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Integrating Wind and Weather Hazard Data into Airspace Management and UTM Systems

Produced by:

UAS Weather Forum



Agenda

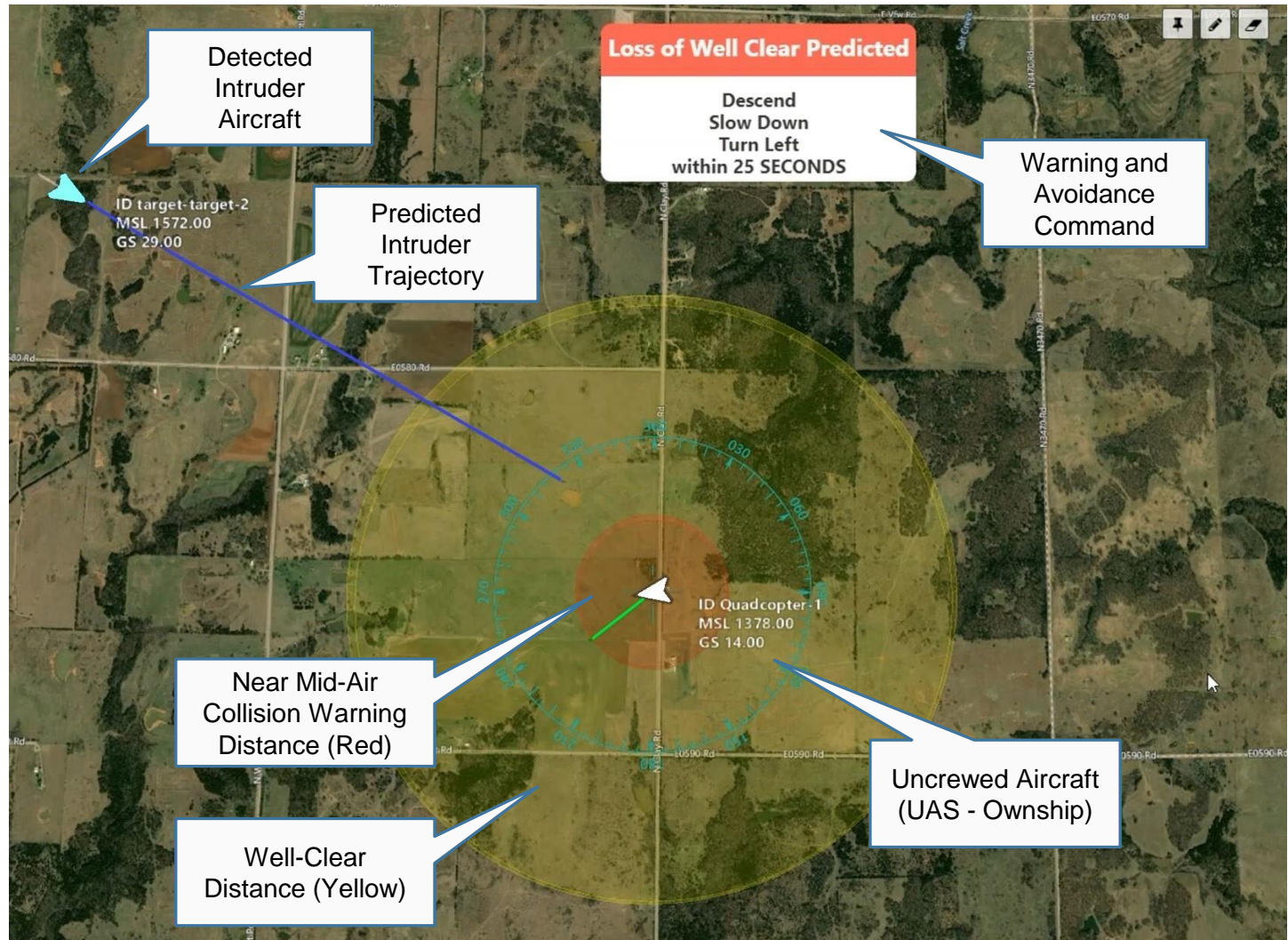
1. Company and System Background
 - System Overview & UI, Selected Industry Projects
 - Weather in Context
2. UTM – Uncrewed Traffic Management
 - Opportunities to use UTM for Weather Hazards
 - Considerations in Weather Hazard Data Integration
 - Goals and End-Users of UTM-based Hazard Data
3. Upcoming Activities and Opportunities
 - Testing with Droneports, Vertiports and Corridors
 - Flight Demonstration Opportunity
4. Questions

Background

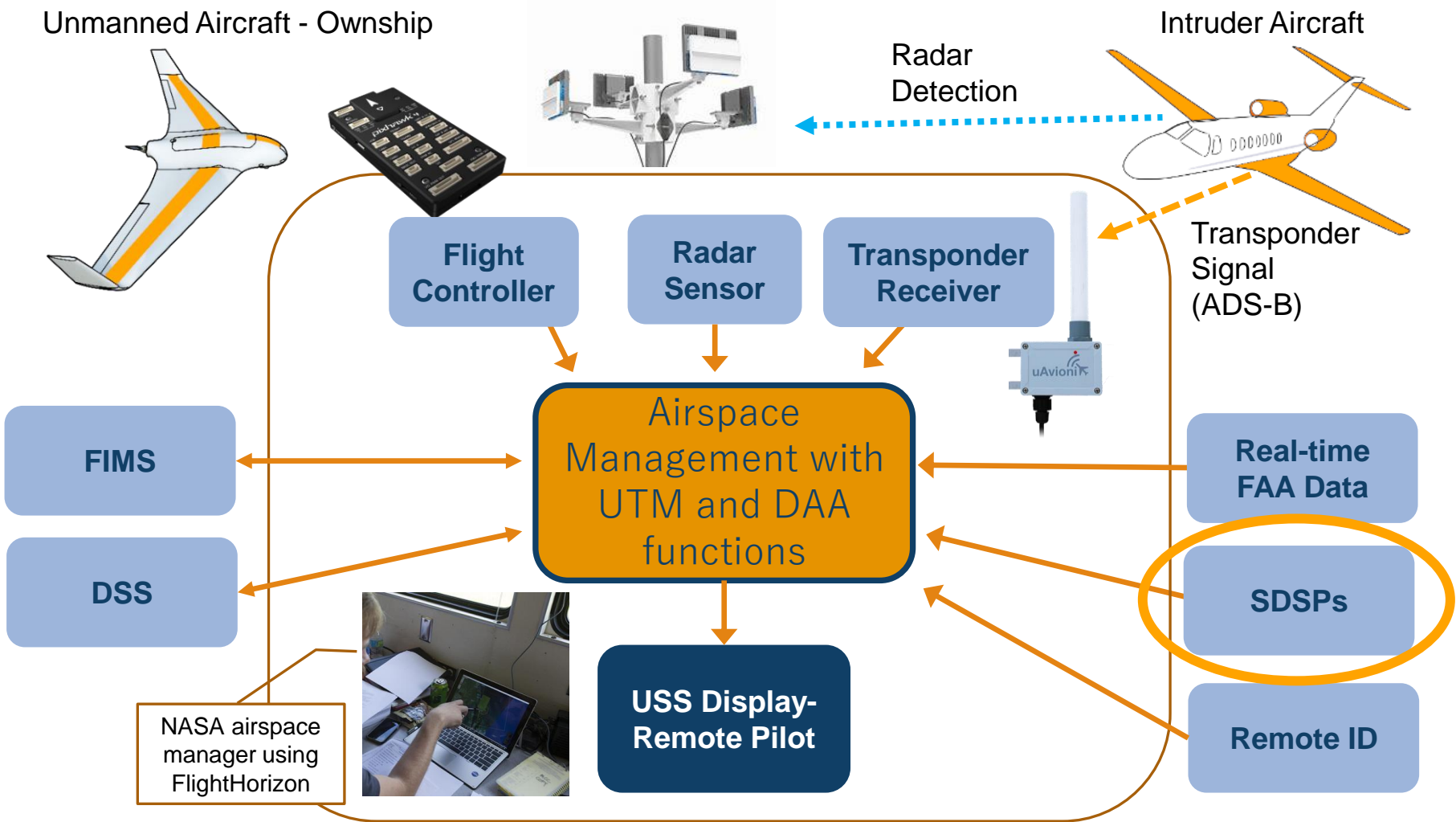
- Vigilant Aerospace Systems & FlightHorizon
- Standards-based detect-and-avoid and UTM-compatible airspace management systems
- Multi-sensor system hosted in the cloud, deployed anywhere
- FlightHorizon based on two NASA patents
- Projects with NASA, FAA, UAS test sites, and multiple USAF and civilian programs
- Uses both local sensors and online data sources including FAA data and others
- NASA Commercial Invention of the Year Award 2021



Detect-and-Avoid User Interface



System Implementation



Selected Industry Projects



- **NASA ULI WindMap project** - FlightHorizon for wind and weather hazard avoidance and airspace management
- **US Air Force AFRL SBIR Phase II** – Onboard detect-and-avoid system for new secret drone
- **US Air Force AFWERX SBIR Phase I** – Counter-UAS system development
- **FAA Contract for Detect-and-Avoid** – FlightHorizon for detect-and-avoid at Alaska UAS Test Site; Full BVLOS Part 107 commercial waiver utilized
- **Airspace Management for Northern Plains UAS Test Site** - FlightHorizon for airspace management at leading Federal UAS test site in Grand Forks, ND
- **NASA Commercial Supersonic Technology Program** - FlightHorizon for detect-and-avoid for supersonic F-18s
- **NASA Commercial Invention of the Year Award 2021** – Won NASA’s highest commercial technology award

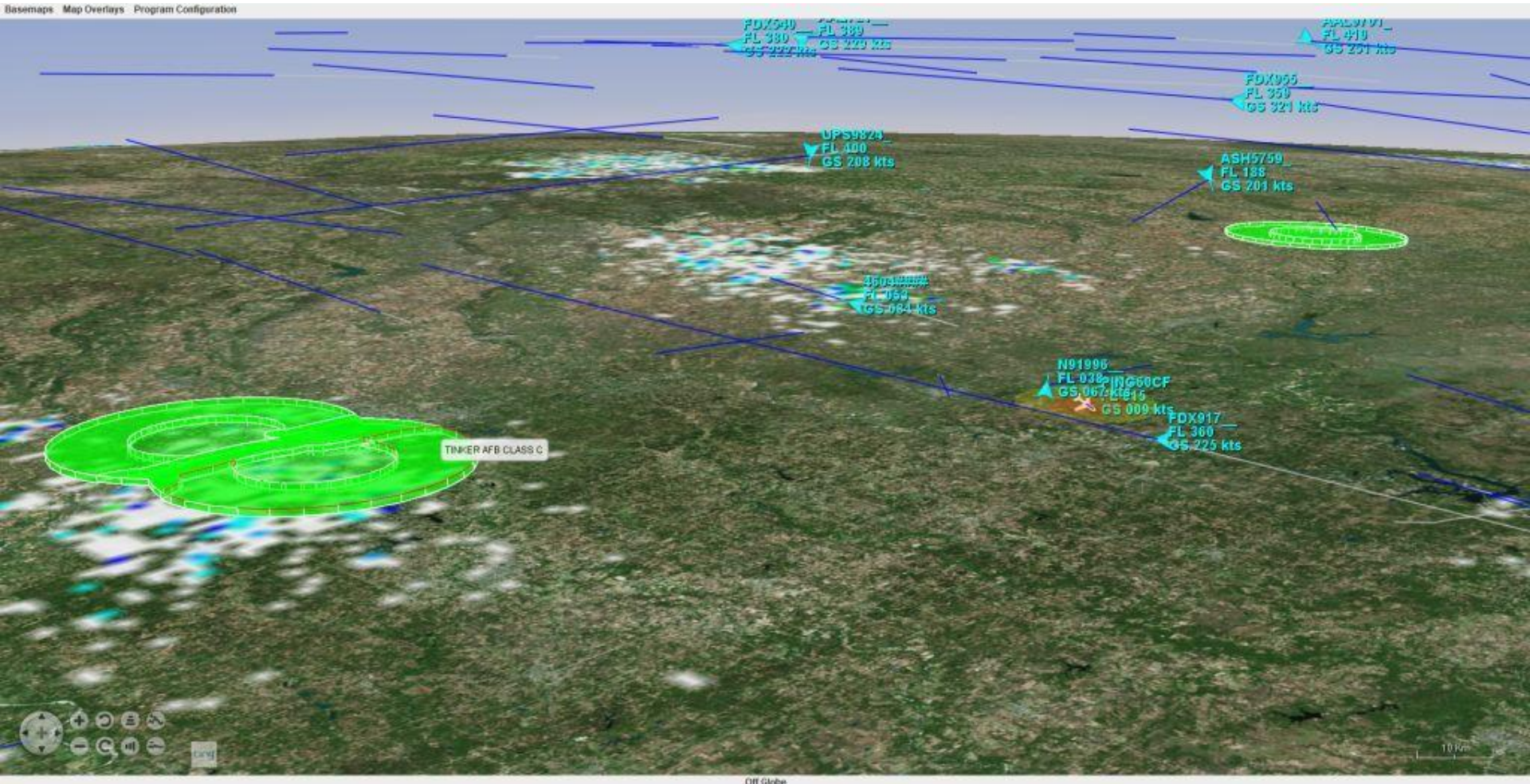
NWS and FAA Weather Data

The screenshot shows a flight simulator interface with a weather radar overlay on a map of North Dakota. The interface includes a top menu bar with 'Go to Ownship', 'FILE', 'MAP LAYERS', and 'SETTINGS'. The 'MODE: SIMULATION' indicator is in the top right. A search bar shows 'North Dakota, USA'. The 'Manage Map Layers' panel is open, showing the following options:

- Image Layers:**
 - Grid
 - Weather Wind Speed
 - Weather Clouds
 - Weather Precipitation
 - Weather Radar
 - Bing Maps Aerial
- Overlays:**
 - ADS-B Airspace Required
 - Restricted UAS Areas
 - Restricted Special Use Airspace
 - VFR Sectional Charts
 - VFR TAC Charts

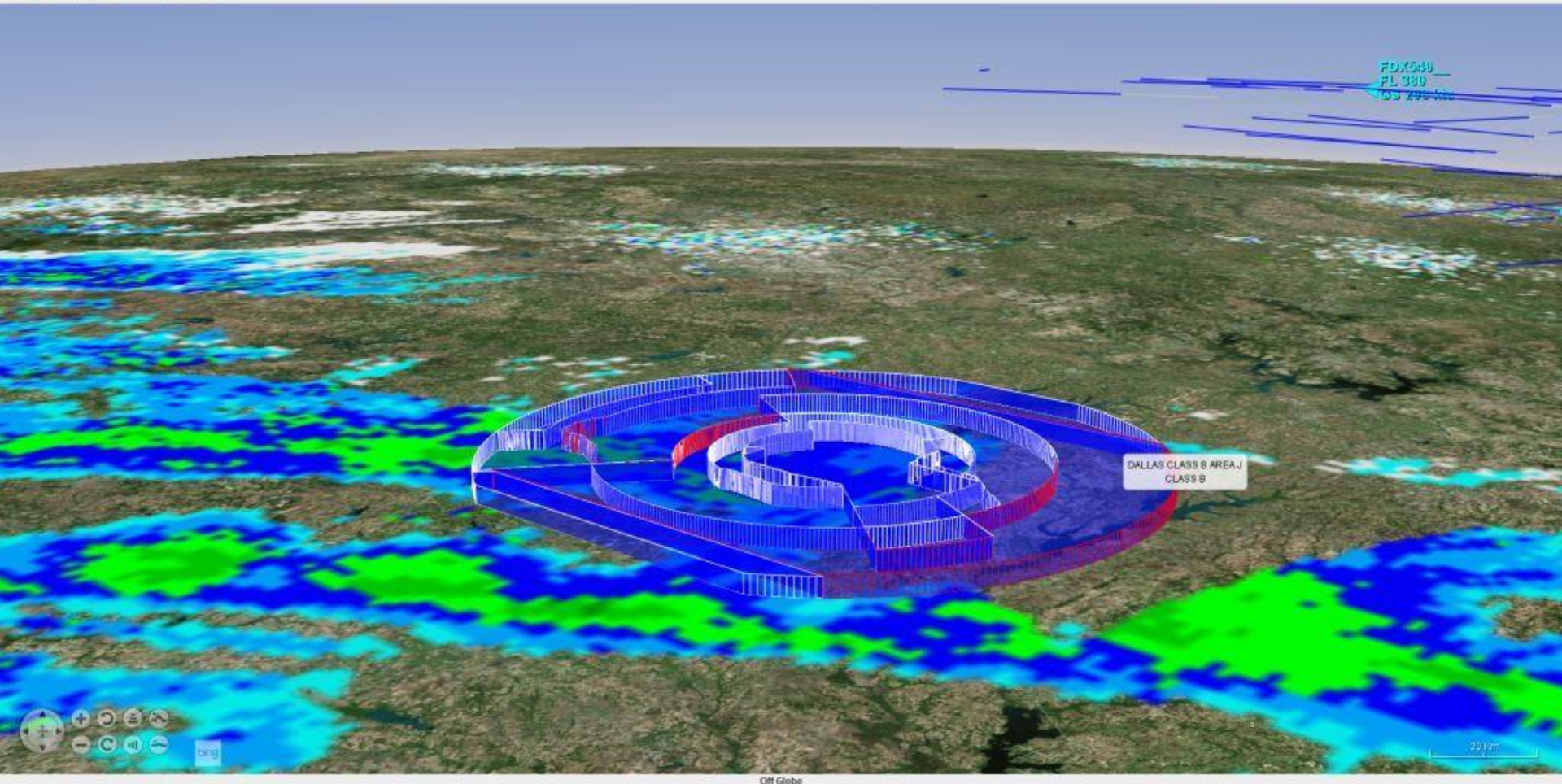
The map displays a weather radar overlay with colors ranging from blue (light) to red (heavy), indicating precipitation intensity. The map also shows Bing Maps Aerial imagery, major roads, and city names such as Fargo, Grand Forks, and Ellsworth.

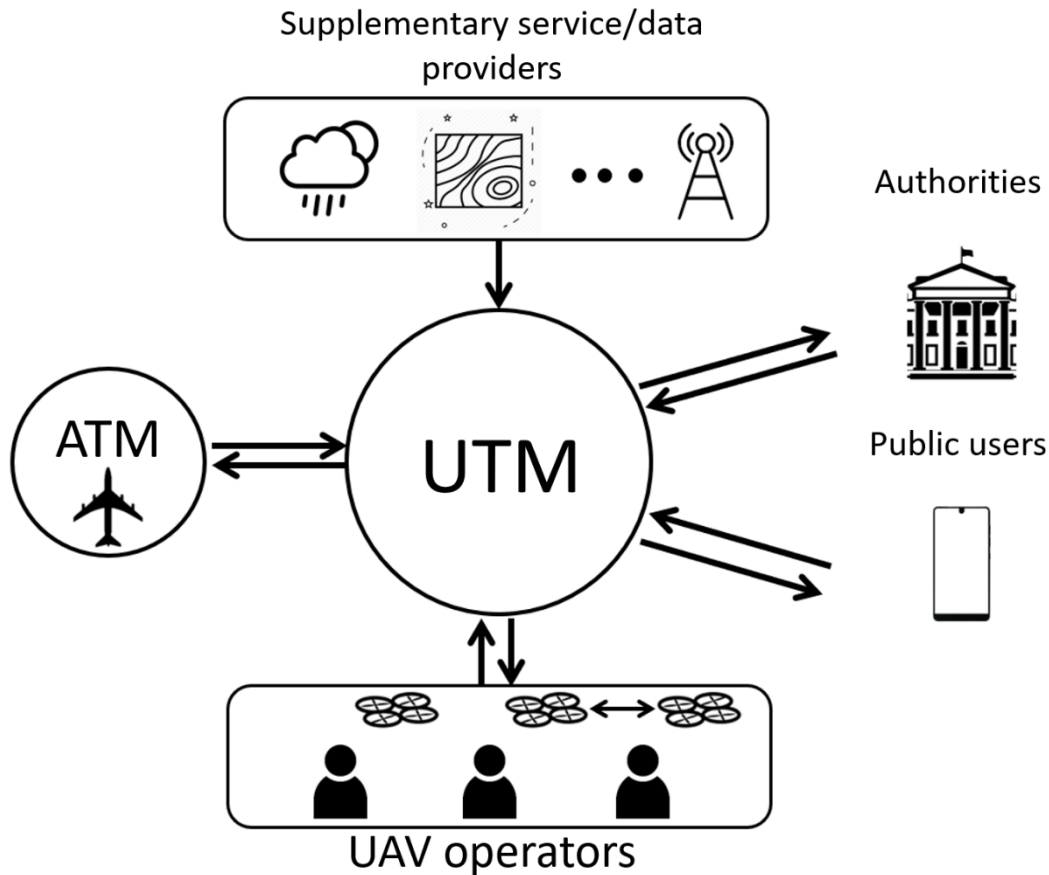
Weather in Context for Safety



Real-time Airspace Visualization

Basemaps Map Overlays Program Configuration

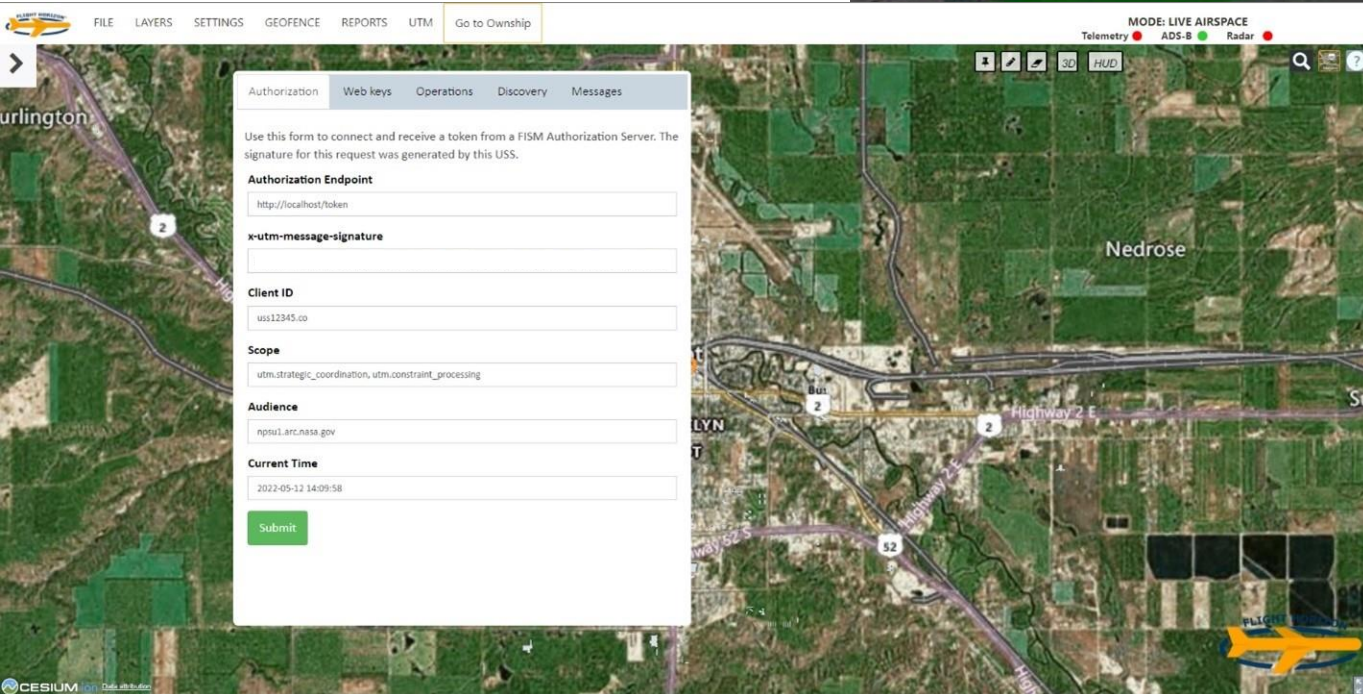
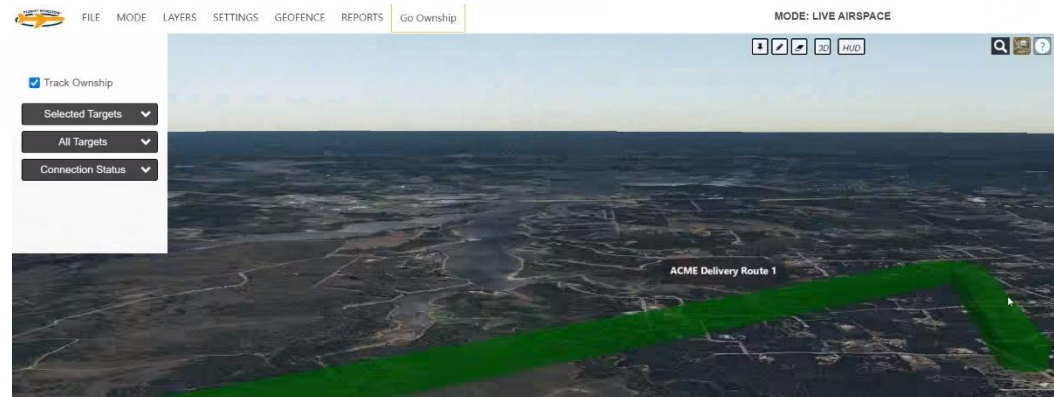




What is UTM?

Vinogradov, Evgenii; Minucci, Franco; Pollin, Sofie (2020). "Wireless Communication for Safe UAVs: From Long-Range Deconfliction to Short-Range Collision Avoidance". IEEE Vehicular Technology Magazine. 15 (2): 88–95. arXiv:1910.13744. doi:10.1109/MVT.2020.2980014.

UTM Functions





Opportunities Presented by UTM

- Real-time data distribution, fully digital, highly automated
- Highly scalable, resilient
- Contingency planning built-in
- Multiple cooperating vendors based on industry technical standards
- Common data quality, format and distribution standards



Integration Considerations

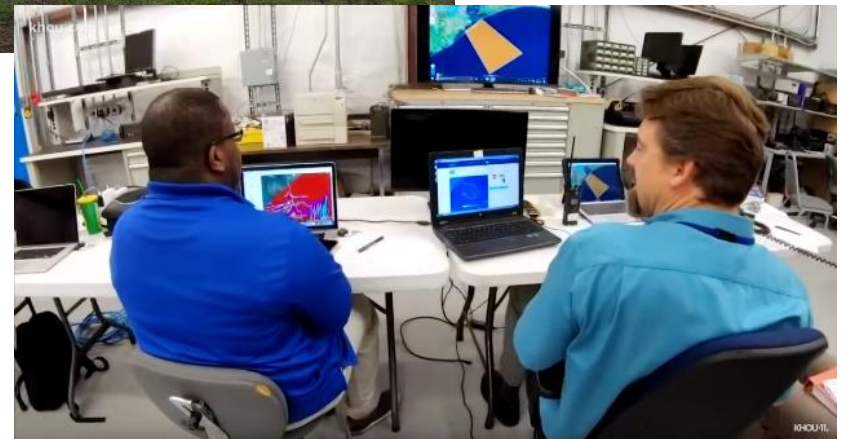
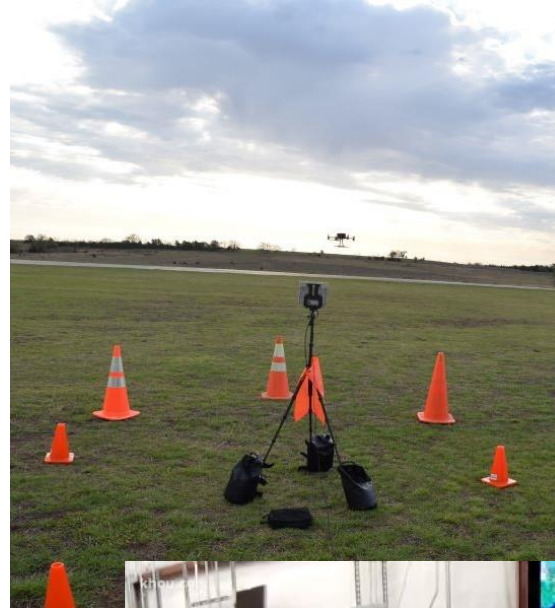
- When and how a “hazard” is declared
 - Differences in sizes and certifications of aircraft
- Data exchange considerations
 - Usability and data format – GeoJSON
 - Timeliness and latency
 - Accuracy and precision of the data
- Technical Standards
 - ASTM F3673-23: Standard Specification for Performance for Weather Information Reports, Data Interfaces, and Weather Information Providers (WIPs)

Goals & End Users

- Goals of our integration project
 - Integration of authoritative, real-time SDSP providers
 - Demonstration of effective wind and weather hazard identification, display and warning
 - Roll-out of national data-driven, automatic wind and weather hazard data for UAS and AAM operators
- End-user types
 - Droneports and corridors
 - Vertiports for AAM,
 - Agricultural and industrial drone operators
 - Delivery drone operators



End-User Installations & Testing



Upcoming Activities & Opportunities

- NASA ULI Windmap Demonstration Flights
 - Tulsa, Sept. 2024
 - Seeking real-time data providers
- Droneports seeking UTM and DAA solutions
 - Standards-based service delivery



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Questions

THANK YOU!