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News from the U.S. Coast Guard Acquisition Directorate

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Research and Development Center Tests Search Optimization Tools to Help Coast Guard Achieve Its Search and Rescue Mission

By Linda M. Johnson

WASHINGTON—The U.S. Coast Guard’s Research and Development (R&D) Center in New London, Conn., has been testing and evaluating various search optimization tools to help the Coast Guard save lives as part of its search and rescue (SAR) mission.

The ultimate goal of the Coast Guard’s SAR program is to prevent the loss of life, injury and property loss or damage at sea by rendering aid to persons in distress. The Coast Guard also aims to optimize the use of its resources in conducting SAR missions.

Capt. Matthew J. Sisson, Commanding Officer of the R&D Center, talked about search optimization tools for sensor systems at the 2009 Search and Rescue Conference and Exhibition in McLean, Va., at the end of March.

A couple of years ago, the Aviation Logistics Center contracted with the R&D Center to develop operational guidance for using helicopters to conduct SAR missions. In response, the R&D Center developed and tested two different modeling tools to help with SAR mission planning.

The first is the Multi-Sensor Performance Prediction (MSPP) tool that helps the Coast Guard estimate the performance of sensor systems prior to acquisition. It is used to generate performance parameters for a particular sensor based on weather conditions, location and time of day, and given various search contacts, such as a person in the water, life raft or boat.



R&D tools like the Multi-Sensor Performance Prediction (MSPP) tool and Sensor Performance Optimization Tool (SPOT) help the Coast Guard’s operating forces save lives. Rescue swimmers from Coast Guard Air Station Kodiak, Alaska, wait for a basket pickup by an MH-60 Jayhawk helicopter during open water training. U.S. Coast Guard photo by PA1 Kurt Fredrickson

“MSPP has the capability to accurately model the sensor, the environment and the [contact] to predict search performance against [contacts] that were not included in field testing,” Capt. Sisson explained.

The second tool is the Sensor Performance Optimization Tool (SPOT), a PC-based visualization and analysis program used to assess, optimize and visualize the impact of various sensor settings and tactics on search effectiveness. SPOT uses MSPP data to determine whether there are any holes in a search pattern so the Coast Guard can modify its search efforts accordingly.

“SPOT is a new addition to our capabilities and it is best known for its ability to graphically show the dynamics of actual sensor usage, including sensor coverage areas and areas that might be missed during a particular search strategy,” Capt.

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Sisson noted. SPOT gives the Coast Guard information that it can use to adjust its search strategy or increase search efforts in certain areas.

Supporting Sensor R&D

The R&D Center uses MSPP and SPOT to support Coast Guard sensor research, development, test and evaluation efforts as well as acquisition efforts. For example, the R&D Center used MSPP and SPOT to provide preliminary operational guidance for the Electro-Optical/Infrared Sensor System acquired by the Aviation Logistics Center.

Using these two tools, the R&D Center has been developing recommended settings for selected SAR contacts, environments, search areas and search patterns, such as the optimum speed, altitude, focal view and camera angle. The goal is for the Aviation Logistics Center to be able to automate the recommended search settings onboard Coast Guard aircraft.

"In 15 years, we've gone from looking outside the window to looking at screens. Now, with radar technology the way it is, you're not even looking at the return on the radar, you're looking at a software interpretation of what the radar sees," Capt. Sisson said.

"We have the capability with these modeling tools to take the angle of view that's outside the windows and the blind spots of every aircraft, combined with operator fatigue factor that will lower your ability to pick out [contacts], given a certain set of environmental conditions, and compensate for them to determine the most effective way of covering a search area," he noted.

The idea is "the operator can press a button or two for the [contact] he has and the altitude he's flying at, and the system will automatically

configure the sensors to work at an optimum rate of return and in concert with each other. The sensors will give you the search rate in square miles per hour – decisions the operator used to make. But now, you will know with that sensor and with that time, this is what you've got to do," Capt. Sisson explained.

Field Testing

The R&D Center uses field tests to validate its predictions. Ongoing sensor testing and performance evaluation benefits Coast Guard acquisition program managers, mission planners and system operators in their efforts to procure, deploy and operate the right SAR tools.

"Testing goes beyond what the vendor says equipment is capable of – it gives us a real understanding of the capability of a new sensor system," Capt. Sisson continued.

Gary Hover, R&D Center Branch Chief, Test and Evaluation, explained, "We've been testing and evaluating human eye balls with regards to SAR activities, and now we've moved on to operationally realistic testing and evaluation of new radars with real search crews that will help SAR teams plan and execute missions."

The Coast Guard, in conjunction with the U.S. Navy and the Joint Interagency Task Force South (JIATF),



The Coast Guard's R&D Center analyzes technologies that will improve the way the service and the Navy cooperate to interdict narcotics traffic and illegal migrants in the Gulf of Mexico and elsewhere. The guided missile frigate, USS *McInerney* (FFG 8), tows a drug runner's self-propelled, semi-submersible craft seized by Coast Guard Law Enforcement Detachment 404.

U.S. Navy photo by Lt. Justin Cooper

recently tested new sensors against a wide variety of law enforcement contacts, such as go-fast boats and self-propelled, semi-submersible, low-profile watercraft, in Key West, Fla.

"We did some amazing work down in Key West against law enforcement [contacts] recently, where we had

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a variety of Navy and Coast Guard aircraft all searching for the same [contacts] so we can calibrate the effectiveness of all of our radars," Capt. Sisson explained.

The Coast Guard plans to use these field test results to publish an addendum to the National SAR Manual, an interservice manual developed by the R&D Center and maintained by the Coast Guard. The addendum will address the specific sensor capabilities of Coast Guard asset platforms and provide the most accurate search performance

planning data that can be given to any asset that finds itself on a SAR case.

The field test results will also enhance the already powerful SAROPS (Search and Rescue Optimal Planning System) tool used at Coast Guard command centers to provide search event modeling, to display animation and to determine an optimized search plan based on sophisticated data.

The next set of sensor field tests will take place this summer in Clearwater, Fla., using SAR contacts. The goal is

to test how the sensors work with an operator who is unaware of the search contact. "You have to use [contacts] in a search area where the operator doesn't know their existence or their location – that's the true test of how well your sensors are working," Capt. Sisson noted.

The third set of sensor field tests, which will be conducted sometime next year, will assess the effectiveness of fixed wing aircraft radars on contacts of opportunity, such as commercial fishing vessels. ■

Coast Guard Team Completes Accreditation of New Modeling and Simulation Tool

By Hunter C. Keeter

In a united effort, the Coast Guard's Acquisition Directorate (CG-9) and Capabilities Directorate (CG-7) have accredited a new computational tool called the Coast Guard Maritime Operational Effectiveness Simulation (CGMOES). A software program that uses mathematical algorithms to represent the Coast Guard's mission requirements, asset capabilities and operational environments, CGMOES is the most comprehensive, up-to-date modeling and simulation system in the Coast Guard's inventory.

CGMOES will begin immediately to support the Coast Guard's modernization efforts. One of its first major tasks will be to provide information for the Fleet Mix Analysis, the first iteration of a collaborative, comprehensive study identifying alternative surface, aviation and shore-based capabilities and force structures to meet future Coast Guard mission requirements.

"CGMOES is now accredited for acquisition planning and force structure planning," said Lt. Michael S. DiPace, an Operations Research Analyst with CG-9 who helped develop, verify and validate CGMOES. "It can compare



The Coast Guard will use CGMOES to help plan its future force structure. Here, CGC *Bertholf* (WMSL 750) has a rendezvous with CGC *Boutwell* (WHEC 719). *Bertholf*, the Coast Guard's newest and most advanced white-hull cutter, will replace the aging high endurance cutters.

U.S. Coast Guard photo by Petty Officer 3rd Class Michael Anderson

the alternative fleet mixes in terms of operational effectiveness within logistics constraints."

In building CGMOES, the Research, Development, Test and Evaluation (RDT&E) Program also worked with

Atlantic Area (LANTAREA), which is expected to accredit the tool for operational force apportionment as well.

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CGMOES is a government-owned model, maintained and operated under contract with MicroSystems Integration (MSI), based in Pawcatuck, Conn.

Strategic and Operational Analysis

CGMOES is run on a network of personal computers that generate results, which analysts use to prepare reports that inform decision-makers about the effects of different choices in relationship to mission requirements. This is called "campaign analysis:" the study of the use of military and naval forces to accomplish strategic and operational objectives.

As the centerpiece of campaign analysis in the Coast Guard, CGMOES holistically analyzes requirements and capabilities in the service's core mission areas of search and rescue; living marine resources, ports, waterways, and coastal security; drug interdiction; migrant interdiction; and other law enforcement work.

Capt. John J. Macaluso, RDT&E Program Manager with CG-9 in Washington, said that the Coast Guard will use CGMOES for a variety of purposes, including helping to ensure that acquisition projects deliver effective, affordable platforms and mission systems with the capabilities, and in the quantities, required to achieve performance goals.

Accreditation team member Dr. Joe DiRenzo III, Chief of Operational Plans and Analysis with LANTAREA, Portsmouth, Va., added that CGMOES also will play an important role in operational analysis, which "looks at the different drivers of mission demands, our concepts of operation, the capabilities of our assets and facilities, and cost and capability trade-offs, before we ever weld two pieces of metal together. This allows



CGMOES also will help the Coast Guard determine the capabilities needed to meet evolving operational requirements for the Arctic, Great Lakes and inland waterways. A survey team from the National Research Council, supported by CGC *Mackinaw* and an HH-65C helicopter, takes core samples from the ice on Green Bay, Wisc.

U.S. Coast Guard photo by AET2 Adam Morehouse

us to come up with different courses of action to address the same end-state strategic goals."

DiPace explained that CGMOES simulates real-world interactions of cutter, aircraft and Command, Control, Communication, Computer, Intelligence, Surveillance and Reconnaissance (C4ISR) combinations when searching for various contacts and when faced with different demands, including the concept of operations with its schedules, logistics and geographic positioning.

"CGMOES is configured to provide a common backdrop across multiple alternatives for comparative assessment," DiPace said. "No model can mimic the real-world exactly, so we make sure the modeled environment is a reasonable baseline to test each alternative against."

Technology Legacy

This isn't the Coast Guard's first or only modeling and simulation tool. CGMOES builds on a legacy that dates to the 1970s, and includes products, such as the Search and Rescue Simulation, the Law Enforcement Simulation, the Maritime Operations Simulation (MarOpSim) and the Deepwater Maritime Operational Effectiveness Simulation (DMOES).

As an iterative step in the technology's evolution, CGMOES includes non-Deepwater assets, such as the Marine Protector-class 87-foot coastal patrol boats, Juniper-class 225-foot seagoing buoy tenders and various C4ISR systems (such as Nationwide Automatic Identification System and Rescue 21).

However, the more significant distinction between earlier modeling

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and simulation tools and CGMOES is that the others focused on the tactical level requirements and capabilities of specific assets or force packages. CGMOES is designed with logistical considerations in mind to cover all Coast Guard missions in all off-shore environments beyond the littoral, or coastal region.

The new tool allows for mission growth. For example, as the Coast Guard develops requirements for expanded operations in the Western rivers, Great Lakes and Arctic regions, there is potential for CGMOES to evolve as well.

"For relatively new missions, such as ports, waterways and coastal security, our understanding of the mission itself is evolving," Macaluso said. "In order to support acquisition,

we have to do a lot of analysis. In order to analyze things that don't yet exist, we have to model and simulate them. CGMOES gives us that capability."

LANTAREA's DiRenzo added that the model also will help the Coast Guard address increasingly sophisticated threats, such as that posed by self-propelled, semi-submersible vessels.

CGMOES's accreditation is an acknowledgement and validation that its methodologies and algorithms accurately reflect the goals and objectives of senior leadership, and that its output and results are credible. The cooperation that went into this accreditation reflects the close partnerships that have been fostered among various Coast Guard organizations, including those involved in

R&D, requirements, acquisition and operations.

Additionally, the continued evolution of Coast Guard modeling and simulation technology leverages interaction with Department of Defense counterparts. This interaction includes the 'Tri-Service Strategic Talks,' at which the Coast Guard, Navy and Marine Corps discuss new ways to work together. Modeling and simulation capabilities are at the nexus of the services' abilities to foster a broad, united effort, with the Coast Guard contributing unique perspectives from its mission areas. ■

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Strong Signals ...

As the world's commercial and recreational distress radio signal networks have switched to the 406MHz frequency standard, the Coast Guard is improving the ability of its aircraft to receive those transmissions. Since January 2007, the United States and other governments have been phasing out the older 121.5MHz signal standard. Today, most vessels are equipped with Emergency Position Indicating Radio Beacons (EPIRBs) and Emergency Locator Transmitters (ELTs) that broadcast in the 406MHz band. A new 406MHz multi-mission direction finding receiver, called the DF-430-F (which can still pick up 121.5MHz signals), is now installed on 89 Coast Guard fixed wing and rotary wing aircraft. The Coast Guard Aviation Logistics Center has completed installations aboard the entire operational fleet (29 aircraft) of HC-130H and HC-130J Hercules long range surveillance aircraft. Additionally, 31 MH-65C Dolphin multi-mission cutter helicopters, 20 HU-25 Falcon medium range surveillance aircraft, seven HC-144A Ocean Sentry maritime patrol aircraft, and two MH-60T Jayhawk medium range recovery helicopters now feature the DF-430-F system. All Coast Guard aircraft are scheduled to be equipped with the DF-430-F by 2012.



The skipper of the crippled fishing vessel, *Beau Vin*, survived because the Coast Guard received his 406 MHz Emergency Position Indicating Radio Beacon (EPIRB) signal.
U.S. Coast Guard photo by BMC Michael A. Freeman

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Put Me in, Coach ...

Ready to take centerfield, the HC-144A Ocean Sentry medium-range maritime patrol aircraft achieved Initial Operational Capability (IOC) on April 2, 2009. Cleared for operational use by the Coast Guard's Assistant Commandant for Capability (CG-7) under guidelines described by the service's requirements documentation, the Ocean Sentry will perform a variety of tasks, including those of search and rescue; drug interdiction; migrant interdiction; other law enforcement; and transport missions. The HC-144A acquisition project so far has delivered seven of 36 aircraft, and three of 12 Mission System Pallets currently under contract.



An HC-144A Ocean Sentry prepares to taxi on the tarmac at Houston. *U.S. Coast Guard photo by Petty Officer Patrick D. Kelley*

Continuing Successful Coordination ...

The Mission Effectiveness Project (MEP) is a highly successful result of the close coordination between the Acquisition Directorate, the Engineering and Logistics Directorate, the Surface Forces Logistics Center, and the Coast Guard Yard at Curtis Bay, Md. To date, the project has extensively refurbished and delivered on time and within budget, eight (of 20) 110-foot patrol boats (WPBs) and eight (of 14) 210-foot medium endurance cutters (WMECs), and also successfully completed seven (of 26) shipyard availabilities for the 13 270-foot WMECs (which require two availabilities per cutter). The MEP reduces maintenance and operating costs, replaces unsupported systems, and ensures that these legacy platforms can meet mission requirements until replaced by new vessels.



CGC *Dauntless* (WMEC 624) recently underwent MEP at the Coast Guard Yard, Curtis Bay, Md. *U.S. Coast Guard photo by PA3 Bridget Hieronymus*