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The COAST GUARD Journal of Safety & Security at Sea

PROCEEDINGS

of the Marine Safety & Security Council

Focus on Safety

Cooperative Efforts to Maintain Towing Vessel Safety

Lessons Learned from Casualty Investigations

USCG Support for Cruise Ship Emergency Preparedness

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Operational Examples of Information Sharing

Special Section:

Capacity, Communication, Culture

The U.S. Coast Guard Marine Safety Performance Plan

PROCEEDINGS

Summer 2008

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Commandant's Perspective

By ADM Thad Allen, Commandant
U.S. Coast Guard

Safety is at Our Core

One of the Coast Guard's greatest strengths is our multi-mission character. It allows us to conduct a wide range of functions in the maritime domain, from marine safety, to law enforcement and national defense, to environmental protection and humanitarian response. The Coast Guard has accrued these roles and missions over two centuries of service because these duties serve a collective good and are most efficiently and effectively accomplished by a single federal maritime force.

Our marine safety mission remains the bedrock of the Coast Guard's value to the nation, and it underpins our security and environmental stewardship programs. This focus on safety pervades all of our mission areas; it is woven into the very fabric of our service, and is the ultimate focus of all we do.

We secure our ports and waterways to keep America safe from terrorist attack, safe from the ravages of illegal drugs, and from unlawful entry of any kind. We protect the world's oceans and our living marine resources. In the event of any natural or man-made disaster, we act to ensure the safety of our citizens and to remove them from harm's way.

The U.S. Coast Guard Marine Safety & Security Council supports these missions and its members direct and drive these efforts. Our operational model is flexible, adaptive, efficient, and capable of succeeding with innumerable maritime scenarios. This positions the Coast Guard to meet a broad range of national interests.

As we seek to continually improve maritime safety, we will also strive to balance each of our essential mission requirements. Coast Guard men and women serve across the nation and around the world keeping people safe, ports secure, and our waters protected. For 218 years, we've been there when the nation needed us most. While we live in a changing world, one thing is certain: Marine safety will forever be at our core.

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Champion's Point of View

By RADM W. D. Baumgartner, Chairman
U.S. Coast Guard Marine Safety & Security Council

The Coast Guard's multi-mission character is defined by its ability to conduct distinct yet complementary functions in the maritime domain. Today, as in the past, our safety, security, and stewardship program goals and authorities to act are inextricably linked. An integrated Coast Guard approach to these key elements best ensures the long-term success of the global maritime transportation system.

Two years ago, *Proceedings* focused on lessons learned from USCG casualty investigations to educate the maritime community on issues of safety with the hope of preventing similar incidents. Response to the issue was overwhelmingly positive; 100% of those surveyed "strongly agreed" that the content was useful. One reader explained, "… casualty investigations provide hard-to-learn real-world situations concerning seamen, ships, equipment, and rules."

With this issue's return to a marine safety focus, we hope to again spotlight stories illustrating how the nation's "Guardian of the Seas" saves lives and property in peril, protects critical infrastructure and resources, ensures homeland defense, safeguards maritime sovereignty, and defends U.S. citizens, interests, and friends worldwide. This issue features:

Towing Vessel Safety – Ensuring safe, successful responses to potential and actual crises while working to minimize economic impact.
Marine Safety Performance Plan – The U.S. Coast Guard's latest efforts toward aggressive responsiveness, inclusiveness, accessibility, and customer focus in this area.
Information Sharing – Advocating and demonstrating our responsibility to share information with our federal, state, local, tribal, public, private, and international partners.
Lessons Learned – Marine casualties, lessons learned from them, and actions taken to prevent such tragedies from recurring.

As these sections demonstrate, safety at sea requires preventive and corrective measures. It depends on competent, educated mariners; a similarly well-informed general public; and the wisdom of their governing bodies to balance measures that are neither too drastic or too lax.

We present this issue of *Proceedings* with the intention of creating better awareness of what is already happening in the field of marine safety, leading to a better unity of effort in maritime planning and operations. I would like to thank this issue's contributors for helping to illustrate examples of a key Coast Guard mission—improving the effectiveness, consistency, and responsiveness of the Coast Guard marine safety program.

Measuring the Economic Impact of Marine Casualties

An incident at Wilson Lock and Dam.

by CAPT Denise L. Matthews
former Commanding Officer, U.S. Coast Guard Marine Safety Unit Paducah

LTC Steven J. Roemhildt
Nashville District Engineer, U.S. Army Corps of Engineers

LCDR Thomas J. Kaminski
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Figure 1: Barge HTCO-3016 pinned beneath the Wilson Lock/Dam upper main lock gate. USCG photo by CWO3 Tim Smith.

On August 3, 2006, a tank barge carrying 20,000 barrels of mixed xylene (a mixture of three isomers: m-xylene, o-xylene, and p-xylene) was damaged while locking upbound through Wilson Lock and Dam (L/D) at Tennessee River mile 259.4, in Florence, Ala. The towing vessel M/V *Potomac* was pushing the jumbo barge (297 feet by 54 feet), HTCO-3016, at the time of the incident. As the lock chamber filled, the barge came in contact with the upper lock gate, dislocating it from its track. As this upper gate fell back into place, the barge became wedged beneath it (Figure 1). Due to the hazardous nature of the cargo, all people within a quarter-mile radius of the dam and all non-essential dam employees were evacuated.

For more than four months, local, state, and federal agencies worked closely to safely remove the damaged tank barge and repair and reinstall the damaged lock gate. They also had to manage constantly changing vessel queues to minimize economic impact to the marine

transportation system, its suppliers, and customers.

The Response

The actions taken following this major marine casualty exemplify the interagency coordination and teamwork required for effective and efficient marine transportation system recovery on the inland waterways. During the emergency response and prolonged post-emergency phases of this incident, key stakeholder issues included:

- potential pollution,
- possible toxicity and explosion hazards,
- resumption of safe navigation and normal locking operations,
- repair of the main lock chamber,
- waterways safety/security,
- economic impact due to lock delays.

Figure 2: Wilson Lock/Dam upper main lock gate lifted from its track. USCG photo by CWO3 Tim Smith.

Perhaps the most fortunate aspect of this incident was that the damage suffered by the tank barge was limited to the barge's forward rake. The tanks, loaded with toxic and highly explosive cargo, were not breached. Verifying this was the first priority of the emergency response teams and included efforts by the local fire/hazmat agencies and the Coast Guard Gulf Strike Team, which monitored the air for potential leaking cargo.

As a precaution, the Tennessee Valley Authority (TVA) police closed the Highway 133 bridge to traffic due to its close proximity to the lock and dam. The Coast Guard captain of the port established a safety zone that closed the Tennessee River from miles 258 to 260. This was enforced by the Florence Police Department, Alabama Marine Police, Coast Guard Marine Safety Detachment (MSD) Nashville, and TVA.

Local emergency management agencies were immediately notified and water intakes secured as part of the initial response. Evacuation of all persons within a one-half mile radius of the lock was initially considered, but that was deemed unnecessary after the initial examination of the damaged barge.

By late afternoon on August 3, a unified command was established at Florence City Hall that included senior representatives from Coast Guard Marine Safety Unit Paducah, TVA, the U.S. Army Corps of Engineers (USACE is the operator of the lock and dam), the Florence Fire Department, and Maryland Marine Inc. (owner of barge HTCO-3016). The initial objectives of the unified command were protecting the community, responders, and maritime industry; safely securing and removing HTCO-3016 from under the lock gate; and beginning operation of the Wilson auxiliary lock to keep barges moving through the area.

On August 4, a marine chemist completed atmospheric testing throughout the barge voids and determined that there were no leaks. It was therefore deemed safe to use the Wilson auxiliary chamber to begin locking through single-barge commercial traffic. To compare, the main chamber typically locks a nine-barge tow in approximately one hour, while the auxiliary chamber requires approximately 10 hours to lock the same nine-barge tow, one barge at a time.

Barge Removal

At this time USACE also began construction of a temporary dam and a support structure for the damaged lock gate (Figure 2). Since the dislocated and damaged lock gate was sitting atop—and therefore supported by—the damaged barge, the plan was to pump out

water to lower the barge, thereby transferring the lock gate's weight to the newly constructed support.

As an additional safety precaution, the chain used to lift the land wall lock gate was tightened in an attempt to keep the gate from settling, as the river wall chain was shattered in the accident and was no longer functional. The barge could then be slid from under the gate and removed from the lock without further damage, eliminating a significant safety concern—mixed xylene releases—from the incident.

On August 5, the U.S. Army Corps of Engineers completed the removal of HTCO-3016, even though the lift chain failed during the removal process. Very fortunately, no injuries resulted and the damaged gate did not impact HTCO-3016 during its removal.

Restoring Traffic

On the morning of August 6, USACE reopened the auxiliary lock to commercial vessel traffic, which had grown to seven towing vessels and 90 barges awaiting lockage. By the afternoon of August 9, the vessel queue had increased to 15 towing vessels and 139 barges loaded with a variety of cargoes including acrylonitrile, styrene, asphalt, fuel oils, coal, iron, rock, and sand.

The significant decrease in Wilson L/D's ability to lock commercial vessel traffic, coupled with USACE's initial estimate of two months to restore normal locking operations (which actually took four months), resulted in significant economic impact to the towboat industry and the Tennessee River marine transportation system, particularly marine transportation-related facilities upstream of Wilson L/D.

Economic Impact

At this point, Marine Safety Unit Paducah and Marine Safety Detachment Nashville worked to calculate the economic impact of this incident. As with any data collection effort, it was necessary to set parameters for the information included and for the amount of time that could be dedicated to this effort. In general, the interest was more in determining the magnitude of the economic impact rather than the specific costs to each impacted party. The economic impact analysis focused on three distinct areas:

- operational costs of tow delays (easiest to capture);
- facility lost production (including production shortfalls, slowdowns, and shutdowns) and alternate delivery costs (more difficult to capture);
- secondary market costs (very difficult and time-consuming to capture).

TVA and the towboat industry worked with Coast Guard personnel to obtain estimated average daily rates for towing vessels and barges operating on the Tennessee River. With these daily rates, personnel tracked vessel queues at Wilson L/D and calculated costs to the maritime industry. That was the easiest part and provided sufficient detail for the purpose of determining cost magnitudes. USACE provided a real-time web link to the vessel queue for immediate access to the information, which greatly facilitated the effort and saved time.

The next challenge was to maintain a close liaison with all marine transportation-related facilities upstream of Wilson L/D to attempt to capture the actual additional costs they had incurred as a result of the Wilson L/D shutdown. Many facilities indicated they had sufficient inventories to avoid production slowdowns or shutdowns and/or increased transportation costs from being forced to use alternate modes (trucking or rail) for several weeks, after which they would begin to incur additional costs.

Others, including a large petroleum processor, indicated that each day the tow delays could cost them up to $1 million in lost production and, more concerning, could result in tens of millions of dollars in lost production if one of two plants needed to be shut down due to lost raw materials. Although this mostly involved anecdotal figures, capturing this information required significant communication with facility operations personnel. Several facility operators were reluctant to release financial figures to the Coast Guard for fear that it would be shared with competitors.

To avoid time-consuming communication to capture this data, MSD Nashville developed a single-page survey for facilities to note additional costs attributable to the Wilson L/D slowdown. If a facility did not submit an update within a two-week period, personnel made a follow-up call to verify that there was no financial impact. Again, this approach adequately provided the cost data, but the time investment was significant, especially for the prolonged duration of the incident.

Capturing secondary market impact was a challenge. It was difficult to obtain additional supply chain information from the facilities that were already spending significant time and effort answering questions about

the effects on their own operations. Little input or data on secondary market impact was received overall.

The total estimated economic impact of this casualty was approximately $29 million. Additional costs were prevented due to outstanding stakeholder cooperation. The Coast Guard's role in the calculation of the economic impact of a marine event is a relatively new initiative for field units, and has become an organizational priority.

Stakeholder Communication and Cooperation

On August 8, the MSD Nashville supervisor attended a U.S. Army Corps of Engineers briefing where USACE expressed its understanding and concern for the economic impact this incident would have on the river industry. It assured the attendees that personnel would provide as much commercial vessel transit as possible while making repairs. USACE also announced it would use the auxiliary chamber and obtain a 500-ton crane to enable use of a caisson to further reduce and manage barge queues at Wilson L/D. This caisson served as a replacement lock gate to periodically allow the use of the main lock chamber, thereby significantly reducing the barge queue.

In general, USACE used "first-in, first-out" prioritization to lock barges but also requested representatives to serve on an industry-led queue management board to help make decisions on priority lockage requests. The MSD Nashville supervisor served as the Coast Guard representative along with TVA, USACE, and industry representatives. Priority lockage decisions were made based on type/amount of cargo and impact on industry. The committee validated priority requests by asking that the receiving facility articulate the criticality of the delivery. This provided verification from a source other than the barge and/or towing company.

On August 17, USACE removed the damaged lock gate, and on August 18 commenced use of the temporary caisson configured for main gate lockage. USACE then began weekly teleconferences to communicate lock repair, vessel queue status, and caisson-use schedules to the Coast Guard, TVA, and industry stakeholders. This process continued until the damaged main chamber lock gate was repaired and reinstalled. Wilson L/D resumed normal operations on December 5.

This incident serves as an excellent example of interagency cooperation in a crisis response situation that evolved into a four-month waterways management challenge. With representatives from local, state, and federal agencies and industry, the unified command ensured a safe and successful response while it worked to minimize economic impact. This case also illustrates how safe and continuous lock operations sustain the transportation of cargo on the inland waterways, which supports the economic viability of our nation's heartland.

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LTC Steven J. Roemhildt, Nashville District engineer, U.S. Army Corps of Engineers, is a 1987 graduate of the U.S. Military Academy and the University of Alaska. He served in a variety of assignments including the 23rd Engineering Battalion, Germany; NATO, European District; 8th Army, Korea; Task Force Sinai, Egypt; director of public works, Yongsan, South Korea; and was deployed for Operations Desert Shield/Storm and Joint Endeavor.

Barge Break-aways

An ever-present risk.

by LT Matthew Meskun
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Because of their efficiency, barges are the primary commercial cargo transportation mode. Unfortunately, from time to time, barges can break free from their mooring or towing arrangements and are swept down the river, potentially wreaking havoc to the river system until they are either corralled by assisting towing vessels or salvaged (if the barges have sunk).

Barge Break-away Locations

There are two primary locations where barge break-aways occur: either at a fleeting area facility, or from a towing vessel underway, pushing the barges as a part of its tow.

Fleeting areas (mooring locations along the riverbank where barges are stored) are abundant on the Western Rivers. Many factors can contribute to a barge break-away that originates from a fleeting area, such as impact from large items floating downriver (heavy ice flow, trees, or other "drift"), high winds and current, rapid changes in water levels, or human error. Break-aways may also occur when other barges hit the fleeting area. All these factors indicate that fleeting area operators need to be extremely vigilant in tending fleets to ensure that barges are properly tied off to mooring cells.

Normally when a barge breaks from a towing vessel underway, the tow unintentionally hits some drift or other obstruction. This collision then breaks the wire gear holding the barges together as a unit. This event can also cause a chain reaction, as the break-away barges can hit other barges further down the river.

Barge Break-away Prevention

Federal regulatory bodies, river industry associations, working groups, and companies have all taken active roles to promote methods that reduce barge break-aways. For example, the U.S. Army Corps of Engineers (USACE) receives, reviews, approves, and oversees the location and placement of each fleeting area facility.

Each fleeting area operator is then required to generate and submit a fleeting area operations manual for approval. This manual—which must be made available to every employee that works at the facility—provides detailed information, including best methods and procedures for securing the facility from break-aways, and procedures for a river's different stages and conditions.

Coast Guard Marine Safety Unit (MSU) Pittsburgh has created additional preventive measures that have been adopted by other Coast Guard units on the Western Rivers. One very successful outreach effort is an annual barge break-away seminar. The audience includes everyone from deckhands working on the fleet all the way up to company executives. The seminar highlights the importance of properly maintaining the fleet in order to prevent barge break-aways.

Another initiative that MSU Pittsburgh spearheaded is random fleeting area facility inspections, conducted jointly with USACE partners. The joint inspection teams visit fleeting facilities to:

- check the condition of the materials used to secure the barges,
- ascertain overall worker safety efforts,

What's left of a hopper barge after an allision with the Eads Bridge on July 6, 2005. The vessel was traveling southbound on the upper Mississippi River at mile 179 as part of a 15-barge tow when it hit a bridge and broke away from the tow. USCG photos.

- verify training practices,
- affirm the use and currency of the approved fleeting area operations manual.

Barge Break-away Response

River industry associations and towing companies are impressive in their selflessness, in that towing vessels typically stop what they are doing to work together and respond to all barge break-aways. When there is a notice of a barge break-away, any towing vessel in the vicinity of the incident will rush to the scene and attempt to control the runaway barge(s). These towing vessel operators understand the potential impact one of these barges can have, and take the measures necessary to protect the waterway from the hazards.

Coast Guard response to a barge break-away notification typically seeks to mitigate any hazard to navigation. The operations specialist standing radio watch in the sector command center receives the notification and issues an urgent marine information broadcast. This broadcast serves two purposes: to alert all vessels in the area of the barge break-away, and to request assistance from any available vessels in the area.

Once the situation is under control and all hazards have been removed, the Coast Guard will stop all operations at the source of the break-away. The operator of the responsible fleeting area will be required to investigate and determine the cause of the break-away, and submit a proposal on how to rectify the discrepancy to prevent a similar reoccurrence.

Break-away Events

Anne Holly

On the evening of April 4, 1998, the towing vessel *Anne Holly* was pushing 12 loaded and two empty hopper barges upbound on the Mississippi River near St. Louis, Mo., when the barges allided with the Eads Bridge. The bridge allision, which occurred during high water, broke the tow apart, sending eight unattended barges downriver. (See related article, *Proceedings* Summer 2006, p. 6)

Three of these barges struck the President Casino on the *Admiral*, a permanently moored vessel that had more than 2,400 patrons aboard at the time. All but one of the *Admiral*'s mooring wires severed, stranding the patrons aboard. Additionally, a natural gas line attached to the moored vessel ruptured, placing patrons as well as first responders in grave danger.

The result of a series of barge break-aways that impacted the Maxwell Locks and Dam on the Monongahela River. Photos courtesy Mr. Dick Ehringer, Waterway Association of Pittsburgh, Pa.

them into a twisted knot of bent steel. As a result, the river was closed to navigation for weeks, causing economic damage that impacted the entire nation.

The Western Rivers system is a vital part of America's economy, and preventing barge break-aways on it is critical. The industry, USACE, and the Coast Guard are working to ensure that the inland river transportation system remains open and free-flowing for the efficient trade and movement of commerce.

Fortunately, the master of the *Anne Holly* prevented further destruction when he piloted his vessel to the *Admiral* and held it in place, keeping it from uncontrollably floating further downriver.

It took more than three hours for authorities to secure the gas leak. Fifty people were treated for minor injuries as a result of this incident.

Maxwell Locks and Dam

After an early cold snap that formed large patches of ice on the Monongahela River and subsequent high water conditions, Pittsburgh experienced one of the most devastating barge break-away incidents in the region.

On January 1, 1990, far up in the West Virginia mountains where the Monongahela River forms, ice began to float free and travel down the river. This ice floe impacted a barge and broke it away from a fleeting area where it was moored.

As this barge continued to float down the river, it hit more barges moored downstream. A domino effect ensued, and 19 barges broke away, each impacting and coming to rest on the Maxwell Locks and Dam, lodging

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CWO William Perkins enlisted in the Coast Guard in 1978. With more than 29 years of experience in the maritime industry, he has served on two Coast Guard cutters, on the Atlantic Strike Team, at Marine Safety Office Wilmington, and at Sector Upper Mississippi River. He is a fully qualified Coast Guard marine inspector and investigator. He has been investigating accidents on the Western Rivers since 1994 and is currently assigned as a marine investigator at Sector Upper Mississippi River.

McAlpine Lock Allision

A misaligned approach sets off a chain reaction.

by LCDR Phillip Ison
Chief, Prevention Department, U.S. Coast Guard Sector Ohio Valley

On January 26, 2006, while southbound on the Ohio River near Louisville, Ky., a towboat pushing three loaded asphalt barges during a period of high water attempted to enter the approach to the McAlpine lockway. It was a clear, cold day with excellent visibility, but the pilot did not line up his approach correctly. The tow allided with the vane dike at the head of Portland Canal and the force of the blow snapped the barges' connecting wires.

The tow broke apart, with each barge drifting downstream individually. Tugs attempted to recover all the barges before they drifted down to the dam, but two barges escaped this recovery effort and went over the dam. The first over was recovered. The second struck a railroad bridge sideways. Within a few minutes, the current forced the upstream edge of the barge down and flipped the barge onto its port side.

There it sat, 300 feet long, 54 feet wide, with 900,000 gallons of asphalt, heating oil, and diesel aboard, bottom pressed firmly against two bridge supports, its port side on the bottom of the river.

Chart depicts the location of the vane dike at the entrance to the McAlpine Locks. Chart courtesy of the Army Corps of Engineers.

Four months, a very large wayward barge, and 900,000 gallons of asphalt.

Over the next four months, the incident command worked as a cooperative group to address all aspects of the incident, from oil recovery to salvage, from site safety to cargo recovery. Conflicting concerns, needs, and recommendations were invariably resolved to the satisfaction of all parties.

Cargo offload was finally complete in late May 2006. The asphalt required re-heating before pumping could proceed, which involved cutting into the barge at each cargo tank and inserting heating coils. This was river-level dependent, and operations were suspended numerous times due to rising water levels. Once ready for removal, the barge was salvaged over a two-day period, using an A-frame crane to lift the barge while it was pulled away from the railroad bridge.

About the author:
LCDR Phillip Ison has served in the Coast Guard for 22 years, with 18 years in the marine safety field.

Permanently Moored Vessels

A cooperative effort.

by LT Christopher Pisares
former Supervisor, U.S. Coast Guard Marine Safety Detachment Quad Cities

When passengers board the casino vessels that are permanently moored along the river in Iowa, some may dream of hitting the big jackpot on the slot machines. Others may think of the scrumptious food that waits at the buffet table. Some want to go up on deck and watch the towboats go by, giving a friendly wave to the pilot in the pilothouse, or gaze in awe upon the beauty of the river valley. However, very few people think about which government agency has inspected their vessels, and those that do may have difficulty distinguishing whether their casino vessel has been inspected by the Coast Guard or the state of Iowa. This is because the casino vessels in Iowa transitioned seamlessly from being Coast Guard-inspected passenger vessels to state-inspected permanently moored vessels.

Why the change? In 2004, Iowa state law affecting gaming vessels was amended, removing the requirement for gaming vessels to maintain the ability to operate while away from the dock.[1] Due to this change, the definition of a vessel per U.S. laws[2] no longer applies to the gaming vessels, and thus the vessels are not subjected to Coast Guard inspection regulations.

Although the vessels may not be subjected to Coast Guard inspection requirements, the gaming vessels are still operating with hundreds, sometimes thousands, of people boarding the vessels each day. For the Coast Guard to remove the certificate of inspection without conferring with state and local officials or vessel owners on the safety of the vessel would not be in keeping with the spirit of passenger safety enforced by the Coast Guard. Thus, the Coast Guard participated in multiple meetings with a workgroup comprised of the state of Iowa, local government officials, and vessel owners to examine and comment on rules developed for state enforcement regarding permanently moored gaming vessels.[3] These rules established a standard level of passenger safety agreed upon by all involved parties, including the Coast Guard.

To establish a standard level of passenger safety aboard the gaming vessels for the state of Iowa, the workgroup began by examining current Coast Guard regulations enforced on an inspected vessel and identifying which rules might need modification. Most of the Coast Guard regulations were written for vessels operating in ocean or coastal water environments. Since the gaming vessels would be permanently moored in a freshwater inland river, some regulations could easily be modified without degradation in passenger safety. The workgroup also discussed various issues regarding vessel and passenger safety, including watertight integrity of the hull, stability of the vessel, firefighting and lifesaving requirements, and incident response. The group also examined regulations for communication equipment monitoring and current Coast Guard inspection standards. In the end, many Coast Guard regulations for inspected vessels were adopted by the state without modification, and the few Coast Guard regulations that were modified for the state of Iowa did not jeopardize the safety of passengers visiting the vessels.

While the discussion of Coast Guard-inspected vessels becoming permanently moored vessels primarily focused around safety, the security of the vessels in a post-9/11 era could not be overlooked. As permanently

moored vessels, they would not be subjected to the same security rules as inspected vessels. Thus, the permanently moored vessels were incorporated in local area maritime security plans.[4] However, since gaming vessels already had strict state guidelines and oversight for security within and around the vessel, and the vessels already had security plans in place, the additional security requirements required for permanently moored vessels were implemented with minimal effort.

With a standard level of passenger safety for permanently moored gaming vessels established by the state of Iowa, the Coast Guard worked with state and local officials to transition the gaming vessels from inspected vessel status to permanently moored vessel status. After a safety risk assessment, review of mooring arrangements, update of emergency response procedures and drills, and a turnover inspection conducted with state and local officials,[5] the Coast Guard removed certificates of inspection and issued letters from the captain of the port stating that the vessels were now classified as permanently moored vessels.

While the transition of an inspected vessel to a permanently moored vessel is not a recent change, the development of state rules for permanently moored vessels along navigable waterways is not a routine occurrence. As seen by the success in Iowa, the Coast Guard can work with vessel owners and state and local officials to ensure vessels not subject to inspected vessel rules still maintain a high standard level of passenger safety. Passengers aboard the gaming vessels permanently moored in Iowa can test their luck against the one-armed bandit or play their best hand at the poker table, knowing that whether it's the Coast Guard or state of Iowa conducting the safety oversight, no one is gambling with their safety.

About the author:
LT Christopher Pisares is the former supervisor of U.S. Coast Guard Marine Safety Detachment Quad Cities. He is currently assigned to the Domestic Port Security Evaluation Division and works with the maritime security risk analysis model, port security assessments, and port security grant programs. LT Pisares is a 1998 graduate of the Coast Guard Academy, with a bachelor of science in mechanical engineering.

Endnotes:
1. Iowa code sections 99F.7 (14) and 462A.20.
2. 46 USC 2101 (45).
3. State of Iowa officials included the Department of Natural Resources and the Iowa Gaming and Racing Commission.
4. 33 CFR 103 Subpart E.
5. Marine Safety Manual Vol. II, Chap B.4.I.1.e-k.

Boundless Brotherhood and Heroism on the Western Rivers

by LTJG Jesse Garrant
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U.S. Coast Guard Marine Safety Unit Pittsburgh

LTJG Jodi Min
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It was a cloudy, frigid January night on the Ohio River as the commercial motor vessel (M/V) *Elizabeth M* began its lock upbound through the Montgomery Locks and Dam. Despite high water conditions and swift currents in the area, operations appeared normal as the vessel executed a "knockout" lockage, a procedure that involves the towboat disconnecting from the barges due to a lack of space lengthwise within the lock chamber, then reconnecting after following the barges through the lock.

As the lock gates opened and the motor vessel exited the lock chamber with its six loaded open-hopper coal barges, an incident occurred that caused the *Elizabeth M*, her seven-man crew, and two of her barges to be swept over the treacherous Montgomery Dam.[1]

As the vessel sank nearly instantly, the crew had little time to prepare for the cold, turbulent water. The powerful river current forced one crewmember overboard, which left him drifting downriver, clinging to floating

A sunken barge broken from the tow, jammed against the Montgomery Dam pier. USCG photo by LTJG Jesse Garrant.

debris until rescuers could arrive. Additional crewmembers clung to the small, exposed portion of the pilothouse, battling the powerful current while also trying to fight hypothermia.

All of the barges subsequently sank, posing hazards to navigation above and below the dam. Tragically, as a result of this casualty, four of the seven crewmembers perished during the early morning hours of January 9, 2005.

Heroism

That morning, mariners along the Ohio River clearly demonstrated the true meaning of brotherhood and heroism. After hearing desperate requests for assistance from the crew, Good Samaritan responders performed actions that displayed bravery and demonstrated the underlying bond among mariners. Crewmembers from the M/Vs *Lillian G*, *Rocket*, and *Sandy Drake* responded, placing their lives in imminent danger.

To render assistance despite the known risk, crews maneuvered their vessels while combating high water conditions and avoiding floating debris and the threat of collision with partially submerged barges that were set adrift during the casualty. Crews from the *Lillian G* and *Sandy Drake* demonstrated commendable valor while retrieving men who had fallen overboard. As a result of their immediate response, one crewmember's life was saved.

When faced with a decision that could cause the crew of the *Rocket* to suffer the same fate as the *Elizabeth M*, the crew unanimously decided to attempt rescue efforts for the two remaining survivors. As a result of the *Rocket*'s actions, both survivors, who battled frigid 34°F temperature water and 33°F air temperature, were safely rescued and successfully treated for severe hypothermia and minor injuries.

These heroic actions may not have been possible without the strong bond that has been witnessed daily on the Western Rivers. Some mariners may not feel their brotherhood equates to heroism, but we must remind ourselves of Ralph Waldo Emerson's quote, "Each man is a hero and oracle to somebody."[2] We may not know when or how this takes place, but we can be assured that it takes place every day on the Western Rivers.

Brotherhood

Coast Guard public service awards, such as the Silver Lifesaving Award and the Certificate of Valor, can be awarded by the Commandant of the Coast Guard to those who rescue or endeavor to rescue another person from the perils of the water. Typical criteria for the awards: The rescue is made at the risk of one's own life, with extreme and heroic daring.

- One *Elizabeth M* survivor, John A. Thomas, was vital in saving his captain by providing him extra clothing to keep hypothermia at bay, maintaining radio communications with rescuers, and holding on to him to prevent him from being submerged in the freezing, raging

Only the pilothouse of the *Elizabeth M* can be seen above the raging waters at Montgomery Lock and Dam. USCG photo by LTJG Jesse Garrant.

dam waters traveling past them at a rate of 13 mph. Mr. Thomas was awarded the Silver Lifesaving Medal for these heroic actions.

Despite frigid weather conditions, the precarious nature of the location, and the sinking vessel, the four crewmembers of the *Rocket* also willingly accepted all risks without hesitation and were able to pull two survivors to safety.

- Crewmembers Donald L. Brown, Robert F. Cornman, and Thomas W. Siegler were awarded the Certificate of Valor for their brave and quick response in rescuing two survivors.

- The captain, Charles L. Montgomery, was awarded the Certificate of Valor for maneuvering and keeping his vessel in position to complete the rescues.

In a river community such as the Pittsburgh operating region, the rivermen form a small group that is extremely protective of one another. Strong bonds like these have been in existence since people started working the rivers. Though not always as life-or-death as the acts of the *Elizabeth M* survivor or *Rocket*'s crewmembers, it is very common to see smaller acts of help and heroism on an everyday, smaller scale.

When towboats and barges go aground or have breakaways, another riverboat will always help them. That help may come in the form of casual conversation noting shallow spots, statements to the Army Corps of Engineers and Broadcast Notice to Mariners informing other riverboat captains of those spots, or towboats coming alongside to tow the boat that needs help.

Calls of distress from any riverboat captain will be responded to by others willing to help, from not only an unspoken rule to assist each other, but also from the knowledge that their boat may be the one that needs help some time in the future. Through the many committees and groups that the rivermen belong to, as well as the rivers they all work on, they consider themselves family, and family members help each other.

The Investigation

The *Elizabeth M* incident led to a formal investigation by the Coast Guard. Subsequent to any marine casualty, under the authority of Title 46 USC 6301 and its regulations, Coast Guard district commanders have the power to convene a formal Marine Board of Investigation to determine, to the extent possible, the cause of the casualty. Formal investigations may also identify acts of misconduct, incompetence, negligence, willful violation of law, evidence that a criminal act was committed, or whether there is need for new laws or regulations to prevent recurrence of the casualty. This casualty resulted in a formal investigation.

These are open to the public, occur within the community, and are presided over by a Coast Guard representative. Public testimony pertaining to the casualty, people involved, policy, and procedures are presented. Parties of interest or their representatives are provided opportunities to cross-examine witnesses. The recorded testimony is then used to produce a comprehensive report of investigation, which includes the facts of the case and recommendations.

Formal investigations can educate an entire community while simultaneously paving the way to safer waterways, providing an awareness of the importance of waterways safety, the enduring brotherhood and heroism of rivermen, and increased knowledge of the investigations process.

River conditions warrant decisions that are based on risk management, safety, and necessity, which are juggled by all vessel captains and crewmembers. The maritime community continues to work diligently to prevent casualties. However, despite careful planning, casualties and accidents still occur, and when they do, the investigations process will alert and educate people to prevent future mishaps. And when the river community extends its help to its brothers, these efforts will be noted and commended.

About the authors:
LTJG Jesse Garrant has served in the U.S. Coast Guard for 16 years. LTJG Garrant, a former boatswain's mate, served aboard the CGC Madrona *and* Rambler*, and has been stationed at Base Charleston, Station Erie, MSU Baton Rouge, and MSU Pittsburgh. He was the responding marine casualty investigator and assigned recorder for the M/V* Elizabeth M *hearing.*

LTJG Jodi Min has served in the U.S. Coast Guard for three years. LTJG Min served as the damage control assistant on the CGC Legare*, and currently works in the investigations and inspections department at MSU Pittsburgh.*

Acknowledgement:
Special thanks to Mr. Michael Gable, U.S. Coast Guard Office of Military Personnel, Medals and Awards Program.

Endnotes:

1. At the time of writing, the cause of the casualty was still an open and ongoing investigation.
2. Emerson, Ralph Waldo, "Letters and Social Aims," James R. Osgood and Company, Boston, 1876.

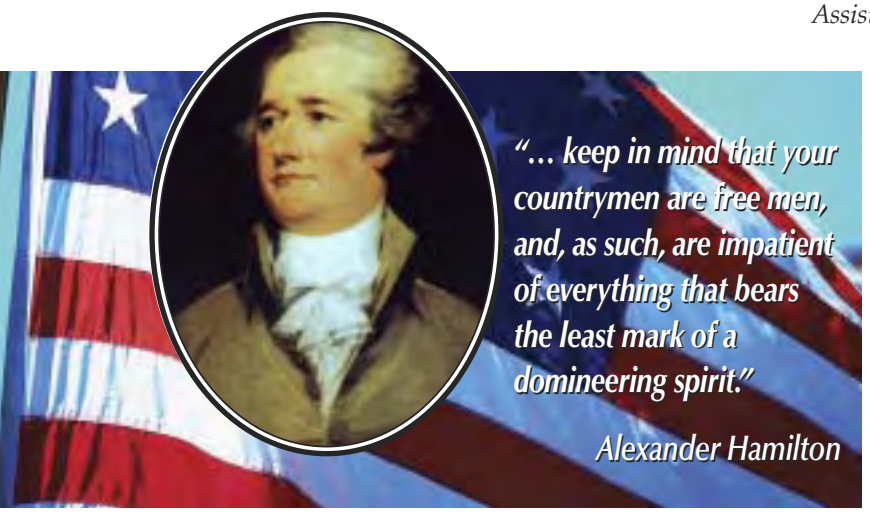
Capacity, Communication, Culture

The U.S. Coast Guard Marine Safety Performance Plan

- ☆ Improving Performance
- ☆ Optimizing Service
- ☆ Strengthening Management

Enhancing the U.S. Coast Guard Marine Safety Program

by RADM Brian M. Salerno
U.S. Coast Guard
Assistant Commandant for Marine Safety, Security and Stewardship



In our fast-paced society, where we face many challenges and distractions, there is tremendous value in taking stock of where we find ourselves and in verifying that we remain true to our purpose. As we do so in the Coast Guard, the words of our founder, Alexander Hamilton, serve as an ever-present reminder of how we must always approach our duties. This is especially true of our marine safety missions, through which we continually interact with mariners and shippers.

Marine safety remains a core mission of the Coast Guard. By working closely with our industry partners, we have—over several decades—successfully reduced the frequency and severity of marine casualties, including personnel injuries, deaths, property damage, and oil spills. Nevertheless, we can never consider the job done. The operating environment is ever evolving, and we must adapt accordingly to improve our services. Recently, we have heard the unmistakable call from many in the maritime community for improvements in how the Coast Guard conducts its marine safety missions.

Specifically, we have heard the view that since the national trauma of 9/11, the Coast Guard has been so focused on improving maritime security that we have relegated marine safety missions to a second-tier status. Added to this is the perception that, as maritime trade has been growing at phenomenal rates and as ships have become increasingly more complex, the Coast Guard has simply not kept pace. Also of concern are the difficulties faced by companies as they seek to attract new entrants into their workforce, as well as those faced by individual mariners. Industry is calling for the Coast Guard to enable this process, and to make it easier for them to operate and contribute to our national prosperity.

Perhaps most disturbing is the view that the Coast Guard has shifted its attitude toward the maritime community, and has apparently begun to view mariners and shippers as potential suspects, rather than as partners in achieving safety and security within the marine transportation system. We have heard all of these concerns, and we have taken them seriously!

Last summer, the Commandant, Admiral Allen, requested retired Vice Admiral Jim Card to perform an overall assessment of how the industry and our own workforce viewed the state of the Coast Guard marine safety program. The views and concerns expressed in Admiral Card's report left no doubt that it was time for the Coast Guard to reset its priorities and fully restore the productive, professional relationship it has historically enjoyed with the communities it serves.

In response, the Commandant sent a message throughout the Coast Guard, outlining his expectations for interaction with industry (page 28), and set staff to work to enhance the marine safety program. The Marine Safety Performance Plan highlighted in this issue is designed to do just that. Through this plan, we will develop an infrastructure that will allow us to:

- field a superior workforce,
- optimize stakeholder service delivery, and
- deploy best management practices.

As we put this system in place, we will also work to improve recreational boating safety, address towing vessel safety, and reduce the risks associated with commercial fishing. We are confident that this focus will provide the nation and the mariner with the service they need and deserve. We look forward to your feedback on this plan and on how we are doing in implementing it.

Go to http://homeport.uscg.mil and click on "Marine Safety" to view:

- Vice Admiral Card's report,
- the full Marine Safety Performance Plan.

We began accepting comments regarding the plan on May 22, 2008. Direct your comments to: MSPerformancePlan@uscg.mil.

Improve Marine Safety Program Capacity and Performance

For the past decade our marine inspector and investigator workforce has remained relatively constant despite a growing demand for domestic inspections, increasing port state responsibility, and increased homeland security requirements.

Our ability to keep abreast of this evolving maritime industry is fundamentally linked to our potential to develop and retain an experienced cadre of technically savvy professionals.

Increase Capacity
To accomplish this, the Coast Guard must increase marine inspector and investigator capacity. We plan to add 276 full-time personnel to the program by the end of 2009.

To retain expertise and geographic-specific competencies while ensuring long-term continuity in critical mission areas, many of these will be civilian positions.

Achieve Appropriate Blend of Military/Civilian Workforce
Military personnel must continue to serve as marine inspectors and investigators to ensure innovation and to garner experience for management and command responsibilities. We will distribute civilian positions according to need and to complement the military workforce.

Objective	Action	Implementation	Progress
Improve Marine Safety Program Capacity and Performance	Increase marine inspector and investigator capacity.	• Add 276 positions.	FY08, FY09
		• Add senior civilian training officers to all sectors.	FY08
		• Double accessions from maritime institutions.	FY08 (goal)

Maintaining proficiency within the marine safety program begins with recruitment and accession of additional maritime professionals. We intend to strengthen recruiting efforts at the maritime colleges through additional liaison officers and by seeking opportunities for Coast Guard officers to serve as faculty at those institutions.

Support and Reward Competency
To support these marine safety program recruits, we will work to ensure a viable career path to the most senior ranks of the Coast Guard. We must recognize and reward those who advance from apprentice, to journeyman, to expert marine safety professional status.

In addition, we will expand training and education programs, including engaging industry (within applicable legal and ethical guidelines) to maximize training opportunities and immerse our personnel in industry operations.

Expand Professional Education
Increased complexity in ship design and construction, including high-speed ferries, liquefied natural gas ships, mega-container and mega-cruise ships, and novel structural designs, call for an innovative and knowledgeable technical staff to develop guidance, standards, and policy. We will work toward additional capacity and expertise to meet this demand.

Objective	Action	Implementation	Progress
Improve Marine Safety Program Capacity and Performance	Strengthen marine safety career paths.	• Expand marine safety training and education.	FY08
		• Double annual industry training billets.	FY08
		• Increase post-graduate opportunities by 50%.	FY08
	Enhance engineering capacity.	• Add billets to support plan review, policy, and standards development.	Future Years

Optimize Service Delivery to Our Stakeholders

Supporting our maritime transportation system stakeholders and acting for the benefit of the general public are fundamental to our purpose as a public service agency. We must deliver customer-focused, high-quality services in a timely and professional manner in a format that is convenient to the industry and transparent to the public.

Centers of Expertise
In support of this effort, the marine safety program will establish additional "centers of expertise" (COEs) to provide venues for professional development and interaction among industry and Coast Guard personnel.

These centers will focus on specialized areas of industry to improve inspector and investigator competencies and promote nationwide consistency. Centers of expertise will also support casualty responses and surge capacity.

We anticipate establishing COEs for:

- investigations,
- large passenger vessels,
- liquefied natural gas ships,
- towing vessels,
- deep-draft lakers,
- outer continental shelf activity.

Improve Information Technology Systems
We will incorporate tools to improve the access to and the exchange of information between industry and government. For example, the Coast Guard will enhance web-based portals to share information with industry, including frequently asked questions and lessons learned. To facilitate transparency, we will also include Coast Guard office directories, suggest contact methods, and provide help desks.

Increase Rulemaking Capacity
We will continue to improve our process to address current and anticipated rulemaking projects. Improvements will include more robust project management, rulemaking development, economic analysis, environmental analysis, technical writing, and administrative law.

We will publish timely guidance to assist industry, and, to the extent practicable, the Coast Guard also will prepare legislative change proposals that minimize required rulemaking process time.

Improve Mariner Credentialing
The Coast Guard restructured its National Maritime Center to focus on a single effort—mariner licensing and documentation. Beginning in 2005, it was divested of all subunits and extraneous duties and, in 2007, re-

located to a dedicated 60,000-square-foot building in W.Va.

Early statistics are promising, as cycle time has been reduced by 17 percent since July 2007. Additional improvements are planned, including:

- online self-help application tracking and payment options;
- bulk application processing for academies, schools, and industry groups;
- issue of merchant mariner credentials in less than one week;
- web-based processing.

Independent Evaluation

We will contract for a comprehensive and independent evaluation of the entire U.S. Coast Guard Marine Safety and Environmental Protection program. The contract is expected to be awarded in the third quarter of 2008 and the final report is expected prior to the end of the second quarter of 2009.

Key elements in the statement of work include:

- identifying program customers and stakeholders;
- verifying their needs and expectations;
- validating program purpose and design;
- evaluating performance, particularly satisfaction with service levels;
- identifying opportunities for improvement.

Objective	Action	Implementation	Progress
Enhance Service Delivery to Mariners and Industry Customers	Establish centers of expertise.	• Six new COEs planned, including two in FY08.	FY08, FY09
	Improve information technology systems.	• Add IT support for marine safety field personnel.	Future Goal
	Increase rulemaking capacity.	• Added 31 billets to boost standards development.	FY08
	Improve credentialing.	• NMC restructuring complete. Productivity up 250%.	FY08

Deploy Best Management Practices

We must deploy dynamic performance management practices through all levels of the program to maintain capacity, performance, and service, while delivering best value to the taxpayer.

Improve Management Accountability
We will restore transparency to the management of the marine safety program, and improve industry accessibility to Coast Guard leadership. In particular, the Commandant and our senior executives will continue to host roundtable discussions with industry leaders.

Service leaders at all levels will create opportunities to improve stakeholder engagement. We will capitalize on the Coast Guard's modernization efforts to strengthen accessibility and timely service without jeopardizing transparency.

Strengthen Program Management
Ensuring that management structures and practices align with customer and other stakeholder needs—and that they are completely understood—is central to improving service delivery to the marine industry.

We will provide program direction that supports close, cooperative relationships with operational commands, industry customers, and other stakeholders. To the greatest extent possible, we will provide single-point accountability for all program outcomes, and designate management authorities and line-of-service responsibilities that correspond with key industry segments.

Develop a Balanced Scorecard
We will expand and improve our performance measurement capabilities and practices and develop a balanced scorecard that includes customer satisfaction metrics as well as a complete suite of outcome, output, activity, capability, and efficiency measures.

Implement a Quality Management System
We will implement a defined set of policies, processes, and procedures to execute marine safety mission activities. Implementing a quality management system throughout the program will enable us to identify, measure, control, and improve the core processes that will ultimately lead to improved mission performance.

Objective	Action	Implementation	Progress
Improve Program Management	Improve accessibility to Coast Guard leadership.	• Hosting a series of listening sessions with industry executives.	FY08

Specific Safety Initiatives

Recreational Boating Safety

Recreational boating is a fun and generally safe activity, yet each year some 700 boaters are lost and thousands more are injured. Recreational boating results in the third-highest annual number of transportation fatalities, and boating deaths are on the National Transportation Safety Board's "Most Wanted" list.

To improve recreational boating safety, the Coast Guard is aggressively implementing a strategic plan developed in consultation with the National Boating Safety Advisory Committee.

Elements of the plan address:

Boating education. We will work with our partners to track the use and effectiveness of training and education courses.

Safety communications. We will act with key stakeholders and partners to improve safety communications and increase awareness of safe boating practices.

Safety equipment. We will increase boaters' knowledge of required safety equipment and monitor trends for carriage.

Compliance with navigation rules. The Coast Guard will collaborate with the National Association of State Boating Law Administrators and other boating safety partners to improve the awareness and enforcement of navigation rules.

Additional Safety Measures

We will aggressively work with our partners to increase life jacket wear rates. We will join forces to assess factors affecting life jacket usage, encourage availability of life jackets, and strengthen the enforcement regime. In addition, we will seek to curb boating under the influence. The Coast Guard will create a baseline measurement to track trends in alcohol use by boaters, assess the effectiveness of field sobriety penalties, and increase the effectiveness of enforcement.

Performance Measurement and Reporting

We will team with National Association of State Boating Law Administrators to pursue a Memorandum of Agreement with all federal land management agencies to ensure proper and timely accident reporting to state authorities.

Manufacturer Compliance Efforts

The Coast Guard will identify boats involved in accidents where carbon monoxide, flotation, capacity, or fuel systems are factors and enhance manufacturer understanding of USCG regulations. We will verify any non-compliance via a factory visit program, and ensure corrective actions are implemented.

We will work to improve life jacket wear rates.

Towing Vessel Safety Regulations

America's economy depends on the towing industry and the nation's 25,000 miles of natural waterways. For example, one loaded barge carries the equivalent of 60 truckloads of raw material or other products, and a single towing vessel may have 40 or more barges in tow.

It is estimated that there are nearly 7,000 uninspected towing vessels operating in the United States. To improve towing vessel safety and meet the mandate of the Maritime Transportation Safety Act of 2004, we are considering developing towing vessel inspection for certification regulations. Since adding towing vessels to the list of vessels inspected for certification increases that population by over 40 percent, we are considering developing various new regulations.

The regulations may require that all towing vessels meet some new standards and requirements, or be removed from service. To date, the Coast Guard has worked extensively with the Towing Safety Advisory Committee (TSAC) and its designated working group to develop recommendations regarding this inspection regime.

Milestones:

Fourth TSAC report to Coast Guard .....Mar 2008
TSAC "redline" review .....Feb 2008
Third TSAC report .....Apr 2007
TSAC working group meetings .....Fall 06 -Spring 07
Second TSAC report .....Sep 2006
TSAC working group meetings .....Fall - Summer 05
Initial report .....Sep 2005

We will work to implement a balanced vessel inspection regime.

Improve Commercial Fishing Vessel Safety

Commercial fishing continues to be one of the most dangerous occupations in America. The industry also faces severe economic pressures, including depleted stocks and limits on fishing, increasing fuel and other costs, and prices that have stagnated since at least 2000. This fosters an attitude of greater risk tolerance that can lead to less emphasis on training, safety equipment, and maintenance.

The Coast Guard has pursued improvements in safety in the commercial fishing industry since before World War II. Voluntary commercial fishing safety programs received considerable attention in the 1970s, and the Commercial Fishing Industry Vessel Safety Act of 1988 provided authority to require survival equipment, but did little to address prevention efforts.

The House Subcommittee on the Coast Guard and Maritime Transportation held hearings in April 2007 that focused on the need for additional authority to regulate the commercial fishing industry, but such legislation has not yet been passed. Even so, the Coast Guard has a clear mandate to minimize marine casualties associated with commercial fishing.

Outreach and Communication

To improve our impact, we will seek to add full-time civilian commercial fishing vessel safety examiners and coordinators. This will allow us to expand the voluntary dockside examination program and reach out to those in the fishing industry to help them understand and come into compliance with regulations for basic safety equipment and lifesaving devices.

The Coast Guard Auxiliary performs a significant number of these safety exams and is an integral part of the fishing vessel safety team. We will seek to expand auxiliary involvement and institutionalize its role. In particular, we will use auxiliarists in boarding officer training and include auxiliarists in fishing vessel casualty investigations.

We will continue to promote safety and best practices through active participation at conferences and industry trade shows and through printed materials.

Partnerships

We will come together within the Commercial Fishing Industry Vessel Safety Advisory Committee to improve safety communications and risk tools to assist fishermen. Additionally, we will join forces with the National Institute of Occupational Safety and Health (that staffs a field office in Alaska focused on fishing industry safety) and take advantage of this expertise to develop future strategies to reduce commercial fishing vessel deaths and injuries.

We will also seek to improve information sharing with insurance companies to better understand injury mechanisms and potential interventions, and will leverage relationships with safety equipment manufacturers to identify areas where new or improved products are needed.

We intend to maintain close relationships with state fisheries regulators and seek to leverage their authority to favorably impact commercial fishing vessel safety. We will also work with Canadian regulators to share solutions and develop common approaches to minimize deaths and injuries.

Maritime Law Enforcement

We will direct a robust program of fishing vessel safety enforcement to deter unsafe operation, detect violations, and educate the industry. We will encourage operational commands to provide capable and sufficient resources, to schedule activities to maximize access to vessels and crews, and to provide ample advance publicity to effectively announce the program and explain its purpose.

We will encourage effective coordination of at-sea boardings, by identifying vessels that pose a greater safety concern because the operators refused to allow a voluntary dockside examination or were found not in compliance.

In all instances, we will emphasize the importance of keeping the process cooperative and non-adversarial.

COMMANDANT'S EXPECTATIONS FOR INTERACTION WITH MARITIME INDUSTRY

In February 2008, the following message was distributed throughout the Coast Guard.

ALCOAST 108/08
SUBJ: COMMANDANT'S EXPECTATIONS FOR INTERACTION WITH MARITIME INDUSTRY

1. USCG activities involving U.S. and foreign professional mariners and maritime organizations will be conducted with utmost professionalism and respect. Licensed and documented mariners are professionals who share our interests in a safe, secure, and environmentally compliant industry. Alexander Hamilton's charge—to keep in mind that our countrymen are free men, and, as such, are impatient of everything that bears the least mark of a domineering spirit—applies as much today as it did in 1790, and equally to international mariners and our trading partners.

2. Unfortunately I have received reports from highly respected professionals, recounting Coast Guard boardings, inspections, and investigations not displaying professionalism. Additionally, some have said they lost the complete trust they once had in the Coast Guard and are fearful of retribution if they challenge the Coast Guard's conduct.

3. We must change this perception. America's position in the global economy, public and environmental safety, and post-9/11 security are at stake. The need for maritime industry/government cooperation and partnership has never been more important. The Coast Guard's obligation to the safety and security of America is shared by the maritime industry and enhanced by working cooperatively with industry at all levels. Openness and transparency will be the hallmarks of our maritime interaction.

4. Boarding team members, marine inspectors, port state control examiners, facility examiners, and their supervisors shall encourage open communication with mariners and other members of industry.

5. Disruption in the normal flow of commerce impacts many parties in the supply chain. We have clearly established appeal procedures when we make a decision that could have negative impacts on a licensed mariner or on the maritime industry. The exercise of appeal is a right we strongly support. Questions, differences of professional opinion, and appeals are normal and improve the conduct of business. We must be as accepting of these as of praise. Attempt to resolve problems at the lowest level possible, and be resourceful in doing so.

6. In instances when decisions are appealed, unit commanders and supervisors must act with a neutral, common-sense attitude; timely resolution is of utmost importance to facilitating legitimate commerce.

7. As Commandant, I actively engage the captains of the maritime industry in round table discussions to uncover what is good and bad with our current practices, so improvements can be made. I expect similar maritime industry engagement at every level of the Coast Guard, followed by aggressive action to address problem areas. Follow ethics rules and standards of conduct in your interactions.

8. As soon as possible, USCG sector commanders shall solicit candid feedback from the individual mariners, industry association representatives, and facility operators who have a significant stake in marine safety, security, and stewardship. This feedback shall identify pending issues needing action, best practices, and recommendations that can be acted upon. Districts shall hold a sector conference to include COTP/OCMI, Prevention and Response representatives to discuss the feedback, determine a course of action for those that merit action, and then close the loop with industry on actions taken. National-level recommendations shall be vetted through area commanders and forwarded to the Assistant Commandant for Marine Safety, Security and Stewardship (CG-5) by 1 June 2008 for consideration in the Coast Guard's marine safety improvement efforts. My goal is to purge the past and reset for the future. Open communication, critical self-examination, and a willing transparency are hallmarks of great organizations, including the Coast Guard.

9. I also expect USCG sector commanders and cutter commanding officers to ensure boarding teams, inspectors, and examiners provide the unit's senior leader contact information, if asked, to vessel masters, port engineers, and facility operators.

10. Effective immediately, Coast Guard requirements that limit vessel movement (such as no-sail orders, major CG-835s, actions that would delay arrivals and departures) are to be affirmed by the sector CID and reported to the Prevention chief, as many already do. At a minimum, a Coast Guard supervisor shall engage, by phone, radio, or in person with the master, port engineer, or facility manager, to discuss the requirements and expectations for resolution. As soon as practicable, USCG sector commanders, MSU commanding officers, and cutter commanding officers shall be informed of all such discussions.

ADMIRAL THAD ALLEN, *Commandant*

Capacity, Communication, Culture

Information Sharing

We all "need to know."

Executive Perspective

by Mr. James F. Sloan
U.S. Coast Guard Assistant Commandant for Intelligence and Criminal Investigations

By presidential declaration, information sharing has been an administration priority since the September 11th attacks. The "need to know" culture of the Cold War era is now a handicap that threatens our ability to uncover, respond, and protect against threats to our national security. Law enforcement organizations and intelligence agencies from the federal level to state, local, and tribal authorities have developed their own networks and data repositories, making it difficult to share data necessary to aggressively plan, communicate, and intercede to thwart a future terrorist attack in a timely manner.

In October 2007, President Bush signed the National Strategy for Information Sharing. This document describes the information sharing vision that has guided the administration for the past seven years. The strategy lays out a plan to establish more integrated information sharing to ensure that those who need information will receive it, and those who have access to information will share it.

Within the intelligence community, Director of National Intelligence Michael McConnell has made accelerating and improving information sharing one of his top priorities. He has called upon the intelligence community to transform its culture to one where the responsibility to provide information is a central tenet. Several major factors drive the need for change. These include the ever-evolving threat environment of the 21st century, recently established national and homeland security customers, and emerging asymmetrical threats that require synthesizing intelligence from a greater variety of sources.

As a reader of *Proceedings*, you have a personal responsibility to follow information sharing protocols. Within the maritime domain, whether you are a government employee or an interested stakeholder, information sharing is a collective responsibility. We must balance our country's civil liberties with the timely exchange of information in order to protect our ports and maritime interests. I hope you find this special information sharing section informative and instructive.

About the author:
As the U.S Coast Guard Assistant Commandant for Intelligence and Criminal Investigations, Mr. Sloan directs, coordinates, and oversees all intelligence and investigative operations and activities. His previous leadership experience comes from working with law enforcement, intelligence communities, foreign governments, and financial and regulatory sectors in such positions as the director of the Financial Crimes Enforcement Network and acting undersecretary of enforcement for the Department of the Treasury.

Additionally, Mr. Sloan served with the United States Secret Service for 21 years, most recently as the agency's deputy assistant director for protective operations, and was senior program manager of its antiterrorism programs. Prior to joining the Secret Service, he served as a police officer, investigator, and as a lieutenant in the U.S. Army.

Information Sharing in the 21st Century

Information Sharing Coordination Council Perspective

by CAPT Christopher J. Tomney
Chief, U.S. Coast Guard Office of Intelligence Plans and Policy

Twenty-first-century problems require 21st-century solutions. This is especially true in the area of information sharing. Director of National Intelligence Michael McConnell has repeatedly stated that our federal agencies must evolve beyond the 20th century mentality of a "need to know" when it comes to information sharing. While this philosophy worked well during the Cold War when dealing with more traditional threats, today's digital world, at risk from asymmetrical threats, requires a more timely exchange of information from those who possess it to those who require it for mission execution. No longer is "need to know" an acceptable principle. As Mr. McConnell stated, we must get beyond the old "need to know" norm to a new paradigm of the "responsibility to provide."

As a law enforcement and regulatory agency that is also a military service and intelligence community member, the United States Coast Guard is in a unique position to acquire and disseminate information to Coast Guard decision makers and operational commanders, as well as to our interagency, industry, and international partners. Information sharing is a fundamental responsibility of every Coast Guard employee. Information stovepipes within the Coast Guard and the larger government community must be eliminated and replaced by enduring protocols, policies, and procedures that promote the sharing of information while protecting sources, respecting security requirements, and abiding by civil liberties protection.

True information sharing ensures that consumers have the information they need when they need it. Users must be able to discover the existence of information and retrieve relevant information when needed. Intelligence analysts must have access to the most sensitive information when creating a product. This information must be accessible through an infrastructure that supports information discovery, retrieval, and collaboration.

This section of *Proceedings* highlights ongoing efforts to establish a culture of information sharing within the Coast Guard. I hope the following articles will stimulate organizational dialogue on additional actions our service can undertake to achieve the spirit and intent of national information sharing initiatives.

About the author:
CAPT Christopher J. Tomney has served in various afloat assignments aboard USCGC Diligence *and USCGC* Confidence. *He served as commanding officer, USCGC* Point Monroe *and USCGC* Ocracoke. *For two years CAPT Tomney was dual-hatted as the Coast Guard Group Key West law enforcement division officer and officer-in-charge of Law Enforcement Detachment Two.*

CAPT Tomney headed the Coast Guard's Operational Intelligence School in Yorktown, Va. Following this, he was dual-hatted as USCG Pacific Area Intelligence Division deputy division chief and director of intelligence operations. He was then deputy director of the Coast Guard's Counterintelligence Service at USCG headquarters. He is presently chief of the Office of Intelligence Plans and Policy within the USCG Directorate of Intelligence and Criminal Investigations.

CAPT Tomney holds a bachelor of science degree in marine science from the U.S. Coast Guard Academy and a master of science degree in strategic intelligence from the Defense Intelligence College.

Creating a Culture of Information Sharing

Information Sharing Executive Agent's Perspective

by Ms. Susan Henry
U.S. Coast Guard Information Sharing Executive Agent

At long last, more than three years after publication of the 9/11 Commission Report[1] and many executive branch memoranda later, Congress passed the Implementing Recommendations of the 9/11 Commission Act of 2007. It was signed into law on August 3, 2007,[2] bringing assessment of federal information sharing practices and performance into sharper focus. Though annual assessment of federal information sharing had already been mandated under the Intelligence Reform and Terrorism Prevention Act of 2004,[3] the ownership and scope of the process were uncertain, and the reorganization of the intelligence community was still in progress.

The interpretation of information sharing within the Department of Homeland Security (DHS) has also been evolving since 2004. Under the current DHS executive leadership, federal information sharing mandates are no longer applied specifically to counter-terrorist intelligence. Within DHS, the vision of our responsibility to share stretches across all threats, all hazards, and all missions under the department's purview. The Coast Guard is accountable for our information sharing performance across all maritime regimes and all missions, with a huge number and variety of partners.

New Annual Performance Measures

A few months after the 9/11 Commission Act was passed, the program manager for the information sharing environment of the Office of the Director of National Intelligence (ODNI) began working closely with DHS and other federal departments and agencies to

SAFETY	SECURITY	STEWARDSHIP
Saving Lives & Protecting Property	*Establishing & Maintaining a Secure Maritime System while Facilitating its Use for the National Good*	*Managing the Sustainable & Effective Use of Its Inland, Coastal and Ocean Waters & Resources for the Future*
Search and Rescue	Ports, Waterways & Coastal Security	Marine Environmental Protection
Marine Safety	Illegal Drug Interdiction	Living Marine Resources
	Undocumented Migrant Interdiction	Aids to Navigation
	Defense Readiness	Ice Operations
	Other Law Enforcement	

Coast Guard missions, excerpted from the "2008 Budget in Brief and Performance Summary," Feb. 2007.

identify specific, achievable measures of information sharing performance. The baseline measures focus on several key improvement categories, including:

- establishing integrated policy and practices, such as international agreements, privacy policy, and interagency reporting of suspicious activities;
- establishing agency-level information sharing governance;
- implementing joint federal/state/local fusion centers and "common terrorism information sharing" standards;
- cultural transformation (including personnel incentives and disincentives) and training.

This summer ODNI used an overall list of 14 key measures to create and present the first annual report to Congress.

How Do We Measure Up?

Coast Guard missions have always required information sharing with international, federal, state, local, tribal, industry, public, and private partners. As a result of our tradition of information sharing, our entering position against the new baseline measures is strong. Coast Guard sector commanders have actively pursued new collaborative planning, prevention, and response partnerships at the local level. Regional alliances promoted by federal law, policy, sponsorship, and grants, such as area maritime security committees, have been added to existing area contingency plan-based and Incident Command System-oriented partnerships.

Since 2006, field surveys of selected critical ports indicate that each Coast Guard sector command typically engages more than 100 active port partners in a multitude of partnerships and forums.[4] These surveys also identified a wealth of best practices, along with many practical recommendations for improving information sharing. Frustrations reported in recent surveys most often related to shortfalls of personnel, lack of shared networked capabilities, and insufficient funds for the joint training needed to sustain and expand collaborative partnerships. Nevertheless, working within our resource constraints, the culture of information sharing called for in the 9/11 Commission Report is already an everyday reality for Coast Guard field units.

Information sharing partnerships are also a high priority in Washington, D.C. The Commandant of the Coast Guard and the Commissioner of Customs and Border Protection initiated a senior guidance team in 2006. In 2008, the Assistant Secretary, Immigrations and Customs Enforcement joined this strategic alliance, which is intended to strengthen collaboration in the field by directing and overseeing specific near-term actions.

CAPT Patrick Trapp, commander, Sector Hampton Roads, reviews each partner's role during a preparedness for response exercise. USCG photo.

DHS is forming several focused shared mission communities, beginning with the Law Enforcement Shared Mission Community, officially launched in January 2008. This group, which includes active Coast Guard members, has been working to identify and clear away information sharing obstructions among DHS and agency members, and to improve understanding of valid legal constraints on information sharing. The group has produced an information sharing strategy document,[5] has begun to develop a shared data architecture, and is supporting an interagency information sharing pilot activity in Los Angeles. Future outreach beyond DHS is planned later this year, expanding the collaboration to other federal, state, and local partners.

New shared mission communities will focus on other aspects of the "all threats, all hazards" DHS realm, establishing policy-level collaboration in critical infrastructure, incident response, and other concerns crucial to safety and security. These will cut across all Coast Guard missions, and all will require Coast Guard representation.

What Do We Still Need to Do?

The new annual federal performance measures require us to take some additional steps forward to account for the information sharing we already do. We need to establish enterprise information sharing governance, an ef-

fort that is part of the ongoing Coast Guard re-organization. We need to develop an agency-level information sharing strategy that publicly articulates the improvements we intend to support and invest in for the future, based on the U.S. Coast Guard Strategy for Maritime Safety, Security, and Stewardship, and in concert with DHS and national strategies.[6] We need to continue to develop an information sharing segment architecture to ensure that our essential exchanges of information with our partners become part of our capability requirements. We also clearly need better collaborative, networked capabilities to work efficiently and effectively with our partners at local and regional levels.

Consistent with the 9/11 Commission Report's call to "unity of effort" in information sharing, the new federal annual performance measures also call us to create a culture of information sharing. To facilitate this, we must include measurable improvements to our personnel evaluation and appraisal standards and institute incentives and rewards for excellence in information sharing, as well as disincentives for obstructing information sharing with our partners. We are also now required to institute and report completion percentages on information sharing training to emphasize the importance of the responsibility to share, in balance to the traditional "need to know" information security rule. We must train Coast Guard personnel to be able to foresee the severe consequences of not sharing mission-essential information with our legitimate partners.

As a whole, our monitoring of Coast Guard field units' information sharing practices shows a multi-mission federal agency stretching to the limits of its resources to share information in order to increase operational effectiveness. The new federal information sharing performance measures give us additional opportunities to showcase successful partnering, better document our constraints, and continue to improve the safety and security of the U.S. maritime domain.

About the author:
Ms. Henry is a career information architect and system engineer who specializes in operational requirements analysis. She is a retired naval officer (cryptologist). She has served the Coast Guard since 1994, following assignments with the Navy, the Marine Corps, the U.S. Pacific Command, and the national intelligence community. She completed her undergraduate and graduate studies in information systems, applied mathematics, and organizational communications at the University of Hawaii.

Endnotes:

1. The 9/11 Commission Report, July 22, 2004, identified information sharing failures and barriers impeding homeland security; Chapter 13 focuses on information sharing.
2. Public Law 110-53, "Implementing Recommendations of the 9/11 Commission Act of 2007," Aug. 3, 2007.
3. Public Law 108-458, "Intelligence Reform and Terrorism Prevention Act of 2004," Dec. 17, 2004, section 1016.
4. "Port Inter-Agency Information Sharing Requirements Annual Assessment," Apr. 2008, and related survey data collected by the Coast Guard Research and Development Center from 2006 to present.
5. "Law Enforcement Information Sharing Strategy," Apr. 2008, DHS Intelligence & Analysis, approval pending.
6. "National Strategy for Information Sharing," White House, Oct. 2007. A companion DHS "Information Sharing Strategy" is in progress.

Capt. Philip Kenul, commanding officer of NOAA Aircraft Operations Center at McDill Air Force Base in Tampa, Fla., along with Rear Adm. David Kunkel, commander of the Seventh Coast Guard District talk about partnership response efforts during potential hurricanes and the importance of preparedness prior to the arrival of a hurricane. Government agencies have a responsibility to alert citizens and respond to those in distress. U.S. Coast Guard photo by PA1 Dana Warr.

Integrated Border Enforcement Teams

New measures to combat cross-border crime.

by CDR Sloan Tyler
Development Officer, Border Security Program
U.S. Coast Guard Office of Law Enforcement

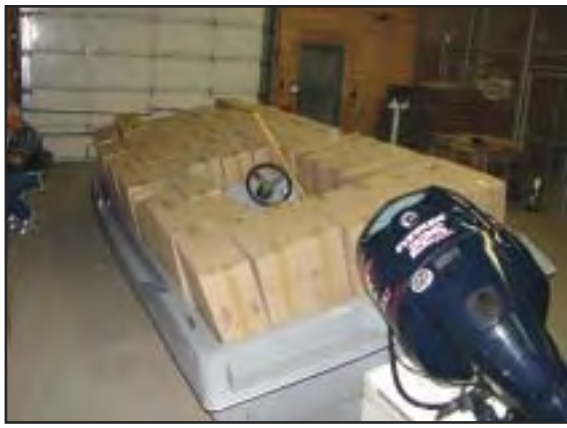
When talk turns to illegal immigration, drugs, and crime, there is a propensity to focus on the southern border of the U.S. as the greatest homeland security challenge. Migrant interdictions and drug seizures along the Mexican border and Florida coast routinely attract attention and media interest. Although our southern border is approximately 2,000 miles long, its length comes in a distant second when compared with the border of more than 5,500 miles dividing the United States and Canada.

This international boundary is a multifaceted line of demarcation spanning three oceans, the Great Lakes, and 14 states. It includes 1,500 miles separating British Columbia and the Yukon Territory from Alaska and is the most expansive, unguarded border in the world.

While travel in and out of the country is generally done through a United States port of entry, a vast portion of our shared border is protected primarily by isolation and inaccessibility. Some geographic areas that are accessible but isolated, such as open fields or farmland, have wide-ranging border security measures. Some areas are "self-reporting," while others monitor individuals who bypass the designated port of entry with hidden sensors along back roads and trails.

Not on Our Water—Introducing Integrated Border Enforcement Teams

These areas may also be used to further criminal activity. In the maritime regions of these remote areas, the U.S. Coast Guard, U.S. Customs and Border Protection, the Office of Border Patrol, U.S. Immigration and Customs Enforcement, and our law enforcement partners in Canada are working together to deny criminals the use of our nations' waterways for illicit activity.



This vessel was specifically designed to smuggle cigarettes into Canada. USCG District 9 photo.

Border security and smuggling are systemic issues, dating back hundreds of years. Despite the ruggedness and inaccessibility of the terrain, the region had become a profitable, safe haven for organized criminal smuggling networks. In the mid-1990s the Canadians expanded the scope of integrated border enforcement teams (IBETs), which were originally implemented to address cross-border crime in a specific region between British Columbia and Washington state.

For years the illegal movement of people and contraband through this remote segment of the international border was investigated by the first law enforcement agency to respond. U.S. and Canadian law enforcement personnel used traditional investigative methods on a case-by-case basis. The integrated border enforcement teams combine the efforts of more than 50 federal,

provincial, state, county, and municipal agencies. Their use was a significant change for law enforcement operations in that area.

Since September 11, 2001, border security along the U.S./Canadian border has been dramatically tightened as both nations strive to coordinate and cooperate to improve tactical and strategic information sharing. Today IBETs operate in strategic locations all along this border. Of these, several are focused on marine areas, including the Great Lakes/St. Lawrence Seaway region.

Top Official Buy-In

In December 2001, Homeland Security Advisor Tom Ridge and Canada's Deputy Prime Minister John Manley signed the Smart Border Declaration. The goal: to enhance the security of our shared border while facilitating the legitimate flow of people and commerce. Enhancing communication and coordination between the two nations and expanding integrated border enforcement teams were key commitments in the declaration.

Attorney General John Ashcroft, one of the first to publicly recognize the importance of the new relationship, remarked, "When we strengthen our northern border, we effectively deter those who may try and escape detection, arrest, or prosecution. These integrated border enforcement teams not only enhance our border integrity, but also demonstrate the success of our joint cooperation on cross-border law enforcement."[1]

IBET partnerships have become an effective multiagency international task force. The goal is to align multinational, tiered resources in targeted areas presenting the greatest threat and to interdict criminal activity at border choke points. The construct employs a risk management approach designed to assess vulnerabilities and engage in proactive planning. IBETs focus on identifying, investigating, and interdicting persons and organizations that pose a threat to national security or are engaged in other organized criminal activity.

Operation Shiprider

The Coast Guard has engaged the Royal Canadian Mounted Police (RCMP) in several joint initiatives along the U.S. and Canadian maritime border. Beginning in 2005, the Coast Guard and the RCMP participated in "Shiprider," several integrated maritime security pilot projects designed to test the concept of joint law enforcement operations in the maritime arena.

Shiprider was specifically designed as a tool to support integrated border enforcement team operations. To facilitate, each government cross-designated its counterpart law enforcement officers. For example, U.S. Immigration and Customs Enforcement cross-designated RCMP officers as customs officers. The RCMP cross-designated Coast Guard officers as "special supernumerary constables." Prior to participation in joint operations, Coast Guard and RCMP officers received law enforcement training on the duties and responsibilities involved with their cross designation at the Coast Guard's Maritime Law Enforcement Academy in Charleston, S.C.

This system allowed armed agents of both countries to conduct joint law enforcement

IBET Partners

Although the concept of the integrated border enforcement team was first implemented in Canada, the program has matured to a multifaceted law enforcement initiative comprised of Canadian and American law enforcement partners. The five core IBET partners are:

- the Royal Canadian Mounted Police,
- U.S. Customs and Border Protection,
- Canada Border Services Agency,
- U.S. Immigration and Customs Enforcement,
- the U.S. Coast Guard.

While these five agencies are core partners, regional, federal, state, local, provincial, and tribal law enforcement personnel are critical to effectively combating cross-border crime.

CBP vessel on patrol. Photo courtesy of U.S. Customs and Border Protection.

operations in both nations' waters. The RCMP officer would have the primary lead in Canadian waters, with a Coast Guard officer supporting as directed. The converse would be true while in U.S. waters. The operation intended to remove the maritime border as an impediment to cross-border law enforcement, increasing operational effectiveness.

Shiprider participants from left: Petty Officer Craig Campbell, USCG; Constable Andrew Smith, RCMP; Petty Officer Kenneth Freeman, USCG; Constable Wally Silver, RCMP; Constable Robert Trepanier, RCMP; Petty Officer Robert Foucha, USCG. District 9 photo.

In January of 2007, the United States and Canada began the process to permanently establish Shiprider. The envisioned framework will be designed to enhance the level of cooperation in the maritime arena and will take an integrated operational approach to maritime law enforcement. The bi-national agreement will also address the complex legal issues and sensitive privacy concerns involved with law enforcement information sharing.

Solidifying Operations

As with any new international initiative, there are areas that will require development, continued bi-national support, mid-course monitoring, and improvements. Issues such as dedication of personnel and afloat/ashore assets, cross-border law enforcement training, communication interoperability, and information sharing will all need to be addressed. A year-long pilot project is planned to beta-test a new radio system that will address common frequency bands and the barriers in telecommunications laws.

Shiprider Pilot Program

The most recent Shiprider pilot was a two-month project completed on September 30, 2007. Operations were conducted in Massena, N.Y., and in Blaine, Wash. Forty USCG and RCMP shipriders conducted more than 1,200 integrated patrols and performed 187 vessel boardings that resulted in 12 arrests and seizure of six vessels, 214 pounds of marijuana, over 1 million contraband cigarettes, and $38,000 in illicit cash.

Shipriders also conducted several search and rescue missions and collected intelligence for shore-based investigators on both sides of the border. It was noted that Shiprider operations resulted in marked increase in land seizures of contraband (including tobacco, currency, drugs, and weapons) in the Massena area, demonstrating the potential for deterrent effect and displacement of cross-border criminal activity.

In assessing the value added by the operation, Ninth District IBET liaison officer LCDR Marc Burd stated, "A Shiprider crew allows the usual impediment of the international border, used by smugglers and organized crime as a shield to hide behind, to be torn away and replaced with a multijurisdictional officer's badge, assisting our law enforcement partners on both sides of the border."

The future of Shiprider looks bright, as evidenced by RADM John Crowley, the Coast Guard's Ninth District commander. In his recent assessment of Shiprider's lessons learned, he noted, "The Ninth District is extremely fortunate and proud to be a core partner of the RCMP-led integrated border enforcement team program. This program is a model for international cross-border law enforcement between two countries that have common national security interests … The recent 2007 Operation Shiprider successfully demonstrated bi-national cooperation during its two-month period of focused information sharing and integrated maritime operations. The IBET program's efforts to date are just the beginning of a long and fruitful relationship for all five core partners and other law enforcement agencies."

About the author:
CDR Tyler is the border security program development officer at the Office of Law Enforcement at Coast Guard headquarters. She is responsible for the development and oversight of maritime law enforcement border policies and procedures. She has been with the Coast Guard since 1991 and has served in various capacities, such as legal counsel for the fisheries and alien migrant interdiction programs; JAG officer at the First Coast Guard District; criminal justice instructor at the Coast Guard Academy; and base legal officer, Kodiak, Alaska. She holds a B.A. in mathematics from Boston College and a J.D. from Suffolk Law School.

Acknowledgements:
LCDR Marc Burd, U.S. Coast Guard District Nine, and Mr. Ben Thomason, program analyst, USCG Atlantic Area.

Endnote:
[1] Dept. of Justice press release, November 19, 2003.

INFORMATION SHARING

The International Trade Data System

The Coast Guard joins a global data-sharing initiative.

by LCDR Mike Dolan
Chief, Cargo Security Branch
U.S. Coast Guard Office of Port and Facility Activities

On January 24, 2008, RDML Brian Salerno, the U.S. Coast Guard Assistant Commandant for Marine Safety, Security and Stewardship, signed a letter of intent for the Coast Guard to become the 43rd participating government agency in the International Trade Data System. This decision opens the door for the Coast Guard to explore new ideas for using information to improve programs, harmonize processes with other agencies, and reduce regulatory burden on industry.

When announced at the February 2008 meeting of the Commercial Operators Advisory Committee, this decision generated applause and acclaim. The senior industry leaders who comprise the committee represent major companies that import the consumer goods our nation relies on. These leaders know that the global marketplace's future progress requires an emphasis on data and technology. As a heavily regulated community, they were happy to see the Coast Guard join a project intended to streamline the process of delivering required information to the government.

So What Is the International Trade Data System?
The International Trade Data System (ITDS) is an ongoing, long-term U.S. interagency community of interest. The Customs and Border Protection automated commercial environment (ACE) major acquisition project, which is creating and modernizing computer network interfaces with the international trade community, supports the ITDS community. The ITDS members' requirements will shape the spiral development of ACE capabilities. The objective is to provide a single portal for commercial entities to submit all trade data and information required by the federal government. Once through the ACE portal, the data then goes into the ITDS community's repository.

The project intends to facilitate more streamlined operations in that commercial entities will submit information to the government only once, in paperless form. Currently, many different agencies require information from commercial entities, and companies must respond to each agency individually, often on paper. The ITDS-sponsored ACE project will greatly simplify and expedite interaction with the federal government. Just as importantly, regulatory agencies will benefit by having complete visibility of all trade data along with connection to all the other agencies' programs and activities.

Opportunities for interagency coordination and program improvement abound, and some agencies have already reaped benefits. For example, the Federal Safety Inspection Service achieved a 44-fold increase in the tonnage of ineligible product detected, detained, and removed from the food supply in one year using information obtained through an early version of the ACE portal.[1]

Why Is This Important to the Coast Guard?
Like most high-level policy issues, the decision to participate in ITDS had both political and pragmatic drivers and implications. First, the politics. Signed into law in October 2006, the Security and Accountability for Every Port Act of 2006 states, "All federal agencies that

require documentation for clearing or licensing the importation and exportation of cargo shall participate in the ITDS." The act also states, "It is the sense of Congress that agency participation in the ITDS is an important priority of the federal government …"[2]

Originally it was assumed that the law did not require the Coast Guard to participate in the International Trade Data System because the agency does not conduct the activities listed for clearing cargo. However, the Coast Guard is a border security agency responsible for clearing the vessels that move the bulk of imported cargo. That's where pragmatic considerations came into play: it was clear that, to maximize the system's potential, Congress expected all federal agencies to support the ITDS project. If it declined to join, the Coast Guard risked alienating itself from Congress, dozens of other federal agencies, and the international trade system—not a good position to be in.

Additionally, Coast Guard leadership began to see potential value in the concept. Program managers started to recognize that participation in the International Trade Data System could give the Coast Guard not only access to information, but to other agencies' processes and programs, as well. This access would have a cumulative value that exceeded any cost of participation.

Finally, because the ACE system and the ITDS agency network interfaces were already being built, the Coast Guard realized that the window of opportunity was limited. The longer the wait to join, the less influence it would have had on the design of the network interface. And so, with a leap of faith, the Coast Guard joined the International Trade Data System with some visionary ideas of what it might achieve.

Big Challenges

Now we come to the not-so-fun part of participation in ITDS and ACE—figuring out all the possible pitfalls and hurdles inherent in any new, complex information network. The technical hurdles are probably the easiest to spot, such as standard network interface issues consisting of varied connection and data security issues. The most problematic hurdle will be integrating existing Coast Guard systems with the International Trade Data System design and architecture, if necessary. This will depend entirely on which projects are pursued, because each project will be associated with its supporting systems. For example, the integration of the Coast Guard's Marine Information for Safety and Law Enforcement (MISLE) system may depend upon the hazardous materials safety program.

Daily Coast Guard activities are becoming increasingly driven by information management and networking with other agencies. USCG photo by Mr. Telfair Brown.

To even begin to understand the technical challenges ahead, we have to recognize the scope of policy development that must take place. Participating government agency status requires its own set of obligations, such as developing a concept of operations and possibly even memorandums of understanding or memorandums of agreements. Once the interagency instruments are in place, the Coast Guard must then analyze the constraints of existing agency policy, both programmatic and technological. This may restrict the scope of proposed projects and applications. This work will also uncover gaps in policy that may need to be addressed.

Finally, we recognize that once ITDS is ready for use, personnel will need sufficient guidance and training to capitalize on the available information. Because the ACE portal is web-based, there won't be new hardware requirements, but personnel will still need to know how to enter and navigate the interface to retrieve information.

As a large, complex organization, we are at the most exciting phase of this new initiative. We are envisioning all the wonderful things that we can achieve, and stand ready to deal with the challenges that lie ahead. Participation in the International Trade Data System gives us a powerful tool and a path forward to make sure that the Coast Guard stays current with technology and stays engaged with the regulated community.

About the author:
In his current headquarters assignment, LCDR Mike Dolan works on international and domestic cargo security standards and strives to align cargo security policies between the Coast Guard and other DHS agencies. LCDR Dolan enlisted in the Coast Guard in 1991. He is a graduate of Embry Riddle Aeronautical University, Marine Corps Expeditionary Warfare School, and the Naval War College.

Endnotes:

1. Report to Congress on the International Trade Data System, November 2007, page 12.
2. Public Law 109-347, Section 405.

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What International Trade Data System applications might the Coast Guard pursue?

➤ Hazardous materials cargo inspections

The Coast Guard continues its legacy Department of Transportation mission, inspecting shipments of hazardous materials (hazmat) in maritime modes of transportation. In some cases, the hazmat container selection process might not encompass the full capabilities of selective targeting. ITDS information can provide detailed information about scheduled cargo arrivals the moment it becomes available. This allows the Coast Guard to analyze targeting criteria based on statistical analysis of port risk or involved party compliance histories, and to plan operations accordingly. Targeting could also be synchronized with priorities such as identifying unregistered international hazmat carriers. The Coast Guard program office for the container inspection program has begun collaborating with the Pipeline and Hazardous Materials Safety Administration to begin this project.

➤ Response operations for incidents involving maritime cargo

Response operations for port safety or security incidents typically involve an initial period of intense, focused research to gather information on the vessels, cargo, and involved parties. This onerous process pulls data from many different sources and often leaves information gaps or contradictions in the initial assessment. The International Trade Data System could improve this process by providing a single source of information for all cargo data, including manifests, stowage plans, international company contact information, and technical cargo data. This would allow all agencies to communicate and coordinate using the same information without additional transmission. While this data may not be information that the Coast Guard uses on a daily basis, in a response scenario, precise cargo information can be crucial.

➤ Intelligence data-mining for advanced security targeting algorithms

The current systems for vessel, certain dangerous cargo, and crew and passenger security screenings are a series of collaborative, custom-built processes shared between Customs and Border Protection and the Coast Guard. The Coast Guard does not routinely receive the same massive amount of raw data regarding cargo that CBP uses in its sophisticated automated targeting system. Instead, the agencies rely on liaison officers and personal relationships to discuss case-by-case concerns or incidents. ITDS could allow direct access to vast amounts of data. The Coast Guard intelligence community could then develop advanced data-mining algorithms that are fused to vessel information to detect abnormal or questionable maritime operations. This supports the theory of layered security systems. Another benefit is that data would be readily available to analysts when an incident occurs, negating the need for CBP or another agency to collect, package, and transmit the data.

➤ Port operations—controlling cargo operations and container movements

Multiple agencies have the authority to interrupt the normal flow of cargo for a number of reasons. The Coast Guard routinely places holds on containers that are physically damaged or improperly packed or placarded. Many units do not inform CBP of the containers they place on hold, nor do they call or fax with follow-up information. This impedes other agencies or companies that need to know the real-time status of containers. The International Trade Data System could solve this problem by providing a centralized status board of all agencies' activities interrupting cargo flow. This could then be filtered back to a status board for shipping companies showing which agency is holding the container, where it is located, and the point of contact. This has the potential to greatly streamline Coast Guard activities in terms of time spent managing containers on hold. Further, it could improve the working relationship with maritime and trade communities and other agencies.

➤ Maritime domain awareness—cargo data to populate the common operating picture

In addition to hold management described above, the same cargo data could be used to improve the background information set for maritime domain awareness applications and port-level information displays. When a vessel is being queried, data such as manifests and stow plans could already be waiting. Currently, obtaining detailed cargo data involves contacting vessel agents or CBP.

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Managing the Risk

The National Small Vessel Security Summit.

INFORMATION SHARING

by Mr. David M. Van Nevel
Maritime Program Specialist
U.S. Coast Guard Maritime Domain Awareness and Information Sharing

Since 9/11, much of the focus in maritime security has been on large commercial vessels. However, world events have led many security experts to become concerned that terrorists could exploit small vessels (those of less than 300 gross tons) to cause disruption and damage to our maritime transportation system. Small commercial vessels run the gamut from towing and fishing vessels to uninspected passenger vessels. Recreational small vessels could be anything from jet skis to yachts. There are approximately 13 million registered recreational vessels[1] as well as an estimated 4 million unregistered recreational boats in the United States.[2]

Additionally, large numbers of small vessels operate within close proximity to critical infrastructure.[3] One limited study of select ports around the U.S. showed that many small vessels were likely to operate within close proximity to important infrastructure. For nine ports examined, there were approximately 3,000 small commercial vessels, 3,000 fishing vessels, and 400,000 recreational vessels that were likely to operate near important maritime infrastructure.[4]

The National Small Vessel Security Summit

With such large numbers of small vessels operating within the vicinity of critical infrastructure, complete elimination of risk would be impossible without sacrificing fundamental freedoms and individual liberty. The goal, therefore, is to manage this risk based on the expected consequences, resulting in acceptable levels of security.

The Department of Homeland Security (DHS) recognized that the agency should address small vessel risks in close consultation with small vessel stakeholders. Therefore, DHS invited more than 400 participants with a range of interests in small vessels to the National Small Vessel Security Summit. Presenters included the honorable Michael Chertoff, Secretary, U.S. Department of Homeland Security; ADM Thad Allen, Commandant, U.S. Coast Guard; Mr. W. Ralph Basham, Commissioner, U.S. Customs and Border Protection; and Mr. Vayl Oxford, Director, Domestic Nuclear Detection Office.

Admiral Thad Allen, Commandant, USCG, responds to a participant question. USCG photos by Mr. Telfair H. Brown.

Over the course of two days in June 2007, DHS personnel and other officials engaged small vessel stakeholders in discussions on a range of issues regarding security risks relevant to small vessel operations in the

DHS Secretary Michael Chertoff delivers the keynote address, underscoring the importance the agency places on small vessel security.

U.S. maritime domain. Objectives for the National Small Vessel Security Summit included:

- Educate small vessel stakeholders on security risks in the U.S. maritime domain.
- Provide a national forum for small vessel stakeholders to present and discuss their ideas on developing security measures to mitigate gaps in small vessel management and control in the maritime domain.
- Provide a national forum for state and local government officials, as well as private members of the small vessel population, to discuss transportation concerns regarding security threats and present their ideas for addressing those threats.
- Record all issues and concerns from the small vessel stakeholders and complete an after-action report for the public, industry, and government to support conclusions for national-level decisions involving the development of small vessel security measures to detect, deter, interdict, and defeat terrorist use of small vessels in the U.S. maritime domain.[5]

The Department of Homeland Security recognized that not everyone interested in small vessel security could make the trip to the Washington, D.C., area. Furthermore, issues vary significantly among regions, so a number of regional summits are planned as well. Interested parties can check for further information on the regional summits at www.dhs.gov.

DHS Response

Although the dialogue with the small vessel community is still ongoing, DHS has already started to take action on summit findings. For example, the agency organized a small vessel security workgroup to draft a DHS small vessel security strategy.

Since the summit, the Coast Guard has launched the vessel identification system (VIS). VIS data consists of registration and ownership data from participating VIS states and the USCG National Vessel Documentation Center. VIS data will only be accessible to registration and law enforcement personnel. States that participate in the VIS will have access to boat registration and ownership data from other states and USCG-documented vessels in a single database.

The Coast Guard is also working diligently to improve America's Waterway Watch (AWW), which seeks to leverage those who live and work in and around our nation's waterways as an additional set of eyes and ears.[6] In addition to increasing public awareness of the AWW program, the Coast Guard is also in the process of developing and expanding an effort modeled after the 13th District's Citizen's Action Network.[7] It is currently working to expand the Citizen's Action Network program nationally, recruiting volunteer citizens to act as a force multiplier for the Coast Guard and training them to be agents of maritime domain awareness.

The U.S. Department of Homeland Security's Domestic Nuclear Detection Office announced a pilot program that will provide maritime radiation detection capabilities for state and local authorities in Washington's Puget Sound and California's San Diego areas. The program involves development of a radiation detection architecture that will reduce the risk of radiological and nuclear threats that could be illegally transported on recreational or small commercial vessels.

The national summit is but the first step in a series of efforts to build a culture of partnership between the government and the small vessel community. Much work remains to be done, but with the publication of the DHS small vessel security strategy, the private sector and federal, state, and local governments will have a common framework as we work together to reduce small vessel-related risks.

About the author:
Mr. Van Nevel is a graduate of the U.S. Coast Guard Academy and Georgetown University Law Center. He served on active duty and in the U.S. Coast Guard Reserve. Mr. Van Nevel is a maritime program specialist on the USCG headquarters Maritime Domain Awareness and Information Sharing staff.

Endnotes:

1. "2006 Boating Statistics," COMDTPUB 16754.20, U.S. Coast Guard, p. 18.
2. "United States Coast Guard Navigation Safety Information Prototype User Needs and Wants Study/Business Case," U.S. Coast Guard Research and Development Center, March 10, 2003, Table 5: NSI User Group Characteristics.
3. The USA Patriot Act of 2001, 42 U.S.C. § 519 c(e), defines critical infrastructure as those "systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters."
4. "An Assessment of Small Vessel Populations in U.S. Waters," U.S. Coast Guard Research and Development Center, June 2007, p. 31.
5. "Report of the DHS National Small Vessel Security Summit," Homeland Security Institute, October 19, 2007. This report is available at www.dhs.gov.
6. For more information on AWW, visit www.americaswaterwaywatch.org.
7. For more information on the program, see www.uscg.mil/d13/can/.

PARTICIPANT FINDINGS

Discussions at the summit were wide-ranging and covered many aspects of maritime governance.

Highlights included:

Need for a national strategy

This strategy should address international cooperation to identify threats as far from our shores as possible. It needs to be flexible to allow for local conditions and should not advocate procedures that are unduly burdensome or overly restrictive.

Stakeholder view of the small vessel threat

Participants generally viewed recreational vessels as a larger threat than commercial small vessels. Small commercial operators tend to be involved in smaller, closer-knit maritime communities and are on the water every day, making it more likely that these operators would notice if something was amiss.

Balance the trade-offs among freedom, security, and economy

Participants felt that overly restrictive and burdensome regulations do little to increase security, and will alienate the small vessel community.

Improve intelligence, analysis, and dissemination

Summit stakeholders generally agreed that there needs to be improved intelligence and the ability to act upon it.

Expand education and outreach to citizen stakeholders

America's Waterway Watch was discussed extensively, and summit participants expressed a very strong consensus that it needs to be expanded and re-energized.

Operator and vessel identification

Opposition to a "federal" recreational boating license was universal. There was some acceptance of boating licenses that would incorporate already existing identifications, such as a "boating" endorsement on a state motor vehicle operator's license.

Employ technologies to detect radiological and nuclear threats

There was widespread support for use of radiation detectors, despite some concern over operational effectiveness and the ability to use them far enough away from the port to allow for adequate response.

Reassess security zones

Security zones were the subject of much discussion at the summit. There was not, however, a consensus on whether they should be more clearly marked and publicized. Some felt that this might make it easier to identify possible targets of attack. There was agreement, however, on the need to educate the boating public on safety and security zones.

Endnote:

Adapted from the "Report of the DHS National Small Vessel Security Summit," Homeland Security Institute, October 19, 2007. This report is available at www.dhs.gov.

INFORMATION SHARING

The Hawaii Superferry

Information sharing leads to operational success.

by CAPT Vince Atkins
former Commander, U.S. Coast Guard Sector Honolulu

ENS Meghan Hough
U.S. Coast Guard Sector Honolulu

The complexities of maritime operations are often compounded by factors such as the variability of the sea itself, differing and sometimes overlapping legal authorities, and the presence of a wide range of concerned agencies with varying competencies and capabilities. Information sharing reduces operational complexity and sets the stage for success. A recent operation in Hawaii underscores how information sharing, taken in the broadest sense, can increase interagency effectiveness and public understanding.

An *Alakai* protester in Nawiliwili Harbor, Kauai, demonstrates directly in front of the *Alakai*. Honolulu Star-Bulletin photograph by Mr. Tom Finnegan.

Hawaii Superferry (HSF) came to Hawaii to start a high-speed ferry service between the Hawaiian islands of Oahu, Maui, and Kauai. The Superferry vessel, the *Alakai*, is a 350-foot high-speed catamaran designed to carry 866 passengers and 282 vehicles.

Unfortunately, strong opposition from segments of the local population shadowed the start of *Alakai*'s service. Citizens and environmental groups opposed to this new service voiced several concerns, citing *Alakai*'s lack of an environmental impact study, the possibility of increased traffic congestion, and the potential for introducing invasive species and harming marine life. Legal challenges were initially successful in Maui, but did not preclude HSF operations into Kauai.

A Hostile Operating Environment

Alakai's initial operations were greeted by an estimated 300 protestors in Kauai. People gathered outside the ferry's shoreside facility, taunted would-be passengers, blocked vehicles, and, in some instances, caused minor property damage. Protesters on shore threw coconuts and other debris at Coast Guard responders and several scuffled with the Kauai Police. The crowd forced the HSF facility to close its gates due to security concerns.

While hundreds of protesters demonstrated on shore, some protesters entered the water and blocked the harbor with surfboards and kayaks, making it unsafe for the ferry to transit into the port. HSF decided to cancel its second Kauai port call, and, due to continuing public unrest, decided to temporarily halt its Kauai operations altogether.

Localized protests grew into a larger referendum on the pace of change in the Hawaiian Islands and dominated local headlines. Several court cases were initiated and court injunctions temporarily kept the *Alakai* from sailing. As the courts wrestled with the legalities of the situation, law enforcement agencies had to prepare for the ferry's possible return to full service and the subsequent widespread civil disturbances it could cause ashore and in the harbors.

USCG Station Kauai's small boat is shown removing protesters on surfboards from the path of the *Alakai* into Nawiliwili Harbor, Kauai. Protesters were removed for their own safety and for the safety of the ferry and its passengers. USCG photo by Petty Officer 3rd Class Michael De Nyse.

Federal, state, and local authorities faced the challenge of balancing a number of seemingly contradictory objectives: upholding the law, ensuring public safety, ensuring the safe arrival and departure of the ferry in multiple ports and jurisdictions, and protecting and promoting constitutional freedoms. Information sharing was critical for successful operations. Further, information sharing needed to be viewed with the broadest scope—not just as an exchange among government agencies, but with the public at large.

Unique Challenges

Multiple agencies had to consider the possibility of same-day operations on two different islands, Maui and Kauai. Island differences such as port geography, community reactions, and local forces were critical planning considerations. As it turned out, HSF decided to continue to defer operations in Kauai due to simmering public sentiments, so actual operations only occurred in Maui. Kauai had still not started operations as of this issue's publication.

Early protests in Kauai were relatively small, but endangered public safety at sea and ashore. By blocking *Alakai*'s transit into the harbor, protesters violated well-established security zone regulations designed to protect large-capacity passenger vessels. Likewise, since many of the protesters were either swimming, on surfboards, or in kayaks, agencies were concerned they could not move out of the *Alakai*'s way fast enough, endangering themselves and/or the ferry. Further, the protesters could have been injured by the propeller-driven boats working to enforce the security zone.

The geographical consideration that both Maui's and Kauai's ports were small and did not leave much room for maneuvering or navigational error compounded both security and safety concerns. Hawaii's Department of Transportation was also concerned that other harbor traffic would be greatly impacted. In an island state (with only one port each to service Kauai and Maui), free-flowing maritime commerce is not just a business concern, but is central to the state government's ability to take care of its citizens. Almost all food, fuel, and consumer products has to arrive through the ports. The state could not risk the ferry blocking a channel if she were to go aground while avoiding protestors. It also wanted to avoid sending a signal that corporate citizens did not enjoy equal protection under the law.

Operational planning and execution posed other complications, as they would involve different county authorities for the two ports as well as different policing capabilities. It was unclear what reception the ferry might receive when operations resumed. The press, in "man on the street" interviews, led officials to conclude that demonstrations would be larger. As the situation developed, constitutional issues of freedom of speech and assembly arose. Also, local and cultural expecta-

tions of unfettered access to the sea became operational planning factors.

Not all public expectations were aligned with the protestors, however. Some citizens and industry groups were, ironically, concerned by Coast Guard and state and local law enforcement restraint in this matter. Some characterized this restraint as an inability or unwillingness to enforce the law and safeguard commerce. Some incorrectly extrapolated the seeming inability to control protestors as an inability to safeguard against potential terrorists. They reasoned that, if law enforcement couldn't handle civilians on surfboards, how could it withstand a determined terrorist attack within our ports? Public confidence was at stake.

Achieving Interagency Alignment

This unique situation of protesters operating both on land and in the water made it imperative for local, state, and federal agencies to work together in order to understand and align the various legal authorities and jurisdictional concerns. Pre-established, close interagency working relationships were essential to effective planning and mission execution. The Coast Guard; its port partners; and various county, state, and federal government officials routinely worked together on a number of committees, at exercises, and during other operational incidents. These mature relationships eased communications, created interagency trust, and enabled agreement on priorities and objectives, greatly increasing operational efficiency.

One local information sharing initiative paid huge dividends during this operation. The Hawaii State Law Enforcement Coalition (SLEC) is a multi-agency coalition of Hawaiian law enforcement agencies including the Coast Guard and the Hawaiian Departments of the Attorney General, Public Safety, Land and Natural Resources, and Transportation. The pre-established partnerships created by SLEC facilitated planning and logistics for this complex operation.

Another critical factor was the Coast Guard's excellent working relationship with the state of Hawaii. Direct communications between the district commander and the Hawaiian governor were frequent; discussions about operational courses of action and potential outcomes were frank; and decisions reflected the careful, necessary balance among public safety, maritime commerce, and the citizenry's right to lawful assembly and speech.

The mechanism that provided for information sharing and interagency alignment was a unified command structure consistent with the National Incident Management System. The Incident Command System (ICS) provides an organizational structure and process wherein agencies with differing authorities, competencies, and equities may come together to work toward a common goal. ICS provides a venue and process for information

An *Alakai* protester in Nawiliwili Harbor, Kauai, demonstrating in front of the ferry, creating serious safety and port security concerns. USCG photo by Petty Officer 3rd Class Michael De Nyse.

sharing, which can be especially helpful when there are complex issues to resolve.[1]

Not all involved agencies were ICS-conversant at the beginning of the operation, but this did not prove to be a problem, as ICS processes are easily explained and understood.

The operational challenges, varying agency concerns, and differing agency capabilities were laid bare and discussed thoroughly during the frequent meetings of the unified command. Alignment, cooperation, and compromise were essential in driving toward an operational plan that met the seemingly incongruent objectives.

Execution of the Operation

The unified command worked together to develop a plan that recognized differing authorities and competencies. Operations were divided into two components: onshore and waterborne security operations. The local police department was in charge of onshore operations, while the Coast Guard took the lead in waterborne operations. The two groups collaborated and created an overall plan designed to reduce the number of on-water protesters, provided a pre-designated protest zone, and developed coordinated methods to deal with illegal and unsafe protests.

The relationship with the Maui County prosecutors and the Maui Police Department (MPD) was particularly important. Close coordination between federal and local prosecutors provided a plan that offered short-term support in processing illegal protestors and a long-term deterrent strategy to eventually reduce the numbers of protestors. MPD also worked extensively with the Coast Guard to ensure seamless jurisdiction from the shoreline into the water. The state Department of Land and Natural Resources (DLNR) provided jet skis to patrol the security zone boundaries. The state Department of Transportation provided logistics support essential to mission execution.

The coordinated plan required a temporary fixed security zone to ensure the safety of the vessel and its passengers. The Coast Guard issued an emergency regulation that permitted it to control harbor waters one hour prior to the ferry's arrival, during the time it was in port, and until 10 minutes after the ferry's departure. Concurrently, the fixed security zone provided for an area where protestors could legally assemble.

Operational Success

The implementation of the new security zone required extensive public affairs efforts to ensure the affected maritime stakeholders and ocean recreation community understood the scope of the security regulations. DLNR and county mayoral offices helped the outreach effort by connecting the unified command with protest groups and canoe and surfer clubs.

To allay concerns regarding access by other users not interested in protesting the ferry, the Coast Guard granted access on a vessel-by-vessel basis while the security zone was in effect. To increase compliance, the unified command formed a joint public information staff to meet with the public on several occasions to outline security zone boundaries and explain the legal consequences of violating the zone.

Public outreach proved successful in deterring a large number of protesters from illegally entering the on-water security zone. Information sharing helped inform the general public of the unified command's objectives. Certainly, a number of citizens disagreed with the operation, but others grew to understand and support the unified command's objectives.

It's important to note that the intended result of this information sharing process and interagency collaboration was not to change the protestors' opinions regarding the ferry operation. In this instance, information sharing achieved its intended goals: allowing the *Alakai* to transit in and out of Maui without incident, allowing protestors to voice their dissent, and helping agencies to make the best use of unique authorities and competencies.

About the authors:

CAPT Vince Atkins graduated from the Coast Guard Academy in 1982 and has served in commands ashore and afloat. At the time of the Alakai *incident, CAPT Atkins served as commander of Sector Honolulu.*

ENS Meghan Hough graduated from the Coast Guard Academy in 2007 and is stationed in the enforcement division at Sector Honolulu.

Acknowledgements:

The authors gratefully acknowledge the support of CDR Kathy Moore, CDR Todd Wiemers, and LT Darwin Jensen while developing this article, but more importantly, for their distinguished and professional conduct during the operation itself.

Endnote:

1. For more information about the National Incident Management System and Incident Command System, see the Winter 2006-2007 edition of *Proceedings*.

INFORMATION SHARING

This Ain't Your Daddy's Coast Guard

A blueprint for change.

by Mr. Ben Thomason
Program Analyst, CACI Corporation

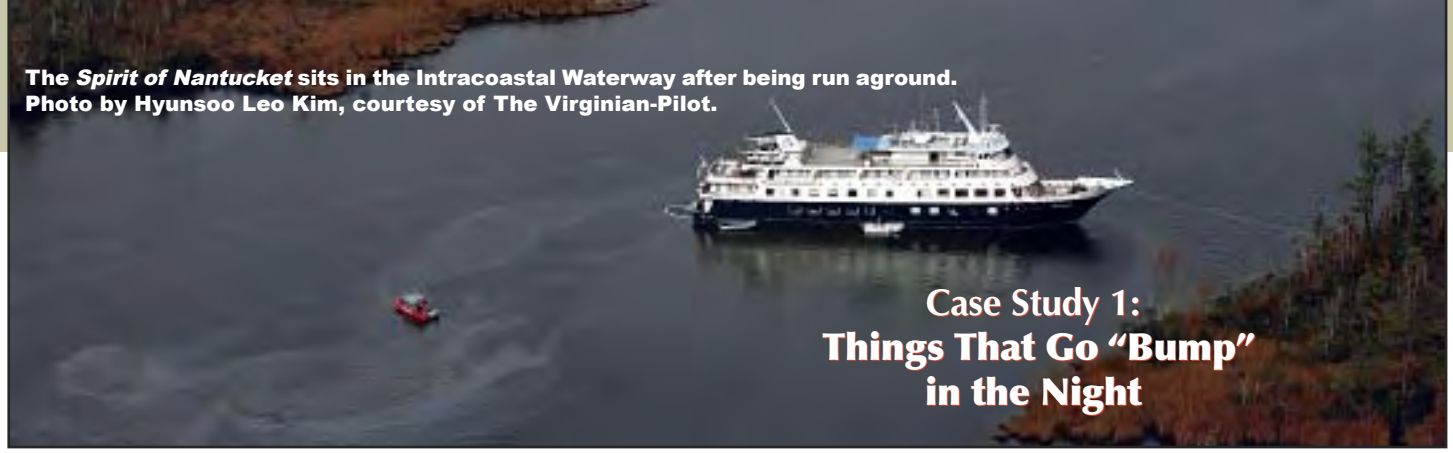
For those of us who have been around the Coast Guard for awhile, the past few years may well be remembered as the most dynamic in its history. The move to the Department of Homeland Security; the highly publicized Katrina rescues; deployable specialized forces; and the arrival of new cutters, boats, and aircraft have been the harbingers of a more significant transformation. In his state of the Coast Guard address, Coast Guard Commandant ADM Thad Allen outlined a synergistic strategy in pursuing the challenges of the 21st century:

"Achieving awareness in the maritime domain, including intelligence and information sharing at all levels of government, is a key to our maritime security. Better awareness of what is out there leads to better unity of effort in maritime planning and operations. We need to have a common operating picture. We also need to integrate our operational capabilities and efforts with our private sector partners to better prepare for, respond to, and recover from incidents."[1]

The Coast Guard has a strong leadership role in maritime security as articulated in the National Strategy for Maritime Security; the Coast Guard Strategy for Maritime Safety, Security and Stewardship; and the Safe Port Act of 2006. The questions at hand are "How well is the doctrine and policy implemented? How well does it actually work? What information sharing tactics, techniques, and procedures are in place?"

continued on page 50

Army Command Sgt. Maj. William J. Gainey, foreground, senior enlisted aide to the chairman of the Joint Chiefs of Staff, pilots a Coast Guard utility boat in the Chesapeake Bay with USCG Senior Chief Petty Officer Daniel B. Kilbourne. Sgt. Maj. Gainey recently toured Coast Guard Sector Hampton Roads units to meet Coast Guard personnel and to gain a better understanding of Coast Guard roles and missions. U.S. Coast Guard photo by Petty Officer 3rd Class Kip Wadlow.



The *Spirit of Nantucket* sits in the Intracoastal Waterway after being run aground. Photo by Hyunsoo Leo Kim, courtesy of The Virginian-Pilot.

Case Study 1: Things That Go "Bump" in the Night

At 5:30 a.m. on Nov. 8, 2007, the *Spirit of Nantucket* struck a submerged object while cruising from Alexandria, Va., to Charleston, S.C., and began taking on water in the Intracoastal Waterway near Pungo, Va. To stabilize the situation, the captain elected to ground the vessel. Sector Hampton Roads dispatched an HH-60J from Elizabeth City that lowered a rescue swimmer and dewatering pumps to the vessel. To facilitate information sharing, the command:

- initiated a command center critical incident communication to simultaneously brief the Fifth District, Atlantic Area, and Coast Guard headquarters within minutes of notification;
- alerted the maritime incident response team, which dispatched local municipal maritime first responders to the scene;
- briefed members of the Virginia Maritime Association and Virginia Port Authority of potential maritime transportation system issues.

<u>The Two-Minute Drill</u>

0610 - Incident reported to Coast Guard

0700 - Air Station Elizabeth City and Stations Portsmouth and Elizabeth City responders on scene; commenced dewatering and boom deployment

0740 - MIRT responded: EMS, police, fire

0745 - Incident command post established

1030 - Disembarked passengers via Coast Guard utility boat

1200 - Interagency planning initiated to stabilize vessel, mitigate pollution, draft salvage plan, secure waterway, and implement safety zone: issued urgent marine information bulletin and press release

1330 - Commenced dive/salvage operations

1700 - U.S. Army Corps of Engineers (USACE) surveyed area, found navigational hazard (NAVHAZ), marked channel

<u>Friday 09 NOV 07</u>

1300 - Salvage plan approved

1700 - USACE awarded commercial contract for NAVHAZ removal

1800 - Alternate channel marked for shallow-draft vessels

1830 - Sector conducted interagency operations brief

<u>Saturday 10 NOV 2007</u>

1200 - Vessel salvage operations completed

2000 - NAVHAZ removed

2200 - Waterway reopened, mission complete

During the post-incident hotwash, several interagency players commented that the operation almost seemed scripted, reminiscent of previous exercises. The sector's relationship building within the maritime community had promoted a cooperative spirit and a level of trust that fast-tracked vessel recovery and NAVHAZ removal.

CAPT Patrick Trapp of Sector Hampton Roads remarked, "I can't say enough about the immediate support the sector received from the maritime incident response team, Virginia maritime community, and, most particularly, the Corps of Engineers. Within hours of the grounding, the corps' side scan sonar located the hazard and contracted its removal. We moved quickly to close the waterway, and more importantly, to reopen it as soon as it was safe for commerce."

A Coast Guard crew from Station Portsmouth unloads passengers from the *Spirit of Nantucket* after it ran aground. USCG photo by Petty Officer 2nd Class Kip Wadlow.

The Birth of Sectors, or "Physician, Heal Thyself"
Prior to reaching out to port partners, the Coast Guard needed to get its own house in order by addressing information sharing issues within its legacy groups and marine safety offices. Despite being siblings, a number of port-level commands treated their counterparts as distant cousins. The events of September 11, 2001, served to accelerate the process of restructuring our shore-based forces into multimission sector commands.

ADM James Loy, who served as USCG Commandant until 2002, coined the watchwords "preparation equals performance." In legacy USCG groups, this meant highly trained boat crews and aviators were poised to respond. In the marine safety offices, this translated to contingency planning, exercises, and Incident Command System oil spill response. The merger to sectors provided a crosswalk of these competencies.

Externally, the sector structure reduced the size of our customers' Rolodexes by providing what VADM James Hull described as a single "belly-button to push" for assistance. Internally, the sector organization simplified resource allocation and risk-based decision making to lessen exposure and mitigate threats. More importantly, the USCG sector became a conduit to implement a "deck plate" level of information sharing essential to Coast Guard mission execution.

Sector Hampton Roads:
Gatekeeper of the Chesapeake Bay
There are now 35 USCG sectors that serve the maritime industry and boating public. These commands are examples of a "bottom-up" focus on information sharing. Sector Hampton Roads, like so many of its counterparts, weathered years of sheet rock dust and portable office space that characterized the transition to the sector structure. This process morphed the resources of two groups and a marine safety office that served the Chesapeake Bay, served the ports of Hampton Roads and Richmond, and maintained an extensive presence in the mid-Atlantic region.

Even as the sector stood up, leadership recognized the necessity to effectively manage change. Leadership theorists have described this as "storming and forming,"[2] where much of an upstart's energy is sapped meeting a mission, leaving less that can be devoted to process improvement. It is analogous to trying to change a flat tire while moving down the interstate. Search and rescue, port security, and hazardous chemical responses allow zero tolerance for failure. The sectors and their command centers operate in a highly dynamic environment offering few opportunities for "do-overs."

CAPT Patrick Trapp wasn't a plank owner but assumed command as Sector Hampton Roads was still acquiring its sea legs. Fortunately his predecessor, CAPT Robert O'Brien, left a full sea bag. CAPT Trapp remarked, "A lot of good work was underway, but there was an ever-present temptation for fighting local brushfires, and being consumed in the 'now.' Getting in the fray may give you a sense of accomplishment, but it's simply not a strategic approach. ADM Allen refers to this as the 'tyranny of the present.' Early on, the mission remained paramount, but whenever there was a respite, we shifted forces in an effort to build essential elements of planning, exercises, and networking interagency relationships."

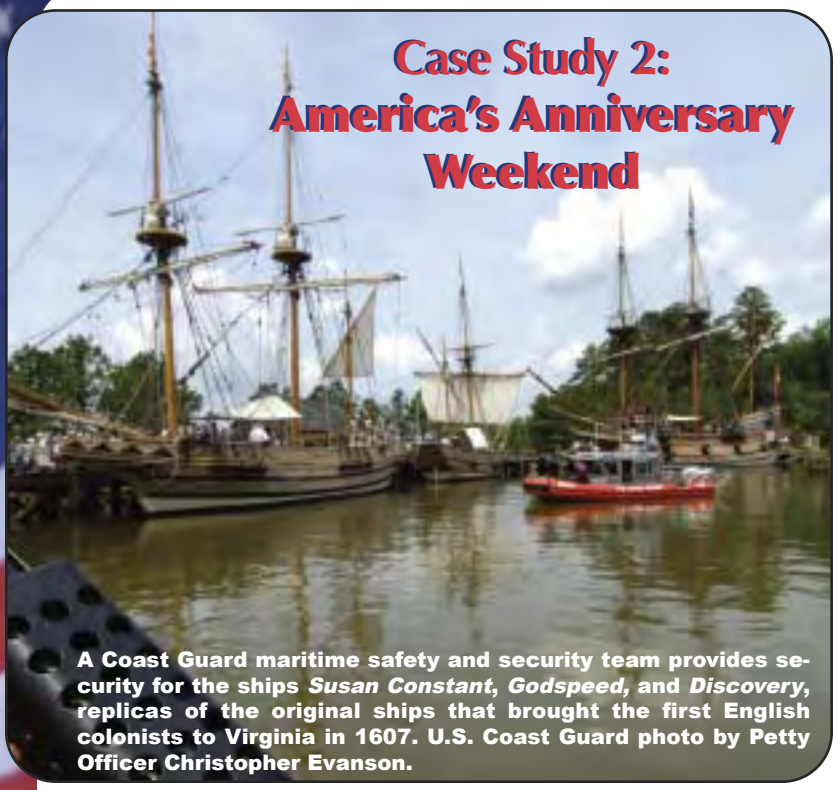
Experience Is Something You Gain
Right After You Needed it the Most
Initially CAPT Trapp moved to ensure that the sector had sufficient resources devoted to long-term planning. He took a two-fold approach, first allocating energetic department heads and staff to the command center, response, prevention, and planning. He also used his position as captain of the port, chairman of the area maritime security committee, and his involvement with the Virginia Maritime Association to personally work the interagency issues.

He then turned the focus on the operational impact of interagency cooperation and information sharing.The efforts have already reaped benefits (see sidebars). According to CAPT Trapp, "I attribute the rapid recovery from the grounding of the *Spirit of Nantucket* and the success of Jamestown 2007 to our front-loaded approach in sharing information and stressing interpersonal relationships—putting faces with names, long before you need to call on them. Both responses were significant contrasts in execution, but the information flow and teamwork maximized safety, and minimized the disruption to the maritime public."

About the author:
Mr. Ben Thomason is a program analyst, maritime domain awareness and information sharing, USCG Atlantic Area. Past assignments include chief of staff/chief of operations, Fifth Coast Guard District; operations officer, Air Station Houston; executive officer, Air Station Houston Borinquen, P.R.; and commanding officer, Air Station Clearwater. He has also served on the board of directors of the Maison Fortune Orphanage, Hinche, Haiti.

Endnotes:
1. "New Threats, New Challenges, New Strategy," state of the Coast Guard address, Washington, D.C., February 13, 2007.
2. "Leading the Team Organization: How to Create an Enduring Competitive Advantage," Dean Tjosvold and Mary M. Tjosvold, 1991.

Case Study 2: America's Anniversary Weekend



A Coast Guard maritime safety and security team provides security for the ships *Susan Constant*, *Godspeed*, and *Discovery*, replicas of the original ships that brought the first English colonists to Virginia in 1607. U.S. Coast Guard photo by Petty Officer Christopher Evanson.

Jamestown 2007 commemorated the 400th anniversary of the first permanent English settlement in North America. The president of the United States and the Queen of England were among the 63,000 visitors during the three-day celebration. James City County was responsible for public safety and for ensuring security for the president and royal family—a huge undertaking. What the municipal government needed most was a planning process and an operational structure.

Fortunately DHS mandated the use of the Incident Command System (ICS). Although ICS was developed to respond to incidents, it is now the preferred system to provide the unity of command for non-emergency management settings.

The Official Language

Because of its reputation for ICS "literacy," Sector Hampton Roads was designated as the senior federal official and assigned key roles in all sections of the unified command. In choosing which provisions might best suit its needs, sector planning staff used the exercise format to effectively prepare and respond during Jamestown 400.

The plans incorporated provisions for awareness, prevention, preparedness, response, and recovery. The staff also arranged for members of the Training Center Yorktown Contingency Planning School and subject matter experts from previous national events to conduct onsite assessments and critiques during the three-day weekend.

During the event, the majority of the Coast Guard's resource hours were dedicated to the maritime operations branch, which focused on the James River. The mission was to prevent and deter waterborne terrorist attacks, mitigate their effects on the public, minimize impact on maritime commerce, and establish maritime emergency response plans in event of actual attack.

One of the primary ways to the event grounds was via the Jamestown-Scotland ferry, which transported over 6,000 vehicles across the James River during the event. Performing vehicle security inspections, coordinating the historic vessel movements, and patrolling the fireworks area presented a significant resource drain to the USCG operations section, maritime operations branch, and on-the-water patrol commander.

Working Together Equals Success

More than 40 federal and commonwealth agencies and local participants comprised the unified command, including:

- Transportation Safety Administration: DHS-designated federal coordinating officer;
- Federal Bureau of Investigation: shared law enforcement databases;
- Virginia Army National Guard: weapons of mass destruction technical expertise;
- Virginia Dept. of Environmental Management: hazmat response;
- James City County: provided county employees for the unified command, preplanning activities, fire, police, pre-event planning;
- Coast Guard: senior federal official.

Additionally, when the USCG command discovered a shortfall of experienced and knowledgeable ICS staff for key positions, Coast Guard members became the "pinch hitters and relief pitchers" due to their knowledge, training, and experiences.

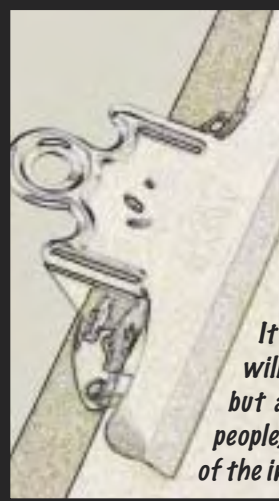
Jeanne Zeidler, executive director of Jamestown 2007, said, "Anniversary weekend truly exceeded our expectations. The enthusiasm and excitement of visitors was tangible. With the help of the dedicated staff, volunteers, and organizations who came together to produce this wonderful event, it was truly the once-in-a-lifetime experience we always thought it would be."[1]

Endnote:

1. www.jamestown2007.org.

Lessons Learned

from Casualty Investigations



These articles continue 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.

Scratching Beyond the Surface

Regulations can't prevent everything.

by Ms. Diana Forbes
Staff Writer, Proceedings

While cruising from Grand Cayman to Montego Bay, Jamaica, in the early morning hours of March 23, 2006, the Bermuda flag passenger ship *Star Princess* suffered a serious external fire. By the time the crew extinguished it one and a half hours later, the damaged area covered three vertical fire zones on five decks. Thirteen passengers and four crewmembers suffered smoke inhalation injuries, and one passenger died.

The investigation report concluded the fire was likely started by a discarded cigarette that ignited combustible materials on a balcony, then the fire spread rapidly from balcony to balcony. The casualty catalyzed the International Council of Cruise Lines (ICCL, now CLIA—Cruise Lines International Association, Inc.) and the International Maritime Organization (IMO) to initiate urgent measures to address cruise ship balcony fire safety. Even though the ship already met the necessary fire protection requirements, the basic principles of this regulation (SOLAS II-2) did not apply to balconies or other external areas. By calling attention to this gap, this tragedy's lessons learned can save countless others.

Background

Since the mid-1980s, balconies have become increasingly common on passenger vessels. They have also been consistently categorized as "open deck spaces" (Category 5) with regard to the fire protection requirements of SOLAS Chapter II-2 by ship designers, national administrations, and classification societies worldwide. These "open deck spaces," however, do not fall under the prevailing fire protection regulations prescribing the combustibility, smoke generation potential, and toxicity of materials. Therefore, the vessel's use of lightweight plastic chairs and tables and polycarbonate partitions was deemed acceptable by regulatory standards. Such exemptions are provided in SOLAS II-2, Regulation 9, Paragraph 4.1.1.6, which states:

"The requirements for 'A' class integrity of the outer boundaries of a ship shall not apply to glass partitions, windows and sidescuttles, provided there is no requirement for such boundaries to have 'A' class integrity in paragraph 4.1.3.3.11. The requirements for 'A' class integrity of the outer boundaries of the ship shall not apply to exterior doors, except for those in

The Investigation

The UK Department of Transport's Marine Accident Investigation Branch (MAIB) served as the lead investigation agency for the incident on behalf of the Bermuda Maritime Administration. The Coast Guard sent teams from the Marine Safety Center, Coast Guard headquarters, and Sector Miami to assist with the investigation, and fully support the results of the investigation. After completing the investigation, the MAIB issued a report on the incident. All conclusions are based on information taken from this report.

The information documented is based on recorded information from the vessel's voyage data recorder (VDR) and fire detection system, witness interviews, and responses to more than 1,000 questionnaires completed by passengers and crew following the accident.

superstructures and deckhouses facing lifesaving appliances, embarkation and external assembly station areas, external stairs and open decks used for escape routes. Stairway enclosure doors need not meet this requirement."

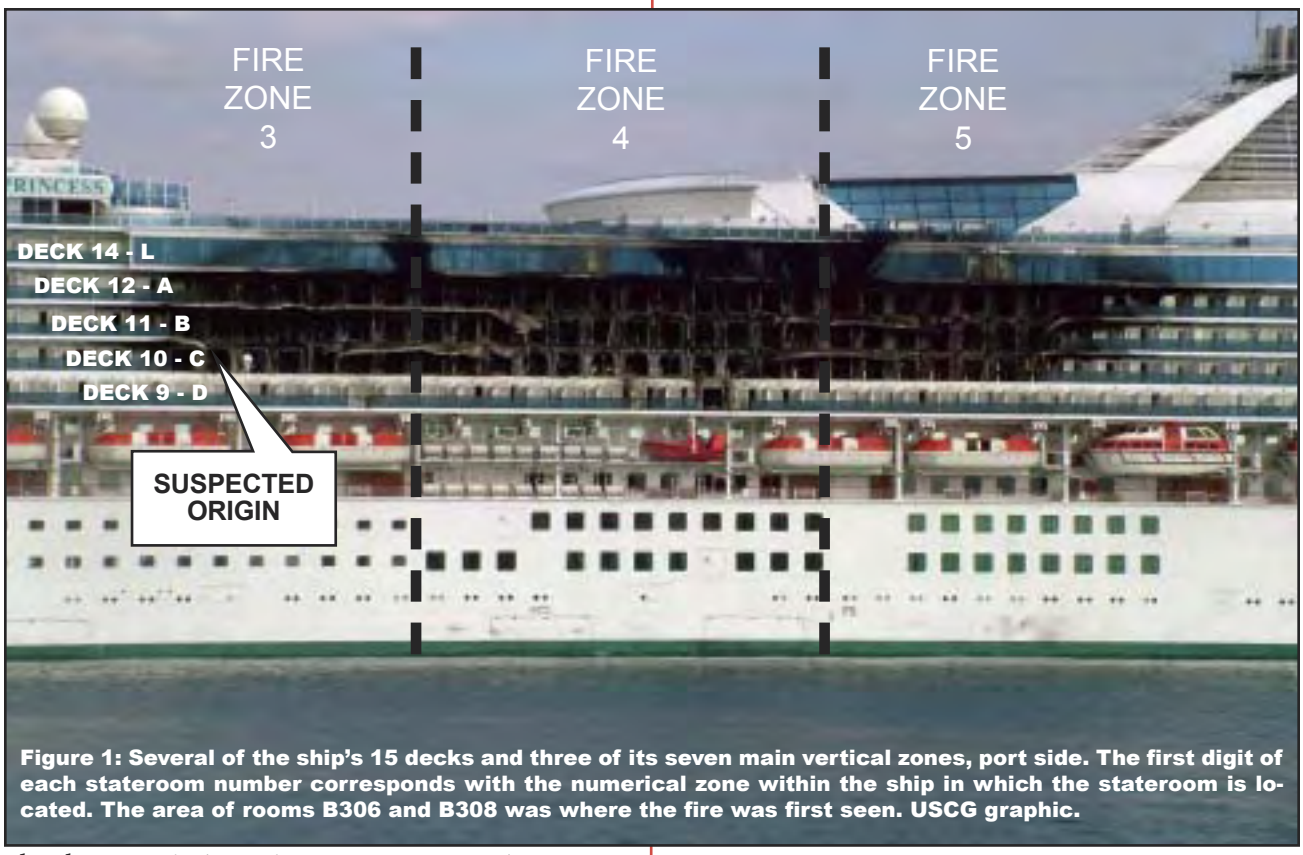


Figure 1: Several of the ship's 15 decks and three of its seven main vertical zones, port side. The first digit of each stateroom number corresponds with the numerical zone within the ship in which the stateroom is located. The area of rooms B306 and B308 was where the fire was first seen. USCG graphic.

The ship's 15 decks and seven main vertical zones are depicted in figure 1. Each deck was given a name and number, and all staterooms were prefixed by the first letter of the name of the deck on which they were located. The first digit of each stateroom number corresponds with the numerical zone within the ship in which the stateroom is located. Staterooms with even numbers were located on the port side of the ship.

Quick Reaction to the Fire Alarm

In accordance with SOLAS Chapter III, Part B, Regulation 19, 2.2 and 2.3, before leaving Port Everglades, Fla., on March 19, 2006, passengers were required to attend a muster drill, and to listen to a recorded announcement in English, which detailed important safety information.

A safety video was also shown continuously over the stateroom TVs on the same day. The video included a description of the signal for "general emergency stations," how to locate muster stations, and what to take; how to don lifejackets; the action to take on detecting a fire; the operation of manual call points, including notification that no sound will be heard; to smoke in designated areas only and not to throw lighted cigarettes over the side; and the abandon-ship procedure. Safety information, including the ship's smoking policy, was also included in an information docket provided in each stateroom. The location and directions to allocated muster stations were affixed on the inside of each stateroom door.

The cruise ship held 2,690 passengers and 1,123 crewmembers. On the morning of the incident, the sea was calm and visibility was good. The vessel was traveling at a speed of 17.7 knots. The air temperature was 25° C, and the relative humidity was 92%.

At 2:50 a.m., a security patrol smelled something burning on the port side of deck 14. The smell was reported to the officer of the watch (OOW) by telephone and the area was checked. Nothing was found, but the security patrol was instructed by the OOW to include the area during its overnight rounds.

It was 19 minutes later that the fire turned from smoldering to fully blown. At that time (3:09 a.m.), the officer of the watch was alerted by a manual call point alarm activated by a passenger in stateroom B254 (in fire zone 2, deck 11), who saw an orange glow from his

balcony right below him and to his left. The bridge lookout reported the same fire almost simultaneously.

Amidst a steady stream of smoke detectors, heat detectors, and hi-fog flow alarms going off on multiple decks/zones, the crew's response attempts also occurred in rapid succession. The officer of the watch immediately made a broadcast over the public address system and also sent personal pages to the assessment party to proceed to the area (3:10 a.m.). Meanwhile, the occupants of adjacent staterooms on deck 11 were alerted by shouting and banging on doors, and began evacuating.

The senior first officer, who was in charge of the assessment party, saw the scale of the fire upon arrival and immediately requested the bridge to broadcast the crew alert (3:13 a.m.). A still from a video taken by the assessment party is shown in figure 2.

Figure 2: A still from the video taken by the assessment party just two minutes after the first alarm went off. USCG photo.

The party contacted the officer of the watch by VHF radio to inform him of the fire's location in the vicinity of staterooms B306 and B308. At 3:14 a.m. the fire screen doors in fire zones 1, 2, and 3 were closed. In the next few minutes, the ventilation was also stopped, and the captain reduced speed and altered course to reduce the wind over the deck. During this maneuver, the relative wind shifted to the starboard bow and the flames became more vertical. At this time, 3:20 a.m., the senior first officer requested the general emergency stations (GES) to be initiated. This was done right away, and the passengers were instructed to go to their muster stations. Lifeboats and liferafts were prepared, but the port boats waited for adequate protection from fire hoses because the fire was on the outside of the ship's port side, so only the starboard liferafts were inflated.

Firefighting Efforts

The fire started on an external stateroom balcony sited on deck 10 in the center of main vertical zone 3, on the vessel's port side. Once established, the fire spread rapidly along adjacent balconies and, assisted by a strong wind over the deck, it spread up to decks 11 and 12 and onto stateroom balconies in fire zones 3 and 4 within six minutes. After a further 24 minutes, it had spread to zone 5. The fire also spread into the staterooms as the heat of the fire shattered the glass in stateroom balcony doors, but was contained by each stateroom's fixed fire-smothering system. Oddly enough, in some of the charred rooms there were still unmelted chocolates on top of pillows. As the fire progressed, the balcony partitions and combustible materials on the balconies generated dense black smoke, which entered the adjacent staterooms and alleyways and hampered the evacuation of the passengers, particularly on deck 12.

To control and combat the fire, the crew rigged hoses and established boundary cooling to cool decks, protect the port lifeboats, and block off other areas. By 3:26 a.m., the deck fire party entered zone 3. Alternating two teams of three men each, they searched outboard staterooms and attempted to control the fire by fighting it from intact balconies and through broken balcony doors. Other hose, boundary, and engine parties attempted to fight the fire from as close as they could get, but access between the balconies was impeded due to immovable partitions between them. The fire was extinguished within 1.5 hours after it had started.

A total of 79 staterooms were condemned after the fire, and a further 218 were damaged by fire, smoke, or water. The damaged area covered three vertical fire zones on five decks.

Passenger Rescue, Complications, and Casualties

Noises on the balconies woke many passengers in the outside staterooms in zone 3 of deck 10. One passenger activated a manual call point, and others banged on doors as they made their exit. Several tried to dial 911 from their room telephones, but there was no response. Some were still in their staterooms when the glass in their balcony doors collapsed. Large clouds of thick black smoke rushed in, smelling of burning plastic, and visibility was immediately reduced. At the time, the al-

continued on page 57

2:50 a.m.

- Smell of burning detected amidships on the port side of deck 14

3:09 a.m.

- Fire seen by passenger and manual call point activated on deck 11, zone 2, port side. Fire seen from port bridge wing immediately after alarm.

3:10 a.m.

- Broadcast for assessment party to proceed to deck 11, zone 2, port side
- First smoke detectors triggered on deck 15, zones 5 and 6

3:11 a.m.

- First smoke and heat detectors triggered on deck 10, zone 3 (C316 and C318)
- First smoke detector triggered on deck 11, zone 3 (alleyway by B324)
- Hi-fog flow alarm triggered on deck 10, zone 3

3:12 a.m.

- Captain and staff captain arrive at the bridge/safety centre
- First heat detector triggered deck 11, zone 3 (B322)

3:13 a.m.

- Crew alert broadcast

3:14 a.m.

- Fire screen doors closed
- Hi-fog flow alarm triggered on deck 11, zone 3
- First smoke detector triggered on deck 12, zone 4 (A402)

3:15 a.m.

- First heat detector triggered deck 12, zone 4 (A402)

3:16 a.m.

- First smoke detector triggered on deck 11, zone 4 (B402)

3:17 a.m.

- First smoke detector triggered on deck 10, zone 4 (C402)
- Order given to reduce ship's speed
- First heat detector triggered on deck 11, zone 4 (B406)
- First smoke detector triggered on deck 12, zone 3 (alleyway by A340)
- First heat detector triggered on deck 10, zone 4 (C402)
- Hi-fog flow alarm triggered on deck 11, zone 4
- First heat detector triggered on deck 12, zone 3 (A338)

3:18 a.m.

- First smoke detector triggered on deck 14, zone 3 (pizza bar)
- Hi-fog flow alarm triggered on deck 10, zone 4
- Hi-fog flow alarm triggered on deck 12, zone 3
- Commenced course alteration to port

3:20 a.m.

- General Emergency Stations broadcast
- Relative wind now on starboard bow

3:22 a.m.

- First smoke detector triggered on deck 14, zone 4

3:23 a.m.

- First smoke detector triggered on deck 14, zone 5

3:25 a.m.

- Order given to prepare the ships' lifeboats
- Progressively established boundary cooling on decks 14, 15, 7, 8, and 9

3:26 a.m.

- Deck fire party enters into fire-affected area on deck 11 with firefighters

3:28 a.m.

- Captain orders an urgency message to be sent. The message is prepared but not transmitted.

3:31 a.m.

- First smoke detector triggered on deck 11, zone 5

3:32 a.m.

- First smoke detector triggered on deck 12, zone 5

3:34 a.m.

- First heat detector triggered on deck 11, zone 5

3:38 a.m.

- Engine fire party enters deck 12, zone 3 with firefighters equipped with breathing apparatus
- First smoke detector triggered on deck 10, zone 5
- First heat detector triggered on deck 10, zone 5
- First heat detector triggered on deck 12, zone 5

3:44 a.m.

- Casualty reported on deck 12, zone 3

4:02 a.m.

- Further casualty reported on deck 12, zone 3

4:25 a.m.

- Second casualty on deck 12, zone 3 pronounced dead

5:18 a.m.

- Speed increased and course altered toward Montego Bay

5:20 a.m.

- Smoke extraction commenced in fire-affected areas

5:48 a.m.

- Deck 11, zones 3, 4, and 5 search complete

6:41 a.m.

- Search of fire affected areas complete

9:45 a.m.

- Ship arrives Montego Bay

9:54 a.m.

- All passengers and crew accounted for. Fatality identified.

TABLE 1: Chronology of Significant Events

leyway door of C316 was wedged open with a wooden wedge (provided in each room to assist stateroom stewards when cleaning), but its occupants managed to close it behind them as they left. Smoke filled the alleyway of zone 3 as the passengers evacuated from their smoke-affected staterooms.

Section leaders attempted to clear every stateroom by using keys to enter and evacuate passengers. However, besides being blocked by the thick black smoke, flames, and glowing embers of the fire, one section leader didn't have keys to dozens of staterooms, and had to bang on doors instead. Because all telephone lines were busy, the section leader couldn't call his zone commander to request additional master keys, nor could he inform the commander that he was unable to check those locked rooms. Meanwhile, four couples in particular struggled for survival:

Rooms A344 and A320: The two married couples in these rooms, who followed posted instructions, encountered a closed fire screen as they attempted to escape, and became separated in the confusion. One wife assumed her husband had made it to safety when she heard a door slam shut ahead of her. Both wives escaped even though they could not see regulated low-location lighting due to the water mist from the sprinklers and the black smoke.

Between 3:44 and 4:02 a.m., the engine fire party recovered the male passenger of room A320 in that same alleyway. They pulled the semi-conscious man to safety, and he survived.

Just 30 feet away, the party found the male of room A344. Though he, too, was quickly transported to safety, where a medical party quickly came to assist, they found he had stopped breathing, had no pulse, and could not be revived.

Room A402: This married couple was able to escape their stateroom, but the elderly man suffered a respiratory arrest and collapsed on his way to their muster station. He was later recovered and taken to safety.

Room A340: This couple was trapped in their room, unable to get through when calling 911. The fire party was able to evacuate them successfully.

Of all 2,690 passengers and the 1,123 crewmembers, there was one casualty. The autopsy of the man in room A344 reported his immediate cause of death was asphyxia, secondary to inhalation of smoke and irrespirable gases. Another 13 passengers and four crewmembers were treated for smoke inhalation. When the ship arrived in Montego Bay, Jamaica, later that morning, the injured male passengers from rooms A320 and A402 were taken by air ambulance to a clinic in Florida, and another four passengers were taken to a local hospital.

Confusion in Communication

When attempting to account for the passengers, roll call and passenger control at muster stations was difficult. Initial headcounts took an hour and a half, and the roll calls to follow took two to three hours because they had to be repeated several times, especially in muster station "C," which did not have a megaphone.

There was much confusion trying to piece together who was safe and who had not yet made it, especially when passengers went to incorrect muster stations.

Figures 3a and 3b: Polycarbonate balcony partitions, plastic furniture, and polyurethane deck tiles before and after the fire. These materials were highly combustible and produced large quantities of very thick black smoke when burned. USCG photos.

This was an especially sad case for the wife of the man in Room A344, who had been told that her husband was simply at another muster station and didn't know any differently until notified of his death.

Other breakdowns in communication occurred among crewmembers. For example, an urgency message had been drafted and was ready to send, but when the captain decided to send it, the Global Maritime Distress and Safety System operator updated the message rather than sending it, unaware he was to do so. In other instances, the staff captain had difficulty contacting the staff engineer in the early stages of the fire-fighting effort, and some communications were given

in Italian rather than English, which was supposed to be the primary language used.

The Cause

There was no evidence that accelerants were used to intentionally set the fire, and the only electrical fittings on the balcony were the enclosed light fittings above the balcony doors. The damage to the light fittings on some of the balconies was consistent with exposure to an external heat source; there was no evidence of arcing or failure. In the absence of any evidence to the contrary, it is considered that the most likely source of ignition was a discarded cigarette. It was determined that the fire probably smoldered for about 20 minutes before flames developed.

Although passengers aboard the cruise ship were instructed to properly extinguish cigarettes in ash trays during a safety video shown throughout the day, on embarkation, and in stateroom safety literature, it is too easy to provide everyday examples that rules such as these are not always followed.

But why did the fire burn so quickly and densely? Aren't regulations in place to fireproof such passenger ships as much as possible?

The material used for the partitions and deck covering was determined by several factors, such as durability in a marine environment, weight, aesthetics, cost, and availability (Figure 3). Combustibility and toxicity when burning, however, were not evaluated. Previous to this incident, such concerns were only defined in regulations such as Regulations 3 and 6 of SOLAS Chapter II-2 to "reduce the hazard to life from smoke and toxic products generated during a fire in spaces where persons normally work or live"—applicable to only internal spaces, not outdoor balconies.

Therefore, the following factors accelerating the spreading of the fire were technically within regulations:

- The balconies' polycarbonate partitions, polyurethane deck tiles, and the plastic furniture were highly combustible and produced large quantities of very thick black smoke when burned.
- The glass in the doors between the staterooms and balconies were neither fire-rated to meet with the requirements of an "A" class division, nor self-closing.
- The balconies crossed main zone fire boundaries, both horizontally and vertically, without structural or thermal barriers at the zone or deck boundaries.
- No fire detection or fire suppression systems were fitted on the balconies.

As a result, the fire was able to develop, undetected, for about 20 minutes, penetrate into the staterooms via the balcony doors, and cross zone and deck boundaries unchecked. This incident brought to light that the regulation's purpose to contain a fire in its space of origin was by no means achieved.

Conclusions —What Went Wrong

- Smoke entered the alleyway in zone 3 on deck 12 through outside staterooms, preventing a number of passengers from evacuating safely, resulting in the death of one passenger, and causing serious injury to others.
- The materials used in balcony partitions and deck tiles would not have been allowed to be used within the ship due to the dense smoke they generated when burned.
- The use of door wedges in self-closing doors, as well as leaving such doors ajar, has the potential to breach openings in fire class divisions.
- The probability that passengers were trapped only became fully apparent when the staff engineer recovered two passengers from a stateroom at the forward end of the alleyway on deck 12, zone 3, shortly after arriving at the scene at 3:35 a.m.
- Passengers trapped in Room A340 were not able to alert the crew to their situation by calling 911 from their stateroom telephone, because the customer service desk was not manned after the crew alert was signaled.
- Following the recovery of the first casualty from deck 12, the search for other trapped passengers was interrupted while firefighters changed air cylinders.
- The engine fire party did not utilize all of the equipment available during its search and rescue operation, and the composition of the party and use of Italian during radio communications were not in accordance with onboard procedures.
- Had the fire not been contained, the time lost when the Global Maritime Distress and Safety System operator did not send the urgency

message could have been significant.

- The difficulties and inaccuracies of the roll call were highlighted by the inaccurate information passed to the widow of the deceased passenger and her friends, and contributed to the inability to identify the deceased passenger.
- Had a roll call initially been started with the passengers from the staterooms in the fire-affected areas, a more rapid and accurate determination of those missing might have been possible.

Conclusions—What Went Right

- The initial actions taken after the alarm was raised at 3:09 a.m., including the calling of the assessment party and the signaling of the crew alert and GES, were prompt and in accordance with the ship's written procedures.
- Although some passengers in zone 3 on deck 12 were not alerted to the situation until between five and seven minutes after those on the decks below, the interval between the sounding of the crew alert and the General Emergency Stations was understandable.
- As the fire was difficult to access and was already well established by the time the fire-fighting effort was started, the application and energy of the ship's crew to bring it under control in about one hour merited commendation.
- The combined effect of the water mist system and the restricted use of combustible materials in staterooms prevented the fire from spreading further into the ship, despite temperatures on the balconies reaching in excess of 550°C.
- Given the amount of damage caused where the water mist system failed to activate (Figure 4b), it was extremely fortunate the system operated beyond the minimum regulatory requirement.

Recommendations

The most critical findings from the MAIB report involved the balconies and the materials on them. The fire spread rapidly across zones and decks because of the combustible materials on the balconies and the strength and direction of the wind over the deck. Though the prevailing fire protection regulations prescribed the combustibility, smoke generation potential, and toxicity of materials used inside the cruise ship, the balconies were categorized as "open deck spaces" to which the regulations did not apply.

The vessel's keel was laid in 1998, so the vessel's fire safety measures were built to meet the requirements of SOLAS, Consolidated Edition 1997. Although SOLAS Chapter II-2 has been modified since then, the guiding eight functional fire safety requirements have remained mostly unchanged. This fire identified a need for SOLAS Chapter II-2 to also apply to cabin balconies, particularly to:

- restrict the use of combustible materials,
- detect any fire in the zone of origin,
- contain and extinguish any fire in the space of origin.

After the fire, the International Council of Cruise Lines (ICCL, now CLIA) published a safety notice with recommended practices for cabin balcony fire safety. The international regulatory body for maritime safety, IMO's Maritime Safety Committee (MSC), initiated urgent measures to address cruise ship balcony fire safety.

An MSC Circular (MSC.1/Circ.1187) was issued containing operational recommendations for passenger ships with cabin balconies. The circular recommended that the cruise ship industry implement a number of recommendations, including increased vigilance such as the deployment of lookouts, fire patrols, and televi-

Careless Smokers Endanger Lives

Following the fire aboard this cruise ship, one passenger reported that during the voyage, a discarded cigarette end had landed on one of the plastic chairs on his balcony, and had left a burn mark. Several other passengers reported that discarded cigarette ends had also landed on their balconies.

According to the National Fire Protection Association (NPFA), cigarettes are the leading cause of fatal fires in the United States. Smoking materials (a category that encompasses only lighted tobacco products, not matches and lighters) led to one out of four fire deaths in 1999, more than any other cause of fire. The NPFA found that these fires typically started when someone abandoned or improperly disposed of smoking materials.

NFPA news release, www.nfpa.org.

sion surveillance systems; advising passengers and crew not to leave towels and personal belongings on balconies; and reminding passengers and crew of the hazards associated with the use of unauthorized heat-

Figures 4a and 4b: The mist system was working properly in the stateroom above. The stateroom below is the only one where the mist system didn't work. USCG photos.

ing elements such as electrical heating coils used in cups or mugs, and open flames such as candles.

Just nine months after the fire, the MSC adopted new SOLAS amendments to improve fire safety of cabin balconies (Resolution MSC.216(82)). These new amendments to SOLAS Chapter II-2 are aimed at ensuring that the application of existing regulations 4.4 (Primary deck coverings), 5.3.1.2 (Ceilings and linings), 5.3.2 (Use of combustible materials) and 6 (Smoke generation potential and toxicity) are extended to cabin balconies on new passenger ships.

Under the new amendments, partitions separating balconies on all ships will be required to be constructed of non-combustible materials. Furniture on cabin balconies will be required to be of restricted fire risk unless fixed water–based fire extinguishing systems, fixed fire detection, and fire alarm systems are fitted to the balconies.

The amendments entered into force July 1, 2008. Vessels built before that date are expected to be in compliance with the new rules at the completion of their first survey after that date. Guidelines for fire detection and fire extinguishing systems for cabin balconies were published as an MSC Circular on December 3, 2007, and can be found at the International Maritime Organization's website at www.imo.org . Fire detection and extinguishing systems installed prior to July 2008 must be approved by the administration.

Lessons Learned

The cruise ship in this casualty, on the surface, seemed to be doing everything it should be. In fact, as evidenced in the "What Went Right" section, the crew's quick and decisive actions in several instances prevented the situation from becoming worse. The ship was also up to code and following the required regulations.

While there was nothing necessarily overt in this case (other than the carelessness of a cigarette smoker, which crewmembers have no control over), there are still many lessons to learn through the follow-up actions taken by the cruise line and other regulatory parties.

In this case, not even the most experienced maritime organizations can think of every possible scenario, as evidenced by the lack of regulations regarding balcony materials. Perhaps this example will provide food for thought by prompting all vessel owners to evaluate whether all areas of their vessels are safe, what potential problems may arise, and whether or not the persons aboard are at-the-ready to respond to emergencies at all times, according to procedures.

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FOLLOW-UP ACTIONS TAKEN

Organization	*Action Taken as a Result of the Fire*
International Council of Cruise Lines	Issued a safety notice dated April 13, 2006, to notify its members of the preliminary indications of this fire and urge immediate action, including the aim of replacing combustible balcony partitions with non-combustible ones within six months.
The Marine Accident Investigation Branch	Issued a Safety Bulletin 1/2006, which included the following recommendations: • Recommended that the Maritime Administration of the United Kingdom submit a formal request to the forthcoming eighty-first session of the International Maritime Organization (IMO) to consider the issue comprehensively, with a view to urgently developing appropriate amendments to the 1974 SOLAS Convention, to address hazardous external areas of passenger ships, such as balconies, and ensure that they meet appropriate standards of fire protection, such as those currently applicable to internal areas of passenger ships. Also, in the interim, advised IMO to issue appropriate urgent guidance on fire protection of external areas of passenger ships, such as balconies. • Advised cruise lines and operators/managers of passenger vessels to take urgent action to comply with the measures identified in the ICCL safety notice. • Advised flag states to urgently review the fire safety integrity of external areas of passenger ships on their register to ensure that the immediate and medium-term actions taken in the light of the MAIB safety bulletin are effective. • Posted on its website the companies and operators from which positive assurance had been received that they were adopting measures to comply with the recommendations in both the MAIB's Safety Bulletin 1/2006 and the ICCL safety notice within the timescale prescribed.
The International Maritime Organization	IMO's Maritime Safety Committee (MSC) 81 approved, in May 2006, a circular for immediate distribution detailing operational measures recommended for immediate implementation on passenger ships with balconies. The committee also approved proposed amendments to SOLAS Chapter II, and the FSS Code submitted by its passenger ship safety working group with the aim of ensuring that balcony partitions are non-combustible, restricting the use of combustible materials on stateroom balconies, and requiring ships with stateroom balcony furniture which is not of restricted fire risk be fitted with fixed fire extinguishing and fire detection systems. The committee also instructed its subcommittee on fire protection (FP) to, as a high priority, review the fire safety of external areas on passenger ships and make recommendations, as appropriate, which was completed in late 2007. Also as a high priority, it advised the FP subcommittee to develop performance standards for fixed water-spraying, fire detection, and fire alarm systems for cabin balconies, which has also been completed.
Cruise Lines	On October 1, 2006, ICCL confirmed in writing that 14 of its member companies (including the cruise ship line involved in the incident) had implemented the immediate actions and conducted the fire risk assessments of balcony areas as recommended in its safety notice. ICCL also confirmed that its members had all developed plans of action for the replacement of identified combustible balcony partitions with suitable non-combustible materials. As of the publication of this issue, the director of public relations for the cruise ship line involved confirmed that all of the corporation's brands had completed this work on all balconies of its ships. The MAIB's website (www.maib.gov.uk) lists all cruise line companies that have completed this work.
Cruise Line Involved in Incident	In addition to the actions taken in response to the ICCL safety notice, the MAIB safety bulletin, and the MSC circular, the cruise line involved: • issued guidance regarding fighting a balcony fire, and initiated drills on its ships overseen by its fleet instructors. It initiated measures to form a party on all its ships dedicated to the role of the search and rescue of passengers. It also arranged firefighting refresher training for the fire parties and checked the availability of fire suits of various sizes on all its ships. • revised its emergency response organization to ensure that the medical emergency number of 911 continues to be answered after the crew alert signal has been sounded. • arranged for door wedges provided in staterooms to be removed, and for crew to be instructed to ensure stateroom doors are closed after checking that they are clear of passengers. • arranged for inclusion of confirmation that an urgency or distress message has been sent on the appropriate bridge checklists. • provided additional respirators aboard its ships. • increased the number of, and improved the accessibility to, stateroom master keys during stateroom searches. • modified its passenger mustering system, including the provision of additional telephone lines in muster control, the designation of telephone operators within each muster station, and the dialing of staterooms within affected areas. • introduced an enhanced English language assessment for all deck, technical, and firefighting personnel, supported by an onboard English language improvement program.

A Passenger Excursion Craft Sinks

A pleasant day on the water turns into a struggle to survive.

by Ms. Barbara Chiarizia
Executive Editor, Proceedings

On the morning of May 1, 1999, the small passenger vessel *Miss Majestic* departed for a trip around St. John's Island in Lake Hamilton, near Hot Springs, Ark. The vessel, a rare hybrid craft (Figure 1), was built for the U.S. War Department as an "amphibious truck." As such, it combined elements of an on-road vehicle with the additional ability to operate as a waterborne passenger vessel. This type of conveyance is known as a DUKW, where:

- D refers to the date of manufacture (typically World War II era);
- U denotes "utility" or amphibian;
- K indicates all-wheel-drive;
- W refers to dual-powered rear axles.

Since they operate on both land and water, these vehicles are commonly referred to as "ducks" or "duck boats." Originally used during World War II and the Korean War as amphibious landing craft, these vessels are now used primarily for commercial land and water tours.

This was just the type of outing that passengers planned on that pleasant day in May. Twenty passengers and the operator boarded the vessel for the tour that began on St. John's Island. The "water" portion of the tour normally lasted about a half-hour, but mere minutes into the tour, the operator realized something was wrong.

Tragedy Strikes

According to the U.S. Coast Guard casualty investigation report,

"Approximately seven minutes after entering the water and while rounding Catalina Point, [the operator] felt the [vessel] react sluggishly, not very responsive to throttle changes, and list to port."[1]

The operator and several passengers also noticed that water was washing onto the deck from the rear of the craft. The operator told one passenger to move to the starboard side of the vessel to compensate for the port list and attempted to turn the vessel back to shore. The vessel continued to take on water, however, and sank in

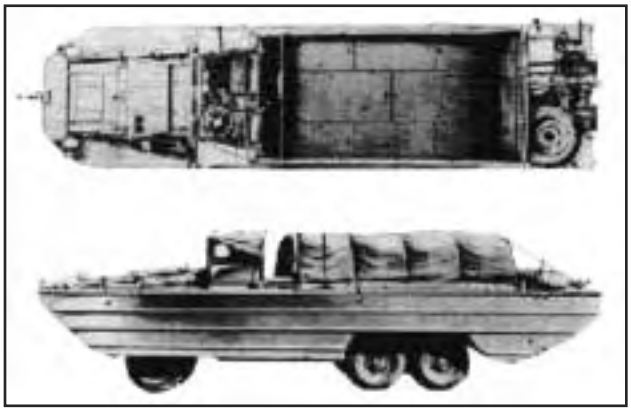


Figure 1: The vessel's as-built arrangement and profile. Design clearances above ground were 18 inches to the molded hull and 12 inches to the axles. Design-loaded freeboards were 24 inches forward and 16 inches aft. The vessel was fitted with three drive axles—one forward and two aft. Graphic from USCG investigation report.

The Investigation

This article is based on the final U.S. Coast Guard casualty investigation report of the incident, "Investigation into the Circumstances Surrounding the Sinking of the M/V Miss Majestic *on Lake Hamilton, Hot Springs, Arkansas on May 1, 1999 with Multiple Loss of Life." All conclusions are based on information taken from this report.*

less than 30 seconds. Of the 21 persons aboard, only eight survived this incident.

How could this have happened? Why did the vessel sink so quickly? How did 13 people drown just yards from the shore? What can be done to prevent anything like this from happening again? These were among the questions U.S. Coast Guard investigators sought to answer.

The Investigation Begins

The USCG investigation initially focused on what caused the vessel to take on water. Investigators determined that the vessel flooded through the aft shaft housing after a seal became dislodged.[2] But this should not have caused the vessel to sink so quickly.

Ultimately, the investigation uncovered many mistakes and oversights that led to this tragedy. Chief among these:

- vessel modifications,
- inoperability of safety equipment,
- the absence of a required safety alarm,
- the lack of operational testing of recent repairs,
- the lack of written maintenance manuals or procedures,
- ineffective oversight of the vessel's operation,
- the owner's lack of comprehension regarding the Coast Guard inspection program.[3]

When so many things go so wrong, it's difficult to know where to begin to explain them. In fact, the roots of this particular tragedy stretch back years before the fatal incident.

The Vessel's History

As noted in the U.S. Coast Guard casualty investigation report:

"The [vessel] had the following fundamental modifications for passenger service. These modifications are typical for DUKWs used in passenger service, although details vary.

a. Installation of 8 rows of school bus type seating, outboard of a centerline aisle for access.
b. Installation of a hinge mounted ladder on centerline at the stern, for boarding the vessel.
c. Raising and lengthening the canopy, making it high enough to allow persons to stand.
d. Installation of roll-up vinyl windows, to provide shelter from the weather.
e. Removal of the forward bilge pump and disabling of original bilge piping.
f. Installation of 3 electric bilge pumps, all operated with a single switch.
g. Removal of the drive train serving the after rear axle, including the differential.
h. Engine changed to V8 and transmission changed to automatic."[4]

As mentioned, these modifications were typical for these vessels, and, although not common, "duck boats" operated successfully and safely all over the country. The vessels have been subject to Coast Guard jurisdiction since the mid-1970s.

After this incident, the Coast Guard reviewed its marine casualty data for this type of craft for the period of 1992 to 1998. There were only 12 reported cases, most involving collisions, steering failures, and engine problems. In only three of the cases did the vessel in question flood, typically due to hull damage. As concluded in the report:

"No evidence was found to indicate any substantial casualty record for Coast Guard inspected DUKW small passenger vessels, specifically no deaths or sinkings."[5]

With regard to this specific vessel, the report noted:

"The 1991 to 1998 vessel inspection records for the [vessel] indicate an absence of recorded deficiencies, with the exception of two items which were documented with a form CG-835 in 1995. The Coast Guard's Marine Safety Information System (MSIS) product set Vessel File Marine Inspection Log … for [vessel] shows no deficiencies were recorded in MSIS from 1985 to 1998. The latest COI [certificate of inspection] for the [vessel] was issued on March 11, 1997."[6]

The Timeline for Tragedy

During an hour-long reinspection of the vessel on February 23, 1999, the Coast Guard investigator noted nine items that needed attention and left a work list with the owner. The investigator considered most of these repair items to be minor, and only entered two into the inspection record:

" … the owner is in process of installing the required high-level bilge alarms required by 11 Mar 99. Owner is researching the availability of flammable vapor detection system required by 11 Mar 99 … " [7]

The investigator did not note a specific due date for installation of the high-level bilge alarms, but cited 46 CFR 182.530 (which contained the March 11, 1999 deadline) on the work list.

The owner made arrangements to address the work list and continued operation of the vessel in the meantime.

A. PROPELLER SHAFT HOUSING SEAL
B. PROPELLER SHAFT HOUSING
C. HULL BULK HEADS
D. PILLOW BLOCK
E. PROPELLER SHAFT ASSEMBLY
F. HAND BRAKE
G. MAIN TRANSFER CASE
H. WATER PROPELLER TRANSFER CASE
I. TRANSMISSION
J. HOUSING DRAIN PLUGS

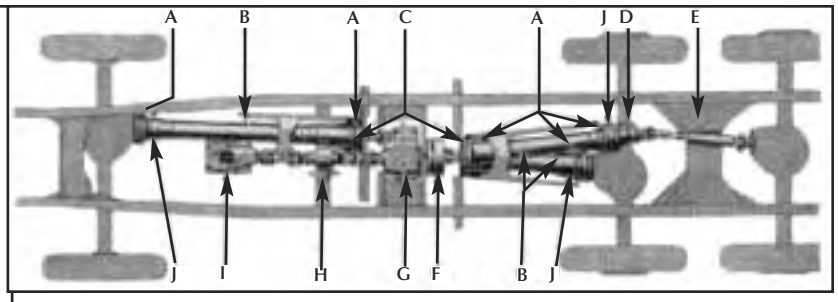


Figure 2: The vessel's chassis and drive trains. There were three drain plugs in the molded hull, which also gave access to the engine crankcase, the transmission case, and the transfer case. Each drive shaft was surrounded by a shaft housing, attached to the molded hull and the axle differentials with thin-wall rubber (boot) seals, using a single metal band clamp to secure each boot seal to the shaft housings. Graphic from USCG investigation report.

He later stated that he was unaware of the March 11, 1999, deadline, and neither of the noted items (the high-level bilge alarm or flammable vapor detection system) was installed on the vessel by May 1, 1999—the day of the incident.

Several days before the incident, the vessel's operator noted problems with the forward bilge pump during operations and cut the tour short. Subsequent examination revealed water in the bilge and a hole in a boot seal to the aft shaft housing.

Over the next several days, the mechanic performed regular maintenance on the vessel, replaced boot seals (Figure 2), and returned the vessel to service on May 1. The mechanic later stated that he did not "water-test" the repairs because it was not company policy to do so.

A. SEAL RETAINING RING
B. HOUSING SEAL
HOUSING TO BULKHEAD
HOUSING TO PILLOW BLOCK
HOUSING TO FRONT AXLE AND INTERMEDIATE AXLE
C. HINGE CAP SCREW AND LOCK WASHER
D. PROPELLER SHAFT HOUSING
E. SEAL CLAMP RINGS
F. DRAIN PLUG
G. HINGE ASSEMBLY
H. HINGE PIN
I. COTTER PIN

At some point in the vessel's past, the original hinge assembly (Figure 3) for the aft shaft housing was removed (apparently to allow access to lubricate the u-joints). The mechanic noted that he had never seen a hinge assembly in place (Figures 4a, 4b) in the 11 years he had worked on DUKWs.[8] Unfortunately, since the hinge assembly for the aft shaft housing was missing, the seals were subjected to stresses they were not designed to withstand.[9]

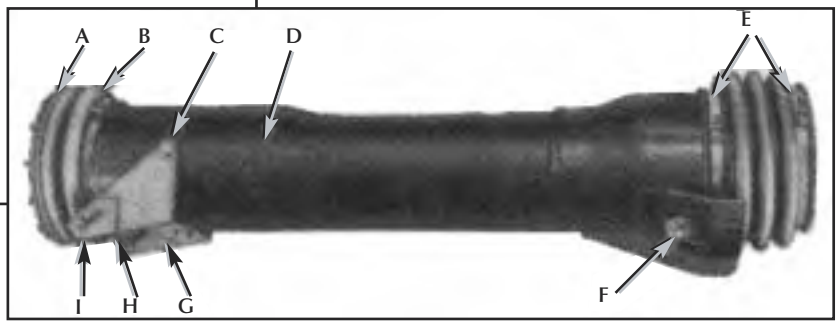


Figure 3: The hinge assembly for the vessel's aft shaft housing was missing at the time of the incident. Graphic from USCG investigation report.

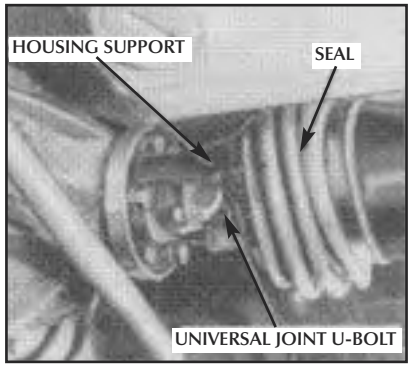
The Incident

The Coast Guard investigation concluded that, as the vessel entered the water or shortly thereafter, the aft boot seal came off of the shaft housing. This caused the vessel to flood. Several bilge pumps began discharging this water, but the operator did not notice this discharge, since the outlets were hidden from her view and because she was focused on her duties as a tour guide.

The flooding continued unchecked, and the working pumps didn't have the capacity to keep up with the amount of water entering the vessel. The largest pump, the Higgins bilge pump, was not working at the time of the incident. The investigation uncovered that it had sustained previous damage and was inoperable at the time of the incident. As stated in the USCG investigation report:

"The Higgins bilge pump has a capacity of about 250 gpm at full throttle and theoretically would have been capable of overcoming the calculated flood rate." [10]

Since the bilge high-level alarms were not installed before the casualty, the operator remained unaware of the amount of water the vessel was taking on until it was too late. Once it became



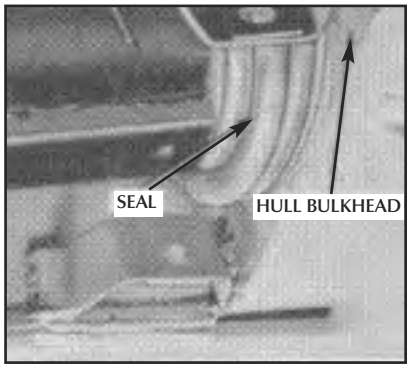


Figure 4a: The housing support at the differential, now informally called a "torque tube saddle" or a "bird cage." Figure 4b: The hull mounts for the shaft housing hinge assembly, near the end of the shaft housing. Graphics from USCG investigation report.

obvious that the vessel was sinking, the operator gave the order to abandon the vessel.

Tragically, that proved impossible for most of the passengers. As the vessel quickly sank, many passengers became trapped beneath the canopy. The retrofitted vinyl windows, installed to provide shelter for the passengers, further entrapped them.

The Aftermath

One can only imagine the horror as this scene unfolded. What began for most of these passengers as a pleasant family outing quickly turned into a struggle for their lives. Most lost that struggle.

As the vessel sank, the passengers floated free of their seats, only to become trapped by the canopy and vinyl windows. Only the operator and seven passengers managed to free themselves from the vessel or escaped before they could become entrapped within it.

The casualty investigation report noted the incomprehensible losses. One passenger lost his mother, father, and sister; another lost husband, son, and daughter. The list goes on. By all accounts, only one family unit aboard (the report implies it was husband and wife) remained intact after this disaster.

The Causes

The main cause of this calamity was the owner's failure to keep the vessel in seaworthy condition. The mechanic did not test the replacement aft boot seal to see if it would remain watertight in operation and it, indeed, did not. Neither the mechanic nor owner questioned the missing hinge assembly, nor were they aware of the stress this would place on the seals.

Further, the pumps that would remove water from the vessel in a flooding event were not regularly tested, and, in fact, were not all operational at the time of the incident. Finally, the high-level bilge alarm that would have alerted the operator to the flooding was not installed by the mandated deadline. It can be argued that if the owner had taken any of the above actions, this calamity may have been averted.

Additionally, and in further violation of federal regulations, the owner did not provide formal safety training or written policy on emergency procedures for the vessel operators. During her time as a DUKW master, the operator developed her own operational safety checklist, which included checking brakes, lights, and hull drain plugs. During operation, she typically did not address evacuation in an emergency, a violation of 46 CFR.[11]

Other contributing factors were the owner's reactive, even passive stance to vessel maintenance and his ignorance of regulations that outlined his responsibilities. As noted in the report:

"[The owner] was not familiar with inspection regulations applicable to his DUKW … and could not remember if he had a copy of 46 CFR Subchapter T in his office. He expected the Coast Guard to ensure he was informed of needed changes to his inspected vessels ... He expected a high level of Coast Guard service as a consequence of having to pay an annual vessel inspection user fee of $300 for each DUKW. He expected the Coast Guard to tell him where he could obtain required new equipment. He stated that the Coast Guard never told him to report repairs to the hull and hence repairs were made and not reported, as required by 46 CFR 176.700. [The mechanic] was also not familiar with the applicable inspection regulations … [the mechanic] simply did what the Coast Guard inspector and [the owner] told him to do." [12]

What began for these passengers as a pleasant family outing quickly turned into a struggle for their lives. Most lost that struggle.

The vessel inspection fee, however, was established to help recover the costs associated with providing Coast Guard vessel inspection services. It did not have any bearing on compliance with safety regulations, and nei-

ther the fee nor the inspection absolved the owner of his responsibilities.[13]

Never Again

While there is little anyone can do to ensure that a vessel owner takes his responsibilities seriously, the Coast Guard resolved to do all it could to help ensure that a tragedy like this one was not repeated.

In the aftermath of this catastrophe, the Coast Guard convened a group of experts to develop comprehensive guidelines relating to the design, maintenance, safe operation, and inspection of DUKW vessels.

On December 11, 2000, the U.S. Coast Guard promulgated Navigation and Vessel Inspection Circular No. 1-01, "Inspection of Amphibious Passenger Carrying Vehicles," which contained the guidelines mentioned above. The guidelines place special emphasis on the importance of the hinge assembly and reiterate that this vital component must be in place for safe operation.[14] These exhaustive guidelines were also distributed to all known DUKW owners and operators, to all state agencies that were involved with DUKW oversight, and to all appropriate Coast Guard units.

Finally, the Coast Guard took action to improve its recordkeeping. All officers in charge, marine inspection received a copy of the final casualty report and subsequent guidelines to re-emphasize the need to maintain complete inspection records—including work lists—and to maintain a Marine Information for Safety and Law Enforcement (MISLE) safety deficiency summary containing all vessel deficiencies.

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Ms. Barbara Chiarizia is the executive editor of Proceedings. *She has been a U.S. Coast Guard civilian since 2006. She oversees 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.*

The vessel is recovered after the incident. Graphic from USCG investigation report.

Acknowledgement:
Proceedings gratefully acknowledges the support of CDR Kelly Post, who provides final review of all "Lessons Learned" articles.

Endnotes:

1. "Investigation into the Circumstances Surrounding the Sinking of the M/V *Miss Majestic* on Lake Hamilton, Hot Springs, Arkansas on May 1, 1999 with Multiple Loss of Life," p. 18.
2. Ibid, p. 1.
3. Ibid.
4. Ibid, p. 8.
5. Ibid, p. 9.
6. Ibid, p. 10.
7. Ibid, p. 11.
8. Ibid, p. 16.
9. The hinge assembly as originally installed provides three vital functions. It supports the weight of the shaft housing, positions the shaft housing to prevent drive shaft and housing contact, and prevents the shaft housing from shifting fore or aft. Without the hinge assembly, the shaft housing seals bear all these burdens—they were not designed for this, nor intended. Enclosure (1) to NVIC 1-01.
10. "Investigation into the Circumstances Surrounding the Sinking of the M/V *Miss Majestic* on Lake Hamilton, Hot Springs, Arkansas on May 1, 1999 with Multiple Loss of Life," p. 24.
11. Ibid, p. 14, 17.
12. Ibid, p. 13.
13. Ibid, p. 6.
14. Enclosure (1) to NVIC 1-01.

Loss of Stability

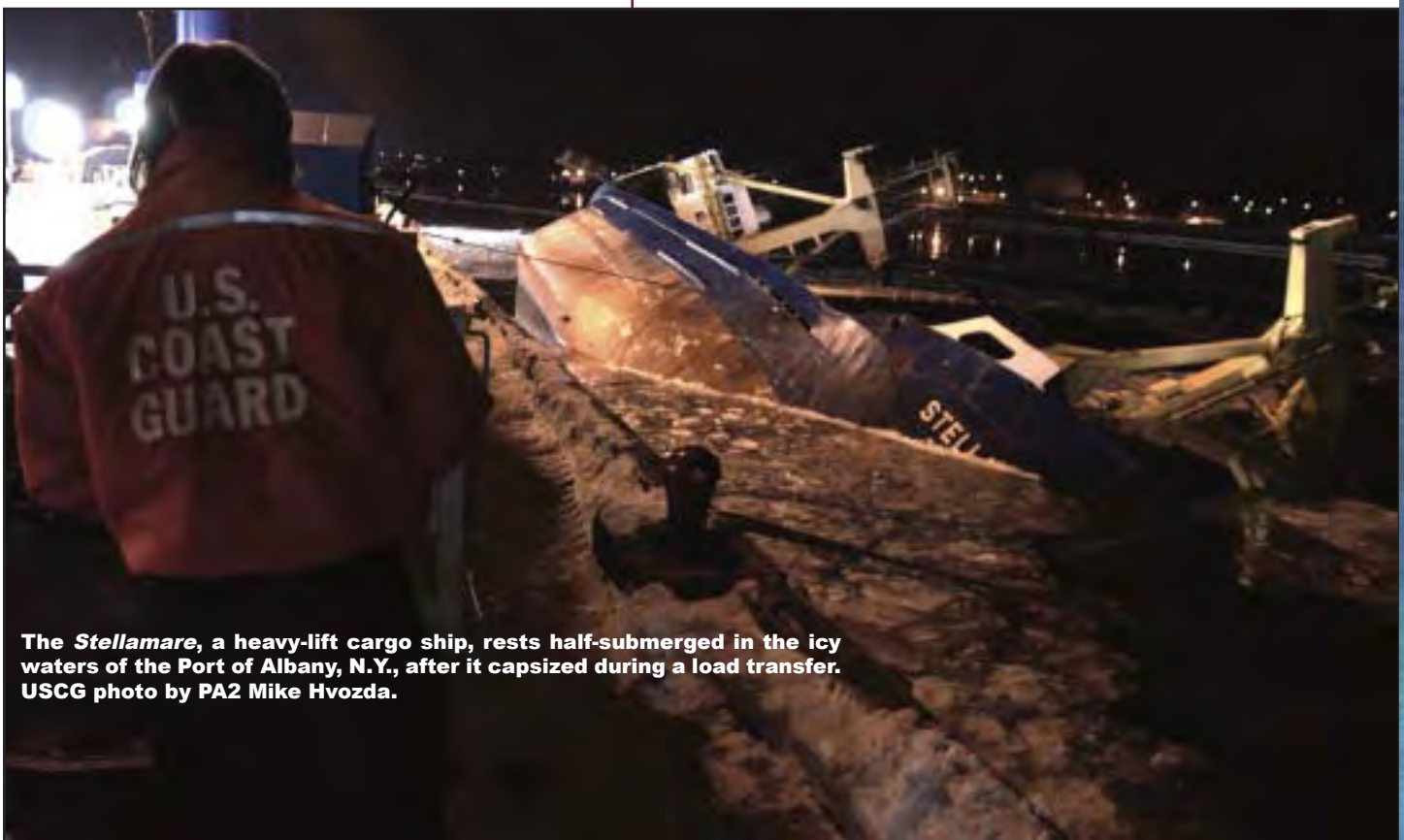
A ship capsizes while loading cargo.

Lessons Learned from Casualty Investigations

by Captain Brendan Saburn
U.S. Coast Guard Office of Investigations and Analysis

On December 9, 2003, the 289-foot heavy-lift freighter *Stellamare* capsized and sank in Albany, N.Y., while loading a 308-metric-ton generator[1] for a power plant. This major marine casualty was caused by improper ballasting and the speed of cargo handling during the loading operation. In other words, human error caused this incident, which resulted in the deaths of three of the ship's crew. Additionally, five other crewmen were injured in this incident. Drug and/or alcohol consumption was not a factor.

To set the scene, Albany is located 126 miles above the Statue of Liberty and the tip of Manhattan. Only a small ship like this heavy-lift vessel can travel that far upstream, due to low bridge clearances and the depth of the Hudson River. Additionally, the operation of a small heavy-lift ship is highly specialized. This is a ship less than 300 feet in length, with cargo gear capable of lifting a total of 360 tons, which is on the order of 10 loaded eighteen-wheeler trucks. This particular ship was fitted with two heavy-lift derricks. Each of these was officially rated by a classification society[2] for a safe working load of 180 metric tons, so a combined load of 360 tons was permissible. This ship's deadweight tonnage[3] was only 2,760 metric-tons, so one heavy-lift load of 360 tons was approximately one-eighth of its total carrying capacity.



The *Stellamare*, a heavy-lift cargo ship, rests half-submerged in the icy waters of the Port of Albany, N.Y., after it capsized during a load transfer. USCG photo by PA2 Mike Hvozda.

Two generators were to be loaded aboard this ship that day. One weighed 308 metric tons, the other one weighed 234 metric tons. Both generators were destined for European ports, one to Italy and the other to Romania. One was for use in a nuclear power plant, where it would be driven by a steam turbine and reduction gear assembly—the same type of turbine and gear assembly used with boilers in a power plant or on an old steamship. The other was intended to be attached to a pair of what's known as gas turbine engines in naval engineering—the same size and type of jet engines that a large modern aircraft has for propulsion, which are the same type of engines that turn the propeller shafts of modern Coast Guard cutters and Navy combat ships.

During operations on December 9, the smaller generator was loaded as planned. It was loaded first, onto what had been an empty ship, to make the ship more stable in preparation for the heavier generator.

Stability: An Illustration

It's important to understand what is meant by "stability." There are three states of stability: stable, neutral, and unstable. To imagine this, think of a small child in a rocking chair. The chair rocking forward and backward is analogous to a ship rolling to starboard and port. If the child is sitting, the chair is very stable and nothing is going to go wrong. The chair can be rocked back and forth, but won't topple over forward or backward, because the center of gravity of the child and chair combination is down low, where it should be.

But what if the child decides to kneel? Then the chair will be in "neutral" equilibrium. If the child leans forward, there is neither a tendency for the chair to return to the upright position nor a tendency for the chair to topple. The chair will stay where the child positions himself while kneeling.

If the child stands up in the chair, the center of gravity of the child and chair combination is now too high. In other words, we now have the condition of unstable equilibrium. If the standing child moves the least bit too far forward or backwards, the chair can topple.

Let's continue our example. How can we make the chair more stable so the child can't upset it by standing in it? One way would be to fasten bricks to the underside of the chair, which would add weight below the desired center of gravity. In other words, we could "ballast" the rocking chair. We could also lengthen the chair's rockers, which would be analogous to making a ship wider.

Stability in Action

Any student of stability also needs to consider the vertical location of the weight of a heavy piece of cargo. The weight is either in the hold, where it's being stowed for the sea passage (a few feet above or below the ship's center of gravity), or the weight is "acting from" a point (such as the head of the cargo boom) that can be 100 feet above where it would be when the piece is down in the cargo hold. In the rocking chair example, if you hung a weight of 10 or 15 pounds from the horizontal top piece of the chair, then moved that weight onto the seat of the chair, the center of gravity would have shifted during this operation.

A stability pontoon is a floating vessel that makes a 300-ton lift and load possible. For a ship this size, the pontoon is approximately 50 meters in length and floats alongside the outboard side of the ship. From its stowed position on deck, it's picked up by one of the booms and carefully lowered down over the side through a track that serves as the attachment bracket. The pontoon increases the ship's "effective breadth;" the wider a vessel, the more stable it is. The two-di-

mensional area of the ship's waterplane[4] has been increased in the width dimension, making the ship a lot more stable. This ship used a stability pontoon on the outboard side that day.

The center of gravity of a ship this small, with a weight of 300 tons suspended from a point approximately 20 meters above its keel, is approximately one or one-and-a-half meters above where it would be if the weight were stowed in the hold, provided the stability pontoon is properly deployed. The ship would have only a small measure of stability while the weight is suspended, but it wouldn't be considered a problem if everything else is all right. The first generator loaded on that day weighed 234 tons (approximately 250 tons with its lifting hardware) and the ship was quite stable while the load was suspended.

The Typical "Lift" Procedure

After connecting the hardware (slings and lifting beam) to the cargo falls, the first step in lifting a weight of this magnitude is to take a slight strain (50 tons, in this case) on the falls using the winches. The strain is judged by the dynamometer gauges and the list of the ship. A ship this small takes on a list of 2.5° or so with two cranes over the wharf and a 50-ton strain on the falls.

Next, the ballast tanks on the opposite (outboard) side of the ship are filled with water. If the ship is moored starboard side to the wharf (as this ship was in Albany), the port side (outboard) ballast tanks are filled with river water to help bring the load across from starboard to port. As they're filling, tension on the falls increases. The goal is to have less wear and tear on the winches, and a smoother, safer loading operation. The ship's center of gravity rises as the falls gather more tension from the cargo's weight.

Depending on the loading plan, ballast water is either pumped from the inboard side to the outboard side, or the tanks on the outboard side are filled from the water in which the ship is floating. The idea of ballasting, by itself, lowers the ship's center of gravity. Though people have been ballasting since ships have been going to sea, this becomes a specialized ballasting operation when done in conjunction with raising a heavy-lift

Divers approach the ship to search for missing crewmen. USCG photo by PA2 Mike Hvozda.

load. Here, the ballast water is referred to as "swing ballast" because its primary purpose is to help swing the load aboard. The applied ballast also has a tendency to lower the center of gravity a foot or two, but that helps to balance out the suspended load, which has a tendency to raise the center of gravity a few feet.

This is a very slow operation for two reasons: it takes time to fill ballast tanks, and it takes time for cargo to be lifted when using 12-power tackle for cargo runners. Both of these evolutions take place simultaneously. Although the ballast tanks on a heavy-lift ship can be filled at a rate of over 200 tons per hour,[5] the speed is determined by the time it takes to slew the cranes inboard once the load gets to a height where it will clear the bulwarks and hatch coaming. For those of us whose block and tackle seamanship is a dusty memory, the load being lifted (or lowered) by a 12-power tackle only moves up (or down) a foot for every 12 feet of cargo fall handled by the winch.

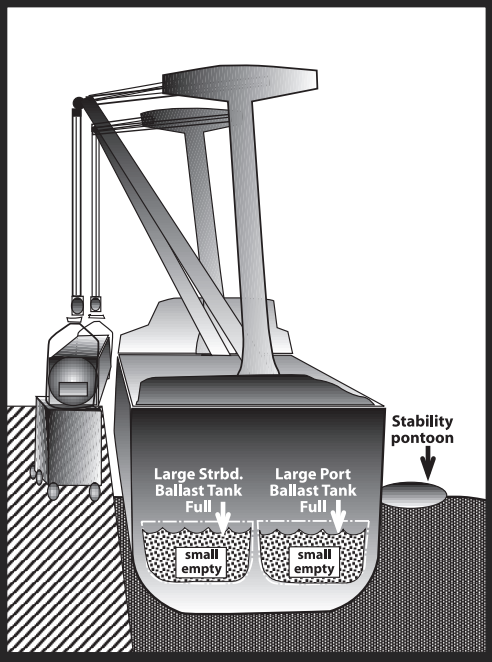
When everyone is in position and ready, the winch operator takes a strain. The captain simultaneously gives the order to begin filling ballast tanks on the outboard side before the list gets to a point that the pontoon comes out of position and loses its effectiveness. If it does, the ship could capsize to starboard onto the wharf. Reaching the point of full tension on the falls, the booms will get slewed inboard. Everyone exercises caution to ensure the cargo load doesn't get ahead of the swing ballast. From time to time the cargo movement stops and the brakes are set to allow the ballast to catch up to the load. The idea is to do as much as possible with swing ballast to ease the operation of the booms.

The First Lift

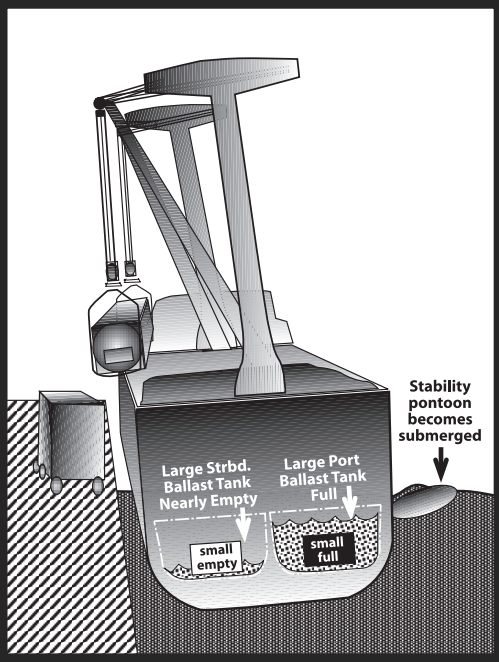
These factors explain why it took three hours to load the first generator on that day in December. This first load went very smoothly. First the cranes were slewed out and positioned over the railcar on the wharf and swing ballast was loaded into tanks on the inboard side. The combined effect of the weight of the booms and the ballast listed the ship slightly inboard (toward the wharf), as desired. At this point in the evolution, someone would have checked on the stability pontoon on the outboard side, since the pontoon would be effective only if the list did not exceed 2.5° to either side. While someone checked on the pontoon, people on the wharf hooked the generator to the cargo falls, which took a good few minutes because of the size and weight of the lifting hardware.

When everyone was in position and ready, the winch operator took a strain. The captain also gave the order to begin filling ballast tanks on the outboard side before the list could get to a point that the pontoon could come out of position and lose its effectiveness. If it had

The Incident

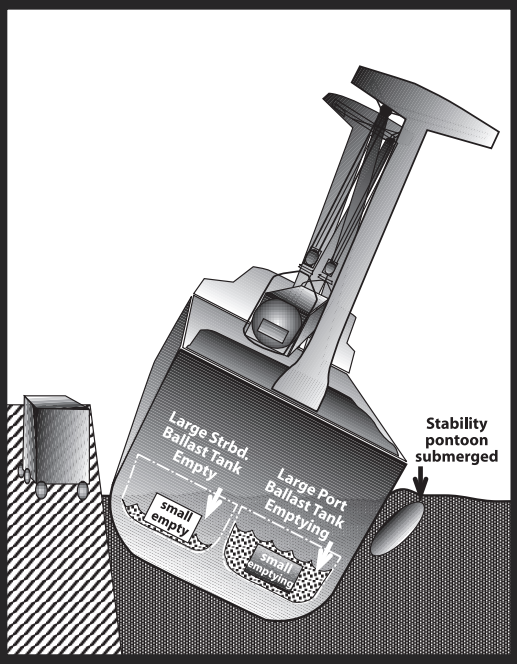


Booms are positioned over the wharf to begin lifting the second generator. At this point, large port and starboard ballast tanks are full. As strain is taken, the stability pontoon becomes misaligned.



As the generator is lifted, ballast is discharged from the large starboard tanks. Smaller port-side ballast tanks are filling. Pontoon begins to become submerged.

come out of position, the ship might have capsized (to starboard) onto the wharf. Reaching the point of full tension on the falls, the crew started to slew the booms inboard. Caution was exercised to ensure that the cargo load didn't get ahead of the swing ballast so that they didn't lose control of the list. From time to time, the movement of the cargo was stopped and the brakes set to allow the swing ballast to catch up to the cargo.



Ship lists to port and discharge of port-side ballast begins. Ship remains listing to port as discharge of port-side ballast begins. The stability pontoon no longer provides additional waterplane area. Additionally, with so much weight (300 tons) suspended from above, and not enough weight (ballast) below, ship is dangerously unstable and capsizes to port.

Eventually, the two large port-side ballast tanks were filled and the generator was properly positioned over the hatch, three meters to port of the ship's centerline. From here it took a few more minutes to lower it down into the hold. Twelve feet of cargo fall had to be paid out for every foot that it descended. Four crewmen down in the hold unhooked it and immediately began securing it for sea. Unfortunately, these crewmen were still in the hold during the second lift.

The Second Lift

The idea of doing as much as possible with swing ballast to ease the operation of the booms was a success during the first lift. As mentioned, the smaller generator was loaded first, onto what had been an empty ship, to make the ship more stable in preparation for the heavier generator. The second lift began the same way, except for how the ship was ballasted. The swing ballast from the first lift remained in the large tanks on the port side. Using that setup, the captain could plan on discharging (overboard) the starboard side swing ballast while the load was slewed aboard.

The second, 308-ton generator, which was the size of a locomotive and weighed the same as eight and a half loaded 18-wheelers, came very close to the maximum lift capacity of the cargo gear. In cases like this, meticulous calculations are required to ensure the ship's stability while the load is suspended. Even the weight of the hardware between the cargo hook and the actual piece of cargo has to be accounted for. For a lift this heavy, the lifting beam and sling assembly weighs more than 20 tons.

The Incident

The heavier generator was to be loaded three meters to starboard of the centerline. Its rotor was intended to be loaded the next day and would have gone on the port side to balance the ship for sea. The derricks were slewed out so the heads of the booms were over the railcar on the wharf with the 308-ton generator. The boom heads were now 13 meters (to starboard) from the centerline. This, by itself, caused a list to starboard. Additionally, the captain had one large starboard-side ballast tank filled to cause a maximum safe list before taking a strain on the cargo runners.

The generator was hooked up with hardware (the lifting beam and its slings, hooks, and shackles) weighing over 20 tons. Meanwhile, the captain and cargo superintendent checked the stability pontoon to ensure the crewmen operating the winches and pumps were in position and ready. Additionally, there were four men down in the hold securing the smaller generator for sea, and a few others were in their staterooms or working in the galley.

As the runners took a strain, ballast was discharged from the large starboard side tanks and the empty ballast tanks on the port side were filled. All of this happened faster than it should have. One pump was available for each ballast tank worked. By the time there was full tension on the cargo runners, all port tanks were full and both of the large starboard tanks were empty.

This led to the first mistake: there was no place to put ballast (on the port side) in case there was a need for it. The port side had no "reserve ballast capacity," a

phrase coined by the Coast Guard's technical advisor to the investigating officer. With full tension on the cargo runners, the captain had the idea that he could safely and easily discharge port-side ballast while slewing in the derricks to bring the generator aboard. At this point in the evolution, the idea was to prevent the ship from listing toward its port side. This would not have been a problem if everything else was all right. Specifically, this would not have been a problem if the stability pontoon had remained in position. The derricks were slewed in faster than they should have been; but the real mistake was that no crewmember was stationed to observe the pontoon for this second lift.

Salvage work continues. USCG photo by PA2 Mike Hvozda.

At some point before the port-side ballast discharge began, the pontoon became submerged and lost its effectiveness. This loss of effective waterplane area meant that the ship, with its suspended load, was unstable, but the captain didn't realize it. The heavy load was suspended on the starboard side—almost in position over the hatch—but the ship was unstable because the pontoon was submerged.

The suspended weight was hanging slightly to starboard and all the port-side ballast tanks were full. At that point, the captain realized the ship was listing to port.[6] The best course of corrective action would have been to ballast. Usually, stability teachings dictate ballasting an unstable ship first on the low side, so the ship can't flop from a port list to a starboard list and capsize (toward the wharf in this case). However, since all the port-side ballast tanks were still nearly full, the alternative should have been to ballast on the starboard side; that is, ballast anywhere possible to make the ship less unstable. When in dire straits, this could even include filling tanks that are normally used as fuel tanks. The captain should have given the orders to fill the starboard ballast tanks and top off the port tanks that he had started emptying. Unfortunately, instead, he didn't realize the condition of instability caused by the submerged pontoon and continued discharging port-side ballast in hope of alleviating the port list. At this point, the captain asked the chief engineer if ballast could be discharged any faster. The center of gravity got higher with every ton of ballast discharged, and the situation became more dangerous.

Then, the inevitable happened—the ship capsized (to its port side, away from the wharf) with unnecessary personnel aboard. In addition to the necessary loading crew—captain, cargo superintendent, chief engineer, and cargo winch and ballast pump operators—there were four crewmen down in the hold securing the previously loaded generator. A cook was at work in the galley. Some other crewmen were in their staterooms.

Everyone on deck immediately tumbled into the 30°F water of the Hudson River, with both brash and skim ice. A few seconds later, they were joined by all of the other crewmen except for three of the four who were down in the hold. Some were able to hold onto some part of the ship. Others were free-floating in the river. The wind blowing on their heads felt like 5°F with the wind chill factor. One multi-million-dollar generator was in the hold, and the other was on the bottom of the Hudson. Fuel oils and hydraulic fluids spilled into the river, as well. The fuel would continue to seep into the river until the tank vents could be plugged.

The Response

The captain of a dredge working just downriver picked up his VHF and made the distress call on behalf of the

continued on page 74

POST-INCIDENT OIL REMOVAL

Nine thousand gallons (1,200 cubic feet[1]) of the ship's fuel oil discharged out through the tank vents before the ship could be refloated. Fuel seeped through the port-side tank vents because the ship was submerged on its port side (on the bottom) after capsizing. The simple float balls that act as check valves[2] in the goose-neck tank vents can't function effectively unless the sunken ship is upright. Immediately after capsizing, river water entered the fuel tanks and fuel oil exited through the port-side goose-necks as the vents were submerged to the bottom of the river.

Slowly, there was free communication[3] of water into the tanks and oil and water out of the tanks. After a few hours, the remainder of the fuel in the port-side tanks was floating on the water that had entered the tanks. Contractors had the vents plugged by the following day. The situation was different on the starboard side. Here, the saving grace was that the goose-necks were above surface of the river, where nothing could flow in or out.

This oil spill was cleaned up by contracted personnel working their way through both brash and skim ice in the Hudson River. Three different contractors were hired and all environmental concerns related to the spill were alleviated quickly.

Generator fuel is much lighter than main engine fuel on any merchant ship. On this ship, there was a difference of 10% in their specific gravities, which is typical. The heavy, main engine fuel had a specific gravity of 0.95 and the generator fuel (#2 diesel fuel) had a specific gravity of 0.85.[4] Depending on the sizes of its tanks, a ship will have its main engine fuel in four to six tanks and its generator fuel in two to four tanks. Each generator fuel tank also has a goose-neck vent that allowed free communication in this instance.

The effect of the low temperatures of the air (below 20°F) and water (approximately 30°F) made the pollution situation out of the ordinary. Had this happened on a hot summer day, evaporation would have made a big difference. But, because of these low temperatures, the diesel fuel actually floated on a thick film of the heavy fuel and was evaporating very slowly, allowing time for the contractors to remove it. The heavy fuel was so viscous at this low temperature that it resisted flowing out through its goose-neck vents. This mitigated the amount of heavy oil spillage. Almost all of the 9,000 gallons spilled was diesel fuel, a product that is easily recovered and recycled at the refinery after clean-up.

Additionally, all cargo ships have pollution potential from the hydraulic fluid that's used for the cargo derricks, hatch covers, and other deck machinery. The hydraulic machinery for the derricks required a fluid, which, in essence, is the same as automatic transmission fluid. The cherry-red-colored fluid was conspicuous next to the diesel fuel on the water, even though only a couple hundred gallons were spilled.

Endnotes:

1. For simple visualization, the total spillage of 1,200 cubic feet of oil amounts to one foot of oil on the floor of a 1,200-square-foot house. A typical (250-gallon) home heating oil tank for a small house is only 33 cubic feet (7.5 gallons in a cubic foot). If a full household tank leaks its entire content onto the basement floor, the flooding will only be five-sixteenths of an inch (8 millimeters) deep.
2. The function of a tank vent is to prevent pressure and vacuum from developing in the tank. The check valve (in the goose-neck vent) will prevent water from entering the tank provided that the ship sinks upright.
3. "Free communication" is a term usually used in the context of a ship with a hole or crack in a tank. Here, the communication (of water in and oil and water out of the tank) is somewhat restricted by the presence of the dysfunctional ball in the gooseneck.
4. Small tug boats and other work boats use the same (diesel) fuel in both the propulsion and generator engines.

ship and its people in the water. All hands on the wharf grabbed their cell phones. In addition to the Coast Guard, the Marine Unit of Albany Fire and Rescue, and a Good Samaritan vessel, a tug that had been moored less than a quarter mile downriver, responded quickly. Meanwhile, workers on the wharf used a shoreside crane to pull people out of the water.

Tragically, all three of the men stuck in the cargo hold either drowned or died of hypothermia. Everyone else was pulled out of the water alive. Five of these people had to be treated for injuries. One real lesson learned was that there was no need for anyone to have been in the hold. Crewmen who weren't directly engaged in the loading operation should not have been on the ship, especially considering that the crew had all night to secure the cargo for sea. The ship would have been in port the next morning to load the rotor for the heavier generator.

The Aftermath

The refloating operation took three weeks for the ship to float upright. The salvage company needed two barges with a large crane on each. In spite of the ship's small size, this operation was not without grave difficulty. With the exception of the house and engine room, this little ship was all cargo hold, and all of it was full of water, since the ship was on its port side on the bottom.

The group planned to get the hatch covers back on as quickly as possible so the hold could be dewatered. The hatch covers were the type put on in sections, using the ship's derricks. This created greater difficulty, as the hatch-cover sections were hollow and had a tendency to float while the salvage crew worked to install them in the miserably cold weather conditions. With cutting torches, the salvage crew burned holes in the sections so they could fill with water and sink as they were manhandled into place by people and machines. Fortunately, the pumps discharged at a faster rate than the inflow of river water, and the dewatering operation was a success.

With divers in the water, boats were able to get wire slings around both of the derricks' masts and the two cranes (aboard the barges) took a strain. Imagine a ship being picked up like a boat that sank in a marina, except that these were big cranes. The ship maintained a severe 20° list through the remainder of the dewatering operation. Finally, the ship floated upright and it was safe enough for the representatives of the insurance underwriters to go aboard. There was a coating of oil everywhere and people had to be extremely cautious with every step.[7] The two generators, one in the hold, the other on the bottom of the Hudson River, were recovered, and the barge cranes were able to get them onto the wharf. The owner was paid an appropriate settlement for the damage to the ship, and the remaining fuel was sold locally.

In May of 2004, the Albany Maritime Ministry held a memorial service for the three men who perished. A ceremonial gravestone with their names and the name of their ship was placed in a park adjacent to the Port of Albany.

About the author:
Captain Brendan Saburn has held the rank of captain in the Navy Reserve since 2006. In civilian employment, he's an analyst of maritime safety data in the Office of Investigations & Analysis at Coast Guard headquarters. Prior to this position, he spent five years at the Coast Guard's National Maritime Center, where he was a recognized subject matter expert, specializing in the material used on exams for prospective merchant marine deck officers and other vessel operators. Formerly, and for a number of years, he was an instructor of celestial navigation and other nautical sciences. The Coast Guard issued him the merchant marine license "master of vessels of any gross tons upon oceans" in 1999.

Acknowledgement:
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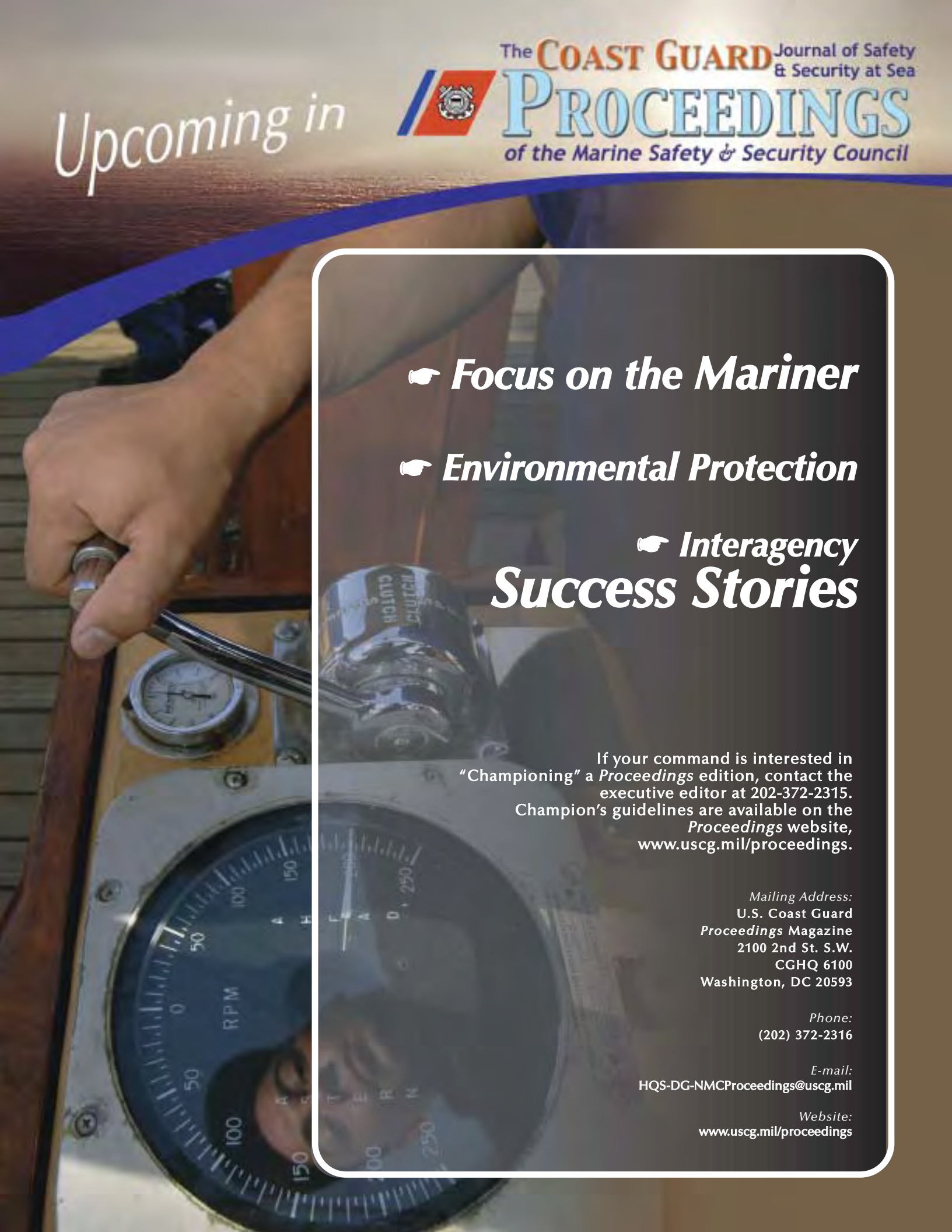
Endnotes:

1. Technically, this was the main body assembly of the generator—the (stationary) stator and its solid framework. Its rotor would not be included since it would be loaded separately, later in the operation.
2. The International Maritime Organization is the bureaucratic maker and overseer of stability requirements for ships via Safety of Life at Sea Regulations: SOLAS Chapter II-1. Governmental regulation enforcement agencies [i.e., the U.S. Coast Guard and its counterparts in other nations and their cooperative classification societies in seapower nations, such as the American Bureau of Shipping (U.S.), Bureau Veritas (France), Det Norske Veritas (Norway), Lloyds (U.K.)] are the on-site overseers to ensure that ships are built and equipped as required.
3. "Deadweight tonnage" (dwt) is the measure of the ship's cargo-carrying capacity in terms of weight. This tonnage is the weight that will immerse the ship to its maximum permissible draft, and includes the weight of the ship's fuel, water, and stores. This ship's dwt was only 2,760 tons.
4. A ship's waterplane is the two-dimensional area of the horizontal plane formed by the ship at the surface of the water in which the ship is floating. It is simply the outline of the hull at the water's surface, as viewed from above. The overall waterplane, in this case, includes the pontoon's waterplane.
5. This ship had three 150-ton-per-hour ballast pumps. If all three are discharging to the same tank, 2,000 gallons per minute is theoretically pumped. This can only be done in theory, due to the physical constraint of the pipes and valves. Realistically, the flow rate is more like 200 to 250 tons per hour with two of the three pumps online. It's imperative that the swing ballast doesn't get ahead of the load, so that the ship doesn't start to return to its upright position too quickly, which could result in the ship suddenly listing to its outboard side. This could be something of a moot point due to the inherent constraints of the piping system.
6. An unstable ship can list either way regardless of which side of the ship has more weight, and there is no physical tendency for the ship to return to the upright position. A ship in such a state is said to be listing at an angle of loll.
7. A merchant ship's cargo is insured separately from the ship itself. Therefore, there are two concerned underwriter parties. The owner has hull and machinery insurance on the ship; analogous to comprehensive insurance on a motor vehicle. Protection and indemnity insurance on cargo is usually purchased by the party to whom it's being delivered, unless other arrangements are made.



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Safety Is No Accident

Cruise industry emergency response preparedness, capabilities, and procedures.

by Captain Ted Thompson (USCG, Ret.)
Senior Vice President, Technical and Regulatory Affairs
Cruise Lines International Association

Commander Stanford Deno (USCG, Ret.)
Director of Operations, Cruise Lines International Association

The overnight cruise vacation continues to be one of the fastest-growing and most enjoyed experiences of the American public. Over the past decade, cruise ships have carried more than a hundred million vacationers to exotic ports around the world and in the United States. One reason for the phenomenal growth in this industry is because of its record as one of the safest modes of transportation available. The member cruise ship operators of the Cruise Lines International Association (CLIA) make an onboard safety culture one of their highest priorities. In addition to preventing accidents, CLIA companies work closely and proactively

The *Nautica* is a typical modern small cruise ship.

with the United States Coast Guard and other response agencies internationally and locally to assure that a response to any onboard emergency is fast, efficient, and well coordinated.

The Cruise Lines International Association, having merged with the International Council of Cruise Lines (ICCL) early in 2007, is an industry association that represents the interests of dozens of cruise ship operators, both American flag and non-American flag, that call on over 600 ports around the world and most major ports of the United States and Canada. CLIA members operate nearly 200 cruise ships. Additionally, CLIA is supported by more than 16,500 travel agent professionals and strategic industry partners such as shipyards, service and supply organizations, and insurers.

It is interesting to note that any incident or accident to a passenger ship is attributed to "the cruise industry" whether or not the boat or ship was an actual cruise ship as CLIA members understand the term. From this we see that any incident tends to "paint" the entire industry in terms of public perception and, to a certain extent, in the view of regulatory bodies. Because safety is a number one priority, CLIA works to achieve this goal for the overall industry, not only for its members.

We do this by working proactively with the U.S. Coast Guard and the International Maritime Organization (IMO), where CLIA has been granted consultative status as a non-governmental international organization. At IMO, the Cruise Lines International Association (on behalf of the industry) assists in developing global shipping regulations that promote sensible, achievable, necessary safety goals. Despite volumes of design, construction, system, and operational regulations; endless training; and well-qualified mariners, parts do break and accidents do happen. Sometimes, these incidents result in a medical evacuation or an emergency response situation that could involve actual search and rescue (SAR) operations. Recognizing this possibility, the cruise industry and CLIA also work closely with response organizations to prepare for such an event.

Preparation for a Major SAR Event

There is a saying that "those that fail to prepare, prepare to fail." As in any endeavor, the key to success is planning, and this is no less true for emergency response. In this case, planning starts with CLIA participation in setting the rules for ships that assist bringing an emergency response to a successful conclusion. In participating at the IMO Communications and Search and Rescue Subcommittee as well as the joint International Civil Aviation Organization and IMO working group on harmonization of aeronautical and maritime search and rescue, CLIA assists in setting standards for such things as ship search and rescue plans, communications equipment and protocols-and lifesaving equipment.

In the not too distant past, IMO amended SOLAS Chapter V Regulation 7-3 to require that "all passenger ships … shall have onboard a plan for co-operation with appropriate search and rescue services in the event of an emergency." In general, these plans include ship and operator contact information, ship deck plans, communications plans, lifesaving equipment onboard, number of passengers, crew permitted, and other descriptive information that will assist in an emergency. These plans are to be filed with a SAR service provider so as to be available to search and rescue authorities. Certainly local Coast Guard offices and community response organizations should be aware of the availability and location of this information and access it for drills and actual response operations.

Cruise Operator Response Operations

With minor differences to account for individual company policies, the number of ships they operate, and varied itineraries, cruise ship operators respond to major incidents in essentially the same manner. In general, if a situation is developing and it is not an emergency that requires immediate response by rescue services, a ship will initially notify the company and the company will then notify the Coast Guard. In the event of an immediate or rapidly developing situation, the ship will normally notify the company and the Coast Guard concurrently.

In any event, the company will establish an open communication line with the ship for as long as a response to the situation requires. If necessary, additional continuously open communication lines will also be established. Most cruise ships nowadays have ready access to satellite communications anywhere in the world. The company will also establish a continuously open and manned communications line with the Coast Guard SAR center or emergency operations center (EOC) as soon as that center is able and ready to handle such continuous communications (Figure 1).

Upon notification of a major incident, the company's first steps determine important information, including:

- nature of the casualty: fire, flooding, collision, grounding, etc.;
- survivability of the ship: is evacuation neces-

Figure 1: Each Cruise Lines International Association operating company has an emergency operations center, such as the one pictured here.

sary? When, where, how? Are external resources available?
- injuries—number and severity;
- need for immediate assistance;
- weather;
- environmental conditions;
- pollution incidence;
- damage control and/or pollution mitigation actions;
- notifications made by the ship.

At the same time, the senior management is notified and the company incident response team is recalled to activate the emergency response center, or EOC. The company "away team" is activated and preparations are made to dispatch this group of experts to the ship or its next port of call. Also, one or more company representatives is sent to the unified command location to participate with the local agents representing the ship and company.

It is important to note that the vast majority of cruise ship incidents, no matter how severe, last only a matter of hours before the incident is under control and resolved. Thus, it is important to establish rapid and efficient communications among the cruise operating company, the "incident owner," and the multiple response organizations that make up the unified command structure. Because of this, and because the company offices of the ship operator will normally be located far from the site of the incident due to extensive ship itineraries, efficient communications must be established quickly and maintained throughout the event.

Normally the local ships' agent is the initial onsite representative for the operator, but continuously manned open lines should be maintained between the unified command/command center and the operating company and between the operating company and the ship that is in distress. Video conferencing should also be considered between the command center and the operator. With this in mind, numerous cruise companies and the U.S. Coast Guard (primarily District 17, located in Juneau, Alaska) are exploring and testing online real-time incident management utilizing the World Wide Web. This technology has tremendous potential, and its development should be fully supported.

Emergency Operations Center

Each Cruise Lines International Association operating company has an emergency operations center, which, in general, will be arranged along the lines discussed below. Some may call it by a different name (such as "emergency response center") and have a slightly different organization, but, in general, they all serve the same functions.

These centers are normally made up of:

- **A team leader:** Normally, a vessel master and the director of overall response. Directs interface with the unified command and keeps the company management informed.
- **Communicator:** Establishes and maintains the communication link among the ship, the EOC, and the unified command. All open lines of communication either go through the commu-

nicator or are coordinated by the communicator and his or her team.

- **Marine representative:** Primary company SAR contact and the person in charge of contacts with the local Coast Guard response operations command, the ship's flag state, tug assistance, salvage contractors, ports, and security from the marine perspective. In some cases, a naval architect may be a part of this team to address stability and structural strength matters.
- **Technical representative:** Contact for the ship's classification society (such as Lloyd's, ABS, or DNV), P&I club, and underwriter's representatives. Also the liaison to the damage stability assessment contractor. This position also coordinates technical advice, spare parts, technicians, and repair facilities.
- **Environmental representative:** Coordinates and directs any environmental response; environmental impact assessment and remedial response, such as reef repair; and all other environmental aspects.
- **Medical representative:** Provides medical advice, coordinates participation of remote medical facilities, and oversees tracking of all injured persons and their disposition to hospitals or other medical facilities. Also coordinates fatality reception and repatriation.
- **Passenger and crew representative:** Gathers and maintains next-of-kin information and tracks passengers and crew as they are moved to hotels, transported home, or provided other accommodation/transportation. Provides information to the crew and passengers on arrangements for necessary travel, facilities, and accommodation ashore.
- **Media representative:** Gathers information and facts to prepare press releases. Coordinates with the joint information center when established and coordinates other media activities for the company. Also serves as liaison to management to provide spokespersons and expert commentary.
- **Family assistance:** Provides 1-800 call-in information for family and friends of passengers and crew. Responsible for disseminating information on passengers and crew, as permitted, to families. Provides information and support to the care team, which provides support for passengers and crew onsite, including resources, accommodations, counseling, etc., and also supports families who may travel to the scene. Care is really the same as family assistance. As a note, CLIA member operators regularly send these representatives to the National Transportation Safety Board (NTSB) Academy, the NTSB family assistance training course, and other international or national family assistance training programs and seminars.
- **Support staff:** This team assures that the EOC members have the information and equipment that they need and that all systems are functioning. Research staff will provide background, technical, legal, and media information as needed by the emergency operations center.
- **Logistics:** Provides hotel and transportation support and coordinates with other cruise lines, tour companies, and shore excursion companies to make arrangements for lodging, feeding, clothing, day-to-day personal supplies, and transportation home. It should be noted that an incident that will take a ship out of service not only involves responding to that particular incident, but also involves future cruise itineraries of that ship and possibly other vessels in the fleet. Passengers on future itineraries that may be canceled must be notified and alternative arrangements must be made. In the event a ship remains in service, but has a reduced capacity or must utilize a different embarkation or disembarkation port than originally planned, all guests and crew changes must be coordinated accordingly.
- **Specialists:** This group may include representatives from the USCG and/or other response or law enforcement agencies and security specialists to coordinate this aspect of a response and other special circumstances that may be part of any given response. It has been found through exercises and actual incident experience that having a local Coast Guard representative in a company's emergency operations center provides valuable assistance. For example, interpreting jargon that is harmful to any organization can be critical to any emergency response operation.
- **EOC coordinator:** The coordinator has the important task of ensuring the efficient operation of the emergency operations center to assure a coordinated and effective response. The EOC coordinator facilitates any special needs of the emergency operations center staff.

Drills and Exercises

Drills and exercises of emergency response plans and organizations are not only required by SOLAS Chapter V, the ISPS code, and other regulations. It is also prudent for any organization to test response capabilities through drills and exercises to highlight any weaknesses in planning, organization, communications, or support functions so that there can be continuous improvement.

CLIA members exercise regularly within their own organizations, but also with the Coast Guard and local communities. These evolutions run the spectrum from shipboard courtesy familiarization visits, to tabletops, to command post exercises. Occasionally a field exercise is held with an actual cruise ship; however, this is extremely difficult due to tight cruise ship schedules, liability issues regarding passengers, and the desire to avoid interrupting passengers' vacations while the ship participates in an exercise. The industry has looked at the possibility of a field exercise involving limited participation of an actual ship during a return to its "home" port after a drydocking and shipyard availability. However, these opportunities, utilizing Coast Guard or company personnel as exercise players (evacuating passengers, mock injuries, etc.), have been hampered by Passenger Services Act interpretations.[1]

One should not be left with the impression, however, that the cruise industry, Coast Guard, and other agencies do not conduct frequent, complex, and intense exercises. All responsible organizations believe in the adage that an emergency situation is not the time when you want to first meet your response counterpart. Cruise Lines International Association continually encourages its members and government partners to meet and communicate on a regular basis.

One issue that we have witnessed in numerous exercises and exercise planning meetings is that there is little understanding of the construction and self-help capabilities of the cruise ships themselves, and the response capabilities and procedures of the industry. This is one of the main reasons for presenting this discussion. Additionally, it has been noted that there is a general lack of understanding among the federal, state, and local agencies as to their respective rolls in responding

TABLETOP EXERCISE

Alaska Cruise Ship Mass Rescue Exercise 2001

A tabletop exercise enacted in Sitka, Alaska, uses a gaming board to bring realism to the exercise and take into account the capabilities of the ship and response elements in relation to their actual locations, weather, and response capabilities.

During this exercise, participants play out the scenario in turns that represent one hour of actual time. Realistic complications are incorporated into the rules of play.

The gaming concept, which was developed in 2001 by Mr. Thomas M. Deely and Mr. Cecil McNutt at the Coast Guard 17th District in Juneau, Alaska, allows participants to see the evolving results of their combined actions to answer such questions as "How long is it going to take to get everyone to shore?" Participants adjust their tactics as play continues in order to improve the final outcome.

Scenario simulates a cruise ship grounding on Vitskari Rocks, just outside of Sitka, Alaska. Navigation channels are depicted with one nautical mile movement spaces. Green and red boxes were used to track hourly resource movements (i.e. each turn, assets move from green to red to denote turn completion).

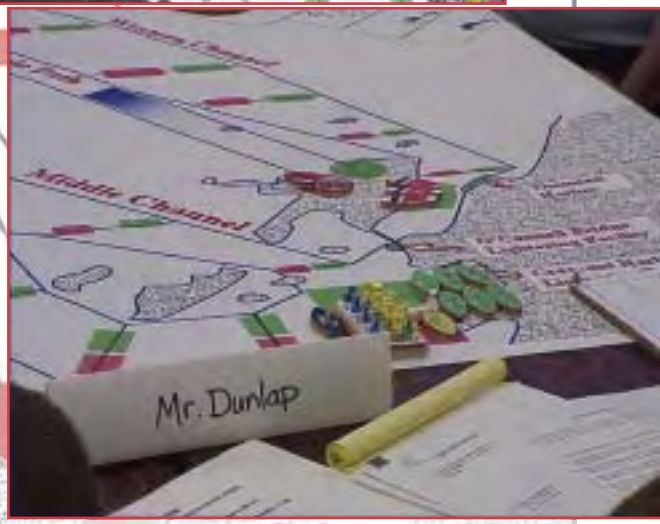
Photos courtesy of Captain Ed Page (USCG, Ret.); Mr. Thomas Deely, USCG District 17; and Mr. Cecil McNutt, USCG District 17.

While there may be numerous specific objectives in any given exercise, there are essentially four reasons to conduct an exercise:

1. *to establish and test communications capabilities and interoperability;*
2. *to execute pre-established response plans of the various parties and their interoperability;*
3. *to identify and test the authorities, jurisdictions, and resources of each participant in order to determine conflicts, duplications, voids, or inconsistencies;*
4. *to improve upon each of the above in order to improve overall coordination and effectiveness of response to any emergency situation.*

This exercise examines the actions needed to safely manage a major casualty involving more than 2,000 passengers and crew, with several injuries.

The game board simulates a cruise ship grounding on Vitskari Rocks, just outside of Sitka, Alaska. Navigation channels are depicted with one-nautical-mile movement spaces. Green and red boxes are used to track hourly resource movements.



Each simulation piece is color-coded to signify which player controls them. Colored pins represent personnel groupings for transport (for example, yellow pins symbolize 50 passengers). Groupings include crew, passengers, medical staff, and injured persons.

Lifeboat tenders and lifeboats at the dock in Sitka, Alaska, having just transported the majority of the passengers to shore. The number of passengers rescued after three turns (three simulated hours) is shown by yellow and red pins on the status board.

to a cruise ship incident. This appears to be improving in areas where there have been, and continue to be, numerous local exercises and ship visits, such as in Alaska and Miami. This is also improving now that cruise ships are being homeported in more locations. However, two things hinder this progress: 1) the transfer and promotion of government personnel, and 2) the inability of a limited number of cruise line operators to participate in the number of local exercises that would be needed to allow each location to gain and maintain a high level of currency for this type of response.

Two types of tabletop exercises have been used effectively to overcome this matter, especially where all the players are able to gather once every few years. The first type is what we would refer to as a "stop and go" tabletop exercise, where a scenario is presented and taken to a certain point. Then, the exercise is stopped and each player is invited to introduce themselves and their organization and describe their interests, jurisdictions, authorities, resources, and actions they would be taking to this point.

The scenario then progresses to a future point or major event. The process is repeated to determine how these interests, jurisdictions, authorities, etc., have either changed or created new issues inserted into the event. Open discussion at each stopping point is also beneficial. This is a particularly interesting way to track the evolution of the involvement of the various players, especially if a scenario is played first as an accident and then secondly using a terrorist action as the initiating event.

The second type of tabletop exercise combines the above discussion on the first day, then continues on the second day using the discussed scenario. A gaming board that was developed by Mr. Cecil McNutt and Mr. Mitch Deely at the Coast Guard 17th District in Juneau, Alaska, facilitates this type of exercise (see sidebar).

A logical next step from this type of tabletop exercise can be a command post exercise or even a limited field exercise. It has been our observation that if either of these is undertaken without the benchmarking and basic information gained by the tabletop discussion/exercise, then confusion regarding these basic issues is a primary factor, and the lessons learned will be similar to those learned from other exercises in the same or other locations. A key component for the industry from each is lessons learned. Cruise lines are required by their safety management systems (required by the International Safety Management Code) to correct issues of safety that are identified as needing correction.

Lessons learned must result in some action for both the industry and government. If no action is taken, then the same issues will surface in the next exercise and the lesson was not really learned. CLIA and the USCG's passenger vessel safety specialists at the Coast Guard districts are working closely to ensure continuous improvement in response management for both industry and government.

The goal of the CLIA cruise ship operators is to provide a safe, secure, and healthy vacation experience to everyone. In the event something does go wrong, however, each operator is committed to a rapid, efficient response that is effectively coordinated with each responding party through the use of the unified incident command concept.

Cruise Lines International Association member lines believe cooperation and interaction in response preparedness activities is critical to overall safety and success. The cruise industry has had a formal partnership with the USCG since 1997 through its association with CLIA. Continued cooperation in this partnership will ensure response operations that are effective and meet the needs of both the industry and emergency response organizations.

About the authors:
Captain Ted Thompson (USCG, Ret.) is senior vice president of the Cruise Lines International Association, a Fort Lauderdale, Fla.-based trade association dedicated to the promotion and growth of the cruise industry. He coordinates the association work regarding technical items including international safety, security, environmental protection regulations, and regulatory oversight. Captain Thompson retired from the U.S. Coast Guard in 1995 after 27 years of active duty.

Commander Stan Deno (USCG, Ret.) is the director of operations for the Cruise Lines International Association. His work with the association encompasses operational matters including international security, safety, training, and regulatory oversight. Commander Deno retired from the U.S. Coast Guard in 1998 after 22 years of active duty.

Acknowledgement:
The authors wish to thank Mr. Paul Debnam for developing the PowerPoint discussion that provided the basis for the emergency response center discussion.

Endnote:
1. The Passenger Services Act, 46 App. USC 289, enacted in 1886, requires the transportation of passengers between U.S. points on vessels that are US-built, US-citizen owned and US-documented by the USCG for such carriage.

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Reader's Survey

A Delicate Balance

Cargo, language, and logistics challenge inspectors and investigators responding to a flooded, fractured, deteriorating vessel.

by CDR Kathy Moore
Chief, Prevention Department, U.S. Coast Guard Sector Honolulu

In December of 2006, the M/V *Tong Cheng* departed South Korea bound for the Caribbean via the Panama Canal. Three days into the voyage, heavy weather damaged the fully loaded vessel, flooding its number two cargo hold. Twenty-six officers and crewmembers spent the following three weeks battling the flooding as they crossed the storm-tossed Pacific Ocean. As the situation further deteriorated, they diverted toward Hawaii with plans to make temporary repairs. What followed was a two-month response effort to save the lives of the crew, prevent the vessel from sinking, prevent its fuel from soiling the pristine coasts of Hawaii, and allow crewmembers to make repairs sufficient enough to take to the Pacific once again.

The Vessel Voyage and Initial Distress

The vessel is an 11,959-gross-ton, 485-foot general cargo vessel delivered in Japan in 1977. The Chinese-flagged and owned ship has four cargo holds, each with a "'tween deck," and the ship also carries deck cargo. The sides of the vessel's cargo holds are common with the sideshell, and the bottom of each hold is common with tank tops for ballast tanks (port and starboard) and a centerline double-bottom fuel tank. The ship is geared with five cargo cranes (twin cranes over cargo hold four) and is classed by the Chinese Classification Society, who had last visited the vessel during its last dry docking January 8-22, 2006. All documents for the vessel were current, with the exception of a certificate of financial responsibility, which was obtained by the vessel's management company by the order of the Coast Guard captain of the port in Honolulu after the decision to divert to a U.S. port for repairs.

The vessel loaded cargo in several Chinese ports and Busan, South Korea, before embarking for Cuba and other Caribbean ports via the Panama Canal. It sailed out of South Korea with 26 crewmembers, all from China, on December 23, 2006. On December 26, 2006, the vessel encountered heavy weather in which waves stove in three containers on deck and dislodged other cargo. The ship also lost the six-person life raft stowed on the bow. The ship's logs did not report any hull damage to the number two cargo hold at this time, but the master later reported the vessel suffered damage during this storm that ultimately resulted in severe flooding in the hold.

The vessel proceeded toward the Panama Canal until January 12, 2007. At that time, the flooding was so severe that the master determined he needed to divert to Honolulu, Hawaii, for emergency repairs. Prior to January 12, the cargo vessels M/V *You Yoe* and M/V *Bao en Chang* began to escort the *Tong Cheng*. The vessel's agent advised Sector Honolulu of the vessel's perilous condition by e-mail. Specifically, the master reported a 70-centimeter fracture at the bottom of the port side hull plating between frames 125 and 126 in the number two cargo hold, and that the lower number two cargo hold was full of seawater (Figure 1). He also re-

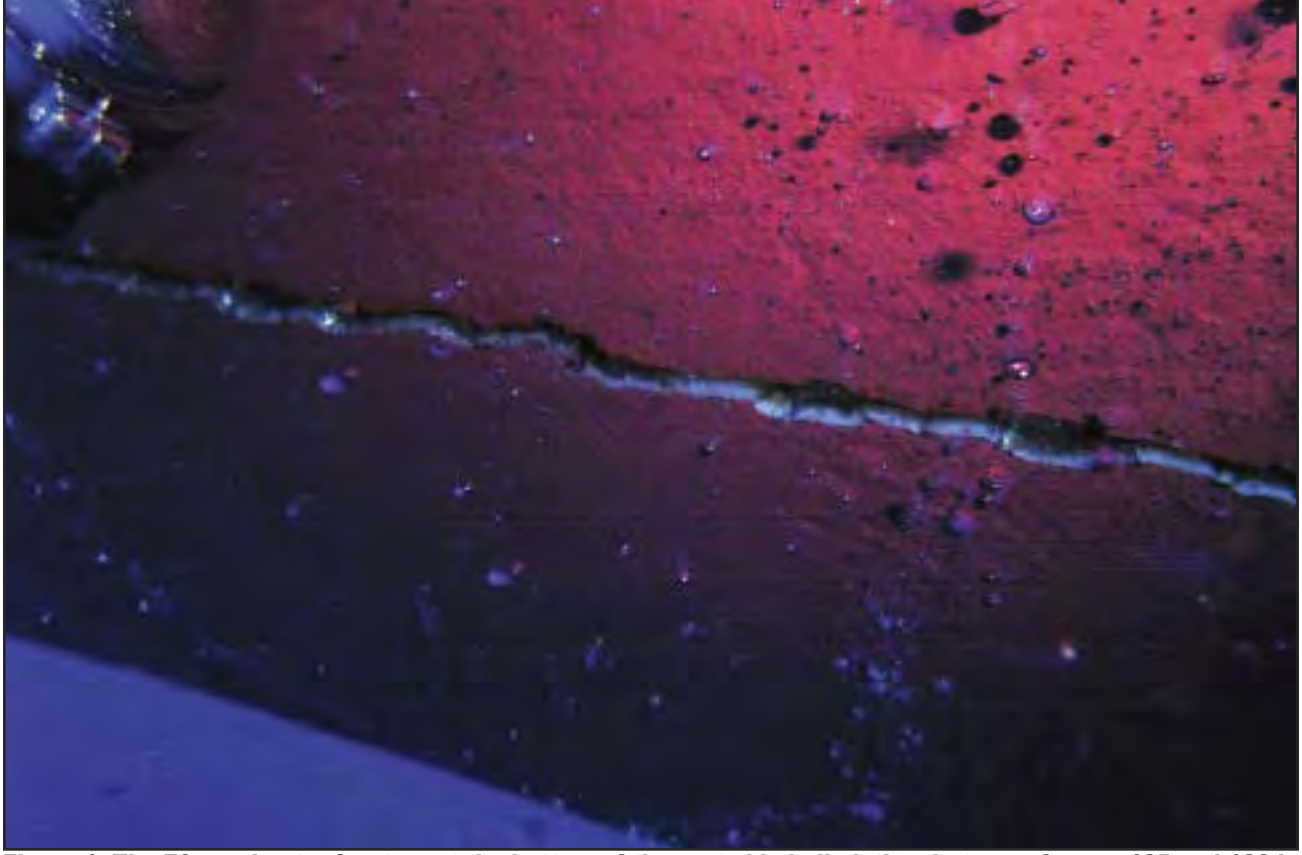

Figure 1: The 70-centimeter fracture at the bottom of the port side hull plating, between frames 125 and 126 in the number two cargo hold. Photo courtesy of the U.S. Navy's Mobile Dive and Salvage Unit 1.

ported the vessel's position and a speed of 7.5 knots. Once notified, the Coast Guard captain of the port (COTP) at Sector Honolulu asked a number of questions concerning cargo, prior dry docking, and structural inspection and required the vessel to begin to sound all cargo, ballast, and fuel tanks every four hours. In addition, the Coast Guard requested a cargo block diagram to assess the vessel's stability in its damaged condition.

As several days passed, news of the vessel's progress and condition continued to raise concern. Its speed decreased to about five knots, and fuels onboard totaled 140,000 gallons, posing a significant risk to the pristine beaches and marine life of the Hawaiian Islands. By January 13, the vessel's pumps could no longer keep up with seawater flooding into the hold.

Other circumstances complicated matters even further. For example, Cuba was a receiving port for military cargo being shipped from China—the ship was therefore subject to a U.S. embargo and prevented from entering a U.S. port under law. In addition, 13 containers were listed as "unspecified cargo" and could not be eliminated as a security threat.

The vessel's damaged condition and uncertain stability led the captain of the port to assemble decision makers and initiate a unified command to coordinate the response to the stricken vessel using the Incident Command System, as directed by the National Response Plan.

The COTP directed the vessel to remain 70 nautical miles away from Hawaii and be assessed by a team of two inspectors and a pollution investigator. A translator assisted with communications with the Chinese crew. The location was chosen as a balance among various factors. One security concern was the many unresolved questions concerning the vessel's cargo and manifest. Another set of factors revolved around the desire to keep the vessel well away from the Hawaiian Islands in the event of the vessel's loss and follow-on discharge of fuel, while also attempting to account for the range of the Coast Guard's rescue assets necessary to save the lives of crew.

Interception

On January 17, a C-130 from Air Station Barber's Point overflew the casualty (Figure 2) and discovered the vessel was trailing a sheen two to three nautical miles long. Coast Guard buoy tender CGC *Walnut* intercepted the vessel and its escorts and the assessment team transferred to the *Tong Cheng* to assess the vessel's condition. Along with the damage and flooded hold and compartment soundings, the inspectors also wanted to assess where the sheen had originated from and the vessel's overall compliance with international treaties and U.S. port state control requirements. The team was

Figure 2: M/V *Tong Cheng*, underway with flooded number two cargo hold in the Pacific Ocean on January 17, 2007. USCG photo.

augmented by a surveyor from the vessel's classification society. The surveyor's stay was brief, so he was not able to inspect the forward bulkhead of the damaged hold—the area of greatest concern. Coast Guard naval architects from the salvage engineering response team calculated that as little as nine feet of seawater in cargo hold number one would cause the vessel to sink by the bow. As a result of these and other uncertainties, the COTP ordered the vessel to remain offshore for further evaluation.

The assessment team identified the extreme fatigue of the crew as a further concern. The vessel had suffered damage from heavy weather nearly three weeks prior. Steaming across the Pacific while dealing with flooding, a hull fracture, and deteriorating stability had taken a heavy toll on officers and crew. The assessment team spent 12-13 hours on board the first day, sounding tanks and tracing piping systems, to identify the source of the sheen. They discovered water had entered the number two double-bottom fuel tank and the diesel had entered the flooded cargo hold. The diesel had then been pumped overboard during dewatering, creating the sheen. After the ship stopped pumping the contaminated water from the flooded hold, the sheen stopped and dissipated.

The team identified two possible mechanisms by which the diesel entered the hold. Either the tank top between the double bottom and cargo hold had suffered a fracture, or a vent line from the fuel tank that passed through the flooded hold had been compromised. Cargo in the damaged hold included plywood in stacks banded by metal straps, steel pipe in bundles, magnesium carbonate in bags, polyvinyl chloride resin sand in bags, ornamental iron in cardboard boxes, paraffin wax in cardboard boxes, and diesel engines and parts stowed in the upper cargo hold above the 'tween deck hatches. Seawater had been in the hold for two weeks, and much of the cargo had either been dislodged during the original storm or been loosed as a result of the flooding. It seemed conceivable that the cargo moving as a result of the seawater in the hold may have damaged the vent line. Inspectors later discovered the vent line was holed due to corrosion (Figure 3), and water entered the fuel tank once it reached the top of the lower cargo hold.

When discussing circumstances with the crew, the chief mate told the assessment team the damage consisted of four fractures. The main fracture was 70 centimeters long, horizontal and situated just above where the tank top of the double bottom ballast tank and the hull plating between frames 125 and 126. As well, three additional fractures 10-15 cm in length (two vertical and one horizontal), were all one-half meter above the main fracture and centered on the plate in way of the frames. The discussions between the inspectors and the vessel crew while the vessel was still offshore were critical to getting good quality information on the vessel's condition back to the unified command, as well as to salvage engineers responsible for monitoring the vessel's stability.

Assessing the Damage

Because of the language barrier with the crew, the assessment team couldn't determine how the crew could be so certain of the description of the cracks due to the cargo in the hold and the flooding. The need to make an offshore dive survey of the vessel became paramount in order to resolve at least some of the questions concerning the damage and structural condition. The unified command was fortunate to have the services of the Navy's Mobile Dive and Salvage Unit One, (MDSU 1). This team is one of two teams in the nation charged with providing mobile ship salvage, towing, damage repair, deep ocean and harbor recovery, and underwater ship repair in support of the U.S. Navy.

The MDSU 1 team made a dive to assess the damage to the port side of the ship. The onboard inspectors were a critical element in the coordinating the dive, as it was necessary to bring the ship to a full stop in the open ocean and tag out every piece of gear or pump that could pose a safety risk to the divers. The amount of

coordination was also critical because the dive was performed in an 8- to 10-foot swell, which posed a significant risk to the vessel's stability if left too long without power in the seaway in its flooded condition.

On January 20, 2007, two of the Navy's finest divers entered the water once the vessel was made safe. The dive confirmed the first mate's description of the damage, but the main crack now measured nearly a meter. As well, the ancillary fractures .5 meter above the main fracture were found to be along a butt weld between two plates. The fractures—previously disconnected horizontal and vertical—were found to be connected and now had diagonal components that ran up into the adjacent plate. To make progress in bailing out the hold and improve the vessel's stability, a plan was made to attempt a temporary epoxy-based patch to stem the flooding. Once the patch was completed, the master began to dewater the hold. Shortly after pumping began, the vessel's pumps clogged with cargo and debris. To further complicate matters, pumping from above was limited by cargo obstructing access to the lower hold as well as the fact that the above space had been determined unsafe for entry.

Anchorage: Preparations for Port Entry

At this point, the unified command engaged with the maritime operational threat response agencies to begin to make further arrangements for the vessel to be able to enter U.S. waters and come safely to anchorage. One issue involved hashing out agreements concerning the fate of the vessel's schedule and cargo as it pertained to existing U.S. law. The vessel was instructed to proceed to a rendezvous location to meet with U.S. Coast Guard forces for a security boarding. They completed the remainder of the transit into anchorage and the Coast Guard enforced a security zone around the vessel while she was at anchor. This is no small evolution, as there needed to be complete accountability for every vessel and individual visiting, surveying, pumping, diving or otherwise working on the *Tong Cheng* and the other vessels in attendance. These other vessels included a stand-by tug to take the casualty to sea should there be catastrophic flooding; an oil-spill response vessel standing by for clean up of any fuel released; the tank barge and its attending tug, which received the contents of the flooded cargo hold; and dive support vessels that worked on two dive operations, sometimes simultaneously (Figure 4).

The epoxy patch ensured that the vessel would be permitted to transit to anchorage. However, to reduce the pressure on the forward bulkhead of cargo hold two and raise the bow of the vessel to less than the maximum draft permitted to enter Barber's Point, Kalaeloa Harbor, sufficiently dewatering the cargo hold was a priority. While the epoxy patch applied offshore stopped the ingress of water, cargo dislodged in the course of the flooding quickly plugged the vessel's bilge/ballast piping and pumps and prevented any significant dewatering of the hold prior to entering the anchorage.

To remedy this, a more robust patch—a vacuum box, or coffer dam—was designed and installed over the first two days at anchorage (Figure 5). One challenge: the damage was adjacent to the turn of the bilge, and the double-bottom tank on the port side could not be welded because diesel could have entered the tank. This meant that welding brackets for the vacuum box were limited to the areas of the box that overlapped the cargo hold and did not include the box at the turn of the bilge.

Inspectors and naval architects monitored the flooding in the hold, draft, and hull stresses while Navy divers utilized "hot taps" to pump the contents of the hold into the tank barge. Hot taps are valve and pipe fixtures that can be affixed below the water line straight through the sideshell of a vessel to allow the contents of the vessel to be removed without leaking into the ocean environ-

Figure 3: The "holed" fuel tank vent line in the number two cargo hold. USCG photo.

ment. Several taps had to be performed to complete the job, and the suspended PVC resin, wood fragments, and wax in the cargo presented incredible obstacles to pump teams, who had to take pumps offline and clear them nearly every 45 minutes to an hour. After several days, the hold was dewatered sufficiently for the vessel to safely make an entry into Kalaeloa Harbor at Barber's Point. Preparations were made to ensure security shoreside and on the water within the harbor, and the vessel was brought to the pier without incident.

While the emergency phase of the response concluded with the ship safely at the pier, inspection and investigation activity began in earnest as cargo was removed from the vessel to inspect for damage and plan and carry out repairs. Of note throughout this evolution was the incredible interagency cooperation that allowed these tasks to take place in the midst of all the appropriate security measures being applied to the ship and its embargoed cargo. Customs and Border Protection, the Hawaii Department of Transportation Harbors, several Coast Guard marine safety and security teams, and many of the members of Sector Honolulu worked diligently over the next six weeks of delicate cargo operations, damage assessments, and repairs.

Figure 4: Operations at anchor on the M/V *Tong Cheng*, T/B *MSRC 400*, and tug *Jimmy Smith*, on January 23, 2007. USCG photo.

Pier Side: Investigation and Repairs

As damaged cargo was removed and contaminated water pumped from the cargo hold, the extent of the damage to the vessel's side-shell became evident. Inspectors visited the vessel nearly every day to learn the latest discoveries as hull plating and structure was revealed. What was measured as a one-meter crack during an early dive was found to be 1.5 meters when the vessel arrived at anchor. Once the ship was alongside the pier, the fracture was carefully measured to ensure a proper repair and found to be 2.5 meters in length, involving the plating across nearly five frames. The main fracture followed parallel to the tank top, but the star fractures involved additional plating.

Figure 5: The 10-foot long cofferdam installed at anchorage. USCG photo.

The damage was so extensive that a second, much larger cofferdam had to be constructed to facilitate temporary repairs. Once the cargo hold was emptied and cleaned, the cause of the fracture became clear to inspectors and investigators. Despite the vessel's trip to drydock only a year before,

many of the toe brackets that tie the side shell frames into the deck at the bottom of the cargo hold were tripped and wasted (Figures 6a and 6b). In fact, six frames in a row were tripped and wasted, and the main fracture was centered in this region of the side shell.

Because this large section of plate was only tied into the tank top by the weld along the tank top, the side shell was subject to "oil-canning" in heavy seas. That is, because the side shell plating was only constrained horizontally, changes in pressure increased the stress on other surrounding areas, weakening them and setting the vessel up for fatigue fracture.

Sector Honolulu inspectors monitored repair progress daily, working closely with a host of surveyors and officials with oversight responsibilities for the work. Repair plans, cargo loading plans, and amendments were reviewed not only at Sector Honolulu, but also by the Coast Guard's traveling inspections staff and the naval architects at the Coast Guard's Marine Safety Center. Repairs included using hydraulic rams to align the fracture surfaces and welding the fractures. The tow brackets were cropped, renewed, and welded to the tank top, and the hold discovered in the fuel tank vent was repaired using a sleeve. These repairs were considered temporary until the vessel was able to return to China for drydocking.

Over the course of the Coast Guard's response to the flooded vessel, discussions were held with China (the flag state) offering cooperation in investigating the cause of the casualty. Though they were unable to provide an investigator to attend the temporary repairs in Hawaii, the flag state welcomed any photographic or statement evidence and findings of fact collected by the Coast Guard. Investigators visited the vessel on several occasions to interview the master and crew. They packaged crew statements, extensive photographs of the cargo hold, damage, and other features of the hold and forwarded them to the flag state to assist their investigation.

Over the course of two months, inspectors and investigators from Sector Honolulu contributed to the Herculean efforts of the Coast Guard and other members of the unified command in one of the most complex responses to a vessel in need of assistance. As a result of sound risk-based decision making and hard work by a host of personnel, the M/V *Tong Cheng* was able to get underway and return to her departure port. In the process, 26 lives were saved, 140,000 gallons of fuel did not enter the pristine marine ecosystem of the main Hawaiian Islands, and the effort's success contributed to good will between the U.S. and People's Republic of China.

Figure 6a. Close-up of tripped toe bracket. USCG photo.

Figure 6b. Frames and toe brackets, after repair. USCG photo.

About the author:
CDR Kathy Moore has served as chief of the Sector Honolulu Prevention Department since July 2006. Prior to entering the Coast Guard, she worked for Martin Marietta Corporation and the Naval Research Laboratory as a metallurgist. She received her commission in 1990 after graduating from direct commission officer candidate school. Her previous assignments include tours as a staff engineer, Marine Safety Center engineering division; marine inspector and marine investigator, MSO/Group Los Angeles-Long Beach; inspections department chief, MSO San Juan, Puerto Rico; environmental standards division chief, and aquatic nuisance species program manager, at USCG headquarters. CDR Moore graduated with honors from the University of Maryland with a bachelor of science in mechanical engineering. She also holds a master of science degree in engineering management from the University of Maryland and a Master of Marine Affairs degree from the University of Rhode Island. She has also authored several technical publications.

PROCEEDINGS Magazine Reader's Survey

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Summer 2007, WATERWAYS MANAGEMENT

How about "Collision" series, bearing down on what went wrong, why, and what might have been done differently given the applicable ColRegs?

Great content and very timely themes lately. Nice work! Magazine appears to be on a real upswing and a giant leap forward in professionalism and look. Real meaty content being provided by a well-rounded collection of authors and subject matter experts—not just a bunch of Coasties giving sermons. I also like the opportunity to provide and see feedback now in the magazine. Keep up the great work. BZ!

Status of LORAN C and plans for its disestablishment or continuation.

Government-specific regulations regarding pipelines.

How GPS can aid the mariner and its limitations. Why is celestial navigation still a test subject for merchant marine officers and are there are any plans to discontinue it?

Your magazine is informative and handsome!! Could you print it on a lesser quality paper to save money?

Fall 2007, BOAT FORCES

The validity of port state control in assessing the safety of an administration's merchant fleet, e.g. is there any relationship between PSC statistics and safety record in terms of ships or tonnage lost? [Would like to see] anything on the interaction between the USCG and other countries' administrations.

My disappointment in this current edition is due to the majority of articles devoted to Boat Forces ... I am not saying there shouldn't have been any Boat Force articles, but there should have been more of a tie-in to industry with how Boat Forces will help the commercial maritime industry.

I would like to see an update on the towing safety advisory committee. What has been accomplished? What is the path forward? Are there going to be third-party inspectors? How would an organization become approved to be an inspector or auditor on related regulations?

Winter 2007-08, WESTERN RIVERS

Topics I would like to be covered: Inland waters and CEMS workload.

More stuff on the cooperation between the auxiliary and active USCG.

How about writing up the activities of your OCONUS-based commands, such as U.S. Coast Guard Activities-Far East? It is an unknown commodity outside the USCG (and probably within USCG as well).

Large commercial shipping issues should be separated from small craft, boat issues. Also, I would like to see trends seen by port state control inspections on international trading vessels.

Marine accident reporting, possibly worldwide, as special insert.

I would like to see included an indicator of what the upcoming Proceedings *issues will be about.*

Your comments are anonymous, so feel free to express your opinions. However, since we won't know who sent a particular comment, please direct anything to which you'd like a reply to: HQS-DG-NMCProceedings@uscg.mil.

2007 Annual Editorial Index

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FOR COMPLETE 2007 ARTICLE INDEX, INCLUDING SUBJECT MATTER INDEX, SEE PROCEEDINGS' WEBSITE: WWW.USCG.MIL/PROCEEDINGS

Nautical Engineering Queries

Prepared by NMC Engineering Examination Team

1. Which of the listed motors will operate at the highest RPM, assuming that each operates at the same frequency?

A. a four-pole synchronous motor under normal load
B. a four-pole induction motor under no load
C. a six-pole synchronous motor under normal load
D. a six-pole induction motor under full load

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2. The most common instrument used to measure diesel engine exhaust pressure is the _____.

A. pyrometer
B. bourdon gauge
C. pneumercator
D. manometer

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3. An example of a combustible liquid is _____.

A. lube oil
B. gasoline
C. butane
D. benzene

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4. An additive used to improve the ability of a lube oil to reduce friction is known as a/an _____.

A. suppressant additive
B. dispersant additive
C. extreme pressure additive
D. ph alkaline additive

Nautical Deck Queries

Questions

Prepared by NMC Deck Examination Team

1. How is a navigation light identified on an Army Corps of Engineers navigation map?

A. name and light characteristic
B. name and miles from a reference point
C. light characteristic and miles A.H.P.
D. none of the above

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2. Which agency is authorized to assist the Coast Guard in the inspection of vessels for the suitability of loading hazardous materials?

A. the American Bureau of Shipping
B. the Environmental Protection Agency
C. the National Cargo Bureau, Inc.
D. U.S. Navy loading details

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3. INTERNATIONAL ONLY When moving from a berth alongside a quay (wharf), a vessel must sound _____.

A. three short blasts
B. a long blast
C. a prolonged blast
D. no signal is required

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4. You are preparing to load fuel oil onto a vessel of 150 gross tons constructed after June 30, 1974. Before loading, you must check that the fuel oil tank vents _____.

A. are not obstructed by on-deck cargo
B. have a fire extinguisher within the immediate area
C. have containment capacity for at least five gallons
D. are opened and the flame screen replaced

1. A. a four-pole synchronous motor under normal load

Correct Answer: The speed of a synchronous motor rotor is equal to the rotating stator flux speed, which is directly proportional to the frequency of the applied voltage, and inversely proportional to the number of stator poles. The fewer the number of stator poles, the greater the speed. Expressed mathematically: $n_r = n_s = \frac{120}{P} f_s = \frac{120}{4} f_s = 30 f_s$

where n_r = rotor speed (RPM), n_s = synchronous speed, f_s = frequency of applied voltage, and P = number of poles.

B. a four-pole induction motor under no load

Incorrect Answer: At a constant frequency, a four-pole induction motor will run faster than a six-pole induction motor or six-pole synchronous motor, but slower than a four-pole synchronous motor due to slip.

Expressed mathematically: $s = (n_s - n_a) / n_s$ where s = slip, n_s = synchronous speed, and n_a = actual speed.

Full-load slip varies from less than 1% in high hp motors to more than 6% in small hp motors.

C. a six-pole synchronous motor under normal load

Incorrect Answer: See explanation for choice A. The greater the number of stator poles, the slower the speed.

Expressed mathematically: $n_r = n_s = \frac{120}{P} f_s = \frac{120}{6} f_s = 20 f_s$

Thus, a six-pole synchronous motor will run slower than a four-pole synchronous motor or four-pole induction motor under normal load, but faster than a six-pole induction motor.

D. a six-pole induction motor under full load

Incorrect Answer: A six-pole induction motor will run slower than a four-pole induction motor or four-pole synchronous motor or six-pole synchronous motor under full load conditions.

Note: A synchronous motor is a constant speed machine in which the rotor normally rotates at the same speed as the revolving stator field (synchronous speed). An induction motor is a variable speed machine in which the rotor always rotates slower than the revolving stator field. The induction motor is the most commonly used AC motor in industry because of its simplicity and low cost. Large low-speed synchronous motors operate more efficiently than an induction motor, and are typically used as marine propulsion motors.

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2. A. pyrometer — Incorrect Answer: A pyrometer is a high temperature measuring device, and is used to monitor cylinder and/or engine exhaust temperatures.

B. bourdon gauge — Incorrect Answer: The accuracy of a bourdon tube pressure gauge diminishes below pressures of 15 psig and vacuum pressures slightly less than 14.7 psia, rendering it unsuitable for measuring the low exhaust pressures typical of diesel engines.

C. pneumercator — Incorrect Answer: A pneumercator measures liquid tank levels proportional to the height of a liquid producing static pressure.

D. manometer — Correct Answer: A manometer is a liquid column instrument that measures very accurately low pressures nearly atmospheric, and is ideal for measuring comparatively low engine exhaust pressure. In its simplest form, a manometer consists of either a straight or U-shaped tube filled with a liquid. One end of the tube is open to the atmosphere, and the other end is connected to the pressure source to be measured. The liquid reacts to the amount of pressure exerted on it and moves up or down within the tube. The pressure in a U-tube is determined by matching the difference in liquid level against a graduated scale (such as inches or millimeters of water) within the manometer.

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3. A. lube oil — Correct Answer: Lube oil is a Grade D combustible liquid. Grade D combustible liquids are those having a flash point above 80°F, but below 150°F. Grade E combustible liquids are those liquids that have a flashpoint above 150°F.

B. gasoline — Incorrect Answer: Gasoline is a Grade B flammable liquid. A Grade B flammable liquid has a Reid Vapor Pressure (RVP) between 8.5 and 14 psi, and a flash point of 80°F or lower.

C. butane — Incorrect Answer: Butane is a Grade A flammable liquid. A Grade A flammable liquid has a RVP of 14 psi or greater, and a flash point of 80°F or lower.

D. benzene — Incorrect Answer: Benzene is a Grade C flammable liquid. A Grade C flammable liquid has a RVP of 8.5 psi or less, and a flash point of 80°F or lower.

Note: A combustible liquid is any liquid which gives off flammable vapors above 80°F, and within this class of liquids are two grades, Grades D and E, which are based on flash point. A flammable liquid is any liquid which gives off flammable vapors at or below 80° F, and within this class of liquids are three grades, Grades A, B, and C, which are based on Reid Vapor Pressure and flashpoint. There is a misconception that flammable and combustible liquids burn or explode. Specifically, the vapors produced by these liquids either burn or explode in the proper amount of air.

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4. A. suppressant additive — Incorrect Answer: Suppressants are anti-foam agents added to lubricating oil.

B. dispersant additive — Incorrect Answer: Dispersant additives prevent oxidized particles from attaching to each other or the engine metal surfaces by keeping the particles suspended in the oil.

C. extreme pressure additive — Correct Answer: An extreme pressure (EP) additive is an agent utilized in lubricating oil that reacts with metal under high pressure to prevent metal-to-metal contact and thus reduces friction.

D. ph alkaline additive — Incorrect Answer: Ph alkaline additives are added to lube oil to prevent the corrosion of metal as a result of acids formed by oxidized oil substances.

1. A. name and light characteristic
Incorrect Answer: Light characteristics are not included on the navigation map, but may be found in Light List V for the Mississippi River System.

B. name and miles from a reference point
Correct Answer: On a yellow background, with black lettering, the light is identified by its name and the river mile from a reference point. For example, on the Mississippi River above Head of Passes (A.H.P.) is considered to be mile zero.

C. light characteristic and miles A.H.P.
Incorrect Answer: Above Head of Passes (A.H.P) is the reference point for the Mississippi River only. Each river has its own designated reference point.

D. none of the above
Incorrect Answer: This answer is incorrect, since answer "B" is the correct answer.

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2. A. the American Bureau of Shipping
Incorrect Answer: The American Bureau of Shipping performs surveys required for loadline assignments and is authorized to issue loadline certificates. (46 CFR 42.07-35)

B. the Environmental Protection Agency
Incorrect Answer: The Environmental Protection Agency administers the air pollution emission control program for new marine diesel engines.

C. National Cargo Bureau, Inc.
Correct Answer: 49 CFR 176.18 states that the National Cargo Bureau, Inc., is authorized to assist the Coast Guard in administering this subchapter with respect to the "inspection of vessels for suitability for loading hazardous materials."

D. U.S. Navy loading details
Incorrect Answer: U.S. Navy personnel load ordinance under guidelines set forth in naval safety instructions, and do not provide inspection assistance to the Coast Guard.

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3. A. three short blasts
Incorrect Answer: Rule 34(a), both international and inland, states that three short blasts indicates "I am operating astern propulsion."

B. a long blast
Incorrect Answer: The term "a long blast" is not defined in these rules, vice the term "a prolonged blast."

C. a prolonged blast
Incorrect Answer: Inland only, Rule 34(g) states when a power-driven vessel is leaving a dock or berth, she shall sound one prolonged blast.

D. no signal is required
Correct Answer: There is no international rule requiring a sound signal for a vessel leaving a dock or berth. This should not be confused with a vessel operating in astern propulsion.

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4. A. are not obstructed by on-deck cargo
Incorrect Answer: Although it is prudent to have access to fuel oil tank vents in the event of an overflow, this is not a regulatory requirement.

B. have a fire extinguisher within the immediate area
Incorrect Answer: It is sufficient to simply maintain your vessel's defined firefighting structure. There is no requirement for having a fire extinguisher in the IMMEDIATE area.

C. have containment capacity for at least five gallons
Correct Answer: According to 33 CFR 155.320, ships of 100 gross tons, but less than 300 gross tons, constructed after June 30, 1974, are to have their tank vents, overflow, and fill pipes provided with either 1) a permanent containment tank with a capacity of at least one-half gallon OR 2) a portable container with a capacity of at least five gallons.

D. are opened and the flame screen replaced
Incorrect Answer: Vents need to be opened during loading and discharge to avoid developing increases in tank pressure and/or to prevent a vacuum from developing in the tank. However, there is no requirement to change out a flame screen prior to every load-out.

U.S. Department
of Homeland Security

United States
Coast Guard