U.S. Department
of Homeland Security

United States
Coast Guard

Fall 2007

The COAST GUARD PROCEEDINGS

The Coast Guard Journal of Safety & Security at Sea

of the Marine Safety & Security Council

Boat Forces

- Successful Aquisition Strategies
- Improved Shore-Based Response
- Risk-Based Mission Analysis
- Innovative Crew Scheduling
- Partnerships Within DHS

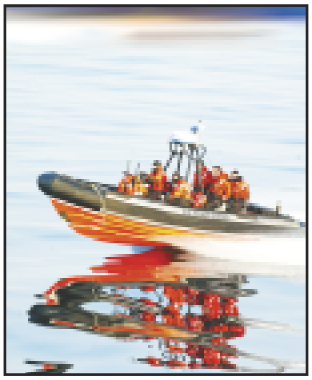
Also Inside:
Special Risk Management Section
Lessons Learned: The fiery demise of a tank vessel

PROCEEDINGS

Fall 2007

Vol. 64, Number 3

On the Cover



“Days like those are why I joined the Coast Guard," LTJG Jake Kyer recalls of the operation depicted in the cover photo. “We did a total of nine boardings that day with my team in the OTH [over-the-horizon].”

Kyer’s team participated in “Operation Triton’s Gate,” a fisheries pulse op that began at midnight on March 1, 2007, when a closed scallop harvesting area in District 5 called "Elephant Trunk" was reopened for the first time in years. “It was like a gold rush, with dozens and dozens of boats coming from as far away as Maine and Georgia to get in on the action off the coast of New Jersey,” Kyer says. “In the span of three days, we conducted 20 full-blown commercial fishing vessel boardings. We even lost one of those days to bad weather. We identified and alpha-reported another 12 vessels in addition to the ones we boarded.”

As Kyer’s team was only one of five at-sea enforcement assets (aided by seven additional units), the number of targets totaled significantly more. According to Sector Delaware Bay BOSN2 James Todd, who ran the operation, USCG assets boarded 41 commercial fishing vessels, one recreational vessel, and identified 60 additional vessels as ones to watch as future boarding targets.

The effort’s success was due, in part, to the evolution of the cutter boat-over the horizon (CB-OTH). Kyer explains, “The OTH boat allowed me to take my team all over the access area, bouncing from one boat to another, enabling Sector Delaware Bay to sort the targets and identify prime boarding opportunities.” The CB-OTH’s surface interdiction support, over-the-horizon radio capability, and speed and distance capabilities aided the team’s efficiency.

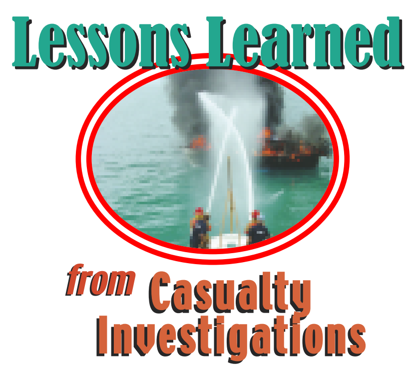
Pictured on the cover from left to right: BM2 Dana Anderson, coxswain; ENS John Laraia, boarding team member; MK2 Oliser Ward, boat engineer; LTJG Jake Kyer, boarding officer; and GM1 Berlin Gabretti, assistant boarding officer. Also in the boat but not visible are boarding team members SN Joseph D’Ambrosio and GM2 Andrew Beska.

USCG photo by ET2 Dave Simmers.

Boat Forces

Focus on Risk Management

Lessons Learned



On Deck

Assistant Commandant's Perspective

By RDML R. Parker, *U.S.C.G.*
Assistant Commandant for Capability

America's maritime domain faces growing threats to its safety and security. The challenges and dangers confronting the nation are real. Bioterrorists, desperate drug smugglers, and human traffickers are evolving new and more sophisticated tools to combat detection or interdiction and evade apprehension. The nation's littoral and waterways, providing so abundantly for our wealth, are constantly threatened by over-fishing, pollution, and transiting threats. Defeating multiple threats demands a multimission Coast Guard. Much of this mission falls directly on the shoulders of Coast Guard Boat Forces to execute.

As stated in *Creating and Sustaining Strategic Intent in the Coast Guard* (May 2005):

"The world the Coast Guard must operate in is changing profoundly. The terror attacks of September 11th are the most vivid illustration, but accelerating change has been buffeting the service since the end of the Cold War. Rapid, almost dizzying advances in technology, global networks, transnational forces, and international markets are profoundly reshaping global maritime security. The emerging maritime domain is a much riskier place, and is changing the face of every Coast Guard mission. It is essential today that the Coast Guard think and act with an understanding of the forces behind the changing world of the 21st century."

Effective and safe boat operations in support of all missions require a substantial investment in human capital, capabilities, training, and leadership to assemble and employ a professional force. The Coast Guard's long-range strategy to ensure effective and safe boat operations is based on establishing goals that are targeted to build and sustain the right capabilities and competencies to meet mission requirements.

By advancing this strategic plan, the Coast Guard will sustain effective and safe boat forces capability, support the execution of operations that advance national goals and objectives, and fortify the Coast Guard Boat Forces vision: "The world standard for professional boat operations."

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Champion's Point of View

By CAPT Scott Robert, *U.S.C.G.*
Chief, Office of Boat Forces

Coast Guard Boat Forces enable mission performance in support of the strategic roles of the Coast Guard—maritime security, maritime safety, protection of natural resources, maritime mobility, and national defense—by providing the core competencies and capabilities, based on operational requirements, that are necessary to effectively and safely operate boats. Whether they are response boats patrolling strategic ports, motor lifeboats crashing through mountainous surf, or aids to navigation boats restoring safe navigation, Coast Guard Boat Forces are essential to the nation's maritime safety and security.

The growing threats to our nation's ports and waterways demand the full attention of the Coast Guard's Boat Forces. With a reputation for excellence in mission execution, Coast Guard Boat Forces has been called upon to perform in a continuously changing environment. Each year Coast Guard Boat Forces is responsible for:

- 47% of the Coast Guard's operating hours.
- 69% of the Coast Guard's ports, waterways, and coastal security hours.
- 68% of the Coast Guard's search and rescue.
- 77% of lives saved by the Coast Guard.
- 89% of property saved by the Coast Guard.
- 76% of the Coast Guard's maritime law enforcement boardings.

All this is accomplished by less than 20% of the Coast Guard's workforce, and with less than 20% of the Coast Guard's budget!

People and boats are the foundation for successful mission execution. Mission support enables Coast Guard boat crews and boats to execute Coast Guard missions, and doctrine provides the principles of operation. These are fundamental to the success of Coast Guard Boat Forces.

This issue of *Proceedings* highlights several of the many initiatives that are ongoing to provide Coast Guard Boat Forces with the right people and the right boats. Articles span the wide spectrum of activities that make up the boat force's world of work, including defining the process that closes our capability and capacity gaps, partnering with Customs and Border Protection for commonality in the boat types we operate within the Department of Homeland Security, acquiring new boats that place the odds of successful mission execution in the Coast Guard's favor, unique mission support initiatives, and putting modern simulator technology to work for training Coast Guard Boat Forces.

I would like to thank all of the authors for their contributions to this edition. Coast Guard Boat Forces will meet head-on the threats and challenges faced in the global maritime domain.

We Are Not in Doubt

The answer is "B."

by RDML R. Parker, *U.S.C.G.*
Assistant Commandant for Capability

The question:

Are standardization, commonality, and interoperability **a)** paradoxes, *or* **b)** mandates for a more nimble force?

The United States Coast Guard is military, maritime, and multimission. Our operational requirements demand that we work well with numerous partners. The ability to harmonize seemingly contradictory mandates is a critical element of the Coast Guard's success. Thus, we are charged at once to be policemen and mariners, warriors and lifesavers, industry regulators and industry partners. Coast Guard members are stewards of the environment, diplomats, and always guardians of the coast.

Our operating environment is far from static. In addition to meeting today's challenges, we must plan for the future. When threats and hazards evolve, our Coast Guard must evolve either with or in front of them. We have not only expanded our missions since 9/11—the entire Coast Guard has grown. We have added almost 7,000 people to the service (a 16 percent increase) and our annual budget has almost doubled to $8 billion.[1]

Going forward, our challenge is to continually adapt our forces, command and control structure, and mission support organization in response to our changing environment. We must be flexible, nimble, and capable of operating with multiple partners in response to specific incidents, surge operations, and increased threat levels. At the same time, we must sustain our performance in our traditional missions.

We routinely conduct multiagency operations with Department of Homeland Security (DHS) and other partners. Our response to Hurricane Katrina drove home

We must be flexible, nimble, and capable of operating with multiple partners. USCG photo.

what we already knew—we must be able to coordinate large-scale operations with diverse responders.

We will not be able to reliably repeat this without standardization within the Coast Guard, commonality across our own platforms and with our partners, and interoperability across a broad spectrum of governmental and nongovernmental organizations. These diverse interoperability requirements require an unprecedented degree of cooperation and coordination that would not be possible without well-established standards.

Standardization Ignites Success

Perhaps the most visible among the Coast Guard's many Hurricane Katrina success stories was the ability of standardized aircrews and aircraft to respond rapidly to the emergent, cataclysmic situation. Aircrews by the score from air stations all over the country got in aircraft flown to our forward operating bases in the area, with people they may have never met, and prosecuted missions as if they'd been doing it together for years. There was no required "just-in-time" training.

Hurricane Katrina was proof positive that standardization enables highly flexible operations.

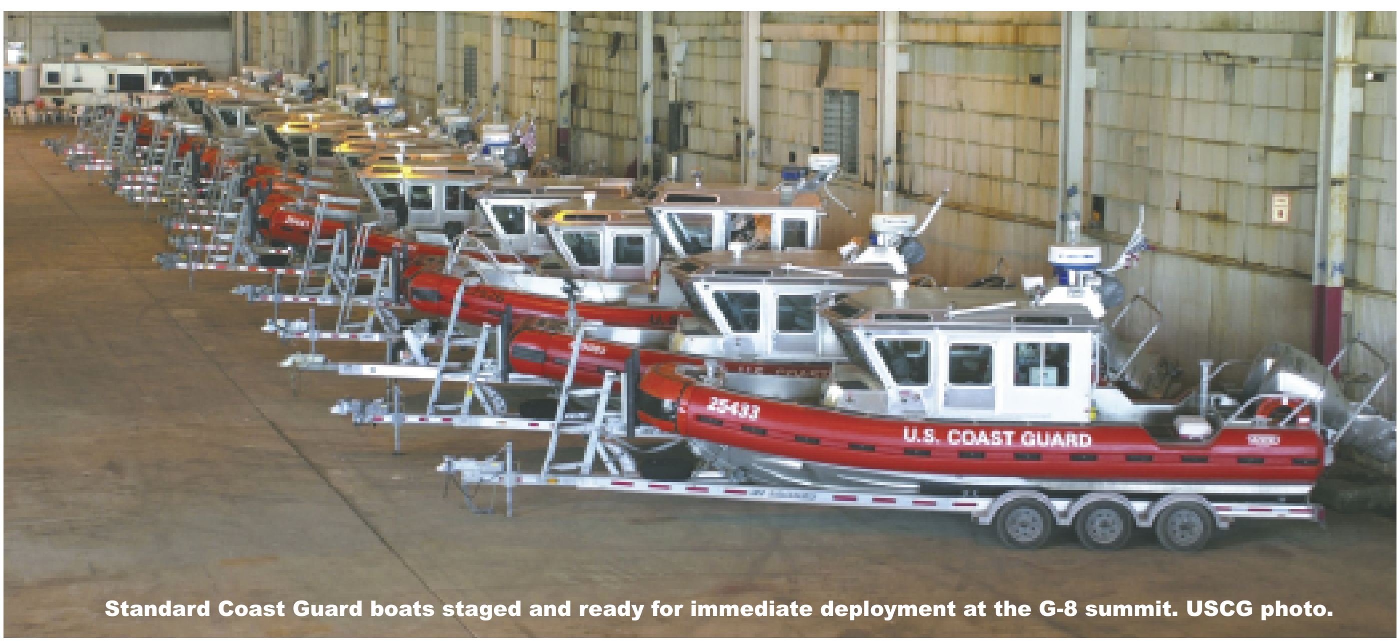
Appropriately, the focus was on the unique and substantial demands of the mission and the necessary adaptation of standard procedures to perform previously unseen feats, knowing full well when they had departed from the standard to account for the attendant risk. The results were spectacular. Though 40 percent of our aircraft fleet was relocated to the New Orleans area for this event, Coast Guard aircraft mechanics from all over the country were able to keep them flying because all Coast Guard air assets are maintained using strict configuration management and standard maintenance procedures.

Though less visible in Katrina operations, our boat crews attained equally compelling results, made possible through standardization and informed innovation on scene. The more standard the assets and qualifications of the folks on scene, the more thought and energy was available in reserve to apply to the many unique challenges they so ably overcame. Though other factors contributed to this success, standardization definitely helped.

From a maintenance and logistics perspective, standardization reduces the number of different spare parts and reduces ownership costs while still enabling the cost efficiencies of purchasing spares in greater quantities. Standardization fosters a culture of preventive and corrective maintenance vice casualty response, and standardization promotes a higher training efficiency when crews learn standard systems through a standard syllabus and qualification process they transfer with portable qualifications. In the end, standardization enables crews' enhanced mobility.

Innovation Meets Configuration Management

While onscene initiative is a Coast Guard hallmark, and innovation is lauded, these qualities are not always best for the organization when it comes to configuration management. Operators will do what it takes to get the job done, but if it is too difficult to work within the



Standard Coast Guard boats staged and ready for immediate deployment at the G-8 summit. USCG photo.

bounds of configuration management, their tendency will be to innovate.

We will require more agile change request processes than currently exist, and will require significant change in user and supporter mindsets.

Configuration management is a critical component of standardization—perhaps the most critical component.

the Boat Commodity Council, we found that U.S. Customs and Border Protection (CBP) had similar equipment needs, and we collaborated to develop operational and capability requirements. The resultant purchase is what the Coast Guard has designated the special purpose craft-law enforcement (SPC-LE). The SPC-LE is a 33-foot interceptor equipped with three 275-horsepower outboards, capable of reaching speeds in excess of 50 knots.

As mission and operational requirements change, and as new capabilities become available, we must be organizationally responsive and timely to update our equipment and yet maintain configuration management. In this regard, successful configuration management poses some challenges. Our processes must adequately address technology refresh rates and be responsive to the requirements to find solutions to tomorrow's problems rather than last week's.

We will require more agile change request processes than currently exist, and will require significant change in both user and supporter mindsets. Both configuration management (with subsets of configuration identification, control, status accounting, and audits) and the full cooperation of operators and supporters alike are absolutely necessary for future Coast Guard success. Without disciplined configuration management, costs of ownership will continue to spiral upward, and standardization will be an unachievable goal.

Commonality Bolsters Partnerships

Where the Coast Guard cannot meet standardization in the truest sense, we must reconcile the highest degree of commonality. Common hardware and common procedures can be terrific force multipliers in surge, contingency, and consequence management operations, and can provide efficiencies in acquisition and maintenance. This perspective is tough to see at a unit level and frustrating to endure, as seemingly Byzantine processes grind into no visible action. This is, however, painfully obvious at an organizational level. We are working closely with our federal, state, and local partners to attain the highest possible degree of commonality, as we have clearly found that no one agency has the necessary resources to carry out its missions alone.

The Department of Homeland Security Boat Commodity Council is a good example of how to achieve commonality. Coast Guard operational commanders articulated requirements for a more robust shore-based pursuit and intercept capability (more speed and better sea-keeping ability for near-shore interdiction operations) than was afforded by current inventory. Through

The SPC-LE is prewired for a stabilized forward-looking infrared camera and has a scalable integrated navigation system that is standard Coast Guard gear, common across our platforms, and interoperable with current Coast Guard command and control systems. The Coast Guard is making use of CBP's National Marine Center to conduct all intermediate- and depot-level maintenance. It is using CBP to conduct j vessel pursuit tactics training for use with the SPC-LE (a skill set that was resident in that agency's force) and is managing this capability through the Boat Commodity Council.

Coast Guard assets, systems, and procedures strive to be fully standardized and as common with other agencies as possible. In the world of boat forces, we are involved with a variety of joint councils and working groups at all levels of the organization, all with the goal of achieving commonality with our partners. Some examples are the DHS Joint Requirements Council, the DHS Commodities Councils, and Coast Guard/U.S. Navy Commonality Working Groups.

Interoperability Enables Operations

Given the number of partners and competing interests for our resources, true commonality is problematic at best. To fully leverage our collective capability, our minimum requirement must be interoperable systems in critical areas like communications on all levels where we are neither standard nor common. Interoperability on a human level means that we must be "bilingual" when it comes to incident response.

For domestic incident response, we make use of the National Incident Management System and the standard structure of the Incident Command System to provide a nationwide approach to incidents and improve interoperability between jurisdictions and disciplines. To maintain interoperability with the Department of Defense (DoD), on the other hand, we must be conversant in the

Joint Operation Planning and Execution System, which is an integrated, joint, and standardized command and control system used to support senior-level decision-makers and their staffs.

Our minimum requirement must be interoperable systems … where we are neither standard nor common.

The systems concept employed by the Coast Guard for long-range interdiction of illegal cargo offers a good example of interoperability. Long-range maritime patrol aircraft (which could be Drug Enforcement Agency, CBP, Department of Defense, Coast Guard, or coalition forces) are equipped with sensors designed to survey, detect, track, and identify targets in accordance with C4ISR (command, control, communications, computing, intelligence, surveillance and reconnaissance) doctrine. Target information is relayed via secure communications to Coast Guard cutters or Navy vessels with embarked Coast Guard law enforcement detachments, which act as command and control platforms and the conveyance for airborne use of force and boats and boarding teams.

Endurance, precision firepower, speed, onscene prosecution, and persistence are all present only because of a collective force mix that allows us to fully exercise our broad authorities as far from our borders as possible. Of note, we depend on our DoD and coalition partners for down-range logistics to sustain these forces and provide first-rate detection and monitoring capability. None of us has it all, but together, we get much closer.

The Overall Missions Perspective

Achieving standardization, commonality, and interoperability has never been easy and is becoming increasingly complex. With so many players and so many promising tools being developed in the burgeoning technology, it will only get more complicated. The tools that will carry the day for us will be those that work with or easily adapt to other related equipment and simplify or automate complex tasks for operators.

The Coast Guard has come a long way in advancing commonality, interoperability, and standardization among our forces, but much work remains to be done. We are replacing our inventory of nonstandard assets and working the commonality and interoperability seams as never before. Meanwhile, we need to march to the drumbeats of standardization and configuration management in communities that are waking to the reality of their benefits, while simultaneously working to lessen the differences in our fleets of boats, cutters, and aircraft.

As an operator for many years, I was slow to recognize the benefits of standardization, commonality, and interoperability. The perspective from my current job makes these benefits painfully obvious. The days of single agency operations on a large scale are fading into history. In the future, we can expect to work with many more partners, some yet unknown. We will do well to establish pre-need relationships, as we do not clearly know exactly the next threat or its vector, and our best response will be with our partners—with common, interoperable, and standardized equipment and systems. The answer is "B." We have a mandate for a more nimble force.

About the author:
RDML Robert C. Parker is a 1979 Coast Guard Academy graduate. He holds an M.A. degree in national security and strategic studies from the U.S. Naval War College and completed a one-year national security fellowship at the John F. Kennedy School of Government at Harvard. He has accumulated over 12 years of sea time, which includes command of three cutters. Tours ashore include liaison officer in Monrovia, Liberia; chief of professional development, USCG Academy; chief of operational forces for CG Pacific Area; chief of operations for CG District Eleven in Alameda, Calif.; and chief of staff for CG District Thirteen in Seattle, Wash. RDML Parker is the current assistant commandant for Capability at Coast Guard headquarters in Washington, D.C.

Endnote:

1. FY01 and FY07 enacted budget statistics.

Strategy = Success

Boat acquisitions.

by Ms. Jennie Peterson
Contracting Officer, U.S. Coast Guard Office of Contract Support

The successful delivery of a boat to a field unit is the culmination of months or even years of effort. This involves developing validated operational requirements, determining an appropriate acquisition strategy, and putting a contract in place to allow the Coast Guard to procure operational assets. This can be a relatively quick process or quite a lengthy one, depending upon which acquisition strategy is chosen.

The Acquisition Process

The first step in the acquisition process is to identify the operational requirements of the platform. This is accomplished by listing the needs of the service. Experience has taught us that the most successful procurements are well grounded in robust operational requirements derived directly from field units.

The end users are clearly in the best position to articulate what they need to do their jobs. The Office of Boat Forces solicits requirements and insight from other sources as well, including the headquarters-level offices and the Department of Homeland Security (DHS). The office also performs extensive market research and gathers historical information.

Procurements generally fall into two broad categories: new capabilities or replacement capabilities. Requirements for a replacement capability are generally easy to derive, as they can be based on the legacy assets, which at least provide a starting point. New capabilities generally take more time to derive, as there is more uncertainty as to how operational requirements can best be met by the new asset.

The new special purpose craft–law enforcement boats have a top speed of over 50 knots and are intended to enhance offshore capabilities of Boat Forces units. USCG photo.

The Asset

As stated, operational requirements include input from other DHS components. The cross-component review of the requirements is coordinated through the DHS Boat Commodity Council, which consists of all agencies in the department that operate boats. Once broad requirements are identified, a "box" is defined for the new asset. This is a broad look at the operational requirements for the new asset—speed, length, weight, weaponry, seating, electronics, range, etc.

Field requirements for the new 26-foot trailerable aids to navigation boat are gathered during the acquisition process. USCG photo.

The box is further refined by a matrix of all stakeholders, including the USCG Offices of Boat Forces, Electronics Systems, Naval Engineering, and Contracting. A group is chosen to represent each office's interest as the project goes forward to ensure everyone's concerns and interests are acknowledged and addressed as the platform takes shape. During this process, the Office of Boat Forces works to establish funding to field the boat and to support it for its intended service life.

The Acquisition Strategy

After the right mix of people is gathered, it is time to talk acquisition strategy. The contracting officer provides the acquisition options based on the extent of the program, complexity of the asset, and number of boats to be procured. There are several options available, and each one is discussed with the program office so the best decision can be made as to how to procure the boats. In the past, we have utilized the General Services Administration schedule, set-asides, sole source, letter contracts, two-phased acquisitions, and full and open procurement strategies to procure the small boats currently in the Coast Guard inventory. The various procurement strategies will not be discussed in detail here, but the various options provide streamlined procurements to quickly buy either one boat in emergent circumstances or an entire fleet of boats that will serve the Coast Guard for years.

While these acquisition strategies are being discussed, one must consider the value of the resultant contracting vehicle, the rules and regulations that govern the various procurement processes, and the timeline for award. All of these factors play into deciding which acquisition strategy is most appropriate for the pending procurement. Additionally, consideration must be given to the available sources and interest from the industry providing the platforms to be procured. It is always the intent of the Coast Guard to maximize competition whenever possible and to mitigate risk to the government as much as practicable. Choosing the most appropriate acquisition strategy and resultant contracting vehicle type is the key to making that happen.

The Specification

Meanwhile, as the acquisition strategy is being determined, the requirements and the necessary documentation to support the procurement are being finalized. The Office of Boat Forces continues to gather input from the field units, headquarters offices, and DHS components. The broad requirements are translated into a specification (spec) that provides more detailed information as to the specific requirements of the boat. It is important to note that the spec is generally kept performance-oriented. We generally try not to tell the builder how to build the boat, but rather focus on what the boat should do. For example, we required the contractor on the trailerable aids to navigation boat (TANB) contract to provide a boat that went at least 30 knots, but we did not tell them what type of engine to use.

The various representatives of each of the offices mentioned continue to refine and review the spec several times to ensure we have updated references, addressed new requirements, and incorporated information that has been gathered from the field and DHS components. In most instances, a request for information (RFI) is released to industry to provide the draft requirements when they are close to final format. This is done for several reasons. The Office of Boat Forces obtains pricing information, which helps support government cost estimates and funding requests. It helps validate our requirements and it provides industry insight into the forthcoming requirements. This is key, as it helps us speed up the procurement process and helps industry better prepare a response to the subject solicitation, which, in turn, provides benefit to the government.

Solicitation/Response/Review
Once the RFI data is gathered, the same individuals in the matrix team meet again to go over the comments and questions and give the spec a final review before the solicitation is released. The solicitation is the actual procurement action that leads to a contract award. In the meantime, all required documentation and approvals are obtained, so when the final requirements are complete, the solicitation can be released to industry for response.

The technical evaluation team is gathered and sequestered upon receipt of the quotes or proposals to review and evaluate the responses to the solicitation. This team consists of technical experts from the field, engineering, logistics, electronics, and the program/sponsor's office. Each quote or proposal is evaluated against the requirements, and the results of that technical evaluation are provided to the contracting officer for consideration in award. Price and relevant past performance are also considered, and the contracting officer combines the results of these evaluations to either make the award or recommend award to the selection authority, depending upon the acquisition strategy.


Seaman Bradley Rode and Seaman Apprentice Nathan Leger prepare the over the horizon boat for launch from Coast Guard Cutter *Escanaba*. USCG photo by PA2 Lisa Hennings.

The Award and Production
After an award is made, the focus shifts to the production, delivery, and support of the platform. Provisioning technical documentation is obtained from the manufacturer to support the logistics offices and the field units for support and repair of the platform. Spare parts are procured to provide adequate support for the platforms once fielded for when the boats are out of the established warranty period.

The platforms are entered into the Fleet Management Information System (at http://www.boatforces.com), which tracks the discrepancy items upon delivery, acceptance of the platforms, configuration management of the platforms, spare parts deliveries, service bulletins, and warranty occurrences.

Early on, multiple status meetings are coordinated with the contractor to address all potential configuration changes and questions they may have in commencing production of the platform. This is extremely important, as the most successful procurements are the ones in which expectations between the Coast Guard and the contractor are clearly defined. In recent years, the Office of Boat Forces has found that delaying production of the boats slightly after the first one is fielded has provided an opportunity to address any concerns with safety or operational effectiveness from the government's side that were not identified prior to receiving the boat. This provides to the field a platform that has been given the "once over" to try to mitigate any potential minor issues or concerns that typically come to light with a new boat.

Delivery and Support
The boats are delivered to the locations and the contractor typically provides some type of training for the units, goes over the platform, and reviews its unique features and operating parameters to educate the unit on its new asset. The unit gets a technical binder along with the platform, in addition to instant access to http://www.boatforces.com to administer and manage its new platform.

Each new platform has a dedicated platform manager in the Office of Boat Forces who is the resident expert on all issues pertaining to the boat. Each platform manager is responsible for the success of the platform, from the start of the requirements until all platforms are delivered under the applicable contracting vehicle.

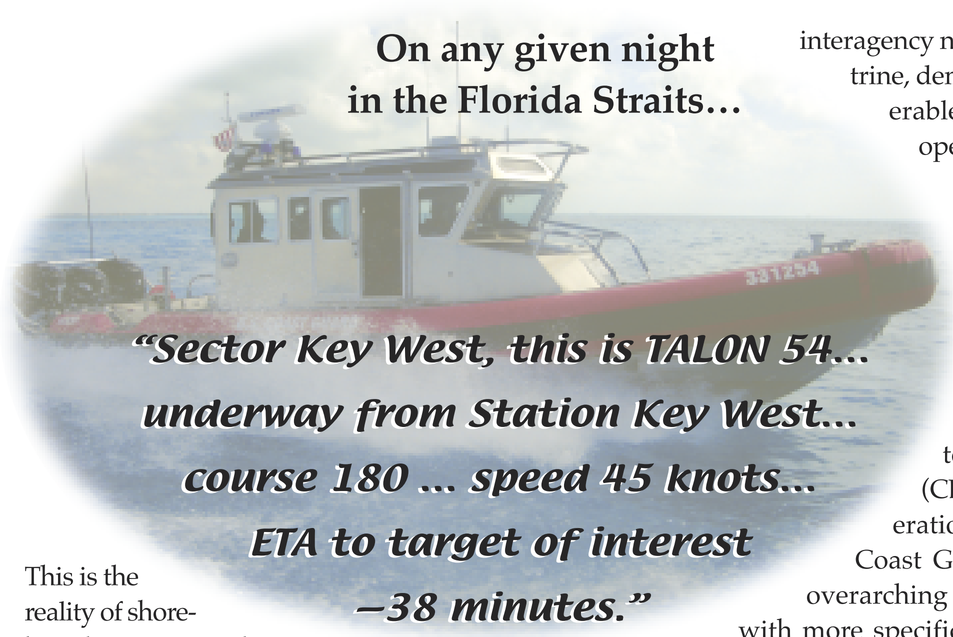
Diligent development of acquisition requirements, combined with proactive management of the program in all stages of the procurement, guarantees the success of the acquisition and ensures that the right asset is delivered for the right price and in a timely manner.

About the author:
Ms. Jennie Peterson has been with the Coast Guard in the Office of Contract Support for more than 14 years. She has worked at the Motor Life Boat Project Resident Office for three years and has been involved with most small boat procurements. She is currently a team leader who services the USCG Operations Directorate and USCG Intelligence Directorate. She has a master's in acquisition management from American Graduate University.

Shore-Based Response Capability

A new core competency and the means to deliver it.

by LCDR Matthew White, *Sector Key West Response Department*



This is the reality of shore-based response today, not only in south Florida, but across the country, where maritime threats require equivalent maritime capabilities. The arrival of the special purpose craft-law enforcement (SPC-LE) has transformed shore-based mission execution. It has embedded noncompliant vessel use of force doctrine and training as a core competency, contributing directly to effective maritime governance.

Critical Elements of Maritime Governance

The Coast Guard strategy for maritime safety, security, and stewardship places at its center the concept of effective maritime governance, made possible through interoperable and cooperative maritime regimes, domain awareness, and operational capabilities. Maritime regimes encompass legal statutes, international agreements, and standard practices and procedures. Operational capabilities provide the means to respond to threats and hazards. The SPC-LE, along with a proven, interagency noncompliant vessel pursuit doctrine, demonstrates the power of interoperable maritime regimes and operational capability.

Our guiding doctrine for interagency noncompliant vessel pursuit is found in Annex 4 to the Standard Operating Procedures for Coordinated Air and Maritime Law Enforcement Operations, signed by U.S. Customs and Border Protection (CBP)–Miami Air and Marine Operations Branch and the Seventh Coast Guard District commander. The overarching standard operating procedure, with more specific follow-on pursuit tactics and procedures, was signed in June 2004. Coast Guard headquarters published commandant-approved tactics, techniques, and procedures to further define operational tactics. Under this doctrine, noncompliant vessel pursuit depends largely on two fundamentals—tactical advantage and an on-scene coordinator (OSCOOR).

Tactical advantage requires comparable or greater speed and maneuverability than that of the target pursued. It also requires the ability to deliver force to disable the target, if necessary. The SPC-LE possesses superior operational capability. With top speeds in excess of 50 knots; a range of more than 200 miles; and over-the-horizon command, control, and communications; it is an extraordinarily capable shore-based response asset.

OSCOOR can be thought of as the quarterback of vessel pursuit and interdiction. The mission can begin with a cutter, aircraft, SPC-LE, or other agency asset. The goal is to possess tactical advantage prior to exercising any use of force.

Capability alone isn't adequate to address the threat. In this area, this usually involves "go-fast" vessels smuggling undocumented migrants or contraband across international borders. Employing this capability effectively relies upon an effective training and tactics

USCG 33-foot special purpose craft–law enforcement. USCG photo.

regime. Through this, the special purpose craft-law enforcement is turned from a fast boat into a game-changing capability that enhances mission execution and maritime governance.

Bridge to Deepwater

Aside from delivering tactical advantage, the SPC-LE also creates a unique bridge to Deepwater. When the Coast Guard needs to improve operational capability, the most commonly cited example is the Deepwater acquisition, which, given its size and scope, is necessary and understandable. We must aggressively recapitalize our Deepwater surface and aircraft fleet.

However, when discussing the Coast Guard force structure as a strategic trident: shore-based, Deepwater, and deployable; it's also important to keep focused on those capabilities that cut across and connect this force structure. The SPC-LE is a perfect example of an asset that can stitch together the Deepwater and coastal domains. Its speed and range, coupled with a very capable command, control, and communications package, make it an asset that responds from shore, but can operate seamlessly with Deepwater assets.

There is no such thing as a "routine" go-fast interdiction, but in many cases, it starts with detection by a Deepwater asset, such as a medium-endurance cutter, patrol boat, or aircraft. Upon detecting a target of interest, shore-based SPC-LEs are sortied, vectored in by a Deepwater asset, and the interdiction is completed. Thanks to a curriculum developed by Customs and Border Protection, with the cooperation of the USCG District Seven Tactical Law Enforcement Team and the Office of Boat Forces, we are now providing training to medium-endurance cutter boat crews equipped with over-the-horizon cutter boats. With that, we have a common pursuit doctrine across Deepwater and shore-based assets.

Go-fast chases typically happen at night and at high speeds, maximizing the need for a seamless operating environment between Deepwater and coastal assets. The SPC-LE delivers on that need and provides a bridge between coastal and Deepwater capability. This bridge is needed every day in the Florida Straits, and would be needed anywhere in response to a major coastal maritime incident. Think of September 11, 2001 and Hurricane Katrina. Among the first responders were Deepwater assets (aircraft and cutters) operating within and around port and coastal areas.

The mission requirement for shore-based boat forces and Deepwater forces to be mutually supportive and fully integrated has never been greater. The special purpose craft-law enforcement is a representation of that effort. The days of isolated small boat operations, limited to the line-of-sight communications from multimission stations, are gone.

The Next Steps—Standard, Not Special

We've tried employing fast interceptor-type platforms before, from the fast coastal interceptors in the 1980s to deployable pursuit boats in the 1990s. They were capable platforms, but never fully integrated as a core Coast Guard capability. As a result, the programs withered and became unsustainable.

From design to operational deployment, the SPC-LE has demonstrated superior capability. Coupled with an innovative and effective maintenance philosophy, this places a reliable and superior platform in the hands of our talented crews. The SPC-LE is here to stay, at least where mission requirements require its capability. To facilitate this, the special purpose craft-law enforcement is being maintained and equipped as a standard Coast Guard platform, subject to rigorous configuration control. The boats are maintained through an interagency agreement with Customs and Border Protection.

Interdiction Safety Initiative

Locally, Sector Key West has implemented an interdiction safety initiative to keep a recurring focus on the challenges and inherent risks of the mission. Through this initiative, we're continually working to find better and safer ways of doing business. Some ideas have resulted in changes to tactics, but some will require capability modifications to the SPC-LE.

Herein lies another important intersection between maritime doctrine and operational capability. Our doctrine, based on many years of Coast Guard and CBP experience, flatly states that "closer is better" for the following reasons:

- Closer proximity to the target of interest reduces relative speed and, therefore, energy at contact. However, close proximity is beneficial only as long as a tactically advantageous position is maintained.
- If contact is made, the closer proximity provides for a "glancing blow" effect, rather than piercing (t-bone) contact.
- The closer the law enforcement unit position is to the target of interest, the less opportunity it has to turn toward the law enforcement unit and possibly ram/attack.

In the Future

Noncompliant vessel pursuit is not a stand-off capability. We ask our coxswains and crews to interdict noncompliant vessels at night, at high speeds, and to deliver disabling fire. It's incumbent upon us to make sure they have every capability they need to succeed. The delivery of any mounted night vision and/or forward-looking infrared (FLIR) capability would be a welcome enhancement. Sector Key West is involved in an ongoing FLIR sensor prototype effort to help further define these requirements.

About the author:

LCDR Matthew White has served 12 years in the Coast Guard, including six years afloat. He has served in staff assignments for the Coast Guard Office of Congressional Affairs and the Office of Budget and Programs and presently serves as the chief of Response for Coast Guard Sector Key West. He is a 1994 graduate of the Coast Guard Academy and a 2003 graduate of the JFK School of Government at Harvard University.

High-Speed, High-Tech, and High Stakes on the High Seas

Over-the-horizon-capable cutterboats.

by LT JOSEPH B. ABEYTA
Platform Manager, U.S. Coast Guard Office of Boat Forces

LT JOSHUA N. BLOCKER
Past Platform Manager, U.S. Coast Guard Office of Boat Forces

The law enforcement alarm sounded and the ready boat crew rolled out of the rack at double time. Without glancing at his watch, the coxswain figured it to be about 2:30 in the morning and judging by the difficulty he had getting his boots on, the sea state was about four to six feet. The next thing he knew, the cutterboat was sheering away on the sea painter. He yelled to the boat crew, "Sea painter away!" and off the cutterboat peeled to starboard.

The sea spray was refreshing and helped alert his senses. During the mission brief the crew realized that this would be a long chase. Intel reports from surveillance aircraft had indicated the "go-fast" had refueled at sea with a co-conspirator.

There was a go-fast out there; the cutter could see it on the forward-looking infrared radar, and the watchstander in the combat information center was relaying information to the cutterboat via secure radio networks as fast as possible.

The plan was to get the cutterboat into a covert tactical position, then the ship would launch the ready helicopter. Both assets (the cutterboat and the helo) had done pretheatre work-ups and use-of-force training. This was what the whole program had come down to: Stop the smugglers in their tracks.

From the early days until just a short time ago, stopping smugglers was a near-impossible struggle that had frustrated the frontline fighters of the war on drugs. Legacy assets were slow, and to issue warning shots or disabling fire from anything other than a Coast Guard cutter was unthinkable. But that was then. Now, here they were, and the hunt was on.

Scenarios like the fictional one above are commonplace on every high- and medium-endurance Coast Guard cutter in the world. But how did the Coast Guard get to this point? During the early to mid-1990s, it was estimated that only 10 percent of the vessels smuggling illegal narcotics were being interdicted in the Caribbean and Eastern Pacific. Smugglers realized that a Coast Guard asset's capability to catch a go-fast did not exist. Helicopters are ex-

A cutter boat-over the horizon conducts noncompliant vessel pursuit training. USCG photo.

pensive to operate and have limited endurance. High-altitude surveillance aircraft such as C-130s and Navy P-3 Orions could easily be evaded close to shore and under the cover of darkness. Evading interdiction by a cutter on patrol was the rule, not the exception. But the rules of the game were about to change.

In the late 1990s, the Commandant of the Coast Guard issued a directive to investigate ways by which the Coast Guard could ratchet up its interdiction capabilities. But there was a catch: Resources with which to execute this new strategy would be difficult to secure. The idea to build a new class of cutter was discounted almost immediately, as were several other notable concepts. The one idea that gained traction was simple, yet effective. Take an armed helicopter, capable of delivering warning shots and disabling fire, and integrate it with a high-speed, rigid-hull inflatable cutterboat. This combination would provide surface interdiction support and over-the-horizon radio capability. Couple these assets with a full-scale Coast Guard cutter, serving as the command and control centerpiece, and you have a force package able to deliver results.

A New Frontier

This concept was dubbed "Operation New Frontier" and work within the aviation and boat community started off at a feverish pitch. The surface component of Operation New Frontier, the cutterboat–over the horizon has evolved (over three generations) into the high-tech, high-speed, extremely capable CB-OTH MK III. Here's how.

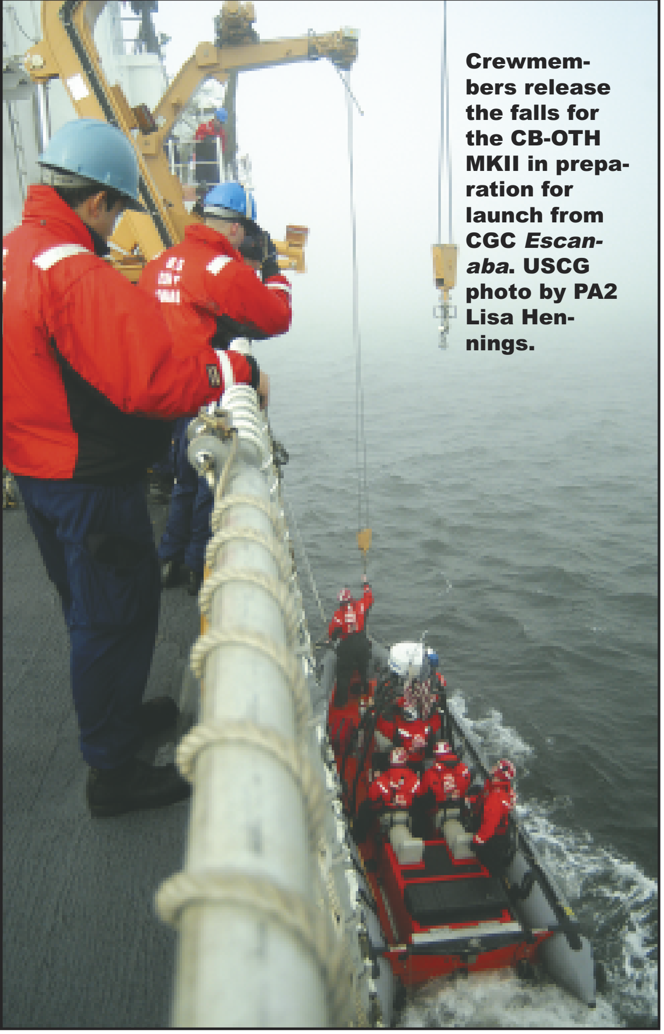
In 1997 the Office of Boat Forces set out to procure a fleet of 20 rigid-hull inflatable boats capable of thwarting illegal go-fast operations. The boats had to be fast—faster than any cutterboat in the Coast Guard's inventory. The new fleet of boats also had to go far—at least 80 miles away from the parent cutter, far beyond the typical seven- to 10-mile range of current assets.

As if the boat designers and engineers did not have enough to do, communications for this new asset had to be rethought. Marine band VHF-FM would not work 80 miles from the cutter, and the helo crew relied heavily on secure HF communication. Additionally, designers sought features such as voice-activated microphones and the ability to talk and listen over classified and unclassified systems using just one headset. After much hard work, all of these requirements came together and the "over the horizon" cutterboat was born. It would be officially named the cutterboat–over the horizon, or CB-OTH.

In 1998, a contract was awarded to Zodiac of North America for the initial run of 20 CB-OTHs. Despite the boat's vastly superior capability over existing non-OTH cutterboats, there were numerous programmatic and logistical problems that plagued the project. First, there was no requirement for the boat manufacturer to integrate the communications package into the overall boat design. The quick-fix solution was to hire a separate contractor to install a drop-in communication package, which was burdensome and restricted crew movement fore and aft.

Second, the boats were fielded faster than the support infrastructure could be established. Although only approximately 20 boats were purchased, the configuration of each boat was different, further stressing the logistics system. To make matters worse, all available funding was dedicated to purchasing the boats, with little left over for critical spare parts. The boats were, like all cutterboats before, relegated to nonstandard boat status and only provided with limited funding and zero oversight.

Despite these shortcomings, the program itself was off to a near-perfect start. After just a few trial runs in late 1998, every go-fast encountered was interdicted by the joint air and surface team. Since the beginning of Operation New Frontier, 155 tons of illegal narcotics were seized—26 tons in fiscal year 2004 alone.[1]



Crewmembers release the falls for the CB-OTH MKII in preparation for launch from CGC *Escanaba*. USCG photo by PA2 Lisa Hennings.

Working in the shadow of this immediate success, the CB-OTHs and their crews managed to persevere for nearly six years, but all were operating on borrowed time. The lack of an established logistics support system was evident. Due to the ever-increasing operational tempo, boats were minimally maintained and began to slip into a general state of disrepair. Boats were being removed from service well before their end-of-service life and the much-needed funding that could be used to remedy these issues was also, ironically, still over the horizon.

CB-OTH MKII

In mid-2003, the Office of Boat Forces began investigating a recapitalization project for the CB-OTH. This time, it integrated a complete platform communications package, logistics support billets, training, and a full spectrum of spare parts. This new generation of CB-OTH, the MK II, was also to have a top speed in excess of 40 knots and a total operational endurance of 200 miles.

The Office of Boat Forces began crafting a resource proposal for the 2006 budget, which was formally submitted in 2004. In the proposal, the contractor was deemed responsible for the integration of the communications package into the platform and there were numerous provisions in the requirements document for logistics. There was even a line item to include a trailer for each boat delivered.

The USCG Office of Budget and Programs had managed to help the CB-OTH line item survive a rather vicious budget battle, and the project was designated a fully funded program beginning in fiscal year 2006. The full budgetary funding allowed additional billets for boat support personnel, including maintenance managers at both Maintenance and Logistics Commands and the Engineering Logistics Center. There was also an extensive logistics support system under development. Plans were underway to build a CB-OTH that no one could have foreseen.

CB-OTH MKIII

Up until this point in the program, the critical failure point was the boat's fiberglass hull. Due to the extreme operating environments, hull failure was common, especially in the older boats from the initial 1998 production run. Nothing can remove a boat from service faster than a cracked hull. The hours of brutal pounding inherent with fast boats also took its toll on the operating crews.

Designers worked to alleviate these problems. Making the switch to an aluminum hull would solve the problem of hull failure. Ironically, this meant that the service life would be extended and a greater number of operating crews would be exposed to violent forces associated with operating these boats. Human factors engineers, who were well versed in crew endurance and health concerns, joined the design team.

The result: The aluminum hull CB-OTH MKIII was fitted with special marine suspension seating by Shockwave Marine. © This new seating system cushioned the crew from the shock of vertical acceleration by absorbing the forces on springs that provided eight inches of suspension travel. The seats also housed equipment pods for the communications and navigation gear.

During testing, the aluminum-hulled MK III exceeded the contractual requirements and surpassed expectations. For example, the contract requirement for total endurance was 200 nautical miles. During trials, the MK III had a calculated range of nearly 325 nautical miles. Grounding and bonding the communications system, problematic at best in a fiberglass boat, was a non-issue in the aluminum-hulled MKIII. To top it off, the aluminum boat matched the speed of its fiberglass counterparts.

Ongoing Testing and Improvement

The aluminum MK III underwent some final fitting and made its way to Zodiac of North America's Stevensville, Md., headquarters, arriving in late May of 2006. Without delay, the Zodiac crew and Office of Boat Forces personnel began 30 days of testing and evaluation that would stretch from Stevensville to Tampa, Fla., and numerous points in between. An impromptu test of the boat's heavy-weather capabilities was conducted at the entrance to the Chesapeake Bay and again at Oregon Inlet, N.C.

A specially designed M240 weapons mount was tested by the U.S. Coast Guard's Special Maritime Training Center in Camp Lejeune, N.C. The MK III even underwent a davit lift and cradle-fit testing aboard the Coast Guard Cutter *Gallatin*. With the successful completion of testing and evaluation, the Office of Boat Forces made the decision to convert the entire production effort to the aluminum MK III.

But the successes of the program do not stop here. The current generation CB-OTHs are capable of carrying and employing the M240—the first cutterboat ever capable of utilizing a mounted automatic weapon. This capability has provided ships with their own antiterrorism and force-protection vessel. Additionally, as a force multiplier, in-port cutters now have the opportunity to participate in ports and waterways coastal security missions, another first. In June of this year the Coast Guard Cutters *Seneca* and *Midgett* completed a one-year operational testing and evaluation.

The boat has been unanimously and eagerly received. Crewmembers on the CGC *Midgett* reported that, while on patrol in support of Operation Iraqi Freedom, their Zodiac MKIII CB-OTH was the most capable seven-meter boat in the coalition forces. In keeping with the ever-expanding nature of the program, the Office of Boat Forces was recently directed to acquire a jet-driven version of the CB-OTH MK III, in support of the Deepwater program.

Fiscal year 2008 will mark the 10-year anniversary of the CB-OTH project. Since that time, the cutterboat crews have been providing a capability that has contributed successfully to one of the Coast Guard's primary missions—enforcement of laws and treaties. Since 2002 the Coast Guard has successfully seized almost $8.2 billion dollars in narcotics, arrested over 400 suspects, and put 110 smuggling vessels out of service—permanently.[2]

What does the future hold for the CB-OTH? Nobody knows for sure, but we can say without a doubt our theater of operations is ever-changing and dynamic. A new threat on a new frontier is born every day. The activities of smugglers and terrorists are harsh realities, and, as long as they exist, the Office of Boat Forces and our partners are committed to providing the assets and personnel to counter them.

About the authors:
LT Joseph Abeyta, the current CB-OTH platform manager, is a 15-year Coast Guard veteran and prior BM1. Past assignments have included tours aboard CGC Valiant *and CGC* Dauntless *as a cutterboat coxswain, CG Station Charleston; Group Charleston search and rescue controller; operations officer at Operations Bahamas, Turks, and Caicos–Nassau, Bahamas; and most recently as commander and deputy commander of Group Cape Hatteras. He is also the recipient of the U.S. Navy League 2004 Captain David H. Jarvis Inspirational Leadership Award.*

LT Joshua Blocker is a 1997 graduate of the Citadel and a 12-year Army and Coast Guard veteran. Past assignments include Station Charleston; Group St. Petersburg; and Office of Boat Forces, Washington, DC. He is currently serving as the chief of the Incident Management Division at Sector Baltimore.

Shock-mitigation seating arrangement for crewmembers onboard a CB-OTH MKIII. Note the electronics "ride" in the same pods as the navigator and communicator positions. Photo courtesy of Shockwave Marine Inc.

Authors' note:
The following offices and units have contributed immensely to the success of the CB-OTH program:
USCG Office of Acquisitions, USCG Electronics Systems Acquisitions, USCG Office of Naval Engineering, USCG Office of Law Enforcement, USCGC *Midgett*, USCGC *Seneca*, Zodiac North America, Zodiac Hurricane Technologies, and Shockwave Marine.

Endnotes:
1. Statistics courtesy of USCG Office of Law Enforcement.
2. Ibid.

Trailerable Aids to Navigation Boat Project

Right requirements, right contractor, right asset.

by LT Bob Post
U.S. Coast Guard Office of Boat Forces

On August 7, 1779, the United States Lighthouse Service was established. Its main purpose: to ensure lighthouses were brightly lit and aid mariners around dangerous shoals and points of land to guide them into a harbor. As vessels became larger, faster, and more concerned with deadlines, the Lighthouse Service, now the United States Coast Guard, deployed the first buoys to mark the safest, shortest route into a port. By 1931, the Coast Guard had successfully marked 40,580 statute miles of coast and river channels and was actively maintaining 19,556 aids to navigation.[1]

Members of Coast Guard Aids to Navigation Team New York service a buoy in New York Harbor from their new 26-foot TANB. From left: BM2 Jonathon Hemphill, BMCS Joseph Wright, and MK3 James Weeks. USCG photo by BM1 Josh Namowitz.

The Coast Guard continues to set and maintain the nation's buoys, lighted structures, ranges, and beacons. Today, the Coast Guard is responsible for maintaining more than 50,000 federal aids to navigation.[2] The principal Coast Guard units responsible for responding to aids in need of maintenance are the aids to navigation teams (ANTs). In addition to discrepancy response, the ANTs have primary responsibility for 22,000 of the 50,000 federal aids.

The Asset: Trailerable Aids to Navigation Boat
The primary vessel used by aids to navigation teams is the trailerable aids to navigation boat (TANB). The Coast Guard currently owns 80 TANBs. The fleet was initially procured in 1980 and was only projected to last seven years. Through two major overhauls, one in 1992 and another in 1999, the Coast Guard successfully kept these boats in service for more than 20 years. Needless to say, the TANB fleet needed to be renewed. The Office of Boat Forces teamed up with the acquisition branch to acquire a replacement trailerable aids to navigation boat.

A great deal of planning and preparation goes into acquiring the right boat for the Coast Guard. A key aspect of the initial planning process is to establish a good "requirements" document and a detailed acquisition plan. The requirements document is developed to ensure the acquisition team meets the field's needs, whereas the acquisition plan guides the acquisition team through the process.

The Replacement TANB: Design and Acquisition
In February 2005, the Office of Boat Forces embarked on a two-phase, down-select acquisition strategy for the replacement TANB. This is a proven strategy where more than one boat is procured and tested operationally to effectively mitigate the technical risk associated with the procurement. The first thing that the Office of Boat Forces focused on was identifying the requirements, specifically identifying what the aids to navigation teams needed. The requirements for the new trailerable aids to navigation boat were based primarily on field and industry input, as well as additional requirements from the Coast Guard Offices of Naval Engineering and Navigation Systems and the Department of Homeland Security (DHS) Boat Commodity Council.

The Office of Naval Engineering provided vital information to ensure that the boat builder would be able to provide enough support information for successful provisioning and long-term support. The Office of Navigation Systems ensured that the Coast Guard would receive the proper electronics equipment to support effective mission execution and provide commonality of navigation and communications systems with other Coast Guard assets.

The boat was required to carry a considerable amount of deck cargo—a significant design consideration. It was important to ensure that the proper stability requirements were met to make sure the new TANB and its crew would be safe when lifting buoys and sinkers. The Engineering and Logistics Center provided us with key information to ensure that the new trailerable aids to navigation boat would be stable. Additionally, a key aspect to the design of the new platform was the ability to work structures from the cabin top. This issue further demonstrates the importance of input from the field, since, to the laymen, working from the top of the boat would never have been a consideration. It was a unanimous requirement from the aids to navigation teams that the new TANB have the ability to service aids from the cabin top to facilitate servicing 15- to 20-foot structures.

The acquisition process began in July 2005 with phase one, a request for proposal submitted by the acquisition team. This was the industry's opportunity to provide the Coast Guard with what it thought would best meet our needs. A technical evaluation team received and evaluated several proposals. This team consisted of aids to navigation team experts and other experts from various Coast Guard headquarters offices. The team scoured the many proposals and recommended awarding contracts to three companies that best met specifications. These companies were selected to each build one boat for testing and evaluation. Three separate contracts were awarded to each company for a minimum of one lead boat for testing, with options for up to 99 additional hulls (including 20 options available for other DHS agencies) to the company that was successful in the operational evaluation.

Phase two of the process began in October 2005. This phase included production, operational testing, and evaluation of the three selected boats. During the production of these boats, Coast Guard personnel conducted site visits and verified good construction/welding procedures were being followed at each facility. The first three boats underwent a thorough pre-acceptance inspection. The inspection was designed to make sure each boat met specifications with regard to construction, outfit items, speed, and maneuverability. Only two of the three boats met our requirements and moved on to the operational evaluation phase.

Crew from ANT Baltimore, BMC Stephen Burke, BM1 Robert Flickinger, MK1 Oscar Ramos, and MK3 Walter Avelar underway on their new TANB. USCG photo.

Operational Evaluation and Contract Award

Once preacceptance was complete, the two remaining boats went through a rigorous operational evaluation phase in February of 2006. The testing was completed by ANT experts, including officers in charge, an engineering petty officer, and junior coxswains. The test boats were put through a series of performance factors and evaluated on servicing structures, servicing buoys, discrepancy response, speed, maneuverability, and towing. Crews completed more than 50 hours of testing on each boat in a 10-day period. Upon completion of each test, the team evaluated and rated the performance according to set procedures dictated by the contracting officer.

While both boats had significant strengths, the team recommended an award to American Marine Holdings (AMH) based on the superior performance of its offering. The contracting officer determined it to be the best value to the Coast Guard and awarded AMH the indefinite delivery/indefinite quantity (IDIQ) contract. The flexible nature of the IDIQ contract allows the Coast Guard to procure TANBs using existing boat recapitalization funding and supplemental appropriations. AMH had a joint venture with Gravois Aluminum Boats under the trade name Metal Shark Boats (MSB), based in Jeanerette, La., where the boats are currently being constructed.

Production commenced in October 2006 and a total of 21 new trailerable aids to navigation boats have been delivered as of September 2007, with an additional 29 on order.

Senior Chief Petty Officer James Dillon (left) shows off the unit's new trailerable aids to navigation boat. Aids to Navigation Team Galveston was one of the first units to receive the new boat. USCG photo by PA3 Mario Romero.

Currently, one TANB is delivered every 18 days.

The New TANB

All operational capabilities met or exceeded our requirements during the operational testing phase of the Metal Shark Boats trailerable aids to navigation boat (MSB TANB):

- Its top speed exceeded our objective by nine percent (35-knot objective, 39 knots demonstrated).
- Its full load (1,000 lbs. plus crew) cruising speed exceeded our objective by 25 percent (25-knot objective, 32 knots demonstrated).
- Its range exceeded our objective by 13 percent (150-nautical mile objective, 172 nautical miles demonstrated).

The MSB TANB comes equipped with twin Honda 150s and features a spacious working deck, a dive door, a davit with a 500-lb. safe working load limit, and a robust working platform on the cabin top for working structures. This is a significant improvement over our legacy TANBs, and has increased the effectiveness of the TANB while working structures by an estimated 100 percent.

The MSB TANB also has a very sophisticated electronics package, including a scaleable integrated navigation system with integrated automated identification system and three radios (VHF, UHF, and DSC). The electronics package is standard with all other Coast Guard boat types. The MSB TANB was the first Coast Guard boat to completely comply with Rescue 21 communications requirements and the first platform to have AIS-based asset tracking fully integrated into its electronic systems.

The state-of-the-art TANB also includes shock-mitigating seats for four, providing crew comfort. The seats are made by Shockwave Marine. During operational testing, the seat configuration was deemed very favorable by the crews. Since they were first incorporated in the trailerable aids to navigation boat, these seats have also been installed on the aluminum-hulled cutter boat–over the horizon.

In order to provide ports, waterways, and coastal security capability, the contractor was required to provide a mounting point for the M240 machine gun. The location of the mounting point was given considerable attention. The contractor, with vast naval special boat unit experience, considered several locations and determined the best position for the weapon was on the tripod. The weapons mount is located in the open buoy deck area. This gives the gunner a stable platform and flexibility to effectively operate the weapon as well as the ability to communicate with the coxswain as he stands beneath the loud hailer.

The new TANB will be a one-for-one replacement for legacy craft. Additionally, the new trailerable aids to navigation boat could possibly replace other 55-foot aids to navigation boats, due to its increased sea-keeping capabilities and exceptional aids to navigation capability.

Ongoing Support

The Office of Boat Forces has had great success acquiring this new, highly capable boat, but it is also important that the new platform comes with the proper technical data to effectively support the TANB fleet over the lifetime of the boat. If the legacy TANB is an indication of how long we must support our assets, we know this boat will be around for a long time.

We required MSB to provide all the technical publications and drawings associated with the trailerable aids to navigation boat. We will work with our engineering staff to ensure we develop a maintenance plan so that our aids to navigation units will conduct proper maintenance.

Additionally, we have hired a contractor, CDI Marine of Severna Park, Md., to conduct a thorough maintenance analysis of the TANB systems. CDI will develop maintenance procedure cards so that aids to navigation teams can properly care for the vessel. The contractor will also provide a boat operator's handbook that details all the systems and operating parameters that will be promulgated to the field through the Office of Boat Forces.

About the author:
LT Bob Post enlisted in the Coast Guard in 1989 and graduated from Officer Candidate School in 1998. He came to headquarters in September 2005 after serving as the commanding officer on the CGC James Rankin. *He holds a bachelor of science degree in organizational management from Nyack College, Nyack, N.Y.*

Endnotes:
1. http://www.uscg.mil/systems/gse/webCHOKEaa.html.
2. Ibid.

DHS Partnership

The real thing.

by Mr. Thomas Norton
Director, National Marine Center, U.S. Customs and Border Protection

As many founding members of the Department of Homeland Security (DHS) know, combining 22 agencies into a new department with a focus on creating synergies is easier said than done. Subsequent to the creation of DHS, it was difficult for many legacy agencies to abandon their "old way" of doing business and embrace change. But today is a different day. Agencies must learn to fully cooperate if we are to succeed in protecting this country from the myriad threats we face. Parochial attitudes will prevent us from becoming efficient, effective organizations and will hamper our chances of success.

Having served in an operational capacity for many years, I am no stranger to the sometimes stressful relationship that existed between Customs and Border Protection (legacy U.S. Customs Service) and the U.S. Coast Guard. Rest assured, nothing could be further from the truth today. We have created a true partnership. Not just lip service to the term "partnership," but a genuine effort to help each other and other DHS marine organizations to become better equipped to succeed in our missions.

Assessing Assets
In late 2003, DHS directed the strategic sourcing office to form a Boat Commodity Council (BCC). The idea

Asset standardization within the Department of Homeland Security ensures interoperability. Photo courtesy of CBP.

was to leverage buying opportunities and create resource synergies within each agency. The bottom line of this effort was to save money.

I will not soon forget the first Boat Commodity Council meeting I attended and how each representative (from agencies including USCG, CBP, and the Federal Law Enforcement Training Center) seemed so guarded, myself included. The perception was that a move was in place to consolidate the marine programs of several agencies into one. This could have had the unwanted consequence of one or more of us losing our program. As it turns out, this was a false perception.

Our first objective was to determine the marine boat assets and resources of each agency along with their roles. Imagine participating in an initiative that fully exposed your program! You ask yourself: "Will we be more vulnerable? Are they simply taking inventory to cull our program of assets that some may view as unnecessary?" These were valid points. However, we were soon able to dispel those concerns. We gathered data that provided us a fairly accurate estimate of the number and types of assets operated by each component, and the methods each component used to procure those assets. We then identified areas that could produce some cost savings. Areas such as procurement, standardization, training, and maintenance became our focus areas.

Discovering Commonalities

The next step was to make site visits in order to gain a better understanding of the resources that were available to meet our objectives. The USCG Boat Forces Center in Yorktown, Va.; Federal Law Enforcement Training Center (FLETC); and National Marine Center in St. Augustine, Fla., all provided great insight to help us keep moving toward our objective. We gradually started to trust that no one had any hidden agenda—no take-over attempts were really going to be pursued. The representatives of the council started to gel and function as a team. We focused on making the marine community within DHS more streamlined, responsive, and capable of meeting the ever-present maritime threat.

Once we had a fairly good estimate of the assets and missions of each agency, we needed to execute a procurement that produced savings and met a legitimate requirement. Our first big opportunity was to allow the Border Patrol to purchase six defender-class boats from a USCG contract. The Border Patrol had an urgent requirement for these vessels and the Coast Guard had a contract in place to procure them quickly.

The formula used to capture these types of cost avoidances is approximately two percent of the acquisition cost. What this means is that the ordering agency (Border Patrol) avoided two percent of the acquisition cost by not having to engage in the contract process. The Border Patrol was also afforded the extensive warranty terms of the USCG contract. Furthermore, the Coast Guard allowed the boats to be produced from its defender-class production line, which accelerated the de-

liveries tremendously. In total, DHS realized an estimated $500,000 in savings.*

Buy in Bulk!

Next step: personal protective equipment (PPE). Imagine all of the DHS marine community purchasing from different sources. Think of the wide variances in costs for survival suits, life vests, tactical vests, dry suits, etc. It's easy to understand how your buying power improves when you are buying for all of DHS, rather than for just one agency. CBP, for example, only has to equip approximately 200 marine enforcement officers, while the Coast Guard equips more than 9,000.

By combining PPE procurements into large, strategically sourced bulk contracts, CBP was afforded economies of scale that it would not have been able to achieve on smaller procurements. To date, the Boat Commodity Council has managed three PPE procurements, two for dry suits and one for personal locator beacons. It is estimated that by strategically executing these procurements, an estimated $500,000 will be saved over the life of the contracts.

With a couple of sizeable procurement savings in place, we then started to take on the bigger items. What about standardizing our boats? Think of the savings in acquisition, maintenance, training, etc. The National Marine Center (NMC) teamed up with the Coast Guard Office of Boat Forces and created the first joint CBP/USCG joint procurement. Customs and Border Protection had a requirement for shore-based intercept operations. The USCG had a requirement for a high-speed, shore-based, offshore boat intercept and joined in the procurement. Requirements for both agencies were included, and in September 2005 CBP awarded a contract to SAFE Boats International for up to 17 boats. CBP procured one boat, and the USCG exhausted the rest of the 17-boat contract.

Because the Coast Guard exhausted CBP's contract, it was agreed that USCG would take the lead on putting a new contract in place. Again, the Coast Guard and CBP collaborated on the requirements, and, in September of 2006, a second contract was executed for up to 95 boats over five years. Customs and Border Protection participated fully in the evaluation, and there are unique configurations that meet each agency's marking and electronics requirements. By working together on the procurements, and executing large contracts that leverage economies of scale, an estimated $1.2 million was saved.

Along with the acquisition, the Coast Guard determined that the current CBP vessel maintenance contract could provide turn-key maintenance and life cycle support with significant cost savings and increased efficiency. An interagency agreement was developed and USCG now uses the Customs and Border Protection national vessel maintenance contractor to maintain its special purpose craft–law enforcement vessels. Using the CBP maintenance contractor has directly resulted in increased operational availability for USCG vessels and savings in operating costs. It is estimated that by

leveraging CBP maintenance services, the Coast Guard will save approximately $240,000 in operating funding annually, once all the boats are delivered.

Sharing Equipment, Training, and Maintenance Results in Savings

To ensure the success of the shore-based offshore interceptor program, the Boat Commodity Council arranged for CBP to provide high-speed, noncompliant vessel pursuit training to the Coast Guard personnel who operate these boats. This training is provided before the boats are placed in operational service, and has directly contributed to several successful interdictions. It has further ensured that during multiagency pursuits, which are very common in some transit zones, both the USCG and CBP are using the same tactics, which not only improves the effectiveness of the pursuit, but also significantly enhances officer safety.

The council also recognized an opportunity to leverage the capability of the National Marine Center to maintain Honda outboard engine depot-level maintenance for the Coast Guard. USCG currently has approximately 1,400 Honda outboard engines in its inventory. Coordinating management and depot-level maintenance on such a large population of engines is a significant task. After a lengthy evaluation of USCG requirements, it was determined that a pilot program would be instituted to support USCG's First and Fifth Districts. NMC aggressively pursued certification as a Honda authorized dealer, and, as such, can execute both warranty and non-warranty repairs on defender-class boat engines.

The program places the responsibility to maintain the proper level of Honda engine inventory directly on the Naval Engineering Support Units, who leverage NMC maintenance and repair capability for depot-level repairs. The NMC computer database is accessed by units through the Internet to requisition engines and lower units. This program has been extremely successful to date, and is currently under evaluation for potential expansion USCG-wide.

The BCC has also brokered a significant number of boat transfers between DHS agencies. To date, approximately 22 boats have been transferred between the Coast Guard and CBP and between USCG and FLETC. These boat transfers have resulted in real savings of approximately $2 million. A significant side benefit of these transfers has been that Customs and Border Protection has been able to make measurable strides toward standardizing the Border Patrol's fleet of boats.

As the Coast Guard "excesses" nonstandard boats that are replaced by standard defender-class boats, NMC repaints, marks, and re-powers the boats, making them standard to the Border Patrol. The Border Patrol not only avoids the acquisition costs associated with the boats, but they are also afforded all the benefits of standardization, including operations, training, and maintenance efficiencies.

Share Ideas

There are many other examples illustrating the success of the BCC. It is important to highlight the major accomplishments and allow agencies an opportunity to learn that many perceived barriers can be negotiated. The key is to have a common objective, real cooperation, and to allow individuals to make recommendations—no matter how far "off the reservation" you think the recommendation may be.

It is not always easy to adapt to new cultures and processes. In today's atmosphere, however, we must be flexible and welcome change if that is what it takes to be better at our jobs. The stakes are high. Posturing ourselves to secure our borders will take every available resource.

This article is not intended to oversimplify the efforts of these programs, but rather to illustrate that this partnership truly works. Use this example in your organizations to help create opportunities for improvement. If it means calling the "guys next door" to find out how they do things, call them! You may be surprised to learn that their approach is better suited to meet your objectives.

About the author:
Mr. Norton's government career began in 1977. He is a former U.S. Marine and U.S. Army aviator. He has held numerous positions within the Customs and Border Protection Office of Air and Marine. A former customs pilot, and now the director of the National Marine Center in Saint Augustine, Fla., Mr. Norton works in concert with the U.S. Coast Guard to foster the partnership developed as a result of the DHS Boat Commodity Council. As the co-chair of the BCC, Mr. Norton aggressively pursues efficiencies, effectiveness, and cost-saving opportunities.

*All savings estimated by leveraging economies of scale through strategic sourcing initiatives and contract costs avoidance through joint procurement efforts.

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Reader's Survey

Risk-Based Mission Activity Analysis Process

Systematically aligning mission requirements, capabilities, competencies, and training.

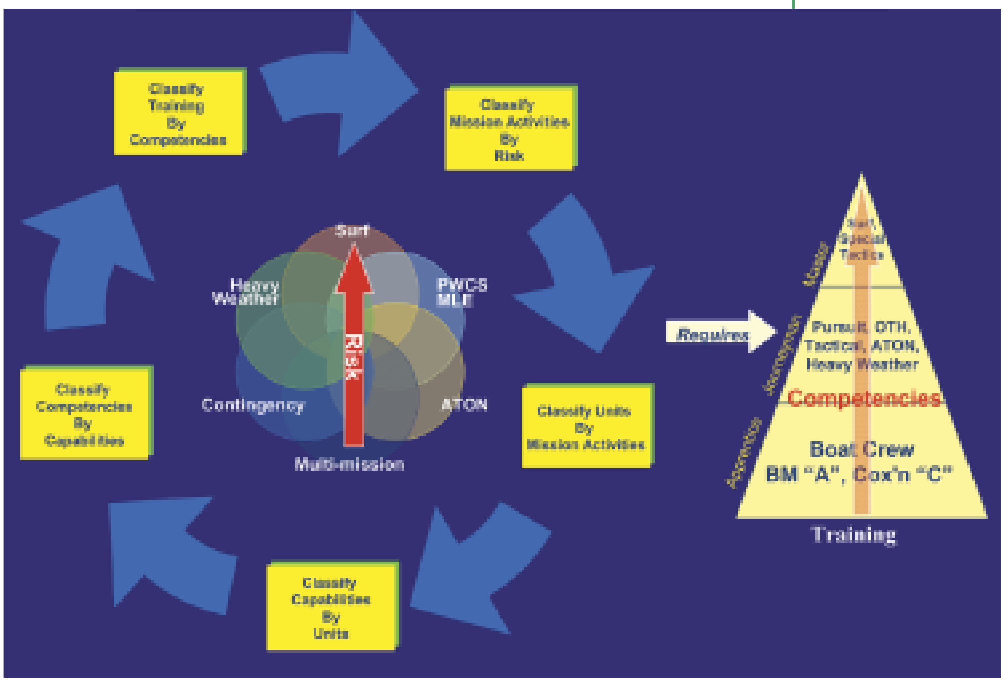
by Mr. Jeffrey Wheeler, USCG (Ret.)
Manager, Boat Crew Training and Professionalism, U.S. Coast Guard Office of Boat Forces

Recognizing that Coast Guard Boat Forces has significant capability (people and boats) and competency (skills and knowledge) gaps, with very little growth potential in budget forecasts, it is imperative that the Office of Boat Forces carefully aligns available capabilities and competencies with mission requirements. This will ensure that current capabilities are being optimized, allow the office to defensibly articulate requirements and "boat hours" gaps, and take immediate steps to mitigate these disparities through effective base management.

As the Coast Guard continues to mature in this post-9/11 environment, it is paramount that Boat Forces positions itself for future threats. With additional homeland security duties and responsibilities; an increase in shore-based drug and migrant interdiction operations; and continued legacy mission activities such as search and rescue, maritime law enforcement, marine environmental protection, recreational boating safety, and short-range aids to navigation; Boat Forces is heavily taxed and relied upon more than ever.

We must think and act differently in order to sustain our level of activity. Boat Forces consume nearly one-half of the Coast Guard's operating hours; three-quarters of all ports, waterways, and coastal security hours; conduct three-quarters of all maritime law enforcement; and account for three-quarters of lives and property saved.[1] For successful mission execution, we must continue to provide the best trained, most versatile, and most inclusive boat crews, equipped with the most capable and technologically advanced fleet of multimission boats.

To ensure that Coast Guard Boat Forces has the necessary tools to improve mission execution in a budget climate of zero growth, we must systematically look for efficiencies. The only way this can be achieved is through a detailed mission activity analysis—categorizing mission activity and deploying capabilities, competencies, and training by risk.



Risk-based mission activity analysis process. USCG graphic.

To assist in this decision-making process, the Office of Boat Forces has developed a risk-based mission activity analysis process. This process is a common-sense approach used to identify capability, competency, and training requirements based on a unit's highest level of risk. The process is sustainable and can be applied to all mission activities. Although risk can occur in all mission activities, some basic assumptions can be made, based on mission requirements. Here is how the process works.

feet, surf conditions exceed eight feet, and/or winds up to 50 knots.

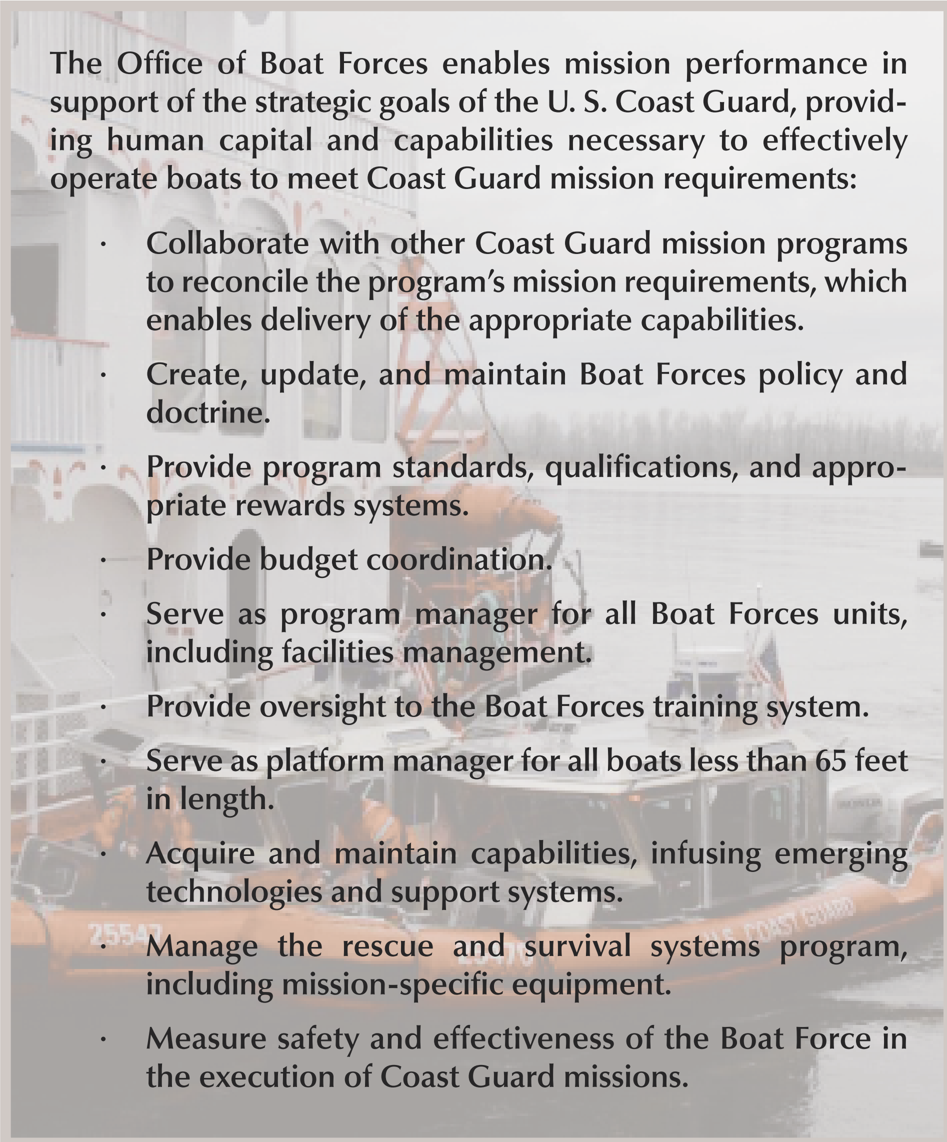
- **Ports and waterways coastal security –** antiterrorism and counterterrorism, including support of military outloads, to protect the U.S. maritime domain and the U.S. marine transportation system.
- **Maritime law enforcement –** armed intervention by Coast Guard personnel to detect and/or suppress any violation of applicable law.


USCG defender-class boat crews conduct training exercises. USCG Photo.

Classify Mission Activities by Risk

First, the Office of Boat Forces receives requirements from various Coast Guard mission program offices. These requirements typically fall under one or more of these mission activities:

- **Surf –** search and rescue response in environmental conditions where seas may reach 30
- **Heavy weather –** search and rescue response in environmental conditions where seas exceed eight feet and/or winds up to 50 knots.
- **Contingency –** responding to emergencies caused by natural disasters, terrorists, subversives, or by required military operations.
- **Aids to navigation –** the construction, maintenance, or deployment of short-range aids to



The Office of Boat Forces enables mission performance in support of the strategic goals of the U. S. Coast Guard, providing human capital and capabilities necessary to effectively operate boats to meet Coast Guard mission requirements:

- **Collaborate with other Coast Guard mission programs to reconcile the program's mission requirements, which enables delivery of the appropriate capabilities.**
- **Create, update, and maintain Boat Forces policy and doctrine.**
- **Provide program standards, qualifications, and appropriate rewards systems.**
- **Provide budget coordination.**
- **Serve as program manager for all Boat Forces units, including facilities management.**
- **Provide oversight to the Boat Forces training system.**
- **Serve as platform manager for all boats less than 65 feet in length.**
- **Acquire and maintain capabilities, infusing emerging technologies and support systems.**
- **Manage the rescue and survival systems program, including mission-specific equipment.**
- **Measure safety and effectiveness of the Boat Force in the execution of Coast Guard missions.**

navigation, including discrepancy response.

- **Multimission –** legacy missions (all-inclusive).

Although most Coast Guard Boat Forces units can be placed in general mission activity categories based on the most high-risk mission activity, it is important to note that missions and level of risk can change rapidly. Personnel must remain multimission capable.

As an example to explain this process, we will use a drug and migrant interdiction mission requirement. The Coast Guard has a shore-based requirement to prevent illegal drugs and/or illegal migrants from entering the United States. With smugglers and migrants using faster, more capable boats to breach our borders, the Coast Guard's current capabilities and competencies cannot support off-shore high-speed pursuit. With the requirement to stop illegal drugs and/or migrants, the Office of Boat Forces classifies this mission activity as maritime law enforcement–noncompliant vessel pursuit.

Classify Units by Mission Activities

Secondly, the Office of Boat Forces assesses all of a unit's assigned mission activities to determine the most high-risk mission activity performed on a routine basis. Continuing with our example, a Coast Guard station in Florida has the multimission responsibility to perform search and rescue, recreational boating safety, marine environmental protection, ports and waterways coastal security, and maritime law enforcement.

Included within the maritime law enforcement mission activity, this station has a requirement to perform shore-based drug and migrant interdiction. This mission activity requires shore-based, high-speed capable boats and specially trained people with the knowledge, skill, and ability to perform noncompliant vessel pursuit. The station's highest-risk mission activity is maritime law enforcement, so the station is classified as a "maritime law enforcement" station.

Classify Capabilities by Units

Next, the office assesses the capability requirement. Based on the operating hour requirements to perform each mission activity, the right number of boats and boat types are assigned to our Florida station. This will, in turn, drive the required number of personnel through a staffing algorithm.

Classify Competencies by Capabilities

Next, we assess the skills and knowledge required, based on the capabilities assigned. Since the station has been classified as a maritime law enforcement station, the capabilities required to perform the assigned mission activities have been determined. The Office of Boat Forces can now determine the required competencies (skills and knowledge) that the assigned personnel must possess to execute the mission activities. Required competencies include the following:

- **Noncompliant vessel pursuit coxswain–** trained to command and operate boats in noncompliant vessel pursuit.

- **Coxswain–**able to command and operate boats for multimission activities.
- **Boat crew member–**trained in deck seamanship and deck evolutions for search and rescue and maritime law enforcement.
- **Boat engineer–**schooled in boat engine and associated systems maintenance.
- **Boarding officer–**able to conduct maritime law enforcement vessel boardings, weapons deployment, and use of force.
- **Boarding team member–**trained to assist the boarding officer in conducting maritime law enforcement, vessel boardings, weapons deployment, and use of force.

In most cases, personnel are cross-trained to perform multiple functions. A boat engineer may very well serve as the boarding officer and a boat crew member may serve as a boarding team member.

Additional competencies, dependent on a unit's mission activity classification, include:

- **Surfman–**trained to command and operate boats in a surf and heavy weather environment.
- **Heavy weather coxswain–**able to command and operate boats in a heavy weather environment.
- **Aids to navigation coxswain–**able to perform construction, deployment, and maintenance on short-range aids to navigation.
- **Contingency coxswain–**reservist trained to command and operate boats for contingency operations.
- **Tactical coxswain–**trained in boat tactics and weapons deployment to protect high-value assets and defend against threats to the United States.

Dependent on the unit, additional competencies may be required to execute primary or collateral duties.

Classify Training by Competencies

Finally, with the determination of required competencies complete, the we can now articulate training requirements. The Coast Guard delivers training to our personnel through standard resident training (training centers), exportable training (training teams), or on-the-job training. Based on the availability of training, the Office of Boat Forces may require the development of training, obtain training quotas for existing standard resident courses, provide exportable training, or require the use of personal qualification standards.

Continuing with the example of the station in Florida, the Coast Guard had no doctrine or training capacity to support this level of training, so contract support was deployed. Customs and Border Protection had been doing this mission activity for years and had developed associated tactics, techniques, and procedures. A contract was let for Customs and Border Protection to provide Coast Guard boat crews with initial and sustainment training in support of noncompliant vessel pursuit. Joint tactics, techniques, and procedures were developed and deployed. Qualification tasks were developed and competency codes established to track this specific competency.

Once a Coast Guard member has achieved certification for a specific competency, he is required to conduct semi-annual and/or annual proficiency maintenance to ensure continued proficiency and professionalism.

Maintaining the Risk-Based Mission Activity Analysis Process Cycle

Whether Coast Guard Boat Forces are assigned new mission activities or called upon to step up existing ones, we must be ready. The Office of Boat Forces assesses readiness through a series of readiness measures, including human capital capacity, capability capacity, and consumption capacity.

Providing the right boats and the right people to meet assigned mission activities is the end goal. Today, this can only be accomplished by using a systematic approach to allocating limited resources to the most high-risk mission activities.

About the author:

With vast knowledge and experience in Coast Guard Boat Forces, CWO (BOSN) Jeff Wheeler was assigned as the manager of Boat Crew Training and Professionalism within the Office of Boat Forces in 2000. Retired from active duty in 2003, Mr. Wheeler continues to serve in that capacity.

Endnote:

1. U.S. Coast Guard Abstract of Operations System.

The Use of Operational Hours in Boat Service Life Management

by Mr. David M. Shepard, P.E., *Project Officer, U.S. Coast Guard Office of Boat Forces*

The U.S. Coast Guard owns and operates a fleet of more than 1,800 boats. Performing search and rescue; law enforcement; ports, waterways, and coastal security; recreational boating safety; and aids to navigation missions, along with many other missions, these boats contribute to the overall effectiveness of the Coast Guard. Of the 1,800 boats, over 1,100 are divided into 12 distinct standard classes of boats that are managed with national or regional program oversight.

Operational Hours

Each of these classes owned by the Coast Guard has an estimated "operational hour" level that represents the maximum number of hours that each boat is expected to be operated each year and a projected service life in years. These values are cornerstones of the boat class service life management program, and are used for a wide range of planning purposes, ranging from scheduling maintenance and reprocurement of spare parts to the recapitalization of the class of boats.

The calculation of the operational hours and the projected service life is done very early in the development of a new class of boats, long before the actual boats are delivered. The operational hours and service life are typically established based on the historic values for the class of boats for which the new class is to replace, or through a comparison to similar classes of vessels. In some cases, the operational hours are set higher than normal when the mission requirements dictate the use of a high operational tempo asset, and this typically correlates to a shorter projected service life. Operational hours and projected service lives for representative classes of boats are shown in table 1.

The operational hours are used in a wide range of service life management issues to determine the fleet size for a class of boats, plan for maintenance and logistics, and to establish the correct support funding and personnel through the budget process. The projected service life is also used for planning purposes, particularly with regard to acquisition planning.

Fleet Size

The operational hours statistic is a key element in determining the number of boats that are required in any class of boats. For boats that are to replace existing assets, the process is fairly straightforward. The Coast Guard constantly monitors the use of its boats through a program called AOPS (abstract of operations) and this data can be used to assess the historic operational need, in hours, for a given class of boats. This data can, in turn, be used to project the future needs for a new class of vessels. For example, if the AOPS data showed that 10,000 annual operating hours were required for a class of boats, and that class had a operational hour limit of 500 hours per year, the model would indicate that the Coast Guard would need 20 boats of this class.

In a 2004 siting analysis the Office of Boat Forces addressed the proper number and type of boats required by each Coast

Forty-nine-foot buoy utility stern-loading boat. USCG photo.

Guard station. Using AOPS data gathered from all the stations, and combining that with other data, such as special mission capability, weather conditions, and the ability to respond to both shallow water and offshore missions, the analysis determined a boat mix for each station using the operational hours for each class of boat. Of course the operational need, in hours, rarely results in a perfect whole number match when dividing by the boat operational hours, but every attempt is made to get the right mix of boats without requiring the boats to exceed the operational program hours.

Once this analysis was complete, it was forwarded to the operational commanders (Coast Guard areas and districts) for review and refinement. Surprisingly few changes were recommended. However, the siting plan and AOPS hours at each station is continually monitored as changes in operational requirements and policy can influence the fleet size requirements and relocation of assets. Recently this model was again reviewed and modified by shore-based working groups, convened by the areas.

Maintenance and Logistics Planning

Maintenance and logistics planning is essential to keeping the Coast Guard's fleet of boats running. Knowing the number of hours that a boat will operate in a given year is essential in this planning effort.

Some aspects of maintenance and logistics planning are not driven by operational hours. For instance, a larger boat with anti-fouling bottom paint will typically need that paint renewed on an annual basis. The same is true for a number of inspections that are conducted on a daily, weekly, monthly, quarterly, or annual basis to determine the condition of the boat's systems and equipment.

However, when it comes to the propulsion system, which is the largest and most complex system on a boat, the maintenance prescribed by the equipment manufacturer to ensure reliable operation is typically based on the number of operational hours. Maintenance tasks range from changing the oil and filters to complete overhaul or replacement of engines and other propulsion components.

At the early stages in the development of a new class of boats, a boat class maintenance plan is developed that provides an overarching plan on how frequently and at what level maintenance will be conducted. This plan, combined with the operational hours, helps program managers make sure that the right level of spare parts and materials are available, helps determine if the correct number of maintenance personnel will be available to conduct the maintenance, and is crucial in determining the correct level of annual support funding, called the standard support level, for each class of boats.

Budgetary Issues

The federal budget provides the resources for the Coast Guard to acquire new boats and maintain them through the lifecycle. The budget process is complex and well beyond the scope of this article, but understanding some of the basic issues involved in the budget process as it impacts the Coast Guard's boat fleet will help in understanding why establishing operational hours and a service life is vital to boat service life management.

Budget resources include both money and personnel, and for both there is a distinction between the resources needed to provide continued operation and those needed for the acquisition of long-life capital assets.

Resources for continued operation are called operating expenses (OE). In very simple terms, each agency like the Coast Guard has an OE base, meaning that there is a recurring amount of operational resources that are provided to that agency each year. Annual budget changes are made to increase or decrease these resources based on the needs of the agency.

Acquisition, construction, and improvement (AC&I) resources are used to acquire, provide, or improve long-life capital assets. Unlike the OE base, AC&I resources are provided separately in each budget. The funding for the operation and maintenance of assets acquired using AC&I funding is provided using OE resources. There are other categories of resources, but these typically don't apply to the boat fleet.

The typical budget process requires three years from the development of an agency's request for additional resources to the final receipt of those resources. However, there is always competition for limited resources, and simply making the request in no way guarantees that the resources will be provided. In the intricate balance of an agency's needs and the federal budget's ability to meet those needs, it is frequently difficult to predict which initiatives will be approved and ultimately result in additional resources being made available to the agency.

One of the primary keys to success in the budgetary process is the ability to accurately predict future resource needs. The use of operational hours goes a long

continued on page 35

EXCEEDING THE OPERATIONAL HOURS

It seems like a simple thing to just run a boat more than the operational hours. It is unlikely that this will have a dramatic impact on the boat's operations in the short term. However, fleetwide, and over the life of the vessel, exceeding the operational hours can have serious programmatic impact.

The most noticeable initial impact is the added maintenance required. This means that in a given year more resources (labor and materials) will be used than were originally predicted, and this places a burden on those who conduct the maintenance. It also strains the planned budget and logistics support system. In particular, this can cause shortages in the parts and supplies stocked to support the maintenance, exceed the capacity of overhaul facilities, and burden already-strained crews with an additional workload.

In the longer term, the increased usage will decrease the service life in the same way that a car that is driven 30,000 miles a year will need to be replaced sooner than a car that is driven 15,000 miles a year. If the same small portion of the fleet repeatedly exceeds the operational hours, those boats will need to be replaced before the rest of the fleet. This imbalance typically means that a stop-gap purchase of boats is required to fill the need before a contract can be put in place to build a new fleet.

The most effective strategy for mitigating this is to monitor the activity of the boats, and then redistribute the fleet so boats that exceed operational hours are rotated with boats that are not reaching the operational hours.

Class	Operational Hours	Service Life in Years
24-foot Cutter Boat–Over the Horizon (CB-OTH)	150	5-7
25-foot Defender-Class Boat	500	5-7
26-foot Trailerable Aids to Navigation Boat (26′ TANB)	500	5-7
41-foot Utility Boat (41′ UTB)	600	20
45-foot Response Boat–Medium (RB-M)	600	20
47-foot Motor Lifeboat (47′ MLB)	600	20
49-foot Buoy Utility Stern Loading Boat (49′ BUSL)	500	20

Table 1

A 47-foot motor lifeboat conducts surf operations. USCG photo.

way to ensure the accuracy of these forecasts, allowing the Coast Guard to predict the resources required to support existing boats.

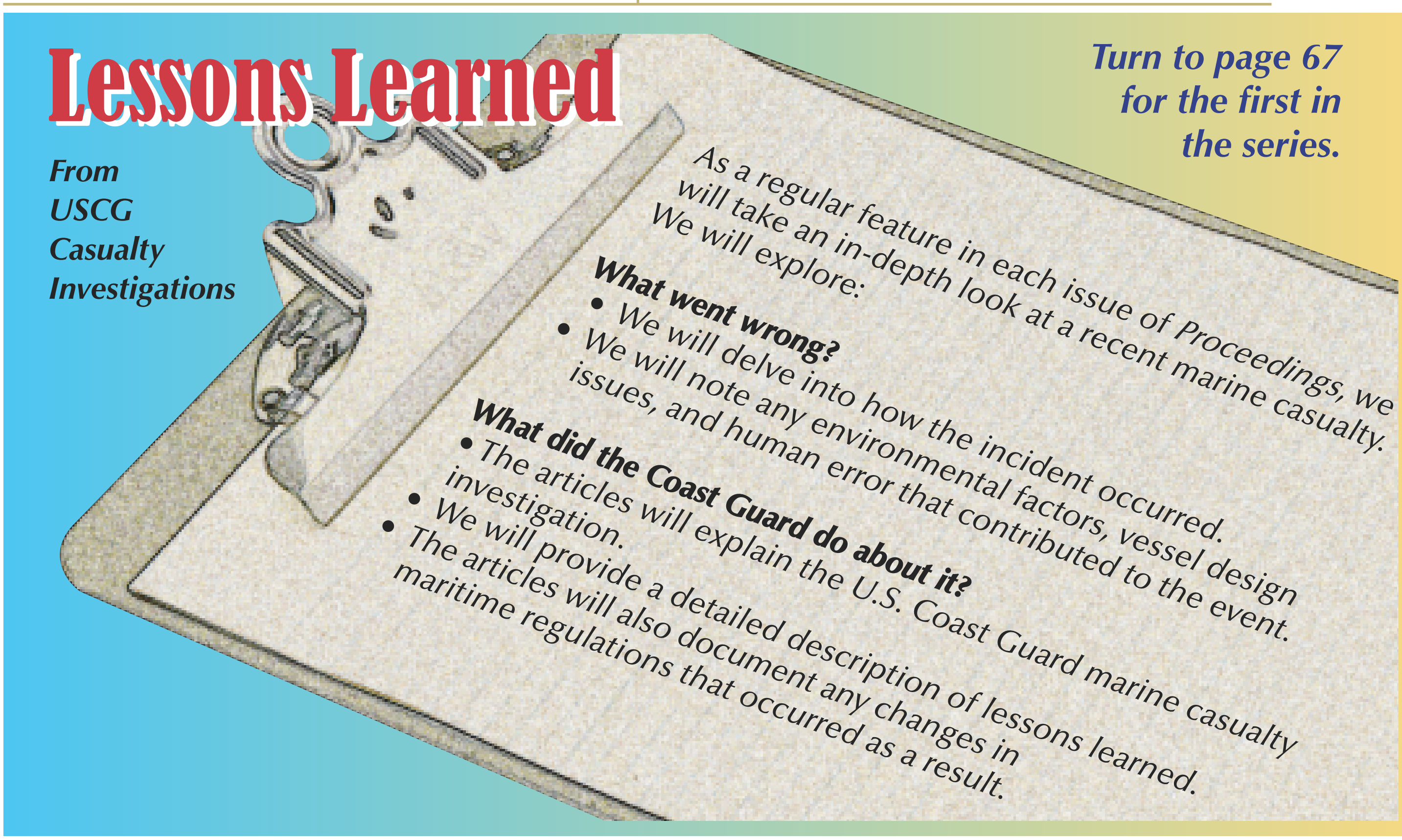
Buying a new class of boats is rarely easy. It takes a considerable amount of work to develop the requirements, the acquisition plans, solicit for proposals, evaluate the proposals received, and, finally, construct the boats. With the constantly evolving missions of the Coast Guard, there is almost always a desire to improve the performance of new boats over those currently in the inventory. This is definitely the case in the post-9/11 environment, where the Coast Guard is attempting to incorporate multimission capabilities in each class of standard boats. Providing multimission boats typically means that there is no strict "off-the-shelf" solution, and acquisition strategies must allow for more developmental designs and the necessary evaluation of these designs.

At best, once the funding is provided through the budgetary process, the first boat of a new class of boats can be delivered in one year, using a streamlined acquisition process. However, this timeline can easily extend to years for a complex acquisition. Aside from the technical complexity of the new boat, the acquisition complexity increases with the value of the acquisition. The rules established by the Federal Acquisition Regulations, and the combined Department of Homeland Security and Coast Guard regulations, dictate increased complexity and greater levels of checks and balances for acquisitions when the dollar value of the acquisition increases. For these complex acquisitions, like the 47-foot motor lifeboats and the 49-foot buoy utility stern-loading boats, it can take five to 10 years from project inception to fielding the first production boats.

These extensive timelines mean that it can, and often does, take considerable planning to ensure that new boats are procured in time to replace boats that are at the end of their service life. One of the major keys to this planning is to ensure that budget requests are submitted, and fully supported, in time to provide the resources for the new boats.

Operational hours and the projected service life are valuable tools in effectively managing the Coast Guard's fleet of boats. Using these values, program managers can effectively plan for maintenance and recapitalization of the Coast Guard's extensive fleet.

About the author:
Mr. David Shepard has more than 20 years of experience working with Coast Guard boats, and for the last six years has served as a project officer with the U.S. Coast Guard Office of Boat Forces. He has a bachelor's degree in naval architecture and marine engineering from Webb Institute, a master's degree in engineering from George Washington University, and is a licensed professional engineer.



USCG Small Boat Operator Trainer

State-of-the-art simulator technology expands the maritime training continuum.

by Commander Scott Burlingame, USCG (Ret.)
Program Manager
Naval Air Warfare Center Training System Division

Mr. William Smith
Senior Program Manager
Computer Sciences Corporation

Mr. Eugene Miller
Senior Principal Engineer
Computer Sciences Corporation

Mr. Brett Fox
Senior Project Engineer
Computer Sciences Corporation

The U.S. Coast Guard's renewed emphasis on the ports, waterways, and coastal security mission has given rise to an increased operational requirement for Coast Guard forces to provide waterside security measures. Although these forces have conducted similar operations in the past, there is a heightened awareness of the threat to USCG forces and the assets they may be assigned to protect. Limitations on available training opportunities with high-value assets, restrictions on live-fire training opportunities, and the practical difficulties associated with planning and executing complex force protection training exercises introduce additional challenges to ensuring the proficiency of mission resources.

The simulator systems include:

- a boat control station with actual boat controls, console, navigation radar, communications, and, for the defender class, the actual boat cabin;
- a visual scene image-generation and display system with horizontal field of view ranging from 50 to 360 degrees, depending on model;
- sound simulation;
- an interface to a small arms trainer;
- an instructor/operator station;
- scenario generation, replay, and debriefing capability.

Simulator-based training of boat crews in ports, waterways, and coastal security and other mission areas has the potential to increase the quality and frequency of this training in a cost-effective manner. Through partnership with the U.S. Navy Training Systems Division in Orlando, Fla., the Coast Guard has introduced small boat operator trainer simulators into its training continuum.

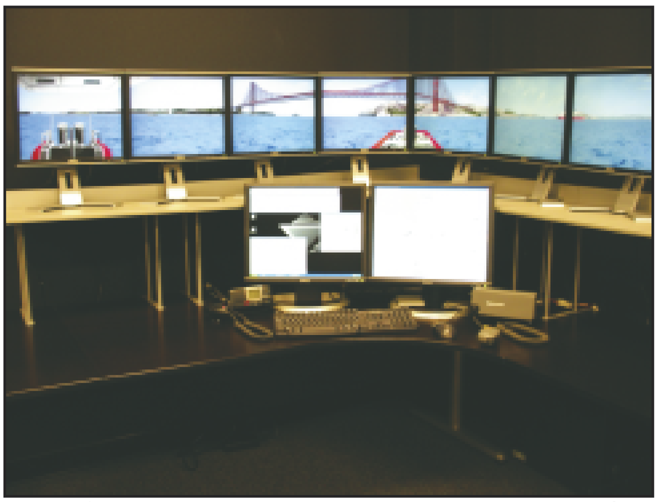
Three prototype defender-class simulator systems have been delivered to the Boat Forces Center at the USCG Training Center, Yorktown, Va., and an additional 47-foot motor lifeboat (MLB) prototype system has been installed at the National Motor Lifeboat School in Ilwaco, Wash.

The simulator systems take advantage of a commercial software baseline that incorporates years of development in both Army and Navy maritime simulators that include antiterrorism force protection capabilities. The small boat operator trainer systems operate within a flexible architecture that is easily modified to accommodate dynamic mission requirements.

Most recently, the Coast Guard confirmed the feasibility of integrating a proven automatic weapon simulator system within the small boat operator trainer simulator environment. This integrated simulation capability will allow com-

View from inside a defender-class boat operator trainer cabin, looking forward. Photos courtesy of Computer Sciences Corporation.

Inside the defender-class boat cabin, looking aft.



The defender-class boat operator trainer instructor/operator station.

External view of the defender-class boat operator trainer.

bined training of tactical coxswains, boat crews, and gunners in a realistic virtual environment that would be nearly impossible to replicate in a live training exercise.

Small Boat Operator Trainer Capabilities

Small boat operator trainer simulators provide the Coast Guard boat forces community with an increased ability to conduct practical exercises to reinforce the skills of the coxswain and crew in a virtual environment. In particular, the simulators provide boat forces with the ability to:

- exercise tactics and procedures that are too dangerous to include in live training;
- customize training scenarios to include specific environmental conditions (weather, time of day, etc.) that cannot be controlled in live training;
- customize a series of training scenarios to address specific crew shortfalls through focused remedial sessions that would prove too costly to include in a traditional live training class curriculum;
- create complex multi-boat scenarios with threats and other vessel traffic that could not be created in live training exercises;
- change from one training scenario to another within minutes;
- play back training scenarios for immediate student critique and feedback;
- continuously validate doctrine and tactics.

One of the defender-class systems and the 47-foot motor lifeboat system are configured with visual systems capable of a 360-degree field of view. The other two systems are smaller and have 50-degree field of view visual systems, with optional head-mounted displays. The three defender-class systems can operate in stand-alone mode, or as integrated systems in complex training scenarios.

The Coast Guard small boat operator trainer simulators utilize Computer Sciences Corporation's "VirtualShip" simulator software. As such, the simulator is compatible with the software and databases that are currently being used by the Army's maritime integrated training systems at Ft. Eustis, Va., and Mare Island, Calif.; the Navy's conning officer virtual environment at the Surface Warfare Officers School Command in Newport, R.I.; the Navy's guided missile destroyer pre-com unit at Bath Iron Works, Bath, Maine; as well as by the Military Sealift Command at St. Helena, Va.

By selecting a Department of Defense-proven software product as the baseline for small boat operator trainer simulator systems, the Coast Guard has been able to field systems that incorporate millions of dollars' worth of previously developed ship models, harbor databases, scenarios, antiterrorism force protection/weapons capability, and other DoD lessons learned at a fraction of the cost.

Small Boat Operator Trainer Development

After selecting the software baseline, development was focused on three key initiatives unique to boat forces operations and training:

- Development of a real-time boat response model for the MLB and defender-class boat suitable for use in Coast Guard training applications. These models had to be valid over the full range of boat operating speeds; include the maneuvering performance of the defender-class and MLB; and include motor lifeboat response to waves, including breaking waves and surf.
- Development of a model/procedure within the simulation to represent large breaking waves and surf that is suitable for the motor lifeboat training application that interfaces the wave parameters into the MLB response model.
- Development of a visualization procedure for the large breaking waves and surf and the integration of this visualization into a real-time simulator.

Since boat operations occur under a wide range of conditions, the latest spiral development initiative has been to integrate the operator trainer with a proven automatic weapon simulator system. This will support combined training of coxswains, boat crews, and gunners in a common virtual environment and allow assessment of marksmanship and judgment skills related to weapons engagement while operating on a small boat platform.

The Coast Guard plans to evaluate the effectiveness of the weapons simulator integration at TRACEN Yorktown with follow-on plans to relocate this cutting-edge training capability to the Special Missions Training Center at Camp Lejeune, N.C.

Deployment

The Coast Guard's initial deployment of small boat operator trainer simulators for the defender-class and motor lifeboats, some with integrated small arms trainer simulators, is ongoing. Expansion to other boat types is being evaluated. These systems are showing significant capability to extend and enhance the training of coxswains, boat crews, and gunners in complex ports, waterways, and coastal security and related mission areas.

In addition to ongoing weapons simulator integration and Navy-funded development efforts to continuously enhance the software baseline, there is the potential to team with other end users to add capability or further validate current capability. Organizations with similar operational and training requirements, such as the Navy Center for Security Forces, DoD Special Forces, and the Federal Law Enforcement Training Center have expressed interest in partnering with the Coast Guard to enhance simulator training capability.

About the authors:

Mr. Scott Burlingame is the USCG program manager at the Naval Air Warfare Center Training System Division in Orlando, Fla. He served as commanding officer on two cutters and was the Coast Guard's first senior duty officer in the White House Situation Room.

Mr. Miller, Mr. Smith, and Mr. Fox have more than 50 years' experience in the field of maritime simulation technology, primarily focused on providing training solutions to the military services.

Station Duty Standing

New missions necessitate a new approach.

by LT Matthew Baer
Commanding Officer, USCG Station Seattle

BMC Christopher Gempp
Operations Chief, USCG Station Seattle

The creed of the United States Coast Guardsman sums up the beliefs, guiding principles, and heritage shared by "Coasties" around the world. Among our service's most cherished and respected duties, ingrained in us all from the beginning of our careers, is that of standing the watch. The sixth line of our creed states: "I will always be at my station, alert and attending to my duties." That is exactly what station boat crews and boarding teams do every hour of every day.

Creed of the United States Coast Guardsman

(written in 1938 by VADM Harry G. Hamlet, USCG)

I am proud to be a United States Coast Guardsman.

I revere that long line of expert seamen who, by their devotion to duty and sacrifice of self, have made it possible for me to be a member of a service honored and respected, in peace and in war, throughout the world.

I never, by word or deed, will bring reproach upon the fair name of my service, nor permit others to do so unchallenged.

I will cheerfully and willingly obey all lawful orders.

I will always be on time to relieve, and shall endeavor to do more, rather than less, than my share.

I will always be at my station, alert and attending to my duties.

I shall, so far as I am able, bring to my seniors solutions, not problems.

I shall live joyously, but always with due regard for the rights and privileges of others.

I shall endeavor to be a model citizen in the community in which I live.

I shall sell life dearly to an enemy of my country, but give it freely to rescue those in peril.

With God's help, I shall endeavor to be one of His noblest works...a United States Coast Guardsman.

For more than 200 years, Coast Guard personnel have labored, standing a variety of watch rotations or schedules that were developed to ensure the best readiness possible at the given unit. Four-hour watches aboard ship, 12-hour watches at command centers, and 24-hour watches at stations are all part of our Coast Guard heritage and legacy. Over the years, lessons learned and success stories have helped shape and mold our duty-standing models into what they are today.

Never has the Coast Guard been more relevant or esteemed in the federal government, the maritime community, or to the boating public that we serve. That relevance is born of tasking, beyond our legacy mission profile, predominately in the realm of maritime security patrolling and escort activities in our ports, waterways, and coastal security (PWCS) regions. Effective watchstanding is one of the leading ways we fulfill our service to the maritime public, yet executing our vast mission responsibilities is accomplished only through efficient workforce management of our duty crews.

As leaders, we must focus our attention to ensure our crews stand the watch in the most efficient manner possible, thus improving quality of life at home, balancing work/life issues, and reducing risk in the process. As mission tasking rises and our staffing models change, our policy on duty-standing postures must evolve as well.

The terrorist attacks of September 11, 2001 drastically impacted the Coast Guard's mission requirements and dictated a shared number-one priority mission status for both search and rescue (SAR) and maritime homeland security. The resultant alteration was felt heavily across all programs, but stations in the PWCS regions bore the brunt of this paradigm shift. In fiscal year 2005 alone, Coast Guard boat forces units logged nearly 179,000 PWCS underway hours, which accounted for 69 percent of all Coast Guard PWCS mission hours.[1] A majority was conducted in the form of planned patrol activity that was accomplished in conjunction with maintaining a ready response posture for distress cases.

The creation of maritime safety and security teams and the increased operational tempo of 87- and 110-foot patrol boats has helped ease the increased mission burden on units like Station Seattle. However, due to the deployable nature of maritime safety and security teams and personnel tempo limitations of the patrol boats, longer-term station staffing shortfalls still exist. Since the Coast Guard's current station staffing model is based predominantly on SAR readiness requirements, our program manager, the USCG Office of Boat Forces, has systematically funded additional boats and crews in an attempt to size units based on PWCS activities since 9/11.

Despite best efforts, recent analysis of boat forces units conducting ports, waterways, and coastal security activities revealed a gap in excess of 324,000 hours.[2] The source of this gap is predominately due to lack of boat crews, which can only be corrected through future budget allocations. To help identify the proper staffing level at stations, the Office of Boat Forces has thoroughly analyzed new mission requirements and developed a modernized station staffing model that includes PWCS patrol activity. In the meantime, collectively across the Coast Guard, the burden of competing SAR and PWCS missions is taking a toll on boat crews. While we wait for future personnel allocations to come our way, stations must find creative ways to employ our people and boats.

Traditional Watchstanding Rotation

A "port/starboard" duty rotation (Figure 1) refers to a work schedule where a particular section works two days on, two days off, and has duty every other weekend. Historically across the Coast Guard, the term "on duty" has required the member to be "onboard" the unit, with the unit normally divided into multiple duty sections, with multiple crews in each.

In the traditional sense, all hands in the duty section would be required to sleep each duty night at the station, but only one four-person boat crew would be responsible for the actual search and rescue response duty. The remaining members would remain onboard for contingencies and to complete station work.

Station Seattle is just one of many units that has developed a "best practice" duty-standing rotation that strives to efficiently balance work/life factors. No cookie cutter model exists, because each unit is different and has different personnel resources, boat types, and station maintenance needs, as well as a different operating environment.

Modified Port/Starboard Duty Rotation

Given current staffing limitations, stations staffed sufficiently to provide two or more certified boat crews in each of two sections can find that a modified port/starboard duty rotation, with sliding weekends, works best (Figure 2). To combat our personnel staffing shortfalls, Station Seattle utilizes this type of duty rotation to maintain a 24/7 response capability while supplying boat crew shifts for PWCS patrols.

By modifying the traditional schedule to require only one four-person boat crew and requiring any duty section members in an "unqualified status" to sleep onboard the unit each night, Station Seattle allows the other duty section members to work a 12-hour shift and spend the evening at home in "recall" status. The next duty day, the SAR response duty is relieved, and the duty crews swap places.

The daily focus of the 12-hour shift workers is patrol activity, training, station maintenance, and crew professional development. The mission activity does sometimes require that all hands be underway, which may postpone general military training sessions or preventative maintenance duties. The model does not account

Week	Crew	Mon	Tue	Wed	Thur	Fri	Sat	Sun	Total
Week 1	A	24	24	0	0	24	24	24	120
	B	24	24	0	0	24	24	24	120
	C	24	24	0	0	24	24	24	120
Week 2	A	0	0	24	24	0	0	0	48
	B	0	0	24	24	0	0	0	48
	C	0	0	24	24	0	0	0	48
Week 3	A	24	24	0	0	24	24	24	120
	B	24	24	0	0	24	24	24	120
	C	24	24	0	0	24	24	24	120
Week 4	A	0	0	24	24	0	0	0	48
	B	0	0	24	24	0	0	0	48
	C	0	0	24	24	0	0	0	48
Week 5	A	24	24	0	0	24	24	24	120
	B	24	24	0	0	24	24	24	120
	C	24	24	0	0	24	24	24	120
Week 6	A	0	0	24	24	0	0	0	48
	B	0	0	24	24	0	0	0	48
	C	0	0	24	24	0	0	0	48
Week 7	A	24	24	0	0	24	24	24	120
	B	24	24	0	0	24	24	24	120
	C	24	24	0	0	24	24	24	120
Week 8	A	0	0	24	24	0	0	0	48
	B	0	0	24	24	0	0	0	48
	C	0	0	24	24	0	0	0	48
Week 9	A	24	24	0	0	24	24	24	120
	B	24	24	0	0	24	24	24	120
	C	24	24	0	0	24	24	24	120
Week 10	A	0	0	24	24	0	0	0	48
	B	0	0	24	24	0	0	0	48
	C	0	0	24	24	0	0	0	48
AVERAGE WORK WEEK HOURS									**84**

Figure 1: Traditional port/starboard rotation schedule.

Week	Crew	Mon	Tue	Wed	Thur	Fri	Sat	Sun	Total
Week 1	A	24	12	0	0	12	12	12	72
	B	12	24	0	0	12	12	12	72
	C	12	12	0	0	24	12	12	72
Week 2	A	0	0	24	12	0	0	0	36
	B	0	0	12	24	0	0	0	36
	C	0	0	12	12	0	0	0	24
Week 3	A	12	12	0	0	12	24	12	72
	B	12	12	0	0	12	12	24	72
	C	24	12	0	0	12	12	12	72
Week 4	A	0	0	12	12	0	0	0	24
	B	0	0	12	12	0	0	0	24
	C	0	0	24	12	0	0	0	36
Week 5	A	12	24	0	0	12	12	12	72
	B	12	12	0	0	24	12	12	72
	C	12	12	0	0	12	24	12	72
Week 6	A	0	0	12	24	0	0	0	36
	B	0	0	12	12	0	0	0	24
	C	0	0	12	12	0	0	0	24
Week 7	A	12	12	0	0	12	12	24	72
	B	24	12	0	0	12	12	12	72
	C	12	24	0	0	12	12	12	72
Week 8	A	0	0	12	12	0	0	0	24
	B	0	0	24	12	0	0	0	36
	C	0	0	12	24	0	0	0	36
Week 9	A	12	12	0	0	24	12	12	72
	B	12	12	0	0	12	24	12	72
	C	12	12	0	0	12	12	24	72
Week 10	A	0	0	12	12	0	0	0	24
	B	0	0	12	12	0	0	0	24
	C	0	0	12	12	0	0	0	24
AVERAGE WORK WEEK HOURS									**50.4**

Figure 2: A sample breakdown of the rotation for Station Seattle, with three duty crews per duty section over a 10-week period.

for "all-hands" days; surge operations; training team visits/inspections; or unforeseen medical issues, injuries, or illnesses. As is the case with any level of staffing, flexibility remains the key to success, as no rotation can accommodate all possible scenarios.

In the modified port/starboard duty rotation, within each section, boat crew "A" would stand the first 24-hour response rotation and boat crew "B" would work a 12-hour shift and be allowed to go home after completing patrol activity, training, and station maintenance/work for that day. The following day, boat crew "B" would assume the 24-hour rotation and boat crew "A" would work a 12-hour shift. Based on a one-month duty rotation, and assuming sliding weekend duty, each section's average work week is reduced from approximately 90 hours to close to 50. Available PWCS mission hours are increased, and the schedule allows added flexibility to schedule 24/7 shift work.

This model is scalable to suit a staffing level that provides any number of additional crews available per duty section to support a mandated level of PWCS activity at a given station. For instance, some stations are staffed to a level that renders three crews available per section. These stations may incorporate a rotation of 12-hour shifts that increases available PWCS and training hours, while balancing station maintenance/work and off-duty time in the most efficient and effective manner.

Each unit must, of course, take into account the reality of its own unique situation prior to modifying the duty rotation. However, as a good business practice, each station should review current duty section practices and look for new ways to more effectively maximize existing resource utilization, while improving the quality of life for our crews. It is obvious that many operational situations arise that require direct command management to ensure continuous success. Modifications to onboard duty section requirements necessitates constant monitoring by boat forces leadership to ensure the unit maintains operational readiness through all levels of operational tempo, leave, temporary duty periods, and personnel transfer cycles. Traditional thinking—that all personnel must be onboard—can no longer be considered the norm if we are to meet increasing mission requirements and ensure quality of life for our crews.

About the authors:
LT Matthew Baer has served in the Coast Guard for nine years aboard U.S. Coast Guard cutters Diligence *and* Juniper *as operations officer at Group Hampton Roads, and as commanding officer of Station Seattle.*

BMC Christopher Gempp has served in the Coast Guard for more than 19 years at six stations, Aids to Navigation Team Galveston, and as executive petty officer aboard CGC Point Sal *and CGC* Sturgeon.

Endnotes:
1. U.S. Coast Guard Abstract of Operations.
2. U.S. Coast Guard Office of Boat Forces analysis.

STATION SEATTLE

Based in a year-round recreational boating hub of activity and a militarily and economically strategic commercial port, Station Seattle is tasked daily with a multitude of legacy SAR response cases and law enforcement boarding targets while also conducting patrol activity in support of PWCS missions. Post-9/11, Station Seattle transformed almost overnight from a rather quiet response unit into the busiest Pacific Area station, with the third-highest annual operating hours nationwide.[1] The spike in mission requirements, along with an increase in boat allowance and personnel assigned to the unit over the past few years, forced a change in the leadership mindset toward boat crew utilization.

To accomplish its vast operational mission profile, Station Seattle employs its 42-person crew in a modified port/starboard duty rotation that provides one on-duty SAR response crew and one to two PWCS patrol crews daily. At the current staffing level, this rotation produces an ideal balance among underway missions, unit maintenance, training, and leave/liberty time for the crew.

In fiscal years 2004, 2005, and 2006, Station Seattle crews amassed 4980, 5098, and 4355 hours, respectively, with each duty-standing coxswain averaging approximately 687 hours per year.[2] This equates to about 12 hours of patrol and response activity per day.

In keeping with our traditional SAR response legacy, and through exceptional partnering with other government agencies, we are still able to respond to every SAR case. However, despite our best efforts, a gap still exists in the patrol missions we accomplish and the PWCS mission requirements, forcing other units (patrol boats, maritime safety and security teams, and Maritime Force Protection Unit Bangor) to augment the operational commander's mission execution for PWCS. Like any other unit in the Coast Guard, Station Seattle does its best to do more with less, but likewise, this PWCS gap is not unique to us.

A Station Seattle 41-foot UTB delivers a port security boarding team to a merchant vessel. USCG photo.

Endnotes:
1. U.S. Coast Guard Abstract of Operations.
2. Ibid.

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Boat Forces E-Training System

A new, fully integrated training system.

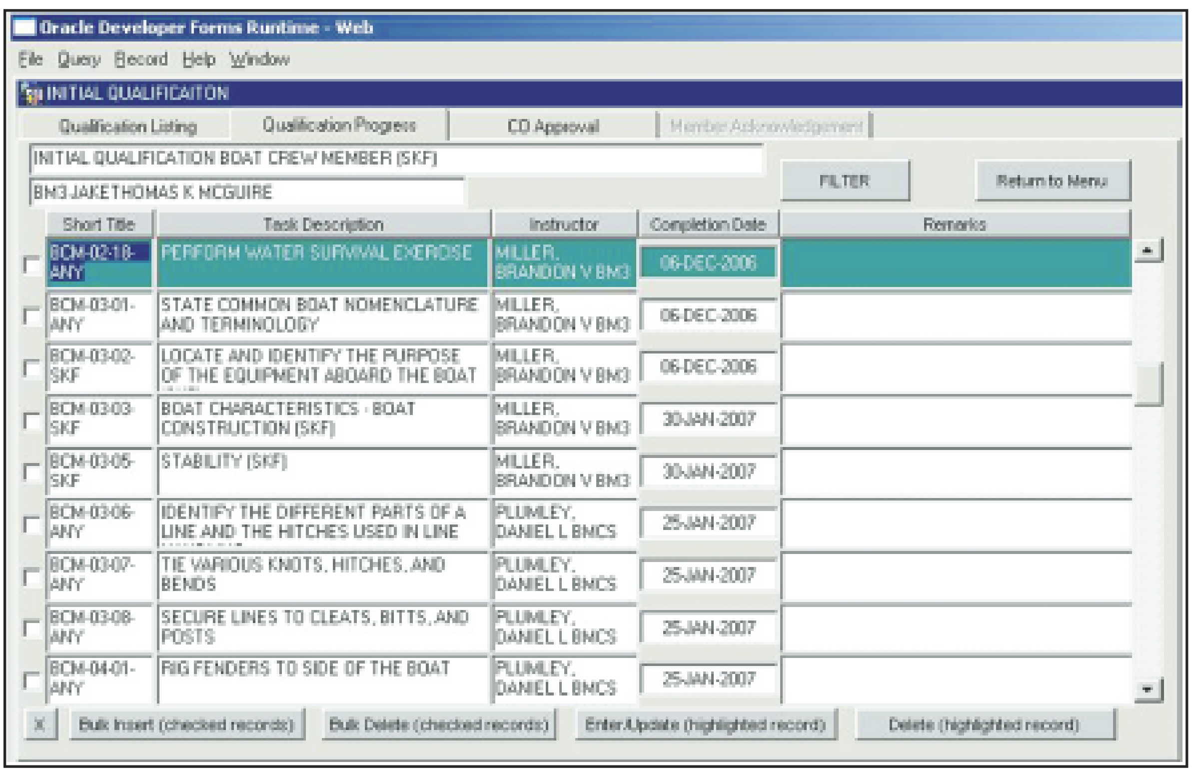
by LTJG Thomas Martin, *Training Management Tool Program Manager*
U.S. Coast Guard Office of Command & Control Capabilities

Mr. Robert Mills, *Training Management Tool Project Officer*
U.S. Coast Guard Operations Systems Center

On January 1, 2007, the U.S. Coast Guard Office of Command and Control Capabilities and Office of Boat Forces deployed a new electronic training system, Boat Forces E-Training, to all Boat Forces units. The Boat Forces E-Training system is a tool that tracks the completion of all required training for all positions on all boat types, and eliminates the need for paper-based training records. This new system embodies the intent of e-Coast Guard,[1] saves time, and allows for better training oversight and management.

The Boat Forces E-Training system is an integrated module of the Coast Guard's abstract of operations/training management tool (AOPS/TMT) program, which is used to record resource hours for operational units and track training at the unit and boat crew level. The system contains individual competencies for each Coast Guard boat type and includes both active duty and reserve contingency competencies.

The system was beta-tested at eight small boat stations. The feedback from these first users was incorporated when the system was fully deployed. Upon full-scale deployment, the initial feedback from field users has been overwhelmingly positive. Since its



Oracle Developer Forms Runtime - Web

File Query Record Help Window

INITIAL QUALIFICAITON

Qualification Listing | Qualification Progress | CO Approval | Member Acknowledgement

INITIAL QUALIFICATION BOAT CREW MEMBER (SKF)

BM3 JAKETHOMAS K MCGUIRE

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Short Title	Task Description	Instructor	Completion Date	Remarks
BCM-02-18-ANY	PERFORM WATER SURVIVAL EXERCISE	MILLER, BRANDON V BM3	06-DEC-2006	
BCM-03-01-ANY	STATE COMMON BOAT NOMENCLATURE AND TERMINOLOGY	MILLER, BRANDON V BM3	06-DEC-2006	
BCM-03-02-SKF	LOCATE AND IDENTIFY THE PURPOSE OF THE EQUIPMENT ABOARD THE BOAT	MILLER, BRANDON V BM3	06-DEC-2006	
BCM-03-03-SKF	BOAT CHARACTERISTICS - BOAT CONSTRUCTION (SKF)	MILLER, BRANDON V BM3	30-JAN-2007	
BCM-03-05-SKF	STABILITY (SKF)	MILLER, BRANDON V BM3	30-JAN-2007	
BCM-03-06-ANY	IDENTIFY THE DIFFERENT PARTS OF A LINE AND THE HITCHES USED IN LINE	PLUMLEY, DANIEL L BMCS	25-JAN-2007	
BCM-03-07-ANY	TIE VARIOUS KNOTS, HITCHES, AND BENDS	PLUMLEY, DANIEL L BMCS	25-JAN-2007	
BCM-03-08-ANY	SECURE LINES TO CLEATS, BITTS, AND POSTS	PLUMLEY, DANIEL L BMCS	25-JAN-2007	
BCM-04-01-ANY	RIG FENDERS TO SIDE OF THE BOAT	PLUMLEY, DANIEL L BMCS	25-JAN-2007	

X | Bulk Insert (checked records) | Bulk Delete (checked records) | Enter/Update (highlighted record) | Delete (highlighted record)

Figure 1: The E-Training system displays the required task list for qualification. USCG graphic.

implementation, there have been more than 20,000 records created in the system. Now that the system has been fully deployed, work has begun to expand, update, and improve the system based on user feedback and program requirements.

The System in Use

Boat Forces units use the E-Training system to assign members' training based on unit position. The assignment process allows units to specify what training each individual requires and allows the unit the utmost flexibility in determining its own training requirements (Figure 1). Once a member is assigned a specific competency, the system then provides a list of all the boat crew qualification tasks the member must complete in order to earn a competency code. When the member finishes the required training, the date of completion is entered into the system. The list of required training is constantly updated, showing the member's progress through the qualification process.

For units that have multiple boat types, trainees can be assigned specific training on each boat type. Tasks that are common to all boat types need only be entered once, and they will automatically populate the training lists for the other types. Tasks that are not required at a specific unit or cannot be completed can be deferred. Upon completion of all the required boat crew qualification tasks, the unit's commanding officer or officer in charge must certify the trainee in the E-Training system (Figure 2). The trainee then acknowledges the certification in the system and is recorded as "qualified." Once qualified, the system automatically assigns the member the required currency maintenance training in TMT, so the member can begin tracking recurring training requirements. The system also automatically enters the qualification into the Coast Guard's personnel information system.

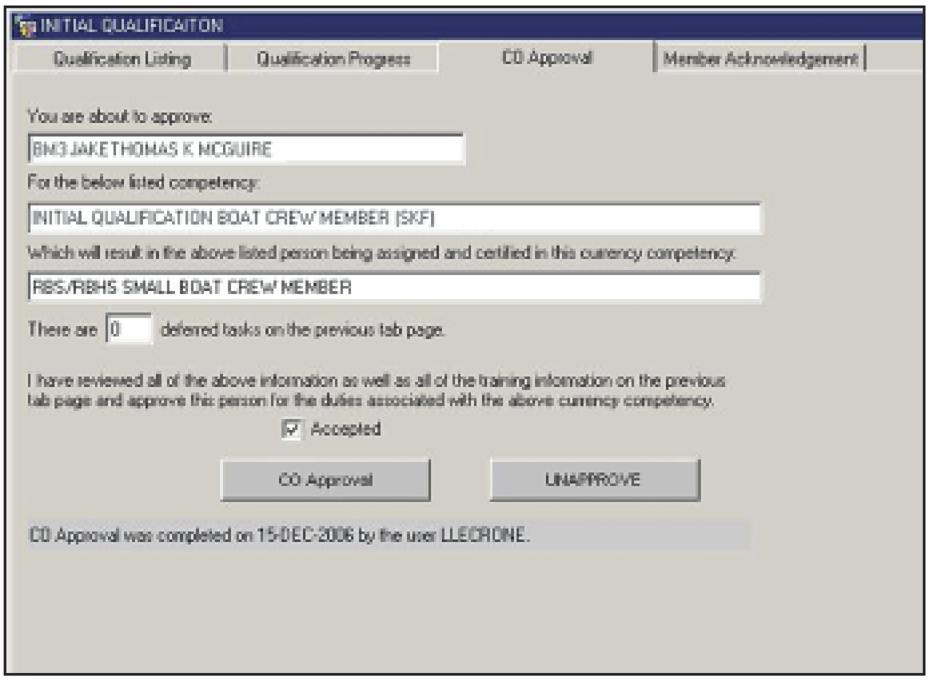

Figure 2: Command approval of member qualification completion of required training. USCG graphic.

The Boat Forces E-Training system was also designed to enforce current training policy and align with the training program managed by the Office of Boat Forces. The system follows policy by ensuring that lower-level competencies, such as "crewman," are completed prior to an individual beginning training on a higher-level competency, such as "coxswain." The system also ensures that only the commanding officer, officer in charge, or acting CO/OIC can certify a member. Along similar lines, the system prevents COs/OICs from certifying their own records, requiring sector commanders or their delegates to verify task completion and provide certification.

System Efficiencies

Prior to the deployment of the E-Training system, all training required for initial qualification was recorded on paper; recurring training was recorded in TMT. The new system has allowed all Boat Forces training to be recorded in one central system. This provides two benefits to Boat Forces units. First, it reduces workload, since there is only one system to update and maintain. Units no longer need to maintain paper training records or create paper certification memorandums. Second, the automatic data transfer between the E-Training system and personnel information system prevents the unit from having to enter the same qualification information into two separate systems.

The new system also allows for better oversight of the training system as a whole (Figure 3). Now, Coast Guard standardization teams can check a unit's training information via the intranet without actually traveling to the unit. It also allows for a much faster review, cutting review time from days to hours. The system also provides new visibility into the effectiveness of the Coast Guard's training program. Since the system records the date when a member starts and finishes his or her training, the Office of Boat Forces can now get detailed information on the length of time required to qualify at various boat crew positions and can better track whether stations are properly staffed with qualified personnel. Such information was not available using the paper-based system.

The Boat Forces E-Training system is fully integrated into Coast Guard Business Intelligence (CGBI), a reporting tool that all Coast Guard members can access via the web. Through data sharing with CGBI, all Boat Forces personnel can track their own training and qualifications. The CGBI system also blends information from multiple systems into reports that allow units to monitor their training, readiness, and equipment status, as well as the status of subordinate units. In addition, users can make custom reports of specific information that will automatically update whenever they access CGBI. This facilitates complete visibility of information from headquarters all the way down to a boat crewmember, leading to better decision making, force management, and readiness.

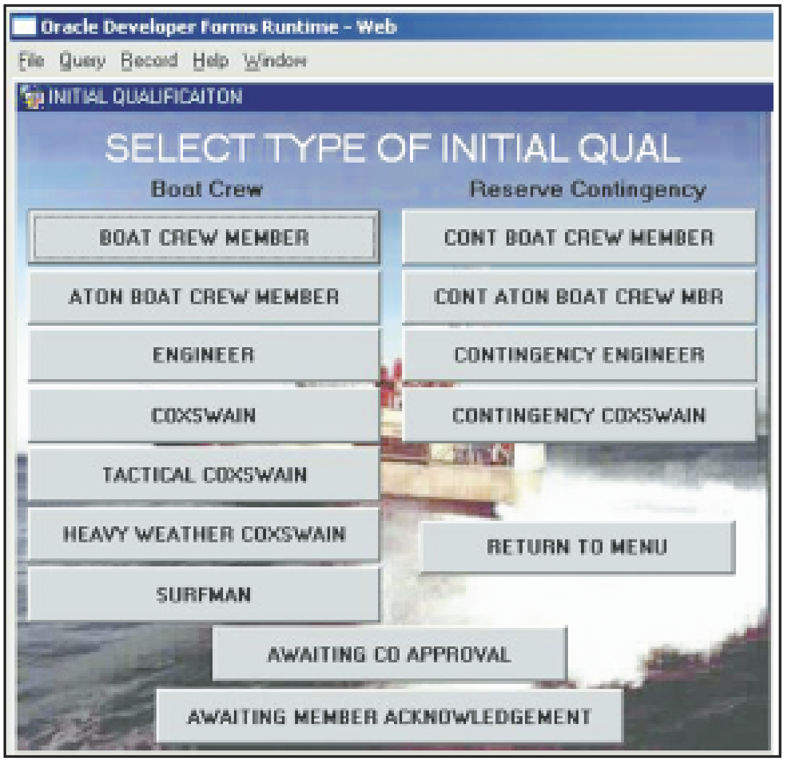

Figure 3: Screen shot of qualification selection screen, showing all qualifications available in the system. USCG graphic.

Future Plans

The system will be expanded to handle Boat Forces member recertification, an abbreviated qualification process used when a member's qualification lapses or transfers to a new unit. Further improvements will allow units to track the training and inventory of personal protective equipment and include the station watchstander qualification. The program will begin to automatically notify members if their currency is about to lapse and automatically decertify members who fail to complete required training.

Boat Forces' successful use of the system has sparked interest from other Coast Guard programs. The law enforcement, weapons, and maritime inspections programs have each discussed using the system to track the training requirements for their different programs.

The creation and implementation of the Boat Forces E-Training system has been a resounding success. The system reduces workload for Boat Forces personnel by effectively managing all unit-level qualification and currency maintenance training. This provides valuable program oversight and data that can be used to improve the overall Boat Forces training program. It seamlessly integrates with other Coast Guard systems to provide commanders with a full view of readiness, training, and equipment. Future improvements and additions to the system will expand these benefits to other Coast Guard programs.

About the authors:

LTJG Thomas Martin has served in the Coast Guard since 2004. He is currently the project manager for the Abstract of Operations/Training Management Tool (AOPS/TMT) program. Prior to his current assignment, LTJG Martin was a deck watch officer on the CGC Vigilant.

Mr. Robert Mills has served as a civilian employee with the U.S. Coast Guard for more than 16 of his 31 years of service. He has served as a project officer for various computer systems located at the U.S. Coast Guard's Operations Systems Center in Martinsburg, W.Va. Mr. Mills has received various awards, most notably the U.S. Secretary of the Department of Transportation's Team Award for the Readiness Management System in 2001.

Endnote:

[1] A term from the Commandant Intent Action Order #10, e-Coast Guard strives to use service-oriented architecture to improve mission planning and execution. It uses information technology and data sharing to provide the Coast Guard with critical data to support planning, reduce workload, and improve resource allocation and mission execution.

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Logistics Transformation

Overcoming inertia to drive change.

by CAPT A. Scott Reynolds
Director of Logistics, U.S. Coast Guard

One strength of bureaucracies is that the performance of the organization can be maintained throughout changes in leadership. However, the inertia of the status quo within bureaucracies can also serve to stop productive change even when change is desperately needed. For the past 15 years the Coast Guard has faced the inertia of the status quo when attempting to change its logistics practices. Despite a 1993 logistics concept of operation (CONOP) that said "The logistics system will be configuration based and will have a uniform look and feel that does not vary by platform, equipment, unit type, or geographic location" and nineteen separate studies concluding the Coast Guard could significantly improve its logistics practices, the Coast Guard implemented only minor modifications. This article explains how the 20th study was leveraged to trigger change, captures our transformation progress to date, and highlights our lessons learned.

Figure 1: USCG rescue during the Hurricane Katrina effort in New Orleans. Photo courtesy of Petty Officer 2nd Class Kyle Niemi.

To set the stage for a discussion on Coast Guard logistics transformation, it's important to first understand a little bit about Coast Guard culture as well as the evolution and organization of Coast Guard logistics today. Just as bureaucracy has both strengths and weaknesses, so does one of the Coast Guard's most heralded attributes: autonomy.

Figure 2: U.S. Coast Guard assets. USCG photo.

The Drive to "Go it Alone"

In the aftermath of Hurricane Katrina, Coast Guard rescuers did not wait for direction to engage (Figure 1). Instead, they followed the service doctrine and culture that taught them to assess risks and respond immediately and autonomously, within their capability. However, the autonomy that distinguishes the Coast Guard operationally can also prevent us from being effective and efficient logistically.

Units thrive on supporting themselves with little reliance on a central support infrastructure. We reward local support personnel for doing whatever is necessary to maintain local readiness, but, unfortunately, these actions are often at the expense of following established support doctrine and enterprise objectives.

At a higher level, each of the Coast Guard's major support programs (for example naval, aeronautical, civil, industrial) also operated autonomously, or at least without regard to an overarching, integrated approach to support like the one stated in our logistics CONOP. This evolved out of our service culture, with each program having the organizational autonomy and resources to construct its own business model with the processes and information technology to support it. While support within each of these independent programs typically ran consistently enough, it eventually became difficult to manage and defend the wide variation and duplication among the programs when taking an enterprise perspective.

Practices Assessment

Two years ago, I was named the Coast Guard's director of logistics, and became a major shareholder of the Coast Guard's $12 billion capital plant, consisting of 26,000 facilities, 255 cutters, 205 aircraft, 1,879 boats, and 5,400 vehicles (Figure 2).[1] The Coast Guard was nearing completion of its 20th major study on logistics. These studies covered a spectrum of perspectives, as they were performed by internal Coast Guard personnel, by outside consultants, and by federal auditing agencies. The most recent study added very little to our breadth of knowledge on the need to change our logistics practices, but it did achieve its stated goal to build a more thorough business case in support of the change (Figure 3).

In fact, every study the Coast Guard performed added to the argument for change. The first lesson in driving transformation (absent an external forcing element) is that management will always want more information on which to base its decision. Transformations, after all, can be risky undertakings, and it is a manager's job to manage risk. Unfortunately, managers often use information gathering as a means to delay difficult decision making. Consequently, as study after study is performed, there is the illusion of progress, but little is ever actually done. In the end, it is ultimately a leadership decision—not a management one—that is needed to embark on a transformational journey.

Need for Change

The key to solving the "need to know more" problem is twofold. First, a case must be presented so that it is clear that maintaining the status quo is detrimental to the organization. In the case of Coast Guard logistics, instead of discussing the minute details of the elements of logistics, we focused on raw, eye-catching statistics that illustrated the shortcomings of today's practices. Some of these included:

- Fifty-five percent of the parts we purchase to outfit our cutters are never used during the life of the cutter.
- The logistics community provides only 18 percent of the parts actually used by the operating commands.
- Of the parts purchased locally, only 65 percent of the parts are ever used.
- We didn't know the configuration, true maintenance requirement, or cost of operating our assets.
- Our technicians are only trained on 20 percent of the equipment we ask them to work on.[2]

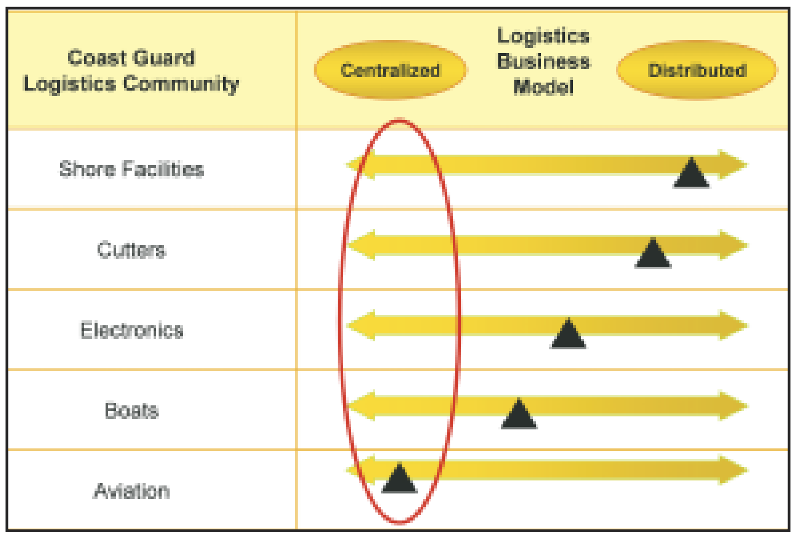


Figure 3: Current state of logistics. USCG graphic by the Logistics Management Transformation Office.

We had built a case for change. However, a case for change alone is not enough, because while the need for change had been made apparent, what to change to and how to get there was not. So the second step was to advise senior leadership where we ought to be going and how we could most effectively get there. In our case, we suggested moving to the internal Coast Guard logistics program most closely aligned to industry best practice—our aviation model. Furthermore, we argued that we should fully adopt the aviation support practices without alteration for our initial implementations.

While our research was detailed in collection, review, and analysis, and thereby defendable if challenged, our recommendation was presented in an easily understood decision-making form. In the end, the Coast Guard leader most interested in pursuing transformational logistics change was our chief of staff, then Vice

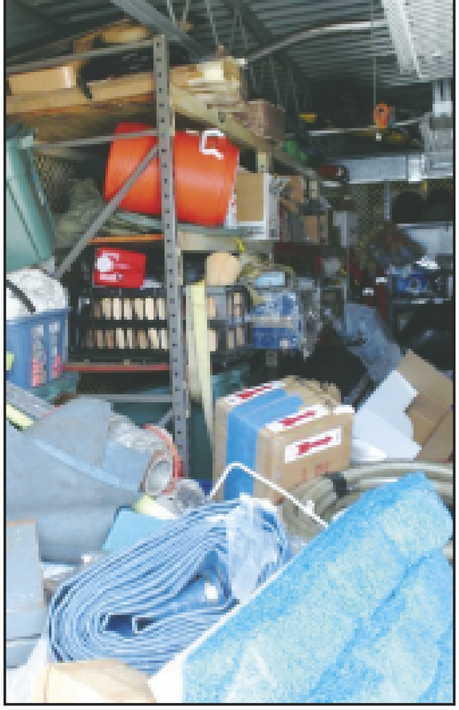


Figure 4: Typical cutter storage shed. USCG photo by LT Andrew Joca.

Admiral Thad Allen, now our commandant. Upon receiving our recommendations for action following the 20th study, his direction to us was to "proceed at best speed." [3] We had our marching orders.

Proceed at Best Speed
Even after decisions are made, organizational inertia remains. We understood that one of the most effective ways to break inertia and compel change was to create a sense of urgency. That urgency arrived in the form of the Coast Guard's Chief Financial Officers (CFO) Act audit, conducted by the Department of Homeland Security. The Coast Guard was receiving extensive pressure from Congress and the Department of Homeland Security to meet CFO Act requirements.

One critical shortcoming was in the area of operating materials and supplies. The Coast Guard could not certify the quantity, value, application, and condition of a large portion of its $250 million in field unit inventory holdings. Of course, much of these holdings were a direct result of our ineffective configuration, maintenance, and supply management practices in our non-aviation programs, as well as an outgrowth of unit autonomy, which gave local units the need and the means to accumulate large holdings over time. As a result, we created the urgency for change by linking our logistics transformation to this CFO Act deficiency that demanded we cull a large amount of unused and unneeded inventory from field unit storerooms (Figure 4).

What Do You Mean, You're Taking My Stuff?
As you might expect, units were not pleased with the idea of us removing thousands of inventory items from their storerooms. This inventory served as a "readiness security blanket" and provided a sense of assurance that they could fix anything without having to rely on the outside support system for help. This was not an unreasonable position for units to hold.

But the data also showed that they were no better than our logistics system at stocking what they needed to maintain readiness, and units were slowly being buried in unneeded parts and the attendant workload required to account for them. Therefore, by tying the urgency for this removal effort (for example, 3.3M items valued at $161M were removed from 694 units within nine months)[4] to our larger, systemic logistics system problems, we got people's attention and were able to effectively drive home the need for change.

As time passed, our efforts gained even more credibility because the readiness degradation that the units dreaded never materialized. Instead, units benefited from the reduction in useless parts and their attendant management. Also, the Coast Guard conservatively saved our overworked field personnel an estimated 96 person-years of effort annually just by avoiding a quarterly inventory of unneeded parts.[5]

The Aviation Logistics Model
During the nine months we were pulling back parts, we also spent time documenting and "selling" the aviation logistics model to a skeptical Coast Guard. If all we did was establish a case for change, which, frankly, had been done before, we would fail in our goal to transform Coast Guard logistics. We needed to show people how to change and what to change to.

While there was general agreement on the need for change, there was rarely agreement on how or what to change to, which history told us would eventually devolve into disagreement and inaction. Our inability to resolve the "how" and "what" had kept us from attaining a goal we all agreed upon.

In getting senior leadership to direct adoption of the Coast Guard's aviation logistics model, we avoided numerous negotiations and disagreements, which would have turned our rapid revolution into a painfully slow evolution, and risked failure of the entire initiative. The "what" was decided. In directing that we would implement this model at two of our shore unit commands, unchanged and intact, our leadership further dictated how the model would be implemented. We had our marching orders. The case for change was made, the method of change decided, and the time for debate had passed.

I cannot overstate the significance of our leadership's actions in this regard. Once a decision is made there are literally thousands of lesser decisions that can derail a transformation effort. The key is to structure your plan to eliminate "debatable moments." Allow me to use an illustration I've tried in several briefings to our field personnel. Just imagine I said we were going to get a dog, and you agreed that getting a dog would be a good idea. So off we go. However, you would think of your favorite dog, a Great Dane perhaps. Meanwhile, I'm thinking German Shepherd. Debatable moment #1. I want to get my dog from a breeder, and you want to get yours from the pound. Debatable moment #2. Finally, I want to keep the dog in the house, you want to keep it outside. Debatable moment #3. Each of these debates consumes time and energy, and at some point puts the outcome, the thing we initially agreed upon (to get a dog), in jeopardy. Frustrated that we can't agree on the WHAT and HOW, we retreat to the status quo, or maybe compromise on a cat, which neither of us really even wanted. We can point to the cat as evidence of some shared progress, but it's really not what we set out to accomplish.

Using this example, every time someone wanted to debate how to proceed, had a better way, or didn't like what we were doing, leadership pointed to the commandant's mandate to adopt the aviation logistics model intact at two sectors. This ended the debate and allowed us to keep moving forward. Good leaders recognize that one of the most important things they can do for their people is make decisions that simplify chaos and provide clarity of purpose.

The Logistics Transformation Program Office

A key component of the "how" was the formation of a logistics transformation program office (Figure 5). Ad-hoc matrix teams don't lead transformations. We needed a transformation office. The Government Accounting Office had documented several failed transformation efforts within the Department of Defense, and a common element that turned those failing programs around was the establishment of a transformation office.

Transformation offices recognize the need for dedicated cross-programmatic expertise in the areas of finance, human resources, policy, operations (since one can't change logistics without also changing operations), logistics, and IT. It is also useful to incorporate key elements and team members of pilot programs within the transformation office, as we did with the acquisition phase of logistics.

Two things make these teams part of a successful transformation:

(1) All members must be experts within their areas. If you are truly doing a major transformation, then the best people should be made available.

(2) The teams must know the strategic goal, but work the tactical goals.

For example, the teams work to solve the three- and six-month goals. They don't struggle to solve world hunger; world hunger is the leader's job. The aviation logistics model calls for the centralization of all logistics funds. The majority of those funds are presently distributed to Coast Guard field units. Our finance team did not work to solve the centralization of all logistics funding at the outset, even though that was our long-term objective. Rather, they strove to centralize the funding from the two sectors that were acting as proof-of-concept for the new model.

The Coast Guard stands poised to run a pilot program of the new Coast Guard logistics model at Sectors Baltimore and San Francisco. We got the idea of using progressively bigger pilots from my IT background. Software is routinely developed through larger spirals, and transformation efforts that are worked with that development model allow for meaningful three- and six-month goals, as well as an opportunity to create successes, then build upon them.

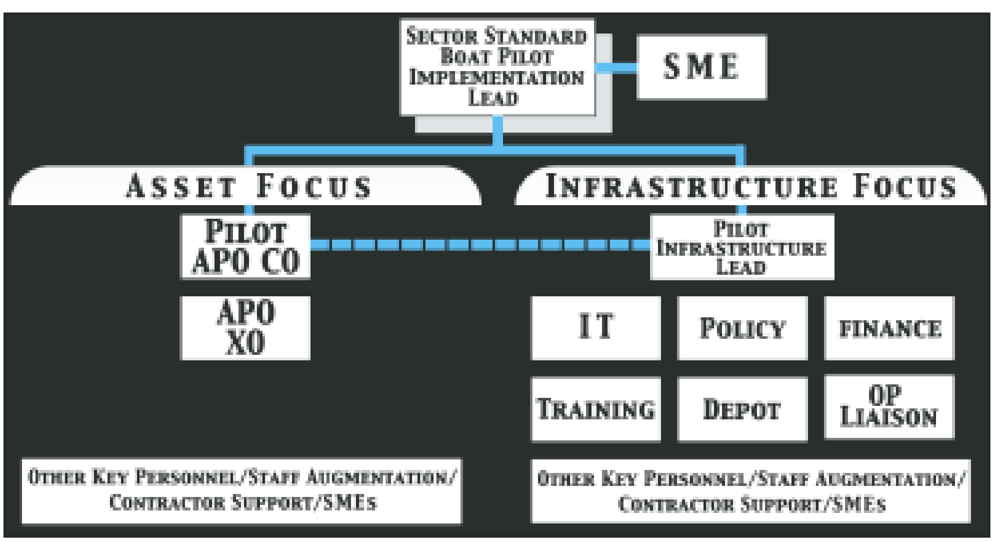


Figure 5: Asset project office organizational chart. USCG graphic by the Logistics Transformation Program Integration Office.

Ownership, Attitude, Humor

Change management books stress the need for communications—you must communicate 10 times more than you plan. They also stress the need for senior leadership support and for surgically removing those against the change. In other words, "lead, follow, or get out of the way!" These are all valid strategies that need to be adopted in order to succeed. In my mind, however, what's often missing from the change management literature is a discussion of ownership, attitude, and humor.

For a transformation to succeed, there must be strong leaders throughout all levels of the organization. When senior leadership signals an impending change, they are also signaling the need for their subordinates, middle managers, and field personnel to "own" that change.

ADM Allen recognized this fact quite recently, when, during his 2007 State of the Coast Guard address he said, "I can't just order the Coast Guard to change, I'm asking you to join me in one of the most important challenges we have faced in the post-World War II Coast Guard. The success of this endeavor will be measured not by my commitment, but yours. My challenge is not to force change on the Coast Guard, but to make the Coast Guard understand that change is necessary."

At a recent logistics transformation meeting with my peers from around the Coast Guard support community, I heard several complaints of conflicting orders from senior leadership and multiple requests to approach the flag corps for resources and guidance. A defining moment of our logistics transformation effort occurred when my peers agreed that it was up to us to make this work, and that any expectation of help was wasted time not spent on driving the transformation. This moment also triggered an important attitude change that bears true for all tasks in life: Your own resolution to succeed is more important than any other factor. As the old adage goes:

"Whether you think you can or whether you think you can't—you're right."

Finally, humor: Hard work is, well, hard work. There's little sense in making it drudgery by allowing it to consume your life, and the lives with whom you work and live. Surround yourself with people that can laugh at themselves, life, and, most importantly, work. Humor softens blows and increases the pleasure of successes. Without humor, tasks of this nature can become too cumbersome to overcome, and too unbearable to persevere.

A Tiger by the Tail

As a result of applying the change-management techniques discussed here, the Coast Guard is on schedule 19 months into a five-year plan to provide an integrated enterprise-wide logistics system that delivers consistent capabilities in support of operations in a flexible, scalable, and modular manner.

However, being 19 months into a five-year transition is analogous to having a tiger wrestled to the ground. You feel and may actually be in control, but you also know one moment of relaxing or forgetfulness and the tiger will be on you.

We've won a few important battles, but the war is far from won. As I prepare to end my Coast Guard career, I'm proud to have helped the Coast Guard embark on this important and necessary journey. Along with the other changes that ADM Allen has signaled for our service during his tenure as our commandant, never have I seen such dramatic change embraced so quickly. The prospects for success are excellent, and that is a fine testament to the spirit of Coast Guard people, and to our motto—Semper Paratus—always ready for the mission, always ready for change, always ready to do what our country and our leadership asks of us.

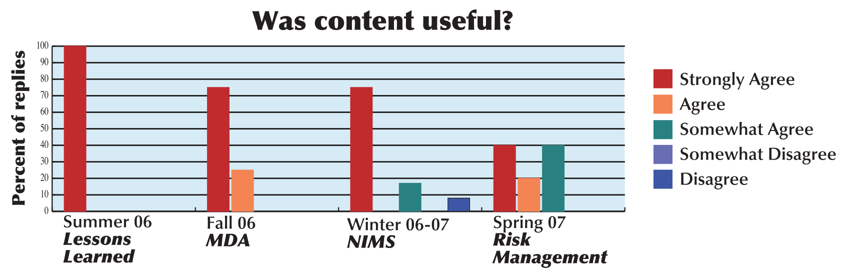
About the author:

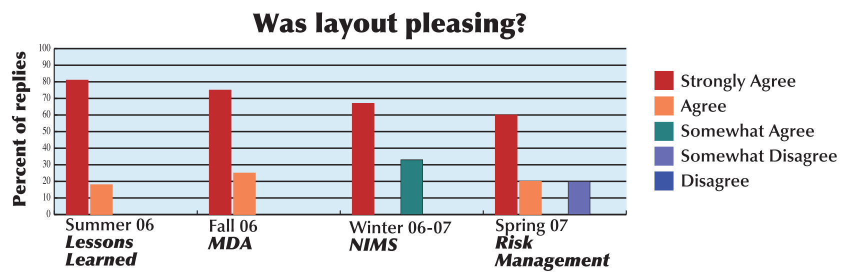
CAPT Reynolds is the Coast Guard's director of logistics. He has served in this position since April 2005. He is responsible for ensuring that the Coast Guard's $12 billion capital plant consisting of 26,000 facilities, 255 ships, nearly 1,900 boats, more than 200 aircraft, and 5,400 vehicles are ready to meet mission requirements. Concurrently, CAPT Reynolds is the program manager for the Coast Guard's logistics transformation. This is a five-year program to re-engineer outdated business processes, redefine the Coast Guard's workforce, and modernize on a single IT suite. Previous tours for CAPT Reynolds include director of the Coast Guard's Research and Development Program, liaison to the Deepwater Capabilities Replacement Acquisition Project, director of Enterprise Architecture Management, and chief of the Year 2000 (Y2K) Planning Office.

Endnotes:

1. Statistics from the Coast Guard Capital Asset Management Portal, April 24, 2007.
2. Coast Guard Office of Logistics, Field Unit Inventory Redistribution Project, June 2005.
3. Logistics Transformation Management Office Decision brief to VADM Allen, CG Chief of Staff, June 23, 2005.
4. Coast Guard Office of Logistics, Field Unit Inventory Redistribution Project, March 2007.
5. Coast Guard Office of Logistics, Inventory Workload Analysis, November 2006.

What You're Saying





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How about a regular column on casualty investigations and prevention? Single-topic issues are really boring! Winter 2006-07

Articles that highlight the CG ability to forge successful partnerships are very welcome. It really shows what can be done well with a government agency that has a KNACK for getting such a broad range of missions and then must rely upon more than just dollars to accomplish them. I work in an off-dock cargo handling facility. Some focus with an article or two that's relevant to this portion of the industry under the main subject of an issue might be helpful. Winter 06-07

The last two issues of Proceedings *have read like procedural manuals for the command staff of the Coast Guard. The amount of technical information presented in recent issues was overwhelming. Although well written, it may have been a little too much for your average reader, unless most of your readers are in the admiralty.* Winter 06-07

Enjoyed this issue as casualty investigations provide hard-to-learn real-world situations concerning seamen, ships, equipment & rules. Would like more (many more) casualty reports, causes and conclusions and more interesting reading to your non-Coast Guard (and retired USCG) readers. Summer 2006

Security and safety are both serious subjects. To catch the readers' attention it might be worth considering including a humorous anecdote connected with the above topics. Spring 2007

I wanted to pass on a "Well Done" for the Summer 2006 edition of the Coast Guard Proceedings. *You have many fine articles in your publication, but Summer 2006 was a very special "cover to cover read" for me. The items pertaining to "Lessons Learned" were outstanding and in greater depth than most marine casualty accounts from commercial publishing sources. Keep up the great work.* Summer 2006

I would like to read about real-life action or incidents regarding security, criminal activities, violations of rules & regulations, etc. and the investigations, disposition, or end results of these kinds of matters. In any case, the magazine is still of great interest to me. Spring 2006

Would like to see a little more on seamanship and seaworthiness, and maybe a little less on homeland security and law enforcement. I'd also like to see you bring back the "Chemical of the Month" articles. They were most informative, and most were real eye-openers. Fall 2006

Keep hammering away on intel and fusion. A little case study on a positive operational result from actionable intel would be great. (Fall 2006) was way too much data all at once. Every article should be required reading for every commanding officer and those who aspire to command, but it took me two days of concerted on-and-off reading to get through it. Help us get through it in bite-sized chunks or perhaps disseminate the Cliff Notes version via CG Central or Homeport. This sheer volume of reading at the field level is overwhelming and will most likely go unread at the field level. Fall 2006

When managing risk, it is imperative for leaders and managers to periodically step back and assess whether they are using risk-based policy to defend the status quo in lieu of carefully listening to feedback with humility and recognizing that constructive criticism is an opportunity. Spring 2007

There is a fine balance of many topics of interest. Continue with vessel casualty articles. Summer 2006

"

Tell us what you think.
Survey available online: www.uscg.mil/proceedings

What We're Doing

PROCEEDINGS Magazine READER'S SURVEY

"I would like to read about real-life incidents…"

"How about a regular column on casualty investigations?"

"Would like more (many more) casualty reports…"

Beginning with this edition, we will publish a regular "Lessons Learned" section in *Proceedings*, where we will delve into marine casualties.

We will explore how each incident occurred, outline the U.S. Coast Guard marine casualty investigation that followed, describe the lessons learned through the investigation of these incidents, and document any changes in maritime regulations that occurred as a result.

Turn to page 64 to read about the marine casualty investigation process, followed by an article that outlines a recent marine casualty.

"…way too much data all at once. Help us get through it in bite-sized chunks. The sheer volume of reading…is overwhelming…"

"The amount of technical information presented in recent issues was overwhelming. Although well written, it may have been a little too much for your average reader, unless most of your readers are in the admiralty."

We hear you—and agree!

We have added sidebars that contain "must-read" information to most of *Proceedings*' articles. (Look for text with special graphic treatment, set off from the main text of an article.)

We have also added more charts, tables, and graphics to illustrate and emphasize important information.

"Would like to see a little more on seamanship and seaworthiness and maybe a little less on homeland security and law enforcement."

"Single-topic issues are really boring!"

This issue contains a "special focus" section on risk management. Look for special sections in upcoming editions, where we will explore varied topics in addition to the main issue topic.

We will also continue to include "Mariner's Seabag" features and "Prevention Through People" articles in future issues.

In an ongoing effort to improve the magazine, we began including a reader's survey in each Proceedings, *beginning with the Fall 2005 issue. Since then, staff has tracked your responses, while simultaneously reviewing the magazine for their own ideas to improve it.*

Fortunately, we all agree on the best ways to improve Proceedings! *We will be working to make the information easy to get off the page. We will also be adding new features and special focus sections.*

Keep watching: Over the next few editions, we will incorporate these improvements.

Please keep your comments coming, as we strive to make Proceedings *an even more useful tool for its readers.*

Most importantly: We're listening!

We appreciate hearing your opinions and ideas. Keep them coming!

Go to www.uscg.mil/proceedings,
click on "Reader's Survey," and tell us what you think.

IMO Passenger Ship Safety Initiative

Applying risk management in an evolving industry.

by LCDR Kevin Ferrie
Staff Engineer, U.S.Coast Guard Office of Design and Engineering Standards

Imagine yourself basking in the sun while you cruise the Mediterranean, stopping at historic cities in different countries every day, all the while enjoying luxury services that your "floating hotel room" gladly provides.

People are doing more than imagining this; they are living it at record rates. The cruise ship industry has seen significant growth over the last several decades, and as a result, companies are building much larger and more complex ships than ever before.

This trend has caught the attention of the International Maritime Organization (IMO), and it has responded by conducting a comprehensive review of the international passenger vessel regulations, as current regulations were developed before the trend in larger ships began. The goal of this initiative is to review the current regulations to ensure they are applicable to new ship designs without inhibiting the ability of naval architects to further advance the design of these ships.

Larger Ships, More Passengers

There are several factors that triggered the need for IMO to reconsider the regulations for the passenger vessel industry. For example, cruise ships are getting much larger; they are carrying many more people; and they are now traveling to remote areas where a response to any emergency may be limited, if available at all. Figure 1 shows the average size of cruise ships (in gross registered tons). According to the Fairplay 1998 Database of the Cruise Industry News – Annual 2000, the size of cruise ships remained relatively constant from the 1950s to the 1970s, and then began to increase significantly sometime in the 1980s.

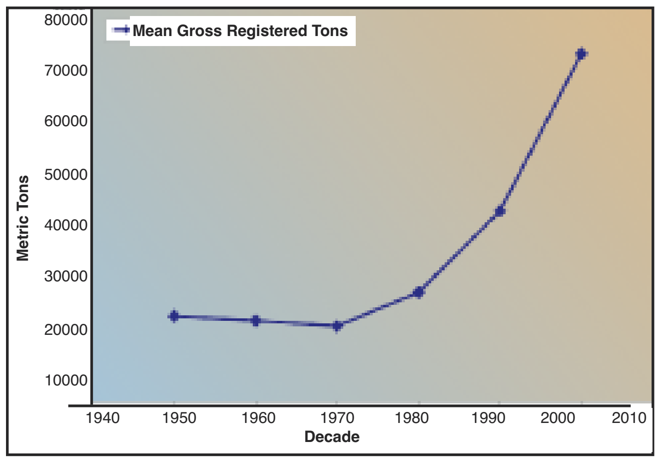


Figure 1: The average size of cruise ships (in gross registered tons) from the 1950s to present. Data courtesy of the Fairplay 1998 Database of the Cruise Industry News – Annual 2000.

Currently, the average size is almost four times the size of cruise ships of the 1970s, when the last major revision to the Safety of Life at Sea (SOLAS) convention was made, with respect to the laws governing these ships. The number of passengers carried on these ships is consistent with the increase in size, as seen in figure 2. This was relatively constant from the 1950s to the 1970s, but has since nearly tripled—from around 700 passengers to nearly 2,000.

Imagine evacuating three times as many people from a ship four times as large as those addressed in the SOLAS convention. Add to this the possibility that this evacuation may occur in areas with limited search and

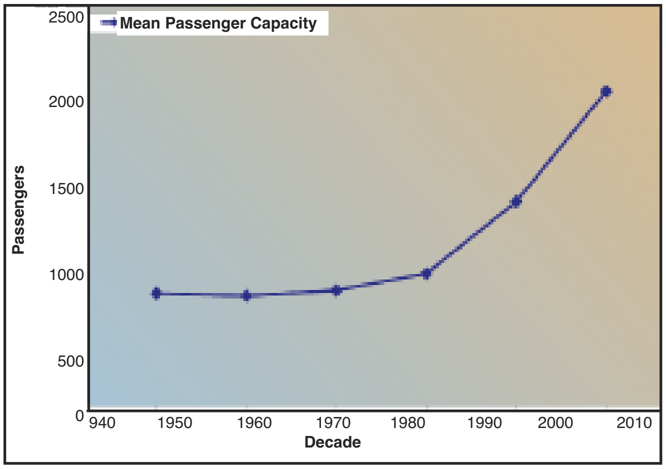


Figure 2: The average capacity of cruise ships from the 1950s to present. Data courtesy of the Fairplay 1998 Database of the Cruise Industry News – Annual 2000.

rescue capabilities. This led the secretary-general of IMO to initiate a project to review the regulations and consider the current risks involved in the industry.

Regulations Review

At the meeting of the Maritime Safety Committee in May 2000, the secretary-general said that he had been concerned as to whether the SOLAS and Load Line Conventions duly addressed all the safety aspects of the operation, in particular in emergency situations, of large passenger ships.

He had no reason to doubt the safety of recently built large cruise ships or whether they complied with the most recently adopted SOLAS requirements. However, he felt that the time had come for the organization to undertake a global consideration of the safety issues pertaining to large ships. As a result, the committee provided support for the project and issued some general guidance on the scope of this project, which included:

- Conduct an overview of the existing situation relating to large passenger ships in light of current practices, the existing regulatory regime, and safety philosophy/approaches.
- Identify areas of concern, using a holistic approach; in particular, take into account the human element.
- Identify the potential risks future large passenger ships may face in the coming decade, and any long-term considerations relating to the above.

Guidance was left ambiguous, because the goal of this project was to evaluate the current state of the industry and amend the regulations to address the risks the industry will likely encounter heading forward. In addition, the Maritime Safety Committee was hesitant to limit the scope of the project before full consideration was given to the entire state of safety of the industry.

The committee utilized a risk-based approach in this review by looking at the scope of regulations governing these ships as a single system, from the detailed engineering standards used in design to the training standards shipboard personnel must meet. This was unique, as the current regulations had developed from a series of independent initiatives that lacked cohesive coordination. This new approach gave the committee the opportunity to coordinate the review.

Risk-Based Analysis

The first step was to perform a gap analysis of the current IMO instruments (regulations) to identify any glaring holes in the current regulations. This allowed the review to address any obvious weaknesses that had never been realized or that have become apparent with the changing trend in the industry. The next step was to consider the adequacy of existing regulations. In order to address this, the Maritime Safety Committee considered past casualties and potential future problems, while using a traditional risk equation to determine if amendments were necessary.

The risk equation used was:
Risk = (the probability of a negative event occurring) times (the consequence of the event)
This equation encompasses two theories in regulation development:

1) reducing risk by preventing an event
2) reducing the consequence of the event once it occurs.

These theories led to intense discussion as to which was the preferred method to manage overall risk. The committee noted that, while the probability of something occurring that would require evacuation is incredibly low, the consequences are too great to ignore. This resulted in a strategy that included both elements: reducing the probability of negative events through prevention measures and also reducing the consequences through response measures.

Holistic Standards

The committee recognized the complexity of successfully evacuating thousands of people from a ship and quickly realized, while a means for evacuation must be provided, it should not be the preferred method for managing risk. History has shown that mass evacuations of cruise ships are potentially very dangerous situations. This meant mitigating consequences through abandonment is clearly not the desired outcome. Instead, the committee considered the negative event to be an abandonment (versus a fire, flooding, etc.), and developed a set of holistic standards that attempt to avoid an abandonment.

The *Star Princess* leaves port. Coast Guard Station Los Angeles crewmembers escort the 3,000-passenger cruise ship from the Port of Los Angeles. 2003 USCG photo by PA1 Daniel Tremper.

These holistic standards consider the system (passenger ship) as a whole, and attempt to design the ship so that it can act as its own survival craft. This will allow ships to return to port if a casualty occurs while maintaining a safe, habitable place for passengers.

In order to remain habitable to passengers, basic services for living must be maintained while the ship makes its way to port, where an orderly and safe disembarkation can occur. This design criterion for new ships will attempt to prevent abandonment. Designing a ship to act as its own lifeboat is surely the preferred method to manage risk, but the Maritime Safety Committee realized that would not be possible in all circumstances.

To account for casualties outside the realm of the expected, the committee established casualty thresholds. If these thresholds are exceeded, such as a fire that exceeds one main vertical zone, the ship must provide adequate time (three hours is the current recommendation) for an orderly evacuation and abandonment. During this time, essential services, such as power to the embarkation areas, bilge, and ballast systems, and public announcement systems must remain operational. The goal of these regulations is to reduce the consequences of the abandonment.

The committee looked at the survival craft in more detail to further mitigate the consequence, and determined that provisions must be available for an adequate time in which it would be expected for the survival craft to be recovered, up to a maximum of five days. This would account for ships operating in remote areas where help could be several days away.

Passenger vessel safety is a high priority on the International Maritime Organization's agenda. This article highlights only a small part of the overall passenger ship safety agenda, but provides an example of how IMO's Maritime Safety Committee is managing risk from two separate angles, in order to provide some redundancy in passenger ship safety. This will improve the safety of cruise ships as we move forward and will allow more and more passengers to enjoy the life of luxury while cruising the high seas.

At the time of this writing, IMO was finalizing the work on passenger ship safety. Details including the applicability and timelines for implementation should be available by the time of this publication. While this safety initiative has the support of IMO, these proposals have not yet been approved for adoption. The final approved regulation changes may differ from the information contained within this article.

About the author:

LCDR Ferrie has been a staff engineer in the Office of Design and Engineering Standards since 2004. Previous assignments include an engineer tour aboard USCGC Venturous *and the Marine Safety Office in Tampa, Fla. LCDR Ferrie earned a Bachelor of Science degree from the U.S. Coast Guard Academy in 1997, and a Master of Engineering degree in concurrent marine design from the University of Michigan in 2004.*

The Crew Endurance Management System

A systematic approach to manage the factors that lead to fatigue and degrade performance.

by LCDR Vivianne Louie
Staff Engineer, U.S. Coast Guard Office of Engineering and Design Standards

It all began one day in a little room during an experiment at Florida State University. Researcher Carlos Comperatore kept laboratory animals in complete darkness for days, then exposed them to little shots of light. Students measured circadian rhythms and argued about the role of melatonin in human physiology. Eventually, these studies included human volunteers, who were also kept in dark rooms and given dosages of light to capture and study melatonin levels. These years of research now support how light affects endurance levels.[1]

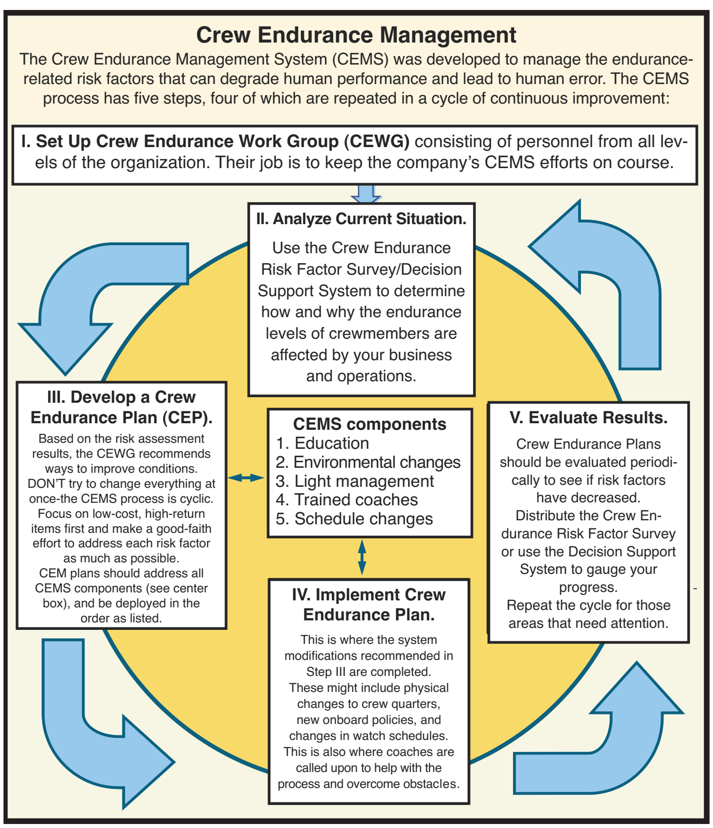


Figure 1: The CEMS process. USCG graphic.

In 1999, Dr. Carlos Comperatore brought this base of knowledge to the Coast Guard Research and Development Center. Nearly a decade of research and numerous studies onboard a wide variety of vessels have followed. These studies were conducted aboard deep-draft vessels, towboats, ferry boats, cutters, small boats, and aircraft to identify the specific crew endurance risk factors common in maritime operations. Fifteen specific factors were identified. These risk factors can be grouped into categories that encompass:

- quantity and quality of sleep,
- work and rest schedules,
- work and living environment,
- individual physical and personal stressors.

The Crew Endurance Management System

In order to manage these risk factors, the Crew Endurance Management System (CEMS)—created specifically for the commercial maritime industry and the Coast Guard—uses a systematic, continuous improvement approach. From an organizational implementation perspective, there are five basic steps (Figure 1) in the CEMS process:

1. Set up a crew endurance working group.
2. Analyze the current situation by identifying the endurance risk factors on board.

3. Develop a crew endurance plan to address the specific risk factors.
4. Implement the crew endurance plan.
5. Evaluate the results periodically and then repeat step 2.

From a vessel implementation perspective, there are also five basic steps that occur during the development and implementation of the crew endurance plan:

1. Educate crew and shoreside personnel.
2. Make environmental improvements to work and living areas.
3. Use light management techniques, particularly to adapt crews to night watches.
4. Make coaches available to support crewmembers and the working group.
5. Change watch schedules to maximize sleep quantity, quality, and consistency.

Education is the cornerstone of the ongoing success of crew endurance. Through a Coast Guard-sponsored training and certification program, a cadre of more than 1,200 certified Crew Endurance Management System coaches (from industry and government agencies) are peppered throughout the country from Puget Sound to California, Maine to the Gulf of Mexico, and along the Mississippi and its tributaries. Interest in CEMS is not limited to the United States. The network of coaches includes organizations from Argentina, Australia, Brazil, Canada, France, and Norway.

Case Study: Eidesvik Offshore

In the far reaches of the North, where the days (and nights) are long, and temperatures are frigid, the Norwegian shipping company Eidesvik Offshore understands the value that the Crew Endurance Management System contributes to safety. The company operates a fleet of 20 vessels comprised of platform supply vessels, seismic survey vessels, and fiberoptical cable-laying vessels. Eidesvik Offshore employs a full-time medical doctor, Dr. Knut Omdal, who specializes in maritime occupational medicine (Figure 2).

Recognizing that fatigue is a major maritime safety risk, Dr. Omdal was determined to mitigate this risk, but wanted to use a tried-and-true method. "As an MD, I deal with evidence-based medicine," he says. "That's the basis of our work. I had done quite a lot of searches for medical articles on this subject until I found that the U.S. Coast Guard had developed a tool—CEMS—based on science, for dealing with this problem."

Figure 2: Dr. Knut Omdal at the helm of the M/V *Viking Avant*. Photo courtesy of Eidesvik Offshore.

So in May of 2006, Dr. Omdal travelled to New Orleans for the sole purpose of obtaining CEMS training and certification. Shortly after returning back to Norway, he translated the reference materials to Norwegian, while the information was still fresh in his mind. The concept of CEMS was introduced to management and, following textbook procedure, the group developed a plan and decided to start with small steps. "We agreed on a project using one vessel (M/V *Viking Avant*), and if this was successful, the system would be implemented to the rest of the fleet," says Dr. Omdal.

The *Viking Avant*, a platform supply vessel designed to operate north of the polar circle, has a crew complement of 12, who remain on the vessel for four weeks at a time (Figure 3). The crew was brought in for a full day of training, and shortly thereafter a complete risk assessment was conducted. With the exception of crew schedules, no major adjustments were made. The wheelhouse and accommodation spaces were evaluated for noise, light, and motion disruptions, but because the house and sleeping areas are located near the stern of the vessel, the environment was found to be quiet and fairly conducive for sleeping.

As for diet, the company had focused on proper nutrition with highly trained cooks long before CEMS, so there was no need to change the content of the meals. However, breakfast, lunch, and dinner times were adjusted to accommodate watch changes.

Prior to implementing the Crew Endurance Management System, the crew worked a two-watch system, using the traditional six on/six off watch schedule (except for the engineers who worked 12 on/12 off). After learning more about CEMS, the crew decided to take a big leap forward with regard to watch schedules and transitioned to the 8/8/4/4 watch (in which crews work one four-hour and one eight-hour watch, separated by one eight- and one four-hour rest period).

Although the new watch schedule is a big adjustment, the crews are pleased with the results. Eidesvik Offshore is continually assessing the crew endurance plan and making changes as practicable. Most of the changes that have been made are subtle, but have significantly improved performance and morale.

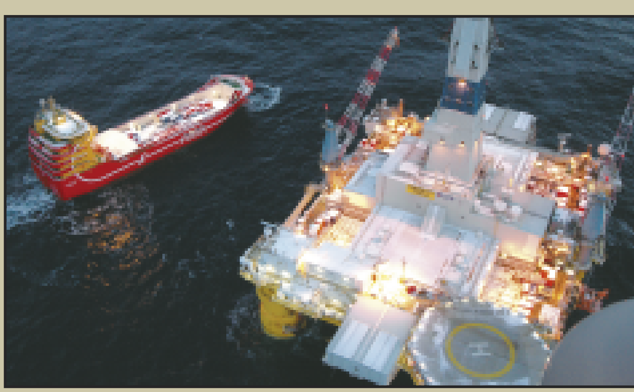


Figure 3: M/V *Viking Avant*. Photo courtesy of Eidesvik Offshore.

Figure 4: Adding squares assessment tool. Courtesy of Mr. Javier Maradei, Antares Naviera.

Case Study: Antares Naviera

On the other side of the hemisphere, another company has implemented CEMS, but has taken risk analysis to another level. Antares Naviera, based in Buenos Aires, Argentina, conducts business in Argentina, Brazil, Chile, Peru, the United States, and Europe. It is a part of the Ultragas Group that manages up to 50 vessels, including tankers, tugboats, supply vessels, and container ships.

Mr. Javier Maradei, of the Ultragas safety, quality, and environmental department, came to Houston, Texas to complete the CEMS coach's course in August of 2004. After successfully completing the class, he completed the train-the-trainer expert's course. Now, as a fully qualified crew endurance coach and expert, Mr. Maradei has translated the CEMS guide and addendum to Spanish, his native language, and began implementing the Crew Endurance Management System onboard vessels.

With a small staff and large fleet of vessels and crews to manage, Mr. Maradei developed a powerful visual tool (Figure 4) that gives a quick synopsis of the current levels of risk. "The usefulness of this tool is that I can evaluate the whole fleet for one specific risk group," he says. This dashboard view or "control panel" is a color-coded picture that enables managers to focus on risk factors that are specific to a department within a vessel, several vessels, or expand out to the entire fleet or trade pattern.

Mr. Maradei organized the tool by categorizing the 15 crew endurance risk factors into four groups: sleep, work, fitness, and family for each vessel. The severity of the risk is color-coded, and ranges from low (green) to severe (red). The level of risk is determined by the frequency of the risk occurring within a set time frame. Risks that occur six to seven times per week are in red, and conversely, risks that occur only one time per week are coded in green.

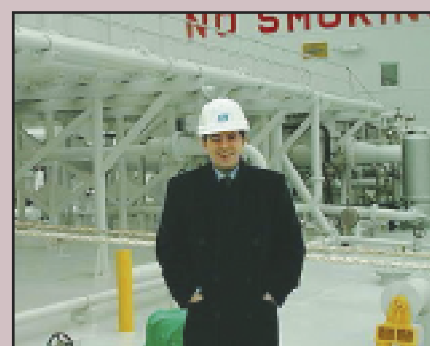


Figure 5: Mr. Javier Maradei onboard the M/V *San Julian*. Photo courtesy of Mr. Javier Maradei, Antares Naviera.

After conducting an initial survey of more than 170 crewmembers, a baseline was developed to measure progress in terms of reducing the incidence of endurance risk. The results were entered into a database and analyzed by different categories:

- the entire crew,
- masters,
- deck officers,
- engineering officers,
- deck ratings,
- engineering ratings,
- stewards department.

Over time, the company can easily track the progress of its efforts in reducing endurance risk. "In my opinion, a valuable use of this tool is that I can show the improvements made for the different groups or factors," says Maradei. In addition to finding common problems among vessels and among certain groups onboard, the tool enables managers to focus on problem areas and link common risk factors for individual crewmembers or the work environment.

The Results Speak for Themselves

As demonstrated in Coast Guard studies, there is very little risk and much to gain from implementing the Crew Endurance Management System. Organizations that practice CEMS here in the U.S. and abroad have documented improvement in performance, morale, and general health and well-being.

In the words of another CEMS expert, Mr. John Baker of Kirby Corporation, "CEMS is a practical answer to addressing maritime safety issues, overall mariner health, and potential fatigue issues. Whether you are a one-boat operator or operate multiple boats, CEMS can and will help you achieve your goals of decreased safety incidents and improved quality of life for you and your employees." Progressive, safety-minded shipping companies such as Kirby Corporation, Eidesvik Offshore, and Antares Naviera have proven that CEMS is a very flexible tool that can be tailored to fit just about any operation, anywhere in the world.

About the author:

LCDR Vivianne Louie is currently assigned to the Office of Design and Engineering Standards at Coast Guard headquarters and manages the CEMS program. LCDR Louie attended Oregon State University, earning a master's degree in industrial engineering. Her field assignments include marine inspections at MSO Puget Sound in Seattle, Wash., and MSO Juneau, Alaska.

Endnote:

1. "Crew Endurance Management Practices: A Guide for Maritime Operations," Coast Guard Research and Development Center, Groton, Conn.

Risk-Based Decision Making + the Incident Command System = SUCCESS

by LCDR Michael Simbulan
Staff Engineer, U.S. Coast Guard Human Element & Ship Design Division

LCDR LaDonn Allen
Chief, Inspections Division
U.S. Coast Guard Sector Upper Mississippi River

The Incident Command System, or ICS, is a standardized, on-scene, all-hazard management concept. It allows its users to adopt an integrated organization structure to match the complexities and demands of a single or multiple incident(s) without being hindered by jurisdictional boundaries.[1] The Coast Guard uses ICS because it is required by Homeland Security Presidential Directive 5, and also because it is a vital tool for managing resources associated with multi-contingency response operations and planned events.

Just as the Coast Guard needs ICS to effectively manage response activities, it also needs risk-based decision making (RBDM) to effectively make decisions—significant decisions that may affect large populations of stakeholders and have a major effect on the outcome of an incident response.

Risk-Based Decision Making

RBDM is a process that organizes information about the possibility for one or more unwanted outcomes into a broad and orderly structure that helps decision makers make informed management choices.[2] Risk-based decision making helps ICS users in response operations to identify and assess hazards or risks that can affect response personnel and overall response objectives, and then use risk information to strategically manage limited response resources. Like the Incident Command System, RBDM defines standard terminology and processes, which facilitates communication and keeps everyone involved on the same page.

Within the Incident Command System, there is a need for risk-based decision making whenever assets or resources are being managed. RBDM helps incident commanders and everyone in the ICS organization make good decisions by asking them to answer three simple questions:

1. "What can go wrong?"
2. "How likely is it to go wrong?"
3. "How bad can/will it be if things go wrong?"

ICS Element	Examples of Risk-Based Decision Making
Safety Officer	Part of the site safety plan is to identify the hazards and manage the risks or exposure to them—this is RBDM.
Public Information Officer (PIO)	Risk communication is part of the RBDM process, and a major function of the PIO. Ideally, the PIO should ensure that stakeholders are involved in the RBDM process, and communicate risk information in terms easily understood by the public or a specific audience.
Operations Section	Strategies and tactics must be determined to meet assigned objectives, and decisions must be made on scene in the execution of plans to better manage resources or protect responders. Hazardous waste operations and operational risk management training ensure that the "boots on the ground" are aware of the risks and prepared to make these tactical decisions.
Incident Command/ Unified Command	Sets response priorities and objectives, identifies limitations and constraints, and compares alternative strategies.
Planning Section	Determines information that needs to be collected to support risk-based decisions, then evaluates and disseminates the information as appropriate. Analysis includes predicting the probable course of incident events. Based on this information, the planning section determines the best place to put resources in accordance with strategies, tactics, and plans.
Intel Officer	Analyzes and prioritizes all intelligence information that can have a direct impact on safety, and influences the disposition of maritime security assets involved in the response.

Table 1: Risk-based decision making in ICS. USCG graphic.

Within the ICS organization there are multiple areas in which to apply risk-based decision making. Table 1 provides some examples of how risk-based decision making can be used within ICS.

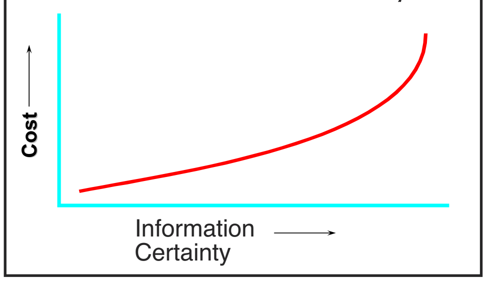


Figure 1: Cost versus information certainty.

Time is of the Essence

To get information, we need to expend resources. However, as you get to the right side of the curve, more effort or resources are needed to get the information (Figure 1). While we all want to be on the far right on the curve (that is, as certain as possible), sometimes we don't necessarily need to be on the far right to make a good decision.

When responding to a catastrophe and managing an incident, time is of the essence. The ICS command structure takes some time to stand up, and information may be sparse during the early stages of a response. However, once things get rolling, there is lots of information to digest, and often there isn't enough time to make the "perfect" decision because the window of opportunity to execute a strategy may be very small.

Risk-based decision making can help facilitate the process of making decisions and can prevent "analysis paralysis" by providing the decision makers with just the right amount of information to make an informed decision quickly. Some of these decisions include, but are not limited to:

- ensuring the safety of responders and the public,
- responding to threats to homeland security,
- minimizing adverse impacts on the environment,
- restoring the transportation infrastructure/maritime commerce,
- minimizing further loss of property,
- investigating and apprehending those responsible,
- preventing further threat and/or attack.

The National Incident Management System and RBDM

ICS is incorporated within the National Incident Management System (NIMS). Besides creating an organizational structure for responding to large-scale events, NIMS also provides a national framework for preparing for, preventing, responding to, and recovering from incidents.

Preparedness is one component of NIMS, and, among other things, it involves planning, training and exercises. Risk-based decision making can be used within all three of these preparedness and crisis/response management functions.

Table 2 provides some examples of how RBDM can be used within various preparedness activities.

RISK ASSESSMENT TOOLS

One way risk-based decision making can be used to expedite the collection of information needed by an incident commander is through the creation of risk assessment tools. Risk assessment tools streamline the risk assessment portion of the RBDM process by providing a simple or preformatted method for gathering the information needed. Once the tool is populated with information, the tool can quickly provide a snapshot of the risk information needed to make a decision, and may also expedite the creation or review of alternative risk management strategies. Furthermore, by facilitating decisions, risk tools provide a framework and structure that is easily understood by other stakeholders—a key to effective risk communication.

The Spring 2007 issue of *Proceedings* featured three risk tools that have been used or can be used by an incident commander: the Maritime Security Risk Assessment Model (MS-RAM), the National Response Options Matrix (N-ROM), and the post-Katrina salvage response tool.

- MS-RAM is essentially a spreadsheet that facilitates the collection of information on security risks, as well as a calculator that facilitates the "crunching of numbers" and scoring of scenarios and assets. The Maritime Security Risk Assessment Model facilitates the prioritization of resources for security-related decisions.
- N-ROM is a checklist that provides decision makers with a list of response options in response to an attack on the maritime infrastructure. Specifically, N-ROM aims to protect and prevent against follow-on attacks at ports and areas outside of a port that have been attacked. These response options have been vetted by Coast Guard leadership and other federal agencies involved in its creation.
- The post-Katrina salvage response tool provided the salvage group and incident commander with valuable information and an understanding of the risks posed by Hurricane Katrina-related wrecks and debris. The tool allowed the salvage team to efficiently prioritize cases and optimize the allocation of limited resources so that vital waterways could be reopened.

Note: While it is possible to create risk assessment tools "on the fly," ideally these tools should be created prior to an incident through the planning and exercise functions of a unit.

Preparedness Function	Example
Planning	Preparedness plans describe how resources will be used to support incident management. RBDM can help determine priorities. In addition, RBDM can be used to develop strategies for incident response. This is also where risk-based information from all contingency plans, such as the area contingency plan and the area maritime security plan, come into play.
Training	As noted previously, providing hazardous waste operations and operational risk management training is an important part of the response training.
Exercises	RBDM is very useful in screening and selecting scenarios, and certain risk analysis techniques (such as fault tree analysis) can be very helpful in creating scenarios for exercises.

Table 2: Examples of how risk-based decision making can be used within various preparedness activities.

Communication is Key

Both the Incident Command System and risk-based decision making were developed to facilitate communications. Communications is a common denominator between RBDM and ICS, and a key component of a successful response. ICS provides a framework and organizational structure that facilitates communication, while RBDM provides a process and method for understanding and communicating risks.

In addition, efforts to improve coordination and cooperation within the response community have been bolstered by the development of NIMS and forums such as the area committees. The area committees and NIMS make it easier to reach out to and involve stakeholders, and provide excellent opportunities to apply risk-based decision making.

About the authors:

LCDR Michael Simbulan is an engineer from the Human Element and Ship Design Division at Coast Guard headquarters. He has served in prevention billets in San Juan; Puerto Rico; and Honolulu, Hawaii. He is currently responsible for programs and policy related to the design and construction of novel craft and is also a risk-based decision making facilitator.

LCDR LaDonn Allen is currently the chief of inspections, Sector Upper Mississippi River, St. Louis, Mo. In her last assignment as the school chief for the Contingency Preparedness and Response Management School, she became proficient as an ICS instructor. She is a qualified marine inspector and has served in inspections, port operations, and planning and intelligence billets.

Endnotes:

1. Definition of ICS taken from the DHS Emergency Management Institute, available at http://emilms.fema.gov/ICS100G/index.htm.
2. Definition of RBDM from the RBDM Guidelines, available at http://www.uscg.mil/hq/g-m/risk/e-guidelines/rbdm.htm.

Where Can I Get More Information on ICS and RBDM?

RBDM

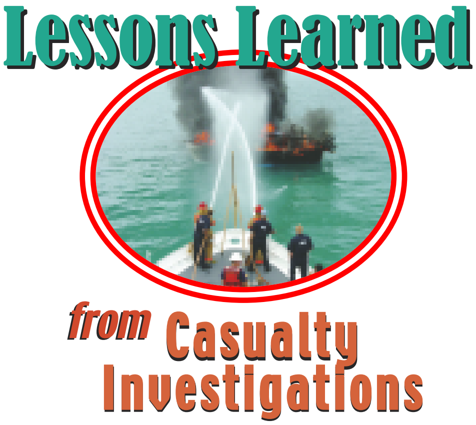
Risk-based decision making is a very useful tool, and like Incident Command System training, it will one day be a core competency for all responders in the Coast Guard. While no formal Coast Guard RBDM training is provided (except as modules within other C-school courses), readers are highly encouraged to visit the RBDM website at http://www.uscg.mil/hq/g-m/risk/.

Among other things, the website contains the RBDM guidelines and a computer-based training tool. In addition, there is a worksheet to guide a risk analysis (http://www.uscg.mil/hq/g-m/risk/e-guidelines/Resources.htm). This worksheet is very helpful in guiding users through a risk assessment. In addition, users seeking assistance with an assessment will be asked to submit the worksheet to facilitate troubleshooting.

NIMS/ICS

The Coast Guard has set servicewide NIMS/ICS training requirements and deadlines for all members. Fortunately, there are plenty of opportunities for ICS training. While classroom training for courses such as ICS-300 and ICS-400 should be arranged through your training coordinator, there are several ICS courses offered online through the Emergency Management Institute (http://emilms.fema.gov/).

Please also see the article "NIMS/ICS Training" in the Winter 2006-07 edition of *Proceedings*. This provides a list and description of courses available.



From Disasters to Lessons Learned

The investigation process for marine casualties.

by LCDR Kelly Post, *Marine Casualty Program Manager*
U.S. Coast Guard Office of Investigations and Analysis

Ms. Diana Forbes
Proceedings *staff writer*

The U.S. Coast Guard investigates marine casualties to promote maritime safety and security and to protect the marine environment. The term "marine casualty" includes any event or occurrence involving a vessel that results in damage by or to the vessel; its apparel, gear, or cargo; or injury or loss of life of any person. Ultimately, the goal of the U.S. Coast Guard is to protect the public through prevention of incidents by revealing the linkage of compounding factors that causes an accident or casualty.

When any marine incident in U.S. navigable waters occurs, the Coast Guard first conducts a preliminary investigation to determine whether a report is genuine, how severe the incident is or will become, whether the Coast Guard has jurisdiction, whether other offices or agencies must be notified, and what level of Coast Guard investigative effort is necessary. The cognizant investigative authority then assigns one of three levels of investigation:

- **Data collection investigation** usually consists of collecting basic factual information for the Marine Information for Safety and Law Enforcement (MISLE) database for future reference and analysis. This category may be assigned to incidents such as groundings with no vessel damage, collisions or allisions with less than $25,000 of property damage, or loss of propulsion or steering on an uninspected vessel 100 gross tons or less.
- **Informal investigations** build upon data collection activity requirements to also include the determination and reporting of a casualty's causal factors as well as a violation analysis, when applicable. This level of effort is necessary in cases involving one death, significant injury, loss of a small vessel, property damage less than $1,000,000, a collision or allision resulting in property damage exceeding $25,000, loss of propulsion or steering on an inspected vessel of over 100 gross tons, flooding or fire on an inspected vessel or vessel over 100 gross tons, lifesaving equipment failure, a medium level of discharge, or a commercial or recreational diving casualty.
- **Formal investigations**, which will be the focus of each "Lessons Learned" feature, are reserved for more serious incidents or other significant occurrences we can learn much from. This most serious level of investigative effort is required for any incident resulting in two or more deaths, two or more seriously disabling injuries, loss of an inspected vessel or a vessel of 500 gross tons or more, property damage exceeding $1,000,000, or a major discharge of oil or a hazardous substance.

The Marine Investigation Process and Policy

There are many interactions between the operational parts of the system, including mariners, management, facilities, vessel traffic services, navigational aids, publications, charts, manuals, and the environment. Because of the complexity of the maritime transportation system, there is constant danger that critical information may be overlooked or lost during a marine investigation.

To avoid this, the Coast Guard has adopted the International Maritime Organization (IMO)'s code to determine the facts and causes of the incidents investigated. The Coast Guard's marine investigation process is based on and mirrors the approach prescribed by the IMO, which asserts that there is no single "root cause" of an incident; rather, there are many causal factors that all contribute in some way. The steps of the process, along with a comparison to IMO's corresponding steps, can be found in figure 1.

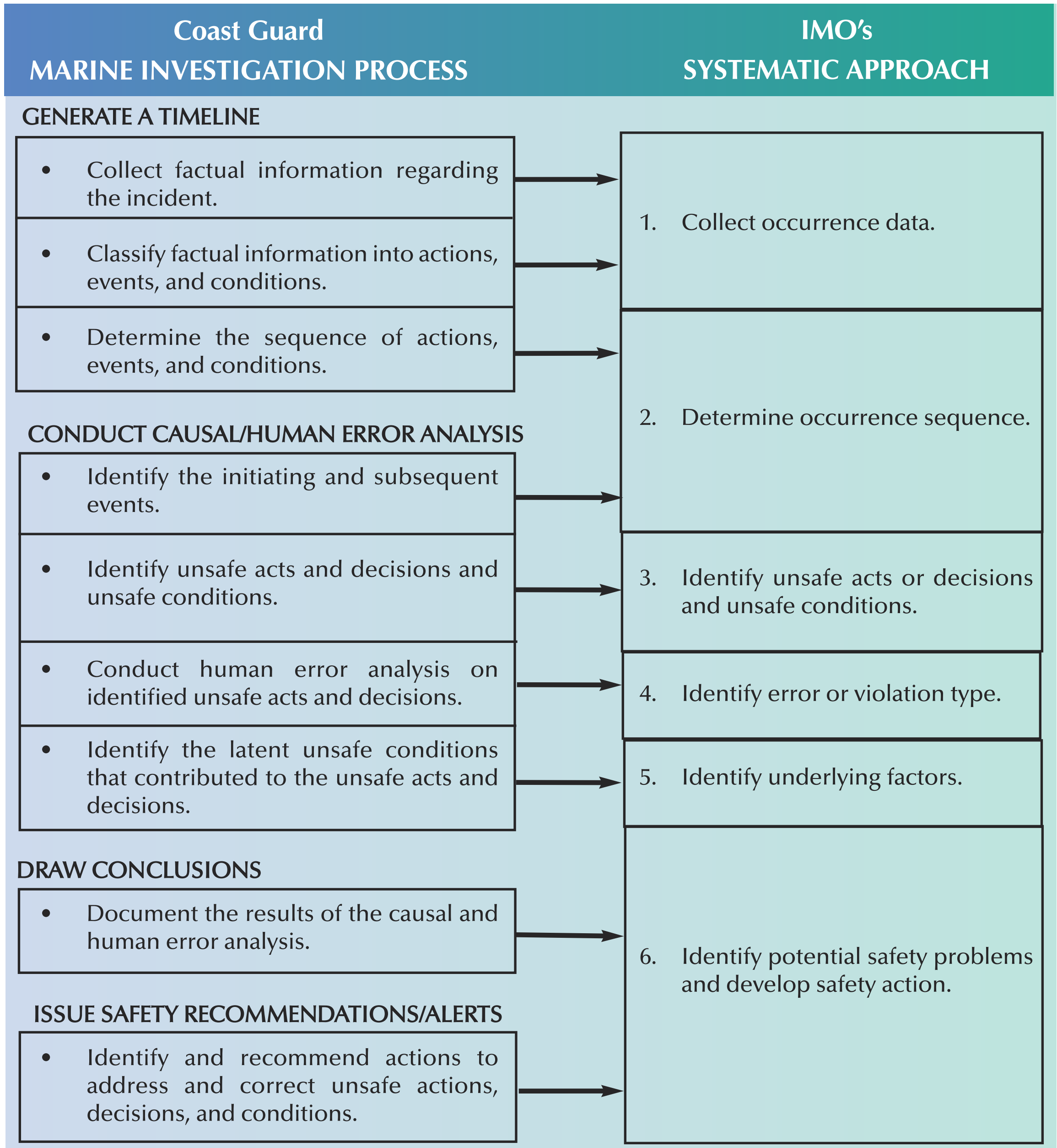


Figure 1: The Coast Guard's marine investigation process as compared to IMO's systematic approach. USCG graphic.

Step 1: Generating a Timeline

Marine investigators use what is called the SHEL model (Figure 2a) to categorize various actions, events, and conditions and generate the timeline of an accident. This model suggests that all of the operational elements of the maritime transportation system belong to one of four categories:

- **software (S)** – information/support systems that guide people;
- **hardware (H)** – vessels, facilities, machinery, cargo, equipment, and material people work with;
- **environment (E)** – the internal and marine environment in which people work;
- **liveware (L)** – other people involved in the situation.

Another "L" at the center of the model represents the person involved in the casualty, who is influenced not only by factors entirely within him or herself, but also by the mismatches that may occur between/among all five elements of the model.

Using the SHEL model moves the focus from the individual (mariner) to the system, and instead assumes that any failure results from a mismatch between two or more components. The model can also be expanded to represent complex situations in which multiple people play roles in the incident, each reacting to a different set of situational factors (Figure 2b).

Once all pertinent information has been collected and sequentially organized to give the "when" part of the timeline, it is classified into actions, events, and conditions. These steps identify the "who," "what," and "where" part of the timeline.

Step 2: Causal Analysis

At this stage, marine investigators conduct causal analysis to determine how and why the incident happened. This occurs in several stages:

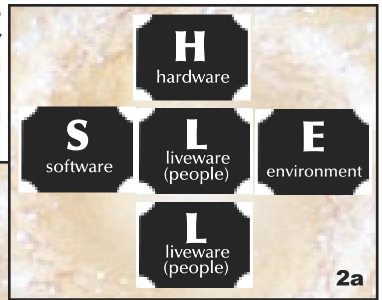


Figure 2a: The SHEL model represents a central person (the center "L," or "liveware") interacting with software, hardware, environment, and other liveware (other people) in an incident.

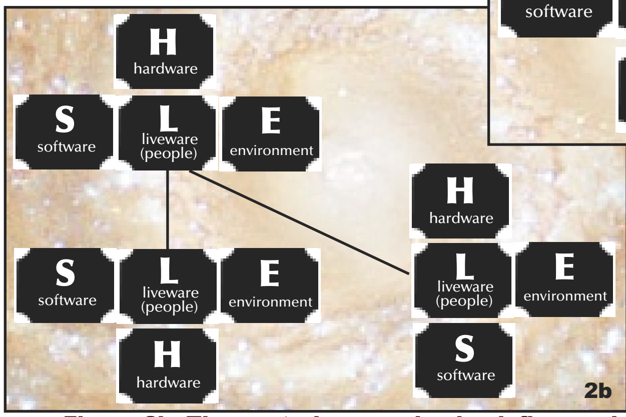


Figure 2b: The central person is also influenced by mismatches in interactions between or among the other components. In this diagram, each person (each member of the bridge crew, or the operator of two vessels and a vessel traffic service operator) should be represented as the "center" of a SHEL diagram, each interacting with the others. USCG graphic.

- Identify the initiating event, subsequent events, and the defense failures that allowed the subsequent events to occur.
- Identify the unsafe act(s)/decision(s), condition(s), and defense failures that allowed the initiating event to occur.
- Identify the remaining causal factors with regard to unsafe act(s)/decision(s), and condition(s) in the model of production.

Step 3: Human Error Analysis

For every unsafe act or decision identified in the first stage of causal analysis, the marine investigator should determine the type of human error involved. As human error is analyzed, it may emerge that certain errors relate principally to specific preconditions. It may also emerge that certain errors are harder or even impossible to defend against. These relationships determine what safety recommendations are made and what improvements the Coast Guard recommends.

Step 4: Conclusions

Conclusions are the results of the causal and human error analysis as they relate to the accident and are generally stated in a "cause=effect" statement. They are classified as either "direct," when analysis leads to only one possible result, or "inferred," when there are one or more possible results and the investigators or others with professional experience and knowledge must decide which is most likely true.

Step 5: Safety Recommendations

The purpose of safety recommendations is to propose corrective actions for identified unsafe conditions or other unwanted outcomes in order to prevent those conditions from contributing to future casualties. They are based upon and flow logically from the timeline, causal and human error analyses, and conclusions of the investigation. Control measures, or defenses, may include conventions, laws, regulations, policies, and/or procedures. Such safety recommendations should only be made for one of two purposes:

- To address unsafe conditions in cases where there are currently no control measures in place, but which can be controlled to some degree.
- To address unsafe conditions for which current control measures are found to be inadequate.

Detailing a Complicated Process

This overview barely scratches the surface of such an intricate process. The Coast Guard's Office of Investigations and Analysis Policy Letter 2-04 breaks each of the five steps mentioned into pages of detailed instruction to explain and illustrate the myriad factors a marine investigator must consider. It also gives philosophical direction to guide investigators as to which pieces of information are most important—and why—for each step of the process. The same office has also published a marine casualty/pollution incident investigations job aid as an in-the-field performance tool to take notes, check off lists, and cover all bases in such investigations.

Similar resources for investigators and information for all, including the general public, can be found on its website, http://marineinvestigations.us. The site contains a wealth of information on casualty reports, the safety alerts and lessons learned that originated because of such incidents, and other information on prevention efforts.

About the authors:

LCDR Kelly Post is the marine casualty program manager in the Office of Investigations and Analysis at Coast Guard headquarters. She was a marine inspector and investigator at MSO Portland Maine, MSO/Group Philadelphia, and Activities New York. She also worked for the Port Authority of New York/New Jersey in the Investigations Industry Training Program.

Ms. Diana Forbes has been a staff writer for Proceedings *since December 2006. Previously, she worked at Coast Guard headquarters as a technical writer for the Human Element and Ship Design division. There she wrote and edited a wide range of publications such as reports to Congress, instructional guidebooks, newsletters, marketing materials, and regular* Proceedings *PTP (Prevention Through People) articles.*

References:

G-MOA Policy Letter 2-02
G-MOA Policy Letter 2-04

Tragic Mistakes, Fatal Consequences

The fiery demise of a tank vessel.

by Ms. Barbara Chiarizia, Proceedings *managing editor*

This is the first article in what will be a regular feature in *Proceedings:* "Lessons Learned From USCG Casualty Investigations." In this ongoing feature, we will take a close look at recent marine casualties. We will explore how these incidents occurred, including any environmental, vessel design, or human error factors that contributed to each event.

We will outline the U.S. Coast Guard marine casualty investigations that followed, describe in detail the lessons learned through them, and indicate any changes in maritime regulations that occurred as a result of those investigations.

It is important to note that lives were lost in some of the marine casualties we will present in this feature. These were tragedies not only for those whose lives were lost, but also for the family and crewmembers who remain. Out of respect for all these people, the articles presented here will mention no names of any person involved in any of the incidents.

The chemical tanker *Bow Mariner*, a 22,587-gross ton vessel, departed from Al Jubail, Saudi Arabia, on January 26, 2004, loaded with 22,000 metric tons of methyl tert-butyl ether and 6,000 metric tons of ethyl alcohol, en route to facilities in the United States. On February 28, 2004, off the coast of Virginia, the vessel caught fire, exploded, and sank. Of the 27 crewmembers onboard, only six survived.

There were many factors that contributed to this casualty. Sadly, this incident, as the subsequent U.S. Coast Guard casualty investigation illustrates, should never have happened.

The Crossing

The voyage began when the tanker took on cargo in Al Jubail on January 26, 2004, and departed for Port Said, Egypt. On February 2, 2004, in Port Said, the second assistant engineer signed off and a new second assistant engineer joined the crew. The vessel then sailed to Kali Limenes, Greece, where it took on 1,200 metric tons of heavy fuel oil and departed for Algeciras, Spain. Arriving in Algeciras on February 12, it took on an additional 200 metric tons of light fuel oil and departed for New York, N.Y. The planned arrival date in New York was February 23, 2004.

During an otherwise uneventful crossing, the vessel encountered some severe weather and was forced to reduce its speed, losing two days. It arrived at the Port of New York/New Jersey on February 25, 2004. It was noted that the heavy seas during the transit prevented the deck crew from performing various maintenance

This article is based on the final U.S. Coast Guard casualty investigation report of the incident by Mr. Jerry Crooks, chief of investigations, U.S. Coast Guard Marine Safety Office Hampton Roads. All conclusions are based on information taken from this report.

tasks prior to a charterer's inspection, scheduled for the end of this voyage in Houston, Texas.

At Stapleton Anchorage off Staten Island, N.Y, in an uneventful transfer, the tanker discharged approximately 6,000 metric tons of methyl tert-butyl ether (MTBE) [1] to a barge, which then departed for a facility in Delaware City, Del. Subsequent MTBE transfers (approximately 10,000 metric tons ashore at St. Linden Terminal, Linden, N.J., on February 26, and about 6,000 metric tons to the Shell Motiva facility on February 27 and 28) were also uneventful. All told, the tanker discharged the contents of 22 tanks.

The USCG casualty report explained the procedures (as spelled out in the ship's manuals) used on this vessel to drain cargo lines after discharge. As outlined in the vessel owner's cargo and ballast operations manual:

"The [vessel] was equipped with tank bottoms that sloped toward the deepwell pump sumps and a cargo stripping system. When the bulk of the liquid cargo had been discharged, the main tank suction valve was closed and the stripping suction valve was opened, in order to remove the last remaining pumpable remnants of the cargo. The remaining cargo contained in the pump stack [the piping that rises from the pump housing in the cargo tank sump to the top of the cargo tank and into the main cargo piping] was purged into the main cargo line on deck using air, a process that took about 10 minutes, and ended when an audible change in sound from the pump was heard. At that time, the stripping valve and the hydraulic line to the pump were closed.

The procedure for draining or clearing the cargo piping after discharge involved blowing down the lines with compressed air. A two-inch flexible air hose was connected to the line at the tank valve. The air valve was opened and the line blown for 20 seconds at eight bar [approx. 116 psi]. This procedure was repeated three times. Afterward the air was left on and the manifold valve closed for 10 seconds, then re-opened. This procedure was also performed three times. Next, the air supply was disconnected from the tank valve and connected to the offshore side of the manifold. The shore line was blown ashore for 20 seconds, and the manifold valve opened and closed twice during this procedure. When done, the air supply was disconnected and the manifold valve closed." [2]

It is important to note, however, that using compressed air to blow down lines that had contained flammable material is not recommended. To avoid adding oxygen to a potentially flammable atmosphere, the recommended procedure is to use inert gas or nitrogen. [3]

Tank Cleaning

On February 28, while en route to Houston, the crew was ordered to clean the tanks that had previously contained methyl tert-butyl ether. This tank-cleaning operation most likely led to the subsequent fire and explosions.

The tank-cleaning procedure used aboard this vessel was noted in the investigation report:

"…the charterer's commodity book contained instructions for gas-freeing the tanks by cleaning the sumps and ventilating the tanks. The commodity book reads as follows:

'VENTILATION

Ventilate tank until gas free, (content in sump should be removed). Use of duct and pull vapour out from the bottom of the tank. A deionized water flush of the bottom might be required.

ALTERNATIV (Sic):

CLEANING WITH FRESH WATER.

Clean tank using warm (50–60C) fresh water for 30 minutes. If short of freshwater, use 30 minutes warm seawater, and then freshwater for 10 minutes. For cargoes requiring high grade water white standard (Methanol MEG FG/Standard) a final rinse with deionized water or the product to be loaded may be required. If cold water is used, 50% more cleaning time is necessary.'" [4]

While the standard line blow-down procedure aboard the tanker was problematic in the use of compressed air, the standard tank-cleaning procedures used aboard this vessel were also worrisome. The commodity book, for example, stated to "ventilate tank until gas free" but did not mention how that was to be accomplished.

The *Tanker Safety Guide, Chemicals*, published by the International Chamber of Shipping, was incorporated into the operator's safety, quality, and environmental management system, but the master did not follow these guidelines:

"7.7.1 Safe procedures for gas freeing after tank cleaning

1. Venting of toxic and flammable gas during gas freeing should be through the vessel's approved gas freeing outlets, and therefore the exit velocity should be sufficient to carry the vapours clear of the deck. No escape of cargo vapours should occur at deck level before concentration within the tank has fallen below 30% LFL [lower flammable limit] and the relevant threshold limit value. Thereafter, final clearance *of the vapour mixture may continue at tank deck level through other larger deck openings.*

2. If portable ventilation equipment is to be used to blow air into a tank, tank openings should be kept closed until work on that tank is about to commence." [5]

The Fatal Order

It is reported that, once at sea, the master ordered the crew to open all of the cargo tank hatches for the empty tanks. The master did not explain his order, nor did the crew question it.

Opening the hatches on all of the empty tanks (that still contained MTBE in their sumps) allowed flammable vapors to escape onto the deck of the vessel. Worse, these vapors are heavier than air, so the vapors would tend to displace air at the lowest available level, placing the "flammable zone" at deck level. Worse still, this allowed more oxygen into the cargo tanks, probably

SHIPBOARD CULTURE

The USCG casualty investigation uncovered circumstances that likely contributed to this incident and certainly contributed to the high loss of life. As noted in the report:

"The master, chief officer, and chief engineer of the [vessel] were Greek and the remaining officers and crew were Filipino. Under the safety, quality, and environmental management system, the master has 'total responsibility' for the operation, seaworthiness, and safety of the vessel at all times….The master has full authority over all persons (personnel and passengers) onboard his vessel. The master's authority is not questioned and must be supported and maintained by onboard personnel. Orders must be carried out and obeyed as said, in letter and in spirit. Refusal to do so is grounds for prompt disciplinary action, including possible termination of employment.

Such absolute authority is not unusual aboard seagoing vessels. Indeed, many would argue such absolute authority is essential to maintaining good order and discipline. But… the distinctions between the Greek senior officers and Filipino crew were remarkable. Filipino officers did not take their meals in the officer's mess, were given almost no responsibility, and were closely supervised in every task. The second assistant engineer, who was working aboard a [company] vessel for the first time, was upset when he was chastised on his first day aboard because he inquired about his management and administrative duties. The chief engineer sternly told him that he would be given verbal job orders daily, was to do only as he was told, and would have no administrative duties beyond making log entries.

In contrast…the fleet operating procedures manual spells out significant duties for the second engineer—duties the chief engineer…was not prepared to entrust to his subordinate officers. The lack of trust was apparent on deck as well. The surviving deck crew reported that the chief officer would not sleep, beyond short naps in a chair in the cargo control room, during cargo operations. The chief officer performed all management and administrative duties himself, including the preparation of plans for cargo loading/unloading, ballast management, tank cleaning and gas freeing, training, and drills. He did not delegate or attempt to train the junior officers to perform any of these tasks, either to reduce his own workload or provide for their professional growth.

When questioned about what they would do if instructed to do something unsafe by one of the senior officers, each crewman replied that they would do as they were ordered. One crewman said that the orders of the Greeks were 'like words from God.'

Probably the most telling evidence of the lack of cohesiveness in the crew…was their response to the explosion. Although the official language of the crew was English, the [master] and chief engineer were conversing in Greek when they assembled with the crew, aft of the accommodations. The surviving messman, who was with this group, reported that he and the other crewmen were simply waiting for someone to tell them what to do. Those instructions never came. The final blow came when the [master] ignored questions from the third officer about whether a distress signal had been sent." [1]

Endnote:

1. "United States Coast Guard Investigation into the Explosion and Sinking of the Chemical Tanker *Bow Mariner* in the Atlantic Ocean on February 28, 2004 with Loss of Life and Pollution," Mr. J. R. Crooks, chief, investigations, U.S. Coast Guard Marine Safety Office Hampton Roads, pp. 42-43.

bringing the contents into the flammable range.

As the crewmembers worked to clean the tanks, the flammable vapors most likely accumulated in sheltered areas of the deck or near the tanks. All that was required was a single spark to ignite that gas and cause a fire that raced back to the source of the vapors—the cargo tanks—causing them to explode.

Forward-looking infrared photo of the vessel, shot from the C-130 dispatched from Air Station Elizabeth City. USCG photo.

The Incident

From all evidence, this is precisely what happened. No surviving crewmember has first-hand knowledge of the tank-cleaning operation at the time of the initial fire or explosion, so the report relies upon witnesses on other vessels in the vicinity, the statements of the survivors, and remotely operated vehicle examination of the submerged vessel.

At 6 p.m. on February 28, 2004, the bulk carrier *Dakshineshwar* was approximately two nautical miles east of the doomed vessel when the chief officer reported that he saw a yellow flash on the tanker's port side, forward of the manifold, approximately 20 meters aft of the bow. He stated that this flash was followed by a fire that rose upward and engulfed the manifold area, followed by two large explosions.

Two other vessels were in the immediate vicinity. The captain of the commercial fishing vessel *Karen L*, which was an estimated 14 nautical miles away, reported that he saw and heard an explosion at about 6 p.m., followed by several smaller explosions. The commercial fishing vessel *Capt. Bucky Smith* was scalloping about 18 miles away. The captain reported that he saw a fireball in the distance, but didn't hear an explosion. All vessels diverted to assist.

Aboard the Vessel

Aboard the doomed vessel, chaos and confusion reigned. The recollections of the survivors in the investigation report makes for poignant reading. All of the survivors mention that, in the aftermath of the explosions, they saw fellow crewmembers who aren't mentioned in the report again, except among the tally of the dead.

At the time of the initial explosion, an electrician, the third officer, and an able seaman were in their rooms. All three had participated earlier in the ongoing tank-cleaning operation. The chief cook and a messman were in the galley. The second assistant engineer was at the door to the engine room. Each reported that there was a large explosion at about 6 p.m. that caused the vessel to shake and list dramatically to starboard. Several explosions followed and all reported flames forward and to port. The second assistant engineer stated that the explosions did not occur in the engine room.

In the chaos that ensued, no one directed any firefighting, communication, or abandon-ship efforts. The third officer and the messman reported that they saw the master of the vessel and the chief engineer descending from the fourth level and making their way to the starboard winch deck. It is reported that neither senior officer gave any direction to crewmembers, nor did the master answer the third officer when that officer asked about sending a distress call.

Receiving no reply to his questions, the third officer made his way to the bridge. He activated the digital selective calling alarm and sent a mayday. He then went to the bridge top to activate the emergency position-indicating radio beacon and cast it overboard.

The Six Survivors

The third officer made his way back to the starboard winch deck, where he held fast to the piping of the fixed CO_2 system. He saw many crewmembers in the water, including the master and the chief engineer. He was also able to see the second assistant engineer, the chief cook, and the able seaman as they clung to the stern railing.

As the ship was sinking, the third officer was able to jump directly into the starboard life raft, approximately four meters below. He was followed by the second assistant engineer, who missed the life raft but was able to climb in. The chief cook and the able seaman were able to drop into the raft from their perch at the stern rail.

These four men cut the raft's painter and searched for survivors. They located the electrician and messman, both of whom had entered the water earlier from the starboard winch deck, and pulled the two oil-covered men aboard the life raft. Although the men in the life raft heard cries for help and lit flares in an effort to locate crewmembers and guide them to the raft, they found no other crewmembers.

Search and Rescue

Coast Guard assets from Coast Guard Group Eastern Shore, Air Station Elizabeth City, and Air Station Atlantic City conducted the search and rescue efforts along with Coast Guard cutters *Albacore* and *Shearwater*. Group Eastern Shore launched a 47-foot motor lifeboat, Elizabeth City scrambled HH-60 Jayhawk helicopters and a C-130 Hercules fixed-wing aircraft, and Atlantic City sent an HH-65 Dolphin helicopter. (See SAR sidebar.)

During rescue efforts, the crew of the first Elizabeth City Jayhawk plucked all six men out of the downed vessel's starboard life raft and took them to a hospital in Virginia. All survived.

Meanwhile, Air Station Atlantic City's Dolphin helo located an unclothed body in the water. Using the Dolphin's searchlight, the Coast Guard crew guided the *Karen L* to the body and the fishing vessel's crew recovered the lifeless man. The victim, later identified as the chief officer, had sustained severe injuries to his head and extremities. These injuries and his unclothed state indicate that he may have been in the vicinity of the explosions.

The rescue swimmer from the Dolphin pulled another crewmember—the third assistant engineer—from the oily water. He was alive, but only barely. The flight mechanic and rescue swimmer performed CPR during the flight to the Ocean City, Md., airport, where the victim was loaded into an ambulance. He later died at the hospital.

A final victim was found clinging to a life raft and was pulled aboard fishing vessel *Capt. Bucky Smith*. He was hoisted into the second Elizabeth City Jayhawk, where crew performed CPR. He was transferred to a police helicopter, which then transported him to a local hospital where he was pronounced dead. He was later identified as the ship's fourth assistant engineer.

The Aftermath

The crippled tanker sank beneath the waves at approximately 7:30 p.m. on February 28, 2004. Although search efforts continued until the night of February 29, no other victims were recovered. Ultimately, only the six crewmembers who made it into the starboard life raft survived the ordeal. All told, only nine crewmembers were recovered (the six survivors, the deceased chief officer, and the third and fourth assistant engineers who did not survive, despite heroic rescue efforts). Eighteen crewmembers of the downed vessel, including the master and the chief engineer, remain missing.

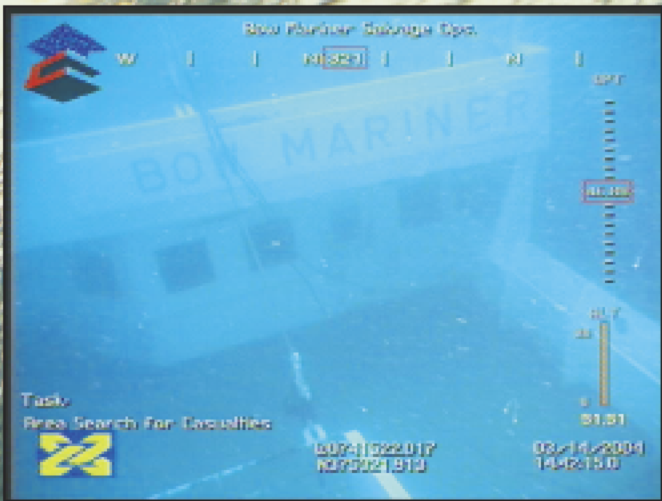
> **Instead of an organized, thoughtful response, the situation deteriorated to "every man for himself."**
>
> —USCG investigation report

Following this tragedy, investigators were left with more questions than answers. What caused this incident? Why was the damage so catastrophic? As the investigation proceeded, new questions arose. Why did the master order all tanks open at once? Why did no one question that order? Why was the loss of life so high?

The day following the incident, a fire-damaged lifeboat from the vessel was discovered adrift. No one was onboard. USCG photo.

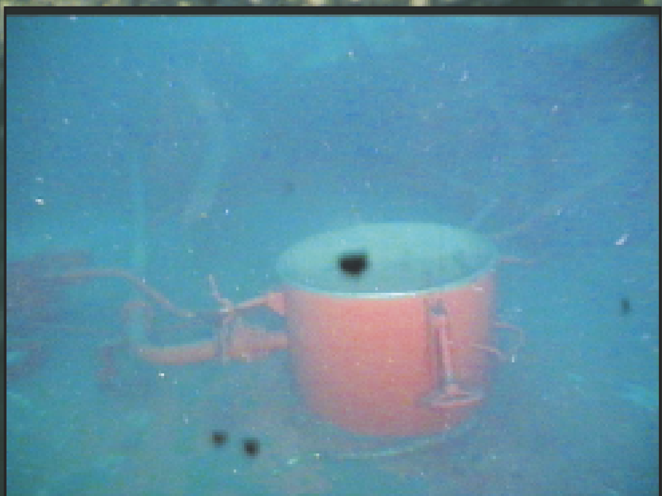
The official report concluded that the cause of this casualty was the ignition (from an undetermined source) of a fuel/air mixture on deck. Possible sources of the fatal spark:

- electrostatic discharge,
- mechanical sparks caused by metal-on-metal contact,
- faulty electrical equipment,
- sparks caused by changing batteries on portable electrical equipment.[6]



The vessel lies at the bottom of the Atlantic. Photos courtesy of Canyon Offshore.

This photo shows structural damage from the explosion, which is indicated by the way the plate is torn and bent outward.



This photo shows one of the 22 cargo hatches found open during the underwater survey. There is no damage to the hatch, which indicates it was not "blown" open by an explosion, but was open at the time of the explosions.

This is a photograph of a center cargo tank, one of six loaded tanks. Note the extensive damage on the cargo deck and that the tank was securely closed. The pipe at the left margin of the photo is the platform for the remotely operated vehicle.

The vessel suffered such catastrophic damage because nearly all of the 22 empty cargo tanks exploded. Survivors and witnesses reported a series of explosions, and, later in the investigation, underwater video revealed evidence of massive explosions in the cargo area. (See photos above).

Why Open All Tanks at Once?

It can be surmised that the master intended to make up for lost time (the ship was two days behind schedule) before the upcoming charterer's inspection, when the cargo tanks were required to be gas-free. According to the USCG report, however:

"[The] order to open the 22 cargo tanks that had previously held MTBE was a stunningly significant breach of normal safe practices for a tank ship and defies explanation or excuse." [7]

"There is no evidence that the speed of the gas-freeing process would have increased by opening the cargo hatches." [8]

Why Did No One Speak Up?

As for why no one questioned the master's order, it is important to note that there was a severe cultural divide aboard this vessel. The master, chief officer, and chief engineer were Greek; the rest of the officers and

continued on page 75

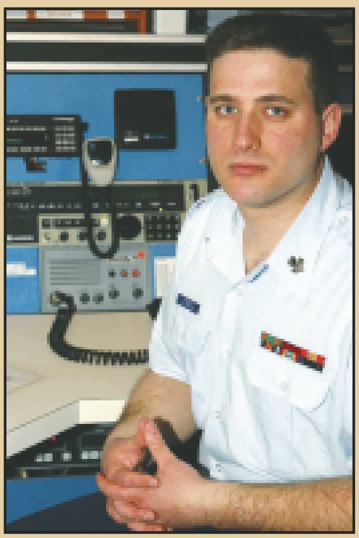
SEARCH AND RESCUE

by PA1 Krystyna A. Hannum
U.S. Coast Guard

The foreign accent was filled with urgency and terror and demanded immediate attention.

"*Bow Mariner*, *Bow Mariner*. We are on fire, we are on fire! Mayday, mayday, mayday. This is *Bow Mariner*, *Bow Mariner*, we are on fire. Mayday, mayday, mayday, this is *Bow Mariner*, we are on fire, we are on fire!"

At Coast Guard Group Eastern Shore in Chincoteague, Va., Operation Specialist 1st Class Christopher S. Wheeler attempted to make radio contact with the frightened man, but his calls went unanswered. Information poured over the radio as various marine vessels radioed the Coast Guard about a vessel in distress and Wheeler was able to piece together that an explosion had occurred offshore. Expecting a mass casualty, Wheeler and other watchstanders got on the phones to get as many assets as possible to assist the ship.



Just as he was relieving the watch, OS1 Christopher S. Wheeler heard the mayday call, kick-starting one of the largest search and rescue cases the Coast Guard has seen in recent years. U.S. Coast Guard photo by PA1 Krystyna A. Hannum.

In the brief minutes following the alert, the Coast Guard learned that the vessel name was *Bow Mariner*, a 570-foot Singapore-flagged tanker en route from Linden, N.J., to Houston, Texas carrying 3.5 million gallons of industrial ethanol. It had been about 50 miles east of Chincoteague, Va., Feb. 28, 2004, when an explosion fatally wounded it.

Air Station Elizabeth City
Farther south in North Carolina, many of the aircrew at Coast Guard Air Station Elizabeth City had finished dinner and were relaxing in the crew's duty lounge. Electronics Technician 2nd Class Sam W. Pulliam and Aviation Machinery Technician 3rd Class Jeremy L. McMullen were among them when the pulsing "whoop, whoop" of the SAR alarm rang throughout the building.

"Now, ready helo crew. Boat on fire off the coast of Chincoteague," came the watchstander's broadcast. The duty HH-60 Jayhawk crew, including Pulliam, two pilots, and a rescue swimmer raced to their helicopter and prepared to launch.

Minutes later, the alarm sounded again, yet this time without a broadcast, and when AMT3 McMullen, who was on the C-130 Hercules crew, saw his pilot run by he knew that they too were going to launch. He grabbed his bag and dashed out to the plane. Twenty-one minutes after the alarm, the plane was airborne.

CGC *Albacore*
Meanwhile, the commanding officer of the 87-foot Coast Guard Cutter *Albacore*, at anchor for the night in the mouth of Delaware Bay, received word that they were diverting to assist and directed the crew to haul anchor and set a course for the position.

The eyes high in the sky, AMT Jeremy L. McMullen aboard the C-130 from Air Station Elizabeth City, N.C. With the powerful camera, McMullen was able to locate the raft with the only six survivors from the tragedy. U.S. Coast Guard photo by PA1 Krystyna A. Hannum.

Air Station Atlantic City
Aviation Survival Technician 3rd Class Zee Lee was sitting down to dinner when the SAR alarm at Coast Guard Air Station Atlantic City sounded. AST3 Lee quickly learned of the possible burn victims and chemicals present and prepared the cabin of the HH-65 Dolphin helicopter with extra burn victim medical gear. The Dolphin went airborne with Lee and three more crew and sped toward the vessel.

On Scene
With a faster air speed, the Elizabeth City Hercules won the race to the scene. AMT3 McMullen, looking through an infrared lens, panned the camera down and couldn't believe what he saw. The stern of a ship was sticking out of the water, the rest already beneath the water's surface.

"This thing's going down," McMullen reported to the pilot.

Flying over the sinking ship, McMullen spotted a covered life raft. Zooming in with the camera, AMT3 McMullen examined the screen, looking for evidence of any survivors. He concluded that someone had to have set up the life raft and was possibly inside of it. The Hercules radioed to the crew of the Jayhawk, 15 minutes away, to check it out when they arrived.

The Dolphin from Air Station Atlantic City appeared moments later and immediately began searching for survivors, focusing on the rapidly receding superstructure. Amazingly, lights still burned brightly inside the condemned ship, but as Lee and the crew drew closer, the lights flickered twice before becoming as dark as the surrounding water and sky. Searching for anyone who might be clinging to the ship, the Dolphin hovered nearby. The crew saw no one.

At 7:30 p.m., as rescuers watched in silence, the last section of the vessel slipped below the surface and made its voyage to the ocean bottom.

Above the scene at 5,000 feet, the Hercules took on the role of on-scene commander. Searching with a powerful C-130 airborne sensor palletized electronic reconnaissance camera, McMullen spotted possible areas with survivors while his fellow crewmembers vectored in the helicopters.

The Rescues
The Elizabeth City Jayhawk reached the life raft and confirmed there were men inside. However, the pilot was hesitant to lower rescue swimmer, Aviation Survival Technician 3rd Class Dave Foreman, into the chemicals and oil that had escaped from the fractured ship. AET2

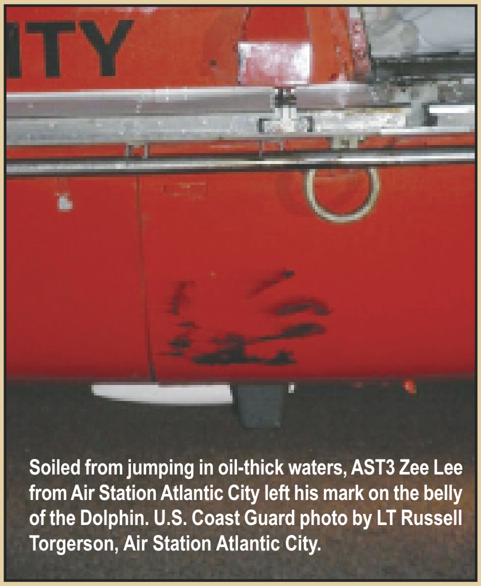
Pulliam, operating the hoists, dropped the basket next to the raft, hoping the men would get into it on their own. When they made no attempts to leave their raft, it became clear the swimmer would have to go in.

The first four trips of the basket went quickly, although as each survivor entered the cabin of the Jayhawk, the air became more pungent with the smell of alcohol, and the decks more slick from the oil. Although Pulliam was attached to the helicopter with a harness, the survivors weren't, and he realized that one wrong move and one of them might slide out of the open door to the water 70 feet below.

There were only two men left in the raft as AET2 Pulliam readied the stokes litter for a man with a possible back injury. After the fifth survivor was raised to the Jayhawk, Pulliam wrestled him into the cabin. Disconnecting the litter, Pulliam reattached the basket and sent it down one last time.

As he watched the basket rise, Pulliam thought that the swimmer had been mentally affected by the fumes and had placed a black bag in the basket. As the basket reached the cabin door, Pulliam realized the "bag" was a person so completely covered in oil that not even the whites of his eyes or teeth showed.

Once the swimmer was aboard, the pilots turned the Jayhawk's nose southwest and headed to the hospital. During the hour transit, AET2 Pulliam, not wanting to move the severely hypothermic man more than necessary, held on to the basket atop the litter so that it would not crush the man still in the litter. To prevent the man in the basket from falling asleep, a dangerous situation for a hypothermic victim, Pulliam jostled, poked, or pinched him each time he closed his eyes, but each time the man would respond aggressively, ensuing mini-skirmishes in the already tight quarters. It took nearly an hour before the helicopter landed at Norfolk Sentara Hospital in Virginia.



Soiled from jumping in oil-thick waters, AST3 Zee Lee from Air Station Atlantic City left his mark on the belly of the Dolphin. U.S. Coast Guard photo by LT Russell Torgerson, Air Station Atlantic City.

Back at the search area, a large field of debris and pollution made the search for more survivors difficult. During the Jayhawk's rescue of the six survivors, the Air Station Atlantic City Dolphin found an additional person. Aviation Survival Technician 3rd Class Lee was dropped into the oil-coated water.

Once in, Lee cautiously swam toward the man and worried that he was already deceased. When he saw the man move his arm slightly, Lee immediately clipped him into his own sling and directed the flight mechanic to hoist them up together.

With difficulty, the oil-soaked pair struggled into the helicopter. AST3 Lee checked the man for a pulse and couldn't find one. As the helicopter sped towards the nearest hospital, Lee and the flight mechanic began CPR. The oil in the cabin complicated efforts, making

AET2 Sam W. Pulliam, the flight mechanic from the helo that rescued six crewmembers, knew that the case was going to be big after hearing of the tanker explosion. U.S. Coast Guard photo by PA1 Krystyna A. Hannum.

the use of oxygen impossible. Lee began administering mouth-to-mouth resuscitation while the flight mechanic started compressions.

The Dolphin was well on its way to Maryland when a second Jayhawk helicopter from Elizabeth City and a 47-foot motor lifeboat from Station Chincoteague arrived at the debris field. The eyes high above in the Hercules were still directing the Coast Guard and civilian assets to various search areas when Aviation Machinery Technician 3rd Class McMullen spotted a person on a lifeboat. The Jayhawk was already with the lifeboat but was unable to see the man. A nearby commercial fishing vessel, the *Capt. Bucky Smith*, came alongside and two fishermen jumped aboard the partially submerged boat. The front and back ends of the lifeboat had been blown away and a man was clinging to the side of it—alive.

The fishermen hauled the man onto the *Capt. Bucky Smith* as the Jayhawk lowered Aviation Survival Technician 3rd Class Joel Sayers. Sayers checked the man, who was alert and talking, although there was a language barrier. Sayers prepared the hoist from the hovering Jayhawk and when he returned to the man, realized that he had stopped breathing. AST3 Sayers and the fishermen quickly strapped the man into the litter and hoisted him, followed by the rescue swimmer. Sayers and the flight mechanic performed CPR on the man as the helo raced to the hospital. However, the man never regained consciousness and was pronounced deceased. The man AST3 Lee had plucked from the water later succumbed to his injuries as well.

SAR Concludes

A fishing vessel on scene recovered one other deceased crewmember, who was later transferred to the *Albacore* and brought back to Norfolk.

The six men who had been found in the life raft were the only survivors of the 27-member Filipino and Greek crew. Although the Coast Guard continued searching for more than 40 hours, 18 crewmembers remain missing today.

About the author:

PA1 Krystyna Hannum enlisted in the Coast Guard in 1998 and become a public affairs specialist in 2001. Her public affairs career was spent at Atlantic Area / Fifth District in Portsmouth, Va. During her tour there, she wrote stories and photographed numerous Coast Guard cases including the response to September 11; detainee operations in Guantanamo Bay, Cuba; the Athos 1 *oil spill; the shuttle Columbia tragedy; and migrant operations in the Caribbean. She transferred to the reserves in July 2006 and currently drills for public affairs, USCG Seventh District.*

crew were Filipino. The Filipinos, even the officers, were not given appropriate authority and were closely monitored during any assignment.

The Greek officers were reported to be condescending and abusive toward the Filipinos. Not only did this treatment culminate in a shipboard attitude of "don't ask questions, just do what you're told," it did not allow the Filipino crewmembers to learn about the technical aspects of their jobs. Even if they were aware of a dangerous situation, they would be unlikely to bring it to the attention of a senior officer. Worse still, given the attitude of the senior officers, it is unlikely that their concerns would have been taken seriously.

Why Was the Loss of Life so High?

The magnitude of the loss of life as a result of this tragedy points directly to the actions of the senior officers (or, rather, lack thereof). Among the conclusions of the USCG report:

"The failure of [the master] to properly organize a response to the explosions contributed to the high loss of life. He abandoned ship without sending a distress signal, without attempting to contact a nearby ship, without conducting a proper muster or search for injured crewmen, and without attempting to launch primary lifesaving appliances.

[The master] and chief engineer abandoned ship within 10 minutes of the first explosion, leaving behind other crewmembers they knew to be alive. Their premature action exposed the crewmen who entered the water with them to the cold water far earlier than necessary.

The failure of [the master] to conduct regular and effective fire and boat drills contributed to the high loss of life. It is widely accepted that people react in emergencies precisely as they have been trained. In this casualty, the officer on watch failed to sound the general alarm, failed to make an announcement, and failed to send a distress signal. Several crewmen panicked and no one reported to their muster stations with the equipment they were assigned to bring. Those who gathered were disorganized, did not know what to do, and were in desperate need of leadership that [the master] and [chief engineer] did not provide." [9]

Lessons Learned

So what lessons can be learned from such a tragedy? How can the U.S. Coast Guard help to ensure that it is not repeated? Unfortunately, there wasn't anything the Coast Guard could have done to prevent this tragedy. It is unreasonable to expect the Coast Guard to create regulations that will protect mariners from all possible hazards. Moreover, safety regulations only help protect those who follow them. Indeed, this incident would never have occurred had senior crewmembers followed their own safety procedures.

In addition, several of the recommendations in this casualty investigation report addressed situations that could not be remedied by regulation. For example, it was recommended that the vessel's operating company review its policies with regard to shipboard workforce interaction and cooperation.

A recommendation to require inerting of vessel cargo tanks that carry flammables was deemed unadvised. To "inert" a tank means to render the contents inert or static. In this case, it means that the tank cannot explode.[10] The argument against a mandatory inerting regulation:

"Currently IGS [inert gas system] requirements do not apply to chemical tankers because the inert gas could contaminate chemical cargoes. For example, carbon dioxide produced as an inerting agent can drive certain cargoes off specification. Additionally, there are other chemical cargoes shipped with inhibitors that react with oxygen in the tank to prevent the cargo from undergoing unwanted reactions, and displacement of the oxygen through inerting can cause the breakdown of those inhibitors required to prevent these reactions." [11]

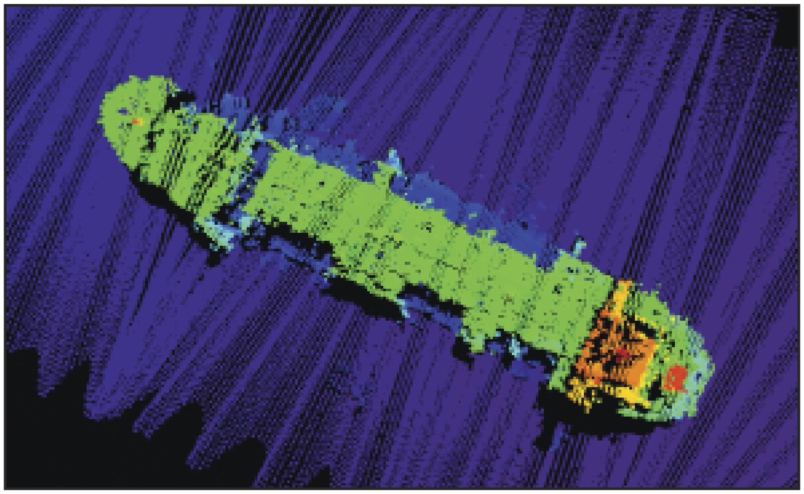
The second assistant engineer and the able seaman stated that, when deciding to climb on the railings and stay with the ship, they were not relying on any specific training in cold water survival, but on what they had seen in the movie "Titanic."

—USCG investigation report

The only regulation changes deemed appropriate to this incident: Codify certain regulations regarding U.S. Coast Guard authority to investigate incidents aboard foreign-flagged vessels within the U.S. exclusive economic zone. These changes have taken effect. Regulations now cover incidents involving significant harm to the environment as well as a probable discharge in waters subject to the jurisdiction of the United States, including the exclusive economic zone. [12]

Final Thoughts

Fortunately, it is reported that the vessel's operator has made some voluntary changes that exceed some current



This is a three-dimensional, side-scan sonar image of the wreckage. This shows catastrophic damage to the wing tanks on both sides of the vessel. The purple is the sea bottom; blue is the tank top; green is the weather deck; orange the bridge top; and the three points of red are the forward mast, aft mast, and funnel. Photo courtesy of the National Oceanic and Atmospheric Administration.

safety regulations. For example, the company has decreed that all its vessels must now utilize onboard inert gas systems to maintain all cargo tanks at an oxygen level below 8% (a level that will not support combustion). Also, in excess of safety regulations, the company has placed immersion suits on all vessels. The doomed vessel carried none, nor was it required to.

It is common knowledge that commercial fishing, shipping, and other seaborne occupations present inherent dangers. Oceangoing mariners labor in an often unpredictable and unforgiving environment. Among their only protections are the integrity of their vessel and the processes and procedures that maintain its seaworthiness. It is hoped that by promulgating this incident and highlighting the many unsafe practices that occurred aboard this vessel, these errors will not be repeated.

About the author:
Ms. Barbara Chiarizia is the managing editor of Proceedings. *She has been a U.S. Coast Guard civilian since 2006. She manages all aspects of the magazine's production. Her duties also include writing, editing, and coordinating articles related to marine safety, security, and environmental protection. She previously produced magazines for the construction and heating/air conditioning industries and has extensive experience in writing and editing technical articles.*

Acknowledgements:
Mr. Jerry Crooks, LCDR, USCG (Ret.) has served with the U.S. Coast Guard for 32 years. He retired in 1999 and became the Coast Guard's first civilian senior investigating officer. He has 28 years of experience in marine safety and more than 20 years as a marine inspector and investigator. He holds undergraduate and graduate degrees in business management, and has been the senior investigating officer at Sector Hampton Roads since March 1997.

The Investigation:
This investigation lasted about nine months and involved more than a dozen investigators at its peak. Investigators interviewed more than 100 people and collected and reviewed more than 3,500 pages of documents, 57 hours of underwater video footage, audio recordings of emergency communications and search and rescue efforts, infrared video footage shot by search and rescue aircraft, and a video shot by a nearby ship.

In April 2004, the lead investigator traveled to Singapore to examine a sister ship and interview former crewmembers. Marine Safety Office Hampton Roads led the investigation with assistance from Marine Safety Office Corpus Christi and Activities New York. In addition, scientists with the Bureau of Alcohol, Tobacco, and Firearms assisted with analysis of evidence and provided technical research assistance. Finally, officials with the Singapore Maritime and Port Authority and Philippine Embassy were instrumental with evidence collection and legal issues.

For more information about this casualty, see: *Proceedings of the Marine Safety & Security Council*, Fall 2004, and the April and December 2004 issues of *Coast Guard* magazine.

Endnotes:

1. Methyl tert-butyl ether (MTBE) is regulated by the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78). MARPOL lists MTBE as a Category D noxious liquid substance, with a wide flammable range.
2. "United States Coast Guard Investigation into the Explosion and Sinking of the Chemical Tanker *Bow Mariner* in the Atlantic Ocean on February 28, 2004 with Loss of Life and Pollution," Mr. J. R. Crooks, chief, investigations, U.S. Coast Guard Marine Safety Office Hampton Roads, p. 32.
3. "Blowing down piping that previously contained a flammable or combustible cargo with air is not a recommended practice aboard tank vessels. Air introduced at high pressure into piping or a tank can cause static accumulation and result in an electrostatic discharge. This practice also introduces air, and thus oxygen, into the piping and tanks, potentially bringing the atmosphere into the flammable range. The recommended procedure for blowing down cargo piping that contained flammable or combustible cargo is to use inert gas or nitrogen." USCG investigation report, p. 32.
4. "United States Coast Guard Investigation into the Explosion and Sinking of the Chemical Tanker *Bow Mariner* in the Atlantic Ocean on February 28, 2004 with Loss of Life and Pollution," Mr. J. R. Crooks, chief, investigations, U.S. Coast Guard Marine Safety Office Hampton Roads, p. 33-34.
5. Ibid, p. 34.
6. Ibid, p. 45.
7. Ibid.
8. Ibid, p. 34.
9. Ibid, p. 46.
10. "The basic premise in [inerting tanks] is to reduce the level of oxygen in the cargo tank to a level that will not support combustion. A mixture of flammable gases and oxygen is flammable only when the components are in the correct balance. The explosive range falls between the lower explosive limit, which is too lean to burn, and the upper explosive limit, which is too rich to burn. Inert gas is a gas that will not support combustion, such as CO2 or nitrogen." USCG investigation report, p. 28.
11. "United States Coast Guard Investigation into the Explosion and Sinking of the Chemical Tanker *Bow Mariner* in the Atlantic Ocean on February 28, 2004 with Loss of Life and Pollution," Mr. J. R. Crooks, chief, investigations, U.S. Coast Guard Marine Safety Office Hampton Roads, p. 2.
12. 46 CFR 4.03-65.

The Role of Social Science Research, GIS, and Trends

Analysis for proactive management in the U.S. Coast Guard.

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Based on its multiple and often intertwined missions of maritime security, protection, mobility, and defense, the U.S. Coast Guard has historically been a "reactive" agency. As the country's oldest continuing maritime service, the Coast Guard has a proud tradition of protecting American waterways and natural resources, ensuring commerce, and saving lives. These missions rely on a structured, linear military management process. For example, when faced with a search and rescue mission or oil spill incident, U.S. Coast Guard personnel rely on training and experience to assess the current conditions, determine a plan of action, execute that plan, and re-evaluate efforts after the task has been completed. This process follows the basic management framework of assessing current conditions, implementing management action, and evaluating outcomes to see how future courses of action should proceed.

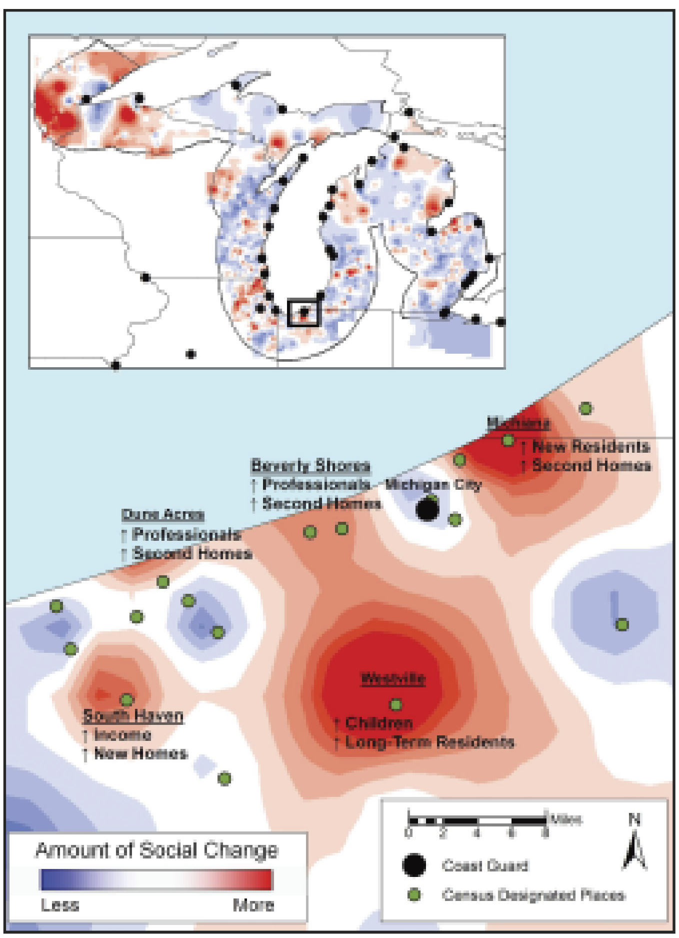

Figure 1. U.S. Coast Guard presence and social change in the Great Lakes region. USCG graphic.

Since the events of 9/11 and USCG's subsequent entry into the Department of Homeland Security, the Coast Guard has seen increased responsibilities in its security-related missions. Several years later, Hurricane Katrina served as a reminder of the importance of the search and rescue, environmental, and incident management missions. The traditional planning model worked in the past, and continues to work successfully. Using its collective tools and training, once a situation arises, the U.S. Coast Guard can take action. However, with its expanded responsibilities and roles comes the need to reconsider the efficacy of this model to meet new challenges. An alterna-

Figure 2. As the population grows, particularly via second home growth, coastal recreational usage increases. In turn, there is potential for increased involvement of the Coast Guard. USCG photo by Joseph P. Cirone, USCG Auxiliary.

tive to reactive-based planning is proactive planning—using current information to project and plan for future conditions.

The Coast Guard already employs some proactive planning. At a micro level, such as risk or incident management, Coast Guard personnel have precise management plans to face unforeseen challenges that may occur during particular phases of their missions. For example, during an oil spill incident, the National Oil and Hazardous Substances Pollution Contingency Plan mandates that the Coast Guard adhere to a predetermined management scheme during spills of national significance. The Maritime Transportation Security Act of 2002 was developed based on risk management principles and requires vessels and port facilities to conduct vulnerability assessments and develop security plans. Though these examples are a good first step, they are few and far between.

The Coast Guard and Social Science

A review of current unclassified research at the Coast Guard Research and Development Center indicated a majority of current research is focused on evaluating current systems or using new technologies to improve mission efficiency. One underemphasized area of research is the role of social science research to improve missions.

It would be specious to say that the Coast Guard does not value the role of social science. A majority of the training at the Coast Guard Academy and the Leadership Development Center applies theories of social science to improve individual leadership through a greater understanding of the social environment. Courses such as leadership and facilitation, conflict management, ethics, and generations are all based in psychology, sociology, and public administration theory. For example, "generations" training seeks to understand the characteristics and values of different generations (e.g., baby boomers and gen x-ers) so leaders can better understand and manage the working and social relationships among team members.[1]

However, similar to other Coast Guard training, these tools work within the context of specific missions and are primarily reactive in nature. In other words, they are employed when a contextual situation arises.

Social science can be a tool in proactive management, particularly by identifying current conditions and planning for future conditions. One tool, the social assessment, is used in land management and studied by human dimensions researchers[2] to understand the socioeconomic and political climate of a given locale and identify areas of change that influence future management action. This type of assessment seeks to identify trends to direct future management action. Trends analysis can identify the spatial and temporal location, magnitude, and direction of change.[3] Trends increase our realm of knowledge by providing a means to help proactively predict where incidences may occur.

A review of publications relating to the Coast Guard and future trends assessment revealed one recent publication, Looking Out for 2020: Trends Relevant to the U. S. Coast Guard, which sought to identify national trends that could impact the Coast Guard in the new century. The assessment proposed a number of societal, technological, political, economic, and environmental trends. However, results from this report suggested that none of the proposed trends would bring about a fundamental change in our mission management and planning. The authors of the report concluded future trends research may have limited value, because most trends were:

- too general,
- not relevant to current missions,
- too speculative.

The resulting decision was for the Coast Guard to continue its direction of managing for contingencies. It will continue to be guided by the direction of congressional and internal leaders instead of relying on trends. Along these same lines, U.S. Coast Guard Commandant Admiral Thad Allen proposed that personnel must "continually prepare for the unexpected," but he continued that the U S. Coast Guard should also "stay ahead of threats and operate integrally with partner agencies." [4] Here is where the value of proactive planning abounds. Using the tools of social science and human dimensions research (such as trends analysis) integrated into a systems approach, multiple partners with varied areas of expertise can use the newest technologies to help plan for future conditions. In short, trends information can be specific, relevant, and sound if it is based on reliable and valid indicators.

Why Study Trends?

The identification of trends, or changing patterns of activity, to improve a process is a common management planning tactic. The reason trends analysis can be used to forecast future events is based on the "continuity principle," [5] which states that the best predictor of future behavior is past behavior. This is important because it suggests trends can be determined by retrospectively assessing a change in condition and extrapolating forward in time. Given a set of changing conditions, management decisions can be made with an improved degree of certainty based on the chain of causality. The chain of causality assumes that the effect of one event can affect the outcome of another event, resulting in an alternate, predictable future condition.[6]

Predicting future conditions is challenging. Projections based on trends are comprised of many factors, sometimes unknown or unquantifiable, and are often nonlinear and of indeterminate temporal consistency. That is, we can never be confident of the validity of a future projection, the lifecycle of a trend, nor can we be certain to capture all of the interrelated factors. Despite this, many publications and organizations attempt to track national and global trends in an effort to improve planning. Research has proposed several reasons why trends analysis is valuable. Of these, three have direct benefit to the Coast Guard:

- saving money through improved resource allocation
- getting early warnings and increased awareness
- staying informed on forces affecting the field.[7]

When spatially referenced, trend analysis can lead to efficient use of resources. Keeping abreast of national (and international) trends can aid resource allocation by shifting resources to where they are more likely to be needed. However, to be of practical value, trends need to be spatially referenced, based on scientific, quantifiable data.

Usable Knowledge

To improve decision making, one needs usable knowledge. Usable knowledge is timely information that meets the decision maker's needs. Usable knowledge is built upon previously understood information and delivered in a clear and effective method.

For trends to fit the concept of usable knowledge, they must be based on solid geo-referenced data and presented in a clear, user-friendly manner. Trends only have practical value when we know the magnitude, direction, and geographic location of the trend. Knowing there is "an increase in traffic congestion at ports" only has value when the trend is based on quantifiable indicators normatively and geographically referenced. For example, if relative to other ports, the Port of New York has had the highest increase in traffic, defined by the number of recreational and commercial boats between 1990 and 2005, this defines a current condition that has practical value for management and tactical decisions.

The question becomes how to display trends in a manner that is usable. Recent literature on human dimensions research proposes research should focus on combinations of indicators using multivariate research approaches.[8] This type of systems thinking is required when attempting to understand complex and intricate phenomena, such as human trends and potential outcomes of geographic demographic change. Integrating geographic information systems with census indicators of socioeconomic change is one means to produce a social weather map[9] depicting "hot spots" or areas of social change in a usable manner.

An Application of Trends Analysis

Areas of social change can benefit Coast Guard management planning in a number of ways. Visualizing indicators of social change can aid in resource allocation and management planning. Figure 1 is an example of overall social change in the Great Lakes region in relation to Coast Guard facilities. The Michigan City Coast Guard Station, for example, is located in an area of rampant social change, particularly in regard to the rapidly increasing number of second or recreational homes in the region. Second home growth can affect maritime communities in a number of ways. There is the potential for increase in recreational boating and fishing, leading to an in-

Figure 3. Example of new development between Michigan City, Ind., and Michiana, Mich. Note the new development east of the lake. Top 2005 aerial photo, bottom 1998 aerial photo. Photos courtesy of the Indiana Spatial Data Portal.

creased need to monitor compliance with federal laws, impacts on commercial maritime industries, introduction of invasive species, and maritime hazards (Figure 2).

The structure of communities can change as owners of second homes are typically at a higher socio-economic class than locals and, being from a different locale, tend to have a different beliefs and values. These different values can alter the communities' relationships with federal agencies, influencing public agency communication and policy. These factors are considerations when planning budget and staff allocations for the local Coast Guard presence. The growth in surrounding communities (Figure 3) may indicate a need to increase resources at this station and a need to promote education on waterways safety to new, affluent residents.

The Broader Perspective of Social Science Research, Planning, and Collaboration

The best method to stay ahead of threats is to analyze the most up-to-date information using the best technology available. The Coast Guard is not alone in this mission. Social science data such as trends and sociodemographic information can be integrated into management planning with other maritime-focused agencies such as the National Oceanic and Atmospheric Association, the Bureau of Reclamation, the Army Corp of Engineers, local and state government, and nonprofit groups. Employing a systems approach to management, with organizations sharing in the protection of maritime resources can improve communication between agencies. Sharing data, methods, and technologies can streamline organizational efforts and missions and overall awareness.

One such initiative is www.HD.gov, a collaboration among the National Oceanic and Atmospheric Association, other federal and state agencies, nonprofits, and universities. It is a tool used by social science researchers to exchange information, research, tools, and methods to improve coordination across multiple agencies to share techniques, allow for quick access of information, and increase the public awareness of agencies and their missions.

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Nautical Engineering Queries

Questions

Prepared by NMC Engineering Examination Team

1. Which of the listed conditions describes the effect on intrinsic semiconductor operation as a result of a temperature increase?

*Note: A semiconductor is a material that has a resistance in between that of a conductor and an insulator. Through a process called doping, impurities are added to the semiconductor to increase conductivity. A pure semiconductor without any doping is called an intrinsic semiconductor. Semiconductors are generally silicon in material, and are used to make diodes, transistors, and integrated circuits.**

A. Capacitive reactance will decrease.
B. Conductivity will increase.
C. Inductive reactance will decrease.
D. Resistivity will increase.

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2. Which of the following statements best describes an oil-lubricated stern tube bearing installation?

Note: Oil-lubricated stern tube bearings are cast from babbitt metal, an alloy of tin, antimony, and lead. The bearing shells have large wall thicknesses, and are pressed directly into the stern tube. The bearing is totally submerged in oil, and the entrance of seawater and leakage of oil is prevented through the use of seals forward and aft of the tube. A circulating pump is generally installed to force the oil through the tube, and a head tank maintains the proper pressure differential between the oil in the stern tube and seawater at the seal.

A. It receives its oil supply from a branch line of the main lube oil system.
B. No shaft liner is needed in the area of the babbitted bearing surface.
C. The system pressure must be lowered when maneuvering in port to prevent blowing the outer oil seal.
D. For precise regulation of the bearing temperature, the system is required to have its own oil cooler.

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3. Which of the following statements is/are true regarding hydraulic pumps in general?

Note: The gear type hydraulic pump consists of two "spur" gears that mesh together within a casing. The driven gear, which is rotated by the prime mover, simultaneously rotates the idler gear, but in the opposite direction. As the gears rotate, the teeth separate from each other on the intake side of the pump, creating a void and suction readily filled by fluid. The fluid is carried by the gears to the discharge side of the pump, where the meshing of the gears displaces the fluid from the area to the outlet between adjoining teeth.

A. Variable volumes can be obtained with gear pumps only by variation of the pump drive speed.
B. A radial piston pump houses sliding pistons in a stationary cylinder block through which passes a rotating pintle or ported shaft.
C. The amount of liquid displaced per revolution of an axial piston rotary pump is at its maximum when the angle of the tilting box is at right angles to the shaft.
D. All of the above.

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4. Kingsbury thrust bearings are lubricated by ________.

Note: Kingsbury or segmental pivoted-shoe thrust bearings are designed to maintain the correct axial position of the main propulsion crankshaft, or turbine rotor, by absorbing the thrust. The bearing consists of a thrust collar, which is fixed to the shaft; stationary thrust shoes, which bear against both sides of the collar; leveling plates; and a base ring. These bearings operate on the principle that a wedge-shaped film of oil can carry a heavier load than a flat film. The thrust shoes, which are free to tilt (pivot), permit the formation of the wedge-shaped oil film. Any forward or astern thrust of the shaft is restrained by the action of the thrust shoes against the thrust collar. The leveling plates distribute the load equally among the shoes, and the base ring transmits the thrust on the leveling plates to the ship's structure.

A. flooding the thrust bearing assembly with oil
B. submerging oil wiper rings in an oil bath
C. pressure lubricating through internal passages
D. spraying oil directly on the thrust collar and shoes

**These notes are not supplied on licensing exam questions.*

1. A. Capacitive reactance will decrease.
   Incorrect Answer: An increase or decrease of capacitive reactance (XC) in a circuit is dependent on a change in frequency or capacitance, not a change in temperature.

   B. Conductivity will increase.
   Correct Answer: Conductivity is a measure of a material's ability to conduct an electric current, and is temperature dependent. Semiconductors have a negative temperature coefficient, which means the resistance of the semiconductor decreases with an increase in temperature, resulting in an increase of conductivity.

   C. Inductive reactance will decrease.
   Incorrect Answer: An increase or decrease of inductive reactance (XL) in a circuit is dependent on a change in frequency or inductance, not a change in temperature.

   D. Resistivity will increase.
   Incorrect Answer: The resistivity of a material is the resistance of a specified length and cross-sectional area. The electrical resistivity of metals increases with temperature, while the resistivity of semiconductors decreases with increasing temperature.

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2. A. It receives its oil supply from a branch line of the main lube oil system.
   Incorrect Answer: An oil-lubricated stern tube bearing system is a closed system and is independent of the main engine lube oil system.

   B. No shaft liner is needed in the area of the babbitted bearing surface.
   Correct Answer: No shaft liner is required as in a water-lubricated system since the corrosive contact with seawater does not occur.

   C. The system pressure must be lowered when maneuvering in port to prevent blowing the outer oil seal.
   Incorrect Answer: The height of the oil head tank in the system maintains a fairly constant system pressure, eliminating sharp spikes in pressure that would "blow out" any of the seals.

   D. For precise regulation of the bearing temperature, the system is required to have its own oil cooler.
   Incorrect Answer: Coolers are rarely used in oil-lubricated stern tube bearing systems, as the temperature leaving most stern tubes does not exceed 120°F.

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3. A. Variable volumes can be obtained with gear pumps only by variation of the pump drive speed.
   Correct Answer: Gear pumps are fixed displacement, meaning they pump a constant amount of fluid for each revolution. Thus, increasing or decreasing the volume of fluid discharged is achieved through variation of the pump drive speed.

   B. A radial piston pump houses sliding pistons in a stationary cylinder block through which passes a rotating pintle or ported shaft.
   Incorrect Answer: A radial piston pump houses the sliding pistons in a cylinder block which revolves around a **stationary** pintle or ported shaft.

   C. The amount of liquid displaced per revolution of an axial piston rotary pump is at its maximum when the angle of the tilting box is at right angles to the shaft.
   Incorrect Answer: The maximum amount of liquid displaced per revolution of an axial piston rotary pump occurs when the angle of the tilting box is at maximum angle to the shaft.

   D. All of the above.
   Incorrect Answer: Choice "A" is the only correct answer.

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4. A. flooding the thrust bearing assembly with oil
   Correct Answer: The Kingsbury thrust bearing is generally pressure-lubricated, and runs in a circulating bath of oil to maintain the wedge-shaped oil film between the shoes and thrust collar.

   B. submerging oil wiper rings in an oil bath
   Incorrect Answer: Line shaft bearings, or spring bearings, support the propulsion shafting, and utilize oil wiper rings submerged in an oil bath.

   C. pressure lubricating through internal passages
   Incorrect Answer: Pressure lubrication through internal passages is commonly utilized in diesel engine crankshaft and connecting rod assemblies.

   D. spraying oil directly on the thrust collar and shoes
   Incorrect Answer: Spraying oil directly on the thrust collars and shoes would not provide a sufficient amount of oil to maintain the wedge-shaped oil film required for proper operation.

Nautical Deck Queries

Questions

Prepared by NMC Deck Examination Team

1. While assigned to a 90 GRT vessel, you are required to sign "foreign" articles on a voyage from Philadelphia to which port?

*Note: "Foreign" articles are required of vessels of 100 gross tons or more on a foreign voyage, which is a voyage from a port in the United States to any foreign port other than a port in Canada, Mexico, or the West Indies. [46 CFR 14.201 (b) (1)]**

A. San Francisco, Calif.
B. Baltimore, Md.
C. Tampico, Mexico
D. Montreal, Canada

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2. If the OCMI has NOT granted an extension, free-fall lifeboats must be lowered into the water and launched with the assigned crew at least once every __________.

Note: Free-fall lifeboats are survival craft that are launched using the free-fall method whereby the craft with its complement of persons and equipment on board is released and allowed to fall in the sea without any restraining constraints.

A. 3 months
B. 6 months
C. year
D. 2 years

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3. INLAND ONLY While underway and in sight of another vessel a mile ahead, you put your engines on astern propulsion. Which statement concerning whistle signals is TRUE?

A. You must sound three short blasts on the whistle.
B. You must sound one blast if backing to starboard.
C. You must sound whistle signals only if the vessels are meeting.
D. You need not sound any whistle signals.

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4. Treatment of frostbite includes _______.

A. rubbing the affected area with ice or snow
B. rubbing the affected area briskly to restore circulation
C. wrapping the area tightly in warm clothes
D. warming exposed parts rapidly

These notes are not supplied on licensing exam questions.

1. A. San Francisco, Calif.
Correct: "Foreign" articles are required of vessels of 75 gross tons or more on a voyage between a port of the United States on the Atlantic Ocean and a port of the United States on the Pacific Coast. [46 CFR 14.201 (b) (2)]
B. Baltimore, Md.
Incorrect: Vessels of 50 gross tons or more on a voyage between a port in one state and a port in another state other than an adjoining state are required to execute shipping articles. This voyage is therefore not considered foreign and does not require "foreign" articles. (46 CFR 14.201 (b) (3))
C. Tampico, Mexico
Incorrect: A vessel of the United States on a voyage from a port in the United States to a port in Mexico is not required to file "foreign" articles. (46 CFR 14.201 (b) (1))
D. Montreal, Canada
Incorrect: A vessel of the United States on a voyage from a port in the United States to a port in Canada is not required to file "foreign" articles. (46 CFR 14.201 (b) (1))

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2. A. 3 months
Incorrect: According to 46 CFR 199.180 (d)(4), gravity davit launched lifeboats are required to be lowered into the water, each with its assigned operating crew aboard, and maneuvered in the water at least once every three months.
B. 6 months
Correct: According to 46 CFR 199.180 (d) (5), free-fall lifeboats are required to be free-fall launched, each with its assigned operating crew aboard, and maneuvered in the water at least once every six months.
C. year
Incorrect: ONLY when compliance with the six-month free-fall launch requirement is impracticable, the OCMI may extend this period to twelve months.
D. 2 years
Incorrect: Extraneous distracter.

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3. A. You must sound three short blasts on the whistle.
Incorrect: As the vessel is one mile ahead of you and these vessels will not pass each other for at least another half mile, then according to Rule 34 (a) Inland, your vessel at this time is not required to sound a maneuvering signal for operating in astern propulsion.
B. You must sound one blast if backing to starboard.
Incorrect: According to Rule 34 (a) Inland, when a vessel is operating in astern propulsion, three short blasts is the required maneuvering signal.
C. You must sound whistle signals only if the vessels are meeting.
Incorrect: According to Rule 34 (a) Inland, when vessels are in sight of one another, and they will pass within a half mile of each other, then maneuvering signals are required for vessels meeting OR crossing.
D. You need not sound any whistle signals.
Correct: Since the vessel is one mile ahead of you and the vessels will not pass/meet for another one half mile of each other, then according to Rule 34 (a) Inland, the vessel is not required to sound a maneuvering signal for operating in astern propulsion.

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4. A. rubbing the affected area with ice or snow
Incorrect: The introduction of ice or snow to a frostbitten part will remove more heat from an affected area and worsen the patient's condition.
B. rubbing the affected area briskly to restore circulation
Incorrect: Rubbing or massaging a frostbitten area briskly can result in inadvertent damage or unnecessary removal of skin in that area, thereby causing further injury.
C. wrapping the area tightly in warm clothes
Incorrect: The remedy of frostbite has two steps. The first is to remove the injured area from the cold. The second step is to rewarm the affected area. Rewarming an area would be impeded by the application of tightly wrapped bandages, which would restrict the natural warming associated with the victim's circulation.
D. warming exposed parts rapidly
Correct: Rapid rewarming is the optimum remedy for a frostbitten area. Wet rewarming is more effective than dry. Care should be taken that the bath into which the affected area would be immersed is no hotter than 111 degrees Fahrenheit. Dry rewarming (requires 3-4 times longer) may be accomplished by putting the patient's affected areas in another's axilla (armpits) or other vascular area.

Decisions of a Coast Guard Coxswain

by Mr. David McCallum
Technical Writer, U.S. Coast Guard Human Element and Ship Design Division

The coxswain's job can be exciting and dangerous, like a scene from an action-adventure film: piloting a 50-knot special purpose craft-law enforcement boat, or shooting out an engine on a "go-fast" boat suspected of smuggling people or drugs somewhere off the coast. Or it could be just as exciting and dangerous as the coxswain battles a raging ocean in a 47-foot motor lifeboat, searching thousands of square miles of water to find mariners in distress and bring them home to their families.

Although perhaps not as exciting, the work involved in ensuring that every aid to navigation is working properly can be just as dangerous as a high-speed boat chase or a search and rescue mission. All of these scenarios involve inherent danger and are part of the Coast Guard's 218-year-old legacy. Each mission activity must be assessed to ensure that all involved return safely. The ultimate decision—and possibly a life-or-death one—is made by a young, ambitious coxswain.

Operational Risk Management

Up until the mid-1990s, coxswains' decisions, for the most part, were not supported by a risk management system. That changed, however, following four mishaps spanning from 1991 to 1993, including the sinking of the F/V *Sea King* off the Oregon coast in 1991, which caused a Coast Guard crewmember's death. After those incidents, the Coast Guard developed a systematic process—operational risk management—to monitor and assess risk.


USCG Station Oregon Inlet conducts a basket hoist drill. USCG photo.

Members of the Coast Guard's boat, aviation, and cutter forces; marine safety; auxiliary; Research and Development Center; quality and performance consulting; and training commands met during the fall of 1996 to develop this simple but effective risk-management process. "This (developing the process) was done in an effort to mitigate the amount of damage to property, injuries, and death associated not only with the boat forces, but also servicewide," says Senior Chief Richard Olson, who is stationed at Hatteras Inlet, N.C. "Everyone attended lectures to learn how to minimize risk by examining a few basic principles associated with almost every evolution a human being could be involved with."

After taking part in the initial training, Olson didn't regard the process of gauging risk factors as "rocket science." In fact, he saw it as a matter of common sense. "While I was navigating a 180-foot buoy tender into position to work on a buoy in a heavy-trafficked channel I thought, 'I would never do what I am doing without talking to the captain, assessing the traffic, looking at my deck crew, and seeing if everyone is ready, assessing my environmental conditions, and considering if it even makes sense to put a ship that draws eight feet of water into 10 feet of water, within 20 yards of a shoal, to service this aid,'" he says. "I was concentrating on the obvious dangers from the operation I was doing at the time and applying my experience. I was extremely short-sighted."

"The risk management policy was written not only for the somewhat mundane—though at the time somewhat personally stressing—task I had at hand, it was developed as a broad-based plan to use in all situations. How many times has a person said to himself, 'If I had only thought that through… .' In the job we do on a daily basis, we cannot be asking that question after the fact. We have to assess the situation at hand, twist it and turn it, until we have the best possibility for success."

Risk Management Models

According to Olson, there are several different risk management models out there, with all kinds of numbers associated with them. Two that are used the most are the severity, probability, and exposure (SPE) model; and the green, amber, and red (GAR) model.[1] Olson and those working at the Hatteras Inlet Surf Station put the GAR model to use.

"It (the GAR model) is the quickest, and the one most often used by a coxswain," Olson said. "It asks you to describe the condition of six basic factors: planning, supervision, team selection, team fitness, environment, and event complexity." An example of using the GAR model to determine risk is when a unit works on buoy maintenance, checking on and repairing buoys, whether in a busy harbor like Boston (with as many as 13 or 14 buoys to maintain in a single day) or an isolated area (with only one buoy to deal with).

Risk Management in Action

The evolution begins with a brief to "assess what we expect to encounter with the evolution," Olson says. There are certain things that everyone—the commanding officer, conning officer, quartermaster, and the buoy deck crew—needs to know during the short pre-operation brief. "During the operation, communication among everyone involved is absolutely critical to success," he says. "It is all done via radio. Chatter is kept to a minimum. We only talk about the operation and what needs to get done. Discussing the possible dangers involved is *always* a part of the brief before we begin the evolution. Everything is pre-planned. All hands need to know what is to happen at each aid."

Each aid to navigation has its own folder with its description, past history, and the dangers involved. The briefing will likely include information about wind force and direction, water depth, tides and currents anticipated in the operation area, type of maintenance to be done, and the area traffic. "Traffic,"

Heavy weather coxswain check ride for BM2 Ryan McClay, Hatteras, N.C. USCG photo.

says Olson, "is always a major concern. You have to monitor traffic, especially in a busy harbor. We always notify traffic as to what time we'll be in the area, and when they can go by on the slow bell or proceed at normal speed."

"When you're working on buoys you feel like you're always under the gun because of the different things that might be happening, whether it's traffic, weather coming in, the sea state, or other things," he says. The most critical time, when there is danger for everyone involved in the evolution, is the time between when the buoy is hooked and getting it up on board and hard-fastened to the tender. When the buoy is up in the air, the tender must be stationary so that the buoy doesn't break loose and come crashing down on the buoy work deck.

"Once the sinker is off the bottom and has cleared the shoal, then the boat can begin maneuvering again," Olson says.

safety violations, and things that need to be done better," says Olson. "The debriefing usually doesn't take that long."

Only the most seasoned and proven individuals can operate boats in the extreme conditions of the surf environment. Usually, these individuals have made a personal career-long commitment to the Coast Guard. There are relatively few surfmen at even the most dangerous surf stations. The next experience level, almost a "surfman in training," is the heavy weather coxswain. The stepping-stone to these positions is the coxswain.

Coxswains must recognize early on that the safety of their crews, the civilians they are sworn to protect, the boats they have been entrusted to operate, and the missions their duty obligate them to complete all hinge on making accurate assessments of any given situation. Incorporating operational risk management into the command structure will greatly assist coxswains in managing operations.

"Backing down" into the surf. USCG photo.

After the buoy has been secured on the deck, it is time for the crew to do the necessary maintenance, such as servicing the light, which takes approximately 45 minutes, or doing the more time-consuming mooring inspection, which lasts anywhere between an hour to one and a half hours.

Following maintenance and placing the buoy back into its designated position, the crew goes through a debriefing session. "It happens after every evolution. We discuss all aspects—things that went well, things that went bad, possible

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Acknowledgement:
Senior Chief Richard Olson is officer-in-charge, Station Hatteras Inlet/Ocracoke. A 25-year veteran of the Coast Guard, his list of units includes the CGC *Knight Island*, CGC *Abbie Burgess*, CGC *Sundew*, CGC *Cherokee*, and Station Parramore Beach.

Endnote:
1. More details about the Severity, Probability, and Exposure model and Green, Amber, Red model, as well as sample evaluation scales for each, can be found in *Proceedings'* Spring 2007 issue on Risk Management.

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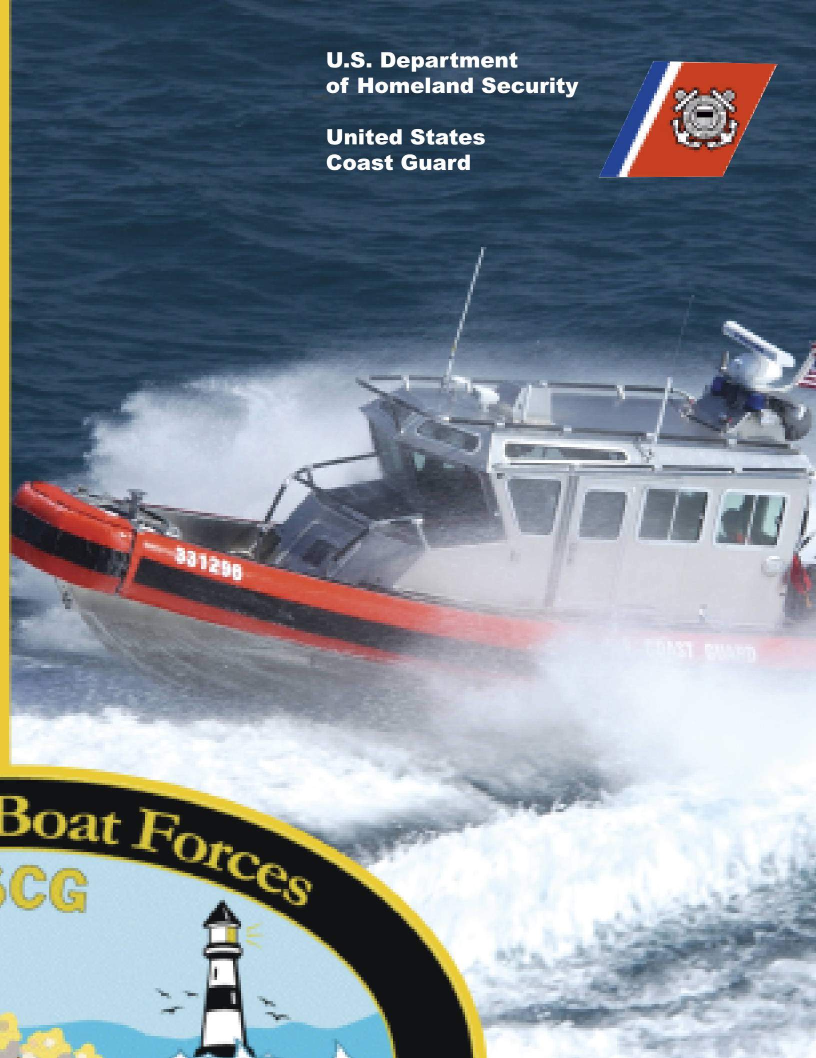

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