



Federal Aviation Administration  
Air Transportation



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# Centers of Excellence



GOVERNMENT • ACADEMIA • INDUSTRY  
PARTNERSHIPS

***THE NATIONAL CENTER OF EXCELLENCE FOR AVIATION OPERATIONS RESEARCH***

*Francisco Estrada C.  
FAA Program Manager  
francisco.estrada@faa.gov*

# NEXTOR – Program Overview



- HISTORY
- PURPOSE
- THE NEXTOR TEAM
- BENEFITS TO THE AVIATION COMMUNITY





# History and Purpose



- 
- **June 26, 1996, four universities form the nucleus of NEXTOR**
    - **University of California Berkeley (UCB)**
    - **Massachusetts Institute of Technology (MIT)**
    - **University of Maryland at College Park (UMD)**
    - **Virginia Polytechnic Institute (VPI)**
  - **George Mason University becomes full partner 2003.**
  - **Advance aviation research and technology in mission critical areas and to strengthen the FAA's partnerships with the academic community and industry.**
  - **Support Congressional interests to broaden universities capabilities in developing pool of talented research scientists and engineers.**



# The NEXTOR Team Partners



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**University of California at Berkeley**

**Massachusetts Institute of Technology**

**George Mason University**

**University of Maryland**

**Virginia Polytechnic Institute**

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## **Industrial Partners (15)**

**Boeing  
California Department of Transportation  
Draper Laboratory  
Federal Express  
Honeywell  
Leigh Fisher Associates  
Logistics Management Institute  
Maryland Aviation Administration  
MASSPORT  
Metron  
Sabre DT  
Seagull Technology  
SCAG  
TASC  
Virginia DOT**

## **University Affiliates (11)**

**Air Force Institute of Technology  
Embry-Riddle Aero. University  
Naval Postgraduate School  
Princeton University  
SUNY at Buffalo  
Rensselaer Polytechnic Institute  
U. of Michigan  
U. of Minnesota  
U. of Rochester  
U. of Southern California  
U. Texas at Austin**



# Benefits to the Aviation Community



- 
- **FAA** increases its access to forward-looking aviation research from leading universities.
  - **Universities** enlarge their technical capabilities and create greater academic opportunities for its students, faculty, and partners.
  - **Industry** the opportunity to participate in developing or adopting new technologies.
  - All gain insights to improve their operational efficiencies and profitability.
  - All benefit from creating highly skill aviation professionals and future leaders for the NAS.

# Benefits to the Aviation Community



**Oct. 20, 2003, Dr. Thomas Vossen was awarded First Place in the INFORMS 2003 Transportation Science Dissertation Prize**

**His dissertation title is, “Fair Allocation Methods in Air Traffic Management”**



# NEXTOR

*\* Research \* Education  
\* Knowledge Transfer*



- **THE NEXTOR ORGANIZATION**
- **VISION**
- **STRATEGIC GOALS**





# The NEXTOR Organization



- 
- **Sponsored by Norm Fujisaki, ASD-2, Office of System Architecture and Investment Analysis**
  - **Managed by an Executive Committee composed of one Co-Director from each of the five NEXTOR universities.**
    - **Dr. Michael Ball, University of Maryland**
    - **Dr. Toni Trani, Virginia Tech**
    - **Dr. Mark Hansen, University of California, Berkeley**
    - **Dr. Arnie Barnett, Massachusetts Institute of Technology**
    - **Dr. George Donohue, George Mason University**
  - **Program Office located at UCB and provides support to the five universities.**



## NEXTOR's VISION

*Research \* Knowledge Transfer \* Education*

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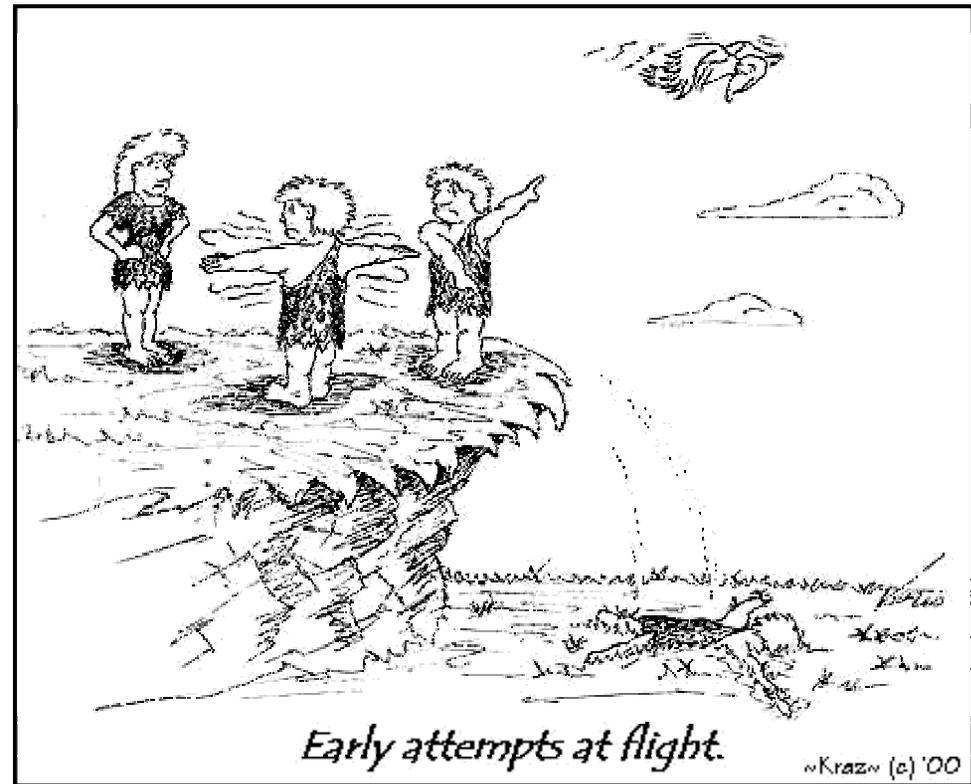
***“ To be recognized as a leader in the field of Aviation Operations Research through advancement of aviation technology, knowledge transfer between government, industry, and academia, and education and training of aviation professionals.”***

# NEXTOR – Strategic Goals

**\*Research \*Education \*Knowledge  
Transfer**



- **Research**: Develop and maintain a stable research program that distinguishes NEXTOR as a source of high-quality, value-added aviation research.
- **Education**: Provide educational opportunities for students and professionals who are or may become the leaders in the aviation community.
- **Knowledge Transfer**: Conduct training for the aviation community that reinforces the view of NEXTOR as the leader in aviation operations research.



- **SURVEY FINDINGS**
  - **VALUE TO FAA**
  - **OF MORE VALUE**
  - **PRODUCTS AND /SERVICES**
  
- **CURRENT ACTIVITIES**
  - **RESEARCH**
  - **EDUCATION PROGRAMS**
  - **KNOWLEDGE TRANSFER**



Mark Garfinkel / Boston Herald



# WHAT MAKES NEXTOR VALUABLE TO THE FAA.

## Managers' Perspectives Survey 8/03



- **Independent thinking from some of the country's brightest individuals.**
- **A good means to fund critical research in a responsive way with a faster turn-around.**
- **Provides alternative views that add value to enhance our research and goals**
- **Solid provider of analytical research for complex problems having multi-dimensional implications.**
- **Serves to educate future aviation professionals for careers in aviation.**
- **Brings new techniques outside of aviation to research aviation issues.**



# WHAT WOULD MAKE NEXTOR MORE VALUABLE TO FAA?



## Managers' Perspective Survey 8/03

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- **Maintain currency on aviation issues in order to be responsive and serve as a valuable broker between government, industry, and academia.**
- **Identify additional partnership opportunities with industry and co-funding arrangements with industry**
- **Continue improving quality of NEXTOR conferences.**
- **Assist FAA in managing the information overload that challenges the decision making process.**
- **Provide fresh new ideas for new operating paradigms, technologies, and transportation policies.**
- **Plan for self-sufficiency by 2006.**



## **SOME OF THE MOST VALUABLE PRODUCTS/SERVICES PROVIDED TO DATE? Manager's Perspectives Survey 8/03**



- 
- **Developed new techniques for normalizing delay for weather and traffic demands.**
  - **Improved analysis of voice tapes for the CPDLC Investment Analysis.**
  - **Developed new statistical analysis for non-normal distributions.**
  - **Created Queuing models for terminal delays.**
  - **Provided access to industry support (TASC-Northrop Grumman)**
  - **Excellent support to FAA's Global Aviation Information Network program.**



- 
- **Mission to conduct research that drives improvements in the NAS and advances aviation technology**
  - **Research focus areas include the following:**
    - **Aviation system economics**
    - **Performance metrics and measurements**
    - **Traffic Flow Management**
    - **Aviation safety**
    - **Aviation security**
  - **Conduct other aviation system research as appropriate**

# NEXTOR RESEARCH HIGHLIGHT FY03



University of Maryland – NEXTOR  
Researchers celebrate their win for Best  
Paper in *Traffic Flow Optimization* in 5<sup>th</sup>  
USA/Europe R&D Seminar





# NEXTOR – Current Research for FAA



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## “WHAT NEXTOR BRINGS TO THE TABLE...”

- **Strategic Decision Support System “Strategy Simulator,” ASD-400**
- **Louisville Area Navigation Development – Quieter landings, AEE-200**
- **Analytical Support for the Free Flight Program Office, AOZ-40**



# NEXTOR – Current Research for FAA



- 
- **Analytical support for the Global Aviation Information Network (GAIN), ASY-10**
  - **The Health of an Air Carrier from the Perspective of Safety, AAR-490**
  - **Case Study for the 7e7 and Target System Description, ASD-100**
  - **Additional info on current research at: [www.nextor.org](http://www.nextor.org)**



# Education Initiatives – NEXTOR

## Short Courses for FAA & Industry



- **100+ FAA employees, industry partners, and contractors have taken short courses offered by NEXTOR.**
- **Recent Short Courses IN 2003:**
  - **Equity and Fair Resource Allocation in ATM, May 14-15, 2003 (UMD)**
  - **Analysis of Air Transportation System, June 9-12, 2003 (VPI)**
  - **The Airline Industry Management & Decision Making, July 23-24, 2003 (MIT)**
- **Future Short Courses for FY 2004:**
  - **Performance Measurements and Metrics - Spring**
  - **Topics in Air Transportation Systems Analysis – Summer**



# NEXTOR – Knowledge Transfer Initiatives



- 
- **Recent Conferences & Workshops 2002/2003:**
    - **Air Traffic Management and Control, June 2-4, 2003 (VPI)**
    - **Performance Metrics Workshop, November 20-22, 2002 (UCB)**
    - **NAS Capacity and the Environment August 28, 2002 (MIT)**
    - **NAS Resource Allocation: Economics and Equity, March 19-20, 2002 (GMU/UMD)**
  
  - **Future Conferences & Workshops for FY 2004:**
    - **Aviation System Performance and Evaluation Conference, January 27-30, 2004**
    - **National System Economics Conference, March 2004**



# NEXTOR'S NEXT FIVE YEARS



- 
- **Continue leveraging NEXTOR's strategic goals.**
  - **Expand research in several key areas:**
    - **Investigate capacity constraints and potential economic solutions for the National Airspace System.**
    - **Develop new performance metrics to improve NAS operations and safety.**
    - **Develop new economic modeling and simulation tools to better understand how changes to the NAS environment affects NAS users and providers.**
  - **Education and knowledge transfer**
    - **Expand training programs and conferences to the aviation community.**
    - **Provide resources to students enabling them to enter the industry with the best capabilities, knowledge, and experience.**