

NETWORK, FLEET AND SCHEDULE STRATEGIC PLANNING

Overview of airline planning processes, with a focus on economic issues and their relationship to operations planning models and decision support tools. Examination of industry practice and emerging methods for fleet planning, route network design, and scheduling, with emphasis on the interactions between the components of airline management and profit objectives in competitive environments.

INSTRUCTORS: Dr. Peter Belobaba (belobaba@mit.edu)
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REQUIRED TEXTBOOK: Belobaba, P., Odoni, A., and Barnhart, C., (eds.), The Global Airline Industry, John Wiley & Sons Publishers, 2009.

Additional readings, data and materials will be posted to the class web site.

DAY/TIME LECTURE TOPICS

MONDAY 10 MARCH

1000-1100	<u>1. Course Introduction and Airline Industry Overview</u> Course syllabus and requirements; Review of airline terminology and measures; Global airline statistics; Airline business models <u>TEXTBOOK:</u> Chapter 1 (1-13)
1115-1215	<u>2. Overview of Airline Planning Process</u> Basic airline profit equation; Introduction to airline planning processes – fleet planning, route evaluation, schedules, distribution, operations <u>TEXTBOOK:</u> Chapter 3 (47-51)
1230-1330	<u>3. Airline Operating Costs</u> Drivers and components of airline costs; Flight operating costs; Total vs. unit operating costs; Unit cost components and trends <u>TEXTBOOK:</u> Chapter 5 (113-122, 132-146)
1430-1530	<u>4. Introduction to Fleet Planning</u> Commercial aircraft categories by size and range; Overview of current aircraft types; Global aircraft orders; Turkish Airlines fleet outlook <u>TEXTBOOK:</u> Chapter 6 (153-156)
1545-1645	<u>5. Evaluation of Alternative Aircraft Types</u> Fleet planning evaluation process; Top-down vs. bottom-up approaches; Aircraft selection criteria; Review of NPV analysis. <u>TEXTBOOK:</u> Chapter 6 (156-162)

1700-1800 ASSIGNMENT 1 – FLEET PLANNING
Introduction to problem scenario and use of spreadsheet (provided).
Begin team work on assignment.

TUESDAY 11 MARCH

1000 **ASSIGNMENT 1 DUE**

1000-1100 **6. Fundamentals of Airline Markets and Demand**
Origin-destination market demand; Dichotomy of demand vs. supply;
Price and time elasticity; Implications for pricing and scheduling

TEXTBOOK: Chapter 3 (51-67)

1115-1215 **7. Estimation of Demand and Market Share**
Demand models and forecasting techniques; Market share vs.
frequency share S-curve; QSI and logit modeling approaches

TEXTBOOK: Chapter 3 (67-71)

1230-1330 **8. Airline Network Structures**
Economics of hub operations vs. point-to-point services; Operational and
marketing advantages and disadvantages; Route planning implications

TEXTBOOK: Chapter 6 (162-168)

1430-1530 ASSIGNMENT 1 REVIEW and DISCUSSION
Discussion of team responses and explanation of solutions to problem
scenario.

1545-1645 **9. Route Planning and Profit Evaluation**
Route profitability evaluation in airline hub networks; Cost allocation and
network revenue contribution models

TEXTBOOK: Chapter 6 (168-173)

ARTICLE: Baldanza, B., Measuring Airline Profitability

1700-1800 ASSIGNMENT 2 – ROUTE PROFIT EVALUATION
Introduction to problem scenario and use of spreadsheet (provided).
Begin team work on assignment.

WEDNESDAY 12 MARCH

- 1000 **ASSIGNMENT 2 DUE**
- 1000-1100 **10. Modeling Passenger Choice of Flight Options**
Decision Window schedule coverage model (DWM); Passenger Origin
Destination Simulator (PODS); Disutility costs of path/fare options
- 1115-1215 **11. Airline Schedule Development**
Network supply definitions; Steps in schedule development process –
frequency, timetable, schedule maps and aircraft rotations

TEXTBOOK: Chapter 6 (173-181)
- 1230-1330 **12. Fleet Assignment**
Optimization of aircraft size on a flight leg; Principal trade-offs and
constraints; Network fleet assignment optimization models

TEXTBOOK: Chapter 7 (185-192)
ARTICLE: Coldstart: Fleet Assignment at Delta Air Lines
- 1430-1530 **ASSIGNMENT 2 REVIEW and DISCUSSION**
Discussion of team responses and explanation of solutions to problem
scenario.
- 1545-1645 **13. Demand, Load and Spill Analysis**
Demand variability and spill relative to aircraft capacity; Flight leg spill
model; Boeing Spill Tables; Recapture and RM impacts on spill
- 1700-1800 **ASSIGNMENT 3 – FLEET ASSIGNMENT/SCHEDULING**
Introduction to problem scenario and use of spreadsheet (provided).
Begin team work on assignment.

THURSDAY 13 MARCH

- 1000 **ASSIGNMENT 3 DUE**
- 1000-1100 **14. Network Schedule Optimization Extensions**
Network itinerary-based fleet assignment: Dynamic fleet assignment
(Demand Driven Dispatch); Crew scheduling problem

TEXTBOOK: Chapter 7 (192-197,201-207)
- 1115-1215 **15. Network Revenue Management: O&D Control**
Network optimization models for revenue maximization
O-D control schemes and distribution issues in practice

TEXTBOOK: Chapter 4 (101-108)

- 1230-1330 **16. From Planning to Operations**
Planned vs. actual operations; Irregular operations and variability;
Overview of airline operations control and schedule recovery

TEXTBOOK: Chapter 9 (253-269)
- 1430-1530 **ASSIGNMENT 3 REVIEW and DISCUSSION**
Discussion of team responses and explanation of solutions to problem
scenario.
- 1545-1645 **17. Airline Network Strategies**
Recent global airline network strategies; Emphasis on hubs and
international growth; Consolidation, alliances and joint ventures
- 1700-1800 **18. Airline Performance and Capacity Strategies**
Review of airline performance by world region; “capacity discipline”
strategies of US airlines; growth plans of emerging global carriers

FRIDAY 14th and SATURDAY 15th MARCH

Analysis and Case Study Sections

March 2014	FRIDAY	ITU Conference Room, TBD	
10:00 AM	10:30 AM	Introductions and Boeing team overview	Alex Heiter
10:30 AM	11:00 AM	Global Airline Capacity Analysis	Alex Heiter
11:00 AM	11:15 AM	Break	
11:15 AM	12:00 PM	European Airline Capacity Analysis	Bruce Tecklenburg
12:00 PM	13:30 PM	Break and Lunch	
1:30 PM	2:15 PM	Middle East Capacity Analysis	Alex Heiter
2:15 PM	2:45 PM	Russia/Central Asia Capacity Analysis	Bruce Tecklenburg
2:45 PM	3:00PM	Break	
3:00 PM	4:30 PM	Turkish Passenger Market Analysis	Alex Heiter
4:30 PM	4:45 PM	Break	
4:45 PM	6:00 PM	Boeing Class Case Study Introduction	Alex/Bruce
6:00 PM		End of day five – Teams encouraged to meet in evening	
March 2014	SATURDAY	ITU Conference Room, TBD	
10:00 AM	11:00 AM	Boeing Class Case Study - teams	Alex/Bruce
11:00 AM	11:15 AM	Break	
11:15 AM	12:15 AM	Boeing Class Case Study - teams	Alex/Bruce
12:15 AM	12:30 AM	Break	
12:30 AM	1:00 PM	Boeing Class Case Study - teams	Alex/Bruce
1:00 PM	2:00 PM	Lunch	
2:00 PM	3:00 PM	Boeing Class Case Study Presentation team 1&2	Alex/Bruce
3:00 PM	3:15 PM	Break	
3:15 PM	4:15 PM	Boeing Class Case Study Presentation team 3&4	Alex/Bruce
4:15 PM	4:30 PM	Break	
4:30 PM	5:00 PM	Boeing Class Case Study Presentation team 5	Alex/Bruce
5:00 PM	6:00 PM	Team Recognition and Course Wrap-up	Alex/Bruce
5:00 PM		End of day six	

COURSE GRADING

3 Team Assignments (during class week)	25%
Final Project	25%
Final Exam	50%