How FAA & NASA Work Together

NextGEN

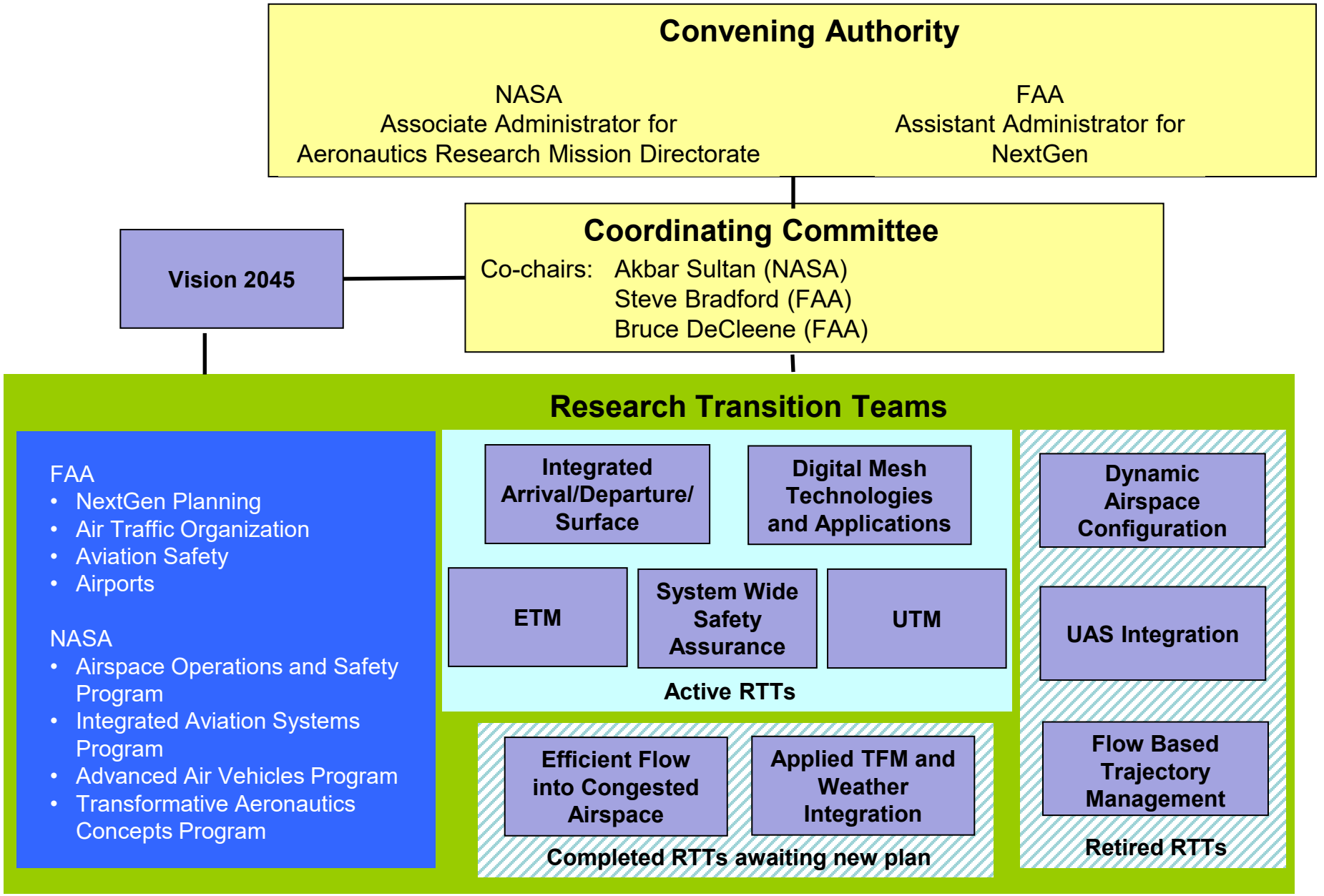
Presented to: FAA Research, Engineering and Development Advisory Committee (REDAC)
Presented by: Steve Bradford, FAA Chief Architect for NextGen
Date: April 21, 2021

FAA

Current Areas of FAA-NASA Collaboration

- Beyond NextGen
  - Vision for 2045 Timeframe
  - Air Traffic Management Exploration (ATM-X)
  - Digital Mesh Technologies and Applications
  - System Wide Safety Assurance
  - V&V of Autonomy (SWS RTT)
  - Digital Twin and Autonomous Freighter (Digital Mesh RTT), exploring possibility
- NextGen
  - ATD-2 Operational Demonstrations, completing in 2021
- Unmanned Aircraft Systems (UAS)
  - UAS Traffic Management (UTM), extended through 2021
  - UAS Integration into the NAS (Large UAS), completing in 2021
  - Upper E Traffic Management
- Advanced Air Mobility (AAM)
  - National Campaign
  - AAM Environmental and Safety Factors
  - AAM Concepts, Aircraft, Airspace, and Automation
- Aircraft Technologies
  - Supersonic Flight, including the Low Boom Flight Demonstrator (LBFD)
  - Advanced Composites and Manufacturing
  - Green Aviation
  - Electrified Aircraft Propulsion
  - Noise
  - Icing Research

RTT Administrative Framework



RTT and AAM WG Administrative Framework

Convening Authority

NASA
Associate Administrator for
Aeronautics Research Mission Directorate

FAA
Assistant Administrator for
NextGen

Coordinating Committee

Co-chairs: Akbar Sultan (NASA)
Steve Bradford (FAA)
Bruce DeCleene (FAA)

Vision 2045

Research Transition Teams

FAA
- NextGen Planning
- Air Traffic Organization
- Aviation Safety
- Airports

NASA
- Airspace Operations and Safety Program
- Integrated Aviation Systems Program
- Advanced Air Vehicles Program
- Transformative Aeronautics Concepts Program

Active RTTs

- Integrated Arrival/Departure/ Surface
- Digital Mesh Technologies and Applications
- ETM
- System Wide Safety Assurance
- UTM

Completed RTTs awaiting new plan

- Efficient Flow into Congested Airspace
- Applied TFM and Weather Integration

Retired RTTs

- Dynamic Airspace Configuration
- UAS Integration
- Flow Based Trajectory Management

AAM Executive Board

Co-Charis:
Steve Bradford (FAA), Mike Romanowski (FAA), Jay Merkle (FAA), Lee Noble (NASA), Akbar Sultan (NASA), Jimmy Kenyon (NASA), John Cavolowsky (NASA)

AAM Working Groups

- UAM Aircraft Design and Development
- Concepts & Transversal Activities
- Vehicle Automation Concepts and Technologies
- Airspace Design and Operations

Expanding FAA-NASA Partnership on Aircraft Technologies

Growing the breadth and depth of collaboration on aircraft technologies

Developing collaboration framework with FAA AIR-600 and NASA Advanced Aircraft Vehicles Program (AAVP)

- Initial discussions held to define structured approach for collaboration
- Introductory meeting between NASA AAVP and FAA Senior Technical Experts Program
- Participating in Advanced Air Mobility (AAM) Working Groups and Executive Board

Engaged in discussions with FAA WJHTC and NASA AAVP

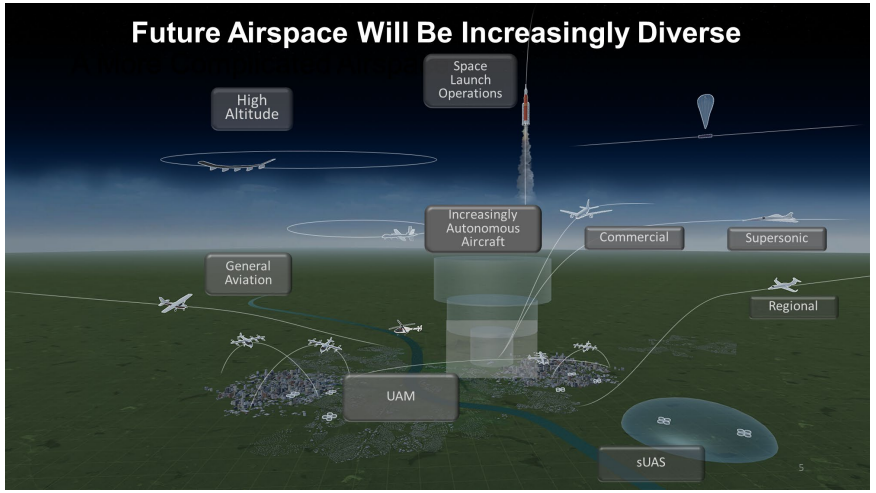
- Building on successful relationship in advanced composites
- Exploring potential opportunities in electrified propulsion

Continuing to grow engagement between FAA AEE and NASA AAVP

- Building on existing strong relationship of research coordination and collaboration
- Focused on Administration's green aviation priorities

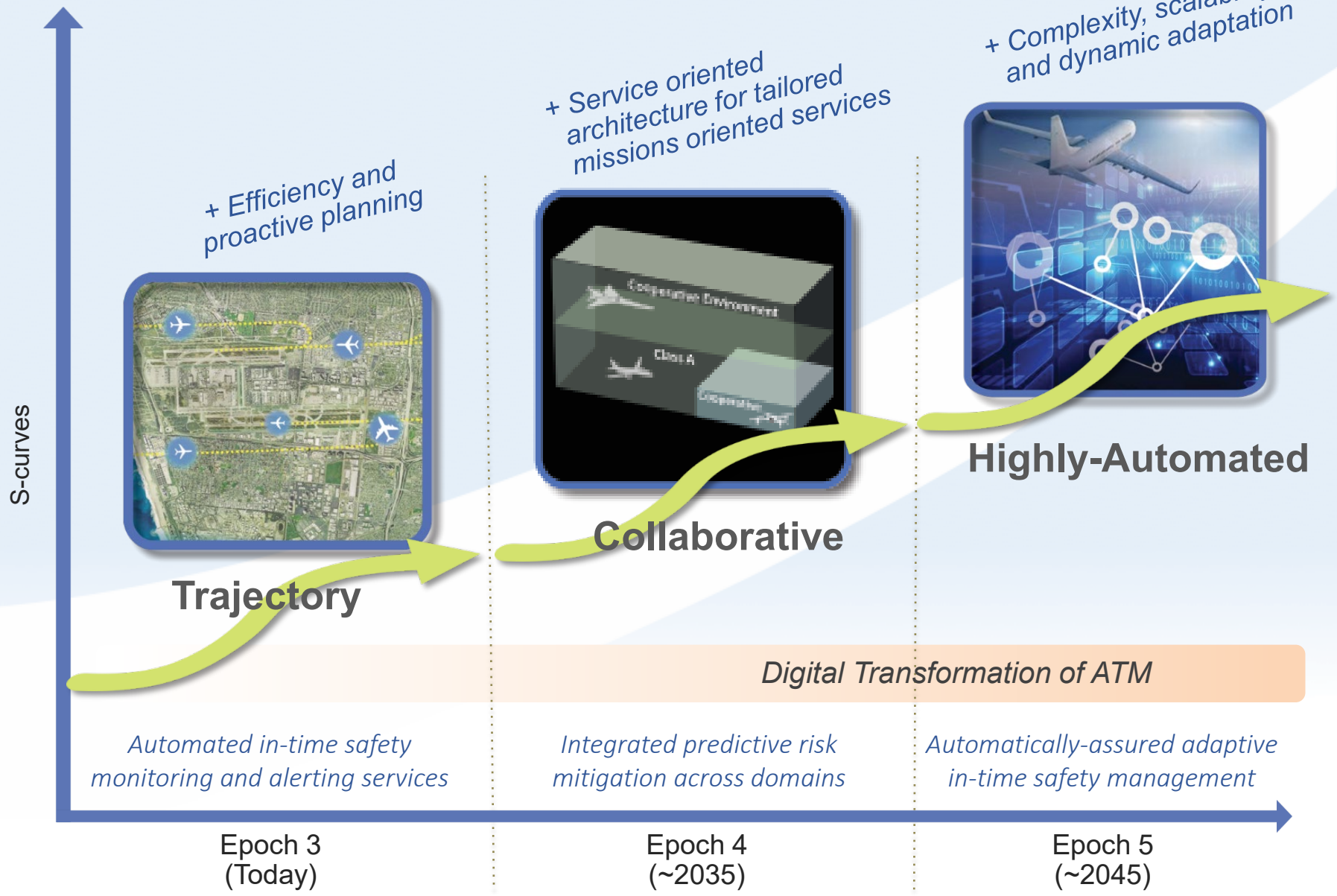
Joint Planning on NAS Transformation

- Future NAS Operations will need to accommodate a broad range of new vehicles and missions and serve increasingly dense and more complex operations while maintaining or improving safety and efficiency
- To address the **diversity**, **complexity**, **density** and **scalability**, higher levels of automation will be required to meet the National Airspace System level goals of efficiency, throughput, capacity and individual user goals of mobility, flexibility, and autonomy.



- Today's system is human centric:
  - Aircraft are designed with human in loop for control, monitoring and safety
  - Airspace is designed/constrained to allow humans to actively control, ensure safety
  - The system is very safe, but is not scalable
- The system must be highly interconnected and data-driven
- Automation will be required to assist/offload human workload, increase precision for air- and ground-based systems and perform system health monitoring and risk assessment

Digital Data and Automation are Critical Enablers for NAS Transformation

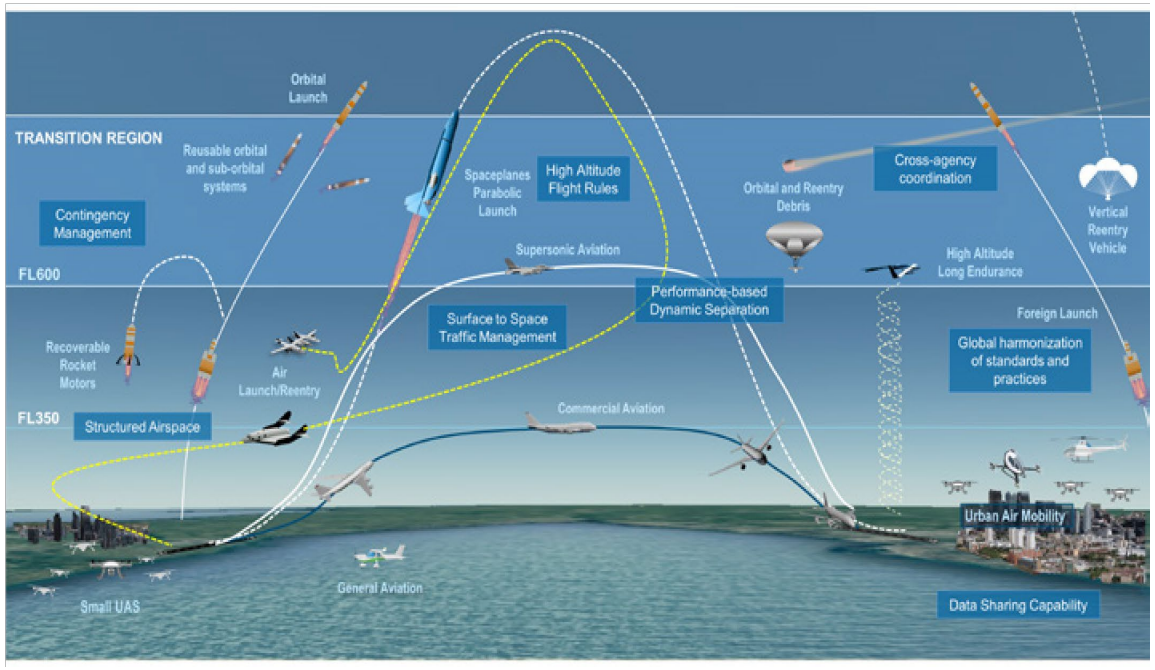

+ Efficiency and proactive planning
+ Service oriented architecture for tailored missions oriented services
+ Complexity, scalability, and dynamic adaptation
S-curves
Trajectory
Collaborative
Highly-Automated
Digital Transformation of ATM
Automated in-time safety monitoring and alerting services
Integrated predictive risk mitigation across domains
Automatically-assured adaptive in-time safety management
Epoch 3 (Today)
Epoch 4 (~2035)
Epoch 5 (~2045)

FAA 2035 Vision Principles and Capabilities
"Charting Aviation's Future: Operations in an Information-Centric NAS"

- Maintaining and improving **safety, security, and resiliency**
- **Collaborative** with **distributing decision making** to enable stakeholders to best meet their objectives
- Incorporating **performance-based standards** throughout
- Building in **scalability** to rapidly expand capabilities to meet operational challenges
- Ensuring **adaptability** and **agility** to keep pace with unanticipated changes

Key Enabling Capabilities

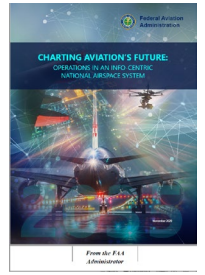
- ML/AI to improve efficiency and safety
- Initial federated architecture
- Functional definition and performance standards for services
- Interoperability requirements
- Automation and role of humans
- Systemwide safety assurance



Initial service-based xTMs, maintains airspace structure and core FAA ATC services

NASA 2045 Vision Principles and Capabilities
"Sky for All"

Operating Principles	Key Enabling Capabilities
Scalability	C1: Federated Service-Oriented Architecture
Accommodate Diversity of Operations	C2: Integrated Digital ML/AI Backbone, CNSI
Density and Complexity	C3: System Level Automation, Increasingly Autonomous Operations, Assurance of Autonomy
Safety and Resilience to Disruption	C4: Automatically Assured Adaptive In-Time Safety Threat Management, Digital Twin
Environmental Sustainability	C5: Tailored Services for Trajectory Optimization



ATCA Blue Skies Initiative

The National Academies of SCIENCES ENGINEERING MEDICINE

AIRBUS BOEING

Community Informed Vision to Provide Seamless Access to Airspace for All Users

NASA and FAA Joint Visions

- Harmonized, complementary, and cross-leveraged joint visions
- Through NAS 2035, NASA and FAA will develop key enablers on the path to 2045
- Sky For All community engagement by NASA in FY21-22 for community vetted vision and roadmap

FAA proposed graphic

FAA & NASA Collaboration Mechanisms

Includes FAA & NASA Only:

- NASA-FAA Research Transition Teams (RTT)
- NASA-FAA AA-Level Coordination Meetings
- NASA-FAA Advanced Air Mobility (AAM) Executive Board
- NASA-FAA Ad Hoc Meetings (Example: Partnership on Aircraft Technologies)
- NASA-FAA Communications Activities (Examples: Coordinate Web Articles and Press Releases; Conduct Joint Events)
- NASA-FAA Joint Panels at Conferences
- NASA-FAA Agreements

Includes External Partners and/or Other Agencies:

- NASA Aeronautics Research and Technology Roundtable (ARTR) under National Academies
- NASA AAM Ecosystem Working Groups (AEWG)
- NASA Independent Review Panel (IRP)*
- FAA REDAC
- FAA NextGen Advisory Committee (NAC)
- FAA NextGen Executive Board (NEB)*
- FAA UAS Executive Committee (UAS ExCom)*
- FAA UAS Roundtable
- FAA Commercial Aircraft Safety Team (CAST)
- FAA Aviation Rulemaking Committees (ARC)
- FAA Centers of Excellence (COEs)

* Government Only