DELAYS IN EUROPEAN AIRPORT

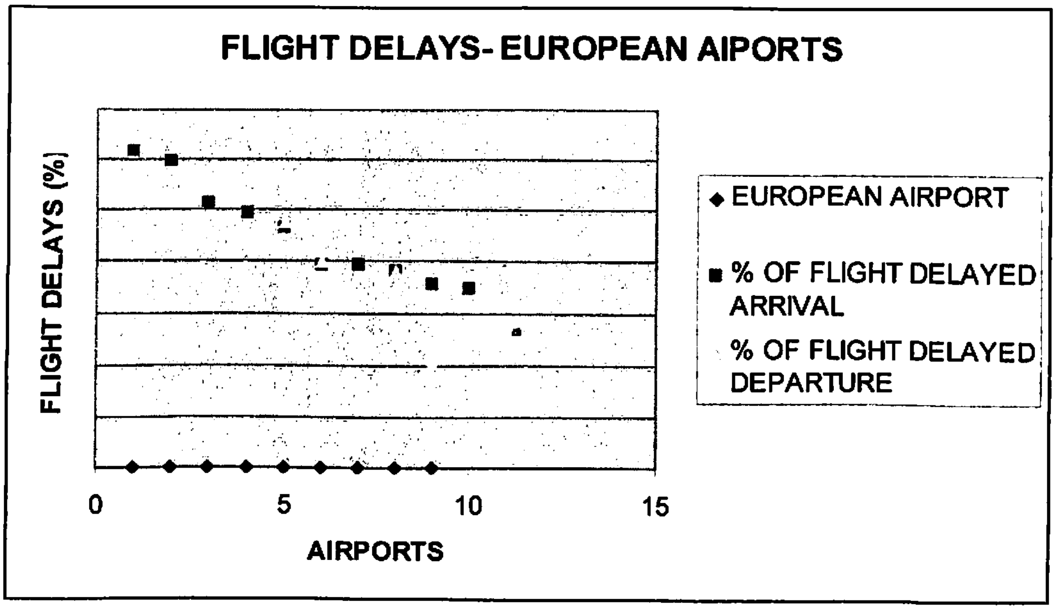
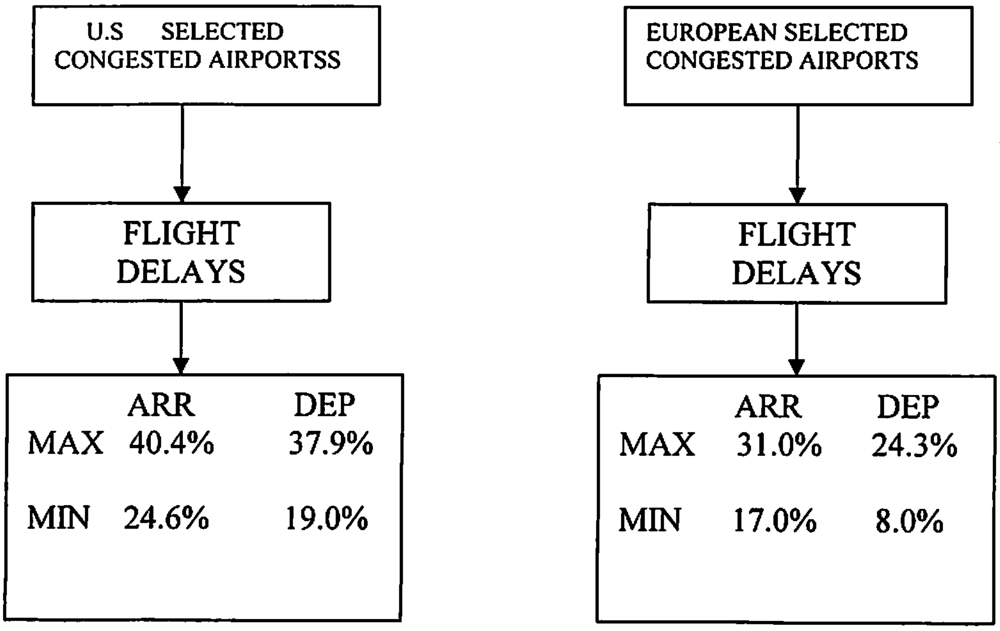


FIGURE 2(c)



At European airports, there has not been any conspicuous difference between the average delay per arrival and departure flight. Almost all delays have been shorter than 10 minutes. In the U.S. airports, the depature delays are higher than the arrival delays. It is varying between 10 and 20 minutes in the departure and in the arrival, the delay varies between 5 to 15 minutes .Generally, the threshold of 15minutes is adjustable and should not be considered delayed at all. In U.S. , on an average of 70%- 75% flight delays caused by weather and congestion causes about 20%- 30% of these delays. In Europe , on an average , 1-4% flight delays are caused by weather and congestion causes bout 30-40% of these delays.

The European Civil Aviation Conference (ECAC) reveals that European region's air transport arise a problem at 35 countries recognized a short of capacity in the airspace and at large airports. The capacity system available seriously constraints access to the system at many airports. Of the airports over 5.0 MPPA in 1993, 25 airports will need extra runway capacity before 2005 otherwise; delays would lead to become worse. The 33 largest airports offered two-third of the total intra European scheduled seats, the others being spread among 72 airports with less than 1 MPPA. The capacity utilization at the major airports is disclosed in Table 1(b) .

TABLE 1(b):EUROPEAN AIRPORT RUNWAY CAPACITY UTILIZATION

AIIRPORTS	ATM/HOURS	MPPA	MPPA/ ATM
PARALLEL RUNWAY			
HEATHROW, LONDON	81	54	0.67
CDG, PARIS	76	28	0.37
COPENHAGEN	76	14	0.18
ORLY, PARIS	70	27	0.39
MUNICH, GERMANY	70	15	0.21
FRANKFURT	70	38	0.54
BRUSSELS	60	11	0.18
FIUMICINO, ROME	56	21	0.38
MALPENSA, MILAN	30	4	0.13
CONVERGING RUNWAYS			
STOCKHOLM	66	13	0.2
ZURICH	60	15	0.25
MADRID	30-50	19	0.38
VIENNA	45	8	0.18
HAMBURG	42	8	0.19
DUBLIN	36	7	0.19
BARCELONA	30	11	0.37
AMSTERDAM	50	25	0.5
SINGLE RUNWAY			
GATWICK, LONDON	47	23	0.49
MANCHESTER	42	15	0.36
DUSSELDORF	30	15	0.5
GENEVA	30	6	0.2
ATENS, GREECE	30	10	0.33
LINATE, MILAN	22	10	0.45

SOURCE: CAA; ACI ANNUAL TRAFFIC STATISTIC

The worst affected airports are the largest hubs, namely – Heathrow, Gatwick, Frankfurt , Charles de Gaulle (CDH), Orly, Amsterdam , Brussels, Berlin, Vienna, Dusseldorf, Manchester, Copenhagen, Zurich, Geneva, Barcelona, Madrid, Milan, Linate, both Rome and Athens. Euro control reveals the airspace capacity system has reached to 70- 75% by 2005 , so that the main bottleneck in the system would be runways.

KEY ON-TIME PERFORMANCE AND FLIGHT CANCELLATION STATISTICS

Based on Data Filed with the Bureau of Transportation Statisticsby the 20 Reporting Carriers

Overall

67.3 percent on-time arrivals

Highest On-Time Arrival Rates

1. Hawaiian Airlines – 91.4 percent
2. Aloha Airlines – 91.1 percent
3. Southwest Airlines– 77.3 percent

Lowest On-Time Arrival Rates

1. Comair – 53.5 percent
2. JetBlue Airways – 57.4 percent
3. Northwest Airlines – 58.8 percent

Most Frequently Delayed Flights

1. US Airways flight 154 from Philadelphia to San Francisco – late 100% of the time

2. JetBlue Airways flight 76 from West Palm Beach, FL to New York JFK – late 96.43 percent of the time

3. US Airways flight 1853 from Buffalo, NY to Philadelphia – late 96.00 percent of the time

4. ExpressJet Airlines flight 3070 from Newark, NJ to Charlotte, NC – late 95.83 percent of the time

4. US Airways flight 1760 from Newark, NJ to Charlotte, NC – late 95.83 percent of the time

5. Mesa Airlines flight 2809 from New York JFK to Charlotte, NC – late 95.83 percent of the time

Highest Rates of Canceled Flights

1. Comair – 10.6 percent
2. JetBlue Airways – 9.2 percent
3. Mesa Airlines – 7.4 percent

Lowest Rates of Canceled Flights

1. Hawaiian Airlines – 0.3 percent
2. Aloha Airlines – 0.8 percent
3. Continental Airlines – 0.9 percent

INDIAN SCENARIO

Hub and spoke networks changed the face of airline competition, creating a network industry far different from what regulators envisioned before deregulation. Since then, the cost advantages of hub and spoke systems have been well documented. Resulting changes in the price and frequency of flights have also been the subject of detailed economic analysis. The impact of hub and spoke systems on flight delays, however, has received less attention, despite the high cost of delays to time-sensitive business travelers. This study seeks to analyze the flight delays.

Flights of Air India were delayed by more than *20 minutes in a large number of cases ranging from 17.35 to 21.87 *per cent* of total flights. The reasons for the delays were mainly commercial (delay in identification of baggage, passenger manifest reconciliation etc.), ground services (aircraft handling at airport), operational (delayed arrival of crew), engineering (last minute technical snags developed in the aircraft) and miscellaneous (delay in clearance from Air Traffic Control, Immigration/Custom related issues, weather conditions etc.) . The Company did not maintain the industry data in regard to the adhering to flight schedules, for evaluation of its own performance *vis a vis* the other airlines. While the delays falling under categories like Commercial, Engineering and Miscellaneous categories were largely unavoidable, the delays due to non-availability of operating crew or cabin crew at the last moment and non availability of ground services could be avoided to some extent by proper planning and effective control system.

Every minute an aircraft hovers over an airport, waiting in an air-queue to land, the airline it belongs to loses Rs 2,500.That is if the aircraft is a Boeing or an Airbus. If it's an ATR, the cost is about Rs 750 a minute. The collective fleet of various Indian carriers today stands at 1,200 aircraft. Half of them have to circle above airports for an average 30 minutes every day. That is a loss of Rs 135 crore per month for the airline industry - for no fault of theirs. The daily losses on account of airport jams are, by conservative estimates, pegged around Rs 5 crore. But it is not just higher jet fuel costs that have hit the airlines. Air clogs also bulk up personnel costs because airlines shell out overtime money to pilots and cabin crew. It also squeezes their cargo revenues. This is because airlines are forced to carry more fuel - about 30 to 40% more since. This, in turn, increases the weight of aircraft, which automatically limits the cargo that an aircraft can carry.

According to Spice jet , they usually fill five tonnes of aviation turbine fuel (ATF), but due to congestion, they now fill around 7-7.5 tonne of fuel. Due to this increased load, the engine uses more fuel. This also forces us to reduce the cargo onboard. An Air Deccan complained the congestion also led to lower levels of aircraft utilisation

Depending upon the nature of delay from the schedule departure time, Snacks & Meals are served to the passengers from the best available lounge prevailing at the respective airports.

- ¨ Delays beyond 2 hrs passengers are given 100% refund or can have the ticket endorsed to other airline subject to availability of the same connection.
- ¨ Flights getting indefinitely delayed and resulting in cancellation due to uncontrollable factors like natural calamities, bad weather & Bandhs the passengers are provided accommodation and the expenses incurred are borne by Air Sahara.
- ¨ We have a unique scheme unlike any other airline 'If We Delay We Pay' which is applicable on all direct flights between metro stations and the passengers have an option of having a cheque of Rs. 1500/- or ticket credit of Rs. 3000/- (this is applicable to all passengers flying on all published fares.)

CHAPTER-2

CAUSES OF FLIGHT DELAY

Delays above 5 minutes affect airline schedule integrity and can create extensive passenger inconvenience when flights are cancelled or diverted. When the airport is operating at reduced capacity, a large share of all arriving flights will be delayed or cancelled, and delays can typically average an hour or more, with frequent flyers routinely experiencing two to three hour delays. It should be pointed out that "modeled" delays are not directly comparable to other commonly quoted delay statistics from the FAA and Bureau of Transportation Statistics. These data track airline on-time performance and delays throughout the national airspace system, whereas this analysis focuses exclusively on what happens within the Oakland air route center airspace extending out about 150 nm. Delay information for Bay Area airports is summarized in the appendix using FAA CODAS data for 1997 and 1998.

2.1 FACTORS AFFECTING DELAY ON RUNWAYS AND AIRSPACE

Aircraft and passenger delays occur for many reasons. The factors affecting delay are presented and discussed. The purpose of this discussion is to orient the reader on the causes of airport delay. The following four factors have the most significant impact on delay:

- Weather Conditions – Weather at the airport, especially as it affects visibility
- Airfield Layout –Configuration of runways (parallel, intersecting or combinations)
- Fleet Mix – Mix of aircraft, by size and type, using the airport
- Traffic Peaks – Periods when traffic volumes reach high points during the day

Of the four factors, weather has the most significant effect. It also directly impacts the other factors because it determines the rules under which aircraft are operated. Better understanding of all these factors will help to identify the source of delays at Bay Area airports, and to develop solutions to relieve congestion.

2.1.1 Weather Conditions

Weather affects airport operations in a number of ways. Wind direction and strength combined with visibility conditions (range and ceiling) require different runway use combinations and result in different airport capacities at the three Bay Area airports. While wind may change the direction of aircraft operations, it generally does not inhibit capacity. However, SFO normally has aircraft arrive on runways 28L and 28R and depart on 1L and 1R except when westerly winds exceed 20 nm per hour. In this condition, runways 1L and 1R cannot be used for departures. All aircraft must then use runways 28L and 28R for arrivals and departures, reducing SFO from four runways to two. This occurs at SFO between 7% and 10% of the time.

Visibility has a significant effect on capacity and defines the two main weather-related conditions under which aircraft operate. These are visual flight rules (VFR) and instrument flight rules (IFR). In good weather, skies are clear and VFR is in effect, typically allowing simultaneous use of close parallel runways because pilots can see nearby aircraft. When the cloud ceiling is low and visibility is poor, however, IFR is in effect and aircraft require greater separation. Under IFR conditions with closely spaced parallel runways (less than 4,300 feet separation or 3,400 under certain conditions), only one runway can be used. Since this is the situation with SFO, only a single runway can be used for arrivals during IFR conditions.

Table 2(a) shows the proportion of VFR to IFR conditions for the three Bay Area airports. SFO is affected the most by weather, which often means that the airport loses one of its two landing runways, thereby cutting the capacity from a maximum of 60 arrivals per hour to 30 or less per hour.

Table 2 (a) Percentage of Visibility Conditions

	VFR (Good Weather)	IFR (Bad Weather)
San Francisco	80.0%	20.0%
Oakland	79.5%	20.5%
San Jose	85.0%	15.0%

Source: San Jose International Airport Master Plan, Draft 1996.

Bad weather is typically the main cause of delay at Bay Area airports. There are two types of bad weather that affect operations:

1) Bad weather in the morning during the summer due to low ("stratus") clouds,

2) Bad weather all day, usually in the winter, due to seasonal storms with gusting southeasterly winds.

While bad weather mornings are about twice as frequent as bad weather all day, there is a greater chance of flight cancellations when weather is bad all day. When the weather is bad only in the morning, the airport has a chance to recover with delayed flights (similar to recovery following peak periods described in Section 2.1.4). When the weather is bad all day, the airport is often unable to accommodate all of the scheduled flights, leading to cancellations or diversions.

SFO's recent analysis shows that:

- On good weather days, 83% of the flights arrived on time (within 15 minutes of their scheduled arrival time)
- On days when weather was bad in the morning, 67% of the flights arrived on time
- On days when weather was bad all day, only 48% of the flights arrived on time[1]

Also, with poorer weather, more flights are cancelled, ranging from an average of 2% on good weather days to about 10% on days when the weather is bad all day.'

2.1.2 Runway Layout

The capacity of an airfield is determined in part by its configuration. Once a runway's capacity is exceeded, the airfield begins to experience delays. Two layout characteristics are the primary determinants of capacity. These are lateral spacing (between parallel runways) and intersecting runways. Other airfield characteristics that affect capacity are location of high speed exits, and taxiway configuration. The two major runway layout characteristics are:

Lateral Spacing – San Francisco currently has two pairs of parallel runways with each pair spaced 750 feet, which is adequate for simultaneous landings and takeoffs in VFR.conditions. San Francisco does not have adequate separation, however, under IFR conditions for independent simultaneous operations, as shown in the standards in Table 2(b).

Table 2(b) Runway Separation Standards Using IFR for Parallel Streams

Operation	Minimum Separation
Simultaneous approaches	4,300 feet
Simultaneous approaches (radar) *	3,000 feet
Simultaneous departures (non-radar)	3,500 feet
Simultaneous departures (radar) **	2,500 feet
Simultaneous approach and departure	2,500 feet

*Under consideration by FAA with high update radar and monitoring equipment.

** When the departure tracks diverge by at least 15° on each side, simultaneous departures in IFR are possible even for runways as close as 750 feet.

Oakland and San Jose do not currently have parallel runways, but San Jose has one under development, and Oakland has future plans that include a new parallel runway. A narrower runway separation limits aircraft throughput, especially for arrivals and under IFR conditions. Wider runway separation allows for more operational flexibility and therefore a higher capacity. If runway thresholds are staggered, separation may be reduced or increased, depending on the amount of stagger and which runways are used for arrivals and departures. FAA provides complete guidelines for runway separation.

Intersecting Runways – When runways intersect, the throughput is limited by the obvious need to coordinate the cross traffic. The capacity of intersecting runways is dependent upon the location of the intersection; the manner in which runways are operated for takeoffs and landings (known as the runway use strategy); and the aircraft mix. The farther the intersection is from the takeoff end of the runway and the landing threshold, the lower the capacity. The maximum capacity is achieved when the intersection is close to the takeoff and landing threshold.

With two intersecting runways, departures are typically held on one runway, while an arriving aircraft lands on the intersecting runway. This dependent operation can be further complicated when a runway intersects parallel runways or more so when two sets of parallel runways intersect. In this case, operations must be synchronized into arrival pairs and departure pairs to maximize the window for intersecting traffic. In the case of the three Bay Area airports, only SFO has intersecting runways; OAK and SJC do not.

2.1.3 Fleet Mix

The fleet mix at a given airport affects the flow of departure and arrival streams due to the varying characteristics of different aircraft and their impact on one another. Standards for minimum separation (headway) between arriving and departing aircraft must be met; this limits the flow of operations and hence is a factor affecting delay. Size, based on weight, determines the minimum separation between aircraft. Smaller aircraft must have adequate separation behind larger aircraft due to the wake turbulence created by the larger aircraft.

Table 2(c), below, is a definition of the four aircraft groups FAA has designated to determine aircraft separation. The B757 is in its own category because its weight places it in the "Large" category, however its wake characteristics are like a "Heavy" aircraft. Table 2(c) shows typical aircrafts that are representative of these categories.

Table 2(c) Aircraft Categories for Wake Separation

Heavy	Gross weight greater than 300,000 lbs. – B747, Airbus 340
B757	B757
Large	Gross weight greater than 12,500 lbs. but less that 300,000 lbs. – B737, Airbus 320
Small	Gross weight less than 12,500 lbs. – Citation II, Beech Baron

In an arrival stream, the order in which aircraft of different weights are allowed to approach must be considered. Using the aircraft categories above, final approach wake turbulence separation, measured in nautical miles, is determined by the order of the arriving aircraft. In a departure stream, the order in which aircraft of different weights are allowed to takeoff must be similarly considered. Also, the mix of turboprops and jets is another factor determining departure separation, since turboprops climb in altitude more slowly than jets do. Greater separation must be provided between a jet following a turboprop, in order to give the turboprop sufficient time to reach the point at which it leaves the jet route.

As an example of the application of these rules, for San Francisco, the separations presented in Table 2(d) are followed. This table shows separations within 10 nautical miles of the airport and in the larger aircraft (general) as well as in VFR and IFR conditions.

Table2(d): Minimum SFO Trailing Aircraft Separations (in nautical miles)

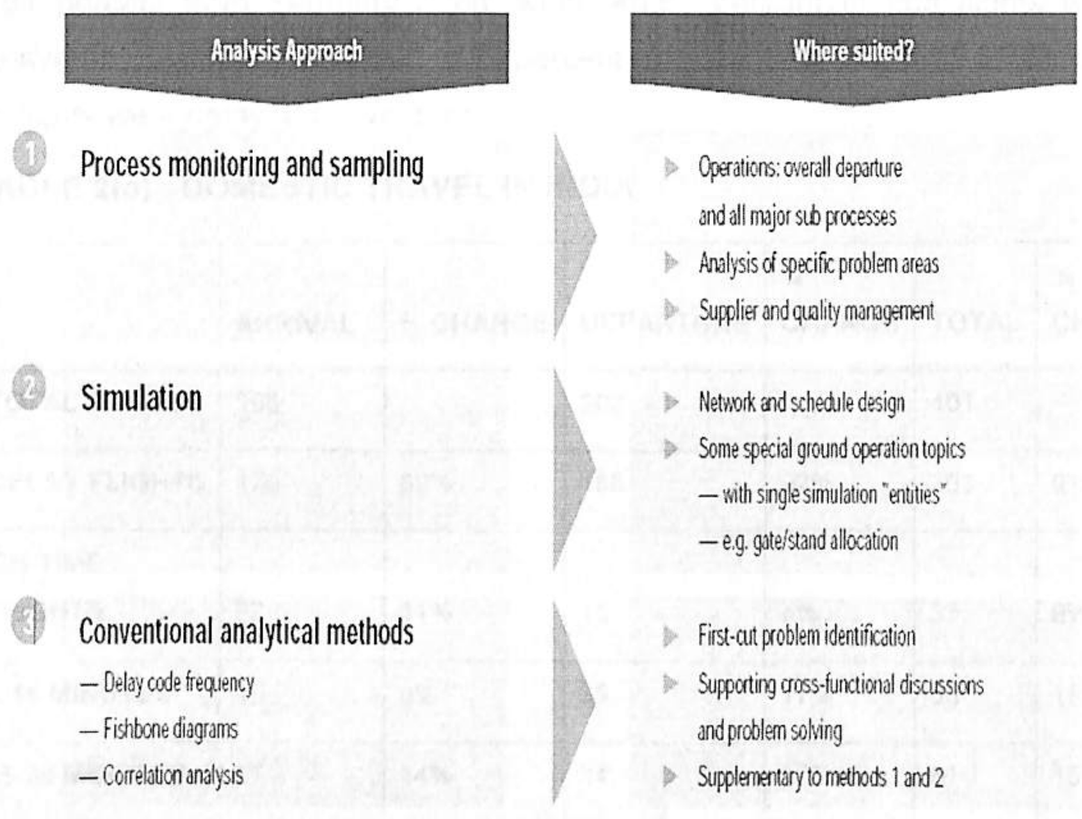
		Trailing Aircraft							
		Final Approach (within 10 nm)				General			
Conditions	Leading Aircraft	Heavy	B757	Large	Small	Heavy	B757	Large	Small
Visual Flight Rules	Heavy	2.9	3.6	3.6	4.5	4.0	4.0	5.0	5.0
	B757	2.9	2.9	2.9	3.7	4.0	4.0	4.0	5.0
	Large	2.5	2.5	2.5	2.7	4.0	4.0	4.0	4.0
	Small	2.5	2.5	2.5	2.5	4.0	4.0	4.0	4.0
Instrument Flight Rules	Heavy	4.0	4.0	4.0	6.0	4.0	4.0	5.0	5.0
	B757	4.0	4.0	4.0	5.0	4.0	4.0	4.0	5.0
	Large	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	Small	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

2.1.4 Traffic Peaks

As mentioned above in discussing runway layout, every airfield has capacity limits. When that capacity is exceeded, delays result. During peak periods, the airfield capacity may be exceeded for a brief or sustained period depending on the peak's duration. In the case of a brief or sustained peak, a queue begins to form which results in delay. For a shorter peak, the queue will begin to dissipate in the time following, and delays will decrease as the volume reduces back to or below capacity. For a more sustained peak, however, the recovery time is much longer and the delays persist. Sometimes, the impact of a long peak has a ripple effect that can be felt throughout the day. If there are significant peaks that begin to overlap, the airport may experience a low level of service and not recover all day.

Table 2(c) illustrates what happens when capacity is exceeded during most of the day. The upper curve is the cumulative demand curve, i.e., aircraft arriving in the airport area since midnight. The lower curve is the cumulative number of aircraft that have been processed (landed). For an aircraft arriving at 1800 (6 p.m.), the tower may tell the pilot "you are number 420 and we are currently serving number 320. Your estimated landing time will be about 2200 (10 p.m.)". This implies a four hour delay. This figure also shows that once capacity is exceeded, the delays just keep growing.

Exhibit 5. Three Approaches for Identifying the 'Real' Delay Root Causes



DELAY SCENARIO

In February, the carriers filing on-time performance data reported that 8.83 percent of their flights were delayed by aviation system delays, compared to 8.34 percent in January; 9.58 percent by late-arriving aircraft, compared to 7.88 percent in January; 8.14 percent by factors within the airline's control, such as maintenance or crew problems, compared to 6.74 percent in January; 1.38

percent by extreme weather, compared to 1.1 percent in January; and 0.07 percent for security reasons, compared to 0.06 percent in December. Weather is a factor in both the extreme-weather category and the aviation-system category. This includes delays due to the re-routing of flights by DOT's Federal Aviation Administration in consultation with the carriers involved. Weather is also a factor in delays attributed to late-arriving aircraft, although airlines do not report specific causes in that category.Data collected by BTS also shows the percentage of late flights delayed by weather, including those reported in either the category of extreme weather or included in National Aviation System delays. In February,41.68 percent of late flights were delayed by weather, down 8.61 percent from February 2006, when 45.61 percent of late flights were delayed by weather, and down 8.49 percent from January when 45.55 percent of flights were delayed by weather.

TABLE 2(e) : DOMESTIC TRAVEL IN INDIA

	ARRIVAL	% CHANGE	DEPARTURE	% CHANGE	TOTAL	% CHANGE
TOTAL FLIGHTS	198		203		401	
DELAY FLIGHTS	176	89%	188	92%	363	91%
ON-TIME FLIGHTS	22	11%	15	7%	37	9%
1-15 MINUTES	15	8%	35	17%	50	13%
16-30 MINUTES	27	14%	34	17%	61	15%
31-60 MINUTES	56	28%	51	25%	107	27%
ABOVE 60 MINS	78	39%	68	34%	146	36%

TABLE 2(f) : INTERNATIONAL TRAVEL IN INDIA

	ARRIVAL	% CHANGE	DEPARTURE	% CHANGE	TOTAL	% CHANGE
TOTAL FLIGHTS	80		74		154	
DELAY FLIGHTS	65	81%	64	86%	129	84%
ON-TIME FLIGHTS	15	19%	10	14%	25	16%
1-15 MINUTES	13	16%	15	20%	28	18%
16-30 MINUTES	16	20%	15	20%	31	20%
31-60 MINUTES	17	21%	13	18%	30	20%
ABOVE 60 MINS	19	24%	21	28%	40	26%

TABLE 2(g) : DOMESTIC DEPARTURE IN INDIA

HOURS	FLIGHTS	DELAYS
0601-7000	19	16
0701-0800	14	13
0901-1000	18	18
1001-1100	15	15
1101-1700	15	12
1701-1800	17	16
1901-2000	11	11

TABLE 2(h) : DOMESTIC ARRIVAL IN INDIA

HOURS	FLIGHT	DELAYS
0901-1000	17	15
1101-1200	14	11
1201-1300	13	11
1501-1600	16	14
1701-1800	13	12
2000-2100	13	13
2101-2200	14	13
2201-2300	13	13

TABLE 2(i) : INTERNATIONAL DEPARTURE IN INDIA

HOURS	FLIGHTS	DELAYS
0201-0800	6	5
0301-0400	3	2
1301-2000	5	5
1901-2300	6	4
2301-0000	5	4

TABLE 2(j) : INTERNATIONAL ARRIVALS IN INDIA

HOURS	FLIGHTS	DELAYS
0401-5000	7	7
1701-1800	5	3
2101-2200	7	7
2201-2300	6	3

Flight Cancellations

The consumer report also includes BTS data on the number of domestic flights canceled by the reporting carriers. In February, the carriers canceled 4.5 percent of their scheduled domestic flights, up from both February 2006's 2.1 percent rate and January 2007's 2.5 percent mark.

AIR TRAVEL CONSUMER REPORT

ADD ONE

Mishandled Baggage

The U.S. carriers reporting flight delays and mishandled baggage recorded a rate of 8.23 reports of mishandled baggage per 1,000 passengers in February, higher than both February 2006's 6.10 rate and January

2007's 8.19 mark.

Incidents Involving Pets

In February, carriers reported two incidents involving pets while traveling by air, down from four incidents in January. The February incidents both involved deaths.

Complaints About Airline Service

In February, the Department received 823 complaints about airline service from consumers up nearly 50 percent from the 550 complaints filed in February 2006 and up nine percent from the total of 752 received in January 2007.

Complaints About Treatment of Disabled Passengers

The report also contains a tabulation of complaints filed with DOT in February against specific airlines regarding the treatment of passengers with disabilities. In February, the Department received 19 disability-related complaints, down 24 percent from the total of 25 received in February 2006, and 32 percent less than the 28 received in January 2007.

Complaints About Discrimination

In February, the Department received 6 complaints alleging discrimination by airlines due to factors other than disability – such as race, religion, national origin or sex –one more than the number recorded in February 2006.

CHAPTER-3

IMPACT OF FLIGHT DELAYS

3.1 NATIONAL IMPACT

For the purposes of this study, civil aviation and its impacts include:

- Scheduled and unscheduled commercial passenger and cargo operations (including cargo-only transportation)
- General aviation (including business aviation and air taxi)
- Their related manufacturers, servicing, and support (including pilot and maintenance technician training)
- Their supply chains (indirect impacts)
- The effects of income generated (induced impacts) directly and indirectly by civil aviation
- The direct, indirect, and induced impacts of related industries, such as travel and tourism, for which air transportation provides an enabling function

Civil aviation's total impact in 2000 amounted to about 9 percent of GDP, of which 40 percent arose directly from civil aviation and related industries .Specifically:

- **Direct Impact:** $343 billion and 4.2 million jobs were produced directly in civil aviation11 or in industries related to civil aviation, such as travel and tourism .
- **Indirect Impact:** $255 billion and 3.2 million jobs arose indirectly in the other industries in the supply chain to civil aviation and related industries.

- **Induced Impact:** The remaining $305 billion and 3.8 million jobs were induced throughout the economy as the income generated by civil aviation is spent.
- **Total Impact:** Civil aviation generated a total impact of $904 billion in GDP and 11.2 million jobs. Of this, $102 billion in GDP and 1.3 million jobs were generated by general aviation. Of the 11.2 million jobs generated, roughly 60 percent arise in other industries.

3.1.1 "Rule 220" CONTRACT OF CARRIAGE

"If your flight is delayed, cancelled or you miss a connecting Airlines flight, due to a schedule irregularity"

- Airlines must confirm you on their next flight (on which space is available) at no additional cost.
- If there is an alternate Airlines flight that will arrive at your destination earlier than the alternate you have been offered, you have the right to be confirmed on this Airlines flight at no additional cost, even if first class space is all that is available.
- If the alternate Airlines flight is not acceptable to you, you have the right to be confirmed on the flight of a different airline at no additional cost.
- If there is an alternate "different airline" flight that will arrive at your destination earlier than any alternate flight you have been offered, you have the right to be confirmed on this flight at no additional cost, even if first class space is all that is available.
- If no alternate flight (a "different airline") is acceptable to you, Airlines must refund your money - even if you have a non-refundable ticket."

3.2 QUANTIFICATION OF CONGESTION COSTS

Congestion costs can be empirically appraised with the flight delays , by computing total extra time spend by passengers and airlines, and using some assumptions on the value of time for passengers and cost for airlines. X done a study on congestion cost at one of the European airport (Madrid Airport) with the help of actual number of passengers at each flight is known, the type of aircraft providing the service, which allows applying differential hourly rates per aircraft to evaluate airlines congestion costs. Passenger congestion costs reveal the magnitude of the problem facing at Madrid Airport. In July 2000, total passenger costs amounted to 16.2 million. Average costs are estimated between 4.5- 5.0 per passenger. The process of airport expansion induced some reductions in the average cost per passenger obtained in 2000 compared to previous years. Adding congestion costs borne by passengers and airlines, the significant of the problem of congestion experienced at Madrid airport can be assessed.

TABLE 3(a): PASSENGER CONGESTION COSTS: TOTAL COST AND AVERAGE COST

	Jul-97	**Jul-98**	**Jul-99**	**Jul-00**
TOTAL COST (IN MILLION *)- TOTAL MONTHLY COSTS				
ARRIVAL	6.42	7.39	8.71	8.84
DEPARTURE	7.94	7.64	8.6	7.34
TOTAL FLIGHTS	**14.36**	**15.03**	**17.31**	**16.18**
AVERAGE COST (IN */PASSENGER)- PER PAX				
ARRIVALS	4.04	4.36	4.51	4.01
DEPARTURE	4.91	5.89	5.95	4.53
TOTAL FLIGHTS	**4.96**	**5.02**	**5.14**	**4.24**

SOURCE: MADRID AIRPORT FINANCIAL STATISTICS

TABLE 3(b): AIRLINES CONGESTION COSTS (IN MILLION)

	Jul-79	Jul-98	Jul-99	Jul-00
ARRIVALS	14.7	16.7	20.3	22
DEPARTURES	18	17.6	20.4	17.2
TOTAL FLIGHTS	**32.7**	**34.3**	**40.7**	**39.2**

TABLE 3(c): WORLD- WIDE AIRSIDE AND TERMINAL DECLARED CAPACITY PER HOUR

AIRPORT	RUNWAY	TERMINAL	STATE	REGION
HARTSFIELD	184-200	22000	ATLANTA	N. AMERICA
O'HARE	150-175		CHICAGO	N. AMERICA
DALLAS FORT WILLIAMS	270	22000	DALLAS	N. AMERICA
DENVER	200	15500	DENVER	N. AMERICA
HALIFEX	56	3300		N. AMERICA
HONOLULU	120	12500		N. AMERICA
Mc. CARREN	110		LAS VEGAS	N. AMERICA
LOS ANGELES	153		CALIFORNIA	N. AMERICA
MIAMI	120	18400	MIAMI	N. AMERICA
St. PAUL	125	8000	MINNEAPOLIS	N. AMERICA
MIRABEL	40		MONTREAL	N. AMERICA
NEWARK	108	17000	NEW YORK	N. AMERICA
JFK	100	31000	NEW YORK	N. AMERICA
LA GUARDIA	81-100	12000	ORLANDO	N. AMERICA

ORLANDO	110		SAN FRANCISCO	N. AMERICA
SAM FRANCISCO	120	6000	CANADA	N. AMERICA
VANCOUVER	80	4600		N. AMERICA
COPENHAGEN	83-100	4500	GERMANY	EUROPE
FRANKFURT	80-100	14000	GERMANY	EUROPE
BRUSSELS	74			EUROPE
GENEVA	38-40		LONDON	EUROPE
GATWICK	50-60	12000	LONDON	EUROPE
HEATHROW	80-100	20000	LONDON	EUROPE
MANCHESTER	59	13000	RUSSIA	EUROPE
RUSSIA DOMO	51	6000	THAILAND	EUROPE
BANGKOK	60	10500	BEIJING, CHINA	ASIA PACIFIC
PEKING	60	9200	JAKARTA	ASIA PACIFIC
HONG KONG	50		PAKISTAN	ASIA PACIFIC
SOEKAMO HATTA	74	2100	PAKISTAN	ASIA PACIFIC
KARACHI	30	600	MALAYSIA	ASIA PACIFIC
LAHORE	30	1200	CHINA	ASIA PACIFIC
KUALA LUMPUR	50	7100	INDIA	ASIA PACIFIC
MACAU	24	4000	INDIA	ASIA PACIFIC
MUMBAI	24	5000	JAPAN	ASIA PACIFIC
DELHI	24	3500	S.KOREA	ASIA PACIFIC

KANSAI	30		SINGAPORE	ASIA PACIFIC
GIMPO SEOUL	32		SYDNEY	ASIA PACIFIC
CHANGI	66	19000	TAIWAN	ASIA PACIFIC
KINGSFORD	80	7200	NEW TOKYO	ASIA PACIFIC
TAIPEI	50	12000		ASIA PACIFIC
NARITA	44	16000		ASIA PACIFIC

Terminal Capacity- Assessment based on Number of Terminal (Total)

Airside Capacity- Assessment based on IFR/VFR/ATC/Runway/Noise/Terminal

Taking July 2000 as a month of reference, total congestion costs in 2000 amounted to 55.4 million (Pax costs + Airlines Costs). In annual terms, assuming that July could be considered a representative month of the activity of Madrid airport , total congestion costs are evaluated to 664.8 million.

3.2.1 Scenario of Asia- Pacific Airports

Asia Pacific region is now driving the world's economic growth including aviation sector, with Singapore, Thailand , Vietnam, China and India leading a centre stage and going to occupy the prominient share in the aviation growth. Asia Pacific rregion share has gone up in the aviation market during the last one decade. The prospective market in the air transport has exposed cryptogram of a sturdy global resurgence, with Asia Pacific region's performance far exceeding the world average growth during the next one decade. Government in Asia has been spending huge investment on national carriers and there is a sign of ploughing private sector investments into private airlines. Asia Pacific region traffic has zoomed to 760.90 million from approximately. By ,2014 ,the region will touch 1.0 billion passenger traffic will be touching 36.0% by 2014, primarily as a result of trade expansion and liberalization and globalization policies.

Trade normalization and market liberalization would help China and India to achieve the highest growth as compared to other countries in the Asia Pacific region . China will become the largest Asia Pacific country for domestic and internationall schedule passenger followed by India, Japan, Vietnam and other countries. The most rapid growth has been seen in the Europe- Asia Pacific and Trans Pacific traffic. The current globalization trends have encouraged airlines to intensify hubbing activities at major airports in the Asia Pacific. During the last 10 years, significant progress has been made in the airport and air space development to enhance growing demand. Accordingly, the region has started building "New Brand Airports" at Hong Kong, Kuala Lumpur, Kansai airport. Other countries like Singapore. Indonesia, Philippines and India are also expanding the terminal to accommodate the growing traffic in the region. The Table 3(d) would show the declared capacity of airside and terminal at the respective airports as on 2002.

TABLE 3 (d)

AIRPORT	**RUNWAY**	**TERMINAL**	**STATE/COUNTRY**	**REGION**
BANGKOK	60	10500	THAILAND	ASIA PACIFIC
PEKING	60	9200	BEIJING, CHINA	ASIA PACIFIC
HONG KONG	50	9000	CHINA	ASIA PACIFIC
LAHORE	30	1200	PAKISTAN	ASIA PACIFIC
KUALA LUMPUR	50	7100	MALAYSIA	ASIA PACIFIC
MUMBAI	24	5000	INDIA	ASIA PACIFIC
DELHI	24	3500	INDIA	ASIA PACIFIC
GIMPO SEOUL	32		S.KOREA	ASIA PACIFIC
CHANGI	66	19000	SINGAPORE	ASIA PACIFIC
KINGSFORD	80	7200	SYDNEY	ASIA PACIFIC
TAIPEI	50	12000	TAIWAN	ASIA PACIFIC
NARITA	44	16000	NEW TOKYO	ASIA PACIFIC

3.2.1.1 Proliferation of Low Cost Airlines in Asia

Many Asian countries have under gone transformation in which suddenly in the last one year, the number of airlines has multiplied. Singapore has three low cost airlines (Jet Star, Tiger Airways and Valuair), which launched their operations in 2004. Indonesia has over 20 commercial airlines; Malaysia is home to Air Asia, the region's largest and fast growing low cost carrier. Thailand has also several leisure carriers such as Phuket Air and Bangkok Airways as well s a raft of new low cost carriers: Nok Air , Thai Air Asia and One- Two- Go. China government sweeping reforms has opened the domestic civil aviation market to the private sector. India is also experiencing extraordinary growth, which is setting to accelerate the air traffic in the country. Air Deccan , Spice Jet , Paramount Airlines are the low cost carriers operating in the country. Around half a dozen new low-cost air carriers are planning to launch and may fly in the Indian air space.

Government in Asia Pacific region are on the job of capacity management to meet the growing demand. Many countries in the region are seeking private sector model to invest in the airport infrastructure in order to expand the airside and lanside management through joint venture. For example, Second Bangkok International Airport Limited (BAIL) and very recently , India has called bidding for Mumbai and Delhi airports. This drastic measures would help the growing travelers with the seemless travel without any delay and congestion in the year to come

3.2.2. Financial Losses of Air Traffic Delay

FAA records air traffic control (ATC) delays caused by (e.g.- Equipment, runways, volume, weather and other) with delays defined as flights arriving at least 15 minutes beyond the scheduled arrival time. In 2004, 86.5 million ATC delay costs for US Airlines. On an average, extra crew time and fuel burn are estimated to have cost the industry nearly $34 per minutes during this period. Maintenance and aircraft ownership costs totaled $20 per minutes. The monetary value is segregated into different heads is appended below-

---------TABLE 5.13 : MONETARY VALUE OF AIR TRAFFIC DELAY IN US------

DIRECT (AIRCRAFT) OPERATING COSTS	PER BLOCK TIME ($)	PER YEAR ($ MILLIONS)
FUEL	17.05	1475
CREW- PILOTS	10.29	890
CREW-ATTENDENTS	6.48	391
MAINTENANCE	10.16	879
OWNERSHIP	9.74	843
OTHER	3.36	291
TOTAL DELAY OPERATING COSTS (A)	57.09	4768
AVERAGE DELAY COST TO AIR TRAVELLERS (B)	33.25	
GRAND TOTAL (A+B)	90.34	

Delayed aircraft also need for extra gates and manpower on the ground and impose costs on airline customers (including shippers) in the form of lost productivity, wages and goodwill. Assuming $33.25 per haour as the average of passenger 's time , delay costs to air travelers can be considerable.

ATC delays are now returing in many parts of the national airspace system (NAS), especially en-route. Based on the growth projections laid out in FAA's aerospace forecast s, the current airport and airway infrastructure will be grossly inadequate , particularly if the tax revenue are not channeled to system checkpoints. Delays could once again threaten to bring air travel and air cargo to a halt, with a debilitating effect on the U.S. economy. Chart 5.11 clearly indicates the cost structure of air traffic delay referring to airlines operations. 31% of the air traffic delay cost goes towards fuel, followed by Crew- (Pilots) 19% ,Mintenance and Ownership shares to 18% each in total delay cost structure.

From these analyses, all aviation stakeholders must find ways to increase the capacity to meet this impending challenge. In addition to new runways, the development of modern ATC technologies and challr=enges to operational procedures are critical to the nation's air traffic system.

3.3 DETECTING SERVICES FAILURES

"It isn't that they can't see the solution. It's that they can't see the problem."- Grover Cleveland

When an AOG situation leads to a long flight delay, it does not take a passenger survey to conclude that a service failure has occurred. More often, however, service failures arising out of less dramatic happenings- often routine unmonitored services encounters- go completely undetected. One way of uncovering them is to ask customers directly (in the focus groups) or sample the customer base for common problems (using survey instruments). Another way is to listen carefully to the complaints.

Complaints Complaints are a valuable source of information on service failure and a potentially invaluable learning resource; they should be facilitated .Research shows that the majority of dissatisfied customers never complain, preferring instead simply to take their business elsewhere. On the other hand, complaints that are dealt with in a timely , positive (i.e. not defensive), and responsive manner tend in the majority of cases not to lead to customer defections.

The problem with the complaints in that airlines, like most other organizations, do not get enough of them. Consider the following.

- It is widely believed that fewer than 5% of dissatisfied customer complaints. Many of the 'silent majority' simply switch to other airlines- assuming acceptable alternatives exist and the loss of FFP benefits is not an overriding consideration; they also talk to as many as ten other people about their negative experience. If true, this suggests that one complaint masks:
    - At least 19 unidentified service failure;
    - Approximately 200 (i.e. 20 X 10) potential customers exposed to negative word-of- mouth publicity.

- Research by British Airways some years ago discovered that approximately one-third of its passengers felt dissatisfied in some way, and that of these dissatisfied customers:
  - 8% contacted Customer Relations;
  - 23% spoke only to the nearest BA employee;
  - 69% did not talk to anybody (Sasser and Klein,1994).

This begs the question of why people tend not to complain when dissatisfied. The literature suggests the following possible reasons: they do not seeany payoff in complaining; they prefer to avoid conflict ; and/or they do not blame the particular service provider involved for what they perceive to be an organizational problem, and do not want to risk getting that person into trouble.

Clearly' the manner in which complaints are handled can affect not only an airline's ability to learn from what customers are telling it, but also the likelihood that a complainants's future business will be retained. The probability of retaining a dissatisfied customer's business will rise through the following stages.

- No complaint registered
- Complaint registered , but not resolved to the customer's satisfaction (although this might, depending on the circumstances, carry a higher risk of customer defection than 'no complaint registered' situation).
- Complaint resolved to the cutomer's satisfaction.
- Complaint resolved quickly to the customer's satisfaction.

An effective complaint management system will most probably therefore be one with the following capabilities.

- It ensures that the front- line employees are trained to:
  - Identify and resolve unarticulated dissatisfacation;
  - Handle different types of complaint.

- It ensures that there is well- organized complaint- handling system away from the front line capable of accommodating:
  - Customers' complaints;
  - Information and suggestions from employees arising from customers' informal comments or their own observations.
- It encourages 'silent majority' among those customers who are dissatisfied to register their complaints,because this gives the airline an opportunity to:
  - Learn how service might be improved;
  - Attempt service recovery.

Commonly used methods include inflight survey forms, interactive terminals in club lounges , direct contact with high -value accounts (e.g. , during sales calls on corporate customers), toll free numbers prominent inflights magazines and FFP literature, and opportunities to comment provided on an airline's websites.

It is absolutely vital that the customers as a whole, but particularly customers with a problem, perceive the airlines as approachable and responsive that they do not perceive it to be defensive. Some airlines nonetheless still hide from the potentially valuable source of feedback, making it difficult to complain and frequently using their internal procedures to turn dissatisfied customers into transgressors. It remains relatively rare to find on ticket wallets or on tickets themselves (if airline, rather than IATA, stock) the invitations to comment about the product that are found on packaging of consumer goods in many countries.

On the other hand , a growing number of airlines do not have systematized procedures for logging , coding, responding to , and learning from complaints. According to Sasser & Klein (1994) , British Airways found that complainants want : to be taken seriously; to receive an apology or recognition that the problem exist; to have input into the solution or , at least , an explaination of what went wrong and what has been done to lower the risk of its happening again; and to see a quick resolution- ideally by telephone and with a single point of contact (i.e. a single 'owner' of the problem). Research suggest that customers expect 'fairness' of three types when their complaints are been dealt with (Tax & Brown,1998): outcome fairness – response which recognizes their problem and offers redress propationally to their perceptions of its seriousness (e.g. vouchers to purchases duty free goods in the event of an IFE equipment failure on a long- haul flight); procedural fairness- hassle free access to a clear complaint –handling mechanism on the ground if a problem gets that far without being resolved on the front line; and interactional fairness – courtesy, concern and signs of a palpable effort to deal efficiently and effectively with the problem.

This suggests that customer relations staff:

- Should: sympathise, explain if explanation is possible, rectify , and where necessary compensate;
- Should not: avoid, delay, deny, or justify;
- Need: training in conflict management , paraphrasing problems, negotiating, and decision- making; latitude, within clear limits , to rectify and compensate; credibility within the organization to act as the customer's advocate; and information systems which:
    - Allow instant access to each complainant's file, charting progress in resolving the complaints;
    - Permit cataloguing of the root causes of complaints so that recurring problems in the service delivery system can be addressed

Finally, we need to be aware that articulated complaints these days may not be sent directly to the airline concerned. Internet chat- rooms and even special purpose web sites need to be monitored by an airline actively interested in improving its service and protecting its image.

3.3.1 Failure Analysis and Reliability Improvement

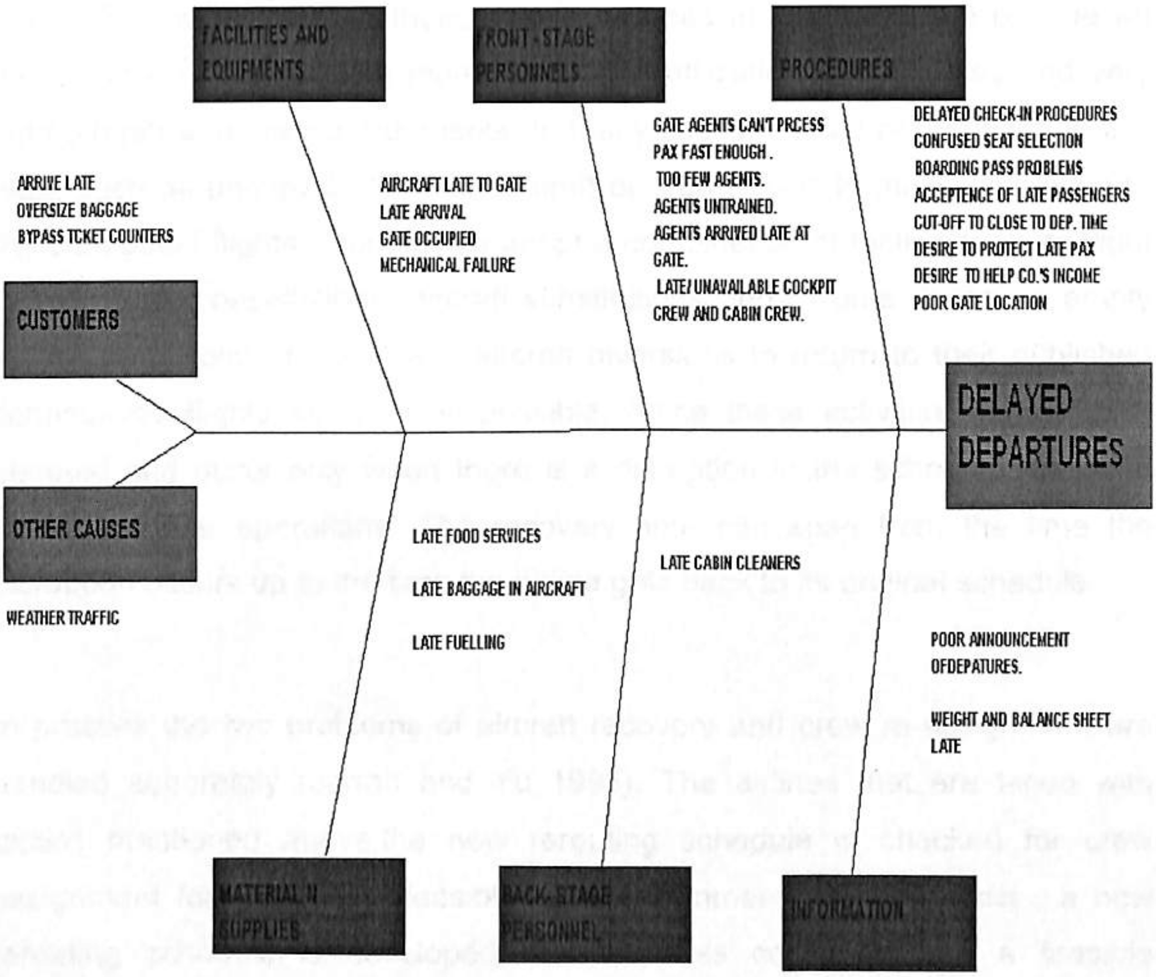
Whatever the failure , there is likely to be 'root cause' hidden below the immediately apparent reason(s). For example, the root causes(s) of poor punctuality could be airport or airway congestion, an ageing and mechanically unreliable fleet , a new fleet with 'teething' problems, tight scheduling of aircraft , crews, gates, and/or connections, or inefficient turnaround procedures. Below each of these problems might lie a further layer of 'root causes' that need investigating. Figure 4(a) illustrates use of cause- effect- technique to assist with the learning process.

Developing cause-effect- relationship work, Lovelock (1996: 478) has proposed that factors which might cause a specific problem should be identified (e.g. in brainstorming sessions) and categorized into one of eight groupings; back- stage personnel; procedures; information; customers; and other causes.

Fault- tree analysis is similar in principle to the cause-effect relationship approach, except that it starts with an actual or potential failure and works backwards to one or more causes. Ask why a problem is occurring, then apply a further 'why'? to the answer and to each subquent answer through ,say, five iteration (i.e. 'the five whys') and the root cause of any problem is likely to become clear. Other approaches to the analysis of any failures includes focus groups and the critical incident technique. The latter requires customers (or staff) to give accounts of specific incidents in the course of service delivery that caused (or are believed by staff to have caused) dissatisfaction; resons for dissatisfaction can then be categorized and linked to specific services failures and their causes.

Having analysed why service failures are occurring or could occur in future, efforts will need to be made to prevent them or make them less probable. The reliability of an airline's service delivery system can be improved by one o more of the following: designing- out- fail-points (e.g. more easily); fail- safe critical points of the delivery system (e.g. add more standby staff and aircraft); fail-safe critical points of the delivery system; improving system maintence- which includes staff training as well as the maintenance system of facilities and equipment. None of this is necessarily cheap. As always in services management , there is a trade-off between effectiveness and efficiency to be arrived at; the context within which resolution should take place is the particular airline's service concept(s)- type(s) of customer value it is offering and the market positioning of the offer(s)

FIGURE 4(a) CAUSE AND EFFECT CHART FOR AIRLINE DEPARTURE DELAYS



3.4 AIRLINES IRREGULAR OPERATIONS

Aircraft mechanical problems, severe weather, crew sickness, airport curfews, and security are among the problems that force an airline to delay and even cancel their regular published flights. On an average day in the United States, approximately 15 to 20% of all flights experience significant delays (more than 15 minutes) and approximately 1 to 3% of all fligts are cancelled (YU , ET AL. 2003). The scheduling methodologies describes in chapter 3to 6 provide an airline with a very efficient many plan, high utilization of resources and very tight aircraft and crew assignments. In many cases a small perturbation in this plan, such as unavailability of an aircraft or crew, result in major disruption to the scheduled flights. The airlines adopt a combination of tactics such as flight delays, flight cancellations, aircraft substitutions, ferry flights (flying an empty aircraft to a point of need) and aircraft diversions to return to their published scheduk\led flights as soon as possible. Since these activities are not pre-planned and occur only when there is a disruption in the schedule, they are called irregular operations. The recovery time can span from the time the disruption occurs up to the time the airline gets back to its original schedule.

In practice the two problems of aircraft recovery and crew re-assignment are handled separately (Jarrah and Yu 1993). The airlines that are faced with tactics mentioned above.the new rerouting schedule is checked for crew assignment feasibility. If a feasible crew assignment does not exist , a new rerouting schedule is developed. This process continues until a feasible rerouting and crew- reassignment is found. This chapter examines the daily aircraft rerouting schedule for single fleet only. See the list of reference for models that examine multi- fleet and crew re-assignment. The aircraft schedule recover problem is basically defined as:

Given the position of planes at the time of a disruption, he original flight schedule,

An estimated length of disruption time and a time frame foe recovery , find the "best" assignment of aircraft of flights so that after the recovery time the airlines is capable of operating its regular published flights. Some of the objectives for the “best” assignment include minimizing total passenger delays , minimizing cancellations, honoring curfews and regulations and minimizing the total cost to the airline.

CHAPTER- 4

COMPENSATION FOR FLIGHT DELAY

4.1 "AIRTICLE 19"DELAYS OF INTERNATIONAL CARRIAGE BY AIR

The carrier is liable for damage occasioned by delay in the carriage by air of passengers, baggage or cargo. Nevertheless, the carrier shall not be liable for damage occasioned by delay if it proves that it and its servants and agents took all measures that could reasonably be required to avoid the damage or that it was impossible for it or them to take such measures

1.When an operating air carrier reasonably expects a flight to be delayed beyond its scheduled time of departure:

- for two hours or more in the case of flights of 1500 kilometres or less; or
- for three hours or more in the case of all intra-Community flights of more than 1500 kilometres and of all other flights between 1500 and 3500 kilometres; or
- for four hours or more in the case of all flights not falling under (a) or (b),passengers shall be offered by the operating air carrier:
    - the assistance specified in Article 9(1)(a) and 9(2); and
    - when the reasonably expected time of departure is at least the day after the time of departure previously announced, the assistance specified in Article 9(1)(b) and 9(1)(c); and
    - when the delay is at least five hours, the assistance specified in Article 8(1)(a).

2. In any event, the assistance shall be offered within the time limits set out above with respect to each distance bracket.

4.1.1Right to Compensation

1. Where reference is made to this Article, passengers shall receive compensation amounting to:

(a) EUR 250 for all flights of 1500 kilometres or less;

(b) EUR 400 for all intra-Community flights of more than 1500 kilometres, and for all other flights between 1500 and 3500 kilometres;

(c) EUR 600 for all flights not falling under (a) or (b).

In determining the distance, the basis shall be the last destination at which the denial of boarding or cancellation will delay the passenger's arrival after the scheduled time.

2. When passengers are offered re-routing to their final destination on an alternative flight pursuant to Article 8, the arrival time of which does not exceed the scheduled arrival time of the flight originally booked

(a) by two hours, in respect of all flights of 1500 kilometres or less; or

(b) by three hours, in respect of all intra-Community flights of more than 1500 kilometres and for all other flights between 1500 and 3500 kilometres; or

(c) by four hours, in respect of all flights not falling under (a) or (b),

the operating air carrier may reduce the compensation provided for in paragraph 1 by 50 %.

3. The compensation referred to in paragraph 1 shall be paid in cash, by electronic bank transfer, bank orders or bank cheques or, with the signed agreement of the passenger, in travel vouchers and/or other services.

4. The distances given in paragraphs 1 and 2 shall be measured by the great circle route method.

4.1.2Right to Reimbursement or Re-routing

1. Where reference is made to this Article, passengers shall be offered the choice between:

(a) - reimbursement within seven days, by the means provided for in Article 7(3), of the full cost of the ticket at the price at which it was bought, for the part or parts of the journey not made, and for the part or parts already made if the flight is no longer serving any purpose in relation to the passenger's original travel plan, together with, when relevant,

- a return flight to the first point of departure, at the earliest opportunity;

(b) re-routing, under comparable transport conditions, to their final destination at the earliest opportunity; or

(c) re-routing, under comparable transport conditions, to their final destination at a later date at the passenger's convenience, subject to availability of seats.

2. Paragraph 1(a) shall also apply to passengers whose flights form part of a package, except for the right to reimbursement where such right arises under Directive 90/314/EEC.

3. When, in the case where a town, city or region is served by several airports, an operating air carrier offers a passenger a flight to an airport alternative to that for which the booking was made, the operating air carrier shall bear the cost of transferring the passenger from that alternative airport either to that for which the booking was made, or to another close-by destination agreed with the passenger.

4.1.3Right to Care

1. Where reference is made to this Article, passengers shall be offered free of charge:

(a) meals and refreshments in a reasonable relation to the waiting time;

(b) hotel accommodation in cases

- where a stay of one or more nights becomes necessary, or

- where a stay additional to that intended by the passenger becomes necessary;

(c) transport between the airport and place of accommodation (hotel or other).

2. In addition, passengers shall be offered free of charge two telephone calls, telex or fax messages, or e-mails.

3. In applying this Article, the operating air carrier shall pay particular attention to the needs of persons with reduced mobility and any persons accompanying them, as well as to the needs of unaccompanied children.

4.2 COMPENSATION FOR FLIGHT DELAYS AND OVER BOOKING

Any flight taken by air traveler can be delayed for any number of reasons, for example due to weather or mechanical problems. In most cases, the delay does not cause any hardship. However, there are times when the delays can lead to missed connections, unexpected overnight stays in the airport, or other significant inconveniences. Airlines that fly in the U.S. are not legally obligated to provide any compensation for a delayed passenger. They are however, required to compensate passengers who have a reservation but are denied boarding, also known as getting bumped from the flight.

This is in contrast to airlines that fly in the European Union, which are required to compensate passengers who are bumped, as well as passengers who experience many types of delays and flight cancellations. No matter where air travelers fly, they should make the effort to become familiar both with what an airline is required by law to provide in the way of compensation, airline's policies on compensating passengers ,and how you may be able to negotiate for additional compensation.

4.2.1 Delays and Cancellations for Domestic U.S. Flights

For domestic U.S. Flights, there are no U.S. federal regulations that require any compensation for a delayed or cancelled flight. However, keep in mind that each airline may have a policy for compensating passengers whose flights are delayed or cancelled, and those policies may include compensations such as meals, hotel rooms, or phone calls. The airline may also arrange an alternate flight on another aircraft on either the same airline or with a different airline. These policies are either included with the paperwork associated with your ticket, or are available from an airline representative. Before an air travel, passenger may want to review the airline's policies to see what compensation may be offered in the event of a delay or a cancellation.

4.2.2 Delays Involving Unaccompanied Minors

If there is an unaccompanied minor traveling, passenger should absolutely check with the airline before the trip. As is the case with all delays and cancellations involving domestic U.S. flights, there are no U.S. federal requirements for any special services or compensation for unaccompanied minors on a delayed or cancelled flight. At the very least, you should have an alternative plan in place to deal with the possibility of the child being delayed overnight or arriving at the destination airport well after the expected time.

4.2.3 Delays and Cancellations for non-U.S. Domestic Flights

Rules for compensation for delayed and cancelled flights will depend on the rules of that country and the rules of the airline. As is the case with domestic flights in the U.S., if passengers are traveling on a domestic flight in another country, at the very least passenger should review the policies or regulations of that airline to see what compensation they can expect in the event of a delay or a cancellation.

4.2.4 Delays and Cancellations for European Union Related Flights

Unlike the U.S., the European Union (EU) does provide for compensation for flight delays and cancellations. In most, but not all, cases involving a delay or cancellation of a flight, a passenger is entitled to compensation under European Parliament Regulation (EC) 261/2004 for delayed and cancelled flights. There are three levels of compensation:

- in the event of long delays (two hours or more, depending on the distance of the flight), passengers must in every case be offered free meals and refreshments plus two free telephone calls, telex or fax messages, or emails;
- if the time of departure is deferred until the next day, passengers must also be offered hotel accommodation and transport between the airport and the place of accommodation;
- when the delay is five hours or longer, passengers may opt for reimbursement of the full cost of the ticket together with, when relevant, a return flight to the first point of departure.

This regulation applies to all airline flights departing from an EU airport or to any airline licensed in the EU if that flight is departing from an airport outside the EU to a destination at an airport in an EU member state.

4.2.5 Delays and Cancellations for Other International Flights

While the EU has some regulations that specifically deal with EU related international flights, there are no requirements to compensate passengers on most other international flights that are delayed or cancelled. The most relevant international treaty is the 1999 Montreal Convention, an international agreement signed by the U.S. and many other countries. There is no specific language in this agreement that obligates the airline to compensate passengers in the event of a flight delay or flight cancellation. As would be the case with domestic U.S. flights, review your airline's policies to see what compensation, if any, that the airline may provide.

4.2.6 Overbooking and Involuntary Bumping on U.S. Airlines

U.S. airlines are allowed to overbook flights to allow for "no-show" passengers. However, if passengers are involuntarily bumped, airlines are required to do ask for volunteers to give up their seats in exchange for compensation. Most involuntarily bumped passengers are subject to the following minimum compensation schedule:

- There is no compensation if alternative transportation gets the passenger to the destination within one hour of the original scheduled arrival.
- The equivalent of the passenger's one way fare up to a maximum of $200 for substitute domestic flights that arrive between one and two hours after the original scheduled arrival time or for substitute international flights that arrive between one and four hours after the original scheduled arrival time.
- If the substitute transportation is scheduled to get you to your destination more than two hours later (four hours internationally), or if the airline does not make any substitute travel arrangements for you, the compensation doubles to a maximum of $400.

There are exceptions to these rules. This minimum compensation schedule does not apply to charter flights, to scheduled flights operated with planes that hold 60 or fewer passengers, or to international flights inbound to the United States. If a passenger can't be accommodated to their satisfaction, they may be eligible to request a refund for the remaining part of the trip, even if the trip were on an otherwise nonrefundable ticket.

4.2.7 Denied Boarding Compensation in the European Community

If you are bumped from a flight and your flight was either departing from an EU country, or if you were on an airline registered in the EU and your flight departed outside the EU for a destination within the EU, you would have the following rights:

- reimbursement of the cost of the ticket within seven days or a return flight to the first point of departure or re-routing to the final destination;.
- refreshments, meals, hotel accommodation, transport between the airport and place of accommodation, two free telephone calls, telex or fax messages, or emails;
- compensation totalling:
    - - 250 euros for all flights of 1,500 kilometers or less;
    - - 400 euros for all flights within the European Community of more than 1,500 kilometers, and for all other flights between 1,500 and 3,500 kilometers;
    - - 600 euros for all other flights.

4.2.8 Overbooking and Voluntary Bumping

Before an airline involuntarily bumps passengers on an overbooked flight, they will first ask for passengers who are willing to voluntarily give up their seat. Passengers considering volunteering to give up their seat should be aware of two important considerations. First, they will no longer be compensated under the denied boarding or involuntary bumping rules that are in effect for that flight. Second, a passenger who voluntarily gives up their seat is in a position to negotiate with the airline for other compensation that could be more valuable to the passenger. However, a passenger would be wise to volunteer only after the following six steps:

1. Determine whether the later flight has a confirmed reservation and whether the scheduled arrival time is acceptable.
2. Determine what will happen if the airline is unable to find a seat on the next flight or if that flight is delayed or cancelled.
3. Determine whether the airline will pay for food, lodging, or other extra costs you may incur due to taking a later flight.

4. Determine whether the compensation being offered for giving up your seat is worthwhile (hint: ask for more than what an involuntarily bumped person would get).
5. Determine what kinds of restrictions or limitations are on the travel vouchers or other compensations that are being offered.
6. Insist that any compensation be provided immediately and with any documentation needed to claim the compensation.

4.2.9 Complaining About Your Service

If for some reason you believe that the airline's response to your flight's delay or cancellation, or overbooking was not satisfactory, you may want to complain to the airline or to the authorities. If your flight was on a U.S. airline or on a flight to or from the U.S., you can also use the AirSafe.com Online Complaint Form and AirSafe.com will forward your complaint to the U.S. Department of Transportation.

4.3 PROVISIONS THAT TRIGGER WHEN THERE IS FLIGHT DELAY OR CANCELLATION

The progress made this past year is often obscured when the traveling public experiences widespread delays and cancellations. We found the customer service areas most in need of improvement are for those provisions that trigger when there are delays and cancellations. One such provision is to keep customers informed of delays and cancellations, another promises to meet customers' "essential" needs during "extended" on-aircraft delays, and another commits to making reasonable efforts to return delayed or mishandled checked baggage within 24 hours. The evidence shows significant investment and progress by the Airlines toward meeting these commitments, and improvement is evident since our Interim Report. Still, there are persistent problems. We frequently found, among other matters, untimely, incomplete, or unreliable reports to passengers about flight status, delays and cancellations as follows.

- In 21 percent of our observations of nearly 550 flight delays nationwide,the flight information display system showed the flight as on time when, infact, the flight had been delayed for more than 20 minutes; timelyannouncements about the status of the delay were made in the gate areas66 percent of the time; when status announcements were made, theinformation provided about the delay or cancellation was adequate about57 percent of the time. Performance varied by Airline and non-ATAairline, with Hubs generally performing better than non-Hub airports.

- Baggage that did not show up with the passenger was delivered within 24 hours 58 to 91 percent of the time. Again, performance among the Airlines and non-ATA airlines varied.
- All Airlines have taken steps to accommodate passengers' "essential" needs during "extended" on-aircraft delays. However, we found that the Airlinesdiffer in what qualifies as "extended." The trigger thresholds for this provision vary from 45 minutes to 3 hours. We think it is unlikely that a passenger's definition of an "extended" on-aircraft delay will vary depending upon which air carrier they are flying.

We also found that the provisions within the Commitment do not directly address the root causes of customer dissatisfaction: extensive flight delays, flight cancellations, and baggage not showing up with the passenger. Since air travelers in 2000 stood a greater than 1 in 4 chance of their flight being delayed, canceled, or diverted, we believe the Airlines should go further and address steps they are taking on matters within their control to reduce over-scheduling, the number of chronically late or canceled flights, and the amount of checked baggage that does not show up with the passenger upon arrival.

According to the Bureau of Transportation Statistics (BTS), chronically delayed and/or canceled flights are those *regularly scheduled flights6* that, at least 80 percent of the time, arrived at least 15 minutes later than scheduled and/or were canceled during a *single calendar month*. For example, according to BTS data, in December 2000, one Airline's flight with daily non-stop service between Chicago and Miami was delayed and/or canceled 27 of the 31 days it was scheduled to operate. In this case, the flight was delayed and/or canceled 87 percent of the time. Our analysis of BTS data found *regularly scheduled flights* that were at least 15 minutes late and/or canceled 80 percent of the time increased from 8,348 to 40,868 (390 percent) between 1999 and 2000.7

Using BTS data, we increased the amount of arrival delay to 30 minutes or more and identified all *scheduled flights* that, when grouped by individual flight number, were delayed and/or canceled at least 40 percent of the time during a single calendar month. Overall, for calendar year 2000, we identified over 240,000 *regularly scheduled flights* that met our criteria (representing over 10,300 individual flight numbers affecting approximately 25 million passengers).

Currently, the Airlines are required to disclose on-time performance only upon request from the customer. Passengers should not have to ask when making a reservation if the flight is chronically delayed or canceled 40 percent of the time or more; the Airlines should notify the passenger of this information without being asked.

Airline mitigation measures in the above areas will not solve the delay and cancellation problem since it is caused by multiple factors, some outside the airlines' control, but the airlines should be doing their part. For both the short and long term, the Airlines' Commitment to customer service must be combined with comprehensive action to increase system capacity to meet demand. FAA's efforts to modernize air traffic control through new technology, satellite navigation at airports, airspace redesign and, importantly, new runways will be central elements in any successful effort to add capacity and avoid gridlock.

CHAPTER-5

MEASURES FOR REDUCING FLIGHT DELAYS

5.1 MEASURES FOR ALEVIATING CONGESTION AND DELAYS

There is a broad range of measures to prevent and control congestion of airports. These may be classified into short term and long term planning. The short term planning occupies minimal building of new facilities and long term measures seek to increase physical capacity to meet the current and future demand. Implementation of any one of these measures is often fraught with problems. For example, the main complexity focused in many cities is that the extensive land requirements of airport development and their environmental impacts pretense severe constraints on the provision of extra runway capacity (ICAO,1992)

5.1.1 SHORT TERM PLANNING

Short term planning and management of airport facilities generally revolve around three main strategies:

- Applying better management tools and new technologies to improve the traffic flows at the different facility systems .
- Efforts directed at eliminating restrictions on capacity use
- Re-distribution of demand management during the peak hour periods

Formulating to modify the facilities and equipments and devising new methods for a more efficient use of existing facilities constitute the most common step towards improving the airport flow management. All such measures serve to increase the turnaround time of the aircraft. Steps should be taken to increase productivity of existing resources like, modifying the layouts, introducing better gate management and improving ATC techniques. Further, the airport authorities should take care of better terminal systems in order to examine carefully the possibilities of implementing flexible allocation strategies for various passenger facilities like, check-in counters, immigration counters and customs checkpoints in line with changes in traffic composition. In the runway systems, overall efficiency may be increased by properly locating exits, departure queues and bypasses. Consequently , runway occupancy time may be reduced and will have greater flexibility in managing departure queues (FAA,1996).

5.1.2 LONG TERM PLANNING

The long-term plan reveals the development of new physical capacities i.e. building new terminal and runways if the traffic is growing significantly and exploding the terminal as well as runway. There are a number of important issues, which need to be considered in the implementation of long-term expansion of capacity.

5.1.2.1 TECHNOLOGICAL STRATEGIC SOLUTIONS

The prime objective of the airport system planners is to continue with the availability of appropriate capacity.the strategic options for responding to shortage of capacity are ddone through best possible way by expanding the existing facilities in terms of technological solutions. Hence, New Approach Procedures (FAA) can achieve the easing of existing runway capacity. The New Approach Procedures (NAP) in outlined below:

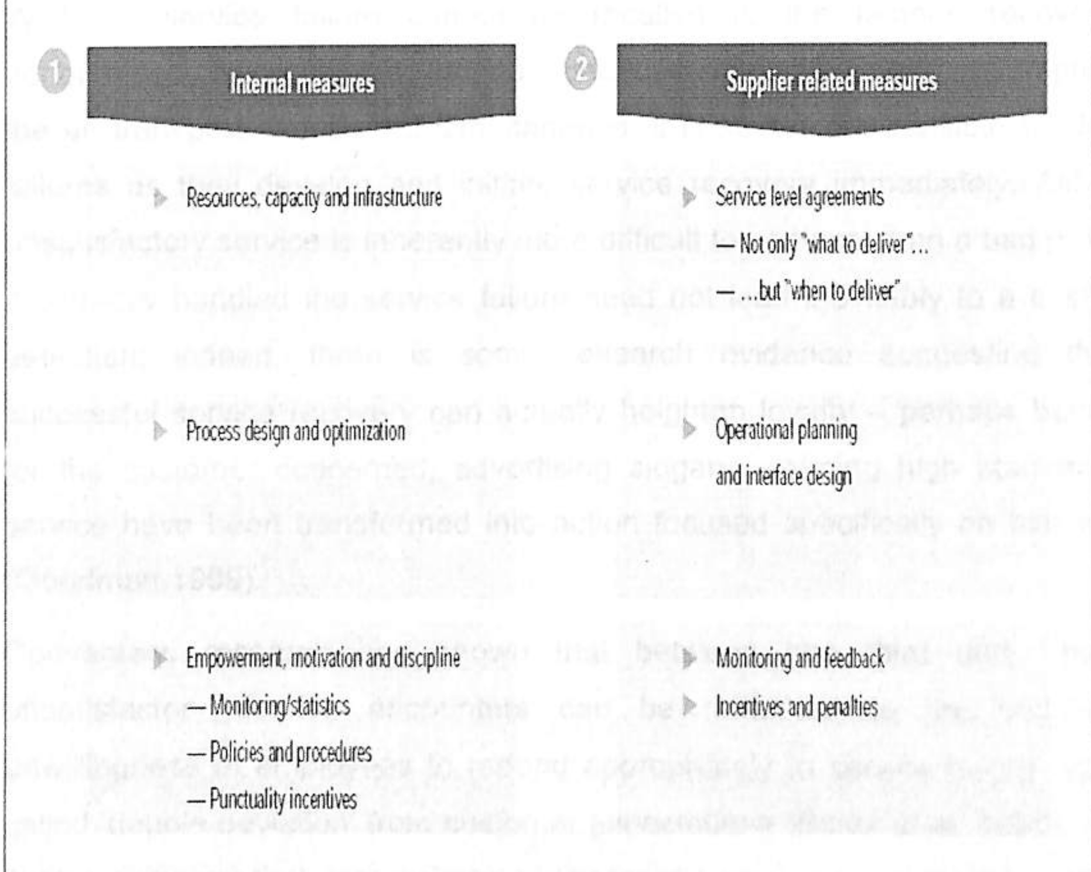
- Reduced longitudinal separation on wet as well as dry runways from 3 to 2.5 nautical miles
- Simultaneous (independent) parallel (IFR) approaches using the Precision Runway Monitor to runways separated as little 3400 feet , by allowing the controller to have almost instant knowledge of aircraft track deviation as a Raleigh – Durham and Sydney airport (Herbert & Custance, 1994)
- Improved dependent parallel approaches to runway separated by between 2,500 and 4,300 feet , which reduces the required diagonal separation from 2.0 to 1.5 nautical miles

- Dependent converging instrument approaches using the Converging Runway Display Aid (CRDA)
- Extending simultaneous operations on intersecting runways to wet runways
- Use of Flight Management System compuers to transition an aircraft from en-route phase onto existing charted visual procedures and ILS approaches
- Separate Access and Landing System (SALS) procedures to take advantage of the superior maneuvering capabilities of regional aircraft (Demonstrated at London city airport) for simultaneous operations with conventional aircraft

It is expected that lateral and in-trail separation on approach and departure will continue to improve as the navigational capabilities of aircraft improve with the use of the Global Position System (GPS), subject to restrictions due to vortex wakes. The benefits of new technologies are very site-dependent, but could increase capacity by 50% in existing situations, and may make it possible to add 100% rather than 50% when incorporated in new expansion plans. Frankfurt airport plans to increase its declared runway capacity from 70 movements per hour to 80 in 2010, using many of the above techniques and also laser detection of vortices (Caves & Gosling,1999).

Many development countries are expecting considerable difficulties expanding their airport capacities in their key cities. North America and Europe , the airports facing congestion due to capital sunk into this mega- infrastructural system, the shift to an option of building the new airport would be costly. The paper has described the concept and theoretical aspects of "airport capacity" on airside and landside and further it explodes the case study of major airports of U.S, Europe and Asia Pacific. It is also briefly describes the short term and long term planning of airport capacity. Further, the study also briefly reveals the measures to alleviate airport congestion and delays through short term plan and long term plan and congestion charging mechanism for peaks and off-peaks with the help of Marginal and Average cost pricing structure. Congestion pricing mechanism at airports could be used as economic instrument of demand management under the following conditions "Congestion is a consequences of the relationship between demand and airport capacity causes delays longer than than threshold of 15 minutes, i.e. when the demand / capacity ratio moves or exceed one".

Exhibit 8. Solving the Delay Problems



Source: Booz Allen & Hamilton

5.2 SERVICE RECOVERY

Service recovery efforts might range in scle from an operations control centre trying to get aircraft and crews back onto the published schedule after a major weather disruption, down to a customer service representative dealing with a ingle passenger's missed connection. Service recovery is an integral part of defections management. The manner in which service failures are to be identified and handled and how recovery procedures can be used proactively to avoid customer defections should be considered as part of the service design process. Different recovery procedures will be needed to meet different types of failure, but they should all share the same basic elements: information about the problem, resources to deal with the problem, and the right attitudes on the part of suitably trained and empowered , service-oriented employees. Service recovery is not just a matter of procedures, it is also a question of commitment and culture (Pai and Trefzger,1998).

Whilst a service failure cannot be recalled to the factory, recovery is nonetheless often possible. Indeed , because production and consumption of the air transport service are simultaneous, it is sometimes feasible to identify failures as they develop and initiate service recovery immediately. Although unsatisfactory service is inherently more difficult to 'replace' than a bad product, if correctly handled the service failure need not lead inevitably to a customer defection; indeed, there is some research evidence suggesting that a successful service recovery can actually heighten loyalty – perhaps because, for the customer concerned, advertising slogans claiming high standards of service have been transformed into action focused specifically on him or her (Goodman,1999).

Conversely, research has shown that between one third and half of unsatisfactory service encounters can be attributed to the inability or unwillingness of employees to repond appropriately to service failure- what is called 'double deviation' from customer expectations (Bitner at al, 1990). There is also evidence that expectations of successful service recovery grow with the quality of service-price offer that has 'bought into', with eputation of the airline, and the loyalty that a particular customer feels give to the carrier concerned.

Service failure can come to an airline's attention at any stage from initial enquiry through post purchase evolution. How efficiently and effectively the problem is dealt with will determine whether or not the airline can recover any customer satisgaction dissipated as a result of the failure.

It is generally believed that an effective service recovery will have more impact on customer's future purchase intensions than dissatisfaction felt as a result of the original service failure. (Spreng et al, 1995)

5.2.1 APPROPRIATE LEVELS OF SERVICE RECOVERY

How far an airline should go in its recovery efforts ought t reflect :

- The importance of the affected customer(s) in terms of current and potential business;
- The severity of the error in terms of its future impact on relationship

Many airlines have in place graduated responses to deal with 'whole- plane' service failures such as delayed flights; these might range from honest explanations and apology, complimentary drinks during on board delays, meal vouchers during in- terminal delays, through accommodation and alternative booking if required. Our concern here is less with 'whole- plane' service recoveries dealt with using pre- formulated recovery procedures than with recovery from a more individualized failure.

Particularly with regard to response deadlines and scope of redress, recovery efforts directed at an individual customer who has experienced service failure and subsequently complained should be guided by the nature of the service failure and the estimated lifetime value of the customer concerned . For example, a serious service failure involving high value customers must be pioritised for recovery and follow –up.

What makes this prescription difficult to operationalise for many airlines is their inability to put a monetary value on customer relationships. A few carriers are now beginning to build database capable for capturing information that allows them to arrive at approximate valuations of customer relationships and detect drop- offs in service usage over time; drop- offs might be indicative in airline's competitiveness.

Many airlines nonetheless still have reservations, marketing , check-in and FFP systems that cannot communicate , and are just beginning to think about how best to get customer- specific information about preferences, service failures (on previous journeys to present trip), FFP standing and projected lifetome value to the front- line staff who could actually use it in order to help prioritise ans better manage service recovery efforts.

Structured approaches to service recovery these require the following.

- Development of an explicit and clearly understood service recovery programme which address all reasonably foreseeable 'fail points'. Value chain analysis and flow- charting can help here, but perhaps the most important step is to train employees to quickly recognize and recover from service failures. A key variable is the extent to which employees are empowered to respond.
- Facilitation of complaints, comments, and suggestions- which are important sources of learning – and the keeping of a database of root causes.
- Looking both at actual sources of failure and at what it takes to facilitates recovery , an seeing if what is learning can be factored into a redesigned service package or service delivery system.
- Ensuring that management and employees and totally committed to service recovery as an important revenue generation tool, and that adequate resource are allocated to the effort.

Some airlines are now addressing a wider range of potential service failures than in the past (although the ' Airline Customer Service Report' released by Transportation Department Office of The Inspector- General in Feburary 2001 suggested that most US majors still had plenty of room for improvement). Some have responded to their more intensely competitive circumstances by initiating structured approaches to service recovery. An interesting issue is the compatibility of recovery responses within alliances. Where these are imcompatible, however justified the rea sons, customer dissatisfaction in the event of service failure could be heightened by recovery response that falls short of expectations. An example might be different policies regarding the treatment of delayed passengers.

In the final analysis, the primary objective of well- designed service recovery programme shoud be to overcome a customer's feelings dissatisfaction arising from a service failure with a stronger feeling of satisfaction arising from recovery; at its best, service recovery can be an opportunity not just to transform a potential customer defection into successful customer retention , but to build loyally by being responsive and empathetic. Another objective is to learn why a failure occurred and how similar incidents can be avoided. A final objective should be to learn sbout service recovery itself- to find out what works and what does not in dealing with particular types of failure in particular types of circumstances.

5.2.2 PITFALLS IN SERVICE RECOVERY

In general , customers expectations in respect to service recovery will be higher than expectations in respect of the service attribute or encounter that failed (Zeithaml and Bitner ,2000). The literature suggests that a failed service recovery, no matter how genuine and well- meaning the effort, is likely to lead to even greater consumer dissatisfaction than had no recovert been attempted. And even when service recovery is well- executed, if service failures- either of the same or different types- keep coming to the attention of the customer concerned, the authority with which the service is provided is undermined , raising that customer's perception of service risk and heightening the likelihood of defection.

CONCLUSION

Flight delay is the plays a significant role for the airlines and the airports. The on- time performance , reliability of an airlines and airport is being judged through this factor, then the quality of services comes the next priority for the air travelers. Though it is a true that "customer is the King in the market", to satisfy those air travelers the airlines should provide them on- time product and services to them, this will help the airlines in increasing their productivity and goodwill in the market.

To minimize delay proper measures to be taken by the airport and airlines. Some delays are avoidable like weather delay. To overcome this type of delay, the airport should be equipped with new technological equipments and should be updated with them in the future. The airlines and airports should do long-term and short- term planning to minimize the risk of delays.

The delays like ground handling procedures, late check-in and so on can also be reduced, if the airlines and airport staff is being well- trained in advance. Proper training should be given to employee, Ground Handling Programs should be conducted which will help the airlines and airports in popularity in terms of efficiency and on- time performance.

BIBLOGRAPHY

1. C. Barnhart and S. Bratu, National Trends in Airline Flight Delays and Cancellations, and the Impact on Passengers, Workshop on Airline and National Strategies for Dealing with Airport and Airspace Congestion, College Park, Maryland, 2004.
2. Federal Aviation Administration, Airport Capacity Benchmark Report , April 2005.
3. Federal Aviation Administration Bureau of Transportation Statistics, Air Carrier Flight Delays and Cancellations, Report no. CR-2000-112, 2000.
4. U.S. House of Representatives. Committee on Appropriations, Subcommittee on Transportation and Related Agencies. Statement of the Federal Aviation Administrator Concerning Air Traffic Control Delays and Capacity. March 15, 2005
5. F. Wieland, The Detailed Policy Assessment Tool (DPAT) User's Manual, MITRE Technical Report 99W00000012, 2005
6. F. Wieland, Parallel simulation for aviation applications, Proceedings of the 1998 Winter Simulation Conference, Washington, D.C., 2001
7. U.S. Department of Transportation Office of Public Affairs Washington, D.C. www.dot.gov/affairs/briefing.htm, DOT 36-07 ,Monday, April 2, 2007
8. Flight duty time and flight time limitations -Flight crew member, NOVEMBER 2006 America West Airlines. "Company Profile: Fact Sheet." Online: May 4, 2002.
9. <http://www.americawest.com/aboutawa/companyprofile/aa_factsheet.htm>
10. American Airlines. "Address to the Department of Justice's allegations of anti-competitive behavior." 1999. Online: May 13, 2001. <http://www.aadoj.com>
11. Bali Online. "How far is it?" Online: 4/30/02. <http://www.indo.com/distance>
12. Baumol, William J. "The transactions demand for cash: An Inventory Theoretic Approach."Quarterly Journal of Economics. Nov 1952, Vol. 66, pp. 545-556.
13. Berry, Carnall and Spiller. "Airline Hubs: Costs, Markups and the Implications of Customer Heterogeneity." National Bureau of Economic Research Working Paper No. 5561. Cambridge: May 1996.
14. Berardino, Frank J. and Golaszewski, Richard S. "Development in transport policy: US airline policy changes in an era of consolidation."

Journal of transport economics and policy, Sep 1999, Vol. 33, No. 3, pp. 343-350.

15. Borenstein, Severin. "Hubs and High Fares: Dominance and Market Power in the US Airline Industry." Rand Journal of Economics. Autumn 1989, Vol. 20, No. 3, pp. 344-365.

16. Borenstein, Severin. "The Evolution of U.S. Airline Competition." Journal of Economic Perspectives, Spring, 1992, Vol. 6, No. 2, pp. 45-73.

17. Borenstein, Severin and Martin B. Zimmerman. "Market Incentives for Safe Commercial Airline Operation." American Economic Review, Dec 1988, Vol. 78, No. 5, pp. 913-935.

18. Brueckner, Jan, Nichola Dyer and Pablo Spiller. "Fare Determination in Airline Hub Spoke Networks." Rand Journal of Economics, Autumn 1992, Vol. 23, No. 3, pp 309-333.

19. Bureau of Transportation Statistics, US DOT. "Airline on-time statistics, Detailed Report." Online: Jan-May 2002. <http://www.bts.org>

20. Button, Kenneth and Roger Stough. Air Transport Networks. Northhampton, MA: Elgar, 2000.

21. Carlton, Dennis W., William M. Landes and Richard A. Posner. "Benefits and Costs of Airline Mergers: A Case Study." The Bell Journal of Economics. Spring 1980. Vol. 11, No. 1. pp. 65-83.

22. Caves, Richard E. Air Transport and Its Regulators. Cambridge, MA: Harvard UP, 1962.

23. Caves, Douglas W., Laurits R. Christensen and Michael W. Tretheway. "Economies of density versus economies of scale: why trunk and local service airline costs differ." Rand Journal of Economics. Winter 1984. Vol. 15, No. 4, pp 471-489.

24. Freund, John E. and Gary A. Simon. Modern Elementary Statistics. Ninth Edition. Upper Saddle River, NJ: Prentice-Hall, 1997.

25. Hanlon, Pat. Global Airlines, 2nd ed. Oxford, England: Reed, 1999.

26. Jordan, William A. Airline Regulation in America. Baltimore: Johns Hopkins UP, 1970.

27. Joskow, A. "Deregulation and Competition Policy: The US Experience with deregulation in the air transport sector." OECD Report on Deregulation and Airline Competition. Paris: OECD 1988. Annex II.

28. Keeler, Theodore E. "Airline Regulation and Market Performance." Bell Journal of Economics and Management Science. Autumn 1972. Vol. 3. pp. 399-424

29. Liu, Zinan and E.L. Lynk. "Evidence on market structure of the deregulated US airline 51 industry." Applied economics, Sep 1999, Vol. 31, No. 9, pp.1083-1092.

30. Mayer, Christopher and Todd Sinai. "Why does every US Airways Flight in Philadelphia Seem to be Late? Network Effects, Congestion Externalities and Air Traffic Delays."

31. Preliminary Results, 2001. The Wharton School and the National Bureau for Economic Research.

32. National Climate Data Center. "Daily summary data: Denver International Airport, WBAN 03017 and Phoenix International Airport, WBAN 23183." Jan 2000-Feb 2002.

33. Online: May 8, 2002. <http://www.ncdc.noaa.gov>

34. Organisation of Economic Co-operation and Development (OECD). Deregulation and Airline Competition. Paris: OECD, 1988.

35. Pyrke, Richard. Competition Among International Airlines. Thames Essay No. 46. London: Trade Policy Research Centre, 1987.

36. Rose, Nancy L. "Profitability and Product Quality: Economic Determinants of Airline Safety Performance." Transport Policy. Kenneth J. Button and Roger Stough, eds. Northampton, MA: Elgar, 1998. pp. 330-350.

37. Tobin, James. "The Interest-Elasticity of Transactions Demand for Cash." Review of Economics and Statistics. Aug 1956, Vol. 38, pp. 241-247.

38. US Business Reporter. "Airlines IndustryMarket Share Index." 2002. Online: May 16, 2002.

39. <http://www.activemedia-guide.com/totalusairline_mrkt.htm>

40. United States General Accounting Office (GAO). "Aviation Competition: Issues Related to the Proposed United Airlines-US Airways Merger." US Gov't Printing Office: December 2000. Online: May 6, 2002

41. <http://www.airportnet.org/depts/Regulatory/gao/d01212.pdf>

42. United States GAO FAA/OST Task Force. "Airport Business Practices and their Impact on Competition." US Gov't Printing Office: October 1999. Online: May 6, 2002.

43. <http://www.airportnet.org/depts/Regulatory/dot/airports.pdf>

44. Suzuki, Yoshinori, John E. Tyworth and Robert A. Novack. "Airline Market Share and Customer Service Quality: A Reference-Dependent Model." Transportation Research: Part A. Nov 2001. Vol 35. No 9. pp. 773-788.

45. Thengvall, Benjamin G., Gang Yu and Jonathan F. Bard. "Multiple Fleet Aircraft Schedule Recovery Following Hub Closures." Transportation Research: Part A. May 2001. Vol. 35. No. 4. pp.289-308.