Michael Plasmeier 77

Class median 87

take a hint from grade distribution

PS1

Yield = Pax Revenue / RPM

2. Can't do trip data O-D

3. Whats' best

16.71J/1.232J/15.054J/ESD217 The Airline Industry

ASSIGNMENT #2 -- INDIVIDUAL **DUE: Wednesday, October 20, 2010**

QUESTION 1 *(20 points)*

You are provided with the following actual 2009 data on Flight Operating Costs for 4 US airlines that operate the Airbus 320 aircraft type (A320 OPCOSTS.XLS).

	JETBLUE	UNITED	NORTHWEST	VIRGIN AMERICA
CREW COST	$ 519	559	894	297
FUEL/OIL	$ 1,523	1321	1573	1381 Correction
MAINTENANCE	$ 431	759	659	~~1032~~ 325
OWNERSHIP/LEASE	$ 461	586	499	~~325~~ 1032
TOTAL FOC PER BLOCK HOUR	$ 2,934	$ 3,225	$ 3,625	$ 3,035
AIRCRAFT IN FLEET	109	97	51	17
AVERAGE STAGE LENGTH	1,237	979	1,052	1,535
SEATS PER DEPARTURE	150	146	148	149
DEPARTURES PER DAY	3.7	3.9	4.5	3.4
UTILIZATION (BLK HR/DAY)	11.9	10.2	12.7	12.7

Reported

(A) For each airline, calculate the following measures (show your work) *(8 points)*:

(i) Average block speed ← miles traveled/hr ← need for other things

(ii) Total FOC per typical average stage (flight leg)

(iii) Unit FOC per ASM

(iv) Daily aircraft productivity ASM/aircraft/day

Cruise ~500, 550 but – sitting on tarmac target ~300-400 mph

(B) All four airlines above operate the same type of aircraft, but there are substantial differences in the relative values of the different operating cost components. For each of the FOC components below, suggest and explain two reasons why the differences shown above might exist between the costs per block hour reported for the airlines. Your suggestions and explanations may be based on the data above, theoretical expectations, and/or your own knowledge of these 4 airlines *(3 points each)*

(i) Crew Costs per block-hour what drives this?

(ii) Fuel/oil Costs per block hour

(iii) Maintenance Costs per block-hour

(iv) Ownership Costs per block-hour – overhead small to distribute over

no econ of scale

Outsourcing?

QUESTION 2: Boston-Miami Route Profitability Evaluation ***(50 points)***

Frontier

An established (~~unnamed~~) LCC airline is evaluating the possibility of operating non-stop service on the Boston-Miami-Boston route. Currently, American Airlines is the only airline offering non-stop service to this O-D market, with 5 flights per day in each direction at an average fare of $156 one way. Its 5 flights capture 85% of the BOS-MIA O-D market demand. American operates 185-seat Boeing 757 aircraft on this route, and is able to consolidate traffic from many other O-D markets, as it offers a connecting hub in Miami to many Latin and South American destinations. The current total Boston-Miami O-D market demand is 810 one-way passenger trips summed over both directions (PDEW multiplied by 2).

In this question, you will explore the operating costs and potential route profitability for this LCC to provide non-stop service in this market. The LCC plans to operate 2 flights per day in each direction devoting a single aircraft on any given day to this operation of a back-and-forth "shuttle" service. NOTE: In all of your analysis and evaluations below, assume that AA will always match the new entrant's fares exactly.

AA has hub in MIA

70-80% Load

2 should be

2-5-7%

The Excel file BOSMIA Profit.XLS is a template for route profit evaluation. It contains the complete set of operating analysis data to be used in this evaluation, which includes the following information for a BASE CASE analysis:

- The LCC proposes to offer an average fare of $140 (10% lower than current), which it estimates will increase total market demand to 977, with a given demand function, D = 2430-10.38P, where P is the average one-way fare in this market (for both competitors).
- A calculated market share of BOS-MIA demand of 28.57% for the new entrant, based on its estimate of market share equal to frequency share (the new entrant proposes to operate 2 flights per day in competition with the existing 5 flights in each direction).
- Flight operating information, including block hours and mileage for the route.
- Aircraft operating cost estimates for 2 alternative aircraft available in the current fleet of the LCC, configured for a single economy class service, based on average cost information reported by US LCC airlines to DOT Form 41. Note that the new entrant plans to devote a single aircraft tail number to this route on any given day (but can swap in others of the same type at the start of each day).
- Estimates of indirect operating costs for passenger servicing, aircraft and traffic servicing, promotion and sales, and administration overhead. Again, these estimates reflect the costs reported by US LCCs, on average.

Perform the following calculations and answer the following questions. All of your analysis and answers should be for a single day of operations (summed over both directions).

(A) Complete the blue boxes on the BOSMIA Profit.XLS spreadsheet, for the proposed BASELINE scenario (2 flights, $140 average fare) *(10 points)*

   (i) Daily RPMs, ASMs, seat departures, passengers enplaned, and average load factor.

   (ii) Each of the operating cost components for the 2 aircraft types, and the total operating costs for each aircraft alternative

Correction

$$\text{Operating Margin} = \cancel{\frac{\text{Revenue}}{\text{Cost}} - 1} \neq \frac{\text{operating profit}}{\text{revenues}}$$

not what we are using

(iii) Daily operating profit and operating margin (operating profit over total operating costs minus 1) for each aircraft type
(iv) Unit cost of the complete operation for each aircraft type

Submit a printout of the completed XLS sheets (or paste the blue cells into your answer). [HINT: Only one of the aircraft alternatives posts an operating profit!] retaining

(B) Discuss the BASELINE scenario of (A) as proposed by the LCC. At the proposed fare and frequency, which aircraft make a profit? What factors drive the differences in estimated operating profit for each type? Are the baseline load factors and/or unit costs reasonable for this operation? *(5 points)*

(C) Using the BASELINE spreadsheet you completed in (A), perform the following sensitivity tests on the *one aircraft type* that shows an estimated operating profit in the base case. That is, holding all else equal, determine the amounts by which each of the following could vary (in both absolute and percentage terms) before the operating profit drops to zero:

Can have partial pax- since avg

(i) Assumed market share of BOS-MIA-BOS passengers
(ii) Average one way fare
(iii) Flight operating cost per block hour for this aircraft type

Hold all other assumptions constant, as given to you in the BASELINE, and answer each sub-question separately, relative to the base case. Summarize and discuss your findings – which of these assumptions present the most risk to the airline under current industry and competitive conditions? (Do not submit additional copies of worksheets). *(10 points)*

(D) The management of the LCC is considering the possibility of offering even lower fares to stimulate the total market demand and, in turn, increase load factors to maximize its operating profit. Use your completed profit worksheet from (A) to find and recommend the combination of average one-way fare and aircraft type that will maximize operating profit for the BOS-MIA-BOS operation at achievable (i.e., no greater than 90%) average load factors. What is the total market demand at this optimal average fare? What price elasticity value is implied by the estimated demand stimulation levels? Are they reasonable? *(5 points)*

find ~~avg~~ a reasonable def of price elasticity "Southwest" - ? air travel price elastic esp in leisure

(E) For the given frequency of 2 daily flights in each direction, generate a schedule map for the new entrant on this non-stop route, given the constraints provided in this question and your own airline operations planning knowledge. Your schedule plan must meet the following operational constraints:

Scheduled Block Time in Each Direction:	3:00
Minimum Aircraft Turn Time at MIA or BOS:	0:45

Only one aircraft may be used for this operation on any given day, as the new entrant wishes to devote a single aircraft to a "shuttle" style operation. Aircraft may overnight at BOS or MIA. The focus of your effort should be on the timing of flight departures, taking into account demand patterns, operational constraints, and the timing of AA's competitive flights (shown below). Submit a schedule map, and a short explanation of

can't do load factors over 100 and ~~BO~~ 94% load factor not reasonable approaching + above your recommended schedule, as well as its strengths and weaknesses (max 1 page). *(10 points)*

Baseline American Airlines Schedule in Each Direction

Depart BOS	Arrive MIA	Depart MIA	Arrive BOS
0645	1005	0750	1055
0815	1135	1210	1515
1205	1530	1525	1835
1620	1945	1830	2135
1730	2100	2105	0010

4 line schedule map

try to take advantage of weaknesses in their schedule

- you are highly constrained
- more leasure
- 1-2 flights have better timing

(F) Based on the operating and profitability analysis results of parts (A) through (E) above, discuss and critique (negative and positive!) this evaluation, from the perspective of the LCC airline. Your critique should include:
-- An assessment of the validity of the modeling approach that was used, specifically its shortcomings and what the impacts of these shortcomings could be on the bottom line;
-- A recommendation as to whether the airline should actively pursue this route opportunity, and with which aircraft type. Your recommendation should identify the potential risks and real-world competitive concerns. If you recommend against entry, explain why. Your answer should not exceed 1-2 pages *(10 points)*

rip the shreads out of the model

1000 things does not capture

go or no go distinctive

prof i always go day before

QUESTION 3 (30 points) – FLEET COMPOSITION AND AIRCRAFT PRODUCTIVITY

For the same US airline that you analyzed in Assignment 1, perform an analysis of its fleet composition and utilization trends over the period 2000-2009, based on the data available to you at airlinedataproject.mit.edu (specifically, the "Aircraft and Related" data tab). Some suggestions of what your analysis might contain include the following:

make long term projection
- if fuel ↑?

- Changes in overall fleet size, trends in average aircraft capacity ("seat density"), aircraft utilization (block-hours per day) and average stage length
- Composition of fleet by category provided – small narrow-body, large narrow-body, and wide-body aircraft categories. Trends/shifts in this category mix over the 2000-2007 period.
- Analysis of changes in stage length and utilization by aircraft category. Relationships between stage length and daily utilization – to what extent do you see the expected relationships between these measures for your airline?
- Comparison of your airline's use of different aircraft categories type(s) with general industry trends, as well as implications for productivity (ASMs per day) and operating cost per block hour.

diversity makes things more interesting

Your discussion should summarize your analysis and findings, and consider the implications for the airline, its fleet requirements and route structure, and its overall operating cost structure. To what extent does your airline's fleet represent a strength or weakness under current conditions? Please limit your answer to a maximum of 3-4 pages, including tables and graphs, as appropriate.

Corrected

16.71J/1.232J/15.054J/ESD217 The Airline Industry

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OWNERSHIP/LEASE	$ 461	586	499	1032 Values!
TOTAL FOC PER BLOCK HOUR	$ 2,934	$ 3,225	$ 3,625	$ 3,035
AIRCRAFT IN FLEET	109	97	51	17
AVERAGE STAGE LENGTH	1,237	979	1,052	1,535
SEATS PER DEPARTURE	150	146	148	149
DEPARTURES PER DAY	3.7	3.9	4.5	3.4
UTILIZATION (BLK HR/DAY)	11.9	10.2	12.7	12.7

$$\text{operating margin} = \frac{\text{operating profit}}{\text{total revenue}}$$

2-5-7%

(A) For each airline, calculate the following measures (show your work) *(8 points)*:

- (i) Average block speed
- (ii) Total FOC per typical average stage (flight leg)
- (iii) Unit FOC per ASM
- (iv) Daily aircraft productivity

(B) All four airlines above operate the same type of aircraft, but there are substantial differences in the relative values of the different operating cost components. For each of the FOC components below, suggest and explain two reasons why the differences shown above might exist between the costs per block hour reported for the airlines. Your suggestions and explanations may be based on the data above, theoretical expectations, and/or your own knowledge of these 4 airlines *(3 points each)*

- (i) Crew Costs per block-hour
- (ii) Fuel/oil Costs per block hour
- (iii) Maintenance Costs per block-hour
- (iv) Ownership Costs per block-hour

QUESTION 1

AIRBUS 320 FLIGHT OPERATING COST DATA 2009

	JETBLUE	UNITED	NORTHWEST	VIRGIN AMERICA	
CREW COST	$ 519	$ 559	$ 894	$ 297	per block hour
FUEL/OIL	$ 1,523	$ 1,321	$ 1,573	$ 1,381	per block hour
MAINTENANCE	$ 431	$ 759	$ 659	$ 325	per block hour
OWNERSHIP/LEASE	$ 461	$ 586	$ 499	$ 1,032	per block hour
TOTAL FOC PER BLOCK HOUR	$ 2,934	$ 3,225	$ 3,625	$ 3,035	
AIRCRAFT IN FLEET	109	97	51	17	
AVERAGE STAGE LENGTH	1,237	979	1,052	1,535	miles?
SEATS PER DEPARTURE	150	146	148	149	
DEPARTURES PER DAY	3.7	3.9	4.5	3.4	
UTILIZATION (BLK HR/DAY)	11.9	10.2	12.7	12.7	

#

Avg block speed mph	385	374	373	411	mph?
Avg block hr length per stage	3	3	3	4	
Total FOC per stage	$ 9,436	$ 8,435	$ 10,231	$ 11,337	
Unit FOC per ASM	$ 63	$ 58	$ 69	$ 76	
Daily Aircraft Productivity	555	569	666	507	
Fuel costs per mile	3.96	3.53	4.22	3.36	

Michael Plasmeier

Michael Plasmeier 16.71J P-Set 2 10/20

1. a) Avg block speed

$$\frac{\text{Stage lenght} \cdot \text{departures/day}}{\text{Utilization}}$$

See spreadsheet

b). Total FOC per stage

$$\sum_{\text{per FOC}} \text{costs} \cdot \text{avg block hour lenght per stage}$$

? $\frac{\text{Utilization}}{\text{Stages}}$

c). Unit FOC per ASM

$$\frac{\sum \text{costs per stage (b)}}{\text{Seats per departure} \cdot \text{stage}}$$

-2

d) Aircraft productivity

ASMs per aircraft per day

Seats per departure · # departures per day × Average Stage length

M in ASM is for miles

-2

(2)

b) Why costs are different?

i) Crew - Each airline has a different labor agreement which can load to wide varieties in cost.
Northwest was not as sucessful as United in lowering labor costs during bankrupucy. "LCC"
Jet Blue's labor cost actually approches Delta's but Virgin's is still much lower, because it does not have a union.

A second reason?

less senority - I did not think about since all same airplane -1

higher utilization spreads costs out more

ii) Fuel/costs.

Calculate fuel costs per mile

$$= \frac{\text{block hrs per day} \cdot \text{fuel per block hr}}{\text{\# stages per day} \cdot \text{lenght per stage}}$$

Still fairly large variation.
United and Virgin could have a hedging strategy ✓
The book does not talk about other issues.
Perhaps Northwest wastes a lot of fuel circling busy airports or has a large cargo business
↳ wikipedia claims Northwest had the largest cargo business for what thats worth.

-1

(3)

iii) Maintenance Costs

Older planes cost more to maintain / patch up. ✓

Older airlines could have higher labor costs for maintance employees than "LCC" airlines. See discussion under labor section ✓

iv) Ownership Costs

per block hr

Older airplanes have been largly depreciated by the end of their life. - but how does age varry here? yes.

Ownership costs also varry if the airline ownes it planes vs. leases them like Virgin does.

The cost of capital could also varry due to the cost of borrowing bonds / notes.

Old aircraft paid off -1

B6 could have better financing deal

13

(9)

2. Fronteir Airways deciding whither to add MIA service

- MIA is all about cruise ships at least on Sat

i) RPMs

Fronteir demand · miles

↑

PDEW · Market Share

↑

$\frac{\text{your flights}}{\text{market flights}}$

ii) ASM

\# seats · departures · miles

iii) Seat Departures

??

\# seats · departures

iv) Passengers Enplaned (assume 90% max load factor)

$$\begin{cases} \text{Frontier Demand} & \text{if Seat departures} \cdot .9 > \text{Frontier demand} \\ \text{Seat Departures} \cdot .9 & \text{if} \quad " \quad < \quad " \end{cases}$$

v) Avg Load Factor

$$= \frac{\text{pax enplaned}}{\text{seat departures}} = \frac{\text{RPMs}}{\text{ASM}}$$

(5)

vi) Total FOC (Flight Operating Cost)

$$FOC/\text{block hr} \cdot \frac{\text{block hr}}{\text{departure}} \cdot \frac{\text{departures}}{\text{day}}$$

vii) Pax Service

$.008/RPM \cdot RPM = \text{per day}$

viii) Traffic Servicing

$\$10/\text{enplanement} \cdot \overset{\text{pax}}{\text{enplaned}} = \text{per day}$

iix) Aircraft servicing

$\$750/\text{departure} \cdot \text{departures} = \text{per day}$

ix) Promotion + Sales

$.09 \cdot \text{total revenue} = \text{per day}$

x) Gen Admin

$.002/asm \cdot asm =$

xi) Total Operating Costs

Σ above costs

(6)

xii) Unit Cost

$$\frac{\text{Total Operating Cost}}{\text{ASM}}$$

xiii) Operating Profit

Pax Revenue − Operating Cost

xiv) Operating Margin

$$\frac{\text{Operating Profit}}{\text{Operating Cost}}$$

B) The airline will make a slight operating profit when it uses the smaller aircraft. Right now they have an average demand of 70 pax/flight. Assuming load is evenly distributed over the day, even the small plane is only 70% full, which is not much in today's industry. With this limited number of passengers, it does not make any sense to dedicate a larger aircraft because the A318 could be better used elsewhere and it has a higher flight operating cost, due to its larger weight, more fuel and possibly a higher piolet wage scale.

Drivers?

−2

FOC/hr difference (was thinking)

7

Yes I think the numbers are reasonable for this operation, Peter indicated ~5% profit margin was actually quite good for today's industry.

c) Vary the following factors until 0 operating profit for the E190.

i) Assumed market share

ie that Market Share ≠ Freq Share?

ie that more people would perfer AA for other reasons?

at 27.285% operating profit = \$1

28.57 − 27.285 = 1.29% Market Share decrease

ii) Avg 1 way fare

~~Well could do math way~~

~~Cost = 37,722 /pax~~

~~No induced demand~~

~~Pax = 279~~

~~$\frac{37,722}{279}$~~

~~= \$135.20~~

~~Is induced demand~~

~~$P = \frac{37,722}{.2857 \cdot (2430 - 10.38P)}$~~

(8)

$$P = \frac{37,722}{694.25 - 2.96P}$$

$$P(694.25 - 2.96P) = 37,722$$

$$694.25P - 2.96P^2 = 37,722$$

$$-2.96P^2 + 694.25P - 37,722 = 0$$

$\uparrow a$ $\uparrow b$ $\uparrow c$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$P = 85.51, \ 149.03$$

Oh costs are variable too, forget the algebra ok

Guess + Check on spreadsheet yes but you could also have decreased the fares.

\$153.50 Difference $153.50 - 140 = 13.50$ $\frac{13.50}{140} = 9.6\%$ increase

iii) Flight Operating Cost

$\approx 2,163$ Difference $2163 - 2050 = \$113$ ~~never mind the comment, I just read the other part.~~

never mind the comment, I just read the other part.

$\frac{113}{2050} = 5.5\%$ increase

(4) Discuss

See solution about model assumptions.

i) Prof. Belobaba believes that freq share is the most important issue people look at. Price does not matter in this example, because AA matches all prices. Still some people may fly AA for their loyalty program, and any extra services that they still offer, if any. Such market share may not matter much, especially since this is a leasure market. Oh opimistic market share for this freq share - S curve

ii) I forgot to note

fares could fall to \$103 because of induced demand, assuming you can have a 97% load factor

$140-103=37$

$\frac{37}{140}=26\%$

If one assumes a 90% max load factor, Fronteir would still break even at \$110. w/ 4 flights/day both ways

$140-110=30$

$\frac{30}{140}=21\%$

They have significant room to move fares downward in this elastic market. They still have a lot of capacity they can fill, so they can afford a 21% price cut. They actually have less room on the upside, so they can't significantly raise prices. See next question about profit maximization.

(16)

iii) Flight operating costs can only increase by 5.5% or \$113 so if the price of jet fuel rises again, this service would need to go.
above this

I don't know by what percentage jet fuel ~~would~~ need to rise, since the # have not been broken out.

D) Profit maximization at max 90% load w/ induced demand

The most profit would be made at \$128, rounding likely
on the E190 of course. Total market demand will be 1,112 vs 977

$$\varepsilon = \frac{\partial Q}{\partial P} = \frac{\frac{\Delta Q_d}{Q_D}}{\frac{\Delta P}{P}} = \frac{\%\Delta D}{\%\Delta P} = \frac{\frac{1112-977}{977}}{\frac{140-127}{140}} = \frac{.138}{.093}$$

? use old values right?

$$= -1.48$$

This is a little less elastic than Southwest's goal of -2, especially since this is a tourist market.

28

(11)

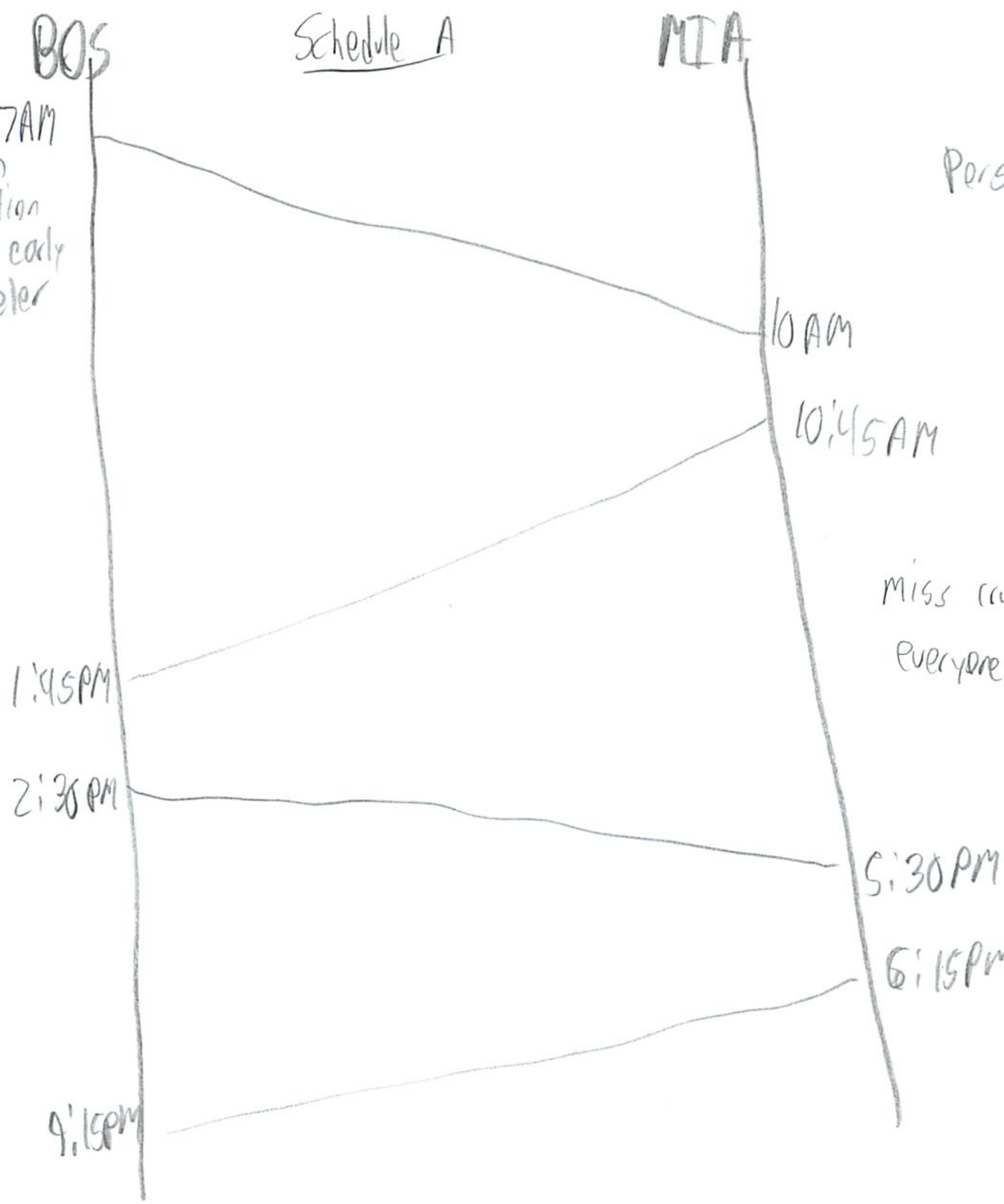
E) Make a schedule map.

3:00 Block time

:45 turn around time

1 aircraft

Consider demand (cruise ship) + AA's flights



start vacation bright and early biz traveler

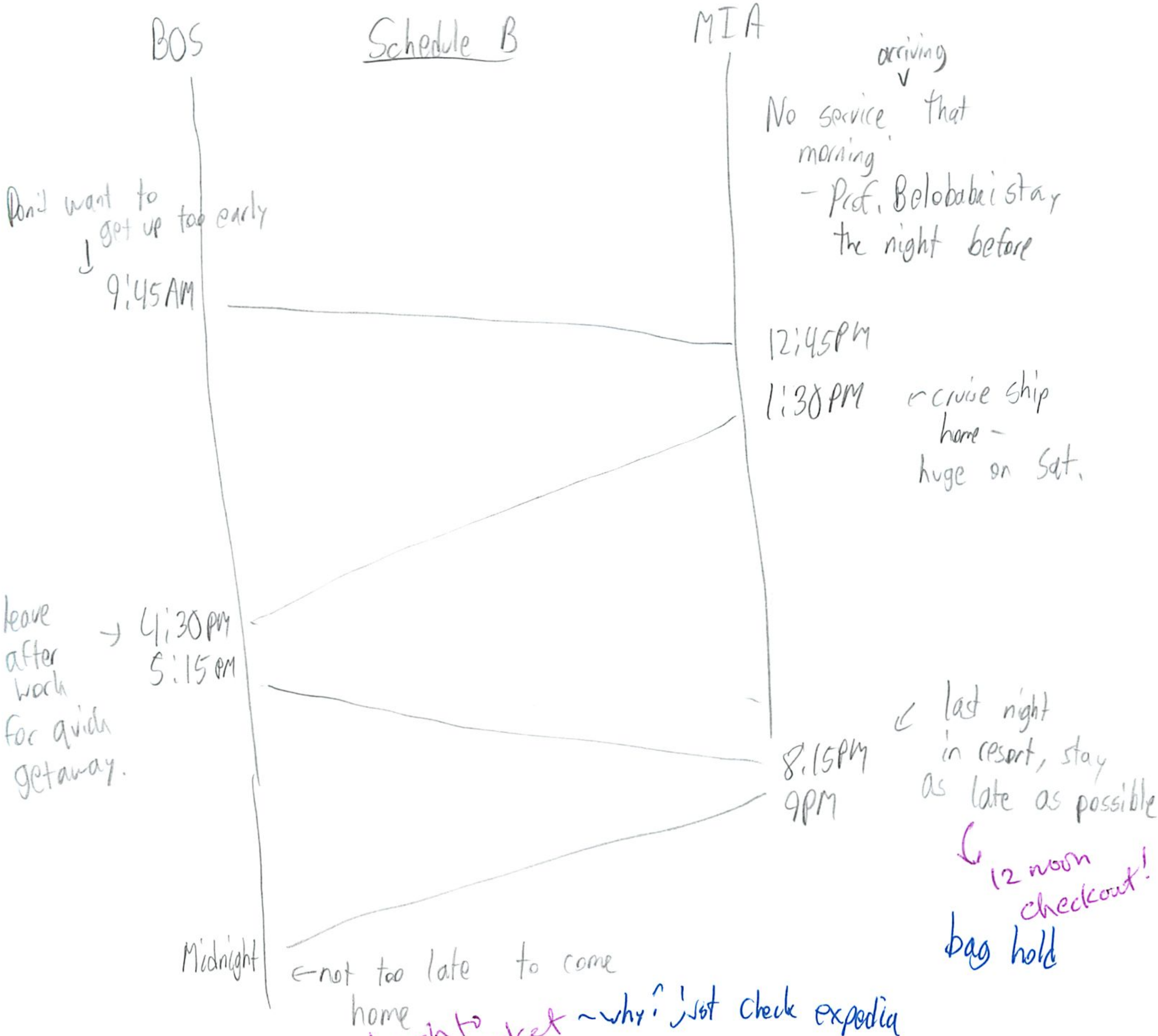
Personal Experience

miss cruise ship rush everyone leaves 1-2PM

airport shut down basically at 6

? NO

from my experience it was



tough to market ~ why? just check expedia

Could also do schedule A on weekdays and B on weekends. A seems to be more business traveler friendly while B is best for the cruise business, but that is only Sat - for going home. People will arrive Fri night as Prof. Belobaba recommended.

(13)

I also did not ~~increase~~ turn around times because I did not see any value in this for either schedule

reduce operational risks!

Both schedules fit into AA's fairly well with some flights close to overlapping, but others fit into gaps on the schedule, I did not find this issue very important to warrent throwing off allignments with demand. ? ?

One issue is that schedule B does not have any arrivals into MIA in the morning. There is no opportunity for people to hop on cruise ships in the morning. If most people share Prof. Belobaba's view and would not do this flight, then it is not an issue.

6 Some good thoughts, but lacking a systematic logic for sched. development.

- why base in Bos?
- which demand are you catering to?
- schedule gaps with AA?

Should have explained better
rushed on this section

(14)

F) Go or no go? Model feedback

The demand modeling approch was very rudinentry, I understand we did this in prior assignments, ? P-set 1 but this is something the airline needs to consider before starting service. In particular, how many 1st class or Y class passengers would be interested in flying.

use average fare

true

Another big input which has not been considered are fees. Today's airlines rely on fees for a significant portion of their revenue. Especially in a tourism market where people pack way too much, such fees could make this service worthwhile.

ok, but still can use average per pax

I think that this service is a go provided Frontier has no better use of this E190 aircraft on another route. I think revenue could be enhanced by adding more flights on the weekends from planes on business routes. This was not allowed in the model, but is certainly allowed. ?

Actually good

5

S-market/freq curve

Quite brief, incomplete. See solution.

O/D Market/Connecting - but not mentioned in scenario
- is that considered part of model?
- interline

Start up Investment

39

AA could fare war - unlikely
Or ↑ Freq - also unlikely

He is obsessed w/ gaps in schedule

BOSTON-MIAMI ROUTE EVALUATION (ALL VALUES ARE PER DAY OF OPERATIONS)

CHANGE AVERAGE FARE IN GREEN CELL ONLY!
ANSWER TO QUESTION 2A IN BLUE BOXES

USER INPUTS:

Average One-Way Fare	**$140**

DEMAND AND REVENUE ESTIMATES

BOS-MIA PDEW (Summed over both directions)	977
Daily Flights (each direction)	2
Expected Market Share (function of Freq Share)	28.57%
Total daily BOS-MIA passengers on New Entrant (sum of one-way passenger trips over both directions)	279
Total daily passenger revenue for New Entrant	$ 39,072

Note: Model Equations
D = 2430 - 10.38P

Market Share= Freq Share

OPERATIONS DATA

Total daily flights	4 both ways
Block Hours per flight	3.0
Daily Block Hours	12
Non-stop miles BOS/MIA	1258

ESTIMATED OPERATING COSTS

Aircraft Type	**E190**	**A318**	
Number of Seats	100	120	
Flight Operating Costs			
Total FOC per Block Hour	$ 2,050	$ 2,400	
Indirect Operating Costs			
Passenger Service	$ 0.008		per RPM
Traffic Servicing	$10		per Enplanement
Aircraft Servicing	$750		per Departure
Promotion and Sales	9.00%		of Passenger Revenues
General and Administrative	$0.002		per ASM

Aircraft Type	**E190**	**A318**	
Number of Seats	100	120	
RPMs per Day	351,090	351,090	
ASM per day	503,200	603,840	
Pax/Departure	70	70	
Seat Departures	400	480	
Passengers Enplaned	279	279	
Average Load Factor	**69.77%**	**58.14%**	
TOTAL FOC	$ 24,600	$ 28,800	per day
PAX SERVICE	$ 2,809	$ 2,809	per day
TRAFFIC SERVICE	$ 2,791	$ 2,791	per day
AIRCRAFT SERVICE	$ 3,000	$ 3,000	per day
PROMOTION/SALES	$ 3,516	$ 3,516	per day
GEN ADMINISTRN	$ 1,006	$ 1,208	per day
Total Operating Costs	**$ 37,722**	**$ 42,124**	per day
Unit Cost	**$ 0.074965**	**$ 0.069760**	
OPERATING PROFIT	**$ 1,350**	**$ (3,052)**	
OPERATING MARGIN	**4%**	**-7%**	

BOSTON-MIAMI ROUTE EVALUATION (ALL VALUES ARE PER DAY OF OPERATIONS)

CHANGE AVERAGE FARE IN GREEN CELL ONLY!
ANSWER TO QUESTION 2A IN BLUE BOXES

USER INPUTS:

Average One-Way Fare	**$140**

DEMAND AND REVENUE ESTIMATES

BOS-MIA PDEW (Summed over both directions)	977
Daily Flights (each direction)	2
Expected Market Share (function of Freq Share)	27.29%
Total daily BOS-MIA passengers on New Entrant (sum of one-way passenger trips over both directions)	267
Total daily passenger revenue for New Entrant	$ 37,313

Note: Model Equations
D = 2430 - 10.38P

Market Share= Freq Share

OPERATIONS DATA

Total daily flights	4 both ways
Block Hours per flight	3.0
Daily Block Hours	12
Non-stop miles BOS/MIA	1258

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Aircraft Type	**E190**	**A318**	
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Aircraft Type	**E190**	**A318**	
Number of Seats	100	120	
RPMs per Day	335,282	335,282	
ASM per day	503,200	603,840	
Pax/Departure	67	67	
Seat Departures	400	480	
Passengers Enplaned	267	267	
Average Load Factor	**66.63%**	**55.52%**	
TOTAL FOC	$ 24,600	$ 28,800	per day
PAX SERVICE	$ 2,682	$ 2,682	per day
TRAFFIC SERVICE	$ 2,665	$ 2,665	per day
AIRCRAFT SERVICE	$ 3,000	$ 3,000	per day
PROMOTION/SALES	$ 3,358	$ 3,358	per day
GEN ADMINISTRN	$ 1,006	$ 1,208	per day
Total Operating Costs	**$ 37,312**	**$ 41,713**	per day
Unit Cost	**$ 0.074149**	**$ 0.069080**	
OPERATING PROFIT	**$ 1**	**$ (4,401)**	
OPERATING MARGIN	**0%**	**-11%**	

fare

BOSTON-MIAMI ROUTE EVALUATION (ALL VALUES ARE PER DAY OF OPERATIONS)

CHANGE AVERAGE FARE IN GREEN CELL ONLY!
ANSWER TO QUESTION 2A IN BLUE BOXES

USER INPUTS:

Average One-Way Fare	$154

DEMAND AND REVENUE ESTIMATES

BOS-MIA PDEW (Summed over both directions)	831
Daily Flights (each direction)	2
Expected Market Share (function of Freq Share)	28.57%
Total daily BOS-MIA passengers on New Entrant (sum of one-way passenger trips over both directions)	238
Total daily passenger revenue for New Entrant	$ 36,585

Note: Model Equations
D = 2430 - 10.38P

Market Share= Freq Share

OPERATIONS DATA

Total daily flights	4 both ways
Block Hours per flight	3.0
Daily Block Hours	12
Non-stop miles BOS/MIA	1258

ESTIMATED OPERATING COSTS

Aircraft Type	**E190**	**A318**	
Number of Seats	100	120	
Flight Operating Costs			
Total FOC per Block Hour	$ 2,050	$ 2,400	
Indirect Operating Costs			
Passenger Service	$ 0.008	per RPM	
Traffic Servicing	$10	per Enplanement	
Aircraft Servicing	$750	per Departure	
Promotion and Sales	9.00%	of Passenger Revenues	
General and Administrative	$0.002	per ASM	

Aircraft Type	**E190**	**A318**	
Number of Seats	100	120	
RPMs per Day	298,858	298,858	
ASM per day	503,200	603,840	
Pax/Departure	59	59	
Seat Departures	400	480	
Passengers Enplaned	238	238	
Average Load Factor	**59.39%**	**49.49%**	
TOTAL FOC	$ 24,600	$ 28,800	per day
PAX SERVICE	$ 2,391	$ 2,391	per day
TRAFFIC SERVICE	$ 2,376	$ 2,376	per day
AIRCRAFT SERVICE	$ 3,000	$ 3,000	per day
PROMOTION/SALES	$ 3,293	$ 3,293	per day
GEN ADMINISTRN	$ 1,006	$ 1,208	per day
Total Operating Costs	**$ 36,666**	**$ 41,067**	per day
Unit Cost	**$ 0.072865**	**$ 0.068010**	
OPERATING PROFIT	$ (80)	$ (4,482)	
OPERATING MARGIN	0%	-11%	

fare 90% rpm max

BOSTON-MIAMI ROUTE EVALUATION (ALL VALUES ARE PER DAY OF OPERATIONS)

CHANGE AVERAGE FARE IN GREEN CELL ONLY!
ANSWER TO QUESTION 2A IN BLUE BOXES

USER INPUTS:

Average One-Way Fare	$110

DEMAND AND REVENUE ESTIMATES

BOS-MIA PDEW (Summed over both directions)	1,288
Daily Flights (each direction)	2
Expected Market Share (function of Freq Share)	28.57%
Total daily BOS-MIA passengers on New Entrant (sum of one-way passenger trips over both directions)	368
Total daily passenger revenue for New Entrant	$ 40,486

Note: Model Equations
D = 2430 - 10.38P

Market Share= Freq Share

OPERATIONS DATA

Total daily flights	4 both ways
Block Hours per flight	3.0
Daily Block Hours	12
Non-stop miles BOS/MIA	1258

ESTIMATED OPERATING COSTS

Aircraft Type	E190	A318
Number of Seats	100	120
Flight Operating Costs		
Total FOC per Block Hour	$ 2,050	$ 2,400

Indirect Operating Costs		
Passenger Service	$ 0.008	per RPM
Traffic Servicing	$10	per Enplanement
Aircraft Servicing	$750	per Departure
Promotion and Sales	9.00%	of Passenger Revenues
General and Administrative	$0.002	per ASM

Aircraft Type	E190	A318	
Number of Seats	100	120	
RPMs per Day	463,016	463,016	
ASM per day	503,200	603,840	
Pax/Departure	92	92	
Seat Departures	400	480	
Passengers Enplaned	360	324	max 90% load factor
Average Load Factor	**90.00%**	**67.50%**	
TOTAL FOC	$ 24,600	$ 28,800	per day
PAX SERVICE	$ 3,704	$ 3,704	per day
TRAFFIC SERVICE	$ 3,600	$ 3,240	per day
AIRCRAFT SERVICE	$ 3,000	$ 3,000	per day
PROMOTION/SALES	$ 3,644	$ 3,644	per day
GEN ADMINISTRN	$ 1,006	$ 1,208	per day
Total Operating Costs	**$ 39,554**	**$ 43,596**	per day
Unit Cost	**$ 0.078606**	**$ 0.072197**	
OPERATING PROFIT	$ 46	**$ (3,109)**	
OPERATING MARGIN	**0%**	**-7%**	

BOSTON-MIAMI ROUTE EVALUATION (ALL VALUES ARE PER DAY OF OPERATIONS)

CHANGE AVERAGE FARE IN GREEN CELL ONLY!
ANSWER TO QUESTION 2A IN BLUE BOXES

USER INPUTS:

Average One-Way Fare	**$140**

DEMAND AND REVENUE ESTIMATES

BOS-MIA PDEW (Summed over both directions)	977
Daily Flights (each direction)	2
Expected Market Share (function of Freq Share)	28.57%
Total daily BOS-MIA passengers on New Entrant (sum of one-way passenger trips over both directions)	279
Total daily passenger revenue for New Entrant	$ 39,072

Note: Model Equations

D = 2430 - 10.38P

Market Share= Freq Share

OPERATIONS DATA

Total daily flights	4 both ways
Block Hours per flight	3.0
Daily Block Hours	12
Non-stop miles BOS/MIA	1258

ESTIMATED OPERATING COSTS

Aircraft Type	**E190**	**A318**	
Number of Seats	100	120	
Flight Operating Costs			
Total FOC per Block Hour	$ 2,163	$ 2,400	
Indirect Operating Costs			
Passenger Service	$ 0.008	per RPM	
Traffic Servicing	$10	per Enplanement	
Aircraft Servicing	$750	per Departure	
Promotion and Sales	9.00%	of Passenger Revenues	
General and Administrative	$0.002	per ASM	

Aircraft Type	**E190**	**A318**	
Number of Seats	100	120	
RPMs per Day	351,090	351,090	
ASM per day	503,200	603,840	
Pax/Departure	70	70	
Seat Departures	400	480	
Passengers Enplaned	279	279	
Average Load Factor	**69.77%**	**58.14%**	
TOTAL FOC	$ 25,956	$ 28,800	per day
PAX SERVICE	$ 2,809	$ 2,809	per day
TRAFFIC SERVICE	$ 2,791	$ 2,791	per day
AIRCRAFT SERVICE	$ 3,000	$ 3,000	per day
PROMOTION/SALES	$ 3,516	$ 3,516	per day
GEN ADMINISTRN	$ 1,006	$ 1,208	per day
Total Operating Costs	**$ 39,078**	**$ 42,124**	per day
Unit Cost	**$ 0.077660**	**$ 0.069760**	
OPERATING PROFIT	**$ (6)**	**$ (3,052)**	
OPERATING MARGIN	**0%**	**-7%**	

BOSTON-MIAMI ROUTE EVALUATION (ALL VALUES ARE PER DAY OF OPERATIONS)

CHANGE AVERAGE FARE IN GREEN CELL ONLY!
ANSWER TO QUESTION 2A IN BLUE BOXES

USER INPUTS:

Average One-Way Fare	$127

DEMAND AND REVENUE ESTIMATES

BOS-MIA PDEW (Summed over both directions)	1,112
Daily Flights (each direction)	2
Expected Market Share (function of Freq Share)	28.57%
Total daily BOS-MIA passengers on New Entrant (sum of one-way passenger trips over both directions)	318
Total daily passenger revenue for New Entrant	$ 40,340

Note: Model Equations

D = 2430 - 10.38P

Market Share= Freq Share

OPERATIONS DATA

Total daily flights	4 both ways
Block Hours per flight	3.0
Daily Block Hours	12
Non-stop miles BOS/MIA	1258

ESTIMATED OPERATING COSTS

Aircraft Type	**E190**	**A318**
Number of Seats	100	120
Flight Operating Costs		
Total FOC per Block Hour	$ 2,050	$ 2,400
Indirect Operating Costs		
Passenger Service	$ 0.008	per RPM
Traffic Servicing	$10	per Enplanement
Aircraft Servicing	$750	per Departure
Promotion and Sales	9.00%	of Passenger Revenues
General and Administrative	$0.002	per ASM

Aircraft Type	**E190**	**A318**	
Number of Seats	100	120	
RPMs per Day	399,591	399,591	
ASM per day	503,200	603,840	
Pax/Departure	79	79	
Seat Departures	400	480	
Passengers Enplaned	318	286	max 90% load factor
Average Load Factor	**79.41%**	**59.56%**	
TOTAL FOC	$ 24,600	$ 28,800	per day
PAX SERVICE	$ 3,197	$ 3,197	per day
TRAFFIC SERVICE	$ 3,176	$ 2,859	per day
AIRCRAFT SERVICE	$ 3,000	$ 3,000	per day
PROMOTION/SALES	$ 3,631	$ 3,631	per day
GEN ADMINISTRN	$ 1,006	$ 1,208	per day
Total Operating Costs	**$ 38,610**	**$ 42,694**	per day
Unit Cost	**$ 0.076729**	**$ 0.070704**	
OPERATING PROFIT	$ 1,730	$ (2,354)	
OPERATING MARGIN	4%	-6%	

Assignment #2 Solution Outline

QUESTION 1 (20 points)

(A) *(8 points)*

	JETBLUE	UNITED	NORTHWEST	VIRGIN AMERICA
CREW COST	$ 519	559	894	297
FUEL/OIL	$ 1,523	1321	1573	1381
MAINTENANCE	$ 431	759	659	325
OWNERSHIP/LEASE	$ 461	586	499	1032
TOTAL FOC PER BLOCK HOUR	$ 2,934	$ 3,225	$ 3,625	$ 3,035
AIRCRAFT IN FLEET	109	97	51	17
AVERAGE STAGE LENGTH	1,237	979	1,052	1,535
SEATS PER DEPARTURE	150	146	148	149
DEPARTURES PER DAY	3.7	3.9	4.5	3.4
UTILIZATION (BLK HR/DAY)	11.9	10.2	12.7	12.7
(i) AVERAGE BLOCK SPEED	384.61	374.32	372.76	410.94
AveStage Length / (Utilization/Departures per Day) = Ave Stage Length / Blk Hours per Departure				
BLOCK HOURS PER STAGE	3.22	2.62	2.82	3.74
Utilization / Departures per Day				
(ii) FOC PER STAGE	$ 9,436	$ 8,435	$ 10,231	$ 11,337
Total FOC per Block Hour * Block Hours per Stage				
(iii) FOC PER ASM	$ 0.051	$ 0.059	$ 0.066	$ 0.050
FOC per Stage / (Ave Stage Length * Seats per Departure) = FOC per Stage/ ASMs per Stage				
(iv) AIRCRAFT PROD PER DAY	686,535	557,443	700,632	777,631
Average Stage Length * Seats per Departure * Departures per day = ASMs per aircraft per day				

(B) ***(3 points each)***

(i) Crew Costs per block-hour

- Differences in actual wage rates per block-hour – Legacy carrier NW has highest pilot costs, lowest for new entrant LCC Virgin America (VX).
- Differences in seniority – at a large legacy carrier like UA, A320 pilots might be less senior than A320 pilots at NW, leading to lower rates per block hour. This is certainly true for VX, which is only a few years old.
- Higher aircraft utilization and longer stage lengths might also contribute to lower crew costs per block hour, through more efficient scheduling and utilization of crews. This does not appear to be the case in the data.

(ii) Fuel Costs per block-hour

- Aircraft age might explain some of the minor differences, for example, VX's fleet is newer and therefore perhaps slightly more fuel efficient.
- Stage length can also explain differences – longer stage lengths mean more time spent at cruise altitude and speed, leading to lower fuel burn per block-hour. This appears to be true for VX compared to B6 and NW (but not UA).
- It is also possible that different airlines simply paid different prices per gallon of fuel, due to hedging and/or preferred fuel purchase contracts.

(iii) Maintenance Costs per block-hour

- Older aircraft have higher maintenance costs per block-hour, and this is evident in the data with UA and NW having higher costs compared to B6 and VX with newer fleets.
- Longer stage lengths, fewer departures per day and higher block-hour utilization should also contribute to lower maintenance per block hour cost, evident for VX and B6.
- UA and NW might have higher paid maintenance employees, or perhaps choose to pay a higher rate to outsource maintenance on this aircraft type to an outside provider.

(iii) Ownership Costs per block-hour

- From the data provided, VX has the higher ownership costs per block-hour, despite having the highest aircraft utilization, which is unexpected. NW and B6 have higher utilization than UA, spreading the fixed ownership costs over more block hours per day.
- It is also possible that some of NW's much older aircraft have lower depreciation charges or lease rates due to their age.
- B6 might have a better financial deal with its leasing company, allowing it to pay less for the same aircraft than the others.

QUESTION 2 BOSTON-MIAMI CASE STUDY (50 points)

(A) Baseline Operating Costs and Profit *(10 points)*

Aircraft Type	E190	A318
Number of Seats	100	120
RPMs per Day	351,090	351,090
ASM per day	503,200	603,840
Seat Departures	400	480
Passengers Enplaned	279	279
Average Load Factor	**69.77%**	**58.14%**
TOTAL FOC	24,600	28,800
PAX SERVICE	2,809	2,809
TRAFFIC SERVICE	2,791	2,791
AIRCRAFT SERVICE	3,000	3,000
PROMOTION/SALES	3,516	3,516
GEN ADMINISTRN	1,006	1,208
Total Operating Costs	**37,722**	**42,124**
Unit Cost	**$ 0.075**	**$ 0.070**
OPERATING PROFIT	**1,350**	**(3,052)**
OPERATING MARGIN	**3.5%**	**-7.8%**

(B) Discuss baseline scenario *(5 points)*

The model indicates that the LCC can only make an operating profit with the smaller, Embraer 190 jet on the Boston-Miami route, using the baseline assumptions of average fare ($140) and frequency (2 round-trip flights per day). However, even using this plane, the operating profit is $1350 per day, a relatively small 3.5% operating margin. The expected market share is 28.6%, and the average load factors are lower than current industry standards at just under 70%. The unit costs in the base case are also somewhat lower than industry averages for LCC airlines (which tend toward 9 cents/ASM). These lower unit costs might be explained by the stage length (1258 miles), which is longer than the average stage length of most LCCs.

The primary driver of the difference in estimated profit between the two aircraft types is the <u>FOC per block hour</u>, which is higher for the larger A318, making it unprofitable given the low load factor. Both aircraft types can accommodate the total estimated demand at the baseline price, and revenues do not vary with aircraft type. Nor do any of the other operating cost components. The A318 is simply too large and too costly to operate for this scenario.

(C) Sensitivity Analysis *(10 points)*

Deviations required to make the E190 baseline evaluation unprofitable:

(i) Assumed market share of BOS-MIA total demand: The LCC's actual market share can drop to 27.3% from the initial estimate of 28.6%, a drop of 1.3 percentage points.

(ii) Average one-way fare BOS-MIA local traffic: The range of profitable average fares based on the demand function in the worksheet is $103 to $154, meaning fares can decrease by 26.4% or increase by up to 10% before the operation becomes unprofitable.

(iii) FOC per block-hour on E190 can increase to $2162 from the $2050 baseline, meaning at 5.5% increase.

Perhaps the most critical variable is the optimistic assumption of a 28.6% market share estimate for the LCC, which will compete against 5 flights offered by incumbent AA. This estimate can only be off by 1.3 points of market share before it poses a serious risk to our profit estimates, even without any changes to fares or fuel costs. Given that the 28.6% assumption based on a linear model is likely an over-estimate, this variable is the most risky in terms of sensitivity.

Given the volatility of fuel prices over the past year, a 5.5% increase in operating costs per block hour is a very realistic threat. On the other hand, should fuel prices surge and cause such a cost increase, both the LCC and AA could well increase their fares.

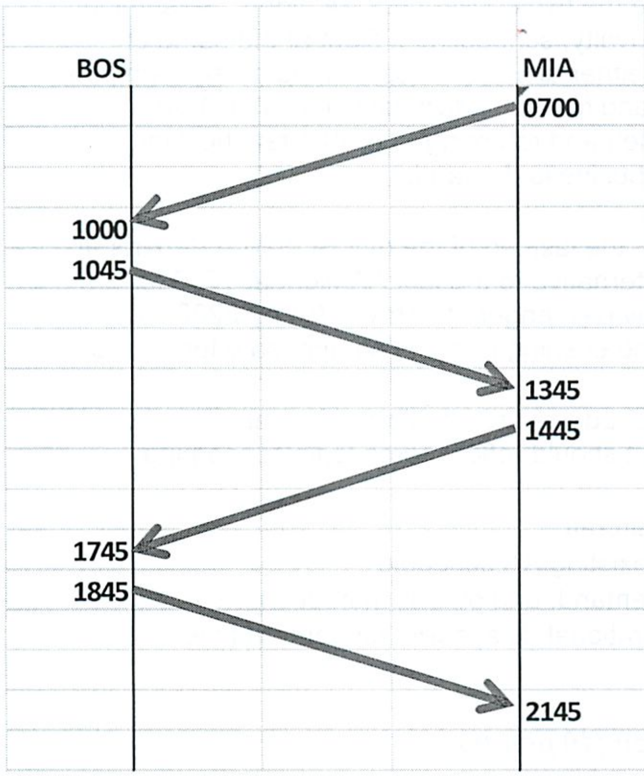
The least sensitive of these assumptions appears to be the average fare, which can range from $103 to $154 while maintaining profitability. Given a baseline assumption of $140, a 26.4% drop in overall market average fares is unlikely. Even if AA responds by matching or undercutting, it would be difficult for them to sustain such a low average fare.

(D) Lower Fare Analysis *(5 points)*

The average fare that maximizes operating profit while maintaining 2 flights per day each way is an average fare of $128, using the smaller E190 airplane. This results in an operating profit of $1,733 per day, representing an operating margin of 4.3%. The daily operating profit increases by 28% compared to the $140 baseline. Average load factors increase to 78.7%, more in line with industry levels and quite reasonable. Using the larger A318 jet is not profitable at 2 flights per day at any ticket price, as its load factors are too low.

At $128 average fare, total market demand increases from 977 to 1101 one-way passenger trips per day (AA will match this fare decrease). We have a 12.7% increase in total market demand caused by a 8.6% decrease in average price, so a simple estimate of price elasticity is 12.7/-8.6, or -1.48 (other estimates also possible). This is quite reasonable, given that air travel is elastic overall, and given that the BOS-MIA market is expected to have a higher than average proportion of price-elastic leisure demand.

(E) Schedule Map and Discussion *(10 points)*



The schedule timings are constrained by operating a single aircraft on the route. The new entrant is unable to concentrate flights at peak times (8-9am, 5-6pm) in both directions as the aircraft can only be serving one direction in each timeframe. The start time at BOS or MIA largely sets the remainder of the schedule, with the airplane operating a continuous shuttle with (close to) minimum turnaround times thereafter.

The choice of whether to overnight the aircraft in BOS or MIA depends on your assessment of AA's schedule gaps, the focus on Boston- or Miami-originating demand, and the nature of the business/leisure mix in these opposite markets. The example schedule provided above is based on the following:

- Given AA's two flights early in the morning BOS-MIA, there is a better opportunity to fill a schedule gap out of MIA at around 7am.
- Although this is largely a leisure demand market, there is also a notable proportion of business demand originating in MIA as well as BOS.

Starting at 0700, the proposed schedule offers an early-morning MIA-BOS flight which can allow MIA-originating business passengers the opportunity to reach business engagements in BOS before noon. AA's flight does not depart until 0750. Following a 45 min turnaround, the return flight BOS-MIA departs at 1045, in between the competing AA flights, advantageous for capturing market share as it can reduce passenger wait times. This 1045 departure time should be attractive to leisure passengers originating in BOS.

5

The next turnaround in MIA is extended to 1 hour, to allow for some schedule slack while still providing a 1445 departure time before the two subsequent AA flights. Assuming equal quality of service and no customer loyalty, scheduling a flight at the same or similar time as AA offers no advantage to either airline (unless there is a very high peak demand), as they will only divide the demand for that individual flight. This 1445 departure should be appealing to leisure demand returning to BOS after checking out of their hotels before noon, as well as some business demand.

Finally, after a 60 minute turn time in BOS, the last leg of the day BOS-MIA departs at 1845 – late enough to provide a distinct alternative to the last AA flight at 1730 for business demand but early enough to allow passengers to arrive MIA by 2200. The extra turn time is critical at Logan during the evening peak, to compensate for delays.

A very large number of other alternative schedules are possible. Your answer should not only be feasible given the constraints, it should reflect some logic concerning:

- Your choice of where to base the aircraft
- Efforts to fill schedule gaps of the existing AA schedule
- The impacts on leisure/business demand, and overall market share
- The need to reduce the risk of operational delays with longer turn times

(F) Model Critique and Recommendation *(10 points)*

The model proposed in this question is a reasonable framework for estimating the profitability of the new entrant airline on this non-stop route but it has a number of limitations and assumptions that raise concerns. *On the other hand*, each concern is tempered somewhat by the context of this route and the sensitivity analysis performed in the above sections.

- No consideration has been made of the capital costs required to enter the market, and the new airline is likely to be interested in the payback period. Should significant investment be required to create a presence at either airport, the route becomes less attractive, due to long payback period related to the low margins that have been estimated. On the other hand, the decision to enter the route can be reversed within months (weeks in some cases), and the airline could contract with an outside company for ground services at Miami if it is not already operating there.

- The route is assumed to be isolated - the demand is related only to the Boston-Miami O-D market and only one aircraft is to be used. The route should be considered in the context of the new airline's existing network – if Boston is an existing airport for the new entrant, the BOS-MIA flight could connect to more O-D markets and the demand could be very different. On the other hand, the geography of BOS-MIA and the nature of LCC networks makes it more likely that this is a point-to-point LCC that will rely almost entirely on the local O-D demand. Carrying connecting passengers would require an interline agreement with a (non-OneWorld) carrier.

- The model assumes that AA responds only by matching fares. It is possible that AA will respond in more ways than this if faced with a competitor on a previously monopolistic route. For example, AA can increase frequency to capture even greater market share, leaving the new airline with even lower load factors and revenues. It might undercut the new entrant's fares temporarily, but such an action would be difficult to sustain. It almost certainly will offer bonus incentives to its frequent flyers. *On the other hand*, the analysis is based on average fares, and in no way excludes the use of differential pricing by either airline. If a "fare war" breaks out, it would most likely be at the low end of the price spectrum, with each airline offering $89 fares (for example) on a limited number of seats per flight. The fare sensitivity analysis performed above indicates that the new entrant can withstand a large drop in average fare.

- The market shares are based solely on frequency share, ignoring differences in departure times, as well as other factors affecting airline market shares – perceptions of brand and service quality, and frequent flyer programs. The absence of these latter considerations likely makes the worksheet overly optimistic for the new entrant profit. If AA increases its frequency, the new entrant becomes totally unprofitable. *On the other hand*, if we believe that our proposed schedule above fills some AA schedule gaps, it might make up for some of this frequency share disadvantage.

Overall, this might at first appear to be a marginal route opportunity in terms of estimated profitability. However, with the use of the lower $128 average fare and the proposed schedule above, the estimated daily profit is $1733, well over $500,000 per year! Market share based on only 2 flights per day is clearly a concern and the most critical assumption above, but the range of profitable average fare levels gives the new entrant a significant buffer. Operating costs could increase, but that is a risk that affects every route served and it affects the competition as well. Bottom line – given that there are relatively few remaining domestic O-D pairs that can profitably support entry by an LCC, the BOS-MIA route opportunity is a good example of one that should be pursued.

Part of PSet 2

US Airways Airplanes

Michael Plasmeier

copy edit

Over the last 10 years, US Airways has refocused on flying larger aircrafts longer distances, as the industry faced intensive pressure from LCCs and high fuel costs. Whereas ~~Were as~~ in 2000, US Airways had 348 small narrowbody planes, US Airways reduced that number by 20% in 2009 to 255. duh In 2000, US Airways had 34 large narrowbodies, while in 2009 US Airways had more than doubled the number of large narrowbodies that it operated to 76. The growth of large narrowbody was matched and exceded by American, Continental, and Delta. United meanwhile kept the number of it large narrowbody airplanes fairly constant at 97 for the entire decade. As much of the industry was downsizing its widebody fleet, US Airways grew its slightly from 15 to 21 widebody aircrafts. The average number of seats on a US Airways airplane increased 14% over the decade from 138 seats to 158 seats. However, as US Airways was increasing the size of its airplanes it was also cutting fuel consumption per block hour from 1,062 gallons per block hour to 879 gallons, a 17% decrease. However, US Airways continues to hold the record of having the lowest fuel consumption per block hour, less than a third of some other network legacy carriers. This is likely due to US Airway's smaller aircraft, which have lower fuel consumptions per hour each one of them is flying, but is less efficent than larger airplanes.

In recent years, US Airways added international service. It currently serves about 11 destinations in Europe and 15 in the Caribbean from Philadelphia.[1] These flights require larger aircraft and are longer, increasing stage length. Extending flight times should also decrease unit costs slightly due to longer flights.

Fuel costs were the largest story in the past decade. Yearly fuel costs reached their maximum in 2008 at $2,882 per flight hour, while those costs were only $848 6 years before. US Airways also faced very unstable costs for labor. During the decade pilot costs per block hour doubled from 2002 to 2005.

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[1] US Airways Route Map on their website

Maintance costs per airborne hour, however, hit a low point in 2005, only to double by 2009. Aircraft ownership per aircraft ranged by 25% over the decade, increasing in the later half of the decade as US Airways brought America West into the equation. Unit costs (total fleet costs per ASM) increased from 5.942 at US Airways to 6.274 cents over the decade at the combined airline.

US Airways' average stage length continues to be the lowest in the industry. In 2000, an average US Airways flight only covered 639 miles vs the network carrier industry average of 967 miles. Average stage length across the industry increased steadily over the decade by about 40-60 miles per year. US Airways average stage length increased signficantly by 143 miles when US Airways merged with America West. However, US Airways continues to cover the shortest distance of any network legacy airline with 972 miles. Nevertheless, US Airways managed to increase its average stage length by 50% over the decade. Over the decade the industry began to increasing rely on third party contract airlines to conduct shorter flights. For example, US Airways has 9 regional partners today.[2] These flights are not reported in these numbers.

OK

Departures per aircraft per day fell 30% at the combined airline in 2009 vs. US Airways before the merger in 2000. Adding America West's 2000 data only leads to a 26% drop in departures per aircraft per day. Both changes, however, were larger than the industry average of 20% over the decade. This trend was due to the airlines extending ~~flight time~~ stage length to serve destinations further and further away over the decade.

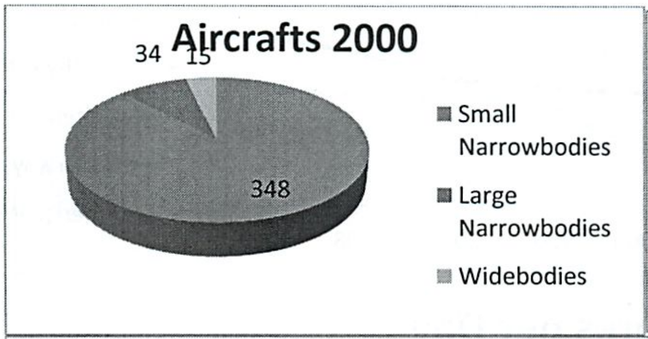
The combined airborne hours of US Airways and America West declined by 37% over the decade from 1,187,426 US Airways hours and 436,257 America West hours to 1,027,197 hours for the combined airline. The combined US Airways and America West airlines flew less hours than just US Airways did only 9 years before. Immeditatly after 9/11, US Airways cut airborn hours sharply by 21%, while America West actually increased airborne hours slightly from 2001 to 2002. US Airways was never able

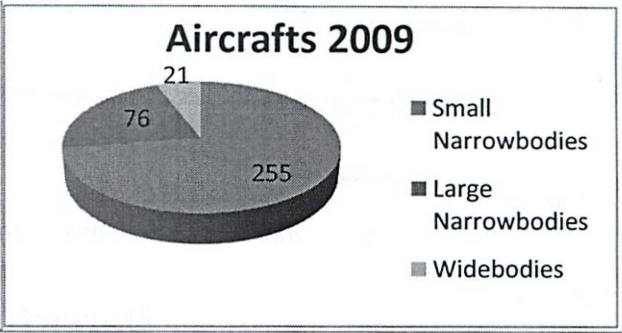
why? smaller fleet?

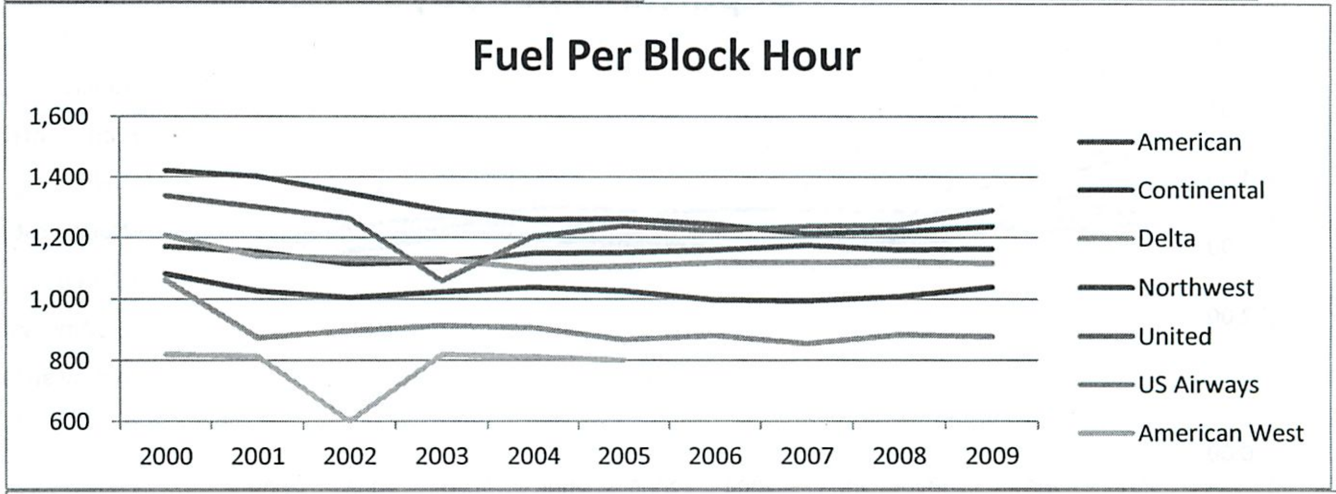
I was thinking cut backs - say

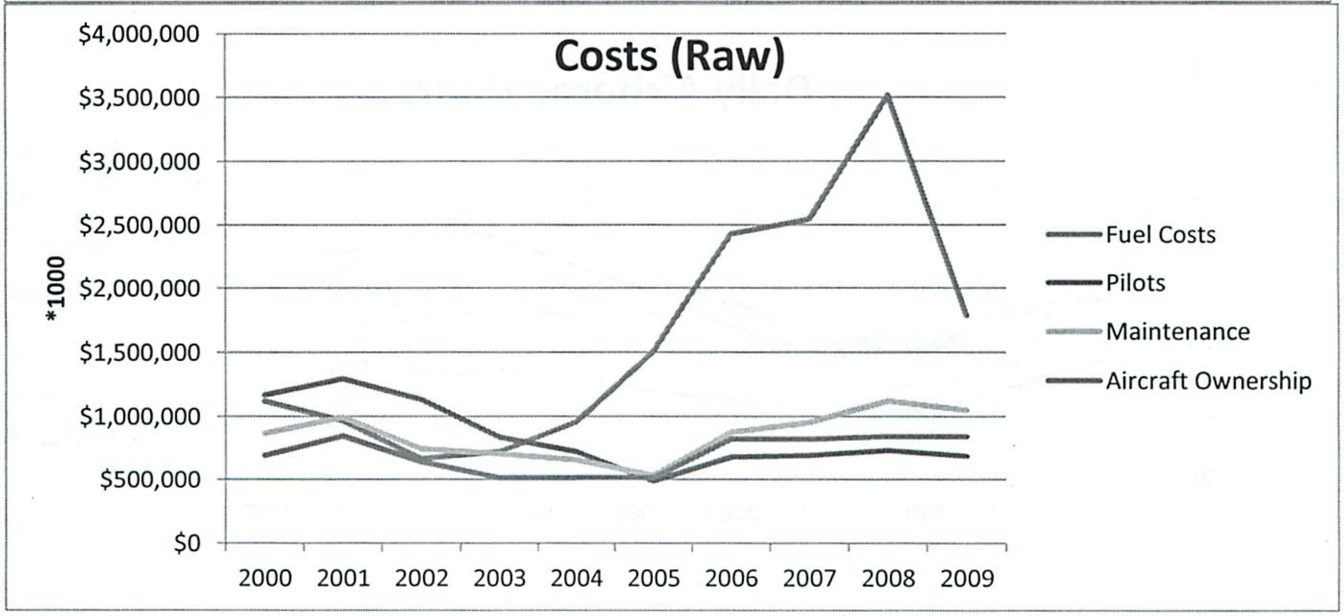
[2] US Airways website

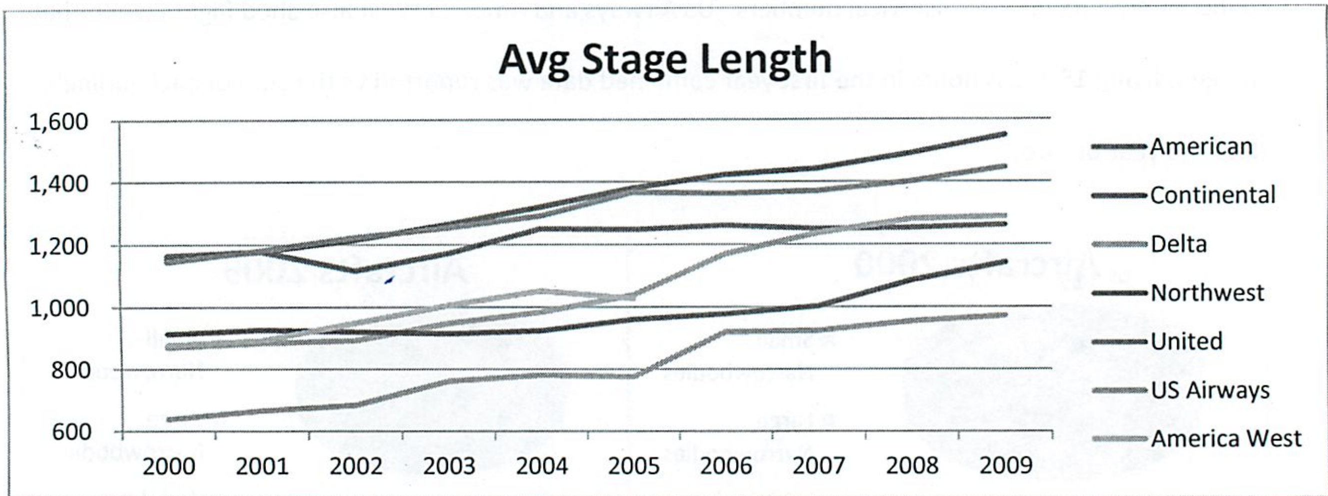
to increase hours back to historical numbers. US Airways and America West also shed flights when they merged, flying 13% less hours in the first year combined data was reported vs the sum of each airline's data the year before.

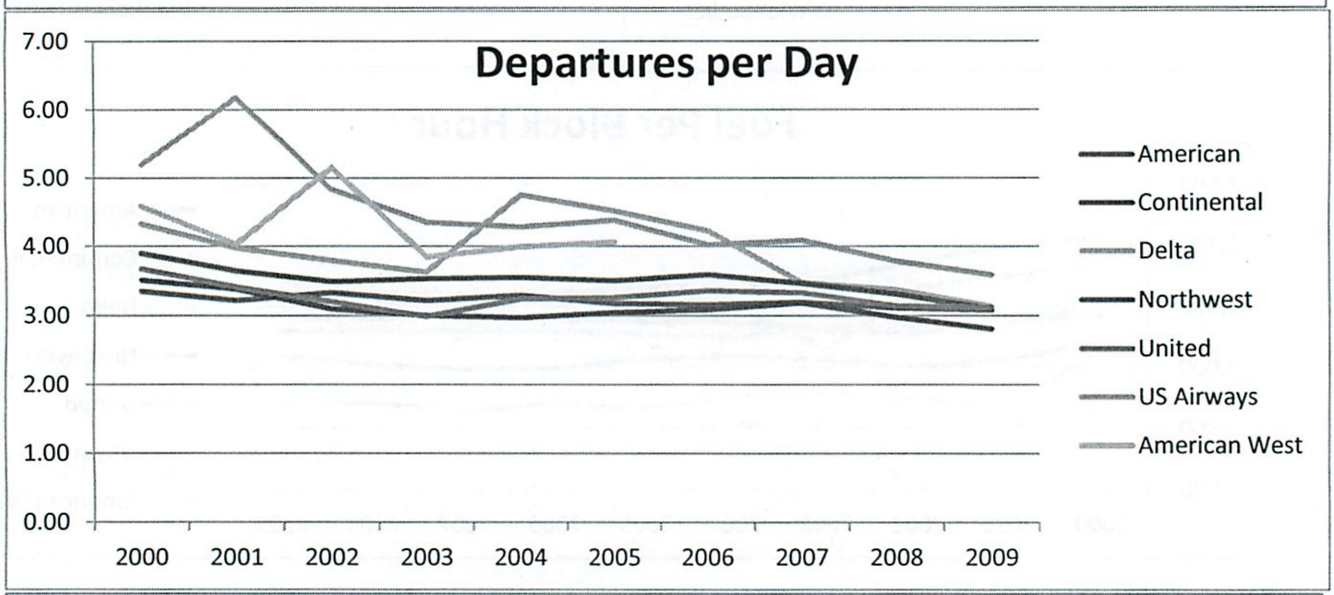


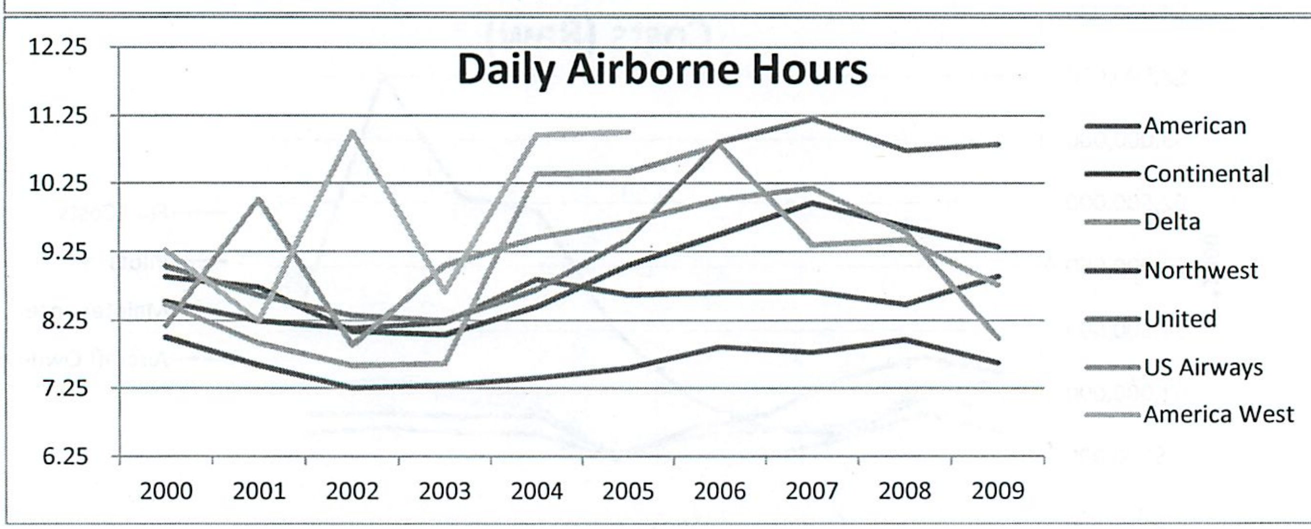












All data is from the MIT Airline Data Project unless otherwise noted. Downloaded 10/20/2010

25 Very good graphs and detailed description of trends. You still seem less comfortable with interactions and implications, however.

good got better

prof says need better interactions + implications

QUESTION 3 (Example of Student Answer)

find them here

Delta has been a major legacy US carrier that delayed to respond to the changes occurred in the airline industry after the emergence of LCCs. During the last decade, two significant events affected Deltas' fleet composition and utilization:

- The file for bankruptcy under Chapter 11, in 2004
- The merger with Northwest Airlines, in October 2008

I think issue is need to know more than just the data sheets

Before starting our analysis, it must be mentioned that some of the data used are questionable. These are:

- Average Daily Block Hour Utilization of Total Operating Fleet in 2004, 2005 and 2006
- Average Daily Block Hour Utilization of Large Narrowbody Aircraft in 2004 and 2005
- Average Daily Block Hour Utilization of Widebody Aircraft in 2006
- Total Operating Fleet in 2004, 2005 and 2006
- Total Number of Large Narrowbody Aircraft in 2004 and 2005
- Total Number of Widebody aircraft in 2006

state implications

These utilization rates (total block hours / total aircraft days) are unreasonable high and in combination with the significant reduction in the number of aircraft (total aircraft days / 365) after Delta's bankruptcy, we can argue that there is a mistake in the "aircraft days" reported in the original source of the data (BTS T2 Schedule). This argument is further supported by comparing the trends of the total block hours and the number of large narrowbody aircraft-days (Figure 1). For example, in 2004, although the block hours increased by 15%, the aircraft-days decreased by 41%.

this is just explaining error

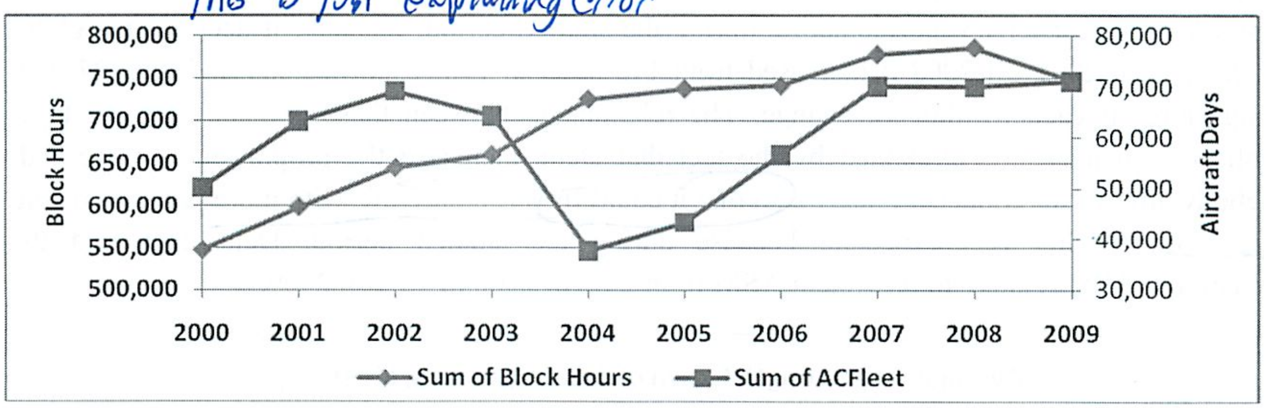


Figure 1, Total Block Hours and Aircraft-days for Large Narrowbody fleet

As shown in Figure 2, Delta's operating fleet has decreased by 31% between 2001 and 2007 (from 625 ac to 435 ac). This reduction is caused by the effects of September 11th and the overall reduction in demand to fly. Furthermore, the lower fares imposed by LCCs forced Delta to cut down its capacity in order to increase its load factors. After 2007, Deltas' total fleet size remained constant. However, the merger with Northwest in 2008 increased the fleet size of the new company by 70%. As mentioned before, the data for the period 2004-2006 are questionable and therefore are not ~~being~~ analyzed in detail. However, it is expected that Delta's bankruptcy in 2004 would have resulted in a big fleet reduction.

implication

From 2000 to 2002 the aircraft utilization was being reduced steadily by 5%. This shows how inefficient Delta was before bankruptcy, because although it reduced its fleet size, it didn't manage to improve its utilization. Between 2003 and 2007, Delta's utilization was increased by 20%. Figure 3 shows that the utilization rate increased sharply in 2003-2004, then remained constant till 2006 and decreased again in 2007. However, the data for this period are questionable and therefore one should only focus in the overall utilization increase and not on the annual trend. annoying

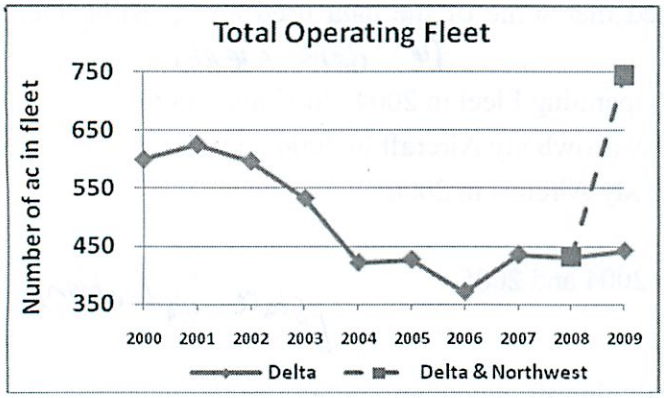


Figure 2

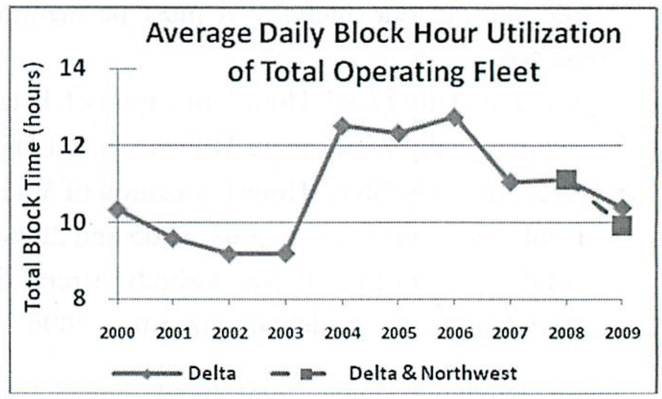


Figure 3

Figures 4 and 5 show that both the average stage length and the average aircraft capacity increased during the last decade. Specifically, the average stage length was increasing steadily every year (there was a sharper increase between 2005 and 2007) and from 871 miles in 2000, it reached 1290 miles in 2010. If we take into account the data for the merged company, the average stage length decreased by 4%, which shows that on average Northwest was operating shorter routes. The average aircraft capacity was fluctuating during the studied period. In 2000, it decreased slightly and then, from 2001 till 2008 it increased from 176 seats to 190 seats. In 2004 and in 2007, the average aircraft capacity did not change. The relationship between these two measures – stage length and capacity – is explained by the fact that Delta increased the proportion of large and widebody aircraft in its fleet (Figure 6), so that it could fly larger aircraft, with more passengers, on longer routes. This was expected, because during the studied period, Delta increased its international ASM relative to its system ASM from 23% in 2000 to 45% in 2009. interaction

implications

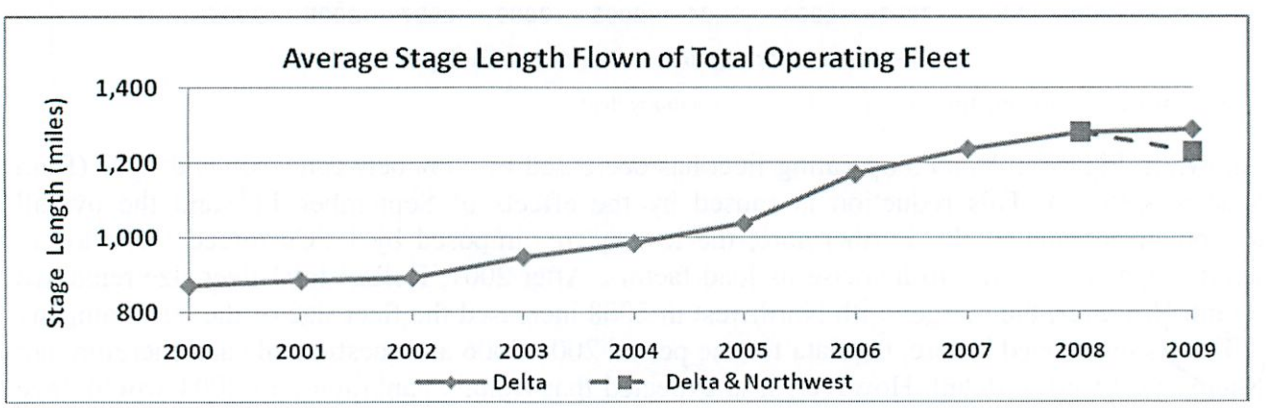


Figure 4

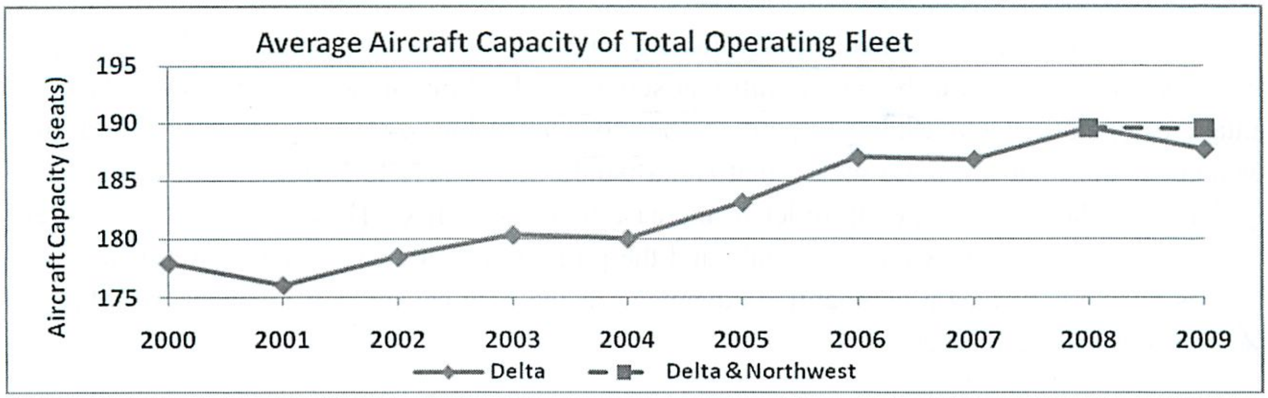


Figure 5

Between 2000 and 2007, Delta reduced its small narrowbody fleet by 187 aircraft (60%). At the same time, 33 widebody aircraft (23%) were taken out of its fleet. On the other hand, the large narrowbody fleet was expanded by 55 new aircraft (40%). These changes in the fleet categories resulted to an increase of the proportion of large aircraft from 23% in 2000 to 44% in 2007 and to a respective reduction of the proportion of small aircraft from 53% in 2000 to 31% in 2007. The proportion of widebody aircraft remained the same. No substantial changes happened in Delta's fleet composition after 2007. The proportional reduction in Delta's small narrowbody fleet, is much bigger compared to the general industry trend (69% in 2000 and 60% in 2009). This was the result of Delta's strategy to reduce its fleet size and shift from short haul domestic routes to longer international routes. he does not talk about regional partners where I did

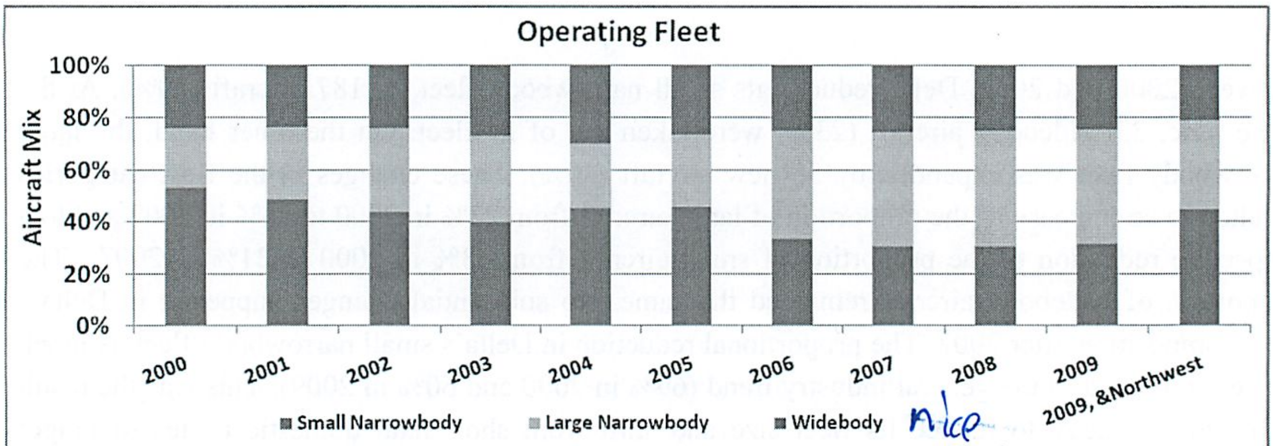
Starting to critique - see I feel I don't know enough in this industry

It is very interesting that Delta did not manage to improve its utilization rate for any of three aircraft categories in the end of the studied period, although they had been fluctuating. The utilization rates were decreasing from 2000 until 2003, then were increasing until 2006 and were decreasing again until 2009, reaching the same rates with 2000. For the widebody and the large narrowbody aircraft, this can be explained by the increase of the average stage length flown (Figures 9 and 10). For the widebody aircraft, the average stage length increased by 107% between 2003 and 2009, and for the large narrowbody aircraft, it increased by 32% between 2002 and 2009. From 2000 to 2009 the average stage length increased slightly by 9%. This siginificant increase in the average stage length caused a reasonable reduction in the daily departures (Figure 11) and thus the utilization rate remained constant. What is utilization - break it down

As it was expected, the daily productivities (Figure 12, ASM per aircraft day) of the three aircraft categories follow the same trends with the utilization rates. Since the utilization rates in 2009 were almost the same with those of 2000, for the same reasons, the aircraft productivities in 2009 are similar to those of 2000. This fact in combination with the changes in aircraft mix results to a 17% reduction of the total daily ASM, which is consistent with the general industry trend.

The flight operation cost per block hour was constantly increasing from 2000 until 2006, for all aircraft categories. In 2007 it dropped slightly and then in 2008 is increased sharply due to the oil crisis. In 2009 it decreased again, resulting to an overall increase of 67% compared to 2000. This increase is close to the change in the general industry's average (72%).

Concluding, Delta's fleet has changed significantly since 2000. By decreasing its fleet size and shifting from small aircraft to bigger aircraft that serve long haul international routes, Delta has the advantage of operating into a less competitive and more profitable market. On the other hand, the fewer number of small airplanes means that Delta would not be able to increase its frequency on many domestic short haul routes in order to increase its market share. However, after the merger with Northwest, the fleet mix changed again and the proportion of the small sized aircraft became 44%. This huge fleet gives a competitive advantage to the new carrier if it manages to utilize it efficiently in profitable markets.



nice Chart

Figure 6

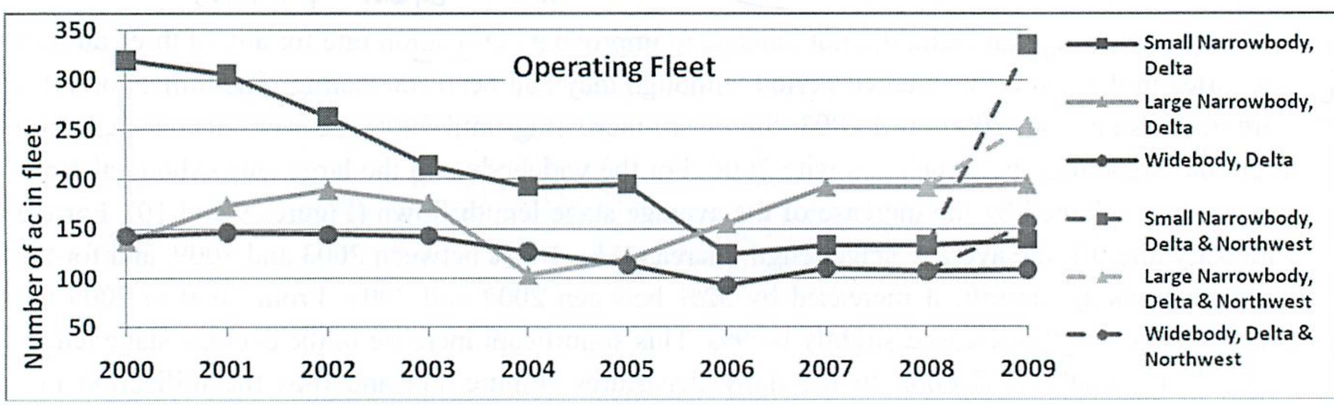


Figure 7

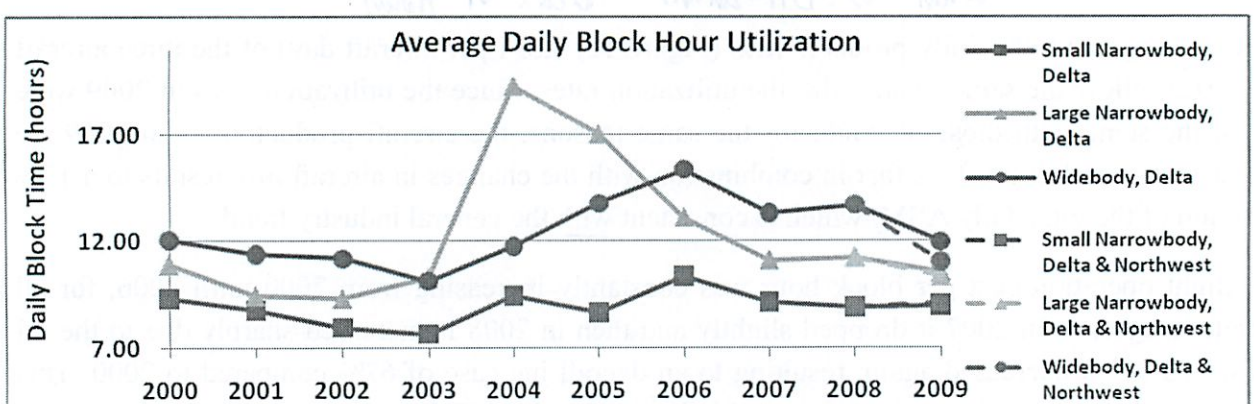


Figure 8

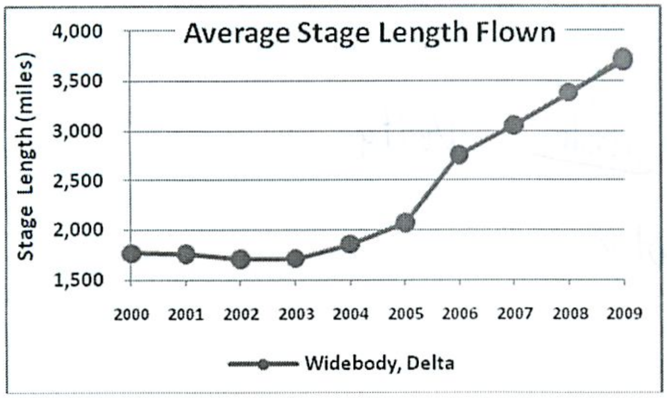


Figure 9

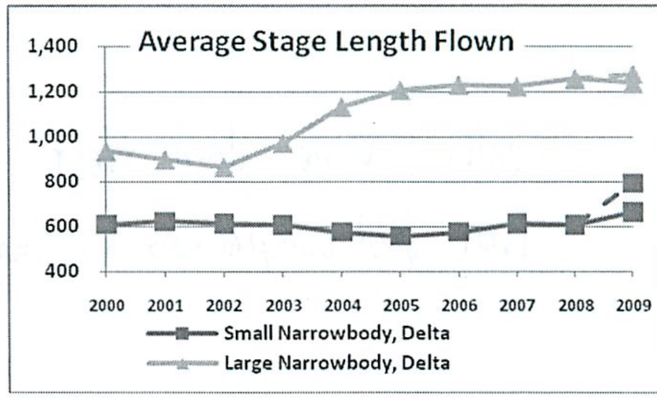


Figure 10

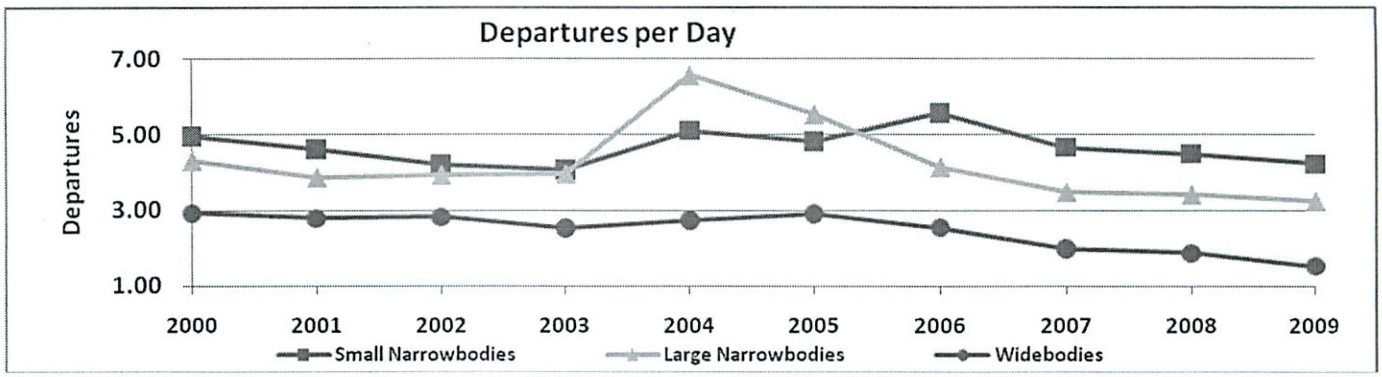


Figure 11

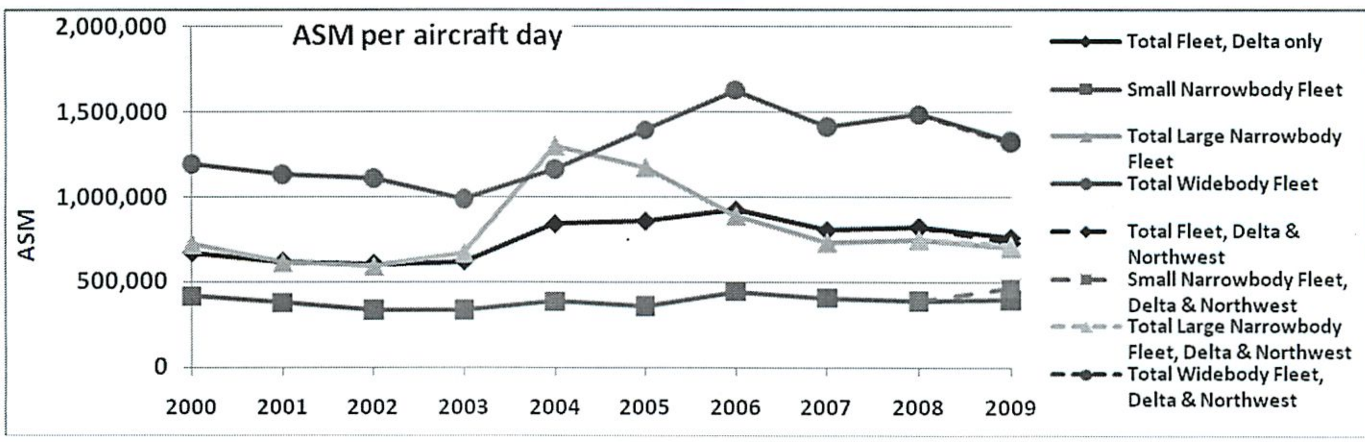


Figure 12

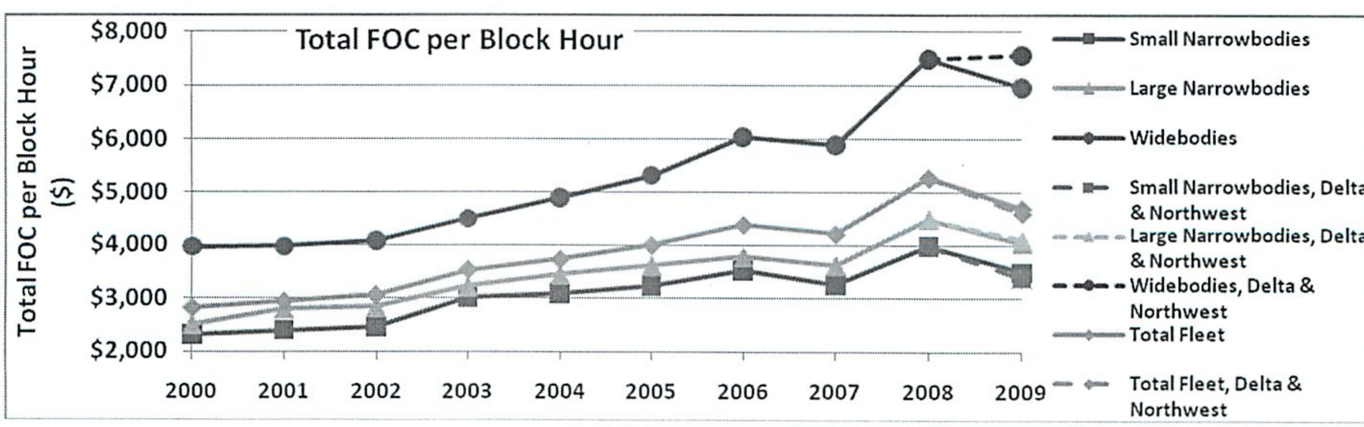


Figure 13

really broke down fleet inside Delta
not just comparisons to industry

Assignment 2 Review

10/29

The BOS-MIA route just made it

Due to all these small aircraft

Load factor reasonable, but below industry avg

- Unit cost kinda low related to industry avg
- but longer stage length so reasonable

Freq share is big + critical assumptions

Could raise fares and could lower fares

most did this

now I was thinking this

Some said freq share weakness

- but obliterates profitability

$128 avg fare

└ no way precludes diff. pricing

Could argue this is bad assumption on what plane to pick

$1733 profit does not seem large

4.3% margin

half a million / year

works out fairly well for this LCC

(2)

Schedule

Thousand diff schedule map

Many assumed plane should start in Boston

Opposet markets

Same biz mix

Identify schedule gaps

- does AA give you peak demands?
- Prof says no

Prof says provide ~~sched~~ service in gaps in their schedule

Could interline w/ non-One World airlines

People good at ripping shreds out of model
and little what's right

Startup cost

Did anyone look what AA was charging?

- we're leading the fare war

Link together parts of analysis

If you don't think this is a good opportunity -
then will be hardpressed to find some

Uncertainty in FOC affects all routes

Only takes 10% fuel ↑

(3)

not a life long committment
- pull out in weeks

Would 1 flight/day be better?

Before - wanted to build market share
- Can't pop into root of market
? now airlines don't think about

~~[illegible]~~