Exercise Use Case Putting it All Together –

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Common Conditions

Flight environment and operation

- Small UAS operation
- Flights are below 400 ft. AGL
- Flight location is within a known area
- Class G uncontrolled airspace
- Low ground risk
    - Very low population density according to US Census data
- Aircraft does not carry its own DAA system.

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Scenario Selection

Crop Management

- Multi-spectral camera system designed for crop surveillance and analysis

Pipeline Inspection

- Long-linear infrastructure

Package Delivery

- Using a small UAS for package delivery

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Key Question: What are the typical air risks for the operation?

- Crop management
  - Crop spraying aircraft – many of which are not cooperatively broadcasting and operate at low altitudes
- Pipeline inspection
  - Traditional aviation assets used to conduct inspections
- Package delivery
  - Operations are usually conducted in areas of higher population – typically also with higher GA and commercial aviation traffic
- DAA reduces risk for each operation type
- Strategic methods should also be incorporated to further increase safety
  - Outreach to NAAA for operations in areas of known Ag traffic
  - Coordination with traditional aviation operators for areas where both manned aircraft & UAS are used
  - NOTAMs

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Applications: Is the ASTM F3442M-23 Standard applicable?

- Applies to uncrewed aircraft (UA) ≤ 25 ft in size, operating < 100 knots.
- Designed for low- and medium-risk airspace (Class G & E, portions of Class B, C, D).
- Traffic mix: Cooperative (with transponders – electronically conspicuous) and non-cooperative (e.g., small GA, helicopters without transponders).
- No ATC separation assumed – UAS must self-separate from crewed aircraft.
- DAA system must work in both day & night operations, Visual & Instrument Meteorological Conditions (VMC/IMC).
- UAS-to-UAS and obstacle avoidance are NOT covered – only detect & avoid for crewed aircraft.

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ASTM F3442-23: Core Functions

Detect Function (DF):
Identify potential air traffic threats.

Alert Function (A1F):
Notify the pilot/system of intruder presence.

Avoid Function (A2F):
Provide flight guidance to maneuver away.

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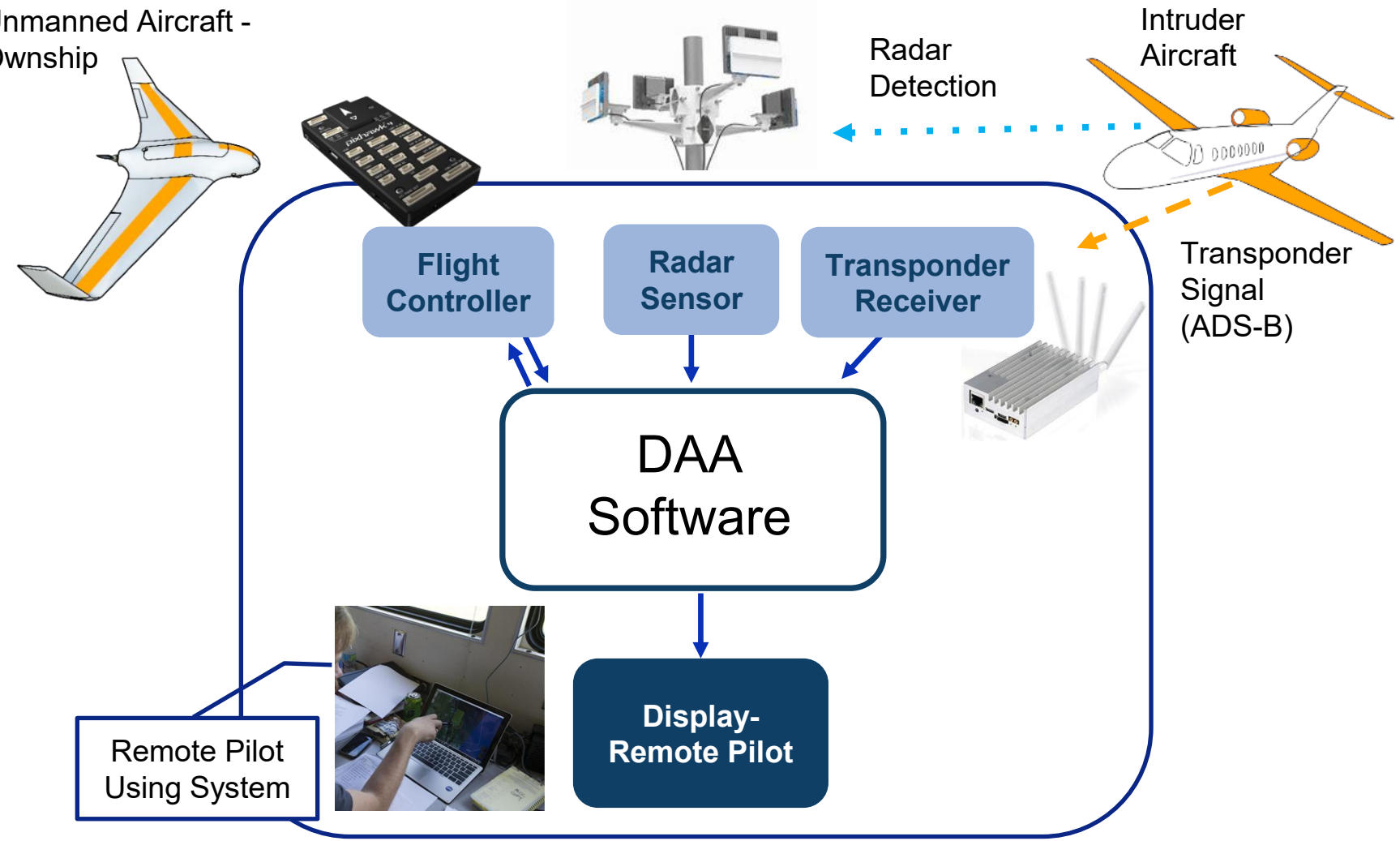
Key Questions: How to Apply ASTM F3442M-23 - Designing a DAA System

- How to provide Detection (DF)?
  - Cooperative Detection?
  - Non-cooperative Detection?
- How to provide Alerting (A1F)?
  - GUI design considerations
- How to provide Avoidance (A2F)?
  - Avoidance logic should cover any intruder approach profile
- How to test and document?
  - Standard Guide for Testing Detect and Avoid Systems for UAS
- How to apply for appropriate waiver/exemption?

Part 107 WSEG asks:

Is the DAA system compliant with the Industry Based DAA Performance Standard or a combination of standards? i.e. portions of RTCA and portions of ASTM

Example System: Bringing it Together



Example System: Timing & Well-Clear

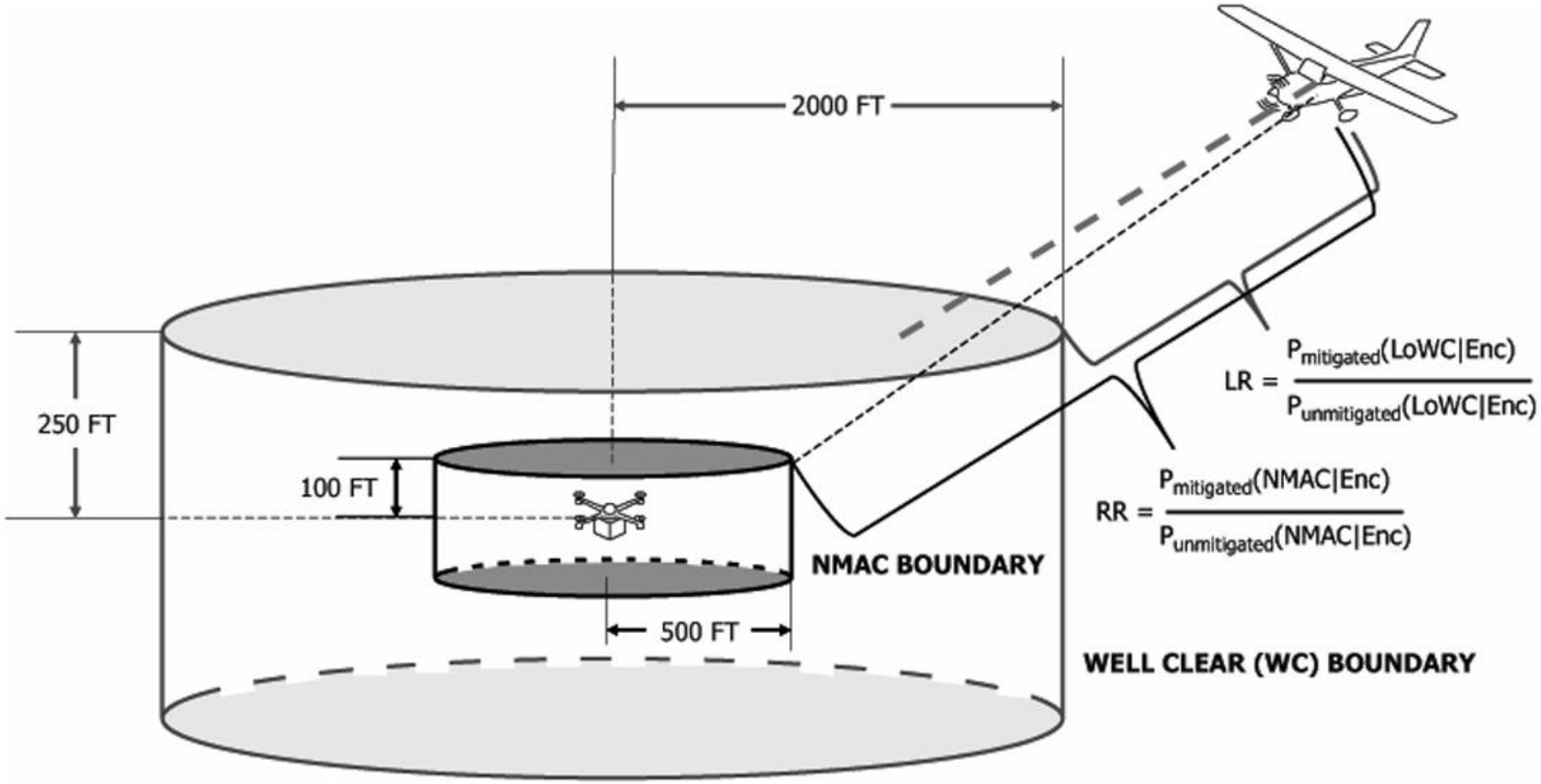


FIG. 1 RR and LR Illustration

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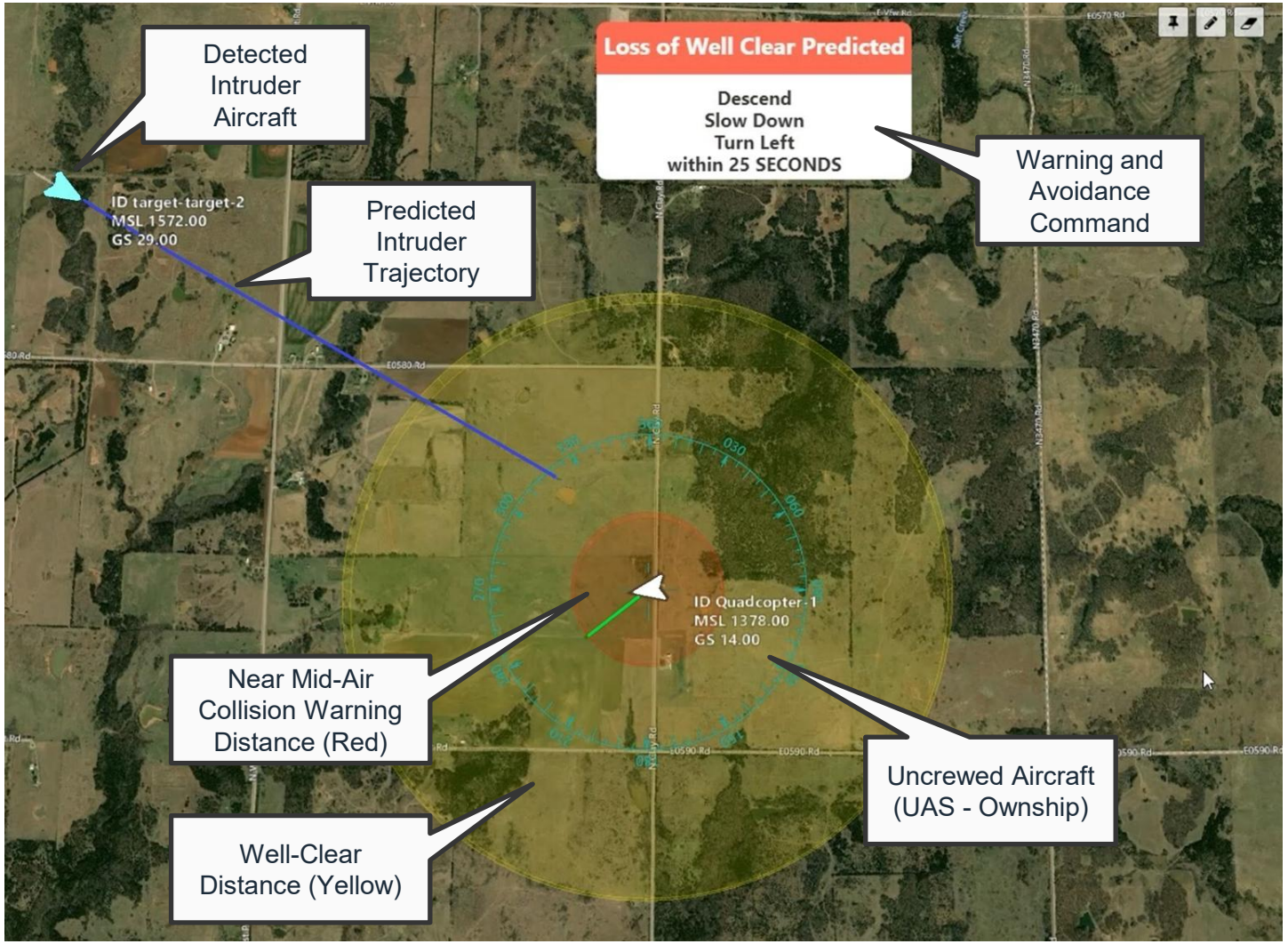
Example System: Ownship Centric DAA



Example System: Field Deployment

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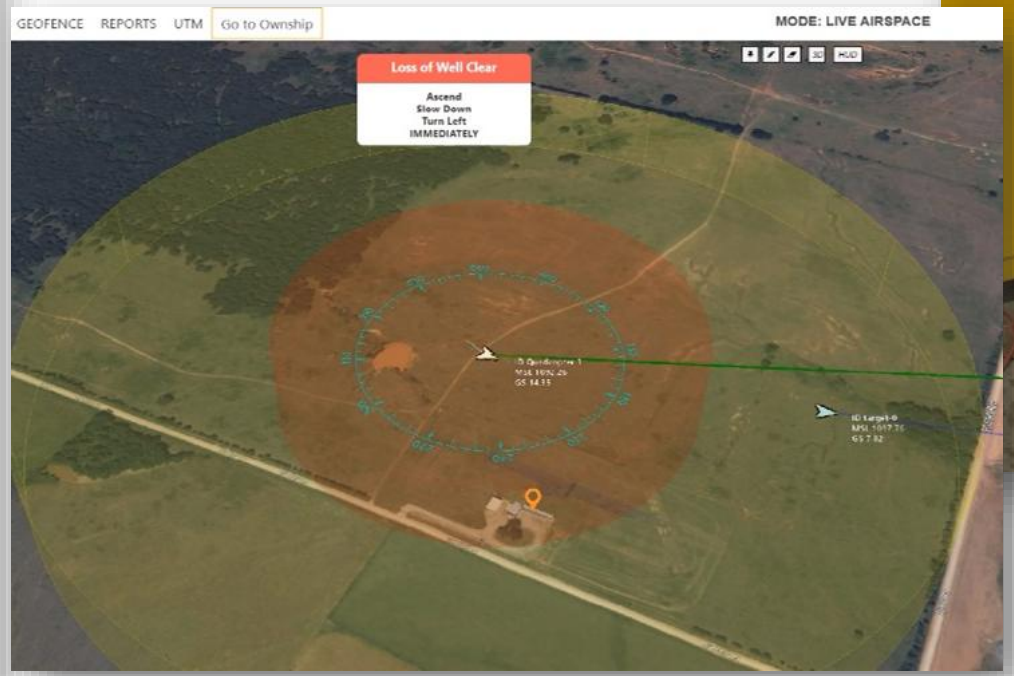
Example System: Field Testing – Small UAS
ASTM F3442-23 Standard



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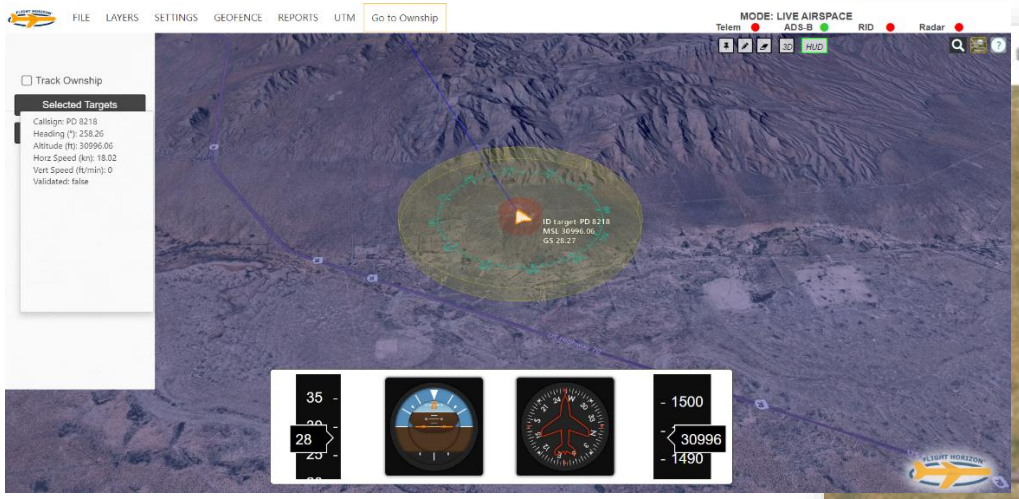
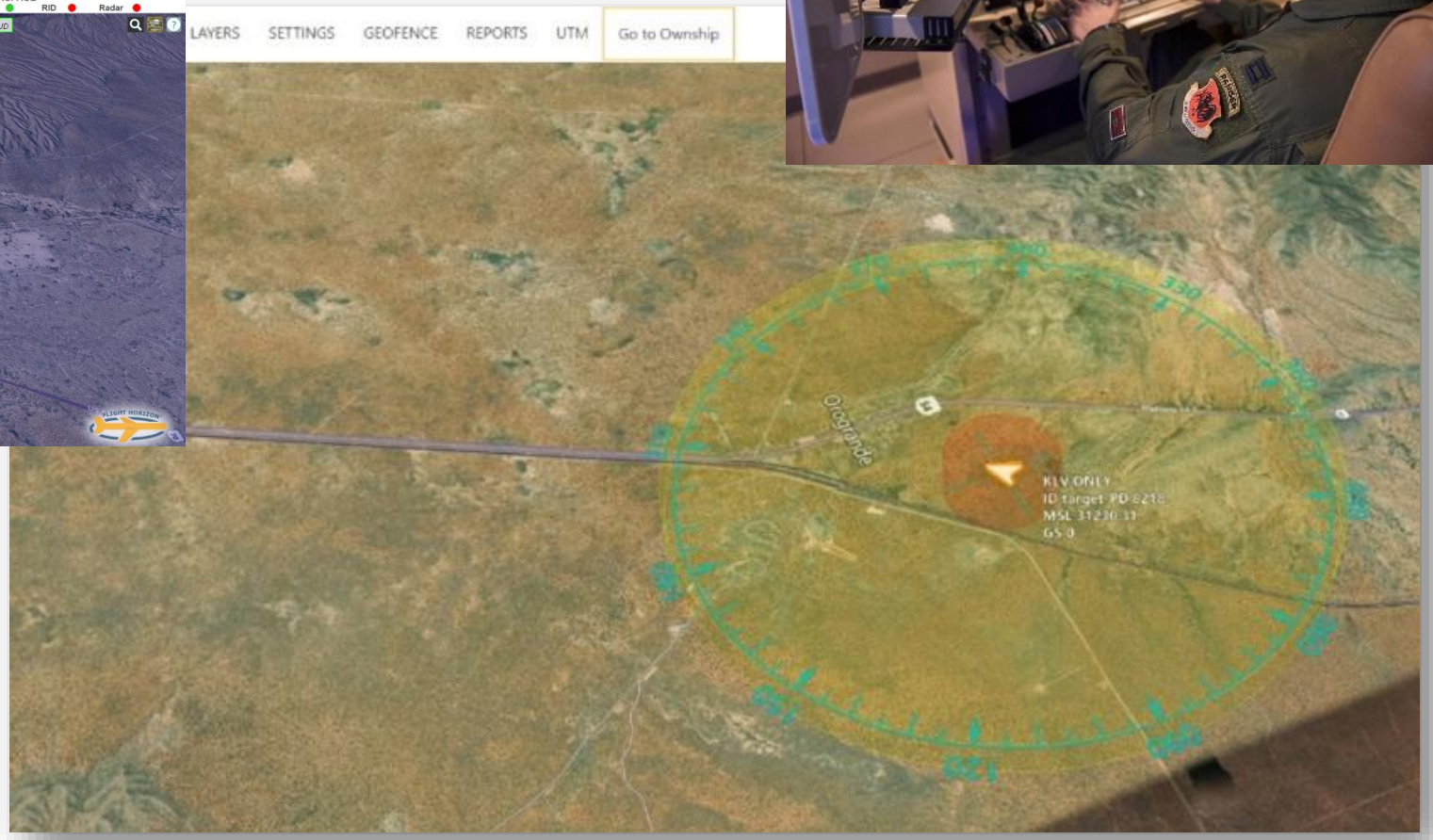
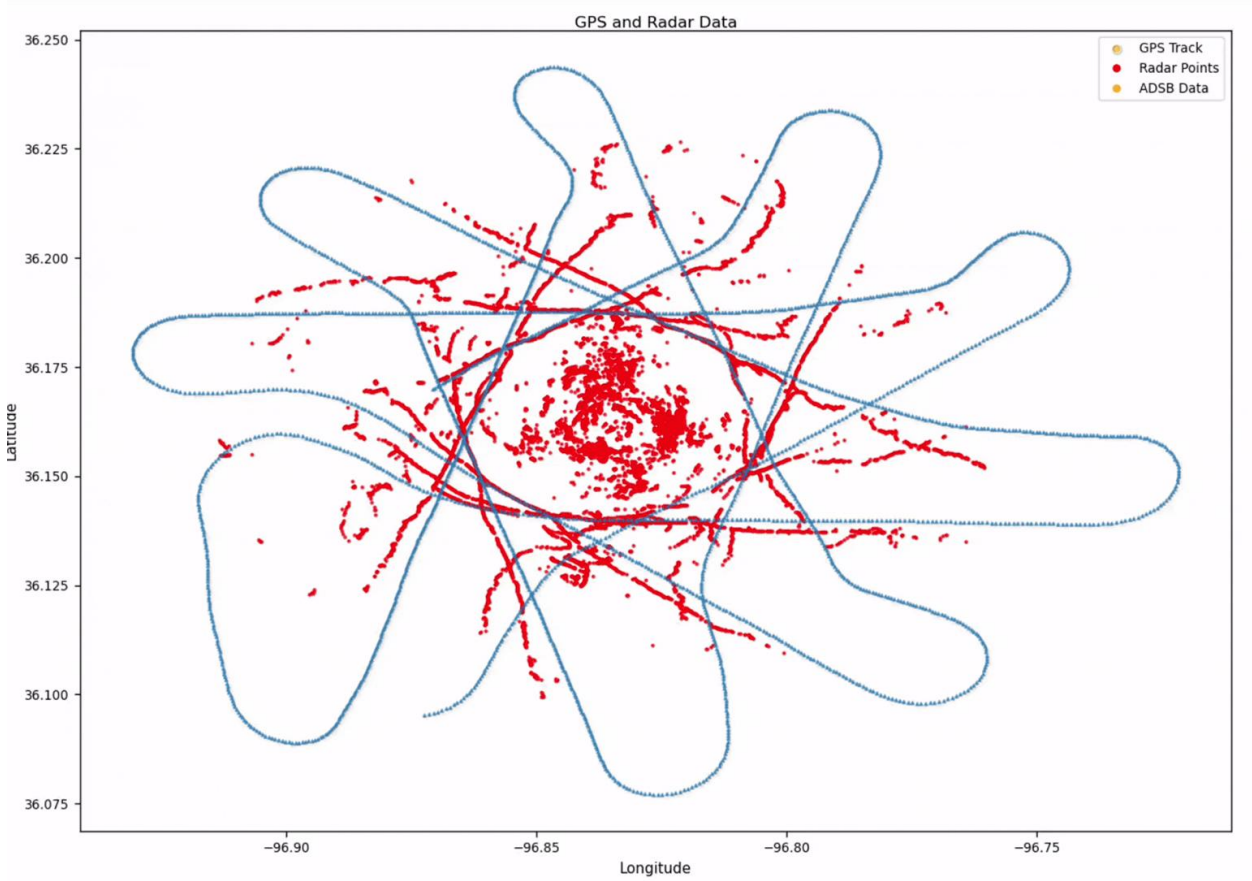
Example System: Field Testing – Large UAS
RTCA DO-365C Standard

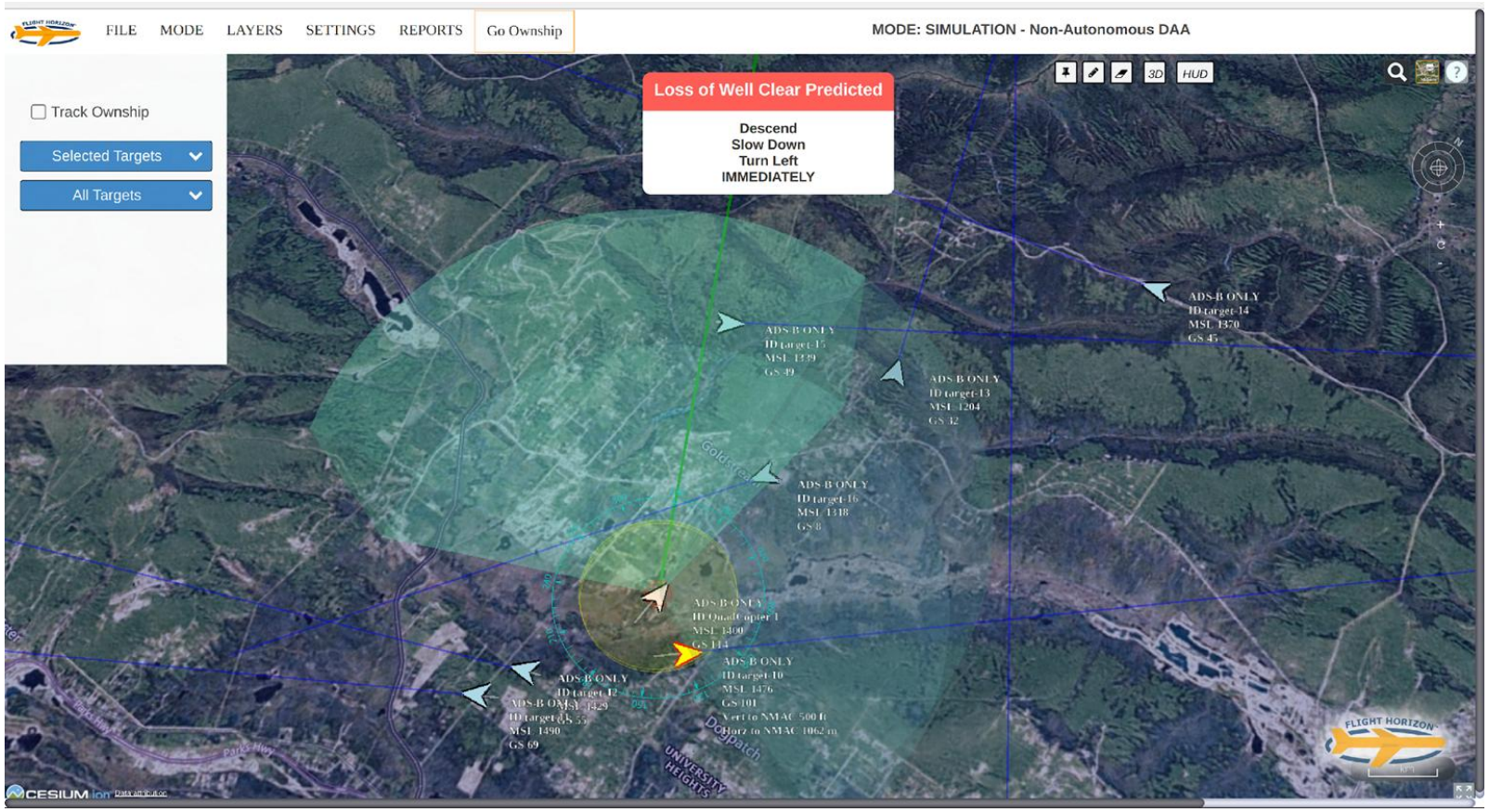




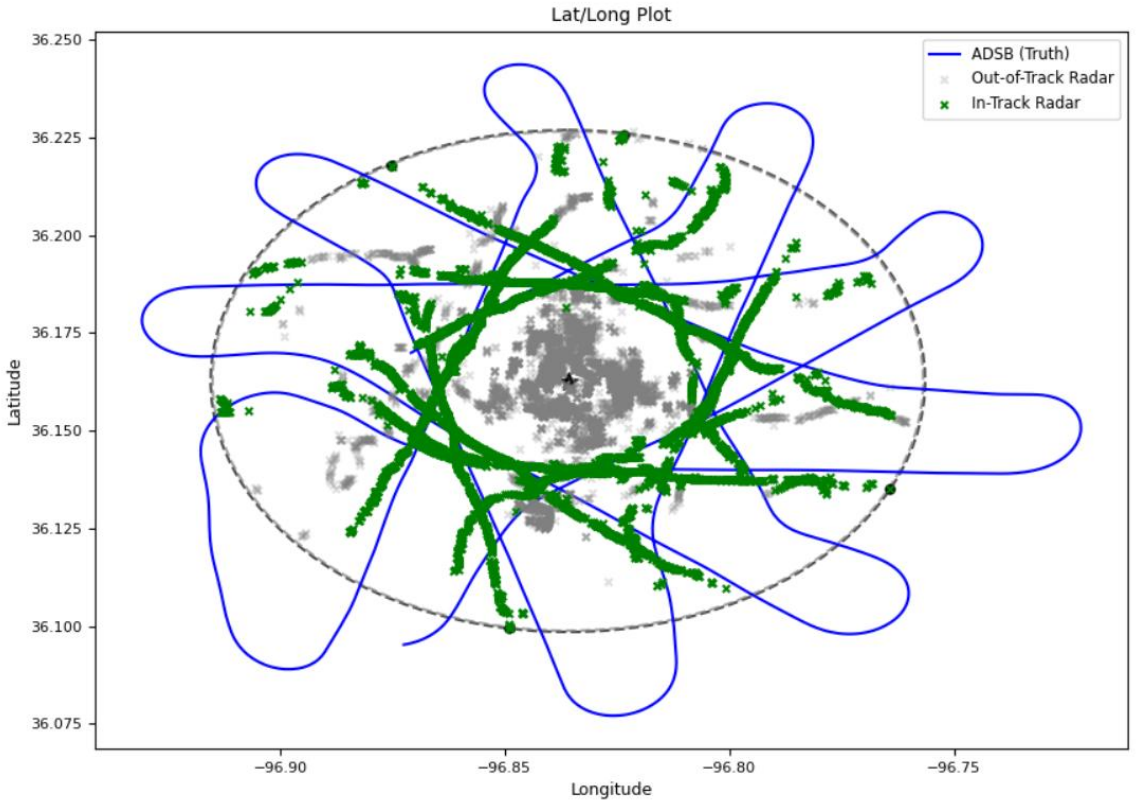
Example System: “Wagon Wheel” testing for Non-Cooperative



Example System: “Monte Carlo” Simulation Testing – 10,000 to 20,000 runs



Example System: Simulations for Risk Ratio calculation



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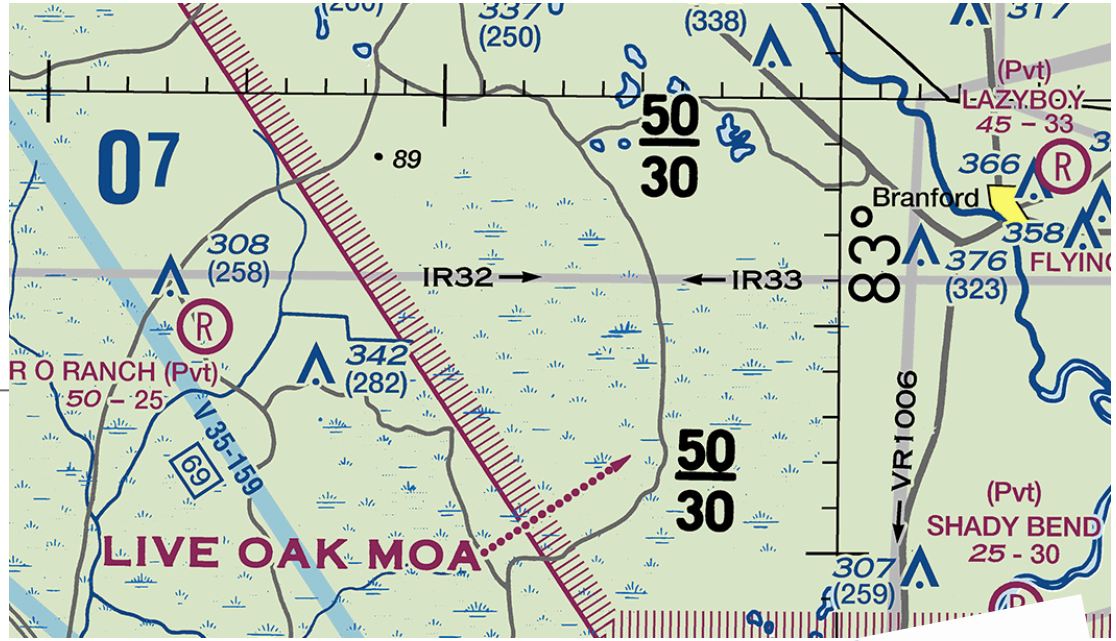
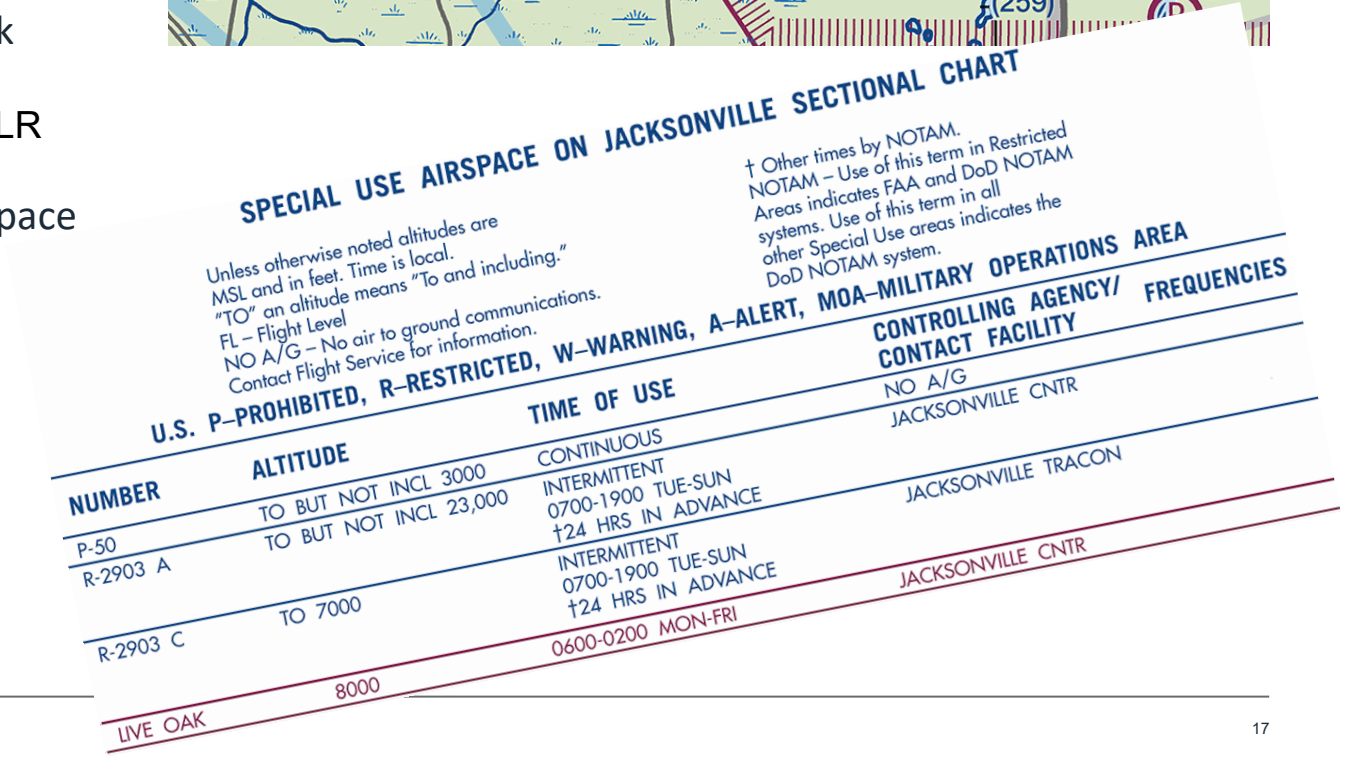
Key Question: Implementation

- How to package the request for operation?
  - DAA solution – proven to the regulator for tactical air risk mitigation
    - Where on the spectrum does the DAA solution lie (RR/LR values)?
  - Strategic mitigation – expand RPIC awareness of the airspace being operated in:
    - Airspace class
    - Proximity to agriculture spraying operations
    - Military training routes – MOAs
    - Navigation routes (RNAV / Federal Airways)





SPECIAL USE AIRSPACE ON JACKSONVILLE SECTIONAL CHART

Unless otherwise noted altitudes are MSL and in feet. Time is local.
"TO" an altitude means "To and including."
FL – Flight Level
NO A/G – No air to ground communications. Contact Flight Service for information.
† Other times by NOTAM.
NOTAM – Use of this term in Restricted Areas indicates FAA and DoD NOTAM systems. Use of this term in all other Special Use areas indicates the DoD NOTAM system.

U.S. P–PROHIBITED, R–RESTRICTED, W–WARNING, A–ALERT, MOA–MILITARY OPERATIONS AREA

NUMBER	ALTITUDE	TIME OF USE	CONTROLLING AGENCY/ CONTACT FACILITY	FREQUENCIES
P-50	TO BUT NOT INCL 3000	CONTINUOUS	NO A/G	
R-2903 A	TO BUT NOT INCL 23,000	INTERMITTENT 0700-1900 TUE-SUN †24 HRS IN ADVANCE	JACKSONVILLE CNTR	
R-2903 C	TO 7000	INTERMITTENT 0700-1900 TUE-SUN †24 HRS IN ADVANCE	JACKSONVILLE TRACON	
LIVE OAK	8000	0600-0200 MON-FRI	JACKSONVILLE CNTR	

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Thank you

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