

Airspace Operations and Safety Program

Research and Development Partnership Workshop

Parimal Kopardekar

NASA Senior Technologist for Air Transportation System

Parimal.H.Kopardekar@nasa.gov

airspace operations enabling beyond possible

Scalable, efficient, safe, sustainable, secure, access for every airspace user

Strategic Thrusts



Safe, Efficient Growth in Global Operations

- Enable full NextGen and develop technologies to substantially reduce aircraft safety risks



Innovation in Commercial Supersonic Aircraft

- Achieve a low-boom standard



Ultra-Efficient Commercial Vehicles

- Pioneer technologies for big leaps in efficiency and environmental performance



Transition to Low-Carbon Propulsion

- Characterize drop-in alternative fuels and pioneer low-carbon propulsion technology



Real-Time System-Wide Safety Assurance

- Develop an integrated prototype of a real-time safety monitoring and assurance system



Assured Autonomy for Aviation Transformation

- Develop high impact aviation autonomy applications

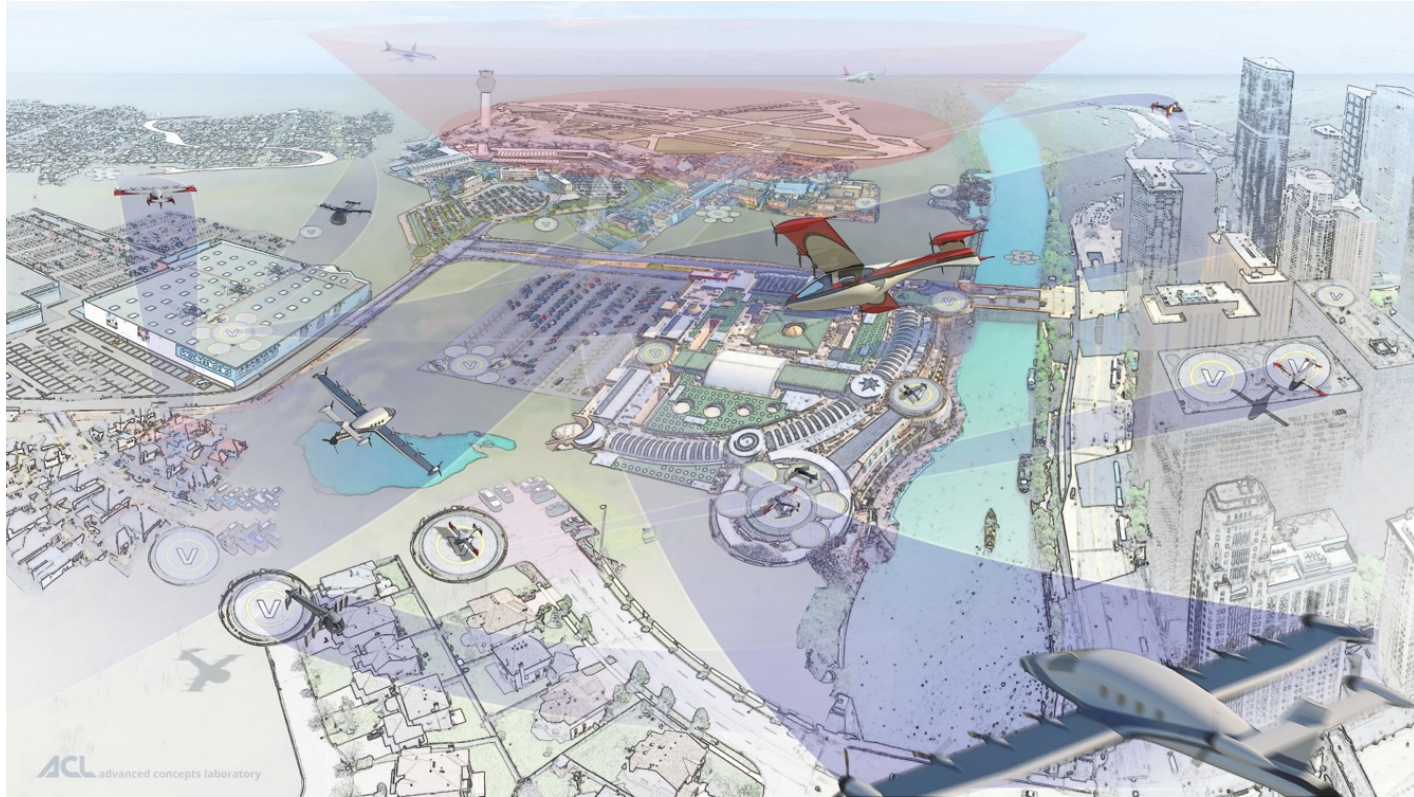
CURRENT AIRSPACE OPERATIONS



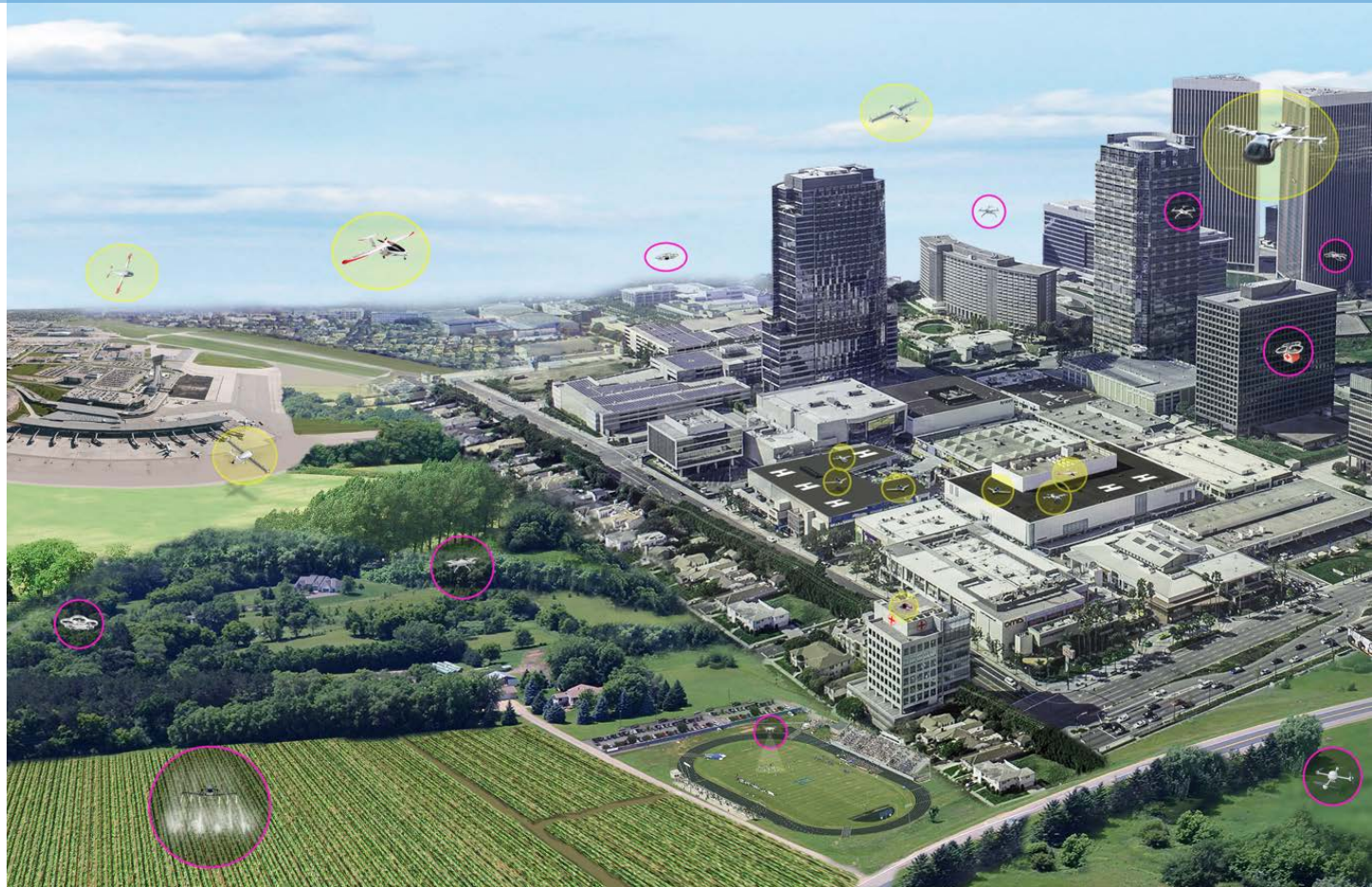
SMALL UNMANNED AIRCRAFT SYSTEMS



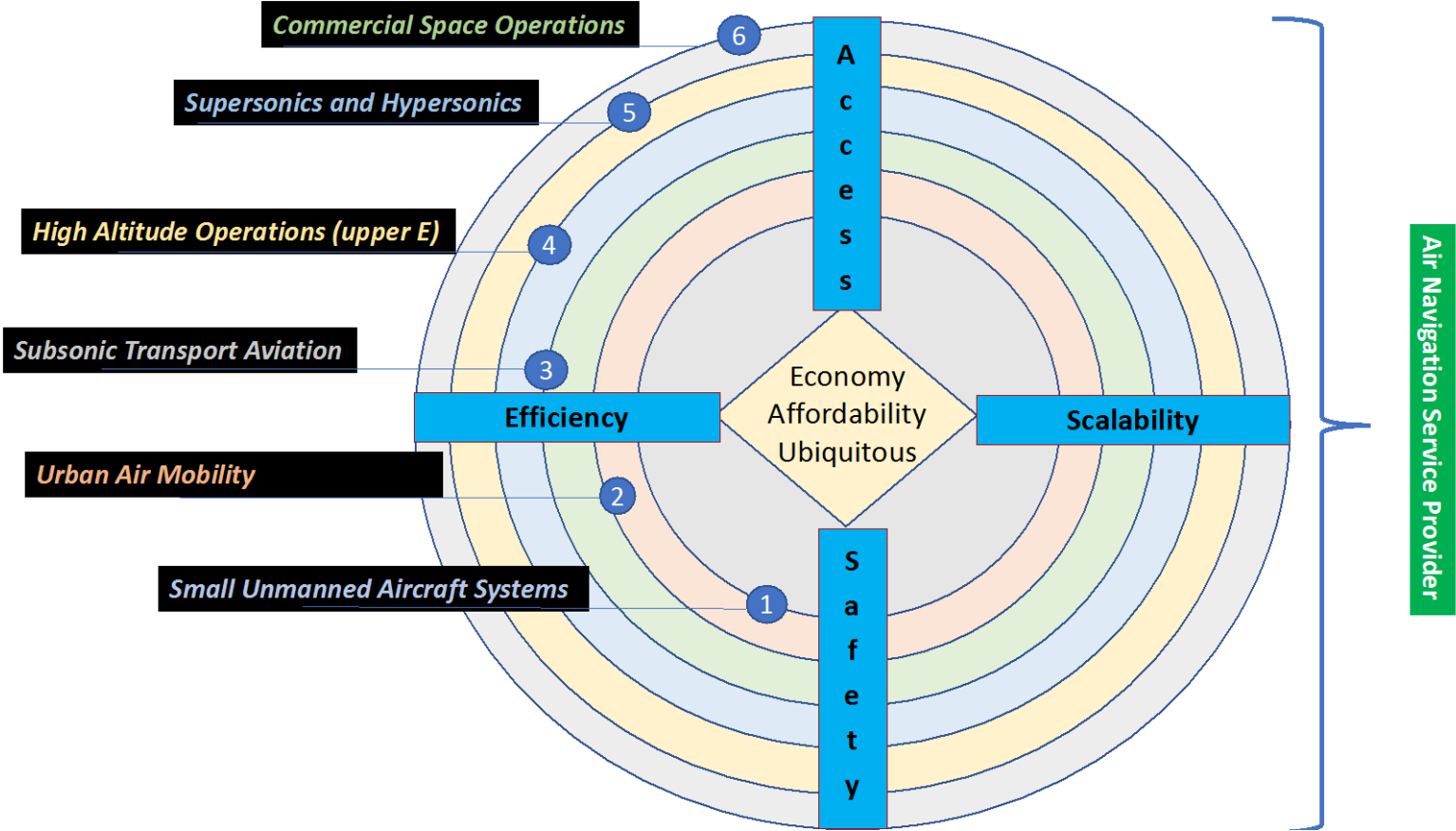
VERTICAL TAKE OFF AND LANDING

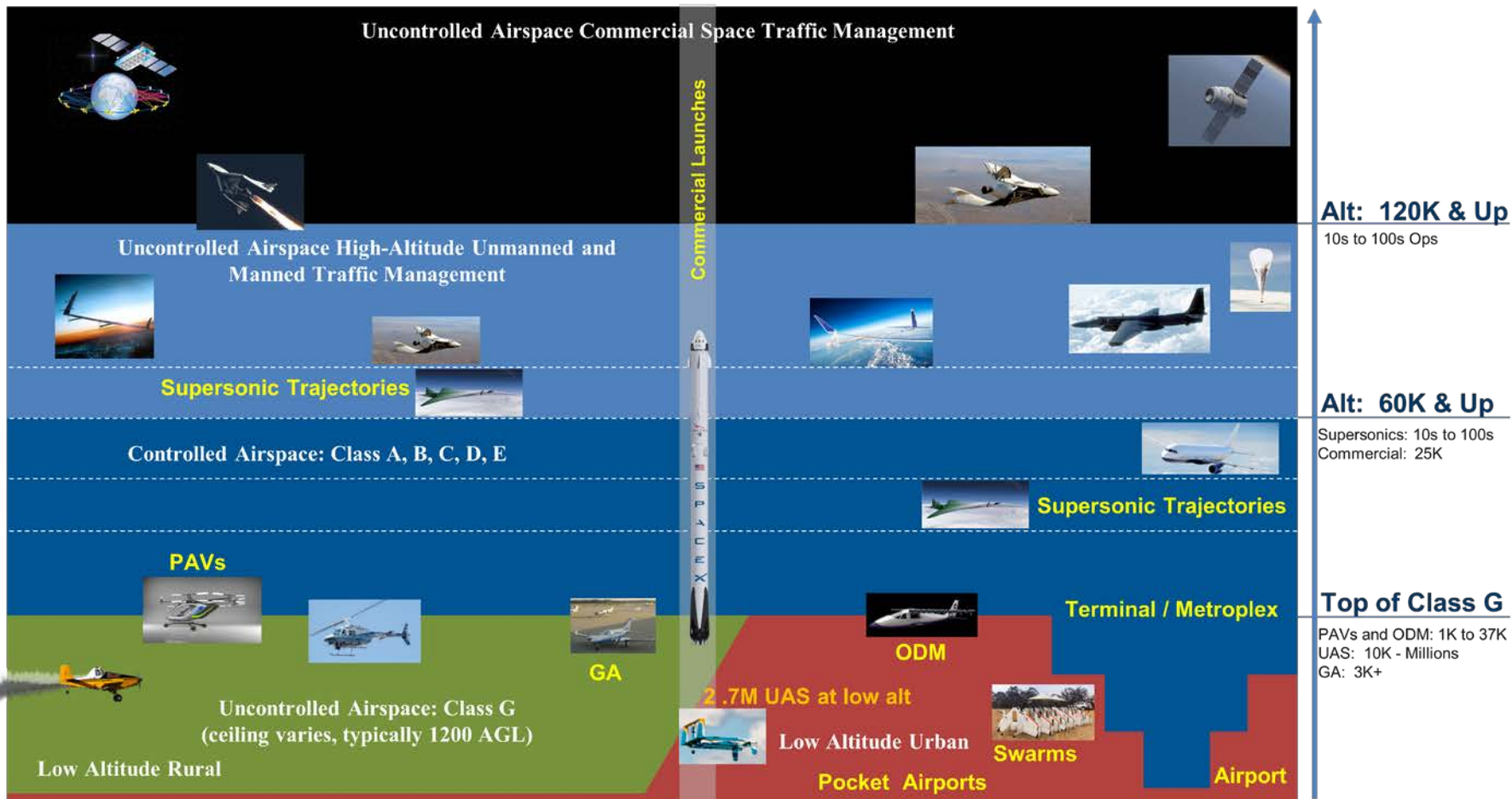


URBAN AIR MOBILITY: SMALL DRONES TO LARGER PASSENGER CARRYING VTOLS



Emerging Users





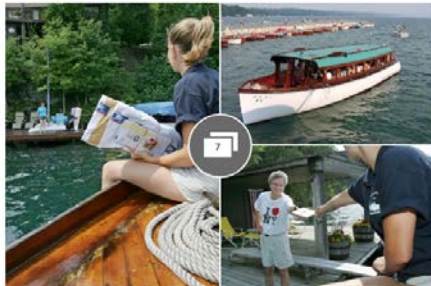
Airspace Operations: Much Room for Impact



The sign on the only cafe in town reads "No Fries 'Til Mail." Life in the community of Supai, Arizona, literally survives on its mail—in fact, inhabitants eat more "mail" than they read.

Barbara S. Wiles mailboat on Skaneateles Lake to retire; new boat launches July 1

Posted on April 15, 2016 at 10:15 AM



HISTORY, JUL/AUG 2017, REGIONAL FACTS

SPECIAL DELIVERY =



Inter-island Autonomous Cargo Delivery

single pilot, off-board manager, or fully autonomous

Transformation – Urban Air Mobility

Increasingly autonomous – focused on access, safety and scalability



UTM-LIKE-ATM AIRSPACE OPERATIONS ENVIRONMENT

- **Cooperative**
- **Intent-sharing**
- **Digital: data exchanges among operators**
- **Standardized application protocol interfaces**
- **Air/ground integrated**
- **Service-oriented architecture**
- **Role for third parties**

Space Traffic Management

High Altitude UTM (upper E)

**Conventional Manned Aviation
(Class A, B, C, D, E)**

Urban Air Mobility

Low-altitude small UAS

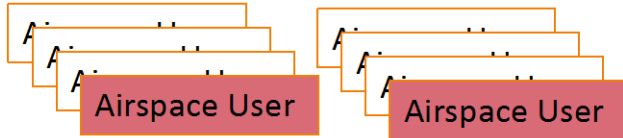
Current ATM

All services are provided by the FAA

- Traffic flow management
- Airspace directives/constraints
- Scheduling, sequencing and spacing
- Separation management
- Off-nominal management
- Every vehicle interaction in real-time

FAA Systems

Humans address off-nominal and contingencies



Very little interaction among users, and 3rd party services

- Human in the epi-center of information integration
- Every data moves through FAA systems for every vehicle
- Each change focused in on domain-specific FAA system

UTM-inspired-ATM

Some services are provided by FAA

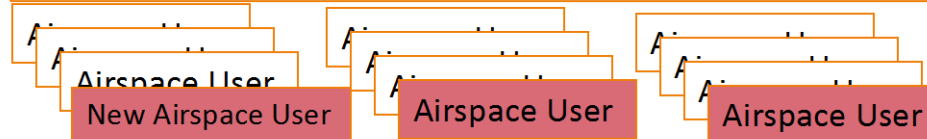
- Airspace directives/constraints
- Resource availability and changes to resources (e.g., arrival/departure rates, resource schedules)
- Separation

FAA Systems

User or third party services

- Flow management
- Sequencing, and spacing
- User participation strategic Separation (e.g., oceanic)

Automation addresses off-nominal and contingencies



Users collaborate/cooperate for efficiency, intra-user preferences for flights into constrained resources

- Automation in the epi-center of information integration
- New paradigm: digital and connected ecosystems-outside apps, scalability

NASA Unique Role: Architecture, data exchange, service allocation/roles/responsibilities, rules of engagement, service performance requirements, automation for contingency management and disruption handling, machine learning environment and algorithms for continuous improvement, safety assurance, certification/acceptance approaches, and technology transitions



Safe, Efficient Growth in Global Operations

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ATD

Airspace Technology Demonstrations

April 10-12, 2018 • Moffett Field, CA



Real-Time System-Wide Safety Assurance

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SWS

System-Wide Safety

April 10-12, 2018 • Moffett Field, CA



Assured Autonomy for Aviation Transformation

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AOSP R&D Partnership Workshop

ATM-X

ATM – eXploration

April 10-12, 2018 • Moffett Field, CA

AOSP R&D Partnership Workshop

UTM

UAS Traffic Management

April 10-12, 2018 • Moffett Field, CA

Future airspace operations?

- Scalable – increasingly autonomous
- Cooperative – information needs, and technologies for cooperation among vehicles, and operators, and service providers
- Digital – data exchanges and standardized application protocols
- Resilient – technologies and procedures for faster recovery from disruptions
- Manage by exception – flexibility where possible and structure where necessary
- Safety assurance – in-time data, prognostics, V&V of increasingly autonomous systems
- Air/ground/cloud integrated
- Service oriented architecture – third party

Space Traffic Management

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airspace operations

enabling beyond possible!

Workshop Structure

- Collaborative Innovation
- Four project overviews followed by program overview
- Lunch time – Sign up for tours on Thursday (limited availability)
- 11 Breakout sessions – 2-3 simultaneous
 - Individual input – areas of collaboration – moderators will collect cards (all breakouts)
- Report out sessions
- Happy hour –Wednesday evening in building 3
- Demonstrations and tours (Th)
- One-on-one meetings with program, project, and other researchers (Th)
- Collaboration – among each other and with NASA to maximize impact
- Be vocal – we want to hear community needs so that research products are most relevant

Collaboration Interest

Breakout Session 1

- A. Status and collaboration opportunities for Airspace Technology Demonstration 2: integrating arrival/departure/surface metroplex traffic management.

Name: _____

Company: _____

Email/contact information: _____

Area of interest: _____

Story of Airspace Operations and Safety Program motivation,

Inter-center NASA cooperation,

Air-ground integration and roles distribution,

Guarantees scalable, safe and efficient operation,

ATD, ATMx, SWS, and UTM execution,

Some focus on airspace and airport optimization,

Some focus on flight validation and simulation,

Some focus on communication,

Some focus on aircraft certification,

That's NASA's inspiration,

Strategic relation with Federal Aviation Administration,

It's all about collaborative innovation,

To enable efficient and safe airspace operation,

We must move towards higher levels of automation,

By government, academia, and industry collaboration,

Let's think beyond imagination, and assure all airspace users' inclusion,

Exploration, simulation, validation, integration, certification, collaboration, implementation will lead to airspace transformation!

embracing innovation in aviation while respecting it's safety tradition

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