Lecture Outline

- **Cost Categorization Schemes**
  - Administrative cost allocation
  - Functional cost categories and typical breakdown
  - Cost trends by category

- **Flight Operating Costs**
  - Comparisons across aircraft types

- **Total costs vs. unit costs**
  - Comparisons across airlines
  - Impacts of stage length on unit costs

- **Unit Cost Trends**
  - Fuel, labor and non-labor unit costs
US DOT Form 41 Database

• **Form 41 contains traffic, financial, and operating cost data reported to the DOT by US Major airlines**
  - Data is reported and published quarterly for most tables
  - Detail of reporting differs for different expense categories
    - Aircraft operating expenses by aircraft type and region of operation
    - Other expenses more difficult to allocate by aircraft type

• **Cost categorization schemes differ, but all are affected by accounting and allocation assumptions**
  - Administrative cost categories – financial reports
  - Functional cost categories – airline cost and productivity comparisons
Administrative Cost Breakdown US Airlines 2012

Source: US DOT Form 41 Financial Reports
**Functional Cost Categories**

- **Aircraft operating costs**
  - Expenses associated with flying aircraft, also referred to as “Direct Operating Costs” (DOC)

- **Aircraft servicing costs**
  - Handling aircraft on the ground, includes landing fees

- **Traffic service costs**
  - Processing passengers, baggage and cargo at airports

- **Passenger service costs**
  - Meals, flight attendants, in-flight services

- **Promotion and Sales costs**
  - Airline reservations and ticket offices, travel agency commissions

- **Other costs, including:**
  - General and administrative expense
  - Depreciation and amortization
**Functional Cost Breakdown**

**US Airlines 2012**

With high fuel prices, total Aircraft Operating Costs sum to 61%.

### Functional Breakdown

- **AIRCRAFT OPERATIONS**: 61.4%
- **PASSENGER SERVICE**: 6.6%
- **AIRCRAFT SERVICE**: 5.7%
- **TRAFFIC SERVICE**: 10.1%
- **RESERVATIONS AND SALES**: 4.8%
- **DEPRECIATION AND AMORTIZATION**: 2.0%
- **GENERAL ADMIN**: 8.4%
- **ADVERTISING**: 0.9%

**Source**: US DOT Form 41 Financial Reports
Activity Drivers by Functional Category

- Aircraft Operating Costs
  - Per Block Hour (for example, $4400 for 150-seat A320 in 2011)

- Aircraft Servicing Costs
  - Per Aircraft Departure (average $1200)

- Traffic Servicing Costs
  - Per Enplaned Passenger (average $15)

- Passenger Servicing Costs
  - Per RPM (average $0.015)

- Reservations and Sales Costs
  - % of Total Revenue (average 9%)

- Other Indirect and System Overhead Costs
  - % of Total Operating Expense (average 10%)
### “Back of the Envelope” Break Even Fare

**Boston-Orlando A320 Flight 80% LF**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC 3.0 block hours @ $4400</td>
<td>$13200</td>
</tr>
<tr>
<td>Aircraft Servicing (1 departure @ $1200)</td>
<td>$1200</td>
</tr>
<tr>
<td>Traffic Servicing (120 pax @ $15)</td>
<td>$1800</td>
</tr>
<tr>
<td>Pax Servicing (132000 RPM @ $0.015)</td>
<td>$1980</td>
</tr>
<tr>
<td>System Overhead Costs (10% of sub-total)</td>
<td>$2020</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td><strong>$20200</strong></td>
</tr>
<tr>
<td>Break Even Net Revenue per Pax (120)</td>
<td>$168</td>
</tr>
<tr>
<td>Distribution and Sales Costs (9% of fare)</td>
<td>$17</td>
</tr>
<tr>
<td><strong>Break Even Average Fare</strong></td>
<td><strong>$185</strong></td>
</tr>
</tbody>
</table>
Airline Operating Cost Breakdown

- Adapted from Form 41, used by Boeing, MIT (and Aviation Daily) for more detailed comparisons

  FLIGHT (DIRECT) OPERATING COSTS (DOC) = 50%
  - All costs related to aircraft flying operations
  - Include pilots, fuel, maintenance, and aircraft ownership

  GROUND OPERATING COSTS = 30%
  - Servicing of passengers and aircraft at airport stations
  - Includes aircraft landing fees and reservations/sales charges

  SYSTEM OPERATING COSTS = 20%
  - Marketing, administrative and general overhead items
  - Includes in-flight services and ground equipment ownership

- Percentages shown reflect historical “rules of thumb”.
## World Airline Operating Cost Breakdown

<table>
<thead>
<tr>
<th>ICAO OPERATING COST CATEGORIES</th>
<th>1992</th>
<th>2002</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Aircraft Operating Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flight Operations (Total)</td>
<td>26.1</td>
<td>30.7</td>
<td>37.7</td>
</tr>
<tr>
<td>Flight Crew</td>
<td>7.2</td>
<td>9.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Fuel and Oil</td>
<td>12.2</td>
<td>13.0</td>
<td>21.9</td>
</tr>
<tr>
<td>Other</td>
<td>6.7</td>
<td>8.7</td>
<td>8.0</td>
</tr>
<tr>
<td>Maintenance and Overhaul</td>
<td>10.9</td>
<td>11.3</td>
<td>10.2</td>
</tr>
<tr>
<td>Depreciation and Amortization</td>
<td>7.0</td>
<td>7.1</td>
<td>6.1</td>
</tr>
<tr>
<td><strong>Indirect Operating Costs</strong></td>
<td>56.0</td>
<td>50.9</td>
<td>46.0</td>
</tr>
<tr>
<td>User charges and station expenses (Total)</td>
<td>17.2</td>
<td>17.0</td>
<td>16.2</td>
</tr>
<tr>
<td>Landing and associated airport charges</td>
<td>3.9</td>
<td>4.0</td>
<td>3.8</td>
</tr>
<tr>
<td>Other</td>
<td>13.3</td>
<td>13.0</td>
<td>12.4</td>
</tr>
<tr>
<td>Passenger services</td>
<td>10.8</td>
<td>10.3</td>
<td>9.3</td>
</tr>
<tr>
<td>Ticketing, sales and promotion</td>
<td>16.4</td>
<td>10.7</td>
<td>9.1</td>
</tr>
<tr>
<td>General, administrative and other</td>
<td>11.6</td>
<td>12.9</td>
<td>11.4</td>
</tr>
</tbody>
</table>

*Source: ICAO, Belobaba et al (2009)*
Operating Cost Breakdown by Region

<table>
<thead>
<tr>
<th></th>
<th>North America</th>
<th>Europe</th>
<th>Asia Pacific</th>
<th>All Major Airlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>36.2%</td>
<td>21.5%</td>
<td>27.2%</td>
<td>24.8%</td>
</tr>
<tr>
<td>Fuel</td>
<td>13.4%</td>
<td>34.2%</td>
<td>12.2%</td>
<td>25.3%</td>
</tr>
<tr>
<td>Aircraft Rentals</td>
<td>5.5%</td>
<td>3.0%</td>
<td>2.9%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Depreciation and Amortisation</td>
<td>6.0%</td>
<td>4.5%</td>
<td>7.1%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Other</td>
<td>38.9%</td>
<td>36.9%</td>
<td>50.7%</td>
<td>41.8%</td>
</tr>
</tbody>
</table>

Source: Company Reports

- Fuel component has increased for all regions, while labor percentages have declined.
- Labor share dropped the most for North America airlines.

Source: IATA
Flight Operating Costs

• Flight operating costs (FOC) by aircraft type:
  ▪ Reflect an average allocation of system-wide costs per block hour, as reported by airlines for each aircraft type
  ▪ Can be affected by specific airline network or operational patterns
  ▪ Collected by US DOT as Form 41 operating data from airlines

• Typical breakdown of FOC for US carrier:
  CREW: Pilot wages and benefits
  FUEL: Easiest to allocate and most clearly variable cost
  MAINTENANCE: Direct airframe and engine maintenance cost, plus “burden” or overhead (hangars and spare parts inventory)
  OWNERSHIP: Depreciation, leasing costs and insurance
US Airlines: Airbus 320 (avg. 150 seats)

**Costs per block-hour**

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2007</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREW</td>
<td>$470</td>
<td>$454</td>
<td>$562</td>
</tr>
<tr>
<td>FUEL</td>
<td>$1327</td>
<td>$1713</td>
<td>$2578</td>
</tr>
<tr>
<td>MAINTENANCE</td>
<td>$524</td>
<td>$576</td>
<td>$774</td>
</tr>
<tr>
<td>OWNERSHIP</td>
<td>$570</td>
<td>$570</td>
<td>$653</td>
</tr>
<tr>
<td>TOTAL FOC</td>
<td>$2891</td>
<td>$3313</td>
<td>$4567</td>
</tr>
</tbody>
</table>

**Based on reported average stage length and block-hr daily utilization (weighted averages):**

- Different stage lengths and utilization by different airlines result in substantial variations in block-hour costs for same aircraft type
- Also, differences in crew (union contracts, seniority), maintenance (wage rates), and ownership costs (age of a/c)
Comparing FOC Across Aircraft Types

• All else equal, larger aircraft should have higher flight operating cost per hour, lower unit cost per ASM:
  ▪ There exist some clear economies of aircraft size (e.g., two pilots for 100 and 400 seat aircraft, although paid at different rates)
  ▪ Also economies of stage length, as fixed costs of taxi, take-off and landing are spread over longer flight distance

• But, many other factors distort cost comparisons:
  ▪ Pilots paid more for larger aircraft that fly international routes
  ▪ Newer technology engines are more efficient, even on small planes
  ▪ Reported depreciation costs are subject to accounting procedures
  ▪ Aircraft utilization rates affect allocation of costs per block-hour
<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Average Seats</th>
<th>FOC/ Block-hr</th>
<th>FOC/ Seat-hr</th>
<th>Average Stage (mi.)</th>
<th>Utilization (block-hrs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E190</td>
<td>100</td>
<td>$3,152</td>
<td>$31.52</td>
<td>610</td>
<td>9.9</td>
</tr>
<tr>
<td>A319</td>
<td>128</td>
<td>$4,099</td>
<td>$32.02</td>
<td>850</td>
<td>10.6</td>
</tr>
<tr>
<td>737-800</td>
<td>158</td>
<td>$4,662</td>
<td>$29.50</td>
<td>1263</td>
<td>10.4</td>
</tr>
<tr>
<td>757-200</td>
<td>179</td>
<td>$5,939</td>
<td>$33.18</td>
<td>1472</td>
<td>9.9</td>
</tr>
<tr>
<td>A330-200</td>
<td>268</td>
<td>$8,882</td>
<td>$33.14</td>
<td>3812</td>
<td>14.7</td>
</tr>
<tr>
<td>747-400</td>
<td>380</td>
<td>$14,257</td>
<td>$37.52</td>
<td>4979</td>
<td>11.7</td>
</tr>
</tbody>
</table>
Total Operating Costs vs. Unit Costs

• Total operating costs increase with size of airline, aircraft size and stage length
  - Increased output (ASMs) leads to higher total operating costs
  - Bigger aircraft cost more to operate (per block hour, per flight)
  - Longer stage length means more fuel burned, more pilot and flight attendant hours

• But, due to high fixed costs, airlines should have economies of scale in unit costs (in theory):
  - Larger aircraft should have lower operating costs per seat and per seat-mile (ASM)
  - Longer stage lengths should lead to lower unit costs

• Larger airlines with bigger aircraft flying longer stage lengths should have lowest unit costs.
Impacts of Stage Length on Unit Costs

• Industry unit cost curve is downward sloping with respect to the average stage length.

• A large proportion of the overall cost base is fixed, at least in the short-term
  ▪ Ownership costs, maintenance and ground infrastructure, reservations/sales and overhead

• Contributing factors: With longer stage lengths
  ▪ All fixed costs can be spread over more ASMs
  ▪ Shorter turn times relative to block times allow greater aircraft and crew utilization
  ▪ Average block speed increases and fuel burn decreases with more time spent at cruise altitude
  ▪ Cycle-related maintenance requirements are reduced
2010 Unit Cost
(Operating Expense per ASK)

Source: Airline Business Database 2011
2010 Unit Cost (CASK)
US NLC vs. LCC

Source: MIT Airline Data Project
2012 Unit Cost (CASK)
Selected Non-US Airlines

Source: Emirates Open Sky 2/14, CAPA Data
CASM Breakdown

- CASM can be broken down as follows:
  - Transport Related expenses excluded for comparisons
**Fuel, Labor and Non-Labor Costs**

- Compare macro trends over time and across airlines
- **Fuel Costs have been increasing to over 30%**
  - Most “variable cost”, typically driven by global oil prices and factors outside of airline control
- **Labor Costs have been decreasing in share**
  - With greater emphasis on cost re-structuring and increasing labor productivity
  - Significant cost advantages for newer airlines and LCCs
- **Non-labor Costs represent structural differences**
  - In networks, product mix and operations
US Airlines: Inflation Adjusted CASM*
Down 35% Since 1978

* CASM excl. Transp. Related Expenses

Inflation Adjusted Unit Costs – Fuel, Labor, Non-Labor

Jet Fuel Price Volatility

Jet Fuel (USGC)

Crude Oil (Brent)

Crude Oil (WTI)

* Refining margin (difference between jet fuel and crude oil price)

Source: ATA and EIA (for WTI and Brent crude oil and U.S. Gulf Coast jet fuel)
Concluding Thoughts

• Legacy carriers made dramatic progress in cost cutting and productivity improvement 2001-2007
  ▪ Labor and distribution costs saw biggest reductions
  ▪ Productivity improvements through network shifts, work rules and use of IT for passenger processing

• Not much room for further cost reductions
  ▪ Labor will push to recover wage and benefit concessions
  ▪ Distribution costs can’t go much lower
  ▪ Aging fleets will push up maintenance costs

• Recent return to industry profitability has relied heavily on demand growth and revenue generation
  ▪ Capacity discipline – higher yields and higher load factors