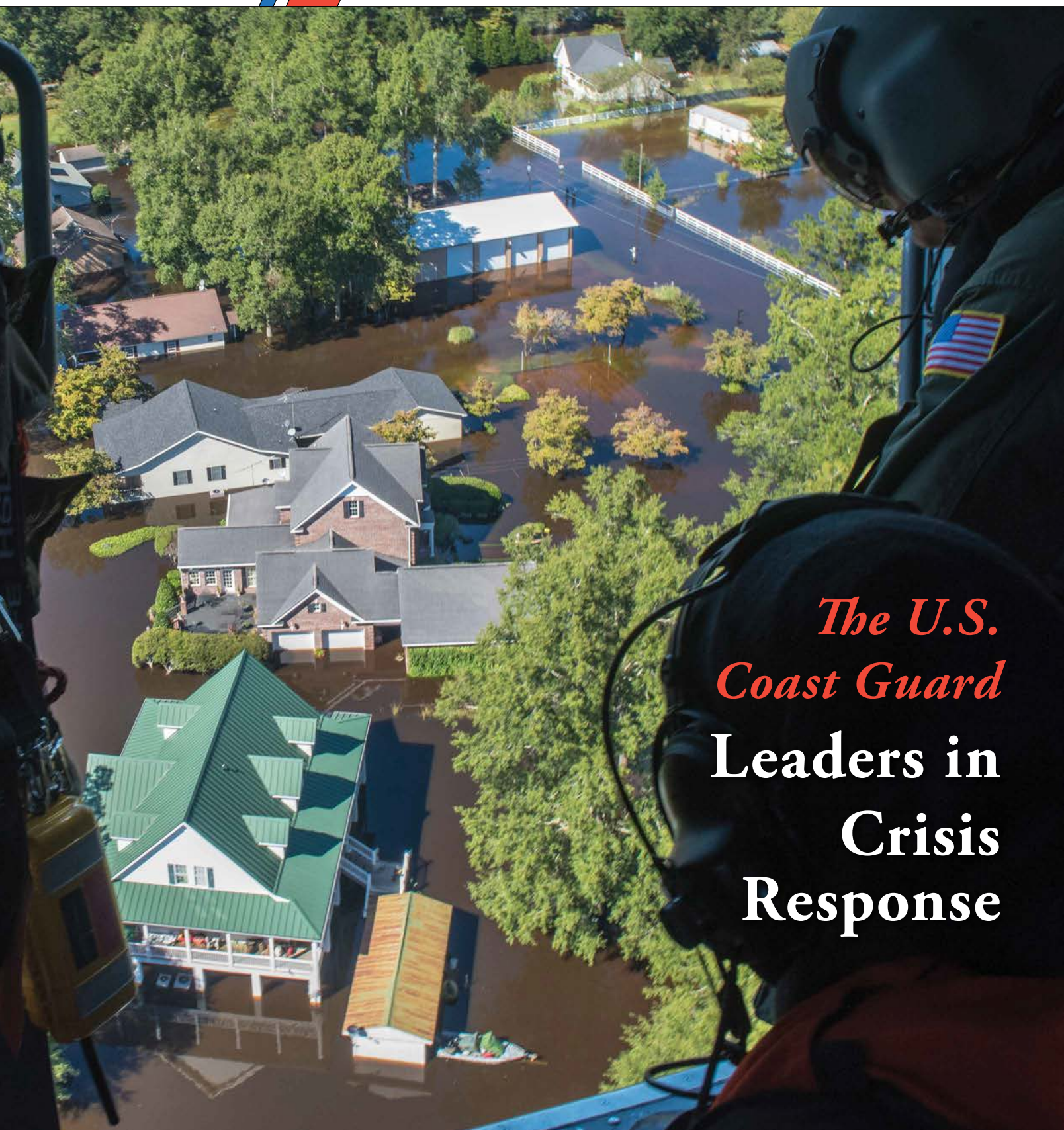
The Coast Guard Journal of Safety & Security at Sea

Proceedings

Winter 2020 of the Marine Safety & Security Council



The U.S. Coast Guard

Leaders in Crisis Response

Hurricane Categories

The Saffir-Simpson Hurricane Wind Scale

1

74–95 mph • 119–153 kmh • 64–82 kts
Very dangerous winds will produce some damage. Well-constructed frame homes could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.

2

96–110 mph • 154–177 kmh • 83–95 kts
Extremely dangerous winds will cause extensive damage. Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted, blocking numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.

3 (MAJOR)

111–129 mph • 178–208 kmh • 96–112 kts
Devastating damage will occur. Well-constructed frame homes may incur major damage or loss of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.

4 (MAJOR)

130–156 mph • 209–251 kmh • 113–136 kts
Catastrophic damage will occur. Well-constructed frame homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed, potentially isolating residential areas. Power outages will last weeks or possibly months. Most of the area will be uninhabitable for weeks or months.

5 (MAJOR)

157+ mph • 252 kmh or higher • 137+ kts
Catastrophic damage will occur. A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas, and power outages will last for weeks or possibly months. Most of the area will be uninhabitable for weeks or months.

Coast Guard Petty Officer 1st Class Phillip McLeod pilots an unmanned aerial system (UAS) in Pensacola, Florida, to survey hurricane damage on September 24, 2020. He is assigned to the Gulf Strike Team and has a collateral duty of UAS pilot. Coast Guard photo by Petty Officer 2nd Class Nate Cox

Incident Types

An incident is defined by the Coast Guard as any occurrence or series of occurrences having the same origin, involving one or more vessels, facilities, or any combination thereof, resulting in the discharge or substantial threat of discharge of oil.

Type 5 — Small incident that can usually be resolved within a few hours with onsite resources.

Type 4 — Minor incident that can usually be resolved within a day with onsite resources and support from other facility personnel.

Type 3 — Incident needs exceed onsite capabilities and additional resources from the local area may be brought in to support the response. The response will last longer than one or two operational periods.

Type 2 — Incident extends beyond the capabilities for local control and often requires the activation of response resources from outside the local area. The response is expected to go into multiple operational periods.

Type 1 — Most complex, requiring national resources for safe and effective management and may continue for many weeks or months.

PROCEEDINGS

Winter 2020 Vol. 77, Number 3

Innovation for a New Future

On Deck

On the Cover: *A Coast Guard overflight shows the lingering effects of flooding in South Carolina's Berkley and Williamsburg counties caused by five days of heavy rain in October 2015. As one of its top missions, the Coast Guard can be counted on to respond efficiently and proficiently to any manner of maritime disaster.*

Coast Guard photo by
Petty Officer 1st Class Stephen Lehmann

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Subscription Requests

Proceedings is free of charge and published in April, August, and December.

Subscriptions:
www.dco.uscg.mil/proceedings

Assistant Commandant's Perspective

by Rear Admiral Scott W. Clendenin
Assistant Commandant for Response Policy
U.S. Coast Guard

The Coast Guard is the nation's premier maritime first responder, strengthening maritime resilience by demonstrating leadership in all-hazard exercises, training, and plans. Once emergencies and disasters arise, we surge maritime response capabilities. The ability to lead in crisis is embedded in our service's ethos and innate in our organizational culture. In order to sustain our reputation as the nation's leader in this space, we must continue to mature agile and adaptable policy, capabilities, and training for our people,

Champion's Point of View

by Dana S. Tulis
Director of Emergency Management
U.S. Coast Guard

It has been a true honor and pleasure to champion this edition of *Proceedings*. As you read these articles, you will no doubt see a common thread: Despite best efforts to mitigate risk through prevention activities, maritime disasters and catastrophic events will continue to occur. As I write this, hurricanes Laura and Sally had just unleashed their fury on the Gulf Coast, while wildfires continue to burn in the Western United States, all during an enduring global pandemic.

When soliciting articles for this edition, we first had to decide just what does "Lead in Crisis" actually mean, and how is the Coast Guard, as the nation's premier maritime first responder, positioned to Lead in Crisis. To answer these questions, we considered the Coast Guard's centuries of service. Our history is replete with amazing stories of extraordinary heroics and daring rescues, responses to unprecedented

recognizing that no emergency or disaster is the same, or demands the same response. We accomplish this through empowerment and a strong bias for action at all levels of our organization. Whether providing support to a local community or a regional response, we ensure incident response and recovery resources are ready and capable of scalable mobilization when needed in coordination with, and in support of, federal, state, tribal, industry, and private sector partners.

We recently commemorated the 10th anniversary of the Coast Guard's strong leadership and coordination during the response to the *Deepwater Horizon* incident, the largest marine oil spill in history. This incident serves as a stark reminder that we must always remain well prepared.

As the lead agency for maritime search and rescue, we coordinate our domestic and global capabilities with our international, federal, state, and local responders. Moreover, the Coast Guard serves as an important leader in international search and rescue. We maintain a vast network of partnerships and communications to monitor distress calls worldwide, and we partner with the world's merchant fleet to rescue mariners around the globe through the Automated Mutual Assistance Vessel Rescue system.

Throughout my career, I have had the privilege of witnessing the selfless actions of our Coast Guard men and women rescuing mariners from perilous predicaments, responding to large oil spills, and helping domestic and international communities respond to natural disasters. Throughout our cutter fleet, aviation, response, prevention and mission support communities, we work together to ensure the Coast Guard's "all-threats and all-hazards" preparedness mission is ready for whatever is on and beyond our horizon. Thank you for taking the time to examine these important missions at the heart of our service in this issue of *Proceedings. Semper Paratus.*

complex maritime challenges, and many efforts to ensure our national security, and economic prosperity. Reflecting on my personal experience with numerous large-scale incidents, dating to the 2001 attacks on the World Trade Center, my decades with the Environmental Protection Agency and nearly five years with the Coast Guard, I clearly recognize the foundational principles the Coast Guard offers in emergency management and crisis leadership. We learn from the routine to the complex. We reflect on previous actions, learn from our mistakes, and adapt and change to be Ready, Relevant and Responsive—a must to be in service to the nation

In this reflection, we realized that Lead in Crisis cannot be singularly defined, rather it is a mindset, a conglomeration of principles, characteristics and guideposts, built through experience. As the Commandant of the Coast Guard, Admiral Karl Schultz, outlined in his Strategic Plan, the Coast Guard is uniquely positioned to Lead in Crisis, as outlined through three strategic priorities:

- Maximize Readiness Today and Tomorrow
- Address the Nation's Complex Maritime Challenges
- Deliver Mission Excellence Anytime, Anywhere

We have learned to organize and lead responses using the Incident Command System. We have developed specialized emergency response capabilities, from our National Strike Force to Search and Rescue assets. We plan, train, and exercise to respond to all-hazards contingencies. We integrate science into response, leverage leading edge technology, and tools to facilitate response.

The articles chosen for this edition illustrate the ways we have learned from the past to be better prepared for the future. Through the lens of significant events like the *Deepwater Horizon* and *Exxon Valdez* oil spills, complex response operations during hurricanes Dorian, Harvey, and Florence, and other maritime emergencies, the articles highlight lessons learned that shaped where we are today and where we strive to be in the future.

I hope you enjoy the broad spectrum of articles. I would like to take this opportunity to extend thanks to my staff for their help in coordinating this edition, and to all the authors who have taken the time to contribute articles. Your efforts were instrumental to highlighting how the Coast Guard and the nation is positioned to Lead in Crisis.

Leading in Crisis: COVID Style

by Capt Kirsten Trego
Deputy Director, Emergency Management
U.S. Coast Guard

In late 2019, as I was assisting with the development of this *Leading in Crisis* issue, we were unaware of the turn the world was about to take. The issue was designed to highlight the many ways the Coast Guard has prepared for and responded to national and international crises, including articles on cases and responses highlighting crisis leadership and lessons learned during these crises. It also included consideration on gaps and challenges the Coast Guard should address, as well as areas for growth to remain at the forefront of crisis leadership. These were couched through events familiar to the Coast Guard—hurricanes, mass search and rescue operations, oil spills, and other complex contingencies.

Little did I know, six months later I would be writing an article about the Coast Guard's response to a global pandemic. The novel Coronavirus (COVID-19) emerged as an unprecedented and extremely challenging national and global crisis. As one Coast Guard senior leader aptly assessed, this is like preparing for, and responding to, simultaneous hurricanes in every port.

As part of Operation Nanook, the crew of Coast Guard Cutter *Campbell* participate in Argus, a search and rescue exercise, off the coat of Greenland in August 2020. The crew conducted many drills throughout the operation while wearing masks as part of the protection measures implemented to avoid COVID-19 . Coast Guard photo by Ensign Ross Kolko

Throughout history, the Coast Guard has consistently risen to the challenge of protecting the American people and our way of life during times of uncertainty. In all cases, the service continued to perform critical missions that protect our national interests, promote economic prosperity, and ensure public safety. The global pandemic has been no exception. Although the far-reaching impacts of COVID-19 are unprecedented, and continue today, the Coast Guard has relied on its foundational ethos, skills, and ingenuity to guide its operational- and mission-support forces to ensure total mission readiness and execution.

As the coronavirus took hold across Asia and Europe in January and February 2020, the United States took action to try to prevent spread into the United States. The Coast Guard played a vital role using its organic authorities to support the Centers for Disease Control's regulations and policies to prevent communicable diseases from being introduced to the United States. Collaboration with the organization ensured that commercial cargo vessels could continue to bring critical supplies into the United States while mitigating the risk of introducing the virus into the country via the marine transportation system.

By March, COVID-19 began spreading across the United States and stay-at-home orders were rapidly put into effect. The Coast Guard had been coordinating their COVID-19 response both horizontally across programmatic lines, and vertically between headquarters and field units. However, it was abundantly clear the Coast Guard needed to take a more holistic, enterprise-wide approach to

develop new strategies and policies, modify existing policies, and ensure appropriate guidance, tools, and capabilities were available to carry out the service's critical missions during the pandemic. Field commanders and their leadership teams were tackling similar issues, accounting for a wide variety of local and regional differences. National level Coast Guard guidance was needed, especially as national health, science, and medical recommendations rapidly evolved.

Under the guidance of the Deputy Commandant for Operations (DCO) and the Deputy Commandant for Mission Support, a Coronavirus Crisis Action Team (CCAT) was stood up at Coast Guard Headquarters to develop Coast Guard strategy and policy and tee-up service level decisions to Coast Guard senior leadership. These policies needed to provide flexibility and empower field commanders to make locally based decisions. In general, policy development is intentionally deliberate and often painstakingly slow, as the implications of new policies have wide-ranging effects. However, in a fast-changing information environment like COVID with significant uncertainty and unknowns, time is not a luxury. Critical guidance and information were needed across the service. The CCAT, with more than 250 dedicated Coast Guard members representing all mission sets and support entities, rose to the challenge and began rapidly developing strategy and policy on every facet that the service could face. These included issues for operational execution and mission enablers, as well as many other challenges that affected the Coast Guard workforce.

A crew from the Coast Guard Aids to Navigation Team in Sabine, Texas, wear COVID-19 mask protection while they hang a new dayboard on Lake Charles, Louisiana, in August 2020. The crew has been working to repair aids to navigation in the tributaries of the Gulf of Mexico in the wake of Hurricane Laura. Coast Guard photo by Petty Officer 2nd Class Ronald Hodges

Showing a bias for action, and structured using the principles of the incident command system, the CCAT quickly developed much needed guidance, and anticipated emerging challenges facing the service. Early efforts focused on providing guidance on which operations should be continued, postponed, or scaled back; the appropriate personal protective equipment and risk assessments to conduct when carrying out critical missions; and updating workforce travel and leave policies in a COVID-restricted environment. Additional efforts focused on telework policies and growth of essential information technology capabilities to enable remote work.

The CCAT focused on human resource policy and guidance with respect to the needs of the Coast Guard workforce—active duty, Reserve, civilian and contractors—to include all mission enablers such as medical support, childcare, and training. Each of these complex issues, required close coordination and alignment to mitigate contradicting policies. The CCAT had to be agile; quickly updating, adjusting, and communicating policy as information and guidance from interagency partners and other federal entities evolved, and as the nation and the Coast Guard learned more.

As I write this article near the end of July 2020, the CCAT has adapted, morphed, and prioritized focus for many months during the response. The initial response focused on commercial vessels and cruise ship safety, search and rescue, and other operational missions, but expanded to a broad spectrum of mission enablers as the virus spread in the United States. To date, the CCAT has enabled development of more than 80 policy documents

The Empire State Building was illuminated in orange, white, and blue on April 27, 2020, in honor of Coast Guard members. The salute was part of "Heroes Shine Bright," a weeklong campaign to thank first responders and agencies working in response to the COVID-19 pandemic. Coast Guard photo by Petty Officer 2nd Class Cory J. Mendenhall

and a comprehensive planning order with numerous updates containing critical tools and guidance for Coast Guard operational commanders. These tools include an employee health decision guide, quarantine and isolation guides, information technology and telework guidance, an agile workforce guide, and the development of a contact tracing program. In addition, the team developed the *Strategic Guidance for Major Cutter Deployments during a Pandemic*, the *Shipboard Mass Infection Guide*, and the *Heavy Weather Disaster Response during a Pandemic Guide*, to cite some specific examples. Ultimately, the CCAT's efforts armed Coast Guard commanding officers with the right tools to execute decisions to meet missions and keep our Coast Guard team safe during this extraordinary and historic event.

In addition to ensuring the service is mission ready through policy and guidance, the Coast Guard was a vital player in the response to this national crisis, lending its unique skills through a variety of actions:

- embedding in the Federal Emergency Management Agency and Health and Human Services national and regional centers to provide incident command leadership
- supporting Department of Homeland Security partners at airport screening facilities
- providing logistical air support to move critical COVID-19 supplies to the remote areas of Alaska and Oceania
- providing waterside security for U.S. Navy hospital ships
- facilitating offloading over 250,000 cruise ship passengers and crew
- conducting Medevacs of suspected COVID cases off vessels
- ensuring the maritime supply chain to the United States remained viable and efficient through Captain of the Port and Officer in Charge Marine Inspection authorities

Though the pandemic continues to inject uncertainty into day-to-day operations, the Coast Guard finds itself at the busiest time of the year historically for its traditional missions of search and rescue, fisheries enforcement, recreational boating safety, and hurricane preparedness and response. The service is, however, postured to meet the challenges ahead, whether contingency response operations, enforcing regulations keeping our marine transportation system and shared-use waterways safe, or thwarting transnational crime and other illicit activities. While mitigating the risk from this unprecedented pandemic through policy and guidance, the Coast Guard remains *Semper Paratus* (Always Ready) to meet today's challenges in the COVID environment.

About the author:

CAPT Trego currently serves as deputy director, Emergency Management at Coast Guard Headquarters, which develops strategy and policy for Search and Rescue, Marine Environmental Response and Emergency Management & Disaster Response. She was fortunate to serve as DCO's Lead of the COVID Coronavirus Action Team from inception through June 2020.

Learning from Experience

Views from *Deepwater Horizon*

A National Strike Force perspective

by CDR Carolyn Moberley
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LCDR Adrian Michalski
National Strike Force Coordination Center
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The *Deepwater Horizon (DWH)* Spill of 2010 was a unique event in U.S. history. The United States Coast Guard National Strike Force (NSF) played a significant role in the *DWH* response effort, as it has across the country and around the world since its inception in 1973. The NSF personnel who deployed for the *DWH* incident have a unique perspective on crisis leadership and how the lessons learned are still relevant today.

Preparation

Another crisis is looming, we just don't know when, where, or its nature. Preparedness is central to everything we do in the Coast Guard. Interviewees for this article reflected on the importance of knowledge, training, partnerships, and crisis response experience in preparing them for the *DWH* response.

Being able to apply knowledge about the authorities and regulations that guide our responses is critical, particularly for those in leadership roles. In the initial phases of response, our leaders need to determine the appropriate framework under which to respond and then, in coordination with our partners, guide the response accordingly. Incident commander (IC) for Incident Command Post (ICP) Houma, Louisiana, during the *DWH* response, RADM Meredith Austin spoke about the criticality of understanding and being fluent in the National Contingency Plan and the National Response Framework. "It's incumbent on us to ensure under which framework we're responding, because if it's the former [contingency plan], it's clear that the federal on-scene coordinator is leading the response," Austin said. "If it's the latter, then the state (or local) government is." Ensuring clarity between overarching guidance and command authority early on can help ease tensions between responding agencies.

In another instance, CAPT Tedd Hutley, National Strike Force operations officer during the response, discussed his efforts to manage the National Strike Force Coordination Center's (NSFCC) Response Resource Inventory. This database is used to track spill response resources maintained by oil spill removal organizations (OSROs). Hutley relied on his knowledge of 33 CFR 154 and 155, as well as the OSRO classification policy, to manage the critical resources being deployed to *DWH* from all over the nation. By understanding the regulations, cascade of plans, and alternate planning criteria, the NSFCC was able to manage the deployment of critical resources to *DWH* with an understanding of the impact of those actions on national preparedness.

On the whole, interviewees reflected that the training they received during their NSF assignments prepared them well for the *DWH* response. The NSF provides highly specialized training for its members in incident management, hazardous substance response, and salvage operations, to name a few. The ability to put that training to work was proven for many during that response. LCDR Ryan Dickson filled many roles during the *DWH* response to include the Vessel of Opportunity Branch director in Port Fourchon, Louisiana. Reflecting on the incident, he noted that the ability to take in all of the information holistically and prioritize response efforts enabled him to sort through the challenges during the early stages when search and rescue and pollution efforts were ongoing. Many NSF members also relied on their hands-on training in preparing them for skimming, dispersant use, and in-situ burn.

A notion many of us are familiar with is the need to forge partnerships ahead of a disaster. Preparedness activities reinforce partner agency relationships in low-stress environments, ensuring the strongest foundation for interaction during crisis. Dickson lauded the Coast Guard's efforts to foster strong partnerships and observed that during *DWH*, "Everyone knew each other's capabilities and roles, which made things a bit easier during the obviously tense and stressful situation." Retired CAPT Roger Laferriere, also an incident commander for ICP

Houma during the response, stressed the criticality of building partnerships well ahead of any disaster. "Know your partners and become their teammates. … You will never fail if your teammates are there to catch you."

Equally important during a crisis is ensuring our internal Coast Guard teams are set up for success. CAPT Mark Shepard, who filled the ICP Houston incident commander's position as well as the ICP Mobile operations section chief (OSC) positions, discussed the need to organize your team appropriately during a crisis, and how routine operations prepare us to lead during disasters. During a crisis, "you have to recognize it, size it up, and build your team," he said. This team extends to the Reserve force, which played a crucial role during *DWH*. Now-retired Chief Petty Officer Robert Schrader, who led the in-situ burn task force and quick reaction force in Houma during the response, cited the valuable and diversified skills of the Reserve contingent. He said that Reserve members want to be there. "You need to identify these people and take and mold them into your force," he said, adding that this yields staffing continuity and a strengthened response.

With increasingly complex dynamics at the senior level, Austin relied on the work she did in the early days of the now defunct Deployable Operations Group, saying that learning to collaborate at the national interagency level was invaluable. However, not all of our training or experience can fully prepare us for future responses. Austin said she wished she had had more experience with what to expect during an incident as politically charged and complex as *DWH* prior to the incident, adding she may have been able to better anticipate political leaders' reactions if she had better understood their motivations. While she doesn't think the Coast Guard would have responded any differently, understanding the political context may have reduced internal frustrations.

Members of Elastec/American Marine Inc. inspect a fire boom containing collected oil prior to conducting a controlled burn in the Gulf of Mexico on May 5, 2010. The U.S. Coast Guard, BP, and other federal agencies conducted controlled burns to aid in preventing the spread of oil following the April 20 explosion on the Mobile Offshore Drilling Unit *Deepwater Horizon*. Navy photo by Petty Officer 2nd Class Justin Stumberg

Immediate Crisis

The foundation provided by the knowledge, training, partnerships, and experience gained throughout our careers is critical, but what makes us truly ready to lead and respond during the various stages of a crisis? At the onset of a crisis, interviewees discussed the importance of bringing calm to the situation, understanding the nature of relationships, and having a decisive and adaptable mindset.

Interviewees reflected on the importance of a leader that brings a sense of calm to the situation. LCDR Brownie Kuk, who served as the federal resource manager at ICP Houma during the response, said he felt he was surrounded by pollution response legends, all of whom had different leadership styles but shared the common ability to bring calm to the crisis. Early on, while the well was still continuously flowing, leadership's calm presence and demeanor was essential and trickled down to the junior folks, enabling them to perform their critical roles and tasking.

As one of the first Coast Guard officials to report to the BP Operations Center, Dickson realized the need to stay calm. "Lives were at stake and that was the primary concern," he said. "Balancing those emotions with the obviously detrimental environmental impact looming [it] was an easy decision to make."

Chief Petty Officer Matthew Schofield, a second class petty officer at the time, acted as a media relations specialist in the Joint Information Center (JIC). Non-stop phone calls to the JIC indicated the breadth of public concern and he identified the need to quickly gather with responders to convey information needs. "The PIO [public information officer] and JIC communicators need to remember to keep a singleness of purpose and hold tight to getting a single voice," he said. "If we are fractured in our communication internally, then it will show externally." This shared outlook enabled the team to balance mission priorities, manage the chaos, and remain effective during the high-stress operations.

Another observation was the transactional nature of relationships during the early stages of a crisis. While a situation is unstable and chaotic, relationships are less personal. "During the earliest days of my deployment, we were still sprinting—setting up new field organizations, building new interagency relationships, trying to get

In June 2010, two months after the *Deepwater Horizon* explosion, the *Discoverer Enterprise* and the *Q4000,* a semisubmersible vessel, worked around the clock burning undesirable gases from the still uncapped *Deepwater Horizon* well in the Gulf of Mexico. U.S. Army photo by SGT Casey Ware

personnel downrange," Austin said. "While the well-being of responders is always paramount, during these early days, I didn't have much time to get to know anyone very well."

Drawing from his strike team experience, then-LCDR Kevin Sligh, filled many roles, including deputy incident commander of the Gulf Coast incident management team and ICP Mobile OSC during the *DWH* response. He cautioned that responders may be thrust into a situation without adequate training or experience, but a bias for action and confidence are key. "There's some level of risk there, but as long as you weigh that risk, you'll be good," he said.

Shepard noted the importance of decisiveness and working with the team to the best of your ability. "No one is 'ready' for this type of response," he said about *DWH.* It is with this confidence that Shepard assumed the role of incident commander at ICP Houston.

> Don't get excited—at least not outwardly … the sooner you can recognize you might be in fight or flight mode, the sooner you'll get back to the higher functions where you make rational decisions.
>
> —RADM Meredith Austin

Getting through the initial phase of a crisis like *DWH* requires a calming presence, an understanding of relationship dynamics within newly formed teams, and a mindset marked by confidence and flexibility. "A crisis brings out the best and worst in people. Bring your best and you'll be able to manage both more effectively," Laferriere said.

Midterm Response

The initial phase of an incident is finite. Even Type 1 incidents like *DWH* move through phases. As the response changes characteristics, good leaders adapt to the changing environment. Interviewees cited the importance of connecting with their people and thinking strategically about the future of the response.

Austin reflected on changes in operational tempo. "As things stabilized, I was able to slow down a bit to take the time to build professional relationships with personnel in the ICP and get to know them better personally." Laferriere also noted the importance of team engagement. "With crews constantly changing, it was difficult to get to know crew members, but your approach in using personal power does not change," he said. "Exhibit positive personal power (with) everyone you contact and your sphere of influence expands multifold and lives forever. Exhibit negative personal power and your influence suffers a quick and untimely death."

Shepard recalled using creative motivation as a way to complete a seemingly insurmountable job. "In Mobile, we had to quickly get three million feet of boom off water before a hurricane. We used friendly competition to increase productivity and decrease stress," he said.

During the midterm stage of a response there may be efforts needed behind the scenes. This was definitely the case during *DWH* when LCDR Kuk evaluated a beach cleaning machine that took up the top layer of sand, sifted it, and replaced clean sand. NSFCC vetted items like this, and provided recommendations to the field for potential use in operations. Transitioning from the crisis stage at ICP Houma to the relatively less stressful environment at NSFCC allowed him to provide unbiased and well-researched recommendations back to the field.

Steady State

Leadership remains vital during the final stages of an incident, though interviewees noted that leadership styles that were effective during high-stress, crisis periods may not work well during the slower-paced, more deliberate stages of the incident.

Shepard recalled the importance of inspiring collaboration as response efforts stabilized and neared completion. "Having multiple teams working and keeping them all motivated and focused took effort," he said. "The tasks needed to be in sequence, so each team had to wait for the right time to perform their task. Competition in this case was harming productivity. Leadership stepped in to talk to both teams about the shared goals. We were all on the same team."

An inevitable threat of steady state is disengagement. Some people long for the thrill of the emergency phase while others would just rather be home. Austin recalled working through this issue. "For those remaining, we had to constantly remind them that our work wasn't done until all of the oil was removed from the shorelines [and] not to lose focus, but also remind them that their hard work was paying off and they should be very proud," she said.

An overflight of the response efforts in the Gulf provided a moment of enlightenment for Sligh when he sighted 30–40 vessels skimming, in-situ burns in process, planes flying dispersants, and a drill ship. "I thought, 'Wow, I'm a part of this,'" he said. "It was incredible to be able to see it all at once." This perspective illustrates the enormity of the challenges and accomplishments of the crisis leadership team.

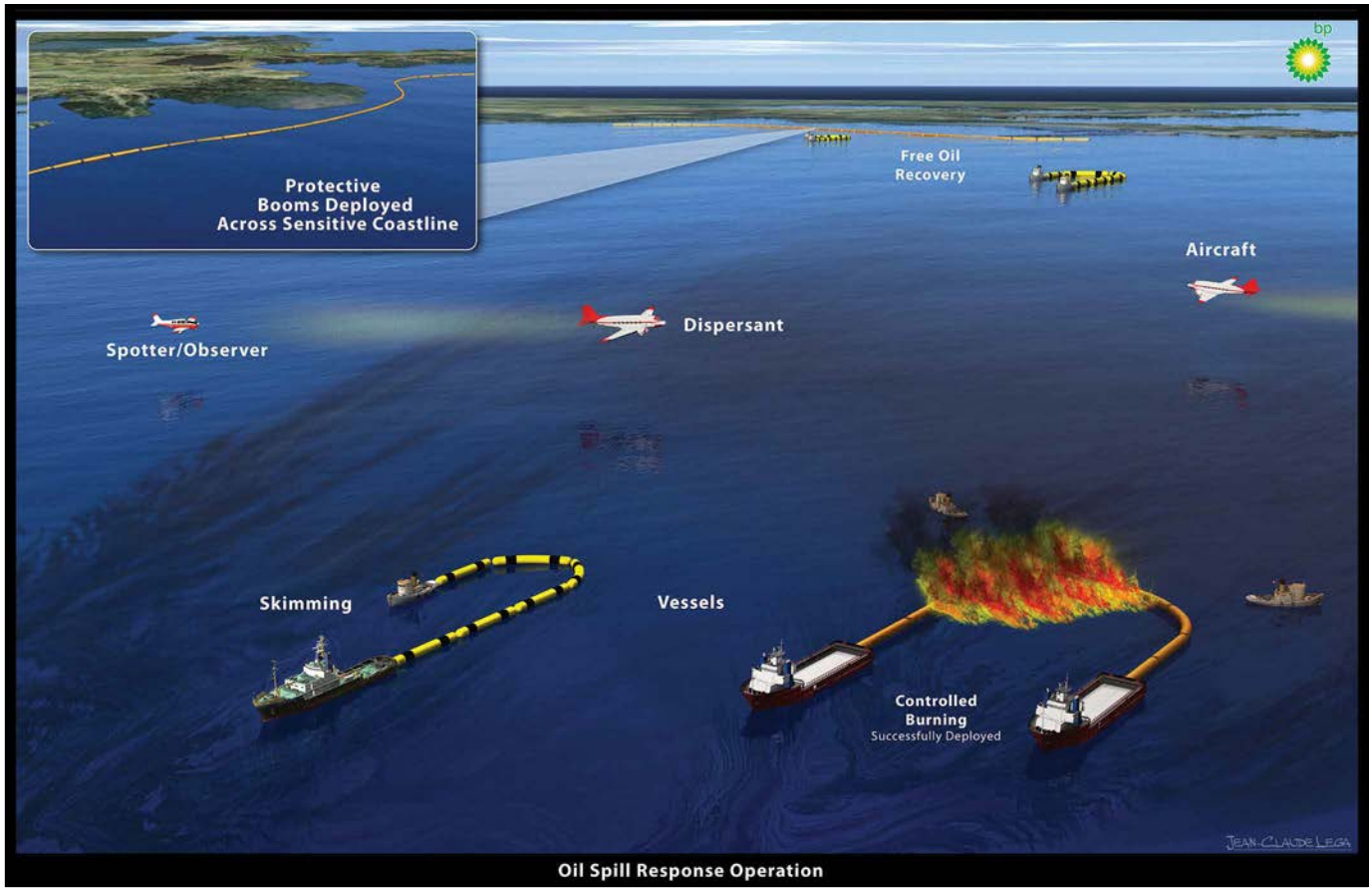
Advice to Future Crisis Leaders

When writing an article about leadership during *DWH,* one of the most complex incidents in U.S. history, it seems appropriate to include guidance from past and present NSF leaders. When asked, "What would you like to suggest to future leaders who find themselves in this type of response?" interviewees gave solid advice:

- Build professional relationships before the incident starts.
- Leverage those relationships.
- Build a culture of trust and seek to understand.
- Build trust among the team and stakeholders.
- Know what you don't know. "Knowing what you don't know, and knowing the right people to bring in to fill those gaps" will help a crisis leader be successful, Sligh said.
- Be invested in the response. "As a crisis leader, you have to be invested into the response as though it is your own personal community," Dickson said. "The ability to establish an environment that allows all first responders to remain focused on the mission and safety is crucial to a successful response."
- Have a common vision. "Leading is more about setting the conditions for success with your team," Shepard said. "Managing is more about organizing and planning to eliminate the chaos. As a crisis leader, you try to build a team and get the team to work together. In that, there is vision and purpose. Then you need to help the team to be empowered to achieve their purpose."
- Work to understand others' intentions. "When you're operating in an environment of high concern, low trust, people's motivations/objectives might differ from what you're trying to accomplish," Austin said. "It's key to understand what their motivations are in order to be able to negotiate the best solution for both sides. You can't please everyone, and that's okay, as long as you're trying in good faith."
- Take care of your people and yourself. "Be aware of your own mental health and stress. Be aware of the team's mental health and stress," Hutley said. "Maintain the big picture and keep things in perspective. It's so easy to be consumed by the response, leading to unhealthy behaviors/workplace climate."
- Be knowledgeable, assess risk, and take action. "Being prepared is critical," Kuk said. "How you approach a response is the same, it's just a different flavor you're dealing with."
- Be flexible and work with what you have. "At the time of crisis, excuses are not acceptable even if they are valid," Hutley said.

Conclusion

On September 19, 2010, 151 days after the *Deepwater Horizon* offshore drilling rig exploded, it was declared permanently sealed. A decade later, this incident remains



A graphic depiction of the comprehensive oil spill response operation and the different methods of containment and collection used in response to the *Deepwater Horizon* oil spill following the explosion on April 20, 2010. Graphic courtesy of BP

a career-defining touchpoint for responders. At the time of *DWH,* some interviewees were nearing the end of their careers. Other responders were introduced to the NSF and the response community during this incident. And yet, from senior officers to midcareer enlisted members, common themes emerged.

Citing the intensity, duration, and complexity of *DWH,* each person frequently expressed that they wished there was more they could have done to prepare, despite having a breadth of experience prior to the incident. Paradoxically, interviewees' reflections offered candid and realistic insight into the importance of personal readiness and organizational preparedness while acknowledging limitations of how ready one can ever be for the worst-case scenario.

Interviewees frequently emphasized the importance of having mental and logistical flexibility. Many cited the criticality of timely, truthful, and empathetic communication internally and with the public. Today, NSF's rigorous training program supports best-case outcomes with worst-case scenarios in mind.

The *DWH* response was a time of operational significance. Now, a full decade later, the impact of the incident continues to shape the Coast Guard's leadership. Through standardized, job-specific training, the NSF propels responders toward increasing levels of expertise and crisis leadership so they are ready any time, any place, and for any hazard.

About the authors:

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Bringing Order to Chaos

The Hurricane Florence response and recovery

by CAPT Bion Stewart
Chief of Staff
Coast Guard District Five

Servant leadership, transformational leadership, democratic leadership. These are just a few of the many leadership styles used to define how individuals influence, inspire, guide and drive the actions and behaviors of others.

Candidly, I have not given much thought to leadership styles over my career. I have heard and read about them, but I have never categorized myself as any particular type of leader. The simple truth is when you find yourself thrust into a crisis, the only thing that really matters is whether you are an effective leader, or you are not. In this article, I hope to convey some of the thoughts, emotions, challenges, and lessons I learned as the incident commander for the Coast Guard response to Hurricane Florence that devastated North Carolina in September 2018.[1] It was without question, the most difficult leadership challenge of my 30-year career.

Hurricane Florence made landfall near Wilmington, North Carolina, on September 14, 2018. In the days preceding landfall, residents throughout the state prepared for what was projected to be a monster Category 4 storm —potentially the strongest storm ever to make landfall in North Carolina. Weather forecasters used phrases like, "the North Carolina coastline will be changed forever," and the words, "catastrophic" and "devastating" became the focal point of my entire existence. At Sector North Carolina, whose main office in Wilmington was directly in the path of the eye of the storm, we were working hard to fully understand and prepare for the enormity of what was about to happen to us, our families, and the communities we serve.

The reality of the task ahead consumed my every thought. Serving in my first sector assignment with no experience in disaster response, I kept telling myself, "I'm not qualified to do this." I was terrified. I obsessed over every weather report and every "spaghetti model" prediction of the storm's path. I spent hours studying flood projections to determine what communities would be hardest hit—and when—and if we needed to evacuate our sector office in Wilmington. I questioned every decision I made leading up to the storm, and the list of "what-ifs" was never-ending. How are we going to manage evacuations and care for families and crew members? What, if anything, will be left when we return to our homes? Perhaps the most difficult question of all, how many lives will be at stake because of the decisions I make? Thoughts of the millions of ways I could fail displaced all thoughts of what I needed to do to succeed. I soon found myself paralyzed by uncertainty trying to manage the problem ahead, until I finally realized I had to stop managing and start leading.

Do Not Manage—Lead

As leaders we are often overwhelmed with management tasks in our daily routine. We invest a lot of time and effort thinking about resources, putting out "fires," dealing with personnel issues, reading and signing memos—all important things to keep complex organizations operating smoothly, but management is not leadership. Leadership is inspiring those around you, making the hard decisions when no one else will, driving teams to achieve the seemingly unachievable, and—particularly

A helicopter crew from Coast Guard Air Station Elizabeth City, North Carolina, searches for residents in distress around Rocky Point after Hurricane Florence flooded the area. Coast Guard photo by Petty Officer 2nd Class Dustin Williams

in a crisis—bringing order to chaos.

There is no way to avoid chaos at the onset of a crisis like Hurricane Florence. The scope and scale of the damage you will experience is often unimaginable. Contingency plans and exercises are essential, but the blunt reality is no plan survives first contact with the enemy fully intact. The command, control, and communications systems you learned to rely upon in your daily operations will break down. You will have to deal with the uncertainty, fears, and even panic that will inevitably impact your team's ability to focus and execute. You need to prepare yourself to lose control of 80 percent of your environment. Accepting this reality up front is essential, because only then will you be able to effectively focus your efforts on the 15 percent you can influence and the 5 percent you may actually be able to control. Everything else will become background noise. Focusing on what you can control and letting go of everything else is the first step toward bringing order to chaos.

Coast Guard Petty Officer 2nd Class Tim Piquette places an identifying decal on a vessel displaced by Hurricane Florence near Oriental, North Carolina. The decal enabled the vessel's owner to coordinate salvage operations with the Emergency Support Function-10 Unified Command. National Oceanic and Atmospheric Administration photo by Katherine Krushinski

Let Go

Letting go of our sense of control as military leaders is difficult. We like predictability and structure, and we are groomed in many ways to think linearly about problem solving because we are often guided and constrained by highly prescriptive policies and procedures for just about every operation or task. What I found during the Florence response was, the harder I tried to apply linear thought, prescriptive policy guidance, and structured procedures to my decision-making, the more I realized our response was not moving forward. I had to let go of my preconceptions about procedures and processes, and direct more of my time and focus on the problem.

Part of letting go and focusing on the problem was learning how to properly leverage the Incident Command System (ICS), but not solely depend on it to answer your questions or solve your problems. This is not to say ICS is a bad thing. In fact, I would argue quite the opposite. ICS is essential in defining roles and establishing a repeatable battle rhythm for your incident command post (ICP). However, ICS demands a lot of resources, and it is bureaucratic and process-intensive. ICS is neither creative nor instinctive, and if not properly implemented, and appropriately marginalized, it will consume every moment of your time and thought. Use ICS to manage process and coordinate activities, but when it comes to leading, you have to let it go.

Another part of letting go is recognizing when you need help. I realized and accepted the fact Florence was going to quickly overwhelm the sector, and I had no doubt it was going to overwhelm me. With these shortfalls in mind, I made three decisions in the ramp up to the response that proved to be essential to our success.

The first decision I made was to put together a lengthy list of support personnel, pollution response experts, Coast Guard Strike Team members, shallow water response assets, and other surge staffing I knew we were going to need. Part of the team that came to our aid was a Type I incident commander[2] who advised me, guided me, and whispered in my ear at just the right time to get me through the most challenging moments of the response. It is sometimes difficult for commanding officers to ask for help or acknowledge shortcomings, but crisis response is not the time for egos and insecurities.

The second key decision I made was designating a federal on-scene coordinator representative (FOSCR) to establish a separate ICP to run pollution response operations, often referred to as Emergency Support Function–10, or ESF-10. Pollution response is highly

complex and requires a dedicated team to coordinate mitigation operations with state and local authorities, private parties, and contractors, often for months after initial response and recovery operations have ended. Delegating authority to the FOSCR and establishing a stand-alone operation under a separate incident commander allowed me to better manage our emergency response resources in the near term, and facilitated a seamless transition to sustained pollution response operations over the long term.

The third decision I made was turning over tactical control of the Coast Guard shallow water response assets to the North Carolina Emergency Management Regional Coordination Center-East (RCC). Shifting tactical control to the RCC allowed the state to use Coast Guard shallow water rescue teams as part of tailored response packages in combination with other state and federal assets, including swift water rescue and urban search and rescue teams. While we maintained central oversight of the teams within the ICP, the RCC's ability to combine assets and quickly respond to the unpredictable nature of the flooding was the most efficient and effective way to use the Coast Guard teams to their fullest potential. Letting go of control of these assets proved to be the best way to attack the problem.

Define and Attack the Problem

Defining the problem is not simply stating the obvious. Saying there is a hurricane creating a huge mess outside does not capture the full scope of risks, impacts, and courses of action you will have to consider as you define and attack the problem. Ask yourself and your team these questions:

- Who and what are at risk? This will drive your priorities and objectives.
- What resources do you have available? This will drive your sequence and pace of operations.
- What variables (functional, operational, administrative, etc.) are within your control, and perhaps more importantly, what variables are outside of your control (e.g., weather, time)? These factors will largely drive your probability of success.
- What decisions are you able to make and what decisions are made by others? Many decisions rest at the state and local level and are outside of your control. Stay in your lane or you can quickly find yourself isolated at a time when you need to be fully integrated with your partners.

Finally, you need to make your priorities and objectives understood by everyone in the command post. Failure to properly define the problem and establish your priorities and objectives before acting will waste resources, jeopardize your operations, and increase risk to your personnel as you push them out into harm's way.

Take a Time Out

There is always an innate drive to "do something" in a crisis, and your first instinct will be to throw the kitchen sink at everything that comes your way. This only creates more chaos. As Coasties, we are pre-conditioned to answer the alarm at full speed, but in a large-scale, highly complex crisis like Florence, you must control the heightened sense of urgency in favor of careful deliberation. It will feel unnatural, and many internal and external drivers will try to force you to succumb to the chaos and be overly reactive. However, you must do everything you can to control the tempo of the response by thinking strategically about the problem and focusing on setting the priorities. The best sports team coaches know how to control the tempo of the game, keep their players fresh, and implement the best strategies to target their team's strengths against their opponent's weaknesses. Crisis response is not much different. Sometimes, when the world seems to be spinning out of control around you, the best thing you can do as a leader is take a "time out." This gives you and your team time to refocus, and most importantly, analyze and define the problem you need to attack. During these time outs, try to get your team to think out of the box and look at the problem from different perspectives. You may be surprised at what you missed and solutions you never considered.

Information—Too Little, Too Much

As you focus your team on the problem, one of the biggest challenges you will face at the onset of a large-scale crisis is the lack of information. There is an unwritten rule that the first report is usually wrong. This rule should be carved in stone in every command post and emergency operations center (EOC) in the country. With limited resources and likely inaccurate information in the early stages of the crisis, you simply cannot afford to overreact to the first report. Be patient and seek ways to validate initial reports before making any major operational plan or decision. For Florence, our best source of information came from state and local EOCs. They had real-time access to the boots on the ground, and we leveraged our well-developed liaison network imbedded in the EOCs to exchange information and maintain direct contact with decision makers. As good as our liaison network was, one of the first lessons I took away from Florence was the need to expand it even more. Take the time to develop liaison relationships *before* a crisis—you will not regret the investment.

Once information begins to flow in, it will quickly become overwhelming. Every few seconds someone will approach you with more information and will want a decision on the spot. At some point, as you instinctively try to absorb and act upon all of the available information, you may find yourself once again trying to manage

A crew from Coast Guard Air Station Elizabeth City, North Carolina, evacuates residents from Rocky Point after Hurricane Florence flooded the area. Coast Guard photo by Petty Officer 2nd Class Dustin Williams

the situation instead of leading it. If you try to know everything and control every decision at every level, you are not effectively empowering your team, you make yourself a single point of failure, and your response will undoubtedly grind to a halt. To avoid this, you need to prioritize and compartmentalize only those critical pieces of information you need to make leadership decisions. Early in Florence, I established clear thresholds for information coming directly to me and information I expected the section chiefs or other members of the incident management team to handle. You must manage information flow so you can maintain focus on the big picture while your team handles the details.

The 80 Percent Rule

There is a point in every endeavor, including crisis response, where you experience diminishing returns and your opportunity costs exceed the benefit of your effort. To lead successfully in a crisis, you must accept that there is no such thing as a 100 percent solution. Sometimes you'll be lucky to break 50/50 as you balance risk, resources and mission demand. Constantly evaluate your effectiveness and be willing to abandon a course of action at the point where it is clear you are being inefficient with your resources or you have no further reasonable ability to mitigate risk. If you can get to the 80 percent solution and reasonably manage the remaining risk, do so and move your focus and resources to the next problem. In a crisis, this is often the only way to keep your response efforts moving forward. I used this rule often as I weighed the relative benefit of opening the ports and waterways versus the risk of not having 100 percent confidence they were safe to navigate.

Keep Your Boss and the Public Informed

As you lead the crisis response, juggling resources, adjusting priorities, often making life-and-death decisions, expect to be bombarded with demands from above. Florence was such a massive event that received so much national attention I found a large portion of each day answering questions from up the chain. We often call this feeding the beast, and it is essential you learn to manage these demands as best you can and avoid becoming overly frustrated. This will not be easy, but you must remember your boss wants to be involved not because they are questioning your decisions or trying to run the response, but because they want to provide help when needed. With absolute certainty, there will be a time when things unexpectedly go sideways and you will need help. Maintaining a regular communications schedule with your boss will allow them to provide you the help you need as quickly as possible. Ensure your

Coast Guard Petty Officer 3rd Class Seth Grayson, a marine science technician, documents the transfer of a houseboat that was displaced onto land at the Rachel Carson Reserve, a dedicated nature preserve, back into shallow water for future removal. The Emergency Support Function-10 Unified Command mitigated pollution from sunken or displaced vessels in fragile environmental areas after Hurricane Florence. Coast Guard photo by Petty Officer 3rd Class Brandon Hillard

boss understands your priorities, give them insights into the unique challenges you are facing, and provide additional background on your decision-making process so they understand not only the "what" but the "why." I found staying regularly engaged with my boss was a huge benefit in making sure our incident command post had the right people at the right time, and we had the resources and support we needed to sustain effective operations.

As you are managing information flow with your boss, do not forget the public. The public is watching everything you do and say, and how the 24-hour news cycle and social media portray the response will become a constant barometer of your success or failure. Do not be passive when it comes to media engagement. Push press releases and post videos on your official social media site explaining the what, how, and why of your response. Let the public see and hear you regularly if possible. You can either control the narrative or be controlled by it.

You Are Human

Finally, remember you are human. You will have intense emotional reactions as the crisis initially overwhelms you. It will seem like you are powerless, and it is easy to become paralyzed with fear. Figure out how to cope with these emotions as best you can and perhaps most important; check your ego at the door. As you accept your own limitations about what you can and cannot control, you will find it easier to set aside your fears and get your mind focused on leading your team.

Through the thousands of actions I directed and decisions I made during Florence, I learned there is no ideal style of leadership in a crisis. Your success will depend on your ability to understand the information and the problem, make the hard decisions, set the priorities and objectives, control the pace of operations, bring order to chaos, and inspire your team to achieve the seemingly unachievable. Trust your instincts and your partnerships, drive the narrative internally and externally, and keep your eye on the ball by focusing on leading and not managing.

I never thought I would lead a crisis response the size and scope of Hurricane Florence. It was overwhelming, terrifying, exhausting, frustrating, and the most rewarding leadership experience of my career.

About the author

CAPT Bion Stewart is a 31-year veteran of the U.S. Navy and the Coast Guard. His operational tours include six cutters and at the time Hurricane Florence made landfall in North Carolina, he served as the commander of Sector North Carolina. He is now serving as the chief of staff of Coast Guard District 5 in Portsmouth, Virginia.

Endnotes:

1. Hurricane Florence was designated a Type I incident, and was the most damaging storm in North Carolina history causing 54 deaths and over $24 billion in damages. Sector North Carolina crews, shallow water teams from eight different units around the country, and aviation crews from Air Station Elizabeth City assisted and saved nearly 600 lives and 300 pets over a period of 15 days. Despite record statewide flooding and extensive facility and waterway damage, Coast Guard aids-to-navigation teams (ANT), station boat crews, and sector personnel worked with state, local, and federal partners to safely reopen two national strategic ports and the Department of Defense Military Ocean Terminal Sunny Point within 96 hours following the storm. Sector North Carolina and Strike Team crews also responded to the pollution and sensitive environmental threats from more than 300 damaged and derelict vessels between September 2018 and November 2018 totaling more than $7 million in removal and mitigation costs.
2. Under the National Incident Management System (NIMS), Type I Incident Commanders have been certified through extensive training and demonstrated experience and proficiency to lead the most complex incidents. Type I incidents typically impact large areas and have the highest threat to life, property, and the economy based on a wide range of factors.

Slammed by Back-to-Back Category 5 Storms

Sector San Juan responds to hurricanes Irma and Maria

by CAPT Eric King
Chief, Training Division at Force Readiness Command
U.S. Coast Guard

In September 2017, just a few short months after I assumed command of Coast Guard Sector San Juan, Puerto Rico, hurricanes Irma and Maria devastated Puerto Rico and the U.S. Virgin Islands. They left more than $50 billion in damages in their wake, destroying Coast Guard facilities in Saint Thomas, San Juan, and Aguadilla. The entire region was essentially crippled, as Irma had also impacted other Leeward Islands. The maritime transportation system was critical to successfully bringing goods, commodities, and relief into the region.

Coast Guard Sector San Juan, like every other Coast Guard Sector, is unique in many ways. Among those differences is a 1.3 million-square-mile area of responsibility throughout the eastern Caribbean, including 18 countries, two large cruise ship ports on two separate islands, and a persistent maritime counter-drug and alien migrant threat greater than any other sector in the Coast Guard. Not only is the primary language Spanish, but both Puerto Rico and the U.S. Virgin Islands face significant fiscal challenges when compared to stateside counterparts. Moreover, prior to the establishment of Base San Juan in 2019, I served as the commander for all mission support functions. This included oversight of a geographically separate 149-unit housing complex, security for housing, and a 15-acre base nestled in old San Juan, as well as oversight of all medical, personnel, engineering, and logistical support functions.

This article focuses on lessons and observations from my perspective as incident commander charged with leading more than 2,000 members of Team Coast Guard—active duty, civilian, Reserve, and Auxiliary—in response to hurricanes Irma and Maria. Many of these lessons and observations are not new or even unique, but hopefully will be helpful, whether on a daily basis, with a challenging case, or even in a crisis.

Lessons and Observations

Know yourself and your team's strengths and weaknesses. A crisis is not the time to work on addressing personal shortcomings, but at least you can recognize your weaker areas ahead of time and help reduce your blind spots. Take advantage of opportunities throughout your career, formal and informal, to continually build your own leadership toolkit. Seek feedback from peers and subordinates beyond the normal evaluation cycles. Even as a senior commander at Training Center Petaluma, California, I took workshops on Myers-Briggs (ESTP) and Emotional Intelligence among other topics to learn more about myself.

At the same time, all leaders should continually assess their departments, divisions, and subordinates to understand strengths and weaknesses. Which of your department heads is the most technically competent? Or speaks another language? What division has the deepest bench strength? Has anyone been through a similar case—a major hurricane, oil spill, etc.—before? Fortunately, I assumed command three months before the first hurricane hit, and had made an initial assessment on the strengths, weaknesses, opportunities, and threats across my various departments and subordinate units as my incoming turnover briefs were fresh in my mind. Based on a recent manpower requirements analysis, I knew our logistics department had large gaps in mission support personnel and resources that we would need to fill.

Lastly, determine what your boss is comfortable with based on their background. RADM Peter Brown, the District 7 Commander, had done multiple tours within the district and was previously stationed in Puerto Rico. Therefore, he was very familiar with the operations and challenges in Puerto Rico and the U.S. Virgin Islands.

Surprisingly, outside of normal twice-daily incident management team calls, we had very few conversations directly focused on operations, as RADM Brown really took it upon himself to support families and dependents who had been displaced to Florida through weekly visits. We would typically speak about current conditions in Puerto Rico prior to those meetings so he could answer questions from dependents.

Maslow's Hierarchy. Anyone that has taken a

psychology course remembers Maslow's Hierarchy of Needs. Early on in the response, we really focused on the physiological needs of water, food, and shelter for our own people and families. You cannot execute the Coast Guard missions of search and rescue and re-opening ports and waterways without ensuring those basic needs for your team (and their families). In terms of the community population's needs, we did not know what we would find outside the gates after the storms.

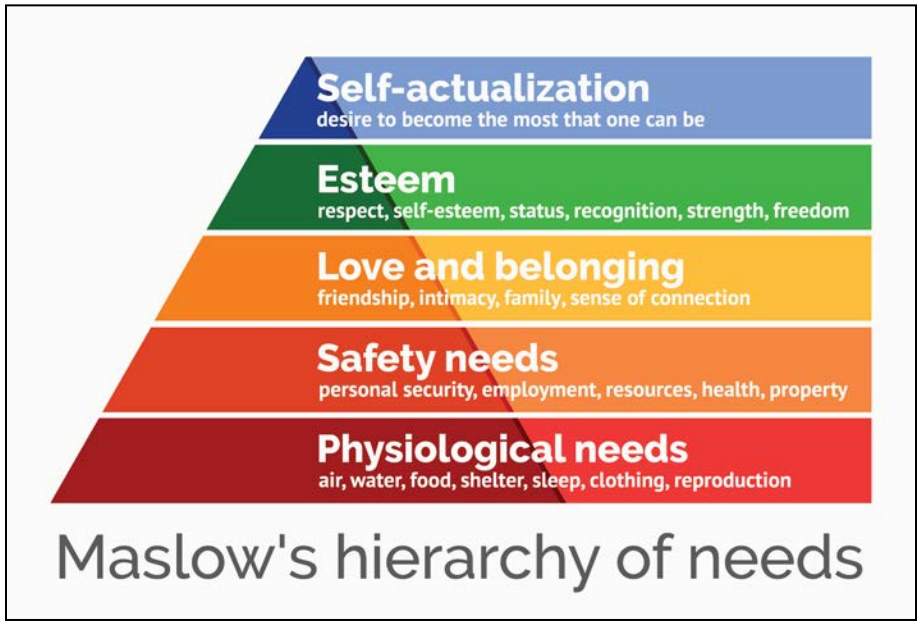
Before the storm, we knew approximately 450 of the 1,100 active duty Coast Guardsmen and their dependents resided in base housing. Although we had flown out the most vulnerable dependents prior to the arrival of Irma and Maria, we still had a significant number of families sheltered in our Coast Guard-owned housing community, Rio Bayamon Housing (RBH). Additionally, we had people that lived outside the gates that moved into vacant houses in the Coast Guard housing community after the storms. This was in addition to those from Puerto Rico that brought extended family members into the community. Literally, we had to go from door to door to get an accurate count of how many people were occupying RBH to account for food and water because we had to ensure basic needs were being met.

Accountability. Both personnel and personal accountability are critical to mission success. There is an expectation, and need, to account for all Coast Guard members—active duty, civilian, Reserve, and Auxiliary—plus dependents in your area following the passing of a hurricane or other disaster. Having a plan on how to complete this phase ahead of an event and practicing is key. These types of large events always happen during the summer transfer season when everyone is moving around and the data just is not accurate yet. The Coast Guard Personnel Accountability and Assessment System, also known as CG PAAS, is a great tool as a starting point for accountability, but ensuring data integrity ahead of time is critical. The challenge we faced in Puerto Rico and the U.S. Virgin Islands was the welfare check requests for families from throughout the Coast Guard. This became overwhelming at one point, prompting us to set up a cell just to track this.

Personal accountability is something we often talk about in terms of personal preparation and resiliency, but we rarely are ever forced into readiness. Well, when a Category 5 storm is about to hit your home, what do you do about your children? What about pets? Spouses with jobs, single parents, extended families? All of these situations impacted our workforce. At one point, we set up a kennel in our RBH gym to manage all of the pet care issues. The coordination was simply incredible and everyone involved was tremendously patient.

As leaders, know your workforce and who has the potential to be impacted.

Phone a friend for advice, to vent, and seek unbiased feedback. One of the first questions I ask incoming prospective commanding officers and officers in charge is who do they call for advice. These friends are outside of your chain of command that you trust and can offer unvarnished truth while giving you ideas and feedback. Moreover, it gives you an opportunity to blow off steam and release your emotions out of the public eye and away from your team. I am forever grateful to folks like CAPT Brian Keffer, Base Miami Beach, and CAPT Jeff Janszen, Sector Key West, for allowing me to bounce ideas off them as we were shutting down the base and operations. CAPT Mark Shepard with the National Strike Force offered invaluable advice on the Emergency Support Function #10 (ESF 10) and Incident Management Team (IMT) transition.



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Don't be afraid to challenge long-standing assumptions. Each of us brings diverse perspectives and new ideas to a job or role based on our point of view and experiences. Leverage that intuition to ask questions and make changes where you see fit. There are many times when you ask the question "Why?" and the answer is because it has always been done that way. I had been through storms at two different sectors, so there were best practices I quickly wanted to apply and implement in terms of port

Coast Guard Chief Petty Officer Nicola Lesourd, part of the National Strike Force's Pacific Team, and the Environmental Protection Agency's Kris Donofrio survey the damage to Great Cruz Bay, St. John, U.S. Virgin Islands, caused by hurricanes Irma and Maria in October 2017. Coast Guard photo by Petty Officer 3rd Class Brian McCrum

assessments and capturing data. Also, I felt much more comfortable shifting our Continuity of Operations Plan location to the base housing near San Juan rather than going to Air Station Borinquen on the other side of the island. This eliminated my concern about being several hours away from the San Juan port, metro area, and key government and interagency stakeholders. The external IMT members that came from throughout the Coast Guard also brought a lot of fresh ideas and innovation to our operations, including different ways to work on quickly reconstituting Sector San Juan.

Provide authoritative communications. The Incident Command System, when implemented with a proper battle rhythm, provides good formal status reports and vertical communications up the chain of command, as well as proper tasking and guidance to the field, subordinate units, and other personnel. It still does not replace the need and benefit of key leaders meeting face-to-face with field personnel. For example, the San Juan Fast Response Cutter fleet and Coast Guard Cutter *Yellowfin* sailed from Puerto Rico down to Curaçao prior to Irma and Maria, returning in between. Upon redeployment to support operations in the U.S. Virgin Islands after Hurricane Maria, the cutters immediately began supporting operations throughout Puerto Rico. This included port assessments, delivering people and supplies to various parts of the island, and conducting meetings with local populations and elected officials. Therefore, when they returned to San Juan, we met them at the waterfront to answer questions and update them on operations.

The other group that wanted authoritative information was our dependents displaced to Weston, Florida, as well as those remaining in Puerto Rico. Some of the families in Weston had left Puerto Rico a day before the storm with just a few hours' notice and a few bags. Others left behind all their possessions, pets, and loved ones. They were starved for information on what had happened to the community and those still there. Certainly, the nightly news coverage did not paint a positive picture. Moreover, they really wanted to know when they could go home. In hindsight, we should have cycled through senior Sector San Juan leaders, including a chaplain, to provide a touch point in Weston. It could have provided the frontline leaders a break, but also fill a communications void for the families. The personnel support team effectively filled the void, but the families knew us better from our shared experiences in Puerto Rico and U.S.

Incident Command System

The Incident Command System is used by the Coast Guard to coordinate emergency response activities from the tactical to the strategic level. In addition to allowing multiple agencies to work together, the Coast Guard also uses it to link together operations, logistics, planning, administration, and finance to track and report activities, resources, and needs.

Virgin Islands.

The families in our RBH community wanted to know what was going on throughout the island and about the status of our operations. I held nightly town hall meetings with dependents featuring lots of whiteboards and flipcharts listing out things like fuel availability, groceries, hospitals, and daily Coast Guard flights that could take dependents stateside.

Tell the Coast Guard story. It is nearly always a good one. One of the things we do very well as an organization is share what we are doing. During a crisis, this level of transparency creates trust with the public when many agencies are having trouble getting in front of the story. The work being performed by our people is valuable and relevant to the mission's success. Rely on the public affairs professionals to work with the media and embrace the opportunity to embed media and your public affairs specialists with your field personnel.

Focus on the bigger issues and do not get hung up on trivial details. As a leader, everyone, internally and externally, wants a piece of your time. Someone will corner you with what they feel is the most important thing in the world and want you to help them. Internally, this can be someone at a different part of the organization circumventing the chain of command to talk to you directly. It is much easier for them to solve their puzzle by getting information directly from the source. Externally, my uniform identified me as a Coast Guard member and O-6, but not everyone understood my role as the Captain of the Port and Sector Commander. In a joint field office with thousands of people working, I am just any other Coast Guard person available to help solve their problem.

Request specialists with focused capabilities. We have some incredibly talented people with a variety of specialized skills in the Coast Guard that bring perspectives from the different facets of the service. Request them early. They will help in so many ways. Look at what your capability gaps are and request those resources. There are four areas we really required assistance:

ESF 10 management. I struggled immensely with the initial decision to turn over the ESF 10 mission and incident specific incident commander to the teams coming in from the National Strike Force. In essence, I was abdicating my power, but they did incredible work with the $75 million mission, ultimately removing over 850 sunken vessels from Puerto Rico and the U.S. Virgin Islands. They built their own IMTs and staffed them accordingly with very little management needed from my team.

In September 2017, Coast Guardsmen from across the country deployed to St. Louis, a location with stable power, to coordinate all of the Coast Guard's Hurricane Irma response efforts. Coast Guard photo by Petty Officer 2nd Class Dustin R. Williams

Incident assist management team. Bringing the Coast Guard Incident Management Assist Team in ahead of the storm really gave clarity to our internal IMT products. Not only did they have great expertise, but they were also wonderful coaches to move us through the process and reduce distractions. They also filled key gaps in the IMT as the response progressed.

Personnel support team. The Coast Guard's mission support organization knocked it out of the park with medical, engineering, and other logistical support in Puerto Rico. The work of the Personnel Support Teams

supporting our families and dependents in Weston helped ensure our success in the response.

Governmental and public affairs. Governmental and public affairs support personnel really helped tie what we were doing into the larger picture and told the Coast Guard's story. Luckily, Sector San Juan has a full-time public affairs officer that helped manage the local picture, but as it became a national news story, having additional resources was critical.

Get rest! More importantly, make sure your team does as well. I personally worked for about 60 days straight and there are plenty of others who worked harder and longer than me. Fortunately, we quickly had power, water, and air conditioning back in RBH. About 55 percent of our personnel lived off base and had to manage finding their own food, water, shelter, and generator fuel, although we eventually had a fuel truck on base to provide fuel to everyone, and food and water was available.

Puerto Rico Department of Natural and Environmental Resources Secretary Tania Vasquez Rivera (right) meets with CAPT Eric King (center), Sector San Juan commanding officer and federal on-scene coordinator, and CDR Kelly Thorkilson, the incident commander for Hurricane Maria ESF Puerto Rico Unified Command, at the incident command post in October 2017. The ESF 10 is the framework by which federal support is coordinated with state agencies in response to actual or potential oil spills or hazardous material releases. Coast Guard photo by Petty Officer 1st Class Timothy Tamargo

Return to normal operations as soon as possible—plan the transition back and do not lose sight of current operations. This applies to regular Type 2 and 3 incidents (see chart on inside cover) where a sector may stand up a separate IMT to manage the incident, while maintaining a focus on normal operations. After all, just because there was a major marine casualty in the northern area of responsibility doesn't mean a huge, overdue search and rescue case won't happen in the southern part. In our case, hurricanes Irma and Maria consumed our daily activities for several months. The IMT, the larger mission support organization, and District 7 did a monumental job helping us reconstitute Sector San Juan as we moved back to normal operations around the beginning of 2018.

Understand the politics. Be savvy enough to understand it; but stay out of it. Puerto Rico received weekly visits from senators and representatives that followed a very similar script of an overflight of damaged areas, followed by a visit to the joint field office for meetings with officials, and a concluding press conference. Just ensure you recognize what the contentious issues are and avoid being used as a prop.

Know your key partners' strengths and weaknesses; concentrate your efforts on opinion leaders. My experience at different sectors is that each state, county, and city does things a little bit differently. You need to understand this because it can often indicate where the power and authorities lie. Some are political appointees and some are career civil servants, so determine this early on.

Know who is in the battlespace. We had several thousand Coast Guard people working on the response over several months, but not all of them worked for Sector San Juan. This can create confusion for other organizations and entities looking for Coast Guard decisions. On more than one occasion, there were things that happened in different ports or facilities based upon a Coast Guard member not associated with Sector San Juan okaying things.

Conclusion

The culture of our service, with our strong bias for action and ability to operate independently, will ultimately help ensure success during any crisis. Recognize that, as a leader, you will be faced with many difficult decisions, but you have to do the right things at the right times to steer your team in the right direction. Continue to hone your own skillset through a lifetime of diverse experiences and build your competencies along the way.

About the author:

CAPT Eric King currently serves as the Coast Guard's director of Training and Development at Force Readiness Command. As the Sector San Juan Commander from 2017 to 2020, he served as the incident commander during Hurricanes Irma and Maria, FEMA's largest overseas response to a natural disaster.

Catastrophic Incident Search and Rescue

Managing inland and maritime response based on Hurricane Harvey

by CDR Jonathan Andrechik
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During a visit to Sector Houston-Galveston following Hurricane Harvey, then-Coast Guard District 8 Commander Rear Admiral Paul Thomas observed that, in the context of a training exercise, most people would have criticized the Harvey scenario as unrealistic. The irony, of course, is that it really happened. The far-fetched Harvey scenario actually unfolded along the Texas coast beginning with the storm's initial landfall on August 25, 2017. Over the next several days, Hurricane Harvey would take the lives of 68 people, cause more than $125 billion in damage, shatter historical rainfall records, and test the limits of first responders, including the U.S. Coast Guard.

> Before Hurricane Harvey's 60.58 inches of rain in Texas, the rainfall record for the continental United States, was 48.00 inches in Medina, Texas, from Tropical Storm Amelia in 1978

An Unprecedented Storm

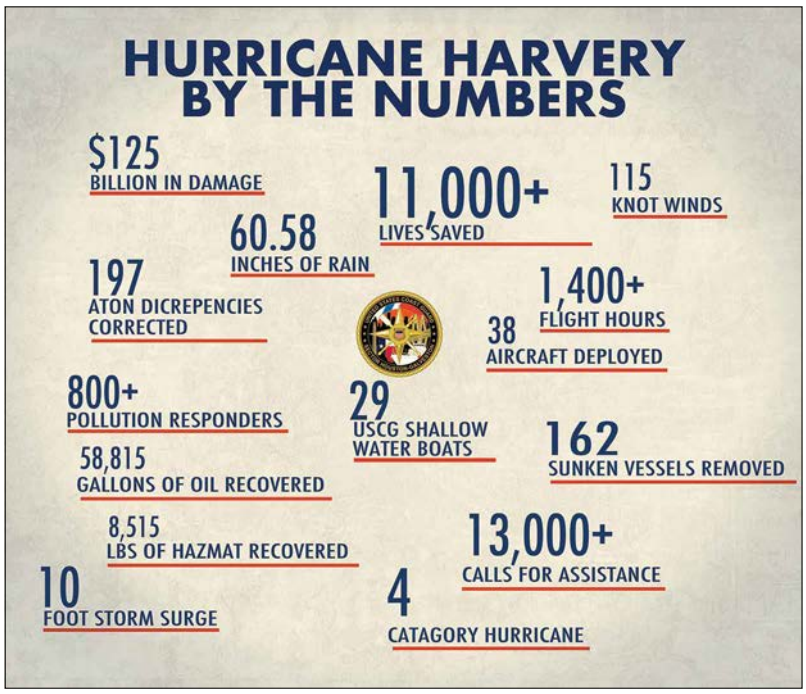
According to the National Hurricane Center, Harvey was the most significant tropical cyclone rainfall event in U.S. history, both in scope and peak rainfall amounts.[1] The new record for rainfall from a tropical cyclone was set in Nederland, Texas, where a rain gauge measured 60.58 inches. While historic, the storm was also unique, making three distinct U.S. landfalls, including two in Texas. Harvey first made landfall as a Category 4 hurricane on San Jose Island, followed by a second landfall on the Texas mainland about 3 hours later. During and after landfall, Harvey battered the central Texas coast with maximum sustained winds of 115 knots and a storm surge of up to 10 feet. In the ensuing days, the storm's unrelenting and torrential rain bands, exacerbated by its stalled forward motion, created unprecedented flooding across southeast Texas, leading to a massive and sustained catastrophic incident search and rescue (CISAR) effort. All told, Harvey was the deadliest U.S. hurricane since Hurricane Sandy in 2012 and the second costliest after Hurricane Katrina in 2005.

All Hands On Deck

The Hurricane Harvey response was truly a team effort—an all-hands-on-deck evolution not just for Sectors Corpus Christi and Houston-Galveston, but for the larger Coast Guard in close coordination with numerous federal, state, and local agencies and volunteers. Within the service, active duty and Reserve forces surged in from across the country, augmented by tremendous volunteer support from the Coast Guard Auxiliary, while command centers at District 8, Atlantic Area, and Coast Guard Headquarters began responding to thousands of forwarded 911 calls from flood victims across southeast Texas. All told, the Coast Guard saved more than 11,000 people during the response. At the same time, the service worked diligently with governmental and industry partners to safely reconstitute economically vital ports and waterways, including the 52-mile Houston Ship Channel, and respond to more than 800 marine pollution incidents in the Houston-Galveston Captain of the Port Zone alone. Across Texas, the Coast Guard, under its Emergency Support Function (ESF) 10 mission assignment, would

recover more than 58,000 gallons of oil, 8,500 pounds of hazardous materials, and remove more than 160 sunken vessels.

Looking back on the historic response to Harvey from the CISAR perspective, Sector Houston-Galveston can clearly point to several challenges and key enablers of success, which have inspired innovative changes and new ways of doing business within the sector and beyond.[2]



Coast Guard graphic

Challenges of CISAR During Harvey

Hours after Harvey's destructive landfall, the storm stalled and began inundating southeast Texas. As floodwaters rose rapidly in heavily populated residential areas across the greater Houston metro area, exceeding the 500-year flood elevation level in many areas, Sector Houston-Galveston began responding to a land-based CISAR event spanning the nation's fourth largest city and eight surrounding counties. While they share the same goal of saving lives, maritime search and rescue (SAR) and land-based CISAR are two very different problem sets. In contrast to maritime SAR, CISAR during Harvey presented several notable challenges.

First, Sector Houston-Galveston experienced an immediate, overwhelming demand for Coast Guard shallow-water and air rescue services across a widespread geographic area as 911 call centers were overwhelmed and calls began to pour into the Sector Command Center early August 27. The call volume was so high—more than 1,000 calls per hour at its peak—that both a makeshift call center and triage system had to be established to begin capturing and properly responding to assistance requests. Not only was the demand overwhelming, it was also geographically widespread making it difficult for rescue assets to proceed to known distress locations without encountering other victims along the way and diverting to assist or vectoring in other rescue assets.

Second, the physical environment of the CISAR effort was unpredictably dynamic. Floodwaters rose in some areas and fell in others, shifting directions as they meandered through a complex topographical landscape. What could safely serve as a staging area or victim collection point one day would be underwater or cut off from access by newly flooded roads the next. Each day presented a new operational environment, rendering parts of the Incident Action Plan for the next operational period untenable. These changes required operations personnel to establish a grid system for managing the coverage of shallow-water rescue teams, adjust work assignments on short notice, and work in concert with city and county emergency operations centers (EOCs) to maximize the utility of Coast Guard rescue teams.

Third, the CISAR environment presented unfamiliar hazards to rescue personnel, both in the air and on the ground. Aircrews experienced the dangers of hover and hoist maneuvers near structures, power lines, and other entanglement hazards, while operating in close proximity to dozens of other rescue aircraft. Shallow-water rescue teams navigated flooded roadways, waded through contaminated floodwaters, accessed flooded structures, encountered stranded animals, and operated among reported criminal activity. At one point, rescue assets were carefully routed around a chemical plant near Houston where failed refrigeration systems on tanks containing hazardous chemicals threatened to explode. At all times, responder safety remained the incident commander's top priority.

Finally, the Coast Guard faced intense media and political interest throughout the response, as one would expect given the very visible and widespread impact of Harvey's historic flooding. With operations ongoing, Sector Houston-Galveston and Air Station Houston hosted 37 national and local media interviews and four national press conferences. They also had an array of high-profile visitors, including the president of the United States, the speaker of the House, all members of the U.S. Congressional delegation representing the state of Texas and impacted districts, and the acting secretary of Homeland Security. With the national spotlight on the greater Houston area at the height of search and rescue operations, the Coast Guard's ability to respond to media and political interest helped instill public confidence in

its CISAR efforts. That capability was made possible in part by a surge of Coast Guard public affairs specialists who deployed to support the joint information center in the Sector Houston-Galveston's Incident Command Post (ICP). At the height of operations, nearly one-third of the Coast Guard's public affairs staff were supporting the Harvey response.

Enablers of Success

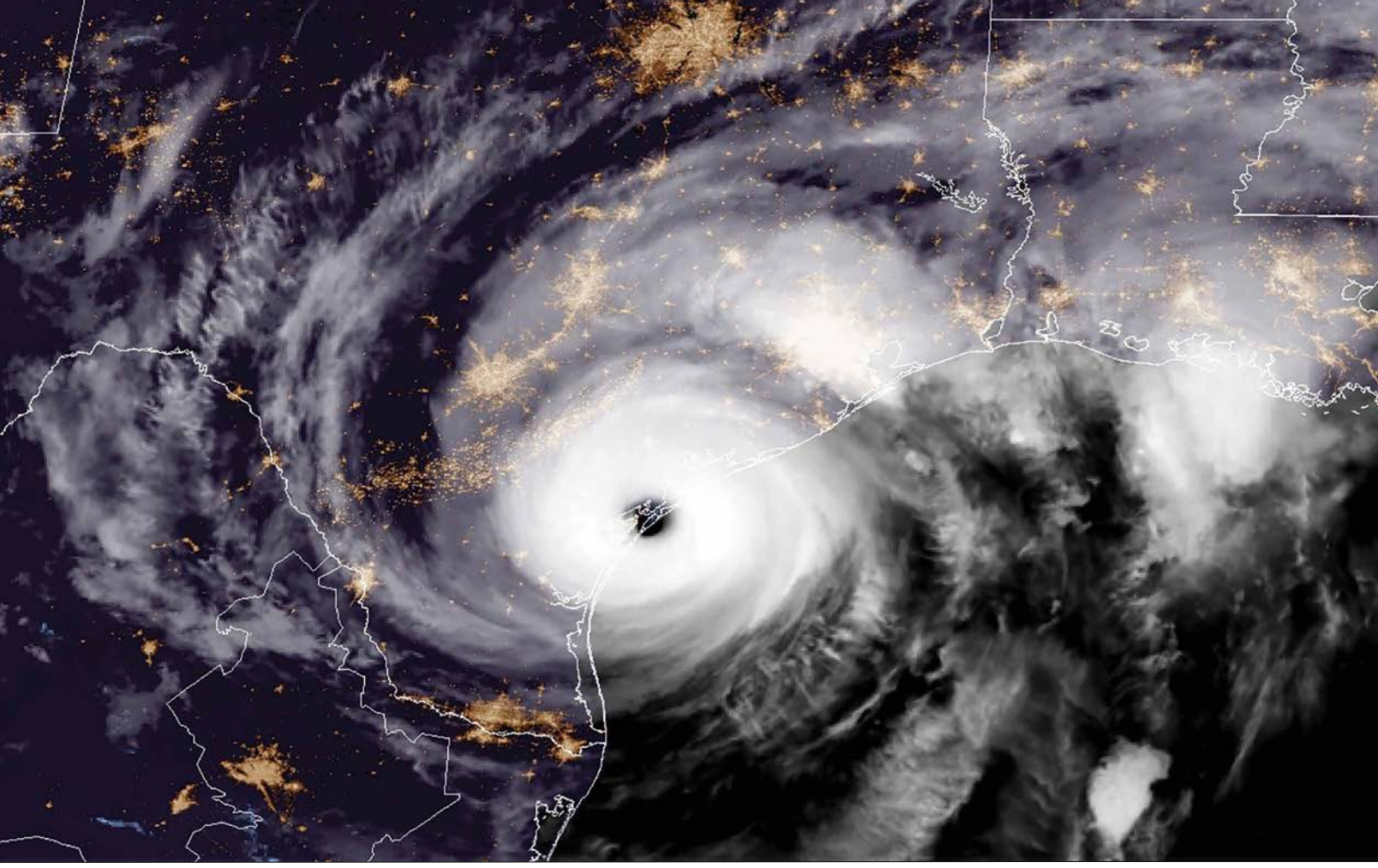
Sector Houston-Galveston was able to overcome the unique challenges posed by CISAR during Harvey due to several key enablers of success.

Partnerships: First, the sector benefited from strong, pre-existing partnerships with other government and industry partners across all mission areas, including SAR. The sector's ability to support the CISAR response hinged on critical access to information provided by agency representatives in the ICP and Coast Guard representatives deployed to local EOCs throughout the region. During the initial frenetic hours within the ICP, Harris County sheriff's deputies and Houston police officers worked directly with Coast Guard SAR branch staff to prioritize and deconflict countless helicopter and surface rescue efforts. Simultaneously, the liaison officer representing the Houston port director for U.S. Customs and Border Protection, translated countless distress calls for non-English speakers in order for SAR forces to respond.

Decentralizing Command and Control: Second, anticipating the potential need for flood response assets, the sector requested that three flood punt teams be pre-staged in its area of responsibility. Decentralizing command and control of these pre-staged teams for the local commander's tasking afforded an immediate flood response capability, minimizing any delay in our contribution to CISAR efforts on the ground. Additionally, District 8 pre-positioning aircraft at Air Station Houston further enabled an immediate CISAR response. With the SAR branch staff and Coast Guard Air Station Houston co-located on Ellington Field, Air Station Houston was able to provide an air boss to support the ICP's SAR branch, providing near instantaneous air dispatch and tracking to continue between the Coast Guard and partner agencies. This was despite the loss of Coast Guard information technology and Rescue 21 resources, including all standard radio communications.

People: Third, enduring local partnerships with county, state, and federal agencies provided immediate access to communications to compensate for the loss of Coast Guard information technology. This coupled with the innovation, adaptability, and on-scene initiative of our people, enabled the Coast Guard to maximize the effectiveness of the CISAR response. The result was the rescue of 7,587 people and 1,434 pets within the greater Houston metro area in just five days.

Coast Guard aircrews medevac a woman rescued from rising flood waters after Hurricane Harvey inundated the greater-Houston metro area in August 2017. Coast Guard photo by Petty Officer 3rd Class Johanna Strickland



The National Oceanic and Atmospheric Administration captured this image via satellite of Hurricane Harvey making landfall on the Texas coast. When it hit the Texas coast on the night of August 25, 2017, Harvey was classified as a Category 4 storm. Photo courtesy of National Oceanic and Atmospheric Administration

Restoring Order Amidst Chaos

With the local 911 call centers overloaded, the Coast Guard SAR branch assumed responsibility for processing a volume of SAR calls far in excess of anything previously attempted. Over the five-day Harvey response, the SAR branch answered approximately 13,000 calls for assistance. This intense surge required improvisation of SAR procedures and significant adaptation to incident staffing to ensure every call for assistance was answered and properly prioritized.

The initial iteration, referred to as Version 1.0, closely resembled traditional Coast Guard procedures and command center staffing with additional ICP personnel on scene to assist. From midnight until 6 p.m. on August 27, this team adapted to the loss of all Coast Guard networked computers and created a paper-based flood rescue tracking system. With each call documented and prioritized, dispatch information was then transmitted by cell phone to a ready helicopter or flood rescue teams. While the adaption to the paper-based systems was necessary and innovative, it was more time consuming then traditional maritime SAR methods. To achieve the necessary precision and safety for high risk SAR, the SAR branch staff increased to more than 50 people to meet rapidly growing demand.

The next iteration, referred to as Version 2.0, was modified to receive and process more distress calls simultaneously. The SAR branch staff increased to a total size of approximately 100 people, all located at Sector Houston-Galveston. A conference room within the sector's command center was set up as a call center with more than 50 persons dedicated to the sole purpose of receiving and processing calls from the public. This dedicated group would include active duty, Reserve, civilian, and Auxiliary members working in shifts around the clock to deliver the paper tracking system results to the rapidly growing number of experienced SAR branch team members dedicated to prioritizing, dispatching resources, and tracking each response.

Version 3.0 recognized a significant step forward in wireless communications as the SAR branch established a Google Docs spreadsheet database that allowed near real-time dispatch communication and prioritization between the sector command center and Air Station Houston. The Google Docs spreadsheet provided necessary data reliability and redundancy, which helped reduce risk for dispatched helicopter crews and flood rescue teams.

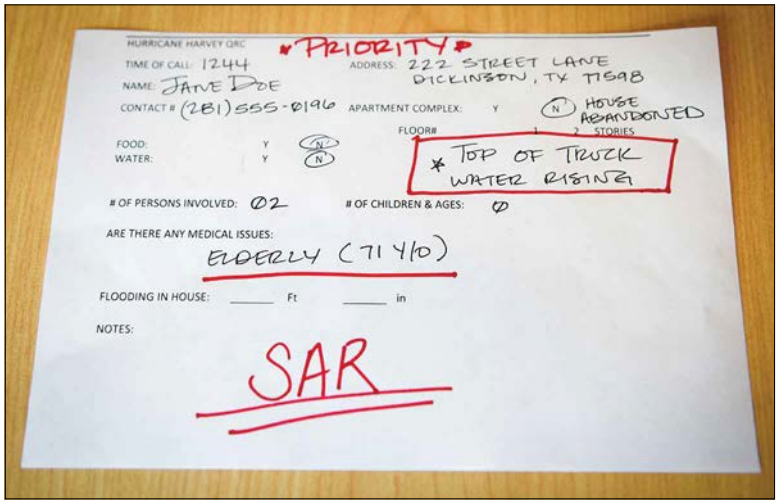
The final iteration, Version 4.0, represented a natural evolution to match call reception capacity to the

overwhelming demand. Call center lines established in the Command Center conference room were transferred to a centralized call center established at Coast Guard Headquarters and manned by about 100 call operators. Using Geosuite, a real time geo-referencing tracking software, these call operators could take a distress call and upload its location and nature of distress to the SAR branch team on a common operating picture display at the sector command center in Houston. Using Google Docs, SAR branch personnel would continue to prioritize and dispatch with air and surface rescue teams. On a limited basis, helicopter crews and flood rescue teams were able to update their status and position by accessing Geosuite with their own wireless devices. Over time, as the situation continued to improve, the SAR coordination staff was able to query, update, and verify SAR responses as they occurred. The use of Geosuite, the expansion of the call center at Coast Guard Headquarters, and the innovative adaptation of experienced SAR personnel greatly improved mission execution. Additionally, the use of a real-time geo-referencing application provided executive level stakeholders at the state and national level with critical situational awareness.

Lessons Learned and Best Practices

The response to Hurricane Harvey and its devastating aftermath fostered a wide array of lessons learned and highlighted numerous best practices that we must capture to better prepare our service for responses to future CISAR events. While inland SAR is not a routine Coast Guard mission, our service possesses strategically positioned assets and personnel with unique capabilities and expertise that make it an immediate potential resource for state and local jurisdictions. Furthermore, the Department of Homeland Security is the primary coordinating agency for ESF 9—search and rescue missions in support of CISAR. The Federal Emergency Management Agency (FEMA), the Coast Guard, the Department of Defense, and the National Park Service are the agencies designated for executing CISAR. All of this, coupled with Sector Houston-Galveston's location in Texas' flood-prone southeast region, increases the likelihood of requests for assistance and necessitates Coast Guard involvement during time critical urban flooding situations. To address these realities and memorialize the lessons learned from this historic event with the goal of improving future hurricane and urban flood response, Sector Houston-Galveston has pursued three critical initiatives:

- establishment of an interagency Flood Response Council
- promulgation of an Urban Flood Response Concept of Operations (CONOPs)
- development of a local Coast Guard sector urban SAR response capability



As Hurricane Harvey continued to batter the Texas coast, connection to all Coast Guard networked computers was lost necessitating the use of a paper-based flood-rescue tracking system. Coast Guard photo

Creation of the Houston-Galveston Area Flood Response Council

Recognizing the effectiveness and success that maritime SAR councils have had in bringing interagency responders and resources together for a coordinated response in the offshore environment, we leveraged that existing concept to create the Houston-Galveston Area Flood Response Council (HGAFRC). This interagency council comprises city and county first responders with urban flood response authority, jurisdiction, and capability, and is chartered to achieve the following primary goals:

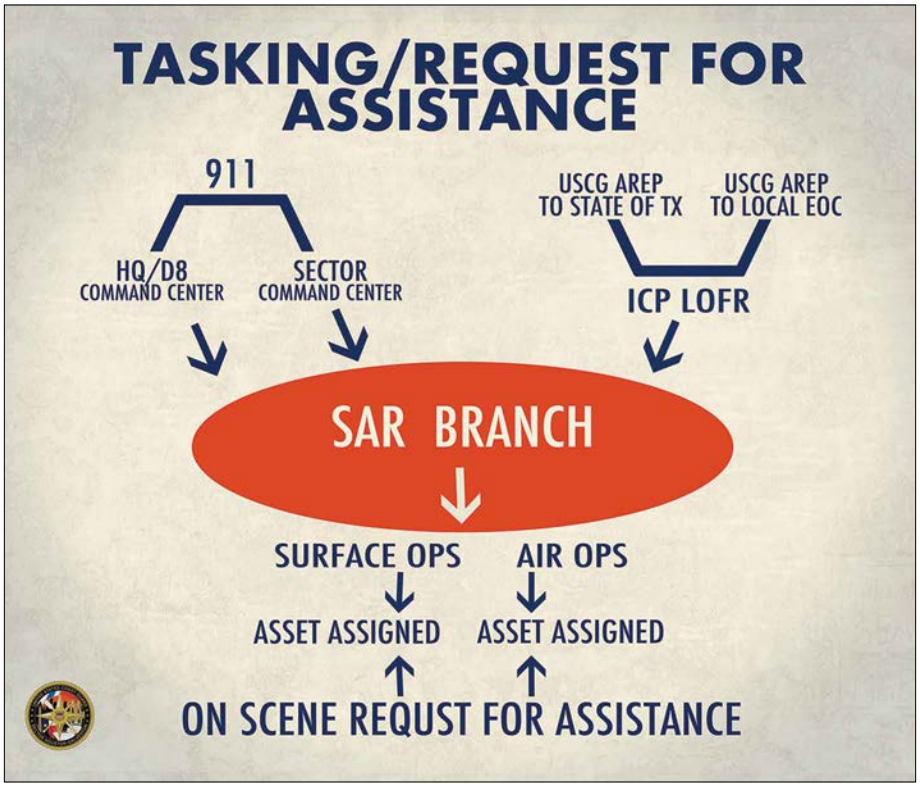
- improve awareness of local area flood response assets and capabilities
- bolster interagency coordination and unified response
- enhance training and preparedness for responses requiring a unified command

With formal establishment of the HGAFRC, we anticipate a better-coordinated and more effective interagency response before, during, and after urban flooding incidents. With creation of the council, we also foresee experiencing a greater demand as member agencies become more knowledgeable about the sector's capabilities. To answer this inevitable demand, we designed the Urban Flood Response CONOPS, which guarantees a consistent and timely response to local and state government requests for Coast Guard assistance.

The Urban Flood Response Concept of Operations (CONOPS)

In addition to the Harvey's impacts, our sector

has experienced numerous heavy rain events throughout our area of responsibility that have fostered varying degrees of requests for our assistance. As a result, it was imperative that we develop a framework to categorize the size and type of incident, classify the different levels of Coast Guard involvement, and outline the decision points and steps required. This ensures we activate and mobilize an appropriate response to all future incidents run by our sector staffs. To align closely with the existing National Incident Management System (NIMS) framework, we categorized Coast Guard Urban Flood Response operations in one of three tiers—local, regional, or national level incidents, and have incorporated the CONOPs as an annex to the sector's Mass Rescue Operations Plan.



Coast Guard graphic

Local level incidents are those situations that are managed effectively using assets, resources, and personnel assigned directly to the local sector/Captain of the Port (COTP) Zone. They involve an event that results in a specific locality or partner agency requesting assistance. A prime example is localized flooding that limits access to, and evacuation of, a specified neighborhood within the region. These events are common throughout southeastern Texas, as the area regularly experiences isolated heavy rainfall events capable of overwhelming engineered drainage and affecting residential and public access locations.

Primary indicators of a local level incident response include:

- Calls for Coast Guard assistance are received from a single entity for a specific location.
- The sector is capable of rendering assistance using locally available personnel, assets, and resources.
- Media interest is low and limited to local news outlet coverage.
- Agency assistance operations are completed within a single 24-hour period.
- Event complexity aligns with standard Incident Command System (ICS) Type 5 or 4 situations and does not require a written incident action plan.

Regional level incidents are those situations that require mobilization and deployment of units outside of those organically available within the sector/COTP Zone, but occur within the district's area of responsibility. Regional level incidents may require contracting additional commercial resources to enhance response capability and involve an event that results in multiple requests for Coast Guard assistance from several different locations within the region. A prime example of a regional level incident is Tropical Storm Imelda that dropped more than 43-inches of rain within a 24-hour period causing widespread flooding to Jefferson County and the Houston Metropolitan Area.

Primary indicators of a regional level incident response include:

- Calls for Coast Guard assistance are received from multiple entities for multiple locations.
- The sector does not possess the personnel, assets, and resources to provide appropriate assistance and must request additional assets from the district.
- Media interest is moderate and extends to regional news outlet coverage.
- Agency assistance operations will span beyond a single 24-hour period.
- Deployment of agency representatives and liaison officers is necessary to ensure a well-coordinated response effort.
- Event complexity aligns with standard ICS Type 3 or 2 situations and may require activation of the sector incident management team and incident specific ICS construct with a written incident

action plan.

National level incidents are those situations that require mobilization and deployment of nationally available Coast Guard assets, as well as federal assets from multiple departments. These incidents extend beyond the capabilities for local control, continue through multiple operational periods, and are often associated with a presidential disaster declaration that involves the coordination and establishment of ESF 9 search and rescue funding administered by the FEMA. Hurricane Harvey serves as a prime example of a national level incident.

Primary indicators of a national level incident response include:

- Calls for Coast Guard assistance rapidly overwhelm locally available asset capability.
- Mobilization of nationally available assets is required to meet the operational needs of the incident.
- Media interest is high and extends to national news outlet coverage.
- Agency assistance operations will span multiple operational periods.
- Pre-positioning of agency representatives and liaison officers is critical to ensuring a well-coordinated response effort.
- Event complexity aligns with standard ICS Type 1 or 2 situations and requires activation of a complete ICS structure with all command and general staff positions filled and strategy developed via written incident action plan.

Agency Assistance Operations for Local Level Incidents: The sector SAR mission coordinator (SMC) must manage requests for Coast Guard assistance in local level incidents in accordance with the policies and procedures outlined in the U.S. Coast Guard SAR Addendum. In these circumstances, requests for assistance are received by a partner agency or directly from the individual in need. The SMC is responsible for evaluating the situation, classifying its emergency phase as either alert or distress, and determining if the sector can support the request or assist in coordinating a local response. Each Coast Guard sector possesses limited resources and must manage requests for urban flooding response assistance against the service's primary responsibility to conduct maritime SAR operations. At a minimum, the SMC must consider the following actions:

- Prepare the stand-up of the sector incident management team.
- Contact local area EOCs and assess the desire for activation of agency representatives.

Agency Assistance Operations for Regional Level Incidents: In addition to the steps listed above for local level incidents, to effectively prepare for a regional level incident, the sector must consider the following actions at least 72 hours prior to the forecasted storm's arrival:

- Submit a Request for Forces (RFF) to the district for pre-positioning of flood punt teams and boats to augment existing local response capability.
- Coordinate with the district and air stations for submission of an RFF to pre-position additional rotary wing aircraft and crews within the area of responsibility.
- Contact local area EOCs to determine pre-designated staging areas, victim transfer, and shelter locations.
- Engage local Flood Response Council membership to identify any known capability gaps, develop primary communications plan, and identify methods for sharing a common operating picture (COP) between response agencies.
- Review local response plans and operations for seamless integration between local and federal assets.
- Bring COP online, if possible, to allow all partner agencies to review available assets and develop resource-efficient response plans.
- Consider contacting the Federal Aviation Administration through the district to establish potential no-fly zones.

Agency Assistance Operations for National Level Incidents: Most national level urban flooding incidents are the result of a major hurricane or tropical storm system that makes landfall. By nature, these storms form over the open ocean allowing the luxury of tracking the system's progress for several days ahead of landfall. In these situations, the sector must activate its severe weather plan through implementation of hurricane and port conditions to prepare personnel, facilities, and assets for the storm's arrival, as well as effective and immediate reconstitution post-event. In addition to the provisions and guidance outlined in the sector's severe weather plan, and the recommended actions in preparation for a regional level incident described above, the impacted sector must also consider the following actions 96 hours prior to the forecasted storm's arrival:

- For sector's like Houston-Galveston that have a subordinate marine safety unit with its own COTP zone, the sector command should identify and pre-position a minimum of two SMCs to manage 24-hour search and rescue operations within that specific COTP zone.
- Request district, area, and/or headquarters level support for establishment of an emergency call center capable of receiving and prioritizing requests for assistance.
- Request and identify an air station representative to serve as the air boss or air operations branch chief during SAR operations.

Crew members from a Coast Guard flood punt team assist a man out of a rescue boat in a Houston neighborhood on August 29, 2017, after Hurricane Harvey had moved through the area. The team traveled from Sector Upper Mississippi River in St. Louis to assist with Hurricane Harvey rescue operations. Coast Guard photo by Petty Officer 3rd Class Ryan Dickinson

- Inquire through the district for the activation of a Coast Guard Mission Assignment to provide FEMA ESF 9 funding to execute CISAR.
- Inquire through the district for the activation of a Coast Guard Mission Assignment to provide FEMA ESF 10 funding to execute oil and hazardous materials response.
- Prepare to stand up a complete ICS structure with unified command representation from other state and local first responders.
- Submit an RFF to the National Strike Force for mobilization of the Coast Guard Incident Management Assist Team and Public Information Assistance Team.
- Consider pre-positioning of Telecommunications and Information Systems Command Deployable Contingency Communications System equipment and acquire access to Iridium phone capability for both the ICP and field teams in the event of a Coast Guard Data Network failure and/or VHF/cellular tower communications saturation.
- Coordinate with local Flood Response Council membership to establish a management system for the potential participation of a volunteer SAR organization (i.e., 'Cajun Navy') in SAR response, and to improve the overall COP to include all participating resources.
- Establish the air station as command and control for all air assets. Any aircraft/drone intending to enter the pre-established no fly zone will require clearance.

Other Lessons Learned: Social Media Requests for Assistance: One of the many challenges facing the Coast Guard and other first responders during urban flood response is requests for assistance generated through social media platforms versus traditional 911 call centers. This becomes even more prevalent if call centers are rendered inoperable, or are unable to function to their designed capability due to equipment failure or higher than designed call volume. While Coast Guard command centers are not resourced, staffed, or trained to actively use social media accounts for receipt and coordination of SAR cases, the use of social media functionality to monitor the overall situation creates a practical tool and additional means to identify "hot-spots" and areas of greater concern for SAR response. As such, sectors

Coast Guard Search and Rescue answered approximately 13,000 calls for assistance over the five-day Hurricane Harvey response. Combined with real time geo-referencing tracking, calls were prioritized and dispatched to air and surface rescue teams. Coast Guard photo

must maintain a readiness posture with the capability to monitor official Coast Guard social media accounts through assignment of at least two social media managers. These managers are critical to ensuring that requests for help received on official Coast Guard social media platforms are answered. Creating an autoreply to notify the public that the account is not continuously monitored, and redirecting the request to 911 call centers is important to ensuring each request is received and properly prioritized. Additionally, to ensure operational awareness, social media managers must verify that each request is cross-referenced with the COP to confirm new requests are properly adjudicated and previously received requests do not cause duplication of effort.

Development of Local Urban SAR Response Capability

For national level urban flooding incidents where sufficient notice of an impending storm is available, flood punt teams and shallow-water response assets are quickly mobilized and deployed to the affected region in preparation for a response. Unfortunately, Sector Houston-Galveston is positioned in the extremely flood-prone region of southeast Texas where urban flooding is a risk from not only tropical cyclone activity, but strong thunderstorms which occur on a regular basis. During these short-notice events, our sector is not afforded the lead-time necessary to request and receive support from district flood punt teams and we do not have locally available resources to support requests for urban flooding assistance. As a result, our sector established a locally staffed and maintained flood punt team that will serve as a branch of the sector's incident management team for immediate deployment. While the team is stationed in Houston to support the high local demand for their capability, they will also stand ready for deployment to other regions of the country that may not be as flood prone but suffer impacts from tropical cyclone activity or other heavy weather events.

Conclusion

Hurricane Harvey was truly a historic event. While our interagency efforts were effective and ultimately successful, our response to the next major CISAR event will undoubtedly be better with implementation of these lessons learned and best practices.

About the authors:

CDR Jonathan Andrechik serves as a program reviewer in the Office of Budget and Programs at Coast Guard Headquarters. While assigned as the response department head at Sector Houston-Galveston, he served as operations section chief for the search and rescue phase of the Coast Guard's response to Hurricane Harvey. A 2000 graduate of the U.S. Coast Guard Academy, he holds master's degrees from the University of California San Diego and the Inter-American Defense College.

CDR Michael P. Attanasio has served on active duty in the U.S. Coast Guard for 18 years. During Hurricane Harvey, he served as command center chief for Sector Houston-Galveston. His other assignments include environmental response, law enforcement, incident management, and officer training. Academic credentials include: a Bachelor of Science from the U.S. Merchant Marine Academy and a Master of Arts from Columbia University. He is currently the operational planning branch chief at Coast Guard District 8.

CDR Jarod Toczko serves as chief of resources management at Coast Guard District 14. During Hurricane Harvey, he was assigned as Sector Houston-Galveston's chief of incident management. A 2003 graduate of the U.S. Coast Guard Academy, he holds a Master of Business Administration and a Master of Science in Accounting from Boston College. His prior assignments include Coast Guard Cutter Aspen, *Pacific Area/ District 11, Sector Long Island Sound, Headquarters Acquisition Directorate, and the Office of Budget and Programs.*

Endnotes:

1. See the National Hurricane Center's Tropical Cyclone Report on Hurricane Harvey, available at: www.nhc.noaa.gov/data/tcr/AL092017_Harvey.pdf
2. The Coast Guard's CISAR Policy was first promulgated in June 2018, partially as a result of the high demand for Coast Guard CISAR capability during Hurricane Harvey.

Bahamas Hurricane Response

Taking emergency management skills abroad

by LCDR Cory Hoffman
Incident Management Assist Team
U.S. Coast Guard

LCDR Heidi Funkhouser
Incident Management Assist Team
U.S. Coast Guard

After historic Hurricane Dorian hit the Bahamas, U.S. Coast Guard members worked through the chaos to provide structure and a strategic plan within 30 days. A blend of hand-picked professionals from the Coast Guard active duty and Reserve forces was asked to go beyond the initial response, and support the government of the Bahamas into early recovery. In these efforts, Coast Guard emergency managers demonstrated crisis leadership in the most challenging conditions and broke ground toward a future of international cooperation.

Historical Background

Well before Hurricane Dorian hit the Bahamas, the Coast Guard fostered a long-standing relationship with the government of the Bahamas. A small population, with a distinct chain of cays and a few larger islands, the Bahamas has had a prolonged struggle in obtaining adequate resources to effectively conduct search and rescue that continues to this day. In 1964, the United States and the governor of the Bahamas developed a memorandum of understanding called the "Sir Grey Agreement," granting the Coast Guard authority to conduct search and rescue within the territorial seas of the Bahamas and otherwise assist as needed.[1]

This memorandum allowed the Coast Guard to provide much-need assistance when the northern islands of the Grand Bahamas and Abaco, within the Commonwealth of the Bahamas, were violently impacted by the Category 5 hurricane. Dorian made landfall on September 1, 2019, and remained uncharacteristically static with winds in excess of 200 mph and a storm surge between 23 and 28 feet. As it hovered over the islands, many areas were impacted for periods in excess of 72 hours, resulting in the devastation of entire communities, including portions of critical infrastructure. By September 3, when the storm had finally moved out of the area, Mr. Antonio Guttierez, United Nations Secretary General, opined after his assessment, "Hurricane Dorian has been classified as category five. I think it's category hell."[2]

The Bahamas' National Emergency Management Agency (NEMA) was charged with disaster relief management, including reducing the loss of life within the Commonwealth. NEMA's National Emergency Operations Center (NEOC) was strategically located on New Providence Island as a central location to the Family Islands[3] and close proximity to the capital. Coast Guard liaison officer, CDR Chris Anderson, was identified to fill a critical role at the NEOC and deployed on September 3, to gain situational awareness, disseminate information, and assist the Coast Guard liaison officer attached to the U.S. embassy.

A Measured Approach

CDR Anderson's initial assessment included the need for a U.S. Coast Guard team to assist the NEOC staff. The Coast Guard's National Strike Force commander, CAPT Mark Shepard, determined "a few well-placed personnel can make a difference," and an initial six-person team was mobilized for deployment.

The blended active duty and Reserve Coast Guard team provided a balanced cross-section of Homeland Security and National Strike Force experience, as well as experience from deployments to Iraq, Afghanistan, West Africa, and Haiti with the Department of Defense.

Arriving at the NEOC on September 6, the team was met by NEMA, U.S. Agency for International Development (USAID) officials, and Coast Guard liaisons already hard at work. The NEOC was organized into emergency support functions (ESF), with representatives arranged in numerical workstations from ESF 1 to ESF 14. Each ESF had a phone, a computer, and a shared printer that remained in a constant state of use unless down for maintenance. Two Royal Bahamian Defense Force members stood radio watch and coordinated search and rescue cases with CDR Anderson, who maintained close contact with LCDR Mark Aguilar at the Bahamas Incident Command Post located at Air Station Miami. There was an air cell composed of Bahamas Civil Aviation Authority officials, who maintained a radio watch and worked tirelessly to deconflict airspace and coordinate airport operations on Abaco and Grand Bahama Island. The Coast Guard team assumed leadership roles to relieve some of the NEMA officials who had worked non-stop coordinating search and rescue cases

while simultaneously organizing the rush of international aid.

From Reactionary to Strategic Action

As noted above, through more than 50 years of collaboration on search and rescue missions and more than 30 years of counter-drug partnerships, the Coast Guard had cultivated a strong relationship with the Bahamas.

That said, while developed and established into a national response framework in the States, the diverse components of emergency management have yet to be fully embraced by leading NEMA officials and international partners. A humble and diplomatic approach was critical to ensuring success, and the use of some of the tools and processes were phased in while building the trust and relationships necessary to establish a proactive approach. Acclimation for the incident management assist team (IMAT) also took time. It included developing an understanding of the Bahamas, including structure, lead agencies' and ministries' priorities, a multitude of other geographic considerations, and most importantly, authorities. With more assistance needed, and Coast Guard authorities limited to search and rescue and counter-drug operations, Coast Guard leaders began exploring new partnership arrangements with the Bahamian government.

All with the best of intent, good Samaritans, members of the United Nations, the Caribbean Community,[4] and nongovernmental agencies, as well as foreign militaries from seven partner countries—including Great Britain and the Netherlands—descended on the NEOC. IMAT leaders identified an immediate need to establish a meeting schedule and to control access to the space. Some of the United Nations cluster group officials[5] and non-governmental agency leaders were leading experts in large scale disaster response, often in areas where governments do not have a strong presence or completely defer to their leadership upon arrival. Naturally, they expected the same scenario in the Bahamas, but the NEMA staff had exercised for this, and was well prepared with emergency response plans. Workspaces within the NEOC became congested, and an emerging need for a separate meeting location for foreign militaries, United Nation cluster groups, and non-governmental agencies became apparent.

Proactive United Nations leaders rapidly secured approval to occupy the second floor of the National Training Agency, about a mile from the NEOC. The building provided a suitable command center with three adjacent meeting rooms, and was named the 'EOC Partner Coordination Office.' The IMAT coordinated with NEMA and the United Nations to revise the meeting schedule, and the USAID Disaster Assistance Response Team coordinator, Mr. Mark Rooney, ensured buses ran a constant schedule between the NEOC and the training center so key leaders could attend meetings at either facility. Most importantly, this enabled a groundbreaking NEMA/United Nations partner coordination meeting on September 13 that put joint operations in motion. The United Nations cluster group leaders showcased emergency management skills in a similar fashion to the Coast Guard. With a multi-lingual staff and technologically advanced planning documents, they also excelled at communications. Their impressive products bolstered the NEOC with a resource request process, tracking system, and data analyses that could be easily accessed from the internet.

Captain Robert Harewood (left), deputy director of the Barbados-headquartered Caribbean Disaster Emergency Management Agency, confers with LT Aaron McClellan, Coast Guard Incident Management Assist Team. Both agencies were deployed to Nassau, Bahamas, to assist the Bahamian National Emergency Management Agency with the aftermath of Hurricane Dorian in September 2019. Coast Guard photo by Joseph Dye

CAPT Shepard and CAPT Ron Catudal, Commanding Officer of the U.S. Coast Guard Reserve Unit, U.S. Northern Command, guided the highest levels of leadership and arranged decision-making meetings with several key leaders, including NEMA executives, Dutch Naval Command representatives, and the Bahamian president of the senate.

All key decisions and priorities were routed to the NEMA leadership for final approval and posted in the NEOC, but not before the IMAT sought the opportunity to again provide organization through capture on an ICS-233, Incident Open Action Tracker. The tasks were arranged by geographic priority and assigned to the appropriate ESF, United Nations cluster group lead, or applicable military force. Version one of the open action tracker began with

94 tasks. It then cycled through multiple revisions overseen by Mr. Rogerio Mobilia, deputy head of the Regional Office for Latin America and the Caribbean, United Nations Office for the Coordination of Humanitarian Affairs, before it was published by NEMA.

Impressively, volunteers like Clay Saunders, who works as an executive for the Bahamian Ministry of Tourism, emerged as a key leader and volunteer within the NEOC. He rapidly assumed duties similar to a National Incident Management Planning System (NIMS) planning section chief, and improved communication by facilitating meetings and keeping planning efforts on task. The back wall of the NEOC was transformed into a NIMS situation unit display, and so began the sharing of information, including the weather forecast by local weathermen who stopped in daily. As Chief Maritime Enforcement Specialist/IMAT member Dan College would say, with common sense applied, the massive team began to organize to achieve the collective vision. As the days melted one into another, a battle rhythm began to take hold, and the giant international response machine began moving forward. The glaring challenge, developing a working logistics plan including "middle mile" and "last mile" logistics to deliver a log-jam of relief resources that lingered in the seaports and airports, still remained.

Chief Petty Officer Dan College (left) coordinates air operations with Mr. Ladario Brown of the Bahamas Civil Aviation Authority. Coast Guard photo by Joseph Dye

Ground Zero—Grand Bahama Island and the Abacos

As focus shifted from search and rescue, it became apparent to IMAT leadership that the ministers and ESFs on Grand Bahama Island and the Abacos had been impacted to a level that reduced effectiveness. Personnel impacts and diminished critical communications began to stall efforts. Additionally, the U.S. Department of Defense, alongside the Dutch and British navies, were quickly demobilizing as the initial response phase was winding down. The forces had made dramatic improvements to major logistical hurdles, including reestablishment of roads and bridges, but the above mentioned "middle" and "last mile" logistics were far from complete on Grand Bahama Island and the Abacos. And at-risk populations still required shelter, water, food, and basic hygiene items.

Understanding the devastation, VADM Daniel Abel, Deputy Commandant for Operations, worked with USAID/OFDA to support deployment of a second, small Coast Guard team to Grand Bahama Island and the Abacos. This was done under a lesser known memorandum of understanding signed in 2011 between the Coast Guard and USAID's Office of Foreign Disaster Assistance (USAID/OFDA).[6]

Prior to the team's arrival, CAPT Catudal, and the embassy liaison, U.S. Southern Command's CDR Paul Rooney, conducted site surveys on East Grand Bahama Island and the Abacos. The wall of water resulting from the storm surge and constant winds left Eastern Grand Bahama Island, and the entirety of the Abacos, flattened and unrecognizable. The citizens, including leadership, remained in a state of shock. Understanding the urgency expressed by the Grand Bahama Island Cabinet Ministries, and at the request of the newly appointed director of NEMA on Grand Bahama Island, Bahamian Senator Kay Forbes-Smith, CAPT Catudal, along with LT George Bowles, Coast Guard Incident Management division chief from Port Arthur, Texas, remained in Freeport, Grand Bahama Island, after their assessment, to guide the establishment of the emergency operations center (EOC) for Grand Bahama Island.

By September 15, CAPT Catudal from the original NEOC began a second round of critical relationship building with the goal of preparing the EOC in Freeport, to work in-concert with the NEOC on New Providence Island. From September 15 to 17, he obtained the use of the C.A. Smith Customs Building as the EOC, established a planning cycle, and began initial coordination with the major influx of non-governmental organizations that had

arrived to make assessments of the islands and cays. The relationships built were the ice-breakers needed and provided Grand Bahama Island a glimpse of what recovery would look like alongside its Coast Guard brethren.

By September 16, the efforts of VADM Abel and USAID/OFDA would come to fruition. In the next 24 hours an additional team of seven Coast Guard members arrived in Nassau. Led by the commanding officer of the Coast Guard's Pacific Strike Team, CDR Lushan Hannah, three of those Coast Guardsmen forward deployed to Grand Bahama Island on September 18. As CAPT Catudal demobilized and CDR Hannah took charge of the small crew, the team rolled up its sleeves and dug into the task of supporting Senator Forbes-Smith.

Despite the gracious support of Carnival Cruise Lines and Operation Relief Saturday during the week of September 9, survivors were still in need of food, water, and critical supplies.[7] As it would turn out, the newly reporting Coast Guard team would have two days to execute a second wave of goods, "Operation Relief Saturday: Part II," a herculean task, but one that could not afford to fail. By the close of the first weekend, major milestones had been achieved, including the successful delivery of supplies to more than 10,000 survivors. Volunteers from every non-governmental organization on the island, and many of the locals, unloaded and organized 20 containers of truly random donations—a gross weight of approximately 100,000 pounds. Most contained useful items, but the unorganized nature of the donated goods created an additional challenge to efficient distribution. If not for the tenacity and leadership of the non-governmental agencies, it would not have been accomplished.

The team on Grand Bahama Island set to work to provide the necessary structure that was lacking. Using WhatsApp® and the National Response Framework, they established groups, task forces and strike teams similar to any standard ICS operations section. Mr. Vince Williams, a member of the Coast Guard IMAT and a retired Marine Corps officer, forged relationships critical to streamline logistics, and ensured that Ms. Tammi Mitchell, the only member of NEMA with a wealth of emergency management experience, was included in introductions to key logistical contacts.

Structure was finally falling into place, and leaders, similar to those in Nassau, were emerging from the volunteers.

Demobilization

Upon receiving notice that the Coast Guard would demobilize, all of the responders shuddered at the thought of leaving their counterparts. What they did not realize, however, was that in establishing the EOCs, establishing

Coast Guard men and women offload boxes of aid from Coast Guard Cutter *Raymond Evans* in Nassau, Bahamas, in September 2019. The service was integral to the Hurricane Dorian recovery efforts, assisting the Bahamian National Emergency Management Agency and the Royal Bahamian Defense Force. Coast Guard photo by Petty Officer 2nd Class Jonathan Lally

The Abacos Islands were unrecognizable after Hurricane Dorian moved through the Bahamas in September 2019. Customs and Border Protection photo by Kris Grogan

battle rhythms, capturing priorities and objectives, and solidifying organization, they had also established a road to recovery. They had trained our replacements, and it was time to empower them. They had provided crisis leadership and assisted more than 50,000 citizens.

The relationships created during this response will be long lasting for many. Those who participated had gone beyond just "executing the planning cycle" and establishing structure. They empathized with a nation that had sustained a severe wound and, as a service, gave more than just honor, respect, and devotion to duty. They also gave heartfelt compassion and understanding.

About the authors:

LCDR Cory Hoffman was assigned to the Bahamas NEOC and the Grand Bahamas EOC as a member of the IMAT. His international experience also includes deployment to the Middle East in support of Operation Iraqi Freedom as a member of the U.S. Army, and deployment to West Africa as a Coast Guard team leader assigned to USMC-Special Marine Air Ground Task Force.

LCDR Heidi Funkhouser is a career Coast Guardsman with tours ranging from Operation Deep Freeze '98 aboard the USCGC Polar Star *to supporting theater security cooperation efforts in the Middle East, Africa, and Europe from 2015 to 2016. As a prior boatswains mate, she qualified to operate across multiple mission sets, but still considers certification as 47' MLB coxswain a career highlight.*

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Bringing Home a "Potcake"

While at the NEOC in Nassau working alongside the Bahamas NEMA representatives, the IMAT members made some friends among not only the locals, but also representatives from various nongovernment organizations and 'other' government agencies. One of these individuals, Hannah Langham from the Samaritan's Purse International Disaster Relief group, became a friend to all, as well as a partner throughout the response. Through this partnership, we discovered Hannah had a particularly tender heart for animals in need, not just people. After a short time and a good bit of effort, she was able to win over one of the local stray dogs, a breed locally called a "Potcake." The term comes from a similar nuance as the South-Southeastern term "Hush Puppy," but in reverse. As locals would cook up their pots of rice and peas, they would toss the strays the thick layer of crust, or cake, from the bottom, hence "potcake." Soon the pup would affectionately be called "Dori," as Dorian would be the catastrophe that brought her to Hannah and the team. When Hannah was gone, it fell on the members of the IMAT to ensure Dori was cared for. It did not take Dori, with her loving eyes and sweet disposition, long to trust the team and become our unofficial mascot.

LT Aaron McClellan, Coast Guard Incident Management Assist Team, poses with his dog Dori. She was a stray following Hurricane Dorian and became an unofficial mascot for the response team during deployment. LT McClellan adopted Dori and brought her back to the States. Coast Guard photo by Joseph Dye

While several team members toyed with the idea of taking Dori back to the United States, none of us acted as fast as LT Aaron McClellan. It would seem he instantly fell in love with the sweet dog and started feverishly researching what it would take Dori home with him. This seemed appropriate since it was LT McClellan that gave Dori her nickname. Partnering with his wife, Emily, who just happened to work at an animal hospital in Virginia, and Hannah, LT McClellan worked with the International Fund for Animal Welfare and the Humane Society of Nassau to file paperwork, get travel arrangements approved, and get Dori checked out by a vet and vaccinated. He even bought her a little pink collar to show she FINALLY belonged to someone!

With a clean bill of health and up to date on her shots, LT McClellan completely confused the lucky pup by getting her bathed and then taking her back to his room where she found a warm, dry, comfortable place to sleep. It would be lying to say she was terrified and didn't know which way was up upon entering the hotel. The truth is she strutted through the lobby and up to HER room with all the confidence of a person that has done it a million times. In fact, she behaved so well and carried herself with such confidence that everyone seeing this beautiful, confident animal walking alongside a group of Coast Guard members assumed she was a USCG working dog. Dori's Coasties routinely fielded questions about her job!

Soon after arriving in the States, Dori sprung one final surprise on everyone. During her check-up at Emily's animal hospital, Dr. Tracey Mullins, the veterinarian who volunteered to take on Dori's case, determined the pooch was more than five weeks pregnant with eight puppies. While there were numerous health concerns, the primary one was how malnourished Dori was at this stage in her pregnancy and how that could affect the development of the unborn puppies. It was an anxious three months until the puppies were born and hit the critical 8-week milestone, but they became rambunctious youngsters living spoiled lives from Texas to West Virginia. One of the lucky pups now calls Emily's dad "Dad."

Dori is now living her best life in Virginia with her forever family. She and the McLellan's other dog, Henry, play tug-of-war for hours at a time. She is learning how to walk on a leash. Fetch is another skill she is working on, and while she currently "throws" the ball for herself, she is learning that having someone throw the ball for her is good fun. Thanks to Dori, her pups, and a tragic storm that brought the two cultures together, the proud Bahamian potcake tradition will live on … in America.

—LT Aaron McClellan and LT George Bowles

The *Caribbean Fantasy* Fire and Grounding

by CAPT Robert W. Warren
Sector Commander, Coast Guard Sector San Juan
U.S. Coast Guard

People often asked what kept me up at night as commander of Coast Guard Sector San Juan, Puerto Rico. A number of responsibilities weighed on me—leading and supporting the 650 Coast Guard members on the island, hurricane preparations and response, and the steady interdiction of drugs and illegal migrants in the approaches to Puerto Rico and the U.S. Virgin Islands. But the answer to that deep question, what actually kept me up at night, was the grave concern over the potential for a mass casualty event or other marine disaster associated with any of the many cruise ships or high-capacity passenger vessels that frequented Puerto Rico and the U.S. Virgin Islands daily.

When the call came around 7:45 a.m. on August 17, 2016, from the Sector San Juan Command Center notifying me of a fire aboard a cruise ship inbound to Sector San Juan, my adrenaline kicked into high gear. The 911 call center had just relayed a report of thick black smoke emanating from a cruise ship outside of San Juan harbor. Subsequent radio calls to the *Caribbean Fantasy*, a 614-ft. passenger and cargo ferry that was inbound from the Dominican Republic, confirmed that a fire in their engine room was out of control, and the 511 passengers and crew were preparing to abandon ship. The crews' initial casualty control actions had proven ineffective in putting out the fire and led to securing all propulsion and power on the vessel, which now drifted off the reef line just northwest of San Juan harbor entrance. Following ineffective attempts to arrest the southerly drift of the ship with a tug and dropping the anchor, the *Caribbean Fantasy* soon grounded by the stern on the reef just west of the harbor entrance. The response that quickly unfolded would become the largest mass rescue operation (MRO) in U.S. waters in 60 years, and would demonstrate the extraordinary unity of effort which has become synonymous with the United States Coast Guard.

Sector San Juan immediately responded, launching every available asset. Three boats from Station San Juan and Aids to Navigation Team (ANT) Puerto Rico, as well as the ready HH-65 helicopter from Air Station Borinquen, launched. Coast Guard Cutter *Joseph Tezanos*, a 154-foot fast response cutter, which was getting underway to commence its pre-commissioning Ready for Operations drills, was designated as on-scene coordinator (OSC). Coast Guard Cutter *Richard Dixon* was diverted from the Mona Passage, and additional Coast Guard aircraft from the air station and small boats from the fast response cutters in port joined the effort. Enacting the San Juan Annex to District 7's Mass

A local San Juan, Puerto Rico-based tug crew uses a fire hose to cool the hull of the 614-foot *Caribbean Fantasy* after its engine room caught fire on August 17, 2016. The fire began to spread forcing passengers and crew to abandon the vessel a mile from San Juan Harbor, Puerto Rico. Coast Guard photo

Rescue Operation Plan, we immediately made notifications to federal, commonwealth, and local agencies. Our response efforts were quickly joined by Customs and Border Protection vessels, response boats from Puerto Rico's marine police units, three local ferries, six tugs, and numerous Good Samaritan vessels in an extraordinary demonstration of unity of effort.

For the next several hours passengers and crew abandoned ship. Most making the harrowing 50-foot descent down the Marine Evacuation Slide system past the hull of the ship, whose paint was blistering from the uncontrolled engine room fire on the other side. The 55-foot ANT Puerto Rico vessel maneuvered close to the searing hull to rescue 33 women and children from a lifeboat which was stranded 15 feet above the water's edge due to a malfunctioning davit. One of the women went into cardiac arrest while embarking the Coast Guard vessel, but was resuscitated when a young Coast Guard petty officer on board the ANT performed CPR. Meanwhile the Coast Guard aircraft conducted additional evacuations from the upper deck.

As the command center worked down their Quick Response sheets and MRO checklists, Coast Guard advance teams from Sector and Station San Juan deployed to the pre-designated landing site at Pier 6 to assist the Coast Guard's passenger vessel safety specialist who had deployed to the site almost immediately after the initial call. Coast Guard personnel organized responders at the site to ensure proper accountability, security, and interagency coordination as response vessels with passengers and crew from the ship, arrived pier side. The teams, in coordination with Customs and Border Protection, local fire, EMS, and other support agencies, synchronized the medical triage and transport of the victims to the passenger reception center or designated medical facilities, as appropriate.

Sector San Juan simultaneously began standing up our incident command system (ICS) structure. Like many sectors, Sector San Juan had standing ICS teams that were on call for a week at a time in the event a scenario like this occurred. Teams from the sector's planning staff, response, prevention, and logistics departments, as well as members of Base Miami Beach's Electronics Support Detachment, established a fully-staffed incident command post. Completed in just two hours, it would support the mobilization of 25 federal, commonwealth, local, and industry partners for the unified response.

The lives of all 511 passengers and crew were saved that day, with minimal injuries or impact to the environment. Over the course of the next three days the unified command would coordinate the salvage efforts to assess, refloat, and safely conduct a dead ship tow of the 28,000-ton burning vessel to Pier 15 in San Juan Harbor. It was pier side that the fire teams were able to access and extinguish the fire.

I have been asked what the key drivers of success were for this significant incident, and there were several. The professionalism, leadership, competence, and forward-leaning posture of every Coast Guard responder was a critical factor, as were the interagency partners who joined us shoulder-to-shoulder that day. And, although I completely concur with the conclusion of many that divine intervention played a contributing role, I would highlight several additional key factors.

The importance of holding regular multi-agency training and exercises: The greatest enemy of the planner is the shelf that perpetually holds the best of plans captive. The requirement per Coast Guard guidance was to exercise the MRO plan twice every five years, with one discussion-based table-top exercise and one full-scale operational exercise over a five-year period. Due to the complexities of these types of incidents, however, and the layers and depth of knowledge required for effective operational execution, Sector San Juan intentionally increased this requirement. Its master training and exercise plan required that the MRO plan be exercised a minimum of once a year, as either a full-scale, functional, or discussion-based exercise. In fact, during the five years prior to the *Caribbean Fantasy* fire and grounding, the sector's planning and force readiness branch and passenger vessel safety specialist had held nine exercises around the island of Puerto Rico and U.S. Virgin Islands, well exceeding Coast Guard and sector requirements. Specifically, Sector San Juan conducted six table-top exercises, one functional exercise, and two full-scale exercises in the previous five years. Moreover, in one of the table-top exercises held about one month prior to the *Caribbean Fantasy* incident, the scenario required an evacuation of a large cruise ship in San Juan Harbor.

Coincidentally, this exercise offered just-in-time training for all response agencies, since many of the leaders and participants in that exercise were the same individuals who responded on August 17. Not only were the responders knowledgeable of the plan details, but the rapport, trust, and relationships established during the exercise at all levels of the responding agencies became critical during the actual event. Had the minimum five-year schedule been maintained, perishable corporate knowledge likely would have appreciably atrophied among the port partners and sector personnel, potentially significantly altering the efficient and effective response.

The assignment of a Passenger Vessel Safety Specialist (PVSS): The value of the up-to-date and rehearsed MRO plan was considerable, and the value of the subject matter expert behind the plan even more so. In addition to the quality and frequency of the exercises, the permanent

A mile from San Juan Harbor, Puerto Rico, a Coast Guardsman monitors passengers as they exit the 614-foot *Caribbean Fantasy* vessel using the marine escape system. On August 17, 2016, around 7:45 a.m., the Coast Guard received initial notification that the ferry was on fire. Coast Guard photo

assignment of a PVSS to Sector San Juan was a significant contributing factor to the overall success of the operation. Their personal connection with critical response partners, intimate familiarity with the MRO plan, and subject matter expertise greatly aided the execution of the plan shoreside. At sectors with a large number of high-risk, high-capacity passenger vessels, having a dedicated, permanently assigned PVSS civilian at the sector pays huge dividends. It allows for the forging of appropriate partnerships which ensures requisite knowledge of key partners across the entire area of responsibility and correctly identifies, mitigates, and manages the risks associated with mass rescue operations.

The criticality of passenger accountability and landing site management: The initial report from the master of the vessel indicated there were 512 on board, although the *Caribbean Fantasy*'s advance notice of arrival paperwork had indicated 516. The actual number was 511, due to one being dropped off at the pier due to medical issues as the ship was leaving Santo Domingo, Dominican Republic. Quickly deconflicting the information and determining the correct number was essential for a successful conclusion to the case. The conditions on the vessel did not easily support onboard searches for missing personnel, and we needed to know if and when all had made it off the ship.

As the team worked to determine the correct number, the response effort also had to ardently hold fast to the pre-determined landing site to ensure all members brought ashore were accurately processed, accounted for, and medically triaged. This was particularly challenging but important when Good Samaritan vessels, who would not have been familiar with the plan, were also participating in the rescue operations.

An appendix of the Sector San Juan MRO plan lists a pre-identified landing site, staging areas, and survivor triage sites for the Port of San Juan. The landing site had been specifically chosen for its pier height and the ability to transfer ambulatory passengers ashore. During the evacuation and transfer of the 511 passengers and crew from *Caribbean Fantasy,* this pre-identified site and victims' reception centers were critical to the successful processing of the victims. It allowed for centralization of medical personnel for treatment and the re-unification

of children and families who were separated during the abandoning ship process.

Initially, other responding agencies advocated dropping off passengers and crew at other locations with similar access. Although operationally feasible, this would have created significant challenges in our critical accountability and triage processes. Once processed ashore and medically cleared, passengers were bussed to the reception center at the cruise ship terminal where they could be processed by customs. Those requiring medical treatment were taken to pre-designated medical facilities with escorts to facilitate treatment and ensure communications and accountability of passengers. The Sector San Juan MRO plan included these arrangements, as well as traffic patterns and staging areas at the landing and processing sites to facilitate the movement of people, vehicles, and response personnel.

The realities of social media and message management: The media can be the best partner or worst antagonist during a major event. One of our first priorities was standing up a joint information center (JIC) to begin handling the hundreds of phone calls we were receiving. These calls ranged from concerned relatives asking about the status of their loved ones, to the press wanting up-to-the minute status of the operation. Our first unified command press conference was shortly after noon on the first day. Sector San Juan conducted a total of 12 live interviews that day, updating the press and public on the status of the response.

The remarkable news and operational successes of the first day became overshadowed on day two of the operation when it was learned that two of the seven dogs on board had not made it safely off the ship. Facebook activists released a video depicting two dogs running loose on the deck of a boat and urged citizens to call in complaints to the command center and protest at the gate. The video was not of the *Caribbean Fantasy*, but public attention abruptly shifted from lauding the number of lives saved by the Coast Guard, to accusing the service of callous negligence regarding the two pets that *were* still somewhere on board the burning ship. The fire teams were directed to look for the pets as they conducted their efforts to secure the fuel lines to the engine room and contain the fire. However, limited air and firefighting capacity on board the vessel, and the myriad dark passageways with no power or lighting, made searching for the dogs difficult.

Protestors responding to the call for action made hundreds of calls to the JIC and picketed outside the Sector San Juan perimeter. Even with the supplemental public affairs personnel assigned, this had become a significant side story, even as we focused our response efforts on refloating the vessel that was grounded with a potential 260,000 gallons of fuel oil on board just off the pristine beaches of Puerto Rico's north coast. Struggling to get our message out beyond the wave of social media posts articulating the opposite, I went outside the gate with my team and personally invited the families whose pets were missing, as well as the principal animal activists, onto the base to speak with them personally. I gave them an overview of our incident command post operations and explained the efforts that were currently underway to find and rescue their pets. Once fire teams on board located the dogs, who had not survived, on a lower deck, we treated the news of their finding with the same sensitivity as we would a next of kin notification in a search and rescue case. Additionally, we established a special pet liaison to work with local organizations to help clarify the status and accuracy of information regarding the pets and our response. These efforts effectively ended the protests and angry calls, however, the entire chapter clearly highlighted how quickly a story can get sideways in the court of public opinion once it hits social media, regardless of its veracity.

The *Caribbean Fantasy* response unified command—the Coast Guard, the Puerto Rico Environmental Quality Board, the Puerto Rico Department of Natural and Environmental Resources, and Baja Ferries—meets at the incident command post at Coast Guard Sector San Juan, Puerto Rico, on August 22, 2016. Coast Guard photo by Petty Officer 3rd Class Jasmine Mieszala

The public can quickly become passionately misinformed when incorrect, unreliable sources provide seemingly accurate information, especially with sensitive subjects including environmental impacts or the death or injury of animals, especially

The *Caribbean Fantasy*, a 614-foot passenger and cargo ferry, is towed to Pier 15 in San Juan Harbor, Puerto Rico, on August 20, 2016. The Coast Guard evacuated 511 people from the ship following an engine room fire three days earlier. Coast Guard photo by Petty Officer 3rd Class Jasmine Mieszala

pets. We had proactively requested and received additional public affairs support for this effort, but even with the supplemental capacity, we had challenges adequately carrying our message and addressing factual errors circulating. A robust social media team established to proactively inform the public, shape public perceptions, and address concerns across the spectrum of social media channels can be critical to successfully managing the external elements of the response. The designation of special liaisons to address pets or other niche issues which may arise as part of the response will help responders get ahead of those reports that might divert critical attention away from the primary efforts.

The pivotal role of the On-Scene Coordinator (OSC): A leader on scene is worth two on the beach. The beginning of the response was tumultuous, as the initial call came in to the Coast Guard via 911 from a third party, and not over the radio from the actual vessel in distress. Confirmation of the conditions on board, the status of the fire and initial action taken, the decision to abandon ship, and even the discussion and direction to drop the anchor prior to the grounding were extremely challenging.

It seemed bridge watch standers and the captain on the *Caribbean Fantasy* appeared overwhelmed by the events transpiring on board, with significant periods where they were unresponsive to callouts via VHF radio. Conflicting reports from passengers on the ship and in life rafts via their cell phones, and reports from observers on the beach made it very difficult for the command center to have an accurate picture of ever-changing on-scene conditions. Directing *Joseph Tezanos* immediately to serve as OSC, with its robust command, control, and communications capabilities, proved critical in directing and coordinating the on-scene response operations. In addition, it became a key information and communications link back to the command center and to the landing site regarding the conditions on scene, the status of the vessel, survivors, and myriad other issues that precipitated from the fire and grounding.

As critical a role as the OSC played, however, the response highlighted gaps in our training and exercise regime. Although cutters know they will likely be called upon to serve as OSCs, specific training related to the operational coordination of multiple assets was new territory. Managing simultaneous communication with myriad units; the effective recovery of passengers and crew from the evacuation slide and life rafts; and the accountability of vessels, passengers, and crew all became elements they wrestled with and developed on the spot. Although cutters do participate in full-scale exercises, their personnel are not generally trained to manage the scope, scale, complexities, and challenges of a large-scale event. Our underway cutters and station crews are also not trained in the recovery of personnel from slides or life rafts, which can often be very difficult with wind, wet conditions, and fatigued and exasperated survivors.

There were many factors that played a contributing role in the success of this MRO. The effective and immediate stand up of the incident command post, the strong relationships between interagency leadership, the proactive posture of every responder, and several other factors aligned circumstances and efforts to achieve the remarkable. There were also many lessons learned and gaps identified that needed to be corrected immediately in our procedures, training, and subsequent MRO plan updates. I am left, however, with a lasting respect for the resilience and heroism of our Coast Guard and local responders, the profound dividends of prior planning and exercises, and the prevailing effectiveness of the multi-agency unity-of-effort that drove extraordinary results over those critical four days.

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CAPT Warren currently serves as chief of staff of the Coast Guard District 1 and has had command both ashore and afloat in his 28-year career. He has served numerous operational and staff tours, including serving on the Joint Staff (J5) at the Pentagon and as director of the Coast Guard's House Liaison Office on Capitol Hill. Having served two different tours in Puerto Rico in command and response positions, he has significant experience in crisis and incident management.

The Oil Pollution Act of 1990 Worked

Part I—Background

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From 1989 to 1990, several large oil spills became coalescing events that led to the Oil Pollution Act of 1990. The first occurred on March 24, 1989, when the *Exxon Valdez* grounded off the coast of Prince William Sound, Alaska, causing the most notorious spill in the United States. The spill discharged approximately 11 million gallons of oil and affected about 1,300 miles of coastline. The response and cleanup to the spill ultimately involved more than 10,000 workers over a four-year period. Then, in early February 1990, the *American Trader* ran over its own anchor just off Huntington Beach, California, puncturing its hull. That puncture resulted in approximately 400,000 gallons of crude oil affecting 15 miles of beach, killing more than 3,000 birds and severely impacting fisheries and recreational beach use. Finally, on June 8, 1990, the tanker *Mega Borg* exploded during a lightering operation about 60 miles off the coast of Galveston, Texas. The resulting explosion and fire caused a discharge of approximately 5.1 million gallons of crude oil. The fire, which lasted eight days, incinerated all but 12,000 to 40,000 gallons of the spilled product. Additionally, planes were used to spread dispersants within five miles of the spill, and over 100 pounds of bacteria were released, becoming one of the first in-situ biological remediation experiments to mitigate an actual oil spill.

After 15 years of unsuccessful attempts to pass similar legislation through Congress, the House and Senate unanimously passed The Oil Pollution Act of 1990 (OPA 90) in response to these spills. President Bush signed it as Public Law 101-380 on August 18, 1990.[1]

OPA 90 established new regulations and strengthened existing regulations which greatly reduced the number and size of spills, while increasing the Coast Guard's response capability. This includes establishment of double-hulled tank vessel requirements; spill liability regulations; industry contingency plan requirements; and the National Pollution Funds Center. It also strengthened the federal on-scene coordinators' (FOSC) role in spill response and the staff, training, and capabilities of the strike teams; as well as defining and strengthening the Oil Spill Liability Trust Fund.

These regulatory changes increased the overall effectiveness of not only national spill response and prevention regimes, but international as well. Both Part I and Part II of this article address the changes OPA 90 brought about and how those changes have become the backbone of U.S. oil spill response and prevention. Part III discusses where we are today, and illustrates some of the trends guiding future efforts.

Prevention

With the passage of OPA 90, Congress sent a clear message to regulatory agencies, industry, and the general public that the way our country deals with catastrophic oil spills must change going forward. The landmark legislation, which created new laws and reorganized existing statutes, called for the secretary of Transportation, the department under which the Coast Guard was operating at that time, to undertake several regulatory rulemakings to help achieve this important objective. OPA 90 had effects beyond the immediate changes enacted when the legislation became law and the regulatory proceedings that were initiated following its passage. It also directed

Coast Guard cutters, tugboats, and fireboats attempt to put out the fire that engulfed the Swedish oil tanker *Mega Borg* after it exploded about 60 miles southeast of Galveston, Texas, on June 8, 1990. Coast Guard photo by Petty Officer 1st Class Chuck Kalnbach

various agencies to conduct a number of studies for the purposes of evaluating existing programs and analyzing whether enhanced requirements would minimize the likelihood of future spills on par with the *Exxon Valdez*'s magnitude.

The final copy of the bill that passed both chambers of Congress and was forwarded to the president for signature included Title IV—Prevention and Removal. Within Title IV's Subtitle A—Prevention were 18 specific sections, each outlining preventative measures designed to mitigate a future incident. A major focus of the Subtitle A sections was a series of directives related to mariner licenses. The legislation also expanded the secretary of Transportation's authority to review an applicant's criminal record, conduct relevant drug testing, and suspend or revoke licenses, certificates, or documents. Many of these requirements now form the basis of the Coast Guard's suspension and revocation program, which the service uses to govern the issuance and misconduct of licensed or credentialed mariners.

In addition to the licensure related requirements, OPA 90 tasked the secretary of Transportation with conducting studies to assess whether he or she should be given additional authority to direct the movement of vessels in navigable waters. The act also directed the secretary to conduct an evaluation of ports and channels in need of new or improved vessel traffic service systems.

Beyond the studies commissioned by the legislation, OPA 90 directed the secretary of Transportation to promulgate regulations establishing minimum standards for hull plating thickness of vessels carrying oil in bulk as cargo or cargo residue. It also addressed standards and regulations related to tank overfill warning devices and tank level or pressure monitoring devices for oil cargo tanks. Finally, the bill also authorized regulatory action related to defining the conditions under which tank vessels may operate in navigable waters with auto-pilot engaged or with an unattended engine room. Limits were also set on the number of hours a licensed individual or seaman could work on a tanker within defined periods.

All the prevention requirements contained within OPA 90 marked a monumental shift in the Coast Guard's authority and ability to address gaps in the federal government's existing prevention and response policies and procedures related to oil spills. Yet, Section 4115, which

established double hull requirements for tank vessels, stands out as perhaps the most aggressive of all the mandates included in the legislation.

The principal requirements of Section 4115 apply to tank vessels operating solely in the waters of the United States. In short, it required all new tank vessels to be constructed with a double hull and excluded single-hull tank vessels of more than 5,000 gross tons, from operating in U.S. waters after 2010. While Section 4115 did contain a few exemptions, including delayed implementation for vessels that operated in lightering zones, or with double bottoms or sides, in general, it required an aggressive, comprehensive phase-out that began in 1995 and ran through 2015.

The United States Congress was not alone in enacting double hull legislation. In November 1990, the United States proposed establishing international requirements for double hulls to the the International Maritime Organization (IMO). Eventually, the IMO adopted regulations 13F and 13G to the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78, which became effective in July 1993 and had provisions similar to Section 4115 of OPA 90.

History has demonstrated the effectiveness of double hull requirements and has reinforced the inherent risk single-hull tankers pose to the environment and the need for OPA 90's phase down of their use. The T/V *Athos I* and the T/V *SKS Satilla* are two incidents that exemplify the importance of OPA 90.

On November 26, 2004, while navigating in the Delaware River, the T/V *Athos I* hit a submerged object while transiting to the berth, ultimately leaking more than 263,000 gallons of heavy oil into the water. Though the T/V *Athos I* was a tank vessel subject to the double hull requirement, the graduated implementation regimen authorized the vessel to operate as a single hull tanker until 2011. Although many causal factors may have led to the incident, the fact remains that, had the vessel been double hulled, the oil spill that resulted from its allision may have been avoided or mitigated. In fact, in the marine casualty report, the investigating officer highlighted that had the vessel been constructed with a double bottom, the cargo tanks probably would not have been penetrated.[2]

The T/V *SKS Satilla* provides a more promising and inspiring example of OPA 90's effectiveness. On March 6, 2009, the 900-foot Norwegian-flagged tanker began listing and taking on water in the Gulf of Mexico. The *SKS Satilla* had hit a submerged oil rig, and the 41 million gallons of crude oil it was carrying posed a major environmental risk. Following an underwater survey of the ship, a large hole was discovered in the *Satilla*'s outer hull, yet due to the ship's double hull construction, the incident did not result in a leak. Ultimately, the ship's cargo was successfully removed, and the vessel was stabilized without any negative impacts to safety or the environment.[3]

OPA 90 represents a major turning point in the United States' overall oil spill response and prevention. However, it is the prevention-related requirements that have established a solid foundation for the authority to inspect and certify towing vessels and establish a safety management system which addresses operations and manning of towing vessels. This newest prevention authority is used to continue to improve safety and reduce risk in the tank barge and towing vessel industry.

Response/Removal

Commercial Oil Spill Response Capabilities

The passage of OPA 90 and the development of the National Planning and Response System has strengthened the nation's overall spill response capacity and

An estimated 263,000 gallons of crude oil was spilled into the Delaware river after the *Athos I*, a 750-foot Cyprus flagged vessel, hit a submerged object on November 28, 2004. The response required a unified effort to contain and minimize environmental damage. Coast Guard photo by Petty Officer Mike Lutz

capability. Vessel and facility response plans specifying response resources, the development of the oil spill removal organization (OSRO) classification program and the development of the Response Resource Inventory (RRI), led to the buildup of both commercial and governmental oil spill response equipment.

OPA 90 and Executive Order 12777 authorized the Coast Guard to issue regulations requiring certain vessels and marine transportation-related facilities to develop oil spill response plans. In 1996, the final rules for vessels and facilities were incorporated into federal regulations in Title 33 of the Code of Federal Regulations (CFR) 155 and 154, respectively. The regulations require that each vessel and facility engaged in transporting, storing, and handling oil as cargo ensures, by contract or other approved means, the availability of mechanical recovery equipment necessary to respond to an oil discharge from that vessel or facility. The Coast Guard and Maritime Transportation Act of 2004 further amended portions of the Federal Water Pollution Control Act and OPA 90. The amendments require an owner or operator of non-tank vessels to develop plans for responding, to the maximum extent practicable, to a worse-case discharge, and to a substantial threat of such a discharge, of oil. Regulations specifying requirements for non-tank vessels were published in 2013. The goals of these regulations are to ensure prompt response to, and effective cleanup of, oil discharged anywhere within U.S. waters.

The regulations also established equipment capability limits (CAPS) on the amount of resources that plan holders require based on their planning scenarios to ensure availability by contract or other approved means. They addressed logistical and availability limitations by specifying tiered response times to ensure resources are capable of being deployed within specified time limits. Recognizing that equipment capabilities, availability, and technology would improve over time, the CAPS are periodically reviewed to ensure equipment capabilities continue to grow as industry grows and technology improves. The last CAPS review was implemented in 2011 and included updates to removal equipment requirements and alternative technology revisions, including dispersants.

Facility and vessel response plan holders must now address the extremely complex system for assembling, mobilizing, and controlling response resources in order to maintain statutory compliance. They must also be prepared to respond to oil spills within their area of operation. Response plans are required to identify and ensure, by contract or other approved means, the availability of response resources necessary to remove, to the maximum extent practicable, a worst-case discharge, and to mitigate or prevent a substantial threat of such a discharge. This includes a discharge resulting from fire or explosion. To relieve the burden on plan holders to provide extensively detailed lists of response resources, the Coast Guard created the OSRO classification program. When an OSRO is classified by the Coast Guard, its capacity has been determined to equal or exceed the response capability CAPS needed by a facility, tank vessel, and non-tank vessel plan holders. If the OSRO meets a plan holder's planning requirements, the plan holders only need to identify the OSROs by name in their response plans. In addition, OSROs voluntarily participating in the classification program must maintain detailed lists of response resources in the RRI. The RRI is a voluntary equipment locator system/national database of response resources that was developed and implemented to meet the OPA 90 mandate. Both the OSRO classification program and the RRI are administered by the National Strike Force Coordination Center (NSFCC).

The RRI is the backbone of the OSRO classification system and its capabilities are two-fold: an inventory element and a classification element. The inventory element provides FOSCs and contingency planners the ability to query the RRI database to identify available oil spill response equipment (OSRE) and its proximity to Coast Guard Captain of the Port (COTP) zones. The classification element, largely considered an incentive for OSROs to enter their inventories into the RRI, complements facility and vessel response plan development and review processes by systematically classifying OSRO response capability up to the response capability CAPS. Classifications are based on time delivery parameters to the geographic location of the COTP office and alternate classification cities (ACC) within a COTP zone and are broken down for six specific operating environments. For many of the classification programs, the NSFCC uses response times, discharge quantities, and equipment requirements specified in the facility and vessel response plan regulations to determine the appropriate classification for each COTP zone or ACC requested by an OSRO.

In order to maintain the integrity of the data stored in the RRI, the NSFCC conducts preparedness assessment verifications. During a verification, NSFCC personnel conduct an OSRO site visit and inspect the equipment. They also review OSRO personnel training records, review equipment maintenance records, and conduct an inventory to ensure that the data entered into the RRI by the OSRO is representative of what is actually present and available. In addition, response plans and capabilities are routinely evaluated during government initiated unannounced exercises and through the National Preparedness for Response Exercise Program (PREP) exercises.

In the three decades since the passage of OPA 90, the nation's oil spill response capabilities have matured into a robust network of commercial OSROs. These commercial resource providers ensure facility, tank vessel, and non-tank vessel plan holders are prepared with the equipment and personnel needed to remove a worst-case discharge up to their response capability CAPS.

Government Oil Spill Response Capabilities

Coast Guard FOSCs are responsible for coordinating an immediate and effective response, as well as directing all on-scene activities during a pollution incident within the coastal zone. Their primary objective is to protect public health and safety, the environment, national security, and economic interests by ensuring the coordinated, integrated, efficient, and effective preparedness for, and response to, pollution incidents and maritime contingencies. Although facility and vessel owners are required to mount an aggressive response in accordance with their facility and vessel response plans, there may be times when it is difficult to determine a responsible party. Spills may occur in areas with limited commercial resources and/or there is a need for immediate government action to mitigate the spill. FOSCs can use government-owned OSRE and can contract commercial resources to mount an aggressive response.

OPA 90 not only drove the establishment of a robust network of commercial response resources, but also spurred an increase in Coast Guard spill response capabilities. The legislation established the district response group (DRG) and district response advisory team (DRAT) at each district, as well as establishing the NSFCC, and reestablishing the three NSF Strike Teams. It also required that new Coast Guard buoy tenders be

A Coast Guard member from the Pacific Strike Team monitors a spilled oil recovery system deployment training from the Coast Guard Cutter *Kukui* moored in Sitka, Alaska, in July 2019. The Pacific Strike Team is one of three teams that make up the Coast Guard National Strike Force. They maintain and rapidly deploy specialized equipment and can provide incident management skills to any place or hazard. Coast Guard photo Petty Officer 3rd Class Charles Long

equipped with oil skimming systems that are readily available and operable, and that complement the primary mission of servicing aids to navigation. As a result, the Coast Guard equipped the new seagoing buoy tenders with spilled oil recovery systems, equipped each district and the NSF Strike Team with OSRE, including vessel of opportunity skimming systems (VOSS) and containment booms, and created an organizational framework to support the FOSC.

The DRG is a doctrinal concept that provides a framework within districts to coordinate the identification, maintenance, mobilization, and deployment of oil and hazardous substance resources for response operations. The DRGs consist of all Coast Guard units within a district's geographical boundaries, including all vessels, aircraft, and prepositioned OSRE, which is strategically prepositioned in each district throughout the nation and available for use in an incident, upon FOSC request.

Part of the district staff, the DRAT is the coordinating body for the DRG. It is a readily accessible, deployable team that provides technical and logistical support for the FOSCs within their respective district. In addition, the DRAT maintains a liaison with the NSFCC, which fulfills the Coast Guard's statutory mandate to provide logistical coordination for the use of private and public personnel and equipment to remove worst-case discharges.

The NSF maintains OSRE capable of protecting property and the environment, as well as collecting, recovering/removing, temporarily storing, and transferring/offloading the spilled oil. This equipment consists of ocean boom systems, VOSS, and oil pumping systems, including a specialized viscous-oil pumping system. The NSF also maintains equipment to monitor the effectiveness of dispersants, monitor particulates in the air as a result of in-situ burning operations, and monitoring devices to ensure the health and safety of public and responders. Its personnel are trained to operate this equipment and assist FOSCs to direct the response and manage the incident.

Coast Guard OSRE was never intended to compete with private industry sources and should only be used to fill the gap or augment industry to ensure an adequate and timely response. The service is obligated to withdraw its resources when adequate commercial resources become available. The decision to use government response equipment is at the discretion of the FOSC, who has the responsibility to direct a coordinated, safe, and adequate response.

The Coast Guard's pre-positioned mechanical recovery capability developed following OPA 90 has been operational for 30 years. However, there has been nominal investment in updating these capabilities, while commercial OSRE has continued to increase in number and improve in capability. Due to sufficient availability of commercial resources and the ability for an FOSC to rapidly contract commercial resources through pre-negotiated basic ordering agreements, the need for organic Coast Guard skimming equipment has been greatly reduced. However, in certain remote areas where commercial resources are insufficient, there remains the need for the Coast Guard to be ready to provide initial response capabilities until commercial resources can be brought in from other areas. Currently, the Coast Guard only maintains pre-positioned equipment at the NSF strike teams and in the remote areas of Districts 14 and 17.

State and Local Impacts

Since several states had oil spill liability laws before OPA 90, per Section 1018, the act does not preempt any state from imposing "additional liability or requirements" concerning the discharge of oil or related response activity.[4] Section 1019 also authorizes states to enforce on their navigable waters the requirements for evidence of financial responsibility under Section 1016.[5]

In 1990, under these authorities, California enacted the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act in response to the *American Trader* spill near Huntington Beach. The law also created an administrator who was designated state-on-scene coordinator representing the state in any coordinated oil spill response efforts with the federal government.[6] A year later, Texas enacted the Oil Spill Prevention and Response Act of 1991, adopting oil spill liability legislation that supplemented the provisions of OPA 90.[7] Several other states followed suit with varying levels of legislation in the early 1990s, as the general public questioned their elected officials about the potential impact of an *Exxon Valdez* in their backyards. A 2003 study identified 16 states that imposed unlimited liability for oil spills.[8]

Part I Conclusion

Part I has dealt with prevention and response measures instituted to lessen the impacts of spills, with the intent of instituting best practices and lessons learned in the early 1990s. Part II focuses on improving response funding, instituting limits of liability, and new research and development measures, as well as current gaps associated with OPA 90. It also demonstrates the success of OPA 90 over the past 30 years.

About the authors:

CAPT Zeita Merchant currently serves as the deputy commander of Sector New York, overseeing the daily operations of the sector's more than 900 personnel, seven cutters, three small boat stations, two aids to navigation teams, and vessel traffic management system. Prior to joining the sector, she was a National Security Fellow at Harvard University.

Enjoying more than 23 years of active duty service, she is a recognized authority in the complex marine safety and emergency management fields.

CAPT Keith Donohue serves as alternate Captain of the Port, alternate officer-in-charge of marine inspection, alternate federal maritime security coordinator, and alternate federal on-scene coordinator for the navigable waterways between Lake Charles, Louisiana, and Matagorda Bay, Texas. Previously he served as commanding officer of the Pacific Strike Team; a consultant for the International Maritime Organization; an international port security liaison officer; as well as other positions in maritime safety, security, and environmental protection.

CAPT Tedd Hutley currently serves as the commander of the National Strike Force and commanding officer of the National Strike Force Coordination Center, overseeing the daily response and preparedness operations of the Incident Management Assist Team, Public Information Assist Team, and the three strike teams. He provides rapidly deployable technical experts, specialized equipment, and incident management capabilities for federal on-scene coordinators and lead agency incident commanders for the most complex response and preparedness missions.

CDR Lushan Hannah is currently serving as the commanding officer of the Pacific Strike Team. His career conducting marine environmental protection, commercial vessel compliance, contingency planning, law enforcement, and search and rescue spans 22 years. He holds a Master of Science in environmental management from the University of Maryland-University College, a master's degree in public health focused on industrial hygiene from the University of Michigan, and a Master of Arts in national security and strategic studies from the Naval War College.

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Part II—National Pollution Funds Center and the Oil Spill Liability Trust Fund

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The *Oil Pollution Act of 1990* (OPA) was enacted in the wake of the T/V *Exxon Valdez* oil spill to promote measures for the prevention of oil spills on navigable waters, the adjoining shorelines, and the exclusive economic zone. It provided a more robust federal response to spills, increased the liability of polluters, or responsible parties (RPs), for such spills, and provided for compensation to those that incurred removal costs and damages as a result of these spills.

The OPA provides that RPs are strictly liable for removal costs and damages resulting from a discharge up to statutory liability limits. In general, RPs are liable without limit when the discharge results from gross negligence; willful misconduct; or a violation of operation, safety, or construction regulations as indicated in OPA 1004 (33 U.S.C. § 2704).

In 1986, Congress established within the Treasury of the United States, the Oil Spill Liability Trust Fund (the Fund);[1] however, it was not until after the 1989 *Exxon Valdez* oil spill that under the OPA, Congress

transferred monies into the Fund and authorized its use. The National Pollution Funds Center (NPFC) was created and delegated authority by the Commandant, via re-delegations of authority vested in the secretary of the department in which the Coast Guard was operating at the time, to manage the Fund. The Fund plays a critical role in the OPA regime, paying federal costs for oil removal when a discharge occurs, and reimburses third-party claims for uncompensated removal costs and damages when a responsible party does not pay or is not identified.

The types of damages compensable under the OPA include damages to natural resources, loss of subsistence use of natural resources, damages to real or personal property, loss of profits or earning capacity, loss of government revenues, and increased cost of public services. In addition, the Fund is an important source of annual appropriations to various federal agencies responsible for administering and enforcing a wide range of oil pollution prevention and response programs addressed in OPA 1012 (33 U.S.C. § 2712).

The Fund is available, as provided by the OPA, to pay claims for removal costs and damages resulting from an oil discharge that exceeds the responsible party's liability limits. This includes payment of claims from RPs who pay or incur removal costs or damages in excess of their liability limits and can establish their entitlement to the limits under the circumstances of the discharge as stated in OPA 1008 (33 U.S.C. § 2708).

Claims to the Fund are payable only from the Fund, and payments are limited by the available balance. For any single discharge incident, the Fund is authorized to pay no more than $1 billion, of which no more than $500 million may be paid for natural resource damages per OPA 9001(c) (26 U.S.C. § 9509).

Funding the Oil Spill Liability Trust Fund

Though Congress created the Fund in 1986, it did not pass legislation to authorize the use of the money, or the collection of revenue to maintain it. It was not until August 1990 that President George H. W. Bush signed OPA into law and authorized use of the Fund. With a balance of approximately $7 billion, the Fund is funded in several ways:

- interest income on the fund's principal
- costs recovered from responsible parties
- civil and criminal penalties from responsible parties
- barrel tax on domestic and imported oil
- transfers from other legacy pollution funds

To date, the largest source of income for the Fund has been from the per-barrel excise tax on imported and domestic oil, originally a 5-cents-per-barrel tax. The Energy Policy Act of 2005 re-instated the tax in April 2006 and the Energy Improvement and Extension Act of 2008 extended it through December 2017, while concurrently increasing the per-barrel excise tax to 8 cents from 2009 through 2016, and to 9 cents in 2017. The current rate is 9 cents per barrel, and the tax expires December 31, 2020. The Act also repealed the requirement that the tax be suspended when the Fund balance exceeded any given amount.

Who pays the OSLTF oil tax?

The per-barrel tax to finance the Fund is addressed at section 4611 of the Internal Revenue Code (26 U.S.C. 4611), and applies to crude oil received at a U.S. refinery, as well as petroleum products entering the United States for consumption, use, or warehousing. The tax also applies to other domestic crude oil used in, or exported from, the United States. The tax on crude oil received at a U.S. refinery is paid by the refinery operator, while the tax on imported petroleum products is paid by the person entering the product for consumption, use, or warehousing. The tax on other crude oil is paid by the person using or exporting the crude oil.

While the Coast Guard is delegated certain authorities to manage and use the Fund, collection of taxes and deposit of collections to the Fund is managed by the Department of Treasury.

What does the trust fund pay for?

The OSLTF has two components. The first is the Emergency Fund which is used to fund removal activities and the initiation of natural resource damage assessments. The second is the Principal Fund, the portion of the OSLTF exclusive of the Emergency Fund, is used primarily to carry out two functions:

- The adjudication and payment of claims for certain uncompensated removal costs and damages.
- Congressional appropriations to various federal agencies, including the Coast Guard, responsible for implementation, administration, and enforcement of OPA, and oil spill research and development.

Fund Limits

Expenditures from the Fund for any one oil pollution incident are limited to $1 billion or the balance of the Fund, whichever is less. Natural resource damage assessments and claims in connection with any one incident are limited to $500 million of the $1 billion per incident limit.

30 Years of Oil Spill Response Research and Development and Interagency Coordination

Responding to provisions in Title VII of OPA 90, the Coast Guard research and development program (R&D) has continued to work with the oil spill research community in addressing regulatory and technological needs to enhance the national oil spill response capability. The service's efforts also further the development of systems and equipment that can be used by the Coast Guard, other oil spill response agencies, and private industry. These undertakings are summarized in four key areas of technology:

- spill response planning and management
- spill detection and surveillance
- vessel salvage and onboard containment
- spilled oil cleanup and alternative countermeasures

These areas include the development of computer-based response decision tools, remote sensing devices, response equipment databases, and oil spill response technique literature review. Also included are the continued support of our nation's academic organizations, as well as facilitation of technology transfer, and promotion of public awareness. OPA 90 created the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR), a 15-agency body chaired by the Coast Guard, to coordinate the federal government's oil pollution R&D activities. This includes coordinating research projects undertaken by agencies, academic research on oil spill prevention and response, port demonstration projects to promote technology transfer, and acceptance by the maritime community. ICCOPR develops and maintains the Federal Oil Pollution Research and Technology Plan and submits a biennial report to Congress. The interagency committee proudly continues to serve as a forum for its federal members to coordinate and maintain awareness of ongoing oil pollution research activities.

Current Gaps

Alternate planning criteria in Alaska

Oil spill response capability in Alaska remains a significant concern 30 years after the passing of OPA 90. While capability has improved, most vessel response plan holders cannot meet national planning criteria (NPC) to satisfy vessel response plan (VRP) requirements per 33 CFR 155 for much of the state. The regulations do allow an owner or operator of a vessel to propose alternative planning criteria (APC) that is equivalent to NPC if they believe NPC is inappropriate for where the vessel intends to operate. Currently, there are five Coast Guard approved APCs in Alaska, but *substantial* gaps in response capability still exist.

As the responsible party, the vessel response plan holder is ultimately responsible for an oil spill but they must pre-identify an oil spill removal organization (OSRO) as part of their VRP to conduct the cleanup operations in the event of a spill. However, through no fault of their own, few OSROs in Alaska have the robust capacities that are available in the lower 48 states. Much of the 47,000 miles of Alaskan coastline lacks any infrastructure, including airports, ports, or roads. Very few airports can support cargo aircraft due to runway limitations and lack of cargo handling equipment. Even fewer ports are collocated with substantial airports. Less than 20 percent of the state is accessible by road. This translates to very limited transportation throughout and, when coupled with vast distances, the issue becomes a logistical bottleneck for response operations. This makes it very difficult for vessel response plan holders to meet NPC requirements for the greater extent of Alaska.

To put it in perspective, imagine an OSRO with equipment and personnel located in Houston responding to an incident in Chesapeake Bay. To get on scene they must first fly all their resources from Houston to Miami, load those resources on board vessels, and then get underway for Chesapeake Bay to respond. Replace Houston with Anchorage, Miami with Dutch Harbor, and Chesapeake Bay with Attu Island. That is what a response that a vessel owner or operator must plan for might look like in Alaska.

Alternative planning criteria are the regulatory compliance focus since NPC is inappropriate for much of Alaska. They are evaluated and endorsed at the Captain of the Port (COTP) level first, then routed to the Office of Marine Environmental Response Policy at Coast Guard Headquarters for approval via Coast Guard District 17 and Pacific Area. During the review process, response capability is assessed against NPC requirements and gaps are noted. Proposed alternatives are evaluated with the existing response capability to determine if an equivalent level of planning, response, and mitigation measures have been used. An illustration of a proposed alternative would be the mobilization of resources to respond in a remote area in the nearshore environment, which would take three days due to distances from response resource hubs. In three days, it is likely more shoreline cleanup operations would be required than on-water recovery operations. The APC could articulate that since skimming operations would not be able to take place for the first 72 hours, greater shoreline

Cleanup crews work to remove oiled material from the Mississippi River near LeClaire, Iowa, in December 2013. Response crews deployed more than 7,100 feet of boom and collected more than 1,800 cubic feet of oily waste using sorbent material and plastic bags. Coast Guard photo by Petty Officer 3rd Class Jonathan Lally

impacts are to be expected. Therefore, enhanced shoreline cleanup efforts would be prepared for as part of the initial response in the APC.

Federal regulations offer very few specifics on what an alternative is or is not. This is a huge benefit to industry because it allows credit to be given for innovation. The use of a 24-hour vessel tracking and monitoring program is an important prevention step. The programs are managed by live watches and can alert the Coast Guard, qualified individual, and OSRO of potential issues with a vessel in near real time. This is far above what regulation calls for and enhances maritime domain awareness for all parties. More significantly, it buys the plan holder additional time to mobilize the appropriate response resources should there be an issue. Prevention measures are critical to environmental protection and, as great as an alternative like this is, how does it offset the gap in response capability when a spill occurs? Evaluating proposed alternatives with little regulatory framework can be very complex and time consuming. Careful consideration must be given to ensure the limited response capability works in concert with the proposed alternatives.

During the evaluation process, the Coast Guard has noted some APCs rely heavily on OSRO classification. The voluntary OSRO classification system was developed by the Coast Guard to aid COTPs and plan holders in evaluating OSRO capability and to facilitate the preparation and review of response plans. Additionally,

plan holders do not have to present detailed lists of response resources by using this classification system. Instead, they may cite a classified OSRO. As stated in Part I of this article, the Coast Guard classifies OSROs by COTP zones or alternate classification cities and is largely based on boom quantities, effective daily recovery, and temporary storage capacities. The 2019 guidelines for the Coast Guard OSRO Classification Program state, "If the OSRO is classified by the Coast Guard, then its capacity has been determined to equal or exceed the response capability caps needed by a facility, tank vessel, and non-tank vessel plan holders." Classification is often misunderstood as meeting NPC requirements as defined in 33 CFR 155 for a given plan holder. NPC is much more nuanced because it requires much more detailed response planning for aerial tracking, logistical support, and sustainment, just to name a few elements not addressed by OSRO classification. Cognizant COTPs across the country should constantly evaluate their zones for potential gaps in response capability and not rely on OSRO classification alone to determine whether NPC requirements are being met by resource providers in their respective areas of responsibilities.

As current regulations exist, APCs will likely be a part of spill response in Alaska. New infrastructure that could support oil spill response built in currently uninhabited locations will not likely be extensive enough. NPC requirements were clearly written for the lower 48 states where spill response resources are bountiful but are not realistically achievable for most of Alaska. The Coast Guard has established the Maritime Oil-Spill Response Plan Advisory Group (MORPAG) to evaluate the Vessel Response Plan (VRP) program and make recommendations for policy and other changes to improve the program. The objective of the MORPAG is to analyze existing regulations and policy regarding VRPs and assist the Coast Guard Office of Marine Environmental Response Policy with revising or clarifying, where appropriate, national spill response planning regulations, policy, and doctrine.

Part II Conclusion

Part II has dealt with improvements to response funding, new research and development measures, and discussed a current gap associated with OPA 90. Part III deals with the way forward and recommendations to improve upon the OPA in future years.

About the authors:

LCDR Christopher Kimrey enlisted in the Coast Guard in 1998 and received a commission in 2007. As a career response professional, he specializes in disaster management, incident command, and oil spill response. He holds a master's in national security studies from the Naval Postgraduate School, a master's in public administration from the University of Pennsylvania, and a master's in business administration from the University of Virginia's Darden School of Business.

LCDR Jereme M. Altendorf graduated from Creighton University with a Bachelor of Science in chemistry and environmental science. He went on to get a master's in environmental engineering from the University of Missouri and an MBA from George Washington University. He is also a certified hazardous material manager. He was commissioned in June 2002 and is currently assigned to Sector Anchorage as a subject matter expert for the Arctic and Western Alaska Area Committee.

LT Omar Borges, a native of Isabela, Puerto Rico, joined the Coast Guard in 2002. His duty assignments include Coast Guard Cutter Haddock, *Marine Safety Office San Diego; Sectors San Diego, San Juan, San Francisco, Honolulu, Columbia River, Boston; and Coast Guard Headquarters. His awards include three Coast Guard Commendation Medals, a Joint Service Achievement Medal, four Coast Guard Achievement Medals, and four Commandant Letter of Commendation.*

LT James Nunez enlisted in the Coast Guard on July 13, 1994, receiving his commission upon completion of Officer Candidate School on December 9, 2009. He spent the last 7 years in Alaska, most recently as the chief of Sector Anchorage's Incident Management Division. He recently retired from the Coast Guard after 25 years of service, and is now the emergency manager for the Lawrence Berkley National Laboratory.

Greg Buie has served in the Coast Guard for 38 years. Currently, he serves as the regional manager for the Western states and Pacific region in the Case Management Division of the NPFC. He provides spill response funding for EPA regions 8, 9, 10, and the Coast Guard's Pacific area. He is the recipient of the Coast Guard's 2018 RADM Sidney A. Wallace Award for Excellence in Marine Environmental Response and Preparedness.

Part III—The Way Forward

by Mr. Kevin Sligh
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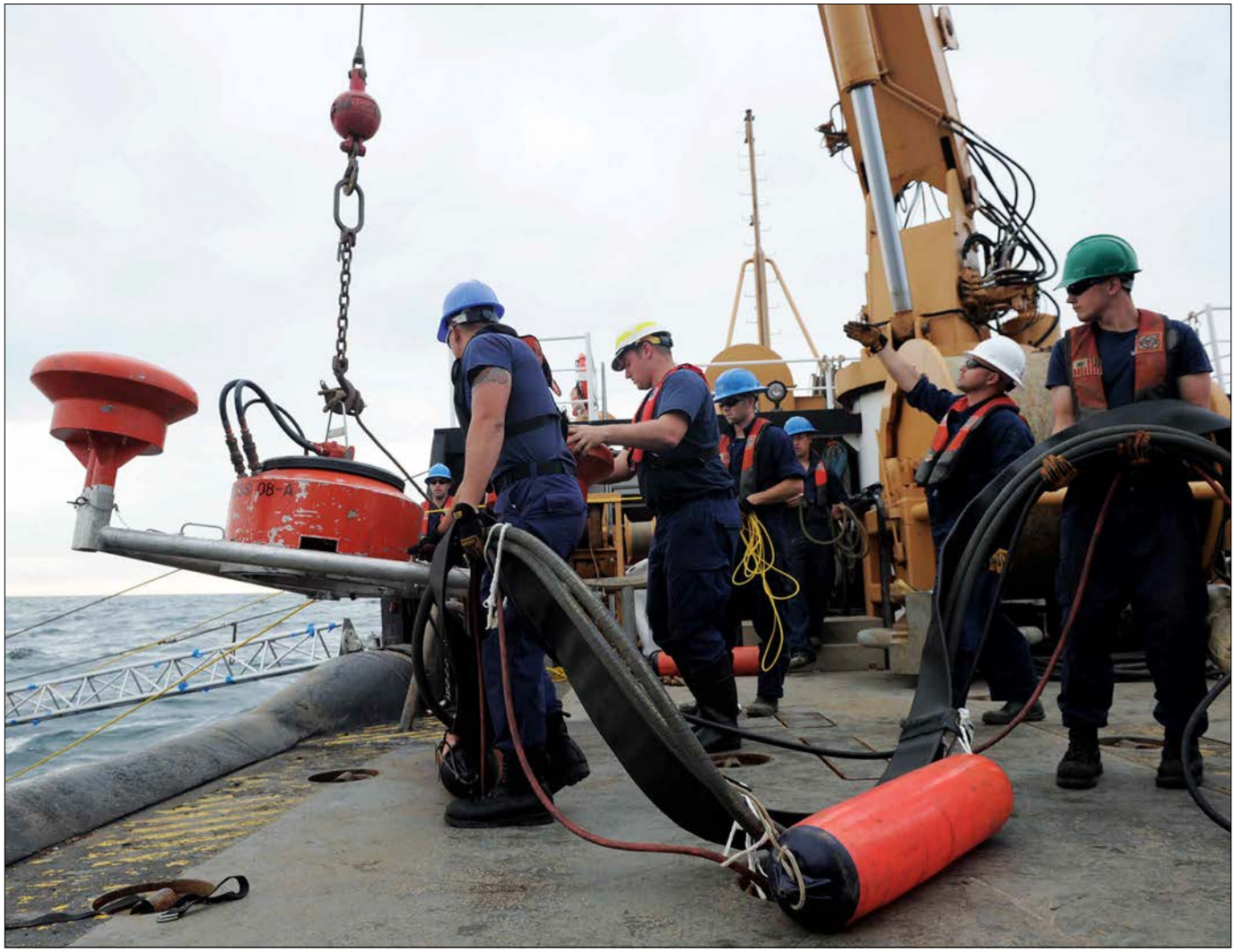
With the success of OPA 90 over the past 30 years, the Coast Guard should start thinking about modernizing its forces to compete for resources in future years. For example, moving away from organic spill response equipment will allow the service to focus on higher priorities like national security and more prevention-related activities (e.g., regulatory enforcement). Gone are the days where the service needs to invest in outdated spill-response equipment, because OPA 90 worked. There are myriad oil spill removal organizations (OSRO) in the coastal and inland zones prepared to meet the nation's need for spill response



Crew members from the Coast Guard Cutter *Harry Claiborne* work to move a vessel of opportunity skimming system into the Gulf of Mexico in May 2010. The Coast Guard worked in partnership with BP, local residents, and other federal agencies to help keep the oil from spreading after the *Deepwater Horizon* explosion on April 20, 2010. U.S. Navy photo by Petty Officer 2nd Class Jonathen E. Davis

equipment and expertise. As a caveat, the National Strike Force (NSF) remains a national treasure and should continue to be supported from a resource standpoint, but as a last line of defense to ensure federal on-scene coordinators (FOSC) have competent and knowledgeable NSF personnel and resources available to ensure spill regulatory requirements of OSROs during spills and/or releases.

The Coast Guard should invest more resources into sector incident management divisions for enforcement purposes, the Marine Safety Specialist–Response rating, and spill response expertise at the areas and districts. The Bureau of Safety and Environmental Enforcement (BSEE) should have the ability to use civil penalties to ensure regulatory compliance. Without this layered approach, the Coast Guard is sure to miss not only opportunities but also set itself up for mishaps or casualties during an actual response in the future.

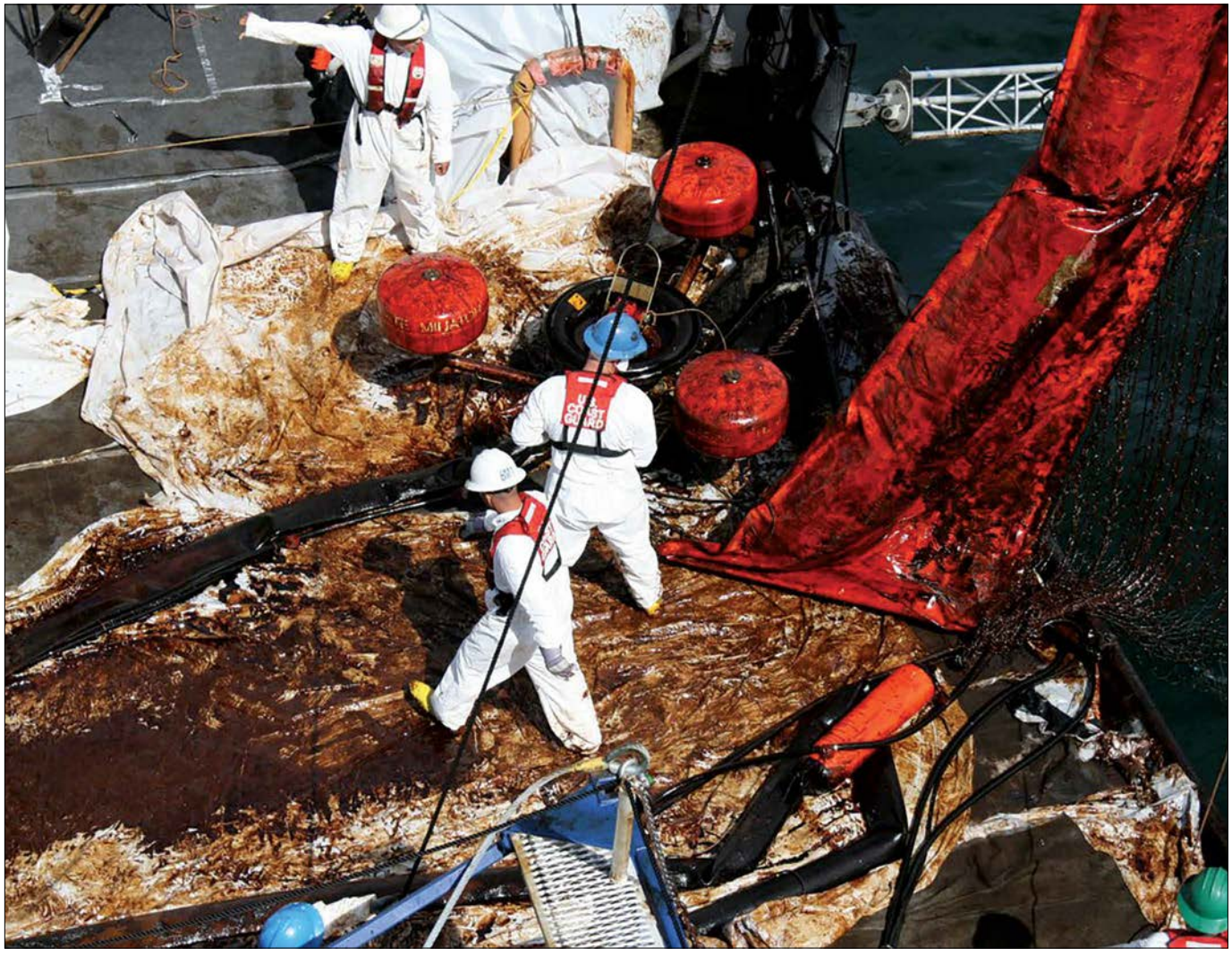
Autonomous Vessels and/or Equipment

As we look at OPA 90's success over the past 30 years one must also look to the future. The future is autonomous technology and it is a game changer for dynamic crisis response operations including law enforcement, special events, natural disasters, and especially, pollution response. This technology allows incident commanders to get assets on scene quicker, safer, and with more endurance. An added benefit is quantitative data collection using the various payloads of instruments the technology can carry, beyond just the "eyes in the sky," or on the water, that manned assets have historically provided.

Unmanned Aerial Systems (UAS) for pollution responses could help FOSCs identify the source of a spill, determine the extent of the impact, and direct response efforts to best prioritize resources and personnel. This would result in increased recovery rates by accurately and continuously directing skimming assets on scene,

ultimately reducing overall environmental impacts. Spill responses are inherently dangerous missions. They often occur in remote and unforgiving terrain where this risk is magnified. Compared to traditional Coast Guard overflights, UAS can provide considerable cost savings and increased safety, eliminating the need to put flight crews at risk.[1]

Automated Surface Vessels (ASV) could also be leveraged for pollution response, specifically, special monitoring of applied response technology (SMART). This technology is used to quantify and calculate the effectiveness of dispersants or in-situ burns, as well as to make determinations of the transport, dilution, and trajectory of the remaining oil. When an initial spill report is received, ASVs could be launched from land or a manned vessel and directed to the general location of the spill. They could immediately start using turbidity sensors to navigate in and around the spill to determine the actual size and boundaries while beginning to provide data back to the command post. The ASVs could also support 24-hour monitoring with minimal supervision and no interruption of data collection. This could close the information gap of traditional over flights or manned surface vessels that must wait until sunrise to start providing limited qualitative information in the form of visual assessments or photos, among other methods. Some ASVs can operate independently for six months or more, depending on mission instrumentation and operating area, and can stream data via a satellite feed. With a collision-avoidance system, ASVs can readily avoid other vessels operating nearby using an automated identification system. If fully employed, in the future SMART could be conducted with no human interaction beyond monitoring, emergency avoidance actions, and maintenance and decontamination.[2] The costs, increased safety, speed of deployment, and reduced logistical footprint of



Coast Guard Cutter *Aspen*, homeported in San Francisco, recovers the fast sweep boom after oil skimming operations in the Gulf of Mexico less than one mile from the shoreline in June 2010. *Aspen* is one of several Coast Guard cutters that skimmed oil in the Gulf of Mexico as part of the *Deepwater Horizon* response effort. Coast Guard photo by Ensign Shea Winterberger

both UASes and ASVs makes their future widespread use inevitable. Automation and improved data collection are the core tenets of the 21st century technology wave for pollution response.

Leveraging Private Industry

Lessons can be learned from the Coast Guard's search and rescue mission. In 1982, Congress directed the Coast Guard to review its policies for towing and salvage of disabled vessels to conserve valuable Coast Guard resources and minimize competition between the Coast Guard and commercial companies. Congress was concerned that Coast Guard resources were being used unnecessarily to provide nonemergency assistance to disabled vessels that could be adequately performed by the private sector. The Coast Guard responded with its Maritime Search and Rescue Assistance Policy (MSAP), which gave rise to the commercial towing industry we are familiar with today.[3] The advent and sustained growth of the commercial towing and salvage industry is one reason the Coast Guard is faced with fewer disabled vessel cases every year. This is true despite the total number of cases that commercial towing and salvage operators respond to rising from about 1,000 cases per year nationwide in the mid-1980s to more than 125,000 cases annually today.[4]

This could mirror a trend in the pollution response mission, as OSROs have substantially invested in, and grown an extensive network of, equipment since the early 1990s. The Coast Guard maintains blanket emergency contracting agreements with several of these OSROs whose equipment and expertise could be brought to bear under the direction of the FOSC when responding to a large-scale oil spill. These OSROs would also likely be "first to the fight" under the direct authority of response plan holders and/or responsible parties, some of which keep these OSROs under a retainer or contract.

Section 4203 of OPA 90 provides that vessels designed and constructed to replace Coast Guard buoy tenders are equipped with oil skimming systems that are readily available, operable, and complement the primary mission of servicing aids to navigation. These oil skimming systems consist of the vessel of opportunity skimming systems (VOSS) and the seagoing buoy tender based spilled oil recovery system (SORS). Apart from remote regions of Alaska and the South Pacific, the increase in private sector resources has rendered VOSS/SORS equipment outdated and redundant. Parts and components are no longer carried, and more importantly, no longer supported by manufacturers. Budgetary decisions have resulted in preventative maintenance being performed by contractors less frequently. In turn, equipment is degrading at a faster rate and the National Strike Force (NSF) is shouldering additional, unfunded labor burdens. The substantial increase in OSRO capacity since the early 1990s has significantly reduced the likelihood that prepositioned Coast Guard equipment, like booms and VOSS/SORS equipment, will be employed. Future public-private partnerships, regulatory oversight, and shared capabilities must continue to pivot towards investment in private sector tactical resources and less towards Coast Guard owned/maintained equipment in order for us to be prepared for the next spill of national significance.

Regulatory Needs

The technology available for cleaning up oil spills has improved only incrementally since 1990. Federal research and development programs in this area are underfunded. After the *Deepwater Horizon* event, agencies, industry, and entrepreneurs focused on developing new response technologies for the first time in 20 years, and several innovations that addressed beach cleanup, subsea dispersants, and in-situ burn tactics quickly emerged. Additional funding equal to or greater than the amounts authorized by OPA 90 would improve oil spill response research.

Recommendations

1. The Coast Guard should invest in a long-range strategic campaign plan to address the above concerns, including improving regulatory frameworks. The service should then leverage the campaign plan to better articulate the need for parity of resources—new technology, funding, personnel, and equipment—within the Coast Guard, the Department of Homeland Security, and the Office of Management Budget.

2. Completely shift away from response equipment in a number of locations to the procurement and use of Coast Guard-owned spill response equipment solely maintained by the National Strike Force as a deployable specialized force, which would modernize the National Strike Force—a key recommendation from the *Deepwater Horizon* oil spill.

3. From a planning perspective, ensure synchronization of preparedness across not only federal government entities, but also private industry to include state and local plans, which would revitalize and improve planning at every level of the National Response System.

Conclusion

Ultimately, the original tenets of OPA 90 have been very successful. No longer is there a need to have the Coast Guard as the primary insurance policy with respect to equipment and personnel purely dedicated to spill response. Gone are the days when the Coast Guard is expected to be the responder of choice. Now, more noticeable in the continental United States, there is a robust

Two crew members from the Coast Guard Cutter *Walnut* haul a spilled oil recovery system across the cutter's buoy deck for deployment. The floating fast-sweep boom collects oil alongside the cutter for skimming and containment in tanks on its deck. Coast Guard photo

network of OSROs written into vessel response plans, area contingency plans, and facility response plans to respond and support the National Contingency Plan under a unified command. Now is the time for the Coast Guard to realize OPA 90 worked and transition from the 30-year old OPA 90 model.

About the authors:

Kevin Sligh currently serves as the deputy regional administrator for FEMA Region V. His responsibilities include operational oversight for six Midwest states and 34 tribal nations. He has held the position of deputy director in the Office of Marine Environmental Response Policy at U.S. Coast Guard and, in 2017, was assigned to the White House where he served as the director for response policy within the National Security Council. His work there was crucial during the 2017 hurricane season. During a 24-year career in the military, he has had extensive experience in incident management and oil spill response.

CDR Lushan Hannah is currently serving as the commanding officer of the Pacific Strike Team. His career conducting marine environmental protection, commercial vessel compliance, contingency planning, law enforcement and search and rescue spans 22 years. He holds a Master of Science in environmental management from the University of Maryland-University College, a master's degree in public health focused on industrial hygiene from the University of Michigan, and a Master of Arts in national security and strategic studies from the Naval War College.

Endnotes:

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2. Ibid.
3. U.S. Coast Guard. (January 2013). "U. S. Coast Guard Addendum to the United States National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR)."
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Deepwater Horizon Leads to Programmatic Changes in Marine Environmental Response

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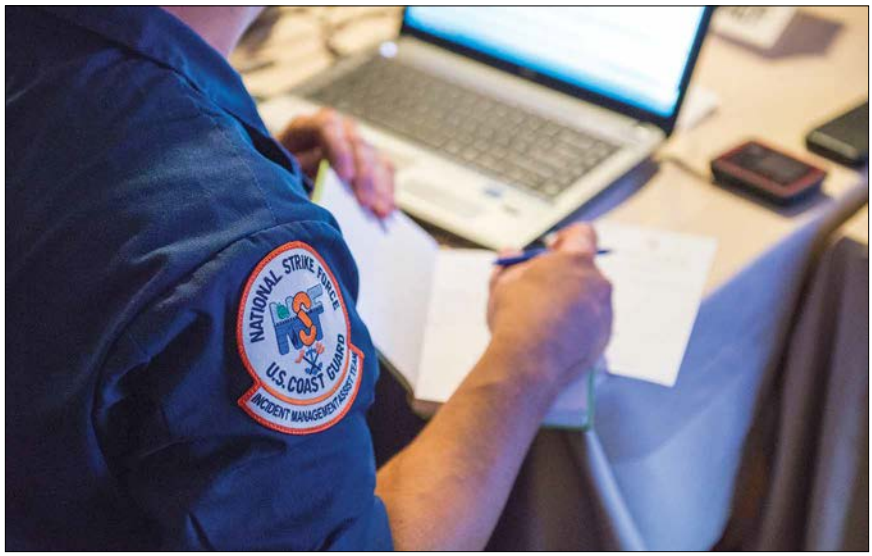
The *Deepwater Horizon* (*DWH*) disaster was a catalyst for programmatic change throughout the Coast Guard's Marine Environmental Response (MER) organization. Out of this human and environmental tragedy, the Coast Guard improved its response organization and policy, interagency coordination mechanisms and partnerships, response strategies and tools, and overhauled many essential crisis response preparedness activities. Like many other long-term programmatic changes, various spill response policy, personnel proficiency, and equipment challenges remain 10 years after the nation's largest and most complex oil spill response.

Changes in Response Organization and Policy

Following *DWH*, the Coast Guard made multiple organizational changes to improve preparedness and response policy and operations. At the headquarters level, the Coast Guard created the Incident Management and Preparedness Policy Directorate, now called the Emergency Management Directorate, which oversees the offices of Marine Environmental Response Policy, Search and Rescue Policy, and Emergency Management and Disaster Response. The new directorate is responsible for all Coast Guard policy initiatives and interagency coordination related to emergency response and Coast Guard operations. In 2016, the directorate published the *U.S. Coast Guard Marine Environmental Response and Preparedness Manual*, which consolidated 17 policy documents and replaced the 20-year-old *Marine Safety Manual, Volume IX*. Directorate staff continue diligently maintaining this manual, which saw its last change in 2018.



Part of the National Strike Force, the Incident Management Assist Team reinforces Coast Guard sectors during times of emergency response. The unit also provides training and subject matter expertise to enhance incident management training and qualification across the Coast Guard through a series of workshops and exercises. Coast Guard photo by Petty Officer 2nd Class Christopher M. Yaw

The Coast Guard also created new civilian positions at each of the nine Coast Guard districts to advise the district commanders on incident management. The new incident management and preparedness advisors (IMPAs) provide a direct link to interagency partners on the regional response teams, serving as co-chairs alongside the Environmental Protection Agency (EPA). In addition to providing long-term continuity that cannot be attained by military members, the IMPAs ensure all preparedness activities are completed in accordance with regulatory requirements and provide subject matter expertise to district units.

At the sector level, the Coast Guard created a new chief warrant officer specialty, the Marine Safety

Specialist—Response (MSSR). The new warrant officer specialty provides a distinct career progression for enlisted personnel with professional training and experience in incident management and pollution response. This cadre provides technical expertise in spill response tactics, preparedness activities, and incident management to federal on-scene coordinators (FOSCs).

Finally, the Coast Guard created the Coast Guard Incident Management Assist Team (CG IMAT), a full-time unit dedicated to providing incident management support and training. Part of the National Strike Force, the CG IMAT surges to Type 1 and 2 incidents, and reinforces Coast Guard sectors during times of emergency response. The unit also provides training and subject matter expertise to enhance incident management training and qualification across the Coast Guard through a series of workshops and exercises.

CAPT Bill Timmons, Coast Guard Sector Columbia River Commander and federal on-scene coordinator, supervises response personnel as they remove oil from the Columbia River adjacent to the Cannery Pier Hotel & Spa in Astoria, Oregon, in January 2018. The oil spill originated from a mid-1900s oil tank located under a dilapidated pier that was once home to a seafood cannery. Coast Guard photo by Petty Officer 1st Class Levi Read

Interagency Coordination

The *DWH* incident was the nation's first spill of national significance (SONS), and prompted the overhaul of the SONS exercise program.[1] Prior to 2010, the SONS exercise program consisted of a full-scale, interagency evolution to test interoperability and coordination. Exercises were not well attended by senior leaders from the interagency. Following *Deepwater Horizon*, SONS exercises evolved into a two-phase event that engages senior interagency decision-makers in a more realistic and productive manner. The new SONS Exercise and Training Program plans for and coordinates an executive seminar, a scenario-based discussion that engages senior agency leadership in top-level strategic discussions of interagency coordination, and culminates in an exercise of increasing complexity and intensity. The new format increased senior leadership participation, and serves as one of the most influential Coast Guard-led initiatives to increase interagency coordination.

Additionally, since *DWH,* the Coast Guard and the Bureau of Safety and Environmental Enforcement (BSEE) have formed a partnership to enhance offshore preparedness, promote safety, and align regulations for pollution response in the near and offshore environments. In addition to forming several workgroups, the agencies have signed 10 memorandums of understanding and agreements to align policies and procedures for the shared regulatory enforcement of Outer Continental Shelf facilities. Further, as part of the Area Contingency Plan (ACP) revitalization effort, which is discussed in further detail below, the Coast Guard and BSEE are standardizing the offshore response information captured in ACPs.

The Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) was established by Title VII of the Oil Pollution Act of 1990 (OPA 90) following the 1989 *Exxon Valdez* oil spill.[2] After a decade of relative dormancy, ICCOPR, comprising 15 agencies, was reorganized and re-chartered after *DWH* in 2010. The Coast Guard's Office of Marine Environmental Response Policy serves as the permanent chair of ICCOPR, while the vice chair position rotates between the National Oceanographic and Atmospheric Administration (NOAA), EPA, and BSEE every two years.

Response Strategies and Tools

Due to the nature and severity of the *DWH* spill, numerous response strategies were employed to mitigate its effects. One of the unique strategies employed was surface and subsea application of dispersants. Prior to 2010, dispersants had only been used 26 times in the United States, and never on the scale that was required by the *Deepwater Horizon* spill. Traditionally, dispersants are applied to oil slicks on the surface to disperse the oil throughout the water column. In this case, dispersants were also applied to fresh oil flowing from a well 5,000 feet below the ocean's surface. Industry, academia, and the federal government continue to examine the efficacy of this technique, refining possible application measures in the event of future spills.

After the *DWH* response, the Coast Guard contributed to the National Response Team's (NRT) development of *Environmental Monitoring for Atypical Dispersant*

Operations: Including Guidance for Subsea Application and Prolonged Surface Application. This guide provides FOSCs and regional response teams with background information to assist in expedited and incident-specific decision making on dispersant use. Today, FOSCs and regional response teams continue to train, exercise, and improve their surface and subsurface dispersant application protocols.

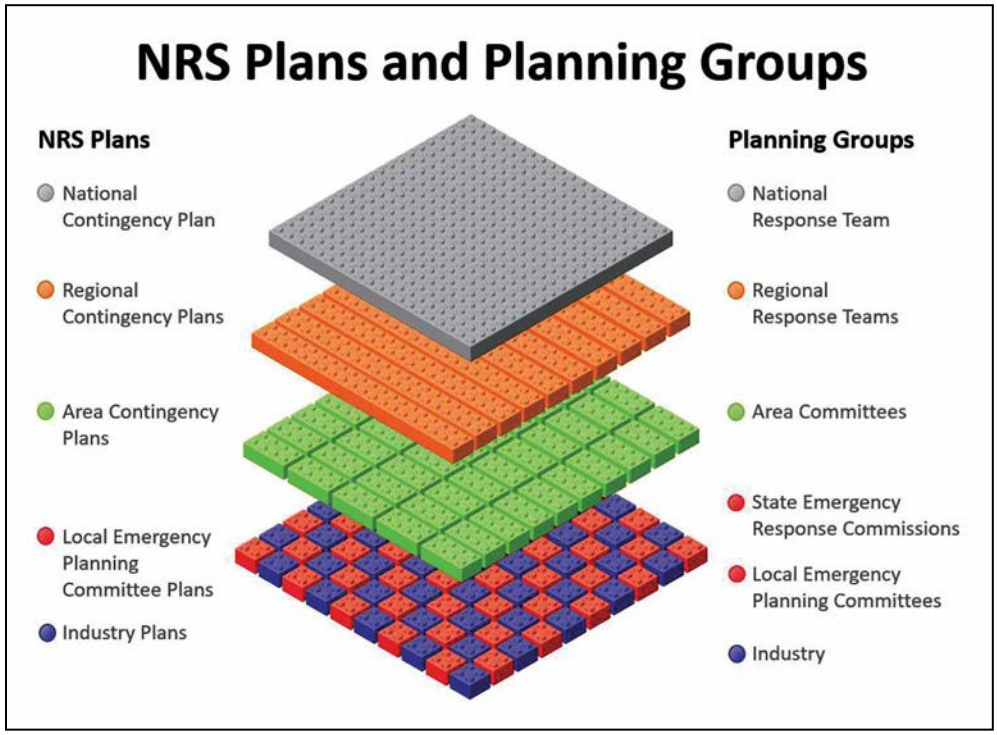
Separately, the *DWH* response highlighted that the effective daily recovery capacity (EDRC) calculation is not an effective or accurate planning standard, nor predictor of actual oil recovery capacity. The calculation, which was codified in regulation following the *Exxon Valdez* oil spill, is used to enumerate the capacity of mechanical oil spill recovery devices. EDRC is used by oil spill removal organizations (OSROs) to meet OSRO guidelines. Since *DWH*, the Coast Guard and BSEE have worked with industry partners to develop new EDRC methodologies and guidelines for response systems deployed in nearshore and offshore operating environments. The efforts resulted in BSEE developing the Estimated Recovery System Potential (ERSP) tool, which provides OSROs an updated planning standard of actual anticipated oil recovery capacity. Today, the Coast Guard Office of Marine Environmental Response Policy continues to work with the Coast Guard Research and Development center to develop a prototype ERSP calculator for inland and freshwater environments.[3] Development of an inland ERSP calculator will enable the Coast Guard to transition from the EDRC standard to ERSP in the coming years.

Preparedness Activities

One of the main focuses of the *DWH* post-spill incident review was incident planning and plan execution. The report emphasized various elements of spill planning, such as agency readiness and responder training, employment of the National Response System's (NRS) plan architecture, pre-spill risk analysis, and information sharing before and during a major spill. It highlighted a number of shortcomings in spill preparedness, including inconsistency in plan coverage, limited documentation of decision-making during the planning process, and a general lack of emphasis on contingency planning in the Coast Guard. The report's authors called for the Coast Guard to "reassess its readiness, programmatically, and reinvest to the extent that [Marine Environmental Response] is, once again, firmly established as one of its core competencies,"[4] Over the past decade, the Coast Guard has made tremendous strides in addressing many of these shortfalls through the amendment of its marine environmental response policies and its active role in institutionalizing new national-level, interagency planning initiatives.

Internally, following *DWH*, the Coast Guard recognized a need to modernize its training and qualification processes for its own pollution response professionals. In 2014, a new formal resident training course was developed and rolled out to standardize their knowledge base and prepare these personnel with the requisite knowledge and tools to directly support the Coast Guard federal on-scene coordinator in preparedness activities, response oversight, and incident documentation. This

Members of the new Coast Guard Warrant Officer specialty, Marine Safety Specialist – Response, pose with the first nine "plank owners" holding this designation in February 2016. The specialty provides a distinct career progression for Coast Guard personnel with professional training and experience in incident management and pollution response. Coast Guard photo by LCDR Meagan Bowis



The National Response System is composed of a hierarchy of plans that address oil spills and hazardous material response from the national level to the local level. For the system to be effective, plans must align both vertically and horizontally to ensure maximum coverage. Coast Guard graphic

resident training course was amended in 2019 to require the completion of structured on-the-job training requirements to further standardize and improve proficiency of Coast Guard responders across the nation.

Following the *DWH* incident, to improve information sharing for pre-spill planning and situational awareness during an environmental emergency, the Coast Guard and NOAA formalized the use of NOAA's Emergency Response Management Application (ERMA®) as the Coast Guard's common operating picture, or primary situational awareness tool for such incidents. ERMA is an online mapping application that helps the incident commander and federal on-scene coordinator visualize relevant information including, environmentally sensitive areas, pre-determined response strategies, and real-time weather conditions during a spill. This platform also preserves response-related data for future reference, analysis, and dissemination, and can be integrated with other data systems to simplify information sharing across agencies and stakeholders.

The level of federal responders' situational awareness before and during a spill has major implications for the federal government's compliance with national environmental policies. Federal response officials are tasked with ensuring their actions are aligned with statutes such as the Endangered Species Act, the National Historic Preservation Act, and the Wild and Scenic Rivers Act to help protect the nation's valuable natural and cultural resources. Lessons learned from the *DWH* spill led the NRT, an interagency coordinating body representing 15 federal agencies, including the Coast Guard, to formalize preparedness mechanisms and response techniques that would protect endangered species and historic resources to a greater extent. As the vice chair of the NRT, the Coast Guard continues to maintain an active leadership role in these efforts, including the development of comprehensive risk analysis planning tools for area committees and simple quick reference guides for response personnel in the field.

Responder training, situational awareness, and legal compliance with national environmental policies, along with numerous other elements of incident preparedness, are organized under the NRS into a framework of plans meant to adequately address spills of all sizes. These plans may be described by their vertical and horizontal relationships. Horizontally, they are intended to provide coverage over the expansive geographic area of the United States. Vertically, plans are organized in a hierarchical fashion and by functional scope. The National Contingency Plan (NCP) serves as the federal government's blueprint for responding to all oil spills and hazardous substance releases, and industry and local-level plans focus on specific potential sources or geographic areas, respectively. Between these lie regional and area contingency plans (ACP). The structure and requirements of these intermediate plans, which focus on different geographic regions, have remained quite steady since the NCP was last revised by OPA 90. Nevertheless, departures from this standard model of plans have occurred, including some hybridization of regional and area plans. Of particular relevance, prior to *DWH,* the Gulf region had adopted a single regional contingency plan, known as the "One Gulf Plan." This plan was found to be far too broad and complex to be effectively used during the *DWH* response, and lessons learned from the response helped guide necessary changes in area contingency planning.

In 2017, as part of the Coast Guard's continued efforts to improve area contingency planning, it initiated an

Personnel from the Coast Guard, the Alaska Department of Environmental Conservation, and an oil spill removal organization test a geographic response strategy that involves deploying shore seal booms to protect the entrance to a salmon stream on Akutan Island, Alaska, in August 2019. Verification of shoreline protection strategies is a key component of area contingency planning. Coast Guard photo by LT Andrew Sinclair

unprecedented area contingency planning revitalization initiative.[5] It highlighted both internal changes to the way the Coast Guard operates regarding area contingency planning and a new strategy to elicit interagency cooperation with the goal of improving consistency and alignment of all plans across the NRS. To address coastal area ACPs, for which the Coast Guard is responsible, it called for the establishment of a Coast Guard National Review Panel (CGNRP), which includes a rotating board of the agency's experts that review all coastal ACPs every five years in perpetuity. The board's mission is to identify gaps in existing ACPs and provide recommendations to Coast Guard sectors, responsible for administering the plans, with the intent of seeking greater consistency and addressing emergent concerns regarding legal and regulatory compliance. The CGNRP marked its third annual meeting in 2020. To date, the panel has identified major areas for improvement and developed recommendations to help units address these as they perpetually update their plans. For example, the board recognized a lack of consistency in the extent to which different plans addressed risk assessment, which is an essential facet of planning. In response, the panel recommended that area committees establish risk assessment workgroups to continuously survey the risk landscape across their area of responsibility. The panel also recommended the development of a worst-case discharge scenario matrix within each ACP, to identify and describe significant threats and, in turn, guide the maintenance of these plans.

In addition to the Coast Guard's area contingency planning revitalization initiative, the NRT stood up an Area Contingency Planning Workgroup in 2016. This interagency body is chaired by the Coast Guard and supported by 14 other agencies with a role in contingency planning. Per its charter, the workshop is charged with "develop[ing] NRT guidance which provides nationally consistent architecture to improve ACPs and facilitate alignment of all plans across the NRS."[6] To this end, the

workgroup first explored the status of area contingency planning in the country by designing and conducting a comprehensive baseline survey. To address planning gaps and inconsistencies identified through the survey, the workgroup convened a rigorous and unprecedented workshop in September 2019 to begin developing definitive courses of action and a joint way forward. The workgroup continues to meet on a monthly basis and hold workshops as needed to advance its goal of producing national-level guidance to better align all plans under the NRS and vastly improve the value they add to environmental response.

In addition to highlighting gaps in domestic spill preparedness, the *DWH* response illustrated the limitations of planning and coordination with international stakeholders. Specifically, the existing process for requesting and receiving emergency assistance from the international community was found to be cumbersome and inefficient, as was the process of offering such assistance to other nations. To address this issue, in 2016 the U.S. government and other nations collaborated with the International Maritime Organization to publish new guidelines for international offers of assistance to a marine oil pollution incident. These guidelines provided a tool, for use by any country, to streamline the request process during large, complex incidents. In 2019, these guidelines were used to facilitate the U.S. government's response to Hurricane Dorian in the Bahamas and a large oil spill off the coast of Brazil.

Future Challenges

Despite the tremendous progress made in spill preparedness and response since the *DWH* disaster, Coast Guard marine environmental response policy does not, and cannot, fully address all possible challenges posed by large-scale environmental response. Through organizational change, interagency coordination, evolving response strategies, and preparedness initiatives, the Coast Guard has, over the past decade, identified and addressed numerous risks to the success and efficiency of future response operations. However, risk remains and challenges persist. Internally, the Coast Guard faces the challenge of maintaining responder proficiency when many active duty and Reserve personnel seldom remain in the same position or location for more than four years. This reality combined with the overall low frequency and wide distribution of major oil spills are limiting factors in building and maintaining long-term organizational experience. While organizational changes have helped alleviate some of this experiential loss over time, there remain few Coast Guard personnel with extensive experience from multiple large-scale spill responses.

Time, distance, and scale, as they pertain to spill response, are ongoing challenges faced by all response agencies. On a tactical level, time for assets to arrive on scene, conduct an assessment, and deploy appropriate gear is a major factor in the overall success of a protection or response strategy. The onset of night and length of time before a source is secured can greatly influence the effectiveness of a response. Distance is similarly challenging, as physical distance of a spill from shore or response resources can improve or worsen the prospects of effective control and management. Finally, scale involves the size of the response, both in terms of spill volume, the extent of shoreline impacted, and the number and type of response resources needed. The vast and varied geography of the United States makes this an especially daunting challenge, and the application of risk assessment all that more important. These challenges reflect the dynamic nature of all spills, and suggest the perpetual need for synergy and alignment across all levels of the NRS, especially when faced with the next major spill or SONS.

Acknowledgements:
The authors would like to thank CAPT Ricardo Alonso, CDR JoAnne Hanson, CDR Wes James, Mr. Jonathan Smith, Mr. Steve Tucker, LCDR Matthew Edes, and LT Omar Borges for their contributions to this article.

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Endnotes:

1. As defined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR 300, a SONS is a spill that due to its severity, size, location, actual or potential impact on the public health and welfare or the environment, or the necessary response effort, is so complex that it requires extraordinary coordination of federal, state, local, and responsible party resources to contain and clean up the discharge.
2. ICCOPR was created to: (1) promote cooperation with industry, universities, research institutions, state governments, and other nations through information sharing, coordinated planning, and joint funding of research projects, and (2) prepare a comprehensive, coordinated federal oil pollution research and technology plan.
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The Winding Road to Restoration

The Coast Guard and the RESTORE Council

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Disasters are focusing events where the resulting impacts exceed the span of human control and where finite response capabilities are overwhelmed by immediate needs. Every disaster carries with it the potential to upend or circumvent existing response frameworks. When that happens, governance structures can tumble into a state of crisis. Communities of the Gulf of Mexico have repeatedly been visited by such disasters and the crises they trigger. Recovery efforts often require multi-year, large-scale undertakings to mitigate environmental impacts, replace or reinforce addled infrastructure, and provide support to overcome fragmentation in some affected communities. The principles of disaster response and incident command are well-vetted across most jurisdictions now, tools to better manage through crises are in place, and authorities have developed plans to address foreseeable threats to the communities they for which they are responsible. However, despite this advance preparation, events that differ from expectations and planning scenarios by type, scale, or scope exacerbate the crisis and compound the challenges of disaster response.

The 2010 *Deepwater Horizon* spill was one such disaster, and remains a touchstone for assessing large-scale, multi-jurisdiction, multi-agency response to an anthropogenic disaster. The spill was a formidable stress test of the pre-disaster planning and coordination work conducted prior to the event and the aftermath fed new lessons into the planning and performance management cycle. Efforts to deal with impacts from the spill and to bolster resilience of affected interests and resources provided a real-time test bed for both immediate and sustained disaster response.

Together, the effects of the *Deepwater Horizon* spill, the dynamics of natural processes at play in the coastal margins and offshore, and changes driven by large-scale natural disasters are broadly acknowledged as drivers of systemic shifts in the Gulf region. These shifts yield direct and indirect impacts on the communities that make use of the Gulf's natural resources. Teasing apart the ways in which the effects of chronic and episodic events might compound on one another is one of the daunting challenges implicit in adopting an ecosystem wide, long-term approach to recover and to planning for events yet to come.

Gulf Ecosystem Restoration Council

Spurred by the *Deepwater Horizon* oil spill, President Barack Obama signed into law the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act) on July 6, 2012. The RESTORE Act acknowledged the national interests in the Gulf Coast's treasured coastline, the adjacent communities, and the waters offshore. It set out a federally supported,

The *Discoverer Enterprise* burns off gas at the site of the *Deepwater Horizon* oil spill in the Gulf of Mexico in June 2010. Coast Guard photo by Petty Officer 1st Class John Masson

regionally focused, and cooperatively implemented approach to recover and protect the long-term health and resilience of the natural ecosystem and economy of the Gulf Coast region. It also launched the Gulf Ecosystem Restoration Council. The council comprises the governors of the states of Alabama, Florida, Louisiana, Mississippi, and Texas, the secretaries of the U.S. Departments of Agriculture, the Army, Commerce, Homeland Security, and the Interior, as well as the administrator of the U.S. Environmental Protection Agency (EPA). In order to fully realize the objectives of the RESTORE Act, the council documented its way forward through the Gulf Comprehensive Restoration Plan, revised and reissued in 2016.[1]

The RESTORE Act of July 2012 established the Gulf Coast Ecosystem Restoration Council. The council includes the governors of Alabama, Florida, Louisiana, Mississippi, and Texas, as well as the secretaries of the U.S. Departments of Agriculture, Army, Commerce, Homeland Security, Interior, and the administrator of the U.S. Environmental Protection Agency. Photo courtesy of Keala J. Hughes

As one component of the multi-faceted approach to support the Gulf region's recovery, the council enables work to directly address the impacts of the spill and to bolster the resilience of affected Gulf resources and the communities that depend on them. Establishment of the Gulf Ecosystem Restoration *Council* followed the Gulf Ecosystem Restoration *Task Force* and the release of *America's Gulf Coast: A Long Term Recovery Plan After the* Deepwater Horizon *Oil Spill* by the EPA. That report included the forward-leaning recommendation that restoration work supported by civil penalties address identified recovery needs falling outside the scope of the Natural Resources Damage Assessment Process under the Oil Pollution Act.

The Special Challenges of Prolonged Response Posture

Organizations and individuals that have a leadership role when communities are confronted by crisis face numerous challenges. The stakes may be greatest during and immediately following a disaster, when decisions that prioritize unmet needs have clear implications for public health and safety. Less evident, are the implications of longer term decisions made throughout the course of recovery and mitigation efforts, particularly as they relate to consequences from future disasters.

During disasters, response agencies have greater latitude to focus on necessary actions to mitigate threats and address impacts already sustained. The bureaucratic processes that ensure public oversight of, and input to, government actions are truncated, undertaken on an emergency or after-the-fact basis. In order to maintain good faith with the public, decisions to hold public processes in abeyance are made sparingly, and only in instances when the need is clearly compelling. Long-term efforts that follow after the most immediate impacts of a disaster have been addressed and any crisis abated, must adhere more closely to the regular requirements of public decision making. The need to honor requirements for public participation and to make good use of opportunities to engage with the public, can create an unintended tension with expectations for swift action to implement necessary post-disaster changes.

The council manages the tension that can arise from these two priorities—fostering substantive public process and facilitating swift, efficient action. Its principle tools for supporting these priorities are distribution of outreach materials through multiple channels, by promoting transparency and inviting review and comment, and by allocating time and resources to the partnerships that bring great solutions home to the affected communities. The council presses forward with the understanding that time is of the essence to best serve the goals and objectives of the comprehensive plan, while also providing due diligence to keep members and stakeholders sufficiently engaged to pursue the long game through adaptive approaches that consider regional and systemic interdependencies.

> ***"...restoration efforts that only focus on improving the structure and function of ecosystems, while disregarding the needs of relevant stakeholders who are often the most direct recipients of ecosystem services will rarely succeed."***[2]

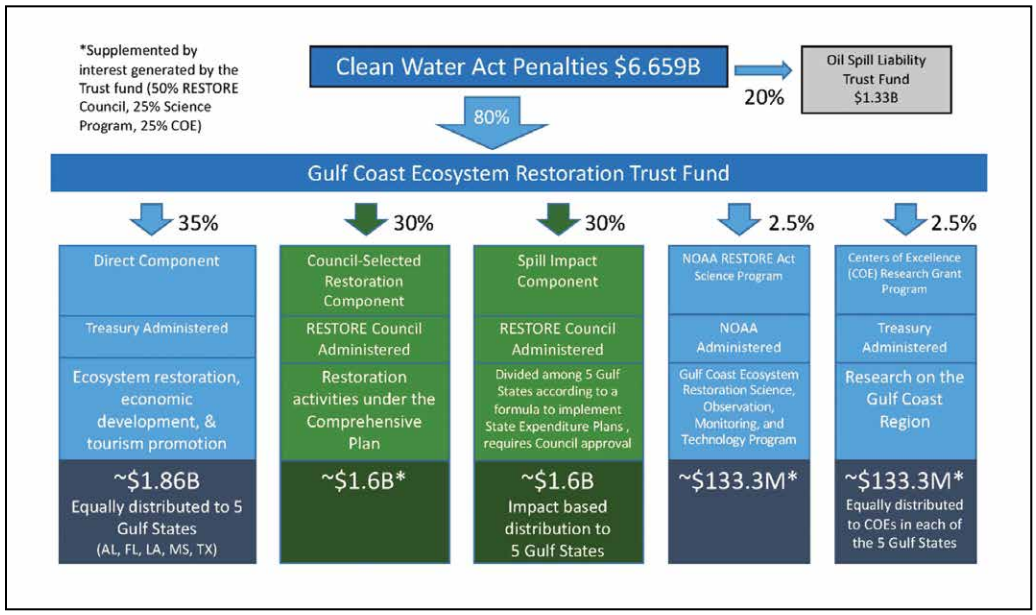
The Coast Guard's Role with the Council

The Coast Guard, on behalf of the Department of Homeland Security and in accordance with the act, fills a federal agency seat on the council. Through its Emergency Management Directorate, and with support of the Office of Marine Environmental Response Policy and other program areas, the Coast Guard brings expertise to the council that complements those of the other members and their staff. Like several of its counterparts, the Coast Guard elected to enter into an inter-agency agreement with the council, establishing the goal to "strengthen GoM [Gulf of Mexico] restoration by determining the need/ability to incorporate spill resiliency and spill response readiness into selected RESTORE restoration activities."[3]

Accordingly, the Coast Guard is working to capitalize on opportunities to cooperate with other council members and to pursue specific initiatives that may improve long-term outcomes following large-scale oil spill events. The Coast Guard RESTORE initiative seeks to foster increased interaction between the environmental restoration, natural resource management, and spill response communities of practice. In entering into an inter-agency agreement with the council, the Coast Guard also committed to undertake a collaborative assessment process, identifying and assessing available risk assessment tools, and explore approaches to foster "Response Ready Restoration." Response Ready Restoration is a moniker for the idea that improved outcomes might be realized, if spill response requirements are factored into the design of large-scale restoration projects. This idea of targeting effort to protect natural resources that are the subject of significant public investment should have intuitive appeal. However, the capability to conduct such assessments in a streamlined, effective manner still lies over the horizon, and will necessitate a novel effort leveraging the expertise in spill planning and response communities, and their counterparts in natural resource and restoration science and coastal engineering.

The council's priority criteria place a premium on, among other things, projects that are large in scale and that restore the long-term resilience or affected resources. Currently, the tools available to support the planning of such projects rely on static inputs that are updated opportunistically in a sometimes-fragmented manner across the various planning areas and sub-jurisdictions. The difficult task of prioritizing the deployment of spill response actions to safeguard environmental features, rather than built infrastructure, is response dependent. A different set of data, presented differently, is needed to provide responders with optimal decision support tools that relate the potential benefits and impacts of response actions to the vulnerability of environmental features.

For example, data on the distribution of listed species and other sensitive receptors is available in Environmental Sensitivity Index (ESI) maps. Cartographic support for viewing ESI and a complex array of other data is available to responders through the Environmental Response Mapping Application (ERMA). This application was developed to meet the need for a common operating picture to help coordinate the *Deepwater Horizon* response, and has continued to evolve. Moving beyond static ESI maps, leveraging opportunities to forecast likely spill trajectories in the Gulf of Mexico and implementing decision frameworks that incorporate assessments of relative risk and vulnerability are daunting tasks and actions that require effort and expertise from multiple stakeholders. Factoring ecosystem services and human dimension models into pre-spill planning will properly weight areas of substantial public investment, allowing planners and responders to factor the loss of that investment against impacts to other sensitive receptors and



Signed into law in July 2012, the RESTORE Act dedicates 80 percent of all administrative and civil penalties related to the *Deepwater Horizon* spill to a Gulf Coast Restoration Trust Fund. The funds are used to restore and protect the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, coastal wetlands, and economy of the Gulf Coast region. Graphic courtesy of the Gulf Coast Ecosystem Restoration Council

facilities. Conversely, factoring impacts from a possible spill and related response activities into restoration design will help safeguard the resources and public investment.

Resources such as mangroves, coastal marshes, and coral reefs have been studied, their capacity to blunt storm effects quantified, and cost models for ecosystem services have been generated to estimate their relative 'worth' in this context. A great deal of work has been done to characterize the role natural resources can play attenuating the impacts of different types of disasters, including storms and coastal inundation. As a result, additional tools may be available to assess the broader array of interests at stake when the resilience of natural resources are threatened by oil spills. Impacts to these resources can arise from a multitude of activities, including, but not limited to, oil spills that have a bearing on their ability to withstand and recover from future oiling events—and to continue to provide important ecosystem services. Factoring the consequences of a reduction in ecosystem service generally, and disaster mitigation specifically, into pre-spill planning would create a better picture of the consequences that might ensue from both persistent and episodic impacts. The time is drawing near—and some would say is past due—to treat sustainment natural resources and the services they provide as a type of "green infrastructure," rather than as an ancillary "conservation interest." In today's context, the distinction is a false one.

> ***"As a conservation strategy, restoration locks in an exorbitantly costly cycle of crisis-response that is both ecologically and economically unsustainable."***[4]

From this vantage point, a Coast Guard role in Gulf environmental restoration comes into sharper focus. As environmental and natural resources science advances, the RESTORE initiative is exploring opportunities incorporating these important considerations into pre-spill planning, resource restoration planning, and on-scene decision-making. In military parlance, such a tool will help us get to "the left of boom," and to improve upon the cycle of post-disaster restoration. Much work remains to be done in order to identify a consistent, scalable process that would incorporate spill response into the environmental design, construction, and monitoring of restoration and protection projects.

Day Breaks Over the Horizon

The Coast Guard has 11 statutory missions and many, many accountabilities to fulfill. Direct assessment of ecosystem services and the underlying natural sciences on which that assessment would depend, are areas where we must look to other agencies with greater depth of expertise. Much work remains to be done. Past analyses by the National Research Council have helped to frame the procedural and data needs required to enhance post-disaster assessment of such impacts.[5] Developing standardized applications and approaches that might improve advanced assessments through scenario-based analyses and improved application or restoration design and engineering approaches is an area of inquiry well worth pursuing.

The Coast Guard's principle tools for oil spill planning are spatially driven, data dependent, and collaboratively administered with local experts and authorities. These planning and response frameworks are challenged from the outset. Response frameworks chart a narrow path that holds competing interests in dynamic tension with one another. Jurisdictions may prioritize response needs differently in accordance with their direct mandates. Further, response plans are challenged to set guideposts for consistent decision making and standards of practice, while also affording responders the latitude to act on the facts and observations they are immediately confronted with.

The RESTORE Council conducts a field meeting for the Laguna Atascosa National Wildlife Project. The site is one of a suite of restoration projects that improves and conserves the entire Bahia Grande Wetlands system in Texas, and was included in the first round of funding disbursed by the council. Photo courtesy of Keala J. Hughes

Many of the complexities of the Gulf of Mexico's ecosystem are on display here, and the dynamic currents both in the ocean and the atmosphere are evident. Streams of the *Deepwater Horizon* spill are evident south of Alabama and the Florida panhandle as they traverse the Gulf. Graphic courtesy of the National Aeronautics and Space Administration

Trends in science to tackle adaptive, regional, and ecosystem approaches have driven an expansion in thinking about the networked interests of planning, response, and restoration activities. This is also true for how improved planning for spill response might bear on the resilience of not just built infrastructure, but also 'green infrastructure,' the natural resources that support healthy oceans and coasts. Furthermore, we see a need to expand the existing toolbox and find ways to move beyond reliance on static, non-standard data. We need to prepare the way for more dynamic decision-support tools informed by more effective forecasting capabilities that could integrate threats, vulnerabilities, and real-time conditions. We need to do so in a way that addresses the needs of first responders making immediate decisions, and for planners and engineers working on longer time frames, and the different needs of those parties.

Of course, the Coast Guard is not a natural resource management agency, but the nexus between spill response activities and those same resources is an ever-present consideration. The Coast Guard does have specialized expertise and experience assessing risk and identifying available response technologies, documenting gaps, and investigating novel improved approaches. Where planning and response activities may be germane to outcomes, we must prepare to leverage and incorporate factors like societal costs from ecosystem impacts.

The ongoing work to recover the Gulf's resources and protect those that are still intact should be a catalyst for the future. Every day, these efforts leverage an unprecedented aggregation of talented experts and authorities working within resources recovery and the oil-spill planning communities of practice. If we are to marshal response and recovery efforts forward in a manner that accommodates more regional, systemic approaches, and is thus more readily scalable to address long term resilience, it is a course we need to embark on now.

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Evolution of the Coast Guard's ESF 10 Response During Natural Disasters

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In the mid-20th Century, a host of legislation was enacted to provide federal support to states during times of disaster emergencies. Beginning in 1968 with the National Flood Insurance Act to the Disaster Relief Act of 1974, and the creation of the Federal Emergency Management Agency (FEMA) in 1979, post-disaster federal support continued to evolve. After FEMA was established, the Robert T. Stafford Act was enacted in 1988, and in 1992, came the Federal Response Plan, the operational blueprint for federal support during disaster events.[1]

Coast Guard salvage teams in Empire, Louisiana, oversee commercial salvage operators in December 2005 as they work to recover over 2,200 vessels in southeastern Louisiana, following Hurricane Katrina. Coast Guard photo by Petty Officer 2nd Class Susan Blake

Following the 2001 terrorist attacks and the establishment of the Department of Homeland Security, the Federal Response Plan morphed into the National Response Plan (NRP), an all-discipline, all-hazards plan that established a single, comprehensive foundation for the management of domestic incidents.[2] The NRP combined several existing federal plans for the coordination of response efforts to a variety of incidents, including the Federal Response Plan, U.S. Government Interagency Domestic Terrorism Concept of Operations Plan, and the Federal Radiological Emergency Response Plan. Published in 2004, the NRP superseded all of the above listed plans, consolidating them into a single document.

In 2005, Hurricane Katrina tested the new NRP, which was less than a year old. The response to this devastating tragedy provided a variety of lessons learned and the response community urged the next evolution of the NRP, which was reworked to create the National Response Framework (NRF). Initially released in 2008, and updated in October 2019, the new format recognized the collaborative nature of effective response coordination at all levels of government with private sector, non-governmental organizations, and private citizens.[3] Critical to pollution responders, the NRF incorporated the National Contingency Plan (NCP), 40 C.F.R. 300, as an operational supplement.

The work conducted under the NRF is managed through the issuance of mission assignments to federal agencies to support states during times of disasters. Encompassed in 15 Emergency Support Functions (ESF), such as search and rescue, primary and support agencies are pre-identified for each of the ESFs. Each time a mission assignment is issued, FEMA and the impacted state negotiate a cost-share agreement, whereby the impacted state, territory, or commonwealth may be responsible for a portion of the response costs. This is incredibly important when understanding limitations on federal support to states under mission assignments and why cost accounting is so critical. An example of

such limitations includes mitigation to impacts on federal lands. Unlike traditional National Contingency Plan responses, ESF response involves state funds, and therefore response actions on federal lands are managed through agency funds or special appropriations. Furthermore, the response actions a state is willing to fund will be clearly stated in the mission assignment, so ESF response decision-makers must be very careful to remain within the dictates of the mission assignment tasking. When a disaster impacts multiple states, each can be issued a mission assignment, frequently with different cost shares, and response entities must carefully track resource hours dedicated to each state's recovery efforts.

Coast Guard Petty Officer 2nd Class Andrew Steele, left, and Chief Petty Officer Nicholas Calise examine a large shrimp boat that grounded near Coast Guard Station Venice, Louisiana, in October 2005. The Coast Guard oversaw a massive salvage operation to recover more than 2,200 vessels after Hurricane Katrina, including this one. Coast Guard photo by Petty Officer 2nd Class Susan Blake

As the NRF itself evolved, so has the Coast Guard's mission in support of Emergency Support Function 10 (ESF 10), Oil and Hazardous Materials Response. The Environmental Protection Agency (EPA) is designated as the lead agency for ESF 10 operations. Historically, the EPA would allocate funds to the Coast Guard to allow the Coast Guard federal on-scene coordinators (FOSC) to address pollution incidents occurring within the coastal zone, in accordance with NCP authorities and responsibilities. As partner agencies on the National Response Team, where the EPA serves as chair and the Coast Guard as vice chair, the agencies have a legacy of collaboration to define areas of responsibility. However, during response to a large natural disaster, there is usually enough work to go around, and the traditional delineation of roles may not be the best use of expertise and resources.

During the response to Hurricane Katrina, EPA activated ESF 10 and, in coordination with the Coast Guard, the pollution response and mitigation mission were split along "party lines." The EPA took the lead with hazardous materials response, while the Coast Guard handled oil spills. In order to manage the vast span of control issues stemming from Hurricane Katrina, the commanding officer of Sector Mobile, Alabama, leaned on the National Strike Force. He issued a letter of delegation designating the commanding officer of the Gulf Strike Team as the incident specific federal on-scene coordinator to lead pollution mitigation efforts in the states of Mississippi and Alabama. Sector New Orleans did the same for the commanding officer of the Atlantic Strike Team for efforts in Louisiana. The EPA quickly became encumbered with household hazardous waste and orphaned container collection, while the Coast Guard managed the multiple oil incidents from facilities. It is estimated the cumulative oil discharge exceeded the oil discharge released from the *Exxon Valdez*.

Within weeks of Hurricane Katrina, the area was hit by Hurricane Rita. This additional mission assignment and expanded operational area complicated the ESF 10 mission. Financial lines of demarcation were established using state boundaries. By November, the Coast Guard had most of the oil incidents in a maintenance phase and work shifted to support the EPA in orphan container collection. The Coast Guard National Strike Force continued ESF 10 work by supporting the EPA with the hazardous materials response.

The response to Hurricane Katrina was the first large scale, Type I incident application of the NRP, and challenges with the response were compounded by the second hurricane. There was actually an ESF 10 planning meeting in which the finance section chief "could not support the plan" due to a delay in extending the mission assignments that threatened to halt all operations. FEMA was overwhelmed with the administrative

Boat Removal Cautions

Boats carry a variety of hazardous substances, including fuel and associated oils and engine lubricants, that could impact the environment. To further complicate the issue, responders cannot simply remove these pollution hazards and leave the boat in the water. Once the battery is removed, the bilge pumps won't operate, which puts the boat at risk for sinking. Response operations have to be carefully coordinated with marinas, owners, and other parties to remove the pollution and ensure the boat does not become a future navigation hazard.

workload that was generated by the vast nature of the federal response effort. Response leadership struggled with balancing the demands and public perceptions of environmental response operations with the inconsistencies and constraints of implementing the NCP under the NRP. With most of the federal response community implementing the NRP for the first time, there was a significant education initiative with FEMA to explain pollution response decisions and funds management.

As the ESF 10 operations began to close, the Coast Guard received a request from the Army Corps of Engineers for assistance with mitigating the derelict and displaced boats under ESF 3, Public Works and Engineering. The widespread devastation from the hurricanes left hundreds of recreational vessels stranded on land throughout Mississippi and Louisiana. The Corps' effort was dedicated to resolving the levee failures and they requested the Coast Guard accept a task order under their mission assignment to address the pollution and debris threats from the displaced vessels.

While the Coast Guard ESF 3 efforts commenced several months after the hurricanes, and significant recovery efforts had been accomplished in terms of infrastructure, there were still numerous challenges associated with the response. This predated smartphones and widespread cellular data access. Data collection and reporting was laborious and time intensive. Cellular service had been impacted by the storms, so communications were still spotty in some areas. Many of the vessels were stranded in remote areas which made retrieval difficult and dangerous. Identifying and locating vessel owners, many of whom had lost their homes and were themselves displaced, was exceptionally challenging. Contracting the appropriate salvage resources was also problematic as there were still widespread recovery efforts across the region and many assets were otherwise employed.

Despite the challenges, the Coast Guard led the effort to remove the pollutants from displaced boats and ensure they would not become future marine debris or hazards to navigation. This was the first time the Coast Guard conducted such a mission and it laid a foundation for what would later evolve into a mission under ESF 10. One that would repeat with every major hurricane in coming years.

In October 2012, Superstorm Sandy pounded the mid-Atlantic, causing an estimated $70 billion in damages.[4] Coordinating with the EPA, the Coast Guard received a direct mission assignment to lead ESF 10 response operations in support of the states of New York and New Jersey that focused on mitigating facility releases and assessing other pollution threats waterside of the mean high tide line. The issue of displaced boats once again came to the forefront of response operations, but this time the Coast Guard adjudicated the pollution threat from these boats under ESF 10.

The ESF 10 response to Superstorm Sandy was also complicated by individual mission assignments for New York and New Jersey. Cost tracking is very important in all pollution response efforts, and the Coast Guard relies on the National Pollution Funds Center to provide expertise in cost documentation for more traditional pollution incidents and those activities associated with ESF 10 operations. In this response, two different mission assignments were managed—one for each state—in one incident command post, which added to the difficulties of cost accounting and resource tracking for the Coast Guard's ESF 10 efforts. Additionally, cost-sharing discrepancies between the two states determined the prioritization of vessel removal efforts managed by ESF 10. Retired CDR David Reinhard, then a lieutenant commander, was the executive officer of the Atlantic Strike Team and deputy incident commander for the Coast Guard's ESF 10 operations. He noted, "the disparity of the cost share between the states, combined with the fact that Sector Delaware Bay was also expending funds against the New Jersey mission assignment ceiling for operations throughout the rest of the state, made cost accounting and close coordination for operations extremely critical in providing timely and appropriate support to both states."

> Under an ESF 10 mission assignment, the Coast Guard works in a support capacity and uses the respective state, local, territory, or tribal government authorities and legal frameworks related to abandoned and derelict vessels to execute vessel removal operations.

The transition of managing the displaced boat operations under ESF 10 during Superstorm Sandy represents a large evolutionary step in how the Coast Guard responds, and a number of tools were developed in this response to assist unified commands and field operators. The advances in technology alone contributed to better tactical planning and mission tracking. For the first time, the National Oceanic and Atmospheric Administration's (NOAA) Environmental Response Management Application (ERMA) was used to collect and display data. Response documentation leapt

forward with the creation of guidance and operational protocols for displaced vessels and recovery of containers, and forms for target identification, mitigation, and operational progress. Lessons learned were identified for response to vessels on federal lands, response to insured versus uninsured vessels, and responsibility for final vessel disposition. These processes were replicated during the unprecedented 2017 hurricane season when the Coast Guard responded to hurricanes Harvey, Irma, and Maria.

Between Superstorm Sandy and the 2017 hurricane season, there were a number of interagency efforts to refine processes and produce national level guidance documentation to improve federal response efforts to ESF 10 missions. The National Response Team published the *Abandoned Vessel Guidance,* which helped to deconflict Coast Guard and EPA responses with FEMA activities. It also served as an excellent resource for Coast Guard and EPA federal on-scene coordinators (FOSC) in outlining authorities, funding options, and the limitations of addressing abandoned vessels in situations external to disaster responses. The Coast Guard also worked closely with FEMA to develop pre-scripted mission assignments to expedite response timelines once Stafford Act declarations are made. Partnerships and local procedures were tackled at the area committee level to better prepare for these types of response operations. For example, Texas developed the Natural Disaster Operational Workgroup (NDOW) specifically to improve coordination and establish an operational construct between state and federal agencies in preparation for, and execution of, ESF 3 and ESF 10 mission assignments.

Despite the progress made between 2012 and 2017, the series of devastating 2017 hurricanes that left more than 4,000 vessels sunken, submerged, damaged, and derelict along the coasts of Texas, Florida, Puerto Rico, and the U.S. Virgin Islands tested the limitations of the Coast Guard's ESF 10 response posture. Senior members of the National Strike Force (NSF) once again provided incident-specific incident command and FOSC representative support to the impacted areas in each state, territory, and commonwealth. While each of these entities had different legal authorities, capabilities, and resources to dedicate to the post-disaster response mission, NSF leadership was able to bring experience, best practices, and established processes to each response.

Members from Resolve Marine Group remove a boat identified as *STT060* from Benner Bay, St. Thomas, U.S. Virgin Islands, in February 2018. The Coast Guard-led Emergency Support Function 10 response, in support and under the direction of the U.S. Virgin Islands Department of Planning and Natural Resources, was established to mitigate pollution and remove the 479 vessels identified as displaced by Hurricanes Irma and Maria between August and October 2017. Coast Guard photo by Petty Officer 1st Class Gina Ruoti

Each of the ESF 10 responses used NOAA geodetic pre- and post-storm aerial imagery for a high-resolution imagery layer in ERMA that was again used to provide the common operating picture and initial vessel target assessments to determine the preliminary scope of work. EPA's *Response Manager* data and *Survey 1-2-3* mobile data collection tools on tablets and smartphones were used by field responders to provide real-time data updates to the incident command post. Operational protocols and processes, legal documentation, and environmental best management practices and strategies were shared and tailored to meet specific needs at each of the four ESF 10 incident command posts.

Resources and support from technical specialists contributed to a robust response and included:

- Coast Guard incident management preparedness advisors
- response documentation specialists
- district legal officers
- National Pollution Funds Center
- Coast Guard Shore Infrastructure Logistics Center emergency contracting
- salvage emergency response teams
- emergency preparedness liaison officers
- district response advisory teams
- NOAA Scientific Support Coordinators
- EPA on-scene coordinators
- federal and state historic preservation officers
- state environmental, law enforcement, and emergency management representatives

Florida and Texas benefitted from existing abandoned and derelict vessel legal frameworks that contributed to the rapid establishment of interagency response efforts to execute the ESF 10 response operations. This wasn't the case, however, for the Commonwealth of Puerto Rico or the U.S. Virgin Islands, neither of which had similar legal processes in place.

In addition to geographic constraints associated with island response, a lack of power and communications, and a lack of available personnel to assist in the development of response strategies, plans, and processes, this complicated the response planning and execution.

For example, Puerto Rico did not have specific authorities to remove abandoned and derelict vessels from waterways, which required the unified command to create a robust vessel owner outreach program to facilitate the removal of displaced vessels under "public nuisance" legislation on submerged lands. While the Virgin Islands had abandoned and derelict vessel removal authority and protocols, due to a lack of pre-identified staging areas and disposition processes, ESF 10 operations became mired in administrative procedures as an agreement was coordinated through FEMA to employ ESF 3 resources.

Following the 2017 hurricane season, progress to improve response processes through interagency partnerships and committees continued. The FEMA prescripted mission assignments were updated again and employed in the 2018 hurricane season for Hurricanes Florence and Michael. Efforts to provide the Coast Guard with a direct mission assignment ensured ESF 10 operations were quickly established after the storms. Relying on the processes established for Hurricane Irma as a foundation, the ESF 10 response to Hurricane Michael in the panhandle of Florida was able to quickly evolve to meet the operational demands. However, after Hurricane Florence, North Carolina faced challenges with a lack of state authorities to address displaced vessels and political concerns over state liability. As a result, the ESF 10 response in North Carolina leveraged the Coast Guard's National Contingency Plan authorities and focused on the recovery of pollution from 120 displaced vessels, but left the vessels in place, in coordination with state officials. Efforts continue in the North Carolina General Assembly to rectify the issues that resulted from the lack of legal processes to mitigate displaced vessels.

Coast Guard and Army Corps of Engineers members discuss the salvage plan for the *John B. Caddell*, in November 2012, after the 184-foot tanker ship ran aground on Staten Island, New York, during Superstorm Sandy. Coast Guard photo by Petty Officer 1st Class Matthew Schofield

North Carolina Wildlife Resources Commission Master Officer David Midyette oversees Coast Guard contractors' lift and pollution mitigation operations at Wayfarers Marina and Cove in Minnesott Beach, North Carolina, in October 2018. Conducting such complex operations requires federal, state, and contracting agencies to work as a cohesive team. Coast Guard photo by Petty Officer 1st Class Sara Romero

The Coast Guard continues to work closely with its interagency partners to share best practices and address policy issues for post disaster response and ESF 10 operations. An ESF 10 Annex template for area contingency plans was developed and shared by Mike Sams, the Coast Guard District 8 incident management and preparedness advisor. On February 22, 2019, Ms. Dana Tulis, the director of the Coast Guard's Emergency Response Directorate, and Mr. Damon Penn, of FEMA, signed an interagency memorandum to formalize the role of the Coast Guard in executing ESF 10 missions.[5] In July 2019, the Office of Marine Environmental Response Policy developed guidance to better integrate the commercial salvage/public assistance community into ESF 10 operations to deconflict vessel removal efforts between federal and commercial entities.[6] While 2019's Hurricane Dorian did not have significant U.S. maritime impact, the use of improved technology for post-storm response continued. Unmanned aircraft systems were used to rapidly assess potential vessel impacts and provide data for a determination that no ESF 10 mission assignment was necessary.

As the whole of government approach to post-disaster response operations has matured through the last two decades, the understanding of how the Coast Guard responds to support the NRF, specifically for ESF 10 operations, has been clarified through experience, lessons learned, and best practices. These in turn have been documented and formalized through continual policy development, technological advancements, and partnerships.

About the Authors:

CDR JoAnne Hanson was privileged to serve 16 years assigned to the National Strike Force. She responded to hurricanes Katrina/Rita, Irma, and Florence, and coordinated NSF resources for Superstorm Sandy. She is currently the chief of the Interagency Coordination Division at Coast Guard Headquarters in the Office of Marine Environmental Response Policy.

CDR Kelly Thorkilson is the commanding officer of the Coast Guard Incident Management Assist Team. She possesses more than 19 years of experience in incident and emergency management, pollution response, contingency and planning, and incident command system instruction.

Endnotes:

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The United States Coast Guard

A premier *all-risk, all-hazard* maritime emergency management agency

by CAPT Kailie Benson
Chief, Office of Emergency Management & Response
U.S. Coast Guard

CDR Laura Miller
Division Chief, Office of Management & Disaster Response
U.S. Coast Guard

When one thinks of the United States Coast Guard and the term emergency management, some may envision a Coast Guard helicopter rescuing distressed citizens from a rooftop following a major hurricane. While others may think of a Coast Guard Cutter delivering lifesaving supplies to a less fortunate nation recovering from a major earthquake. Whatever the case may be and, although this is certainly a piece of the overall emergency management picture within the Coast Guard, it doesn't tell the full story. The Coast Guard has many identities. Many will assert that the Coast Guard is a sea-going service. Some may say that we are a law enforcement agency. Still others may say that we are a regulatory agency. It is likely that we are most famous for our excellence in life-saving skills and capabilities.

We have many legacy identities that are rooted in a long, proud history dating back to the Revenue Cutter Service (1790), the Steamboat Inspection Service (1871), the Life-Saving Service (1878), the Bureau of Navigation (1884), and the Lighthouse Service (1910). The U.S. Coast Guard of the 21st century is all of those individual identities and much, much more. Frankly, emergency management fundamentals in the Coast Guard spans across all of our missions and provides the framework in which we operate day to day. Regardless of the type of maritime disturbance, the Coast Guard is uniquely positioned to manage the entire crisis and respond swiftly with effective, coordinated, and decisive actions to ensure the safety and security of the nation. In effect, the Coast Guard lives emergency management day in and day out, and arguably has become a globally recognized maritime emergency management organization known for the highest caliber of all-risk, all-hazard prevention, response, and maritime transportation system recovery capabilities.

NPG Five Mission Areas and Core Capabilities

Prevention	Protection	Mitigation	Response	Recovery
Planning				
Public Information and Warning				
Operational Coordination				
Intelligence and Information Sharing		Community Resilience	Infrastructure Systems	
Interdiction and Disruption		Long-term Vulnerability Reduction	Critical Transportation	Economic Recovery
Screening, Search, and Detection		Risk and Disaster Resilience Assessment	Environmental Response/Health and Safety	Health and Social Services
Forensics and Attribution	Access Control and Identity Verification	Threats and Hazards Identification	Fatality Management Services	Housing
	Cybersecurity		Fire Management and Suppression	Natural and Cultural Resources
	Physical Protective Measures		Logistics and Supply Chain Management	
	Risk Management for Protection Programs and Activities		Mass Care Services	
	Supply Chain Integrity and Security		Mass Search and Rescue Operations	
			On-scene Security, Protection, and Law Enforcement	
			Operational Communications	
			Public Health, Healthcare, and Emergency Medical Services	
			Situational Assessment	

Coast Guard graphic

It is helpful to think about the Coast Guard's core maritime emergency management nexus through the lens of the National Preparedness Goal (NPG) which was created at the direction of U.S. Presidential Policy Directive 8: Prevent, Protect, Mitigate, Respond, and Recover. The goal is "a secure and resilient nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk." The five mission areas and 32 core capabilities highlighted within the NPG correspond with almost every Coast Guard mission.

The following graphic highlights some of the Coast Guard's achievements from the FY18 Annual

NPG Mission Areas and Coast Guard Mission Highlights*

NPG Core Capability	Coast Guard Mission Highlights
Prevent	Conducted more than 19,000 inspections of U.S. flagged commercial vessels
Prevent	Executed 23,000 container inspections for structural & hazardous materials
Protect	Interdicted 209.6 metric tons of cocaine and 21,564 pounds of marijuana
Protect	Provided support for 131 military out load security zones
Protect	Conducted 4,441 small vessel security boardings
Mitigate	Conducted 6,757 hours of icebreaking to support Great Lakes movement
Mitigate	Cited 144 significant fishery violations
Respond	Responded to 15,634 search and rescue calls
Respond	Interdicted 3,603 undocumented migrants
Recover	Managed 296 federal cleanup projects

* Coast Guard mission highlights from Coast Guard FY2018 Annual Performance Report

Coast Guard graphic

Performance Report across the five mission areas of the NPG. Although this is only a sampling, the entire list, in some way, fits into that overarching NPG.

Emergency management, by many definitions, is the organization and management of the resources and responsibilities for dealing with all humanitarian aspects of emergencies—prevent, protect, mitigate, respond, and recover. The aim is to reduce the harmful effects of all hazards, including disasters. This is crisis leadership and management, at which the Coast Guard excels. However, under the auspices of continual process improvement, there is always room to do better. Readiness and proficiency are each a journey, not a destination.

Beginning in late 2018, the Coast Guard's legacy Office of Contingency Planning and Exercises designed and implemented what is akin to a massive programmatic transformation and was officially renamed as the Coast Guard Office of Emergency Management and Disaster Response in early 2019. In addition to the name change, numerous programmatic brand, training, and policy updates were undertaken in rapid succession, and many more are underway. The simple name change, coupled with significant policy and doctrine updates, represented a seismic shift to align with modern emergency management elements and agencies. It also makes the often under-appreciated work of planning, interagency exercise development and execution, and incident action planning much more relevant, attractive, and identifiable as necessary and relevant capabilities.

The review of our training menu, both content and delivery methods, revealed the need for introduction of a new emergency management curriculum and the need to seek improvements in training delivery to meet the needs of a varied and diverse workforce. It also revealed the need to design and implement a Coast Guard emergency management credential to explicitly state the desired scope and depth of experience and training desired within our mission-focused talent pool. This would result in a higher, and standard, skill level of emergency managers who are charged with ensuring our operational commanders have the best and most skilled players ready during a crisis. These training initiatives are in progress, with many already completed. Our team used Agile Scrum project management processes to organize and execute all of the program transformation initiatives, hence the astonishing speed with which most were executed.

The Coast Guard Office of Emergency Management and Disaster Response seeks to bring the Coast Guard emergency management program and functions out of the background and into a place of organizational prominence. Locally established, nationally positioned, and globally connected, the Coast Guard excels in crises leadership and management. This is a journey of excellence in maritime emergency management and there is much work left to do.

About the authors:

CAPT Kailie Benson is currently serving as the chief of the Office of Emergency Management and Disaster Response (CG-OEM). She holds a Master of Arts in international relations from University of Oklahoma. Her prior assignments include liaison to Military Sealift Command, and chief of prevention for Sector San Juan, Puerto Rico.

CDR Laura Miller is currently serving as a division chief in the Office of Emergency Management and Disaster Response (CG-OEM-1). She holds a master's in homeland security with a concentration in emergency management from Northeastern University. Her prior assignments include the emergency management and force readiness chief at Coast Guard Sector South Portland and commanding officer of the Pacific Regional Fisheries Training Center.

Coast Guard Emergency Management Certification

Advancing emergency management in the Coast Guard

by Freddie Bizzell
Former Chief of Incident Management and Disaster Response Division
Office of Emergency Management and Disaster Response
U.S. Coast Guard

In 2015, as a student in the Federal Emergency Management Agency (FEMA) Advanced Emergency Management Leadership Academy, we heard from former FEMA Administrator Craig Fugate regarding the need to increase the number of certified emergency managers around the United States. In his presentation, he highlighted the importance of having certified emergency managers available to assist local, county, state, and national officials with developing and maintaining emergency management programs. He stressed that the knowledge and experience of certified emergency managers is vital to helping prepare for, respond to, and recover from the impacts of disasters. In emergency management, certification signifies that an individual has met an established set of local, state, national, or international criteria necessary to manage all facets of an emergency management program beyond emergency/disaster response. The purpose of the U.S. Coast Guard Emergency Management Certification Program (CGEM) is to recognize members of the Coast Guard workforce who have experience, or are seeking to gain experience, in emergency management and prepare them for certification as emergency managers. This new program will advance the emergency management profession within the Coast Guard and provide emergency management support to the service's port partners and the nation.

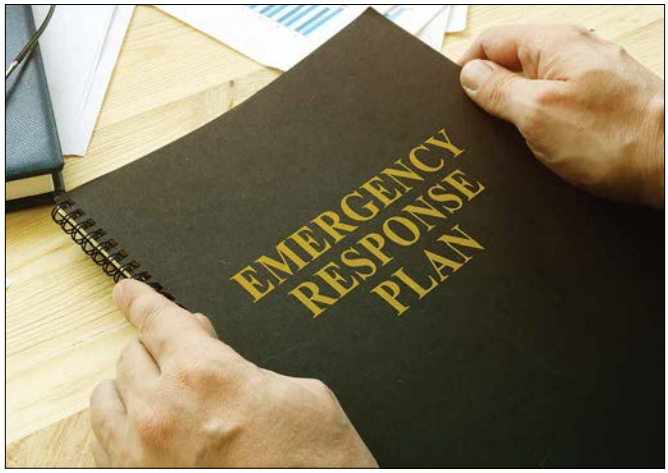
Program Development

During the development of the Coast Guard's CGEM, a certification working group examined emergency management certification program requirements from around the country. Its purpose was to determine which elements of those programs the Coast Guard could use to build a certification program that would be most beneficial to interfacing with the greater emergency management community. The working group reviewed the Associate Emergency Manager (AEM) and Certified Emergency Manager (CEM) requirements for certification awarded by the International Association of Emergency Managers (IAEM), as well as the U.S. Air Force's Certified Emergency Management Program. It was determined that the Coast Guard's program needed to include a baseline set of requirements similar to those set forth by IAEM, as the IAEM requirements for certification are the standards recognized nationally and internationally within the emergency management field. The certification working group felt developing a program that incorporated these standards would best enhance the acceptance of the CGEM within the emergency management field and provide the most significant opportunity to collaborate with other certified emergency managers across the country.

Who Can Apply

The Coast Guard CGEM program will be open to all

As of June 2020, just over 2,000 individuals globally held either the International Association of Emergency Managers' Associate Emergency Manager or Certified Emergency Manager credentials. Then-LCDR Matt Walter, pictured in 2018, is one of them. Coast Guard photo



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Coast Guard active duty, reservists, civilians, and auxiliarists, as well as anyone who is currently certified by the IAEM as a CEM. Intending to provide additional nationally recognized personnel to assist emergency managers around the country, the certification working group developed a CGEM certification process with three requirements, which are detailed below.

Emergency Management Experience

Applicants will be required to have a minimum of five years in emergency management. The five year experience requirement ensures that applicants have ample time and experience in emergency management. Applicants will have to submit an emergency management work history detailing their comprehensive experience in the field. This must include evidence of participation in full-scale exercises, real-world events—disaster or planned—or special events. The applicant's work history will have to show clear evidence that their work experience encompasses the mitigation, preparedness, prevention, and response phases of emergency management.

Applicants will also be required to complete a total of 200 emergency management training contact hours, split evenly between emergency management and general management. To meet the contact and training hour requirement, applicants will be able to use several different sources of training. Acceptable emergency management training may include any local, state, federal, or institutes of higher education sponsored emergency management training course, or other emergency management-related training course. In addition to the contact hour requirement, CGEM applicants will be asked to complete several FEMA online independent study courses. These courses are free, but applicants will sign up with the FEMA Emergency Management Institute to get a student identification number which they will use to enroll in, and complete courses. These requirements are designed to show that an applicant has taken the time to familiarize themselves with all applicable principles, laws, and regulations that govern emergency management.

Multiple Choice Examination

Applicants will be required to achieve a passing grade of 75 percent on a 100 question, multiple-choice exam focused on emergency management principles. The proctored, closed-book exam will include questions considered to be universal core content for emergency management and will be taken directly from the required independent study course material. Certification tests are the current emergency management industry standard for assessing whether a potential emergency manager possesses the minimum level of knowledge necessary to become certified.

Letters of Reference

With the successful completion of the above requirements, applicants will be required to submit a signed letter of recommendation from their current supervisor. The letter of recommendation should attest to the applicant's contributions to the emergency management field, and speak to the applicant's potential to perform in the emergency management field as a certified emergency manager. Once an applicant has completed all requirements for certification, they will submit their completed application to the Coast Guard Office of Emergency Management for review and approval.

Conclusion

Once certified, individuals will be able to provide much-needed assistance to their local commands and port partners in emergency management, both pre- and post-event or incident. The CGEM program and certification will aid in the professionalization of the emergency management field within the Coast Guard and benefit all those who become certified. Those who become certified will have a solid baseline of knowledge that will allow them to interact on a peer-to-peer level with other emergency managers. These interactions will lead to enhanced levels of communication and emergency management response and recovery capability throughout the country and further improvements at the international level.

About the author:

Freddie Bizzell, Jr., is an Emergency Management Specialist at the U.S. Department of Justice Executive Office for U.S. Attorneys. He is a retired Marine Science Technician from the U.S. Coast Guard who specialized in incident and emergency response management policy and training. He is the former Chief, Incident Management and Disaster Response Division for the Coast Guard's Office of Emergency Management and Disaster Response.

U.S. Leadership in the Arctic Council

International collaboration in an ever-changing Arctic marine environment

by CDR Wes James
Chief, International & Domestic Preparedness
Office of Marine Environmental Response Policy
U.S. Coast Guard

The Arctic marine environment has profound significance for the United States, the ecosystems, and the populations that depend upon its health and sustainability. As maritime economic activity increases in the Arctic, so does the risk of maritime accidents and the need for enhanced Arctic incident response planning and preparedness. Any type of response in the Arctic presents major operational challenges due to the harsh operating environment and limited infrastructure, distances involved in mounting a response to the incident location, and the inherent difficulty of deploying resources in ice-covered waters.

Interagency Coordination

In order to create a framework of preparedness and response that addresses the unique issues experienced within the Arctic, both domestically and internationally, a collaborative approach is required. The *2019 U.S. Coast Guard Arctic Strategic Outlook* states that, "The United States is an Arctic Nation, and the United States Coast Guard has served as the lead federal agency for homeland security, safety, and environmental stewardship in the Arctic region for over 150 years." The Coast Guard serves as the lead organization for oil and hazardous substance incident responses in our nation's waters. It is, however, through a network of local, state, and federal partners working to protect the nation's Arctic marine resources. and those who depend upon those resources,

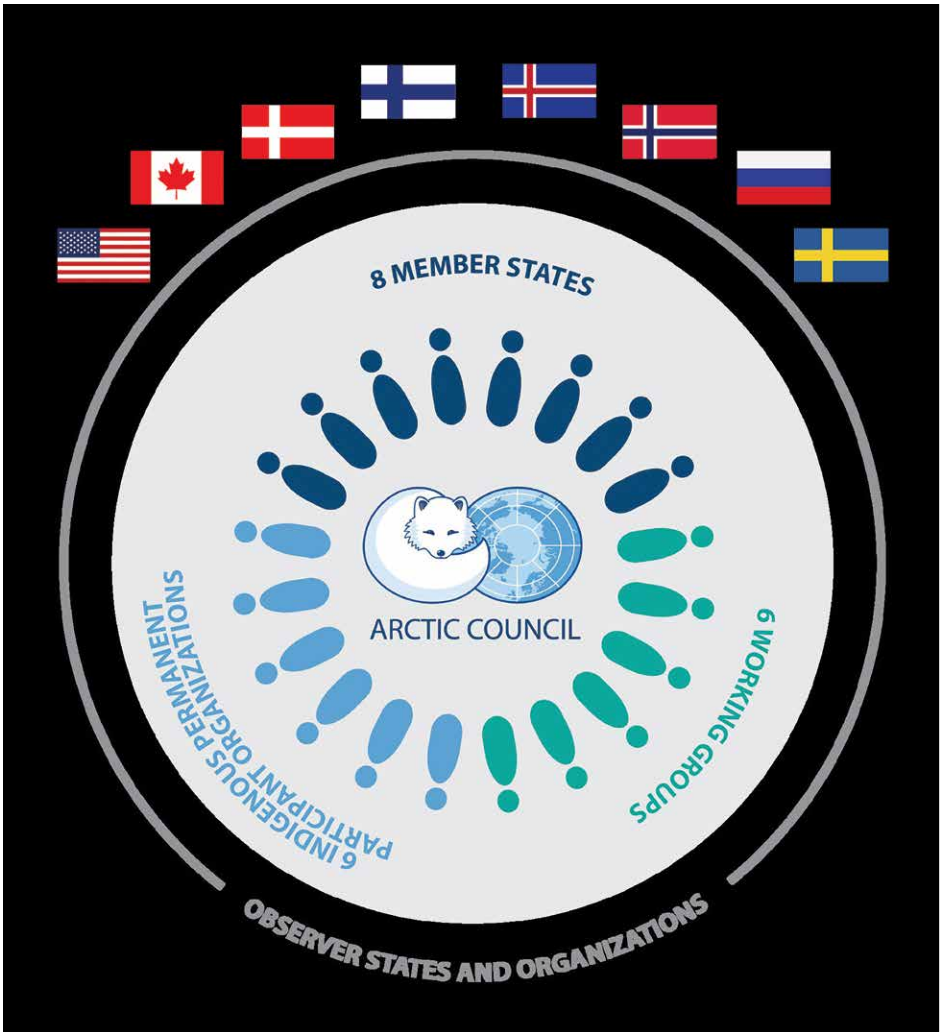
The Bureau of Safety and Environmental Enforcement (BSEE), under the Department of the Interior, "ensures safe and environmentally-responsible operations throughout all of the exploration activities in the Arctic."[2] Specifically, this includes ensuring safe offshore operations through oversight of drilling operations to the approval of oil spill response plans, which ensure adequate response resources to mitigate impacts to the Arctic environment in the event of an oil spill. Within the Arctic, the National Oceanic and Atmospheric

Coast Guard Cutter Healy crew prepare to lower a National Oceanic and Atmospheric Administration buoy into the Chukchi Sea near Icy Cape, Alaska, in July 2017. The buoy will serve as a test bed for evaluating innovative sensors and techniques for increasing observational capabilities in the Arctic. Coast Guard photo by Petty Officer 2nd Class Meredith Manning

Administration (NOAA) provides "vital Arctic science, services, and stewardship, including information and products that form a critical foundation for science and management of our trust resources in Arctic oceans and on the coasts…."[3]

Additionally, numerous local, state, and federal agencies, and academia, especially within the state of Alaska, work to support protection of the Arctic marine environment.

These agencies work within their own jurisdictions and authorities to enforce laws and regulations aimed at protecting the Arctic. They also work collaboratively through a variety of forums, including the national response team and the Alaska regional response team, under the leadership of the Environmental Protection Agency and the Coast Guard, to further ensure protection of the Arctic. Together, they play a significant role in U.S. federal governance in the U.S. Arctic..



Along with the eight member states (United States, Canada, Denmark, Finland, Iceland, Norway, Russia, and Sweden), there are six organizations representing Arctic indigenous peoples as permanent participants. The Arctic council conducts its objectives through a structure of six working groups. Graphic courtesy of the Arctic Council Secretariat

International Coordination

International outreach and coordination are a critical components of marine environmental preparedness and response, especially in the Arctic. U.S. waters may be directly impacted by a spill originating in another nation's waters, and conversely, a spill in U.S. waters may impact a foreign nation's resources. A network of cooperation toward the common goal of preparing for and responding to environmental disasters has been established and maintained through formal and informal engagements to mitigate these risks. Formal cooperation exists through bilateral or multilateral agreements, and international conventions. Informal engagement may take place through collaboration and information sharing with our international partners, which promotes readiness to respond to environmental incidents and fosters communication that aids in globally enhancing pollution preparedness.

Bilaterally, the U.S. Coast Guard and the Canadian Coast Guard have a long history of cooperation in executing our responsibilities to prepare for and respond to oil and hazardous substance events under the auspices of the Canada-United States Joint Marine Pollution Contingency Plan (JCP). The JCP, last updated in 2017, provides the mechanism for coordinating the independent responses of each nation in order to maximize response resources and minimize the damage to the environment and the likelihood of transboundary contamination. The JCP is comprised of a base national plan and five regional annexes that provide details for execution of efficient and effective coordinated response in adjacent waters. The annexes are managed, exercised, and implemented by border U.S. Coast Guard districts and Canadian Coast Guard regions.

Additionally, in 2011, the U.S. and the Russian Federation signed a JCP for combating pollution in the Bering and Chukchi seas. This JCP, which is between the U.S. Coast Guard and the Russian Federation's Marine Rescue Service, provides for oil spill planning and preparedness through meetings and exercises, the

coordination of marine oil spill responses, and operational communications. Under both the Russian and Canadian JCPs, the U.S. Coast Guard works to effectively plan and prepare for transboundary maritime oil spill prevention, preparedness, and response.

The Arctic Council

The U.S. Coast Guard also works collaboratively within several multilateral forums to advance Arctic initiatives. Within these forums lies one of the most successful organizations focused on protecting the Arctic, the Arctic Council. The Arctic Council was established by the Ottawa Declaration of 1996 and includes eight original member states: Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States.[4] The Ottawa Declaration states that the Arctic Council is the leading intergovernmental forum for promoting cooperation, coordination, and interaction among the Arctic states, Arctic indigenous communities, and other Arctic inhabitants on common issues … focusing on issues of sustainable development, environmental protection and response, as well as numerous other critical issues (search and rescue, safe navigation/shipping, etc.) in the Arctic.[5]

Along with the eight Arctic member states, there are six organizations representing Arctic Indigenous peoples noted as permanent participants who actively participate and consult within the Arctic Council. They are the Aleut International Association, the Arctic Athabaskan Council, the Gwich'in Council International, the Inuit Circumpolar Council, the Russian Association of Indigenous Peoples of the North, and the Saami Council. Observer status in the Arctic Council is open for 13 total non-Arctic states, 13 total intergovernmental and interparliamentary organizations, and a total of 12 nongovernmental organizations.[6] Observers primarily contribute through their engagement in the Arctic Council at the level of working groups.[7] Finally, all administrative aspects within the Arctic Council are facilitated by the Arctic Council Secretariat, which was established in 2013 and resides in Tromsø, Norway.

The Arctic Council, which is focused on the protection and sustainment of the Arctic, conducts its work through a structure of working groups, senior Arctic officials, and ministers. Currently, there are six working groups within the Council that work within specific mandates to achieve the common goal of ensuring protection of the Arctic, its resources, and the people who depend upon those resources. Those six groups include:

- Arctic Contaminants Action Program
- Arctic Monitoring and Assessment Programme
- Conservation of Arctic Flora and Fauna
- Emergency Prevention, Preparedness and Response (EPPR)
- Protection of the Arctic Marine Environment (PAME)
- Sustainable Development Working Group

Membership within the working groups is composed of experts from sectoral ministries, government agencies, and researchers whose expertise ranges from emergency preparedness and response to climate.[8] Each working group operates under its own mandate and the leadership of a chair and, usually, multiple vice-chairs, receiving support from the Arctic Council Secretariat, and often collaborating with other working groups on related projects. The working groups operate in a collaborative forum open to permanent participants, observers, and invited guests, however, decisions are made on a consensus basis by the eight Arctic member states.[9] The U.S. Coast Guard primarily works within the EPPR and PAME working groups.

The chair of the Arctic Council rotates on a two-year cycle, which is transferred from the incumbent member states to the incoming member state in May of the second year. Currently, Iceland serves

Alongside state and federal entities, Coast Guard members observe Alaska Chadux Corporation personnel speak about oil spill response and give a demonstration in Bethel, Alaska, in July 2018. Coast Guard photo by Petty Officer 3rd Class Lauren Dean.

As part of Operation Nanook, the crew of Coast Guard Cutter *Campbell* participated in Argus, a search and rescue exercise off the coast of Greenland on August 17, 2020. Emergency response in the Arctic is primarily the responsibility of the nation in whose waters the incident occurs Coast Guard photo by Ensign Ross Kolko and Ensign Heaven Bailey

as chair of the Arctic Council, which it assumed from Finland in May 2019. The United States last held the position of chair from 2015–2017. Iceland will transfer the chair position to Russia in May 2021. With a specific focus or theme in mind, each member state serves its term as chair while working alongside the other member states to implement the required Arctic Council mandates. For example, Iceland's theme reflects the country's commitment to the principle of sustainable development and refers to the necessity of close cooperation between the states and peoples of the region and beyond. "With sustainable development as an overarching theme, Iceland will highlight four priorities: The Arctic Marine Environment, Climate and Green Energy Solutions, People and Communities of the Arctic, and a Stronger Arctic Council." [10]

Emergency Response in the Arctic

Emergency response in the Arctic largely falls to the nation in whose waters the incident occurs. For an incident that occurs in U.S. Arctic (coastal) waters of the United States, its laws, and regulations, as well as its national response system, will be applied with the U.S. Coast Guard serving as the lead organization for oil and hazardous substance incident responses. When an incident occurs along the transboundary maritime areas of two nations, bilateral agreements could be activated to help facilitate and coordinate the emergency response, especially if that response exceeds the national capabilities of one nation. For example, the aforementioned JCPs between the U.S. and Russia and the U.S. and Canada, could be activated. These JCPs, once activated, help coordinate the transboundary oil spill response between both nations while also recognizing the sovereign waters, laws, and rights of each nation. Finally, certain events exceed both the national and bilateral capabilities of the involved nation(s) to respond to the event, and require multilateral coordination. Examples of those could include an event the size of the *Deepwater Horizon* incident or a cruise ship incident that occurred in the Arctic where mass rescue operations and large-scale oil spill response would be necessary. Advance coordination with other Arctic nations is critical to ensure agreements, protocols, and resources are in place in order to facilitate the most efficient response possible. Through the Arctic Council, these efforts increase global

Representatives from the United States led the Marine Oil Pollution Preparedness and Response in the Arctic exercise in 2016. The exercise focused on a notification and request for assistance initiated by Norway. Coast Guard photo by CDR Wes James

capabilities for preparedness and create the blueprint for coordinated emergency response in the Arctic marine environment.

Representatives from the eight Arctic member states, including the United States, work to mitigate risks and ensure safe, secure, and environmentally responsible activities in the Arctic. One of these forums is the aforementioned Arctic Council's working group on EPPR, which specifically addresses the areas of marine environmental response (MER), search and rescue (SAR), and radiation (RAD) for the Arctic marine environment.

"EPPR is mandated to contribute to the prevention, preparedness, and response to environmental and other emergencies, accidents, and SAR.," according to the EPPR strategic plan. "Members of EPPR conduct projects to address gaps, prepare strategies, share information, collect data, and collaborate with relevant partners on capabilities and research needs that exist in the Arctic. Projects and activities include development of guidance and risk assessment methodologies, coordination of response exercises and training, and exchange of information on best practices with regards to the prevention, preparedness and response to accidents and threats from unintentional releases of pollutants and radionuclides, and to consequences of natural disasters."[11]

Arctic Council agreements, which EPPR works to support, include the Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, signed in 2011; the Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic (MOSPA), signed in 2013; and the Agreement on Enhancing International Arctic Scientific Cooperation, signed in 2017. EPPR uses a number of expert groups to support its mandates and initiatives, meeting twice per year to advance its initiatives, enact its strategic plan, and advance deliverables to senior arctic officials for final approval at the ministerial level. Ministerial meetings occur every two years as the Arctic Council chairmanship transitions. The U.S. delegation to EPPR includes representatives from U.S. Coast Guard, BSEE, NOAA, the National Nuclear Security Administration, and a number of other agencies. One of its goals is to contribute to the protection of the Arctic environment from the threat or impact that may result from an accidental release of pollutants or radionuclides. It also supports the development of protocols and procedures for mitigating environmental threats in the Arctic and considers questions related to the consequences of natural disasters. Most recently, EPPR took on a project considering the impacts from circumpolar wildfires in the Arctic.

EPPR accomplishes many of its environmental objectives through the implementation of the MOSPA Agreement and the agreement's Appendix IV: Operational Guidelines. These guidelines address notification procedures, requests for assistance, command and control in response operations, joint training and exercises, administrative issues, and other recommended measures to facilitate an effective, cooperative oil pollution incident response.

The objective of the MOSPA Agreement is to strengthen cooperation, coordination, and mutual assistance among the parties on oil pollution preparedness and response in the Arctic in order to protect the marine environment from pollution by oil.[12] EPPR works to exercise and maintain the MOSPA Agreement by ensuring all eight Arctic states remain engaged in multilateral discussions, which includes exercises specific to validating the MOSPA's Operational Guidelines. The first exercise under the MOSPA Agreement was hosted by Canada in 2014, and consisted of a communications exercise simulating the notification of parties and the request for and

receipt of international offers of assistance. In 2015, the United States hosted the next phase of the exercise, a workshop held at the U.S. Coast Guard Headquarters in Washington. The workshop emphasized the identification of the highest risk Arctic spill scenarios, the review of lessons learned from the 2014 Canadian-led exercise, as well as updating the MOSPA Agreement and Operational Guidelines. The United States led the third MOSPA exercise in 2016, with Finland hosting the most recent MOSPA exercise in March 2018.

The after-action reports from both the 2016 and the 2018 MOSPA exercises, as well as other relevant documents, can be found at https://oaarchive.arctic-council.org/handle/11374/3.

In addition to MOSPA exercises, EPPR hosts annual connectivity tests to ensure critical contact information for each Arctic nation remains accurate and duty officers have familiarity with the protocols in place when a request for assistance is received.

The U.S. Coast Guard led several critical aspects during, and after, the U.S. Chairmanship from 2015–2017. In addition to leading the 2016 and 2018 MOSPA exercises, it led the development of the MER expert group in 2016, serving as chair from 2016–2019, the development of the SAR expert group where it currently serves as chair, and the development of the EPPR's MOSPA Exercise Design Guidance.

In March 2019, a real-life incident changed the way EPPR focused its approach to exercising the Arctic SAR and MOSPA Agreements. The Norwegian cruise ship, *Viking Sky*, suffered an engine failure off the coast of Norway. With 1,300 passengers and crew aboard, the vessel drew dangerously

Norwegian cruise ship *Viking Sky* suffered an engine failure off the coast of Norway in March 2019 with 1,300 passengers and crew aboard. The ship drew dangerously close to the rocky coastline as crew and emergency towing vessels worked to keep the ship from grounding while executing air evacuations. Varhaugvik | Adobe Stock

close to the rocky Norwegian coastline as the crew and emergency assist towing vessels worked to keep the cruise ship from grounding, while also executing air evacuations of passengers. Fortunately, the *Viking Sky* was able to regain operation and eventually navigated away from the coastline and into port. EPPR, recognizing that the incident was exactly the type its collaboration could support, began working to review after-action reports and lessons learned from the incident. EPPR also reviewed its offers of assistance protocols to ensure they addressed this specific type of response, which would involve both search and rescue and marine environmental response in a remote location and a harsh weather environment. With a review of the incident, EPPR set out to explore the next logical step in its exercise process, the transition from executing a mass search and rescue operation to executing a large-scale oil spill response.

Mass rescue operations of cruise ship passengers, while also executing an oil spill response, could easily exhaust any Arctic nation's resources and capabilities. Both the Arctic SAR and MOSPA Agreements are in place to help facilitate this process while the resources are moved into place to execute the response. In April 2021, the Arctic member states will come together to exercise this type of scenario, and those agreements, in what will undoubtedly be one of the largest Arctic maritime exercises to date. During this live, full-scale exercise, EPPR will work alongside the Arctic Coast Guard forum, with U.S. Coast Guard representatives leading exercise planning, to execute both search and rescue and oil spill response operations with actual Arctic member states' coast guard assets on scene. This exercise will also highlight the exceptional collaboration between Arctic nations and the agencies charged to execute emergency response in the Arctic.

> One small community outreach video is divided into five short videos suitable for social media and, can be found at www.vimeo.com/eppr. EPPR is now working on a second set of videos to be completed by 2021.

For more information

For more information on the Arctic Council visit:

Arctic Council Agreements
https://rb.gy/wdhiuv

EPPR Reference Documents
https://rb.gy/7iec7a

EPPR Project (Operational Guidelines, exercise AARs, etc.) Documents
https://rb.gy/6vv92w

2019 EPPR Ministerial Deliverables - EPPR_2019_Ministerial_Deliverables
https://rb.gy/l7tugo

EPPR's Focus Beyond SAR and MER

EPPR's efforts in the Arctic expand well beyond search and rescue and marine environmental response. Its mandate includes all areas of emergency response and natural disasters. In 2018, EPPR approved the initiation of work for the establishment of an expert group focusing on maritime radiological/nuclear response in the Arctic. In June 2019, the proposed mandate was approved and the EPPR radiation expert group was subsequently established. The function of the radiation expert group is to facilitate the implementation of the EPPR mandate and strategic plan framework regarding radiological/nuclear emergencies. In its role with the SAR expert group, the U.S. Coast Guard works to facilitate collaboration on SAR response during a radiological/nuclear maritime incident in the Arctic.

Another area of focus within EPPR includes oil spill research and development (R&D). In 2017, the United States hosted the first EPPR R&D workshop, which was followed with another workshop hosted by Norway in June 2019. EPPR then approved the establishment of a steering group on oil spill R&D aimed at creating broader multilateral collaboration across all eight Arctic member states, permanent participants, observers, and the scientific and academic research communities. This effort further supports collaboration under the 2017 Agreement on Enhancing International Arctic Scientific Cooperation, which plays a critical role supporting scientific engagements under the Arctic Council. This effort will allow Arctic nations to partner on oil spill research projects with the academic and scientific communities, expanding the Arctic oil spill R&D enterprise and ensuring the best available science and technology exists for mitigating impacts to the pristine Arctic environment. The U.S. Coast Guard is leading the establishment of the EPPR

R&D steering group along with NOAA and BSEE.

EPPR also works to increase prevention, preparedness and response for small communities through a project to build awareness of the challenges that incidents may create in small communities and provide options to prepare appropriate responses during an oil pollution response. Some of these options are discussed in short outreach videos. The U.S. Coast Guard assisted Norway in the development of the first series of videos and is currently assisting Norway in the development of a second series of videos.

Finally, the most recent addition to EPPR's slate of projects includes a project proposed in June 2019 by the Gwich'in Council International on the issue of how wildfires have become an increasing concern in the Arctic region. It was determined that this area of work remains relevant to the EPPR mandate and that it will be part of a coordinated Arctic Council approach to wildfires. The Circumpolar Wildland Fire Cooperation project aims to improve the coordinated response by Arctic states and permanent participants in response to catastrophic wildland fires in the Arctic region. The project will promote international cooperation and contracting of wildland fire resources across Arctic state boundaries, as well as coordinate training between relevant agencies.

Maritime Incident Response during COVID-19

The United States and our bilateral/multilateral partner nations are currently mitigating impacts from the ongoing COVID-19 pandemic. Maritime incident response is an already difficult evolution, but even more so in the face of the extreme Arctic environment and an ongoing pandemic. Therefore, the Arctic Council and its member states recognize that the COVID-19 pandemic has greatly impacted the response operations of the member states and is internally reviewing its best practices, challenges, experiences, and gaps relevant and specific to COVID-19 in the Arctic. Specifically, the Arctic Council is exploring how nations' response postures—specifically search and rescue, marine environmental response, and radiological incidents—have been impacted by the pandemic and how they have mitigated/overcome these obstacles. The Arctic Council and its working/expert groups continue to explore and share lessons learned and best practices, determine any potential impacts to Arctic Council protocols and existing agreements, and coordinate with our Arctic Council bodies, where appropriate. These efforts ensure maximum coordination on COVID-19 impacts in the Arctic and look for opportunities to create efficiencies in these processes in order to continue to execute our mandates that are so critical to the Arctic and those that depend upon its resources.

Future Opportunities

The U.S. Coast Guard exercises influence and leadership in the Arctic Council, primarily through active participation in its working groups and other subsidiary bodies. Each line of effort, listed in the U.S. Coast Guard's Arctic Strategic Outlook, depends upon "Partnership, Unity of Effort, and a Culture of Innovation to succeed."[13] Through its leadership in the Arctic Council, the U.S. Coast Guard is able to advance those lines of effort and creates great success through its engagements. As the service continues to "adapt and innovate", it will continue to play a major role in protecting our nation's interests in the Arctic, as it has done since 1867.[14]

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International Capacity Building for Improved Maritime Environmental Response

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History has shown that the exploration, extraction, production, and transportation of petroleum products can lead to maritime spills. Maritime pollution incidents can have devastating effects on a nation's environment, economy, and stability. Over the past decade, in support of the Department of State and other federal agencies, the Coast Guard's Office of Marine Environmental Response Policy's (MER) International and Domestic Preparedness Division undertook numerous international environmental protection capacity-building missions. These missions included the development of bilateral coordination plans, the improvement of national contingency plans, and provision of general assistance in oil spill response planning, mitigation, and recovery. These efforts all focused on the advancement of a robust, efficient, and well-regulated petroleum industry.

The Coast Guard's Office of Marine Environmental Response Policy's International and Domestic Preparedness Division strives to build international environmental protection capacity through the development of bilateral coordination plans and the improvement of national contingency plans. Coast Guard graphic

In addition to the environmental benefits, the safe, proficient, and well-regulated expansion of a foreign nation's offshore petroleum industry reduces opportunities for corruption, improves prospects for further economic growth, helps reduce conflict, and makes governments more accountable to its citizens. When natural resources are managed through approved international practices and good corporate governance, the revenue produced from gas and oil development contributes to economic growth, creates jobs, fosters investments in infrastructure, health, education, and other high-impact sectors, and accrues appropriate national savings. On the contrary, mismanagement and corruption undermine democracy and accountability, deter investment and economic growth, contribute to conflict, reduce the impact of aid, and can increase the costs of fuel, energy, and other critical commodities.

One of the president's priorities for promoting American prosperity is ensuring energy security by working "with allies and partners to protect global energy infrastructure" and supporting "diversification of energy sources, supplies, and routes at home and abroad."[1] MER engagements with foreign governments directly supports the president's National Security Strategy. Furthermore, these activities advance the Commandant of the Coast Guard's strategic priority of safeguarding commerce, specifically, the preservation of the marine environment as a "leader and participant in international … partnerships that promote marine environmental protection and preservation."[2]

U.S.-Cuba Bilateral Coordination Plan Development

In order to enhance maritime oil spill preparedness in response to Cuba's offshore development potential, and to normalize relations between the U.S. and Cuba, the State Department led the drafting of the non-binding *Joint Statement between the United States of America and the Republic of Cuba on Cooperation on Environmental Protection*. Both countries signed the statement on November 23, 2015, paving the way for bilateral planning for marine environmental preparedness and response between the two nations.

On January 9, 2017, both countries signed the *Cooperation Agreement between the United States of America and the Republic of Cuba on Preparedness for and Response to Pollution Caused by Spills of Hydrocarbons and Other Noxious and Potentially Hazardous Substances in the Gulf of Mexico and the Straits of Florida*. This agreement directed both nations to develop a bilateral coordination plan for a response to oil and hazardous substance spills that could affect the waters of the other country. It also identified the Coast Guard as the lead U.S. agency and the Ministry of Transportation and National Civil Defense Headquarters as the lead Cuban agencies.

The Unites States completed the first draft of the *Bilateral Coordination Plan between the United States of America and the Republic of Cuba Regarding Marine or Coastal Environmental Pollution Events caused by Spills of Hydrocarbons and other Noxious and Potentially Hazardous Substances* (CUBUS Plan) in February 2018. As head of delegation for the United States, the Coast Guard led negotiations between the nations over the next 22 months. The National Security Council and State Department reviewed and approved the CUBUS Plan in July 2019. The Coast Guard's Deputy Commandant for Operations signed it in December 2019 and Cuba's Director General of the Ministry of Transportation and the chief of the National Staff of the Civil Defense of Cuba signed in March 2020.

While not legally binding, the CUBUS Plan is an active bilateral plan and shall be applied in accordance with the national laws of the Republic of Cuba and the United States. The purpose of the plan is to establish a coordinated system and operational guidelines for national preparedness, planning, mitigation, and response to pollution events that may affect the coastal waters/marine environment of Cuba and/or the United States. It designates national authorities and a joint planning team, which consists of representatives from specified agencies in Cuba and the States while allowing for information exchanges, both operational and scientific, during the planning, preparedness, and response phases. It also calls for the coordinating authorities to promote training opportunities and plan seminar, tabletop, functional, and full-scale exercises on a four-year cycle. Finally, the CUBUS Plan outlines activation, response, operational, and administrative procedures for executing an oil spill response.

The inaugural CUBUS meeting, likely an executive seminar, was scheduled for fall 2020, but due to the COVID-19 pandemic, planning for this engagement is currently on hold with the first meeting now likely to take place in summer 2021, if not later. The goal of this inaugural meeting will be to familiarize Cuban and U.S. agency principals with the CUBUS Plan and to begin planning the first tabletop exercise.

Guyana National Contingency Plan Development

Despite its proximity to the vast oil reserves of Venezuela, the Caribbean and the rest of South America were never large oil producing regions. The perception that there was limited oil in these regions began to change when Cuban officials first detected potential offshore oil wells in 2004.[3] This discovery never amounted to any oil production, but it did show that the Caribbean and South America potentially had more oil than originally believed. Additional offshore oil reservoirs were sporadically located in the following 10 years, but the general notion that the Caribbean and South America were void of major oil reservoirs did not change until 2015 when ExxonMobil's joint venture with the Hess Corporation and Statoil, a Norwegian oil company, located massive oil reservoirs off the coast of Guyana. At the time, this discovery was the world's largest offshore finding in years.[4]

In September 2017, representatives from MER and the Environmental Division of the Office of Maritime Law travelled to Guyana to understand the country's framework, responsibilities, and functions during a response to an oil spill. This mission was in support of the State Department's Bureau of Energy Resources' Energy Governance and Capacity Initiative (EGCI).[5] EGCI provides a wide range of technical and capacity-building assistance to the host governments of select countries that are on the verge of becoming the world's next generation of oil and gas producers. The initiative's core objective is to help these countries establish the capacity to manage their oil and gas sector resources responsibly. Recognizing the Coast Guard's unique role and expertise in maritime oil spill planning, preparedness, and response, the Coast Guard and the State Department entered into a multi-year, interagency agreement to support EGCI.

The Coast Guard team directly interacted with key Guyanese government officials, to include ministers and heads of agencies. In comparison to the U.S. model, it was evident the legislative and regulatory structure at the time, from oil production to spill response, was

inadequate to address the unique facets of the offshore industry. Throughout the meetings there was consensus that a national contingency plan, specific to oil spills, was important and necessary. The Coast Guard members provided the Guyanese government with guidance and recommendations on how best to begin development of a national contingency plan, following the International Maritime Organization (IMO) guidelines.

In January 2019, Guyana's Foreign Minister, Carl Greenidge, met with U.S. Deputy Secretary of State John Sullivan, to discuss the U.S.-Guyana partnership. Oil spill planning, preparedness, prevention, and response assistance was one of the foreign minister's top requests.[6] That same month, the State Department's Bureau of Western Hemisphere Affairs, Office of Caribbean Affairs received a formal request from Guyana's director of the Department of Energy requesting U.S. presence at a March 2019 workshop on contingency planning. Hosted by the IMO Regional Activities Center (RAC) Curaçao, the workshop's focus was oil spill contingency planning, targeting Guyana's federal, regional, tribal, non-governmental, and industry stakeholders.

The presence of Coast Guard personnel highlighted the United States' commitment to long-term capacity building in Guyana. In his opening remarks, Dr. Mark Bynoe, director of Guyana's Department of Energy, noted the importance of the efficient and effective management of the oil and gas sector, including establishing protocols for equipment inspection, training, and a national contingency plan.[7] In addition to the workshop, the Coast Guard representative conducted a one-on-one meeting with the director of Guyana's Civil Defence Commission to identify the government's long-term needs.

At the time of the workshop, a collaborative group of Guyanese agencies had revised Guyana's National Oil Spill Contingency Plan (NOSCP), a revision to the first draft created after the September 2017 meeting. The updated plan established a clear chain of command and delineated agency responsibilities in the event of a large-scale oil spill. In October 2019, the Coast Guard remotely conducted a review of Guyana's final draft NOSCP and provided final recommendations for improvement. Guyana intends to finalize, sign, and publish their NOSCP in the coming months.

U.S.-Mexico Energy Business Council

The U.S.-Mexico Energy Business Council is a binational business council composed of 10 U.S. and 10 Mexican energy companies tasked with providing actionable recommendations to the two governments on ways to enhance energy security and two-way trade in energy-related goods and services. The undersecretary of Commerce for International Trade and the assistant secretary of Energy for International Affairs from the United States, and the undersecretary of Foreign Trade and general director of Investor Relations and Promotion at Mexico's Ministries of Economy and Energy, co-chair the council.[8] It meets twice a year, once in Mexico and once in the United States, with coordination between the private sector and governments occurring regularly in the interim.

In June 2018, the International Trade Administration (ITA) contacted the Coast Guard for input on U.S.-Mexico relations during large oil spills, as one of the council's top concerns was the movement of oil spill response equipment across the border in the event of a large-scale spill. Unbeknownst to the ITA, the Coast Guard maintains the U.S.-Mexico Joint Contingency Plan (MEXUS Plan) which helps facilitate communications and oil spill operations between the governments in the event of a cross-border oil spill. John Anderson, the ITA's deputy assistant secretary for the Western Hemisphere, requested that the Coast Guard provide a detailed presentation on the MEXUS Plan and the transboundary movement of oil spill equipment at the council meeting in Mexico City, in November 2018. The presentation sparked fruitful discussion from both industry and government personnel of both countries. The Department of Energy and the International Trade Administration are two agencies that the Coast Guard would rarely, if ever, engage with, but, through this unique relationship, have furthered interagency and international awareness of joint contingency plans.

Development of Argentina's Offshore Regulatory Regime

Under the EGCI and in cooperation with the Department of Interior's International Technical Assistance Program, the Coast Guard provided support to the government of Argentina in advance of offshore petroleum expansion. The government recently conducted a round of bids where some of the world's largest oil companies acquired the rights to conduct exploratory drilling in specific sections off the shores of Argentina.[9] Given that the start-up of an offshore production operation may take more than 10 years, Argentina's focus is on establishing a strong regulatory regime promoting a culture of safety, proper management of resources, and the protection of the marine environment.

The Coast Guard conducted two workshops for Argentine officials, one in Buenos Aires, and one in New Orleans. The first workshop provided an overview of the U.S. offshore regulatory activities and interagency coordination with the Department of the Interior's Bureau of Safety Environmental Enforcement (BSEE) and the Department of Commerce's Commercial Law Development Program. In August 2018, when the first workshop was held in Buenos Aires, Argentina had

yet to designate or create an agency akin to BSEE, therefore it was an ideal opportunity to begin to shape their future offshore regulatory agencies.

The joint U.S. team outlined the numerous memorandums of understanding and memorandums of agreement that exist between the Coast Guard and BSEE, which illustrate the close collaboration that exists between our two agencies. The joint U.S. team stressed that this relationship constantly evolves as the offshore industry changes. The U.S. team also outlined the numerous federal agencies—the Department of Transportation, Environmental Protection Agency, and Federal Aviation Administration—that work on Outer Continental Shelf regulations and policy.

Four members from the Prefectura Naval Argentina (PNA) Coast Guard visited U.S. Coast Guard Station Venice, Louisiana in June 2009. The primary objective of the visit was to gain insight into the U.S. Coast Guard's best practices for implementation into their organization. The PNA members viewed the site of a previous oil spill and asked questions about Coast Guard cleanup procedures. Geographically, southeastern Louisiana is similar to Argentina. Coast Guard photo by Petty Officer Casey J. Ranel

The goal of the second workshop, held in New Orleans in May 2019, was to share the U.S. approach in the development of oil spill contingency plans, preparedness requirements, and the National Response System. The Coast Guard provided an overview of its roles and responsibilities concerning oil spill planning, preparedness, and response, as well as its joint contingency and bilateral coordination plans. Additionally, the Coast Guard Gulf Strike Team presented on the capabilities of the Coast Guard National Strike Force, which provided valuable insight into the level of technical competency required for the execution and management of an effective oil spill response. This engagement culminated in the Argentines observing an industry-led exercise where they were able to see first-hand the implementation of the Incident Command System to manage a large-scale spill.

RAC/REMPEITC-Caribe Efforts

The Regional Marine Pollution Emergency, Information, and Training Centre–Caribe (REMPEITC) contributes to the sustainability of the marine environment in the Wider Caribbean Region (WCR) by assisting countries in the implementation of international conventions created to reduce pollution from ships. REMPEITC is one of four regional activity centers of the Caribbean Environment Programme. Established in 1995, the government of Curaçao hosts RAC/REMPEITC-Caribe. Subject matter experts temporarily assigned by states signatory to the 1983 Cartagena Convention staff the event. The Coast Guard has assigned an officer to the RAC as an expert consultant since REMPEITC's conception.

Since 2010, REMPEITC has facilitated more than 175 activities throughout the WCR. These activities focused on the improvement of Caribbean island response capacity, the establishment of a national response framework for each country, and the development of mutual aid agreements to facilitate a regional oil spill response. REMPEITC also developed the Caribbean Island Oil Pollution Response and Cooperation (OPRC) Plan, which focuses on the planning for, and response to, a regional oil spill. The OPRC Plan, when used in conjunction with existing IMO guidelines, helps form an interlocking system of scalable plans.

Recently, with the increase in oil exploration in the region, REMPEITC shifted focus to countries with a high potential for future production who do not have sufficient existing response systems or legislation. Accordingly, REMPEITC conducted national contingency planning workshops in Guyana in March 2019, in Suriname in October 2019, and a transboundary oil spill exercise with both countries in August 2019. In addition to these in-person workshops, REMPEITC also provided remote assistance on risk modeling, national contingency plan reviews, and the development of geographic response strategies and other tactical plans.

In addition to national level engagements, REMPEITC has also conducted several regional activities. These

Representatives from the Coast Guard and the Department of Interior meet at a joint-agency workshop on offshore safety held in Buenos Aires, Argentina, in August 2018. Coast Guard photo by CDR Jeff Platt

included a workshop on the Convention on Oil Pollution Preparedness, Response, and Co-operation in St. Kitts in March 2019, and a workshop on oil spill exercise and exercise design in Belize two months later. These regional workshops are especially important in the WCR where very few individual countries have the resources and/or capabilities to respond to a large, or even medium sized, oil spill. Additionally, due to the close proximity of Caribbean islands, even a small spill would affect multiple countries, as shown by a southern Caribbean spill, which originated in Trinidad and Tobago, but affected four neighboring countries – Venezuela, Aruba, Curaçao, and Bonaire.

REMPEITC is also in the process of developing a long-term regional capacity-building plan. This regional plan will include a schedule of national and regional workshops, as well as initiatives to establish a regional reporting mechanism, and a regional GIS platform for risk assessment, contingency planning, and operational response. Given the resource constraints and political limitations in the WCR, this interlocking plan for national and regional capacity building is essential to ensure that the region is prepared to meet future risks and ensure a safe and prosperous future for energy development.

Summary

The Coast Guard is in a unique position to assist developing nations in the development of the offshore energy sector and protection of the marine environment. As a supporting, leading, and collaborative federal agency, the service is helping to ensure the safe and responsible exploration, production, and transportation of petroleum throughout the waters of the Caribbean and South America. Oil spill planning, preparedness, and response are not static actions. A government must constantly exercise, revise its plans, and embrace technological advances in order to best protect its citizens and the environment. By sharing lessons learned and best practices from our own experiences, the Coast Guard is ensuring a prosperous future for those nations that seek U.S. assistance.

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LCDR Matt Richards is the chief of Emergency Management and Force Readiness at Coast Guard Sector Anchorage. He was previously an expert consultant at the International Maritime Organization's Regional Activity Center in Curaçao where he was responsible for capacity building activities for 33 Caribbean nations and territories. He focused on the prevention and response to pollution from ships and the enforcement of international environmental standards.

LT Jimmy Knudsen is the Southern Portfolio manager in the Office of Marine Environmental Response Policy's International and Domestic Preparedness Division at Coast Guard Headquarters. In this role, he leads all Coast Guard marine environmental response engagements and initiatives in the Caribbean and Central and South America. Prior to this assignment, he served in the Emergency Management and Force Readiness Division at Coast Guard Sector Lower Mississippi River.

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The 2019 Flood

A case study in maritime governance

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U.S. Coast Guard

The United States is a nation shaped by its inland and coastal geography. Deepwater access to Atlantic and Pacific seaways, including a direct connection to the country's agricultural heartland, has had dramatic influence on the national economy, not to mention myriad domestic and international policies.

From its Native American roots through its colonial infancy to its modern superpower status, the nation's history is overlaid by a connection to the sea. Additionally, the importance of capable ports and waterways was evident from our earliest days. "A few armed vessels, judiciously stationed at the entrances of our ports, might at a small expense be made useful sentinels of the laws," Alexander Hamilton noted in Federalist Paper No. 12, written in 1787. The Mississippi River is a tried and true veteran that has borne witness to many defining experiences including conflict, territorial expansion, transcontinental transportation, and the growth and redistribution of major metropolitan centers. The 1803 Louisiana Purchase, with the mighty Mississippi at its heart, equated to a one-time expenditure of roughly $18 per square mile. Current, conservative estimates indicate that the Mississippi River generates approximately $496 billion per year.[1] So, in a single year, the nation's return on investment for each square mile of the Louisiana Purchase is more than $599,000. Extrapolated over 216 years, the economic benefit of the heartland and its riverine connection to the coast is … priceless.

As a veteran, the river has also been tested, from the Battle of New Orleans in 1815 to the flooding in 2019—the

A Case Study in Shared Governance

During the spring and summer of 2019, the portions of the United States that make up the watersheds that supply the Mississippi, Illinois, and Missouri Rivers experienced a flood of record proportions in terms of magnitude and duration. The unique scale of this flood tested maritime governance at all levels. This brief case study was originally published in *The Waterways Journal* and serves to highlight some the operational successes of shared governance on the inland river system. Moreover, it serves as a reminder of the countless amazing professionals—federal, state, local, and maritime industry—that work toward the shared objectives of safety, security, efficiency, and environmental quality of our critical maritime transportation system.

The Marine Transportation System (MTS) is part of maritime governance and is a multi-modal network of ports, rivers, channels, and seaways that support seaborne commerce. The MTS is critically important to the economic prosperity and security of the nation. Ed Metz | Adobe Stock

Located about 12 miles west of New Orleans, the Bonnet Carré Spillway is a flood control operation that allows waters from the Mississippi River to flow into Lake Pontchartrain. In 2019, for the first time in history, the spillway had to be operated twice in one year. U.S. Army Corps of Engineers photo

longest flood fight in U.S. history. Disruptions to our Maritime Transportation System (MTS), whether a result of war or natural disaster, have always had significant impact. The growth of global supply chains and interconnected trade have only added complexity. Despite the challenges of the 2019 high-water period—including more than 290 days above flood stage and damage that is only now coming into focus—the river, a lifeblood of our nation, added another survival story to its long history.

Shared Governance

On a daily basis, the women and men of the Coast Guard leverage unique authorities, jurisdiction, and operational capabilities to safeguard the efficient and economical movement of maritime commerce. The influence of the Coast Guard in, on, and around the maritime domain is arguably the most far-reaching of any government agency. Yet, successful maritime domain governance is not a solo sport. It requires the collaboration and active participation of myriad federal, state, and local agencies, as well as the maritime industry.

Across the Midwest and inland river system, shared governance of the nation's inland maritime domain was on full display during the unprecedented 2019 flood. Without the exceptional vigilance of the men and women of the U.S. Army Corps of Engineers working to keep the river dredged and ensuring the levee systems operated as designed, it would not have been possible.

For the purposes of this discussion, maritime governance refers to the management of the MTS, in this case the Mississippi River. Its goal is to provide for the efficient, safe, secure, and environmentally sound use of the system by a complex network of lawful users. Given its interstate nature, governance of the inland river system is inherently complex, with multiple—sometimes competing—layers of concurrent and exclusive jurisdictions. River and navigation infrastructure, navigation rules, vessel safety requirements, search and rescue resources, and even local tax and fee processes are only some facets of MTS governance. Yet, none of these facets can be successful if approached as a go-it-alone endeavor.

Consequently, the concept of *shared* governance is of critical importance to success, both day-to-day and in response to contingencies. It is through shared governance that fully transparent communications, coupled with a flexible contingency response framework, can fully rise to current and future challenges.

Maritime governance is applied across the MTS. Nationally, the MTS is the multi-modal network of ports, rivers, channels, and seaways that support seaborne commerce. Comprised of 361 defined ports, 95,000 miles of shoreline, and 20,000 bridges all stitched together through 25,000 miles of navigable channel, the MTS is critically important to the nation's economic prosperity and security. Our concept of the MTS, and the need to effectively govern it, has matured over time, as has the Coast Guard's recognition of the need for partnership and a shared approach. Nothing should illustrate this more than the Coast Guard's commitment to maintaining the waterway by initiating the Waterways Commerce Cutter project, which seeks to recapitalize our aging fleet of aids to navigation tenders.

From its earliest inception, the use of the inland river system for commercial transportation included governance mechanisms. While perhaps rudimentary by today's standards, information on river conditions and hazards was relayed from river pilot to river pilot via riverside mailboxes where logs were updated by passing boats. That system's DNA can be found in today's digital Marine Safety Information network which transmits information via radio, internet, and even boat-to-boat, via modern automated identification system transceivers.

The Flood Of 2019

The flood of 2019 can be measured and counted in any number of ways, and this brief discussion is not meant to recount every aspect, yet some contextual scale and scope facilitates the discussion of shared governance. As noted earlier, the flood of 2019 was the longest on record as measured at many locations on the Mississippi River alone. Over the course of the flood, all six of the U.S. Army Corps of Engineers districts and three Coast Guard Captains of the Port were simultaneously engaged in flood fight and waterway management efforts. The Bonnet Carré Spillway near New Orleans was operated twice in one year—a historic first. Missouri's Port of St. Louis was also closed twice for a total of 51 days, setting another record. By nearly every measure the flood of 2019 set records, including all-time high water crests at numerous locations.

Shared governance, and a commitment to the mutual goals that underpin it, provided several keys to success. At the largest scale, effective communication was fundamental to continued function of the maritime transportation system. In this case, it was communications between the Coast Guard, the Army Corps of Engineers, and the maritime industry that most directly influenced realization of shared governance. The pre-existing, well-matured industry groups of the Mississippi River provided not only the mechanism for communications but also the many relationships that set the stage for positive, collaborative dialog, and consensus building. The success of the response to the flood relied on the robust nature of these committees.

Perhaps slightly different from other events, this flood's system-wide impact not only required *inter*-agency communications, but also a heightened level of *intra*-agency communications. Speaking for the Coast Guard alone, each Captain of the Port had to be keenly aware of challenges in adjacent zones in order to effectively manage the system as a whole.

Communications Framework

Successful, meaningful communications were only part of the equation. A framework for those communications set the mutual understanding necessary for shared governance. For the inland MTS, this framework is the Waterways Action Plan (WAP). This pre-established framework has been developed over many years and covers every portion of the main-stem inland river system. As a playbook, it sets both "operational responses" as well as "operational considerations." Generally, the responses are specific, time-tested waterway actions (e.g., harbor closures or daylight transit restrictions) triggered at specific gage readings. The true strengths of the WAP, however, are the outlined operational considerations. These considerations force rich conversation and compromise resulting in risk-based guidelines to meet the immediate contingency or circumstance.

As of January 14, 2020, the WAP for the Upper Mississippi River has been completed and published. Of note, and based on lessons learned from 2019, is the merging of legacy Ohio Valley and Upper Mississippi WAPs creating a single, unified WAP from mile marker 857.6 to mile marker 0.0 on the Upper Mississippi. Additionally, and a further testament to shared governance, industry and four Captains of the Port agreed to a z-drive specific horsepower-to-barge ratio that maintains a high safety margin and facilitates the implementation of advanced technology on the rivers, further supporting a safe, secure, and efficient marine transportation system.

Indeed, even in the short number of years since September 11, 2001, the advent of the Maritime Transportation Security Act, SAFEPORTS, the Marine Transportation System Recovery Unit, and Waterway Action Plans have all played roles in facilitating commerce and protecting life and property. Any significant disruption to the MTS, whether man-made or natural, has the potential to cause cascading and devastating impact to our domestic and global supply chains. It seems clear that shared governance supports an effective and highly resilient system. In the case of the Mississippi River, shared governance increased safety, minimized impact, and facilitated the quickest possible return to operations, thus protecting America's economy and national security.

Editor's note: *Originally published in* The Waterways Journal, *October 18, 2019.*

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Endnote:

1. Estimate taken from www.umrba.org/umr-econ-profile.pdf and www.lmrcc.org/programs/lower-mississippi-river-economic-profile/

Managing a Complex Exercise Program

Coast Guard exercise support team partners with maritime initiative

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Managing a bicoastal exercise program for the maritime forces of three countries is no easy task. So, when the North American Maritime Security Initiative's (NAMSI) Exercise Planning Team (EPT) needed support for planning and executing two interrelated exercises in one year, the Coast Guard contingent turned to Coast Guard Force Readiness Command's (FORCECOM) Exercise Support Teams (EST). The result was a robust NAMSI exercise program producing benefits beyond original expectations.

Coast Guard Exercise Support Teams

Coast Guard ESTs were originally established in 2006 and operated under the Coast Guard Office of Contingency Planning and Exercises. As a result of Coast Guard modernization and organizational changes, on August 16, 2009, Coast Guard ESTs became part of FORCECOM's Exercise Support Division. Since their creation, ESTs continue to provide Coast Guard field units with the most professional support and expertise in the design, development, execution, evaluation coordination, and after-action report development for all-threats and all-hazards contingency exercises. ESTs have supported both national and international exercises by assisting field units and improving their response organizations' overall preparedness. ESTs greatly minimize the overall exercise planning burden that typically falls on operational units' EPTs. ESTs develop all the needed exercise documents, facilitate exercise planning meetings, gather and analyze participant feedback forms, and lessons learned for the development of exercise after action-reports. "Coast Guard EST 3 has been essential to developing diverse and complex exercise scenarios, innovative exercise tools, gathering mechanisms for lessons learned and very complete and effective after action report development," said CDR Morga de Dios, a Mexican Naval Officer and key member of the NAMSI working group.

NAMSI's Background

NAMSI began as an outgrowth of the U.S. and Canada's Maritime Homeland Security/Maritime Homeland Defense War Game held in 2006. The intent of NAMSI is to develop and refine maritime operations, and to synchronize training and operational interoperability amongst deployed forces of the member nations. Its working group was established in 2008 with the signing of the original letter of intent between the Coast Guard, U.S. Northern Command, and the Mexican Navy. In 2011, Canada Command, now Canadian Joint Operations Command, became signatory to the letter making NAMSI a trilateral effort.

Since its inception, the NAMSI working group has identified numerous impediments to multinational operations and interoperability at the tactical and operational levels of command. As a result, the group developed guidance to overcome those impediments. The updated interoperability guidance now includes rapid translation cards to mitigate the language barrier between tactical forces and a standing NAMSI communications plan with protocols between respective operations centers. The interoperability guidance developed and validated by the working group was published in the NAMSI handbook, for which Coast Guard Atlantic Area serves as custodian, and is a required publication for maritime forces operating in the Pacific and Gulf of Mexico (GOMEX) areas of operations.

NAMSI's Exercise Program

In order to exercise interoperability among its member forces, the NAMSI exercise program began what became known as "Quick Draw" events. These fairly simple

Participating in a North American Security Initiative exercise, Coast Guard Cutters *Steadfast* and *Edisto*, Royal Canadian Navy vessels *Nanaimo* and *Whitehorse*, the Mexican Navy vessel *Revolución*, and two Mexican Navy fast patrol craft steam in formation in the Pacific Ocean off the coast of Mexico in February 2015. Coast Guard photo by Petty Officer 2nd Class Rob Simpson

engagements required little prior planning, took advantage of opportunities between assets that happened to be in close proximity, and mainly consisted of search and rescue scenarios or formation steaming events of limited complexity. The NAMSI working group soon collectively realized the need for a more formal methodology to increase the utility of its exercise program.

In 2012, the working group established its formal exercise program codified in the NAMSI handbook. Soon after, its exercise program started interrelated annual exercises called "NAMSI GOMEX," a full-scale exercise (FSE), and "NAMSI PACIFIC-EX," both executed in the same year. The NAMSI exercise program now has three primary objectives:

- familiarize and train personnel from member organizations in the NAMSI interoperability guidance
- discover potential impediments to interoperability in the various operation areas
- test the mitigation guidance being developed by the working group

A standing NAMSI EPT, consisting of representatives from the major NAMSI working group stakeholders, was established and tasked to translate the working group's guidance into exercise plans to meet the three primary program objectives.

Enter the Coast Guard Exercise Support Team

The NAMSI exercise program soon became a victim of its own success. Its two annual exercises became more complex, and the number of available exercise formats increased. The number of participating stakeholders also grew rapidly to include interagency stakeholders like Joint Interagency Task Force South, and U.S. Customs and Border Protection. The members of the NAMSI EPT, who only meet three times a year, soon realized the scope of work involved with managing, planning, and executing two trilateral exercises each year exceeded its capacity when added to its own regular national duties. As the Coast Guard leads the planning of the NAMSI exercises, exercise planners from Districts 7, 8, and 11 reached out to FORCECOM for exercise support assistance.

FORCECOM responded in 2018 by assigning EST 3, located in Alameda, California, to support NAMSI PACIFIC-EX and the GOMEX. The team arrived at the 2018 initial planning meeting ready to work and facilitated all the exercise planning meetings, helped draft all exercise objectives and scenarios, and assisted with all the planning logistics and efforts. It also took over the time- and labor-intensive tasks of developing all the exercise documents and manuals, as well as the collection of participant feedback forms, lessons learned, and recommendations to improve exercise planning and execution procedures.

Supporting NAMSI exercises was anything but business as usual for EST 3 as the 2018 exercise cycle turned out to be as much a learning experience as it was a matter of traditional support. "The 2018 NAMSI GOMEX

FSE in Tampico, Mexico, had a very dynamic, and at times, challenging vision of what the NAMSI Exercise Planning Team wanted from their exercises," EST 3 member, Drew Cheney, said. "We had a pretty steep learning curve that first year."

A member of the Mexican Navy slides tiles across a floor chart during an operations brief for all members participating in the North American Maritime Security Initiative exercise in Chiapas, Mexico, in February 2020. Coast Guard photo by Petty Officer 2nd Class Zackery Snow

Innovations Lead to Success

The partnership of the NAMSI EPT and Coast Guard EST 3 had to be innovative in its planning approach to meet the objectives of the NAMSI working group. First of all, NAMSI needed the two exercises, PACIFIC-EX and GOMEX to be linked and progressive in their respective formats. One exercise needed to support and provide input to the other. The lessons learned and recommendations for improvement collected during a functional exercise—formally referred to as command post exercises—on one coast, had to be turned around and incorporated into the other coast's FSE.

The objective to actually test developing interoperability guidance also required the NAMSI EPT and EST 3 to be innovative in their approach to choosing exercise formats. For example, the standard discussion-based format of a traditional tabletop exercise (TTX) didn't quite produce the desired product. So the team developed a type of "hybrid tabletop war game" format. This war game board format gave TTX participants a dynamic visual reference resulting in much greater interaction and examination of developing concepts. This dynamic exercise approach was also used very effectively by Mexican naval officers in the recent 2020 NAMSI PACIFIC-EX FSE in Chiapas, Mexico. Accordingly, commanding officers and other personnel who attended the exercise's pre-sail briefing lauded EST 3's team lead, emphasizing "The use of the war game board by Mexico's naval officers was brilliant and effective as they clearly showed all involved the expected movement of air and surface assets in the exercise."

"Since we observed how effective[ly] Mexican naval officers used the war game board concept in the

A Coast Guard Air Station Sacramento C27 aircrew and staff from District 11 are welcomed by the Mexican Navy upon arrival to Base Aeronaval Tapachula, Mexico, ahead of a three-day North American Maritime Security Initiative exercise in February 2020. Coast Guard photo by Petty Officer 2nd Class Zackery Snow

2018 NAMSI GOMEX FSE in Tampico, Mexico, we continue recommending its use in future NAMSI exercises and in TTXs EST 3 will support in the U.S.," said James Connors, an EST 3 member.

Results of the NAMSI-EST partnership were not long in coming. Soon, the 2019 exercise cycle produced results providing the NAMSI working group with valuable input leading to advances in real-world interoperability. The 2019 GOMEX concluded that the sheer magnitude of simultaneous mass maritime rescue operations (MRO) on both coasts is likely to overwhelm the responding on-scene decision process. Thus, the working group has initiated an effort to develop an on-scene coordinator check list to aid in prioritizing efforts in a multi-national response situation. Concerns for an on-scene response during a MRO, is also shared by the North Atlantic Coast Guard Forum leading to a collaboration between the two forums. The NAMSI working group hopes to include the resulting guidance in the International Maritime Search and Rescue Agreement.

Coast Guard Cutter *Alert* sails near Puerto Chiapas, Mexico, while participating in a three-day North American Maritime Security Initiative exercise in March 2020. Coast Guard photo

The 2019 and 2020 PACIFIC-EX lessons learned resulted in the development of a communications supplement to the NAMSI guidance handbook. The supplement will provide a single source for stakeholder maritime forces to access the NAMSI standing communications plan, rapid translation codes, and other important information needed in a multinational operation.

The NAMSI-EST partnership isn't resting on its laurels. The NAMSI working group's desire for increasingly complex exercises requires incorporating multi-incident, multimission scenarios to include not only maritime law enforcement and maritime interdiction operations, but humanitarian response and fisheries protection and enforcement. The recent 2020 PACIFIC-EX FSE in Chiapas included a medical evacuation exercise involving a Mexican helicopter landing three times on Coast Guard Cutter *Alert*'s flight deck. Many crew members on the *Alert* who observed the helicopter landing operation applauded the superb job by all involved.

Nothing Happens by Accident!

As a result of the success of NAMSI's exceptional exercise program, stakeholder maritime forces are now engaged in coincidental, coordinated, or cooperative operations in the North American Pacific Ocean and the Gulf of Mexico. They are also experiencing increased mission successes in operations from marine law enforcement and maritime interdiction operations to search and rescue missions. Successful interceptions and prosecutions for illicit transit of drugs, arms, and people, as well as lives being saved, are occurring daily. Interest in and the export of NAMSI interoperability guidance to other partner nations like Belize, Guatemala, and Colombia is occurring and making maritime safety and security in the region a reality. These successes are owed in part to the efforts of the NAMSI and Coast Guard EST partnership. *SEMPER PARATUS*!

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Mr. Joe Moeglin is a civilian on the staff of the commander, Coast Guard Atlantic Area. He serves as an international engagement planner and detached duty external personnel program manager. He joined the staff after his retirement as a Navy surface warfare commander in 2011. He served on various surface ships, as well as Navy section chief, U.S. Embassy Dominican Republic, NATO doctrine officer for Navy Warfare Development Command, and homeland defense planner, U.S. Fleet Forces.

Innovation for a New Future

Teamwork and Determination

Mitigating the threat of pollution from the historic wreck of the *Coimbra*

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At the start of World War II, the British-flagged vessel M/T *Coimbra* departed New York City with an estimated 35,000 barrels, or 1.47 million gallons, of lubricating oil on board. Coast Guard boarding and inspection records show there was also a cache of defensive weapons and ammunition on board the ship, along with a crew of 46 crew members of varying nationalities. In the early morning of January 15, 1942, the day after setting sail, German U-boat *123* torpedoed *Coimbra*'s starboard side causing the 422-foot tanker to sink. News reports indicated a large oil spill was visible in the aftermath. The vessel came to rest on the Atlantic Ocean seafloor in 180 feet of water approximately 27 nautical miles off the South Shore of Long Island, New York. Thirty-six souls perished, including the captain of the ship.

A schematic of the ship, *Coimbra*, clearly outlines the three large sections remaining after its sinking. Coast Guard graphic

The NOAA RULET Program

In 2010, Congress appropriated $1 million to identify the wrecks with the most potential to pollute U.S. waters. The subsequent Remediation of Underwater Legacy Environmental Threats (RULET) project yielded the 2013 National Oceanic and Atmospheric Administration

(NOAA) report, *Risk Assessment for Potentially Polluting Wrecks in the U.S.*

Through an evaluation of more than 20,000 wrecks in NOAA's Resources and Underwater Threats Database, 87 wrecks posing a potential pollution threat were identified based on the following criterion:

- Vessel casualty information and how the site formation processes have worked on this particular vessel
- Ecological resources at risk
- Socio-economic resources at risk
- Other complicating factors (war graves, other hazardous cargo, etc.)

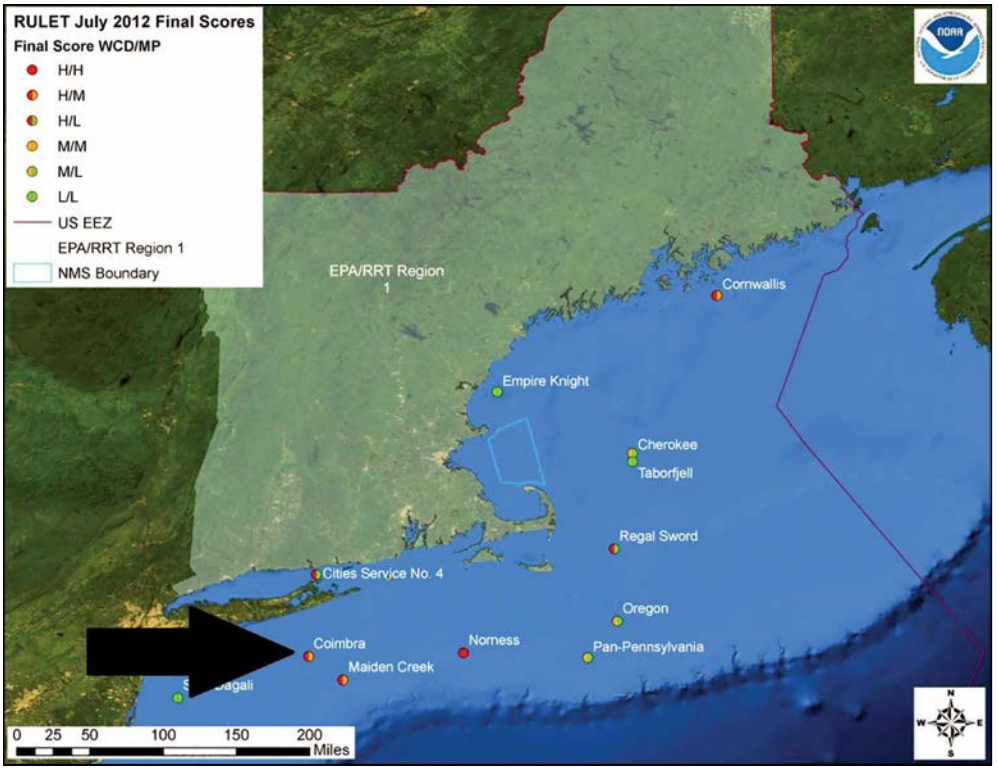
These risk factors were then further evaluated using a numerical scale applied to three subcategories including impacts to the water column, water surface, and shoreline. As a result, 36 wrecks were identified as high priority worst case discharge risks, and six are identified as high priority average most probable discharge risks. The *Coimbra*, designated as one of the 36 high priority risks, is also designated as a medium priority most probable discharge risk. As a result of this assessment, NOAA concluded its report with recommendations to the Coast Guard. These recommendations included further assessing the risk by determining the vessel's condition, the amount of oil on board, and the feasibility of oil removal action. Additionally, NOAA recommended actively monitoring the wreck for releases, investigating it as a possible source of the mystery spills reported in the area, and conducting outreach efforts with stakeholders.

It was also the first shipwreck from the RULET list addressed by the Coast Guard. With support from the National Pollution Funds Center (NPFC), and money from the Oil Spill Liability Trust Fund (OSLTF) for emergency response, the Coast Guard eliminated the threat that *Coimbra* posed to the marine environment.

Persistence: Assessing the Risk and Building the Case

In 1967, Coast Guard District 3, with assistance from the Navy's supervisor of salvage (SUPSALV), contracted a commercial salvager and conducted a 23-day, 41-dive underwater assessment. From the CGC *Westwind*, four World War II-era wrecks off the coasts of New York and New Jersey were assessed at the direction of President Johnson. The resulting *Sunken Tanker Project Report* included one of the first assessments of the *Coimbra*, which documented "intermittent oil seepage was observed on the surface of the water but its source could not be located."

On October 19, 2009, following years of recreational divers reporting increasing oil at the *Coimbra* site, and growing interest in determining the true risk, a Coast Guard HU-25 Falcon photographed a light sheen in the area of the *Coimbra*'s charted wreck location. The sheen was approximately 10 yards wide and 600 yards long, but an on-site surface investigation by Long Island's Marine Safety Detachment (MSD) Coram personnel on board a Coast Guard Station Shinnecock 47-foot motor-lifeboat, could not successfully locate it. Coast Guard leadership next secured NOAA's assistance to revisit the site and conduct a high-resolution sonar survey of the wreck. The results of this November 2009 expedition provided the first full imagery of the wreck site and confirmed the ship was resting in three large sections with the hull and superstructure largely intact. While the NOAA survey supported the likelihood that tanks containing large volumes of oil might remain, surface oil was not detected at the site. Thus, it would still require a major undertaking



The National Oceanic and Atmospheric Administration's Remediation of Underwater Legacy Environmental Threats project found the *Coimbra* to have a high score of worst case discharge and a medium score of most probable discharge. Graphic courtesy of the National Oceanic and Atmospheric Administration

to safely conduct a comprehensive survey of the wreck in order to determine what, if any, pollution threat existed.

On July 12, 2016, 74 years after the *Coimbra* came to rest on the ocean floor, MSD Coram received notification from the National Response Center (NRC) that NOAA satellite imagery had identified an oil sheen in the vicinity of the *Coimbra* wreckage. The satellite report was shared with MSD Coram, Sector Long Island Sound (SLIS), the Environmental Protection Agency, the New York State Department of Environmental Conservation (NY-DEC), Coast Guard District 1 Response Advisory Team (D1 DRAT), and the senior NOAA scientific support coordinator. These experts once again reinvigorated efforts to attain a comprehensive assessment of the potentially polluting shipwreck. MSD Coram's marine science technicians (MSTs) championed the issue and ensured senior staff up the chain of command was kept well informed. From July 2016 to November 2016, MSD Coram received 15 additional NRC reports in the vicinity of the *Coimbra* from NOAA satellite imagery and overflights conducted by Coast Guard Air Station Cape Cod. After an initial evaluation, the decision was made to use the OSLTF to gain more information on the wreckage and possibly mitigate any future impacts to the environment. On November 8, 2016, personnel from MSD Coram boarded the National Response Corporation's response vessel *Guardian* in New York City, and transited to the wreckage site. With a disagreeable North Atlantic sea state, again the oil sheen could not be located.

Fortunately, the determination of those driven to protect the marine environment did not yield, and planning efforts for the next attempt began right away. This time, MSD Coram and SLIS coordinated with the Navy SUPSALV to use the *Coimbra* site as a training location for the Navy's Mobile Dive and Salvage Team while obtaining the critical information needed about the true nature of the wreck's status as a major or minor environmental threat. From June 8 to June 10, 2017, personnel from MSD Coram, SLIS, D1, NY-DEC, NOAA and the Navy ventured back to the *Coimbra* site. The persistent efforts paid off and five key objectives were successfully accomplished. The team:

- confirmed the wreck was actively discharging lube oil into the Atlantic Ocean
- verified the location of all sections of the wreck
- collected accurate water depth (173–177 feet) and temperature (49–51 degrees Fahrenheit) readings
- retrieved steel samples of the hull to provide for analysis back at the U.S. Coast Guard Academy
- obtained official lube oil samples from the surface of the wreck for analysis

In June 2018, with the confirmation of some degree of oil at the site, the project transitioned to SLIS's Incident Management Division (IMD). By this time, more than 25 reports of sheens and slicks were documented by satellite imagery in the vicinity of the wreck. Technical experts and key partners were assembled into a *Coimbra* Task Force. In addition to staff from SLIS and MSD Coram, the task force included representatives from NY-DEC, D1 DRAT, Coast Guard Atlantic Strike Team, Navy SUPSALV, Coast Guard Office of Environmental Management, Coast Guard Salvage Engineering Response Team, the Coast Guard Academy, NPFC, and NOAA. With critical support from NPFC and the Coast Guard Shore Infrastructure Logistics Command, an evaluation panel was established, and Resolve Marine Group hired as the salvage contractor to conduct an underwater assessment of the wreck. The initial scope of work called for the contractor to:

- conduct a survey of the *Coimbra* that would allow for the determination of the potential for a substantial threat of a larger oil discharge
- capture data to establish a baseline condition to inform potential future response decisions
- construct a digital model of the wreck
- ensure that safety of human life remained the highest priority for all operations

Ultimately, after many years of spill reports and

Petty Officer 3rd Class Mark Paquette collects samples of oil removed from the *Coimbra*. Coast Guard photo by CDR Jesse Diaz

satellite imagery showing oil sheens, the commanding officer of SLIS, authorized use of the OSLTF to assess, and eliminate if present, any immediate threat to the environment from oil remaining inside the submerged tanks of the *Coimbra*.

Inclusive Leadership

From late spring into summer 2019, members from SLIS, along with other government and industry stakeholders, worked in a unified command (UC) to evaluate the wreckage of the sunken WWII-era tankship *Coimbra* and further analyze the threat of a potential large-scale discharge of oily product. If substantiated, the team would have to develop a sound tactical approach, and agree on a series of priorities, processes, and protocols to guide the full scope of operations. In this modern era of pollution response, some experts had previously questioned whether response actions could cause equal, if not more damage to the local ecology than the introduction of the pollution itself. Could taking no action be the less intrusive and better solution than potentially agitating the vessel which had rested in place for more than 70 years? Was the "juice worth the squeeze" as the previous 1967 assessment suggested there may only be minimal product aboard based upon the science methodology and technology used at the time?

The UC initially accepted that much was unknown regarding the source of ongoing reports of sheening, but proper analysis might better influence any further consideration to remove product from *Coimbra* if it existed. The team understood what was at risk—functioning waterways and the livelihood of many on the south shore and back bays of Long Island. A restricted or polluted marine transportation system translates to millions of dollars lost annually in commerce for coastal residents and businesses. Also, the command felt an obligation to understand the cause of the sheens as it could impact marine mammals and migratory birds in the area. An option of calling for "no action" without close examination of the short- and long-term consequences couldn't be taken lightly.

Forming an effective team and cultivating an atmosphere of respect remains an incident commander or UC's best tool. Representatives from SLIS and NY-DEC regularly engage to manage myriad response cases along Long Island. *Coimbra* presented the challenge of leveraging those existing relationships and developing new partnerships with agencies and community leaders, as the level of complexity was much greater than routine mystery spills or sunken recreational vessels. As the federal on-scene coordinator, the primary measure of success was bringing the right people to the table to ensure their concerns were heard and considered. This operation required a strong, yet humble team, and each participating agency needed to feel directly connected to the positive outcome. Egos were checked at the door, and this open approach paid huge dividends in building trust, crafting a way forward, and galvanizing a consistent decision-making process. Every positive gain, and each seamless decision point came out of the collective dedication to harboring transparent relationships with fellow agencies.

Having engaged in two years of operational discussion prior to the first mobilization of response crews, the UC component paved the way ahead on guiding a safe operation rife with unknown challenges, limitations, and uncertainty. There was always a high degree of confidence, reaching informed decisions in harmony with all concerns. This standard was carried throughout all interactions where representatives from all participating entities took opportunities to offer their expertise, critique the planning cycle, and review any public outreach efforts for clarity. These members, and those who would become on site supervisors and advisory specialists during response operations, knew the UC's expectations for managing a safe and successful operation, and they mirrored the collaborative approach in sharing information and conducting inclusive situational briefings. The components involved with surveying *Coimbra*—dive teams, hyperbaric chambers, remotely operated vehicle operators, shipboard navigation, and deck management throughout each phase of the operation, from exploration to demobilization—required leaders working in harmony to bring out the very best in each team member.

Through selfless commitment to the UC response goals and the team's success, the response effort removed close to 500,000 gallons of oily product from the environment, nearly all the oil associated with the *Coimbra* wreck. There were no injuries, or impacts to wildlife, and risks to the south shore of Long Island, the pristine gateway to the Hamptons and Fishers Island, were vastly reduced. Prior to commencing operations, the crew observed a moment of silence to honor the memory of the mariners who perished in the sinking of *Coimbra*. At the conclusion of operations, members from the various agencies came forward and offered their respects to the fallen as part of a closing vigil. The mood was solemn, yet upbeat, and personnel were proud as they knew their innovative work and the final results had elevated the bar for response operations. Chaplain John Sears summarized the event best in his remarks, noting the cooperation amongst the group greatly honored the memory of those lost in the disaster. The operation and outcomes proved to be worthy of the effort. Recognizing the need to employ advanced technology made embracing a modern approach to teams a necessity. The takeaway: "Recognize the team's talent, empower individuals to confidently provide input, and be bold enough to share

the limelight." The results can be staggering.

Adaptable Teamwork, On Scene and Behind the Scenes

The *Coimbra* response was not a singular effort, but rather a collaboration of efforts from nine Coast Guard units and offices, and multiple federal and state partner agencies, all working in conjunction with industry experts to accomplish a common goal. Resolve Marine Group's project manager Aaron Jozsef directed the on-site commercial contractors. With a daily on-scene crew size of 55 crew members from Resolve, Bordelon Marine, Morrison Energy, ROVOP®, SEARCH Archeology, SLIS, the NSF, and many others, site safety and constant communication were imperative. Bringing real-life and field-proven expertise, NSF members were ideally suited for the contractor oversight and site safety coordinator roles. The uniqueness, scope, and technical sophistication of the project, however, was also an incredible training opportunity not to be wasted. Exposing and integrating as many personnel as possible into the response paid great dividends in growing and maturing the expertise of current and future Coast Guard junior officers, petty officers, and chiefs. There was also a great opportunity to grow and strengthen stakeholder relations while improving contingency plans and technical response capabilities.

Flexibility was key to the success of this response from the start. Though years of trial and error helped identify the appropriate weather window, and allowed for testing of, and improvement on, a robust incident action plan, there were still monumental challenges ahead. After years of preparation, a five-phased mission plan was created to:

Mobilize: The dynamic positioning vessel, *Shelia Bordelon*, was to be launched from the Gulf Coast and sailed to the wreck site. The blended government and industry response team would embark, and test response equipment. A memorial service would be conducted a prior to the start of operations to honor the 36 *Coimbra* crew members that perished

Assess: The *Coimbra* wreck would be fully scanned and an intrusive assessment conducted to identify oil threats within the tanker. Oil and metal samples would be taken and the team would prepare the site for removal operations as applicable.

Remove: Petroleum products would be pumped off and properly disposed of at a regulated facility.

Stabilize: The site would be secured in accordance with agreed upon clean-up endpoints. A second memorial service would be conducted prior to conclusion of operations.

Demobilize: The crew and equipment would be removed from the *Shelia Bordelon* and returned to homeport. The ship would be decontaminated, response costs properly accounted for, and a final and accurate cost-documentation package delivered to the NPFC.

With advice from a former NSF member, the team incorporated plans to remain on scene and be ready for immediate oil removal operations should the assessment determine the presence of oil and identify a significant environmental threat.

Operations finally got underway with a planned 30-day at-sea deployment in April 2019. The offshore supply vessel *Shelia Bordelon* mobilized from Louisiana and transited to Fire Island, New York, where responders and contractors boarded the ship and tested equipment prior to commencing work at the site. Once equipment tested satisfactorily, remotely operated vehicles (ROV) and mixed-gas diver assessments began. In the very first days of the assessment phase, the team identified leaking rivets on the *Coimbra*'s hull, and soon after confirmed the presence of oil within the torpedoed tanker was vastly greater than had been previously estimated.

With experienced professionals from the Coast Guard and industry at-sea over the wreck site, the immense mission support and administrative aspect of the project was managed ashore at the SLIS MST bullpen in New Haven, Connecticut, under the wonderful leadership of the federal on-scene coordinator representative (FOSCR). As *Coimbra* was 26 miles offshore of Long Island, New York, radio communications from the *Shelia Bordelon* to shore were unreliable. Real-time information was relayed

Divers securely drill into the oil tanks of British-flagged tanker *Coimbra*, May 8, 2019. The tanker was torpedoed by a German U-boat during World War II. Coast Guard photo

Coast Guard and response crew members observe a moment of silence for those who perished aboard the *Coimbra* crew.. Coast Guard photo by CDR Jesse Diaz

through shipboard satellite internet, using smartphone communication applications to relay timely operational updates and photographic imagery back to the UCs. Close coordination between Resolve Marine Group and the Coast Guard led to an efficient cost documentation process for the duration of the project that ensured financial obligations were met and ceilings for the project were fiscally managed. Collecting the information and daily costs ashore allowed the greatest information flow and transparency through all available means without struggling with the limited internet connectivity aboard the *Shelia Bordelon*. This setup also allowed SLIS staff the greatest flexibility in managing *Coimbra* case work while maintaining all other primary duties and responsibilities.

As the scale of the project increased, so did the logistics of managing a lengthy project through the Coast Guard's busiest season, kicking off with Memorial Day and going through the Fourth of July. The response proceeded through the transfer season where over a third of the key Coast Guard members involved transferred to new permanent duty stations. It became a balancing act between using members from all three teams of the NSF, MSD Coram, and SLIS, both active duty and Reserve. The involvement of personnel at the sector and MSD went above and beyond their normal duty assignment in contributing to the success of the operation. With personnel depleted due to transfer season and the *Coimbra* mission, the units continued performing their daily summer missions. During the removal phase of *Coimbra*, the sector and MSD managed and investigated more than 110 other pollution incident reports to maintain the Coast Guard's readiness and responsiveness throughout the Long Island Sound area of responsibility.

Six weeks into the recovery of the ship's lube oil cargo, the confirmed presence of large volumes of heavy fuel oil surprised the UC. The complexities of recovering heavy fuel oil from a depth of 180 feet in 40-degree water, required that the *Shelia Bordelon* be brought dockside and re-equipped with additional pumping, heating, and storage capabilities to efficiently bring the thicker oil to surface. Three months after getting underway, removal operations had been completed to the satisfaction of the UC with approximately 476,000 gallons of potentially polluting oil removed. In total, 193 tandem ROV and mixed-gas dives had been completed without a single injury, and the first vessel on the RULET high-threat list was eliminated from the marine environment. Many years of planning culminated in 84 deployed days on site above *Coimbra* for assessment, oil removal, and capping of the tanks. More than 55 people from various specialty rates and ranks with varying degrees of expertise within

Crews aboard the *Shelia Bordelon*, right, offload more than 450,000 gallons of oil from the *Coimbra* shipwreck 30 miles from Shinnecock, New York. Coast Guard responders discovered a significant amount of oil in cargo and fuel tanks during on-site assessments of the *Coimbra* in May 2019. Coast Guard photo by Petty Officer 2nd Class Michael Himes

the Coast Guard directly contributed to the project. With a monumental task of ensuring an accurate historical record of the case, the documentation expertise of Coast Guard civilian, Mr. George Amon, was absolutely indispensable. For the Coast Guard FOSCRs, the casework equated to more than 660 pages of pollution incident daily resource reports that were all scrutinized for contractor costs; 50 situation reports that had to be drafted and released; 352 files that had to be created to document response efforts and costs; and more than 60 travel authorizations to be reconciled. In all, upwards of 53,000 documents capturing response decisions, actions, and financial management were generated to close out the case and for historical posterity. Just over 77 years after the *Coimbra* became a casualty of war, the imminent threat to the environment was finally eliminated.

About the authors:

CAPT Kevin Reed enlisted in the Coast Guard in November 1992 and commissioned from Officer Candidate School in 1996. He has served at the National Strike Force Coordination Center; Marine Safety Office/Group Los Angeles-Long Beach; Marine Safety Office San Juan, Puerto Rico; and Coast Guard Headquarters Office of Port and Facility Activities. He has also served as supervisor of Resident Inspection Office St. Croix-U.S. Virgin Islands, and as commander of Sector Long Island Sound, New York. He now serves as the chief of Pacific Area Preparedness Division in Alameda, California.

CAPT Keith Donohue was commissioned from Officer Candidate School in 1997. He has served at Marine Safety Office Providence, Rhode Island; Coast Guard Headquarters Office of Operating and Environmental Standards Division; USCG Activities Europe; and as chief of response at Marine Safety Unit Port Arthur, Texas; commander of the Pacific Strike Team; and deputy of Sector Long Island Sound, New York. He now serves as the deputy of Sector Houston-Galveston.

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CWO2 Ann Marie Borkowski enlisted in the Coast Guard in January 2006. She has served at Station Cape Cod Canal, Massachusetts; Sector New York; Marine Safety Unit Chicago; Sector Boston; and Sector Long Island Sound, New York. She now serves as the primary federal on-scene coordinator representative for Marine Safety Unit Port Arthur, Texas.

Chief Petty Officer Hillary Zarack enlisted in the Coast Guard in January 2007. She has served at Sector Buffalo, New York; Sector Ohio Valley; Coast Guard Recruiting Office Boston; and Marine Safety Detachment Coram, New York. She now serves as an apprentice marine inspector at Sector Virginia.

Training Crisis Leaders

by CDR Joel Carse
Chief, Response Training Branch
Training Center Yorktown
U.S. Coast Guard

In August 2017, Hurricane Harvey made landfall in southeast Texas as a Category 4 hurricane. As the storm system weakened to a tropical cyclone, its movement stalled, producing both an unprecedented 61 inches of rain over three days and a large-scale mobilization of emergency managers and first responders. By the end of this nation-wide response, 11,000 people and 1,300 pets would be rescued. As many of these responders were leaving Texas, Irma and Maria were forming as Category 5 hurricanes. For emergency managers, 2017 was a busy year and proved a ripe environment for developing crisis leaders.

While planning and preparing for incidents of national significance is not a new idea, the rate at which these responses are occurring does appear to be increasing. What were once considered high-risk/low-frequency events are now more prevalent and the landscape for them is expanding. Environmental responses, hurricanes, mass-rescue operations, and terrorist attacks have been the models for which emergency managers have historically prepared. Today, however, this also includes cyber attacks, wildfires, active shooter mitigation, catastrophic incident search and rescue (SAR), and executing responses in isolated areas like the Arctic.

> When the next incident occurs, the Coast Guard uniform should be a symbol of hope to the public that help has arrived.

In an era of increasingly frequent crisis incidents of national significance, the need for a dedicated interagency planning structure and coordination process is critical for preparing emergency managers for the next maritime disaster or catastrophic incident. The training to support this is also fundamental to the Coast Guard's mission execution.

Within the Coast Guard, a majority of this training happens in Yorktown, Virginia. In 2018, Training Center Yorktown reorganized legacy training branches to more accurately align with Coast Guard sectors. The Operations and Marine Safety branches were restructured and schoolhouses, courses, and functional statements were redefined to represent the work students are performing at operational ashore units. With this reorganization, the Response Training Branch was established to train the most junior to senior members of the operations ashore community who are performing some of the Coast Guard's most dynamic mission sets. This branch encompasses 27 courses spanning 195 resident, exportable, and international meetings for 4,500 students annually. Additionally, the Response Training Branch performs 23 Command Center Standardization (STAN) visits and three National Strike Team operational readiness assessments in support of the National Coordination Center each year.

Emergency responses to major oil spills, hurricanes,

Commandant of the Coast Guard Admiral Karl Schultz, then Atlantic Area Commander, is briefed at the incident command post of Port Arthur, Texas, following the aftermath of Hurricane Harvey in August 2017. Coast Guard photo

flooding, mass rescue operations, and other historical events have provided the Coast Guard with a fertile proving ground to test and further develop our responders' experience, training, and strategic planning. These events, supplemented with standardized and performance-based training, help to shape the development of crisis leadership in an environment of limited financial resources and students who have an appetite to learn through the most relevant and innovative training delivery systems available. The Response Training Branch ensures these members gain valuable performance-based training during key milestones in their careers. Taking these initial steps to develop junior emergency managers and provide them with the right preparation at the right time will help ensure they develop into the future senior crisis leaders within the Coast Guard.

Marine Environmental Response students discuss mitigation strategies during shore-line assessment exercises. Coast Guard photo

Striving to provide the highest fidelity and modernized training, the Response Training Branch continues to develop, maintain, and deliver advanced performance support to those carrying out duties as Command Center watchstanders coordinating search and rescue, overseeing marine environmental response operations, and managing emergency and disaster incidents throughout the port and global maritime domains.

While maintaining readiness for 27 courses, innovative methods for course delivery have been initiated to ensure the highest quality training to the field. Some of the recent major projects in course delivery have included:

- **SAR Self-Paced e-Learning:** Coordinating with the Coast Guard Office of Search and Rescue, the Incident Response School has overseen the development of a Learning Management System-supported training program for students to complete prior to starting resident classes. This will allow for knowledge-based training to happen prior to their arrival at the school and facilitate more time for performance-based training in the classrooms.
- **Command Center Support Products:** In conjunction with Coast Guard Office of Shore Forces, the Command Center STAN team has developed a similar learning management system product providing standardized and scheduled training for recurring requirements for those performing Command Center and SAR functions. These innovations are geared toward easing the burden of field units and staff, while making training standardized, more available, and easier to administer for Command Center supervisory staff.
- **Federal On-Scene Coordinators Representative (FOSCR):** Collaborating with the Coast Guard Office of Marine Environmental Response Policy, the Marine Environmental Response School modernized the legacy course FOSCR into a two-part format. Using a structured on-the-job training (SOJT) layout that aligns learning objectives with performance qualification standards, members complete individual tasks at their parent units and demonstrate base-line competency in knowledge retention of key concepts. After completing this SOJT, members attend the FOSCR course, which has been redesigned into a comprehensive two-week curriculum focusing entirely on managing authorities and jurisdictions in supporting Captain of the Port and federal on-scene coordinator functions.
- **Incident Command System (ICS) 300/400/402:** Modeling what the Federal Emergency Management

Agency (FEMA) has done for these fundamental intermediate and advanced Incident Command System courses, the Emergency and Disaster Management School has worked with the Coast Guard Office of Emergency Management and Disaster Response to put this high-demand training online to be more available to end users while reducing time away from home units and significantly reducing training costs. All three are now fully implemented and available online via the USCG Learning Management System.

Additionally, working with Coast Guard Force Readiness Command training managers and five different program offices, the Response Training Branch staff ensures the highest validity of training through deliberate analysis of course content provided in the classrooms. This has included:

- **On-Scene Crisis Management Coordinator and ICS-410, Incident Commander, courses:** Working with performance support staff at Training Center Yorktown, both of these critical courses are undergoing a job task analysis simultaneously. This process is expected to produce more efficiencies during the analysis process as both courses are normally scheduled back-to-back, with over-lapping content and with students regularly pipe-lined from one course to the next. These efficiencies will ensure the validity of the course curriculum for students learning some of the Coast Guard's most publicly visible skill sets in marine environmental response, incident command, multiagency response management, and media relations.
- **Emergency Management Specialist Course:** While planning and exercise functions have always been a key component to port resiliency, the duties and functions of those doing these jobs at the sector level has continued to mature. Additionally, with a commitment to operationalizing ICS, a complete modernization of the legacy Preparedness and Exercise course has developed into the new Emergency Management Specialist course with the targeted student audience of sector emergency managers, and a pilot course is anticipated in 2021.
- **National Strike Force (NSF) Capabilities:** The NSF Center of Expertise is structuring NSF qualifications with National Fire Protection Association standards and prioritizing the desired capabilities of response members to ensure better interoperability when working with other federal response agencies like the Environmental Protection Agency and FEMA. Most recently, this work has been paramount in the NSF's ability to perform joint operations in urban search and rescue during major flooding responses in 2017 and 2018.
- **Command Center STAN Team:** Members of the Command Center STAN team continue to analyze results of units to measure training retention and ensure standardization in how the Coast Guard's 48 command centers execute some of our most visible and dynamic mission sets in the port and maritime environments. Working closely with staff from the National SAR School, the results of these assessments identify gaps in classroom training and help program offices determine trends in how we are conducting operations on the watch floor of command centers and executing all Coast Guard missions.

As the landscape of emergency management continues to develop, ensuring the sustained reliability of

The Command Center Standardization Team provides an out brief to an audience ranging from senior command and command center watch standers to aircraft commanders and small boat coxswains. The November 2019 brief included lessons learned and administrative requirements. Coast Guard photo

course content is a paramount concern for the Response Training Branch. Recent changes to these courses included:

- **SAR Mission Coordinator course:** While the Coast Guard strives to find every lost mariner we search for, there are times when we have to inform families that we were not successful in finding their loved ones. Active Search Suspension briefings and next of kin notifications can be one of the most mentally fatiguing aspects of SAR. This course recently reorganized the delivery structure within the class and added a four-hour block to focus on these communications with family members. This new block of instruction includes intensive exercises with role-players acting as emotional family members and having to perform media briefings. "You can do everything you are supposed to during the case, but if you don't get the interactions with the family or media right, that can ruin the whole public perception," said Mark Ogle, a retired Coast Guard captain and course chief for the Sector Command Cadre courses.

The On-Scene Coordinator Crisis Management course attendees include Coast Guard sector command cadre and port, agency, and industry partners. One aspect of this course includes two days of intensive media training with cameras, playbacks, and experienced reporters. Coast Guard photo

- **Sector Commander Course:** Two full days of intensive marine inspector training has been built into this senior officers' course. This training developed a deeper base-line and greater commonality within the Sector Command Cadre for understanding Office In Charge, Marine Inspection authorities and responsibilities.
- **International Training Support:** In supporting Director of International Affairs and Foreign Policy initiatives, two courses were piloted and reached 295 maritime officers from the global port community:
  - ***International Command Center:*** Following 15 months of development, this two-week resident course kicked off in 2019 by hosting representatives from eight countries with significant interest in enhancing their maritime domain awareness.
  - ***International Incident Command System:*** This exportable course combined intermediate and advanced ICS training into a single two-week course previously spread across two convenings specifically tailored to the international community. This innovative initiative increased capacity for international emergency management training and achieved significant savings in training costs.

When the next incident occurs, the Coast Guard uniform should be a symbol of hope to the public that help has arrived. "The goal during an incident is to minimize the threats or damage while maximizing public confidence in our abilities," said Larry Brooks, a retired Coast Guard captain and senior instructor in the Marine Environmental Response School. "That's what we teach here. The Response Training Branch is cultivating that ability in today's crisis leaders and emergency managers to meet the nation's needs of tomorrow, while presenting the Coast Guard's image of Ready, Relevant, and Responsive to the American people and international community."

A note from the Author: I would like to recognize the contributions of co-authors LT Joseph Della Rosa, LCDR David Vihonski, and LCDR John Laraia as well as the work of the entire Response Training Branch staff in preparing this article.

About the author:

CDR Joel Carse serves as the chief for the Response Training Branch at Training Center Yorktown where he oversees 27 courses, the National Strike Force Center of Expertise, and the Command Center STAN team. He is a prior Damage Controlman 1st Class and a 2003 Officer Candidate School graduate.

Unmanned Autonomous Aviation Systems as a Post-Disaster, Human-Capital Force Multiplier

Sector Delaware Bay's partnership efforts

by CWO4 Todd Wardwell, CEM
Deputy Marine Environmental Response Branch
U.S. Coast Guard Sector Delaware Bay

Despite an evolving and robust offshore unmanned aviation systems (UAS) program used by Coast Guard cutters in the deep maritime environment, the Coast Guard has struggled with a clear use-case to move into the UAS arena for operations ashore.

Emerging technologies, new Federal Aviation Administration (FAA) regulations, limited budgets and personnel, cyber security, and federal privacy laws are all challenges to developing a national UAS program when operating within the continental United States. The Coast Guard is unique among services. It is a federal agency that operates with national level oversight of regulations but also operates in lock step with emergency management elements at the lowest local level. These relationships with local governments make the Coast Guard a greatly effective response agency but also make applying a "broad brush" approach to emerging programs and technology difficult to enact to meet such a diverse set of needs across the hemisphere.

Partnerships and synergy of mission have been the policy of the Coast Guard with regard to achieving common goals with local, state, and even other federal agencies since the Coast Guard's inception.

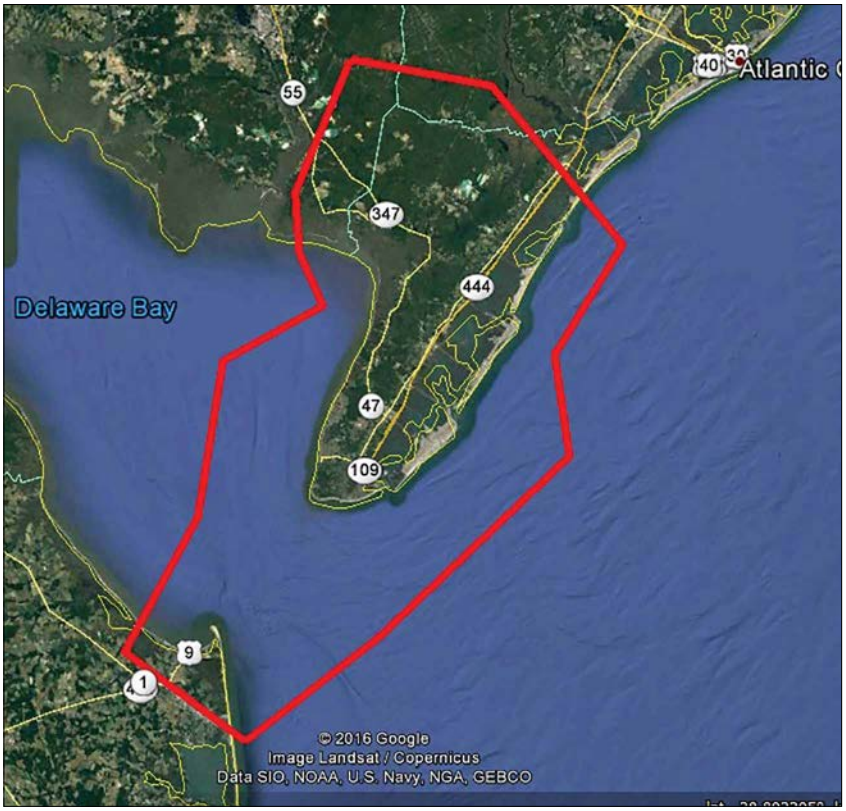
With respect to UAS innovations and technology within the Port of Philadelphia, Coast Guard Sector Delaware Bay has been documenting industry counter-UAS capabilities through the Area Maritime Security Committee. This is in addition to participating in government led UAS initiatives that may enhance sector emergency response and that of our port partners. The primary focus of this article will be from this perspective.

The Hx8 XXL is an American-made unmanned aviation system, used in a Defense Logistics Agency operation to carry supplies to the Coast Guard Cutter *Lawrence O. Lawson*. It can carry payloads of up to 70 pounds for up to 5 miles. Coast Guard photo by CWO4 Todd Wardwell

Prior to discussing any of our UAS experiences, it is imperative to understand the general operating environment that encompasses Sector Delaware Bay. Within the sector's area of responsibility (AOR) are three states, two Environmental Protection Agency and Federal Emergency Management Agency regions, and 18 counties. The Delaware River and Bay are home to the largest importers of fruit, juice, paper, and cocoa beans. It is the largest freshwater port in the world, as well as the largest liquefied petroleum gas exporter on the East Coast. The refinery capacity within the port ensures that, on any given day, there will be between 4 million and 9 million barrels of crude oil in transit or at anchor and 90,000 barrels arriving in port by rail each day. These industries, and many others,

have created and sustained 135,000 jobs while raising more than $78 billion a year in this tristate area.[1] There are more than a quarter of a million recreational boaters in the AOR coexisting with critical natural resource habitats and the largest scalloping grounds in North America. By a 2019 estimate, a mid-river port closure would cost more than $1,500 U.S. dollars (USD) a second in real capital lost just within the directly affected maritime industries. Secondary and tertiary industries indirectly affected by a daily port shut down could post monetary losses closer to $4,000 USD a second. It is with this in mind, that it becomes obvious that unmanned autonomous-aviation systems can become a major post-disaster human capital force multiplier.

The key to operating in an environmentally, industrially, and economically unforgiving AOR is partnerships at all levels of government, private sector organizations, and community/volunteer groups. Setting up a unified command structure for large-scale emergency management issues in the Delaware Bay AOR is not a nicety, but a necessity and requires these partnerships. It was through these partnerships that members of Sector Delaware Bay Incident Management Division learned of regional efforts by the private sector and local governments to build up UAS research efforts within New Jersey's Cape May County. The county was granted a waiver by the FAA to conduct unmanned test flights over much of the county, as well as adjacent areas of the Atlantic Ocean and Delaware Bay. (See map)



In conjunction with Cape May County, New Jersey, American Aerospace Technologies, Inc., has been granted a certificate of authorization (COA) to operate a commercial unmanned aircraft in the area designated by the red lines. A COA is a waiver issued by the Federal Aviation Administration authorizing operation of unmanned aviation in a designated area. Graphic courtesy of American Aerospace Technologies, Inc., and Google Maps

The FAA waiver, known as a Certificate of Authorization (COA), is only issued by the FAA for specialized purposes. Cape May's COA allows for testing and developing high-altitude, long-range flights with unmanned aerial vehicles (UAV) of more than 55 pounds at altitudes up to 7,000 feet. UAS's under 55 pounds can fly using this COA but are additionally licensed under the FAA Part 107 regulations.

After attending a UAS innovation event in Cape May, the sector networked with American Aerospace Technologies, Inc. (AATI). The small company is working with Cape May County to use the existing COA to spearhead public and private partnerships with respect to autonomous vehicles. The company showed great interest in adapting current and future technologies to better facilitate emergency management capabilities. These efforts quickly evolved to include post-hurricane response, oil and hazmat spill response, and a real-time picture of port safety.

What is a Femtocell?

A Femtocell is essentially a small cell site in the sky that can provide 4G cell phone and internet coverage to areas where traditional service is not available, or no longer available, due to ongoing incidents.

Public-Private Partnerships

AATI had been doing considerable outreach about conducting UAS demonstrations. In May 2017, it conducted a functional exercise to test a post-hurricane response sortie in an environment where communications were down. The UAS, an RS-20 with an average flight time of 16 hours, carried a small Verizon wireless airborne LTE operations "femtocell" modem on board.

There were two objectives for this flight.

Objective 1: Provide wireless communications for first responders in a simulated post-disaster,

communications-denied environment through the UAS, connecting them with Cape May County Office of Emergency Management (OEM) and the New Jersey State Police Regional Incident Operations Center (RIOC).

Objective 2: Provide near real-time, map-based imagery to county OEM and the RIOC from the UAS.

The New Jersey Department of Transportation, State Police, Cape May County and New Jersey offices of Emergency Management, Verizon Communications, and Coast Guard Sector Delaware Bay all participated in the drill. During the exercise, high-resolution, map-based imagery from the overflight was simultaneously broadcast via secure weblink to Philadelphia; Trenton, New Jersey; and the Cape May County Emergency Operations Center. It was also received at a command van located at the Woodbine, New Jersey, airport where the flight crew was located. The bandwidth and coverage provided by the modem on board the RS-20, allowed for use of the UAS's imagery and data by limitless ground locations, and the lag time between collection and distribution of the imagery was only a few seconds, meaning the UAV never needed to land to upload the data and could stay on station.

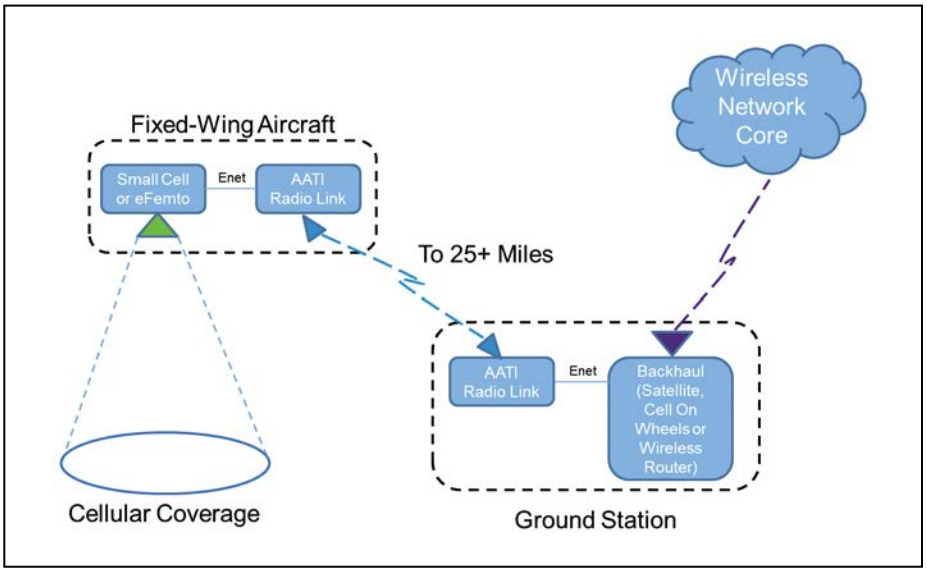
Anyone who has ever done a "hot wash" after a major disaster or emergency management drill will note that communications was one of the problems during the event. In most post-hurricane areas, cell phone communications will be almost crippled due to outages in both power grids and/or cell towers. During the exercise, AATI continued to work with Verizon wireless to use a UAS as a post-hurricane replacement for simulated tower outages. Essentially the UAV would act as a 2000-foot-tall cell tower while flying. First responders were able to witness directly, on dozens of wireless devices, the transition from regional cell service-providing towers to the cellular service provided by the UAS with no drop in clarity or bandwidth.

Lessons Learned from Hurricane Irma

The conditions experienced in the Florida Keys after Hurricane Irma are well documented at this point, but there are a few important issues worth revisiting. In the initial phase of the hurricane, the primary operating picture for Coast Guard responders was in the form of satellite imagery provided by the National Oceanic and Atmospheric Administration (NOAA). This consisted of a few passes over the Keys in a period of less than a week. The routinely encountered problems of little or no cellular service and internet coverage made getting this imagery from the incident command post in Miami to responders in the Florida Keys incredibly challenging. These issues did not improve as hurricane operations in Puerto Rico became a higher priority and the capabilities in the Keys were redeployed to those areas. In previous hurricane responses there has been an expectation of being able to access contracted private aviation assets for non-emergency missions. This was not the case in the Keys as many of the existing aviation landing strips or pads were being used for housing or not accessible due to infrastructure damage. There were simply no private contract aviation platforms readily available that could operate in those environments. This meant that finding leaking vessels, sunken boats, blocked channels, and searches for human remains had to be conducted by multi-agency teams doing in-person scouting in vehicles and vessels using week-old satellite images.

Defense Logistics Agency (DLA) Test Flights

With lessons learned in hand, Sector Delaware Bay again attended a UAS conference in Cape May and sponsored by the Cape May County Chamber of Commerce. Coast Guard personnel gave presentations on lessons learned from Hurricane Irma and how UAS could have been deployed to assist based on previous experience with our public and private partnerships. In the audience was a contingent of personnel from the Philadelphia office of the Defense Logistics Agency (DLA). They had gone to great lengths in the previous hurricane season to procure and ship huge quantities of Meals Ready to Eat (MRE's)



During disaster response, the unmanned aviation system (UAS) acts as a substitute for a cell tower while flying. In tests, there was a transition from regional cellular service to cellular service provided by the UAS with no drop in clarity or bandwidth. Graphic courtesy of American Aerospace Technologies, Inc.

to Puerto Rico. The MREs made it down via vessel to Puerto Rico but ended up not being delivered due to wide spread failures in the marine transportation system, including port berth availability, as well as damage to cargo handling equipment. DLA representatives spent time talking with Sector Delaware Bay responders who were deployed to the hurricanes to get a better sense of what could be done in the future to get logistical supplies into the hands of those that needed them most. The consensus among all the responders was that port closures and deliveries to the "last three miles" were the most problematic for on-water logistics missions. The last three miles means that responders were unable to get critical supplies from main roads or routes into smaller side streets or towns to get the supplies to people who desperately needed them. In the case of logistics in post-hurricane Puerto Rico, there was no way to start getting supplies off the vessel. In essence, the hurricane response became a first three miles and last three miles problem. DLA wished to collaborate with AATI and Coast Guard Sector Delaware Bay to conduct a test flight with an unmanned food and water delivery from a land-to-land flight and a land-to-water flight involving a vessel.

The Hx8 XXL unmanned aviation system is shown here, loaded and ready to fly, with over 60 pounds of Meals Ready-to-Eat, and two cases of bottled water underslung from its cargo system. This was part of a joint exercise between the crew of Coast Guard Cutter *Lawrence O. Lawson* and the Defense Logistics Agency. Coast Guard photo by CWO4 Todd Wardwell

Unmanned Flight Operations on the Coast Guard Cutter *Lawrence O. Lawson*

Many administrative hurdles pushed the DLA test flight back. Department of Defense (DoD) cyber security issued an edict stating all UAS operations outside of combat zones would cease until the UAS contractor could prove the UAVs had no cyber vulnerabilities created by a foreign manufacturer. At this time, AATI had brought on Skyscape Industries, a subcontractor, to handle the logistics mission with a large cargo octocopter UAV. To meet DoD cyber security requirements, the entire UAS had been created primarily in the United States, but the majority of its operating code was manually rewritten to ensure compliance and increase flight safety parameters. Skyscape's UAS met approval and was allowed to continue. The ferry terminal in Cape May was selected as the primary launch and recovery facility. Located 2 miles away, the Rutgers Agricultural Facility in Cape May was to be the land-to-land portion of the test. For the land-to-vessel portion, the Coast Guard Cutter *Lawrence O. Lawson* was identified as a potential candidate. The *Lawson* is a 154-foot patrol boat that has no flight deck but has a dedicated hoist area that was ideal for landing or unloading a UAV.

Prior to operating in the vicinity of the cutter, the contractor wished to conduct an electronics emissions safety check to ensure that the cutter's broadcasting/transmitting gear did not interfere with the electronic systems on board the UAV. The test was conducted by simulating a flight using a crane with straps on the dock to "hover" the UAV in front of the cutter. The cutter then switched on various radar and communication units to ensure that contact between the UAV and the monitoring pilot was not lost. This enabled the cutter to have a list of emissions safe gear that could be activated during the approach of the UAV with no loss of navigation safety.

In July 2019, AATI was ready to fly the payload after

numerous setbacks and administrative hurdles from a multitude of sources. The UAV that flew on that day in July was almost completely rebuilt, reprogrammed, and refitted from the stock airframe that AATI had started with. The Hx8 XXL took off and carried a 50-pound cargo of bottled water and MRE's from the Cape May Ferry Terminal to the Rutgers Agricultural Campus and back with no issues. Trailing the UAV up the back bay was a "chase" safety boat provided by Coast Guard Station Cape May. The UAV was checked, recharged and made ready to rendezvous with the *Lawson*. The transit to the *Lawson* was flawless and incredibly efficient using only 30 percent of the expected battery life to travel the 1.2 miles to the cutter offshore. For safety, the UAV did not land on the cutter but it dropped the cargo to the deck. A DLA member inspected the cargo to ensure no breakage and the UAV returned to the ferry terminal.

Future Operations and Final Thoughts

DLA is looking to conduct additional testing in the future to acquire a much longer range UAS to deliver emergency response rations, though at this time the future DLA project has not yet been put up for bid. AATI has since been hired by multiple private industries to conduct long-range pipeline and infrastructure surveys nationwide. Taking what they have learned from the Cape May COA process, they are assisting other parts of the country in applying for special use UAS authorizations. AATI continues to push boundaries using UAS technologies relating to emergency management. In 2017, they proved to be an invaluable resource during a NOAA/Industry drill conducted off of Santa Barbara, California, using natural oil seeps as targets. Using UAS real-time imagery and "Drone to Map" GIS overlay software, oil-spill responders were able to deploy shoreline cleanup assessment techniques teams more than eight hours faster than previous spills. Imagery was able to find even partially hidden targets, which were geo-tagged and uploaded into Survey 123 programs and used by the teams in the field. In the years since that drill, technology has become mainstream with reduced costs.

Coast Guard Sector Delaware Bay continues to rely heavily on partner agencies through our various committees. This includes both the use of UAS for nontraditional responses and through our area maritime security committee, as well as best practices to counter the use of UAS for the purpose of port safety/security. UAS, and other unmanned vehicle systems, will become far more mainstream as the safety factors increase and the costs decrease. Under current safety regulations, or operating certificates, it can take twice as many personnel to fly an "unmanned" mission as it would to simply fly a mission via a regular aviation asset. As these programs mature and become more common, the quantity of people involved will diminish as fast as the usefulness of the technology increases. Despite greater personnel requirements, the Standard Rate Instruction[2] indicates the direct cost of operating a Coast Guard HH-65 helicopter for one hour was far more expensive than 16 hours of UAS flight time with a five-person team and support vehicles. Future UAS flights will be longer, and far more multimission in nature with the ability to carry out several tasks at once. In this sense, UAS will be a true human-capital force multiplier, freeing up both field and command post personnel. This will occur at the same time, increasing the quality of information provided while cutting response times by hours and days. This major increase in the Coast Guard response curve is critical when responding to a major disaster, including an oil spill, as the damage to the economy and environment are quite literally quantified in seconds and minutes.

Acknowledgements:
American Aerospace Technologies, Incorporated contributed to this article.

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A 4K video of the flight is viewable through this QR code or by searching AATI DLA flight on Youtube: (Destination is Youtube.com)

Beyond Social Media

The evolution of crowdsourcing for disaster response

by LTJG Evan Twarog
USCGC Healy
U.S. Coast Guard

The 2017 hurricane season will be forever etched into the Coast Guard's memory. All told, there were 17 named storms that caused a staggering $265 billion in damages.[1] Through the peril, Coast Guard men and women consistently rose to the occasion, saving lives and responding in new, innovative ways. In the aftermath of Hurricane Harvey, the service is credited with saving more than 11,000 lives, marking the largest domestic search and rescue (SAR) effort since 2005's Hurricane Katrina.[2] Hurricane Harvey stands out in Coast Guard history because it marked the first time social media helped guide large-scale SAR efforts.

Harvey seemingly came out of nowhere, leaving tens of thousands of Texans trapped inside Houston as more than four feet of rain besieged the city.[3] Thousands of families were forced onto their roofs or highway overpasses as they desperately fought to stay out of the rising flood waters. As 911 call centers experienced unprecedented call volume, hold times exceeded 4 hours. After waiting on hold for hours, and with dying phone batteries, thousands of these families turned to social media "911 posts" as a last hope. Prior to Hurricane Harvey, these posts had yet to be broadly incorporated into rescue efforts. Working quickly and innovatively, the service began working alongside elite technical volunteers to ensure no call went unanswered.

Volunteer efforts in the aftermath of the storm focused on monitoring Facebook and Twitter for emergency traffic. Urban search and rescue (USAR) flood teams began using crowdsourced maps to track social media posts, which provided assistance in near real time.[4] One of the most widely used information sources was a joint effort between Coast Guard Academy cadets and volunteers from the humanitarian nonprofits Standby Task Force (SBTF) and Humanity Road.[5] The latter groups specialize in deploying geospatial tools for disaster recovery and merged crowdsourced social media "911 posts" into heatmaps, which were used by helicopter pilots, flood teams, and command centers to prioritize which neighborhoods received the most resources.

The storm marked a pivotal moment for the federal emergency management community. As the Federal Emergency Management Agency (FEMA) watched what was happening at the Coast Guard Academy, its senior leadership embraced and aimed to deploy similar work for events going forward. During Hurricane Maria, FEMA stepped beyond social media monitoring and embraced all forms of crowdsourced situational awareness.[6] The storm brought much more widespread damage than anticipated, and as Puerto Rico became an "information black-hole," the agency turned to alternative information streams. FEMA worked with the SBTF to determine the status of the hospitals across the island. Within 36 hours, a team of 55 volunteers determined the status of 33 of the island's 65 hospitals.[7] This was comparable to what officials found through established information channels, and in some cases, information was collected on otherwise unreachable hospitals. Emergency managers then used this information to build hospital resupply plans, support volunteer medical groups, and prioritize resources.

Since Hurricane Harvey, new geospatial technologies and crowdsourcing have fundamentally changed the way in which emergent information flows. Resiliency and innovation are the keys to success during major disasters, and crowdsourcing is a fundamental pillar to unlocking them. Think tanks, local citizens, digital volunteers, professional rescuers, and emergency managers are collaborating on new ways to match operators with the information they need each hurricane season.

Crowdsourcing

Crowdsourcing enlists the services of a large number of people or sources, typically via the internet, to obtain information or input into a task or project. Recently, the Coast Guard has embraced crowdsourcing as a key situational awareness tool during natural disasters to aid search and rescue personnel navigate road closures, flooding, and traffic.

The Rise of Disaster Response Crowdsourcing

Disaster communication looks dramatically different today than during Hurricane Katrina, and this greatly

impacts how response efforts are carried out. A side effect of social media's evolution is that disaster survivors now have a plethora of sites like Facebook and Skype to connect with family members and friends in the aftermath of destruction. Additionally, information now spreads much more rapidly than it did 20 years ago. This has empowered the rise of digital disaster volunteer networks. These volunteer technical organizations (VTO) work collaboratively, or crowdsource, to accomplish specific tasks, such as mapping emergency shelters, identifying road closures, or tracking emergency calls.[8]

Coast Guard LT Christopher Capule, a pilot from Air Station Corpus Christi, Texas, monitors the weather while en route to San Angelo, Texas, as Hurricane Harvey approaches the state's coast in August 2017. The Coast Guard worked closely with local and state emergency operation centers using crowdsourcing techniques in rescue efforts. Coast Guard photo by Petty Officer 3rd Class Johanna Strickland

The VTO "ecosystem" is remarkably diverse, with each organization serving a unique niche. Data collection methods vary widely. For example, Humanitarian OpenStreetMap Team uses the help of thousands of volunteers to map structures and roads in satellite imagery for damage assessments, whereas TweetDeck uses automated algorithms to sift through millions of social media posts.[9] Their lifespan also varies dramatically. Some platforms are founded and last only one disaster, whereas others are well-established nonprofits. Humanity Road, a leading volunteer group responded to 68 events in 2018 alone.[10] Crowdsourcing platforms are not limited to non-profits. Companies like Waze are valuable resources for tracking the effectiveness of evacuations and route planning.[11] This ecosystem's diversity is what makes it remarkably powerful to first responder agencies. Crowdsourcing can help build a level of situational awareness previously thought impossible.

During Hurricane Harvey, the Coast Guard engaged in crowdsourcing in the form of social media monitoring. While these products are ultimately produced by crowdsourcing organizations, there is a difference between crowdsourcing and social media monitoring. Social media monitoring is a capability whereas crowdsourcing is a process. Crowdsourcing engages with volunteer networks to conduct a specific task, be that the collection of a road closures/damage, flooding extent, and traffic jams.[12] At the core of these collection efforts is a culture of collaboration. This culture relies on the recognition that the Coast Guard is on the same team as the VTOs responding from around the world. Collaborating with the VTO ecosystem is in the best interest of the people the service is rescuing.

Hurricane Maria taught FEMA this lesson about collaboration and since then, crowdsourcing has become a key situational awareness tool. Most notably, FEMA launched a crowdsourcing unit after the 2017 hurricane season.[13] When hurricanes Florence and Michael struck in 2018, the crowdsourcing unit deployed a team to FEMA's National Response Coordination Center (NRCC). Consisting of staff from across the government, including the Coast Guard, the NRCC is a multiagency center that coordinates overarching federal support during major events and disasters.[14] Working from the NRCC, FEMA's crowdsourcing unit focused on bringing VTOs and first responders together to best coordinate efforts. During previous seasons, VTOs frequently and unintentionally duplicated efforts, wasting resources and complicating rescue operations. Hosting daily conference calls that included all responding VTOs, the unit was able to virtually eliminate these duplicate efforts.[15] Stakeholders from across dozens of organizations participated in these phone calls to gain valuable situational awareness.

This trend towards broader collaboration has sparked new response tools.

Most notably, crowdsourcing is helping the Coast Guard reimagine and redefine search and rescue capabilities. During the 2018 and 2019 hurricane seasons, the National Alliance for Public Safety GIS Foundation[16] partnered with the International Association of Fire Chiefs and a host of VTOs to create the Joint SAR Activity Map. This map brought together field reports from USAR teams, social media monitoring efforts, and traditional reporting avenues to create a resource all responders could leverage.[17] Rescuers from FEMA USAR teams,

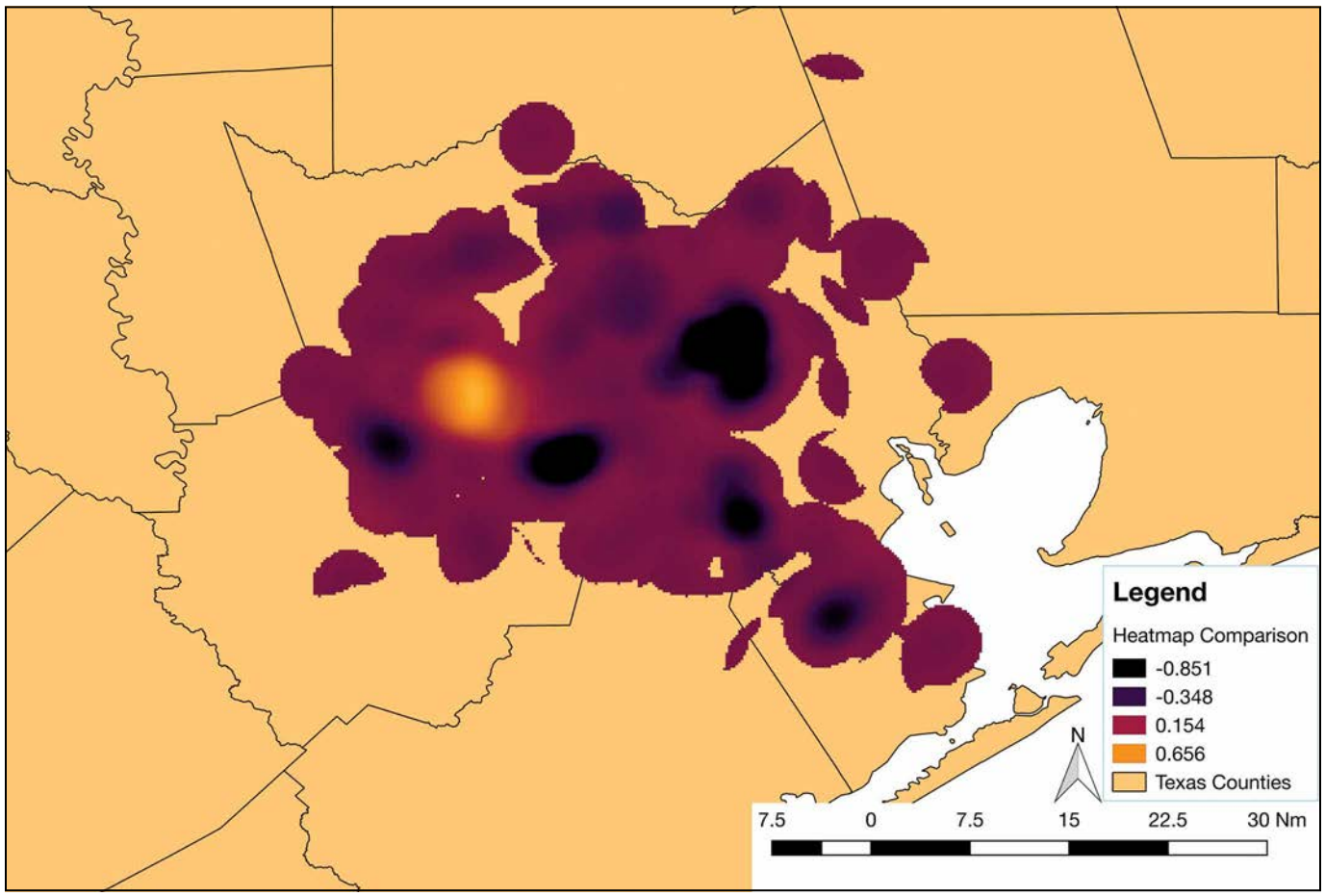
local fire departments, and grassroots rescuers like the Cajun Navy, all shared access to the same data. Live data that is openly available to all responders means more lives saved faster.

New situational awareness tools bring significant value to the Coast Guard at almost no cost. During Hurricane Harvey, survivors requesting help via social media were located in different neighborhoods than those calling 911. Helicopters responding to a 911 heatmap would be going to a different neighborhood than those responding to a social media heatmap. Leveraging resources like the Joint SAR Activity Map can inform command centers and operators about potential information "black holes." Crowdsourcing products can be used to route flood teams and other rescue assets into the affected zone. Previously, it has been cumbersome and slow to identify road closures or gas shortages, but sites like Waze and GasBuddy can be used to quickly route flood rescue teams to their destination, saving hours of driving and frustration. Crowdsourcing can be used to identify gaps between reality and contingency planning. Planners might expect mandatory evacuations to take 48 hours to implement, but Facebook activity products from organizations like Humanity Road can be used to determine the plans' effectiveness. Better, more timely situational awareness is truly critical in the early hours of a disaster, and crowdsourcing is a unique tool at the service's disposal during this time.

The Three Pillars

The Coast Guard can learn from the successes and shortcomings across the emergency management community, as they have broken ground on crowdsourcing. Thought leaders, particularly those at the Department of Homeland Security (DHS) Science and Technology Directorate, and the FEMA crowdsourcing unit have compiled valuable resources that organizations like the Coast Guard can use to expedite and ease crowdsourcing implementation.

The most important of these resources is DHS's "Operationalizing Social Media" report which outlines how crowdsourcing can be systematically implemented from start to finish. Implementation relies on three pillars:



Heatmaps, like this one, are used to prioritize which types of resources are appropriate for specific neighborhoods and helped the Coast Guard respond more effectively to Hurricane Harvey in 2017. This heatmap shows more 911 calls in the lighter areas and more social media emergency requests in the darker areas. Coast Guard graphic by LTJG Evan Twarog

An MH-60T Jayhawk helicopter crew from Coast Guard Sector San Diego begins preflight operations at Sector San Diego before deploying in support of Hurricane Harvey response efforts in August 2017. Coast Guard photo by Petty Officer 3rd Class Joel Guzman

- People and Process
- Governance
- Technology

The people and process pillar focuses on building the right connections early. People are the single most important asset of any successful organization, and the Coast Guard is full of some of the brightest disaster thinkers the world has to offer. The challenge behind this pillar is getting the right talent in the right place, and having the right conversations. The first step is to identify key crowdsourcing talent and then empower them to begin establishing relationships with VTOs and the emergency management community.[18] Once these relationships begin to form, the report notes that they can be formalized through memorandums of understanding (MOU).

Governance casts progress into policy. At the core of crowdsourcing governance is data standardization. The VTO ecosystem gives rise to new efforts with each disaster, and data standardization helps to ensure interoperability and information trustworthiness. Standardization is critical to formalize during the off-season so that VTOs can quickly generate new products without having to worry about system compatibility concerns.

Getting information into the right hands at the right time is critical. The technology pillar focuses on developing means of sharing information across all levels of the chain of command. Admirals and helicopter pilots should have equal access to insights. Early on, these products can be as simple as a PDF document. Later, these products might advance to live web maps.

The DHS report also advocates for a "crawl, walk, run" approach that values gradual, though experimentally driven, implementation. Change is hard and takes time. It is unrealistic to expect a fully mature crowdsourcing team to be built overnight. Rather, it is best to embrace experimentation and innovation to rapidly test new ideas and products before and during disasters. This helps to establish areas that crowdsourcing can have the most impact without committing too heavily to one solution.

Hurricane Season 2021

The Coast Guard is remarkably well-poised to launch crowdsourcing capabilities during upcoming hurricane seasons. In 2018, the service made significant progress that can be quickly rekindled. The Coast Guard was approaching an MOU with Humanity Road for a standardized search and rescue social media heatmap. This MOU would have standardized a live web map of social media "911 posts" and created a heatmap layer capable of being displayed in Coast Guard One View (CG1V).[19] Additionally, the Office of Search and Rescue Policy was outlining the operational need for social media monitoring during major disasters. Each of these steps helped break institutional barriers and lay a foundation that future work can build off. Revitalizing this work offers a path towards quickly standing up a crowdsourcing capability for the upcoming hurricane season.

As the Coast Guard looks towards the upcoming season, three ingredients will enable the service to benefit from crowdsourcing.

1. Identify a Champion: Change is hard and takes time. Meaningful change requires top cover to quickly cut through red tape. Doing crowdsourcing right will mean gaining the support of a broad range of stakeholders, and

that effort requires a champion, a forward-leaning leader to ensure the cycle of experimentation is not hampered by bureaucratic overhead or complex routing chains.

2. Recruit and Empower Subject Matter Experts: The Coast Guard has access to some of the best disaster response thinkers in the world. They have helped lead previous crowdsourcing efforts, have stood watch in command centers, and waded through flooded streets. A concurrent step to finding a champion is to build a world-class team consisting of this disaster response talent. This team of computer scientists, crowdsourcing subject matter experts, and first responders should be given TDY opportunities to a variety of Coast Guard offices to quickly develop the program. They should draft policy and begin to educate the broader Coast Guard community about the evolving information landscape. Finally, they should train alongside emergency management crowdsourcing personnel in anticipation of the upcoming season.

3. Deploy a "Harvey-Ready" Solution: Talk is cheap, but if a major disaster like Hurricane Harvey were to occur this season, the service needs to be ready to deploy its new crowdsourcing capability, and 90 percent of the work takes place before landfall. There are two components to this preparation: Education and data standardization. A capability is useless if operators are uneducated about its value. Sending the crowdsourcing team on a "Sector Roadshow" would educate Command Center personnel about the uses, benefits, and limitations of crowdsourcing should a major disaster unfold.

The second component, understanding how information flows, is critical and poses the greatest technical challenge. Understanding data formatting and dissemination empowers real-time experimentation. Finally, when landfall does happen, personnel should be deployed to information fusion centers that generate the greatest cross-pollination between emergency managers and the crowdsourcing community. FEMA's NRCC is a natural candidate for this. The crowdsourcing team can identify operational needs, identify relevant information, and then distribute it back across the Coast Guard.

Resilience and innovation are the keys to successful 21st century disaster response. Creating a crowdsourcing capability would put the Coast Guard in alignment with other forward-thinking response agencies. Emergency management offices across the United States are rapidly embracing it as a means of supplementing traditional information sources. This revolution has helped to generate a wealth of resources and lessons to draw from. The Coast Guard has already taken significant steps to work through the guidelines outlined by DHS, meaning the service is poised to quickly mature its crowdsourcing capabilities for the upcoming hurricane season. As families are rushing to their roofs to escape rising flood waters, crowdsourcing might just be that critical link between life and death. Will we innovate today to save lives tomorrow?

About the author:

LTJG Evan Twarog has helped lead multiple crowdsourcing efforts since 2017. During Hurricane Harvey, he helped initiate social media monitoring capability for search and rescue efforts that tracked more than 1,000 cases involving more than 5,200 survivors. He currently serves as a deck watch officer on USCGC Healy.

LTJG Trevor Layman and LTJG Reid Wiegleb contributed to this article.

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BSEE Advances in Oil Spill Response Technology

by Mr. William Vocke
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The Bureau of Safety and Environmental Enforcement (BSEE), the Coast Guard, and other research organizations have made dramatic advancements in all aspects of oil spill response research, planning, coordination, and operations in the 10 years since the *Deepwater Horizon* oil spill. The first step was to assess the status of response technologies and determine where improvements were needed. The Coast Guard, BSEE, and the other members of the Interagency Coordinating Committee on Oil Pollution Research evaluated more than 600 research needs and established a new series of research and technology plans (R&T plan). The 2015 R&T plan identified 150 priority research needs in the areas of preparedness, prevention, response, and injury assessment and restoration. With the 2015 R&T plan as a guide, BSEE has tackled these challenges and made significant progress in many areas, which are discussed below.

In Situ Burning

In situ burns are an effective way of removing oil from the marine environment. During the *Deepwater Horizon* response, an estimated 250,000 barrels were removed through 411 burns. However, burns may not be considered in situations where the oil is emulsified because emulsions are difficult to ignite. For instance, oil spill response planners generally believed that California crude oils are not able to ignite and burn because they quickly emulsify. BSEE researchers challenged that belief and tested the ignition and burning behavior of neat, weathered, and emulsified variants of several California crude oils to determine the applicability and window of opportunity of in situ burning for oil spill response planning. The results identified the amount of gelled fuel primer needed to initiate the burns for each oil. They also found that some quantities of water in the emulsions increased the burning efficiency by atomizing the oil droplets, thereby increasing oil vaporization. Together, these findings provide valuable information to expand the consideration of in situ burning. Additional research is underway to further expand upon these findings and increase the use of in situ burning.

In situ, or in place, oil burns are used as an effective way of removing oil from the marine environment. New research continues to provide new insights to expand the consideration of in situ burning. Stuart Monk | Adobe Stock

Remote Sensing

Oil spill response in high latitudes can be constrained by poor visibility in low light conditions. Research advancements to overcome these limitations include the development of the Mapping and Reconnaissance Imager, Night-enhanced for the Sensing of Contaminants, Oil and Unseen Threats (MARINE SCOUT) system. The MARINE SCOUT system was optimized for oil spill detection and response from small unmanned aerial vehicles such as the hand-launched Puma. The system and post-processing software were developed and tested in the Santa Barbara, California, oil seeps as well as at Ohmsett, the National Oil Spill Response & Renewable Energy Test Facility in New Jersey, in December 2017. Long-wave infrared images from the tests showed a clear picture of oil in the Santa Barbara seep locations.

BSEE is also advancing remote sensing through a project to develop a system and algorithm to estimate oil thickness and emulsification from an unmanned aircraft system (UAS). The project designed a UAS platform that can operate a combination of multispectral and thermal sensors. An oil classification and an image processing

Oil Types Defined

Neat oil refers to fresh crude oil that has not been exposed to the elements and still contains all of its volatile components.

Weathered oil refers to oil whose light hydrocarbons have evaporated.

Emulsified oil has water incorporated into it from wind and wave action in the open ocean.

algorithm were then developed to complete the system. Field testing at Ohmsett showed the multispectral measurements provided clear distinctions between areas of oil, emulsified oil, and open water. The automated algorithm will be developed in the next phase to provide a quicker response.

Mechanical Recovery

Oil thickness is a key factor in the efficiency of skimming operations. Knowing the slick thickness helps operators optimize their recovery. BSEE research is advancing measurement tools and approaches with the development of two new sensors that measure the thickness of various crude and refined oils on water. One sensor, a capacitive sensor, is designed to measure 3- to 100-millimeter-thick oil layers while mounted to a skimmer, in the apex of a boom, or on a free-floating buoy. Data is communicated wirelessly and transmitted in real time to the user. The second sensor, also a capacitive sensor, is a handheld measurement tool that can be used to verify thickness data during equipment testing or for data collection off the side of a vessel.

Mechanical recovery is also being enhanced through development of an in-line, flow through oil recovery sensor (RE sensor) to monitor in real time the percentage of oil and water in fluid recovered during oil spill response operations. Testing at Ohmsett showed that the sensor was accurate to within 6 percent when tested with multiple oils and water salinities. The primary application of the RE sensor is for offshore oil spill recovery operations where responders currently do not have a quantitative method for knowing in real time how much water they are collecting with their oil. Having this information will allow a responder to make on-the-spot adjustments to their recovery operations to maximize efficiency. In addition, the sensor will provide data on the overall oil/water collection during a response.

Operational Awareness

Tracking the location of response equipment is being improved by development of the Geo-Referencing Identification (GRID) Tag system. This system uses a low-cost radio frequency identification tag that communicates via satellites with a user-friendly interface. The tags are designed to operate in all conditions, including harsh Arctic environments. An enhancement to the GRID tags added 3-axis accelerometers so they can also measure wave characteristics, including height, length, and period. Spill responders can attach the tags to booms and other key equipment and vessels and track their location and operating conditions. This operational awareness provides the possibility of shifting assets to optimize response operations.

Conditions in the Arctic are likely to create situations where oil is trapped under, or encapsulated in, ice and cannot be removed until conditions improve. The movement of ice may transport the oil for miles from the spill location. Responders need to track the movement of the oil and ice, so they know its location when a response is possible. BSEE funded development of an ice floe tracking system (IFTS) that includes a tag placed in the slick under the ice, and GRID tags located on the ice that communicate via satellite through cloud infrastructure to the user interface. The above-ice tags are designed with spikes to attach to an ice floe and send periodic "pings" to report its geographic location and are anchored to the ice surface either manually or by dropping them from an aircraft. Locations of the devices are transmitted via satellite and can be displayed on a geographic information system that the operators can use to track movement of the ice and the oil slick beneath.

A Gavia Scientific autonomous underwater vehicle (AUV) dries on the deck of the Coast Guard Cutter *Healy* after recovery from a simulated oil in ice exercise in the Arctic in August 2014. The AUV is outfitted with sonar and radar sensors that allow responders to locate oil trapped beneath or within the ice. Coast Guard photo by Petty Officer 1st Class Shawn Eggert

Preparedness Planning Tools

BSEE's technological advancements also extend to the preparedness planning process with the development of three new "response system calculators" that estimate the oil removal potential of various types of response equipment. Since the 1990s, planners have used an oversimplified calculation focused on the maximum fluid recovery rates of available mechanical recovery skimmers. This calculation can be very inaccurate and does not consider oil encounter rates or other recovery system limitations. BSEE research evaluated all the factors that can affect the oil removal process and developed new planning tools to better estimate the potential capabilities of mechanical recovery, in situ burning, and dispersant response systems. These tools enable oil spill removal organizations to calculate how changes to a removal system can affect its overall capacity, and to better optimize their equipment inventories to match their planning needs. The Coast Guard is also developing a similar tool for estimating the removal potential of skimming systems operating in inland waters or rivers.

Technology Readiness

BSEE implemented a technology readiness level (TRL) metric to measure the progress of oil spill response technology and equipment developments from concept to commercialization. Adopted from NASA, this metric enables BSEE and other researchers to organize their research portfolios to encourage continuous advancements in technologies. It also provides a way for oil spill preparedness planners to know what technologies are ready for use in spill responses.

BSEE Oil Spill Response Technology Readiness Levels

TRL	Brief Description	Detailed Description
Technology Research and Development		
1	Basic principles observed or reported	Basic scientific exploration of relevant biology, chemistry, or physics begins and leads to enhanced knowledge for a relevant subject area.
2	Technology concept and speculative application formulated	The technology concept has been formulated and the potential broad class of spill response applications has been identified. Preliminary data from experiments or a computational model has been generated.
3	Technology proof of concept demonstrated	The proof of concept of the relevant biological, chemical, or physical, principles or techniques has been shown and reproduced on a relevant hydrocarbon product on a laboratory scale or model data generated.
Technology Advancement, Development, and Demonstration		
4	Technology prototype demonstrated in laboratory environment or model scenario	A prototype of the technology has been demonstrated in a laboratory environment. The prototype is advanced over the proof of concept either by hardware, software, and/or with reproducible data generated for specific scenarios on relevant hydrocarbon products or applications.
5	Technology prototype tested in relevant environments	A prototype of the technology with increased fidelity has been demonstrated in relevant environments. Accuracy and precision of the results have been documented. Model data validated with experiments.
6	Full scale prototype demonstrated in relevant environments	A full scale prototype has been demonstrated in relevant environments. The prototype is advanced over the proof of concept either in component integration, fidelity of the hardware or software, or with experimental or model data generated for specific scenarios. Regulatory approvals and industry standards are considered.
Technology Implementation in Operational Environments		
7	Integrated technology tested on a large scale or in open water	Full scale prototype integrated into intended operating system and tested on a simulated spill, in a relevant environment, in open water, or in a real spill environment. Intended operator is identified and system has been beta tested by others. Data analysis or interpretation becomes automated.
8	Final integrated system tested in real or relevant environment	The final integrated system has been proven to function in real or relevant environment with performance and operational specifications and limitations defined. Reproducible data to support claims has been documented in publically available publications. The technology is ready for spills of opportunity and field use.
Technology Deployment in Real Spill Environment		
9	Final integrated system deployed in real spill environment	Technology has been successfully operated on an intentional or unintentional spill in a real spill environment by the intended operator and meets the technology claims. Training, supporting documents including a user manual and any independent verification or certifications are included.

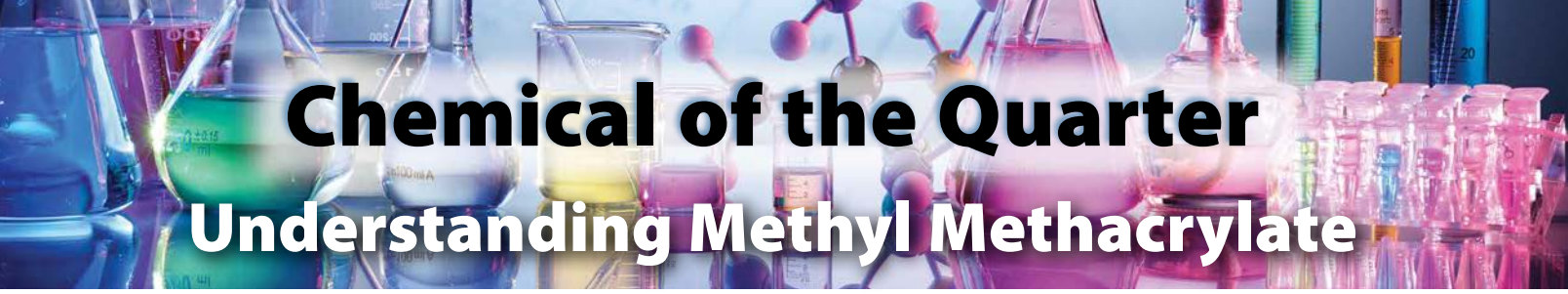
The Bureau of Safety and Environmental Enforcement implemented a Technology Readiness Level metric that helps measure the progress of oil spill response technology and equipment developments from concept to commercialization. *Proceedings* graphic, based on BSEE information

Conclusion

BSEE and the other Interagency Coordinating Committee on Oil Pollution Research agencies are continuing to tackle the research priorities identified in the 2015 R&T plan. Recent BSEE research addressed several of the research priorities and advanced the state of the art of oil spill response technology. These advancements will provide responders with additional tools to ensure greater recovery of oil during spills.

About the author:

Mr. Bill Vocke is a senior advisor in BSEE's Oil Spill Preparedness Division (OSPD). Previously, he served as the executive director of Interagency Coordinating Committee on Oil Pollution Research (ICCOPR). There he oversaw development of the Research and Technology plan and facilitated research coordination and collaborations among the member agencies and with researchers in industry, academia, and the private sector throughout the United States and internationally. He currently provides advice to OSPD and ICCOPR on research policy and programs.



Chemical of the Quarter

Understanding Methyl Methacrylate

by Andrew J. Eckles
Hazardous Materials Division
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What is it?

Methyl methacrylate is a monomer used in large volumes for production of poly (methyl methacrylate), or PMMA, which is commonly referred to by the trade name of Plexiglass. It is also a component of many other materials from adhesives, resins, and plastics to car paints, toners inks, oil additives, and dental and medical products. Currently, around 75 percent of the world's production is used in the manufacture of PMMA.[1] The formula for methyl methacrylate is (CH_2=C(CH_3)$COOCH_3$). The International Union of Pure and Applied Chemistry name is methyl 2-methylprop-2enoate. It is also referred to as methacrylic acid methyl ester.

An inhibitor is required to prevent polymerization during storage and transport. The most common inhibitor used for this material is the methyl ether of hydroquinone. Hydroquinone is used less often due to color problems.

What volumes are produced?

The global market for methyl methacrylate is increasing significantly, while supply continues to be constrained due to production shutdowns and operational issues at aging production facilities.[2]

Why should I care?

➤ *How is it shipped?*

Methyl methacrylate is shipped under United Nation (UN) number: UN1247 METHYL METHACRYLATE MONOMER, STABILIZED, Class 3, Packing Group II. It is shipped in drums or in bulk by rail car, tanker, or barge. The polymerization reaction is highly exothermic so this material must always be shipped with sufficient concentration of inhibitor and must not be exposed to excessive heat.

➤ *Health Concerns*

Methyl methacrylate is irritating to the skin, eyes, and mucous membranes in humans. An allergic response to dermal exposure may develop.

Respiratory effects have been reported in humans following acute (short-term) and chronic (long-term) inhalation exposures. Neurological symptoms have also been reported in humans following acute exposure to methyl methacrylate. It is a sensitizing agent and the Occupational Safety and Health Administration (OSHA) considers it a potential cancer hazard. The OSHA legal airborne permissible exposure limit is 100 ppm average of an 8-hour work shift.

➤ *Fire or explosion concerns?*

This material is stable at room temperature and atmospheric pressure, but shipping containers can explode if runaway polymerization is initiated. The toxic vapors given off in a fire or explosion include monomer vapors, carbon dioxide, and carbon monoxide. The closed cup flash point is 10 C and the explosive limits in air are 2.1 percent to 12.5 percent.

What is the Coast Guard doing about it?

The Coast Guard enforces maritime transportation requirements for hazardous materials such as methyl methacrylate. Regulations found in 49 CFR Subchapter C are in place to minimize the risks associated with transporting packaged hazardous materials and include requirements for marking, labeling, and vessel transportation. The regulations found in 46 CFR Subchapter O include safety requirements for transporting this chemical in bulk by barge or ship. 46 CFR 150 in Subchapter O lists compatibility of cargoes. Methyl methacrylate is in compatibility group 14, acrylates.

About the author:

Andrew J. Eckles is a chemical engineer in the Hazardous Materials Division in the Office of Design and Engineering Standards with the United States Coast Guard. His primary responsibilities are in the areas of hazardous bulk liquids shipment by water. He serves as the subject matter expert for rulemaking projects harmonizing international and domestic packaged hazardous materials regulations. He earned his masters of science in chemical engineering at the Georgia Institute of Technology, and gained his experience with acrylic monomers while plant manager of a monomer processing facility.

Endnotes:

1. The Methacrylate Producers Association, Inc. online, accessed January 7, 2020. mpusa.org
2. IHS Markit, Challenges in the Global Methyl Methacrylate Market, accessed January 7, 2020. https://ihsmarkit.com/research-analysis/challenges-in-the-global-methyl-methacrylate-market.html

Nautical Engineering Queries

Prepared by NMC Engineering Examination Team

1. Which of the following represents a characteristic of an ungrounded system?

A. Accidental contact between one line and ground does not cause an outage.
B. Double ground faults on different phases will not cause an outage.
C. Ground detection systems are unnecessary.
D. Accidental contact between one line and ground will always cause an outage.

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2. The heat gained per pound of refrigerant in the evaporator is known as what?

A. Latent heat of vaporization
B. Sensible heat
C. Refrigerating effect
D. Specific volume

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3. The midships house of your ship is constructed with an interior stair tower from the main deck to the bridge. According to 46 CFR Part 92.07, under which of the circumstances listed may the doors from each deck to the stair tower be kept open when underway?

A. They are to be kept closed at all times.
B. They may be kept open if the ventilation or air conditioning system is shut down.
C. They may be kept open if they can be automatically closed from the bridge.
D. They can be kept open if the Muster List ("Station Bill") has personnel designated to close them in case of fire.

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4. If live steam is supplied directly to the tank heating coils, the collected drains in the 'clean' section of the contaminated drain inspection tank are removed directly to the _____ .

A. main and/or auxiliary condenser
B. atmospheric drain tank
C. deaerating feedwater heater
D. makeup feedwater tank

Engineering Answers

1. A. Accidental contact between one line and ground does not cause an outage — **Correct answer.** "The most significant advantage of an ungrounded system is better service continuity. Accidental contact between one line and ground will not trip a breaker or blow a fuse, and thus will not cause an outage."

B. Double ground faults on different phases will not cause an outage. — Incorrect

C. Ground detection systems are unnecessary. — Incorrect

D. Accidental contact between one line and ground will always cause an outage. — Incorrect

Reference: Operation, Testing, and Preventative Maintenance of Electrical Power Apparatus, *Hubert, page 606*

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2. A. Latent heat of vaporization — Incorrect

B. Sensible heat — Incorrect

C. Refrigerating effect — **Correct answer.** "The quantity of heat that each unit mass of refrigerant absorbs from the refrigerated space is known as the refrigerating effect."

D. Specific volume — Incorrect

Reference: Principles of Refrigeration, 2nd Ed., *Dossat, page 116*

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3. A. They are to be kept closed at all times. — Incorrect

B. They may be kept open if the ventilation or air conditioning system is shut down. — Incorrect

C. They may be kept open if they can be automatically closed from the bridge. — **Correct answer**

D. They can be kept open if the Muster List ("Station Bill") has personnel designated to close them in case of fire. — Incorrect

Reference: 46 CFR 92 07-10(d)(4)

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4. A. Main and/or auxiliary condenser — Incorrect

B. Atmospheric drain tank — **Correct answer.** "The atmospheric drain tank receives drains from the fuel oil inspection tank."

C. Deaerating feedwater heater — Incorrect

D. Makeup feedwater tank — Incorrect

Reference: Modern Marine Engineer's Manual, Vol 1., *Osbourne, page 7-37*

Nautical Deck Queries

Questions

Prepared by NMC Engineering Examination Team

1. Both international and inland: Which equipment, to generate fog signals, is required on a vessel 20 meters in length?

A. Whistle and bell
B. Whistle, bell, and gong
C. Whistle only
D. Bell only

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2. Which of the following aspects of a flooded space will most adversely affect transverse stability if it is subject to free communication?

A. Open to the sea above and below the waterline
B. Off-center
C. Completely flooded
D. On the centerline

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3. Your longitude is 179°59'W. The LMT at this longitude is 23h 56m on the 4th day of the month. Six minutes later, your position is 179°59'E longitude. What is your LMT and date?

A. 00h 02m on the 4th
B. 23h 50m on the 5th
C. 00h 02m on the 5th
D. 00h 02m on the 6th

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4. What provides little or no indication that a vessel is dragging anchor?

A. Changing bearings to distant fixed objects abeam
B. Vibrations felt by placing a hand on the anchor chain
C. Drift lead with the line leading perpendicular to the centerline
D. Increasing radar range to a fixed object ahead

1. A. Whistle and bell

Correct answer. "A vessel of 12 meters or more in length shall be provided with a whistle and a bell and a vessel of 100 meters or more in length shall, in addition, be provided with a gong, the tone and sound of which cannot be confused with that of the bell. The whistle, bell, and gong shall comply with the specifications in Annex III to these rules. The bell, gong, or both may be replaced by other equipment having the same respective sound characteristics provided that manual sounding of the prescribed signals shall always be possible."

B. Whistle, bell, and gong — Incorrect

C. Whistle only — Incorrect

D. Bell only — Incorrect

Reference: International and Inland Rule 33(a)

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2. A. Open to the sea above and below the waterline — Incorrect

B. Off-center

Correct answer. "Note that the most important factor contributing to free communication loss of stability is the distance from the centerline of the ship to the centerline of the flooded compartment."

C. Completely flooded — Incorrect

D. On the centerline — Incorrect

Reference: Stability and Trim for the Ship's Officer, *George, 4th Ed., page 284*

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3. A. 00h 02m on the 4th — Incorrect

B. 23h 50m on the 5th — Incorrect

C. 00h 02m on the 5th — Incorrect

D. 00h 02m on the 6th

Correct answer. "At any instant the date immediately to the west of the date line (east longitude) is 1 day later than the date immediately to the east of the line." In navigational computations this can also be accomplished by converting local time to Greenwich time and then convert this to local time at the new location by applying zone description (sign reversed).

Reference: Bowditch, *2002 Ed., page 278*

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4. A. Changing bearings to distant fixed objects abeam — Incorrect

B. Vibrations felt by placing a hand on the anchor chain — Incorrect

C. Drift lead with the line leading perpendicular to the centerline

Correct answer. "A drift lead is useful although not always to be trusted. This is a heavy lead kept on the bottom, with its line made fast, but left hanging with considerable slack, to some place well forward that is convenient for observation. As long as the ship is fairly steady, a drift lead will usually give notice of dragging, but if it sheers about considerably, it cannot be relied upon."

D. Increasing radar range to a fixed object ahead — Incorrect

Reference: Knight's Modern Seamanship, *Noel, 17 Ed., page 285*

In the News: Fire on Coast Guard Cutter *Waesche*

A fire team on board Coast Guard Cutter *Waesche* cools down bulkheads in the hangar during a fire in the Western Pacific region on September 19, 2020. The *Waesche* was on a scheduled deployment in the U.S. Seventh Fleet's area of operations. The fire was quickly contained and five crew members had minor injuries requiring onboard medical treatment. Coast Guard photo by Petty Officer 3rd Class Aidan Cooney

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Operations to mitigate the effects of the April 20, 2010, *Deepwater Horizon* catastrophe in the Gulf of Mexico continued for more than 85 days, until the well was capped on July 15. Coast Guard photo by LCDR Rob Wyman