EXPLORE FLIGHT

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Data and Reasoning Fabric (DRF)

December 2022

- Transportation shapes society, enabling economic and social interactions.

- The quality of life is impacted by ever growing commute time

- Transportation is increasingly driven by door-to-door logistics

Air Mobility can convert our 2D mobility system to a 3D system, increasing transportation options for both people and goods

- The national airspace system will follow an evolutionary path from the current National Airspace (NAS) to a NAS with integrated Advanced Air Mobility (AAM) operations:

  o A federated system of AAM operators, Vertiport operators and data service providers will need to be accommodated to safely manage the airspace at scale.

  o Integrated AAM operations , will require more complex safety-critical systems, with increased digital data exchanges and AI informed decision support tools.

  o The airspace constructs that will have emerged will be used routinely in conjunction with third party systems and services to ensure safe, efficient, and equitable access to the airspace for the AAM operators.

Data & Reasoning Fabric
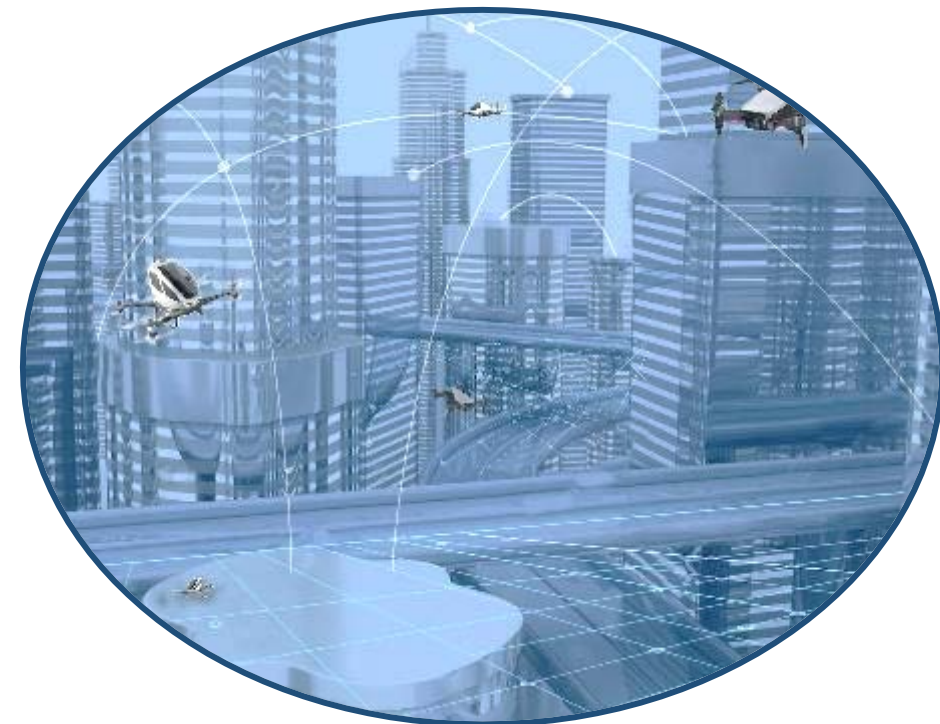
DRF is envisioned to provide the foundation for an ecosystem of data and reasoning to support:

- Transportation of people and cargo to places previously not served or underserved by aviation.

- Efficient and user-friendly integration of emerging and evolving traditional air transportation capabilities.

- Support for AAM decisions that depend on accurate, reliable, and current data.

Barriers to AAM Adoption

Several data access and decision support barriers must be overcome to enable advanced air mobility

Barriers	What is Needed?
Limited interoperability & data standardization between service providers and AAM & vertiport operators	Data exchange **Interoperability** between service providers and AAM or vertiport operators
Insufficient accurate data where it is needed to make airspace operations & management decisions	A **decentralized** approach to supporting data exchange and decision support across an AAM ecosystem
Highly Reliable and low-latency access to edge computing devices in support of tools to support safety related decisions	A **trusted** mechanism for transferring data across an AAM ecosystem
Reusable reasoning (decision support) services are not easily accessible	An approach for providing **low-latency** access to data needed for decision support
Clear economic incentives for data service providers	A mechanism to support the **monetization** of data and reasoning (decision support) services

AAM Challenges

The AAM community has identified following 6 major challenges in the AAM concept:

Infrastructure

Key Vehicle Technologies (e.g., power, autonomy)

AAM Airspace Integration

AAM Fleet Management

Policies, Regulation and Certification

Business Model

AAM Challenges – DRF Benefits

Traditional Data Sources:
- Airspace geometry
- Flight plans,
- Surveillance
- Wind,
- Weather

New data sources:
- Environmental sensors
- Other sensors
- Data collected by vehicles – video, audio, sensors
- On board sensors
- Zoning data

AAM Challenges

Infrastructure
Key Vehicle Technologies (e.g., power, autonomy)
AAM Airspace Integration
AAM Fleet Management
Policies, Regulation and Certification
Business Model

Benefits of DRF

- Infrastructure:
  - Interoperability – air and ground systems
  - Impact of ground systems including traffic, micro-weather

- Airspace Integration
  - Optimal flight planning and routing
  - Contingency planning and operations
  - Airspace capacity – multi-conflict Airspace availability assessment

- Policies and Regulation
  - How to adhere to zoning laws
  - How to propagate governance policies from different stakeholder – cities, operators, FAA

- Business Model
  - Provide access to data relevant to business (e.g. terrain, population)
  - Provide access to decision support tools (e.g. flight plan options)

Data & Reasoning Fabric (DRF)

Trusted Service Discovery and Exchange Backbone
for the Future Airspace Ecosystem
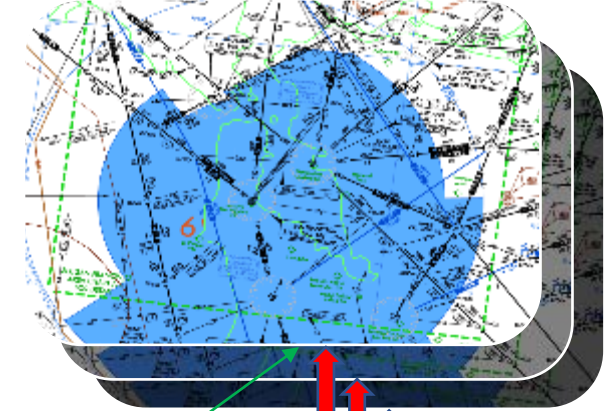
A Data & Reasoning Fabric
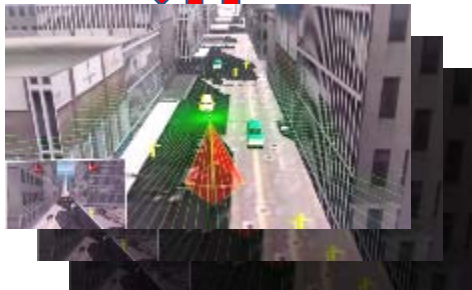

Service Providers

PLANNING

OPERATIONS

PERFORMANCE

DATA & REASONING FABRIC

ENABLE EFFICIENT AND PERVASIVE DATA DISCOVERY, AGGREGATION, AND DATA/$ TRANSACTIONS, IN ORDER TO ENABLE A DATA AND REASONING SERVICE EXCHANGE FOR AAM ENVIRONMENTS
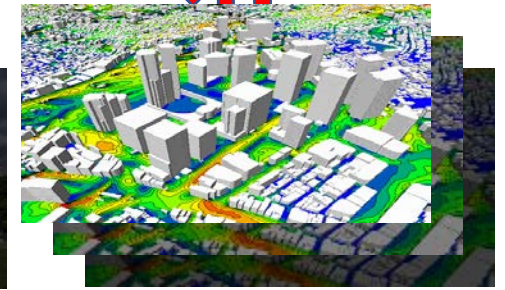
SMART VEHICLES

SMART AIRSPACES

SMART CITIES

REGULATORY

MICRO-WEATHER

Data & Reasoning Services

DRF is not a marketplace

DRF is a platform that enables future Data & AI Ecosystems

- The DRF team in collaboration with the California Civil Air Patrol (CAP), is executing a field test that will identify a preliminary set of data and reasoning service areas that can be enabled and enhanced by DRF to potentially bring forth improved accuracy and reduced latency to CAP's mission critical decision making, in wildfire detection.

Registration of Data & Reasoning Services	Registration of Users & Service Discovery	Simulated Lightning Strike	Identification of Fly Target Areas	Identification of Flight Trajectories

Leveraging weather and environmental data and decision support reasoning services to plan wildfire detection missions

Onboarding data & reasoning services	Enabling data & reasoning service discovery	Access weather data services	Interoperable access to diverse data to support reasoning service	Leveraging multiple reasoning services for decision support

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Diverse and Inclusive AAM with DRF

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- Advanced Air Mobility calls for technologies, standards and protocols to accommodate new entrants as well as legacy operations

- The new entrants will require safe and efficient operations

- Require migration to comprehensive autonomy, better data links and distributed information systems

- Operations in real time as needed.

- To achieve an inclusive AAM system, we must get autonomy and data management right