

NASA Advisory Council
Aeronautics Committee Report

AGENDA

- Policy / Executive Order
- Stakeholder Outreach and Collaboration
- Fundamental Aeronautics Program (\$293M)
 - Link Between Aeronautics Research and Space Exploration
 - Mars Reentry
 - Thermal Protection Systems (TPS)
- Aviation Safety Program (\$74M)
- Airspace Systems Program (\$98M)
- Aeronautics Test Program (\$88M)



National Aeronautics R&D Policy

National Aeronautics Research
and Development Policy



December 2006

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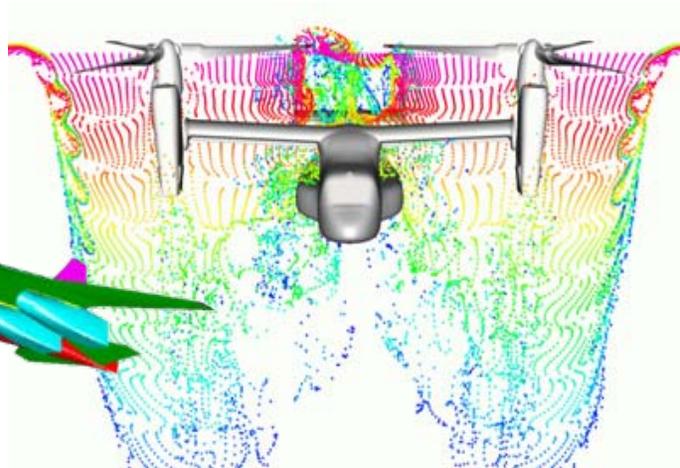
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Fundamental Aeronautics Program



Fundamental Aeronautics Program: Mission Statements

- ***Hypersonics***

- Fundamental research in all disciplines to **enable very-high speed flight** (for launch vehicles) and **re-entry into planetary atmospheres**
- High-temperature materials, thermal protection systems, advanced propulsion, aerothermodynamics, multi-disciplinary analysis and design, GNC, advanced experimental capabilities

- ***Supersonics***

- **Eliminate environmental and performance barriers** that prevent **practical supersonic vehicles** (cruise efficiency, noise and emissions, vehicle integration and control)
- Supersonic deceleration technology for **Entry, Descent, and Landing** into Mars

- ***Subsonic Fixed Wing (SFW)***

- Develop revolutionary technologies and aircraft concepts with highly **improved performance** while satisfying **strict noise and emission constraints**
- Focus on **enabling technologies**: acoustics predictions, propulsion / combustion, system integration, high-lift concepts, lightweight and strong materials, GNC

- ***Subsonic Rotary Wing (SRW)***

- Improve **competitiveness of rotary wing vehicles** (vs fixed wing) while maintaining their unique benefits
- Key **advances** in multiple areas through **innovation** in materials, aeromechanics, flow control, propulsion

Aeronautics Research and Space Exploration

NASA's aeronautics research has historically played and will continue to play a vital role in space exploration.

- Aerodynamics
- Aerothermodynamics
- Computational Fluid Dynamics
- Flight Dynamics and Control
- Materials & Structures
- Integrated Vehicle Health Management
- Human factors & Human/automation interface modeling
- Multidisciplinary Design Analysis and Optimization (MDAO)

All access to space and all entry through an atmosphere require travel through the hypersonic, supersonic and subsonic regimes.

Hypersonics: Thermal Protection System Research

- **The vast majority of *research* work in TPS is being funded by the Fundamental Aeronautics program. Development work funded by ESMD.**
- **Opportunities for collaboration with ESMD, SOMD, and SMD exist and are being pursued:**
 - **MSL 2009 MEDLI effort**
 - **Potential Shuttle DTO experiments in transition, TPS, catalytic effects**
- **Development of research plans in Hypersonics benefited from discussions and reviews with personnel from the Air Force**
- **A TPS Working Group (NASA, AF, industry) has been established and is looking at the possibility of establishing collaborative roadmaps for future work**

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Aviation Safety Research

Project Goals

Integrated Vehicle Health Management

Reduce system and component failures as causal and contributing factors in aircraft accidents and incidents.

Integrated Intelligent Flight Deck

Produce tools, methods, concepts, principles, guidelines, and technologies for revolutionary adaptive flight deck systems that improve safety.

Aircraft Aging and Durability

Detect, predict and mitigate or manage aging-related hazards for future aircraft.

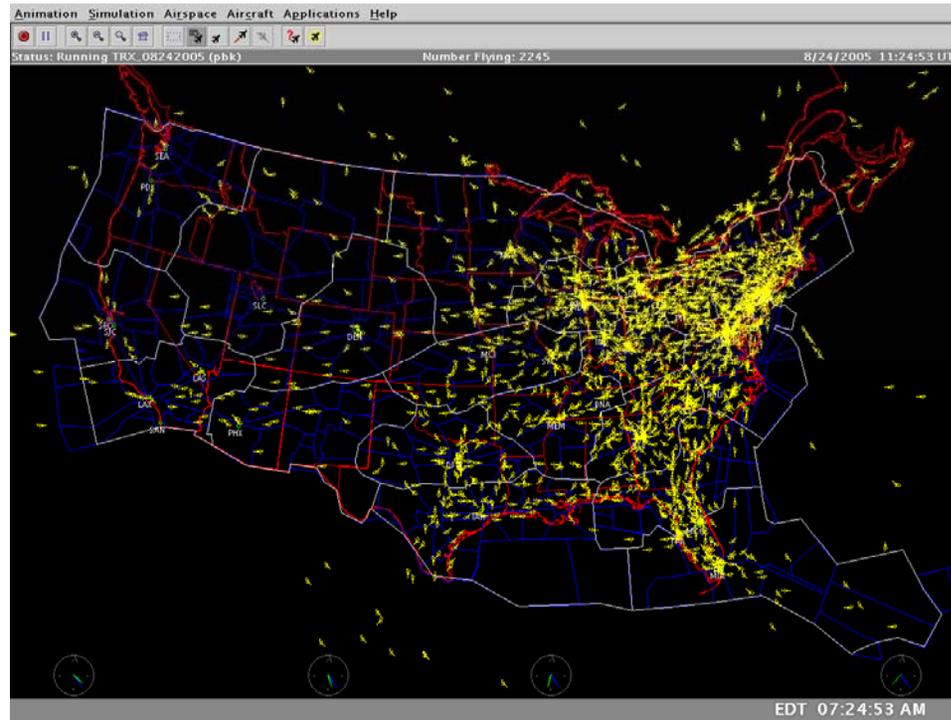
Integrated Resilient Aircraft Control

Provide onboard control resilience to ensure safe flight in the presence of adverse conditions.

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Airspace Systems Program



This animation was created using Future ATM Concepts Evaluation Tool (FACET) developed at NASA Ames Research Center. The data for September 6, 2001, was obtained from Volpe Center's Enhanced Traffic Management System (ETMS). It covers twenty four hours of traffic data, starting at 00:00Z (7:00 pm EDT, September 5, 2001) through 23:59Z (6:59 pm EDT, September 6, 2001), with each frame being, on average, three minutes apart. The display shows Air Route Traffic Control Center (ARTCC) boundaries in white, high altitude Sector boundaries in brown, and US State Boundaries in red. Each aircraft symbol represents an aircraft (not to scale) that filed a flight plan, including General Aviation aircraft. The total number of aircraft in the National Airspace System (NAS) considered by FACET at any instant of time is represented in the middle of status bar (at top).

Somewhere around 12:30Z (7:30 am EDT), there appears a vertical wall along the center of the country, east of which there is a multitude of aircraft, and west of which (4:30 am PDT), the day has not started for passengers. Proceeding from this time, the traffic gradually moves westward and ultimately the number of aircraft peak at about 4800!

NGATS ATM: Airportal Project

Address factors leading to an airportal where operators achieve maximum efficiency in the use of gates, taxiways, runways, approach airspace while balancing requirements such as safety and environment.

Airport Configuration and Arrival/Departure Balance

- Demand
- Weather
- Runway Length & Condition
- Noise and Emissions
- Airport Constraints
- Airline Preference
- Flow Direction
- Flight Schedule
- Airport Optimization Strategy

NGATS ATM: Airspace Project

Address demand/capacity imbalance problem in the most safe, equitable, and efficient manner.

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Aeronautics Test Program

Goals Of Corporate Management Of Facilities - ATP

- Increase the probability of having the right facilities in place at the right time for NASA's mission - over the long-term
- Operate those facilities in the most effective and efficient manner possible
- Ensure intelligent divestment of and investment in NASA's aeronautic test facilities as part of NASA's current and/or long-term mission

Elements of ATP

- **Aeronautics Ground Test Facilities**
 - Facilities Operations Support
 - Support for DoD Family Rates
 - Maintenance
 - Test Technology
 - University Research
 - Program Office Management
- **Flight Operations and Test Infrastructure**
 - Western Aeronautical Test Range
 - Support Aircraft
 - Test-Bed Aircraft
 - Loads Lab. And Simulators