National Aeronautics and Space Administration

AIRSPACE SYSTEMS PROGRAM

Aeronautics Research Mission Directorate

NEXTGEN

Overview for NARI Seedling Fund Presentations

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Airspace Systems Program Overview

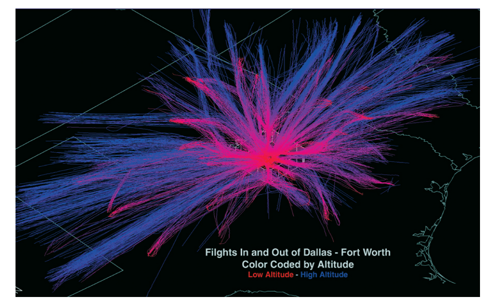
Perform research in air traffic technology to increase the efficiency and capacity of the nation's air transportation system.

Integrate these capabilities to maximize operational throughput, predictability, efficiency, flexibility, and access to the airspace system while maintaining safety and ***reducing fuel consumption, noise, and emissions***.

- Enable NextGen from Gate-to-Gate and Reduce the Total Cost of air transportation operations
- Increase Maturation and Implementation of ASP technologies to accelerate NextGen

Concepts and Technology Development (CTD) Project:

Develop gate-to-gate concepts and technologies for NextGen to enable significant increases in capacity and efficiency

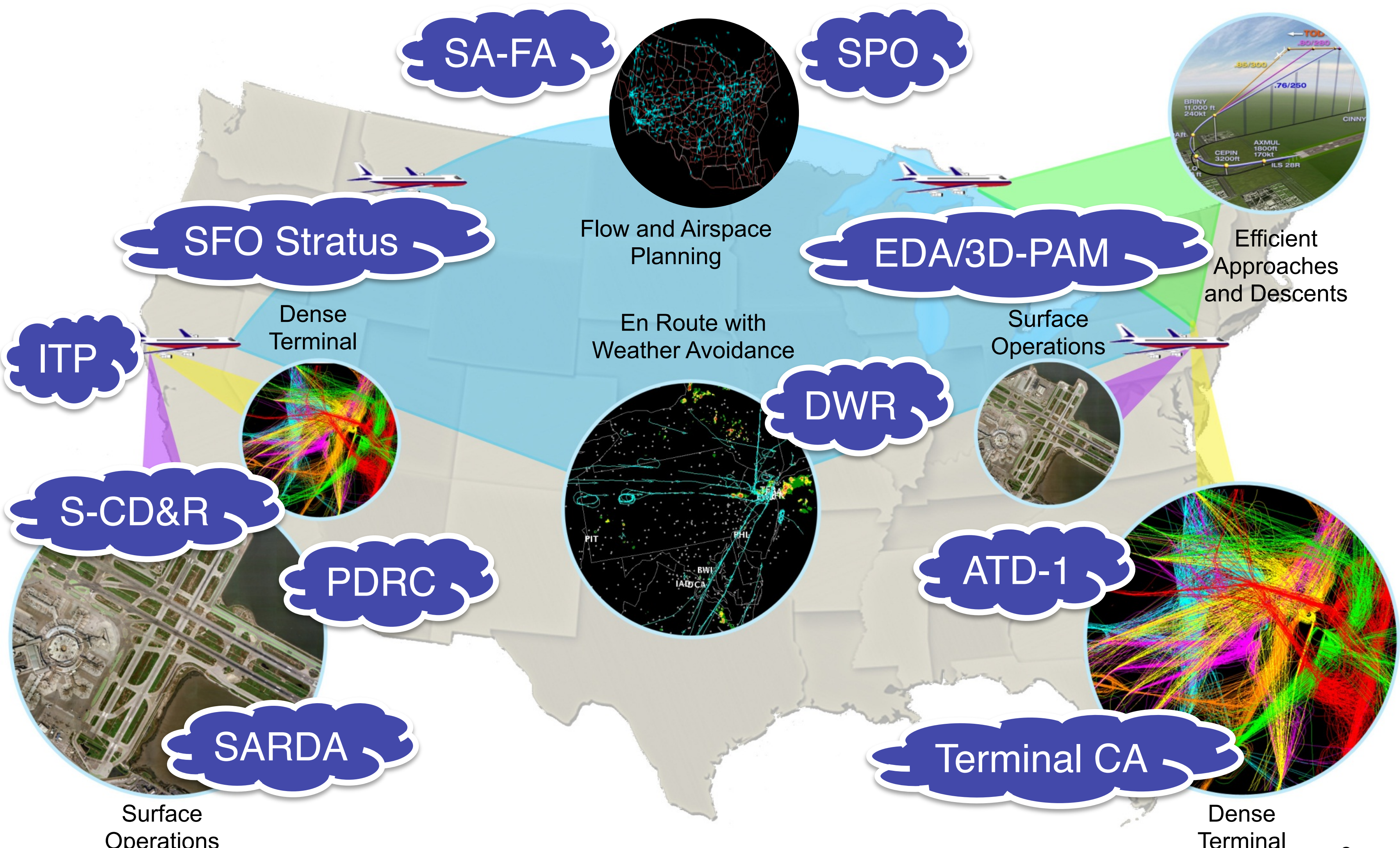


Systems Analysis, Integration & Evaluation (SAIE) Project:

Facilitates R&D maturation of integrated concepts and technologies through evaluation in relevant environments, enabling transition to stakeholders

CTD and SAIE will deliver on collaborative work plans to accelerate products and impacts for NextGen

Gate-to-Gate Concepts and Technology



Airspace Systems Strategic Structure: ATM Epochs

ATM+1: NextGen

Improved operational performance in individual domains (e.g., surface traffic flow) with some initial integration between domains.

- Provides improved efficiency in each domain at the earliest possible date, supporting airline cost savings and reduction of environmental impact.

ATM+2: Full NextGen

Integrated terminal, en route, surface and arrivals/departures operations to realize trajectory-based operations including system modeling to enable greater predictive capabilities.

- Provides system efficiency, predictability and reliability gains to further improve airline and ATM network operations and support traffic growth, including UAS.

ATM+3: Beyond NextGen

Dynamic, fully autonomous trajectory services enabling rapid adaption to meet user demand or respond to system perturbations.

- Provides a flexible, scalable, and resilient system to meet significant traffic growth and support changing operators' business-network models.

Technical Challenges

Goal: *Enable NextGen and reduce the total cost of air transportation operations*

Thrust: *Aircraft and ground-based technologies to simultaneously increase throughput/capacity and aircraft efficiency*

Cross-Cutting Challenge: *All densities and all weather conditions*

(1) **ATM Technology Demonstration – 1**: Improve arrival operations efficiency while increasing arrival throughput using integrated aircraft-based and ground-based automation technologies [ATM+1]

(2) **Integrated Arrivals/Departures/Surface Operations**: Simultaneously increase arrivals, departures, and surface operations efficiency while increasing overall throughput [ATM+1]

(3) **Weather Integrated Decision-Making**: Reduce weather-induced delays by integrating probabilistic and/or deterministic weather information with aircraft, flow and airspace management strategies [ATM+1]

(4) **Separation Assurance Functional Allocation**: Establish the basis for air/ground functional allocation for separation assurance including safe, graceful degradation of performance in response to off-nominal conditions [ATM+1]

(5) **Oceanic Operations Efficiency Improvement**: Increase oceanic airspace operational efficiency by efficient routing and rerouting based on changes in weather, and reduced separation minima based on ADS-B operations, and integrated air/ground procedures and technologies [ATM+1]

(6) **Shadow Mode Assessment using Realistic Technologies for the NAS (SMART NAS)**: Develop a real/live, virtual, and constructive environment where alternative future concepts, technologies, air/ground human/machine architectures can be examined in an integrated fashion to assess NAS-level performance and benefits [ATM+2]

(7) **Enabling Trajectory-based Operations**: Increase efficiency of flights by enabling trajectory-based operations rather than airspace-based operations and reducing delay-increasing tactical changes to trajectories [ATM+2]

(8) **Networked Air Traffic Management**: Develop and demonstrate concepts, algorithms, technologies, architectures, and business models employing advanced networking capability that will significantly reduce duplication of data, processing, information, and allow for integrated decision making and the most cost-effective provision of air traffic management [ATM+3]

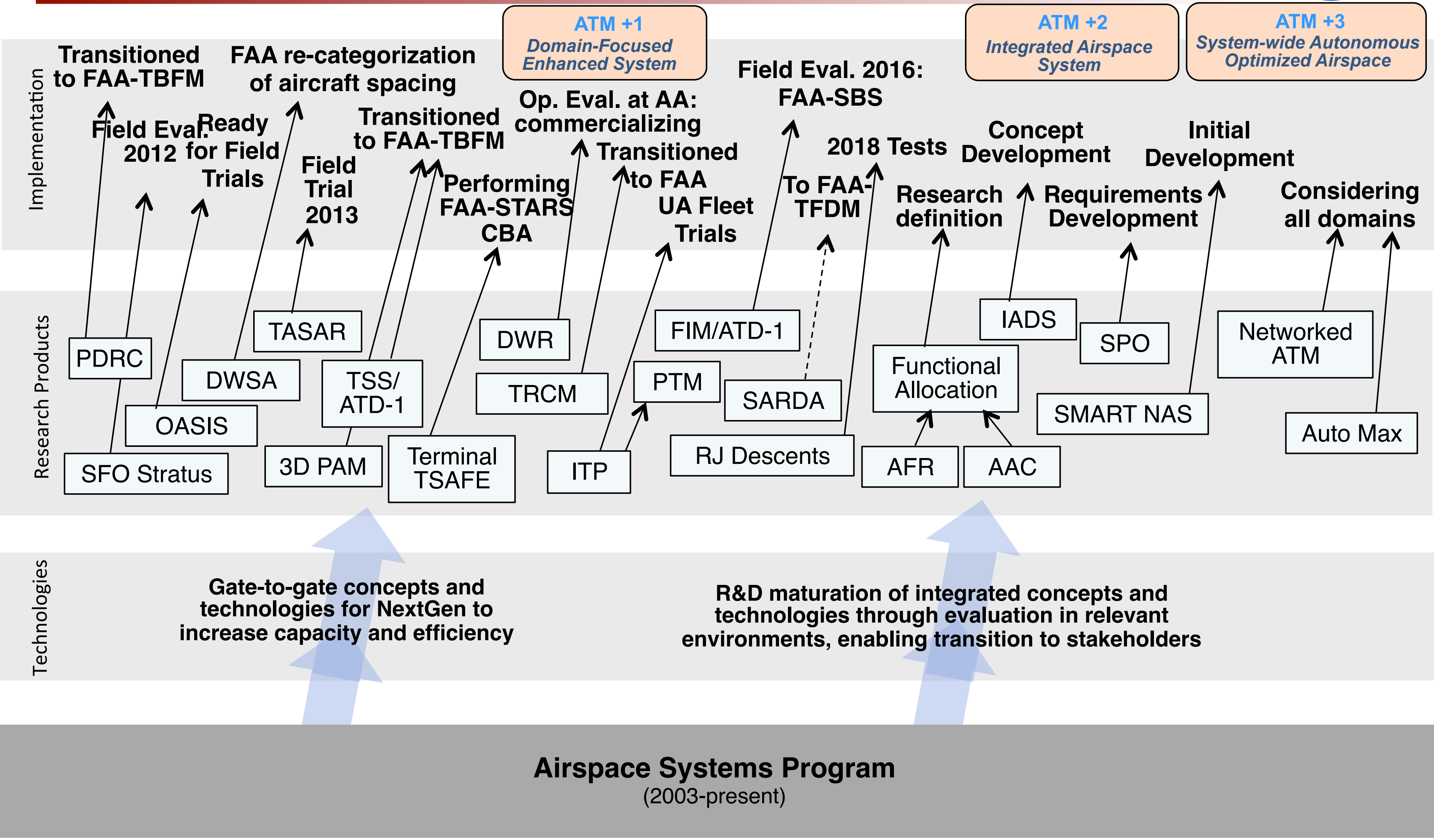
(9) **AutoMax**: Through the greatest use of autonomy, accommodate future demand, vehicle mix/airspace uses, and different operating business models to enable highest possible realization of economic value from the airspace operations at the lowest possible total cost of operations [ATM+3]

Current Barriers: Limitation of cognitive workload to develop optimal solutions on multiple dimensions (efficiency, throughput) and lack of automation

NASA ASP Discriminator: Develop air/ground concepts and technologies for developing precision schedule and delivery for gate-to-gate air traffic management operations for NextGen and beyond

ASP Strategy: Deliver/transfer products to enable changes in NAS: integrated and singular

Current ARMD ATM Research is Delivering Technologies for the Future ATM System



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Air Traffic Session – Tuesday February 25, 2014

Time EST	Time PST	Title/Presenter/Affiliation/Phase
13:45–14:00	10:45–11:00	Session Welcome and Keynote: Barry Sullivan (ARC)
14:00–14:45	11:00–11:45	Transforming the NextGen Test Environment: Integrating Fused ADS-B Surveillance Data, Michelle Eshow for Bimal L. Aponso (ARC), Phase 1
14:45–15:30	11:45–12:30	Intelligent UAS Sense-and-Avoid utilizing Global Constraints, David E. Smith (ARC) Phase 1
15:30–16:15	12:30–13:15	BREAK
16:15–17:00	13:15–14:00	Using Historical Data to Automatically Identify Air-Traffic Controller Behavior, Todd Lauderdale (ARC) Phase 1
17:00–17:45	14:00–14:45	Reducing the Environmental Impact of Aviation: A Data Mining Approach to Instantaneous Estimation of Fuel Consumption, Nikunj Oza (ARC) Phase 2