



SMALL AIRCRAFT TRANSPORTATION SYSTEM PROJECT

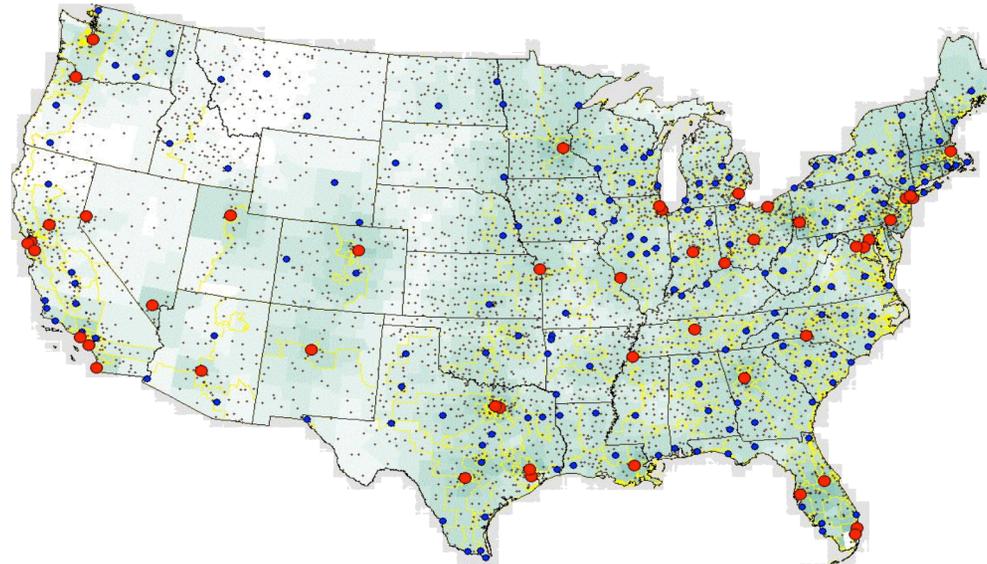
AVR SATS Briefing

December 10, 2003



SATS Purpose

Operating capabilities that could potentially enable people and goods to travel faster and farther, anywhere, anytime

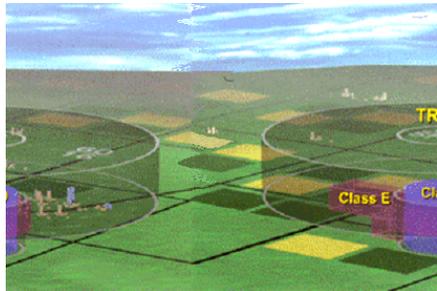


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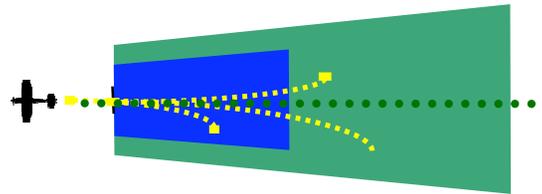
- **Small aircraft (4-10 passengers)**
- **Under-utilized rural and suburban airports, many having no radar or towers**

SATS - The 5-year Project

- The SATS Project is a R&T activity focused on four operating capabilities:



Higher Volume Operations



Lower Landing Minima



Single Pilot Performance



En Route Integration

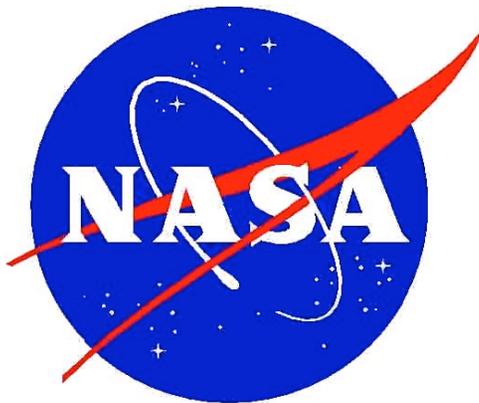
- **Project will**

- Develop and evaluate technologies to enable the four operating capabilities
- Demonstrate technical and operational feasibility of the four operating capabilities in an integrated flight demonstration
- Assess the technical, operational, and environmental impact of SATS operating capabilities on the NAS and the airport infrastructure

Government/Industry Partnership

The SATS Project is being conducted through a public-private partnership under a funded Space Act: Joint Sponsored Research and Development Agreement (JSRDA)

- Cost-sharing
- Influence, expertise, and capabilities, of partners
- Enhanced opportunities for technology transfer, technology infusion, information sharing, commercialization and certification



**National Consortium
for Aviation Mobility**

Freedom of Access Throughout America



National Consortium for Aviation Mobility

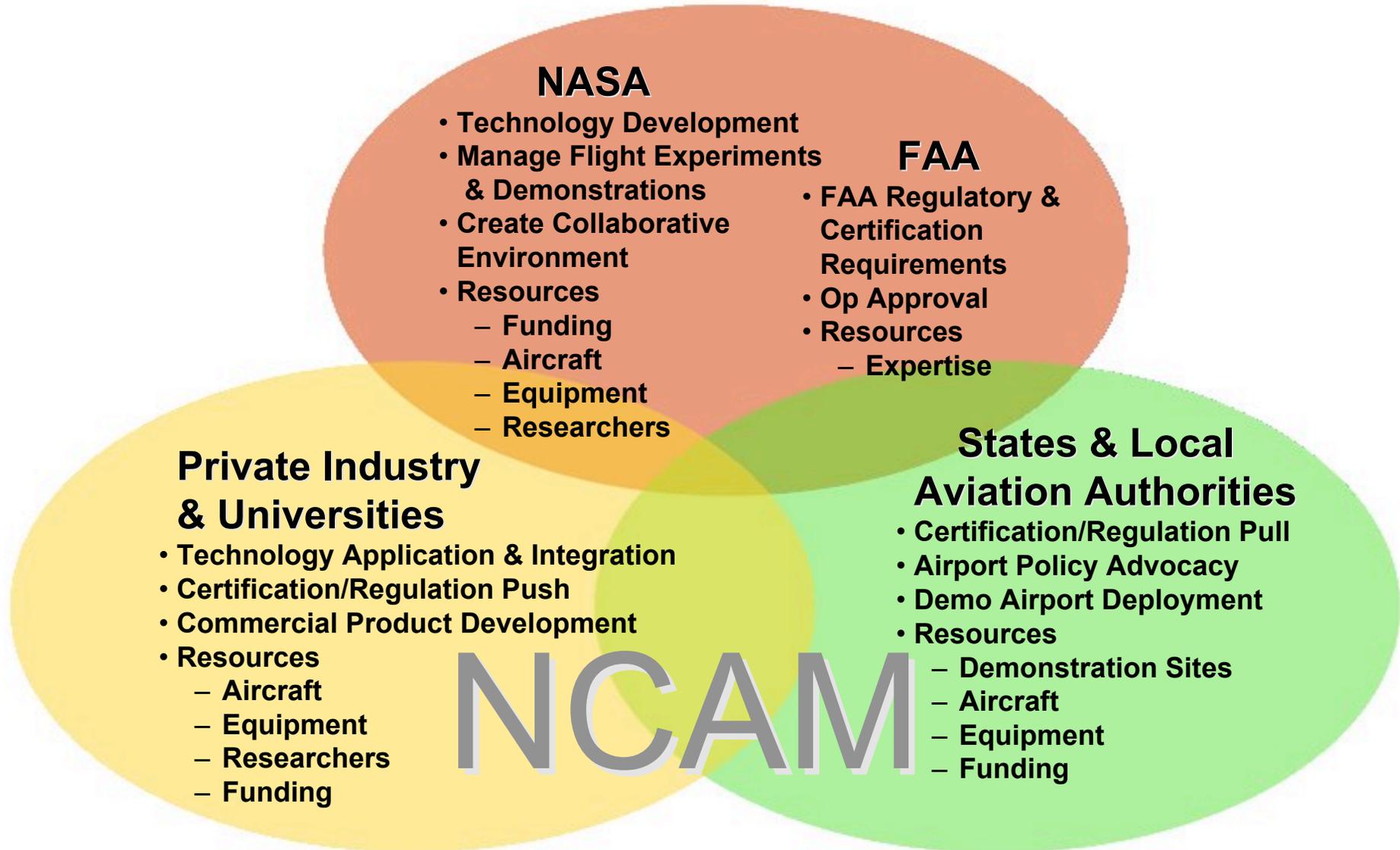
Freedom of Access Throughout America

- Maryland Mid-Atlantic SATSLab
(Univ of Maryland Research Foundation)
- North Carolina and Upper Great Plains SATSLab
(Research Triangle Institute)
- Southeast SATSLab
(Embry Riddle Aeronautical University)
- Virginia SATSLab
(VA Dept of Aviation)
- Michigan SATSLab
(Munro and Associates)

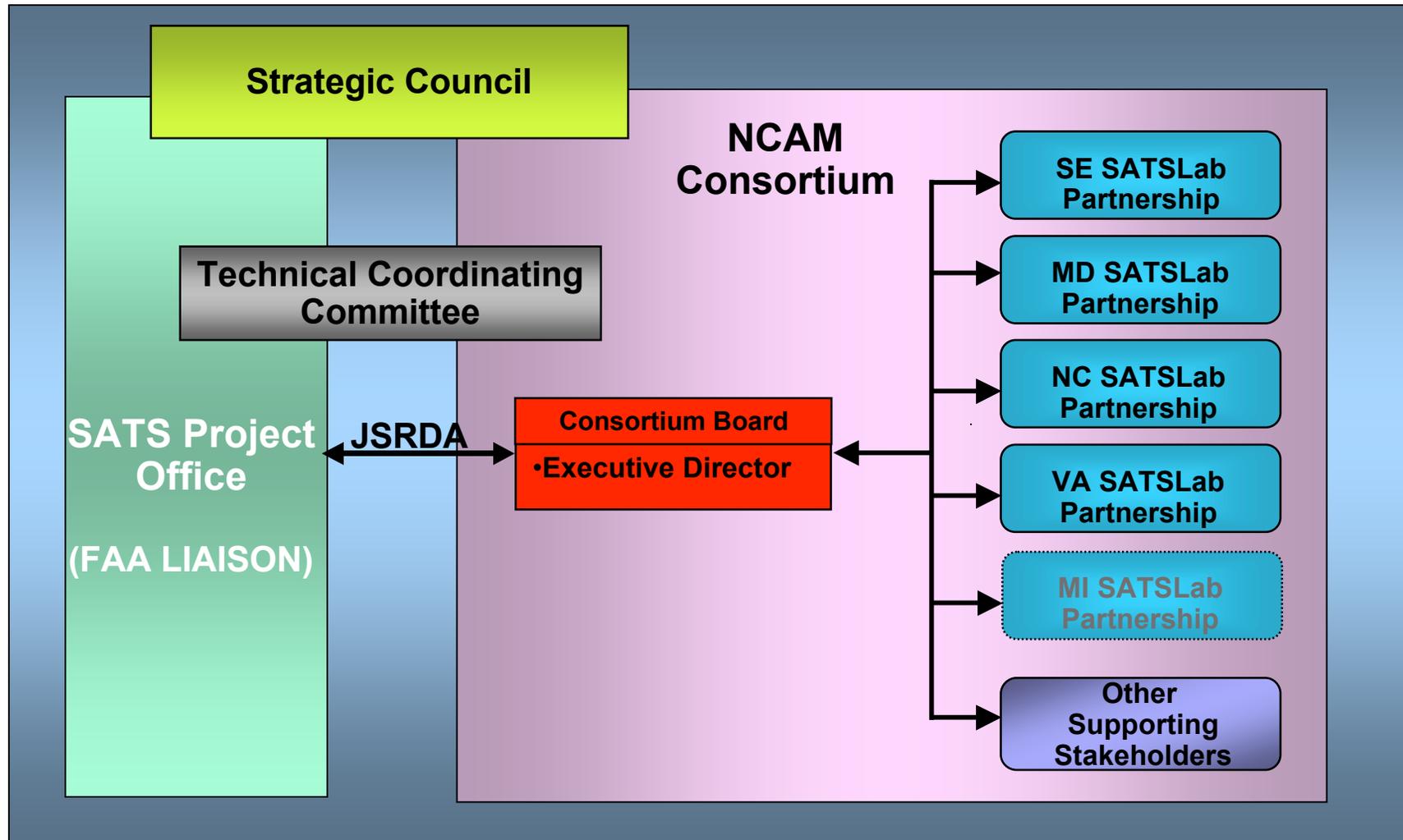
NCAM SATSLabs Consortia include 130 members (44 participating) from

- Universities and research institutes
- State /local aviation authorities
- Airframe manufacturers
- Avionics manufacturers
- Airport operators
- Transportation service providers

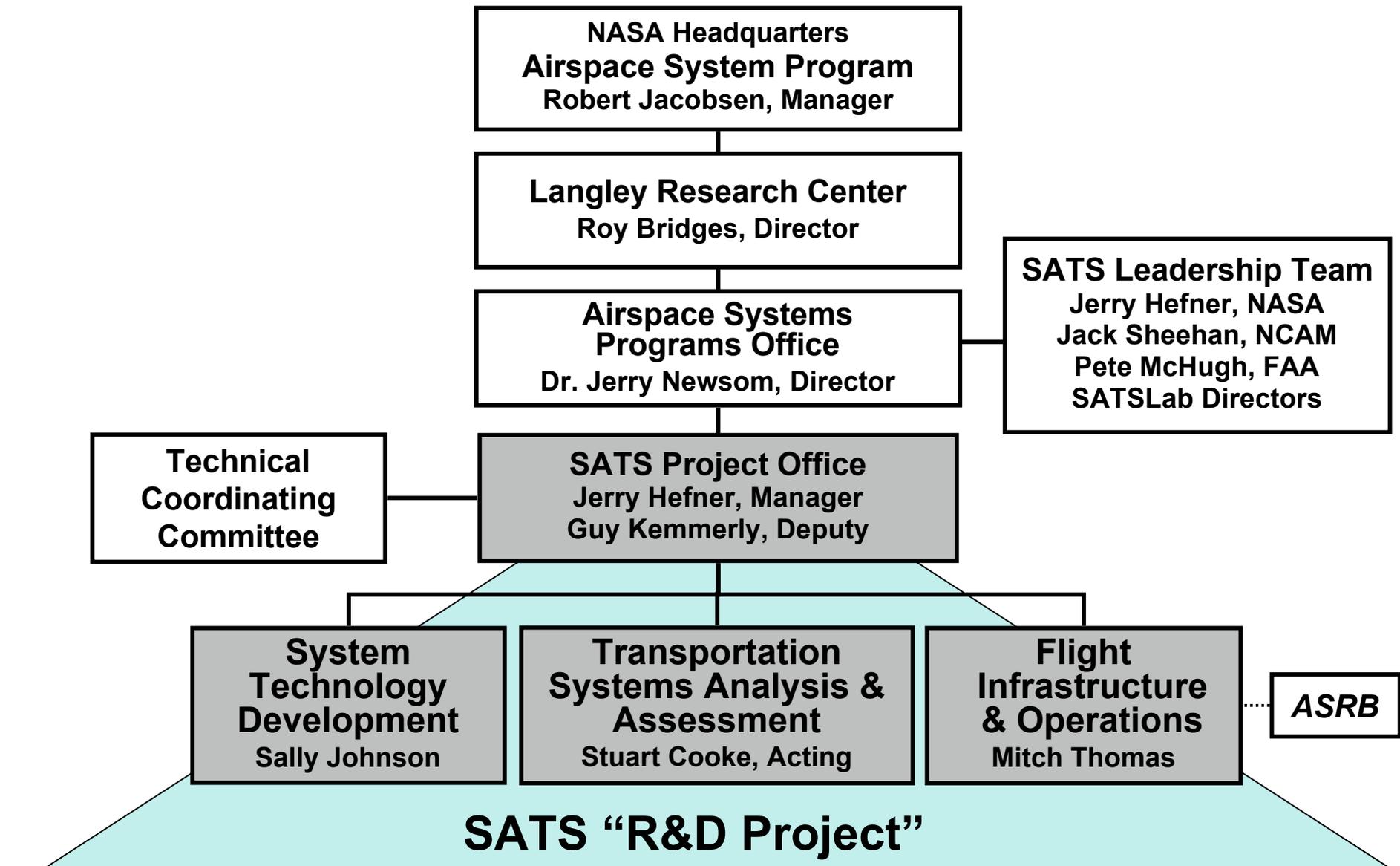
NASA / FAA and NCAM (SATSLabs) Contributions to SATS Project



SATS Government/Industry Partnership Structure



SATS Management Structure

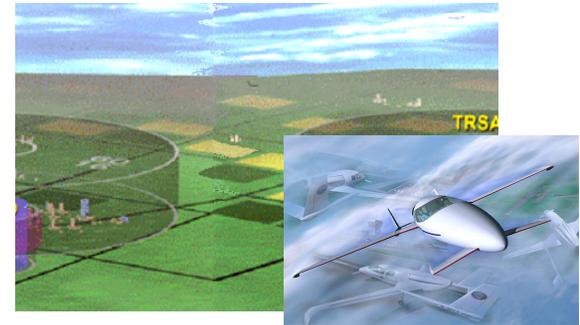


Research Elements of SATS Project

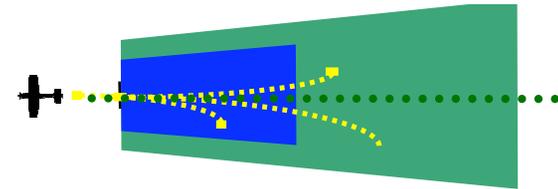
- **Systems Technology Development, STD** (research & development)
 - Technology, concepts, and algorithm development
 - Technology integration and evaluation
 - Technology demonstration
- **Flight Infrastructure and Operations, FIO** (flight testing)
 - Ground and flight infrastructure
 - Operation of research aircraft
 - Aircraft equipage
- **Transportation Analysis and Assessment, TSAA** (analyses)
 - Transportation systems engineering analyses
 - Technology assessments
 - Operating capability impact analyses and assessments

SATS Operating Capabilities

Higher Volume Operations in Non-Radar Airspace and at Non-Towered Airports



Lower Landing Minimums at Minimally Equipped Landing Facilities



Increase Single-Pilot Crew Safety & Mission Reliability



En Route Procedures & Systems for Integrated Fleet Operations





Transportation Systems Analyses and Assessments



- Benefits and Impact Analyses
 - Modeling/methods to enable assessments of technical, operational, environmental and economic benefits of SATS operating capabilities and technologies
 - Impact and benefits assessments associated with implementation of SATS operating capabilities including technical, operational, and environmental issues
- Operating Capability and Mobility Goals
 - Transportation mobility assessments that detail progress towards the NASA OAT Mobility Goal as a function of the SATS operating capabilities.
- Technology Assessments
 - Comprehensive technology assessments for the four SATS operating capabilities
- Gap Analyses and Technology Roadmap for follow-on R&T



2005 Technology Demonstration

- **Flight demonstration** of the 4 SATS operating capabilities and enabling technologies and procedures in an integrated fashion, including
 - Takeoff and transition into en route IFR
 - Entering SCA from en route IFR
 - Conflict detection and resolution
 - Merging into stream of arrival traffic
 - Straight-in, curving, and steep approaches
 - Missed approaches
- Transportation **systems analyses** demonstrating benefits and impact of SATS operating capabilities

Technical Performance Measures

Number of simultaneous operations supported in non-radar, non-towered terminal area for HVO-equipped aircraft.	HVO
Operations rate (takeoffs and landings) at non-radar, non-towered airport.	HVO
Throughput supported at non-radar, non-towered airport.	HVO/ LLM
Percentage of successful approaches and departures at a) 200 ft ceiling and 1/2-mile visibility, and b) 0 ceiling and 1/4-mile visibility without conventional instrument approach instrumentation.	LLM
Dispatch reliability	LLM
Total System Error (Flight Technical Error combined with Navigational System Error) for a) new (<500 hr), and b) median-currency, instrument-rated pilot operating SPP-equipped aircraft.	SPP
Controller workload required to support procedures for aircraft entering and exiting Self-Controlled Area.	ERI
Measured cost and “door-to-door” block times for airfield pair combinations, compared to commercial air, rail, or highway modes.	TSAA
Operational all-weather reliability for airfield pairs.	TSAA

Leveraging Other Programs



AATT DAG-TM

- Airborne technologies
- En route and terminal ops
- Formal methods



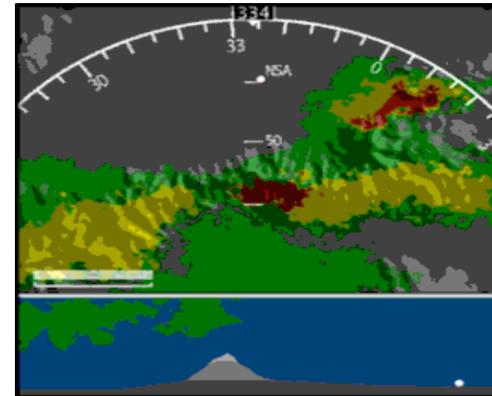
SafeFlight 21

- Cockpit Display of Traffic Info
- Datalink communications
- In-trail self-spacing



Quiet Aircraft Technologies

- Curved approaches
- Approach energy management



Aviation Safety Program

- Weather data distribution
- Hazardous weather avoidance
- Synthetic vision systems



Project Status



- Project in it's fourth year; partnership in its second year
- Technology development and evaluation going well
 - NCAM SATSLabs working Lower Landing Minima and Single Pilot Performance with multiple paths to achieve, at least, minimum success criteria
 - NASA working High Volume Operations and Enroute Integration to, at least, minimum success criteria
 - Development/installation of flight and ground infrastructure and aircraft equipage for flight testing and evaluation nearing completion
 - First generation modeling and methodology for transportation systems analyses and assessments upgraded and analyses underway
- Budget increase in FY05 and FY06 provides full cost of work force necessary to conduct technology demonstration.
- FY 03 earmark expanded scope of Project to include automobile technology infusion, accelerated regional service provider demonstrations; funded Michigan SATSLab
- Collaboration and interaction with FAA is increasing
- Independent analysis by LaRC SMO found SATS in compliance with 7120.5b; more lower-level detailed documentation added to risk management
- Resources are adequate to demonstrate operating capabilities to at least the minimum success criteria in FY 05



Continuing Growth in SATS Interest

- Small airplanes utilizing small airports is happening now
 - Fractional ownership
 - Air charters
 - Air taxis
- The number of new small business aircraft manufacturers is growing.
- FAA has history of supporting small aircraft using small airports and proposed an initiative for expanded small airport utilization.
- JPO very interested in point-to-point air transportation using small airports.
- 7 state/regional groups have contacted NASA/FAA/NCAM about becoming SATSLabs
 - Indiana
 - Ohio
 - North Dakota
 - Texas
 - Oregon
 - New Hampshire
 - Oklahoma

Summary

- SATS is both a technology R&D project and an experiment in public-private partnerships.
- NASA/FAA/NCAM working together to develop and evaluate technologies that enable the technical and operational feasibility of the four operating capabilities to be demonstrated.
- Public-private partnership enables the leveraging of shared resources, expertise, capabilities, and information among a broad range of stakeholders, users, and funders to accomplish goals of project and to transfer/infuse technologies important to four operating capabilities.