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Proceedings

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March-April, 1993 *Vol. 50, No 2*

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Cover photo

The Queen Elizabeth 2 is drydocked in Boston, Massachusetts, after touching bottom in Martha's Vineyard Sound on August 7, 1992.
Photo by CWO Edward Madura

World famous liner touches bottom

By PA3 Amy J. Gaskill

Queen Elizabeth 2 strikes uncharted object in Martha's Vineyard Sound

On Friday, August 7, 1992, the QE2 is on the last lap of a five-day excursion from New York City to St. John, New Brunswick, and back via Bar Harbor, Maine. The 13-story, 937-foot cruise liner anchors off the northeastern tip of Martha's Vineyard for passengers to go ashore to shop and see the sights. They return seven hours later and the ship gets underway for New York to make its scheduled 8 a.m., Saturday, arrival.

Two hours after weighing anchor at Martha's Vineyard, the QE2's 2,819 crew and passengers startle under heavy vibrations. It is immediately apparent that the vessel had touched bottom.

The *QE2*'s master, CAPT Robin A. Woodall thought the engines had failed when equipment on the bridge started to rattle. "Grounding was the last thing that crossed my mind," he said, "I knew there was sufficient water in that area for that ship."

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QE2 in drydock in Boston. *Photo by William P. Quinn, Orleans, MA.*

The QE2 girded by containment boom. *Photo courtesy of William P. Quinn.*

Continued from page 1

When CAPT Woodall felt a second set of vibrations, he ordered all engines stopped. He immediately contacted the Coast Guard in Woods Hole, and was directed to anchor.

The Coast Guard cutter *Bittersweet* raced to the wounded liner to head off possible marine pollution in the event fuel tanks had been ruptured. Small boats were deployed to spread containment boom in case oil leaked from what was later found to be six underwater gashes, one of which was 74 feet long.

Divers went down at noon on Saturday to assess damage and to determine whether a tank holding 38,500 gallons of number two fuel oil was ruptured. Miraculously, it remained intact with gashes on both sides.

At 1:30 Saturday afternoon, the 1,500 passengers departed on ferries bound for Newport, Rhode Island. The *QE2* remained at anchor until Monday when it was escorted by tugs to the Black Falcon terminal in South Boston, Massachusetts. There it waited until the nearby General Ship drydock -- one of few on the East Coast capable of handling so large a vessel -- was prepared to receive it.

In the meantime, the Coast Guard, amid the glare of intense world-wide publicity, prepared for a joint investigation of the accident with the National Transportation Safety Board. The *QE2* officers, an American pilot who was on board and representatives of the National Oceanic and Atmospheric Administration (NOAA) were included in the investigation.

When the incident occurred, the ship was navigating by NOAA charts. A NOAA survey ship was deployed to the location of the grounding and conducted its own investigation with divers and instruments. Its preliminary finding was that the liner hit an uncharted obstruction.

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QE2 is patched up

By LCDR Kevin Tone

Damage

The *QE2* was drydocked in Boston at the General Ship Corporation facility on August 13. A damage survey was conducted by Coast Guard inspectors from Marine Safety Office (MSO) Boston, accompanied by representatives from Cunard Lines (the vessel's owners), Lloyds Register of Shipping (the vessel's classification society) and the United Kingdom Department of Transport.

Extensive damage was found on the ship's bottom plating, centering along the keel. The damaged area extended about 500 feet from the stem to past amidship.

Many of the bottom shell plates were set in, some as much as two feet with fractures through some of the more severe insets. Many internal structural members including fuel and ballast tanks were severely damaged. One fuel tank was leaking.

The Officer in Charge Marine Inspection (OCMI) from MSO Boston requested a repair proposal be submitted for evaluation. On August 16, the Cunard Lines surrendered the *QE2*'s Control Verification Certificate until permanent repairs could be made.

Repairs

As the *QE2* was committed to an extremely busy international schedule, repairs had to be made as quickly as possible. After evaluating the extent of repairs needed to reinstate the vessel into passenger service, Cunard Lines decided to have the repairs done in two stages. The General Ship Corporation would make temporary repairs to enable the ship to travel to Germany, where permanent repairs would be completed in the Bloom and Voss Shipyard.

The OCMI supervised the temporary repairs, along with Cunard Lines and Lloyds Register of Shipping. This repair work was conducted starting on August 17 through September 1, when the *QE2* left the port of Boston.

Three-quarter inch doubler plates were welded over the one and one-half inch bottom plate where damaged. All fractures and cracks were stop drilled and welded tight. Internally, tripping brackets were installed to shore up damaged floors, and foam was inserted at watertight

(Left) Hand indicates width of gash in the hull.
(Below) Inspector checks hull damage on QE2.

bulkheads and between the temporary doubler plates and bottom hull plating. Finally, several sections of bilge keel on the port side were cropped out and replaced.

Coast Guard inspectors witnessed the satisfactory installation and fitting of the temporary doubler plates and bilge keel plates. They also examined 16 double-bottom voids for watertightness and over saw testing of all repairs.

On September 1, the *QE2* sailed to Germany for permanent repairs. Upon completion in October, the vessel returned to the United States where Coast Guard inspectors from the Marine Inspection Office in New York conducted a control verification examination. The ocean liner was then reinstated for United States passenger service.

Summary

The prompt efficient manner in which all repairs were completed reflects the cooperative spirit among the vessel's owner, the contractor and vessel regulators including Lloyds Register of Shipping and the British Department of Transport. Because of this outstanding cooperation, the high marine safety standards set by the International Convention for the Safety of Life at Sea (SOLAS) were upheld.

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Thirteen fishing vessels mugged in Typhoon Alley

By LT Vance Bennett, LT Don Noviello and BM1 Dan Derwey

At about 6 p.m. on August 28, 1992, the eye of Typhoon Omar passed directly over Guam. Winds of 150-miles-per-hour destroyed hundreds of buildings, left nearly 3,000 people homeless and knocked out a large portion of Guam's electrical distribution system, which rendered virtually the entire island powerless. Consequently, thousands of people were without potable water.

MSO observations

At first light, the next day, members of MSO Guam surveyed the port area and found several surprises. The eye passed over Apra Harbor, causing widespread damage to the port and many moored vessels. Two 16,000-ton Navy supply ships were run hard aground and a large sailboat was pushed up on a breakwater. Several fishing boats were sunk, capsized and/or broken completely in half -- one down the centerline.

The MSO observers also found that one of the Navy supply ships had its mooring lines intact and at the end of each line was a piece of the dock. Two purse seiners, that had been moored together to a buoy at the north side of the harbor, were located at the harbor's south end, a quarter of a mile apart. They had run aground three times in three different locations before coming to rest, according to crew members.

Salvage workers tackle remains of a fishing vessel that was sliced in half.

Clean-up and salvage

Coast Guard officers immediately began prodding shell-shocked vessels owners and agents to begin salvage and clean-up efforts on sunken vessels that were discharging fuel and lubricating oils into Apra Harbor. Shortly, clean-up and salvage contractors started work. Within 24 hours after the storm, MSO Guam had an effective clean-up underway.

Several storm-related problems surfaced after clean-up and salvage efforts began, including the widespread locations of damaged or destroyed vessels. The vessels, all 50-to-70-foot foreign-flagged longliners, were sunk, awash or capsized at four different berths.

The salvage contractor, assisted by two local tug companies, towed the damaged vessels to a berth in the port that provided a natural collection area for floating oil, and offered easy access for the heavy equipment needed for salvaging. As the tugs towed vessels away, they often found other boats sunk underneath.

Identification

The next problem involved identifying the vessels and contacting responsible parties. Some crews were reported to have fled at the height of the typhoon and were never seen again. Few of those around spoke English.

Many of the vessels were so damaged that their markings were illegible. Some of them were broken in half, with the stern at one berth and the bow at another. It was extremely time-consuming to match "body parts." Also two vessels which had broken in half and sunk on top of each other, had the same name.

After several days of working with crews and agents to identify vessel parts, the names and owners of all 13 vessels were matched.

Clean-up obstacles

In any spill, worker safety and health is a prime concern. This spill was no different. The water around the sunken vessels was covered with debris, diesel fuel, lube oil, rotting fish and who knows what else. The MSO asked the Guam Occupational Safety and Health Administration (GOSHA) to send an official to evaluate the hazards and recommend protective action.

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After three days work, the salvage contractor had collected 13 longliners.

Clean-up crews tie fishing vessel remains to the side of a merchant ship to tow them to a collection area.

Continued from page 5

The GOSHA representative and Pacific Strike Team members, who had recently arrived, recommended that clean-up workers be required to wear gloves, respirators and protective coveralls. The high heat and humidity made wearing this gear uncomfortable, and initially some of the workers resisted. The requirement was carried out and most of the workers complied.

Once the collection area for the 13 damaged vessels was surrounded with containment boom, the task remained to remove the tons of debris, which included pieces of boats, fishing gear, dead fish and various personal effects. The salvage contractor had to remove the larger pieces to get to the sunken vessels, and the clean-up contractor had to remove most of the debris before skimming the floating oil. (Both contractors had an added incentive in that it was rumored that vessel crews had left large amounts of cash on board the abandoned boats.)

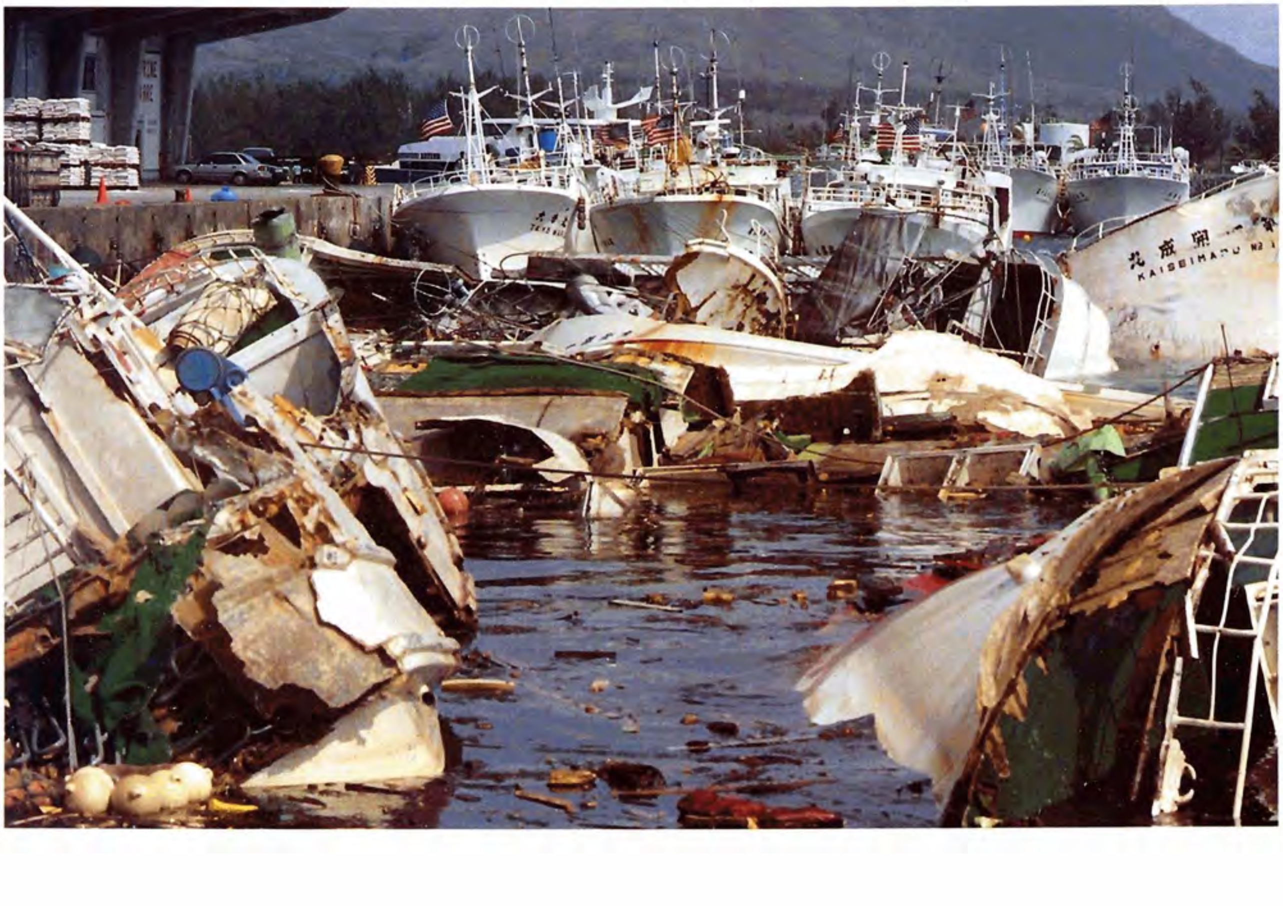
Removing the debris proved to be the most time-consuming and labor intensive part of the whole job. Several removal methods were tried in vain before a piece of a chainlink fence was found. Workers fastened each corner of the fence to cable and attached it to a crane. They then lowered it into the water and tossed debris into the "net." When it was filled, the crane would raise it and dump the contents into a dumpster.

Before long several dumpsters were filled with debris -- more than the local landfill could accept. The MSO, the local environmental protection agency and the contractor decided their only solution was to burn it. The EPA monitored the burning.

Large pieces of debris, such as what was left of the 13 vessels, would not fit in the dumpster. An emergency ocean dumping permit was granted and the vessel owners were permitted to sink the remains of their boats, instead of removing them from the water.

Sinking craft made of wood or foam-cored fiberglass presented another problem -- they would not sink. The salvage contractor tried ramming the hulks, shooting them with an AK-47 and setting fire to them. The hulks, however, were very reluctant to sink and, over the next few weeks, the Coast Guard received several reports of sunken vessels from passing ships as the hulks surfaced in all sorts of odd locations.

The remains of nine of the 13 wrecked fishing vessels lie in collection area.



Clean-up payment problems

Getting the responsible parties to fulfill their obligations proved to be the biggest headache of all.

The Japanese-owned vessels were adequately insured and all clean-up costs were paid in advance, enabling the contractor to meet this payroll and purchase supplies.

The owners of the Taiwanese boats, however, were uninsured and their agent disavowed any connection to the remains of the seven longliners. The clean-up and salvage contractors stated they would finish work on the Japanese vessels, but would go no further on the others without some guarantee of payment.

It would be extremely difficult to justify charging the salvaging costs to the Pollution Fund, so innovative methods were needed to assure the contractors of continued revenue.

MSO personnel contacted local representatives of the Taiwan government to discuss potential ramifications of the incident. This was a delicate process, because there are no diplomatic relations between the United States and the Republic of China.

The Taiwanese representatives soon realized, however, that the prospect of the seven sunken vessels tying up the port of Guam could generate negative public opinion against their country and even more negative action on the part of the Guam government. After conferring with superiors in Taipei, the representatives proffered a guarantee of continued funding for any necessary clean-up and salvage operations.

With that to fall back on, MSO personnel decided to play hardball with the recalcitrant responsible parties. They told the agent for the Taiwanese boats that the Pollution Fund would pay for clean-up operations, but not for any salvage work. Moreover, the National Pollution Fund Center would make every effort to recover the clean-up costs from all individuals connected with the seven vessels.

The agent's attorney advised him that the Coast Guard was not in the business of giving disaster relief grants or low interest loans, and that, sooner or later, the Taiwanese would have to cover the costs. Under pressure from the port of Guam to remove the sunken boats, the agent decided to pay for the clean-up and salvage work.

Area committee's role

Much of the success of this operation is due to months of work with the local area committee. Under Oil Pollution Act of 1990 amendments to the Federal Water Pollution Control Act, federal, state and local environmental protection agencies are required to form "area committees" to develop comprehensive area contingency plans in which each agency has an ownership interest. These committees must directly confront and resolve controversial issues early in the planning process so that the response community can aggressively manage a crisis when the oil hits the water, instead of being delayed by arduous decision-making. (See the May-June, 1992 issue of *Proceedings*, pages 36 to 39.)

For the first time on Guam, government agencies allowed a responsible party to bury oiled debris on site. They also expedited the approval of a request for an ocean dumping permit to allow for the fast, cost-effective disposal of the wrecked vessels. The Guam Occupational Health and Safety Agency acted immediately to protect the response workers, and the Guam Environmental Protection Agency was a key player in every major decision. None of this would have happened had not the area committee discussed the issues in depth and reached a consensus well before Typhoon Omar hit.

Conclusion

MSO Guam has had the dubious distinction of having a major response both before and after the area committees got started. In this response, the committee greatly expedited decision-making, enabling member agencies to make informed decisions and bring their resources to bear on appropriate issues in a timely fashion.

When this response is compared to those in the years B.C. (before committee), there is no doubt that there is a great improvement.

BM3 Jay Kaufman took the photos accompanying this article.

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Rhode Island capsizes in Pennsylvania

By LT James H. McDowell

On October 1, 1992, the dredge barge Rhode Island capsized in Lake Erie, about five miles northwest of Erie, Pennsylvania. The dredge had up to 3,500 gallons of diesel fuel and lube oil aboard.

The obvious solution was to tow the dredge to a dock in the port of Erie and attempt to right it. However, the port is located in Presque Isle Bay, a state park and an ecologically sensitive area.

The open communication and cooperation between the Coast Guard and the marine industry led to a successful resolution of what could have been a tragic marine casualty.

Rhode Island

The dredge was the second of two barges being towed astern by the tug *Ohio* from Buffalo, New York, to Cleveland, Ohio. It is a 76- by 35-foot sectional barge, designed to be dismantled and transported by truck over the highway. It did not have a load line.

The dredge is formed by five pontoons, two ballast/fuel pontoons on each side with an engineroom pontoon in the center. A deck house is bolted over the center pontoon with an upper "lever" room, from which the dredge is operated. A "snorkle" consisting of a dredge pipe configured in an "S" shape, together with its associated steel "A" frame and hydraulics, is at the bow.

Immediate situation

When the tug operator discovered that the dredge had capsized, he first tried to keep it from sinking. There was very sketchy information on the height of the on-deck structures, which now extended down from the capsized dredge and could snag or hang up during the tow into port.

Charts of Presque Isle Bay indicated a power cable crossed the entrance to the port, which was a single narrow channel.

Concerns for preventing the loss of the *Rhode Island* dredge had to balance the obligation to protect the sensitive area of Presque Isle and also to keep the entrance channel open. The *Fastness*, a 423-foot ocean-going ship docked in Erie, was scheduled to depart the next day.

Before the dredge could enter the bay, the towing company had to assure the Coast Guard that it could be done safely. First the towing company had to determine the position and height of the on-deck structures, and the amount of fuel on board, and be prepared for a possible pollution response.

Preparations

The Cleveland towing company assembled a team of experts to develop a plan to safely tow the *Rhode Island* through the sensitive area and started staging pollution response equipment at the scene. Coast Guard MSO Buffalo sent an investigation team to provide on-scene reports and to serve as a communications link with the tug's crew and the towing company's team.

The towing company faxed drawings of the *Rhode Island* to the MSO. However, the dredge had been modified several times, and it was not clear whether the drawings represented its present configuration. The crew of the tug did not have access to the drawings and could not confirm the height of the on-deck structures.

A diver was hired to measure the vertical clearance of the on-deck structures. His calculations, however, did not agree with the drawings. But, after taking three measurements, his

The capsized dredge barge and the deck barge are towed in tandem by the tug, Ohio. *Photo by MK2 David W. Dombkowski.*

(Left) A diver (center) attached suction and vent hoses to remove fuel from the capsized dredge barge, Rhode Island.

(Below) The diver prepares to reenter the water to unhitch the hoses from the barge after defueling.

Photos by LT James H. McDowell.

assessment was accepted as more accurate than the drawings. According to the diver, it appeared that the dredge could negotiate the entrance channel with the structures clearing the bottom, if the reported channel depths were accurate.

If these channel depths were in error, the dredge could touch ground as it was towed in. It would block the channel, and also take a good beating if the weather deteriorated as was predicted. (Four-foot seas and 15-knot winds had been forecast.)

Coast Guard personnel took fathometer and lead lines readings, and confirmed the channel depths. Then the weather and the condition of the dredge became the important factors.

A Coast Guard investigator reported that the *Rhode Island* appeared to have very little reserve buoyancy. Taking this and the pending bad weather into consideration, it seemed that the potential for a pollution incident was greater if the dredge remained in the lake outside the protected waters of Presque Isle Bay.

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Once the necessary response equipment was staged at the dock, the tug *Ohio* was permitted to bring the dredge into port, assisted by another tug. The two-mile transit took more than an hour.

As the tow approached the dock, the dredge snagged about 100 feet away. The tugs pushed it free, but the bow grounded again a few feet from the dock. The tugs were able to push the stern into the dock and tie it off, but the bow appeared to be hard aground. They did not attempt to push it free.

Fuel removal

The next day, the focus shifted to removing the fuel in preparation for righting the barge. The operator brought in a pollution-response company to offload the fuel into a "super sucker" vacuum truck. Working with drawings and directed by the tug crew, a diver attached suction hoses to vent lines. He also attached air return hoses to the fuel fill lines to prevent the tanks from collapsing as the fuel was removed.

Once the vacuum truck took suction, fuel began to flow, but there was no air returning to the tanks. The operation was halted a few times to prevent the tanks from collapsing. Eventually, the vacuum truck created sufficient suction to draw air into the tanks. In about two hours, 3,420 gallons of fuel was removed from the dredge. The operator's best estimate of the amount of fuel on board at the time of the grounding was between 3,400 and 3,450 gallons.

Righting the barge

Now with the threat of pollution significantly reduced, the focus again shifted to righting the barge. A naval architect was hired by the operator to develop a plan, which was submitted to the MSO for review, and, in turn, to the Atlantic Strike Team and the Navy Supervisor of Salvage. The architect incorporated modifications recommended by both of the latter, and the operator began to stage equipment to right the barge.

All tanks and voids were tested for flammable vapors before any welding was done on the dredge. Five "I" beams were welded crosswise along the bottom of the dredge for rigidity. Pad-eyes were welded to the ends of these beams so that cables could be attached.

Cables were led from the outboard pad-eyes and tied off on the dock to act as a fulcrum for the dredge. A second pair of cables were attached to pad-eyes on the dock and pulled under the dredge to two tugs about 100 yards away. The tugs would haul on these cables to roll the barge upright. A third pair of cables were attached to the stern and the bow, and led to a 300-ton stiff arm crane on the dock.

After two days of preparation, the crane started to lift and retract its arm, the tugs took a strain on the cable, and the dredge pivoted on the cables attached to the dock. The *Rhode Island* was righted in about an hour.

Conclusion

Nine days after it capsized, the dredge was upright and sufficiently stable for investigators and surveyors to assess its condition and try to determine why it capsized.

A definite cause was not established, but it is safe to assume that the following factors may have combined to bring about the capsizing: the lack of residual stability and watertight integrity, flooding of the engineroom through non-weathertight openings, shifting of loose gear, the towing speed and the distance of the tow astern.

On October 22, after a few minor repairs, the *Rhode Island* was towed to Cleveland. This was done in fair weather with seas less than three feet and winds under 15 knots. Also, the dredge was towed as close to the tug as the master considered safe, the tow speed was kept under four knots and a constant lookout on the dredge was maintained throughout the voyage.

Throughout the three weeks of the operation, the Coast Guard and the towing company tried to protect the sensitive environment of Presque Isle Bay while attempting to salvage the dredge. The key to the success of the operation was the close cooperation and open communications between the towing company in Cleveland and the MSO in Buffalo.

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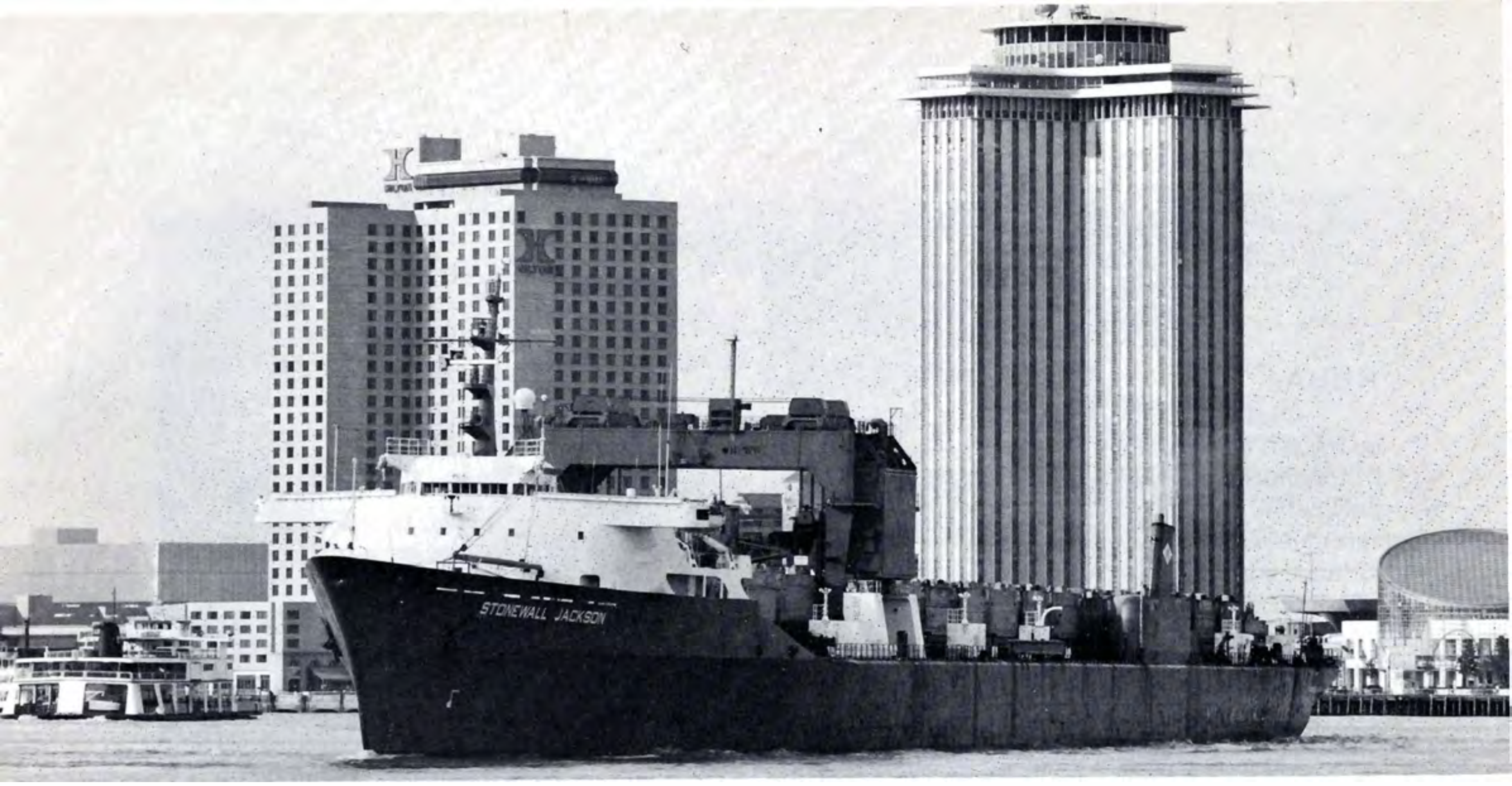

Stonewall Jackson passes New Orleans. Photo courtesy of Waterman Steamship Corporation.

Questions raised by engineroom fire

By LCDR Roger K. Butturini

On February 9, 1991, an engineroom fire erupted on the LASH ship Stonewall Jackson, *while cruising in the Indian Ocean between Singapore and the Suez Canal. Six members of the engine department lost their lives.*

A lack of first-hand knowledge about the fire made determining the cause speculative. It possibly ignited when lubricating oil circulating through an unsecured oil strainer on the steam-powered generator sprayed onto hot, uninsulated steam piping. The fire was short-lived, but very intense.

The engineroom filled with thick, oily smoke almost immediately, trapping crew members in a suffocating cloud. A class 3 sliding watertight door between the shaft alley and the lower engineroom level mysteriously closed on its own during the fire and could not be reopened.

Efforts to rescue the crew members in the engineroom were hampered by extreme heat and impenetrable smoke.

A detailed investigation of the accident and subsequent evaluation at Coast Guard headquarters revealed alarming similarities to other recent shipboard fires, and safety considerations that may have hitherto gone unnoticed.

The major issues of the accident are:

(1) What can be done to prevent a similar occurrence?

(2) What can be done to make a similar accident more survivable?

(3) What steps can be taken to enhance crew rescue?

(4) What happened to the watertight door?

Cause

The major cause of engineroom fires is oil leakage. Protection against fire from leakage has been discussed at International Maritime Organization (IMO) conferences, where the United States delegation has proposed amending the Safety of Life at Sea (SOLAS) treaty to require double-jacketed fuel systems insulation of hot surfaces and spray shields for fuel oil piping.

Also, the American Society for Testing and Materials (ASTM) standard F 1138-88, *Standard Specification for Spray Shields for Mechanical Joints*, states, "The shields are intended for use around mechanical joints (flanged, bolted, unions, etc.) in liquid piping systems to prevent the impingement of flammable liquid on hot surfaces or fluids onto elec-

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trical switchboards and components resulting from a leak in the mechanical joint."

Both of these approaches will help reduce the incidence of engineroom fires.

EEBAs

Engineroom fires often produce copious quantities of thick black smoke. If smoke rapidly fills a multilevel engineroom, crew members may not be able to feel their way out before succumbing to smoke inhalation. A matter of minutes may be critical to survival.

Strategically placed Emergency Escape Breathing Apparatuses (EEBAs) could provide a quick, easy-to-operate source of breathing air, affording a crew member sufficient time to escape even when vision is impaired by the smoke.

The cost of EEBAs ranges from $500 to $1,500 -- a minimal amount compared to the potential life saving increase. They could be located at each ladder. Actually, the best and most economical locations for EEBAs would be where crew members are most likely to be working, which could be easily determined.

Human factors

Human factors are also a consideration in this case. The oil strainer was designed in a way that made it difficult to service. It was located almost five feet above the deck and a crew member had to reach more than 24 inches over piping to service the strainer. Consequently, one strainer of a tandem pair was only used when the other strainer was being cleaned.

ASTM standard F 1337, *Standard Practice for Human Engineering Programs for Ships and Marine Systems, Equipment and Facilities*, is being developed to prevent inconvenient and potentially dangerous equipment designs.

SCBAs

The *Stonewall Jackson* was equipped with the required number of Self-Contained Breathing Apparatuses (SCBAs) and spare bottles. Due to smoke, heat and problems with the sliding watertight door, however, the SCBAs were exhausted before the engineroom could be safely entered. Fortunately, the *Bremen Express*, a container ship was in the area and able to provide enough air bottles to search for survivors.

It has been a common occurrence during shipboard fires to run out of SCBAs. The need to improve SCBA capabilities aboard ship has been a topic of discussion at IMO, and has been publicized in connection with fires aboard the cruise ships, *Sovereign of the Seas* and *Britanis*.

In each case, the number of SOLAS-mandated SCBA bottles was quickly exhausted during efforts to investigate and put out the fire. In the case of the *Sovereign of the Seas*, shoreside fire fighters with their own SCBAs were on scene, a luxury not available at sea. As for the *Britanis*, the owners, luckily, had added ten extra SCBA bottles just prior to departure.

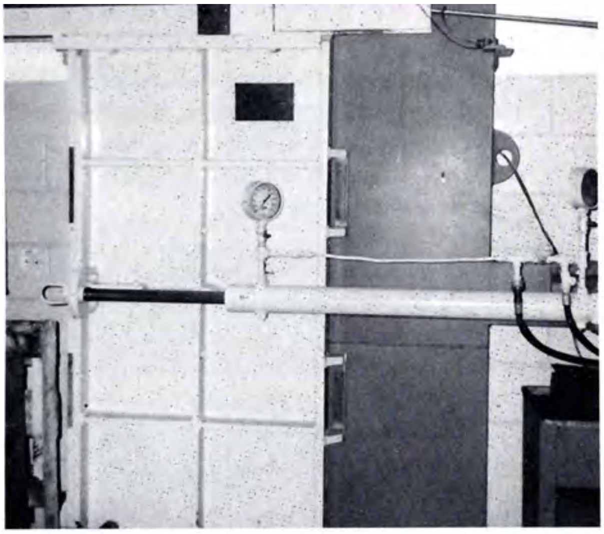
Accident records demonstrate that fire fighters expend their breathing air at alarmingly fast rates -- 10 to 15 minutes per bottle in the *Sovereign of the Seas* fire. Recognition of the need for improved SCBA capabilities prompted the IMO Fire Protection Subcommittee to adopt a resolution increasing their number aboard passenger ships. The use of additional equipment, such as air bottle refilling stations is also under consideration.

Door closing

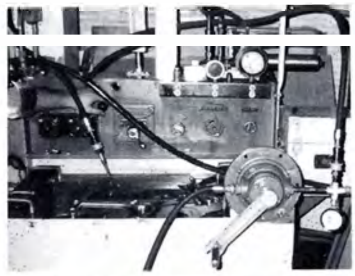
The circumstances surrounding the unexpected closing of the sliding watertight door and the difficulty in reopening it are complicated. The door had a typical electro-hydraulic control system for opening and closing, with a rotary piston-type hand pump. The hydraulic lines and electrical service led forward from the door inside the engineroom casing, across the overhead above the generator, then up several levels to the remote closing station and hydraulic oil sump about 50 feet above.

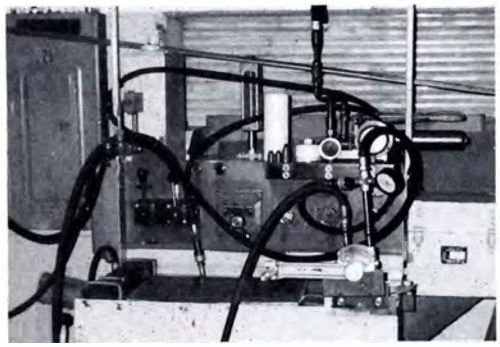
During the fire, electrical wiring was burned and the hydraulic tubing was heated. The expansion and vaporization of the fluid pressurized the hydraulic lines, and boiled hydraulic fluid out of the sump. The supply line to the watertight door had check valves on one end and the cylinder on the other. The rotary piston configuration did not allow the leakage that might be expected in a gear-type pump. With no other way of relief, the pressure actuated the cylinder, thus closing the door.

The watertight door could not be immediately reopened by the rescuers for several reasons. First, no hydraulic oil flow could be established because the lines were vapor locked. Second, the door and contiguous bulkheads had no fittings on which to attach equipment to force the door open. Third, with the operating pressure of the pilot-actuated relief valve set near the operating pressure of the door, the physical force



Mock-up of watertight door.





Door closing tests:

(Left) using gear pump,
(Below) using piston pump.

Photos by LCDR Roger K. Butturini.

needed to open the relief valve and dump the hydraulic fluid in the cylinder could not be reached.

The door was finally pried open by hand and the engineroom was searched for survivors. The door satisfactorily tested for proper operation afterwards.

Tests on a similar door were conducted by the Coast Guard and a door manufacturer to verify the theory explaining how the door closed. The tests demonstrated that a gear pump allows leakage of fluid when the hydraulic line is pressurized and the door will not close. When the test was repeated with a rotary piston pump, the door closed in less than 30 seconds with minimal external pressure applied to the hydraulic system.

A watertight door closing during a system failure is desirable. However, a door should always be capable of being opened, particularly during a rescue.

Several options exist which might have averted the problems with the door. All door designs could be required to include a method for manually relieving hydraulic pressure from either side for an added $1,000 per door. All doors could be required to use a pump to allow leakage when exposed to external pressure. Lastly, the concept of high risk areas could be invoked from SOLAS. Under this philosophy, designers would have to route services to vital equipment away from areas of high damage potential. For instance, hydraulic and electrical service might be routed to the shaft alley outside the engine casing or on the other side of the engineroom away from potential fire hazards.

Conclusion

Some of the issues raised by this accident are the subject of current initiatives to improve marine safety. IMO is considering double-jacketed fuel lines and spray shields to address the most common cause of engineroom fires, and has already taken action to improve fire fighting capabilities on passenger vessels.

EEBAs can drastically enhance survivability in accident-prone manned spaces, and are relatively inexpensive.

Resolving the watertight door problem illustrates the approach that designers and operators must consider more often. As safety factors give way to economic pressures, and the demands on smaller crews increase, ship safety must be looked at from a systems point of view. That is, the relationship between different aspects of ship operations must be taken into account. As this casualty points out, that process must protect vital equipment and systems from too much convenience and not enough good common sense.

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Casualty statistics 1989

Annually, the Coast Guard's Marine Investigation Division publishes a summary of commercial vessels and related personnel involved in various types of casualties. The primary source of this data is the CASMAIN data base for commercial vessel casualty information. The current data base has been continuously updated and improved upon since 1981.

Marine casualty reporting

The authority to require notification and reporting of a marine casualty is in 46 U.S.C. 6101. The authority to require reporting of casualties involving offshore oil and gas exploration, production and support activities is derived from the Outer Continental Shelf Lands Act, 43 U.S.C. 1331, et. seg.

The primary vehicle for reporting marine casualties is Form CG-2692, *"Report of Marine Accident, Injury or Death."* This form contains instructions and reporting criteria for casualties involving vessels, mobile offshore drilling units, outer continental shelf facilities and commercial diving as well as the personnel involved. Whenever possible, it is completed by personnel directly involved in the casualty, such as the vessel or facility owner or operator.

The completed form is submitted to a local field office, such as a marine safety office, marine safety detachment or marine inspection office, for verification, screening and possible further investigation. In the latter instance, the report is forwarded on to the Marine Investigation Division to undergo a thorough review and receive final approval. The data in the report is then processed and becomes part of the CASMAIN casualty data base.

Reported casualties

The following casualties must be reported:

- an accidental grounding;

- an intentional grounding which also meets the other criteria or creates a hazard to navigation, the environment, or vessel safety;

- loss of main propulsion or primary steering, or any associated component or control system, which causes reduction of vessel maneuvering abilities; (Loss means that systems, components, subsystems or control systems do not perform their specified or required functions.)

- an occurrence adversely affecting the vessel's seaworthiness or fitness for service or route, including but not limited to fire, flooding, or failure of or damage to fixed extinguishing systems, lifesaving equipment, auxiliary power generating equipment or bilge pumping system;

- loss of life or serious injury; or

- an occurrence not included above, but resulting in more than $25,000 in damages, including the cost of restoring the property to its condition before the casualty, but excluding the cost of salvage, gas freeing, drydocking and demurrage.

Casualties excluded

Casualties involving only pleasure craft are not included in these statistics. Such incidents are contained in an annual report by the Auxiliary, Boating and Consumer Affairs Division of the Office of Navigation Safety and Waterway Services.

There is reason to believe that a small percentage of casualties meeting the above criteria are not reported due to ignorance of the requirements to do so.

1989 casualties

In 1989, there were 3,693 marine accidents that involved 5,606 commercial vessel. Of these, 462 resulted in a total loss of the vessels. Of these, 252 were fishing vessels.

There were 5,144 vessels involved in accidents that did not result in a total loss. Of these, 1,156 were fishing vessels.

There were 53 deaths and 48 injuries in accidents with vessels which were a total loss. There were 29 deaths and 171 injuries from accidents with vessels not totally lost. In addition, there were 113 deaths and 822 injuries not associated with vessel casualties, such as persons falling overboard.

Major casualties

Major marine casualties involve vessels, other than public vessels (as defined in 46 CFR 4.03-40), which result in one of the following:

- the loss of six or more lives;
- the loss of a mechanically propelled vessel of 100 or more gross tons;
- property damage initially estimated at $500,000 or more; or
- a serious threat to life, property or the marine environment by hazardous materials.

There were a total of 39 major casualties in 1989. One required a marine board of investigation. A description follows.

Exxon Houston casualty

On March 2, 1989, at 5:15 p.m., Hawaiian standard time, the United States flag tankship *Exxon Houston* broke away from the Hawaiian Independent Refineries, Inc., single point mooring. The vessel later grounded about .5 miles off Barber's Point, Oahu, Hawaii, at 8:06 p.m.

The separation from the mooring system ruptured a cargo transfer hose, causing about 400 barrels of Alaskan crude oil to be released.

In addition, the grounding of the vessel caused hull damage to No. 3 port and No. 5 starboard cargo tanks, and to the port bunker tank and engineroom double bottom, resulting in approximately 200 gallons of No. 6 bunker oil entering navigable waters of the United States.

At the time of the incident, the *Exxon Houston* was conducting normal cargo oil transfer and bunkering activities at the terminal. There were no deaths or personnel injuries directly attributable to the vessel parting from its mooring or the grounding. The damage sustained by the vessel was significant enough, however, to consider it a total loss. After a final damage survey, the vessel was sold for scrap value and towed to Hong Kong for dismantling.

Statistical summary

These statistics summarize casualties for the entire United States commercial fleet and foreign-flag vessels in United States waters. The Marine Safety Evaluation Branch of the Marine Investigation Division will explain data summary methods to those who request it.

Suggestions for changes or improvements in the statistics should be addressed to Commandant (G-MMI-3), Coast Guard, 2100 Second Street, S.W., Washington, D.C. 20593-0001.

Telephone: (202) 267-1424.

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Exxon Houston

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Table 1 Commercial Vessel Total Losses 1989

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	MISSING	OTHER	TOTAL
FREIGHTSHIP								
SUBTOTAL	8	2	1	4	1	0	0	16
LT 100 GT	2							2
100-199								0
200-299	3			2				5
300-499								0
500-1599	3				1			4
1600-4999				1				1
5000-9999		1		1				2
10,000-19,000		1	1					2
GE 20,000								0
PASSENGER SHIP								
SUBTOTAL	9	3	1	4	0	0	4	21
LT 100 GT	9	3	1	4			4	21
100-1599								0
1600-4999								0
GE 5000								0
TUG/TOWBOAT								
SUBTOTAL	36	8	7	4	1	0	4	60
LT 100 GT	16	2	1	1			1	21
100-199	14	2	1		1		2	20
200-299	1	2	3	1				7
300-999	4	2	1	2			1	10
GE 1000	1		1					2
TANK BARGE								
SUBTOTAL	3	2	0	0	2	0	2	9
LT 500 GT							1	1
500-999	3						1	4
GE 1000 GT		2			2			4
MODU								
SUBTOTAL	0	1	0	0	0	0	1	2
LT 300 GT								0
GE 300 GT		1					1	2
PLATFORM	5	2	1				1	9
SUBTOTAL	5	2	1	0	0	0	1	9
(cont. next col.)								

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	MISSING	OTHER	TOTAL
TANKSHIP								
SUBTOTAL	0	1	0	0	0	0	0	1
LT 100 GT								0
100-1599								0
1600-4999		1						1
5000-9999								0
10,000-19,999								0
20,000-39,999								0
40,000-99,999								0
GE 100,000								0
								0
OFFSHORE SUPPLY								
SUBTOTAL	2	1	0	0	0	0	0	3
LT 100 GT	2							2
100-199		1						1
200-499								0
GE 500 GT								0
FISHING VESSEL								
SUBTOTAL	128	44	19	33	12	0	16	252
LT 100 GT	93	33	9	25	11		15	186
100-199	15	9	6	5				35
200-499	1							1
500-999	1		1					2
GE 1000 GT				1				1
STATE NUMBERED	18	2	3	2	1		1	27
FREIGHT BARGE								
SUBTOTAL	33	0	6	2	0	0	6	47
LT 100 GT								0
100-999	16		3	1			5	25
GE 1000 GT	7		3	1			1	12
UNKNOWN	10							10
MISCELLANEOUS								
SUBTOTAL	20	9	7	2			4	42
LT 100 GT	16	9	3	2			4	34
GE 100 GT (SP)	2		1					3
GE 100 GT (NSP)	2		3					5
U.S. TOTALS	244	73	42	49	16		38	462
FOREIGN FLAG								
SUBTOTAL	*1*	*2*	*2*	*3*	*0*	*0*	*1*	*9*
FREIGHT		2	1	2				5
TANK								0
OTHER	1		1	1			1	4

Table 2 Commercial Vessel Total Losses 1989

VESSEL TOTAL LOSSES

	0 - 4 YEARS	5 - 9 YEARS	10-14 YEARS	15-19 YEARS	20-24 YEARS	25-29 YEARS	30 + YEARS	UNKNOWN	TOTAL
FREIGHTSHIP		1	5	5	3	1	1		16
TANKSHIP				1					1
PASSENGER	5	3	1	2	2	3	5		21
TUG/TOWBOAT	1	10	14	10	8	1	16		60
OSV		2		1					3
MODU				2					2
PLATFORM	1						5	3	9
FISHING	11	27	46	27	24	12	69	9	225
STATE #	3	4	2	5	3	6	2	2	27
BARGES									
TANK		1	2	3	2		1		9
FREIGHT		3	6	10	7	4	5	12	47
MISC	11	6	4	1	4	1	11	4	42
TOTALS	32	57	80	67	53	28	115	30	462
FOUNDERED	11	29	38	32	34	16	65	19	244
FIRE/EXPLOSION	11	9	12	15	6	4	11	5	73
COLLISION	4	10	6	3	3	5	9	2	42
GROUNDING	2	6	12	5	4	2	16	2	49
HULL/MACH			4	2	3		6	1	16
OTHER	4	3	8	10	3	1	8	1	38
TOTALS	32	57	80	67	53	28	115	30	462

(D)EATHS AND (I)NJURIES ASSOCIATED WITH VESSEL TOTAL LOSSES

	FOUNDERED		FIRE/EXPLOSION		COLLISION		GROUNDING		HULL/MACH DMG		MISSING		OTHER		TOTAL	
	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I
FREIGHTSHIP															0	0
TANKSHIP															0	0
PASSENGER	6	5		1				1							6	7
TUG/TOWBOAT		3		2	3										3	5
OSV			7	13											7	13
MODU															0	0
PLATFORM															0	0
FISHING	13	3	3	3	14	4	1	1	1	3					32	14
STATE #	5	2													5	2
BARGES															0	0
TANK															0	0
FREIGHT															0	0
MISC		4				3									0	7
TOTALS	24	17	10	19	17	7	1	2	1	3	0	0	0	0	53	48
LIC OFF															0	0
CREW	20	9	10	15	17	5	1	1	1	2					49	32
PASS	3	7		1		2		1		1					3	12
OTHER	1	1		3											1	4
TOTALS	24	17	10	19	17	7	1	2	1	3	0	0	0	0	53	48

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Table 3 Commercial Vessel Non-Total Losses 1989

	FLOODED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	WEATHER	OTHER	TOTAL
FREIGHTSHIP								
SUBTOTAL	4	19	119	146	169	8	58	523
LT 100 GT			10	11	5		2	28
100-199			1	1	1			3
200-299	1	1	4	3	1		1	11
300-499			5	8	2		2	17
500-1599		3	28	43	19		11	104
1600-4999		1	6	1	13		6	27
5000-9999			12	9	11	1	6	39
10,000-19,999	2	7	29	27	55	5	13	138
GE 20,000	1	7	24	43	62	2	17	156
PASSENGER SHIP								
SUBTOTAL	11	13	79	95	97	7	41	343
LT 100 GT	8	4	63	82	49	7	32	245
100-1599	3	1	8	10	25		7	54
1600-4999		2	5	1	19		2	29
GE 5000		6	3	2	4			15
TUG/TOWBOAT								
SUBTOTAL	21	25	414	653	99	7	79	1298
LT 100 GT	7	5	95	116	25	2	29	279
100-199	5	15	146	159	44	5	26	400
200-299	3	4	57	48	8		5	125
300-999	5	1	104	306	20		10	455
GE 1000	1		12	24	2			39
TANK BARGE								
SUBTOTAL	3	4	146	207	26	1	18	405
LT 100 GT	1		5	7				13
100-499			2	6			1	9
500-999			28	44	8		6	86
GE 1000	2	4	111	150	18	1	11	297
MODU								
SUBTOTAL	1	3	5	1	7	1	3	21
LT 300 GT		1		1			1	3
GE 300 GT	1	2	5		7	1	2	18
PLATFORM								
SUBTOTAL	1	6	17	6	2		4	36
(cont. next col.)								

	FLOODED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	WEATHER	OTHER	TOTAL
TANKSHIP								
SUBTOTAL	2	20	79	96	102	8	18	325
LT 100 GT		2	2	5	1			10
100-1599	1		23	21	4	1	2	52
1600-4999	1		6	10	2	1		20
5000-9999			3	4	3			10
10.000-19,999		4	13	15	29	3	3	67
20,000-39,999		5	16	16	23	1	7	68
40,000-99,999		9	15	25	33	2	5	89
GE 100,000			1		7		1	9
OFFSHORE SUPPLY								
SUBTOTAL	1	9	25	7	8	1	3	54
LT 100 GT	1	2	8	2	1	1	1	16
100-199		1	4		2			7
200-499		6	13	5	4		2	30
GE 500					1			1
FISHING VESSEL								
SUBTOTAL	118	48	122	156	392	16	304	1156
LT 100 GT	88	29	66	103	258	9	178	731
100-199	16	14	40	30	69	7	78	254
200-499				1	5		1	7
500-999			1	1	2		1	5
GE 1000 GT		3	1	3	4			11
STATE NUMBERED	14	2	14	18	54		46	148
FREIGHT BARGE								
SUBTOTAL	8	1	238	387	38	3	91	766
LT 100 GT			2	2	1		1	6
100-199	6		140	276	16	1	52	491
GE 1000		1	53	68	14	2	12	150
UNKNOWN	2		43	41	7		26	119
MISCELLANEOUS								
SUBTOTAL	9	10	75	65	23	3	32	217
LT 100 GT	4	3	38	23	8		15	91
GE 100 GT (SP)	2	5	16	16	8	1	10	58
GE 100 GT (NSP)	3	2	21	26	7	2	7	68
U.S. TOTALS	179	158	1319	1819	963	55	651	5144
FOREIGN FLAG								
SUBTOTAL	27	19	55	103	76	1	31	312
FREIGHT	2	3	39	51	51		15	161
TANK	23	10		35	18	1	9	96
OTHER	2	6	16	17	7		7	55

Table 4 Commercial Vessel Non-Total Losses 1989

NON-TOTAL LOSS

VESSEL CASUALTIES

	0 - 4 YEARS	5 - 9 YEARS	10-14 YEARS	15-19 YEARS	20-24 YEARS	25-29 YEARS	30 + YEARS	UNKNOWN	TOTAL
FREIGHTSHIP	73	139	104	102	38	10	35	22	523
TANKSHIP	25	55	96	65	25	13	35	11	325
PASSENGER	85	51	51	39	32	27	54	4	343
TUG/TOWBOA	18	264	268	210	205	73	224	36	1298
OSV	4	24	21	2	2			1	54
MODU		11	3	4	2		1		21
PLATFORM	5	6	6		3	2	4	10	36
FISHING	69	127	217	142	123	54	253	23	1008
STATE #	22	13	27	23	11	11	31	10	148
BARGES									
TANK	2	59	76	115	76	26	24	27	405
FREIGHT	26	155	184	125	81	32	27	136	766
MISC	20	48	40	27	18	12	19	33	217
TOTALS	349	952	1093	854	616	260	707	313	5144
FLOODED	4	21	37	24	20	20	49	4	179
FIRE/EXPLOSI	12	43	36	21	22	5	17	2	158
COLLISION	82	266	263	231	161	71	131	114	1319
GROUNDING	105	365	412	329	230	76	188	114	1819
HULL/MACH	85	141	185	153	114	52	203	30	963
WEATHER DAI	8	11	18	6	4	1	7		55
OTHER	53	105	142	90	65	35	112	49	651
TOTALS	349	952	1093	854	616	260	707	313	5144

(D)EATHS AND (I)NJURIES ASSOCIATED WITH VESSEL NON-TOTAL LOSSES

	FLOODED		FIRE/EXPLOSION		COLLISION		GROUNDING		HULL/MACH DMG		WEATHER		OTHER		TOTAL	
	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I
FREIGHTSHIP				2				1		6				2	0	11
TANKSHIP			3	3					2	7					5	10
PASSENGER				1	1	10	1	14		1				11	2	37
TUG/TOWBOAT		1		3	1	8		3		9			2	1	3	25
OSV				2				1		2				1	0	6
MODU			1	13						5					1	18
PLATFORM				3		1				3					0	7
FISHING		1		5	2	15		2	3	3	1	1	6	6	12	33
STATE #					1	1							1	2	2	3
BARGES																
TANK				1		2									0	3
FREIGHT										1					0	1
MISC				3	3	11		1	1	2					4	17
TOTALS	0	2	4	36	8	48	1	22	6	39	1	1	9	23	29	171
LIC OFF										1			1		1	1
CREW		2	4	36	1	43	1	9	6	37	1	1	8	11	21	139
PASS					6	5		12		1				12	6	30
OTHER					1			1							1	1
TOTALS	0	2	4	36	8	48	1	22	6	39	1	1	9	23	29	171

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Table 5 Commercial Vessel Non-Casualty-Related Deaths and Injuries 1989

	FREIGHTSHIP	TANKSHIP	PASSENGER SHIP	TUG/TOWBOAT	OFFSHORE SUPPLY	FISHING VESSEL	MOBILE DRILLING	PLATFORM	FREIGHT/TANK BARGE	MISCELLANEOUS	TOTAL	CREW (INCL. LIC. OFF.)	PASSENGERS	OTHERS	TOTAL
DEATHS															
SLIP/FALL	1			1		2	1	1		2	8	6	2		8
OVERBOARD	2	1	1	9	1	27			1	1	43	37	2	4	43
DISAPPEAR						11					11	9		2	11
STRUCK BY OBJ	1				1		1				3	2		1	3
PINCH/CRUSH				1	1						2	2			2
BURN/SCALD											0				0
ELEC SHOCK											0				0
CUT							1				1				0
ENTANGLED						3					3	2		2	4
ASPHXA	4	1	1	2	2	6		1		3	20	18	2		20
SPRAIN/STRAIN											0				0
DIVING			8			3				4	15	5	8	2	15
UNK/NOC				1		5				1	7	7			7
TOTALS	8	2	10	14	5	57	3	2	1	11	113	88	14	11	113
INJURIES															
SLIP/FALL	75	54	55	22	17	25	30	82	4	26	390	350	27	13	390
OVERBOARD	2		2	2	0	2	2	2		1	13	11		2	13
DISAPPEAR											0				0
STRUCK BY OBJ	29	10	10	4	6	17	15	26	1	10	128	86	4	38	128
PINCH/CRUSH	8	9	9	2	4	18	8	24		8	90	87	3		90
BURN/SCALD	4	1	1		1	1	2	4	1	2	17	16		1	17
ELEC SHOCK										2	2	2			2
CUT	3	4	5	2	7	7		7		2	37	35		2	37
ENTANGLED	1	1	2	2	1	7	2			1	17	17			17
ASPHXA	2			1	1	3				2	9	7	1	1	9
SPRAIN/STRAIN	13	6	5	3	4	1	8	31		5	76	75	1		76
DIVING			12		3	4		3		3	25	4	16	5	25
UNK/NOC	2	5	1		2	4	2			2	18	16	2		18
TOTALS	139	90	102	38	46	89	69	179	6	64	822	706	54	62	822

Table 6

Commercial Vessel Casualty Summary 1989

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	MISSING	OTHER	TOTAL
PERSONNEL								
SUBTOTAL	81	45	466	652	52	0	88	1384
INATT. TO DUTY			9	9	1		4	23
ERROR JUDGEMENT	6		50	116			5	177
CARELESSNESS	7	24	9	4	6		12	62
LACK KNOWLEDGE		1	2	5	1			9
FAILED TO:								
ACCT WIND/CRNT	4		20	13			1	38
USE NAV EQUIP				4			1	5
USE RADIO			1					1
DETERMINE POSN			9	20				29
SET PASS AGREE			2					2
KEEP LOOKOUT			9	7				16
COMPLY RULE/REG			8	2				10
PROC. SAFE SPEED							2	2
YIELD RT OF WAY			2					2
STRESS					1		1	2
FATIGUE		1		4	1			6
PHYSIOLOGICAL				1			1	2
INTOXICATION			3	3				6
IMPROP LOADING	9			4	2		3	18
IMPROP MAINT	7	5	2	2	14		10	40
IMPROP MOORING	4		2	3			9	18
IMPROP RIGGING	3		2	2	4		5	16
IMPROP SAFETY	1	4		2				7
OPERATOR ERROR	26		318	422	6		20	792
OTHER	14	10	18	29	16		14	101
ENVIRONMENT								
SUBTOTAL	58	1	79	346	18	0	61	563
ADVERSE WEATHER	30	1	12	45	5		30	123
ADVERSE CURRENT	22		11	19	1		21	74
DEBRIS			1	1	5		2	9
ICE			3	5	4		7	19
LIGHTNING								0
SHOALING			2	209				211
SUBMGD OBJECT	6		30	6	2			44
CHANNEL HAZARD			15	53			1	69
INADEQUATE ATON								0
OTHER			5	8	1			14
(cont. next col.)								

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	MISSING	OTHER	TOTAL
MATERIAL								
SUBTOTAL	132	107	84	114	810	0	486	1733
FAILED MATERIAL:								
STRUCTURAL	98	39	20	39	350		133	679
MECHANICAL	15	25	30	32	267		183	552
ELECTRICAL	3	40	8	9	65		32	157
CORROSION	1				5		3	9
NORMAL WEAR	1	1			8		5	15
IMPROPER WELDING		1			3		1	5
IMPROPER RIVETING								0
STEERING FAILURE			13	12	35		18	78
FOULED PROPELLER	2		1	3	14		74	94
INADEQUATE:								
LIGHTING			2				1	3
STABILITY	10				1			11
LIFESAVING EQUIP.					2			2
FIREFIGHTING EQUIP.								0
CONTROLS								0
LUBRICATION								0
MAINTENANCE								0
INSUFFICIENT FUEL				1	11		6	18
PROPULSION FAIL			6	4	35		24	69
FATIGUE FAILURE					5		1	6
OTHER	2	1	4	14	9		5	35
TOTALS	273	153	635	1117	880	0	635	3693

National Pollution Funds Center manages five missions

By LCDR Ernest Del Bueno

Established in February, 1991, the National Pollution Funds Center administers Title I of the Oil Pollution Act of 1990 (OPA 90), one of the most complex legislative challenges ever taken on by the Coast Guard. Located in Arlington, Virginia, the center reports directly to the chief of staff of the Coast Guard.

The National Pollution Funds Center has five missions mandated by Title I of OPA 90:

1) **certifying financial responsibility of vessel operators,**
2) **providing funds for oil removal,**
3) **providing funds to initiate natural resource damage assessments,**
4) **compensating claimants with damages from oil pollution, and**
5) **recovering monies owed by parties responsible for oil spills.**

Mission #1

Issuing Certificates of Financial Responsibility is the center's first mission. These certificates provide assurance that vessel owners and operators will have the assets to pay for oil removal and damages up to the vessel's limit of liability. Financial responsibility is demonstrated mostly by insurance guarantees provided by protection and indemnity clubs, and commercial insurance companies.

Certificates of Financial Responsibility have been in existence for more than 20 years. Prior to the creation of the National Pollution Funds Center, they were administered by the Office of Marine Safety, Security and Environmental Protection.

Mission #2 and 3

OPA 90 authorized the use of the Oil Spill Liability Trust Fund, a $1 billion resource financed by a tax on imported and domestic oil of 5 cents a barrel. The Department of the Treasury collects the taxes.

The National Pollution Funds Center administers a portion of this resource, called the "emergency fund," which pays for both removal costs and the initiation of natural resource damage assessments associated with oil spills. Since OPA 90 was passed in August, 1990, the emergency fund has been accessed 1,041 times for more than $48 million.

Removal activities must be documented to obtain payment from polluters. Here a Coast Guard petty officer keeps track of removal operations at the 1989 Exxon Valdez oil spill.

The National Pollution Funds Center also manages a portion of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) fund. The center uses the CERCLA fund when Coast Guard federal on-scene coordinators respond to hazardous chemical spills.

Mission #4

OPA 90 allows individuals or organizations damaged from oil spills to bring claims directly against the responsible parties or their guarantors. In the event that the responsible party does not pay the claim, or in the case of a mystery spill where there is no designated responsible party, the claim may be presented directly to the National Pollution Funds Center, which to date has received 140 claims, ranging from several hundred dollars to $8 million. Thus far, the center has paid out more than $5 million to claimants.

Mission #5

The last mission is cost recovery. Before OPA 90, recovering money from responsible parties that was paid out of a previous fund was not a high priority with the Coast Guard, as shown by the 1,000 pre-OPA 90 cases inherited by the National Pollution Funds Center.

Now, whenever the Oil Spill Liability Trust Fund is opened, a case officer immediately starts work, with cost recovery an important objective. To date, the center has closed more than 1,000 cases and recovered more than $29 million.

The Center

Approximately 60 civilian and 40 military personnel are assigned to the National Pollution Funds Center. The work force includes lawyers, financial managers, insurance examiners, claims adjusters and case officers, who are organized into case teams to better carry out the principles of Total Quality Management (TQM). This practice ensures that the organization follows the work instead of the work following the organization.

Assigned to specific geographical areas of the United States, each case team has an officer who acts as the point of contact for the various customers (federal on-scene coordinators, states, etc.) in the area.

Conclusion

Providing funds to protect the environment, recovering costs, processing claims and developing regulations has required total involvement from all staff members at the National Pollution Funds Center.

Most important, however, is developing the positive customer relationships that will allow the center to adequately meet the needs of the future.

LCDR Ernest Del Bueno is the Total Quality Management coordinator at the National Pollution Funds Center, 4200 Wilson Boulevard, Suite 1000, Arlington, Virginia 22203-1804. Telephone: (703) 235-4709.

New inspection circulars save time

By ENS Pamela Zearfoss

Two Navigation and Vessel Inspection Circulars (NVICs), recently published by the Marine Technical and Hazardous Materials Division, will save valuable Coast Guard time and resources.

NVIC 10-92 is titled, "*Coast Guard Recognition of Registered Professional Engineer Certification of Compliance with Coast Guard Requirements*" and NVIC 11-92, "*Guidance for Acceptance of the National Board of Boiler and Pressure Vessel Inspectors (NBBI) National Board Inspection Code (NBIC) for Repairs and Alterations to Boilers and Pressure Vessels.*"

By applying Total Quality Management (TQM) principles, these NVICs streamline Coast Guard requirements for the shipbuilding industry. By transferring more responsibility to the industry, the Coast Guard can now redirect and reinvest valuable resources in other critical marine safety issues.

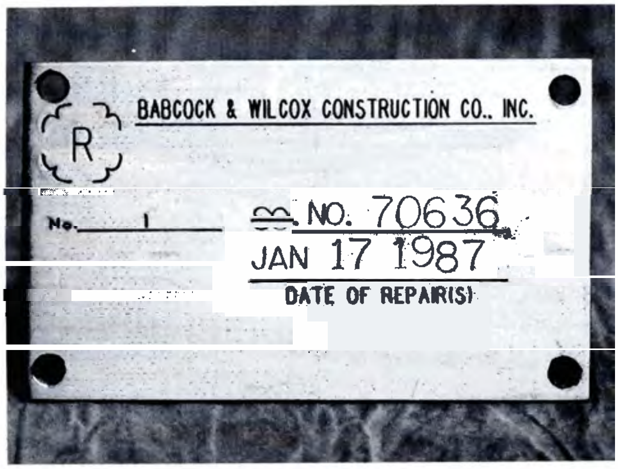
NVIC 10-92

Under NVIC 10-92 provisions, the Marine Safety Center may accept, as a basis for plan approval, the certification of a registered professional engineer that vessel plans, designs and calculations meet or exceed minimum Coast Guard regulatory requirements. This increases the responsibilities of the vessel designer and owner.

Marine Safety Center review of certified plans will vary, depending on the nature of the material presented, the frequency of routinely detected errors and the impact of such errors on vessel safety. The Coast Guard will be able to reduce plan review turnaround time, while spending more valuable time and resources on matters with the greatest potential to improve marine safety.

NVIC 11-92

This NVIC continues a process begun in 1982 of accepting a third party inspection of new boiler and pressure vessel construction under the American Society of Mechanical Engineers' Boiler and Pressure Vessel Code. Under its provisions, ship owners may submit a work proposal to a local Officer-in-Charge, Marine Inspection (OCMI) for review.



NVIC 11-92 accepts a plate with an NBBI "R" stamp mounted on a repaired ASME-stamped boiler.

The OCMI determines the Coast Guard's level of involvement according to the nature of the repair or alteration. In most cases, the OCMI may accept third party inspection and testing of a repair or alteration, as long as it is stamped by an authorized inspector with a National Board of Boiler and Pressure Vessel Inspectors "R" stamp.

Ultimately, the OCMI retains the authority to require any inspection or test deemed necessary to ensure safety. Efficient cooperation with professionals, and a streamlined repair and alteration process, however, are benefits earned by increasing the responsibility of the ship owner.

Conclusion

These NVICs will streamline the inspection and plan review processes by passing more responsibility to the marine industry, while retaining Coast Guard oversight and final approval authority. They acknowledge the expertise of professional engineers and inspectors, allowing more effective use of private sector and Coast Guard resources.

By decreasing routine plan review, the Coast Guard can increase productivity, reinvest resources, keep up with new technologies and speed up plan turnaround time. Ultimately, this should help increase the competitiveness of United States shipbuilding industry worldwide.

Chinese flanges may be hazardous

By ENS Pamela Zearfoss

Due to improper manufacturing practices, some flanges manufactured in China may be extremely hazardous and could be a threat to personal safety and property. Although their markings may indicate otherwise, some of these slip-on and weld neck flanges do not conform to American National Standards Insitute (ANSI) B16.5 and American Society for Testing and Materials (ASTM) A-105 standards.

Testing and results

During the past year, NBBI investigated numerous reports of Chinese flanges with large cracks, leakages, deformed bolt holes and other flaws. Members of private industry also tested and researched questionable flanges from China.

The material in these flanges was analyzed chemically and by metallography. Cross sectioning and photomicrographs determined whether this material was forged and normalized. Hardness tests verified adherence to strength requirements. The test results were compared to the ASTM and ANSI standards.

Some flanges had cracks around more than 75 percent of the neck circumference. Some cracks indicated that the flanges were not single piece components. The cracks were detected by dye penetrant and dry magnetic particle tests, and ultrasonic and radiographic examinations.

A high sulfur content was found in one flange, which is dangerous because it increases the likelihood of steel to hot crack.

Cross sectioning revealed that some welds were slugged with steel rods in attempts to repair defects or to compensate for under dimensioning. It was also found that some flanges were neither forged nor normalized.

Cracking and other problems stemmed from the fact that the flanges were not forged or were forged with poor techniques. For example, overheating during forging caused seams, folds and laps which lead to cracks and leakage. Also some flanges were made out of rolled plate steel, dramatically decreasing their strength.

Action

After these tests, NBBI met with members of the Center of Boiler and Pressure Vessel Inspection and Research of the Ministry of Labour in Beijing, China. Subsequently, the Chinese government ruled that all future flanges, elbows and boiler tubes manufactured in the country be inspected and tested according to accepted international standards.

Faulty flanges

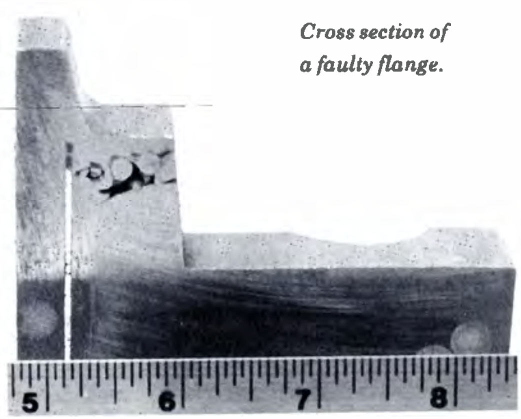
In the meantime, the NBBI has passed on information on faulty flanges now on the market to the United States Customs Service and the Nuclear Regulatory Agency.

If an installation may contain any of the listed faulty flanges, contact the Marine Technical and Hazardous Material Division (G-MTH-2) at (202) 267-2206, FAX: (202) 267-4816.

ENS Pamela Zearfoss is a staff member of the Engineering Branch of the Marine Technical and Hazardous Materials Division.
Telephone: (202) 267-2206.

Faulty flanges

DSI 4 300 RF B16 A-105N STD.345 CHINA
B-16.5 072 LEO STD TMI 454 CHINA
LEO 4" 150 RFWN STD B-16 A-105 TB-511 CHINA
4" 150 N B-16 A-105 DZ44 GJ CHINA
4" 300 STD A-105 57 CHINA
A-105 LEO 6 150 RFWN STD B-16
4 300 STD B-16 A-105 N W/N 58 CHINA
QD CHINA 6 150 A105 90-610 B16.5
18 2 150 RFSO B16 A105 109 MI 292 CHINA



Cross section of a faulty flange.

Dramatic videos drive safety home

By LCDR Paul Comolli

Scene 1: *Merchant seaman Half-Bit whistles happily as he paints a 40-foot tall ship stack. When he reaches over for some fresh paint - horror of horrors - he is not wearing a safety harness!*

Scene 2: *Poor Half-Bit drops to the deck -- a terrible accident which need not have happened.*

Scene 3: *A video camera is dropped 40 feet, simulating how one would feel once "it's too late."*

These are scenes from one of 15 Military Sealift Command's safety training video tapes for civilian crews on USNS ships.

Why video?

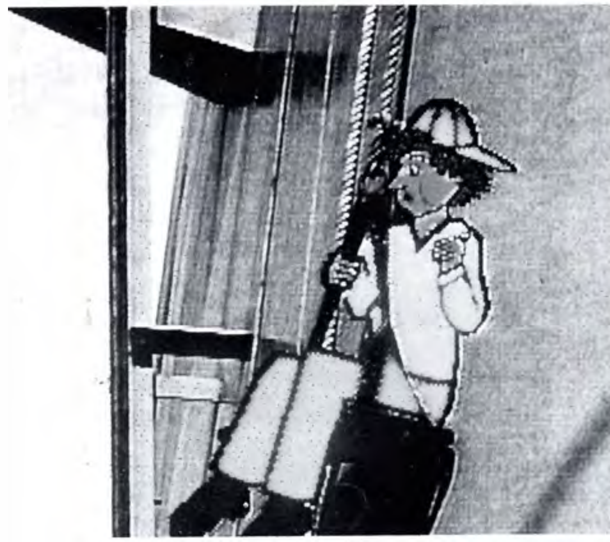
"A picture is worth a thousand words" is the old adage the Military Sealift Command interpreted as, "a thousand pictures is worth a million words," as the most effective method of impressing crew members with the importance of safety measures and how to carry them out.

To put across their training mission of "Readiness through Safety," the Command relied on the medium of audio-visual communication, producing dramatic, realistic videos to provide required on-board safety training.

A safety team based their efforts on a 1986 pilot program funded by the Military Sealift Command and carried out by the Naval Sea Systems Command, that resulted in a library of training videos for various systems on T-AO-187 class fleet oil tankers. These videos insured that the operation, maintenance and repair information provided to the first crew of each new ship would no longer be transmitted by simple word-of-mouth to subsequent crews, but be stored on tape for the life of the ship. Moreover, computer graphics and animation were able to demonstrate complex processes in easy-to-understand lessons.

Safety training tapes

The first two Military Sealift Command safety videos were produced in 1987. They described the Naval Occupational Safety and Health (NAVOSH) Program to crew members on one tape and to supervisors on the other. The



Start of scene 1

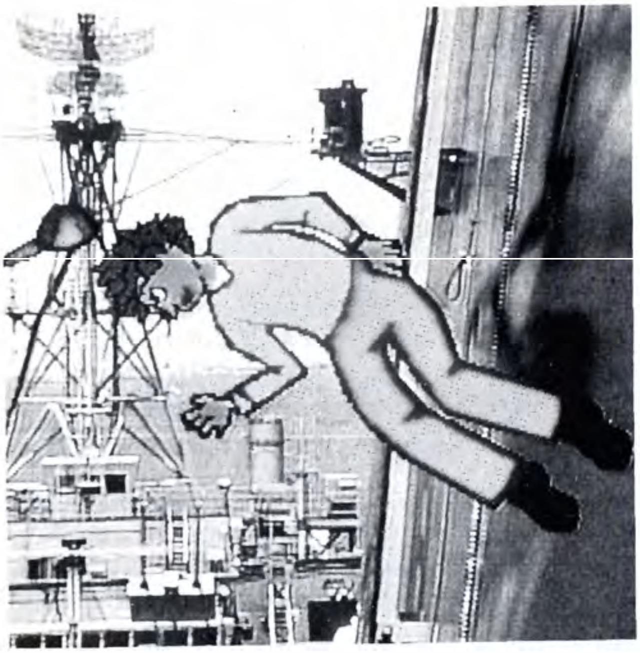
Half-Bit goes up the ship stack without a safety harness.

crew version opens with a simulation of a swinging chain-fall about to strike a crew member, realistically portraying what it feels like to know you are about to be hit.

Subsequent videos on occupational safety and health include, "*Back injury prevention,*" which demonstrates proper lifting techniques, "*Slips, trips, falls and working aloft,*" which deals with the causes of many shipboard accidents, and "*Military Sealift Command electrical safety.*" The last tape highlights the dangers of electricity.

Recent videos feature a cartoon character called, "Half-Bit," who demonstrates improper safety practices which result in injury. The character portrays dangerous stunt-accidents that would be prohibitive for a live actor, such as in the scenes depicting what happened to the stack painter without a safety harness. During Operation Desert Storm in 1990, the Military Sealift Command produced an 18-minute video on the proper donning of chemical, biological and radiological defense protective suits, and procedures for administering antidotes for chemical or biological weapons.

The latest occupational safety and health series consists of tapes on, "*Personal protective equipment,*" "*Heat stress,*" "*Respiratory protection,*" "*Sight and hearing,*" and "*Shipboard*



Start of scene 2

Half-Bit drops off his perch.

asbestos safety." These and all Military Sealift safety training videos are accompanied by lesson plans to augment shipboard instruction.

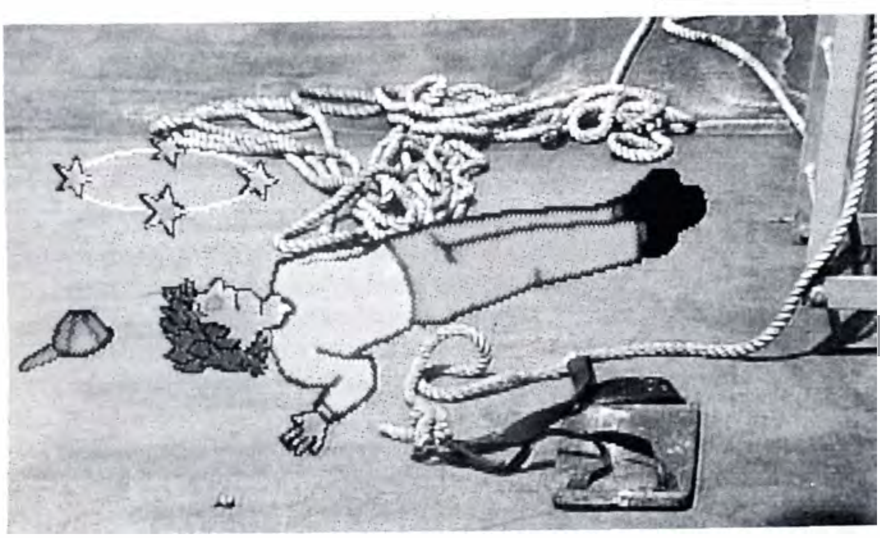
Videos on underway replenishment, safety training and the handling of hazardous materials have been requested by ships' crews and are under consideration, along with safety updates on regulation changes.

Copies of safety training video tapes may be obtained by contacting the Military Sealift Command.

Current safety training tapes

by Military Sealift Command

NAVOSH and the crew
Slips, trips, falls and working aloft
Back injury prevention
Electrical safety (Version 2)
Hazardous material - Hazardous waste
Tag out - lock out (Version 2)
NAVOSH 1990 safety update
Gas-free engineering
NAVOSH inspections
Personal protective equipment
Shipboard asbestos
Sight and hearing
Shipboard heat stress
Respiratory protection
Military Sealift Command safety afloat



End of scene 2

Half-Bit lands on the deck.

LCDR Paul Comolli, USCGR, is a safety specialist with the Military Sealift Command, Washington Navy Yard, Bldg. 210, 901 M Street, S.E., Washington, D.C. 20398-5540.

Telephone: (202) 433-6208.

1/C Julie S. Mehta

Carbolic oil

Carbolic oil is a fraction of coal tar, which contains phenol, naphthalene and cresols. Common synonyms include middle oil and liquefied phenol.

A colorless liquid at 10°C, carbolic oil darkens on exposure to light. The chemical has been variously reported as having boiling ranges of about 190 to 250°C, 100 to 450°C, 270 to 360°C or 300 to 400°C. It has a sweet tar-like odor, and is poison-ous and caustic.

Phenols are used as general disinfectants in solutions, in the manufacture of artificial resins, medical and industrial organic compounds, and dyes, as well as a reagent in chemical analysis.

Carbolic oil is recovered from the crude chemical oil of coal tar by acidification (springing) of the aqueous solution, by injection of carbon dioxide followed by gravity settling. Crude phenols are then fractionated to obtain carbolic oil. For the most part, however, phenols in the United States are produced synthetically by oxidizing cumene.

Hazards

Carbolic oil is a combustible liquid. Its flammable limits in air are 1.7% - 8.6%. Carbolic oil fires are extinguished with water, dry chemicals, foam or carbon dioxide.

Unburned vapor is toxic and will form explosive mixtures in the air. When working with the chemical, contact should be avoided. Chemical protective suits and self-contained breathing apparatus should be worn.

If exposure to carbolic oil occurs, contaminated clothing should be removed immediately and the body flushed with plenty of water. If the chemical is swallowed and the victim is conscious, he or she should drink water or milk but should not be induced to vomit.

The eyes and skin will burn when exposed to carbolic oil. The chemical is readily absorbed through the skin and causes increased heart rate, damage to major body organs, convulsions and even death.

Even in low concentrations, the chemical can become a hazardous water pollutant.

Carbolic oil has an NFPA hazard classification of 3,2,0, and is assigned to reactivity group 21 (phenols and cresols). It reacts moderately when exposed to heat, flame or oxidizers, and reacts violently with aluminum chloride, nitrobenzenes and butadienes. It is not reactive with water or many other common materials.

Storage

Carbolic oil should be stored at ambient temperatures in pressure-vacuum venting systems. Phenol solutions are of packing group II for transport, as determined by the International Maritime Organization (IMO).

It can be packed in glass or plastic bottles, cans, metal receptacles or drums. All containers must be effectively closed and packed safely for transportation.

Carbolic oil has a poison shipping label. Its UN and DOT number is 2821, and the IMO classifies it as a poison, class 6.1. It is regulated by the Coast Guard in 46 CFR subchapter O.

Carbolic oil

Chemical name:	Carbolic oil
Formula:	Mixture of naphthalene, phenol, cresols and similar aromatics
Synonyms:	Middle oil, liquefied phenol, coal tar distillate
Physical description:	Colorless liquid with a sweet tar-like odor -- darkens when explosed to light
Physical properties:	
Boiling range:	190 - 250°C
Freezing point:	Less than 41°C
Vapor pressure:	1 mm @ 40.1°C
Threshold limit value:	
Time weighted average:	5 ppm/Skin (for phenol)
Short-term exposure limit:	n/a
Flammability limits in air:	
Lower flammability limit:	1.8%
Upper flammability limit:	8.6%
Combustion properties:	
Flashpoint:	175°F, c.c.
Autoignition temperature:	1318°F
Density:	
Specific gravity at 41°C:	1.04
Identifiers:	
CHRIS code:	CBO
Cargo compatibility group :	21 (phenols, cresols)
CAS registry number:	65996-92-1
U.N. number:	2821 (phenol solutions)
U.N. class:	6.1, Poisons
NFPA: Phenol	
Health hazard:	3
Flammability:	2
Reactivity:	0

Julie S. Mehta was a first class cadet at the Coast Guard Academy when this article was written as a special chemistry project for LCDR Thomas Chuba.

This article was reviewed by the Hazardous Materials Branch of the Marine Technical and Hazardous Materials Division of the Office of Marine Safety, Security and Environmental Protection. Telephone: (202) 267-1577.

Nautical queries

The following items are examples of questions included in the third assistant engineer through chief engineer examinations and the third mate through master examinations.

Engineer

1. The shaft sleeves installed on a centrifugal salt water service pump have been recently replaced. Despite taking up on the packing gland until it has seated against the casing, a lot of water pours out along the shaft. The probable cause for this is ______________.

A. an "O" ring seal was not installed at the inboard ends of the new sleeves
B. suction head pressure is excessive
C. the seal water flow to the stuffing box is plugged
D. only two sections of the lantern ring were installed

2. Iron tends to go into solution when the hydrogen ion concentration is below 9.5. Consequently, boiler water should be_____

A. pure with neutral pH
B. pure and treated to a pH of 4-4.5
C. maintained at a pH of 7.0
D. pure and treated to a pH of 11-11.5

3. The speed of a squirrel cage induction motor is determined by the ____________

A. diameter of the stator
B. number of stator poles
C. rotor winding resistance
D. rotor conduction bar's resistance

4. With the steam control valve wide open during normal operation, the rate of steam flow from the auxiliary exhaust steam line is actually controlled by the ______________

A. rate of condensation in the DC heater
B. spring pressure of the spray valves
C. water level in the DC heater reservoir
D. rate of evaporation in the DC heater

5. Sacrificial zinc anodes are used on the saltwater side of heat exchangers to _______

A. reduce electrolytic action on heat exchanger metals
B. keep heat transfer surfaces shiny and clean
C. prevent rapid accumulation of marine growth
D. provide a protective coating on heat exchanger surfaces

6. If fuel injection in a 4-stroke diesel engine begins earlier than the design start of injection, ignition may be delayed because_____

A. the cylinder compression pressure may not be high enough
B. the cylinder compression temperature may be too high
C. the fuel oil injection pressure may not be high enough
D. the scavenge and purge process is incomplete

7. A fire in the windings of an overloaded electrical motor is considered a __________

A. class A fire
B. class B fire
C. class C fire
D. class D fire

8. Which would be best to use when it is important that vibration not loosen a nut?

A. Square nut.
B. Wing nut.
C. Cap nut.
D. Castellated nut.

9. An example of a combustible liquid is___.

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

Deck

1. In moderate wind and current, how long should a chain with a single anchor be?

A. Five times the depth of the water in good holding ground.
B. Ten times the depth of shallow water.
C. Two times the depth of the water in poor holding ground.
D. Eight times the depth of deep water.

2. Every vessel navigated in violation of the Vessel Bridge-to-Bridge Radiotelephone Act or its regulations is subject to a penalty of_.

A. not more than $100
B. not more than $500
C. not more than $1000
D. not more than $1500

3. Surface burns should first be treated by_.

A. washing the area with a warm soap and water solution
B. flooding, bathing or immersing the area in cold water
C. covering the area with talcum powder and bandaging tightly
D. exposing them to the atmosphere

4. What requirement must be observed when a tow includes a barge carrying chlorine?

A. The wing voids shall not be opened when underway.
B. A deckhand must keep a special watch on this barge.
C. A cargo information card for chlorine must be in the pilot house.
D. All of the above.

5. BOTH INTERNATIONAL AND INLAND-- What determines if a vessel is "restricted in its ability to maneuver?"

A. Whether or not all of the vessel's control equipment is in working order.
B. The vessel's draft in relation to the available depth of water.
C. The nature of the vessel's work limiting maneuverability required by the Rules.
D. Whether or not the vessel is the give-way vessel in a meeting situation.

6. Since electrical burn victims are subjected to shock, the first response is to check for_.

A. an indication of broken bones
B. breathing and heartbeat
C. symptoms of concussion
D. bleeding injuries

7. How should you signal the crane operator to lower?

A. With forearm vertical and forefinger pointing up, move hand in a small horizontal circle.
B. With arm extended downwards and forefinger pointing down, move hand in small horizontal circles.
C. Extend arm and point finger in the direction to move the boom.
D. Extend arm with thumb pointing downward, and flex fingers in and out.

8. The UN number assigned to a hazardous cargo represents____________

A. the relative degree of hazard presented by the cargo
B. only that specific cargo and is unique to it
C. the major hazard presented by that cargo
D. the type of stowage required

9. A new crewman reports on board. Under the requirements of the SOLAS Convention as amended, he must be trained in the use of the ship's lifesaving appliances within_____

A. two months
B. one month
C. two weeks
D. before sailing

Answers

Engineer

1-A, 2-D, 3-B, 4-A, 5-A, 6-A, 7-C, 8-D, 9-A.

Deck

1-A, 2-B, 3-B, 4-C, 5-C, 6-B, 7-B, 8-B, 9-C.

If you have any questions concerning "Nautical Queries," please contact U.S. Coast Guard (G-MVP-5), 2100 Second St., S.W., Washington, D.C. 20593-0001. Telephone: (202) 267-2705.

Final regulations

Reservists education: the Veterans' Benefits Programs Improvement Act and the Montgomery GI Bill (38 CFR part 21) RIN 2900-AD89 (December 3).

The Veterans' Benefits and Programs Improvement Act of 1988 contains several provisions which affect the Montgomery GI Bill -- Selected Reserve. These include liberalizing the eligibility requirements for this program; providing less than half-time training under this program and liberalizing the standards for determining extension to a reservists basic period of eligibility. A few of the amended regulations needed to implement this law were made final in the *Federal Register* dated March 7, 1991, on pages 9627 to 9633. These amended regulations will acquaint the public with the way in which the Department of Veterans Affairs will administer the remaining provisions of law.

Effective Date: The revisions to these regulations and the new regulations contained in this proposal are effective on the same date as the provisions of law on which they are based. Consequently, the revisions to 38 CFR 21.7520(b)(14) and 21.7639(b) are retroactively effective on June 1, 1989. The revisions to all other regulations are retroactively effective on November 18, 1988.

For further information, contact: Ms. June C. Schaeffer (225), assistant director for Policy and Program Administration, Education Service, Veterans Benefits Administration, Department of Veterans Affairs, 810 Vermont Ave., N.W., Washington, D.C. 20420. Telephone: (202) 233-2092.

Final rule: delay of effective date

CGD 89-037, Stability design and operational regulations (46 CFR part 170) RIN 2115-AD33 (December 10).

The Coast Guard announces a delay of the effective date of 46 CFR 170.210 in the stability design and operational regulations published on September 11, 1992, at 57 FR 41812. These regulations became effective on December 10, 1992. The effective date of this section is being delayed indefinitely to allow further investigation of the costs associated with the performance of the periodic lightweight survey requirements in 46 CFR 170.210.

For further information, contact: Ms. P. I. Carrigan, Marine Technical and Hazardous Materials Division, (202) 267-2988.

Notice of proposed rulemaking

CGD 91-019, Chemical drug and alcohol testing of commercial vessel personnel; collection of drug and alcohol testing information (46 CFR part 16) RIN 2115-AD84 (December 15).

The Coast Guard proposes to amend its regulations for chemical drug and alcohol testing of commercial vessel personnel to include information collection requirements regarding marine industry drug and alcohol testing programs. The Coast Guard proposes to collect this data to assess the effectiveness of the marine industry drug and alcohol testing programs.

Date: Comments must be received by April 14.

Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406) (CGD 91-019), Coast Guard headquarters, 2100 Second Street, S.W., Washington, D.C. 20593-0001, or may be delivered to Room 3406 at the above address between 8 a.m. and 3 p.m., Monday through Friday, except federal holidays. Telephone: (202) 267-1477. Comments on collection of information requirements must also be mailed to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB), 725 17th Street, N.W., Washington, D.C. 20503. Attn: Desk officer, Coast Guard.

The executive secretary maintains the public docket for this rulemaking. Comments are part of this docket and are available for inspection or copying at room 3406, Coast Guard headquarters.

For further information, contact: LCDR M. A. Grossetti, Marine Investigation Division. Telephone: (202) 267-1421.

Final rule

CGD 92-058, Tonnage measurement of vessels (46 CFR part 69) (December 17).

The Coast Guard is amending its tonnage measurement regulations for vessels by updating the list of organizations authorized to measure vessels, by extending application of the simplified measurement system to all barges over 79 feet in overall length not engaged on a foreign voyage, and by eliminating, in most instances, the need to file an additional form for simplified measurement. These amendments are necessary to update the regulations and align them with changes in the tonnage measurement laws.

Effective Date: December 17, 1992.

For further information, contact: Mr. Donald W. Goebel, Vessel Documentation and Tonnage Survey Branch. Telephone: (202) 267-1103.

Notice of proposed rulemaking

CGD 90-052, Requirements for cargo lightering operations (33 CFR parts 151, 155 and 156) RIN 2115-AD68 (January 5).

The Coast Guard proposes to amend the applicability sections of the safety and pollution prevention regulations issued under section 311(j) of the Federal Water Pollution Control Act to make it clear that 311(j) requirements apply to offshore lightering operations. The Coast Guard further proposes to establish what constitutes acceptable evidence of compliance with 311(j). The Coast Guard expects the amendments to codify existing practice and assist mariners in complying with the requirements of section 311(j).

Date: Comments must have been received by February 19.

For further information, contact: Ms. Joan Tilghman, project counsel and project manager, Oil Pollution Act (OPA 90) staff (G-MS), (202) 267-6401, between 9 a.m. and 5:30 p.m., Monday through Friday, except federal holidays.

Notice of proposed rulemaking

CGD 90-071a, Overfill devices (33 CFR parts 155-156) RIN 2115-AD87 (January 12).

The Coast Guard proposes to establish minimum standards for overfill devices for tank vessels that carry oil as their primary cargo. The proposed regulations also would require the phased-in installation and use of overfill devices on the cargo tanks of certain tank vessels that carry oil. These regulations are required by OPA 90. The purpose of the regulations is to reduce the likelihood of oil spills when oil is loaded as cargo.

Date: Comments must be received by March 15.

Addresses: Same as for CGD 91-019.

For further information, contact: LCDR Michael Karr, project manager, (202) 267-6756.

Notice of proposed rulemaking

CGD 92-026, Handling of explosives or other hazardous materials within or contiguous to waterfront facilities (33 CFR part 126) RIN 2115-AE022 (January 13).

The Coast Guard is considering a major revision to the regulations that govern the handling of break bulk containerized, and dry bulk hazardous materials on waterfront facilities. Part 126 was written in the 1950s and does not necessarily take modern transportation methods into account. Comments are sought on the changes needed to update these regulations, including the extent to which current industry standards may be appropriate for incorporation.

Date: Comments must be received by April 13.

Addresses: Same as for CGD91-019 -- only disregard comments to OMB.

For further information, contact: Mr. Gary Chappell (G-MPS-3). Telephone: (202) 267-0491.

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Coast Guard officer lifts a dead cormorant from a heavily oiled beach in Saudi Arabia. See Proceedings 1-2/92 - p 46.

Coast Guard cutter Key Largo escorts USNS Algol out of Savannah loaded with equipment bound for the Persian Gulf during Desert Storm. See Proceedings 1-2/92 cover.

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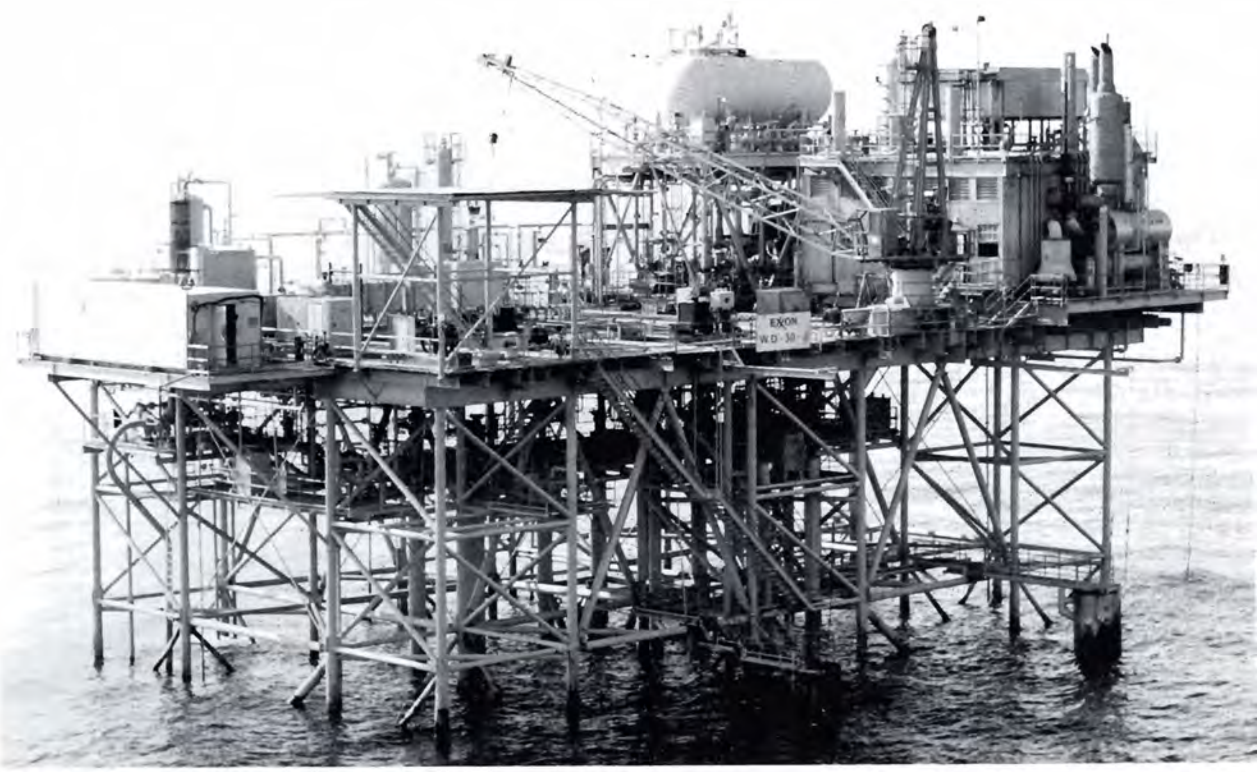

A fixed drilling platform. See Proceedings 11-12/92 - p 38.

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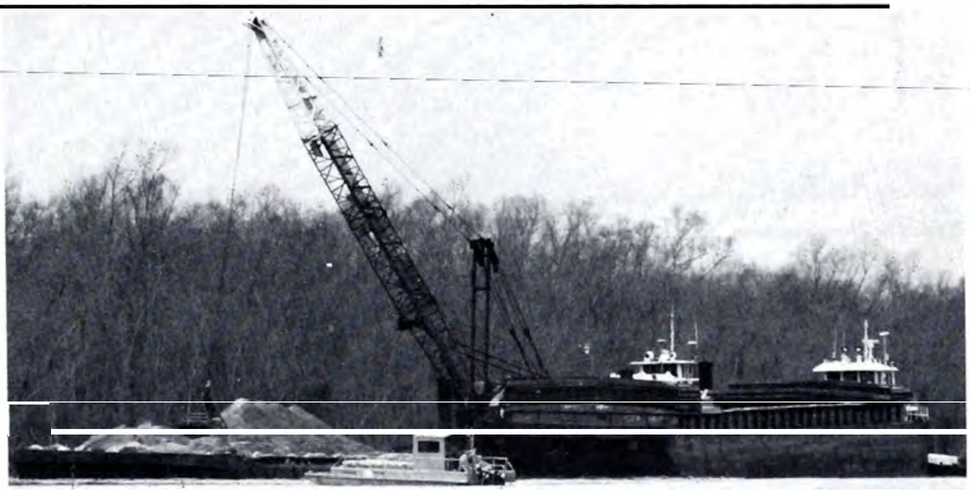

Lightering operations remove styrene-contaminated rocks from barge. See Proceedings 9-10/92 - p 63.

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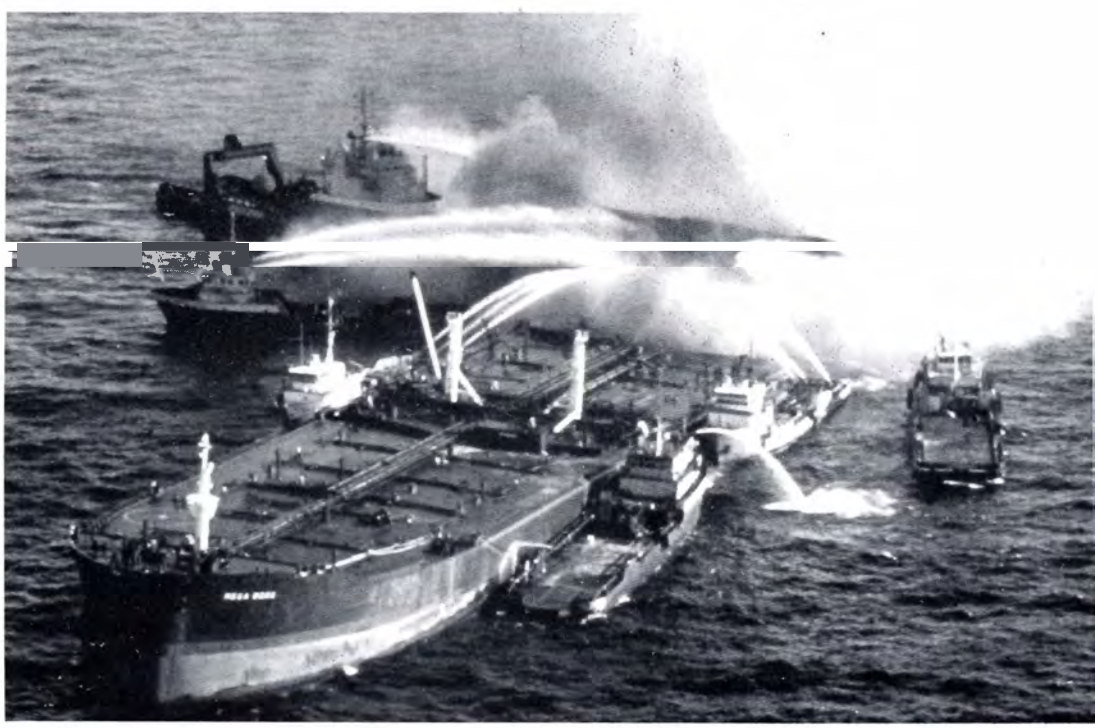

Dousing the Mega Borg fire. See Proceedings 5-6/92 - p 1.

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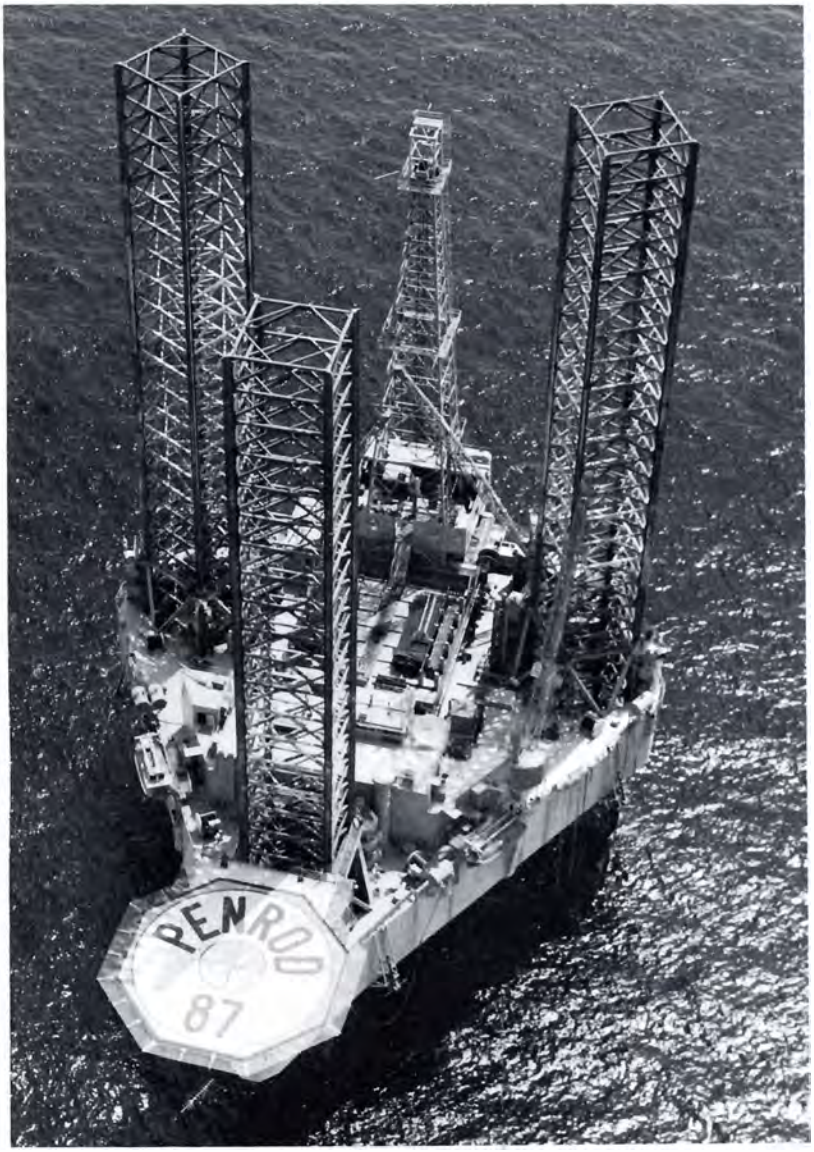
Military Traffic Management Command

Mineral Management Service



Penrod 87 jack-up MODU drills in the Gulf of Mexico. See Proceedings 11-12/92 - p 3.

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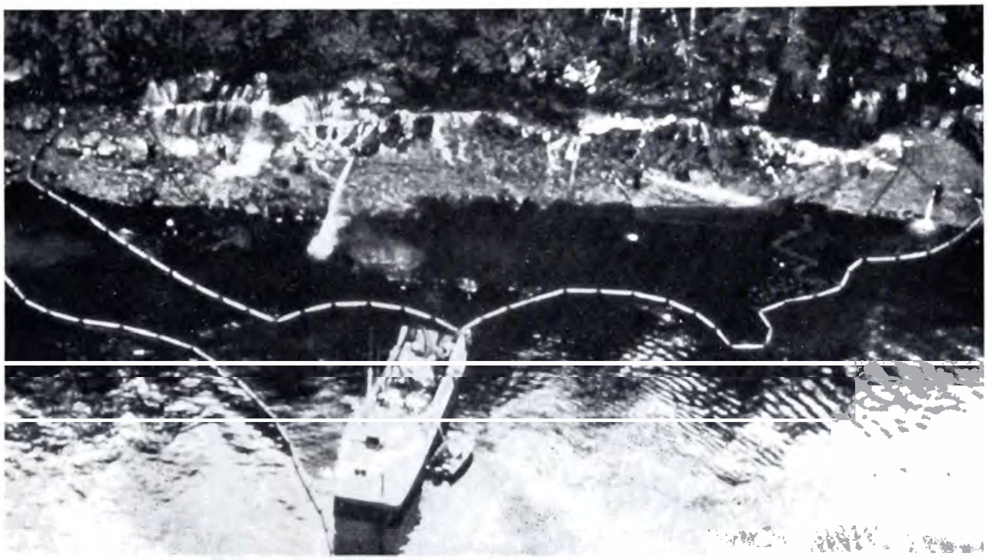

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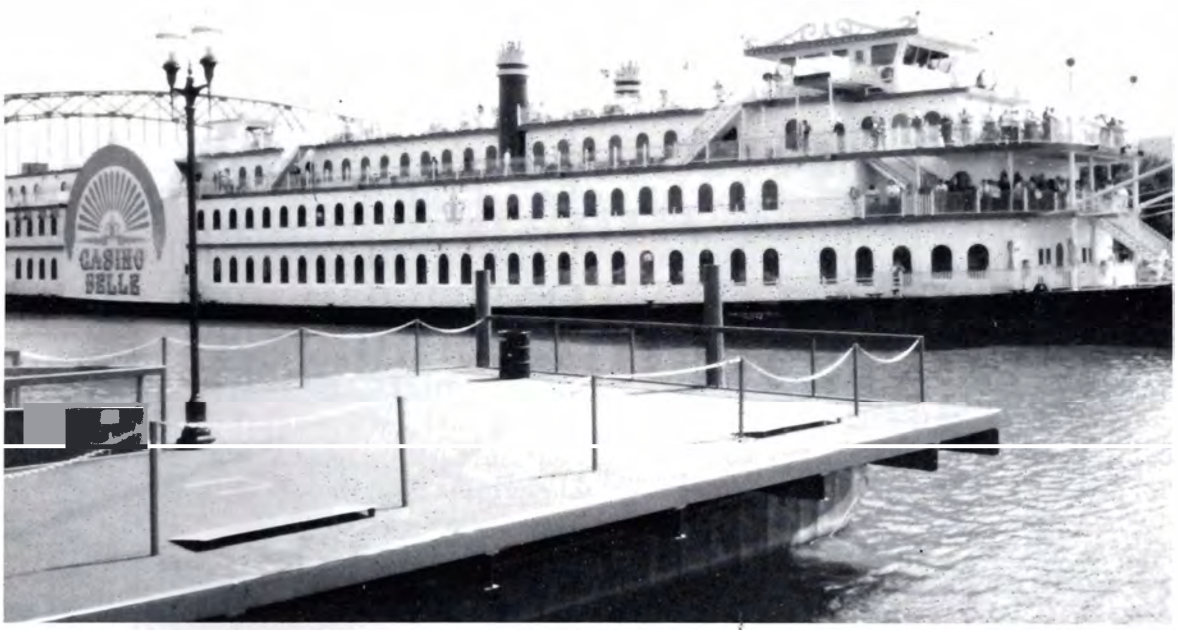

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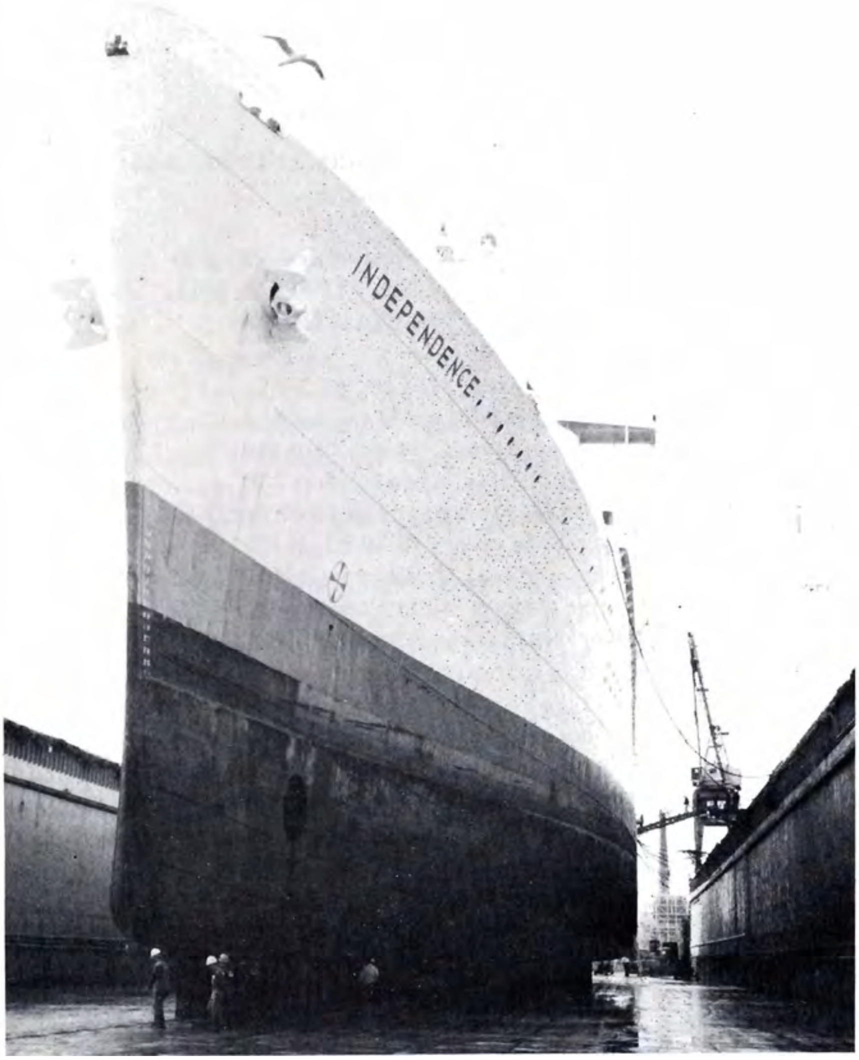

Coast Guard inspectors are dwarfed by the ~~SS Independence'~~ hull in drydock in San Francisco. See ~~Proceedings~~ 7-8/92 cover.

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A hot race to kill a well

By LCDR Vincent M. Campos

By the third day, events were far from routine. The well continued to spew 60 barrels of crude oil an hour (about 2,520 gallons). Personnel and equipment steadily arrived on scene. After three days and nights of work, appreciable gains were finally made on containing the discharged oil.

Hopes were high that the well could be shut down, preventing further oil from being discharged. A pre-noon overflight from a Coast Guard air station in New Orleans was enroute for a bird's eye view of the containment effort and the effects of the oil.

Unfortunately, the pilot observed smoke on the horizon signifying an ominous change of events. In moments, the well was engulfed in flames and would not be easily tamed.

This was the start of a very long day. . .

Countless well heads and miles of subsurface pipelines are located in Timbalier Bay in southern Louisiana. It is a shallow bay more than 12 miles wide, with only East Timbalier Island as a fragile barrier to the Gulf of Mexico. It has been relatively quiet and free from significant oil spills in recent years.

Timbalier Bay is located within the Captain of the Port zone for MSO Morgan City, and is managed by the Marine Safety Detachment in Houma.

The spill

On the evening of September 29, 1992, Greenhill Petroleum Company reported to the National Response Center that it had spilled an estimated 260 gallons of crude oil into Timbalier

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Firefighters work to extinguish platform fire in Timbalier Bay.

Coast Guard strike team member gives status report to command post.

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Bay. While a barge was attempting to activate a shut-in well, a hose ruptured, allowing the crude oil to discharge into the bay.

The following morning, however, the situation changed dramatically. The estimate of total discharge increased to about 700 barrels at 60 per hour. (There are 42 gallons to a barrel.) The retired well had become quite active.

Along with crude oil, the well was also spewing natural gas, a dangerous combination. A sheen extended several miles toward the Gulf of Mexico. The oil was determined to be fairly light crude, which meant that evaporation and natural dissipation would be substantially quicker than if it were a heavier crude. This was good news for the clean-up workers.

Containment efforts

By this time, about 1,400 feet of harbor boom had been spread with more on the way. Two skimmers with personnel from a clean-up contractor provided the initial work force with additional workers coming. Another contractor was hired to "kill" (shut in) the well.

Representatives of the Coast Guard and other agencies coordinated the response effort from a command post on East Timbalier Island, which was close to the well and beach impact area. A disadvantage was that the island was accessible only by helicopter or boat. A support station staffed by the Coast Guard was later established on the mainland at Port Fouchon.

At the end of the first full day, the actual crude oil discharged into the water was reduced to about one barrel an hour. This was chiefly due to a slot at the end of the workover barge which acted as a natural collection point for the oil. It was hoped that the discharge could be held to an absolute minimum during well containment efforts. (A workover barge acts as a platform for supporting operations for working on a well.)

Island threat

East Timbalier Island had been hit hard by Hurricane Andrew in August. The storm washed away many parts of the five-mile island, which varies in width from just a few yards to a quarter of a mile. The final barrier to the potentially severe conditions of the Gulf of Mexico, the island provides vital protection for the natural environment and industry in the bay.

Since the silt deposits that formed the island no longer occur, the vegetation and root systems that exist must be preserved to prevent East Timbalier from dissolving into the Gulf. The oil spill threatened the survival of the island in this regard.

Challenge

The response workers were faced with a two-pronged challenge: shutting in the live well that provided a continuous source of crude oil and recovering the oil already in the water and on East Timbalier Island. The key to any oil spill is securing the source of the discharge, which is not easy. In this situation, the blowout preventer (a capping system with rams and valves) failed and had to be removed so that a replacement could be installed. To accomplish this, the workover barge had to be moved out of the way.

The plan was for the contractor to set the blowout preventer system on the well and let the rams shut it down. With the source secured, clean-up crews could focus their efforts on containing and recovering the oil, as well as protecting the beaches.

Ignition

On Thursday, October 1, shortly before noon, sand and shale were jettisoned from the well, along with a natural gas mixture. A report of sparks led to an immediate evacuation of the workover barge.

Within minutes, the oil and gas spewing from the well ignited, creating an all encompassing inferno, a blazing hulk of metal and oiled debris. Marine radio channels immediately reported a platform fire near Timbalier Bay.

A scheduled overflight from the New Orleans air station arrived on the scene within minutes. From the air, the view was awesome. The well was burning wildly, igniting nearby oil. Fiery patches of various sizes floated away from the well. The containment boom succumbed to flames and broke apart. A large plume of smoke, continuously produced by the burning well, wafted in the wind toward East Timbalier Island.

The situation on the beach was unique. The initial impact of the fire occurred during an unusual high tide, producing a "bathtub ring" effect. The marshes were free at the water level and the tops, but the mid-level of most of the vegetation was covered with oil. Active clean-up was not appropriate because the roots of the plants were not affected and the scientific community strongly advised against it.

Passive means, such as using sorbent booms, were taken, while letting the tidal action "wash" the oil out of the affected areas. Although this took more time, it was the best way to ensure that the clean-up did not harm the environment more than the spill itself.

Wildlife did not escape unaffected. Slightly oiled brown and white pelicans were found on the island and brought to a wildlife rehabilitation center established on Grand Island. Fortunately, when the emergency was over, all wildlife was returned to its natural habitat in good condition.

Recovery efforts

Coast Guard operations were centered at the Port Fourchon station. They included personnel from MSO Morgan City, the Marine Safety Detachment in Houma, the Gulf Strike Team and the Public Information Assistance Team from the National Strike Force Coordination Center in North Carolina. Coast Guard efforts were coordinated with those of the scientific support coordinator from the National Oceanic and Atmospheric Administration, local response workers and clean-up contractors.

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Clean-up crews work on East Timbalier Island.

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Offshore skimmers were able to remove pockets of oil that scattered into the Gulf, but inshore operations were more difficult. Due to the effects of Hurricane Andrew, the water was much shallower than usual. Also the bay is thickly populated with well heads and support structures, which greatly hindered the operations.

The use of the Gulf Strike Team's skimmers, and their open water oil containment and recovery system, proved to be very effective in oil recovery. This system is a high seas barrier 612 feet long. Although it is not designed for shallow water as in the bay and is designed to be towed, the system eventually recovered several times more oil than the clean-up contractors, who used other skimming systems.

The hot cap

The most urgent problem was capping the well to stop the flow of oil. While the fire burned off much of the escaping oil, it still severely hampered efforts to secure the source of the omnipresent discharge.

Two courses of action to shut in the well were taking place concurrently. One was to drill a relief well at a safe distance from the burning well to a depth of more than 8,000 feet in order to intercept the fuel source. This option was decided upon very early and work began shortly after the blow out.

The second course was to conduct a simultaneous well cap and fire kill - which became known as a "hot cap." As each of the two options raced against time, the hot cap turned out to be the best avenue of approach.

The debris of twisted and burned metal from the workover barge had to be removed from around the well. Reminiscent of the twenty-mule team days, a dozen tug boats side-by-side each secured a line to the barge and then pulled at the barge at the same time at maximum power. This mighty effort didn't budge the barge at first, but the combined propeller wash brought too much strain to bear on the boom encircling the well. The boom parted and freed the trapped oil, which made its way into the Gulf to be trapped by offshore skimmers.

Eventually the workover barge was removed by deballasting it and further pushing by the tugs which eventually caused it to break bottom suction and float free. The well was then primed for the "kill." Meanwhile, the relief well was still being drilled in the event that the hot cap failed. The hot cap and the relief well workers participated in a friendly race against time, in which the "first to arrive" would win.

With drilling on the relief well ahead of schedule and a new workover barge in place, all conditions seemed ideal for attempting the hot cap procedure. A reignition plan was carried out to ensure that the well remained lit to minimize the impact of additional crude oil spilled, until the hot cap could be completed.

The hot capping was initiated on a clear and cool Friday afternoon. With unanticipated success, the source of the discharge was stopped, the fire died and the well was completely shut in through the use of salt water and hydroxy ethyl cellulose "pills." (The salt water and pills were pumped down the well shaft to plug up the well below the drilling surface.) This calm conclusion to a complicated and labor intensive operation was most welcome.

Summary

There were nearly 400 individuals from a variety of agencies and companies on site during the operation. Many thousands of feet of boom were spread and a fleet of boats rivaling a small armada scurried about, ferrying people and equipment throughout the period.

The combined effort of forces in an ever changing environment under a variety of weather conditions kept the whole ordeal from ever becoming routine.

Nearly two months after the blowout, the area shows very minimal effects from the oil and/or fire. The environment is thriving with excellent health, which makes the overall effort more than worthwhile.

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Jupiter casualty

demonstrates value of Incident Command System

By CDR James D. Spitzer

On September 16, 1990, the calm of a Sunday morning on Michigan's Saginaw River was shattered by a series of explosions from the gasoline-laden tank vessel Jupiter. Members of the Coast Guard joined hundreds of other response personnel from three dozen organizations.

The fire was out of control until regional and national resources were marshaled for an assault that successfully extinguished it on September 17. The fire, however, reignited several hours later and was not put out until the next day.

The fire and explosions destroyed all internal tank bulkheads, blew off tank tops and weakened the Jupiter so that it sagged in the middle and was in danger of breaking in half. The vessel finally settled with its bow aground with plenty of freeboard, the mid-section awash, and the aft end afloat, obstructing the channel.

During the next few weeks, the remaining pollutants were removed, the hull was strengthened, and a system was constructed for treating millions of gallons of contaminated water that would need to be pumped out. A little more than a month after the casualty, the Jupiter was raised, moved to a scrap yard and the last debris removed from the channel.

The casualty was a major pollution incident. However, the pollution aspects of the case were overshadowed by such events as the heroic rescues of most crew members; the spectacular fire requiring unique fire fighting platforms and equipment; extraordinary operations to move and secure the ship, which was tethered by only one of six mooring lines and was in danger of sinking; a complex salvage operation with a unique means of treating contaminated water; and the use of an Incident Command System to ease the formation and cooperative activity of a complex response organization.

Incident Command System

Created in 1970 to deal with large wilderness fires in southern California, the Incident Command System (ICS) is a management system which can quickly organize and focus people from many disparate organizations. In the past two decades, ICS has been fine tuned into a national model for dealing with all types and magnitudes of national emergencies.

On September 13, 1990, Canadian and United States Coast Guard On-Scene Coordinators agreed to apply ICS to CANUSLAK '90, a field and command post exercise of the Joint Canada-United States Marine Pollution Contingency Plan. Three days later, many of the Michigan-based exercise participants were reunited on the occasion of the spectacular explosion, burning and sinking of the *Jupiter*, the largest Great Lakes maritime calamity in over a decade.

ICS was used effectively to quickly meld dozens of organizations and hundreds of people into a single, coordinated response organization.

Background

Based on traditional good management precepts, ICS was developed as an emergency management system to resolve organizational problems of large multi-agency responses, such as ineffective communications, lack of accountability and a poorly defined command structure.

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ICS components

1) **Common terminology**
A common nomenclature is the unifying language of a multi-organization response.

2) **Modular organization**
As warranted by the complexity and size of the casualty, and numbers of response resources, the organization is tailored from the top down to the incident.

3) **Integrated communications**
Communications protocol calls for the use of "plain language" - no radio codes or agency specific acronyms.

4) **Unified command structure**
Major casualties have no regard for jurisdictional boundaries. Even when there is one incident commander from one agency, all agencies having jurisdiction can contribute to the creation of incident objectives, strategies and resources. When appropriate, a unified command with several lead organizations is formed.

5) **Consolidated action plan**
Every response organization needs an action plan to stay on track toward objectives. It can be supplemented by information that all must know, such as radio frequencies, emergency medical protocol and position assignments.

6) **Manageable span of control**
A supervisor's span of control ranges from three to seven immediate subordinates - five is the usual guide.

7) **Designated incident facilities**
Everyone trained in ICS knows the purpose of each designated facility and what position is responsible for that facility. Facilities include a command post, emergency operations center, communications center, incident base, staging areas and mobilization center.

8) **Comprehensive resource management**
Numerous materials and procedures help organize and manage resources.

The Coast Guard cutter Bramble approaches to fight the Jupiter fire.

ICS and *Jupiter*

The local fire chief was the incident commander while the fire was burning. The Coast Guard federal on-scene commander was the incident commander from September 19, when the fire was put out, until October 21 , when the channel was cleared.

During the first day, a state police fire marshal and the Coast Guard federal on-scene commander led efforts to identify key agency representatives and forge responding organizations into a single response group.

For example, an adjacent community's fire department had staged their command post and apparatus in their city, remote from the incident commander's command post. The most ominous initial threats were the ship breaking in half and releasing burning gasoline, or the parting of the single remaining mooring line securing the ship against a stiff wind. Either event would broaden the scope of the casualty. A Coast Guard representative arranged for the fire chief to survey the area from the air, then helped

(Left) Fire fighters on the Bramble extinguish the Jupiter's blaze. (Below) Five weeks after the casualty, the Jupiter is prepared for its last voyage to a scrap yard.

Photos by CDR James D. Spitzer.

him formulate a defensive plan to protect three vulnerable facilities on the side of the river. In minutes, fire fighting apparatus and local fire fighters were moved to protect those critical areas. The fire chief became a key part of the incident commander's organization instead of working independently within his own jurisdiction.

A leader from each of the principal operational organizations represented his or her group at planning meetings. For example, the Coast Guard federal on-scene commander represented numerous Coast Guard personnel, vessels and aircraft on hand to support operations. Similarly, the governor's declaration of a disaster enabled the state police emergency management division to lead and coordinate state agencies. The shipping company president represented company resources and contractors for clean-up, salvage and other work.

Agency representatives were all of high enough rank to commit resources and declare agency policy. A consensus supported most major decisions, which contributed to a high level of confidence placed in the response organization by the governor of the state, the media and the public, even during the first day.

The easily applied organizational framework contributed to the rapid maturity of the response organization and exceptional levels of teamwork.

Conclusion

The demonstrated smooth integration of numerous agencies and personnel was testament to the effectiveness of the Incident Command System. It compelled the creation of one organization with well defined positions filled by capable parties from all participating response groups and working toward the same objectives under a single plan.

ICS reduced the natural inclination of individuals to be blinded to concerns other than those of their own organization.

Additional information on the Incident Command System is available from the author.

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