

1. Report No. CG-D-16-99		2. Government Accession Number ADA367771		3. Recipient's Catalog No.	
4. Title and Subtitle Maritime Operations Simulation Model: Search and Rescue (SAR) Application Report				5. Report Date May 1999	
				6. Performing Organization Code Project 1012.3.3	
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9. Performing Organization Name and Address U.S. Coast Guard Research and Development Center 1082 Shennecossett Road Groton, CT 06340-6096		10. Work Unit No. (TRAVIS) N/A			
12. Sponsoring Organization Name and Address U.S. Department of Transportation United States Coast Guard Office of Search and Rescue Washington, DC 20593-0001				13. Type of Report & Period Covered Final Report	
				14. Sponsoring Agency Code Commandant (G-OPR) U.S. Coast Guard Headquarters Washington, DC 20593-0001	
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16. Abstract (MAXIMUM 200 WORDS) The Search and Rescue (SAR) application is a modeling effort that was conducted in conjunction with the development of the Coast Guard's Maritime Operations Simulation (MarOpsSim) tool. The main objective of the MarOpsSim project is to create an affordable, internally sustainable, simulation modeling tool which can be applied to multiple Coast Guard mission areas. This SAR application work supported the initial development of MarOpsSim and begins to address an identified lack of analysis tools available for conducting operational effectiveness studies in SAR. Presently, no suitable modeling and analysis tools exist to study various alternatives and possibilities for improved search planning models, technology, tactics and doctrine. This work seeks to exercise MarOpsSim and provides a simulation baseline for conducting future SAR mission analysis studies. Results reported herein show that MarOpsSim can effectively be configured for the analysis of the SAR mission when detection capabilities, expressed as a lateral range curve, are assumed.					
17. Key Words Maritime Operations Simulation, Search and Rescue, Lateral Range Curve			18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, VA 22161		
19. Security Class (This Report) UNCLASSIFIED		20. Security Class (This Page) UNCLASSIFIED		21. No of Pages	22. Price

Executive Summary

The Search and Rescue (SAR) application is a modeling effort that was conducted by the United States Coast Guard Research and Development Center (R&DC) in conjunction with the development of the Maritime Operations Simulation (MarOpsSim). MarOpsSim is a discrete event simulation designed to model the common maritime operations of the Coast Guard. MarOpsSim is intended to provide the Coast Guard with a cost-effective simulation modeling capability supporting mission analysis and acquisition efforts. This report documents an interim stage of MarOpsSim development aimed at modeling specific aspects of the Coast Guard's SAR mission.

The chief motivation for the SAR application was to address the identified lack of analysis tools available for conducting operational effectiveness studies in SAR. Presently, no suitable modeling and analysis tools exist to study and prioritize various alternatives and possibilities for improved search planning models, technology, tactics and doctrine. This work seeks to exercise MarOpsSim and provide a simulation baseline for conducting future SAR mission analysis studies.

The SAR application development was structured in two phases. The objective of phase one was to develop and analyze a scenario that models Coast Guard resources engaged in visual searching, with target detection capability characterized by lateral range curves (LRCs). LRCs are curves plotting cumulative detection probabilities (P_D) versus the closest point of approach (CPA). The second phase extended the work in phase one to accommodate sensors whose detection performance could be represented by a generalized lateral range function. In both phases the sensors being modeled were visual sensors; however, the approach used to generalize a visual sensor could be extended to non-visual sensors such as radar. This work also generated scenarios and tactics that have been incorporated into the MarOpsSim baseline and are available for further experimentation.

Results from exercising the developed scenarios are summarized below:

- The simulated search platform produced detection results consistent with a known LRC.
- A method for generalizing the LRC detection capability was successfully established. Simulation runs conducted with the LRC detection model demonstrated appropriate sensitivity to its driving parameters and produced a reasonable representation of the probability of detection versus coverage factor curve derived from search theory.
- Methods were developed in this effort that allowed for the creation of an accurate representation of the decisions and tactics involved in SAR planning and response.
- The analysis of resource and target motion provided reasonable and expected results.

MarOpsSim is still an evolving product with tremendous potential. Tasks related to the SAR application that should follow this work include:

- Independent verification and validation of the core simulation, the input and output processes, and the scenarios developed under this effort.

- Development of an approach for determining the time of detection when using lateral range curves as a detection model. This is expected to be an important factor in applications where the time of detection can impact search unit tactics and scenario results.
- The creation of a validated tactics library, which could provide the basis for using simulation to explore the effectiveness of SAR plans, tactics, capability enhancements and resource allocation schemes.

MarOpsSim is presently being extended to model law enforcement mission scenarios. In addition, the model will be undergoing further development for use in the Coast Guard's Deepwater Acquisition effort. In light of these two efforts and the work established here, MarOpsSim has the potential to provide the Coast Guard with a powerful new capability for SAR mission analysis, training, and resource planning.