

National Aeronautics and Space Administration



**NASA TECHNOLOGY  
TRANSFER PROGRAM**

BRINGING NASA TECHNOLOGY DOWN TO EARTH

# **Fe<sup>3</sup> Traffic Simulator Overview**

## **NASA Ames Technology Transfer IT & Software Webinar**

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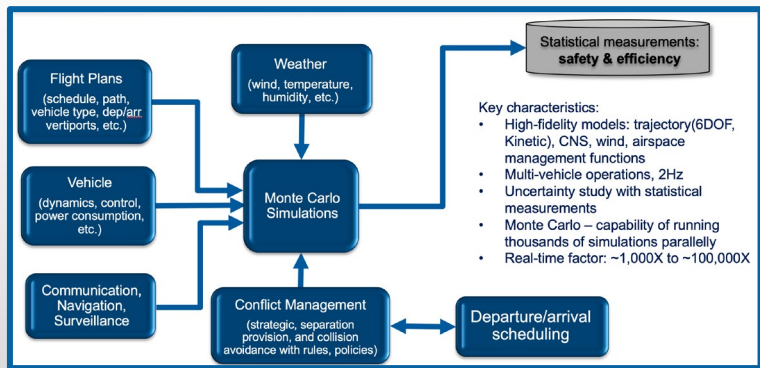
**Technical Lead, Extensible Traffic Management**

**NASA Ames Research Center**

**08/18/2022**

[www.nasa.gov](http://www.nasa.gov)

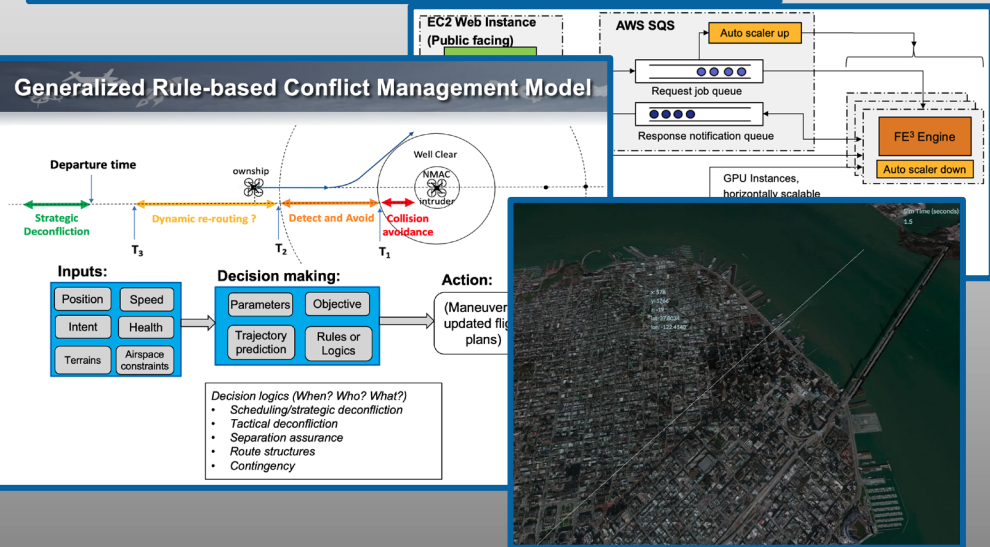
# Fe<sup>3</sup> traffic simulator for new-entrant vehicles



- Key characteristics:
- High-fidelity models: trajectory(6DOF, Kinetic), CNS, wind, airspace management functions
  - Multi-vehicle operations, 2Hz
  - Uncertainty study with statistical measurements
  - Monte Carlo – capability of running thousands of simulations parallelly
  - Real-time factor: ~1,000X to ~100,000X

## Technology:

- **High computational performance:** utilization of cutting-edge cloud and GPU processing technologies, and inclusion of comprehensive and generalized models involving high-volume low-altitude traffic operations
  - Assesses the airborne risk with a near real-time performance
  - **Monte Carlo simulation capability**
- **Modular and flexible user-input capabilities:** users can input their vehicle models into the system configuration file in order to test new vehicles and flight rules within the simulation
  - Generalized and high-fidelity models for trajectory calculation of various aerial vehicles, including multi-copter, fixed-wing, and hybrid aerial vehicles
  - Subsystem models (communication, navigation, surveillance, conflict management, weather, etc.) critical to the traffic system
- **Implementation:** Web-based output and visualization are implemented to facilitate post-analysis ; Can easily convert to a SaaS (software as a service) product for the adopting companies



# Fe<sup>3</sup> traffic simulator for new-entrant vehicles

- Applications:
  - Assessment of airborne risk
  - Validation of Conflict management models or flight rules
  - Development of subsystem requirements
- Potential users:
  - New-entrant vehicle operators
  - Insurance companies
  - Service providers
  - Regulators
  - Academic researchers

Slide Number

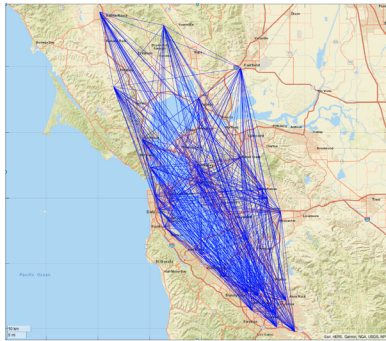
Airspace Complexity/Risk Studies

Develop metrics that can represent airspace complexity based on simulated data

CNS Requirement Studies

Interactions between Scheduling and Conflict Resolution<sup>[1][2]</sup>

UAM multi-modal simulation – air traffic segment



Mission Profile

Scope of airspace system functions

<sup>[1]</sup> P. Yedavalli, E. Onat, X. Peng, R. Sengupta, P. Waddell, V. Bulusu, and M. Xue, "SimUAM: A Comprehensive Microsimulation Toolchain to Evaluate the Impact of Urban Air Mobility in Metropolitan Areas", AIAA Aviation Forum, June 27 - July 1, 2022, Chicago, IL

# Questions?

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