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Proceedings

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Front and back cover photos

Coast Guardsmen patrol small towns in St. Charles County, Missouri, during the great flood of 1993.

Photos by PA2 Don Wagner.

"Old Man River" goes on rampage

Coast Guard is both victim and rescuer

By LT Christopher P. Otto
and PA2 Don Wagner

Heralded as the "great flood of '93," it will be long remembered as the most destructive flood on record in the heartland of the United States. Combining the momentum of a slow-motion avalanche and the devastation of a tidal wave, the summer midwest flood left thousands homeless, paralyzed the inland transportation system and turned farmland into lakes and rivers.

Relentless flood waters enveloped riverside communities from Minnesota to Missouri. Rail, truck and barge traffic had to be rerouted or curtailed altogether for most of the summer. Eleven hundred miles of the Mississippi River were closed to traffic.

Nature's other calamities — earthquakes, tornadoes and hurricanes — can be more deadly, but at least have the decency to depart quickly, allowing survivors to pick up the pieces. The flood of 1993 broke all modern records for duration as well as river height.

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Coast Guard offices are "swallowed up."

Cutting through cornfields in a flood punt.

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Coast Guard

Even the Coast Guard fell victim to the deluge. About 200 miles north of St. Louis, the offices of Coast Guard Group Upper Mississippi River at Keokuk, Iowa, were literally swallowed up by the flood. The group had to set up offices in a motel when its sandbag wall was breached. The buildings of the facility were eventually swamped with five feet of water.

At the same time, the crew of the second district's base in St. Louis, Missouri, feverishly erected a floodwall of aids-to-navigation sinkers and sandbags when crest predictions began to exceed the 1973 record of 43 feet that had flooded the base.

In the meantime, the Coast Guard was called upon to assist in the catastrophe. Second district personnel were augmented by Coast Guard reservists, joining thousands of other local, state and federal agency personnel in the massive operation.

Recent drought

The flood of 1993 was remarkable in that it followed severe drought conditions that had prevailed since 1988. After a moderate flooding in 1986, the Upper Mississippi River Basin experienced drought or near-drought conditions for five years.

Conditions were so desperate in 1988 that commercial river traffic came to a temporary halt when a nine-foot navigable channel could not be maintained between St. Louis and Memphis, Tennessee.

As recently as the fall of 1991, the Mississippi River gauge at St. Louis hovered between zero and five feet. (It must be noted that at a zero reading, there is still a 14-foot navigable channel in the river.)

Pattern shift

Starting in November 1992, the lean rainfall pattern shifted to the opposite extreme. Climatic changes and a major move by the jet stream saturated the western and midwestern states. A spring thaw after heavy winter snowfalls in the Upper Mississippi region brought high but not abnormal seasonal flood levels last April and May.

After a respite in early June, the Midwest continued to be pummeled with rain, accumulating as much precipitation as 18 inches higher than average.

The runoff from the already saturated northern plains and Midwest states turned fields into lakes, streams into rivers and rivers into nightmares. The torrent converged north of St. Louis where the Missouri and Illinois Rivers strain to merge with the constricted and channeled Mississippi.

The initial flooding had little impact on the northern region. Older river towns from Dubuque north tend to be built on higher ground and the floodplain is narrow. South of there, the situation changes radically as the floodplain widens. Many small towns and cities in Iowa, Illinois and Missouri sprawl across the floodplain, relying on levees for protection. The largest city between St. Louis and St. Paul, Minnesota, Davenport, Iowa, had no levee protection.

By the end of June, it became apparent that the Upper Mississippi River would rise above flood stage from St. Paul to St. Louis. As the Fourth of July weekend approached, commercial and recreational traffic on the Upper Mississippi River was rapidly shut down as bridges, 29 locks and dams, and 600 miles of the river were closed along with sections of the Missouri and Illinois Rivers.

Streaming through silo tops on a flooded farm.

Coast Guard activates

Marine Safety Office St. Louis assumed command of the Coast Guard forces and dispatched disaster response units to assist residents on the floodplain between the Missouri and Mississippi Rivers in April. It reactivated its command function in late June, rapidly going from the alert to action phases.

The already overburdened marine safety detachment in Davenport was augmented by disaster response units comprised of MSO St. Louis, staff from the second district office and reserve personnel..

While simultaneously managing disaster response in Iowa and an annual fair on the St. Louis river front, Coast Guard forces under MSO St. Louis rapidly upgraded their readiness posture as the river rose five feet downtown during the holiday weekend.

The Coast Guard forces were supported by 445 reservists as they fielded up to 16 disaster response units at locations from Davenport to Chester, Illinois, 60 miles south of St. Louis. The units worked with local emergency operation centers, rescuing and assisting flood victims, patrolling flooded areas and transporting local officials. Coast Guard auxiliary members also pitched in, volunteering their boats and airplanes, performing administrative tasks, and providing valuable local information and moral support.

Rescue work

Coast Guard disaster response units in 16-foot orange flat-bottomed aluminum john boats called "flood punts" and one utility boat with outboard engines were deployed daily to various strategic "hot spots" in flooded areas.

They evacuated stranded victims, medivaced the sick, and delivered clean water and groceries to diehards who would not leave their homes.

They also patrolled homes, farms, neighborhoods and local businesses, assisting those in need and guarding property from looters. Reservists were sometimes asked by citizens for boat rides to survey their flood-damaged homes.

Afraid that flood waters would reach the top floor of her house, a distraught grandmother pleaded with Coast Guard officers to give her a boat ride home to pick up some family pictures.

An elderly man was not expected to live through the day, and relatives asked the Coast Guard for a ride home to get him a suit for burial.

The Coast Guard helped a man move a tank of combustible fuel into his back yard that had been floating in his basement.

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Checking on flood victims.

Continued from page 3

Risks

While performing their duties, Coast Guard reserve teams put themselves in danger. While patrolling flooded homes, farms and towns, they had to be wary of low-lying and submerged telephone and electric lines, as well as automobiles and tractors. Dempsey dumpsters, mailboxes, fences and signs were also submerged just below the surface of the water.

Floating logs could easily flip over a speeding punt boat. Snakes sought refuge in low tree limbs just inches over passing punt boats. Racing through flooded fields, the boats often had to stop when engine props got clogged with floating cornstalks in the water.

People had to be wary of diseases, including salmonella, hepatitis and tetanus, as well as pestilence, which bring intestinal problems. Shots were advised for anyone who accidentally swallowed or exposed flesh to the flood water.

As time went on, waters covering the fields became more polluted, gradually deteriorating into a cesspool of decomposition, human sewage, pesticides, oil and gasoline from submerged vehicles. Submerged heating oil drums leaked. On the surface of the water floated an assortment of debris, including trash, plastic toys, garden hoses, branches and logs.

Recovery

After a record crest of 49.4 feet on August 1, the Mississippi River slowly began to recede north of St. Louis. The city's 52-foot floodwalls held, but surrounding areas were not as lucky with numerous levees giving way.

River tenders will eventually replace an estimated 5,000 buoys and 750 shore aids. Clean-up teams spent days on flooded shore facilities. A joint Coast Guard, towing industry and Army Corps of Engineers Traffic Information and Control Center normalized river traffic.

The Mississippi River dipped below flood stage in St. Louis in September, and did not do so again until October 2. The flood of 1993 challenged the second district as never before. The Coast Guard family rose to the occasion.

Photographs accompanying this article were taken by PA2 Don Wagner.

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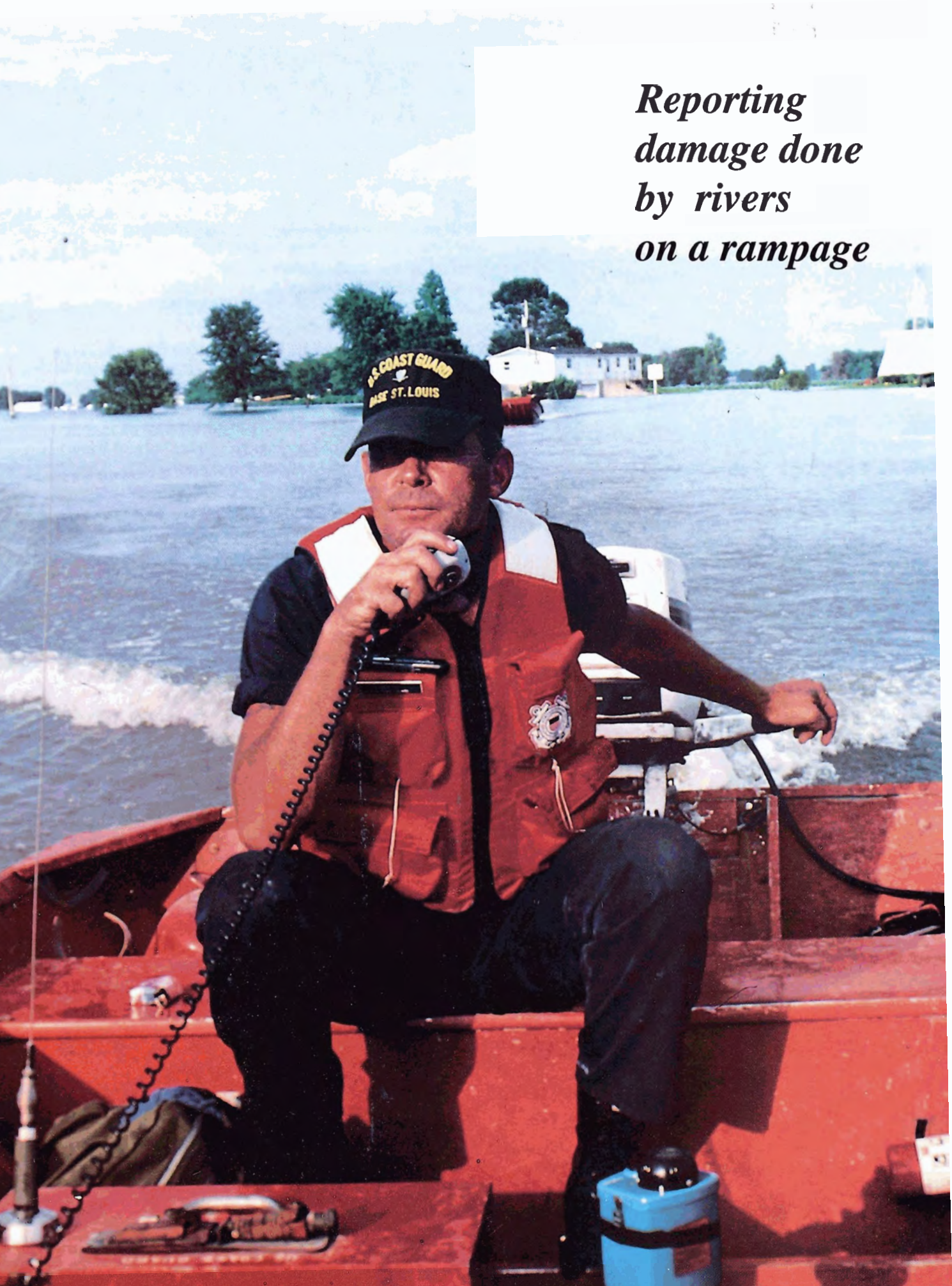
Reporting damage done by rivers on a rampage



Traffic center restores rivers

By PA3 Frank Dunn

After the flood of 1993, falling river levels on the Mississippi, Missouri and Illinois Rivers afforded a glimmer of hope to the river industry that had been paralyzed for nearly eight weeks.

Second Coast Guard District representatives in St. Louis joined with the U.S. Army Corps of Engineers and members of the river towing industry to ensure the safe restoration of river traffic. Safety was the main concern of the men and women who staffed the Joint Traffic Control and Information Center.

The traffic center command post was established at Coast Guard headquarters in St. Louis during the height of the flood to prepare for the resumption of river traffic. Watchstanders initially monitored river conditions, and fielded questions from towing companies and stranded vessels. As the floodwaters began to recede, the traffic center divided its duties into information and control.

The information function linked the U.S. Army Corps of Engineers and Coast Guard emergency operations at St. Louis and Paducah, Kentucky. Data was also collected on river levels, bridge, lock and dam openings and levee status.

The control aspect of the operation monitored traffic by scheduling vessel departures from prearranged checkpoints, enforced safety restrictions and zones, and assessed rapidly changing river conditions.

Before traffic was allowed to move, the traffic center supervised a series of up- and down-river test tows to measure the safety of river transits and their effect on damaged levees and flooded communities.

After successful testing on the Mississippi River, traffic resumed with heavy restrictions on August 23 amid intense local and national media coverage. The traffic center monitored each vessel's passage, informing the operators of river conditions that changed as quickly as the currents.

On August 30, after five weeks of monitoring river conditions and more than 3,000 phone calls, the traffic center scaled down operations.

Summary

The success of the traffic center exceeded all expectations. There were no casualties or accidents on the rivers during the period of its operation, and there were no complaints by residents of flooded areas of towboat wakes or property damage.

The center's operation also helped improve an already strong relationship between the federal agencies responsible for safe navigation and the towing industry.

What is most important is that river traffic was resumed safely in the shortest possible time.

Coast Guard wades across road at "high tide" during flood.
Photo by PA2 Don Wagner.

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Massive HAZMAT inspection is conducted

By QM1 Chris Phelps

Approximately 4.1 million 20-foot containers move through the ports of Los Angeles and Long Beach in California every year, making it the busiest port complex in the country.

In July 1992 and March 1993, the Coast Guard Marine Safety Office (MSO) Los Angeles/ Long Beach coordinated three-day joint multi-agency hazardous material inspections to determine the level of compliance with regulations governing the safe shipment of hazardous material by water, rail and highway.

Toyota truck was placarded as a poison and marine pollutant.

Another busy traffic day at the Pacific port.

Operations

During both three-day operations, 15 designated waterfront facilities and three rail yards were used as inspection points. Shipping documents were checked and containers were inspected for proper labeling, marking, placarding, material segregation and packing. Cargoes inspected included explosives, flammable and combustible substances, corrosives, poisons and radioactive material.

In addition to the freight container examinations, the Federal Highway Administration's Office of Motor Carriers and the California Highway Patrol established checkpoints to verify driver qualifications and vehicle conditions.

In the six days, a total of 721 containers and 1,183 vehicles were opened, resulting in the discovery of 289 discrepancies of hazardous materials or other safety violations (e.g., brakes or tires). More than 50 containers were either taken out of service or placed on hold until the discrepancies were corrected. The most common causes of detainment were shipping paper, placarding or dunnaging (blocking and bracing) errors.

Other agencies participating in this task force included the Department of Transportation's Research and Special Program Administration Office of Hazardous Materials Enforcement, Federal Railroad Administration, California Public Utilities Commission, Los Angeles Port Police, Los Angeles Fire Department, Long Beach Wharfingers Office, Long Beach Fire Department and Long Beach Harbor Patrol.

More than 50 hazardous materials transportation specialists from federal, state and local agencies took part in this effort, working together, sharing information and cross training.

Conclusion

Such massive multi-agency enforcement efforts help ensure that shippers and carriers continue to comply with the rules governing the safe transportation of hazardous materials by water, rail or on the road.

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United States plays active role in

By Mr. Wayne Lundy

A worldwide federation of national standards' bodies, the International Standards Organization (ISO) promotes global trade by unifying criteria for industries all over the world. Considering the progress made in recent years toward a global economy, it is important that United States industries support the development of sound international standards. It is critical that United States products are acceptable under these standards.

In the past, United States maritime industries have been only minimally involved with the ISO. At the same time, however, American data technology firms have been very active players. Realizing that a global market for our maritime industry requires active representation in the international standards arena, the United States began to play a strong role in the ISO's Technical Committee for Ships and Marine Technology (TC-8) in 1991.

Founded in 1946 to promote the development of international standards to facilitate the exchange of goods and services worldwide, the ISO consists of member bodies from more than 90 countries. ISO standards cover all areas, except electrical and electronic engineering, which are covered by the International Electrotechnical Commission.

A total of more than 8,200 standards have been issued by the ISO, 266 of them by the TC-8, which focuses on ship design, building, engineering and operation, as well as on marine environmental protection. Numerous other standards affecting the marine industry have been generated by other technical committees. (Some 34 other committees deal with related products, including internal combustion engines, gears, cranes and pumps.)

ISO (TC-8) last met in October 1993 at Annapolis, Maryland. Among the issues discussed were a major review of existing maritime standards by a working group chaired by Japan. A draft of cross-indexed national standards has been completed and circulated to all members, including the United States representatives.

US TAG

The United States maritime industry's representative to the ISO (TC-8) is the United States Technical Advisory Group (US TAG), which is accredited and chartered by the American National Standards Institute. The US TAG is represented on five of the eight TC-8 subcommittees and three of the four active working groups. The United States leads two major working groups on ships' machinery and incinerators on board ships.

The US TAG has working relationships with international groups, including the IMO, the International Labor Organization, the International Electrotechnical Commission, and the International Association of Ports and Harbors. The American group also works with the European Committee on Standardization for Shipbuilding. This latter group, which represents all European coastal countries, has agreed to use existing ISO standards and promote the development of new international criteria as a high priority.

Ship machinery

The ISO (TC-8) working group on ship machinery is investigating whether changes or new requirements should be made or added to existing standards to increase their value to the marine environment. The group, which is chaired by the United States, has 19 members, including four European and two Asian.

The current objects of the group are:

(1) to identify existing ISO machinery standards that could be more useful if modified;

(2) to review the standards to determine the necessary specific modifications or additions; and

(3) to prepare proposed standard changes to submit to appropriate ISO technical committees, including those involved with gears, internal combustion engines, pumps and gas turbines.

Proceedings readers are encouraged to review ISO machinery standards, identifying those which could be modified for greater value to the maritime industry. Recommendations or comments should be forwarded to the working group chairperson, Tom Hopkins, at (703) 821-2826 or FAX at (703) 821-8240.

International Standards Organization

Shipboard incinerators

A proposed standard for small shipboard incinerators is progressing toward adoption under the direction of the United States-chaired working group. To be issued in both English and French, the standard was well received at the Odense ISO meeting. {It recently was unanimously adopted by the IMO and is being appended to Annex V of MARPOL (the International Convention for the Prevention of Pollution from Ships).}

The standard addresses the materials, manufacture, assembly, operation and testing of small shipboard incinerators used for operational and domestic waste. The performance-oriented standard was initiated by the Coast Guard and includes an emissions annex.

US TAG members

Charles Piersall - *Chairman*
Chairman of the Subcommittee on Shipbuilding of the American Society for Testing and Materials

Howard Hime - *Chairman -- shipboard incinerators working group*
Assistant chief - Coast Guard Marine Technical and Hazardous Materials Division

Tom Hopkins - *Chairman -- ship machinery working group*
Retired Navy rear admiral

John Stocker - President -- Shipbuilders Council of America

Carl Seiberlich - Retired Navy rear admiral

Harlan "Tom" Haller - Associate administrator - Maritime Administration

Glenn Ashe - Director of Engineering, American Bureau of Shipping

Edward Barrett - Director of Ship Design and Construction Division, Military Sealift Command

Edward Kelly - Vice President -- American Maritime Officers

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What happens when inspection processes team up with T.Q.M.?

By LCDR Thomas C. Christian

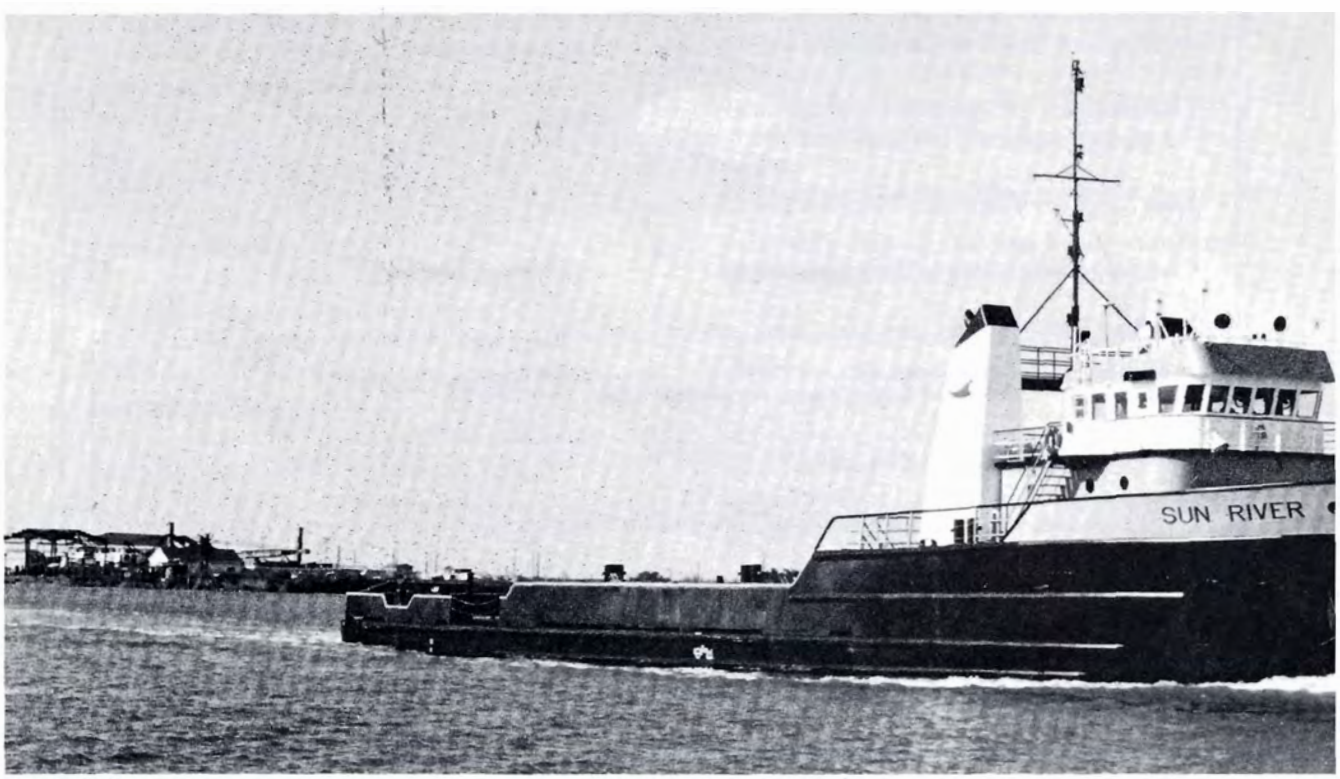
Wow! Stand by for heavy weather when Coast Guard flag officers and industry leaders meet. This time it was a rear admiral and the president of a powerful marine service association. They met last May to discuss regulatory relief for a large marine industry.

As I recall, the industry rep said, "Help." To which, the admiral replied, "Streamline." The industry president asked, "How?" The admiral said, "Total quality management (TQM)."

The first thing they did was set up a quality action team (QAT) at MSO Morgan City, Louisiana. Things started happening fast after that. We received our QAT charter and a deadline of July 15. On May 18, the new team had its first meeting.

Who's on this new team? Four forward-thinking supply and crew boat companies volunteered to participate with five Coast Guard representatives.

Offshore supply vessel.



Off to the races

Meet we did! At last count, we were into this for some 14 meetings, 915 work hours (with a third of the time spent on homework), and enough flip charts to get us listed as a rain forest's worst enemy. The team brainstormed and focused on what appeared to be four problem areas in current vessel inspections:

- **TIME MANAGEMENT**
- **EDUCATION**
- **CONSISTENCY**
- **PARTNERSHIP**

Once we sold that statement to a quality management board of industry and Coast Guard leaders, we were off to the races.

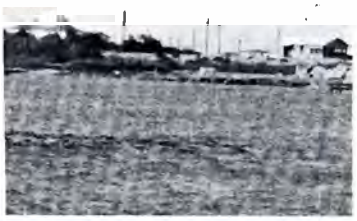
Coast Guard headquarters offered some insight on "ISO 9000." It's a company-side commitment -- from vessel crew to corporate management -- to assume the primary responsibility for the quality of its operation. The government's role is a secondary one of oversight, education, verification and risk evaluation.

Enough theory! Let's get to work! Both the Coast Guard and industry were asked to furnish the QAT with time and money expenditures on inspections. We could use this data as a baseline against which to measure our efforts to improve the existing process.

The biggest surprise was industry expenditures on downtime hours, prep time, duplicity of effort and third-party availability (just in case they were needed during an inspection). Right then, the QAT decided that whatever we propose must have the potential for real savings without compromising vessel safety.

With this in mind, the QAT concluded that our toughest challenge would be to define the Coast Guard's expectations with regard to vessel safety. Simply put, how exactly was a lifejacket deemed adequate or in compliance with regulations?

It was clear that we had to establish some generic inspection criteria. We broke down a typical inspection book into systems and subsystems. We assigned mini-teams comprised of equal Coast Guard and industry representatives within the QAT to develop some 90 specific inspection criteria (labeled SIP-Gs) for all the subsystems identified.



Boy, you should have seen the feathers fly when the mini-teams had to defend their work to the whole QAT. Was the criteria too shallow or too deep? Easily understood? Accurate?

Continued on page 12

Offshore supply vessel.

Continued from page 11

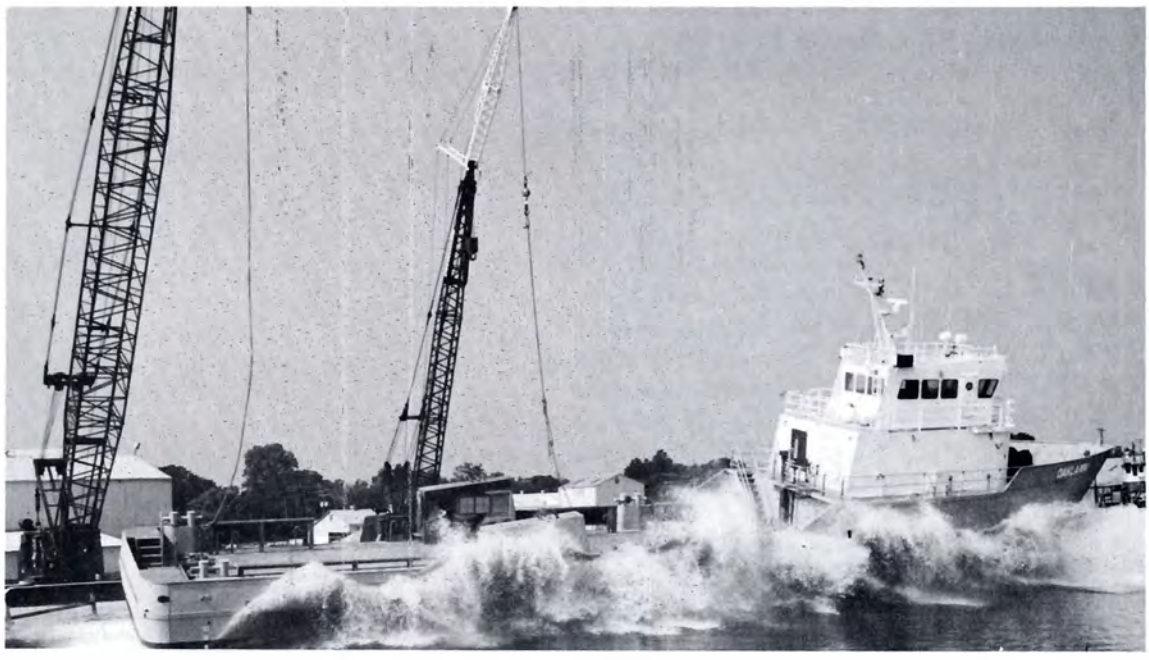
Come a long way

We've come a long way since our first meeting. We've established common expectations, which put us well on the road to achieving **CONSISTENCY**. By learning to work together and justify our work to the group, we began to realize that **PARTNERSHIP** was an achievable goal. And by breaking down the current process to its most basic elements, we certainly became **EDUCATED** as to each other's needs and expectations. At this point, things started speeding up, but we were relieved when our deadline was extended to September 1.

Our next milestone was the realization that by increasing vessel safety checks by qualified crew mem-bers, we could ease the Coast Guard inspection load. The current safety evaluation process is highly dependent upon Coast Guard expertise and cyclical in nature, with most items being examined by Coast Guard inspectors every two years with less extensive mid-period exams in the off years.

For example, if the mate compares the condition of the lifejackets against the appropriate SIP-G once a month during boat drills, it would be reasonable to expect that they are in consistently good condition. The QAT felt that this was a rational expectation and established generic frequencies for each SIP-G that were at least equal to and, in most cases, greater than existing inspection frequencies.

Side launching of offshore supply vessel.



BAM! We were close. We had set specific inspection criteria and frequencies. We developed a generic report to document monthly, quarterly and annual subsystem exams; generic company action plans spelling out process, authority, organization, training, and vessel and crew criteria; and a Coast Guard action plan redefining our role in overseeing and ultimately verifying that a quality process is in place. This all adds up to more efficient **TIME MANAGEMENT**.

What lies in store

In September, we heard that the quality management board concurred with our team's findings. Yes! The district commander also authorized the four involved companies to participate in a nine-month trial period, which started in November. This trial period is divided into three quarters, each conducted essentially as an extension of the QAT.

By designing specific measurement criteria in the SIP program, progress can be evaluated every step of the way. The QAT reconvenes quarterly to evaluate an anticipated decreasing number of problems, as well as to make course corrections. Motivated inspectors, charged with doing their best to make the program succeed, are assigned to each company. By acting as assistant coaches, they help foster partnerships in safety with industry. By the end of the trail period, we feel certain that regular checkups (the new SIP process) will produce healthier safety systems than spring cleaning (the existing system).

Wrap-up

These concepts are not new to experienced inspectors who have called upon qualified, motivated individuals such as mates, engineers and pumpmen to assist in determining the material condition of a vessel. We feel that by enabling motivated companies to empower their crews with the primary responsibility for the vessel's safety, the streamlined inspection process will require fewer Coast Guard inspector work-hours to verify than actually do the inspections.

Will there still be a job for inspectors? Of course there will— particularly on higher risk vessels. Can other companies participate? Sure, that's why we made this stuff generic — it can be tailored to any specific vessel.

But I think we're getting ahead of ourselves. Give us time to debug this process and take our best shot at making it work. Stay tuned!!

Crew boat with derrick crane barge in background.

The offshore supply vessels and crew boats pictured in this article are the vessel categories evaluated as part of the T.Q.M. experiment.

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Casualty statistics 1990

Every year, the Coast Guard's Marine Investigation Division publishes a summary of commercial vessels and related personnel involved in various types of casualties in *Proceedings*. The primary source of the statistics is the CASMAIN data base for commercial vessel casualty information. The current data base has been continuously updated and improved 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 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:

- accidental grounding;
- 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 reduces vessel maneuvering abilities; (Loss means that systems, component parts, subsystems or control systems do not perform their specified or required function.)
- 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, dry-docking and demurrage.

Casualties excluded

Casualties involving only pleasure craft are not represented 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.

1990 casualties

In 1990, there were 3,428 marine accidents involving 5,496 commercial vessels. Of these, 400 resulted in a total loss of the vessels, 185 of which were fishing vessels. There were 5,069 vessels involved in accidents that did not result in a total loss. Of these, 1,146 were fishing vessels.

There were 44 deaths and 19 injuries in accidents with vessels which were a total loss. There were 27 deaths and 143 injuries from accidents with vessels not totally lost. In addition, there were 101 deaths and 1,113 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.

Two major casualties

Aleutian Enterprise

On March 2, 1990, the fish processing vessel *Aleutian Enterprise* departed Dutch Harbor, Alaska, with a crew of 30 and headed for fishing grounds in the Bering Sea. During the following weeks, the vessel made several uneventful trawls and received two additional crew members, one of whom transferred onto another processing vessel.

At about 1:30 p.m. on March 22 (Alaska standard time) in relatively calm seas and wind with 31 crew aboard, a net failed while hauling the biggest catch of the trip, resulting in fish shifting on deck. This caused the vessel to list to the port side. With the cargo holds filled to capacity, the vessel listed further as the captain and chief engineer attempted in vain to adjust it.

With the port stern settling, the captain sent a May-Day to nearby vessels and activated the general alarm, which failed to go off. He went below decks to alert the crew and then abandoned ship.

The vessel capsized and sank at approximately 1:40 p.m. in about 400 feet of water at latitude 56 degrees, 13'22" north and longitude 169 degrees, 48'56" west. Nearby fishing vessels recovered 22 persons from liferafts and the water.

A subsequent search by Coast Guard aircraft and fishing vessels failed to recover additional crew members. Nine individuals are missing at sea and presumed dead.

Aleutian Enterprise

Surf City

On February 20, 1990, the reflagged 760-foot United States tank ship *Surf City* departed Kuwait for ports in southern Europe. It was loaded with naphtha and automotive diesel oil.

At 10:12 a.m., on February 22, the master and the chief mate were standing at the No. 4 starboard water ballast tank access trunk when an explosion occurred. The tank and the area aft to the deckhouse on the starboard side were immediately engulfed in flames.

The crew abandoned ship in the port lifeboat and were rescued at 10:53 a.m. by the *USS Simpson* (FFG-56) a Navy-guided missile frigate. Another United States Navy vessel recovered the master's remains. The chief mate is still missing and presumed dead.

The fire burned for two weeks and 196,985 of the 606,215 barrels of cargo were lost. The damage loss amounted to $31.53 million.

Surf City

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), United States Coast Guard, 2100 Second Street, S.W., Washington, D.C. 20593-0001. Telephone: (202) 267-1417.

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Table 1 Commercial vessel total losses 1990

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	MISSING	OTHER	TOTAL
FREIGHTSHIP								
SUBTOTAL	3	1	2	0	2	0	0	8
LT 100 GT		1	1					2
100-199								0
200-299								0
300-499	1							1
500-1599	2		1					3
1600-4999								0
5000-9999								0
10,000-19,000								0
GE 20,000					2			2
PASSENGER SHIP								
SUBTOTAL	3	5	1	0	1	0	0	10
LT 100 GT	2	5	1		1			9
100-1599	1							1
1600-4999								0
GE 5000								0
TUG/TOWBOAT								
SUBTOTAL	33	4	11	1	2	0	5	56
LT 100 GT	19	2	2		1		2	26
100-199	10		2	1	1		3	17
200-299	2		1					3
300-999	2	2	5					9
GE 1000			1					1
TANK BARGE								
SUBTOTAL	0	0	5	1	1	0	1	8
LT 500 GT								0
500-999			1	1	1			3
GE 1000 GT			4				1	5
MODU								
SUBTOTAL	0	0	0	0	0	0	0	0
LT 300 GT								0
GE 300 GT								0
PLATFORM	5	2						7
SUBTOTAL	5	2	0	0	0	0	0	7
(cont. next col.)								

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	MISSING	OTHER	TOTAL
TANKSHIP								
SUBTOTAL	2	1	0	0	1	0	1	5
LT 100 GT								0
100-1599	1						1	2
1600-4999								0
5000-9999								0
10,000-19,999								0
20,000-39,999								0
40,000-99,999	1	1			1			3
GE 100,000								0
OFFSHORE SUPPLY								
SUBTOTAL	3	0	0	0	0	0	1	4
LT 100 GT	1						1	2
100-199								0
200-499	2							2
GE 500 GT								0
FISHING VESSEL								
SUBTOTAL	92	33	21	25	5	0	9	185
LT 100 GT	72	22	14	17	3		8	136
100-199	11	9	3	5	1		1	30
200-499			1	1				2
500-999								0
GE 1000 GT		1						1
STATE NUMBERED	9	1	3	2	1			16
FREIGHT BARGE								
SUBTOTAL	19	0	25	2	1	0	36	83
LT 100 GT	1							1
100-999	10		21	2	1		31	65
GE 1000 GT	5						2	7
UNKNOWN	3		4				3	10
MISCELLANEOUS								
SUBTOTAL	13	1	2	1			17	34
LT 100 GT	9	1	2				17	29
GE 100 GT (SP)	3			1				4
GE 100 GT (NSP)	1							1
U.S. TOTALS	173	47	67	30	13		70	400
FOREIGN FLAG								
SUBTOTAL	*1*	*1*	*0*	*1*	*2*	*0*	*2*	*7*
FREIGHT		1			1			2
TANK					1			1
OTHER	1			1			2	4

Table 2 Commercial vessel total losses 1990

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		1	1			4	1	8
TANKSHIP		1		2			2		5
PASSENGER	1	1	1	2	1		4		10
TUG/TOWBOAT		6	8	12	8	4	18		56
OSV		1	2	1					4
MODU									0
PLATFORM			1		1	1	3	1	7
FISHING	10	11	41	15	30	5	56	1	169
STATE #		1	2	1	1	2	5	4	16
BARGES									
TANK			1	2	3		2		8
FREIGHT	2	8	16	13	13	12	10	9	83
MISC	3	1	2	4			7	17	34
TOTALS	17	30	75	53	57	24	111	33	400

FOUNDERED	3	7	27	16	21	10	64	25	173
FIRE/EXPLOSION	7	8	11	11	2	1	6	1	47
COLLISION	2	8	16	8	16	6	7	4	67
GROUNDING	3	1	2		2		4	1	13
HULL/MACH	3								
OTHER			17	14	14	6	19		70
TOTALS	17	30	75	53	57	24	111	33	400

(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			2	2											2	2
PASSENGER		1		1											0	2
TUG/TOWBOAT	7			1											7	1
OSV		1													0	1
MODU															0	0
PLATFORM															0	0
FISHING	27	7		1	4	2		1					1	31	12	
STATE #	1														1	0
BARGES															0	0
TANK															0	0
FREIGHT															0	0
MISC	3	1													3	1
TOTALS	38	10	2	5	4	2	0	1	0	0	0	0	0	1	44	19

LIC OFF	1														1	0
CREW	35	10	2	5	4	2		1					1	41	19	
PASS	1														1	0
TOTALS	38	10	2	5	4	2	0	1	0	0	0	0	0	1	44	19

Continued on page 18

Continued from page 17

Table 3 Commercial vessel non-total losses 1990

	FLOODED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	WEATHER	OTHER	TOTAL
FREIGHTSHIP								
SUBTOTAL	7	20	99	115	231	8	13	493
LT 100 GT	2	2	1	5	4		1	15
100-199				2	1		1	4
200-299		2	1	2				5
300-499			6	2	1			9
500-1599	1	2	14	20	10		3	50
1600-4999		1	3	4	8	1		17
5000-9999		1	3	8	35		2	49
10,000-19,999	3	6	39	36	72	2	1	159
GE 20,000	1	6	32	36	100	5	5	185
PASSENGER SHIP								
SUBTOTAL	11	18	44	65	144	4	19	305
LT 100 GT	11	15	33	51	76	3	16	205
100-1599			6	6	43		3	58
1600-4999		1	3	4	20	1		29
GE 5000		2	2	4	5			13
TUG/TOWBOAT								
SUBTOTAL	17	26	374	574	110	7	77	1185
LT 100 GT	4	6	71	99	28	3	41	252
100-199	7	11	133	195	41	1	19	407
200-299	2	5	49	54	14		4	128
300-999	3	4	106	202	20	3	12	350
GE 1000	1		15	24	7		1	48
TANK BARGE								
SUBTOTAL	4	8	164	292	37	11	21	537
LT 100 GT				4			1	5
100-499	2	1	2	3				8
500-999	1		41	58	8	3	6	117
GE 1000	1	7	121	227	29	8	14	407
MODU								
SUBTOTAL	0	1	6	1	8	2	2	20
LT 300 GT			2					2
GE 300 GT		1	4	1	8	2	2	18
PLATFORM								
SUBTOTAL	2	4	10	1	6		3	26

(cont. next col.)

	FLOODED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	WEATHER	OTHER	TOTAL
TANKSHIP								
SUBTOTAL	1	13	33	63	137	2	11	260
LT 100 GT		1			1			2
100-1599			5	5			1	11
1600-4999			3	2	5	1	2	13
5000-9999			4	6	4			14
10.000-19,999		6	7	11	34		1	59
20,000-39,999		2	8	26	44	1	2	83
40,000-99,999	1	4	5	13	47		5	75
GE 100,000			1		2			3
OFFSHORE SUPPLY								
SUBTOTAL	1	9	20	7	12	0	0	49
LT 100 GT		4	6	2	3			15
100-199		1	1	1	2			5
200-499	1	4	12	4	5			26
GE 500			1		2			3
FISHING VESSEL								
SUBTOTAL	113	43	116	117	473	7	277	1146
LT 100 GT	82	22	60	74	294	4	171	707
100-199	21	12	36	26	107	3	75	280
200-499	1	3		3	9		1	17
500-999		1	2	1	1			5
GE 1000 GT		4	3	1	7		2	17
STATE NUMBERED	9	1	15	12	55		28	120
FREIGHT BARGE								
SUBTOTAL	4	5	317	440	45	0	122	933
LT 100 GT			1	3	1		4	9
100-199	1	4	239	344	28		103	719
GE 1000	3	1	58	84	11		9	166
UNKNOWN			19	9	5		6	39
MISCELLANEOUS								
SUBTOTAL	4	8	53	16	23	1	10	115
LT 100 GT	2	5	36	8	11	1	6	69
GE 100 GT (SP)	2	2	8	5	10		2	29
GE 100 GT (NSP)		1	9	3	2		2	17
U.S. TOTALS	164	155	1236	1691	1226	42	555	5069
FOREIGN FLAG								
SUBTOTAL	2	13	64	105	115	0	14	313
FREIGHT	1	7	42	49	73		6	178
TANK		2	14	38	36		3	93
OTHER	1	4	8	18	6		5	42

Table 4 Commercial vessel non-total losses 1990

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	39	111	90	103	46	23	46	35								493
TANKSHIP	20	39	72	49	27	10	33	10								260
PASSENGER	62	43	51	32	16	22	71	8								305
TUG/TOWBOAT	14	184	233	234	161	89	220	50								1185
OSV		16	23	6	2	1	1									49
MODU																
PLATFORM	3	2	3	5	4		2	7								26
FISHING	77	92	253	122	118	64	265	35								1026
STATE #	12	13	12	17	13	6	29	18								120
BARGES																
TANK	5	37	112	154	89	52	54	34								537
FREIGHT	36	171	251	242	84	39	25	85								933
MISC	13	17	14	21	12	7	20	11								115
TOTALS	281	739	1117	987	572	313	766	294								5069

FLOODED	8	20	30	24	20	10	47	5	164
FIRE/EXPLOSION	12	25	32	29	23	8	23	3	155
COLLISION	60	191	242	271	148	71	121	132	1236
GROUNDING	72	286	408	378	180	110	188	69	1691
HULL/MACH	85	155	270	193	141	69	268	45	1226
WEATHER DAM.	3	4	11	10	7	3	4		42
OTHER	41	58	124	82	53	42	115	40	555
TOTALS	281	739	1117	987	572	313	766	294	5069

(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										11					0	11
TANKSHIP			1			1				4					1	5
PASSENGER		1		13		16		9		4					0	43
TUG/TOWBOAT			2	4		8		1	1	4			1	1	4	18
OSV			2	5		2				1					2	8
MODU																
PLATFORM			1	1		7				2					1	10
FISHING		1		6		3	1			5			9	1	10	16
STATE #						2									0	2
BARGES																
TANK										1		2			0	3
FREIGHT				2											0	2
MISC			5	2	4	7		1		2					9	12
TOTALS	0	2	11	34	4	46	1	11	1	46	0	2	10	2	27	143

LIC OFF															0	0
CREW		2	11	19		27	1	2	1	33		2	9	2	22	87
PASS				13	3	18		8		2			1		4	41
OTHER				2	1	1		1		11					1	15
TOTALS	0	2	11	34	4	46	1	11	1	46	0	2	10	2	27	143

Continued on page 20

Continued from page 19

Table 5 Commercial vessel non-casualty related deaths and injuries 1990

	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	1		3	1	2	2	11	9		2	11
OVERBOARD	5	1	2	8		13	1	1	4	35	28	2	5	35
DISAPPEAR		1		2		3				6	5		1	6
STRUCK BY OBJ	3			3		2	2		1	11	9		2	11
PINCH/CRUSH	2					1				3	3			3
BURN/SCALD										0				0
ELEC SHOCK										0				0
CUT										0				0
ENTANGLED			1			1				2	1	1		2
ASPHXA	1		1	1	1	3		1	1	9	6	2	1	9
SPRAIN/STRAIN										0				0
DIVING			6	1		1			1	9	1	6	2	9
UNK/NOC	5	1	2	4		2		1		15	13	1	1	15
TOTALS	17	3	13	20	1	29	4	5	2	7	101	75	12	14	101
INJURIES														
SLIP/FALL	87	53	40	49	20	36	40	51	4	8	388	333	21	34	388
OVERBOARD	1		5	1		4	1	3			15	9	5	1	15
DISAPPEAR											0				0
STRUCK BY OBJ	23	22	4	20	12	46	17	24	3	9	180	166	2	12	180
PINCH/CRUSH	13	5	6	6	1	21	8	7	1	2	70	64	2	4	70
BURN/SCALD	6	6	3	1	1	2	2	8			29	27		2	29
ELEC SHOCK	3	1	2	1				1			8	7	1		8
CUT	14	6	7	5	2	11	5	13		3	66	62	2	2	66
ENTANGLED	4	1	3	4	5	11	3	1		2	34	33		1	34
ASPHXA	5	1		1		7					14	5	4	5	14
SPRAIN/STRAIN											0				0
DIVING			11		1	7					19	2	16	1	19
UNK/NOC	62	38	19	36	13	36	29	46	1	10	290	246	20	24	290
TOTALS	218	133	100	124	55	181	105	154	9	34	1113	954	73	86	1113

Table 6 Commercial vessel casualty summary 1990

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	MISSING	OTHER	TOTAL
PERSONNEL								
SUBTOTAL	78	44	392	634	44	0	169	1361
INATT. TO DUTY	4		9	13			7	33
ERROR JUDGEMENT	5	1	33	68	1		2	110
CARELESSNESS	6	10	7	9	10		25	67
LACK KNOWLEDGE	1		3	1				5
FAILED TO:								
ACCT WIND/CRNT	1		25	15			1	42
USE NAV EQUIP			2	4				6
USE RADIO								0
DETERMINE POSN			5	8				13
SET PASS AGREE			9	1				10
KEEP LOOKOUT	1		12	4				17
COMPLY RULE/REG	1	2	2	1	2			8
PROC. SAFE SPEED			2	1				3
YIELD RT OF WAY			3					3
STRESS							1	1
FATIGUE			1	2				3
PHYSIOLOGICAL								0
INTOXICATION				1				1
IMPROP LOADING	9			1			5	15
IMPROP MAINT	9	6	1		6		38	60
IMPROP MOORING	2		3	4			14	23
IMPROP RIGGING	2			1			6	9
IMPROP SAFETY	2	5			5			12
OPERATOR ERROR	22	3	257	478	3		34	797
OTHER	13	17	18	22	17		36	123
ENVIRONMENT								
SUBTOTAL	29	1	76	209	48	0	52	415
ADVERSE WEATHER	8		16	32	10		22	88
ADVERSE CURRENT	15		17	19	7		12	70
DEBRIS			3		12		4	19
ICE			1		4		5	10
LIGHTNING		1						1
SHOALING				121				121
SUBMGD OBJECT	6		21	11	14		7	59
CHANNEL HAZARD			11	23	1		1	36
INADEQUATE ATON								0
OTHER			7	3			1	11

(cont. next col.)

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACH DMG	MISSING	OTHER	TOTA
MATERIAL								
SUBTOTAL	128	108	57	93	932	0	334	1652
FAILED MATERIAL:								
STRUCTURAL	89	35	22	27	318		128	619
MECHANICAL	11	32	22	28	358		100	551
ELECTRICAL	2	37		3	115		8	165
CORROSION	2				15		1	18
NORMAL WEAR	1	2			16		2	21
IMPROPER WELDING	1				6			7
IMPROPER RIVETING								0
STEERING FAILURE	1		10	9	16		5	41
FOULED PROPELLER				6	15		69	90
INADEQUATE:								
LIGHTING	1							1
STABILITY	15			1			1	17
LIFESAVING EQUIP.								0
FIREFIGHTING EQUIP.		1						1
CONTROLS								0
LUBRICATION					2			2
MAINTENANCE								0
INSUFFICIENT FUEL		1		1	25		10	37
PROPULSION FAIL	1		1	6	12		8	28
FATIGUE FAILURE	1				11			12
OTHER	3		2	12	23		2	42
TOTALS	235	153	525	936	1024	0	555	3428

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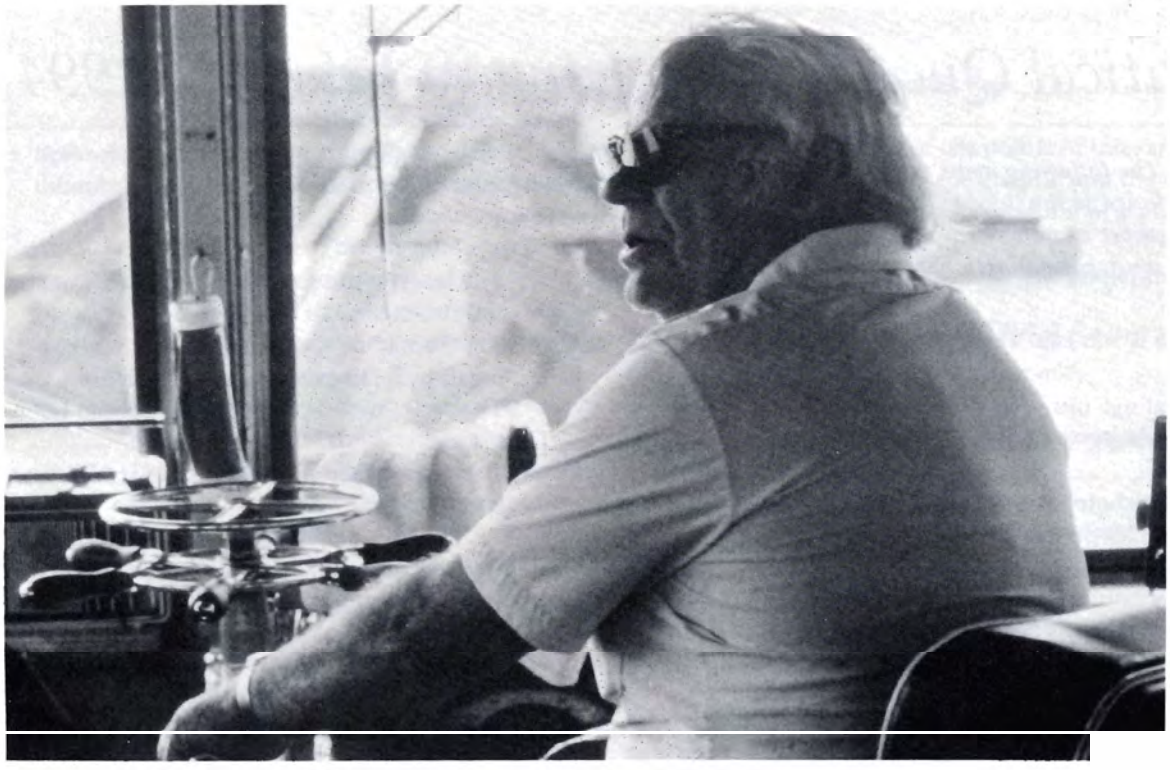

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tions included in the third assistant engineer through chief engineer examinations and the third mate through master examinations.

ENGINEER

1. Air leakage into a flash type distilling plant could occur through__________________________.

A. gasketed joints
B. valve stems
C. gauge-glass packing
D. any of the above

2. The maximum temperature rise of oil passing through any reduction gear or bearing should not exceed __________________________

A. 30°F
B. 50°F
C. 70°F
D. 90°F

3. The thermostatic expansion valve in a refrigeration system opens when the pressure __________

A. decreases in the evaporator
B. decreases in the expansion valve control bulb
C. increases above the expansion valve diaphragm
D. increases in the solenoid valve

4. To determine the main bearing clearance of a propulsion diesel engine, measure the main bearing shell using a ball anvil outside micrometer and measure the crankshaft journal using a (an)______.

A. telescoping gauge
B. ring "snap" gauge
C. inside vernier caliper
D. outside micrometer

5. Having a relief valve in a hydraulic system set at a pressure lower than the required operating pressure will result in __________________________.

A. accelerated action of the system components
B. overheating of the system
C. overspeeding of the hydraulic pump
D. extended system life

6. When renewing only a portion of an entire hull plate with an insert plate, what guidelines should you follow?

A. The insert plate should cover at least one full frame space.
B. The lines of new welding should, where possible, lie in existing lines of welding.
C. The corners of the insert plate should be square.
D. The insert plate should be at least 9/16th of an inch thick.

7. A safety cover differs from other access doors in that it is fitted with a__________________________

A. spring-loaded pressure plate
B. handwheel
C. nut-operated clamp
D. large gasket

8. In a DC generator, the effects of induced electromotive force are neutralized by the ____________

A. brushes
B. commutating poles
C. armature reaction
D. reversing winding

9. In diesel engines, the four basic events (intake, compression, power and exhaust) are performed once in __________________________

A. two crankshaft revolutions in a two-stroke cycle engine
B. two power strokes in a two-stroke cycle engine
C. one power stroke in a two-stroke cycle engine
D. two piston strokes in a two-stroke cycle engine

10. In pressure measurement, absolute pressure is defined as the difference between ____________

A. any two pressures measured with respect to a common reference
B. atmospheric pressure and barometric pressure at a given point
C. gauge pressure and ambient atmospheric pressure
D. a perfect vacuum and the total pressure at a given point

DECK

1. A vessel is heading magnetic north and its magnetic compass indicates a heading of 356°. How can this error be removed during compass adjustment?

A. If the red ends of the magnets are to port, raise the thwartships tray.
B. If the red ends of the magnets are to port and the thwartships tray is at the top, add more magnets.
C. If the red ends of the magnets are to starboard, lower the thwartships tray.
D. If the red ends of the magnets are to starboard and the thwartships tray is at the top, add more magnets.

2. All of the following can be determined by using a stabilogauge EXCEPT _____

A. metacentric height
B. mean draft
C. moment to trim one inch
D. deadweight

3. A vessel's "quarter" is that section which is ____.

A. abeam
B. dead astern
C. just forward of the beam
D. on either side of the stern

4. What is the length of a nautical mile?

A. 1,850 meters.
B. 6,076 feet.
C. 6,080 feet.
D. 2,000 yards.

5. A holder of a license as operator of uninspected towing vessels may navigate a towing vessel each day for a period not to exceed _____.

A. 6 hours
B. 12 hours
C. 18 hours
D. 24 hours

6. Which is TRUE concerning life preservers?

A. Buoyant vests may be used instead.
B. Life preservers are designed to turn an unconscious person's face clear of water.
C. Life preservers must be worn with the same side facing outwards to float properly.
D. Lightly stained or faded life preservers will fail in the water and should not be used.

7. Retrograde motion is the

A. movement of the points of intersection of the planes of the ecliptic and the equator
B. apparent westerly motion of a planet with respect to stars
C. movement of a superior planet in its orbit about the sun
D. movement of the celestial north pole in an elliptical pattern in space

8. You are on an ice-reinforced vessel about to enter pack ice. You should _____.

A. enter the pack on the windward side where there is a well defined ice edge
B. trim to an even keel or slightly down by the bow to take maximum benefit of the ice reinforcement
C. take maximum advantage of coastal leads caused by offshore winds
D. look for areas of rotten ice and enter perpendicular to the ice edge

9. What is the purpose of the intake/exhaust valves in a diesel engine?

A. They regulate the combustion cycle.
B. They supply cooling water.
C. They synchronize the ignition spark.
D. They supply and regulate lubricant flow.

10. You are off the coast of South Africa when a seaman is injured. What indicator should be used in a message requesting medical advice from a South African station?

A. DH MEDICO.
B. XXX RADIOMEDICAL.
C. MEDRAD.
D. PORT HEALTH.

ANSWERS

Engineer

1-D, 2-B, 3-C, 4-D, 5-B, 6-A, 7-A, 8-B, 9-D, 10-D.

Deck

1-D, 2-C, 3-D, 4-B, 5-B, 6-B, 7-B, 8-D, 9-A, 10-D.

If you have any questions concerning "Nautical Queries," please contact the Coast Guard (G-MVP-5), 2100 Second Street, S.W., Washington, D.C. 20593-0001.

Telephone: (202) 267-2705.

Chemical of the month *1/C Robert Hoffmann*

Diphenyl ether

Also called diphenyloxide, phenyl ether and phenoxybenzene, diphenyl ether is a colorless liquid with a mild pleasant odor at room temperature. It is used as a heat transfer medium, in perfuming soaps and in organic synthesis.

Health hazards

Diphenyl ether is harmful if swallowed. If some is swallowed and the victim is conscious, induce vomiting and give him or her water or milk to drink. Medical attention should be obtained immediately.

The chemical is an extreme irritant to eyes and skin. If it gets in someone's eyes, flush eyes with water for 15 minutes with the eyelids held open. Contaminated clothes should be removed, and effected areas wiped off and washed thoroughly with soap and water.

Fire hazards

Diphenyl ether is combustible, therefore it is incompatible with strong oxidizers. It has a flash point of 239°F and an ignition temperature of 1,148°F. The chemical has flammability limits of 0.8%-1.5% in air.

If a fire occurs, dry chemicals or carbon dioxide are the best extinguishers. Water or foam should not be used because they may cause frothing. Also, diphenyl ether is insoluble in water and may float.

Spill directions

If there is a spill, the fire department should be called and the discharge stopped. All ignition sources in the area should be shut off, and no one should come into direct contact with the chemical. A barrier should be set up to prevent the spread of the diphenyl ether while it is being removed. Rescue workers and clean-up crews should wear face shields or goggles, and rubber gloves.

Shipping

For domestic transportation in bulk, diphenyl ether is regulated by subchapter D, 46 CFR 30-40. For transportation in bulk by tankship, it is regulated by subchapter O, 46 CFR, and the International Maritime Organization's chemical codes as a category A pollutant. The IMDG code considers diphenyl either as a "marine polutant" for transportation as a packaged product.

Although it is non-reactive and stable during transport, diphenyl ether does present minor health and flammability hazards.

Diphenyl ether

Chemical name:	Diphenyl ether
Formula:	$(C_6H_5)_2O$
Synonyms:	diphenyloxide, phenyl ether and phenoxybenzene
Description:	Colorless liquid with a mild pleasant odor

Physical properties:

Boiling point:	257°C (495°F)
Freezing point:	27°C (81°F)
Vapor pressure:	0.887 psi @ 310°F 13.880 psi @ 490°F

Threshold limit values:

Time-weighted average:	1 ppm (7 mg/m^3)
Short-term exposure limit:	2 ppm (14 mg/m^3)

Flammability limits in air:

Lower flammability limit:	0.8% by volume
Upper flammability limit:	1.5% by volume

Combustion properties:

Flashpoint:	239°F (closed cup)
Autoignition temperature:	1,148°F

Densities:

Vapor (Air=1):	5.87
Specific gravity at 27°C:	1.07

Identifiers:

CHRIS code:	DPE
Cargo compatibility group:	41 (Ether)
CAS registry number:	101-84-8
DOT ID number:	Not listed
IMDG Code:	Environmentally hazardous substances, solid, n.o.s.

Robert Hoffmann was a first class cadet at the Coast Guard Academy when this article was written as a special chemistry project under 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.

Final rule

CGD 93-020, Captain of the Port zone boundaries (33 CFR parts 2 and 3) (October 4).

The Coast Guard is revising the descriptions of its Captain of the Port (COTP) zones. Most of the changes are related to extending the boundaries to the seaward limit of the exclusive economic zone. Additionally, changes are made to the onshore boundaries of several COTP zones. The purpose of establishing these boundaries is to define the areas of responsibility of the COTPs. The changes update the regulations to reflect current Coast Guard organization.

EFFECTIVE DATE: November 3, 1993.

Addresses: Unless otherwise indicated, documents referenced in this preamble are available for inspection or copying at the office of the executive secretary, Marine Safety Council (G-LRA/3406), Coast Guard headquarters, 2100 Second Street, S.W., Room 3406, Washington, D.C. 20593-0001 between 8 a.m. and 3 p.m., Monday through Friday, except federal holidays. Telephone: (202) 267-1477.

For further information, contact: CDR Robert Pond, Marine Environmental Protection Division between 7 a.m. and 3 p.m., Monday through Friday, except federal holidays. Telephone: (202) 267-6860.

Notice of proposed rulemaking

CGD 89-050, Vessel identification system (33 CFR part 187) RIN 2115-AD35 (October 5).

The Coast Guard proposes to establish a vessel identification system (VIS) as required by legislation, guidelines for state vessel titling systems, procedures for certifying compliance with those guidelines and rules for participation in this system for undocumented vessels. VIS, in conjunction with current Coast Guard vessel documentation information, will provide a nationwide pool of vessel and vessel owner information that will help in identification and recovery of stolen vessels and deter vessel theft. Mortgages that cover the whole of an undocumented vessel in states that both participate in VIS and hold certification of compliance with guidelines for state vessel titling systems would be deemed to have preferred mortgage status.

DATE: Comments must be received by January 3, 1994.

Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406) (CGD 89-050), Coast Guard headquarters, or may be delivered to room 3406 between 8 a.m. and 3 p.m., Monday through Friday, except for federal holidays. Telephone: (202) 267-1477.

Comments on collection of information requirements must be mailed to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, N.W., Washington, D.C. 20503. ATTN: Desk Office, U.S. Coast Guard.

The executive secretary maintains the public docket for this rulemaking. Comments will become part of the docket for this rulemaking, and will be available for inspection or copying at room 3406.

The Coast Guard has prepared an informational video tape designed for state boating administrators considering participating in the proposed VIS. For information on viewing or obtaining a copy of the tape, contact LT David Fish, (202) 267-6044.

For further information, contact: LT David Fish, Office of Marine Safety, Security and Environmental Protection, Information Management Division. Telephone: (202) 267-6044.

Notice of proposed rulemaking

CGD 88-049, Waterfront facilities handling liquefied hazardous gas (33 CFR parts 126 and 127) RIN 2115-AD06 (October 5).

The Coast Guard proposes to amend its regulations for waterfront facilities capable of transferring liquefied hazardous gas or "LHG" in bulk to or from vessels. The transfer of LHG presents hazards similar to those from the transfer of liquefied natural gas or "LNG," yet facilities capable of transferring LNG in bulk are subject to much more stringent requirements. These amendments would strengthen the requirements for the transfer of LGH and move those requirements from part 126 to 127.

DATE: Comments must be in by January 3, 1994.

Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406) (CGD 88-049), Coast Guard headquarters, or may be delivered to room 3406 between 8 a.m. and 3 p.m., Monday through Friday, except for federal holidays. Telephone: (202) 267-1477.

quirements must be mailed to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, N.W., Washington, D.C. 20503. ATTN: Desk Office, U.S. Coast Guard.

The executive secretary maintains the public docket for this rulemaking. Comments will become part of the docket for this rulemaking, and will be available for inspection or copying at room 3406.

A copy of the material listed in "Incorporation by Reference" in this preamble can be inspected or copied in room 1108, Coast Guard headquarters.

For further information, contact: Mr. Gary W. Chappell, Office of Marine Safety, Security and Environmental Protection, Information Management Division (G-MPS-3). Telephone: (202) 267-0491.

Final rule

CGD 91-209, Requirements for longitudinal strength, plating thickness and periodic gauging for certain tank vessels (46 CFR parts 30, 31 and 32) (October 8).

The Coast Guard is establishing minimum longitudinal strength and plating thickness standards for tank vessels that carry oil cargoes. The regulations also require the periodic gauging of these vessels after they reach the age of 30 years. The regulations are established as required by the Oil Pollution Act of 1990. The purpose of the regulations is to reduce the likelihood of oil spills from structural failure of tank vessels, particularly in the case of unclassed tank barges.

EFFECTIVE DATE: November 8, 1993.

Addresses: Unless otherwise indicated, documents referenced in this preamble are available for inspection and copying at the office of the executive secretary, Marine Safety Council, room 3406, Coast Guard headquarters, between 8 a.m. and 3 p.m., Monday through Friday, except for federal holidays. Telephone: (202) 267-1477.

For further information, contact: Mr. Thomas Jordan, project manager, at (202) 267-6751 or Mr. Phil Almen (G-MTH-3) at (202) 267-2988.

Notice of availability

CGD 93-062, National Preparedness for Response Exercise Program (PREP) (October 19).

The Coast Guard, the Environmental Protection Agency, the Research and Special Programs Administration, and the Minerals Management Service jointly developed the National Preparedness for Response Exercise Program (PREP) to provide guidelines for compliance with the Oil Pollution Act of 1990 pollution response exercise requirements. The PREP guidelines outline the applicability, type, frequency and objectives of the required exercises and will aid industry in meeting the requirements of the federal regulations regarding the pollution response exercises. This notice announces the availability of the draft PREP guidelines.

DATE: Comments should have been submitted by November 30.

Addresses: Copies of the PREP guidelines are available for inspection at G-MEP (room 2100), Coast Guard headquarters, or may be obtained by contacting Petty Officer Daniel Caras at (202) 267-6570 or by faxing a request at (202) 267-4085/4065.

For further information, contact: LCDR Rhae Giacoma, Office of Marine Safety, Security and Environmental Protection (G-MEP-4). Telephone: (202) 267-2616.

Notice of proposed rulemaking

CGD 91-045, Structural and operational measures to reduce oil spills from existing tank vessels without double hulls (33 CFR part 157) RIN 2115-AE01 (October 22).

The Coast Guard is proposing regulations under the authority of section 4115(b) of the Oil Pollution Act of 1990 that would require the owners or operators of existing tank vessels over 5,000 gross tons without double hulls to comply with certain structural and operational measures. The Coast Guard finds these measures provide as substantial protection to the environment as is economically and technologically feasible.

DATE: Comments on this notice must have been received by December 20, 1993.

Addresses: Comments on collection of information requirements must be mailed to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, N.W., Washington, D.C. 20503. ATTN: Desk Office, U.S. Coast Guard.

The executive secretary maintains the public docket for this rulemaking. Comments will become part of the docket for this rulemaking, and will be available for inspection or copying at room 3406, Coast Guard headquarters. Telephone: (202) 267-1477.

For further information, contact: Mr. Randall N. Crenwelge, project manager, OPA 90 staff, (202) 267-6220, between 7 a.m. and 3:30 p.m., Monday through Friday, except federal holidays.

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Policy statement

CGD 93-069, Measurement of vessels; water ballast exemption (46 CFR part 69) (October 27).

In response to an inquiry, the Coast Guard is publishing a policy statement to clarify its position concerning exemption of water ballast spaces from the gross tonnage of a vessel. This clarification will remove the tonnage limit for exclusion from the calculation of gross tonnage of ballast spaces carrying water to be used for underwater drilling, mining and related purposes, including production of all vessels carrying goods, supplies or equipment supporting exploration or production of offshore mineral or energy resources.

EFFECTIVE DATE: October 27, 1993.

For further information, contact: Mr. Kenneth C. Hixson, Vessel Documentation and Tonnage Survey Branch at (202) 267-1492.

Notice of international requirements

CGD 93-070, Oil Record Book required for vessels (November 8).

The Oil Record Book, required to be carried on ships by Annex 1 of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) has been amended. These amendments went into force on April 4, 1993. The Coast Guard is publishing the changes that have been made to the Oil Record Book requirements by these amendments.

For further information, contact: LT Jonathan C. Burton, Marine Environmental Protection Division (G-MEP-1), Coast Guard headquarters at (202) 267-0426.

Notice of proposed rulemaking

CGD 93-055, Inflatable personal flotation devices (46 CFR part 160) RIN 2115-AE58 (November 9).

The Coast Guard is considering the development of regulations establishing a Coast Guard approval program for inflatable personal flotation devices (PFDs) for recreational boaters. If issued, these new regulations would establish structural and performance standards for inflatable PFDs, as well as the procedures for Coast Guard approval for inflatable PFDs. They would also amend the PFD carriage requirements to permit inflatables in addition to the presently approved inherently buoyant types to meet carriage requirements on recreational boats and possibly other vessels.

DATE: Comments must be received by March 9, 1994.

Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406) (CGD 93-055), Coast Guard headquarters, or may be delivered to room 3406 between 8 a.m. and 3 p.m., Monday through Friday, except for federal holidays. Telephone: (202) 267-1477.

The executive secretary maintains the public docket for this rulemaking. Comments will become part of the docket for this rulemaking, and will be available for inspection or copying at room 3406.

For further information, contact: ENS Stephen H. Ober, Office of Marine Safety, Security and Environmental Protection, Attn: G-MVI-3/14. Telephone: (202) 267-1444.

Request for applications

CGD 93-074, Chemical Transportation Advisory Committee: Request for applications (November 9).

The Coast Guard seeks applicants for appointment to membership on the Chemical Transportation Advisory Committee (CTAC). This committee advises the chief, Office of Marine Safety, Security and Environmental Protection on matters relating to the safe transportation and handling of hazardous materials in bulk on United States flag vessels and barges, and in United States ports and waterways. The advice and recommendations of CTAC assist the Coast Guard in formulating United States positions at meetings of the International Maritime Organization (IMO).

The committee usually meets at least once a year at Coast Guard headquarters, Washington, D.C. Special meetings may also be called. Subcommittee meetings are held to consider specific problems. Each member serves for a five-year term and may be reappointed. All members serve without compensation (neither travel nor per diem).

Applicants should have experience in chemical manufacturing, marine transportation of chemicals, occupational safety and health or environmental protection issues associated with chemical transportation. To achieve gender and ethnic diversity among the committee membership, the Coast Guard is especially interested in applications from women and minorities.

DATE: Applications should be submitted before January 15, 1994.

Addresses: Application forms may be obtained by writing to Commandant (G-MTH-1), Coast Guard, or by calling the following points of contact.

For further information, contact: CDR Kevin J. Eldridge, executive director, or Mr. Frank K. Thompson, assistant to the executive director at (202) 267-1217.

Notice

CGD 93-057, Amendment of oil discharge criteria to Annex 1 of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL 73/78) (November 12).

On March 6, 1992, the 32nd session of the International Maritime Organization's (IMO) Marine Environmental Protection Committee adopted a resolution which established more stringent criteria for controlling the discharge of oil or oil-water from a ship's machinery bilges or discharge of an oily residue from a ship's cargo tanks. The resolution was accepted by IMO and became effective on July 6, 1993. However, IMO has recognized that some existing vessels would not be able to comply by then. This notice provides information on the amended requirements and the enforcement policies to be applied to vessels making good faith efforts to have the necessary equipment installed.

For further information, contact: Mr. Robert M. Gauvin, project manager, Merchant Vessel Inspection and Documentation Division (G-MVI-2). Telephone: (202) 267-1181.

Notice of temporary rules

CGD 93-075, Safety, security zones and special local regulations (33 CFR parts 100 and 165) (November 12).

This document provides required notice of substantive rules adopted by the Coast Guard and temporarily effective between July 1 and September 30. 1993, which were not published in the *Federal Register*. This quarterly notice lists temporary local regulations, security zones and safety zones, which were of limited duration and for which timely publication in the *Federal Register* was not possible. It also lists several regulations which were not included in the previous list.

For further information, contact: Ms. Sheri deGrom, executive secretary, Marine Safety Council at (202) 267-1477 between 8 a.m. and 3:30 p.m., weekdays.

Final rule

CGD 89-007, CGD 89-007a, Documentation of vessels; recording of instruments; fees (46 CFR parts 1 and 57) RIN 2115-AD60 (November 15).

The Coast Guard is establishing new recording practices to fully implement the provisions of the codification of the Ship Mortgage Act. In addition, it is simplifying the procedures for documentation of vessels and establishing new and revised fees for vessel documentation services. This final rule will make the regulations easier to use by the affected public and will more fully implement statutory requirements.

EFFECTIVE DATE: January 1, 1994.

For further information, contact: Mrs. Patricia J. Williams, chief, Vessel Documentation Section, Vessel Documentation and Tonnage Survey Branch, Merchant Vessel Inspection and Documentation Division. Telephone: (202) 267-1492.

Proceedings
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Barge crane lifts responders clad in protective gear to "rake" spilled magnesium phosphide from cargo hold of Santa Clara I. See Proceedings 1-2/93 -- front cover.

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Fire contingency plans

Fire control plans

Fire detection and alarm systems

Fire doors and dampers

Fire drills

Fire and explosion hazards

Fighting fire aboard ship.
See Proceedings 9-10/93 -- p 4.

Fire-fighting

The A B C's of effective fire control (9-10/93 -- p 46-49)
Coast Guard and Hampton Roads build response capabilities (9-10/93 -- p 66-70)
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FIRE on Russian trawler -- OPA 90 to the rescue (9-10/93 -- p 24-27)
Investigation uncovers source of fire aboard tankship Skaufast (9-10/93 -- p 7-10)
Shipboard fire-fighting plan takes shape in Juneau, Alaska (9-10/93 -- p 16-22)
Training for the inevitable (9-10/93 -- p 78-81)

Fire-fighting foam

The A B C's of effective fire control (9-10/93 -- p 48)
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FIRE on Russian trawler -- OPA 90 to the rescue (9-10/93 -- p 25-26)
Halon use limited to protect ozone layer (9-10/93 -- p 15)
Investigation uncovers source of fire aboard tankship Skaufast (9-10/93 -- p 7-8)
Ironing out problems with cargo-authority processes (7-8/93 -- p 22-24)
MTBE or ETBE? How to carry these additives - that is the question (7-8/93 -- p 25 and 27)
Not all foam systems are created equal (9-10/93 -- p 11)
Shipboard fire-fighting plan takes shape in Juneau, Alaska (9-10/93 -- p 21)

Fire-fighting systems

The A B C's of effective fire control (9-10/93 -- p 48)
Automatic sprinklers afford excellent fire protection (9-10/93 -- p 33-35)
Check CO_2 systems carefully - frequently (9-10/93 -- p 30-32)
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Investigation uncovers source of fire aboard tankship Skaufast (9-10/93 -- p 7-8 and 10)
New automatic sprinkler standards (9-10/93 -- p 36)
New hose standards help prevent fires (9-10/93 -- p 45)
New riverboats demand new safety measures (9-10/93 -- p 76)
Not all foam systems are created equal (9-10/93 -- p 11)
Shipboard fire-fighting plan takes shape in Juneau, Alaska (9-10/93 -- p 19 and 21)
Training for the inevitable (9-10/93 -- p 78-81)

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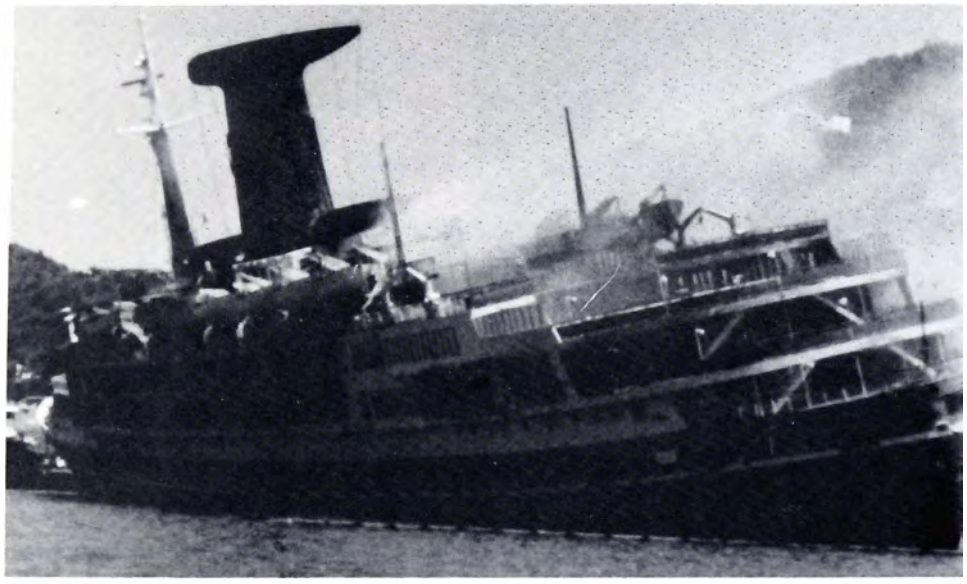

The end of a cruise.
See Proceedings 9-10/93 -- p 72.

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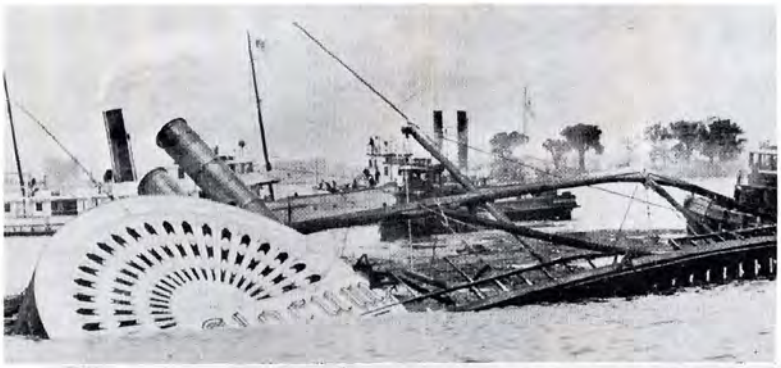
Fire-fighting training

Fire investigations

Fire prevention

Fire safety or protection



The excursion steamer General Slocum before and after burning in New York's East River in 1904. See Proceedings 5-6/93 -- p 7.

Fire security

Don't sell fire security short (9-10/93 -- p 71-73)

Fishing vessel casualties

Thirteen fishing vessels mugged in Typhoon Alley (3-4/93 -- p 4-7)

Fumigation

Getting the bugs out . . . interim fumigation regulations (7-8/93 -- p 48-49)

Universal shipping requirements are just around the corner (7-8/93 -- p 35-36)

Galley fire

FIRE in crew's galley (9-10/93 -- p 37-44)

General Slocum

Small passenger vessel safety is everybody's goal (5-6/93 -- p 1)

A tradition of innovation (5-6/93 -- p 7-8)

Geneva Convention on the High Seas - 1958

Modern day piracy and the IMO (11-12/93 -- p 18)

Global Maritime Distress and Safety System

IMO to modernize seafarer standards (11-12/93 -- p 10)

Group of Experts on the Scientific Aspects of Marine Pollution

Universal shipping requirements are just around the corner (7-8/93 -- p 36)

Want speedy approvals for new bulk chemical shipments? (7-8/93 -- p 18)

Gulf Strike Team

Charleston hazardous materials response UNPRECEDENTED (1-2/93 -- p 16 and 19)

A hot race to kill a well (Timbalier Bay, Louisiana) (3-4/93 -- p 61- 62)

Halon and alternatives

Check CO_2 systems carefully - frequently (9-10/93 -- p 30)

Halon use limited to protect ozone layer (9-10/93 -- p 14-15)

Human element . halon . uniformity . are priority topics at IMO session (9-10/93 -- p 3 and 6)

IMO committee and subcommittee report cards (11-12/93 -- p 49)

Halon Recycling Corporation

Halon use limited to protect ozone layer (9-10/93 -- p 15)

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Cargo is transferred from tankship. See Proceedings 7-8/93 -- front cover.

IMO headquarters in London.
See Proceedings 11-12/93 -- p 3.

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Inspections

Intergovernmental Maritime Consultative Organization (IMCO)

Intermodal transportation

International Association of Classification Societies

International Conference on Oil Pollution Preparedness and Response

International Convention for the Preservation of Pollution from Ships (MARPOL 73/78)

International Convention for Safe Containers

Double-hull oil carrier ~~Eagle~~ under construction. See ~~Proceedings~~ 11-12/93 -- p 3.

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The IMO's main meeting room holds 900 people.
See Proceedings 11-12/93 -- p 9.

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International Maritime Organization (IMO)

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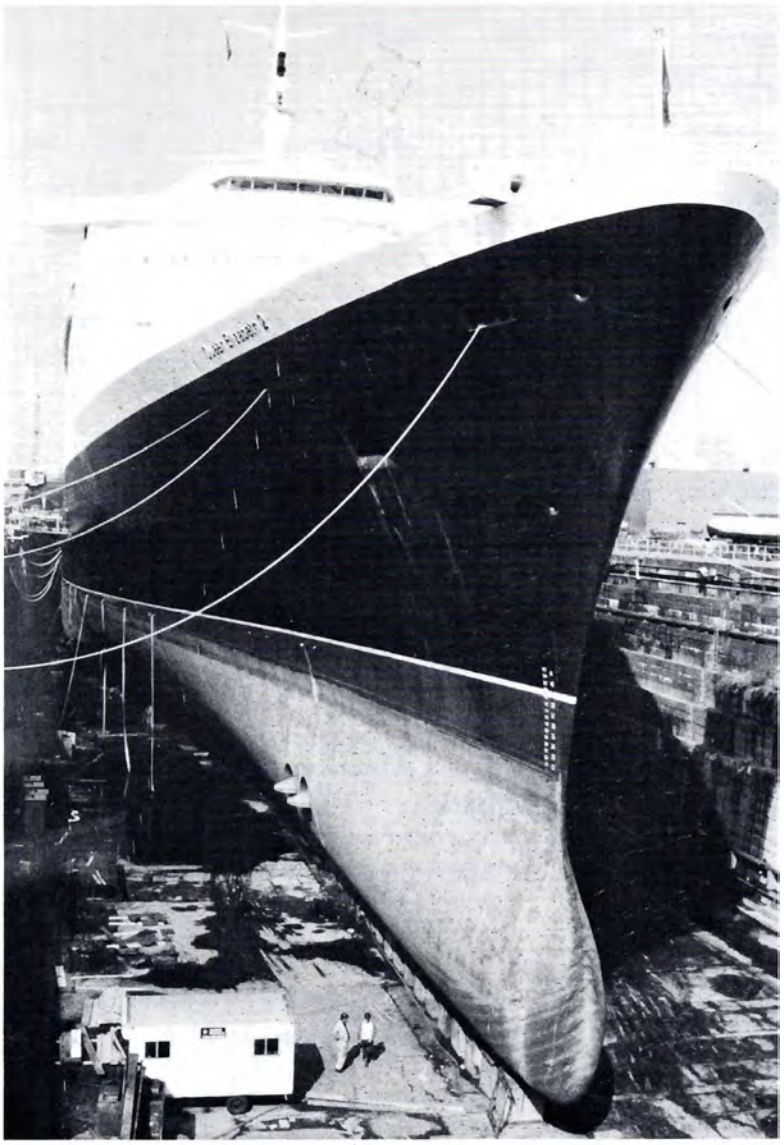

The Queen Elizabeth 2 is drydocked after touching bottom in Martha's Vineyard Sound in August 1992. See Proceedings 3-4/93 -- front cover.

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Captain "Calico Jack" Rackham.
See Proceedings 11-12/93 -- p 20.

Pirate from Spanish ship Panda.
See Proceedings 11-12/93 -- p 20.

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Navigational and Vessel Inspection Circulars (NVICs)

Automatic sprinklers afford excellent fire protection (9-10/93 -- p 35)
Introducing the Chemical Transportation Advisory Committee (7-8/93 - p 47)
Ironing out problems with cargo-authority processes (7-8/93 -- p 22)
New automatic sprinkler standards (9-10/93 -- p 36)
New inspection circulars save time (3-4/93 -- p 24)
New riverboats demand new safety measures (9-10/93 -- p 75)
Not all foam systems are created equal (9-10/93 -- p 11)

Oil Pollution Act of 1990 (OPA 90)

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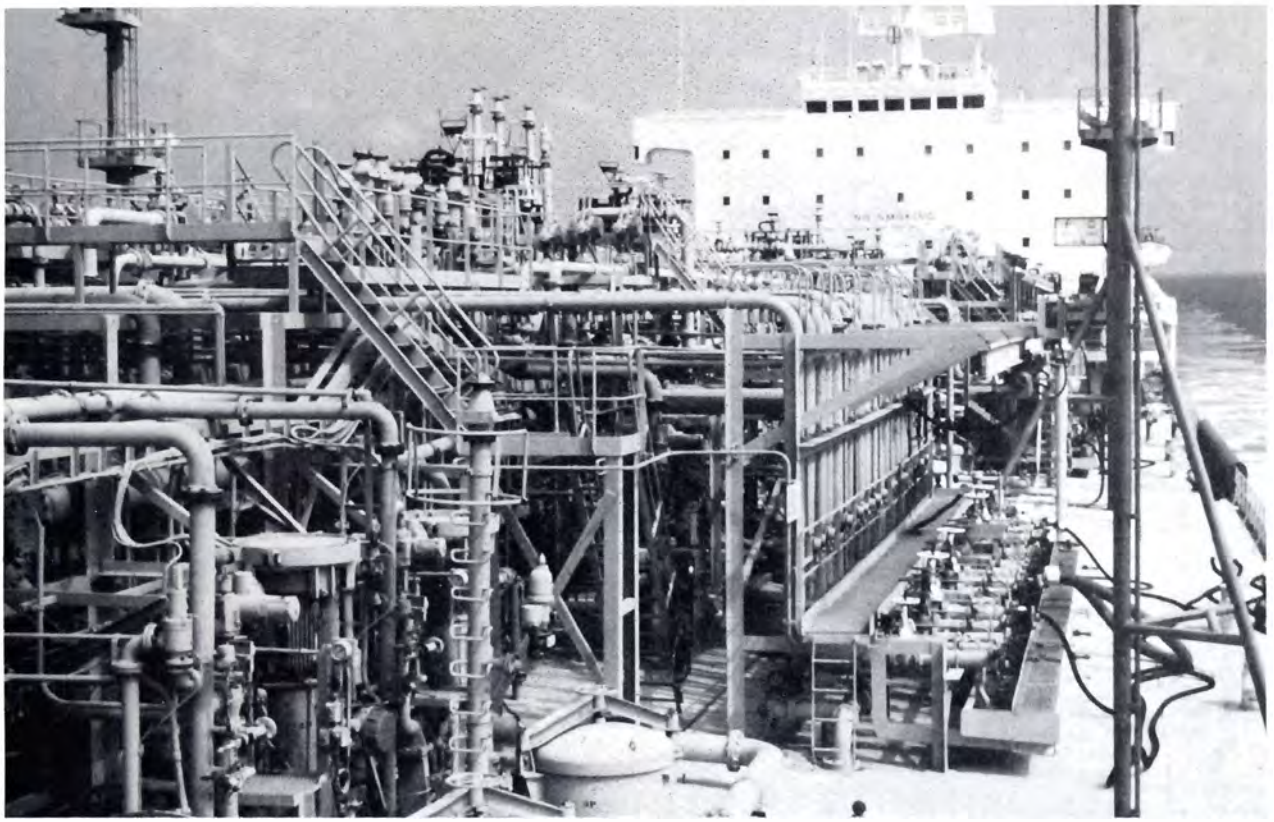

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Saint Lawrence Seaway Development Corporation and Coast Guard officials check salinity of ballast water aboard the merchant vessel Ranger using a meter and probe via ballast tank sounding tubes.

Preventing raw ballast dumping in Great Lakes

By LCDR Frank Shelley

Often called the "fourth coast" of the United States or the "eighth sea," the Great Lakes provides access for international shipping to the heart of North America. The Great Lakes hold approximately 25 percent of the freshwater on the planet, and supply drinking water and irrigation to a major part of the United States and Canada.

The five lakes, which run as deep as 1,000 feet in places and feature thousands of miles of coastline of all types, have developed unique ecosystems, and plant and animal species found nowhere else.

Threat

The very ships that sail the lakes, contributing to foreign trade and providing employment afloat and ashore, pose a significant threat to the quality of water, and the native species and ecosystems. By dumping untreated ballast water into the Great Lakes, these ships can destroy these precious resources.

In addition to the "usual" hazards of pollution, groundings and casualties, these "silent invaders," although only recently recognized, have been adversely affecting the Great Lakes for many years.

In an attempt to reduce this threat, a new program was started in 1992 to check vessel safety and monitor pollution prevention on incoming vessels. With the recent introduction of new United States regulations to prevent the discharge of raw ballast water, a major source of non-indigenous plant and animal species threatening the ecosystem will be shut off.

Background

Previously, vessels entering the Great Lakes would proceed via the St. Lawrence Seaway and through internal United States waters for up to 1400 miles, discharging their ballast before taking on cargo at their port calls. Doing so released foreign fresh water species that, if established, would expand at the expense of native species. Most new species that take up residence in the Great Lakes often drastically decrease or displace native species by denying them historic sources of food or robbing them of their breeding grounds.

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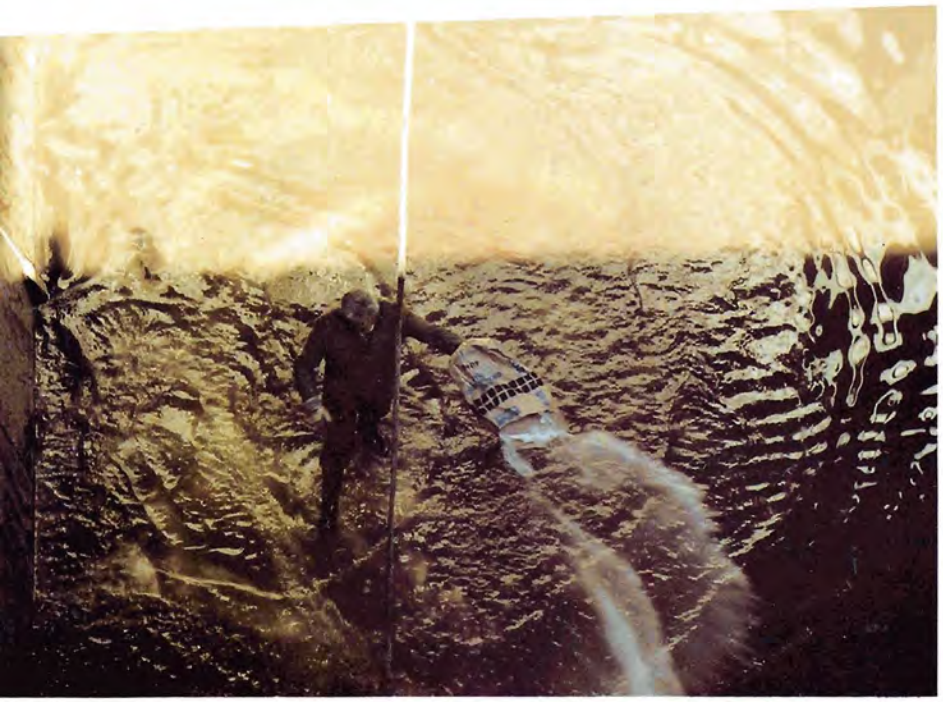
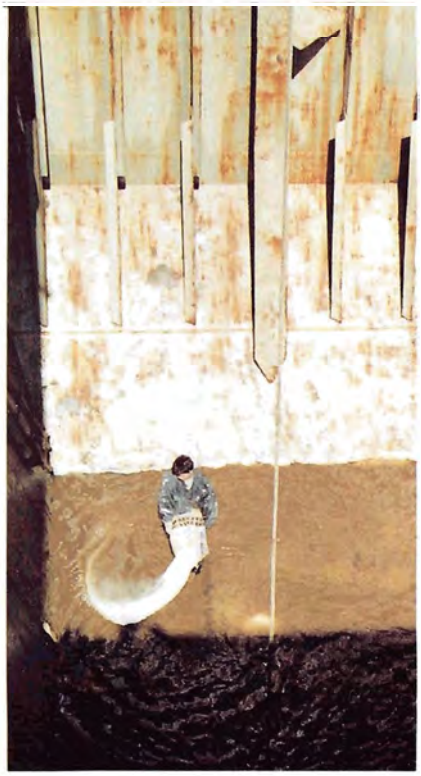


Crew members make salt water brine for ballast water treatment on ~~Ranger~~.



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There are 147 known non-indigenous plant and animal species that have taken up residence in the Great Lakes in the past 150 years. About 80 percent of them have been introduced within the last 30 years. It is suspected that most of these species were carried in ballast water dumped by ocean-going ships that entered the Great Lakes via the St. Lawrence Seaway.

The most infamous invader is the zebra mussel, which is believed to have been introduced in 1986. By the year 2000, it is anticipated that efforts just to control the mussel will cost $5 billion.

However, the two known species of zebra mussel are not the only threats to the environment and economy of the Great Lakes. The European ruffe, spiny water flea, tubenose goby and round goby have also been introduced, also probably since the 1980s.

Besides port safety boardings, there have been 127 other boardings conducted at the locks since a Coast Guard marine safety detachment was established in Massena, New York, in 1991. They have included casualty investigations for other ports on outbound vessels, crew members jumping ship, pollution investigations and major deficiency follow-ups from other ports. The vast majority of other boardings, however, have involved ballast water. This trend should accelerate.

Ballast boardings

Under the Non-Indigenous Aquatic Nuisance Species Control Act of 1990, the Marine Safety Detachment Massena was assigned to ensure that vessels entering the Great Lakes manage their ballast in an environmentally sensitive manner.

At the time, pending ballast regulations played a big part in moving the detachment from Alexandria Bay to Massena. The move offered two big advantages in tackling the problem.

- **Location is strategic.**
  Vessels are boarded within three miles of entering United States waters on the Great Lakes. Waiting until the vessel reaches its first United States port before testing would cost the shipping company more if the vessel had to turn around in Duluth, Minnesota, or Chicago, Illinois.

More brine is mixed up by ~~Ranger~~ crew for treatment of ballast water.

- **Boardings are conducted "on the fly" with minimal delays.**

  Boarding for ballast water testing are done between American locks, and most vessels (if in compliance) experience no delay to their transit.

Compliance

Vessel compliance with the May 1993 regulations under 33 Code of Federal Regulations 151.1510 is accomplished in one of three ways.

The first method is for the vessel to conduct a mid-ocean exchange of ballast to be dumped into the Great Lakes, and complete the flushing action so that the salinity of the ballast to be discharged is 30 parts per thousand (ppt) or greater. Because most of the world's oceans are between 34 and 38 ppt, a thorough exchange of ballast water in mid-ocean should leave what is in the tank well over 30 ppt, taking into account that a certain percentage of water in the tank is "unpumpable."

Besides flushing out most of the hitchhikers in the tank, increasing the salinity from fresh water (0 ppt) to at least 30 ppt should kill anything left in the unpumpable ballast.

By conducting the exchange in mid-ocean at least 2,000 meters of water, one is less likely to pick up salt water species than in a salt water coastal port. If salt water species are discharged in the lakes, chances are that they would either be killed outright in the fresh water, or be unable to reproduce.

The second method is retaining ballast on board. This is obviously not a good option for vessels that are entering the Great Lakes to pick up cargo, as is the case with most vessels. Each kilo of ballast retained on board is one less kilo of cargo that can be taken out of the area.

The third option is treating ballast according to a preconceived plan supported by biological data and previously approved by the Coast Guard. This method holds promise but has not been fully explored.

The merchant vessel *Ranger* was enroute when the regulations took effect. It had partially exchanged its ballast in mid-ocean, but it did not measure up to 30 ppt. The vessel was delayed for four days, while heated discussions were carried out between industry, two governments, various congressional offices and the Coast Guard. It was finally accepted by all parties that 30 ppt was the minimal acceptable limit for foreign originating ballast to be discharged in the Great Lakes.

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More measuring . . .

more mixing.

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Eventually, the *Ranger* was permitted to treat its ballast tanks according to a submitted plan and finally met the minimum standard. However, the cost involved in its delay does not make this an attractive option for other vessels. In hindsight, it would have saved time and money if the vessel had returned to an alternate exchange site in the Gulf of St. Lawrence.

In response to the problems encountered by the *Ranger*, the Canadian Shipping Federation is developing a pilot program that may lead to a permanent treatment method. This program would allow vessels which have made good faith efforts to comply with a ballast exchange, but still fall short of the salinity limit, to treat their ballast prior to discharge, provided it is subject to sampling before and after the treatments, and the minimum salinity level is achieved.

The discharge of ballast to shore is certainly an acceptable option, but very few vessels are capable of pumping ballast to treatment plants. And few shore facilities can accept ballast.

Conclusion

Ballast water invasion is not an exclusive Great Lakes problem. Up to 350 non-indigenous species were identified via samples in one ballast tank on the West Coast. It is only a matter of time before ballast exchange will be considered by every port accepting ocean-going vessels.

Most ports don't have the options available in the Great Lakes, where ocean water salinity exchange provides a natural barrier. Nevertheless, we expect to see ballast management, regulatory enforcement, vessel design initiatives and shore side facility capabilities for treatment in the near future for all deep water ports.

Photographs accompanying this article are by Donald M. Reid.

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Controlled burn of JP-5 jet fuel in marsh near Naval Air Station Brunswick.

A good burn mops up jet fuel spill in Maine

By LTJG Steven M. Wischmann

Last March 29, a civilian employee of Naval Air Station (NAS) Brunswick, Maine, discovered an open one-inch low point drain valve on a pipe carrying JP-5 fuel for a new storage tank system. Buried under new snow, the valve had been leaking fuel for at least two days.

After securing the valve, the worker reported the incident to base officials, who, in turn, notified the National Response Center. Marine Safety Office (MSO) Portland, Maine, was then informed that an estimated 63,000 gallons of fuel had been discharged through the pipe and had flowed into a storm drain that emptied into a stream leading to a marsh next to the Androscoggin River. A small percentage of the spill had gone into the river before it could be contained or collected.

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Coast Guard officers from MSO Portland monitor controlled burn.

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Response

Coordinating with MSO Portland and the Maine Department of Environmental Protection, the naval air station had Seabees construct weir dams at selected sites in the stream to contain the spilled fuel, and hired a contractor to begin vacuum recovery. The captain of the port at the MSO sent a team to the scene to monitor response activities. Atlantic Strike Team personnel provided technical assistance to the effort.

Mechanical recovery operations proved effective until physical access to the marsh was required. Concern over the environmental impact of foot traffic and the risk of pushing spilled fuel into the soil layer demanded consideration of other less intrusive removal techniques such as in situ burning. Appropriate federal and state agencies were consulted on the use of in situ burning. Consideration was given to air quality hazards, the impact to wildlife and humans, and the overall benefits of burning as compared to the effectiveness and collateral damage of mechanical recovery.

Burn

A controlled test burn was conducted on April 5, after about 48,000 gallons or approximately 75 percent of the spilled fuel had been recovered. Initially, a small pool of jet fuel contained in the marsh was ignited to observe its behavior and to determine if it was effective. The answer was affirmative as the fuel swiftly ignited with a bright orange flame and continued to burn.

Full-scale controlled burns were conducted over the next three days, removing an estimated 4,000 to 6,000 gallons of fuel from the marsh. Residual fuel was recovered with a sorbent boom where possible, or allowed to dissipate naturally. The area was carefully monitored by Navy, Coast Guard and state personnel for several days after the burn to ensure that the cleanup efforts were complete. A long-term site assessment will be made to determine the scope of damage to the environment.

Weir dam in stream contained spilled jet fuel which was burned.

Representatives of the Department of Interior, the Department of Commerce (National Oceanic and Atmospheric Administration), the Environmental Protection Agency, the Maine Department of Environmental Protection and the Maine Department of Inland Fish and Wildlife were among those supporting the spill response effort.

This undertaking — the first in situ burning ever authorized in the Coast Guard's first district — was successful due to close multi-agency cooperation and coordination, swift deliberate decision making, and thoughtful concern for the overall protection of the environment.

With this successful precedent established, future use of in situ burning and chemical countermeasures will be more feasible. This will improve future response operations and provide the flexibility so critical to effective pollution response.

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