Upper Class E Traffic Management (ETM) and ATM-X

Jeffrey Homola
NASA Ames Research Center
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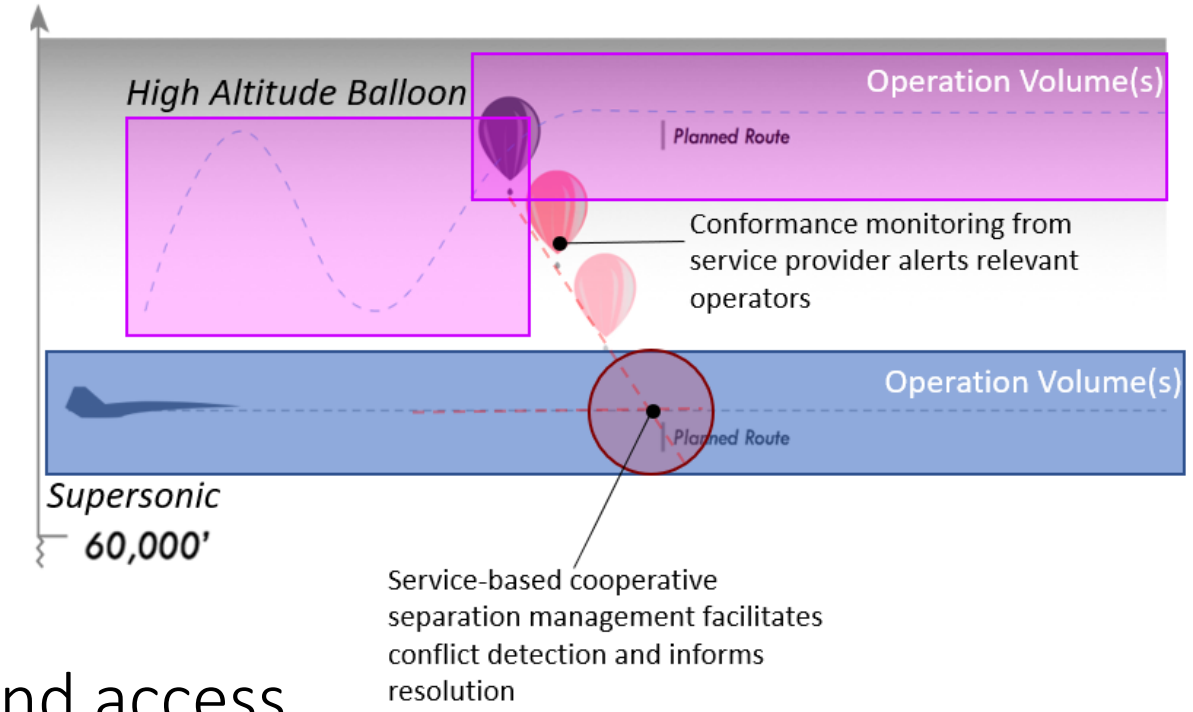
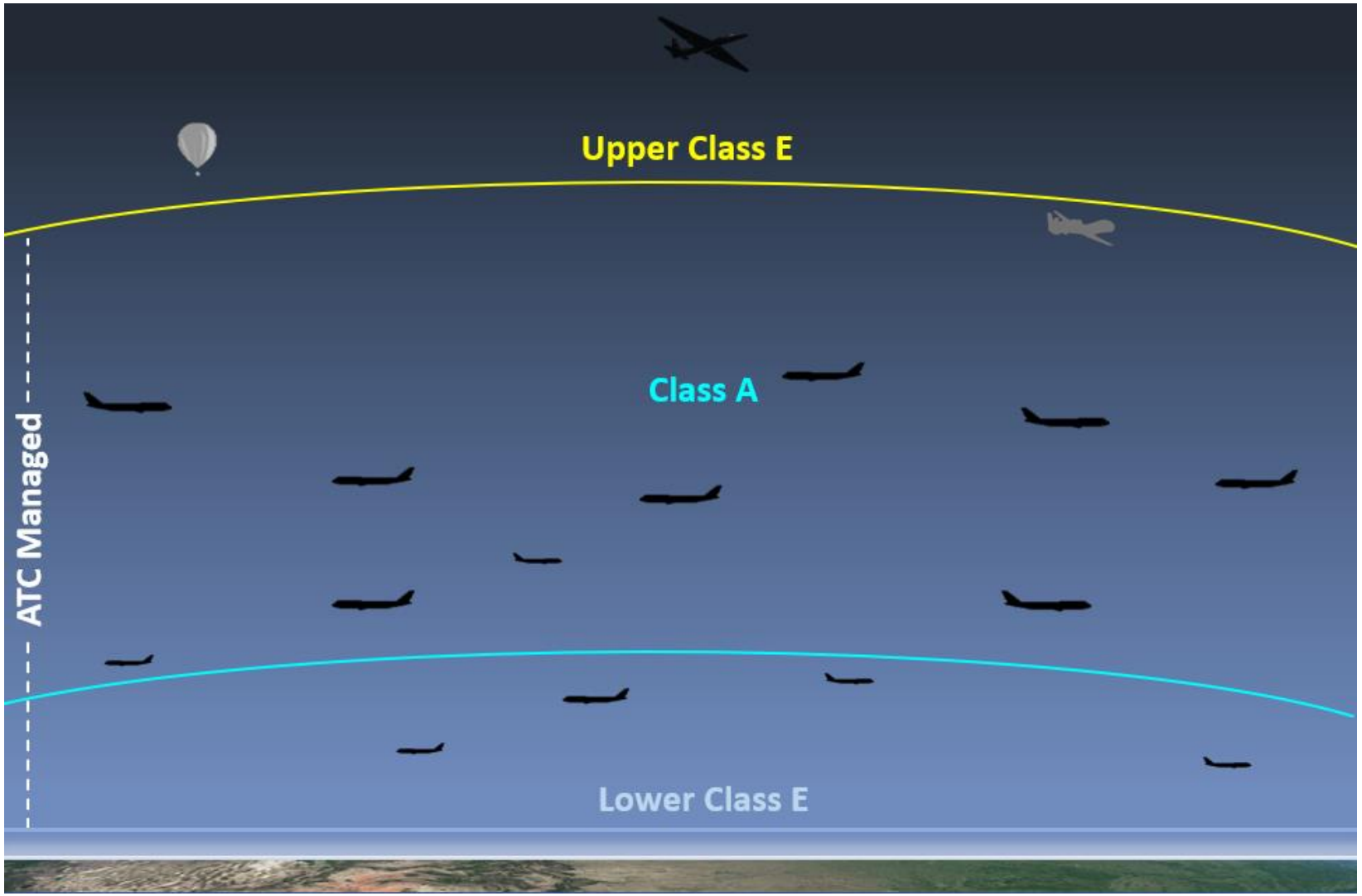
Upper Class E Traffic Management (ETM)

- What is ETM?
  - A cooperative approach to stratospheric airspace integration and management that is safe, scalable, efficient, and fair that accommodates all missions and use cases
- Why is ETM needed?
  - New entrants are emerging
  - Existing users need continued safety and access
  - Demand for Upper Class E airspace use is projected to increase
  - A diverse set of vehicle and operation types are expected
  - In the US, ATC services are limited or not provided in Upper E, which will impact the ability for industry to scale



Background

- Operations in Upper Class E airspace have traditionally been relatively few in number
- Security and science missions have contributed to much of the presence at high altitudes
- Managed services in Upper Class E have historically not been provisioned for civil aircraft operations



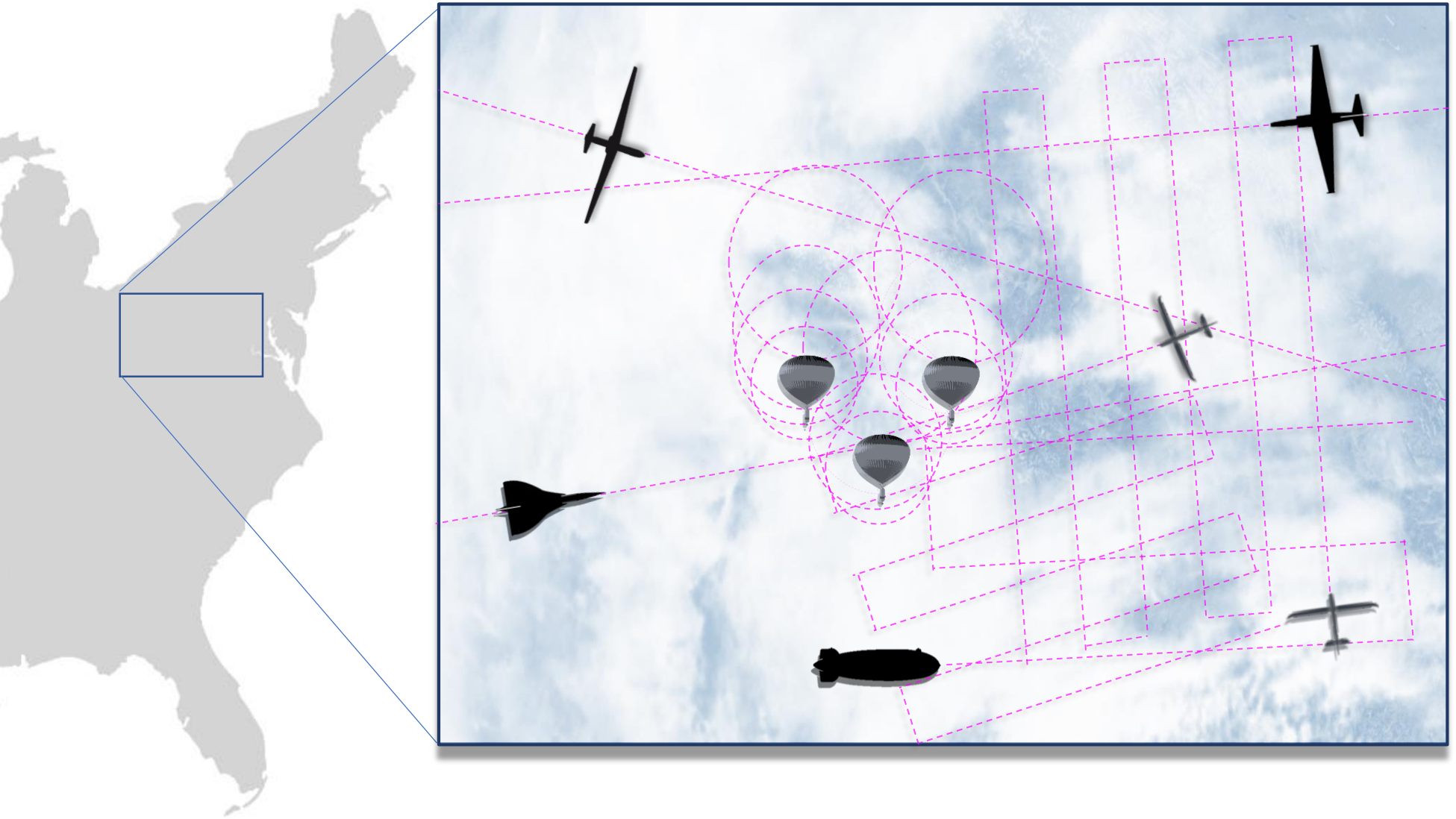
Growth in Upper Class E Opportunities

Security & Science | Communications | Persistent Monitoring | Supersonic Transport | Commercial Space Launch | Hypersonics

Challenges in Upper Class E Growth

- Introduction of new entrants will create an increasingly diverse operating environment
- These operations and associated vehicles will vary by:
  - Speed
  - Duration of flight
  - Configuration
  - Trajectory uncertainty
  - Constraints and maneuverability
  - Mission
  - …

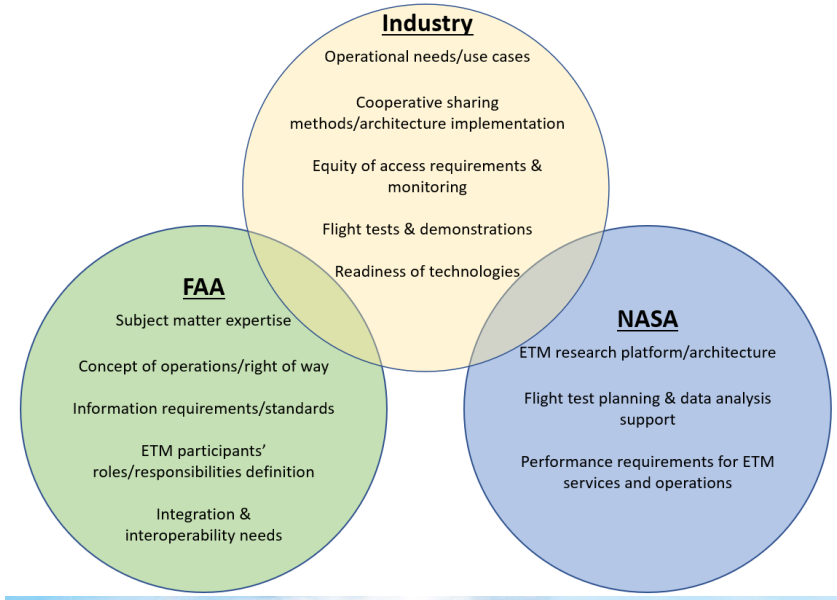
Challenges in Upper Class E Growth

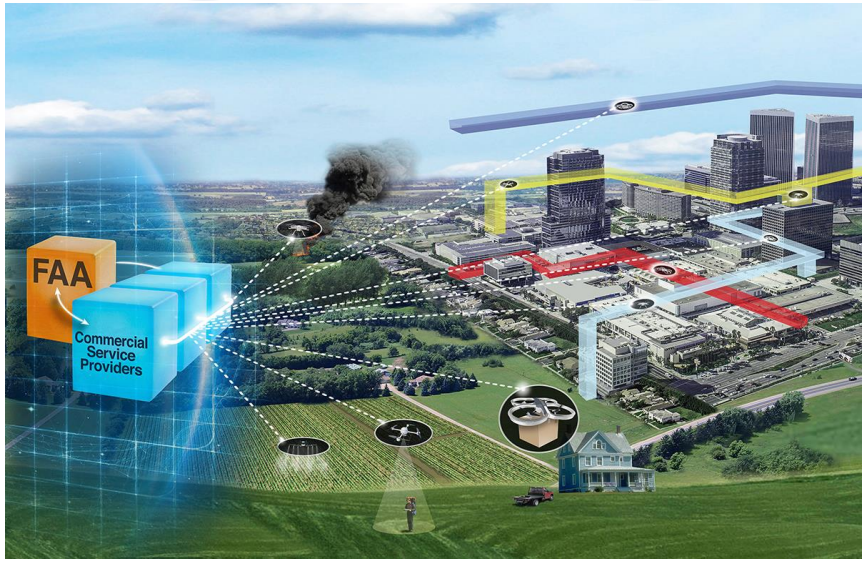


- Resulting environment will pose significant challenges given the diversity of operations
- To enable routine, flexible, and scalable operations, there is a need for a cooperative approach that provides stakeholders with situation awareness and information exchange capabilities to support planning and informed execution of missions

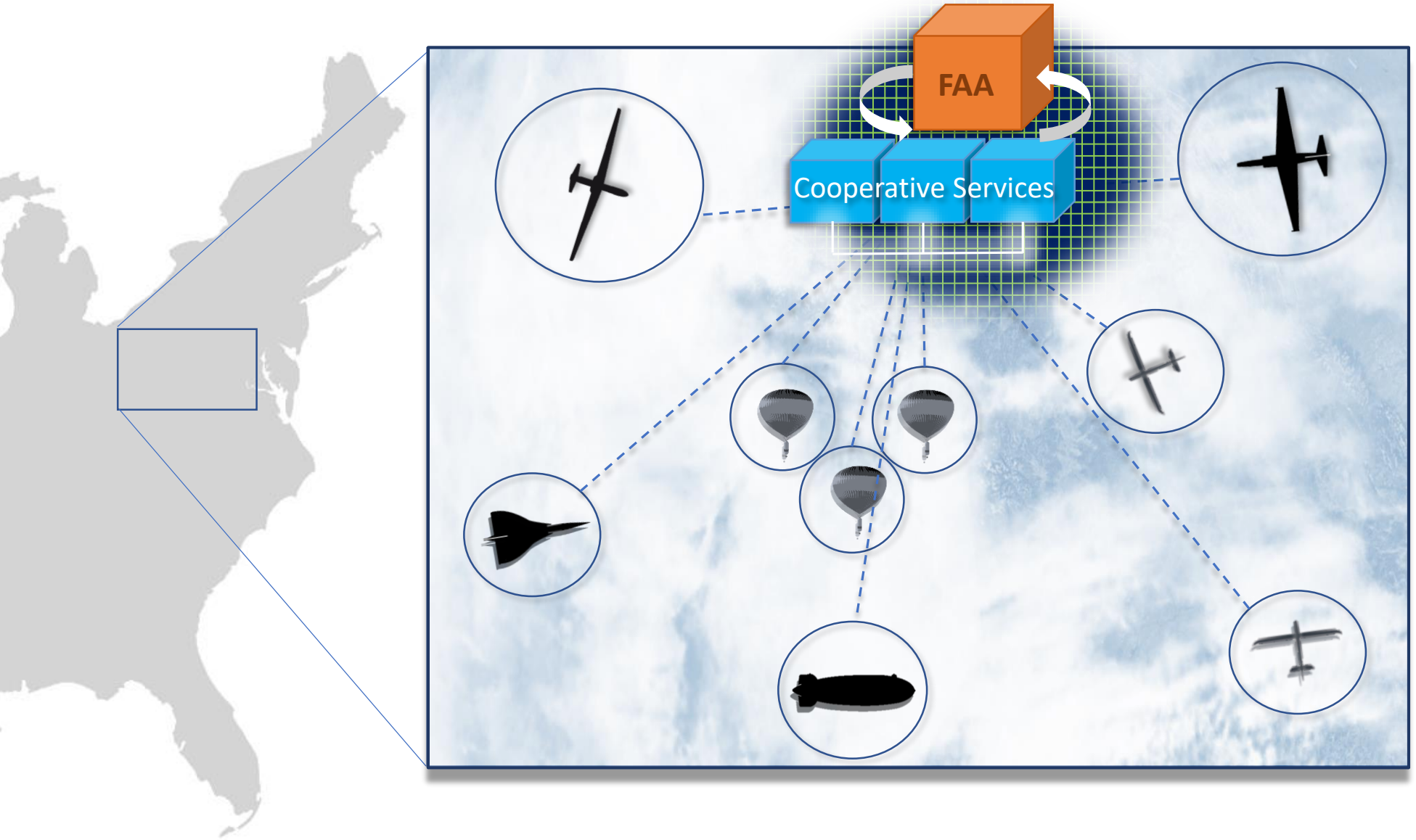
ETM Development

- Development of ETM requires close collaboration with multiple stakeholders
  - Industry
  - FAA
  - Other regulatory agencies and organizations
  - DoD and other federal agencies
- In developing ETM, leverage and build upon the foundations laid in NASA's UAS Traffic Management (UTM) research





Service-Based Cooperative Approach in ETM



- Work in UTM produced an architecture and information exchange method that provided a viable means of digital coordination and cooperation
- Pathway to achieve a cooperative environment that does not burden the current ATM infrastructure
- It is clear, however, that the ETM environment poses unique challenges and needs that were not addressed in UTM

Tabletop Meetings with Industry & Government Stakeholders: Tabletop 1

NASA Ames Research Center

Participants

NASA
Ames Research Center

Standards
Int'l. Civil Aviation Org.

FAA
NextGen (ANG)
Aviation Safety (AVS)
Air Traffic Organization (ATO)
UAS Integration Office (AUS)
National Air Traffic Controllers Association (NATCA)

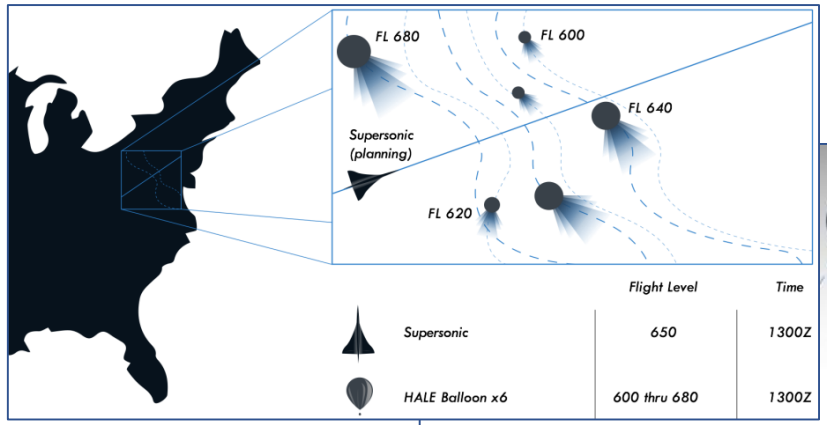
Defense & Security
Dept. of Defense (DOD)
Dept. of Homeland Security (DHS)

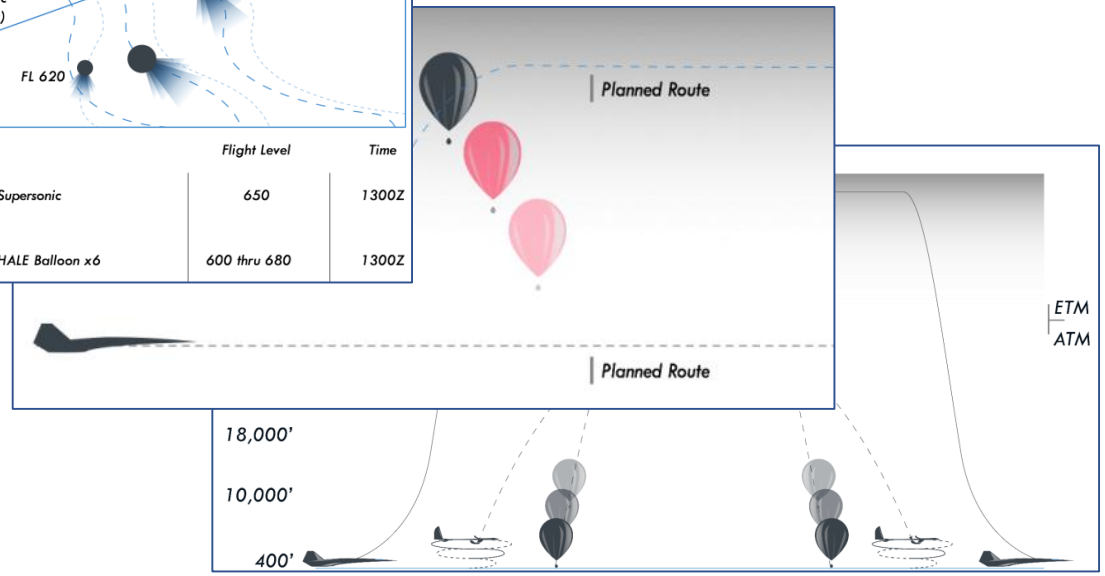
Industry
LOON
BOOM
ROLLS ROYCE
AeroVironment
LOCKHEED MARTIN
BOEING Aurora FLIGHT SCIENCES
GENERAL DYNAMICS
leidos

2

Scenarios

1) Transition into ETM
2) Strategic Deconfliction between Operations (Pre-Flight)
3) Deconfliction between Pre-Flight and Active Operations
4) Planned Overlapping Areas of Supersonic & HALE Operations
5) Tactical Deconfliction
6) Off-Nominal Event





Tabletop Meetings with Industry & Government Stakeholders: Tabletop 2

NASA Ames Research Center

Participants

NASA
Ames Research Center

Defense & Security
Dept. of Defense (DOD)

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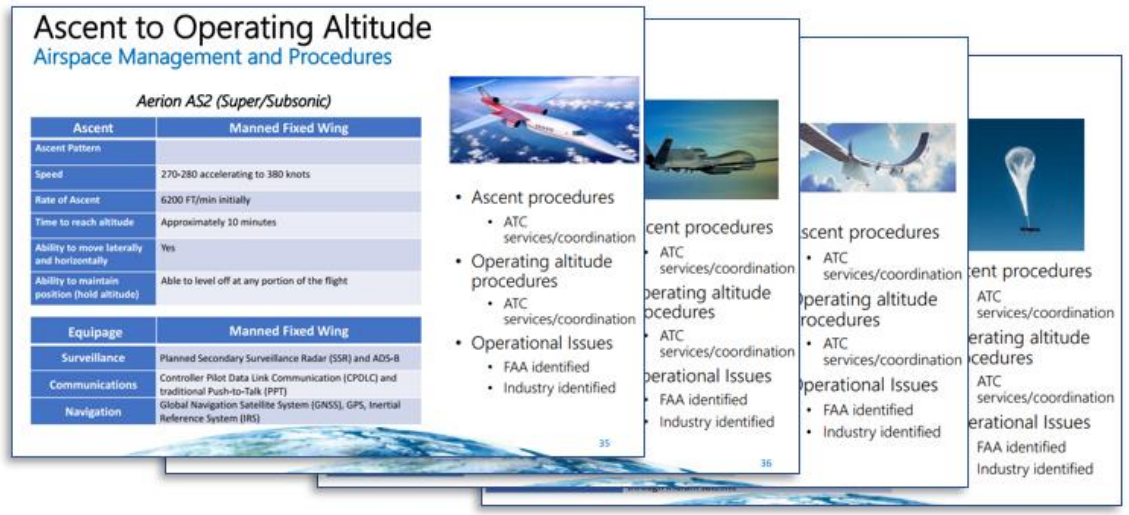
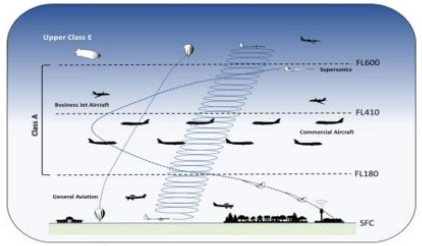
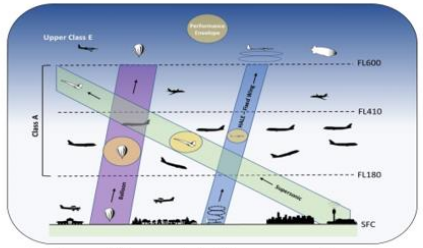
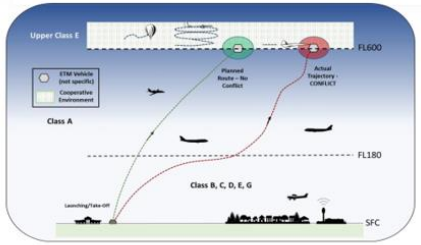




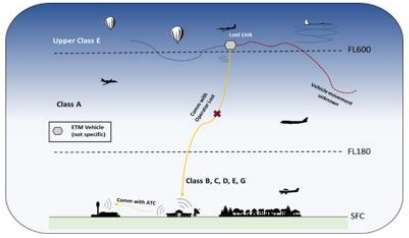
Take-off/launch and transit to Upper Class E airspace



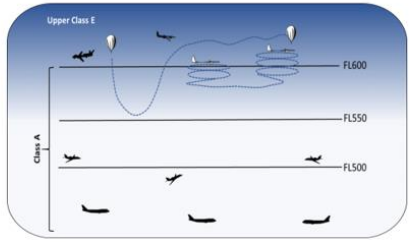
Ascent/Descent to/from operating altitude



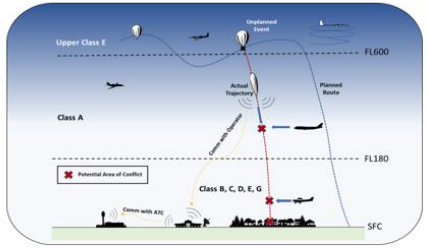
Class E entry point change



Lost link



Operations straddling ETM and provided separation

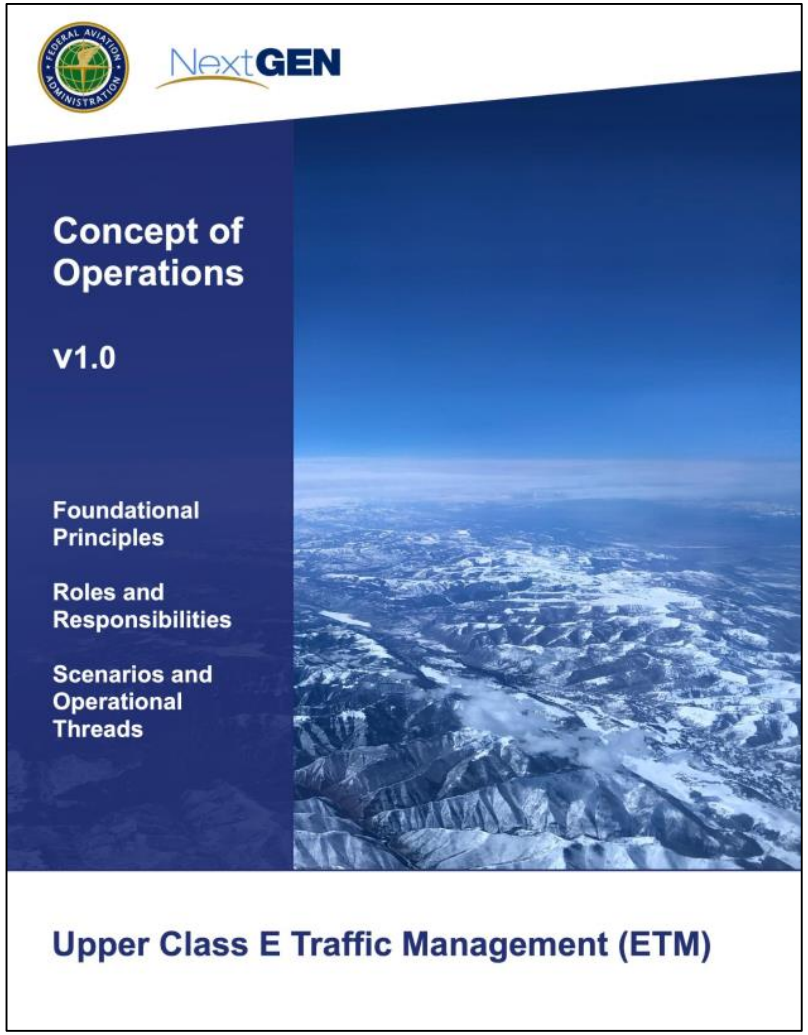


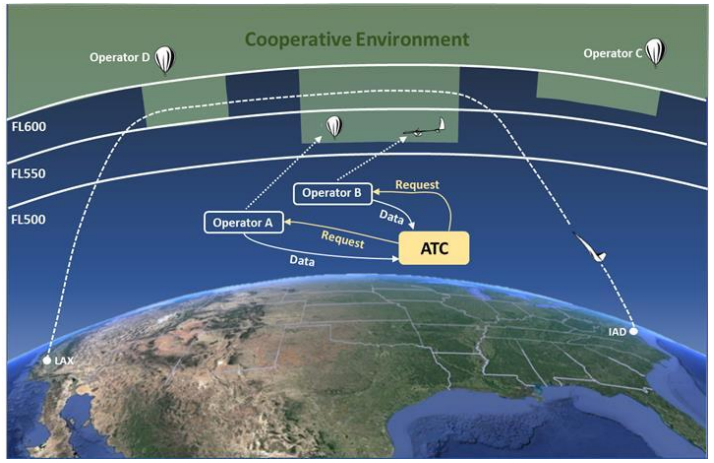
Uncontrolled descent

Engagement

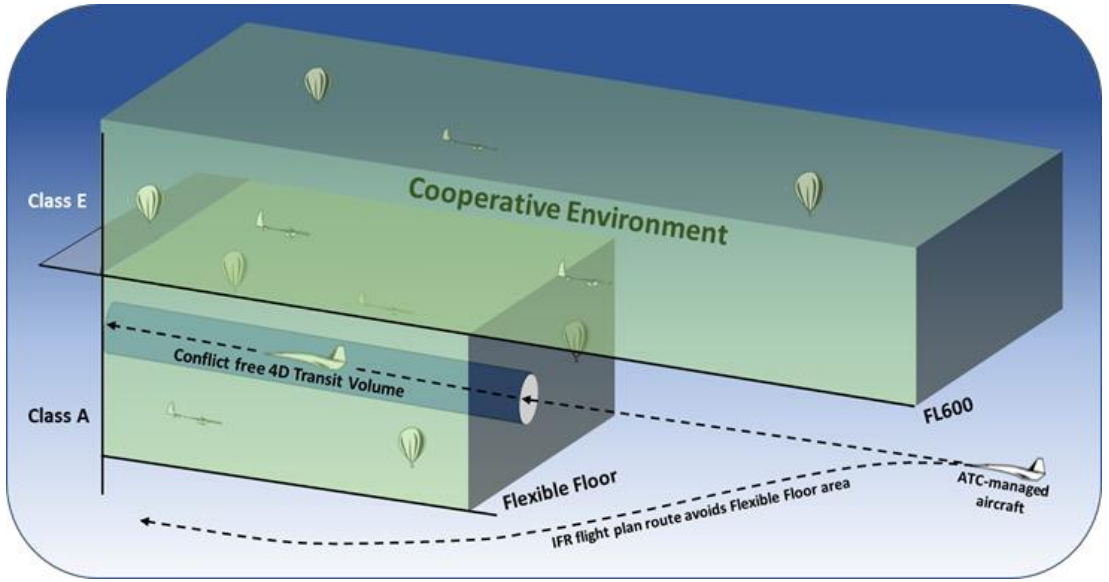
- Regular meeting schedule developed with Industry, FAA, and other stakeholders
- Interim AIA-mediated meetings for Industry consensus

NextGen ETM ConOps

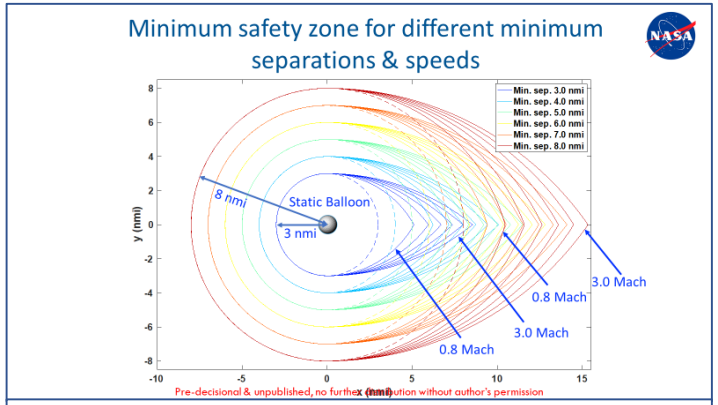


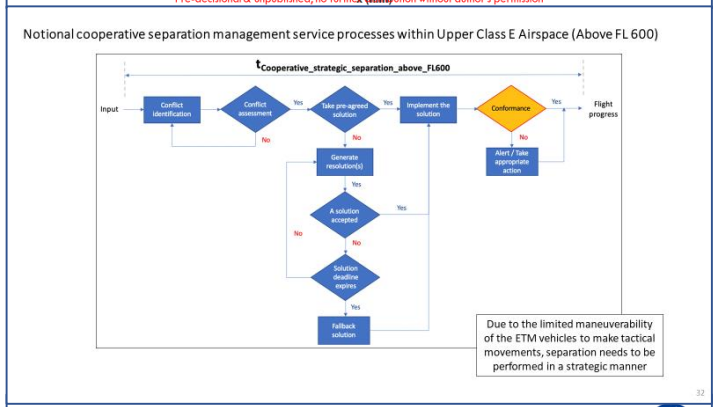


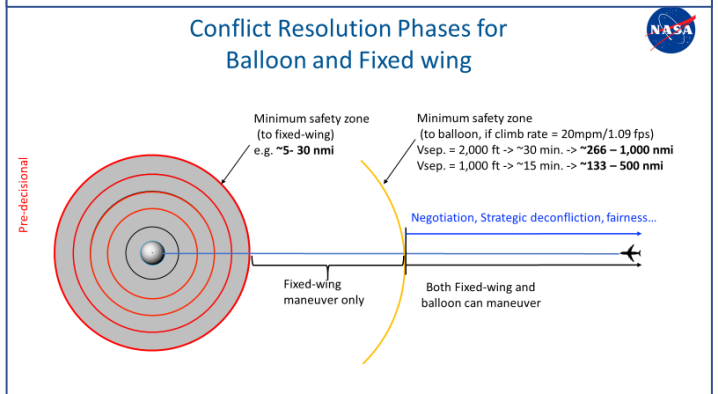
- Operations
  - Pre-Flight and Transition to Upper Class E Airspace
  - Operating Altitude WITHIN Upper Class E Airspace
  - Operating Altitude BELOW Upper Class E Airspace: Flexible Floor of Cooperative Environment
  - Descent from Upper Class E Airspace to Landing (into/through Class A airspace)
  - Contingency Management
- Equity of Airspace Usage
- Security
- ETM Implementation

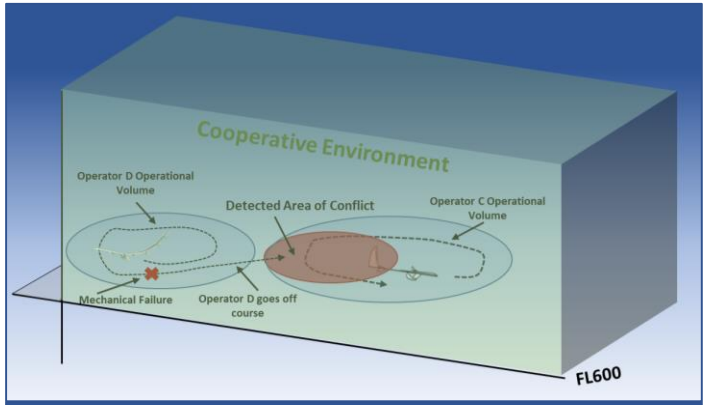


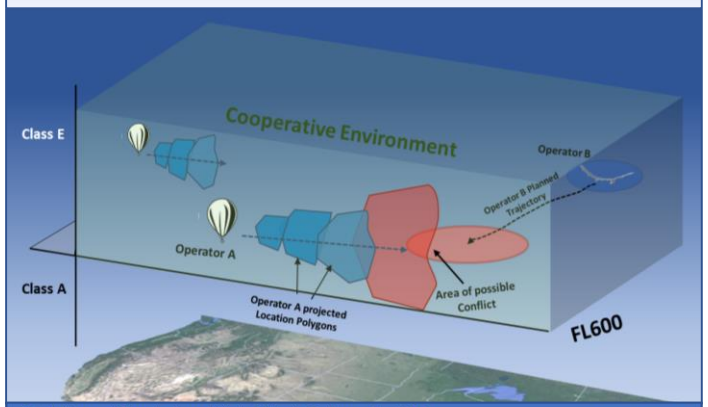
Path Forward

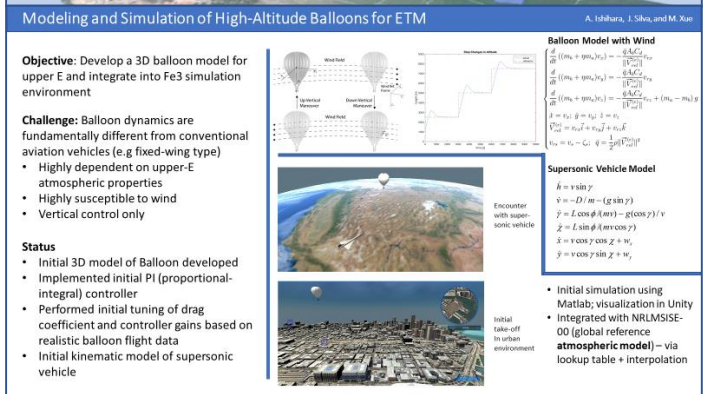






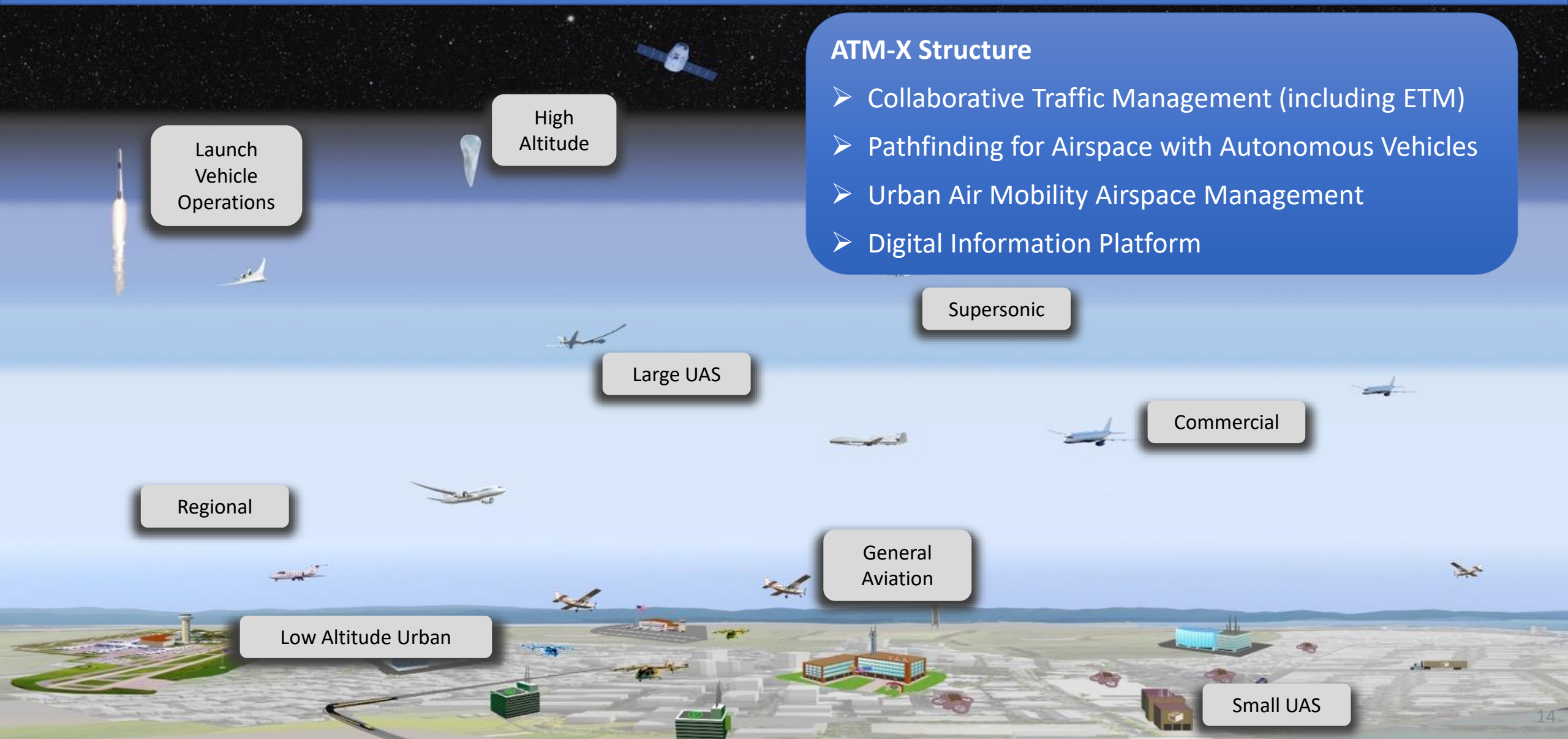






- Continued stakeholder engagement and outreach
- Use case development
- ConOps update
- Simulation research
- Flight demonstration coordination/observation
- Architecture development
- Services analysis and reference development/engagement
- Standards engagement

ETM as Part of ATM-X



ATM-X Structure

- Collaborative Traffic Management (including ETM)
- Pathfinding for Airspace with Autonomous Vehicles
- Urban Air Mobility Airspace Management
- Digital Information Platform

Questions?

jeffrey.r.homola@nasa.gov