



MIT Global Airline Industry Program: Activities Update

Cynthia Barnhart

**Industry Advisory Board/Airline Industry
Consortium Joint Meeting**

October 26, 2006

MIT Building 33, Room 116



MIT

Program Background

- MIT Global Airline Industry Program
 - Multi-disciplinary team
 - Engaged in research, education and outreach
- Established in September 1999 with a 3-year grant from Alfred P. Sloan Foundation
 - Second round of funding secured from the Sloan Foundation supports research from 2003-March 2006
 - Third round of funding (at a reduced rate) secured from the Sloan Foundation supports research from 2006-2009

The Interdisciplinary Faculty Team 2006

Prof. Arnold Barnett

Prof. Cynthia Barnhart

Dr. Peter Belobaba

Prof. R. John Hansman

Prof. Tom Kochan

Prof. Robert McKersie

Prof. Amedeo Odoni

Prof. Nancy Rose

Prof. Jody Hoffer Gittel (Brandeis University)

Prof. Amy Cohn (U. of Michigan)

Prof. Joakim Karlsson (Daniel Webster College)

Prof. Andrew von Nordenflycht (Simon Fraser
University)

Prof. John-Paul Clarke (Georgia Tech)

Economics

Sloan School

ICAT

CTL

ORC

Aero/ Astro

CEE

Other Universities

Graduate Students 2006

Program Objective: Increase the number of Ph.D. and other graduate students engaged in airline-related research

Maria Ishutkina

Antonio Abad

Gerry Tsoukalas

Philippe Bonnefoy

Megan Gaudet

Alexandra Mozdzanowska

Jonathan Histon

Emmanuel Carrier

Matthew Kayser

Ryan Tam

Nikolaos Pyrgiotis

Georg Theis

Valenrina Soo

Michael Hanowsky

Pavithra Harsha

Ying Zhu

Cumulative number of graduate students

from start of Program: 44

Program PhD Graduates

Program Objective: Educate airline industry's future leaders

Andrew von Nordenflycht, Asst Prof-Mgmt, Simon Fraser

Thomas Gorin, Manager-Revenue Management, Continental Airlines

Stephane Bratu, Senior Operations Research Analyst, Citation Shares

Manoj Lohatepanont, Asst Prof, Civil Engr, Chulalongkorn U

Amy Cohn, Asst Prof, Ind. Eng and OR, U of Michigan

Terence Fan, Asst Prof, Singapore Management U

Shan Lan, American Express, Harrison, NJ

Silke Januszewski, Asst Prof, U of CA San Diego

Susan Martonosi, Assistant Prof, Mathematics, Harvey Mudd College

Alex Lee, Consultant, LEK Consulting

Raphael Schorr, Consultant, HighVista Strategies

Hai Jiang, Senior Operations Research Analyst, Sabre Airline Solutions

Education 2006 (1/2)

Program objective: Produce educational materials

- Offered Global Airline Industry Program's Executive Education Course for the 2nd year
 - Part of MIT Airline Industry Consortium
 - Attended by more than 30 representatives of airlines, manufacturers, and other industry and government stakeholders
 - Received overwhelmingly positive reactions from participants
- Continued development of graduate course "*The Airline Industry*"
 - All of the Program's faculty participate
 - Provides a wide-ranging introduction to the many facets of the industry
 - In its sixth year, subject attracts over 40 students per year and receives outstanding student evaluations
 - Course materials provide the basis for a major textbook to be completed by the Program faculty this Spring
 - "The Airline Industry" course can serve as a model for top-level universities

Education 2006 (2/2)

Program objective: Produce educational materials

- Continued development of the E-PODS Airline Management Game
 - Simulation game to teach students how to make airline management decisions regarding fleet planning, route selection and pricing
 - Provides a realistic competitive environment
 - Programming assistance from Boeing
 - Used in MIT's "*Airline Management*" subject for the past 5 years, will be made available to other academic institutions, and to airlines and Boeing

Education: From Program Inception

- Restructuring of MIT air transportation curriculum- 11 new courses/curricula developed from start of Program
 - EXAMPLES:
 - New Subject: The Airline Industry (16.71J/1.232J/15.054J). Graduate course jointly offered by the Department of Aeronautics and Astronautics, the Department of Civil and Environmental Engineering and the Sloan School of Management, and taught by 7 faculty participants of the Global Airline Industry Program. First offered in Fall 2001, now in its 6th year, with 40 registered students.
 - New module and case study entitled Aircraft Delays and the Impacts on Passengers (Educational Module), developed for 16.77/1.206 Airline Schedule Planning.
 - Gittell, J.H., "JetBlue Airways: Starting from Scratch," with Charles O'Reilly, Harvard Business School Case, 9-801-354, January 2001.
- Organized four annual conferences in Washington, DC on current issues in the air transport industry
 - 100-125 academic, industry and government representatives attending
 - Numerous comments indicating the value of these events in providing an up-to-date and unbiased perspective on the status of the airline

Workshops, Seminars, Conferences in 2006

Approximately 15 workshops, seminars, conferences,
or other campus events held this past year

EXAMPLES:

- Distinguished Speaker Seminar Series at MIT (6 speakers)
- “Relational Coordination as a Distinctive Organizational Capability: The Case of Southwest Airlines,” Faculty Working Group on Organizational Capabilities, MIT.
- Airport Systems Planning (3-day short course for airport executives) co-taught by Prof. Odoni and de Neufville, September 25 – 27, 2006
- MIT Airline Industry Consortium Executive Education Course, “The Airline Industry – Current Trends and Challenges”, June 19-20, 2006

Major Research Topics 2006

Program Objective: Develop a body of knowledge for understanding development, growth and competitive advantage in the airline industry, and produce authoritative research reports

- Safety/Security
- Scheduling and Operations
- Pricing and Revenue Management
- Labor Relations
- Infrastructure/Capacity Issues
- Operating Costs and Productivity
- Developing World Aviation Issues

Research Topics on Today's Agenda (1/2)

1. Recent Airline Industry Trends -- Update (Hansman)
2. Pricing and Revenue Management Research (Belobaba)
 - Competitive Fare Analysis in US Domestic Markets (Belobaba)
 - Modeling the Choice of Airline Itinerary and Fare Product (Carrier)
 - Funding of Aviation Infrastructure (Karlsson/Odoni)
3. Airline Operating Costs and Productivity (McKersie)
 - Convergence of Legacy and LCC Performance (Tsoukalas/ Swelbar)
 - Low Cost Competition in the Global Airline Industry: Implications for Employment Relations (Gittell)
 - Update on Airline Labor Relations (McKersie)
4. Some Recent Issues in Airline Security (Barnett)

Research Topics on Today's Agenda (2/2)

1. Dealing with Infrastructure and Capacity Constraints (Odoni)
 - Investigation of the Scalability of Air Transportation Networks (Bonnetoy)
 - Air Traffic Flow Management under Uncertainty (Hanowsky)
 - The Impact of Flat Airport and Navigation Charges (Schorr)
 - Adaptation in Response to Capacity Constraints (Mozdzanowska)
2. Developing World Aviation Issues (Hansman)
 - India and China Infrastructure Needs (Hansman)
 - Aviation Safety in Developing Countries: A Statistical Profile (Barnett)
3. Airline Operations & Scheduling Research (Barnhart)
 - Assessing Delay Propagation in Airline Plans (Cohn)
 - Dynamic Airline Scheduling Models and Experiments (Barnhart/Jiang)
4. Looking Ahead (All)- Discussion of Research Directions

Published in Year Ending 10/2006

Program Objective: Produce authoritative research

- Number of academic ^{reports} papers/ books published in year ending 10/2005: 27
- Examples:
 - Ball, Michael, Barnhart, Cynthia, Nemhauser, George, and Odoni, Amedeo, "Managing Air Traffic and Airline Operations for Schedule Reliability," Operations Research Handbook on Transportation, Gilbert Laporte and Cynthia Barnhart (co-editors), Dec.2005.
 - Barnett, A. "Global Passenger-Mortality Risk Decreased Substantially in Accidents From 2000 to2005" *Flight Safety Digest* (Flight Safety Foundation; January-February 2006)
 - Davison Reynolds, H., Reynolds, T. G., & Hansman, R. J. "Human Factors Implications of Continuous Descent Approach Procedures for Noise Abatement in Air Traffic Control" , *Air Traffic Control Quarterly*, Vol. 14(1) 25-45, 2006.
 - Gittell, J.H., Cameron, K., Lim, S., and Rivas, V. (2006). "Relationships, Layoffs and Organizational Resilience: Airline Responses to the Crisis of September 11th," *Journal of Applied Behavioral Science*, 42(3).

The Link to Industry in 2006

- Approximately 48 visits to companies by members of the Program
- Approximately 28 companies supplying data for research activities of the Program
 - Amadeus, S.A., American Airlines, JetBlue, United Parcel Service (UPS), Lufthansa German Airlines, Finnair, Air Canada, Air Transport Association, Massachusetts Port Authority, International Civil Aviation Organization (ICAO)
- Approximately 30 presentations to industry associations or groups by members of the Program
- Approximately 5 articles in industry trade journals

The Link to Government and Media in 2006

- 8 presentations or testimony given to government agencies or committees
 - Program members viewed as “objective” observers of the air transport industry
- Approximately 16 requests for assistance from government organizations
- Approximately 6 articles or reports about the Program’s work appearing in the news media
- Program members quoted approximately 60 times this year
- Over 100 press inquiries over the past year

Awards and Honors Received this Year

- Prof. Jody Hoffer Gittell won the Best Book Award for The Southwest Airlines Way, Sloan Industry Studies Program Annual Conference, Alfred P. Sloan Foundation, December 2005
- Prof. Amedeo Odoni was chosen to receive an Honorary Ph.D. from the Athens University of Economics and Business in a ceremony to take place on October 16, 2006.
- Prof. Cynthia Barnhart received the 2005 Women in OR/MS Award for the Advancement of Women in OR/MS, INFORMS Annual Meeting, San Francisco, CA, November 13-16, 2005.
- PhD graduate Dr. Hai Jiang was the 2006 AGIFORS Anna Valicek Medal winner for his dissertation entitled, “Dynamic Airline Scheduling: Models, Algorithms and Experiments”
- Prof. R. John Hansman presented the Dryden Lecture for American Institute of Aeronautics and Astronautics (AIAA) on “The Impact of Information Technologies on Air Transportation”.

Sources of Program Funding for 2006

1. Sloan Foundation

2. Industry

- 7 members in the MIT Airline Industry Consortium
- 8 international airlines in the MIT PODS Revenue Management Research Consortium
- Annual gifts from Amadeus, S.A. and Jeppesen Systems
- United Parcel Service
- Draper Laboratory

3. Government

- NASA
- FAA

MIT Airline Industry Consortium

- Consortium of major industry stakeholders:
 - Contribute to forward-looking research agenda for the entire industry
 - Form an academic/industry partnership for strategic airline industry research
 - Gain access to MIT student interns and graduates of our aviation programs
 - Participate in continuing education workshops
- Current members of the Consortium:
 - Air Transport Association, Amadeus SA, Boeing Commercial Airplanes, JetBlue Airways, Lufthansa, Jeppesen Systems, Federal Aviation Administration

Morning Agenda

0845 Introduction (Barnhart)

Update on Global Airline Industry Program Activities

Today's Agenda and Objectives

0905 Update on Recent Airline Industry Trends (Hansman)

0930 Airline Pricing and Revenues (Belobaba)

Competitive Fare Analysis in US Domestic Markets (Belobaba)

Modeling the Choice of Airline Itinerary and Fare Product (Carrier)

Funding of Aviation Infrastructure (Karlsson/ Odoni)

1020 *BREAK*

1050 Airline Operating Costs and Productivity (McKersie)

Convergence of Legacy and LCC performance (Tsoukalas/ Swelbar)

Low Cost Competition in the Global Airline Industry: Implications for Employment Relations (Gittell)

Update on Airline Labor Relations (McKersie)

1140 Some Recent Issues in Airline Security (Barnett)

1200 Lunch

Afternoon Agenda

1300 Dealing with Infrastructure and Capacity Constraints (Odoni)

Investigation of the Scalability of Air Transportation Networks (Bonnetoy)

Air Traffic Flow Management under Uncertainty (Hanowsky)

The Impact of Flat Airport and Navigation Charges (Schorr)

Adaptation in Response to Capacity Constraints (Mozdzanowska)

1400 Developing World Aviation Issues (Hansman)

India and China Infrastructure Needs (Hansman)

Aviation Safety in Developing Countries: A Statistical Profile (Barnett)

1430 *BREAK*

1450 Airline Operations and Scheduling Research (Barnhart)

Assessing Delay Propagation in Airline Plans (Cohn)

Dynamic Airline Scheduling Models and Experiments (Barnhart/ Jiang)

1530 Looking Ahead: Discussion (All)

Discussion of Research Directions

1600 *ADJOURN*