New Technologies, Standards and Developments in the Delivery of Viable Detect-and-Avoid Systems for BVLOS Commercial UAS

AN AUVSI XPONENTIAL 2021 PANEL SESSION

VIGILANT AEROSPACE SYSTEMS™

ACUASI

ECHODYNE

Panelists

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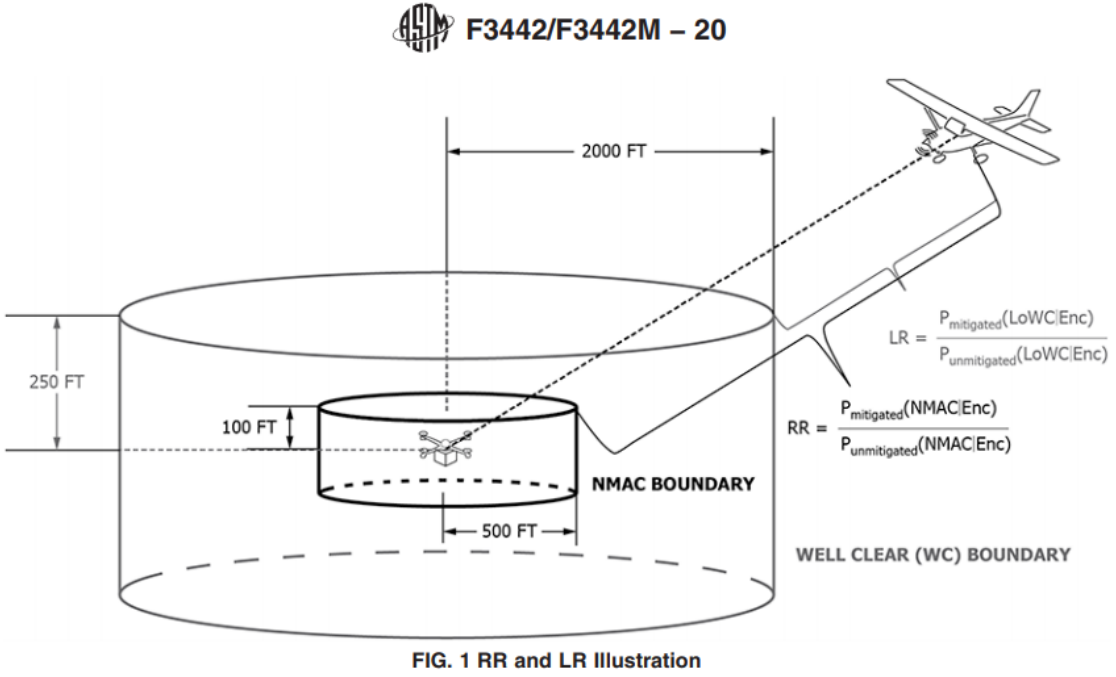
Themes and Topics

- The problem: What is Detect-and-Avoid and why does it matter?
- Introductions from Panelists
- DAA System Components
- Algorithms and Standards
- Emerging Development Trends
- What does DAA success look like?



Distance and timing diagrams from the ASTM F38 Detect-and-Avoid Systems Standard

The Problem

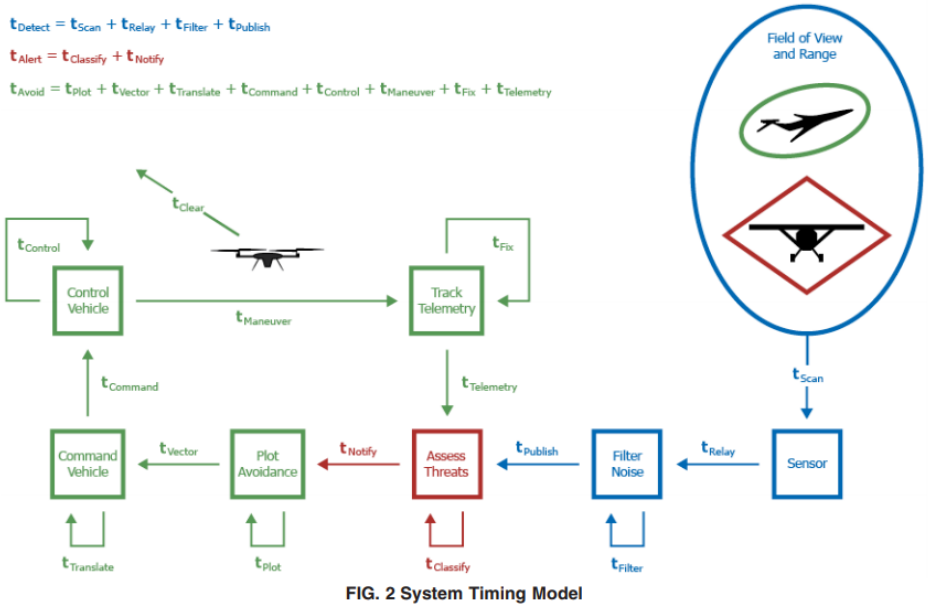
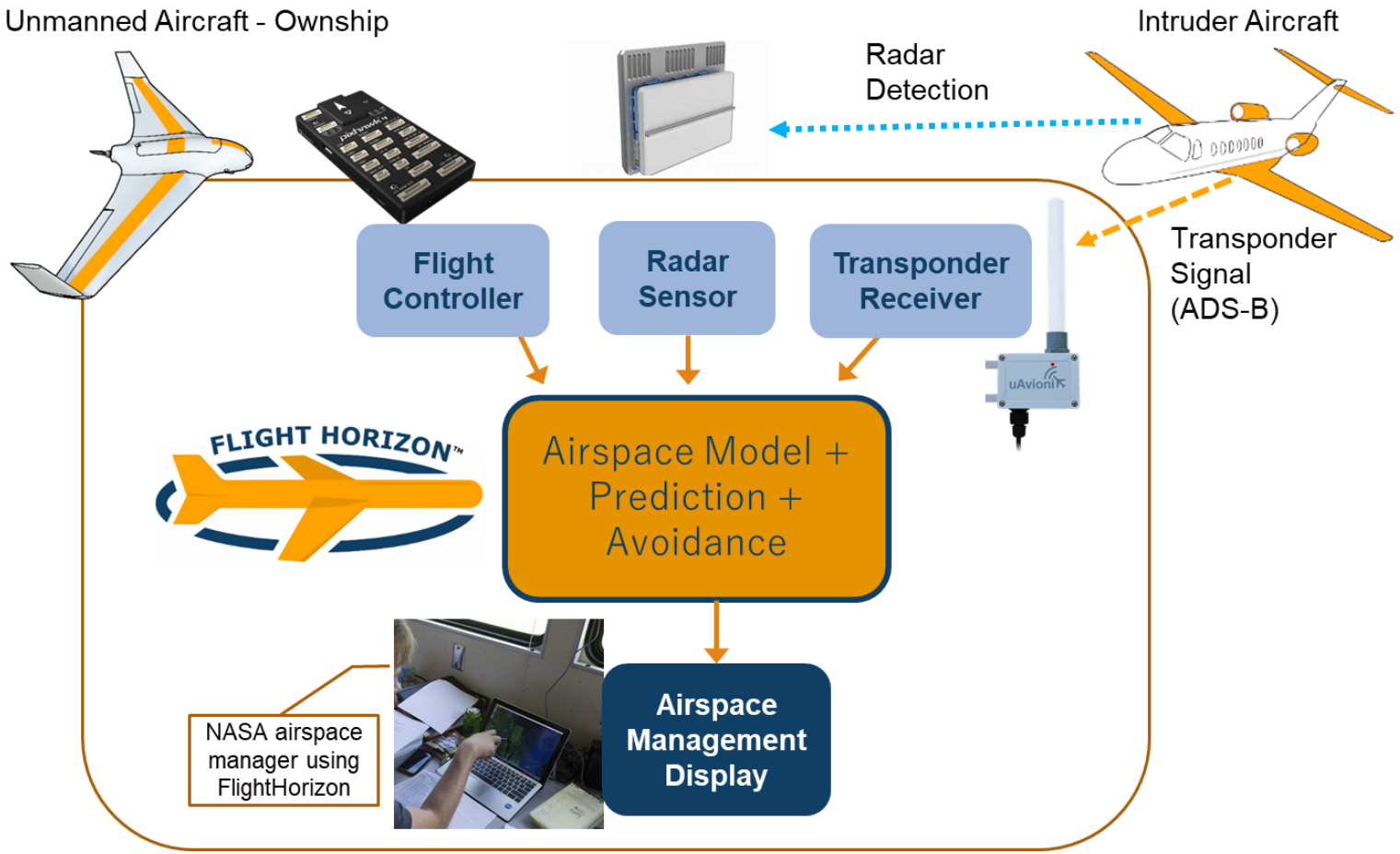


FIG. 2 System Timing Model

Distance and timing diagrams from the ASTM F38 Detect-and-Avoid Systems Standard

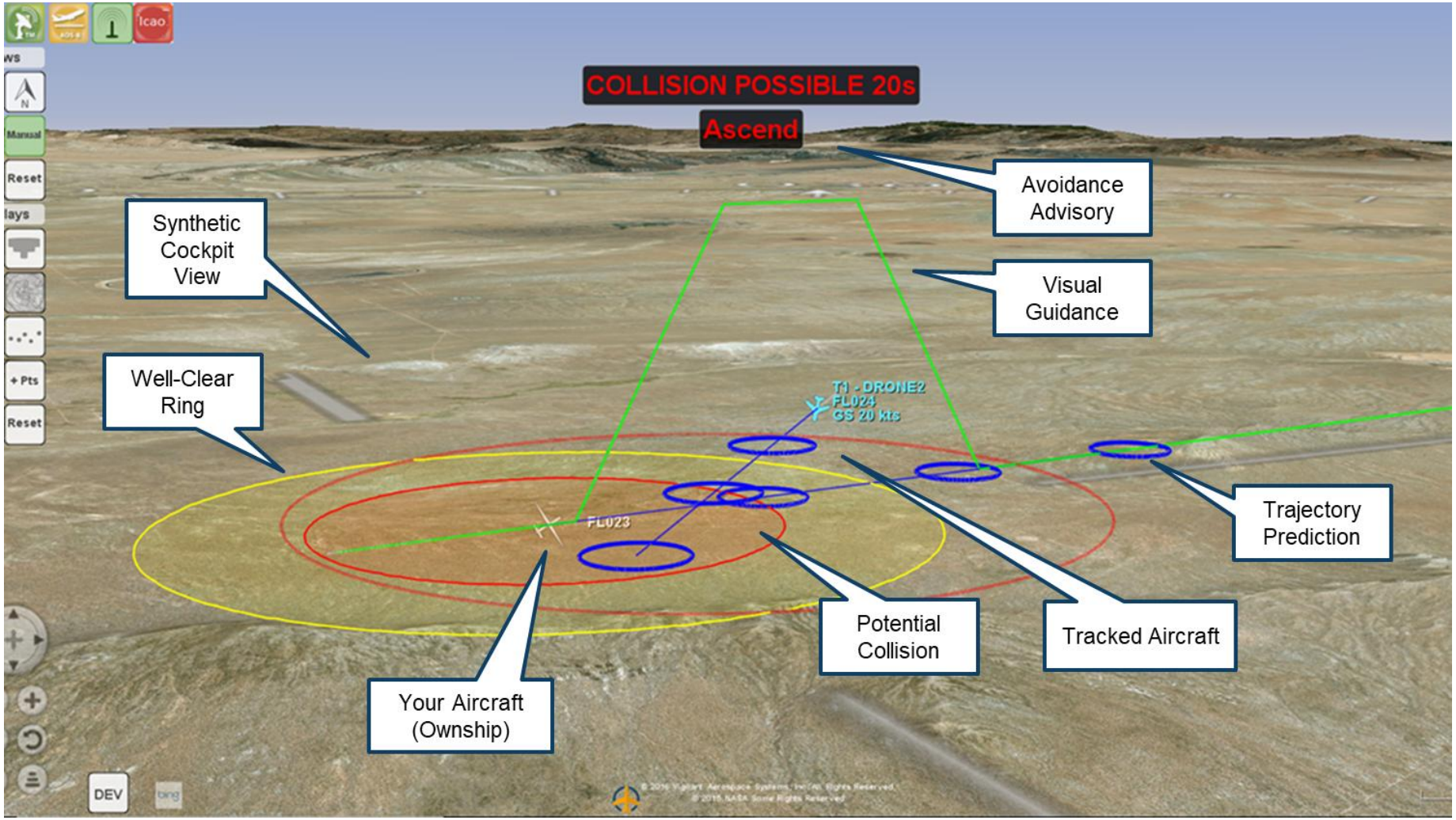
- Routine BVLOS UAS flights require detect-and-avoid systems
- Systems must allow UAS to detect-and-avoid (DAA) other aircraft, especially those without transponders
- Systems must be trustworthy and well-tested
- On-board DAA is required to make long-range BVLOS flights practical and economical
- DAA systems and autonomy can be complex and expensive
- Relevant technologies emerging now

FlightHorizon Introduction



- Vigilant Aerospace provides software & systems integration
- Software for UAS pilots or airspace managers
- Situational awareness and active avoidance: “detect-and-avoid”
- Based on two NASA patents
- Integrates transponder data, radar, UAS flight controller and online data, with multi-sensor correlation
- Predicts conflicts, issues warnings and specific avoidance commands
- Hosted or installed on-site; Ground-based or on-board

FlightHorizon Interface



FlightHorizon Products

- FlightHorizon COMMANDER
  - Airspace management for airparks, droneports, vertiports
  - Modular, scalable, extensible, service-oriented archit.
  - Fuses telemetry, transponders, larger radars and online data
- FlightHorizon PRO
  - Portable Detect-and-Avoid with airspace visualization
  - Automatic alerts, warnings, avoidance advisories
  - Fuses telemetry, transponders, portable radar
- FlightHorizon PILOT
  - Onboard detect-and-avoid
  - Integration with onboard radar, ADS-B In, autopilot

Prior Projects

- NASA Space Act Agreement – 2016
- NASA SonicBAT Supersonic Program – 2017-2018
- NASA-DLR NDMAX Program – 2018 (Germany)
- NASA Quiet Supersonic Flights (QSF) Program – 2018
- NASA Resilient Autonomy Program support – 2019-2020
- ACUASCI Integration Pilot Program – 2018-2020
- NPUASTS Integration Pilot Program – 2018-2020
- OSU Unmanned Systems Research Institute (USRI) - FlightHorizon Radar Integration Project – 2019-2021

Current and Upcoming Projects

- FAA BAA R&D Contract: “Enabling Unmanned Aircraft Systems Beyond Visual Line-of-Sight Flight Operations with a Detect-and-Avoid and Air Traffic Situational Awareness System” – 2020-2021
- FlightHorizon COMMANDER for Northern Plains UAS Test Site at Grand Forks, North Dakota – 2021-2023
- ACUASI BEYOND Program– 2021-2024
- NASA ULI WindMap Project with OSU for UAS wind hazard avoidance – 2021-2025
- NASA Commercial Supersonic Technology (CST) Program - 2020-2026
- Other private commercial & military projects