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Assessing Small UAS Operator Flight Behavior and Potential Interference with Aviation Operations in Controlled Airspace

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Introduction: sUAS Interference in the NAS

See video on metadata page
Or
Click https://youtu.be/jzXmxjGbeIk

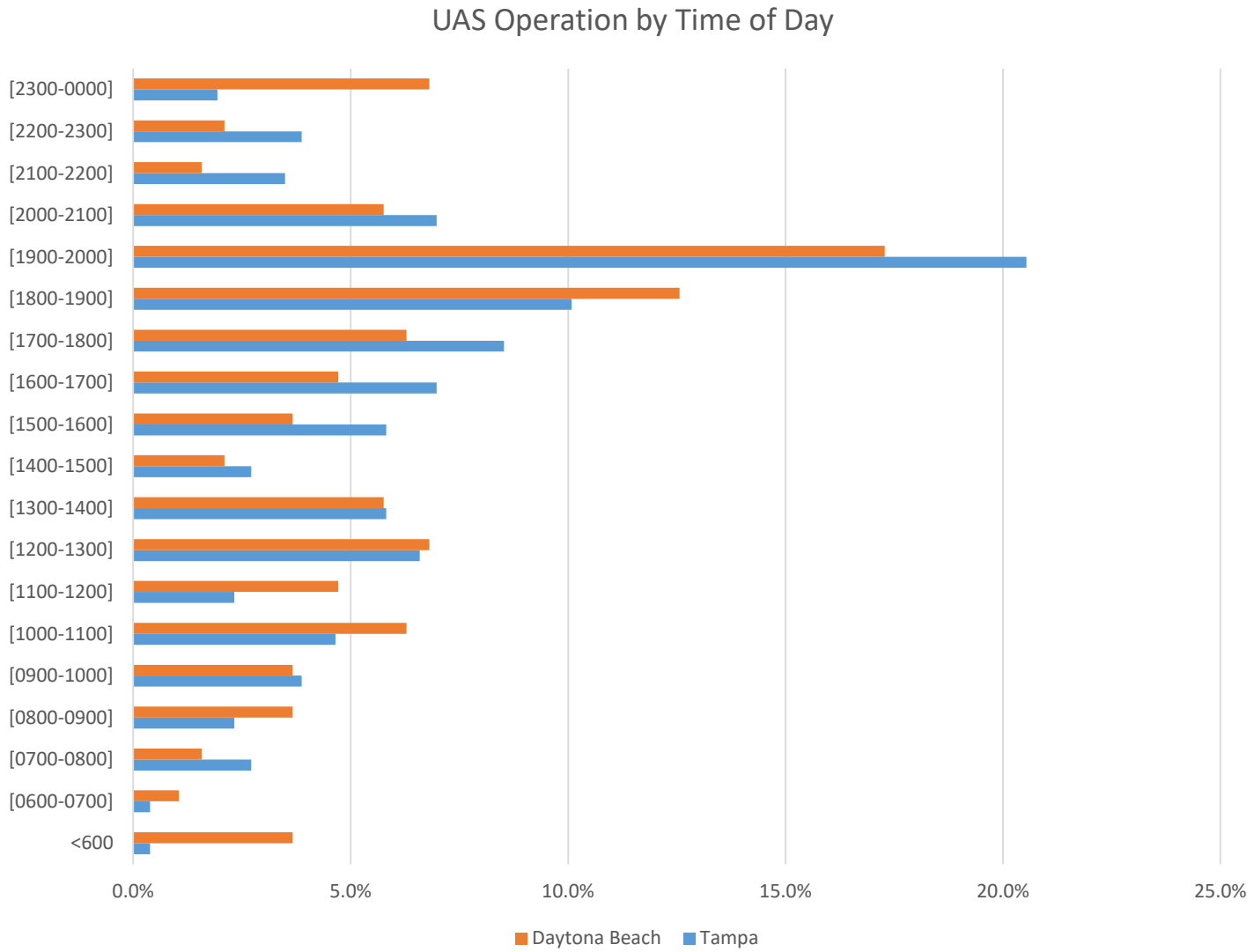
Purpose

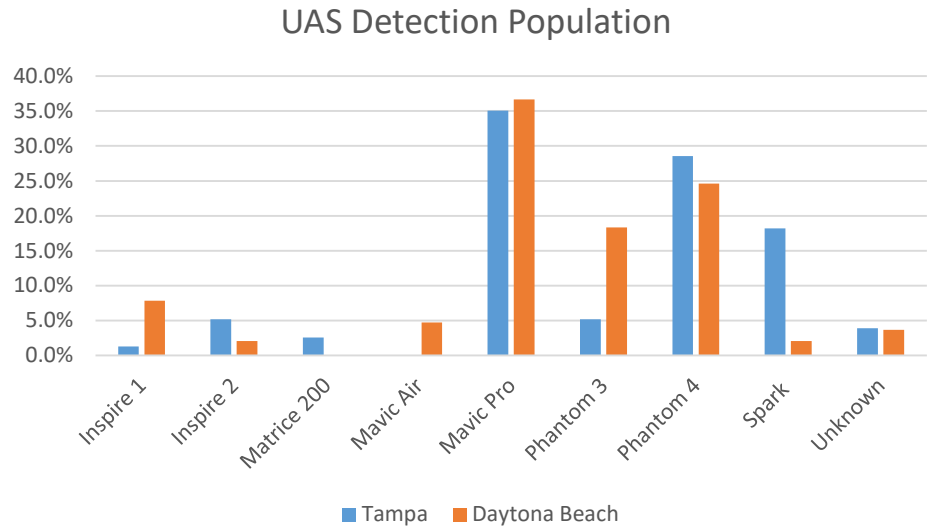
- Identify sUAS operator behaviors
  - Preferred Types of sUAS (DJI)
  - Date/time
  - Altitude
  - Location
- Evaluate potential aviation interference & safety hazards posed by sUAS
  - sUAS operating distance from aerodromes
  - Impact to local airport traffic patterns, approaches / departures, local airspace
  - Historical near midair collision (NMAC)/encounter analysis (DAB only)
- Determine effectiveness of geofencing

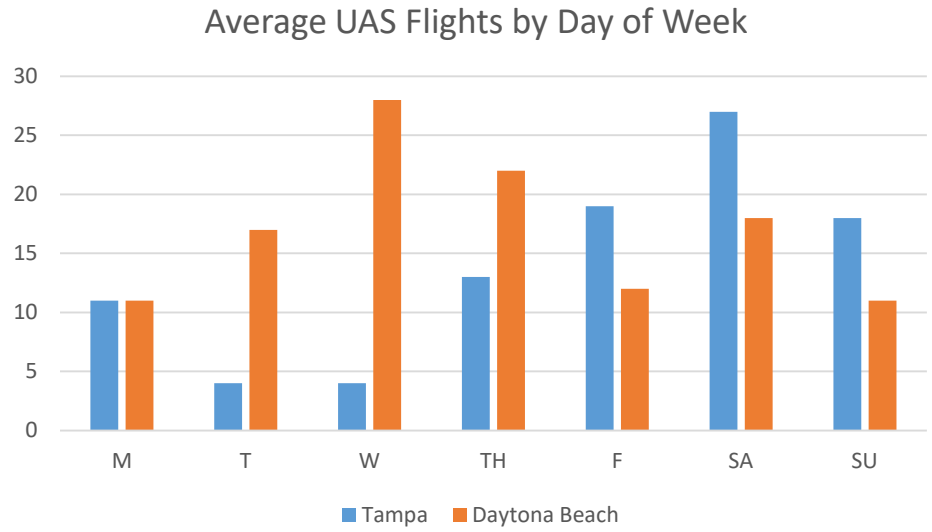
Method

- Applied, exploratory research methodology
- Detection sampling using DJI AeroScope
  - RF collection device that detects sUAS manufactured by DJI
  - ~10 SM detection range
- Data Collection (Convenient Sampling)
  - Tampa, FL (TPA), Class B, 19-day sampling
  - Daytona Beach, FL (DAB), Class C, 13-day sampling
- Analysis Tools & Reference Sources
  - Google Earth Pro (Data plotting)
  - EasyMapMaker (KML conversions)
  - AirNav (Heliport information)
  - FAA Raster Charts (Aeronautical information & overlays)
  - Google Maps (Location identification)
  - Symphony OpsVue (Historical aircraft tracking integrating ADS-B/Mode C, & Mode S data)
  - FAA UAS Facility Maps (UASFM)(Risk Analysis)

Operator Behavioral Indications







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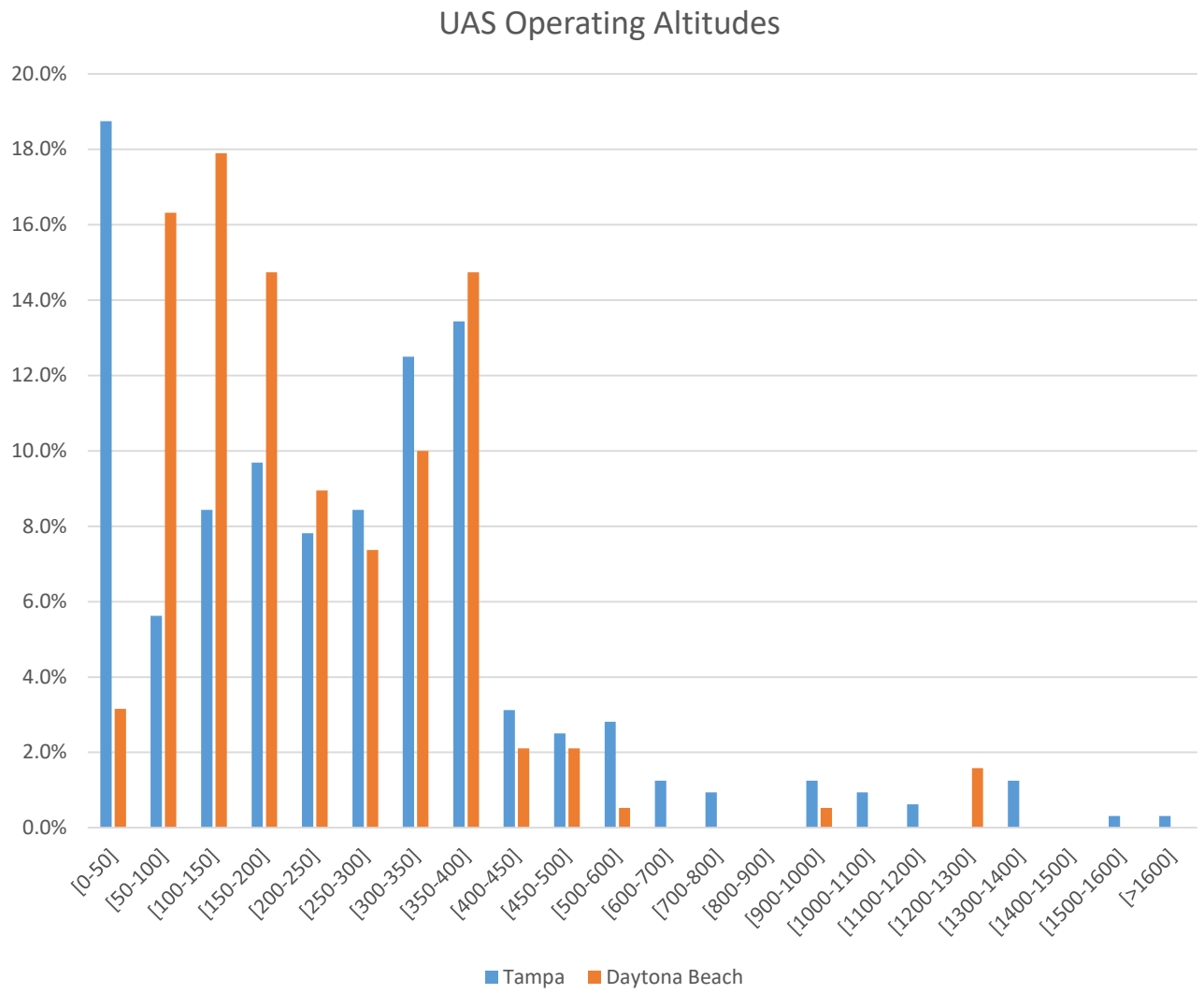
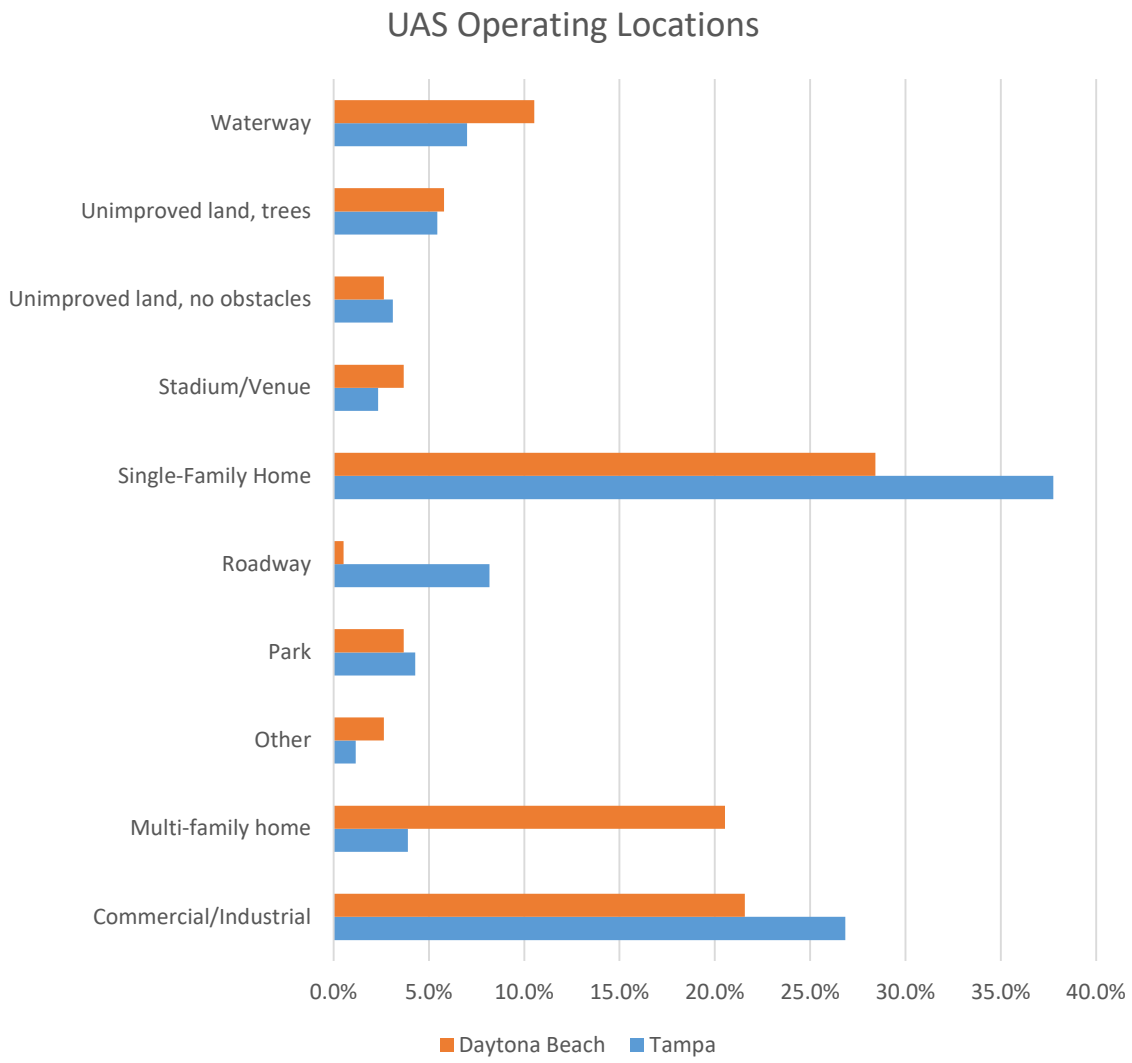
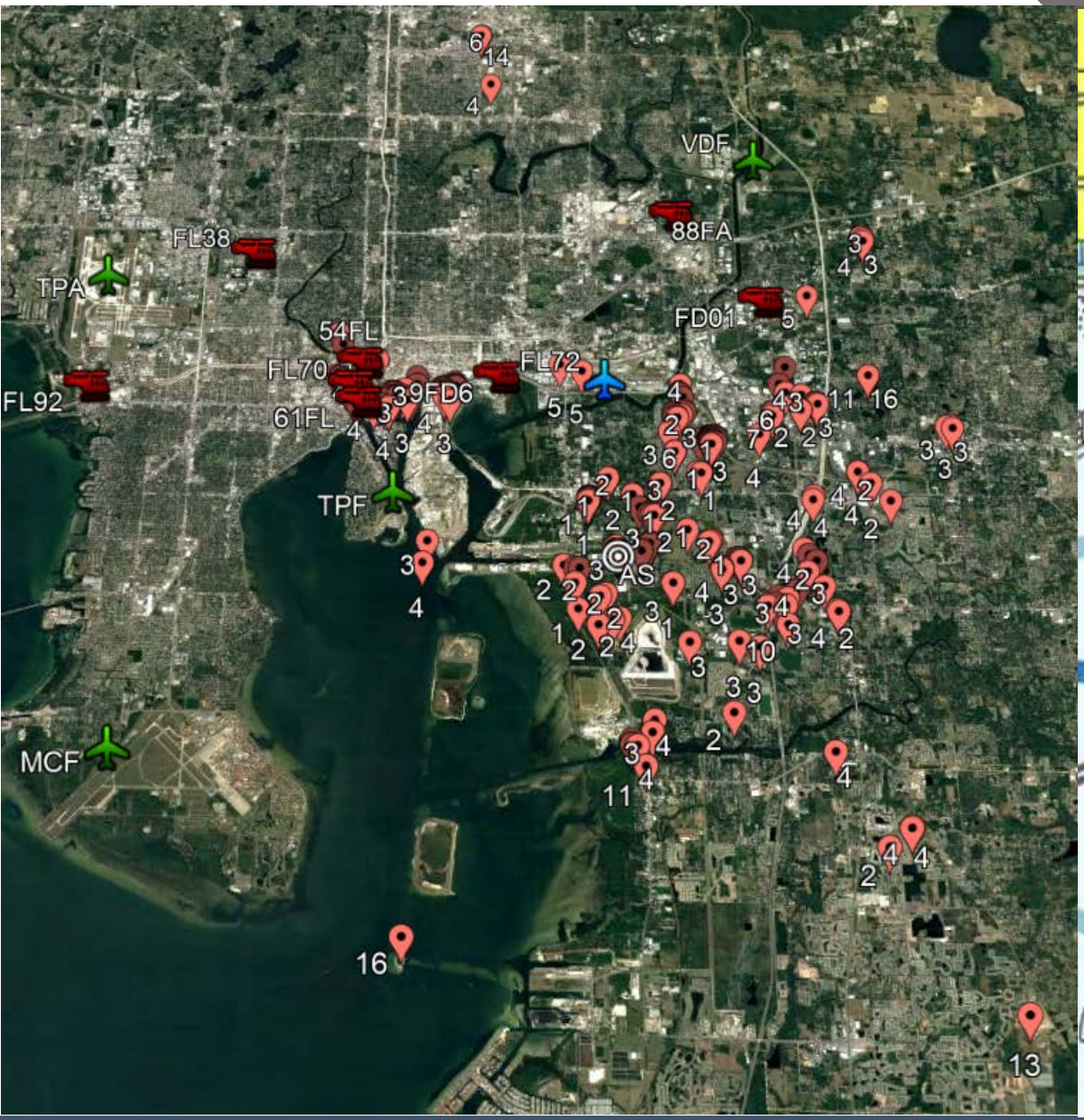
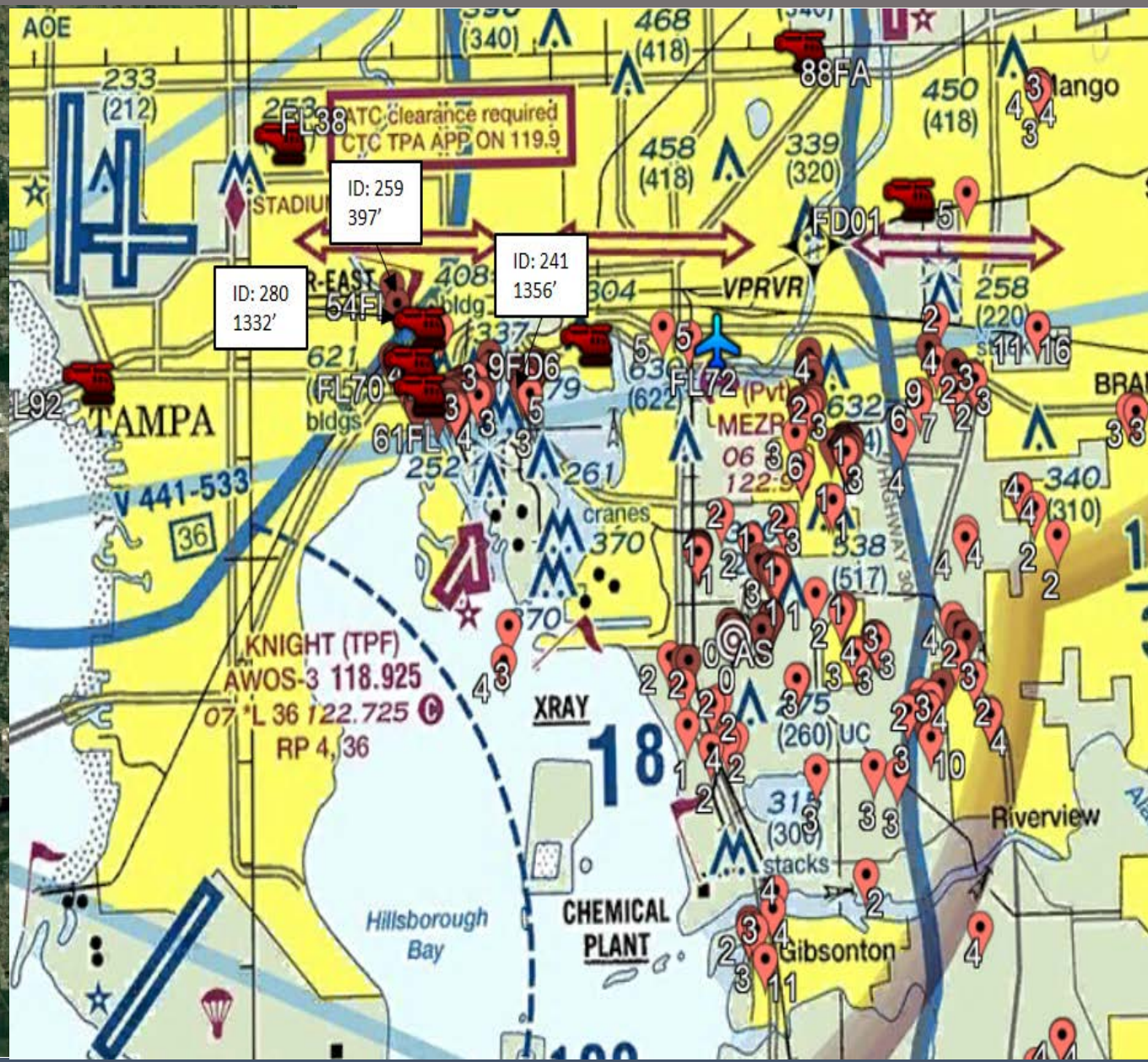


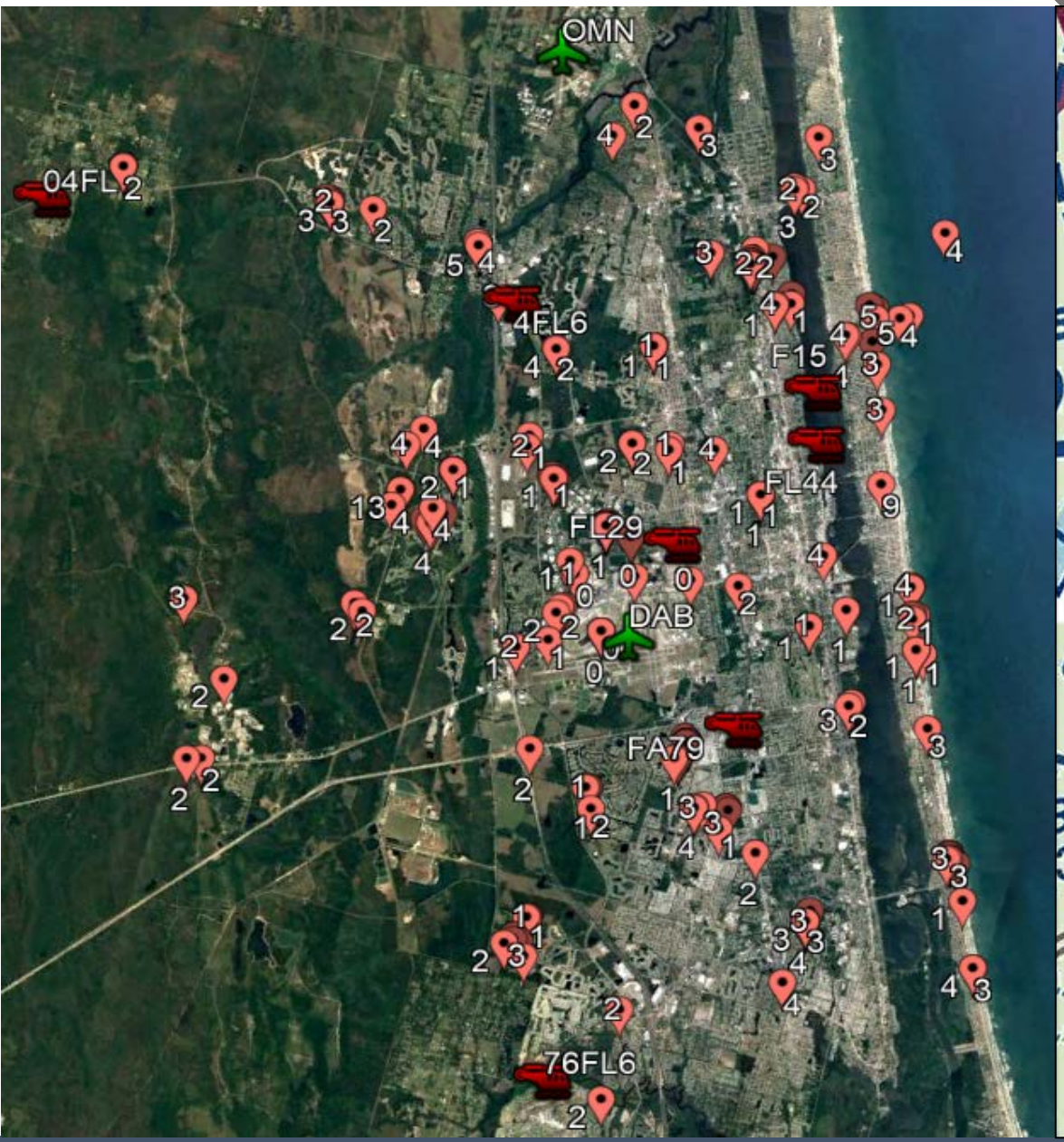


Aviation Interference & Safety Hazards (TPA)



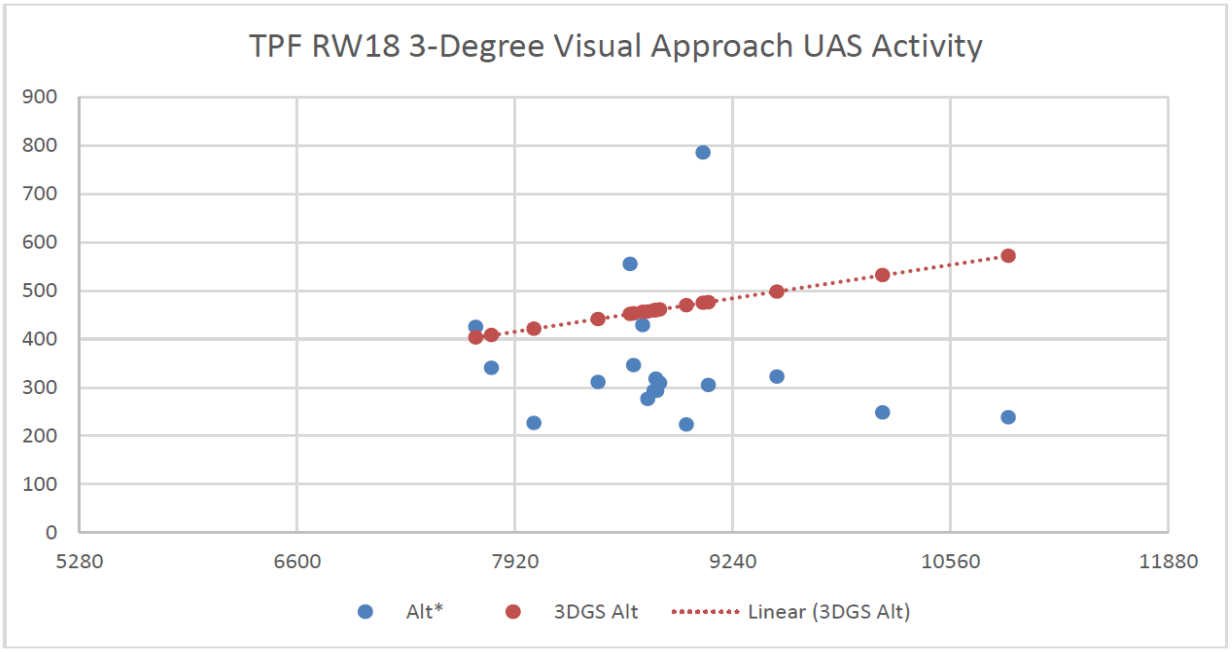


Aviation Interference & Safety Hazards (DAB)



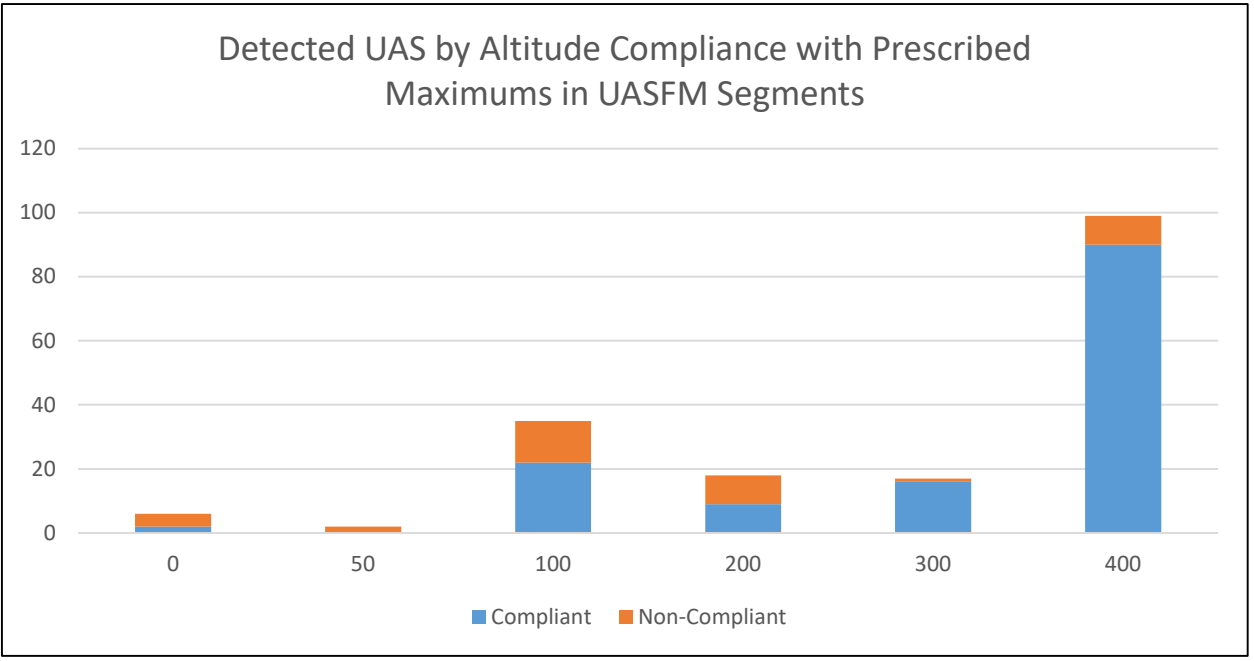
Significant Findings (TPA)

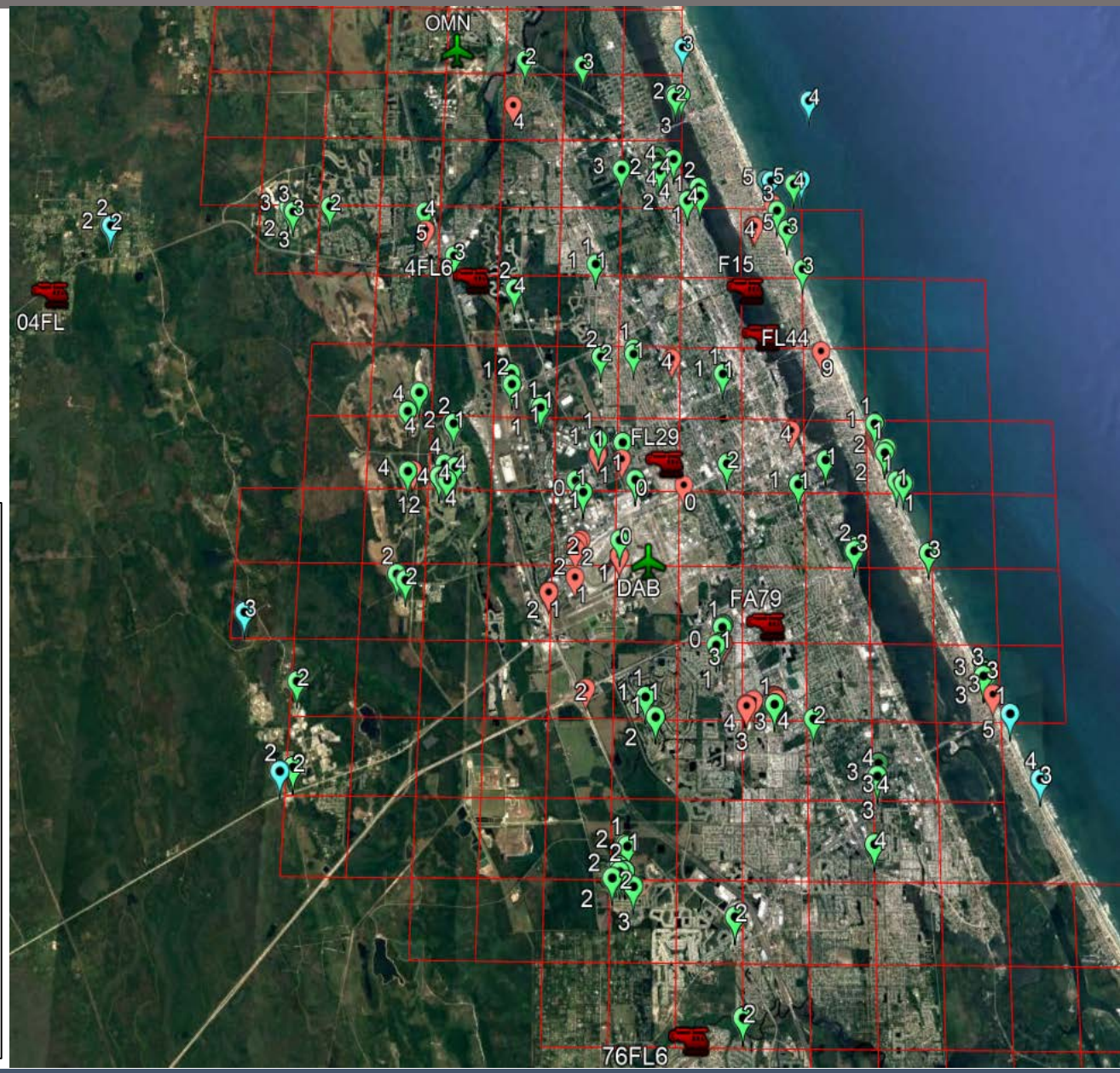
- Several sUAS breaches into Class B surface area & surrounding shelf
- Geofencing areas sometimes offset from aeronautical hazard (heliports)
- Visual approach to Peter O. Knight (TPF), Runway 18 reveals sUAS collision hazard



Risk Analysis Using FAA UAS Facility Maps (DAB)

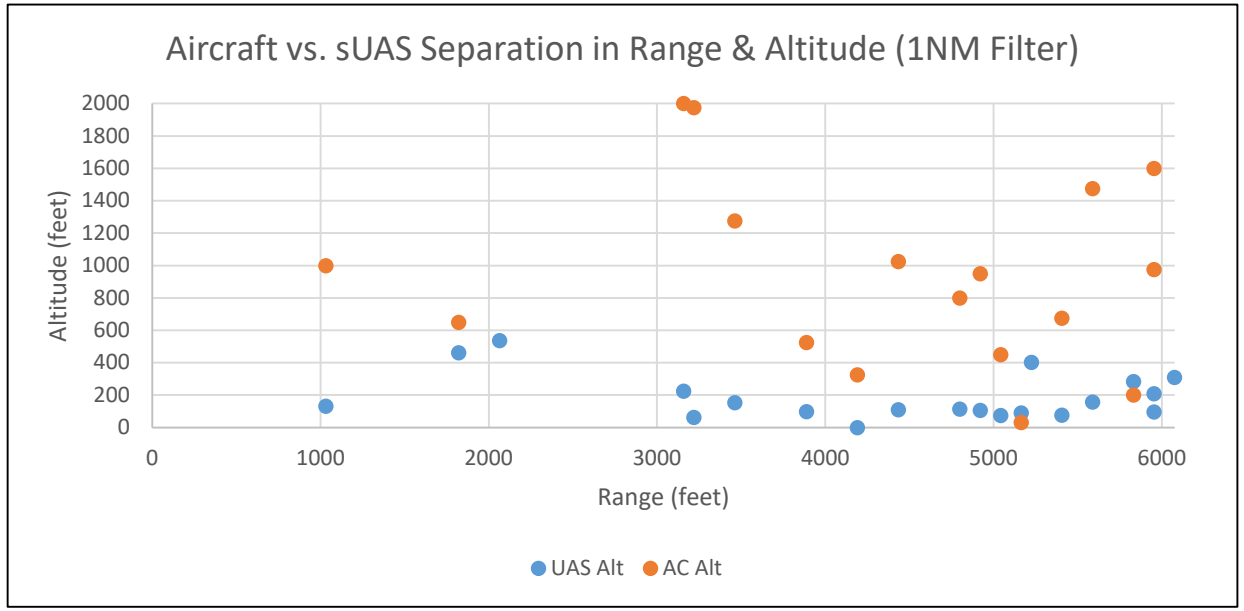
- FAA established UAS Facility Maps as risk management tool for automated sUAS flight authorization via Low Altitude Authorization & Notification Capability (LAANC)
  - LAANC not active in DAB area during data collection
  - LAANC UASFM segments / altitudes used for risk analysis only
- 93% of sUAS flights detected within UASFM segments
- 21.5% of sUAS flights exceeded maximum UASFM designated altitudes

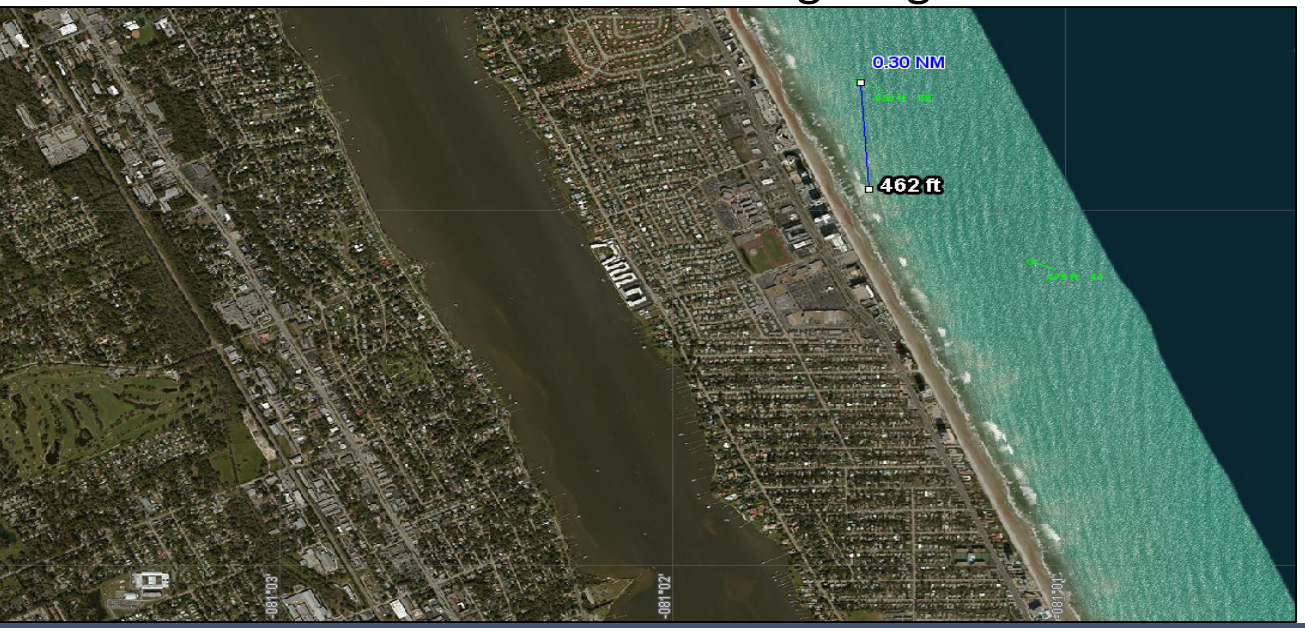


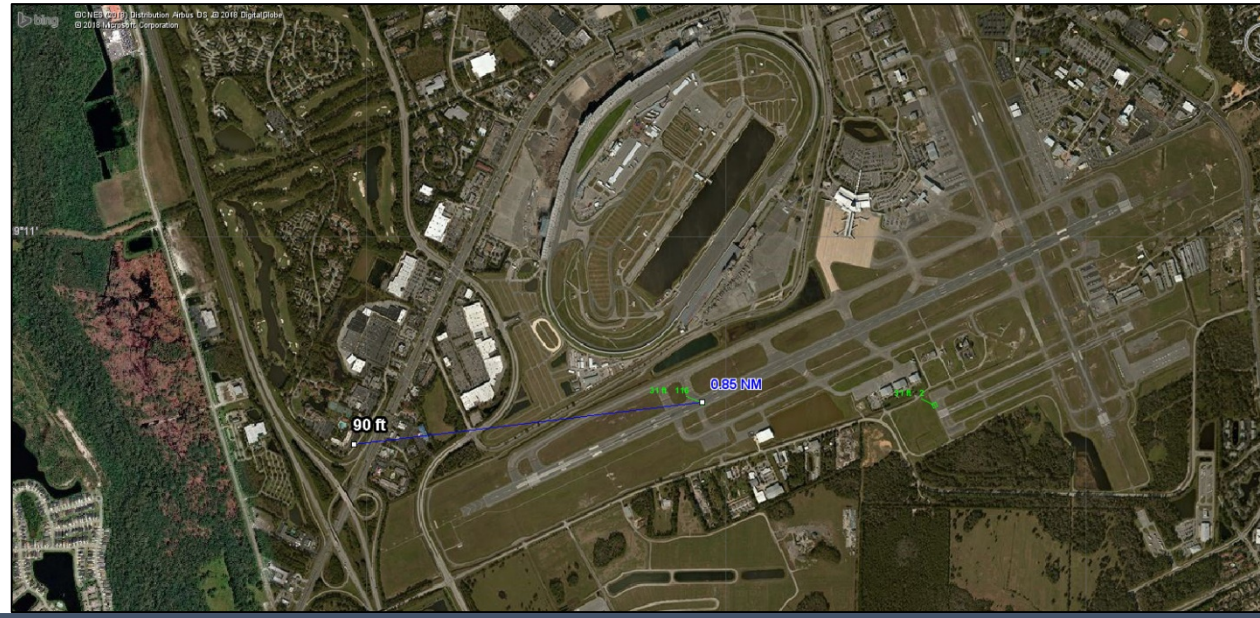


Historical NMAC/Encounter Analysis (DAB)

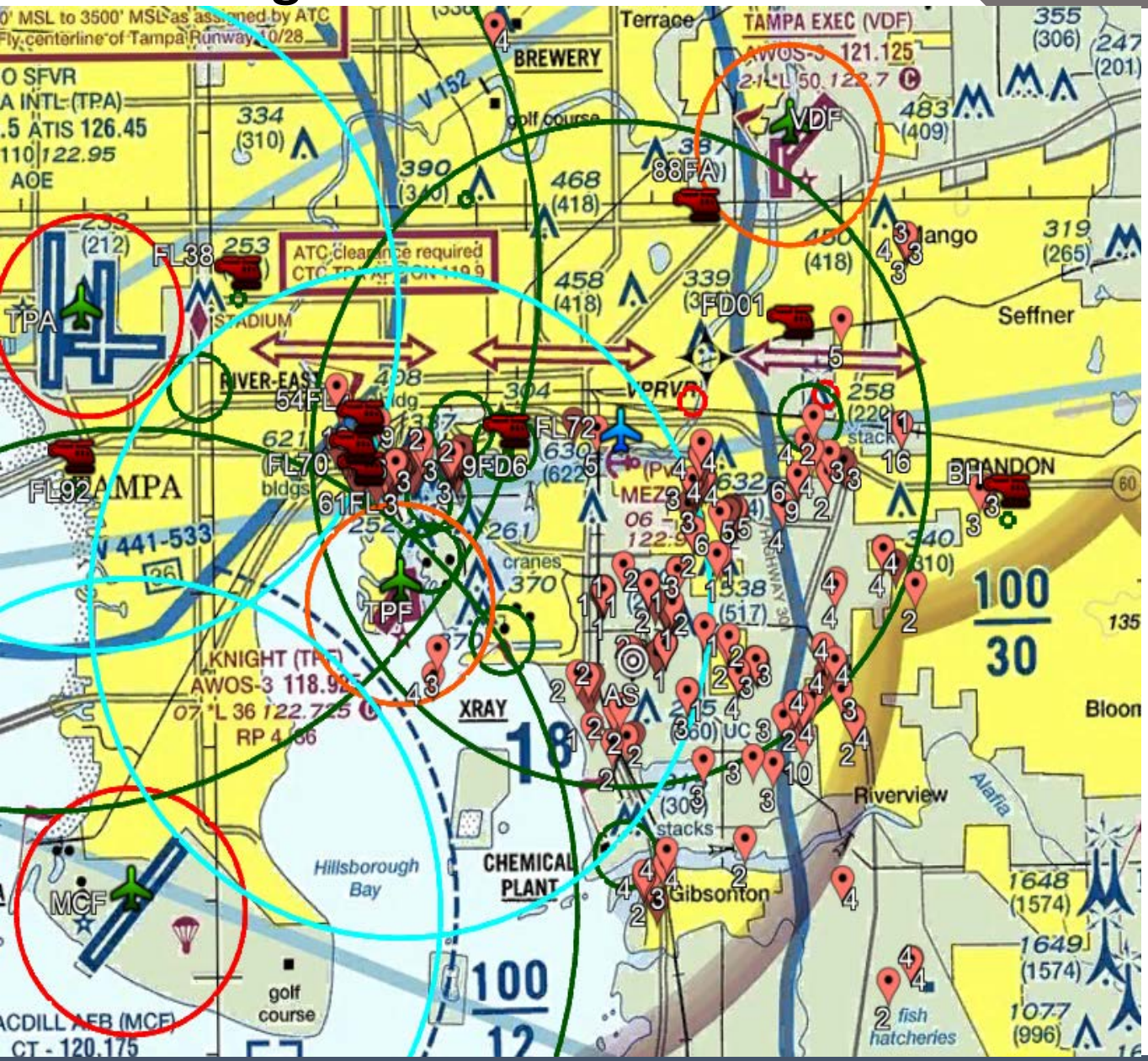
- Coastline (likely banner towing)
  - A/C#1 at 650’ MSL @ 0.30 NM
  - A/C#2 at 475’ MSL @ ~0.50 NM
  - sUAS at 462’ MSL
- DAB Runway 7L
  - A/C#1 detected at touchdown point (30’ MSL)
  - sUAS at 90’ MSL 0.25 NM left of approach path
  - ILS RWY 7L Threshold Crossing Height is 88’ MSL





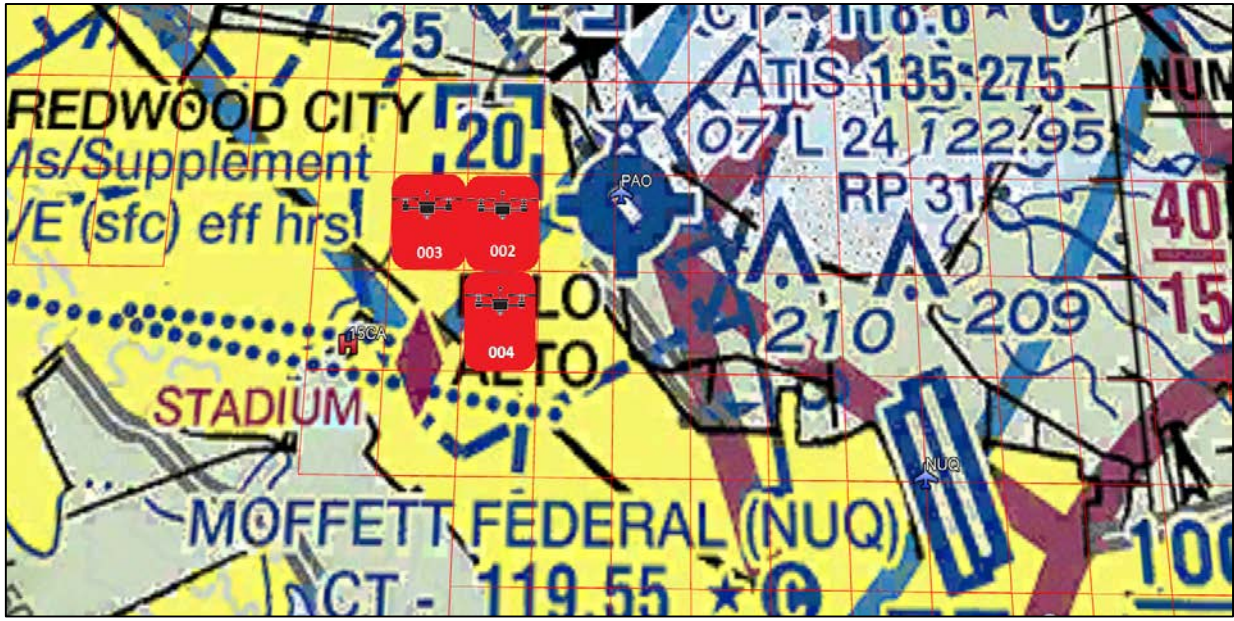


Geofencing Effectiveness



Recommendations

- Integrate geofencing design with LAANC
  - Impose geofencing restrictions on UASFM segments
  - Encode LAANC authorizations with a geofencing unlock code to access UASFM segments
- Create Pilot sUAS situational awareness tools
  - Leverage ADS-B Flight Information Service-Broadcast (FIS-B) and Aeronautical Exchange Model (AIXM) to provide pilots with awareness of active LAANC UAS Facility Map segments
- Codify operational restrictions within 14 CFR
  - Model Aircraft operators are required to operate in accordance with the safety guidelines and within the programming of a “nationwide community-based organization (CBO)”
  - Integrate operational CBO restrictions (such as those recommended by AMA) into 14 CFR 101
  - Establishes permanent operational rules & enables better enforcement for non-compliant operators



Questions?

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