AAM Ecosystem Airspace WG: Initial UAM Concept of Operations V1.0

National Aeronautics and Space Administration

Airspace WG: FAA UAM CONOPS V1.0 - Agenda

August 4, 2020			
Topic	**Speaker**	**Time (EDT)**	**Description**
Welcome	Parimal Kopardekar (PK)	1:00PM - 1:15PM	Introductions Brief review
Initial FAA UAM CONOPS V.1	Steve Bradford (FAA)	1:15PM - 1:45PM	Presentation: Initial FAA UAM ConOps document
Feedback from the Audience	Ian Levitt and PK	1:45PM - 2:45PM	Open mic Questions from chat Questions regarding the FAA UAM ConOps document

Airspace system should be ready when vehicles are ready

Platform and Discussion

- **Active Participants**
  - Platform: MS Teams
  - Discussion: MS Teams microphone and chat functions
    - Leave your cameras/webcams off to preserve WiFi bandwidth
    - Use your mute/unmute button (e.g. remain on mute unless you are speaking)
    - Enter comments/questions in the chat
    - Raise your hand if you wish to speak
    - Say your name and affiliation before you begin speaking

- **Listen Only Participants**
  - Platform: YouTube Live Stream *(go to https://nari.arc.nasa.gov/aamecosystem for the link!)*
  - Discussion: Conferences.io
    - Enter https://arc.cnf.io/ into your browser
    - Select the Airspace Working Group: UAM Concept of Operation (UML 1-2) session
    - Questions will be addressed *at the facilitator's discretion*

Meet Steve Bradford

Steve Bradford

FAA NextGen

Chief Scientist

UAM Concept of Operations Overview

July 2020

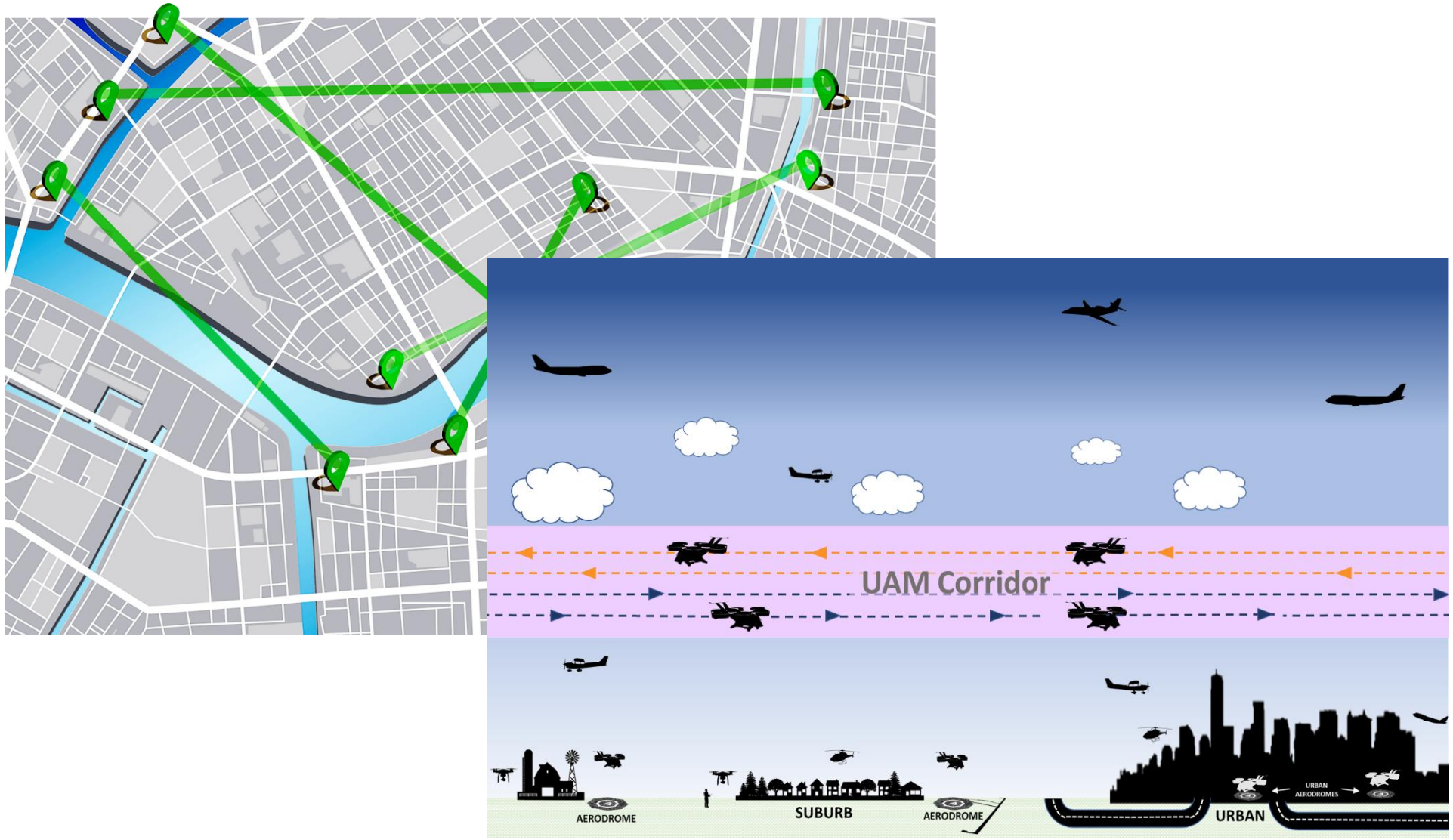
UAM Concept *Drivers for Change*

- Increased ground traffic, resulting in longer trip times and significant economic costs
- Technological advances
  - Improved electrical energy storage and capacity
  - Distributed electric propulsion
  - Increased automation (operational control and networking capabilities)
- Industry business models
  - Leveraging economies of scale

UAM Concept *Overview*

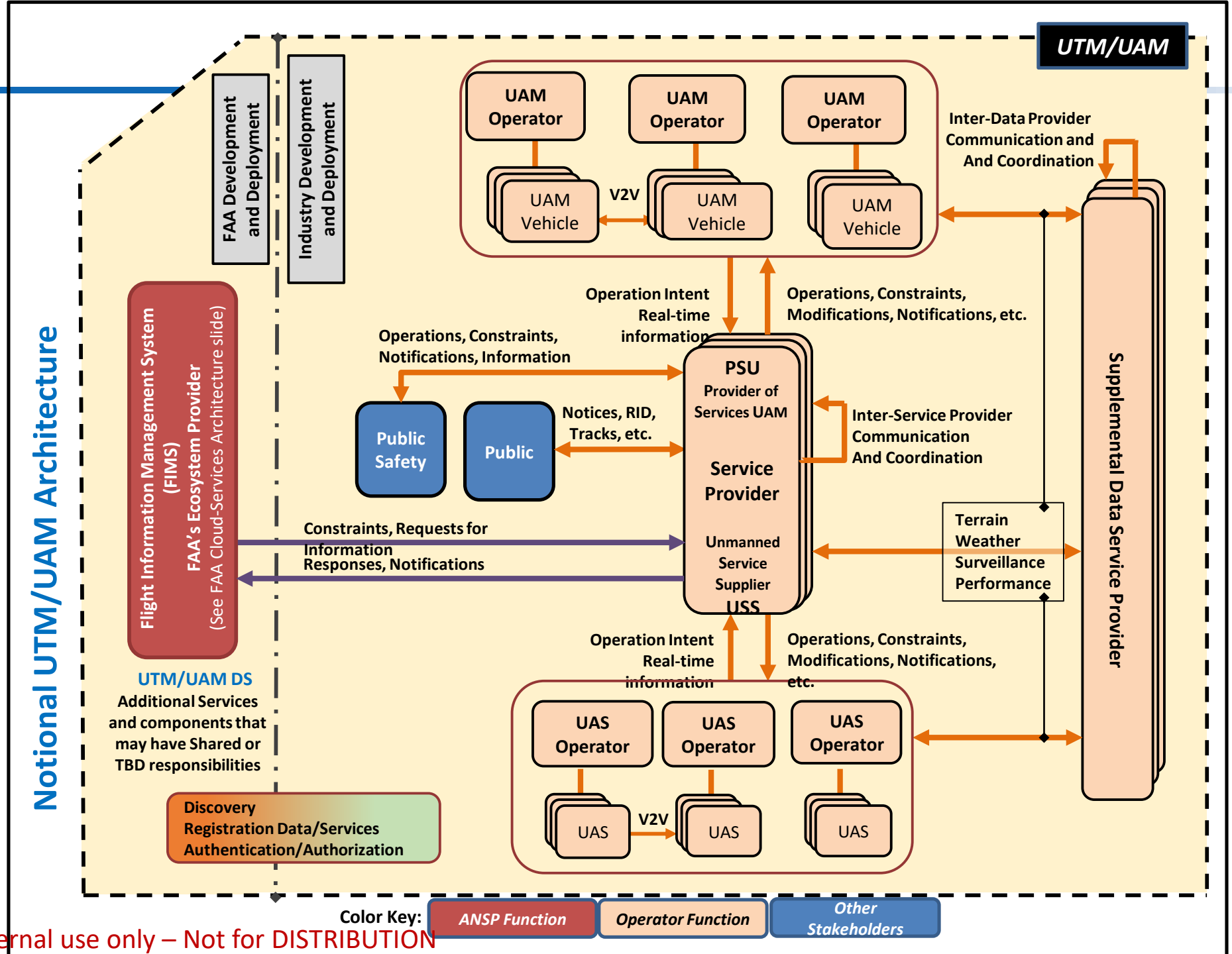
- UAM leverages a common shared environment for UAS Traffic Management (UTM)
- A community-based traffic management system in which the operators are responsible for coordination, execution, and management of their operations
  - Community rules approved by the FAA
- Operations between known locations in volumes of airspace (UAM Corridor) with specified performance requirements
- Cooperative Separation Environment when within UAM Corridor
  - Operators will be responsible for maintaining proper separation when transiting a UAM Route and staying within the bounds of the UAM Corridor
  - Operations must meet the airspace & performance requirements when not operating within UAM Corridor

UAM Concepts - Corridor



UAM Concept *Overview* (continued)

- Leveraging the current model of UTMs UAS Service supplier (USS) a similar model will be needed to provide services for UAM operations.
- A Provider of Services for UAM (PSU) assists UAM Operators with meeting UAM operational requirements that enable safe and efficient use of airspace and UAM Routes
  - Shared network environment
    - Same federated UAM/UTM environment
  - Provide operator with information along the route
    - Based on shared intent data
  - Share operator intent with others via a shared network environment



UAM *Operations Evolution*

Initial Operations

- Will occur within the bounds of current ATM environment
  - Operations will be piloted and under ATC
  - UAM vehicles will have required equipage and meet performance requirements to operate in the current airspace
- No changes to rules and regulations
- Existing routes and procedures
  - Follow sectional and helicopter route charts
  - Possibility of new procedures and/or LOAs and helicopter routes
- New vehicles will be certified to operate in the environment

As tempo increases …

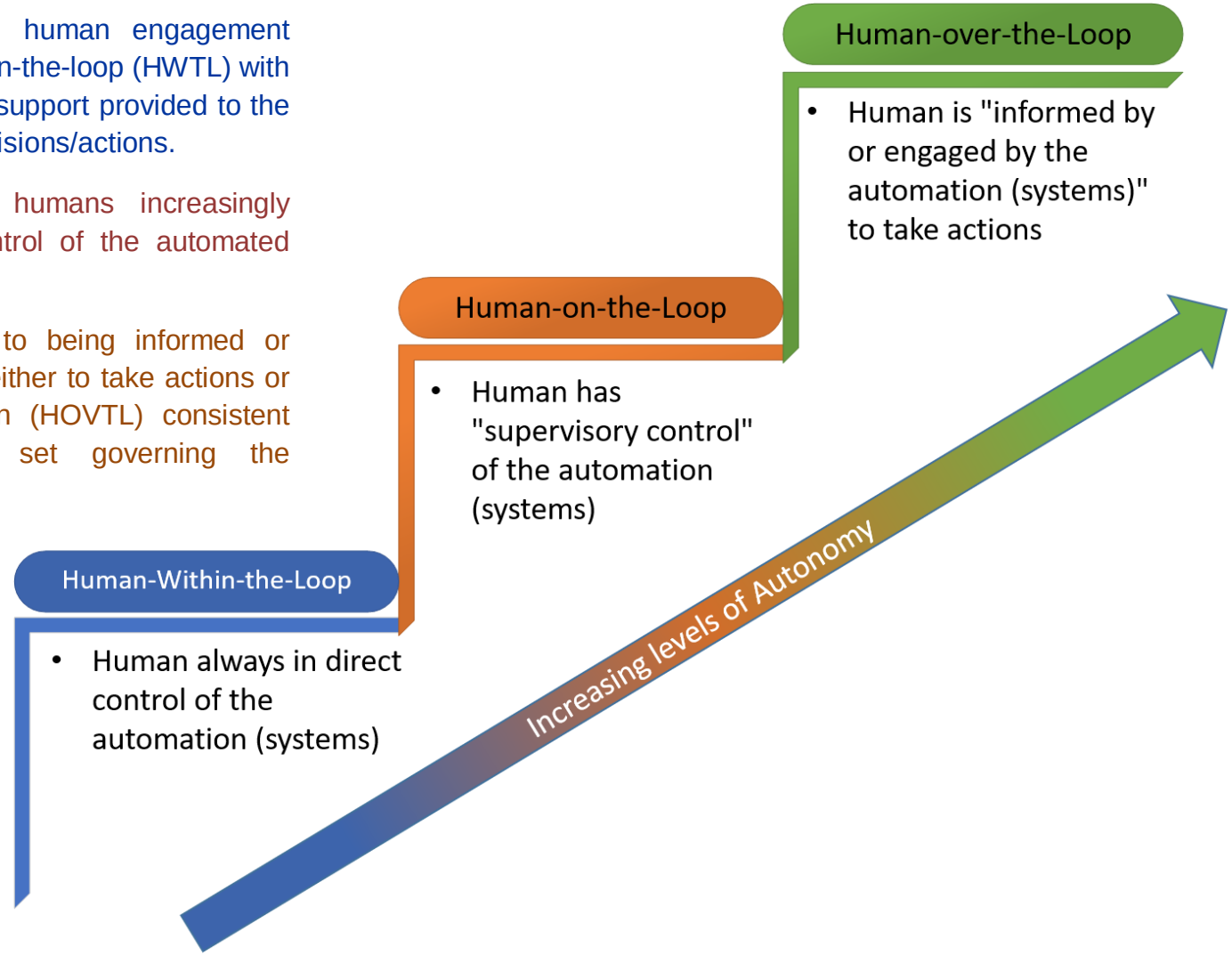
- More structure will be required
  - Shared intent
- Performance requirements will increase
- Increased levels of automation
- Increased vehicle capabilities
- Additional routes will need to mapped out and charted
- Increase in aerodromes (charted/known)

UAM Concept *Assumptions*

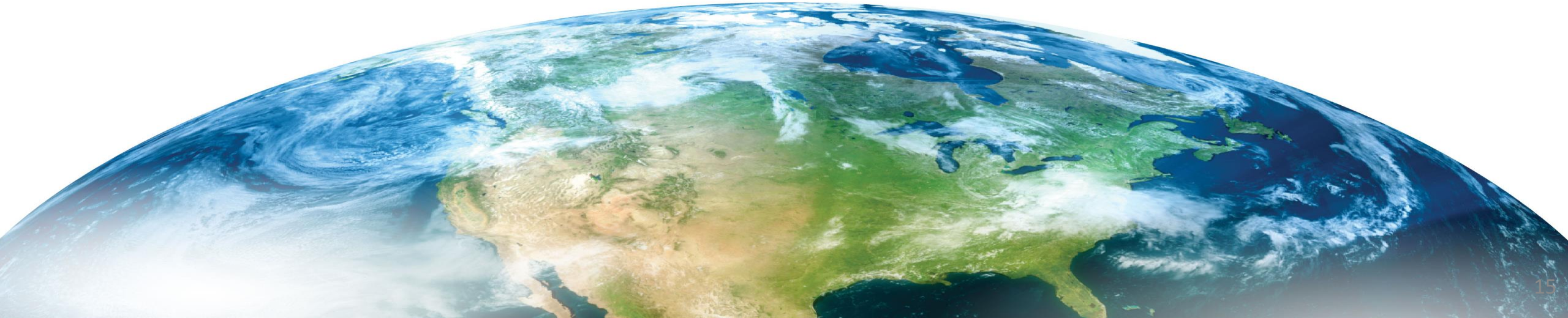
- UAM Routes will be publicly known and can have multiple tracks within that volume of airspace/Route
- The performance requirements to operate within a specific UAM Route will be consistent throughout, but may differ from another UAM Route
- Capacity of the route and its associated tracks are determined by the performance requirement imposed on the UAM route
- Cooperative separation will be applied once a vehicle enters a UAM Route
- If a UAM route is crossing through controlled airspace, vehicles inside the route need to be compliant and have the capability to operate in that controlled airspace
- Providers of Services UAM (PSU) will be utilized by operators to receive/exchange information when operating in a UAM Route
- PSUs will provide the route/track availability to the operators for their flight
- PSUs will be able to obtain small unmanned aircraft systems (sUAS) flight information from the USS Network
- USSs will be able to obtain UAM flight intent from the PSU Network
- UAM operators must maintain conformance to their shared intent; operators, via their PSUs, are aware of intent of others on the UAM Route
- When demand exceeds capacity on a UAM Route, Demand Capacity Balancing (DCB) rules may apply
- Flow management will be utilized within a UAM Route
- As levels of autonomy increase, performance requirements on a UAM Route may change

UAM *Evolutionary Steps (*Operational Systems)

- As automation matures, human engagement evolves from human-within-the-loop (HWTL) with information and decision support provided to the human for virtually all decisions/actions.
- In the second “step”, humans increasingly exercise supervisory control of the automated systems (HOTL).
- HOTL then progresses to being informed or engaged by automation either to take actions or before actions are taken (HOVTL) consistent with a defined rule set governing the interactions.



Questions & Answers



Potential Topics

Focus on Community Based Rule (CBR) for 1st six months

- Sept 1, 2020: CBR – Topic 1: Enter/exit into corridor
- Oct 6, 2020: CBR – Topic 2: Operations inside corridor
- Nov 3, 2020: CBR – Topic 3: Demand Capacity Balancing (DCB)
- Dec 1, 2020: CBR – Topic 4: Equitable Access to Airspace
- Jan 5, 2021: CBR – Topic 5: Security
- Feb 2, 2021: CBR – Topic 6: NAS Safety

Feedback: arc-cal-nari@mail.nasa.gov

Embracing innovation while maintaining safety of operations

Airspace Workgroup Points of Contacts

- Coordinator: Cecelia Town (Cecelia.S.Town@nasa.gov)
- Technical POCs
  - Ian Levitt (Ian.M.Levitt@nasa.gov)
  - PK (Parimal.H.Kopardekar@nas.agov)

Comments on Con Ops, suggestions for future topics, and other workgroup information:

arc-cal-nari@mail.nasa.gov

See you at next meeting on Sept 1st.