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, scheduling and revenue management, with emphasis on the interactions between the components of airline management and profit objectives in competitive environments.

INSTRUCTORS: Dr. Peter Belobaba (belobaba@mit.edu)
Mr. Michael Wittman (wittman@mit.edu)
Mr. Alex Heiter (alex.heiter@boeing.com)
Mr. Ali Hajiyev (ali.hajiyev@boeing.com)

REQUIRED TEXTBOOK: Belobaba, P., Odoni, A., and Barnhart, C., (eds.), The Global Airline Industry, 2nd Edition, John Wiley & Sons Publishers, 2016.

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

DAY/TIME   **LECTURE TOPICS**

MONDAY 28 MARCH

1000-1115   **1. Course Introduction and Airline Industry Overview (Boeing)**
Course syllabus and requirements; Review of airline terminology and measures; Global airline statistics; Airline business models

<u>TEXTBOOK</u>: Chapter 1 (1-13)

1115-1145   *Morning Break*

1145-1300   **2. Airline Current Business Environment (Boeing)**
Analysis of key developments in the current airline business environment, including economic drivers, passenger airline capacity & demand, air cargo and current airline financial performance.

1300-1400   *Lunch*

1400-1515   **3. World/Europe/Middle East Capacity Analysis (Boeing)**
A comprehensive overview of the latest capacity situation worldwide and in regional markets involving Turkey. Focus will be placed on growth profiles of major carriers and city-pair markets.

1515-1530   *Short Break*

1530-1645   **4. Turkish Airlines Revenue Planning Guest Presentation**
Our guest speaker from Turkish Airlines (THY) will share a presentation regarding Network/Revenue Planning at the airline, providing a view of how Turkish Airlines rose into a global carrier in the past decade.

1645-1700   *Short Break*

1700-1800   **5. Airline Network Strategies (Boeing)**
Recent global airline network strategies; Emphasis on hubs and international growth; Consolidation, alliances & joint ventures, growth plans of emerging global carriers

TUESDAY 29 MARCH

1000-1115   **6. Overview of Airline Planning Process (Boeing)**
                  Basic airline profit equation; Introduction to airline planning processes –
                  fleet planning, route evaluation, schedules, distribution, operations

                  TEXTBOOK: Chapter 3 (47-51)

1115-1145   *Morning Break*

1145-1300   **7. Introduction to Fleet Planning (Boeing)**
                  Commercial aircraft categories by size and range; Overview of current
                  aircraft types; Global aircraft orders; Turkish Airlines fleet outlook

                  TEXTBOOK: Chapter 7 (159-166)

1300-1400   *Lunch*

1400-1515   **8. Evaluation of Alternative Aircraft Types (Boeing)**
                  Fleet planning evaluation process; Top-down vs. bottom-up approaches;
                  Aircraft selection criteria; Review of NPV analysis.

                  TEXTBOOK: Chapter 6 (166-170)

1515-1530   *Short Break*

1530-1645   **9. Fleet Evaluation and Financial Analysis (Boeing)**
                  An overview of how airlines undertake the fleet evaluation decision in
                  terms of comparative airplane assessment and economic & financial
                  analysis of alternative scenarios

1645-1700   *Short Break*

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

WEDNESDAY 30 MARCH

1000	**ASSIGNMENT 1 DUE**

1000-1115   **<u>10. Fundamentals of Airline Markets and Demand (Belobaba)</u>**
Origin-destination market demand; Dichotomy of demand vs. supply; Price and time elasticity; Implications for pricing and scheduling

<u>TEXTBOOK</u>: Chapter 3 (51-67)

1115-1145   *Morning Break*

1145-1300   **<u>11. Estimation of Demand and Market Share (Belobaba)</u>**
Demand models and forecasting techniques; Market share vs. frequency share S-curve; QSI and logit modeling approaches

<u>TEXTBOOK</u>: Chapter 3 (67-71)

1300-1400   *Lunch*

1400-1500   <u>ASSIGNMENT 1 REVIEW and DISCUSSION (Wittman)</u>
Discussion of team responses and explanation of solutions to problem scenario.

1515-1530   *Short Break*

1515-1630   **<u>12. Airline Operating Costs (Belobaba)</u>**
Drivers and components of airline costs; Flight operating costs; Total vs. unit operating costs; Unit cost components and trends

<u>TEXTBOOK</u>: Chapter 6 (127-140, 145-153)

1645-1700   *Short Break*

1645-1800   **<u>13. Airline Network Structures (Belobaba)</u>**
Economics of hub operations vs. point-to-point services; Operational and marketing advantages and disadvantages; Route planning implications

<u>TEXTBOOK</u>: Chapter 7 (170-175)

THURSDAY 31 MARCH

1000-1115   **14. Route Planning and Profit Evaluation (Belobaba)**
Route profitability evaluation in airline hub networks; Cost allocation and
network revenue contribution models

TEXTBOOK: Chapter 7 (175-180)
ARTICLE: Baldanza, B., Measuring Airline Profitability

1115-1145   *Morning Break*

1145-1300   **15. Modeling Passenger Choice of Flight Options (Belobaba)**
Decision Window schedule coverage model (DWM); Passenger Origin
Destination Simulator (PODS); Disutility costs of path/fare options

1300-1400   *Lunch*

1400-1515   **16. Overview of Boeing Planning Tools (Boeing)**
Boeing will provide a look at the suite of tools and data it uses to perform
Network & Fleet Planning studies for our customer airlines, including flight
schedule creation, passenger choice model and fleet optimization.

1515-1530   *Short Break*

1530-1645   **17. Route Forecasting Process (Boeing)**
A step-by-step example of a "real-life" longhaul route traffic and
profitability forecast will be provided, utilizing the data and modeling
approaches discussed earlier in the course.

1645-1700   *Short Break*

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

FRIDAY 1 APRIL

1000	**ASSIGNMENT 2 DUE**

1000-1115   **<u>18. Airline Schedule Development (Belobaba)</u>**
Network supply definitions; Steps in schedule development process – frequency, timetable, schedule maps and aircraft rotations

<u>TEXTBOOK</u>: Chapter 7 (180-187)

1115-1145   *Morning Break*

1145-1300   **<u>19. Demand, Load and Spill Analysis (Belobaba)</u>**
Demand variability and spill relative to aircraft capacity; Flight leg spill model; Boeing Spill Tables; Recapture and RM impacts on spill

1300-1400   *Lunch*

1400-1500   <u>ASSIGNMENT 2 REVIEW and DISCUSSION (Wittman)</u>
Discussion of team responses and explanation of solutions to problem scenario.

1515-1530   *Short Break*

1515-1630   **<u>20. Fleet Assignment (Belobaba)</u>**
Optimization of aircraft size on a flight leg; Principal trade-offs and constraints; Network fleet assignment optimization models

<u>TEXTBOOK</u>: Chapter 8 (189-195)
<u>ARTICLE</u>: Coldstart: Fleet Assignment at Delta Air Lines

1645-1700   *Short Break*

1645-1800   <u>ASSIGNMENT 3 – FLEET ASSIGNMENT/SCHEDULING (Wittman)</u>
Introduction to problem scenario and use of spreadsheet (provided). Begin team work on assignment.

SATURDAY 2 APRIL

1000	**ASSIGNMENT 3 DUE**

1000-1115   **21. From Planning to Operations (Belobaba)**
Planned vs. actual operations; Irregular operations and variability;
Overview of airline operations control and schedule recovery

                          TEXTBOOK: Chapter 10 (264-279)

1115-1145   *Morning Break*

1145-1300   **22. Evolution of Airline Revenue Management (Belobaba)**
Overview of RM models and systems; revenue impacts and
tactical/strategic benefits of RM; Leg-based seat optimization and
overbooking models.

                          TEXTBOOK: Chapter 5 (99-111)

1300-1400   *Lunch*

1400-1500   ASSIGNMENT 3 REVIEW and DISCUSSION (Wittman)
Discussion of team responses and explanation of solutions to problem
scenario.

1515-1530   *Short Break*

1515-1630   **23. Network Revenue Management: O&D Control (Belobaba)**
Need for O-D control; Overview of network optimization models;
simulated revenue gains of O-D controls; impacts on airline business
processes.

                          TEXTBOOK: Chapter 5 (112-121)

1645-1700   *Short Break*

1645-1800   **24. New Developments in RM Forecasting and Optimization
(Belobaba)**
Impacts on RM of fare simplification; New forecasting and optimization
models for changing fare structures; Alliance RM and customer valuation
challenges.

                          TEXTBOOK: Chapter 5 (121-125)

COURSE GRADING

3 Team Assignments (during class week)	45%
Final Exam	55%