Chapter 3 Review

<table>
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<tr>
<th>RPM</th>
<th>Demand</th>
<th>QOS</th>
<th>Time Elasticity</th>
<th>Price Elasticity</th>
<th>Revenue</th>
<th>Spill</th>
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<td>QOS</td>
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<td># Flights</td>
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<td>Yield</td>
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<td>RPM</td>
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<td>QOS</td>
<td># Flights</td>
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Chapter 4

<table>
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<th>ASM</th>
<th>QOS</th>
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<td>QOS</td>
<td>Economies Of Scale</td>
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<tr>
<td>Unit Cost</td>
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</tr>
</tbody>
</table>

Operating Expense

Airline Profit

Economies Of Scale
Chapter 4 Review

Overbooking
AU = \frac{CAP}{(1-NSR + 1.645 \text{ STD})}

D = M \times F^{a} \times T^{b}

\log D = \log M + a \log F + b \log T
Chapter 5 Overview (1/2)

LCC Strategies
- No Frequent Flyer
- Single Cabin
- No Frills

RPM Yield
- QOS
- Price Elasticity
- Time Elasticity
- QOS Elasticity
- # Flights
- Revenue

QOS
- Unit Cost
- System
- ASM
- Economies Of Scale
- Ground
- Fuel/ Hedging
- Operating Expense

Unit Cost
- Economies Of Scale
- Labor/ No Unions Lower Wages
- Maint/ Commonality
- No Travel Agencies
- No Commissions
- No Commisions

Spill
- Profit
- Chap 4 Pricing
- Chap 5 Productivity
Chapter 5 Overview (2/2)

LCC Strategies

Inputs
$ Passengers

Controls
Demand

Safety
Spill

Policies
RPM

Strategies

• Aircraft Productivity
  • Aircraft Utilization (block-hours /day)
  • ASMs /Aircraft /Day
• Average Stage Length # of Departures /Day
• Aircraft Capacity (seats /aircraft)
• Employee Productivity
  • ASMs /Employee ASMs /Labor $
  • Revenue /Employee Revenue /Labor $
Airline Operating Costs and Measures of Productivity
Chapter 5
Lesson 4

Sources:
The Global Airline Industry
Peter Belobaba, Amedeo Odoni, Cynthia Barnhart, MIT, Library of Flight Series
Published by John Wiley & Sons, © 2009, 520 pages, Hardback

Outline

• Airline Cost Categorization
  – Administrative vs. Functional
  – Cost Drivers
• Operating Expense Comparisons
  – Percentage Breakdown
  – Legacy vs. Low-Cost Airlines
  – Flight Operating Costs
• Comparison of Airline Unit Costs
  – Total Operating Cost vs. Unit Costs
  – Legacy vs. Low-Cost Airlines Unit Costs
  – Comparisons in Europe, Asia, and Worldwide
• Measures of Airline Productivity
  – Aircraft Productivity
  – Labor Productivity
Airline Cost Categorization
DOT Form 41

• 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
• DOT Form 41 includes the following schedules:
  – P12 : Profit and Loss statement
  – P52 : Aircraft Operating Expenses
  – P6 : Operating Expenses by Objective Groupings
  – P7 : Operating Expenses by Functional Groupings
  – P10 : Employment Statistics
  – B1 : Balance Sheet
Administrative Cost Categories

• Administrative Cost Categories
  – Salaries and related fringe benefits for all personnel (general management, flight personnel, maintenance labor, other personnel)
  – Materials Purchased (fuel & oil, parts, passenger food, other materials)
  – Services Purchased (advertising & promotions, communications, insurance, maintenance, commissions, other services)
  – Landing Fees, Rentals, Depreciation, other Expenses

• Although consistent with general accounting principals, Administrative Cost Categorization does not allow for more detailed analysis of the specific activities that comprise the airline operation and contribute to airline costs
  – “Salaries & Benefits” does not allow one to separate out important subsets of this category, aircraft crew cost
Administrative Cost Categories

UNIT COST BY CATEGORY
Cents per ASM

Source: ATA data
Functional Cost Categories

• Functional Cost Categories – allocates costs to the different functions within the airline’s operation
  
  – Flight operating costs/ Direct operating costs
    • Flying operations – Flight crew, Fuel costs
    • Maintenance – routine maintenance, extensive major checks, “labor & parts”
      Form 41 reports maintenance for direct airframe, direct engine and overhead/ burden
    • Depreciation & Amortization
  
  – Ground operating costs
    • Aircraft servicing – handling aircraft on ground, landing fees
    • Traffic servicing – processing passengers, baggage and cargo at airports
    • Promotion and sales – airline reservation centers, ticketing offices, travel agency commissions, and distribution system fees
  
  – System operating costs
    • Passenger Service – meals, flight attendants, in-flight services
    • Advertising and Publicity
    • General and Administrative – can’t be associated to a particular activity
    • Transport-related – costs associated with the generation of transport related revenues. Fees paid to regional airline partners, extra baggage expense, and other misc overhead
2004 Functional Cost Breakdown

- Flying Operations, 32.7%
- Aircraft & Traffic Servicing, 16.3%
- Depreciation & Amortization, 5.3%
- General & Administrative, 5.7%
- Promotion & Sales, 8.3%
- Passenger Service, 9.1%
- Maintenance, 9.6%
- Transport Related, 13.0%
Cost Drivers by Functional Category

• Flight operating costs
  – Per Block Hour (for example, $3415 for 185-seat B757-200 in 2003)
• Aircraft Servicing Costs
  – Per Aircraft Departure (average $1135 in 2003)
• Traffic Servicing Costs
  – Per Enplaned Passenger (average $18)
• Passenger Servicing Costs
  – Per RPM (average $0.015)
• Promotion and Sales Costs
  – % of Total Revenue (average 10%)
• Other Indirect and System Overhead Costs
  – % of Total Operating Expense (average 12%)
Operating Expense Comparisons
Airline Operating Cost Breakdown

- Adapted from Form 41
  
  **FLIGHT (DIRECT) OPERATING COSTS (DOC) = 53.1%**
  - All costs related to aircraft flying operations
  - Include pilots, fuel, maintenance, and aircraft ownership
  - Varies primarily because of fuel price

  **GROUND OPERATING COSTS = 20.5%**
  - Servicing of passengers and aircraft at airport stations (14.2%)
  - Promotion and reservations/sales charges (6.3%)
  - Dropped from a high around 30%, because of major reductions in promotions and sales costs

  **SYSTEM OPERATING COSTS = 26.4%**
  - Passenger Service (6.7%)
  - General and Administrative (5.9%)
  - Transport-Related expenses (13.7%)
  - The growth in Transport-Related expenses can be attributed to changes in reporting rules and a higher reliance on regional partners as feeder airlines
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
Legacy vs. Low-Cost Airlines

• Network Legacy Carriers (NLCs)
  – More Traditional Airlines
  – Operate large hub-and-spoke networks
  – Regional, Domestic and International Service
  – Big Six (American, United, Delta, Northwest, Continental, US Airways/ America West)

• Low-Cost Carriers (LCCs)
  – Operate smaller networks
  – High proportion of point-to-point or non-hub
  – Reduced levels of service and low fares
  – Southwest, AirTran, Frontier, ATA, JetBlue, Spirit
The LCC Business Model

• Characteristics of all or at least most LCCs
  – Fleet Commonality – reduces the costs of spare parts, maintenance and crew training
  – Point-to-Point instead of connecting hub networks – reduces costs of handling connecting passengers and improves productivity of both aircraft and crews
  – No labor unions and lower wages – higher productivity due to less restrictive work rules
  – Single cabin/class service – reduces complexity and costs
  – Open seating – less time processing passengers and no boarding passes, improves productivity and reduces costs
  – Reduced Frills – less seating space, no food and no beverages, increases ASM and reduces passenger service cost
  – No frequent-flyer programs – reduces administrative costs
  – Avoids traditional distribution channels – no travel agencies, no commissions, tickets directly from airline (website or phone)
## Comparison of Major LCC Characteristics

<table>
<thead>
<tr>
<th></th>
<th>South West</th>
<th>JetBlue</th>
<th>AirTran</th>
<th>West Jet</th>
<th>Easy Jet</th>
<th>Ryan Air</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td>√</td>
<td></td>
<td>√</td>
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<tr>
<td>Point-to-point no hubs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>No labor unions/ lower wages</td>
<td>X</td>
<td>√</td>
<td>X</td>
<td></td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Single cabin/ class</td>
<td>√</td>
<td>√</td>
<td>X</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Open seating</td>
<td>√</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Reduced Frills</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>No frequent flyer program</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Avoid global distribution systems</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>
Recent Trends in Operating Costs

• Flying Operations (Figure 5.7)
  – Costs doubled between 1995 to 2007
  – NLCs 50% higher than LCCs

• Maintenance (Figure 5.8/5.9)
  – From 2000 – 2005 NLCs spent 60% more than LCCs
  – By 2007 NLCs spent 100% more than LCCs
  – Positive relationship between the average age of an airline’s fleet and maintenance costs per block hour? (NextGen?)

• Passenger Service (Figure 5.10)
  – NLCs spend twice the amount LCCs spend per RPM on Passenger Service until 2001
  – Gap has narrowed to 50% by 2007
Recent Trends in Operating Costs (Cont.)

• Aircraft and Traffic Services (Figure 5.11/5.12)
  – Steady increase, especially with security related expenses after 9/11
  – NLC costs double the costs of LCCs (larger aircraft, longer distances)
  – NLC traffic servicing expenses 2-3 times the LCC costs

• Promotion and Sales (Figure 5.13/5.14)
  – Gap has closed between NLC and LCC Costs per RPM
  – NLC costs double LCC costs per enplanement
Flight Operating Cost Comparisons

• Flight Operating Costs (FOC) can differ
  – Across different aircraft types
  – Across different airlines for the same aircraft

• Four Components of FOC
  – Crew – all wages and benefits paid to pilots
  – Fuel – most variable cost element in FOC
  – Maintenance – Direct and Overhead
  – Ownership – Depreciation, Leasing, Taxes and Insurance
Example: A320 FOC (2008 US data*)

• Cost per block-hour of operations (avg. 149 seats)
  – Crew $477
  – Fuel/Oil $2413
  – Maintenance $523
  – Ownership $730
  – Total $4143

• Based on 1135 mile average stage length and 11.2 block-hr daily utilization

* Aviation Daily Quarterly Reports
Example (Cont.): A320 FOC (2008 US data*)

<table>
<thead>
<tr>
<th>Airline</th>
<th>Crew</th>
<th>Fuel/Oil</th>
<th>Maintenance</th>
<th>Ownership</th>
<th>Total</th>
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<td>$2,235</td>
<td>$264</td>
<td>$575</td>
<td>$3,523</td>
</tr>
<tr>
<td>US Airways</td>
<td>$470</td>
<td>$2,501</td>
<td>$916</td>
<td>$934</td>
<td>$4,821</td>
</tr>
<tr>
<td>Northwest</td>
<td>$543</td>
<td>$2,480</td>
<td>$446</td>
<td>$670</td>
<td>$4,139</td>
</tr>
<tr>
<td>USA 3000 Airlines</td>
<td>$372</td>
<td>$2,919</td>
<td>$670</td>
<td>$1,002</td>
<td>$4,963</td>
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</table>

<table>
<thead>
<tr>
<th>Airline</th>
<th># Aircraft</th>
<th>Stage Length</th>
<th>Seats/Dept.</th>
<th>Block Hours</th>
<th>RPMs</th>
<th>ASMs</th>
<th>Load Factors</th>
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<td>Overall</td>
<td>360</td>
<td>1135</td>
<td>149</td>
<td>11.2</td>
<td>525,380</td>
<td>639,919</td>
<td>0.821</td>
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<td>1282</td>
<td>150</td>
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<td>610,284</td>
<td>760,446</td>
<td>0.803</td>
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<td>United</td>
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<td>604,783</td>
<td>0.824</td>
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<tr>
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<td>150</td>
<td>11.1</td>
<td>529,099</td>
<td>640,100</td>
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<tr>
<td>Northwest</td>
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<td>917</td>
<td>148</td>
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<td>432,923</td>
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<td>168</td>
<td>10</td>
<td>543,231</td>
<td>675,119</td>
<td>0.805</td>
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* Aviation Daily Quarterly Reports
# A320 Costs Changes 2006 to 2008*

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<th><strong>Fuel</strong></th>
<th>Maintenance</th>
<th>Ownership</th>
<th>Total</th>
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<tbody>
<tr>
<td>Northwest</td>
<td>$ 543</td>
<td>$ 2,480</td>
<td>$ 446</td>
<td>$ 670</td>
<td>$ 4,139</td>
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<tr>
<td></td>
<td>(-12%)</td>
<td>(53%)</td>
<td>(17%)</td>
<td>(2%)</td>
<td>(26%)</td>
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<tr>
<td>United</td>
<td>$ 486</td>
<td>$ 2,482</td>
<td>$ 589</td>
<td>$ 784</td>
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<tr>
<td></td>
<td>(7%)</td>
<td>(52%)</td>
<td>(25%)</td>
<td>(16%)</td>
<td>(34%)</td>
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<tr>
<td>JetBlue</td>
<td>$ 449</td>
<td>$ 2,235</td>
<td>$ 264</td>
<td>$ 575</td>
<td>$ 3,523</td>
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<tr>
<td></td>
<td>(15%)</td>
<td>(43%)</td>
<td>(14%)</td>
<td>(-1%)</td>
<td>(27%)</td>
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</table>

* Aviation Daily Quarterly Reports

2008 cost per block hour  
% change from 2006
## FOC $ for Selected Aircraft*

<table>
<thead>
<tr>
<th>Type of Aircraft</th>
<th>FOC $ per hr</th>
<th>Seats</th>
<th>FOC $ per seat-hr</th>
<th>Stage Length</th>
<th>Block Hours</th>
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<tr>
<td>777</td>
<td>$10,272</td>
<td>262</td>
<td>$39</td>
<td>4444</td>
<td>13.2</td>
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<tr>
<td>747-400</td>
<td>$14,300</td>
<td>367</td>
<td>$39</td>
<td>4751</td>
<td>12.5</td>
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<tr>
<td>757-200</td>
<td>$5,307</td>
<td>180</td>
<td>$29</td>
<td>1433</td>
<td>10.5</td>
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<tr>
<td>A330-200</td>
<td>$8,378</td>
<td>281</td>
<td>$30</td>
<td>3686</td>
<td>13.4</td>
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<tr>
<td>A319</td>
<td>$3,854</td>
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<td>$30</td>
<td>908</td>
<td>10.8</td>
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<tr>
<td>737-300</td>
<td>$3,880</td>
<td>132</td>
<td>$29</td>
<td>596</td>
<td>9.5</td>
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<tr>
<td>CRJ 100/200</td>
<td>$1,702</td>
<td>50</td>
<td>$34</td>
<td>425</td>
<td>8.9</td>
</tr>
</tbody>
</table>

* Aviation Daily Quarterly Reports
Comparison of Airline Unit Costs
Low fare carriers have lowest CASM across all average stage lengths

Figure 5.18
Lessons from CASM vs. Stage Length

• Unit cost comparisons should not be made between airlines unless differences in their average stage length are taken into account.

• Differences in unit costs between NLCs and LCCs in 2003 were significant, even when we account for stage length.
Unit Cost by Airline Group
Unit Costs by Functional Category 2004

- **Transport Related**
- **Depreciation & Amortization**
- **General & Administrative**
- **Promotion & Sales**
- **Aircraft & Traffic Servicing**
- **Passenger Service**
- **Maintenance**
- **Flying Operations**

Bar chart showing the unit costs for different categories across All Majors, Legacies, and Lowfares.
NLC vs LCC Unit Costs

• Fuel expenses are compared under assumptions all airlines are subject to the same fuel price environment (They are not)
  – Fuel price hedging

• Both NLC and LCC experienced a drop in unit costs after 2001 and a rise in unit costs after 2004
  – NLC’s drop reflects cost-cutting strategies put in place after 9/11 (employee layoffs and passenger service cutbacks)
  – NLC’s rise in costs primarily due to fuel prices
  – LCC’s rise in costs tempered by their capacity growth during the same period
Unit Cost and Ave Stage Length 2000-2004
Measures of Airline Productivity
Aircraft Productivity

• Measured in ASMs generated per aircraft per day:
  \[= (\# \text{ departures}) \times (\text{average stage length}) \times (\# \text{ seats})\]

• Aircraft “utilization” measured in block-hours/day:
  – Block hours begin at door close (blocks away from wheels) to door open (blocks under wheels)
  – Gate-to-gate time, including ground taxi times

• Increased aircraft productivity achieved with:
  – More flight departures per day, either through shorter turnaround (ground) times or off-peak departure times
  – Longer stage lengths (average stage length is positively correlated with increased aircraft utilization = block hours per day)
  – More seats in same aircraft type (no first class seating and/or tighter “seat pitch”

\[\]
Components of Aircraft Productivity

- Average Aircraft Capacity
- Departures per Day
- Average Stage Length
US Major Airlines Aircraft Productivity Aircraft Productivity (ASM$ per day)
AIRCRAFT UTILIZATION 1999-2003
Example: Boeing 737-500 Productivity

<table>
<thead>
<tr>
<th>Airline</th>
<th>Flights per Day</th>
<th>Block Hours</th>
<th>Stage Length</th>
<th>Seats</th>
<th>ASMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continental</td>
<td>3.9</td>
<td>8.3</td>
<td>719</td>
<td>104</td>
<td>291,246</td>
</tr>
<tr>
<td>United</td>
<td>4.3</td>
<td>7.5</td>
<td>564</td>
<td>109</td>
<td>264,284</td>
</tr>
<tr>
<td>Southwest</td>
<td>8.2</td>
<td>10.2</td>
<td>400</td>
<td>122</td>
<td>399,746</td>
</tr>
</tbody>
</table>
Example: B737-500 FOC per Block Hour

<table>
<thead>
<tr>
<th>Airline</th>
<th>Crew</th>
<th>Fuel</th>
<th>Maintenance</th>
<th>Ownership</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continental</td>
<td>$510</td>
<td>$430</td>
<td>$651</td>
<td>$698</td>
<td>$2,291</td>
</tr>
<tr>
<td>United</td>
<td>$927</td>
<td>$487</td>
<td>$1048</td>
<td>$510</td>
<td>$2,974</td>
</tr>
<tr>
<td>Southwest</td>
<td>$388</td>
<td>$537</td>
<td>$251</td>
<td>$350</td>
<td>$1,526</td>
</tr>
</tbody>
</table>
Lowfare carriers lead in aircraft utilization at all average stage lengths
Employee Productivity

- Measured in ASMs per employee per period
- As with aircraft, employee productivity should be higher with:
  - Longer stage lengths (amount of aircraft and traffic servicing for each flight departure not proportional to stage length)
  - Larger aircraft sizes (economies of scale in labor required per seat for each flight departure)
  - Increased aircraft productivity due to shorter turnaround times (more ASMs generated by aircraft contribute to positive employee productivity measures)
- Yet, network airlines with long stage lengths and large aircraft have lower employee productivity rates
Legacy carrier employment down by 25% since 2000, a loss of over 100,000 jobs.
US Major Airline Labor Cost per Employee  Average Salary+Benefits per Employee

- $60,000
- $65,000
- $70,000
- $75,000
- $80,000
- $85,000
- $90,000

- 2000
- 2001
- 2002
- 2003
- 2004
Lowfare carrier salaries/benefits per employee
25% lower than legacy carriers
Salaries and Benefits per Employee$
ASM/employee vs. Average Stage Length

![Graph showing the relationship between ASM/employee and Average Stage Length. The graph plots data points and a trend line, indicating a negative correlation.](image-url)
ASMs/employee and Average A/C Size
Employee Productivity Up 30% From 2002

* ATA
ASM per Employee 2000-2004

Annual ASM per Employee
Revenue per Employee

Annual Operating Revenue per Employee

![Graph showing the annual operating revenue per employee from 2000 to 2004. The revenue decreases from 2000 to 2001 and then increases from 2002 to 2004.]
ASM per Dollar of Salaries + Benefits

Annual ASM per Dollar Salaries & Benefits

![Graph showing the annual ASM per dollar salaries and benefits from 2000 to 2004. The graph indicates a decrease from 2000 to 2002, followed by an increase from 2002 to 2004.](image)
Revenue per Dollar of Labor Expense
Operating Revenue per Salary/Benefit Dollar
Summary: Airline Productivity Measures

• Aircraft Productivity
  – Aircraft Utilization (block-hours per day)
  – ASMs per Aircraft per Day
• Average Stage Length
• Number of Departures per Day
• Aircraft Capacity (seats per aircraft)
• Employee Productivity
  – ASMs per Employee
  – ASMs per Labor Dollar
  – Revenue per Employee,
  – Revenue per Labor Dollar