Route Planning and Profit Evaluation

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M.Sc. Program

Network, Fleet and Schedule
Strategic Planning
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Lecture Outline

• **Route Planning and Evaluation**
  - Route evaluation issues
  - Route planning models
  - Practical and strategic issues

• **Route Evaluation Example: Boston-Rome**
  - Profit estimates for daily DL non-stop service

• **Measuring Route Profitability (Baldanza article)**
  - Incremental revenues and costs of a flight/route
  - Network contribution and costs
  - Example: Different estimates of route profitability
Route Planning and Evaluation

• The process of route planning and evaluation involves the selection of routes to be flown

• Route selection is both strategic and tactical:
  - Essential component of an integrated network strategy or “vision”
  - Route characteristics affect the types of “products” offered to travelers (e.g., need for business and first class products)
  - Stage length and route characteristics affect airline cost structure, as longer routes flown with bigger aircraft have lower unit costs
  - Route requirements provide feedback loop to fleet planning
  - Unexpected route opportunities occur with changes to environment (bankruptcies, competitor withdrawals, new bilateral agreements)
Route Planning and Profitability

- Estimating route profitability requires a detailed evaluation approach:
  - Demand, cost and revenue forecasts required for specific route, perhaps for multiple years into the future
  - Assumed market share of total demand based on models of passenger choice of different airline and schedule options
  - Depends to a large extent on presence and *expected response* of competitors to route entry

- “Route Profitability Models”
  - Computer models designed to perform such route evaluations, but ability to integrate competitive effects is limited
  - Profit estimates entirely dependent on assumptions used
Example: Airline “Profit Manager”

Source: LAN Airlines (2012)
Route Evaluation Issues

- Economic considerations dominate route evaluation:
  - Forecasts of potential passenger and cargo demand (as well as expected revenues) for planned route are critical to evaluations.
  - Origin-destination market demand is primary source of demand and revenues for a given route, but far from the only source.
  - In large airline hub networks, traffic flow support to the new route from connecting flights can make it profitable.
  - Airline’s market share of total forecast demand for the new route depends on existence of current and expected future competition.
  - The fundamental economic criterion for a planned route is potential for incremental profitability in the short run, given the opportunity cost of taking aircraft from another route.
Practical and Strategic Issues

• **Practical considerations can be just as important:**
  ▪ Technical capability to serve a new route depends on availability of aircraft with adequate range and proper capacity
  ▪ Performance and operating cost characteristics of available aircraft in the airline’s fleet determine economic profitability
  ▪ If the route involves a new destination, additional costs of airport facilities, staff re-location, and sales offices must be considered
  ▪ Regulations, bilaterals, and limited airport slots can impose constraints on new route operations, to the point of unprofitability

• **Strategic considerations can overlook lack of route profit:**
  ▪ Longer term competitive and market presence benefits of entering a new route even if it is expected to be unprofitable in short run
Route Evaluation Example: Boston-Rome

• Case Study – Delta Air Lines considers introduction of new daily non-stop flights between Boston and Rome:
  • No current year-round non-stop (AZ via Milan)
  • Cooperation with AZ as SkyTeam member
  • Delta wishes to build up international gateway at Boston

**FLIGHT OPERATING INFORMATION**

- Total Annual Flights (each direction) 358
  (Reflects 98% completion of daily schedule)
- Block Hours BOS to ROM 08:00
- Block Hours ROM to BOS 09:00
- Non-stop miles BOS/ROM 4087
Estimated DL Operating Costs

Direct Operating Costs

Aircraft Type: B767-300
Number of Seats: 204

Cost per Block-Hour:
- Crew Cost: 1050
- Fuel/Oil: 2400
- Ownership: 970
- Maintenance: 650

Total per Block-Hour: 5070

Indirect Operating Costs

- Passenger Service: 0.015 per RPM
- Traffic Servicing: $26 per Enplanement
- Aircraft Servicing: $1,700 per Departure
- Promotion and Sales: 9.00% of Passenger Revenues
- General and Administrative: $0.002 per ASM
# Boston-Rome Revenue Estimates

### DEMAND AND FARE ESTIMATES FOR 2006

<table>
<thead>
<tr>
<th>Description</th>
<th>Demand</th>
<th>One Way Revenue</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total BOS-ROM Local O-D passengers (both directions)</td>
<td>96,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected Market Share for one daily flight</td>
<td>70.00%</td>
<td></td>
<td></td>
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<tr>
<td>Local BOS-ROM passengers on new flight</td>
<td>67,200</td>
<td>$440</td>
<td>$29,568,000</td>
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<tr>
<td><strong>Additional Traffic (Estimated for DL at BOS)</strong></td>
<td></td>
<td></td>
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<tr>
<td>Connections US destinations behind Boston to/from ROM</td>
<td>22,400</td>
<td>$380</td>
<td>$8,512,000</td>
</tr>
<tr>
<td>Connections to/from BOS beyond ROM</td>
<td>9,600</td>
<td>$330</td>
<td>$3,168,000</td>
</tr>
<tr>
<td>Connections behind BOS to/from destinations beyond ROM</td>
<td>3,200</td>
<td>$350</td>
<td>$1,120,000</td>
</tr>
<tr>
<td>Total passengers (both directions)</td>
<td>102,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Cargo Revenue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 percent of passenger revenue</td>
<td></td>
<td></td>
<td>$4,660,480</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>$47,028,480</td>
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# Estimated Annual Operating Profit

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>B767-300</th>
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<tbody>
<tr>
<td>Number of Seats</td>
<td>204</td>
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<tr>
<td>ASM</td>
<td>596,963,568</td>
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<tr>
<td>Seat Departures</td>
<td>146064</td>
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<tr>
<td>Passengers Enplaned</td>
<td>102400</td>
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<tr>
<td>Average Load Factor</td>
<td>70.11%</td>
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<tr>
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<tbody>
<tr>
<td>DIRECT OP COSTS</td>
<td>$30,856,020</td>
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<tr>
<td>PAX SERVICE</td>
<td>$6,277,632</td>
</tr>
<tr>
<td>TRAFFIC SERVICE</td>
<td>$2,662,400</td>
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<tr>
<td>AIRCRAFT SERVICE</td>
<td>$1,217,200</td>
</tr>
<tr>
<td>PROMOTION/SALES</td>
<td>$3,813,120</td>
</tr>
<tr>
<td>GEN ADMINISTRN</td>
<td>$1,193,927</td>
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<tbody>
<tr>
<td>OPERATING COSTS</td>
<td>$46,020,299</td>
</tr>
<tr>
<td>OPERATING PROFIT</td>
<td>$1,008,181</td>
</tr>
</tbody>
</table>
Measuring Route “Profitability”

- **Airline costs are driven by fleet and flight schedule**
  - Fleet drives fixed costs (capital costs) and variable cost rates (fuel burn rates, maintenance rates)
  - Flight schedule drives utilization and thus variable costs
  - Costs are incurred on a flight basis and on a network basis

- **Airline revenues are driven by O-D markets**
  - Prices are set by competitive considerations or by regulation
  - Revenues are earned on a passenger itinerary basis

- **Scheduling decisions are often made at the route and flight departure level**
  - Airline managers must decide which flight legs to remove so that other flight legs can be added
Approaches to Flight Profit Measurement

• Ideally, add/change/remove a flight leg and then measure the profitability given that the rest of the network can be re-optimized
  ▪ Captures interactive or network effects of both costs and revenues
  ▪ Not easy as it requires a good model of the entire operation

• Another approach – allocate all costs and revenues on a flight leg basis and then treat each leg as being independent of the rest of the network
  ▪ Allocation schemes are always subjective
  ▪ Does not capture network effects, very important in most cases
  ▪ But, much easier to conceptualize
Sample Network (Baldanza Article)
Flight-Level Profitability

- Incremental Revenues
- Incremental Costs
- Measures of Profitability
- Network Contributions and Costs
Incremental Revenues (SYR-OMA)

• Two sources of incremental passenger revenues
  ▪ Passengers boarding in SYR and deplaning in OMA (Local Revenue)
  ▪ Passengers boarding in SYR and connecting in OMA to LAX or SFO (Connecting Revenue)

• Connecting O-D revenues allocated to each flight leg
  ▪ Proration methodology needed to split O&D fare into component parts (e.g. mileage, ratio of full fares)
  ▪ Or, assign total connecting O-D fare to flight leg being analyzed

• Implicit assumption is that all revenues from a flight segment will be lost if the segment is cancelled
  ▪ Reality is that airline might recapture some of this revenue
Incremental Costs (SYR-OMA)

- Variable Operating Costs
- Aircraft Ownership Costs
  - Equivalent leasing costs based on duration of flight segment
- Overhead and Non-Operating Costs
  - Equivalent share of other fixed costs based on duration of flight segment
- Fully allocated flight costs equals the variable operating costs plus the aircraft ownership costs plus the allocated overhead and non-operating costs.
Network Contributions and Costs

• Contributions to Rest of Network
  ▪ Additional revenue on other segments due to presence of SYR-OMA segment

• Costs to Rest of Network
  ▪ Cost of processing SYR connecting passengers at OMA
  ▪ Incremental cost of having more passengers on the connecting segments out of OMA
  ▪ Opportunity Costs of selling seats beyond OMA, which could have been occupied by passengers from other O-D markets (known as “network displacement costs”)
Revenues & Costs for Sample Network

- Local SYR-OMA O-D revenue: $6,000
- Connex prorated to SYR-OMA: $1,500
- Connex proration to other legs: $4,000
- Variable operating costs: $4,500
- Aircraft ownership costs: $2,000
- Allocated overhead & non-operating costs: $1,500
- Network variable costs: $700
- Network opportunity costs: $500
SYR-OMA Profitability for Sample Network

- Variable Leg Profitability with Network Contribution: $6,300
- Variable Leg Profitability with Network Contribution and Opportunity Costs: $5,800
- Variable Leg Profitability with Aircraft Ownership and Network Contribution: $4,300
- Variable Leg Profitability with Network Contribution, Aircraft Ownership and Opportunity Costs: $3,800
SYR-OMA Profitability for Sample Network

- Fully Allocated Profitability with Network Contribution: $2,800
- Fully Allocated Profitability with Network Contribution and Opportunity Costs: $2,300
- Variable Leg Profitability: $3,000
- Variable Leg Profitability with Aircraft Ownership: $1,000
- Fully Allocated Leg Profitability: ($ 500)
**What is the right profitability measure?**

<table>
<thead>
<tr>
<th>Decision Process</th>
<th>Relevant Profitability Measure</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term scheduling optimization</td>
<td>Variable with network contribution</td>
<td>In the very short term, ownership and overhead costs are fixed. Flight and market level need the network contribution to be useful.</td>
</tr>
<tr>
<td>Middle-term scheduling optimization</td>
<td>Variable plus ownership with network contribution</td>
<td>In the middle term, aircraft may be fungible.</td>
</tr>
<tr>
<td>Hub profitability for a single month</td>
<td>Variable profitability, no network contribution</td>
<td>In aggregation, adding network contributions would double-count revenues.</td>
</tr>
<tr>
<td>Hub profitability for six months</td>
<td>Variable plus ownership, no network contribution</td>
<td>A combination of the middle-term scheduling and single-month hub profits example.</td>
</tr>
<tr>
<td>Hub viability</td>
<td>Fully allocated profitability</td>
<td>Over time, every cost is variable.</td>
</tr>
</tbody>
</table>