

**TURKISH  
AVIATION  
ACADEMY**



## ***Assignment 1: Fleet Planning Decision*** ***Michael D. Wittman***

***Istanbul Technical University***  
***Air Transportation Management***  
***M.Sc. Program***

***Network, Fleet and Schedule***  
***Strategic Planning***  
***Module A1 : 29 March 2016***

## *About Me*

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- **Course TA: Michael (Mike) WITTMAN**
- **Ph.D. candidate at MIT's International Center for Air Transportation**
- **Formerly Consultant in the Airline Strategies at Airports Group at InterVISTAS Consulting**
  - Led network planning, hub design, and revenue management analyses for airline and airport clients worldwide.
- **Email: [wittman@mit.edu](mailto:wittman@mit.edu)**
- **I am available during and after the class for questions about course content, logistics, grading, etc.**

# ***Assignments***

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- **The assignments in this class are intended to be short exercises to allow you to apply the fleet and network planning concepts from the lectures.**
- **Spreadsheets are provided with each assignment to allow you to practice manipulating data and drawing conclusions.**
- **The exercises are a good simulation of the actual fleet and network planning decisions that are made every day at airlines around the world.**
- **Focus of the assignments is on *interpreting data* and *providing recommendations*.**

# *Assignment Logistics*

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- **There are three assignments for this course:**
  - Assignment 1: Fleet Planning Decision
  - Assignment 2: Route Profitability Analysis
  - Assignment 3: Route Fleet Assignment
- **You will work in teams to complete the assignment.**
  - You may form your own teams, or I can divide you into groups.
- **In the final lecture of each day, I will introduce the assignment and provide ~30 minutes for you to begin work with your teams**
  - I will be available to answer any questions as you begin work.

## ***Assignment Logistics (2)***

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- **Assignments are due at 10AM the day after they are assigned.**
  - No exceptions, no late work will be accepted.
- **Email your team's solutions (1 email per group) to me at wittman@mit.edu before the deadline.**
- **I will grade the assignments with ITU's grading scale.**
  - e.g. AA, BA, BB, CB, CC, DC, DD, FF
- **At 1400 on the day that the assignment is due, I will return the graded assignments and we will discuss the solutions together.**

## ***Assignment 1: Fleet Planning***

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- **Turkish Airlines is considering the immediate lease of 2 wide-body aircraft for a period of 2 years, to provide additional capacity on a known set of high demand long-haul routes while awaiting delivery of new B777-300ER aircraft.**
- **All three alternatives are each wide-body, twin-aisle, twin-engine aircraft requiring two cockpit crewmembers, although their seating capacities, ages and performance characteristics differ.**
  - B767-300ER
  - B777-200ER
  - A340-500

## ***Route and Aircraft Assumptions***

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- **The relevant operating cost characteristics for the aircraft are summarized in THY\_FLEET.xlsx.**
- **The leased aircraft are to be flown on stage lengths that average 7400 km, with an average block-hour time of 9.72 hours per flight leg departure.**
- **THY estimates that the leased aircraft should be able to achieve a 11.5 block hour per day utilization rate, regardless of which type is chosen.**
  - Does this estimate sound reasonable for widebody aircraft?

## *Demand and Operational Assumptions*

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- The average (unconstrained) passenger demand per flight on the routes to be served by the leased aircraft has been estimated to be 241.2 passengers.
- THY's best estimate of the average yield that it can obtain on these routes is \$0.063 per RPK for this demand level, with an average sales and distribution cost equal to 9% of the gross fares.
- Our forecast of fuel costs during the leasing period is approximately USD\$1.65 per gallon.
- Due to seasonal variation in demand, we assume that no aircraft will be able to achieve an average load factor of greater than 85%.

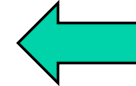


# Worksheet Structure

- **Worksheet assumptions:**
  - Target daily utilization
  - Passenger yield per RPK
  - Fuel Price (USD per gallon)
  - Average Passenger Demand per flight

## Worksheet Assumptions

Target Utilization/Day (block-hours)	11.5
Passenger Yield (per RPK)	\$0.063
Fuel Price (USD per gallon)	\$1.65
Average Passenger Demand per Flight	241.2



- **Changing any of the highlighted (yellow) cells will affect downstream estimates.**
- **You will investigate how changes in each of these assumptions affect estimates of operating margin.**

## *Worksheet Structure (2)*

- Operational Characteristics and Aircraft Op. Costs:**

	B767-300ER	B777-200ER	A340-500
<b><u>Operational Characteristics</u></b>			
Average Stage Length (km)	7400	7400	7400
Average Block Time (hours)	9.72	9.72	9.72
Block Hours/Month	345.00	345.00	345.00
Departures/Month	35.48	35.48	35.48
Fuel burn (gal/block hour)	1865	2030	2345
<b>SEATS</b>	<b>269</b>	<b>305</b>	<b>325</b>
<b>AIRCRAFT OPERATING COSTS</b>			
<b><u>Monthly Fixed Costs</u></b>			
Ownership Costs	\$ 305,000	\$ 335,000	\$ 365,000
Maintenance Burden	\$ 185,000	\$ 160,000	\$ 145,000
Total per Aircraft	\$ 490,000	\$ 495,000	\$ 510,000
<b>Fixed Costs/Block Hr</b>	<b>\$ 1,420</b>	<b>\$ 1,435</b>	<b>\$ 1,478</b>
<b><u>Variable Costs per Block Hour</u></b>			
Crew	\$ 1,220	\$ 1,285	\$ 1,385
Fuel	\$ 3,077	\$ 3,350	\$ 3,869
Maintenance	\$ 610	\$ 540	\$ 510
<b>Variable Costs/Hour</b>	<b>\$ 4,907</b>	<b>\$ 5,175</b>	<b>\$ 5,764</b>
<b>Total AOC/Blk Hour</b>	<b>\$ 6,328</b>	<b>\$ 6,609</b>	<b>\$ 7,243</b>
<b>Total Monthly AOC</b>	<b>\$ 2,183,001</b>	<b>\$ 2,280,203</b>	<b>\$ 2,498,666</b>

## *Worksheet Structure (3)*

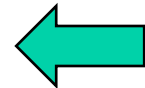
- Ground and Passenger Costs:**

	B767-300ER	B777-200ER	A340-500
<b>GROUND AND PASSENGER COSTS</b>			
<b><u>Aircraft Servicing</u></b>			
Cost per departure	\$ 1,750	\$ 1,850	\$ 1,950
Total Monthly Cost	\$ 62,086	\$ 65,634	\$ 69,182
<b><u>Passenger Costs</u></b>			
Average Pax/Flight	228.7	241.2	241.2
Average Load Factor	<b>85.00%</b>	<b>79.08%</b>	<b>74.22%</b>
Total Pax per month	8,112	8,557	8,557
Total RPKs per month	60,028,797	63,323,621	63,323,621
Total ASKs per month	70,622,114	80,073,401	85,324,116
Traffic Servicing/ pax	\$ 25.00	\$ 25.00	\$ 25.00
Pax Servicing/ RPK	\$ 0.020	\$ 0.020	\$ 0.020
Monthly Traffic Service	\$ 202,800	\$ 213,931	\$ 213,931
Monthly Pax. Service	\$ 1,200,576	\$ 1,266,472	\$ 1,266,472
<b>Total Monthly Costs</b>	<b>\$ 3,648,463</b>	<b>\$ 3,826,240</b>	<b>\$ 4,048,252</b>
Unit Cost per ASK	\$ 0.0517	\$ 0.0478	\$ 0.0474

## Worksheet Structure (4)

- Passenger Revenues and Total Revenues:

	B767-300ER	B777-200ER	A340-500
<b><u>PASSENGER REVENUES</u></b>			
Average Yield	\$ 0.063	\$ 0.063	\$ 0.063
Sales and Distribution (% of Rev)	9%	9%	9%
Gross Revenues	\$ 3,781,814	\$ 3,989,388	\$ 3,989,388
Less Sales and Distribution	\$ 340,363	\$ 359,045	\$ 359,045
Net Passenger Revenues	\$ 3,441,451	\$ 3,630,343	\$ 3,630,343
Additional Cargo Revenues	\$ 485,000	\$ 545,000	\$ 687,000
<b><u>TOTAL REVENUES</u></b>	<b>\$ 3,926,451</b>	<b>\$ 4,175,343</b>	<b>\$ 4,317,343</b>
Operating Contribution	\$ 277,988	\$ 349,103	\$ 269,092
Operating Margin	7%	8%	6%



- Note how changes to the highlighted (yellow) cells change the estimates of operating contribution and operating margin.

## Question 1: Maximum Average Load Factor

- Note that the average passenger load per flight for the B767-300ER has been limited to 228.7 passengers.
  - This is to ensure an average planning load factor of under 85%.

	B767-300ER	B777-200ER	A340-500
<b><u>Passenger Costs</u></b>			
Average Pax/Flight	228.7	241.2	241.2
Average Load Factor	85.00%	79.08%	74.22%
Total Pax per month	8,112	8,557	8,557

- What are some of the reasons that we might want to restrict average planning load factors to less than 85% in this analysis?
  - That is, what are some of the operational and economic factors that would make it unrealistic for an airline to operate at such a consistently high average load factor?

## ***Question 2: Sensitivity Analysis***

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- **Evaluate the sensitivity of the results to changes in input assumptions.**
  - Perform each analysis separately, using the BASE values given.
- **That is, determine the amount of variation in each input factor required to make all aircraft alternatives unprofitable, holding all other factors constant.**
  - Fuel cost per gallon (BASE = USD\$1.65)
  - Forecast passenger demand per flight (BASE = 241.2 passengers)
  - Forecast passenger yield per RPK (BASE = USD\$0.063)
- **Does a 10% variation in fuel cost, demand, or passenger yield have the greatest impact on estimated profit? Which factor is more likely to vary enough in the real world to affect profitability?**

## ***Question 3: Fleet Recommendation***

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- **What additional aircraft performance and operational issues that might affect the final decision as to which aircraft type should be acquired for this relatively short time horizon?**
- **Based on these additional considerations and your analysis above, what would be your recommendation to THY management with respect to this leasing decision?**
- **Which aircraft type do you recommend?**

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***Questions? Have fun!***