Evaluating Search Effectiveness:
Keeping Pace with Technology?

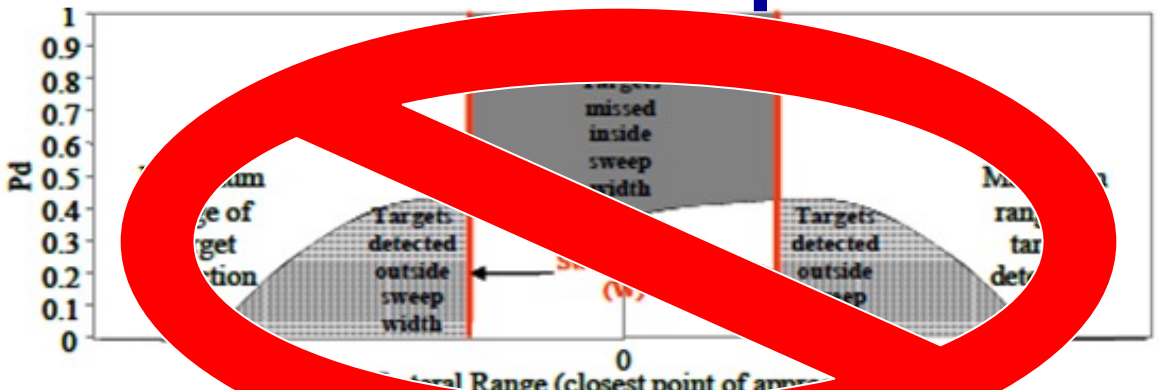
Office of Search and Rescue

Homeland Security

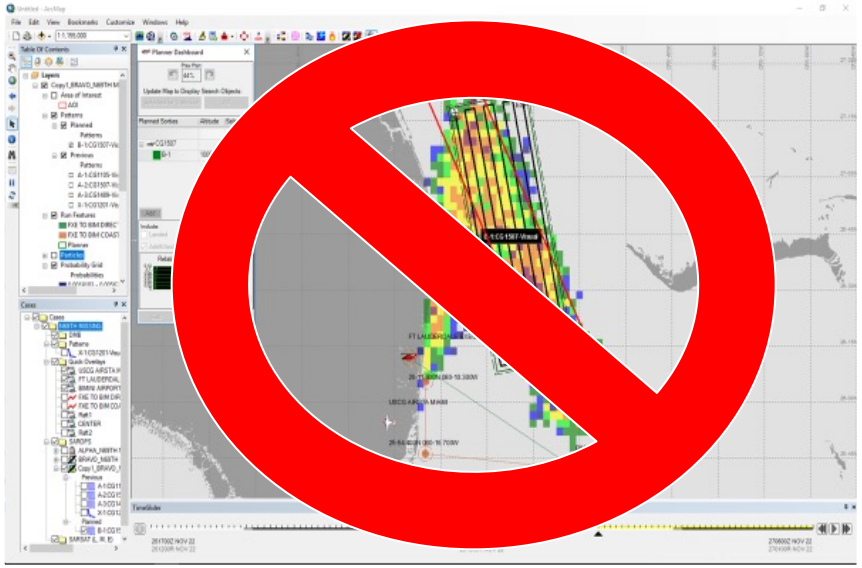
United States Coast Guard

Semper Paratus

Bottom Line Up Front



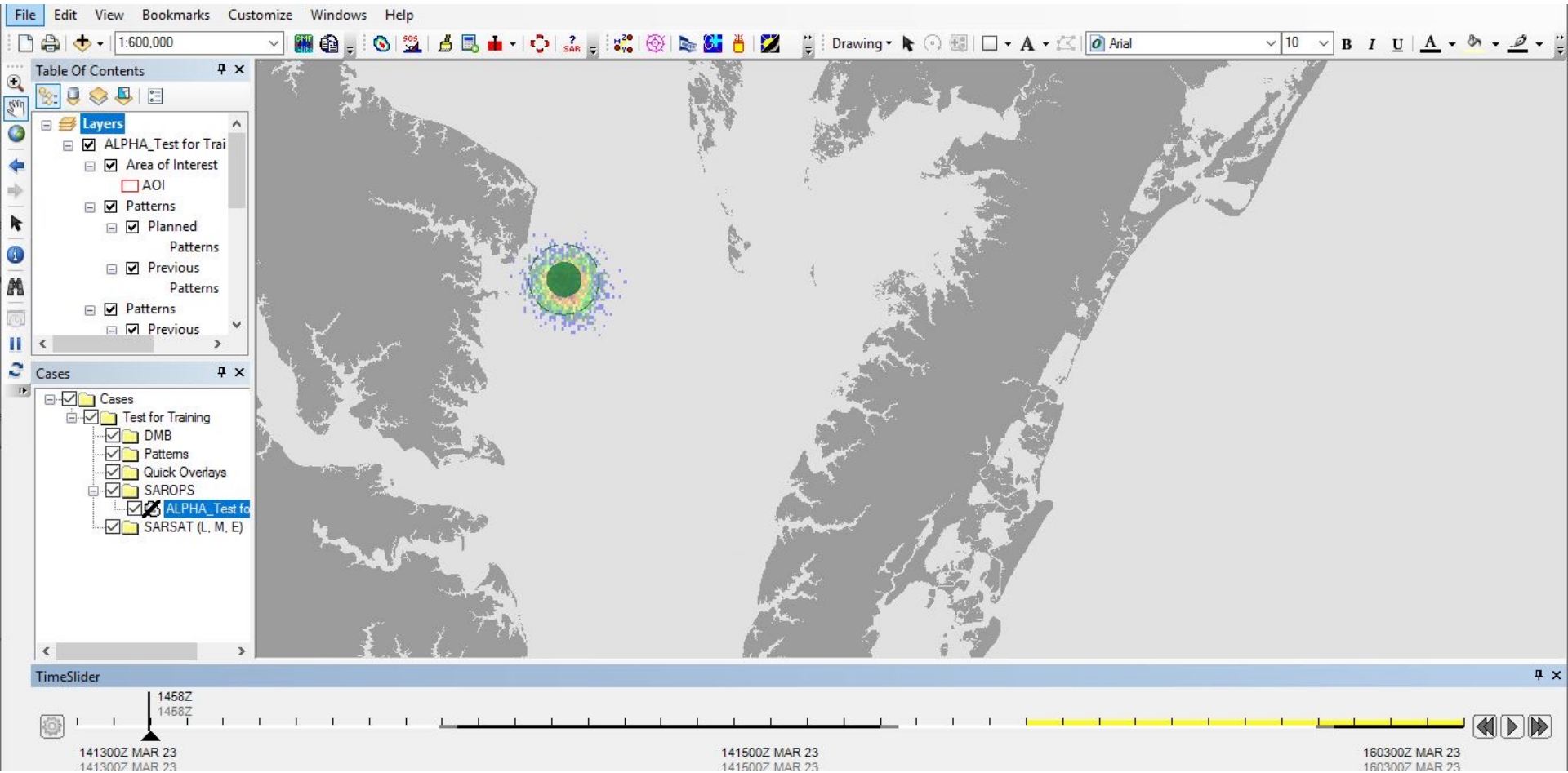
Optimize (in Progress)



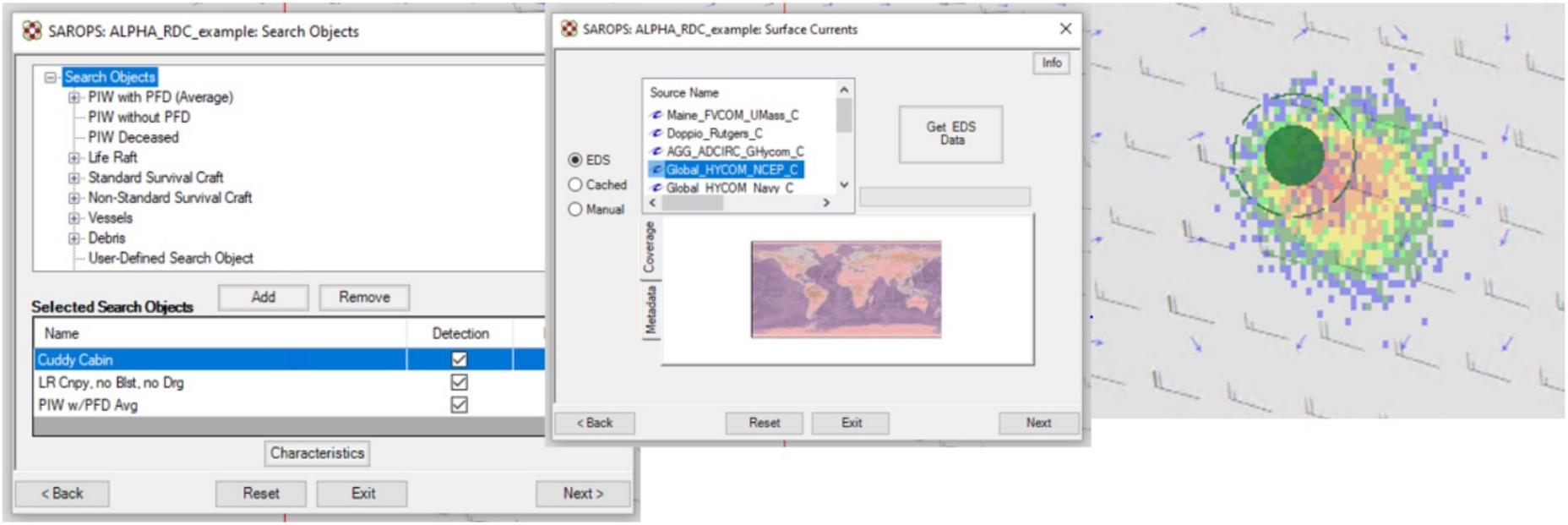
Primary Elements of a Successful Search

- Look in the right place
- Be able to detect what you are looking for

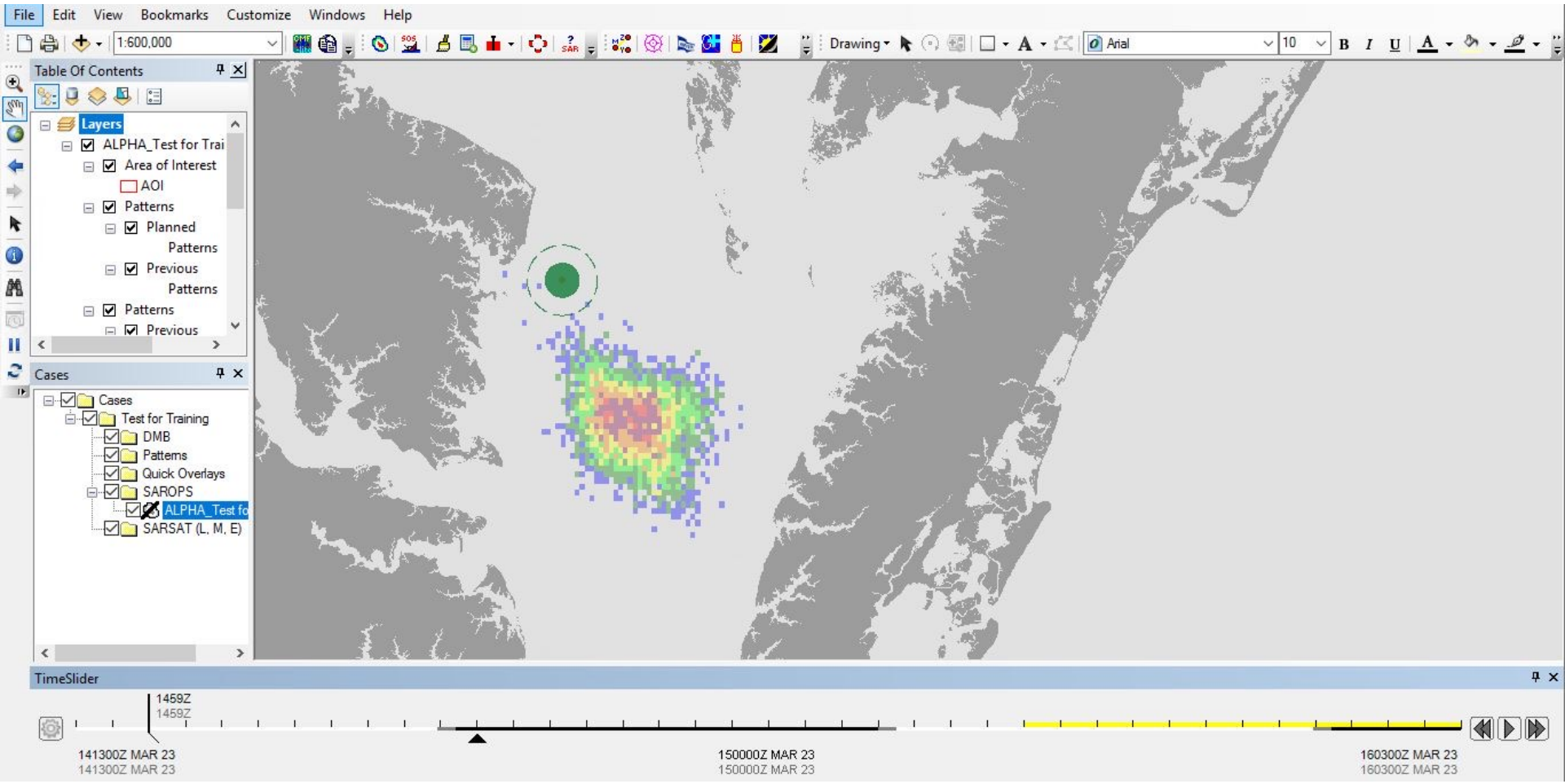
Scenario: Person in the Water



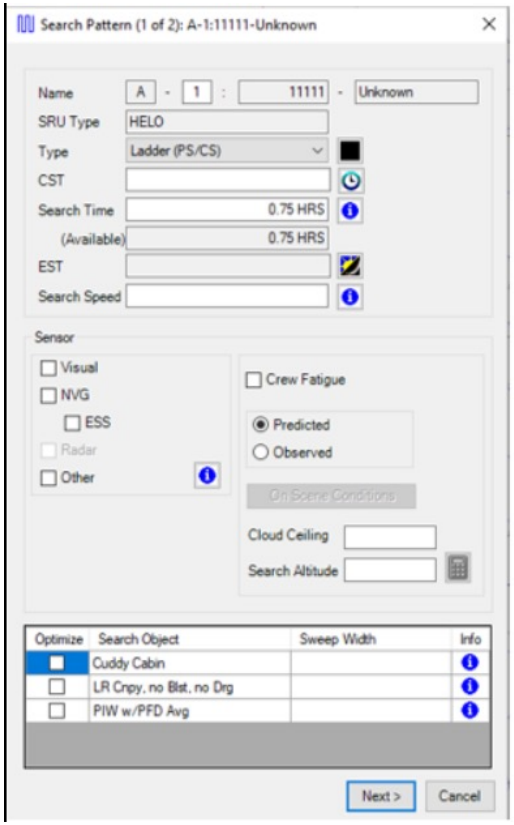
Search and Rescue *Optimal* Planning System (SAROPS) - Simulator

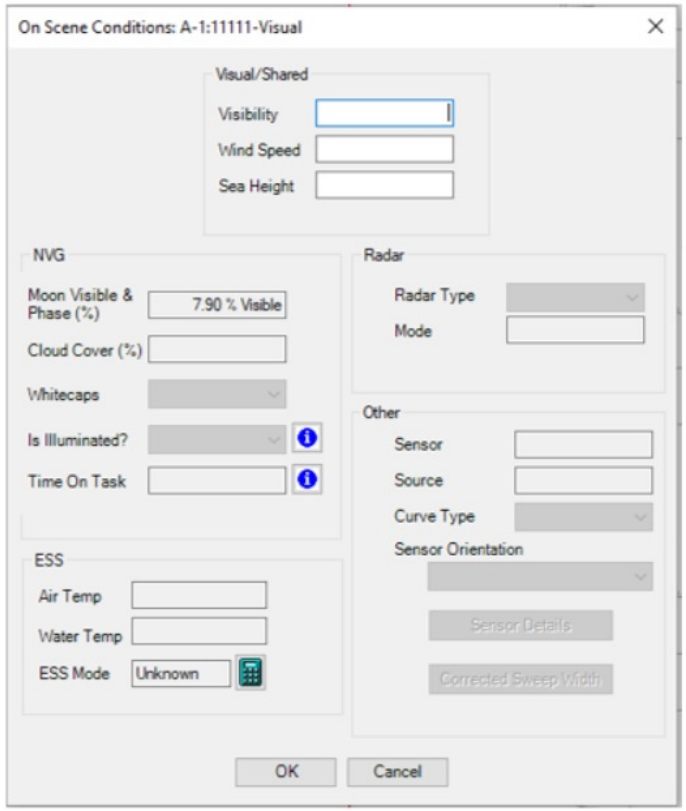


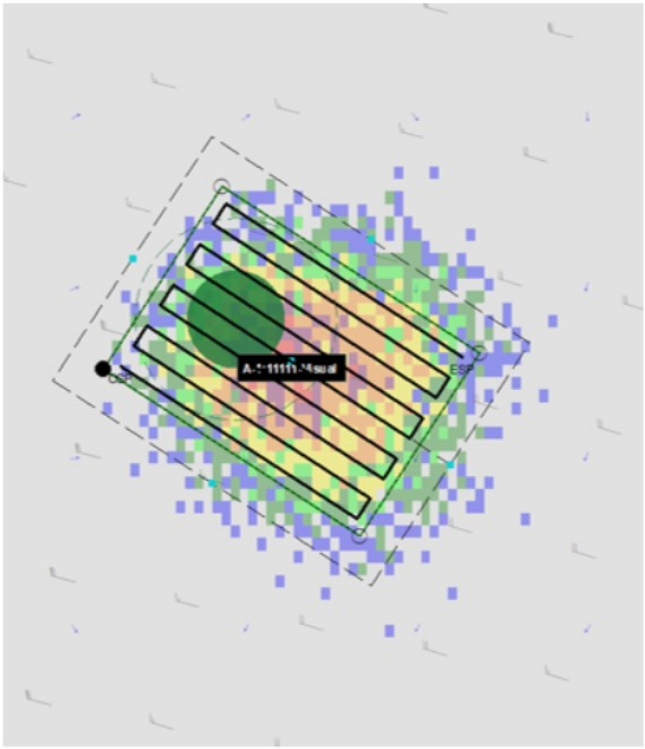
Scenario: +9 hours



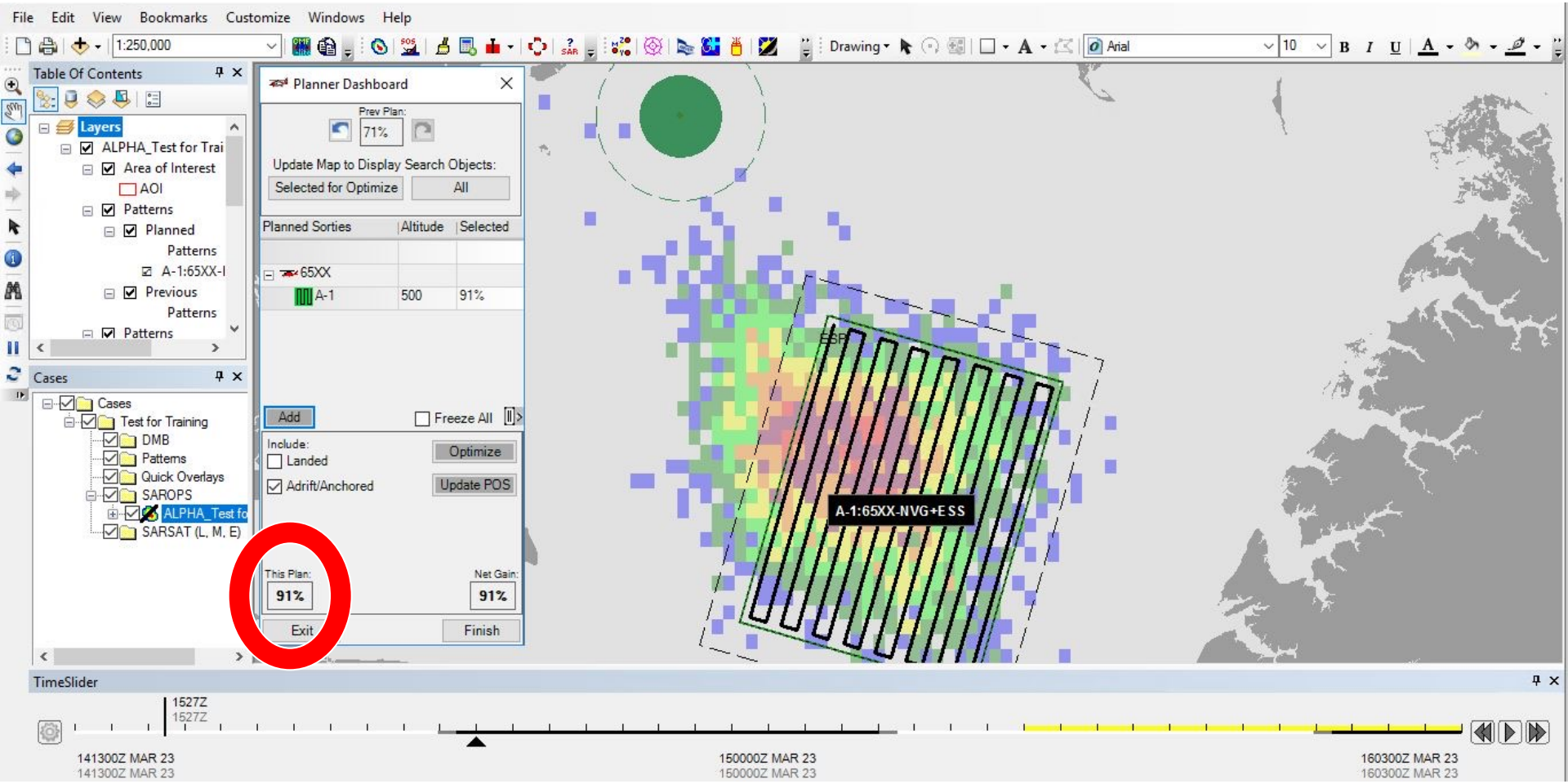
SAROPS - Planner







Scenario: Optimized Search *NVG+ESS*

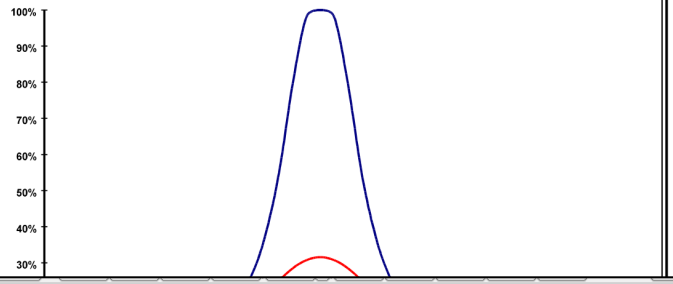


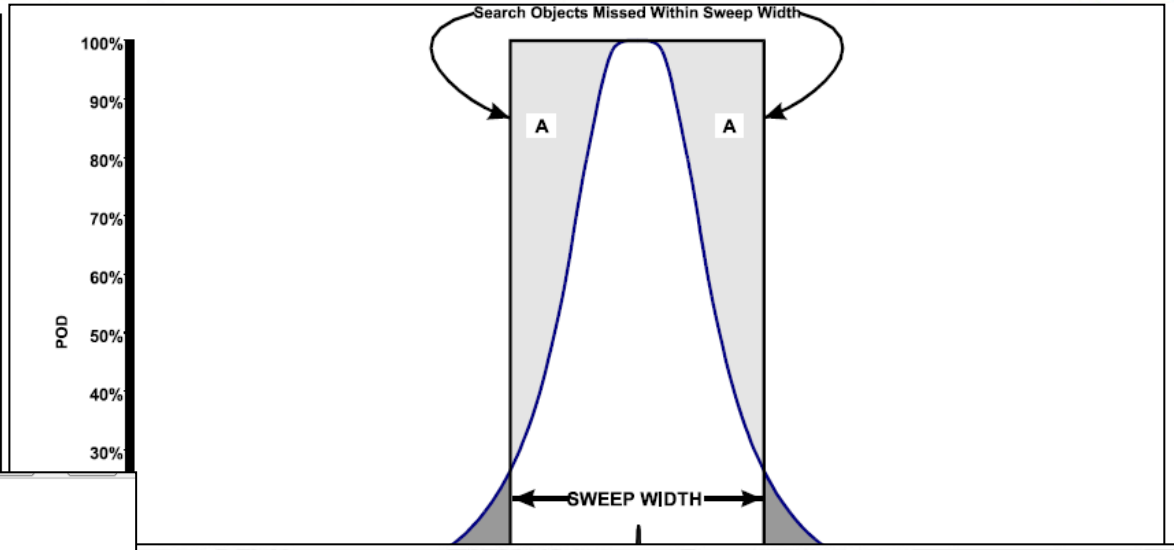
What is the Challenge?

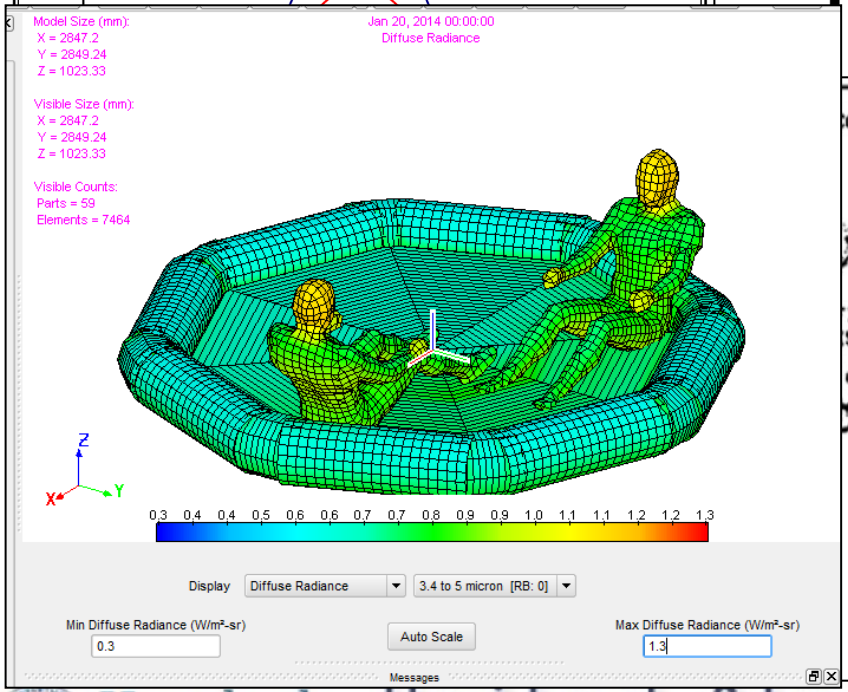
Planning effective and efficient searches requires detailed quantitative measure for each sensor's performance over its entire maximum detection range for every combination of search object type and environmental condition.

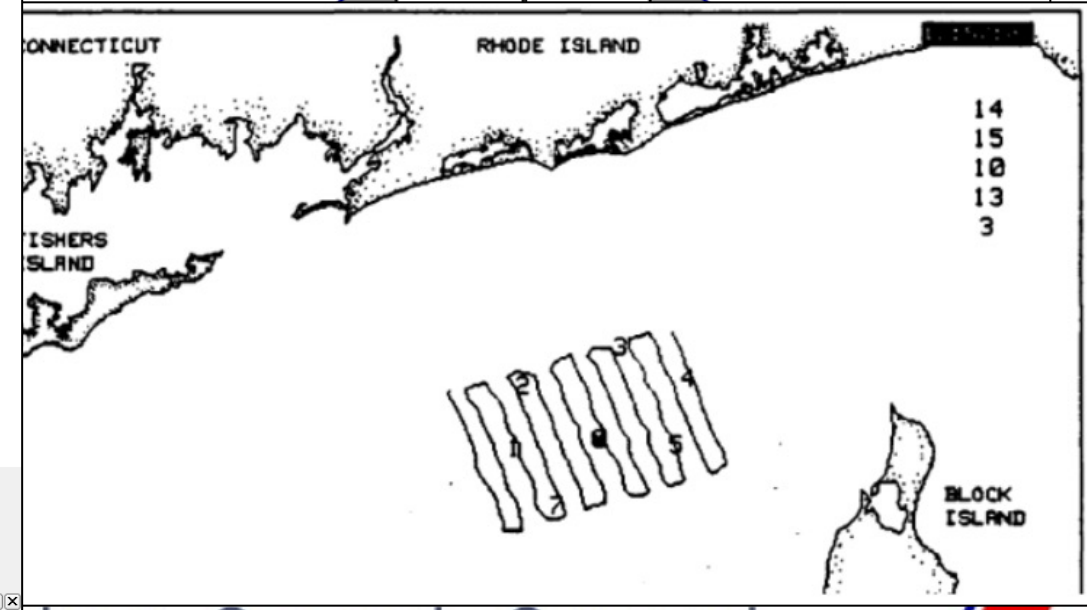
The Theory of Search

A Simplified Explanation

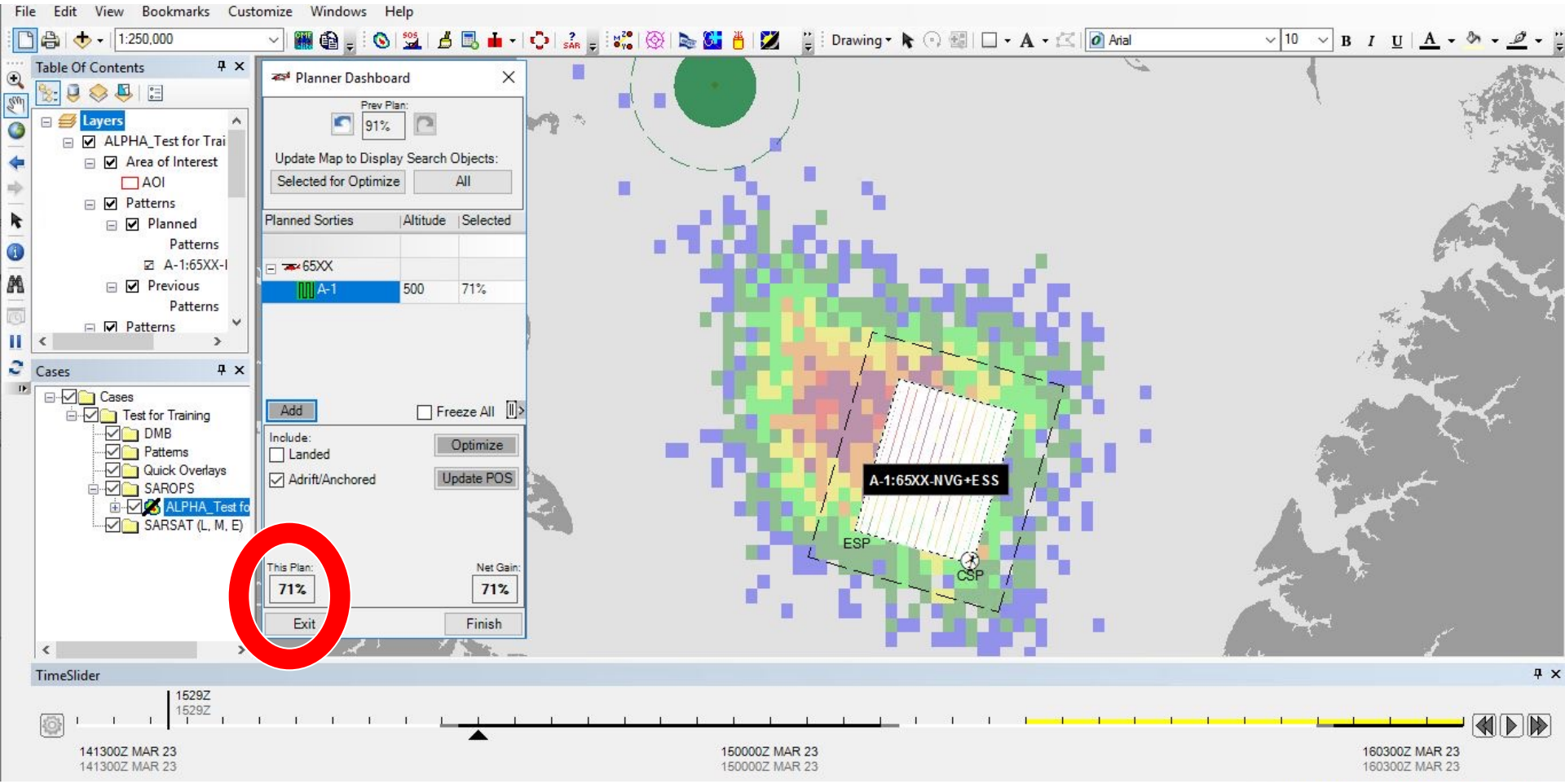




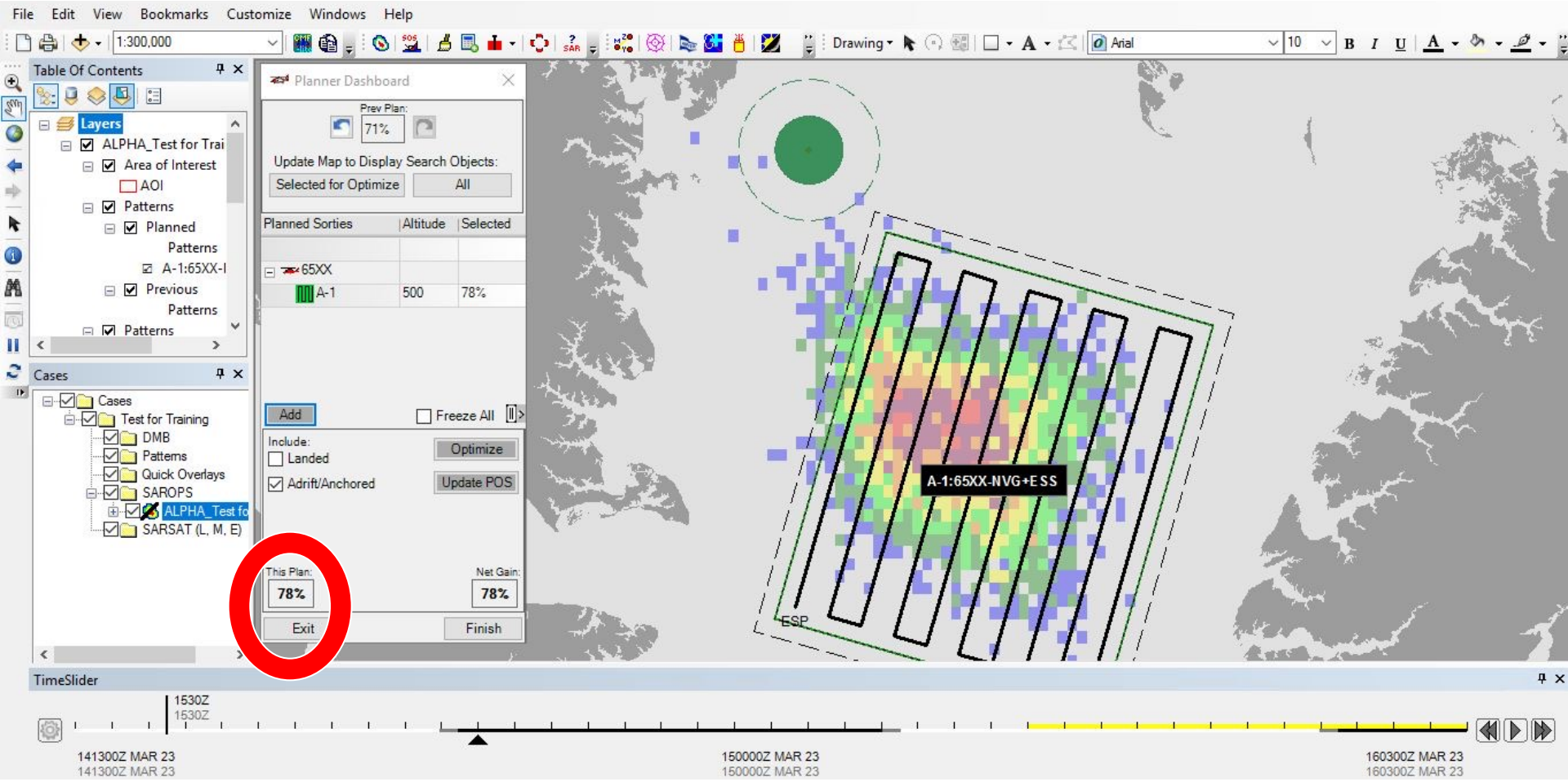




Scenario: Suboptimal Search



Scenario: Suboptimal Search

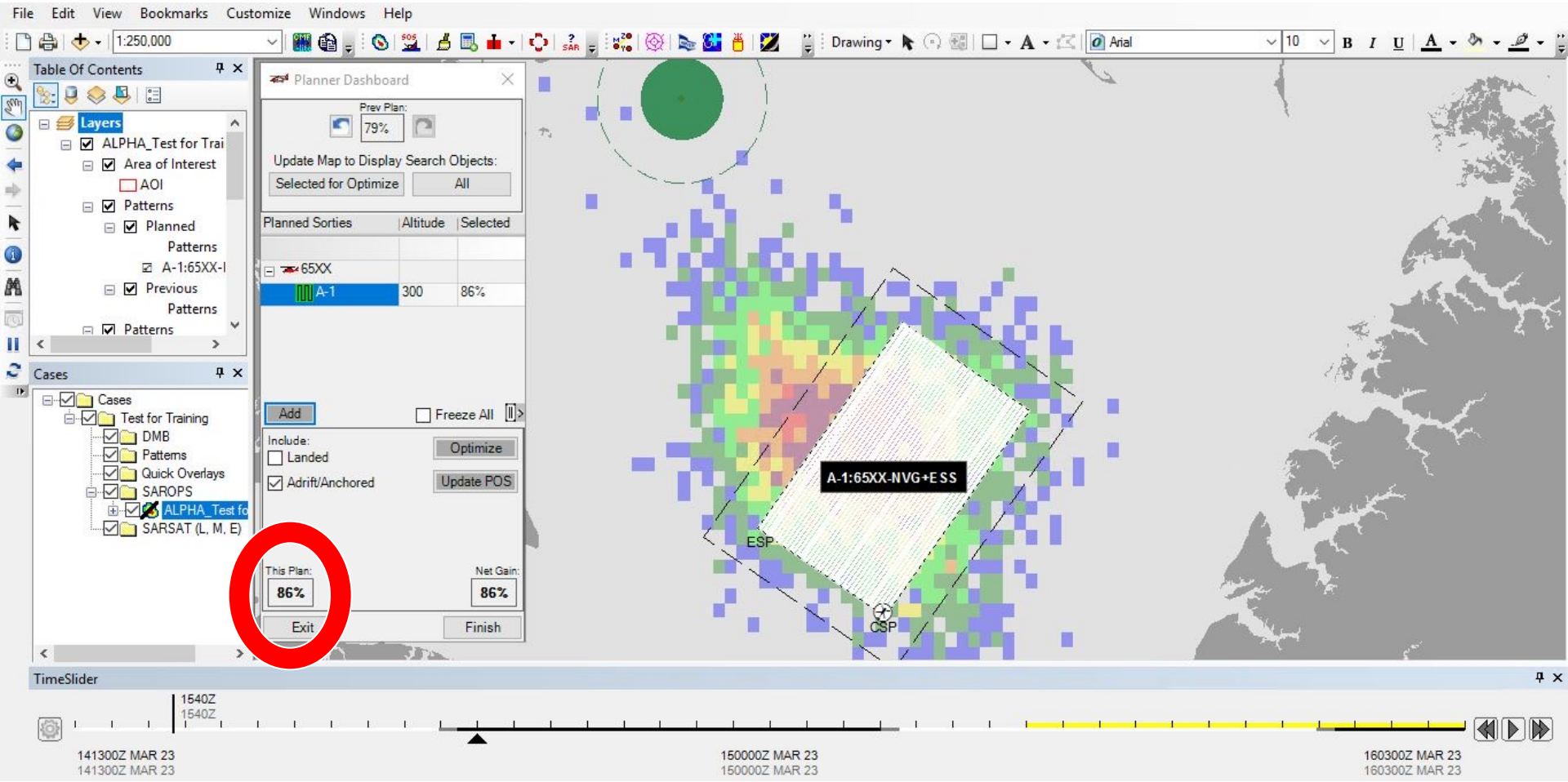


Homeland Security

United States Coast Guard

Semper Paratus

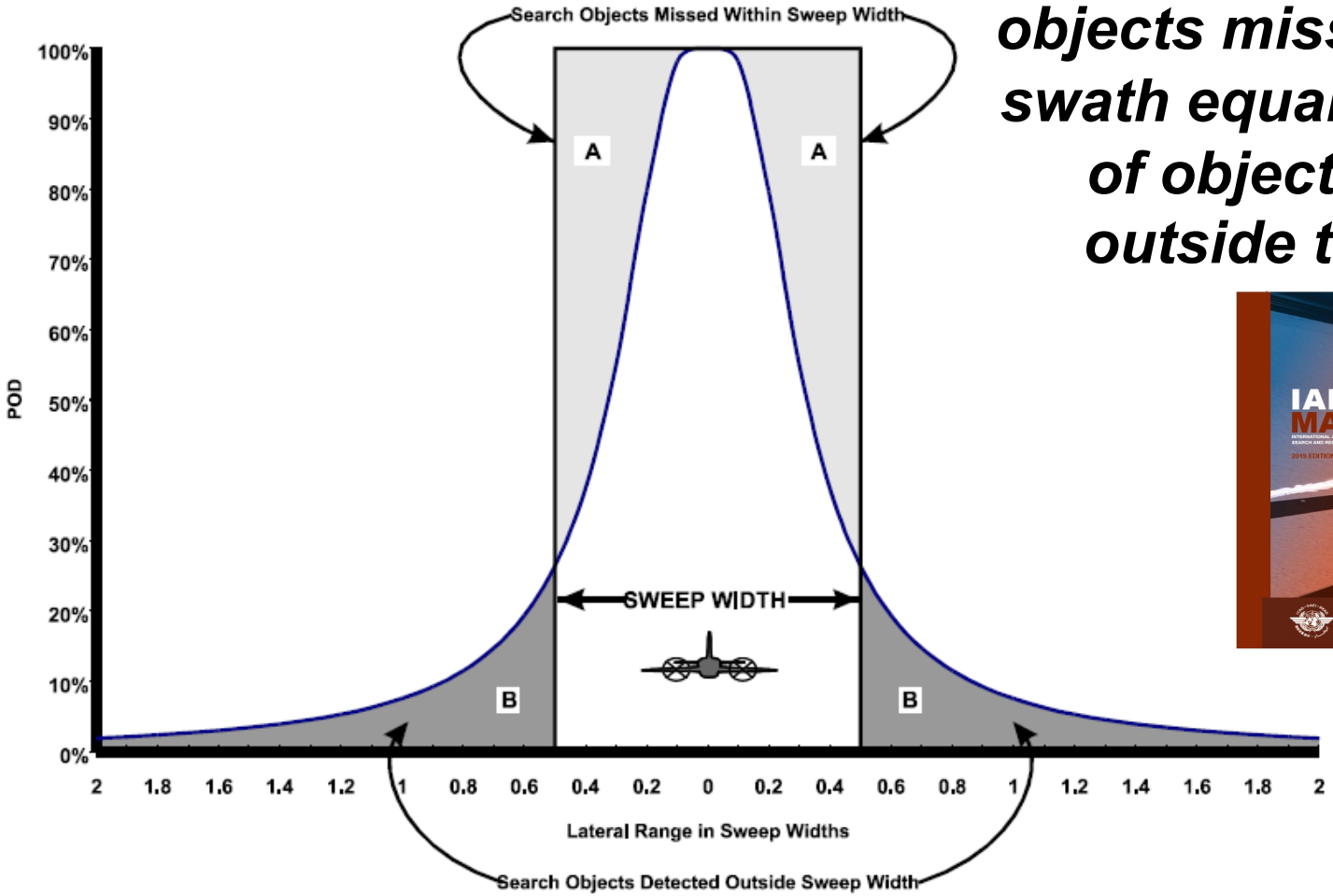
Scenario: Double the Effort



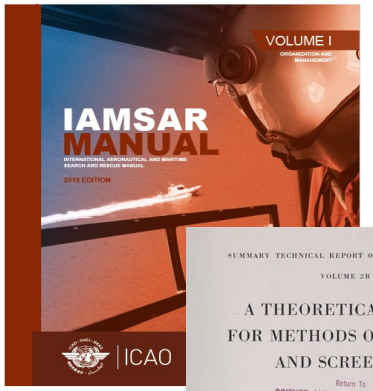
Challenges

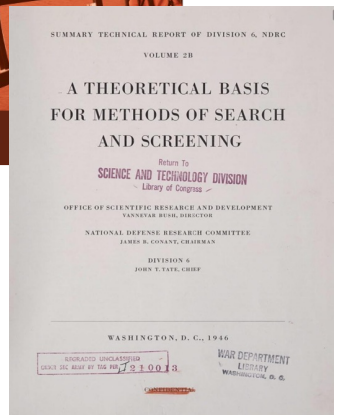
- The traditional empirical method of developing sensor profiles is *exceptionally* resource intensive
- Lack of *adequate* methodology to evaluate AI search object detection technology for search planning
- Lack of consistent use of *Sweep Width* to communicate sensor effectiveness

Sweep Width



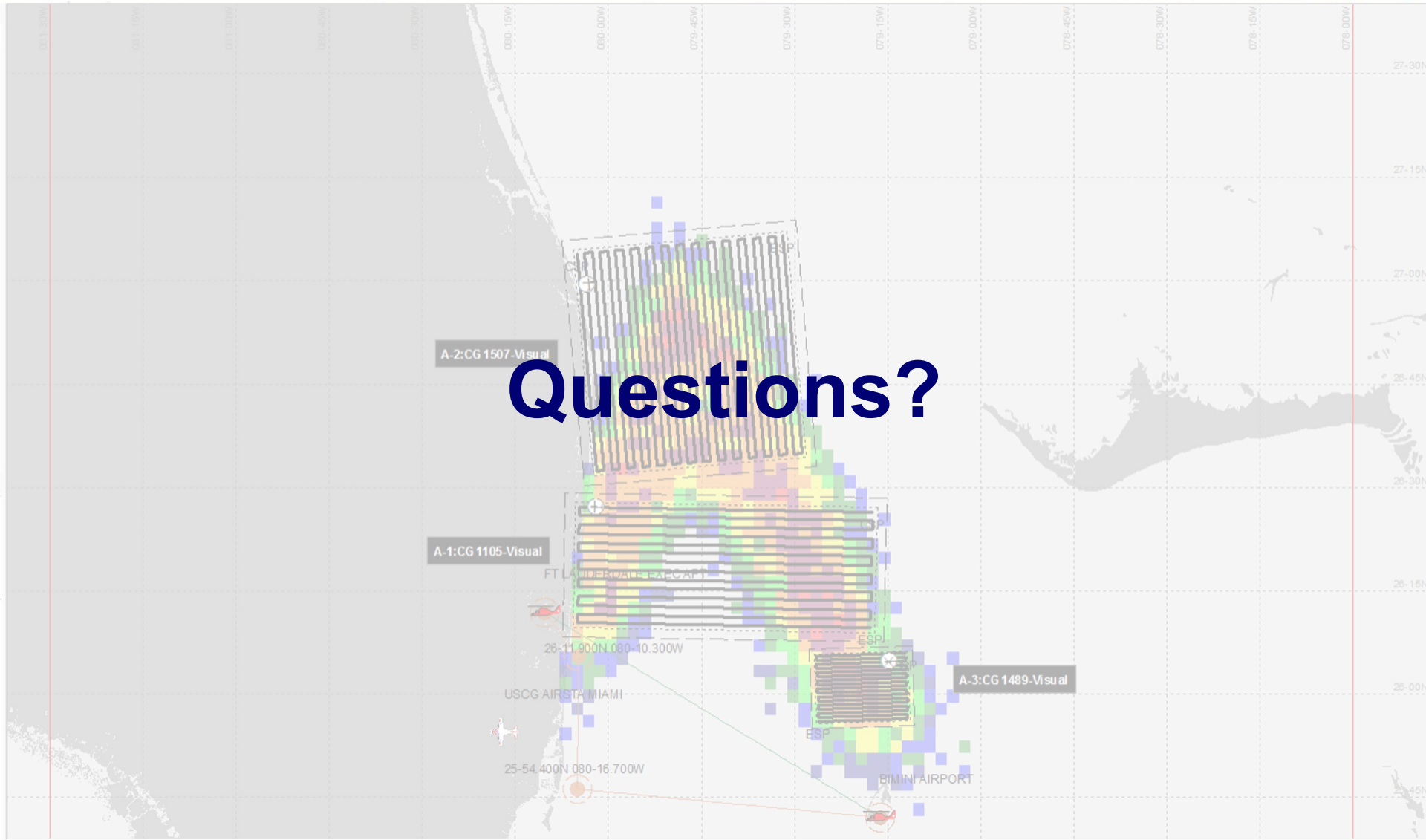
"Width of the swath where the number of objects missed within the swath equals the number of objects detected outside the swath."





Research and Development

- USCG Research and Development Center Initiatives
  - Incorporating Sensor Performance in SAROPS
  - Methodology to quantify the effectiveness of AI object detection for SAR
  - Cooperative Research and Development Agreement


A-2:CG 1507-Visual
A-1:CG 1105-Visual
A-3:CG 1489-Visual
26-11.900N 080-10.300W
USCG AIRSTA MIAMI
25-54.400N 080-16.700W
BIMINI AIRPORT

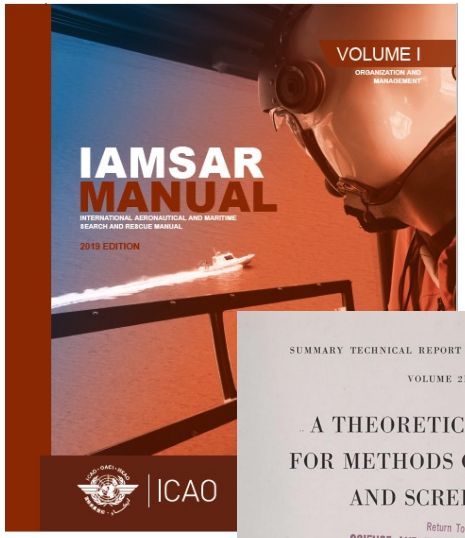
Questions?

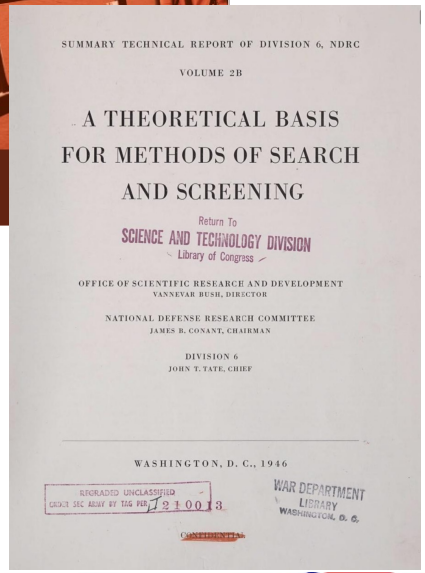
Additional Material Follows:

International Standard:

Effective Sweep Width

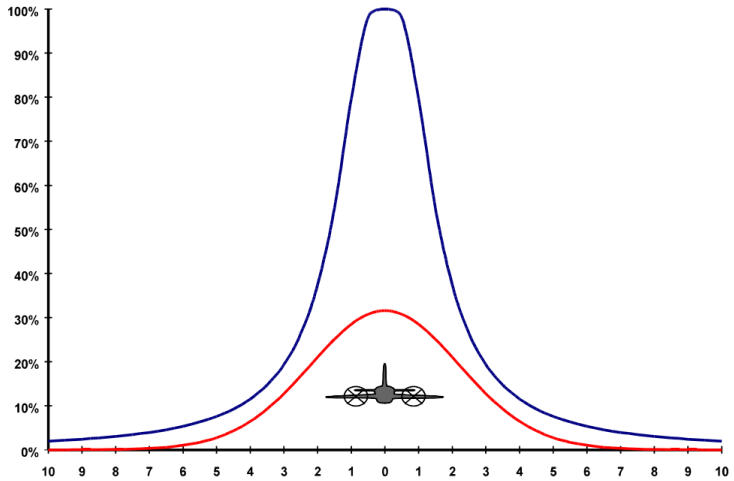
Width of the swath where the number of objects missed within the swath equals the number of objects detected outside the swath.





The Theory of Search

A Simplified Explanation



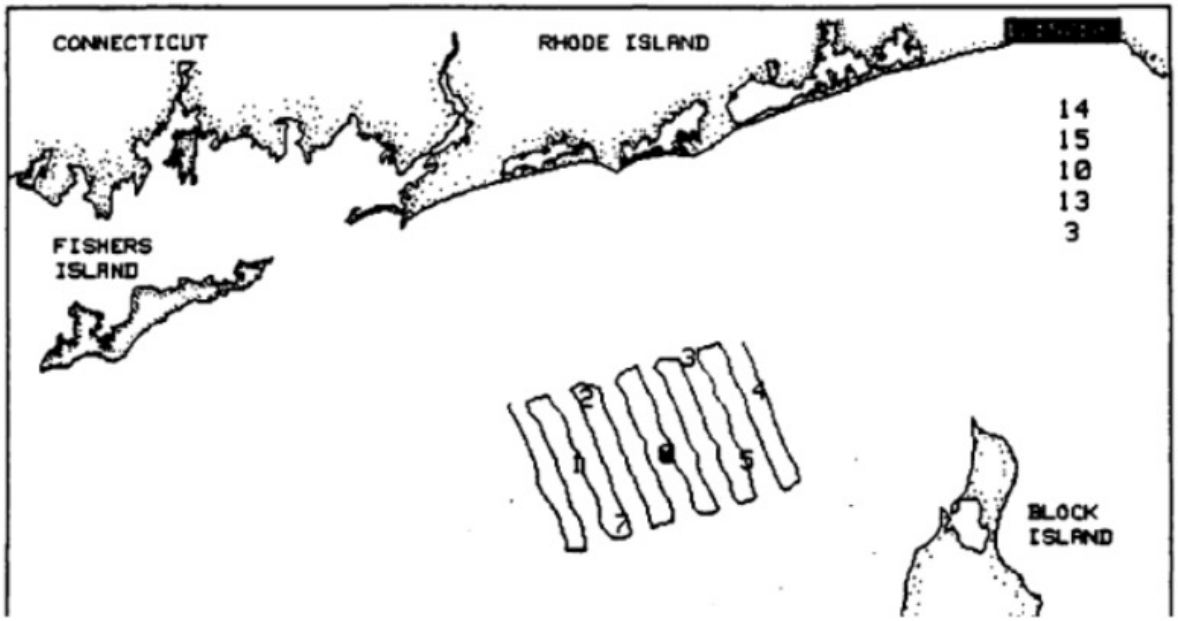
Soza & Company, Ltd.

and

Office of Search and Rescue
U.S. Coast Guard

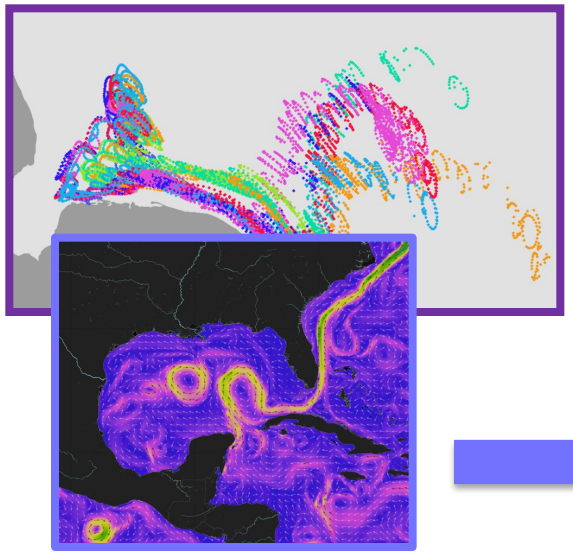
October 1996

Historical Approach

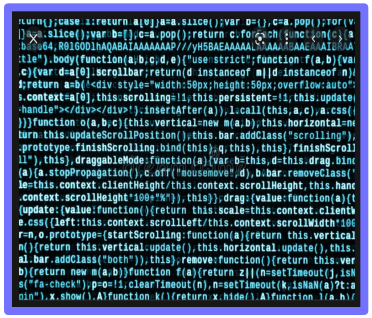


Detected?	Lateral range	Time on Task	Visibility	WindSpeed	CloudCover	Sea Height	SRU_speed	Sun Elevation	Altitude	SRU	SO	DATE
1	0.5	1.1	20	15	0.2	3	10.5	49		41	16FT boat - white	1978-09-13 00:00:00
1	0.2	1.5	20	15	0.2	3	10.5	53		41	16FT boat - white	1978-09-13 00:00:00
1	1	0.72	25	15	0.2	2	80	46	500	HH3	16FT boat - white	1978-09-14 00:00:00
0	2.1	1.73	25	15	0.2	2	80	51	1000	HH3	16FT boat - white	1978-09-14 00:00:00
1	1.5	1.75	25	15	0.2	2	80	51	1000	HH3	16FT boat - white	1978-09-14 00:00:00
0	1.7	2.3	15	20	0.2	3	90	22	500	HH52	Raft - black no canopy	1979-10-24 00:00:00
0	1.7	1.9	15	19	0.2	3	90	25	500	HH52	Raft - black no canopy	1979-10-24 00:00:00
1	0.3	0.1	12	16.5	1	1	15	55		41	Raft - orange no canopy	1980-04-14 00:00:00
1	1.3	0.4	12	16.5	1	1	15	56		41	Raft - orange canopy	1980-04-14 00:00:00

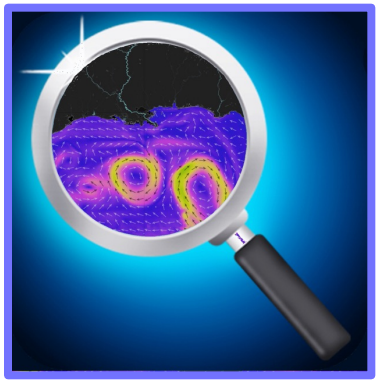
Research & Identification



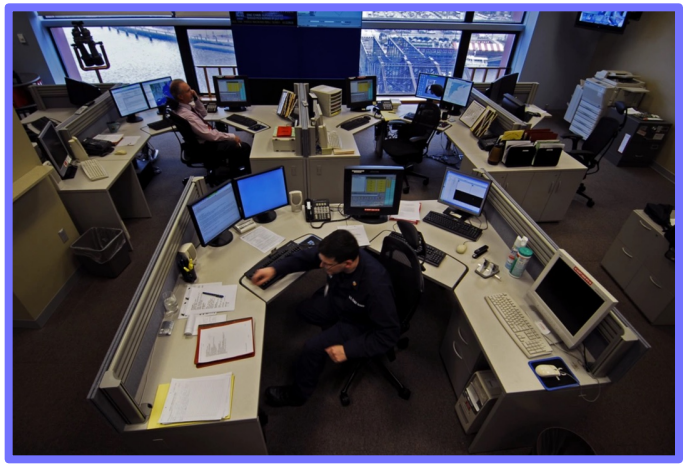
Implementation



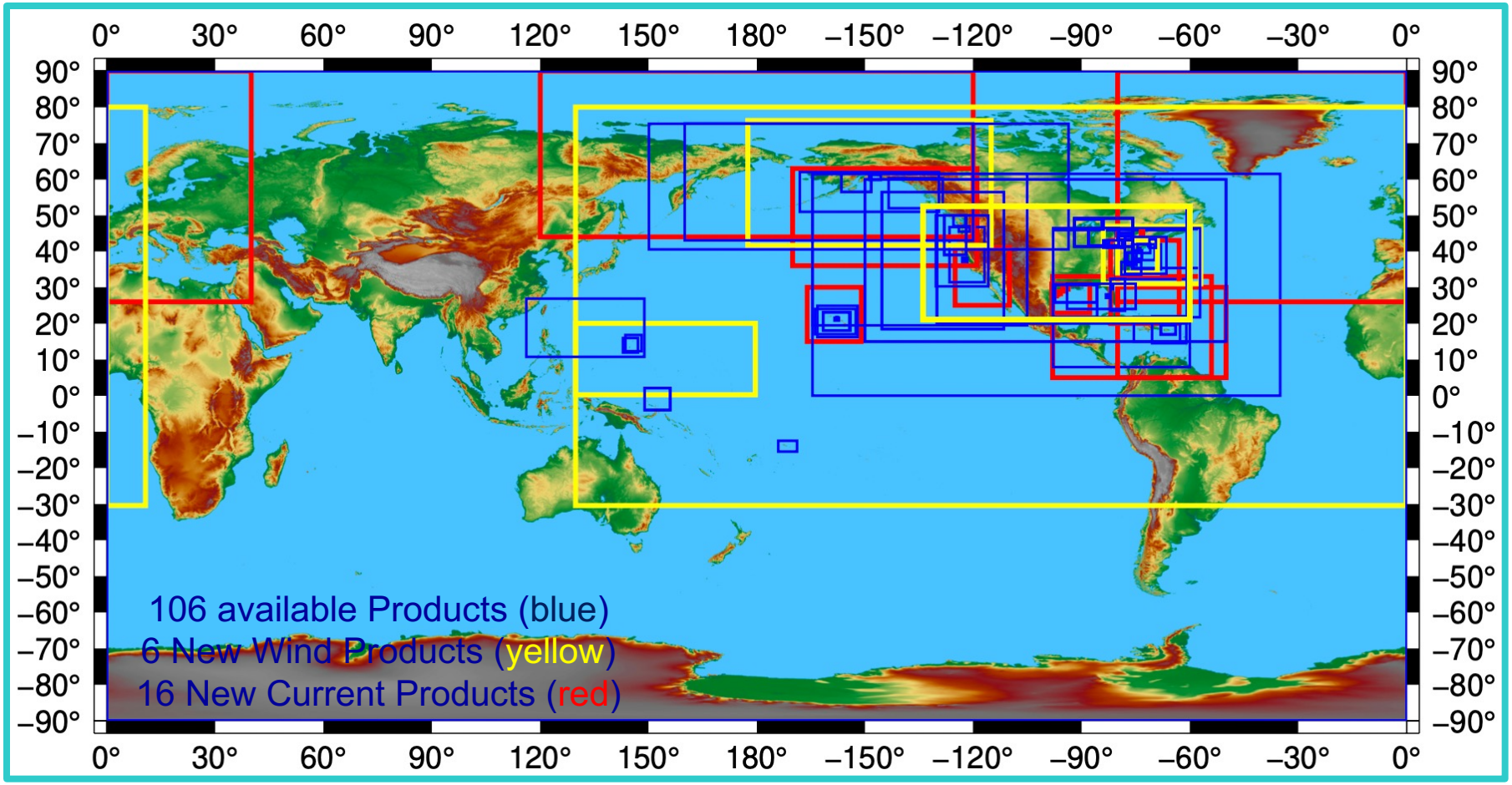
Evaluation & Testing



Update Documentation



Activation for Operations


0° 30° 60° 90° 120° 150° 180° −150° −120° −90° −60° −30° 0°
90° 80° 70° 60° 50° 40° 30° 20° 10° 0° −10° −20° −30° −40° −50° −60° −70° −80° −90°
106 available Products (blue)
6 New Wind Products (yellow)
16 New Current Products (red)

Leeway Studies