The National Center of Excellence

For Aviation Operations Research

The National Center of Excellence for Aviation Operations Research

Program Overview

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NEXTOR Program Overview

- Vision and strategic goals
- NEXTOR Aviation Operations Research
  - Assets NEXTOR brings to the JPO
  - Core research overview
  - Summary

Vision, strategic goals and structure

- To lead the aviation community by advancing new ideas and paradigms for aviation operations, educating and training aviation professionals, and promoting knowledge exchange among industry, government, and academic leaders
  - Continue to build on our strong base of collaborative research and innovative thinking that will address critical needs in the NAS
  - Increase the breadth of aviation operations research knowledge through short courses and degree programs at each of the NEXTOR universities
  - Sponsor frequent conferences and seminars among the senior leadership of the aviation industry, government, and academia
- Structured to allow for flexibility in research efforts
  - Consortium formed in 1996 and now includes five core universities
  - Includes many affiliated universities and research institutions
  - Additional contributions provided by industry partners

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NEXTOR Aviation operations research

Assets NEXTOR brings to the JPO

Core Expertise and Current Projects

Summary

Assets NEXTOR Brings to the Joint Planning Office

- Academic prowess and industry experience
  - US News and World Report Graduate School Rankings
    - Engineering Schools: MIT #1, UCB #3, UMD #16
    - Schools of Business: MIT#4, UCB #7
    - Aerospace Engineering: MIT #1, UMD #10
    - Civil Engineering: UCB #1, VPI #12
  - Focused core of faculty concentrating on aviation issues but with the flexibility to bring in ideas from other industries and fields of study
    - Brings together 10 core faculty members representing collectively over 150 person-years of aviation-related research
    - Including distinguished group of economists with Nobel Prize winners at both the University of California and George Mason University
  - Inclusion of former FAA senior manager as a co-director allows for a unique perspective in establishing research priorities

Assets NEXTOR Brings to the Joint Planning Office

Continued

- Ability to bring the foremost students in the world to work with researchers on aviation issues and analyses
  - Allows FAA to tap the best young minds for tomorrow's challenges
  - Structure of NEXTOR allows students to continue their FAA-related research career through post-doctoral positions at NEXTOR universities
  - Extensive record of graduates moving into academic and industry positions in support of FAA
- Ability to provide high-value, unbiased and low cost assessments and advice to the JPO
  - Commitment to academic excellence versus program growth
  - Substantial majority of researcher salaries funded by universities
  - Working with a very small non-research professional staff

NEXTOR Core Research Expertise

- Expertise and focus areas include the following
  - Aviation system economics
    - Includes cost/benefit trade-offs and including the use of economic methods and policies to drive improved utilization of the NAS
  - Performance metrics development and evaluation
    - Assessment of system and component performance in the NAS
  - Traffic Flow Management
    - Developing new ideas for air traffic operations to improve system efficiency, particularly during conditions of uncertainty (e.g. weather, unexpected maintenance)
  - Human factors in aviation
    - Studies relating to human decision making in the NAS environment, and interaction between humans and automatic control systems
  - Aviation safety
    - Analyzing policy measures and technologies aimed at enhancing aviation safety

Current collaborative NEXTOR research

- NEXTOR projects conducted jointly among core members of the NEXTOR consortium
  - Support for Collaborative Decision Making project (All schools)
  - Strategic Decision Support System – Strategy Simulator (All schools)
  - Metrics analysis and development in support of the Free Flight Program Office (UCB and Virginia Tech)
  - Analysis of the Air Transportation Oversight System (UCB and MIT)
  - Target System Description / Boeing equipage (MIT, UCB, VPI, and GMU)
  - Comprehensive investment analysis in the FAA Terminal Business Services environment (UCB and VPI)

Examples of other current NEXTOR research

- Enabling infrastructures
  - Evaluating the benefits of elements of an existing system that are conducive to a series of activities that may be beyond those for which the elements or components were originally designed
- ATM Tools - Dynamic Density
  - Examines the relationship between underlying airspace structure and the complexity of controlling an ATC situation
- Human Factors Considerations in Future Oceanic Systems Including ADS
  - Examines human factors considerations as new systems are deployed in the oceanic environment

Summary

- NEXTOR's vision
  - To lead the aviation community by advancing new ideas and paradigms for aviation operations, educating and training aviation professionals, and promoting knowledge exchange among industry, government, and academic leaders
- NEXTOR's assets for the Joint Planning Office
  - Academic prowess and industry experience
  - Ability to bring the foremost students in the world to work with researchers on aviation issues and analyses
  - Ability to provide high-value, unbiased and low cost assessments and advice to the JPO
- NEXTOR's core research expertise
  - Aviation system economics
  - Performance metrics development and evaluation
  - Traffic flow management
  - Human factors in aviation
  - Aviation Safety

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Additional Information (Back-up slides)

NEXTOR Organization

- Managed by an Executive Committee composed of one Co-Director from each of the five NEXTOR universities
  - Dr. Michael Ball, University of Maryland
  - Dr. Arnie Barnett, Massachusetts Institute of Technology
  - Dr. George Donohue, George Mason University
  - Dr. Mark Hansen, University of California, Berkeley
  - Dr. Toni Trani, Virginia Tech
- Responsibilities of the Executive Committee
  - Provide strategic direction for the consortium
  - Respond to requests for research or educational services
  - Provide oversight for the NEXTOR Program Office

NEXTOR Program Office
University of California

- Provides program office support to the five universities that comprise the NEXTOR consortium
  - Includes organizational structure, management and operations for NEXTOR
  - Provides “single face to the customer” for all NEXTOR administrative and operational issues
  - Enhances outreach efforts from NEXTOR to the aviation operations community
  - Generates interest in aviation operations research among university students and researchers
  - Facilitates communication between researchers and potential project sponsors for all five NEXTOR universities

Knowledge Transfer Initiatives - NEXTOR Conferences and seminars

- Near-term NEXTOR conferences and seminars
  - University of California - Aviation System Performance and Evaluation - 27-30 January 2004
  - Social and Economic Value of Air Transportation" will be the week of March 29 - April 2, 2004
  - Supporting participant in the annual Sloan Airline Industry Conference
  - George Mason University and University of Maryland - National Airspace System Economics - Spring 2004
- Recent NEXTOR conferences and seminars
  - Boeing Current Market Outlook presentation to the FAA – 11 Sep 2003
  - Virginia Tech - Air Traffic Management and Control - 2-4 June 2003
  - Massachusetts Institute of Technology - 28 August, 2002 - Aviation and the Environment - Friends or Foes?
  - University of California - 20 - 22 November 2002 - Performance Measurement and Analysis
  - University of Maryland and George Mason University - National Airspace System Resource Allocation: Economics and Equity - 19-20 March 2002

Education Initiatives - NEXTOR short courses for industry

- Near Term Short Courses
  - University of California - Performance Measurement and Metrics
  - Virginia Tech - Topics in Air Transportation Systems Analysis
- Recent short courses
  - MIT - Airline industry management and operations
  - University of Maryland - Economics of the National Airspace System
  - Virginia Tech - Analysis of Air Transportation Systems

NEXTOR Administrative Points of Contact

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