



Airspace Systems Program

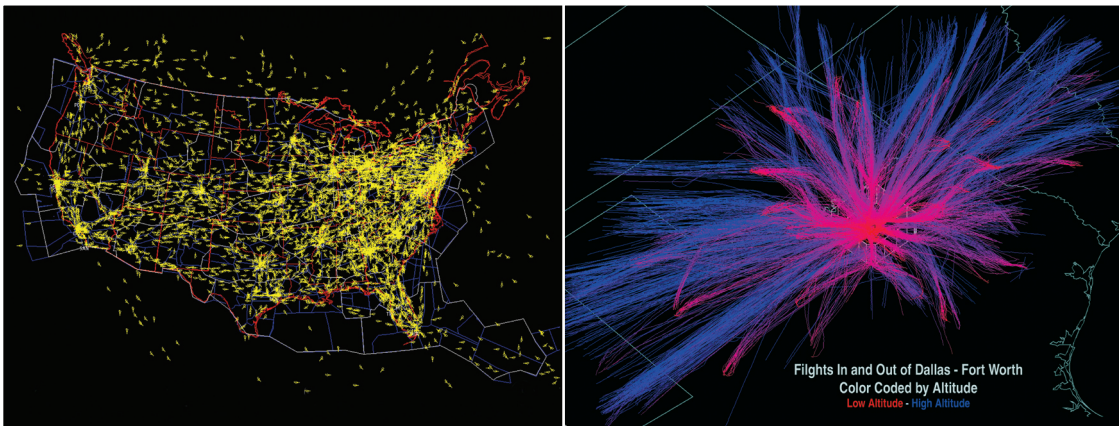
The Airspace Systems Program, part of NASA's Aeronautics Research Mission Directorate, develops revolutionary and affordable solutions for achieving dramatic increases in the capacity, efficiency and flexibility of the U.S. air transportation system.

NASA's airspace systems researchers work to prepare and adapt today's air traffic management system to accommodate increased demand safely and efficiently. They are a critical member of the U.S. government team creating the Next Generation Air Transportation System, or NextGen, by the year 2025.

Airspace Systems addresses challenges that impact the success of a highly complex and integrated transportation system:

- Reducing spacing distances between aircraft to increase traffic throughput without compromising safety;
- Efficiently allocating airspace resources in order to meet demand and reduce delays caused by weather;
- Increasing airport approach, surface and departure capacity;
- Improving the mobility of airport surface traffic;
- Defining appropriate roles for humans (notably air traffic controllers and pilots) in more automated processes;
- Developing automation solutions with which humans can reliably interact and, when necessary, override; and
- Developing automated separation assurance algorithms to increase airspace capacity.

NASAfacts



Images (Clockwise, left to right) **Future Air Traffic Management Concepts Evaluation Tool (FACET)**: A powerful computer simulation tool combines live air-traffic feeds and real-time weather data to display thousands of aircraft trajectories. **Performance Data Analysis and Reporting System (PDARS)**: Vividly displayed flight-track and flight-plan data help U.S. air traffic controllers monitor U.S. airspace and adapt to changing conditions. **Traffic Separation Tools**: New automation tools for aircraft flight decks and air traffic controllers will help more safely and efficiently adjust trajectories in a more crowded airspace.

RESEARCH AREAS

NextGen-Airspace Project

This project develops fundamental concepts and integrated solutions to define and assess allocation of ground and air automation concepts and technologies needed for the NextGen.

Researchers focus their expertise and world-class facilities on when, where, how, and the extent to which automation can more safely and efficiently move aircraft through U.S. airspace.

Major research challenges include:

- Increasing capacity through flexible, real-time allocation of airspace and controller resources;
- Allocating demand more effectively in the presence of uncertainty by managing departure times, modifying routes and adapting aircraft speeds;
- Increasing capacity by introducing more automation into separation management, scheduling sequencing, merging and spacing;
- Developing accurate predictions of aircraft trajectories that integrate seamlessly with aircraft flight management systems and that can be changed in the presence of uncertainty;
- Quantifying performance improvements that come from new in-flight technologies;
- Demonstrating the overall system-level performance of all NASA technologies; and
- Developing computer modeling and analysis tools that evaluate the overall impact of NextGen research.

NextGen-Airportal Project

Researchers in this project develop innovative solutions for improving mobility and increasing throughput in the airport and terminal areas to meet NextGen capacity needs. Gates, taxiways, runways and the airspace near the airport are the domains of NextGen-Airportal.

Because every airport is a unique environment, the project develops and evaluates computer-based tools and technologies to identify solutions that can be used at airports of different sizes and capacities.

Major research challenges include:

- Improving surface traffic operations to accommodate increased capacity;
- Maximizing the capacity of individual runways;
- Maximizing the capacity of multiple runways that interact with the airspace and taxiways;
- Minimizing runway incursion threats in all weather conditions;
- Exploring whether new aircraft approaches made possible by NextGen capabilities can increase airport throughput;
- Modeling and predicting the behavior of wake vortices—air pockets disrupted by aircraft while in flight—to help accommodate more aircraft in existing airspace;
- Balancing arrival and departure traffic management to handle increased capacity; and
- Balancing the need to improve capacity with the need to reduce environmental impact.

Both projects approach their challenges from the “big picture” system level. They share their results in order to ensure gate-to-gate solutions that meet the needs of the NextGen.

We're Working on...

Evaluating controller and pilot roles and responsibilities during simulations of automated separation assurance

Expanding traffic flow management concepts to improve weather model predictability and efficiency

Developing a new set of technologies and procedures to help solve problems in surface traffic planning and control, and in better balancing airport arrivals and departures

For more information about the Airspace Systems Program and NASA aeronautics research, visit www.aeronautics.nasa.gov/programs_asp.htm.

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