Integrated Communications, Navigation and Surveillance Technologies Keynote Address

April 27, 2004
Outline

• NASA Vision
• National Space Exploration Initiative
• Current Mars Exploration
• Aeronautics Exploration
NASA’S Vision

• To improve life here
• To extend life to there
• To find life beyond

NASA’s Mission

• To understand and protect our home planet
• To explore the universe and search for life
• To inspire the next generation of explorers
  …as only NASA can
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President’s Vision for U.S. Space Exploration

New Space Exploration Vision

“This cause of exploration and discovery is not an option we choose; it is a desire written in the human heart.” – President Bush

January 14, 2004
On January 14, the President announced a new space exploration vision for NASA

- Implement a sustained and affordable human and robotic program to explore the solar system and beyond;

- Extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations;

- Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about the destinations for human exploration; and

- Promote international and commercial participation in exploration to further U.S. scientific, security, and economic interests.
Outline

- NASA Vision
- National Space Exploration Initiative
- **Current Mars Exploration**
- Aeronautics Exploration
Sleepy Hollow Depression
(Day 1 from Spirit)

Dark marks are where airbags bounced on the soil during landing.
Our Deepest Hole on Mars!
Meridiani Plains

Opportunity Dug this 6 inch deep Trench On Mars. White is compacted soil.
Spirit Rover Traverse – Bonneville Crater (Sol 65)
Outline

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• Aeronautics Exploration
To pioneer and validate high-payoff aeronautical technologies

To improve the quality of life
To enable exploration and discovery
To extend the benefits of our innovation throughout society.

Our success is measured by the extent to which our results are used by others to improve the quality of life and enable exploration and scientific knowledge.
## Recommendations Matrix

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Click here to play movie
Some of Today’s Challenges

- Limits to capacity - U.S. aviation system is approaching gridlock.

- Noise and emissions are constraints on aviation growth.

- Security and safety must be maintained.
Characteristics of the Future

- Consumers will have lower cost choices for their travel and shipping needs
- Passengers moving through security without delay
- Low cost jets will make private ownership and on-demand service more feasible
- Aircraft will become so environmentally friendly that communities will vie for airports
- Travelers and shippers will take on-time performance for granted
Transformation is required

• Transformation is technologically-enabled change to the system to meet conflicting requirements or to reverse trends
• For example, consider that we need to…
  – Increase ATM productivity while increasing the scalability of the system to handle greater complexity and density of aircraft flows with no degradation for most IMCs
  – Reduce seat-mile costs for small aircraft to allow market-driven penetration of smaller community markets while reducing net fleet environmental impact.
  – Increase airport productivity and efficiency for travelers and shippers while increasing airport security.
Joint Planning and Development Office Coordination

- Joint Planning and Development Office (JPDO)
  - Objective - transforming the Air Transportation System by
    - Developing a National Plan, including a transition roadmap and action plan
    - Developing and implementing government-industry partnerships
    - Coordinating international harmonization of transformation plans and programs
    - Aligning policy and programs across agencies
    - Measuring and reporting on progress toward the National Plan
  - Participating Organizations
    - Federal Aviation Administration
    - NASA
    - Department of Defense
    - Department of Homeland Security
    - Department of Commerce
    - Office of Science and Technology Policy
The Stage is Set for Transformation

National Plan (Transformation)

- Low Wake Quiet Jets
- Increased Mini-Jets
- 4-D Tubes
- RPV
- Satellite CNS Services
- Increased Small & Rural Airport Utilization
- Control by Exception
- Smart Automated Airports
- Transparent Screening
- Near All-Weather Capability
- ATM Center
- Passenger Transportation Network
- Weather Network
- Airborne Network
- Sense and Avoid
Implications for Policy

• Engineering the system to:
  – increase airport capacity in all weather conditions
  – strategically and tactically manage higher volumes and more complex traffic flows

• Incentivizing investment in equipage, infrastructure and training

• Understanding and resolving issues associated with alternative operational roles for pilots, controllers and others

• Regulatory action for new vehicles

• Changes in services effecting trust fund profile – e.g., more on-demand flights
Goal:
Enable major increases in the capacity and mobility of the air transportation system through development of revolutionary concepts for operations & vehicle systems

Objectives:
• Improve throughput, predictability, flexibility, collaboration, efficiency, and access of the NAS
  – Enable general aviation and runway-independent aircraft operations
• Maintain system safety, security and environmental protection
• Enable modeling and simulation of air transportation operations
Airspace Systems
Strategic Technical Focus Areas

Efficient Traffic Flow — Improving the efficiency of individual aircraft operating within the National Airspace System (NAS)

System – Wide Operations Technologies — Efficient operation of the NAS as an overall Nation-wide system with global interaction

Airspace Human Factors — Human interaction, performance and reliability in the design of complex airspace systems
Airspace Systems Baseline Roadmap

Efficient Traffic Flow
- Advanced Air Transportation Technologies
- Efficient Aircraft Spacing
- Efficient Flight Path Management
- Automated Air Traffic Management
- Airborne Autonomous Flight Management
- Unmanned Aerial Vehicle Operations
- Transitional Automated ATM
- Transitional Airborne Autonomous FM
- Transformational Airborne Automated ATM
- Transformational Airborne Autonomous FM

System-Wide Operations Technologies
- Small Aircraft Transportation System
- Virtual Airspace Modeling & Simulation
- Strategic Airspace Usage
- Space-Based Technologies
- System-Wide Information Management Technologies
- Seamless CNS Systems
- Weather Prediction/Forecasting Technology
- Transitional System-Wide Technologies
- Transformational System-Wide Technologies

Airspace Human Factors
- Human Measures and Performance
- Human/System Performance
- Transitional Human Factors
- Transformational Human Factors

Systems Evaluation and Engineering
- Technology Integration
- System-Level Concept Studies
- System Safety Analysis
- System Performance Economic Studies
- Technology Transfer Processes and Agreements
- Transitional Systems Engineering
- Transformational Systems Engineering

Current Projects
Near-Term Planned Activities
Mid-Term Activities
Far-Term Activities

Rev date: April 20
“There’s no question Traffic Management Advisor is a cost-beneficial investment. We’re seeing capacity increases of 3 to 5 percent. That might sound small, but consider this: In Minneapolis/St. Paul, that 5 percent capacity increase means 3,000 more passengers board their connecting flights. Three thousand may seem like a relatively small number. Unless, of course, you’re one of those 3,000.”

Marion Blakey
December 4, 2002
Identified candidate future Air Transportation System capacity-increasing operational concepts.

Selected concepts will be explored and leveraged to achieve NASA’s long-term capacity goals.

Utilized NASA Research Announcements to competitively involve external community.

Selected concepts range from system level to all of the specific domains, address all user classes, and span the gamut of human/automation control.

Airspace Systems
Major FY 05 Annual Performance Goals

• Complete experimental validation of SATS airborne systems
• Establish the fluid dynamics mechanism for alleviating wake through experimental and computational fluid mechanics studies
• Complete development of WakeVAS concept of operations and downselect WakeVAS architecture
• Complete human-in-the-loop concept and technology evaluation of shared aircraft separation
• Complete System-Wide Evaluation and Planning Tool initial simulation and field demonstration
The Wright brothers took humankind to our sky. Let us fully utilize and protect our sky and enable humankind to explore other skies.