INFORMATION PAPER ON AIRLINE STATISTICS

Work of statistics in an airline

The main function of statistics function in an airline is to collect base data from various sources, organize the data and analyze the same so as to take management decisions related to airline planning and operations.

Scope and Use of statistics

The uses of data are manifold and all of them pertain to the ability of the airline to develop and or improve on its planning capabilities so as to be economically efficient. The following are some of the planning efforts, essential for the airline's financial viability, that require a systematic statistics collection and analytical program.

Fleet planning

The selection of aircraft types and the development of a fleet plan is clearly among the most important planning decisions that an airline will ever make. Aircraft represent large capital investments (around US $200 million for a long-range wide body aircraft) that have lasting impacts on airline finances. Fleet planning decision making will not be possible without reliable capacity , traffic , revenue and cost statistics and will make the difference between economic viability or otherwise of the air carrier. This is especially true since the commitment to purchase or lease an aircraft usually involves a long-term horizon of 10 to 20 years or more of economic use. An example of a fleet planning exercise along with the various inputs that go into formulating such an exercise is shown in Appendix 1.

Route Evaluation, scheduled development and fleet assignment

Once the fleet planning exercise is completed and the airline's choice of aircraft and a fleet plan that determines the availability of aircraft with different capacity and range characteristics is known, the next step in the airline planning process is to select the specific routes to be flown. In some cases, the sequence of these decisions could be reversed, in that the identification of a profitable route opportunity might require the acquisition of a new aircraft type not currently in the airline's fleet.

Economic considerations and expected profitability drive route evaluations for most airlines. Route profitability estimates require demand and revenue forecasts for the period under consideration. Also critical to any route evaluation is the presence or absence of competition on the route in question, as the market share of both demand and revenue that an airline can expect to capture will be affected by competition and the frequencies operated by the competing airline.

With the evolution of connecting hub networks around the world, very few routes are operated for the sole purpose of carrying local O-D passengers (i.e., demand originating at A and destined for B on a route from A to B). The hub airline's ability to consolidate traffic from many different O-D markets on each flight leg into and out of the hub allows it to provide connecting

service even to low demand O-D markets that cannot otherwise support non-stop flights. In large airline networks, traffic flow support from connecting flights can be critical for route profitability and should be factored in any route profitability decision making. This is very important since a route that appears to be unprofitable will be actually profitable if we consider the traffic flow support to the route from connecting flights and other non local OD markets.

The two principal ways in which airlines compete for passengers and market share are –

- Frequency of service and schedule of flight departure times on each route served is perhaps the most important determinant of airline market share. In competitive markets, higher frequency shares are associated with disproportionately higher market shares. There is a tendency for competing airlines to match flight frequencies in many non-stop markets to retain market share. Thus an airline will not offer one flight with a 400 seater aircraft if another airline on the route is offering 4 frequencies with smaller aircraft since doing so will almost certainly result in a low market share (20%) for the airline.

- Price charged for the service by the airline and quality of service offered, relative to other airlines, to the extent that regulation allows for price competition. In competitive markets the price and quality differential is being rapidly being bridged making it less of a factor in influencing market share.

Route planning models typically involve use of historical data covering several years. Detailed historical data are required to generate demand, cost and revenue forecasts for each OD market to be served by the specific route being evaluated, perhaps for multiple years into the future. Just as important are estimates of the expected market share of total O-D demand, given the current and future competition for the same passengers from other airlines, which again is dependent on reliable data involving the traffic, capacity, frequencies and the scheduled timings that are on offer all of which affect passenger preferences towards airlines, market shares and demand on flights of carriers competing in an OD market.

The more sophisticated models try to estimate what the actual unconstrained demand might have been for departures with inadequate capacity. These sophisticated models try to answer what may have been if the flight is operated with higher capacity. How much will the spill rate decrease and how much revenue will increase. The basic spill model makes the following assumptions –

- Total demand for a flight departure or series of flight departures can be represented by a Gaussian distribution.

- The demand distribution has a mean and standard deviation that are known or which can be estimated from a sample of observed historical load data for the same or similar flights.

- The estimated demand distribution can represent the magnitude and variability of demand for future flight departures, if properly adjusted for trends and/or seasonal changes in demand.

The airline planning process is therefore a holistic process involving fleet planning and route planning , the efficacy of which will depend on the market shares and demand estimates arrived at from historical data trends and frequencies and timings offered by the airlines on the route being evaluated. Any changes in frequencies on offer and or timings will impact overall OD demand and market shares on each flight for the competing airlines and thus their route profitability.

The objective of airline profitability models is to allow airlines to select routes to maximize total airline profits, given set of candidate routes and estimated demands, subject to fleet and capacity constraints. These models have proven to be useful in comparing alternatives, but airlines must recognize that the profit estimates generated by the models are entirely dependent on the accuracy of historical data, its future demand and revenue estimates, the allocation of operating costs to each route, and assumptions concerning expected market shares.

An example of a summary of the route planning exercise in summary form is given in Appendix 2.

Revenue Management

Revenue Management (RM) is also called the practice of inventory control by the airlines. The success of the same depends on the accuracy of historical data that is at the disposal of the airline. The objective of RM is best described as –

- For a given a scheduled flight, seat capacity and differential prices for those seats the goal of RM is to determine how many bookings to accept in total and by fare type.

- The overall objective is to optimize revenues by filling each seat with the highest possible revenues while minimizing risks of denied boarding due to overbooking.

Computerized RM systems are used by many airlines; its sophistication differs from airline to airline. The systems in place could range from a manual/judgmental model to simple deterministic models which use current No show rates (NSR) to optimize seat allocations. However since the NSR itself can fluctuate and cannot be assumed to be known with certainty, more sophisticated systems uses probabilistic distribution models to arrive at the NSR and determine the booking capacity levels. More sophisticated extension of these models also considers the costs associated with denied boardings and spoilage. The final stage of the RM system is the EMSR model. Typically these systems –

- Generate demand forecasts for each future flight by departure date and fare type and class.

- Optimize seat allocation to different fare type and class.

- Calculate overbooking levels to fill empty seats and limit denied boardings.

An effective RM system brings about significant revenue gains for the airline with little or no increase in operating costs. Whatever be the complexity of the system in place at the airline, the success of the RM system, however depend on the ability of the user to understand the mathematical tools behind the system. A lack of understanding will lead to override of the system recommendations and limit the efficacy of the system. More importantly inadequate data to feed the optimization models can lead to misleading and erroneous seat allocation and overbooking recommendations even for the most basic manual model.

Variance analysis

Variance analysis has myriad forms ranging from simple to complex measures but its basic treatise is simple – compare actual revenue or costs with budgeted or like period figures to establish variances. Once established the actual reasons for the variances are determined such that managers are empowered with the right information to correct deficiencies if any and or to take decisions that will enhance competitiveness and improve profitability. Variance analysis is thus the set of procedures adopted by managers to assist them in understanding the sources of variances between compared data. A separate information paper on variance analysis to improve efficiency is presented as a complimentary to this paper.

Prerequisite for funding and financing

Availability of data is the basic prerequisite which every financier will look for before funding essential projects to add to or improve on existing infrastructure capabilities of the borrower. Absence of reliable data is a major impediment towards attracting funds and can make a difference between economic operations or otherwise of the airline.

To arrive at reliable safety indicators

Safety i.e. accident and incident data are not very useful for global benchmarking purposes or even for conducting an analysis to discern possible trends. To be useful for benchmarking or analytical purposes the numerator i.e. accident and incidents should have reliable statistical denominators or exposure data. The choice of which exposure data to use affect how the safety rates can be compared across and within transportation modes. Passenger kilometer is a very commonly used exposure data in arriving at safety rates. However since safety risk is usually high during certain stages of flight number of departures is also often used to arrive at safety indicators. Finally flying time is also used to arrive at exposure information on safety. No single measurement will provide a holistic safety measure. Passenger exposure data is used when passenger risk is to be indicated while it is tempered with kilometers to smoothen the exposure data from the effect of aircraft size and speed. Departure exposure data is useful to arrive at non uniform risk over a trip while time is a generic exposure necessary for economic, operational and maintenance requirements of aircraft and airlines and data in that form are readily available. the important thing to note is to have a common methodology to

arrive at the denominators mentioned here so as to improve the quality of safety indicators and its benchmarking and analytical process.

Data collection techniques

The importance of reliable data cannot be stressed as it is directly linked with the financial sustainability of the air carrier as discussed earlier. It is important to understand the manner of computation of various data parameters and to keep in mind the fluctuations that may occur especially while benchmarking and comparing own carrier data with data from other sources so as to avoid erroneous decision making by the airline. This paper now examines the collection of base data and how the same can be organized and analyzed so as to assist management in its decision making process and variance analysis so that airline profitability could be optimized.

Nature of statistics

The statistical information compiled by the airline can be broadly divided into operating statistics, traffic statistics and financial statistics.

Operating statistics

The information regarding actual operations is obtained from the Pilot flight reports filed with the Operations department. From the pilot reports the airline can capture its operating statistics or physical parameters detailed here –

Hours flown – Revenue and Non Revenue

a. **Revenue hours** refer to the flying time recorded on bloc to block i.e. chocks on chocks off basis which means the lapsed time consumed between the removal of the blocks or chocks about the wheels of an aircraft prior to the starting the engines and their placement when the aircraft comes to rest after a flight. The timing recorded in the flight reports are in GMT.

b. The **non revenue hours** refer to the hours flown in respect of the following –

- Delivery flight – The first flight of a new aircraft from the manufacturers / lessees own base to the operators own base for the purpose of its delivery.
- Practice/training flight – Flights meant for command/conversion as well as recurring training of pilots.
- Test flights – Flights carried out to test the engines or to obtain the C of A of an aircraft after an accident job or after a major overhaul.

- Ferry flight – These are non revenue flights performed by an aircraft either due to repairs or due to positioning of the aircraft to a point from where revenue traffic is scheduled to be carried.

- Dead flying – After an aircraft takes off from an airport and returns back to the same airport due to engine trouble, weather conditions etc. the time spent during such flights is called dead flying.

- Proving flight – This is a flight operated prior to the commencement of scheduled flights on a new route or prior to the introduction of a new type of aircraft or new technology on an existing route.

- Inaugural flight – These are flights undertaken for publicity purposes when the press and other dignitaries are invited to have the opportunity of experiencing the facilities provided by the airline to the passengers on a new route/aircraft.

Kilometers flown – Revenue and Non Revenue

For compiling these statistics of revenue kilometers flown, the actual kilometers flown by the aircraft are not taken into account because such distances depend on weather conditions, deviations, alternates etc therefore the industry standard is to calculate distances based on the great circle distance between the airports. A great circle distance course provides the shortest distance between two points on the surface of a sphere.

Non revenue kilometers refer to distances covered during non revenue flights viz. test, training etc explained earlier. The kilometers flown during non revenue flights are calculated multiplying the flying time by the standard average speed of the aircraft.

Departures flown – Revenue and Non revenue

Compilation of operational flight report data will allow the airline to keep records of the number of departures flown by the airline for revenue and non revenue flights. Revenue aircraft departures are the actual departures performed by the airline in course of operating a flight number. Thus if an airline operated a flight number 555 routing AAA –BBB-CCC it will have two aircraft departures i.e. AAA-BBB and BBB-CCC.

Fuel consumption

Actual fuel loaded in the aircraft while operating a flight is recorded in the pilot report and needs to be recorded by the airline since it has several important uses related to planning optimal and cost effective fuel uploads besides accurate settlement of vendor invoices. Relating fuel consumption and costs data with other operational statistics like speeds, time of operations into and from airports and route navigation plans will enable an airline to plan ways to reduce fuel consumption either through its fleet planning, frequency development exercise or in upgrading technology for landing or navigation after considering the related cost benefits of doing the same

Available seat kilometers flown (Passenger capacity available) - ASKM

The product obtained by multiplying the number of passenger seats available in an aircraft by the distance flown in kilometers is termed as Available seat kilometers. The ASKM are calculated separately for the various classes of passenger seats in an aircraft for eacg flight operated by the airline.

Example

Flt No 555 of an airline operates a routing as AAA – BBB – CCC with a B747-400 aircraft configuration as y seats in first class and z seats in economy. The ASKM will be calculated as follows –

Flt No	Sector	Kms	Seats available F Class	Seats available Y Class	ASKM F Class	ASKM Y Class	ASKM Total
555	AAA-BBB	1500	60	340	90000	510000	600000
555	BBB-CCC	2000	60	340	120000	680000	800000
555	Total (AAA-BB-CCC)	3500	60	340	210000	1190000	1400000

It can be seen from above that the summary ASKM of the entire flight 555 i.e. for the route AAA-BBB-CCC is arrived at after summing each sector AAA-BBB and BBB-CCC and not by considering the distance (Kms) between AAA and CCC and arriving at the product of such distance and passenger seats available in the first and economy class. Doing so will give an incorrect result where the summary ASKM for the complete flight will be in variance with the sum of the ASKM of sectors operated in that flight.

Available tonne kilometers (ATKM) – Passenger and Cargo

The product obtained by multiplying the capacity in metric tones i.e. payload available for passengers, mail and cargo by the distance in kilometers flown by the aircraft. ATKM will be calculated for each flight operated in lines with the example given earlier for calculating ASKM. The obvious difference being, instead of seats available we use the capacity in terms of payload available for each flight.

The payload available is taken usually from the payload circulars issued by the operations department which gives payload for each type of aircraft and for each sector separately. The payload capacity may vary from the aircraft payload capacity listed by the manufacturer as these are constrained by several factors like weight of fuel carried, runway strengths, climate,

temperature and various other operational factors). These payload restrictions should be reflected in the calculation of each flight's ATKM as otherwise it could give wrong interpretation to management about the true load on the flight and may result in incorrect capacity planning and frequency development decisions.

Cargo available tonne kilometer (CATKM) could be calculated by the airline especially if cargo and passenger both play an important part in the product mix of flights operated by the airline. The CATKM is arrived at by removing the passenger component from the ATKM. Thus if the total seats available in an aircraft is 400 (a standard passenger available weight including free baggage adopted by the airline - *Pwt*) while its total payload for passenger, freight and mail is 110 tonnes, the CATKM will be (110 – (400x (*Pwt in kgs*/1000)) multiplied by the distance in kilometers flown for a sector by the aircraft.

Derived data from operational statistics

The data derived from the operational statistics explained above are –

Average trip distance – which is $\frac{\text{Revenue kilometers flown}}{\text{Number of departures}}$

Average block speeds – which is $\frac{\text{Revenue kilometers flown}}{\text{Revenue Hours flown}}$

Fuel consumption for each aircraft type - which is $\frac{\text{Fuel consumed by the aircraft}}{\text{Revenue Hours flown}}$

Traffic statistics

The traffic statistics show the actual performance of the airline in terms of passengers , freight and mail carried for a given set of capacity on offer. A holistic view of airline statistics will involve a merger of operational statistics and traffic statistics and the information so derived forms the backbone for any analysis and planning decision making the airline undertakes.

Traffic statistics are derived from revenue accounting document like passenger ticket and airway bill usually when the uplift of passengers or freight is completed. Details of Flight number, date of uplift, sector uplifted , amounts collected , currency of collection , Fare type, Fare class etc are usually captured by the Revenue Accounting section of the airline. There are various ways in which revenue or traffic data can be captured , the trend for some time now is to capture the traffic and revenue accounting related data from the CRS or DCS systems of the airline or even from electronic media like BSP tapes so as to minimize data entry related costs, aim at real time processing and fewer data capture errors.

The traffic data and revenue data are closely entwined and usually the Revenue Accounting section of the airline processes these statistic along with passenger and freight/mail revenue

after considering usual revenue accounting guidelines in force. The traffic statistics that are generated are –

Number of passengers carried

The number of passengers refers only to the fare paying passengers traveling on the aircraft. Non fare paying passengers refers normally to SOD or SOL ticket besides some interline passengers traveling on free passes . Infants are not taken into account. Statistics are kept for both fare paying (Revenue passengers) as well as non fare paying passengers. This definition for revenue passengers includes, for example, a) passengers travelling under publicly available promotional offers (for example “two-for-one”) or loyalty programmes (for example, redemption of frequent-flyer points); b) passengers travelling as compensation for denied boarding; c) passengers travelling at corporate discounts; d) passengers travelling on preferential fares (government, seamen, military, youth, student, etc.).

Revenue passengers kilometers flown (RPKM)

The product obtained by multiplying the number of fare paying passengers by the distance in kilometers flown by them is termed as RPKM.

Revenue tonne kilometers performed (Passenger and Cargo)

RTKM is the actual revenue earning load of passengers, excess baggage, mail and freight in metric tones multiplied by the distance flown in kilometers. The product so obtained for passengers and excess baggage is called Passenger tonne kilometers (PTKM), for freight is called freight tonne kilometers (FTKM) and for mail is called MTKM. RTKM is the summation of these i.e.

RTKM = PTKM+FTKM+MTKM and

indicates the actual capacity utilized as against the capacity available in the aircraft (ATKM explained earlier).

For calculation of passenger tonne kilometers the fixed weight of passengers are assumed as follows by airlines –

- First class passengers including free baggage allowance = 100 Kgs
- Economy class passengers including free baggage allowance = 91 Kgs

Passenger load factor

Ratio of Revenue passenger kilometers (RPKM) to Available seat kilometers (ASKM) usually expressed as a percentage is termed as Passenger Load factor.

Overall load factor

The Ratio of actual capacity utilized (RTKM) to capacity available (ATKM – Passenger and Cargo) is termed as Overall Load factor will tell the airline how efficiently the overall capacity available is utilized. This can be arrived at for each category as well as for all revenue categories. For e.g. ratio of PTKM to Capacity available (ATKM – Passengers) will tell the airline how efficiently the passenger capacity available is utilized. Likewise for freight the ratio of (FTKM+MTKM) to Capacity available (ATKM – Cargo) will tell the airline how efficiently the cargo capacity available is utilized. The overall load factor ratio like the passenger load factor is usually expressed as a percentage.

Revenue statistics

Revenue statistics or data as explained earlier is usually the responsibility of the Revenue Accounting section of the airline that accounts for the same in lines with Revenue accounting guidelines and rules governing proration. Both own carrier coupon as well as interline documents are covered in the ambit of Revenue accounting and the airline considers SPA and provisos it may have entered into to arrive at the passenger, freight and mail revenue earned by the airline.

It is important to note that the above explained traffic and revenue data are generated for each flight operated by the airline and for various class of travel i.e. First class, Business class and Economy class offered for sale by the airline.

Operating costs data

The operating costs of the airline that comes out of the airlines accounting systems can be allocated to a flight depending on the variability of the costs in question. Many operating cash costs are variable in nature and can be associated directly with a flight operated by the airline for e.g. landing costs, handling costs (passenger and ground handling), crew hourly costs, crew layover costs, fuel costs , passenger services costs and commission. For other direct operating costs like crew fixed salaries, depreciation costs, lease rentals, hire of aircraft , material costs etc as well as for indirect costs like system overheads, depreciation etc the same can be allocated to a aircraft and to flights operated by that aircraft type on the basis of a consistent formula adopted by the airline like number of departures or hours flown.

OPERATIONS CONDUCTED UNDER CERTAIN COMMERCIAL AGREEMENTS BETWEEN TWO OR MORE AIR CARRIERS

Pooled services. Each air carrier participating in pooled service agreements should report the total revenues of the traffic it carried on its services under the pool under the appropriate revenue items, broken down by type of traffic , and the expenses it incurred for its own operations under the pool under the appropriate expense items Revenues from capacity equalization payments should be included under incidental transport related revenues. Payments made for capacity equalization of pooled services should be entered under incidental transport related expenses.

Code-shared, blocked-space and joint services agreements. In the case of operations conducted under code-shared, blocked-space or joint services agreements, the operating carrier should report the gross revenue from the transportation of its own traffic, plus any

additional revenue gained through the sale of aircraft space under these agreements. The total of these revenues should be broken down by type of traffic carried. The relevant operating expenses are to be accounted under the relevant individual expense item.

The marketing carrier is to account the gross revenue under a separate account head as part of incidental revenues and the related expenses, i.e. the costs incurred for the purchase of capacity from the operating carrier and administrative costs to enter into the agreement under a separate account head under incidental expenses. This will help the marketing carrier to identify the net benefit of entering into commercial agreements involving purchase of capacity from other carrier and will help it in its decision making process.

Summarizing data and summary report

The operational , traffic and revenue data explained above is usually compiled by the airline at detail level for each flight number/aircraft type operated by the airline on each day of operation. Assigning each flight number to a route will allow the airline to summarize the flight no /aircraft type data into airacft type route wise data or into only route group data for a period it opts to view or analyze data for e.g. every week or a month. The data can also be displayed for each direction i.e. Ex and To so as to generate more value and assist in decision making. This is especially useful while presenting management data or holistic analysis for each route group with the option to drill to individual flights and aircraft operated on each route group to justify the analysis. A merger of traffic and revenue data with operating statistics is what the airline should aim for while generating MIS and analytical reports that will assist it in its planning and decision making process. An example of this flight detail report data showing compilation of traffic, operational and profitability statistics is given for referral purposes in Appendix 3 and 4.

Conclusion

Accurate and reliable data with a common methodology are the basis in which most airline planning decisions are based and such decisions are essential for the economic efficiency, profitability and continuity of an airline's operations. Reliable operational and traffic statistics are also essential in determining essential aircraft and airline safety indicators. Finally reliable traffic, operational and revenue costs data are what lenders will look at as an essential prerequisite to funding the infrastructure needs of an airline or even for extending working capital finance . Adoption of a systematic and reliable data collection and analytical process will help in improving the economic efficiency of the airline and sustain faster growth for other related stakeholders in the aviation industry.

Appendix 1

INTERNATIONAL ROUTE NETWORK -- FLEET PLANNING EXAMPLE
(Assumes Constant Load Factor)

STAGE LENGTH:	2144	Miles	International	Scheduled	Operations
FUEL PRICE:	0.78	US$/gal	Utilization:	4000	Hrs/Year

ACFT CHARACTERISTICS	DC10-30 (Current)	MD-11 (CF6-80C2)	B767-300ER (PW4060)	B767-200ER (PW4056)	A310-300 (PW4156)
MTOW (lbs)	553841	618000	407000	387000	360800
Generic Fuel Burn (Gal/Hr)	1965	1515	999	977	989
Seats	280	320	254	226	218
Flight Crew	3	2	2	2	2
Cabin Crew	8	9	8	7	7
Generic Speeds (MpH)	505	525	520	520	514
ROUTE CHARACTERISTICS					
Avg Round Trip Miles	12866.00	12866.00	12866.00	12866.00	12866.00
Avg Blk Hours per RT	27.67	26.62	26.87	26.87	27.16
Avg Sectors per RT	6	6	6	6	6
Annual Round Trips	156	156	156	156	156
Annual Block Hours	4316.52	4152.08	4192.01	4192.01	4236.92
Annual ASMs ('000s)	561987	642271	509802	453604	437547
Annual RPMs ('000s)	405600	405600	405600	362883	350038
Load Factor %	72.17	63.15	79.56	80.00	80.00
Average Blk Speed (mph)	464.98	483.40	478.79	478.79	473.72
Fuel Burn (Gals/Hour)	2254.50	1738.20	1146.16	1120.94	1134.95
No. of Aircraft Required	1.08	1.04	1.05	1.05	1.06
RPM Growth %		0.00	0.00	-10.53	-13.70
Operating Ratio	103	84	117	112	107
HOURLY COSTS PER AIRCRAFT (US$)					
Fuel	1753	1352	891	872	883
Crew Variable	220	220	200	180	180
Crew Fixed	440	440	400	360	360
Maintenance	950	875	750	750	750
	$3,363	$2,887	$2,241	$2,162	$2,173
ROUND TRIP COSTS PER AIRCRAFT (US$)					
Navigation, Comms, etc	4985	5562	3663	3483	3247
Landing & Handling	11631	12978	8547	8127	7577
Station Costs	66461	74160	48840	46440	43296
Sales & Reservations	2600	2600	2600	2326	2244
Pax Services	7800	7800	7800	6979	6731
Commissions	26000	26000	26000	23262	22438
Total RT Costs	$119,476	$129,100	$97,450	$90,616	$85,534
Trip Cost/Hour	$4,318	$4,850	$3,626	$3,372	$3,149
MONTHLY COSTS PER AIRCRAFT (US$)					
Monthly Lease Cost	$450,000	$1,200,000	$740,000	$675,000	$740,000
Block Hours/Month	333	333	333	333	333
Hourly Lease Rate	$1,350	$3,600	$2,220	$2,025	$2,220

ACFT CHARACTERISTICS	DC10-30 (Current)	MD-11 (CF6-80C2)	B767-300ER (PW4060)	B767-200ER (PW4056)	A310-300 (PW4156)	A340-200 (CFM56)
Insured Hull Value ($m)	$45.0	$110.0	$75.0	$72.5	$75.0	$90.0
Monthly Insurance Cost	$56,250	$137,500	$93,750	$90,625	$93,750	$112,500
Hourly Hull Insurance	$169	$413	$281	$272	$281	$338
Total Costs per Hour	$9,200	$11,750	$8,369	$7,831	$7,823	$10,106
Cost per Aircraft Mile	$19.79	$24.31	$17.48	$16.36	$16.51	$20.69
Cost/ASM (USc)	7.07	7.60	6.88	7.24	7.58	6.83
Rev/ASM (USC)	7.29	6.38	8.04	8.08	8.08	6.74
REV/RPM(USC)	$10.10	$10.10	$10.10	$10.10	$10.10	$10.10
BEP	69.96	75.21	68.14	71.65	75.00	67.62
PER AIRCRAFT :- PLF	72.17	63.15	79.56	80.00	80.00	66.69
Total Cost per Month	$3,066,656	$3,916,594	$2,789,698	$2,610,267	$2,607,728	$3,368,804
Gross Rev per Month	$3,163,474	$3,288,760	$3,257,439	$2,914,371	$2,781,409	$3,322,588
MONTHLY CONTRIB.	$96,818	($627,834)	$467,741	$304,104	$173,681	($46,217)
Operating Ratio	103	84	117	112	107	99
Rev per Hour	9490.422841	9866.281171	9772.316588	8743.114246	8344.227068	9967.76292
Block Hours/Month	333.33	33800				
	$9,199.97	$11,749.78				
COST INPUT DATA						
Maintenance / Block Hour	950.00	875.00	750.00	750.00	750.00	675.00

	US $	
Sales & Reservations	0.001	Per RPM
Pax Services	0.003	Per RPM
Commission	0.01	Per RPM
Navigation & Comms	1.5	PER 1000 LBS MTOW per Sector
Landing & Handling	3.5	PER 1000 LBS MTOW per Sector
Crew Variable	20	Per Hour per head
Station Costs	20	PER 1000 LBS MTOW per Sector
Crew Fixed	40	Per Hour per head
Hull Insurance Rate	1.5	
Fuel Price	$ 0.77770	Per Gallon
UTILIZATION	4000	BLOCK HOURS PER YEAR
PASSENGER YIELD	$ 0.101	US$ PER RPM

Appendix 2

BOSTON-FRANKFURT OPERATING ANALYSIS

1. DEMAND AND YIELD ESTIMATES FOR 2004		DEMAND ONE-WAY PAX TRIPS	ONE WAY DL REVENUE PER PAX
	Total BOS-FRA Local O-D passengers (both directions)	168,000	
	Expected Market Share for one daily flight	40.00%	
	Local BOS-FRA passengers on new flight	67,200	$400
	Additional Traffic:		
	Connections US destinations behind Boston to/from FRA	22,000	$445
	Connections to/from BOS beyond FRA	10,500	$370
	Connections behind BOS to/from destinations beyond FRA	4,500	$345
	Total passengers (both directions)	104,200	
	Additional Cargo Revenue	10 % of passenger revenue	

2. FLIGHT OPERATING INFORMATION		
	Total Annual Flights (each direction)	360
	Block Hours BOS to FRA	7.25
	Block Hours FRA to BOS	8.25
	Non-stop miles BOS/FRA	3657

3. ESTIMATED OPERATING COSTS		
Direct Operating Costs		
Aircraft Type	B767-300	
Number of Seats	190	
Cost per Block-Hour:		
Flying Operations	2038	
Maintenance	519	
Ownership	943	
Total per Block-Hour	3500	
Indirect Operating Costs		
Passenger Service	$0.02	per RPM
Aircraft & Traffic Servicing	$65	per Seat Departure
Promotion and Sales	12.00%	of Passenger Revenues
General and Administrative	$0.005	per ASM

BOSTON-FRANKFURT OPERATING ANALYSIS

Revenues	
Passenger revenues	$42,107,500
Cargo revenues	$4,210,750
Total Network Revenues (A)	$46,318,250
Variable operating costs	
Flying operations	$11,372,040
Direct maint costs	$2,896,020
Passenger variable costs	$7,621,188
Aircraft and traffic servicing	$8,892,000
Total variable costs (B)	$30,781,248
Overhead and Non operating costs	
Promotion and sales	$5,052,900
General and Administrative	$2,501,388
Total overhead and non operating costs (C)	$7,554,288
Aircraft ownership costs (D)	$5,261,940
Estimated Annual operating profitability (A-B-C-D)	$2,720,774
Dimensional view of route profitability	
Variable profitability plus network contribution (A-B)	$15,537,002
Variable plus network with opportunity costs	
Variable plus ownership, network contribution (A-B-D)	$10,275,062
Variable, ownership, network plus opportunity.	
Fully allocated plus network contribution (A-B-C-D)	$2,720,774

Appendix 3

ROUTE INDIA/USA

OPERATIONAL STATISTICS

Date	Fltno	Sector	Acft	Kms	Hrs	Payload	Seats Y	Seats F	Seats Total	ASK(000) Y	ASK(000) F	ASK(000) Total	ATKM (000)	Speed
1-May	111	BOM LON	B747-400	7213	8.15	110	400	80	480	2885.2	577.04	3462.24	793.43	885
1-May	111	LON NYC	B747-400	5537	6.22	110	400	80	480	2214.8	442.96	2657.76	609.07	890
1-May	111	BOM LON NYC	B747-400	12750	14.37	110	400	80	480	5100	1020	6120	1402.5	887

Date	Fltno	Sector	Acft	Kms	Hrs	Payload	Seats Y	Seats F	Seats Total	ASK(000) Y	ASK(000) F	ASK(000) Total	ATKM (000)	Speed
3-May	333	BOM LON	B747-400	7213	8.2	110	400	80	480	2885.2	577.04	3462.24	793.43	880
3-May	333	LON NYC	B747-400	5537	6.1	110	400	80	480	2214.8	442.96	2657.76	609.07	908
3-May	333	BOM LON NYC	B747-400	12750	14.3	110	400	80	480	5100	1020	6120	1402.5	892

Date	Fltno	Sector	Acft	Kms	Hrs	Payload	Seats Y	Seats F	Seats Total	ASK(000) Y	ASK(000) F	ASK(000) Total	ATKM (000)	Speed
5-May	555	BOM FRA	B747-400	6567	8.3	110	400	80	480	2626.8	525.36	3152.16	722.37	791
5-May	555	FRA CHI	B747-400	6965	6.5	110	400	80	480	2786	557.2	3343.2	766.15	1072
5-May	555	BOM FRA CHI	B747-400	13532	14.8	110	400	80	480	5412.8	1082.56	6495.36	1488.52	914
W1 May	TOTAL	IND/USA	B747-400	39032	43.47	330	1200	240	1440	15612.8	3122.56	18735.36	4293.52	898

TRAFFIC STATISTICS (Ticket coupon data)

Date	Fltno	Sector	Paxnos Y	Paxnos F	Paxnos Total	PKM(000) Y	PKM(000) F	PKM(000) Total	PTK(000) Y	PTK(000) F	PTK(000) Total	Frttons Total	Mailtons Total	FTK(000) Total	MTK(000) Total	RTK(000) Total
1-May	111	BOM LON	100	20	120	721.3	144.26	865.56	64.917	14.426	79.343	20	5	144	36	260
1-May	111	LON NYC	200	10	210	1107.4	55.37	1162.77	99.666	5.537	105.203	10	0	55	0	161
1-May	111	BOM NYC	180	50	230	2295	637.5	2932.5	206.55	63.75	270.3	10	10	128	128	525
1-May	111	BOM LON NYC	480	80	560	4123.7	837.13	4960.83	371.133	83.713	454.846	40	15	327.13	163.565	945.541

Date	Fltno	Sector	Paxnos Y	Paxnos F	Paxnos Total	PKM(000) Y	PKM(000) F	PKM(000) Total	PTK(000) Y	PTK(000) F	PTK(000) Total	Frttons Total	Mailtons Total	FTK(000) Total	MTK(000) Total	RTK(000) Total
3-May	333	BOM LON	110	20	130	793.43	144.26	937.69	71.4087	14.426	85.8347	20	5	144	36	266
3-May	333	LON NYC	190	10	200	1052.03	55.37	1107.4	94.6827	5.537	100.2197	10	0	55	0	156
3-May	333	BOM NYC	170	50	220	2167.5	637.5	2805	195.075	63.75	258.825	15	10	191	128	578
3-May	111	BOM LON NYC	470	80	550	4012.96	837.13	4850.09	361.1664	83.713	444.8794	45	15	390.88	163.565	999.3244

Date	Fltno	Sector	Paxnos Y	Paxnos F	Paxnos Total	PKM(000) Y	PKM(000) F	PKM(000) Total	PTK(000) Y	PTK(000) F	PTK(000) Total	Frttons Total	Mailtons Total	FTK(000) Total	MTK(000) Total	RTK(000) Total
5-May	555	BOM FRA	120	25	145	788.04	164.175	952.215	70.9236	16.4175	87.3411	20	5	131	33	252
5-May	555	FRA CHI	180	5	185	1253.7	34.825	1288.525	112.833	3.4825	116.3155	10	0	70	0	186
5-May	555	BOM CHI	190	45	235	2571.08	608.94	3180.02	231.3972	60.894	292.2912	20	10	271	135	698
5-May	555	BOM FRA CHI	490	75	565	4612.82	807.94	5420.76	415.1538	80.794	495.9478	50	15	471.63	168.155	1135.733
W1 May	TOTAL	IND/USA	1440	235	1675	12749.48	2482.2	15231.68	1147.453	248.22	1395.673	135	45	1189.64	495.285	3080.598

Note - (1) The BOM NYC traffic will be added to BOM LON and LON NYC traffic while BOM CHI traffic to BOM FRA and FRA CHI traffic for flight stage analysis.

Note - (2) The similar statistics to be compiled for the return flights (USA INDIA) and summing it will give the operational and traffic statistics for the IND USA IND route.

Appendix 4

747-300

	Gulf	Continent	Japan	USA	Total
Flt Number/Date					
Revenue Hours					
Atkm					
Askm					
Rtkm					
Pkm					
No of revenue passengers					
Revenue before pool					
Pool receipts/(payments)					
Revenue after pool (A)					
Load factors					
Passenger					
Overall					
Break even					
CASH COSTS					
Landing fees					
Navigation charges					
Handling charges					
Fuel and oil					
Crew expenses					
Passenger Amenities					
Legal Liability					
Booking agency commission					
Material consumption incl repairs					
Hire of aircaft					
TOTAL CASH COSTS (B)					
CASH CONTRIBUTION(A-B)					
OTHER FIXED COSTS (DIRECT)					
Op & Cabin crew salaries					
Eng. and Stores salaries					
Eng dept staff costs					
Insurance aircaft					
Depreciation/Amort. Aircraft					
Obsolescence on spares					
Lease rentals					
OTHER DIRECT COSTS (C)					
TOTAL DIRECT COSTS (B+C) = D					
INDIRECT COSTS					
Publicity					
Salaries other than crew and Eng					
System Overheads					
Depreciation other than aircarft					
TOTAL INDIRCT COSTS (E)					
TOTAL OPERATING COSTS (D+E)= F					
Credit for handling/servicing (G)					
Net Operating costs (F-G)=H					
Operating Profit/(Loss) (A-H)					

Notes to Appendix 4

Note – 1. The above profitability statement compiled at flight level summarized will give the profitability for the route – aircraft wise or combined for a period of choosing (Month/Quarter/Year).

Note -2 The other fixed costs (direct) will be allocated first to the identified aircraft then to the route on the basis of selected operational parameters like hours or departures.

Note -3 Indirect costs will be allocated notionally to the aircrafts then to the route on the basis of selected operational and or non operational parameters like revenue earned, passengers carried, hours and departures.

Note – 4 If an aircraft/route also provides traffic for onward connections in a hub the same should also be considered to arrive at total network revenues and costs to get a more accurate picture of a flights actual contribution.