

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)
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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 30 MARCH

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| 1000-1115 | <u>1. Course Introduction and Airline Industry Overview (Boeing)</u> Course syllabus and requirements; Review of airline terminology and measures; Global airline statistics; Airline business models <u>TEXTBOOK:</u> Chapter 1 (1-13) |
| 1145-1300 | <u>2. Airline Current Business Environment (Boeing)</u> Analysis of key developments in the current airline business environment, including economic drivers, passenger airline capacity & demand, air cargo and current airline financial performance. |
| 1400-1515 | <u>3. World/Europe/Middle East Capacity Analysis (Boeing)</u> 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. |
| 1530-1645 | <u>4. “The Transformation of a Legacy Carrier – A Case Study of Turkish Airlines” – Erkan Dursun (IATA)</u> Our guest speaker will share his research published in the Journal of Air Transport Management. This study examines the meteoric rise of Turkish Airlines into a global carrier following deregulation and privatization. <u>READING:</u> The Transformation of a Legacy Carrier - A Case Study of Turkish Airlines”, Journal of Air Transport Management 40-2014 (106-118) |

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 31 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)

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 6 (153-156)

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 (156-162)

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

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

WEDNESDAY 1 APRIL

1000 **ASSIGNMENT 1 DUE**

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

TEXTBOOK: Chapter 3 (51-67)

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

TEXTBOOK: Chapter 3 (67-71)
- 1400-1500 **ASSIGNMENT 1 REVIEW and DISCUSSION (Boeing/Wittman)**
 Discussion of team responses and explanation of solutions to problem scenario.
- 1515-1630 **12. Airline Operating Costs (Belobaba)**
 Drivers and components of airline costs; Flight operating costs; Total vs. unit operating costs; Unit cost components and trends

TEXTBOOK: Chapter 5 (113-122, 132-146)
- 1645-1800 **13. Airline Network Structures (Belobaba)**
 Economics of hub operations vs. point-to-point services; Operational and marketing advantages and disadvantages; Route planning implications

TEXTBOOK: Chapter 6 (162-168)

THURSDAY 2 APRIL

- 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 6 (168-173)
ARTICLE: Baldanza, B., Measuring Airline Profitability
- 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
- 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.
- 1530-1645 **17. Airline Schedule Development (Belobaba)**
 Network supply definitions; Steps in schedule development process – frequency, timetable, schedule maps and aircraft rotations

TEXTBOOK: Chapter 6 (173-181)

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

FRIDAY 3 APRIL

1000 **ASSIGNMENT 2 DUE**

1000-1115 **18. Demand, Load and Spill Analysis (Belobaba)**
Demand variability and spill relative to aircraft capacity; Flight leg spill
model; Boeing Spill Tables; Recapture and RM impacts on spill

1145-1300 **19. Fleet Assignment (Belobaba)**
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

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

1515-1630 **20. From Planning to Operations (Belobaba)**
Planned vs. actual operations; Irregular operations and variability;
Overview of airline operations control and schedule recovery

TEXTBOOK: Chapter 9 (253-269)

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

SATURDAY 4 APRIL

1000 **ASSIGNMENT 3 DUE**

1000-1115 **21. 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.

- 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 4 (88-101)
- 1400-1500 **ASSIGNMENT 3 REVIEW and DISCUSSION (Wittman)**
 Discussion of team responses and explanation of solutions to problem scenario.
- 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 4 (101-108)
- 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 4 (108-110)

COURSE GRADING

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