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Evaluating LAANC Compliance and Air Traffic Collision Hazards Posed by Small Unmanned Aircraft Operations in Controlled Airspace

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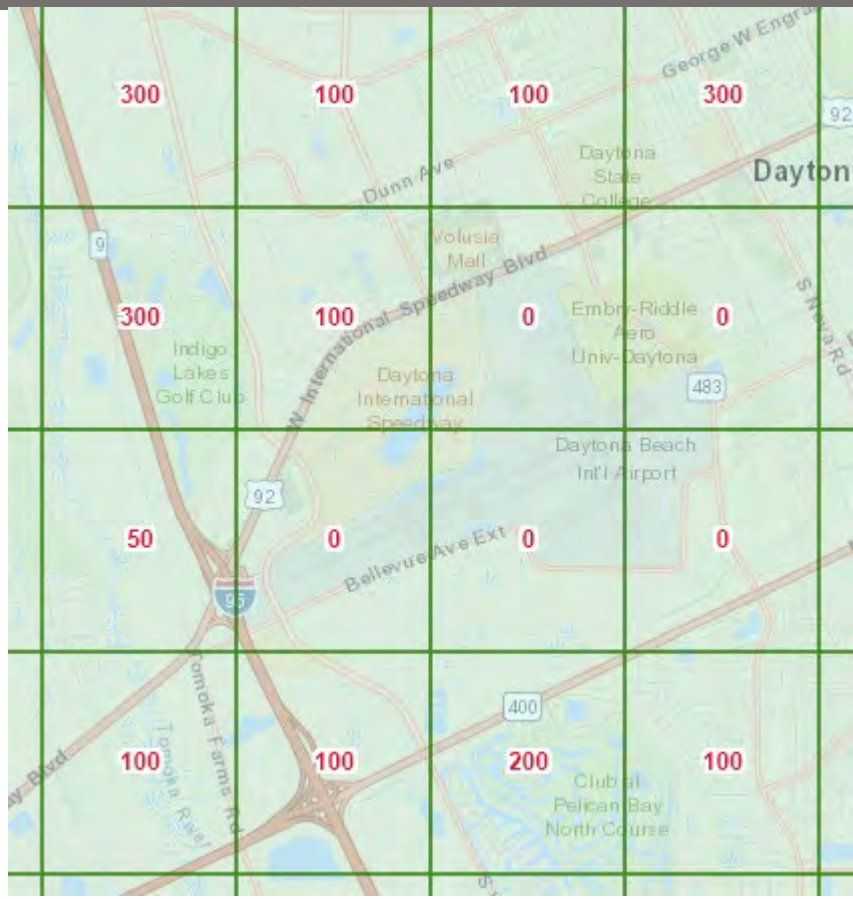
Purpose

- Codify operational behavior patterns of sUAS operations within controlled airspace/LAANC areas
- Determine sUAS operator compliance with LAANC authorization process & accompanying restrictions
- Evaluate potential aviation interference & safety hazards posed by sUAS
- Research Questions
  - What proportion of sUAS activity carried out in controlled airspace can be correlated with a LAANC authorization?
  - What proportion of detected sUAS activity exceeds maximum altitude limits of the UAS Facility Map?

Events at Gatwick & Heathrow (UK) highlight NAS vulnerabilities to UAS interference

What is LAANC?

- Low Altitude Authorization & Notification Capability
  - FAA-industry collaboration to share airspace data
  - Provides access to controlled airspace via near real-time processing of airspace authorizations below approved altitudes
- Advantages
  - Employs a risk-based approach to UAS airspace integration
  - Significant improvement in access & timeliness of airspace authorizations; “built for the pace of business”
  - Leverages industry expertise, technology, and ingenuity
- Disadvantages
  - Currently unmonitored – relies on UAS operator self-conformance



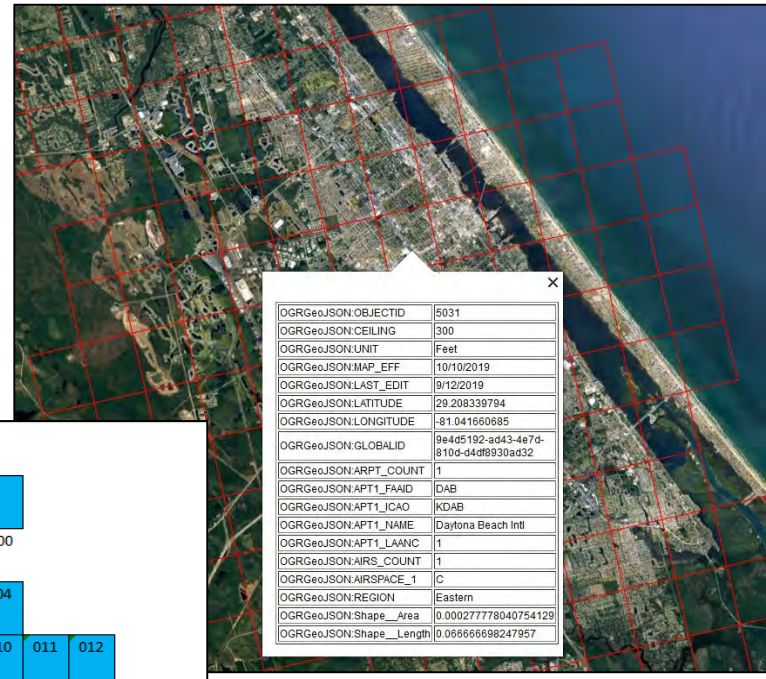
UAS Facility Map, Daytona Beach (KDAB)

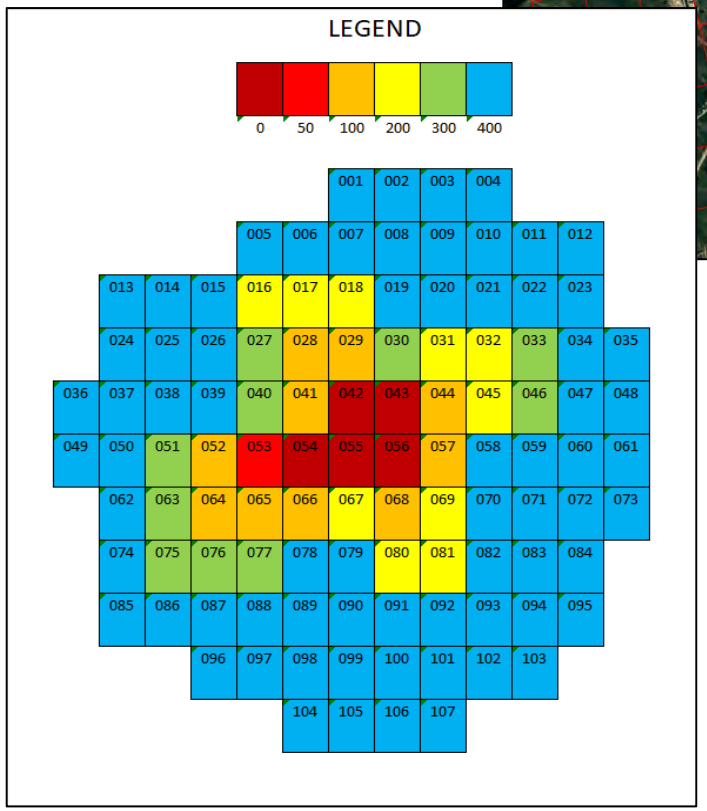
Methodology

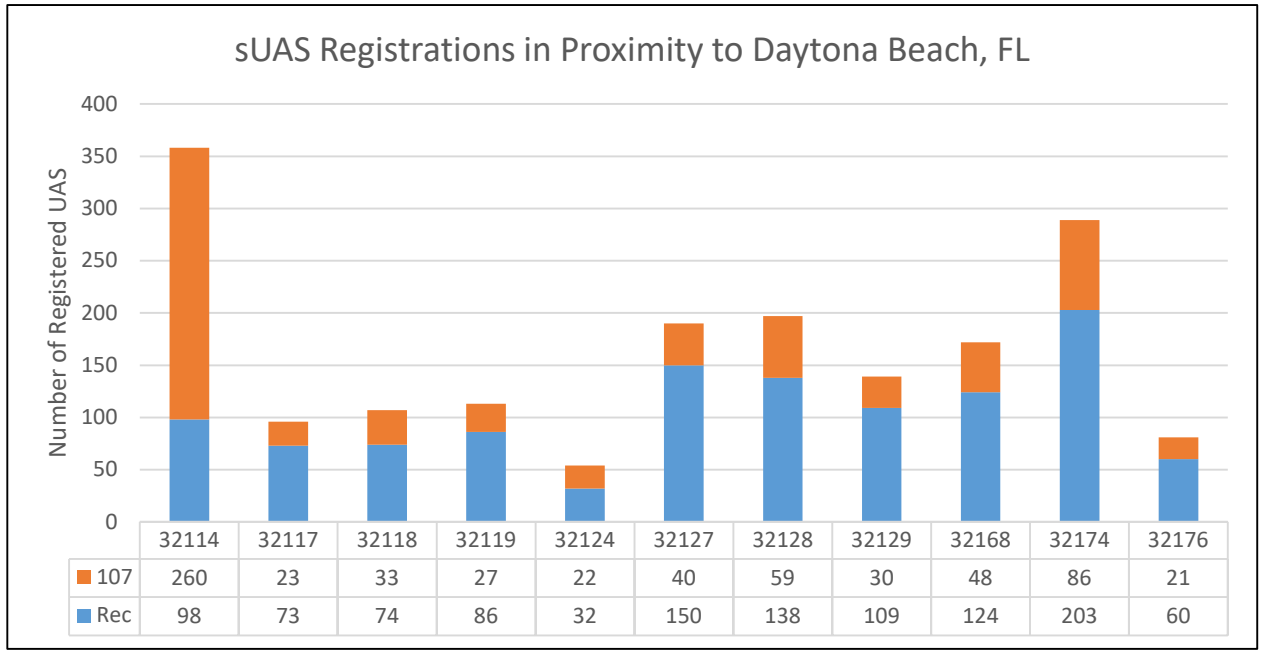
- Applied, exploratory research methodology;
- Convenience sampling at Daytona Beach International Airport (KDAB)
- 30-day sUAS detection sampling using DJI AeroScope
  - sUAS detection device for DJI-manufactured platforms
  - DJI commands an estimated 76.8% of market share (Drone Industry Insights, 2019)
  - ~10 SM detection range
- Requested 30-days LAANC authorization data from FAA
- Correlated sUAS origination detections with LAANC authorization locations

Preliminary Work

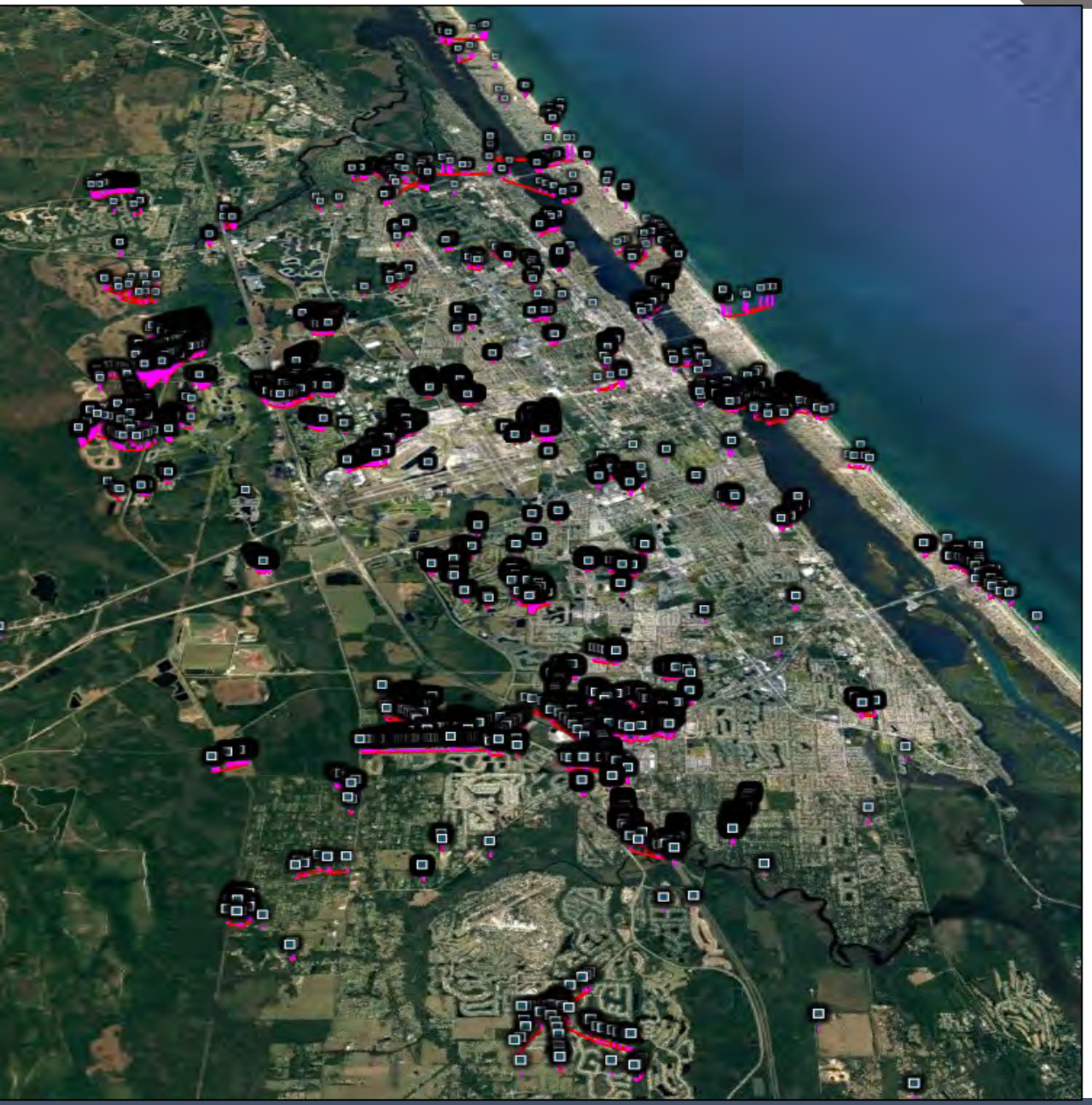
- Assessed area sUAS population (FAA sUAS registration database)
  - Part 107: 649
  - Recreational: 1,147
- Coded KDAB LAANC UAS Facility Map (UASFM)
  - Replaced 16-character coding with sequential numerals to simplify reporting
  - Colorized grids by UASFM maximum altitudes

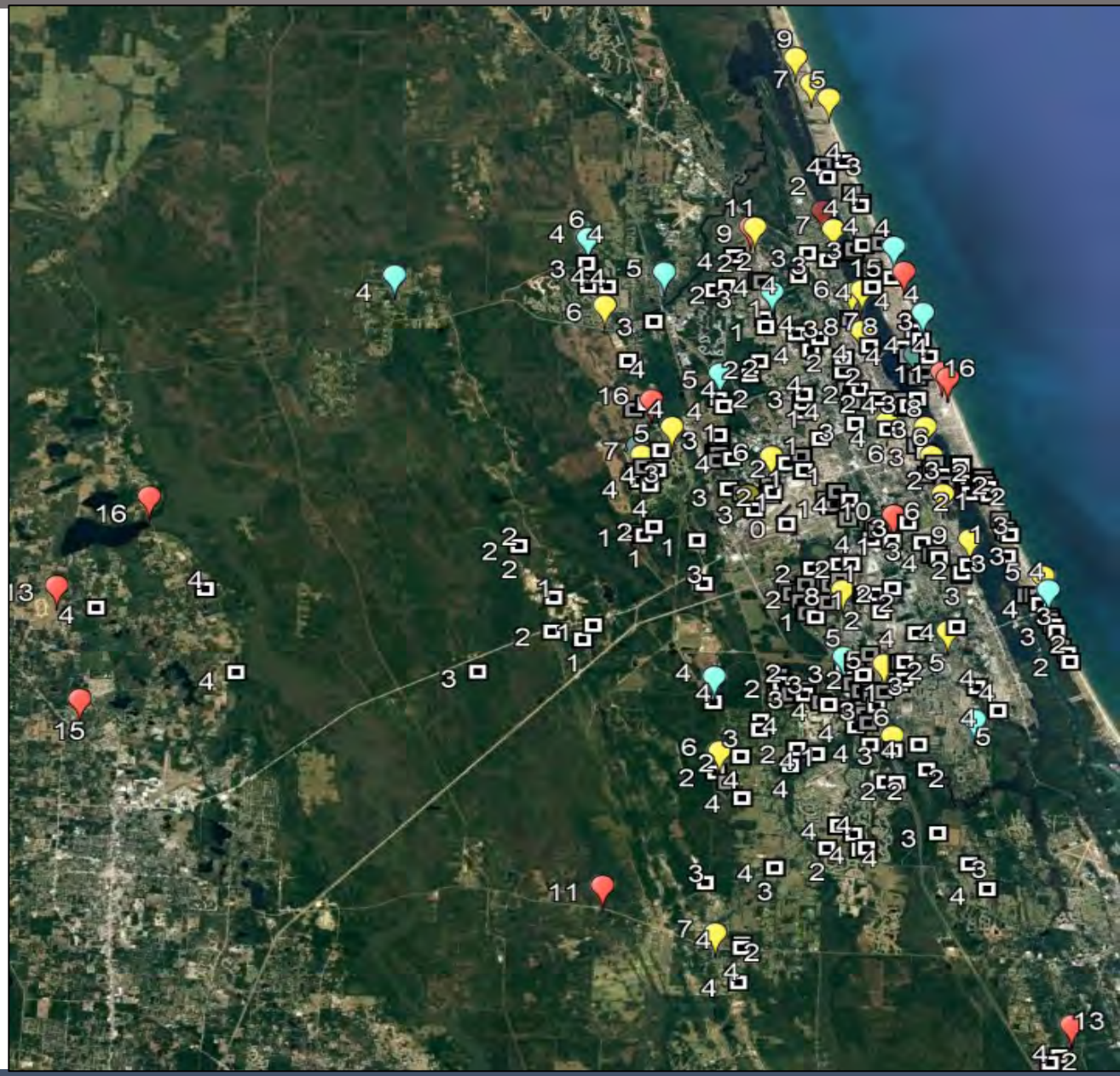






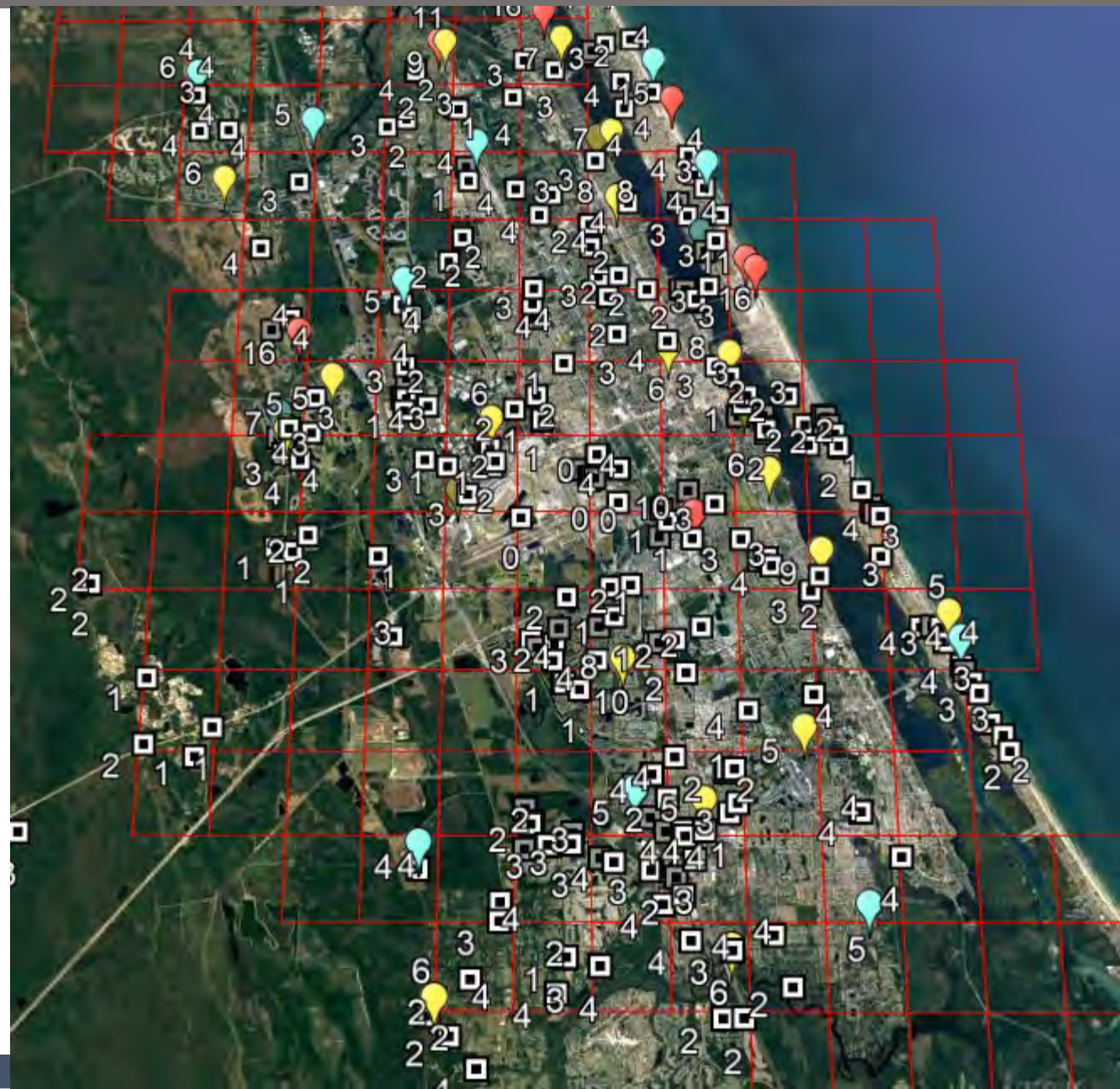
Findings





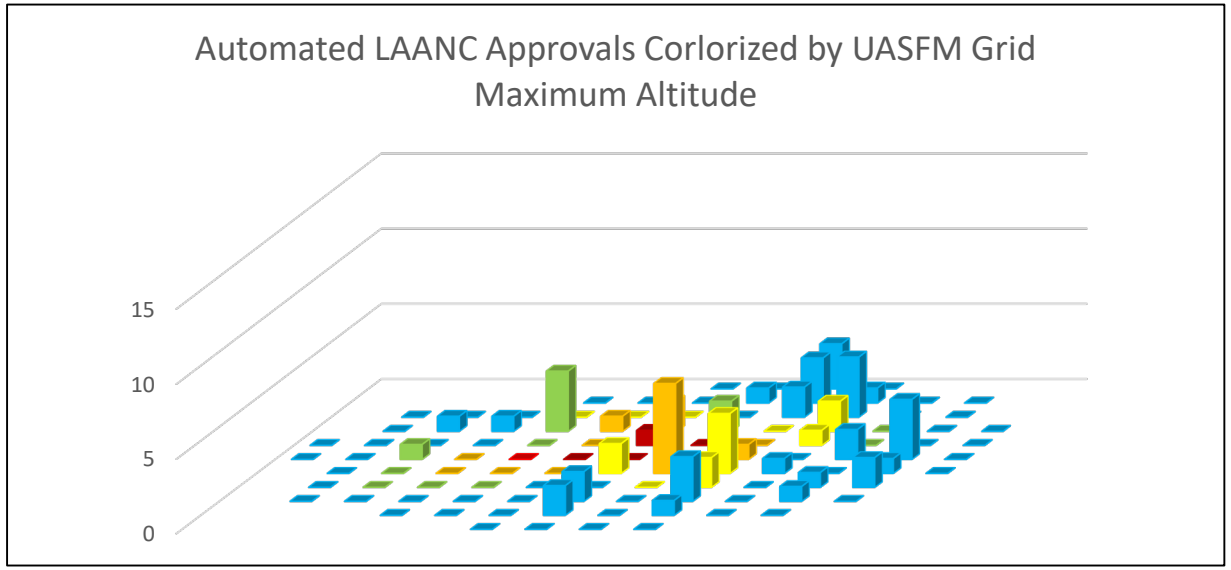
Findings

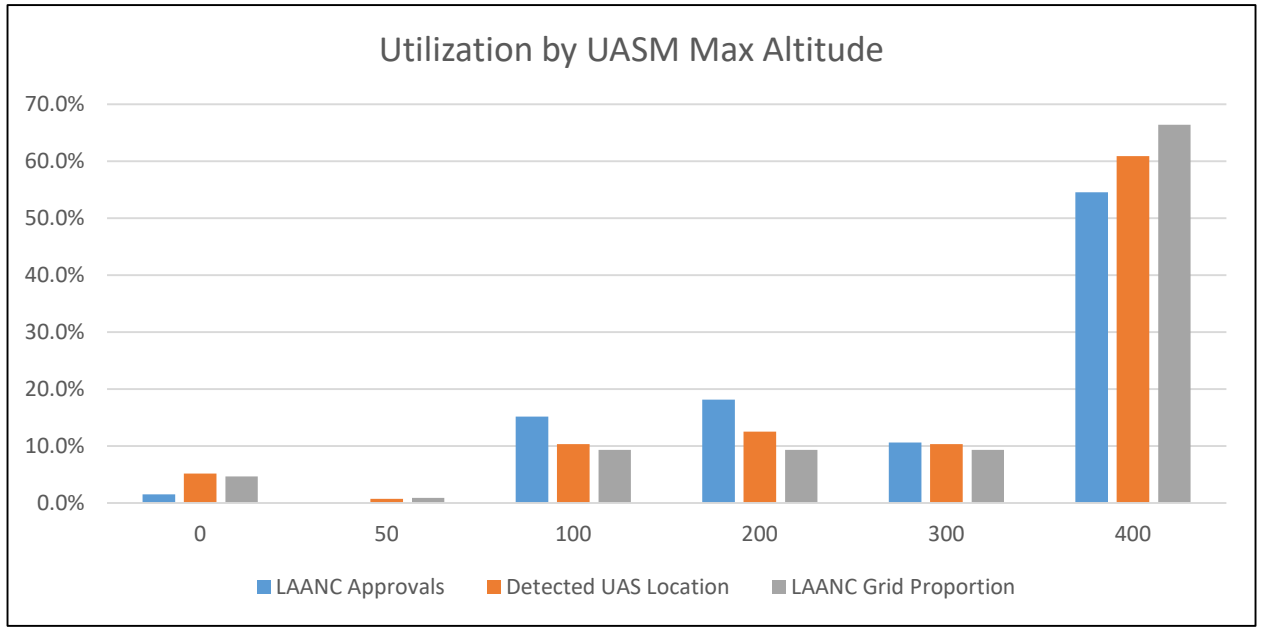
- sUAS Detections
  - Total sUAS detections: 377
  - Within UASFM Grid: 272
- LAANC Approvals
  - Total LAANC approvals: 94
  - Part 107 (auto) LAANC: 41
  - Recreational (auto) LAANC: 24
  - Manually Processed: 29

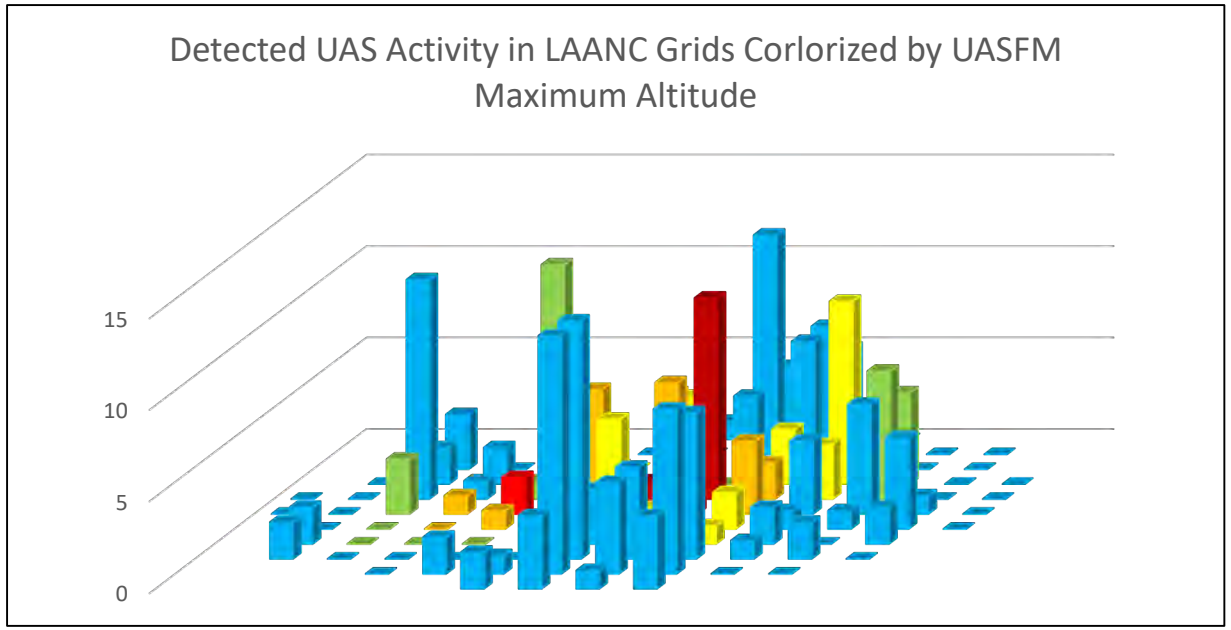


Findings & Discussion

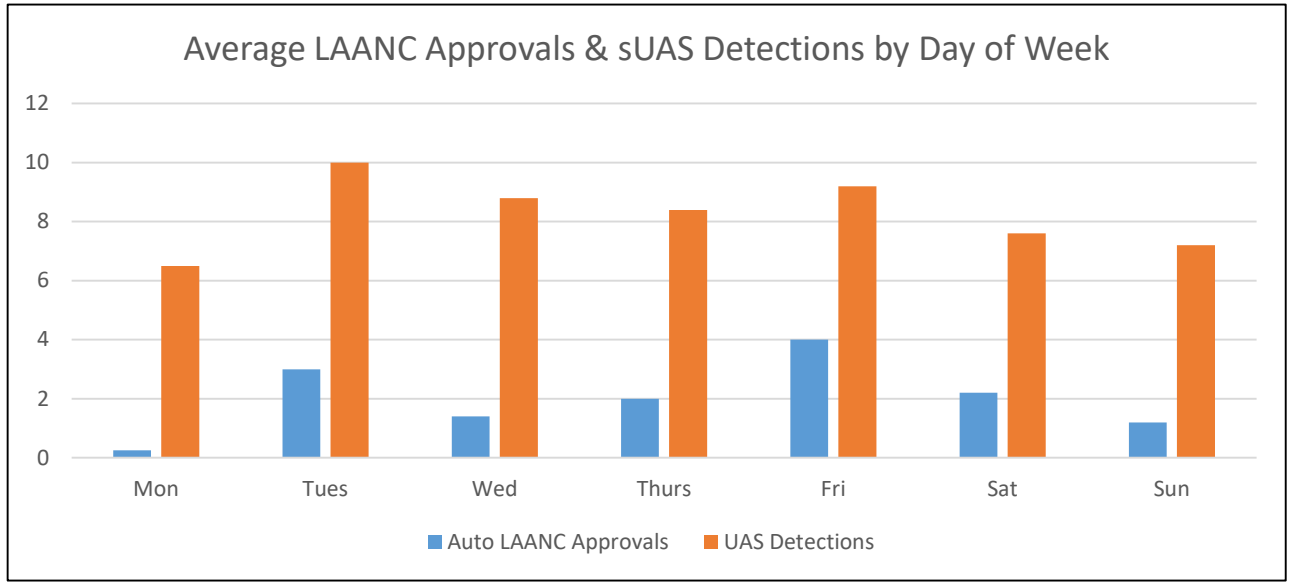
- Overall UASFM utilization proportional to makeup of UASFM grids
- LAANC *approvals* slightly elevated in UASFM areas closer to airfield(s)
  - sUAS operators more likely to know flight nearest to airports requires permission
- Higher unapproved *utilization* in UASFM periphery
  - May indicate sUAS operators are still following rescinded Special Rule for Model Aircraft

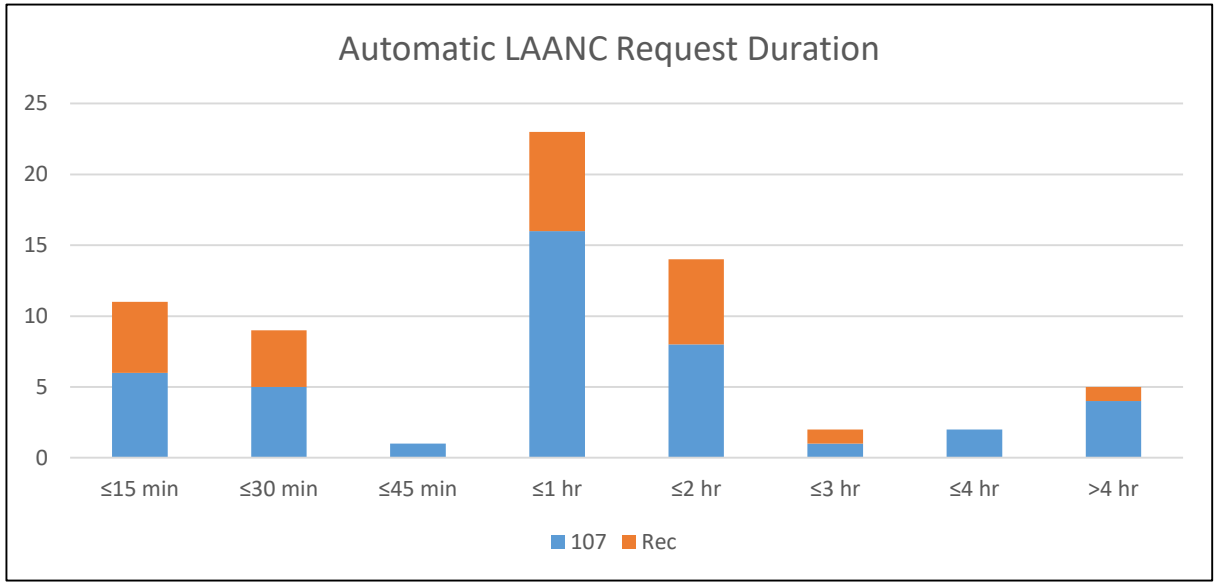


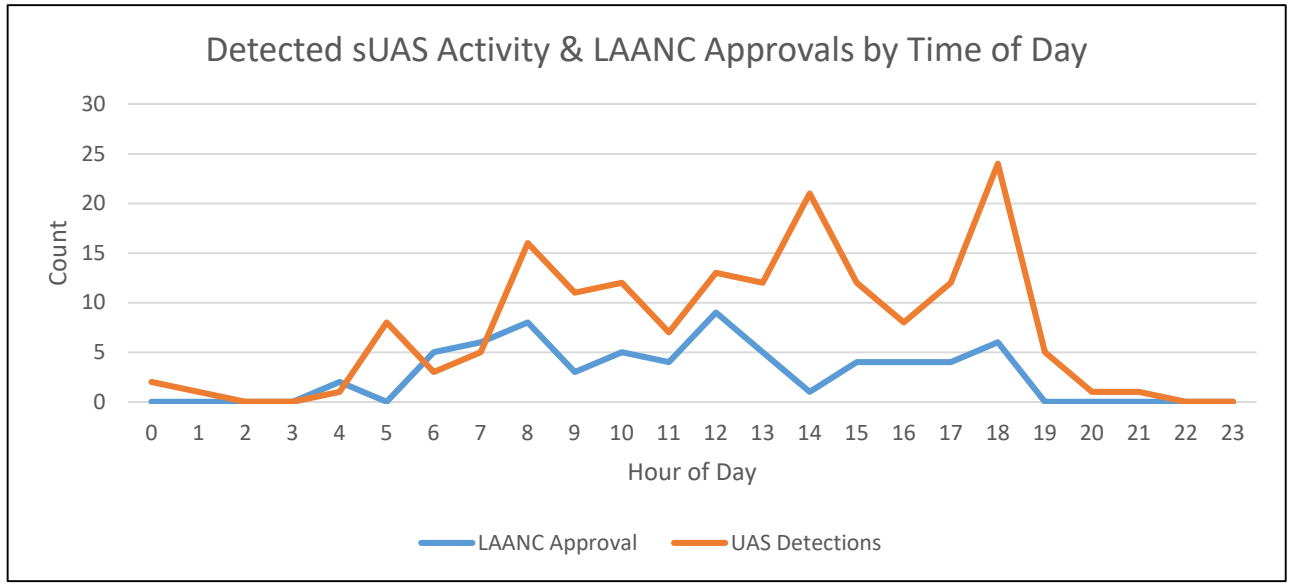


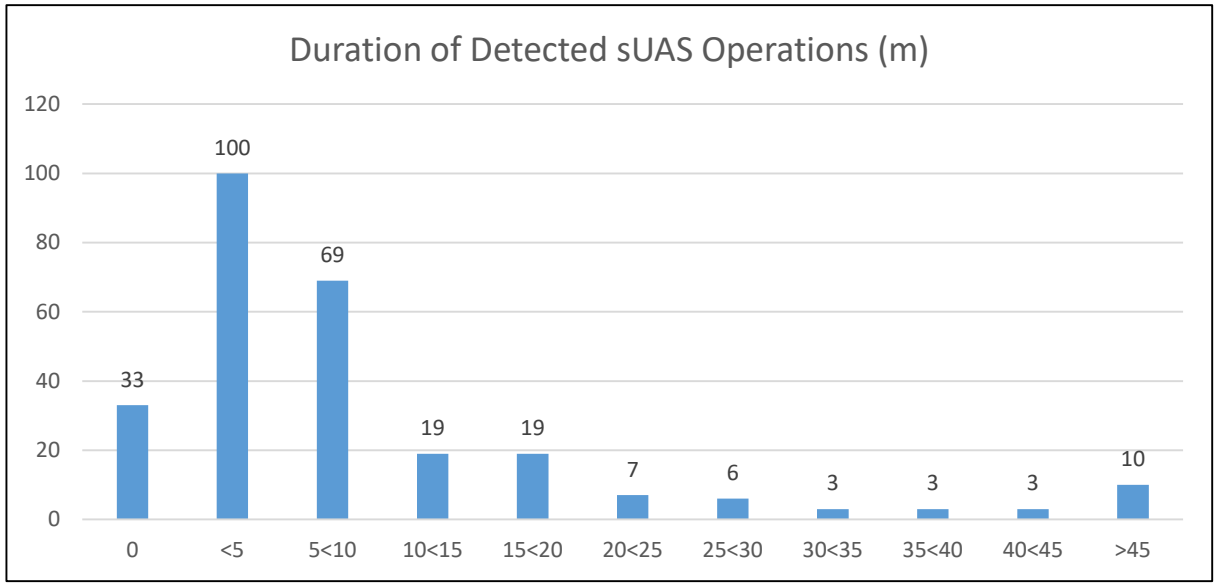


Findings


Average LAANC Approvals & sUAS Detections by Day of Week
12
10
8
6
4
2
0
Mon
Tues
Wed
Thurs
Fri
Sat
Sun
Auto LAANC Approvals
UAS Detections

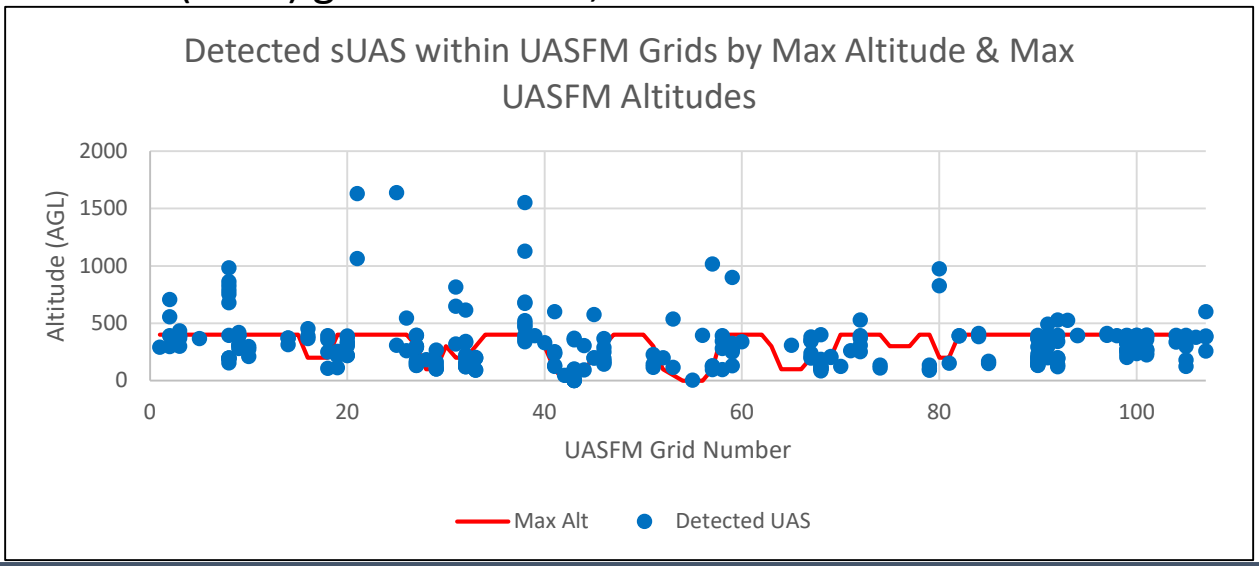

Automatic LAANC Request Duration
25
20
15
10
5
0
≤15 min
≤30 min
≤45 min
≤1 hr
≤2 hr
≤3 hr
≤4 hr
>4 hr
107
Rec

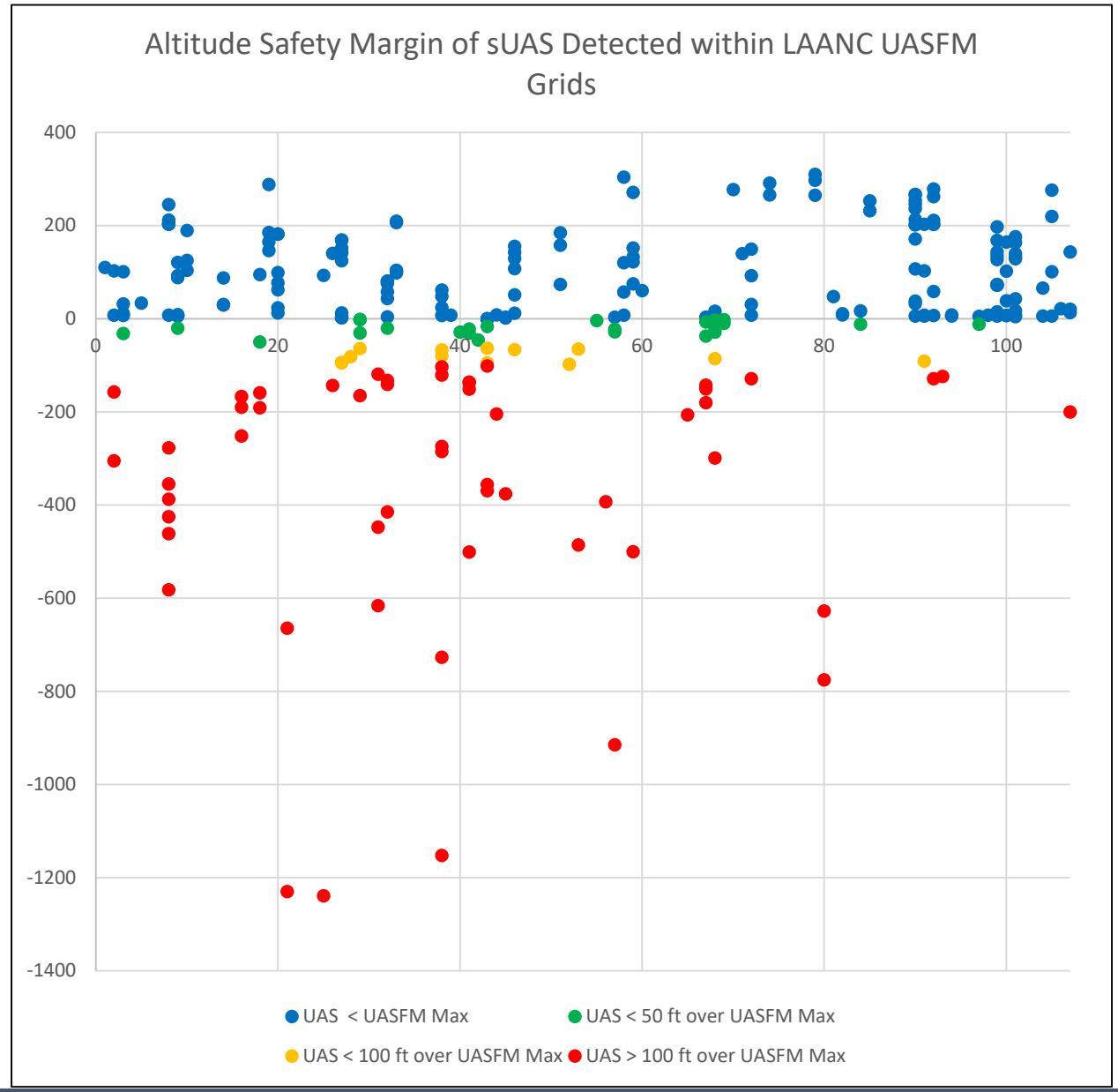

Detected sUAS Activity & LAANC Approvals by Time of Day
Count
30
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour of Day
LAANC Approval
UAS Detections


Duration of Detected sUAS Operations (m)
120
100
80
60
40
20
0
33
100
69
19
19
7
6
3
3
3
10
0
<5
5<10
10<15
15<20
20<25
25<30
30<35
35<40
40<45
>45

Findings & Discussion

- Compliance with UASFM altitudes
  - 178 sUAS platforms (65.4%) detected within UASFM altitude limits
  - 26 (9.6%) within 50 ft of UASFM limit
  - 13 (4.8%) within 100 ft of UASFM limit
  - 55 (20.2%) exceeded 100 ft of UASFM limit
- National Airspace Systems Risks
  - 23 (8.5%) between 500-1,000 ft AGL
  - 3 (1.1%) between 1,000-1,500 ft AGL
  - 3 (1.1%) greater than 1,500 ft AGL

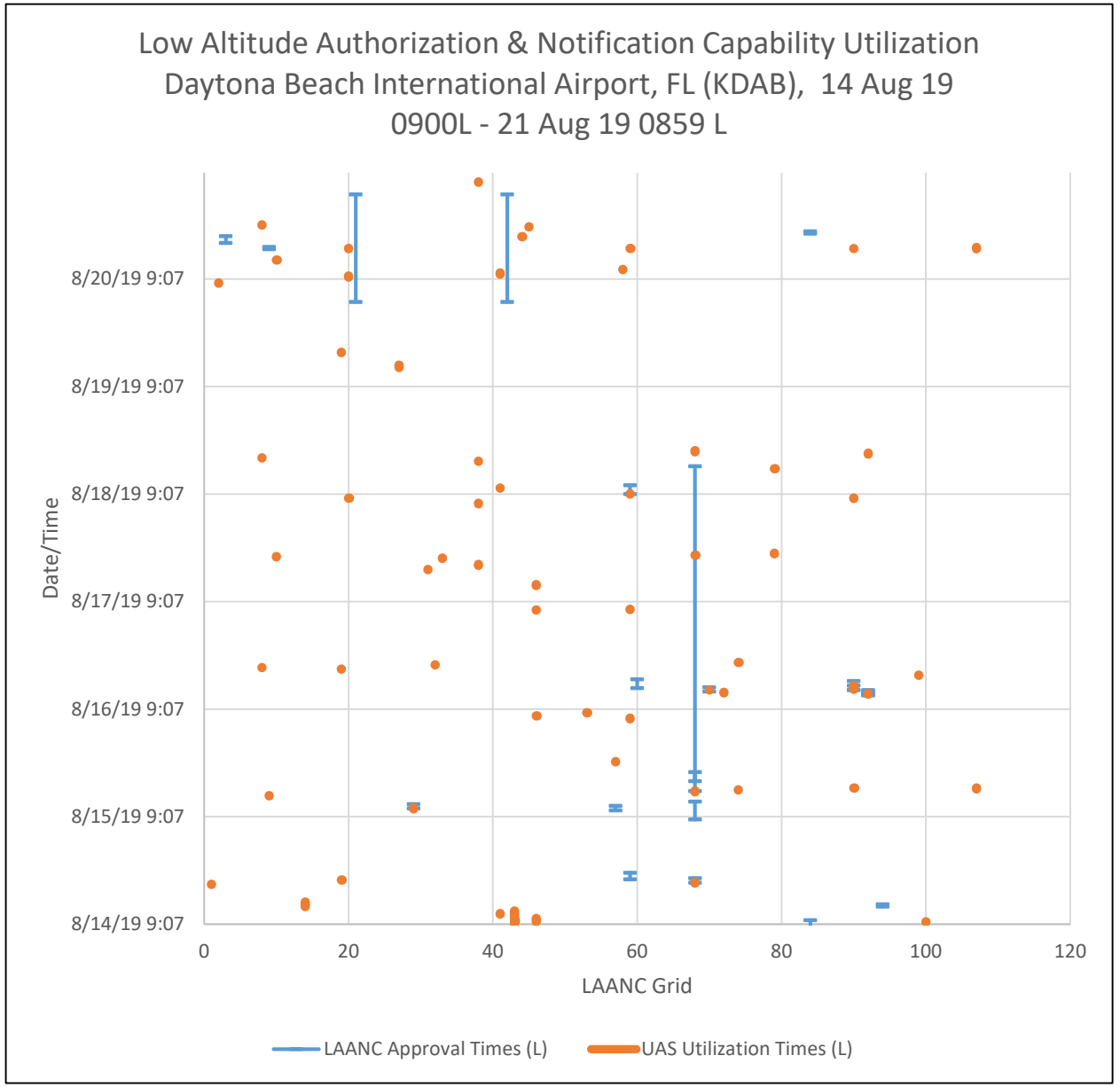




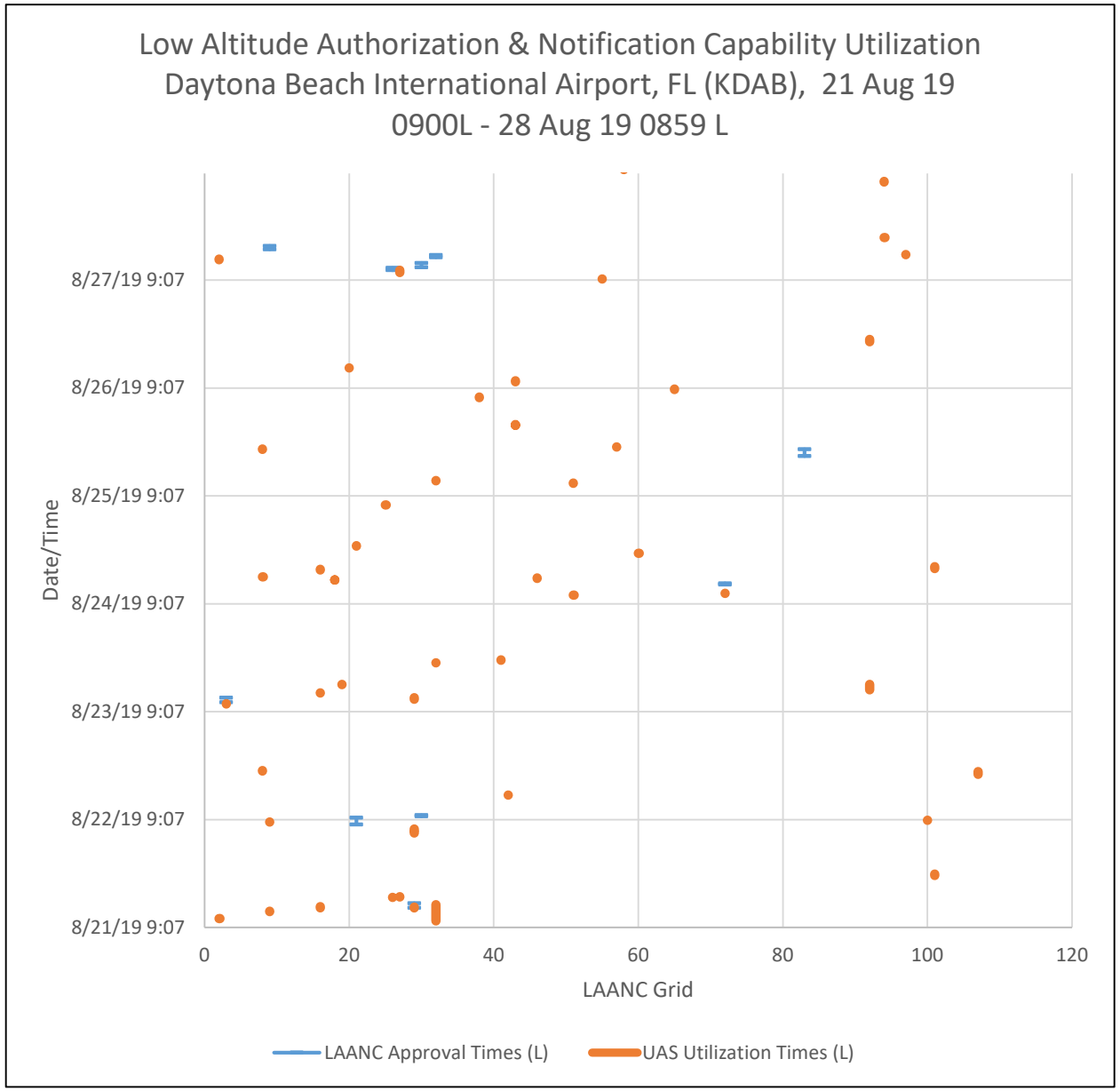
Findings & Discussion

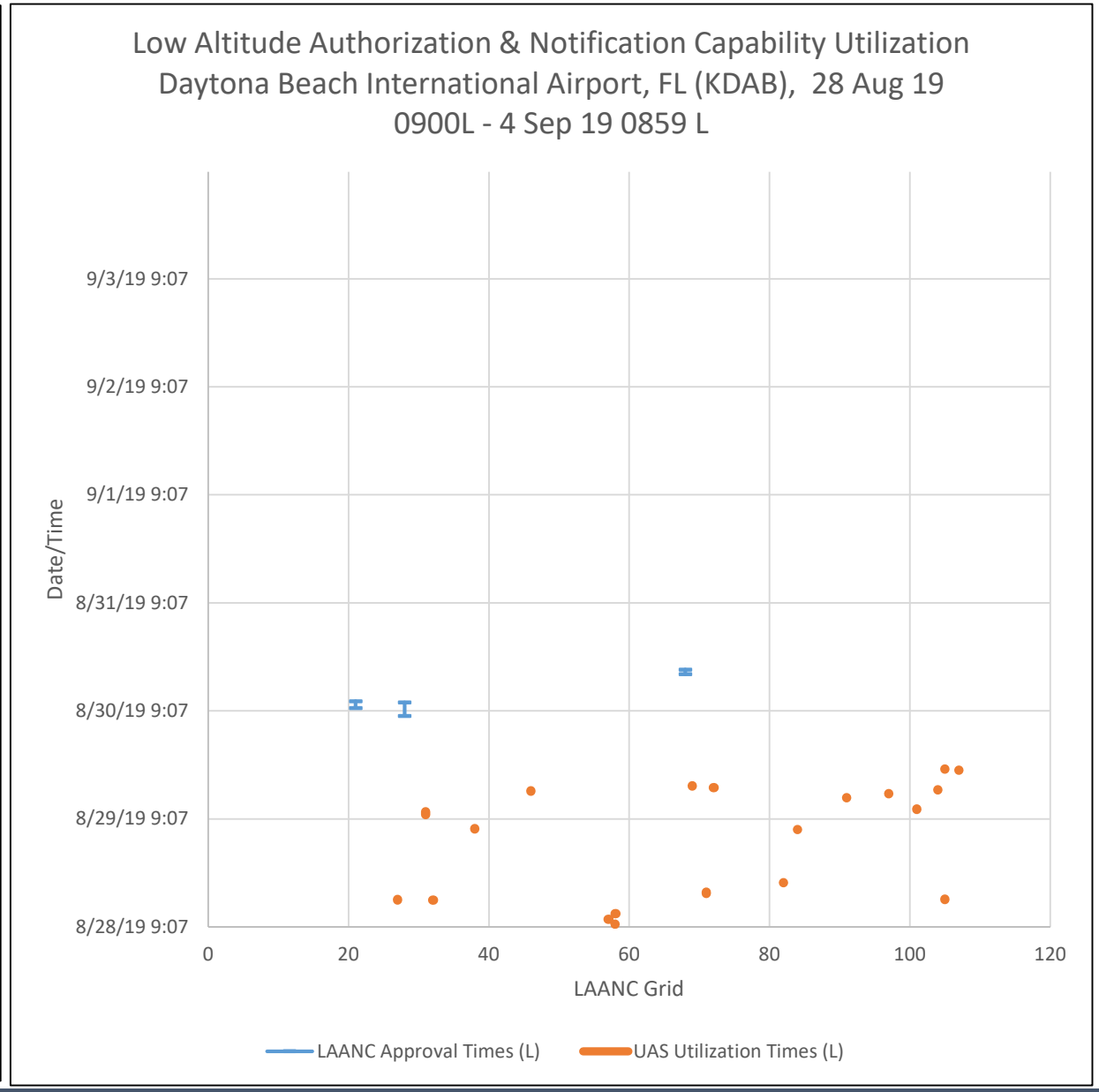
- Only 19 (7%) sUAS flights could be correlated to a LAANC approval
- Possible explanations:
  - While LAANC authorizations were sought, some sUAS operations were not flown
  - Some LAANC authorizations included models of sUAS that were not detectable using the AeroScope
  - While LAANC authorizations were received for specific areas, some sUAS flights may have deviated from their original LAANC request

"The quantity of UAS flights taking place outside the scope of established FAA approval and safety management processes may indicate that current regulatory mechanisms designed to control sUAS operator access to controlled airspace may not be working…"

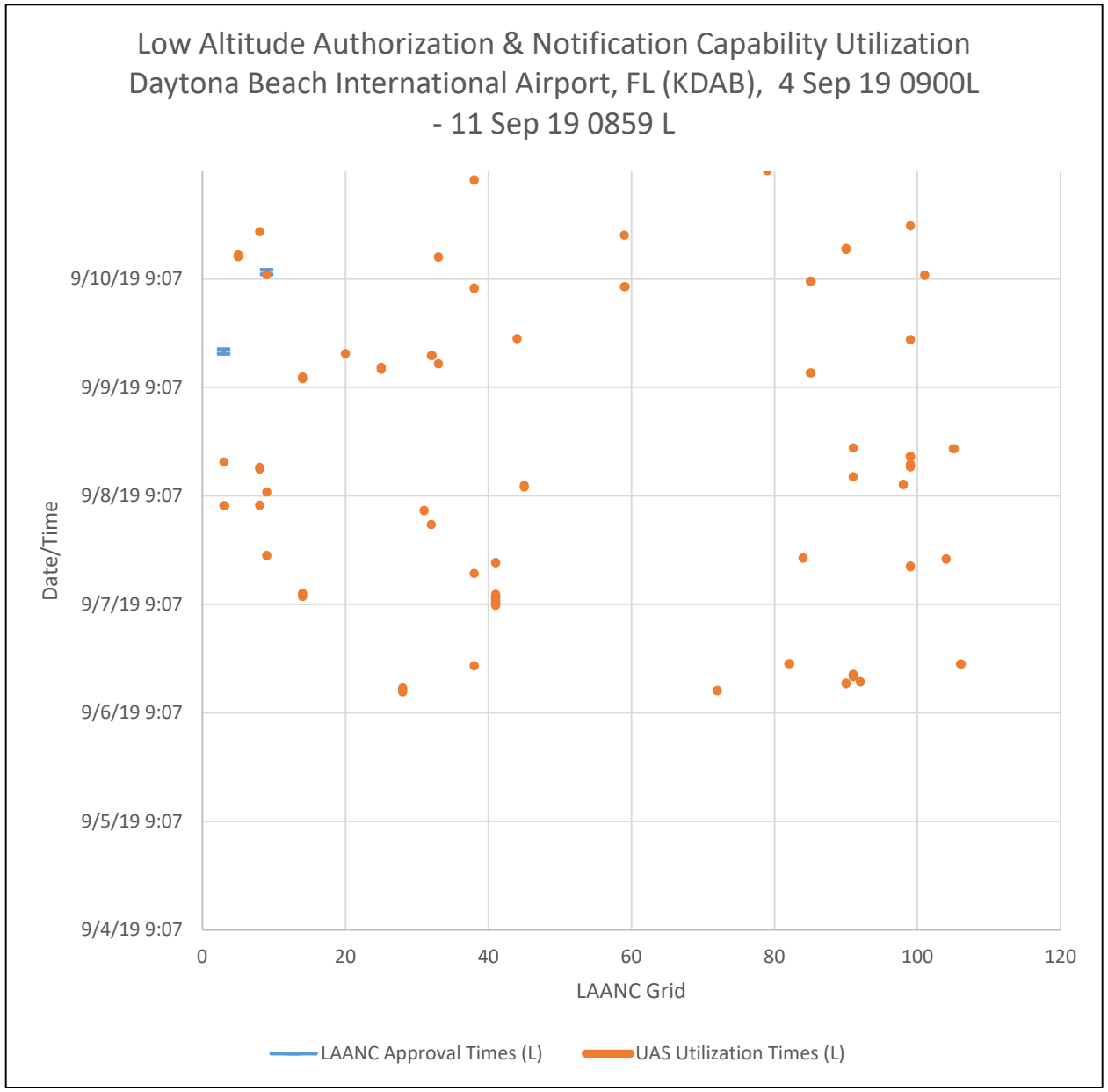


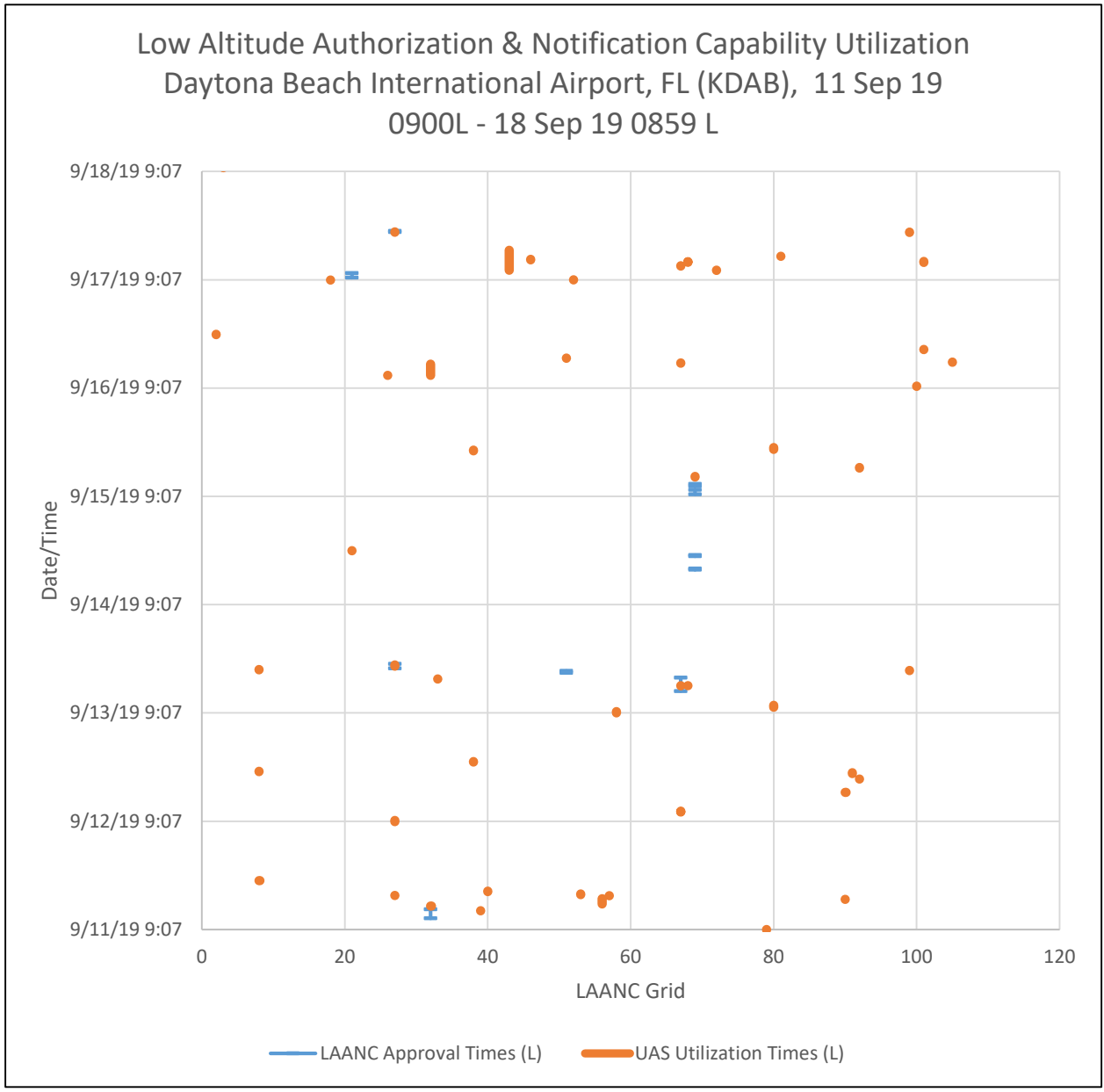
Findings & Discussion





Findings & Discussion





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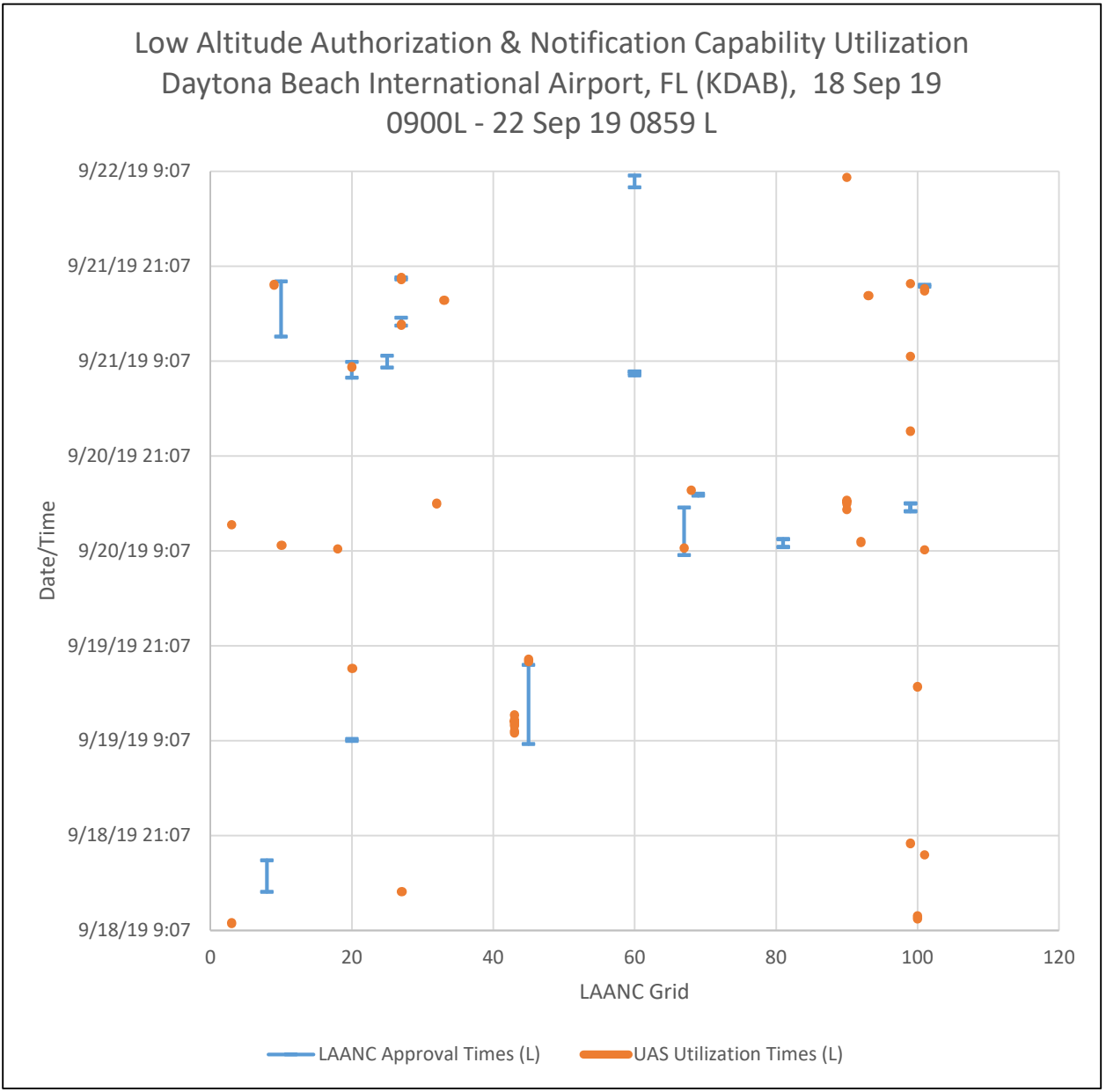
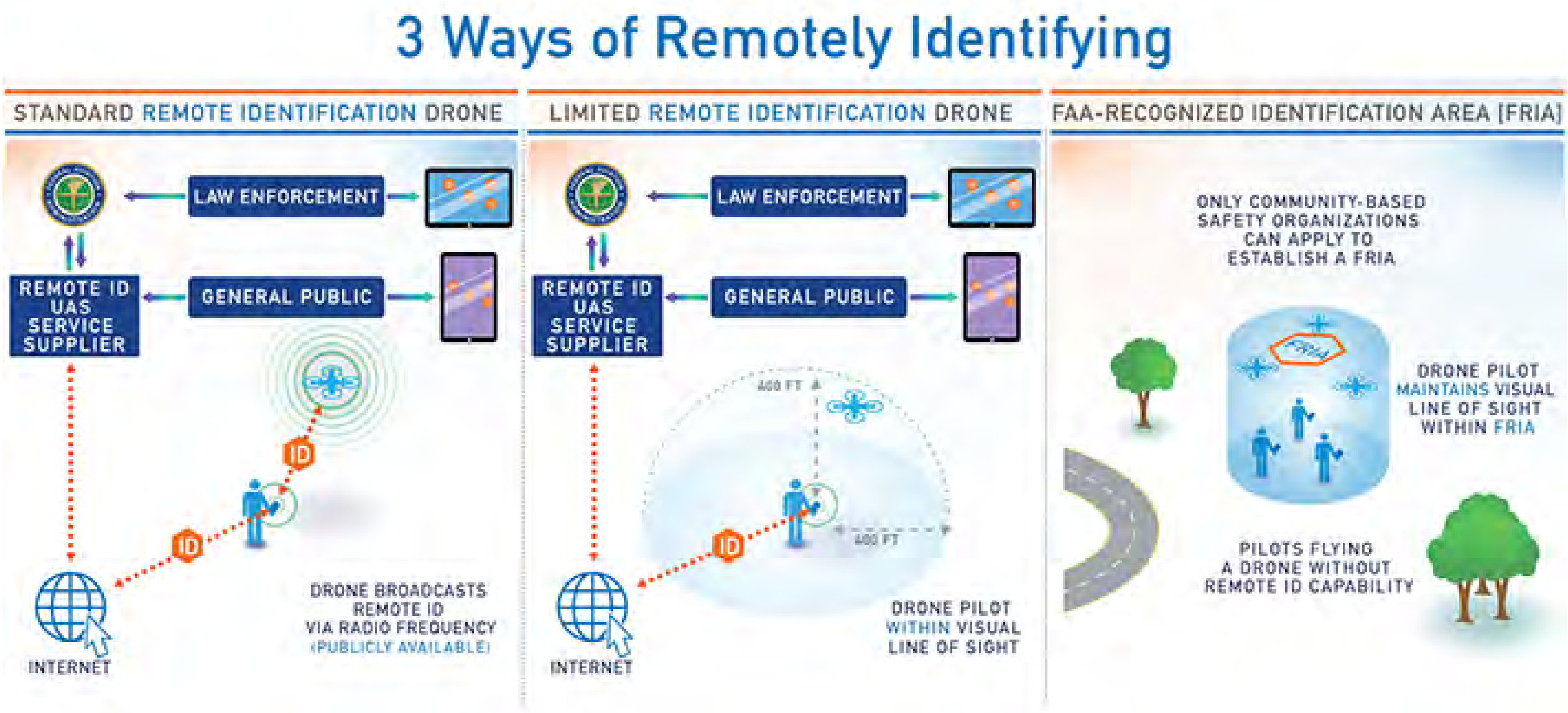


Is Remote ID the solution?



Conclusions

- Relatively equivalent sUAS activity across UASFM network
- Extremely low LAANC approval rate compared to detected sUAS activity in UASFM network
- Difficult to correlate detected sUAS flights and LAANC approvals
- Duration of LAANC approvals vastly exceeds average sUAS flight time; inaccurately portrays activity within UASFM
- 44.6% of sUAS exceeded UASFM maximum altitude limits; 10.7% exceeded 500 ft AGL
- Propensity for some sUAS operations to fly lengthy distances from origination point (possibly outside VLOS)
- Demonstrates need to sample additional UASFM locations to enhance generalizability of findings
- Demonstrates need for additional tracking methods, such as Remote ID

Questions?

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