Evaluating Search Effectiveness: *Keeping Pace with Technology?*



Office of Search and Rescue

United States Coast Guard







Bottom Line Up Front





Primary Elements of a Successful Search

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

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Scenario: Person in the Water



Search and Rescue *Optimal* Planning System (SAROPS) - <u>Simulator</u>



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Scenario: +9 hours





SAROPS - Planner

Search Patter	m (1 of 2): A-1:11111-Ur	nknown	× On Scene Condi	tions: A-1:11111-Visual	×
Name SRU Type Type CST Search Time	A • 1 :	11111 - Unknown		Visual/Shared Visibility Wind Speed Sea Height	
(Available) EST Search Speed		0.75 HRS 0	NVG Moon Visible &	700 1 14 14	Radar Radar Type
Sensor Visual NVG ESS Radar Other		Crew Fatigue Predicted O Observed On Scene Conditions sud Ceiling	Phase (%) Cloud Cover (% Whitecaps Is Illuminated? Time On Task	7.90 % Visble	Mode
Optimize Seam Cuddy LR Cr PIW v	set wh Object y Cabin npy, no Bist, no Drg w/PFD Avg	Sweep Width	ESS Air Temp [Water Temp] ESS Mode [Unknown	Sensor Dietails Corrected Sweep Width Cancel



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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.

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Scenario: Suboptimal Search



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Scenario: Suboptimal Search



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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

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"Width of the swath

Sweep Width





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

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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.















Historical Approach



Detected?	Late ral 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

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Research & Identification

Implementation

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Update Documentation









Activation for Operations



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Semper Paratus

Homeland Security





Leeway Studies



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