



# EXPLORE FLIGHT

WE'RE WITH YOU WHEN YOU FLY

Air Mobility Data & Reasoning Fabric

TACP/CAS D&R Fabric Team



# MOBILITY CHALLENGE

- Throughout the world, especially in dense urban environments, the quality of life is being negatively impacted by ever growing commute time.
- Travel, beyond commuting, is increasingly driven by door-to-door challenges – not just gate-to-gate considerations.
- Air Mobility may be an approach to address these challenges, as it can effectively convert our 2D mobility system to a 3D mobility system, vastly increasing mobility options.



# AIR MOBILITY VISION and CHALLENGES



## CHALLENGES

- Require far more decisions, at times in very short amounts of time, and in safety critical situations.
- Many decisions will need to be made or augmented by machine intelligence.
- Decisions must be made based on accurate, reliable, and current data – must be available to humans, machines, or a combination.
- Data will arise from Smart Vehicles operating in Smart Airspace systems, engaged with an instrumented Smart City.

**VISION: A far greater density of heterogeneous vehicles (UAV, eVTOL, to electrified and autonomous urban, short-haul, and long-haul subsonic and supersonic aircraft) operating safely in all eco-systems, rural to dense urban environments, accommodating routine and contingency situations.**

# Air Mobility Data & Reasoning Fabric

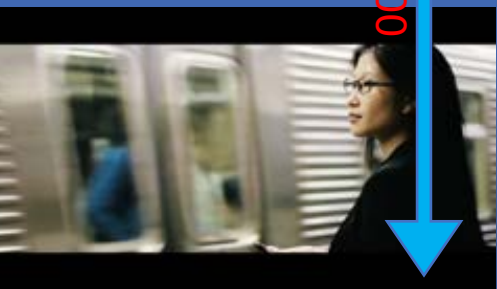
SMART AIRSPACE



SMART VEHICLES



SMART CITIES



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**Data & Reasoning Fabric needs to be an open architecture and a set of data and reasoning services with the following attributes:**

**Data** (Available in-time from disparate sources) – Availability, Quality, Integrity, Correctness, and Authenticity will be driven by standardized requirements.

**Fabric** (Consistent capabilities available as connected nodes across cyber physical entities) – Brings together a choice of nodes across multiple cloud and edge resources that seamlessly work together to tie in data and the reasoning elements for real-time and non-real-time decision-making by *all* users (humans and machines) of the airspace.

**Reasoning** (Available as services) – At the minimum includes various analytics, AI techniques, Machine learning algorithms, uncertainty quantification methodologies, and a set of Physics engines.

**OPPORTUNITY:** Retain current levels of safety even with increased air travel density, complexity, and user communities.



# Air Mobility Planning, Operations, and Performance

## APPLICATION ENGINES



PLANNING



OPERATIONS



PERFORMANCE

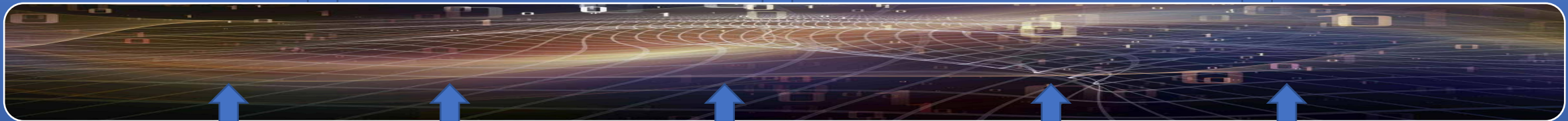
## REASONING FABRIC

Deep Learning

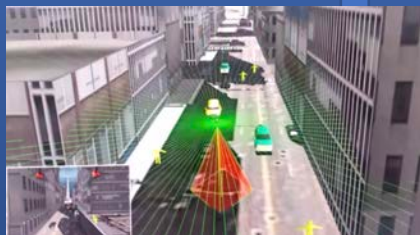
Data Analytics

Physics Engines

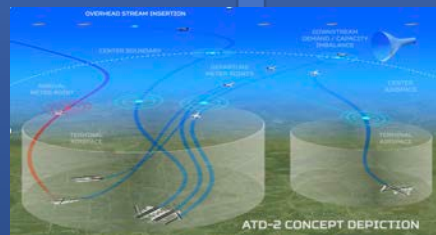
## DATA FABRIC



## DATA SOURCES



SMART VEHICLES



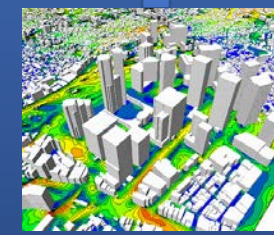
SMART AIRSPACES



SMART CITIES



FAA RULES



MICRO-WEATHER



# Air Mobility Data & Reasoning Fabric

SMART AIRSPACE



SMART VEHICLES



SMART CITIES



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## Questions:

1. Does an Air Mobility Data & Reasoning Fabric address the data & reasoning challenges that must be resolved to achieve the “Jetson’s” air mobility vision?
2. Can elements of the Fabric/Mesh/Big Data technology base being developed across the world be re-deployed as the technology base of an Air Mobility Data & Reasoning Fabric?
3. What role should NASA play?
  - a) Prototype application of Fabric technologies to air mobility challenge?
  - b) Identify missing standards/technologies and develop, then re-prototype?
  - c) Other?
4. How do we assess this opportunity, realistically, given the complexity of the technical challenge and the extreme pace of Fabric technology development?