



Average Alert Times Supported by ATAR Classes A1, A2, and A3

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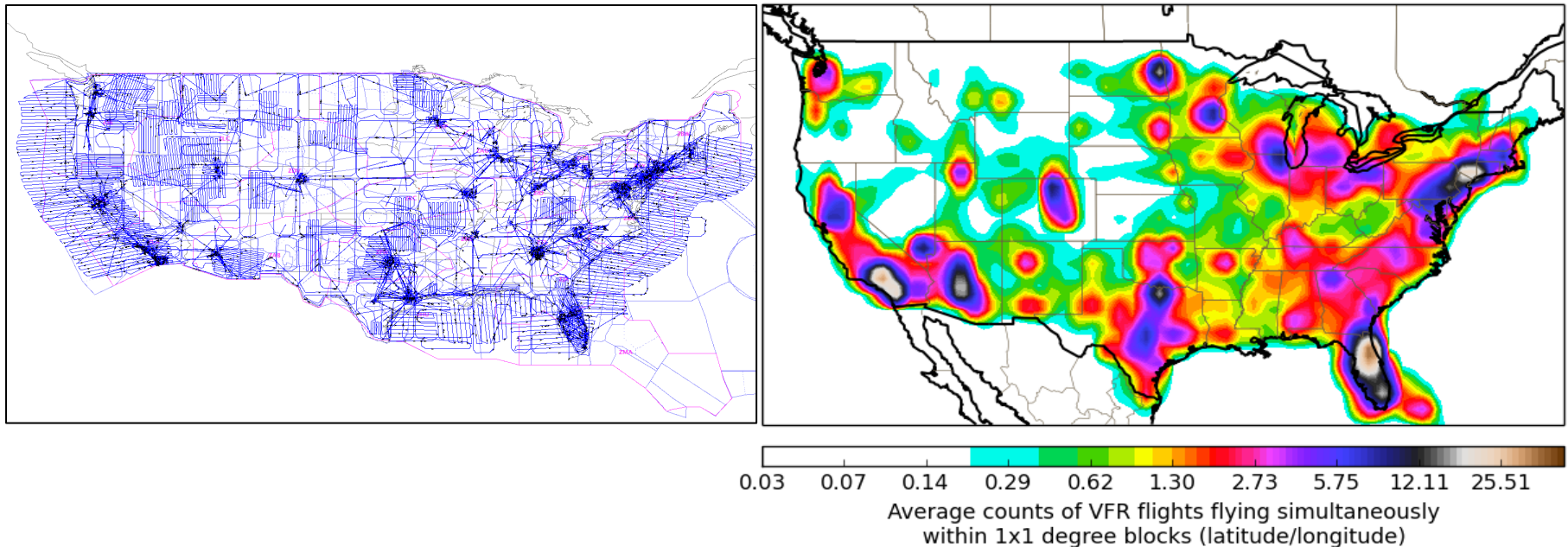
Objective

- Compute the Detect-and-Avoid (DAA) average alert time supported by the field of regard (FOR) of air-to-air radar (ATAR) classes A1, A2, and A3

ATAR Class	Turn Rate (deg/sec)	Minimum UA speed (KTAS)	Maximum UA speed (KTAS)
A1	1.5	100	291
A2	3	40	200
A3	7	40	110

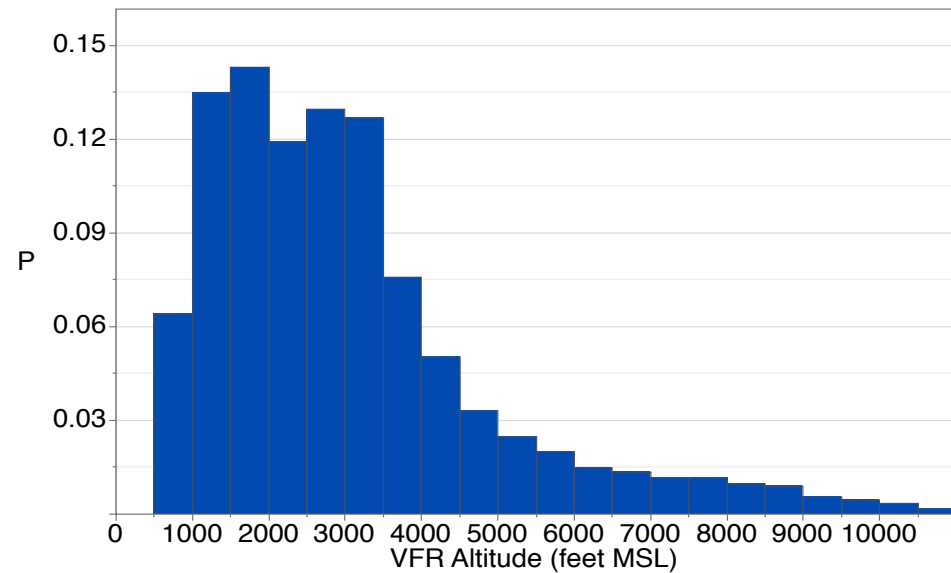
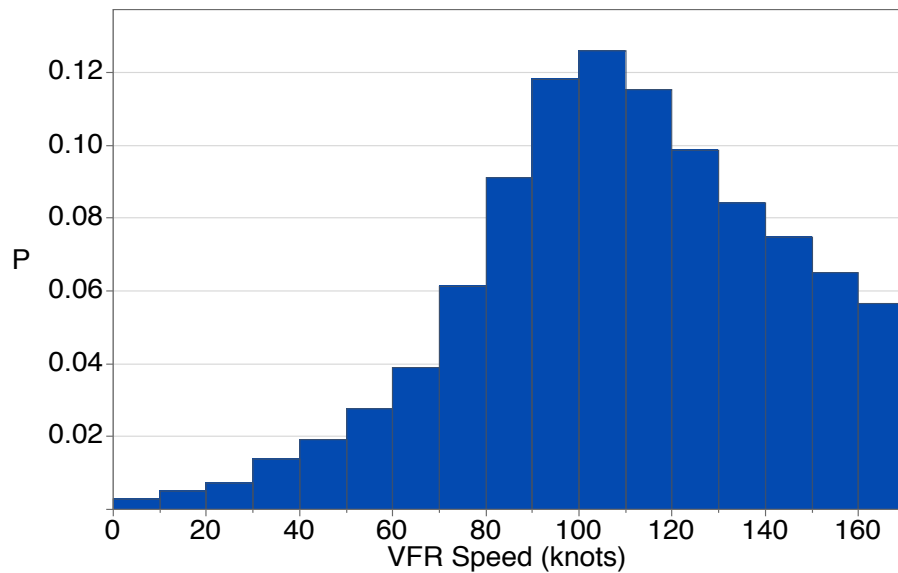
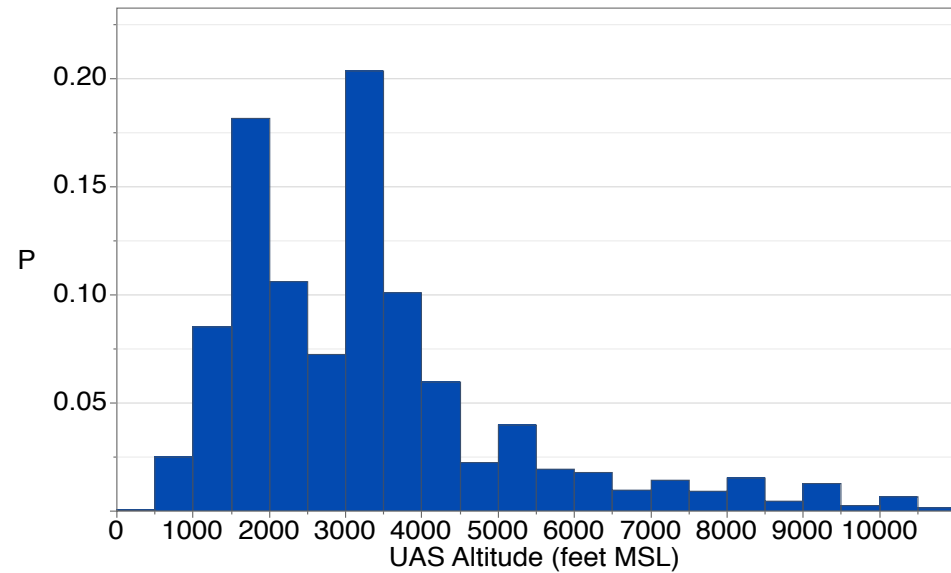
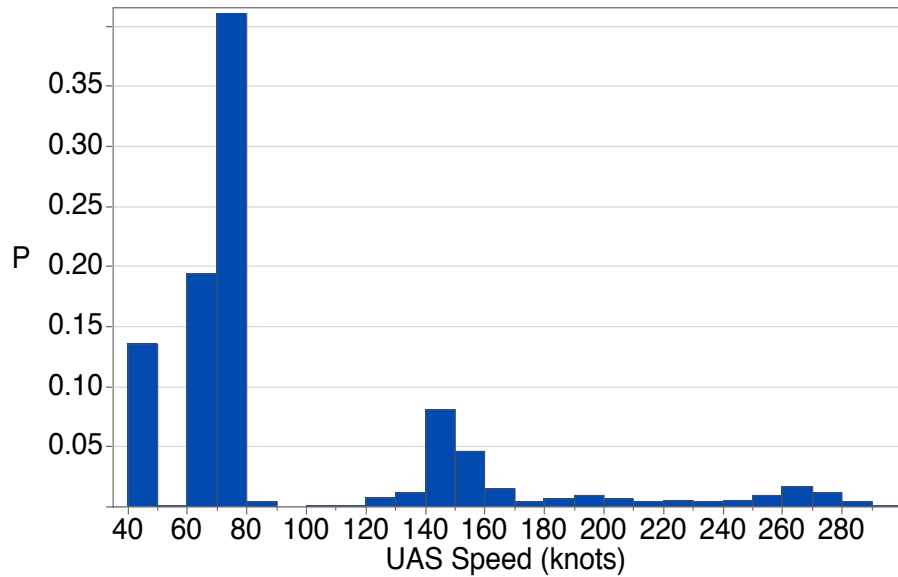
Encounter Set

- 17,100 hours of projected UAS mission trajectories in one day overlaid with each of 21 days' radar recorded visual flight rules (VFR) traffic
- Only encounters between 500 ft AGL and 10,999 ft MSL are analyzed





Speed and Altitude of UAS and VFR Traffic





Alerting Algorithm Configuration

- Detect and Avoid Alerting Logic for Unmanned Systems (DAIDALUS) version 2e
 - Non-cooperative well clear with a buffered horizontal miss distance
 - 60 seconds to (buffered) loss of well clear for corrective alerts
 - 30 seconds to (buffered) loss of well clear for warning alerts



Field of Regard (FOR)

Azimuth range $\pm 110^\circ$

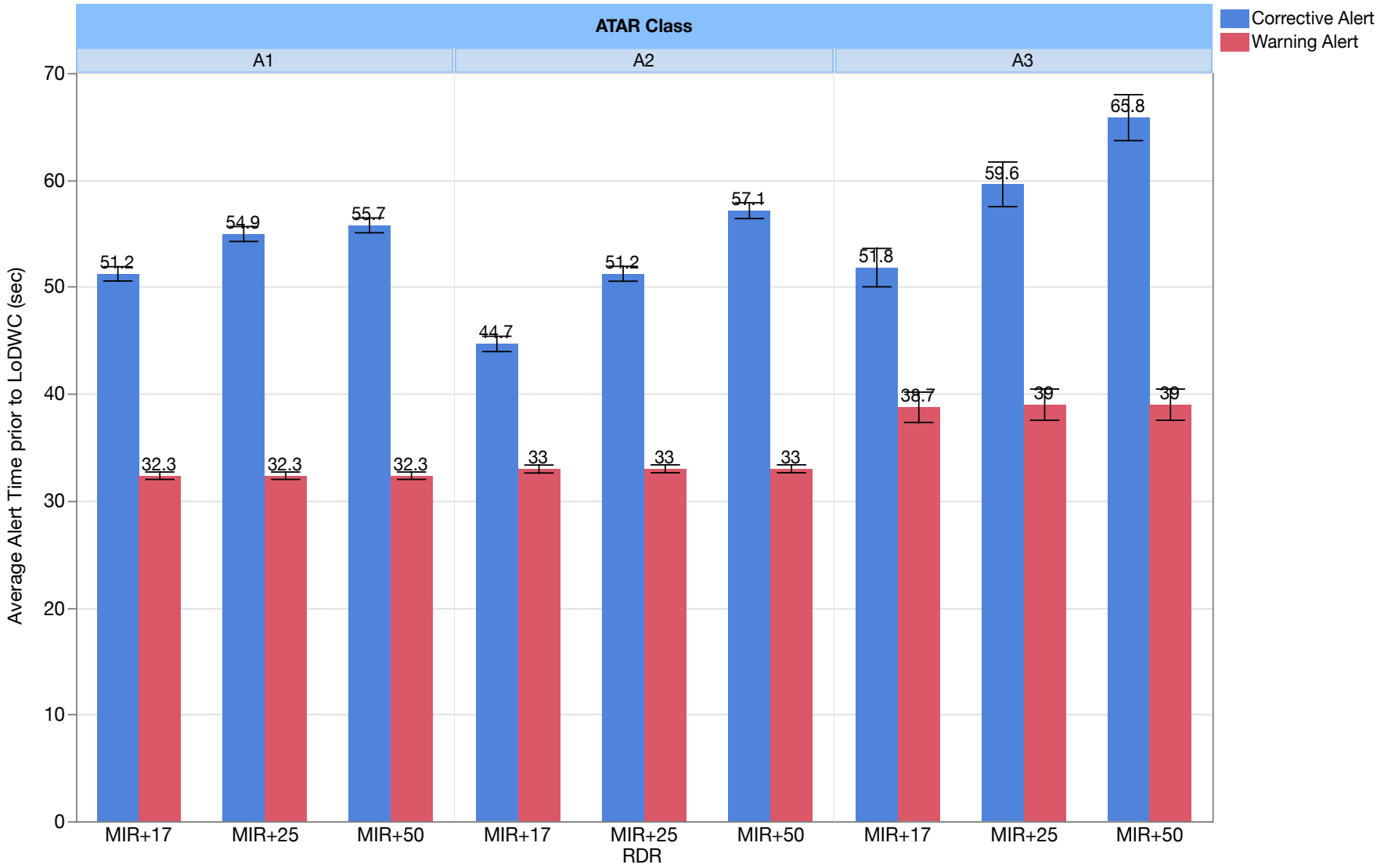
Elevation range $\pm 15^\circ$

The following RDRs (smaller than DO-366A by $\sim 5\%$) were applied to the simulations

A1				
RDR (nmi)	0-30 deg	30-60 deg	60-90 deg	90-110 deg
Small	4.88	2.86	1.61	0.00
Medium	5.25	3.52	2.65	1.34
Large	5.75	4.37	3.82	2.29
A2				
RDR (nmi)	0-30 deg	30-60 deg	60-90 deg	90-110 deg
Small	3.58	2.46	1.36	0.00
Medium	3.94	3.06	2.04	1.15
Large	4.42	3.73	3.16	1.87
A3				
RDR (nmi)	0-30 deg	30-60 deg	60-90 deg	90-110 deg
Small	2.45	2.10	1.99	1.43
Medium	2.80	2.54	2.50	1.99
Large	3.44	3.16	3.11	2.71



Average Alert Times



Note: A2 results cover ownship speed 100 to 200 KTAS



Discussion

- Average warning alert time meets the requirement of 25 seconds.
- Average corrective alert time is close to the requirement of 55 seconds.
- Increasing DAIDALUS's corrective alert time parameter further from 60 seconds may increase the average alert time to some extent but has not been tested.