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Special issue on tank vessels

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***Exxon Long Beach*, a crude oil tanker owned by Exxon Shipping Company.**
Photo courtesy of National Steel and Shipbuilding Company.

RADM A. E. "Gene" Henn Chief, Office of Marine Safety, Security and Environmental Protection

Rear Admiral Arthur Eugene "Gene" Henn became Chief, Office of Marine Safety, Security and Environmental Protection at Coast Guard Headquarters, Washington, D.C., in June 1991. Prior to this assignment, Rear Admiral Henn was Commander of the Maintenance and Logistics Command, Atlantic.

RADM Henn's earlier assignments included that of Operations and Engineering Officer on the Coast Guard cutter *Chincoteague*; Assistant Chief, Merchant Marine Technical Branch, New Orleans, LA; and Special Project Action Officer, Merchant Marine Division, Coast Guard Headquarters.

He was also Marine Inspector and Senior Investigating Officer, Marine Inspection Office, Philadelphia, PA; Chief, Engineering Branch and Chief, Marine Technical and Hazardous Materials Division, Coast Guard Headquarters; Captain of the Port, New York; Commander, Group, New York; Commander, Subsector, New York, Maritime Defense Zone, Atlantic; and Chief, Operations Division and Chief of Staff, Eighth Coast Guard District, New Orleans, LA.

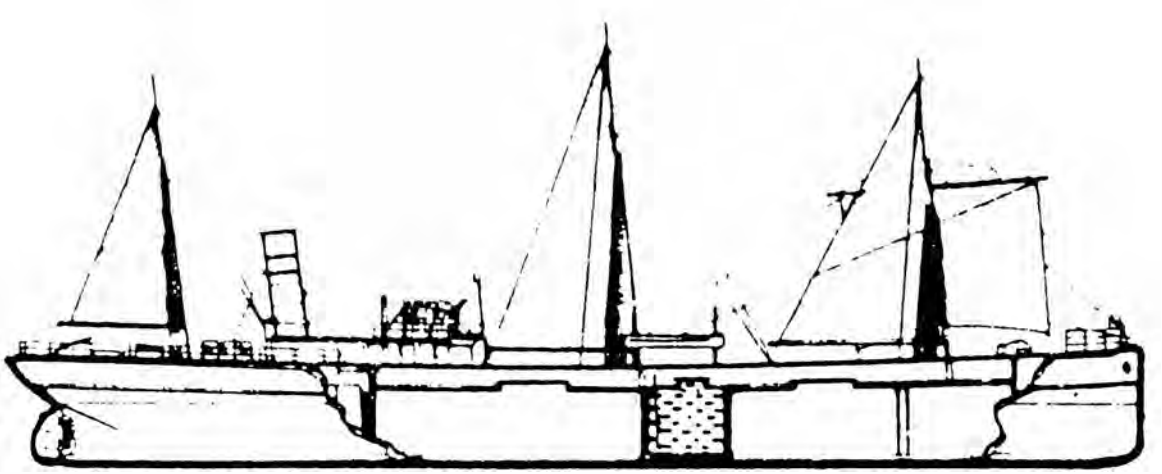
A 1962 graduate of the Coast Guard Academy, RADM Henn earned combined master of science degrees in naval architecture, marine engineering and metallurgical engineering from the University of Michigan in 1968. Also, he is a 1982 graduate of the Army War College.

His decorations include two Meritorious Service Medals, four Coast Guard Commendation Medals, Coast Guard Unit Commendation Ribbon, Coast Guard Meritorious Unit Commendation Ribbon, Coast Guard Achievement Medal and two Commandant's Letter of Commendation Ribbons.

RADM Henn is a member of the American Society of Naval Engineers, American Bureau of Shipping, International Cargo Gear Bureau, Marine index Bureau, Marine Engineering Council of Underwriters Laboratories and the Sealift Committee of the National Defense Transportation Association.

During the past 20 years, he has represented the United States as a member of delegations to the International Maritime Organization, a United Nations specialized agency. He heads United States delegations to meetings of the Maritime Safety and Marine Environment Protection Committees of IMO.

A native of Cincinnati, Ohio, RADM Henn is married to the former Susan Frances Pedritti, also from Cincinnati. They have two grown children, David and Jennifer.



Massis, a three-masted ship built in 1883 by Armstrong Mitchell & Co. for carrying oil on the Caspian Sea.

Evolution of the tank vessel

Ocean-going tank vessels were unknown as recently as the middle of the last century. Wood supplied most of the energy in the United States, which was largely agricultural around 1850. Oil was used locally where it surfaced in different parts of the world. There were some hand-dug wells in Russia, Rumania and Burma, but no one was known to actively drill for oil at that time

In 1859, Professor Silliman Junior of Yale College wrote a paper on petroleum from the natural springs of "Oil Creek" near Titusville, Pennysylvania. A Colonel Edwin Drake drilled a test well at the site the same year, launching what was to become a billion dollar industry.

Early transport

Iron-hooped wooden barrels were used to carry crude oil by horse and cart from wells, which rapidly spawned from Pennsylvania into West Virginia and Ohio. In the early days, barrels were barged on the Allegheny River to the Pittsburgh area where the oil was refined. Later on, the railroad extended tracks to the oil-producing area, using large wooden vats mounted on flat cars for petroleum transport.

By the mid-1860s, the United States was exporting about 750,000 barrels or 100,000 tons of oil -- about half the total production -- mostly to Europe. As in the whaling days, which peaked around 1840, the oil was transported in white oak barrels as part cargo on sailing ships of various types and sizes.

No matter how sturdy the barrel, leakage was always a problem and posed the ever present danger of fire and explosion. The crews of the brigs and schooners carrying even small quantities of petroleum were understandably uneasy.

In 1861, Peter Wright & Sons, Philadelphia merchants, chartered a 224-ton brig *Elizabeth Watts* to carry the first full cargo load of oil in 1,329 barrels to London. The crew deserted the ship out of fear of being burned alive with such volatile cargo. The ship's master recruited a new crew from local bars for the historic journey.

Tank ships

Two years later, the next step in the evolution took place with the design of a two-container "tank ship." *Ramsey,* an iron-hulled sailing vessel, was built for a British merchant to carry 1,400 tons of oil in specially designed iron tanks, as well as barrels in 'tween decks" spaces.

Another sailing ship, *Charles*, was converted in 1869 to carry 794 tons of oil in 59 square iron tanks in the main hold and 'tween decks. The tanks leaked and the vessel was destroyed by fire after three years of trading on the Atlantic.

In 1872, a Philadelphia line ordered a 2748-ton three-deck steamer to be constructed to carry oil in bulk and passengers. *Vaderland* was the first tank steamer, followed shortly by *Nederland* and *Switzerland.* However, the vessels were not allowed to carry oil with passengers, and carried only general cargo, at least until the 1880s.

Around this time, Russia launched a major oil industry near the inland Caspian Sea, a few miles from the seaport of Baku. A way had to be found to transport the oil economically from Baku to the Volga River on to Russian cities and northern Europe.

After acquiring a productive well in the area, two Swedish brothers, Robert and Ludwig Nobel, opened a refinery in Baku in 1875, and connected it to the well with a seven-mile pipeline, replacing the old horse and cart method. The oil was cheap, but to ship it in barrels or other containers would be very costly.

The Nobels turned to Sweden to design and build the world's first tank steamer to transport oil, as well as burn fuel oil instead of coal or wood.. Delivered in 1878, *Zoraster* carried about 250 tons of kerosene in 21 vertical cylindrical tanks within an iron hull. The tanks were later removed and the oil carried against the plating.

Zoraster was quickly followed by other oil tank vessels, including ***Buddak, Nordenskiold and Moses***. By 1907, there were 137 steamers and 149 sailing vessels -- a total of 286 oil-transport vessels -- on the Caspian Sea.

Steam vs sail

Despite the success of the steamers on the Caspian Sea, the opinion prevailed in the 1880s that transporting oil by sailing vessels was safer than by steamers, at least on the long, often rough, Atlantic voyages. Also it was relatively inexpensive to fit old sailing ships with oil tanks.

The old wooden-hulled vessels could carry up to 3,000 tons of oil. The late 1800s, however, saw the emergence of larger metal-hulled ships, which were generally faster than the wooden vessels and could carry more oil.

Tank sailers, although plentiful and cheap, were not ideal oil carriers with the weight of and space used by the double-containment method. Also the vessels didn't always handle well in high Atlantic seas and strong winds.

In the early days of oil carrying, however, steam was not economical for long voyages and there were serious risks involved with the iron-riveted, steam-driven tankers. Open-coal boilers could easily ignite the oil, which sloshed wildly in rough seas. Also there was a fear that rivets could loosen and vapors reach the boilers.

Gluckauf

In 1884, Heinrich Riedemann, a German shipowner, had the sailing vessel, *Andromeda*, converted to carry oil by integrating 72 metal tanks with the hull. He was so pleased with the venture that he decided to construct a deepsea steamship to carry oil in a double-bottomed hull.

Initially, Riedemann had difficulty in finding a shipbuilder to construct this revolutionary vessel because of fear of an explosion occurring during an ocean voyage. In fact, he couldn't even find a German builder willing to undertake the project.

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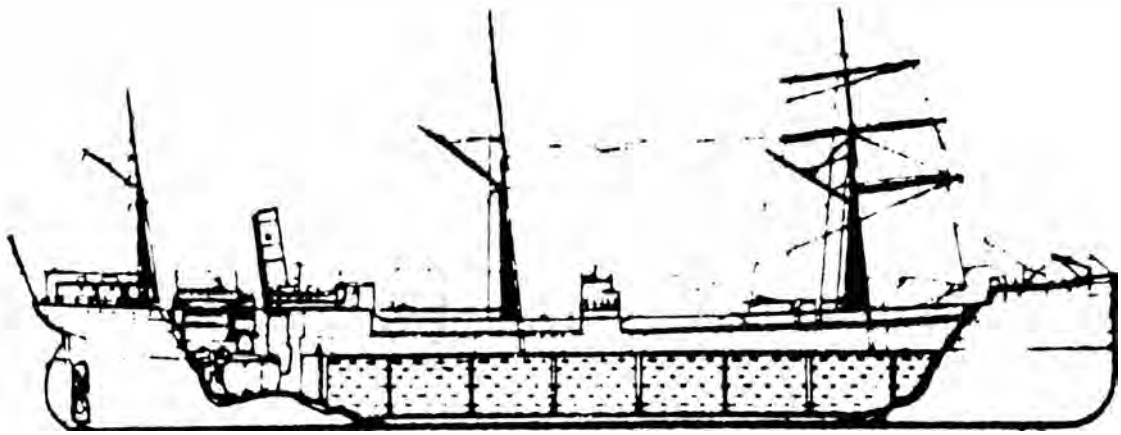
Prototype of today's tanker, ~~Gluckauf~~, built in 1886 by Armstrong Mitchell, had the engineroom aft, separated from the cargo space by the pump room, which formed a cofferdam



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He finally contracted with Armstrong Mitchell & Company, Newcastle upon Tyne, England, to design and construct the vessel, *Gluckauf.* The same firm had built *Massis, Posidon* and *Armeniak* for the Caspian Sea trade.

A prototype of today's tankers, *Gluckauf* was a 300-foot three-masted barkentine. The design consisted of a single-screw steamer with poop deck, forecastle, machinery aft and pump room forward of the boiler space. The vessel could carry nearly 3,000 tons of kerosene.

Launched on June 16, 1886, the vessel was christened *Gluckauf* (good luck), but was soon nicknamed *Fleigauf* (blow up). The ship's arrival in New York for a cargo of petroleum at the end of July was not met with open arms. The longshoremen, oil workers and coopers felt that their jobs were threatened by the vessel's automated loading systems, and persuaded the local coal merchants not to refuel it.

Refueling in St. Johns, *Gluckauf* arrived safely in Geestermunde, Germany, about 20 days later. Before returning for another load, the vessel had additional bunker capacity fitted to avoid having to refuel in New York.

Gluckauf was wrecked off Long Island on March 24, 1893, and was an object of interest for months with its stern under water and fore-body reaching high up in the air.

Fleet growth

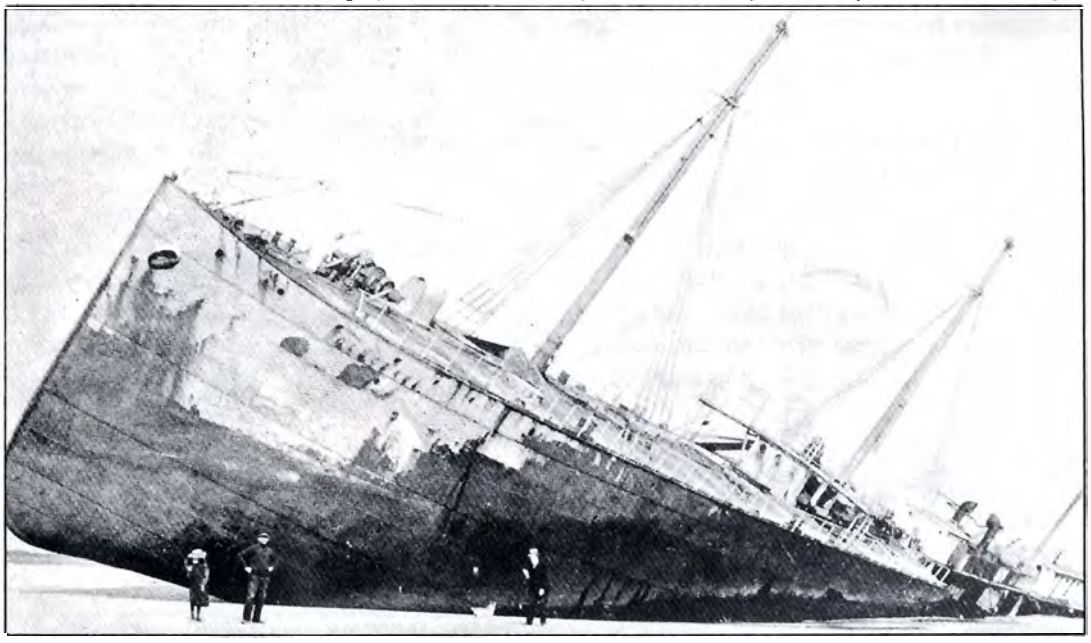
After *Gluckauf's* success in 1886, deepsea tankers began to multiply. Annual improvements in safety, performance, size and economy spurred the growth of the world's oil ships from a total of 193 vessels by 1900 to 1,480 in 1934.

What better illustrates the growth of the oil-tanker industry than the fact that in 1885, about 99 percent of oil cargoes was in barrels, and by 1906, about 99 percent was carried in bulk?

Today's super tankers may measure a quarter of a mile and carry more than 500,000 tons of petroleum, but they are dwarfed by the ingenuity and courage of *Gluckauf* -- the vessel that started the industry we know today.

The line drawings and much of the information in this article are printed with permission from Liquid Gold Ships, A History of the Tanker, by Mike Ratcliffe, published in 1985 by Lloyd's of London Press. Another source of material was Historical Transactions 1893 - 1943, published in 1945 by the Society of Naval Architects and Marine Engineers.

Gluckauf was wrecked on March 24, 1893, off Long Island.
Photograph from the Steamship Historical Society, University of Baltimore Library.



76 years ago -- --
Merchant vessel manning practices have changed since Captain Schellinger took the wheel in 1915.

Photo courtesy of Mystic Seaport Museum, Mystic, Connecticut.

Tanker manning
past - present - future

CDR Charles F. Guldenschuh

Recent tanker casualties, most notably the *Exxon Valdez* grounding have focused a great deal of attention on vessel manning levels. The major issue has been "reduced crew levels."

In fact, the phrase "reduced crew" has been interpreted as "unsafe crew levels" by many people. To understand where we are and where we will be going in vessel manning, it is important to understand where we have been.

Background

In manning vessels, the Coast Guard is obliged to ensure that a minimum number of qualified crew members are onboard for safe operation. Such determinations have been based on a body of statutory requirements, along with policy procedures.

In the past, the Coast Guard has required minimum manning to ensure that a vessel could be safely navigated. The manning scale was based on the typical vessel of a given size, but, as a general rule, did not take into account its particular operations. The remaining workload manning requirements were left up to the operating company. (This practice was very successful until the late 1960s.)

In general, most vessels carried as many as twice the number of Coast Guard-required crew. However, starting around 1970, operating companies began to slowly reduce the number of positions onboard that were not required by the Coast Guard to remain competitive in the world market.

When automation began to replace individual crew member tasks with equipment, the size of required crews began to decrease.

The past

The following is a summary of vessel manning levels since the 1950s. (It does not take into account requirements such as tankerman or lifeboatman, which have not necessarily required individual crew member positions.)

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Typical required crew complement

1950s

1 master
1 chief mate
1 second mate
1 third mate
1 radio officer
6 able seaman
3 ordinary seamen
1 chief engineer
1 first assistant
1 second assistant
1 third assistant
3 firemen-watertenders
3 oilers

1960s

Due to the installation of fully-automated boilers or self-regulating boilers on steam vessels, the requirement for three firemen/watertenders was eliminated. Their other responsibilities were reassigned to the remaining watchstanders.

1970s

Provisions were developed for oilers on steam vessels to be replaced by fully-automated boilers and pilothouse throttle controls, and the centralization of controls and instruments in the machinery spaces.

The requirement for the three ordinary seamen was eliminated by the installation of watch-call systems, sanitary facilities on the bridge and other labor-saving devices.

1980s

More diesel propulsion vessels without propulsion boilers were placed in service, which did not require firemen or watertenders.

The Coast Guard allowed the substitution of up to two specially- trained ordinary seamen for the two required able seamen, while maintaining the mandated percentage of able seamen.

Provisions were developed for oilers on diesel vessels to be replaced with automated systems, pilothouse control of propulsion machinery, and the centralization of instruments and controls to one operating station.

It was no longer necessary for licensed engineers to stand 24-hour watches in diesel vessel enginerooms with the automated systems; plus extensive monitoring, control and alarm systems; the duplication of vital auxiliaries with automatic transfer capabilities; the emphasis from remote control to self-regulating systems, the installation of machinery-space fire and bilge flooding detection systems, and the establishment of machinery-space-planned maintenance programs.

The requirement for six able seamen was reduced to three, plus three maintenance persons (with AB endorsements), by establishing maintenance departments and requiring masters to augment deck watches with maintenance persons when circumstances warranted additional watchstanders.

Clearly, manning changes from the 1950s to the 1980s were based almost exclusively on the use of automated equipment and labor-saving devices. Inevitably, these innovations would reduce the number of required crew members.

The present

The Coast Guard must continue to require an adequate minimum number of qualified crew members for each vessel it inspects and certificates. However, the factors under consideration are evolving.

The 1983 recodification of Title 46 of the U.S. Code, for instance, included a change in the provisions for certificating vessels. Namely, the safe **operation** of a vessel is not limited to its **navigation.** While most of the past manning changes reflect improved technology substitutions, at least one reflects a concern for the total vessel **operations**.

Maintenance

The concept for and policy concerning maintenance persons and departments have been evolving over a number of years. When permitted by the Certificate of Inspection, some individuals in a vessel's required-crew complement may beassigned as deck or engine maintenance persons in their respective departments. They would perform maintenance duties within the deck or engine department boundaries, and are subject to the crossover prohibition of 46 USC 8104(e).

A merchant vessel officer runs his ship from a modern integrated bridge.

Photo courtesy of Sperry Marine

If a vessel establishes an acceptable maintenance department, the mandated maintenance persons will be assigned to it, and are then available as a ship's maintenance crew, not subject to the crossover prohibition.

The required maintenance persons shall hold appropriate qualified ratings (AB, QMED, etc.) so that they may augment navigation or machinery space watches should the need arise.

For those assigned to the maintenance department, watch assignments will be based on individual qualifications. For example, an individual with both deck and engine qualifying ratings may be assigned to either watch at the discretion of the master.

Coast Guard manning regulations, specifically 46 CFR 15.705(a), recognize that the master is responsible for establishing adequate watches. They also recognize that the daily performance of vessel maintenance does not, in itself, constitute the establishment of a watch. Therefore, the maintenance persons can be used in a day working capacity, but are also available to augment watches when determined necessary by the master.

1987 study

In 1987, the Coast Guard sponsored a study, entitled, "Crew size and maritime safety," conducted by the National Academy of Sciences' Marine Board. The results of the recently released study confirmed Coast Guard concerns about manning issues and also confirmed lessons learned from the *Exxon Valdez* grounding, which took place during the course of the study.

Conclusions and recommendations included:

- During the 20-year period studied, there was a substantial reduction in vessel casualties and personnel injuries, along with a significant decline in crew sizes.
- Due to inadequate data, no direct link, either positive or negative, could be attached to crew size and safety.
- United states manning laws were not related to vessel safety and improperly restrict the appropriate use of technology. Therefore, they should be revised to remove unnecessary barriers to innovation and should have a direct link to safety issues.

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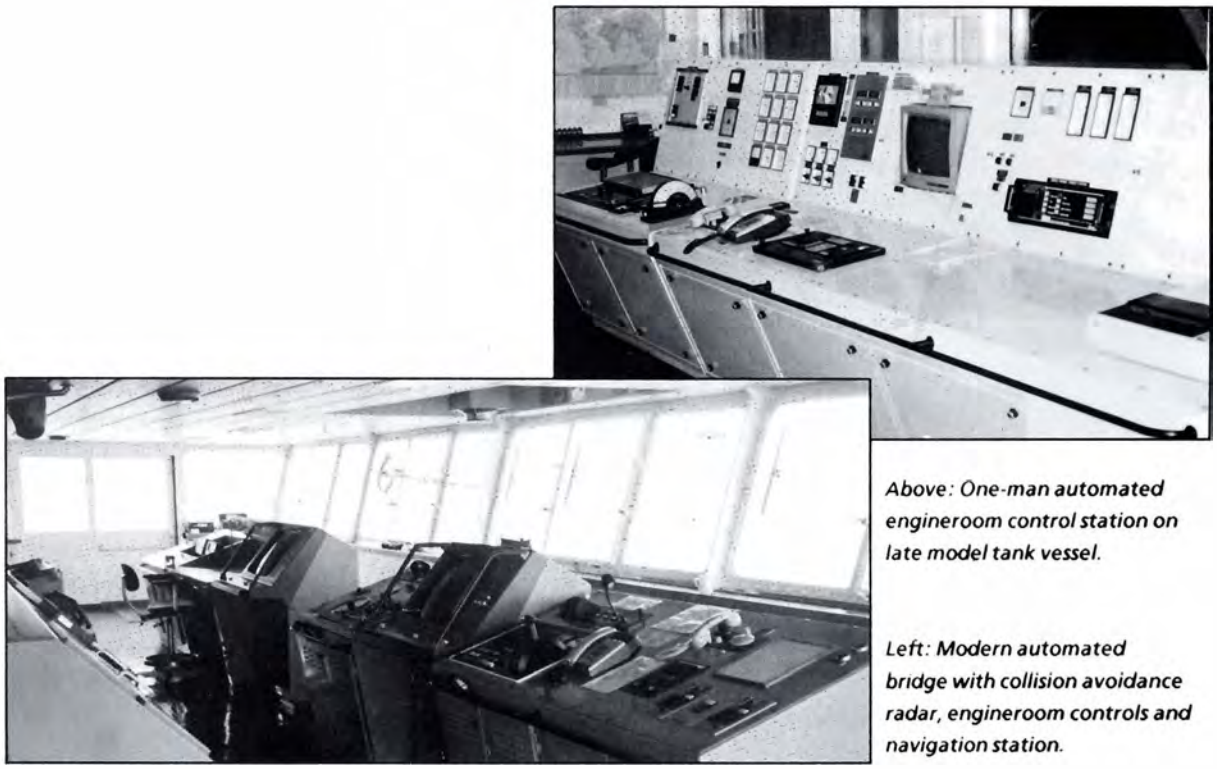

Above: One-man automated engineroom control station on late model tank vessel.

Left: Modern automated bridge with collision avoidance radar, engineroom controls and navigation station.

Continued from page 7

- The United States should ratify the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.
- The need for work-hour limitations providing real protection for crews and environmental safety should be reviewed.
- An analytical model to assist in manning determinations should be developed.

This study and others, including the soon-to-be-released study on shipboard fatigue by the Transportation Safety Center, will influence the direction of additional research and development efforts emphasizing human factors concerns. These efforts will be considered as policies on crew sizes and qualifications, and the role of shoreside management in ship operations are reviewed and revised.

Oil Pollution Act of 1990

At present, the most significant influence on tanker manning is the Oil Pollution Act of 1990, which mandates, among other things, work-hour limitations for all seamen.

The OPA 90 requires that seamen may not work more than 15 hours in any 24-hour period, or more than 36 hours in any 72-hour period, except in an emergency or a drill. "Work" includes any administrative duties associated with the vessel whether performed aboard the vessel or ashore.

This provision went into effect when the OPA 90 was passed. All tanker operators now must take this requirement into account. Future manning modification requests must demonstrate that these work hour limitations will not be exceeded with the modification in place.

In addition, the OPA 90 mandates that the engineroom and steering station must be manned on tankers in all navigable waters of the Unites States, except in waters to be determined. This provision may impose extra manning requirements. Previous manning reductions based on periodically unattended enginerooms may no longer be appropriate if a large portion of a vessel's route requires the engineroom to be manned due to this provision.

The OPA 90 also amended 46 USC 8104 (complement of inspected vessels) to require that consideration be given to the navigation, cargo handling and maintenance functions of a vessel for the protection of life, property and the environment when determining manning levels.

In reviewing modification requests, the Coast Guard will consider operational concerns along with navigational requirements. These include maintenance plans, shoreside support and organizational structures to ensure that a vessel is adequately manned for the intended operation.

[For futher information on OPA 90 manning regulations, contact: Mr. Bruce Novak (G-MS) at (202) 267-6319.]

The future

Predictions about vessel manning can be risky, but some reasonable assumptions about the future can be made. They include:

- the increased development and use of automated equipment and artificial intelligence to perform more tasks traditionally done by seamen,
- the continued blending of traditional departmental duties aboard ship as new equipment emerges, causing reanalysis of individual job functions,
- international efforts to increase shoreside management's role in safe vessel operation,
- international efforts to ensure that vessel operations do not adversely effect the environment,
- international efforts to address the benefits and problems associated with automated vessels with small crews, (The human element, especially fatigue, will be a major factor in this area.)
- international efforts to ensure the proper qualifications of seafarers, as well as their safety and welfare,
- innovative methods by ship operators to reduce the required permanent crew, based on temporary riding crews carrying out approved planned maintenance programs; the expanded use of shoreside maintenance and support for cargo operations, docking and administrative duties; and tailoring crew needs to specific route operations.

Coast Guard efforts

The Coast Guard has not been, nor is it likely to become, an advocate for reduced manning. That advocacy belongs with the industry. The Coast Guard must be prepared, however, to deal with legitimate requests.

The Coast Guard's primary focus must always be the protection of life, environment and property. Coast Guard efforts must address three interrelated elements: **hardware, people and operational practices.**

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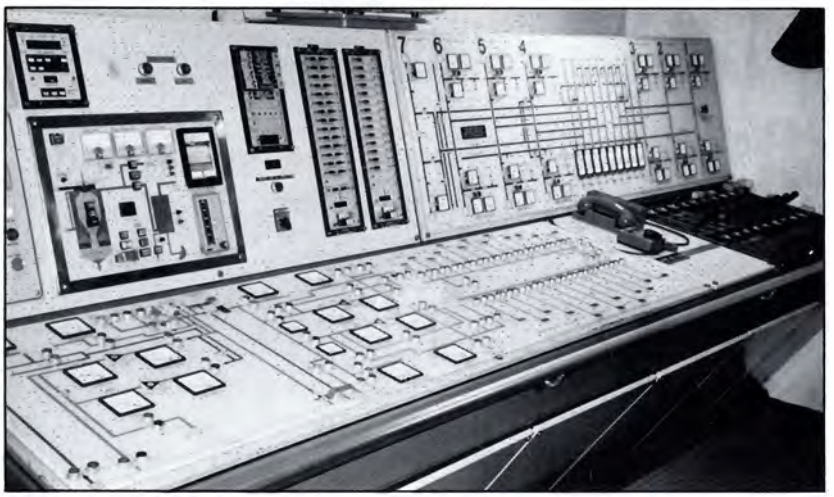

One-man main cargo control station aboard modern tankship.

Photos on pages 8 & 9 by LCDR Steve Ciccalone, Coast Guard traveling inspector.

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Hardware

Integrated bridge, engineroom and ship systems are already with us, and will undoubtedly continue to be improved. The extent to which they will affect the necessary numbers of crew members or their skills is problematic.

The substitution of equipment for people will face two major hurdles.

- It must be demonstrated that the
- equipment is at least equal in its performance to that of appropriately qualified seamen

- There must be evidence that the equipment is consistently reliable to an acceptable degree. (The reliability factor will play a major role in long-term crew adjustments.)

One area that is likely to evolve quickly is the use of international agreements to regulate ships. The United States plays a lead role at the International Maritime Organization (IMO) in safety and environmental protection discussions, many of which involve manning requirements.

The "one-man bridge" concept has received much attention at the IMO. Basically, the issue is whether one person is able, given certain instruments and monitoring systems, to act as the officer of the navigational watch and maintain a proper lookout at night. Several countries are experimenting with a one-man bridge arrangement.

The decisions the IMO might take with respect to these experiments could have a significant effect on future bridge designs, watchstanding procedures and qualifications -- all of which can affect manning determinations. (See *Proceedings* January-February 1990 issue.)

People

If industry continues to attempt crew size reductions, it becomes increasingly more important that the remaining crew members have the necessary skills and demonstrated abilities to perform their duties. Their physical fitness becomes extremely vital, because little backup will be available.

As more ship functions and controls become centralized, there may be a need for a "watch officer" skilled in both traditional deck and engine expertise, along with new positions involving electronics, computers and maintenance management. If permanent crews are to be reduced, based on shoreside or riding crew support, the individuals in these groups must also be properly qualified.

There may also be a need for a new type of versatile officer license and/or other licenses to cover new skills dictated by new technologies and procedures aboard ship. It may be necessary for entry level seamen to have certain training and skills before becoming a member of a ship's crew. Licenses may have to be limited to specific classes of vessels, i.e., tankers, container or breakbulk. As shoreside management becomes part of the manning equation, it may be necessary to verify their skills.

Many of these changes may not take place without statutory manning reforms. Representatives of management and labor in the maritime industry must work together to convince Congress of the necessity of these changes.

Operational practices

It is likely, in the near future, that vessel manning will no longer be based upon typical operations. Ships will be manned according to their specifics and for certain operations.

Vessel routes, cargo handling -- turn-around-times, maintenance plans, support systems, equipment, emergency response, potential fatigue and other human factors will all play a part in manning decisions.

Conclusion

The Coast Guard will continue to require a minimum number of qualified crew members to safely and efficiently operate vessels. However, their organization and skills may well be substantially different than in decades past.

CDR Charles F, Guldenschuh is chief of the Vessel Manning Branch of the Merchant Vessel Personnel Division of the Coast Guard's Office of Marine Safety, Security and Environmental Protection. Telephone: (202) 267-0230.

Tanker training

Mr. Peter S.A. Palmer

The dependability of tankship transportation of oil, chemicals or other hazardous liquid cargoes upon world waterways is more important today than ever before.

To the casual observer, safely navigating a tanker from a loading to a receiving terminal may seem an easy task for a seasoned crew. Just one "little" mistake caused by carelessness or lack of knowledge, however, may be enough to trigger an accident with catastrophic consequences, especially when flammable and/or toxic materials are involved.

The Coast Guard has concluded from the findings and recommendations of a significant number of marine casualty and personnel injury investigations that most marine accidents can be avoided by manning tank vessels with better trained and more knowledgeable crews.

Training convention

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers provides the basic principles to be observed in keeping navigational watches. The text of this convention was adopted on July 7, 1978, by representatives of 72 nations. It was signed by the United States, subject to ratification, on January 25, 1979, and entered into force a year later.

This convention was given favorable advise and consent by the United States Senate in May 1991. United States ratification of the convention is expected in the near future.

Convention regulations for deck-watch personnel cover adequate and appropriate watch arrangements, fitness for duty, watch-keeping ratings, understanding of navigational equipment and watchkeeping duties, proper lookouts, and marine environmental protection. They also include mandatory minimum knowledge requirements for certification of officers in charge of navigational watches.

The convention's engine-watch regulations cover general watchkeeping requirements, machinery operation, fitness for watchkeeping duties, the duties themselves, watchkeeping ratings and marine environmental protection.

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Tankerman demonstrates how to secure a liquid cargo transfer line.

Photo courtesy of Hollywood Marine , Inc., of Houston, Texas.

Instructor uses tank vessel model to demonstrate lessons for trainees.

Photo courtesy of Hollywood Marine, Inc.

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Specific training

Of special note, chapter 5 of the convention specifically addresses tankers, providing mandatory minimum requirements for training and qualification of masters, officers and rated unlicensed personnel of oil, chemical and liquefied gas tankers..

Officers and crew members with qualified ratings who have certain duties and responsibilities aboard a tanker must complete an approved fire-fighting course, a period of supervised shipboard service in safe operational practices and an approved oil-tanker familiarization course.

Masters, chief engineers, chief mates, second engineer officers and anyone responsible for loading, discharging and care in transit or handling of cargo must have experience relevant to their duties, and also complete appropriate specialized training. Individuals meet this requirement if they have served in a relevant position on tankers for at least a year within the last five years.

Certification

Current regulations under Title 46, Code of Federal Regulations, part 12, allow a master, mate, pilot or engineer operating on vessels of more than 200 gross tons to serve as a tankerman without special certification. Individuals without a license for one of these categories may be eligible for certification as a tankerman by the Coast Guard.

Applicants for tankerman certificates must be:

a) trained to perform necessary cargo handling operations onboard a tanker,

b) issued merchant mariner's documents with cargo-handling grades, and

c) able to speak and understand the English language.

In addition, a physician must attest that an applicant's eyesight, hearing and physical condition are such that he or she can perform the duties of a tankerman. The vision evaluation includes color-sensing testing.

An applicant must prove to the satisfaction of the Coast Guard in verbal or written examinations conducted in English that he or she is familiar with the general arrangement of all tanker operations connected with the loading and discharging of cargo, and the use of fire-extinguishing equipment.

The applicant must also demonstrate his or her knowledge of pollution laws and regulations, procedures in discharge containment and

cleanup, and methods for the disposal of sludge and waste material from cargo and fueling operations.

Liquid cargo requirements

The Coast Guard published a notice proposing to amend the regulations under 46 CFR part 12 to require persons-in-charge aboard tankers engaged in transfers of dangerous bulk liquid cargoes to meet tankerman requirements.

The proposed amendments include the:

a) incorporation of industry practices, convention provisions and tankerman manning requirements for tankships and tank barges;

b) establishment of minimum qualification standards for the persons-in-charge of bulk liquid transfers and tank washing operations;

c) requirement of shore-based training covering bulk liquid handling and fire fighting for tankermen serving on tankships;

d) requirement of shore-based training or examination covering bulk liquid cargoes and fire-fighting training for tankermen serving on tank barges;

e) provision for "grandfathering" of individuals currently serving as tankerman; and

f) creation of a new 46 CFR part 13 - certification of tankermen.

Further training

Due to the ever increasing complexity of shipboard technology, the Coast Guard believes that tankermen should have on-going and specialized training, as well as basic knowledge of the general requirements and principles for keeping navigational watches.

The American Petroleum Institute's January 1991 publication on recommended practices for the bridge-management training program offers assistance in developing bridge-management teams aboard tankers. It provides technical guidance for training programs for teams in safe and efficient ship operations.

The institute recommends that initial bridge-management training consist of a 40-hour course including classroom and simulator training. Refresher training should be conducted at least once every five years, and review classroom and simulator training in bridge-management skills. In addition, periodic refresher training should consist of a 16-hour course including sufficient simulator time to allow all participants to practice the bridge-team procedures learned.

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Tankerman trainees are instructed aboard cargo transfer simulator.

Photo courtesy of Hollywood Marine, Inc.

Trainee uses simulated Marine Safety International steering, radio and radar equipment in a pilothouse mock-up.

Photo courtesy of Exxon Shipping Company.

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Although merchant seamen are normally trained by maritime institutions and/or on-the-job on vessels, many ship operators support a need for supplemental training. This is primarily due to advances in technology and a recognized need for increased safety measures aboard tankers.

Gaps in education or refresher training are now being filled by private maritime training centers around the world. Collaborating with maritime universities and the shipping industry, some of these privately-owned centers offer a variety of professional training programs, ranging from tanker fire fighting to the operation of inert gas systems.

The Coast Guard approves of training programs which comply with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, and maintains a list of approved courses offered all over the country by maritime training institutions.

The need for all merchant mariners, whether new or seasoned, to complete upgrade and refresher training in tanker operations is essential to improve tanker safety. This is especially important for individuals who have kept their Coast Guard merchant mariner licenses or certificates active by serving in a shoreside maritime-related capacity, and several years later decide to return to sea aboard a tanker.

The potential for marine accidents will always exist, but such occurrences will be reduced and become less costly as tanker crews complete the type of training programs called for by the International Convention on Standards of Training Certification and Watchkeeping for Seafarers.

The following publications and bulletins are available.

- *The International Convention on Standards of Training, Certification and Watch-keeping for Seafarers,* with Annex, 1978
  U.S. Government Printing Office
  Superintendent of Documents
  Washington, D.C. 20005

- *API Recommended Practice 1140,* First Edition, January 1991
  American Petroleum Institute
  1220 L Street, N.W.
  Washington, D.C. 20006

- *Coast Guard Approved Training Courses*
  Commandant (G-MVP-3)
  U.S. Coast Guard
  2100 Second Street, S.W.
  Washington, D.C. 20593

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Protect our marine environment
Through MARPOL
LCDR Gerald Jenkins

In the early 1970s, the world finally recognized that its oceans were not an unlimited resource for waste disposal. IMO responded in 1973 with the International Convention for the Prevention of Pollution from Ships.

Modified in 1978, the convention is known as MARPOL 73/78. Its objective is to limit shipborne pollution by restricting operational pollution and reducing the possibility of accidental pollution. It deals not only with oil, but with chemicals carried in bulk, hazardous goods carried in packaged form, sewage and garbage.

Acceptance of the convention by national governments obliges them to make the requirements part of domestic law. In the United States, this was accomplished by the enactment of the Act to Prevent Pollution from Ships, Title 33 U.S. Code, sections 1901-1911. This act resulted in the development of regulations contained in Title 33 CFR parts 126, 151 and 154 through 158, and 46 CFR parts 25, 98, 151 and 153.

MARPOL 73/78 requirements deal with five major categories of pollutants.

Annex I	Prevention of pollution by oil
Annex II	Control of pollution by noxious liquid substances (chemicals) in bulk
Annex III	Prevention of pollution by hazardous substances in packaged form
Annex IV	Prevention of pollution by sewage from ships
Annex V	Prevention of pollution by garbage from ships

Annexes I and II are mandatory for nations which are party to the convention. The others are optional and may be ratified individually. The United States ratified Annex V in 1988, and is expected to ratify Annex III very soon.*

***MARPOL ANNEX III**
Prevention of pollution by hazardous substances in packaged form
The United States Senate passed ANNEX III on May 14, 1991. The Department of State is preparing an instrument of ratification with the president's anticipated approval.

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Annex I

Annex I requires that vessels have certain oil pollution prevention equipment on board, and follow specified procedures to reduce the discharge of oil and oily wastes into the sea through normal shipboard operations. Ship design requirements are also mandated which reduce the likelihood of accidental discharges.

Annex I requirements include:

A) Crude oil washing
An improved system for cleaning cargo tanks using oil instead of water for removing sediments, eliminating the need to dispose of large quantities of oil-water mixtures.

B) Segregated ballast tanks
Dedicated ballast tanks making it unnecessary to place water ballast into cargo tanks, eliminating the need for oil-water mixtures.

C) Protectively located ballast tanks
Ballast tanks located in a position to reduce the likelihood of oil discharge in the event of a collision or grounding.

D) Oil-water separation equipment
Equipment permitting the discharge overboard of controlled oil-water mixtures where such discharges are permitted.

E) Cargo and bilge monitoring equipment
Equipment providing a continuous record of the concentration of oil discharged into the sea, and the time of discharge.

F) Damage stability information
Information which permits verification that a ship is properly loaded according to safety and pollution considerations.

G) Oil record book
A record of all internal and external ship transfers and discharges of oil and oily waste, and the operability of transfer and pollution-prevention equipment.

H) International Oil Pollution Prevention Certificates
Certificates documenting that all required pollution-control equipment is on board and functioning properly. They are issued to vessels of nations which are party to the convention. Equivalent certificates are issued for vessels of non-party nations.

I) Discharge limitations
Limitations regarding minimum distances offshore, oil concentrations and other operating requirements for the discharge of oil or oily waste.

Guidance on Coast Guard enforcement of Annex I is in NVIC 8-83 and Commandant Instruction M16450.26 dated October 18, 1983, MARPOL 73/78 boarding and enforcement policies and procedures. Guidance on the issuance of International Oil Pollution Prevention Certificates is provided in NVIC 9-86.

Annex II

Annex II requires that chemical tankers have certain pollution-prevention equipment on board and follow specified procedures to reduce the pollutant discharges into the sea from normal shipboard operations. Ship design requirements reducing the likelihood of accidental discharges are also mandated.

Annex II requirements include:

A) Tank stripping equipment
Equipment which minimizes the amount of cargo remaining in cargo tanks after transfer.

B) Cargo tank prewash
Tanks carrying certain cargoes must be prewashed after off-loading, and the residues discharged to a reception facility.

C) Underwater discharge outlets
Subsurface outlets to facilitate the dispersal of noxious liquid substance discharges under controlled conditions.

D) Procedures and Arrangements Manual
A manual with procedures for noxious liquid substance carriage, cargo transfer and tank stripping, prewashing and ventilation.

E) Cargo record book
A record of all internal and external ship transfers and discharges of cargo, and the operability of transfer and pollution-prevention equipment.

F) Vessel certificates
Certificates demonstrating that a vessel has been inspected and complies with applicable design, construction, equipment and documentation requirements. The required certificate varies, dependent upon the cargo carried, whether the vessel is foreign of United States, and if United States, whether it is in international or domestic trade.

G) Discharge imitations
Limitations regarding minimum distance offshore, permissible products and concentrations, and other operating requirements for permitting discharge.

Guidance on Coast Guard enforcement of Annex II is in Commandant Instruction M16450.28 dated October 26, 1987, MARPOL 73/78 Annex II ship monitoring, cargo tank prewashing, and enforcement policies and procedures for the control of pollution from ships carrying noxious liquid substances in bulk. Guidance on enforcement and issuance of required international and United States certificates is contained in NVIC 5-87.

Annex V

Annex V requirements are aimed at reducing sea pollution resulting from the discharge of ship-generated garbage. These requirements were enacted into United States law by the Marine Plastic Pollution Research and Control Act of 1987, which amended the previously enacted Act to Prevent Pollution from Ships. The marine transport of wastes for ocean disposal is restricted by separate conventions, statutes and regulations.

Annex V requirements include:

A) Plastics
The complete prohibition of discharge of plastics.

B) Discharge restrictions
Discharge of garbage is permitted outside of specified distances offshore as determined by its nature.

C) Waste management plan
A written plan describing the procedures for collecting, processing, storing and discharging garbage.

D) Placards
Placards stating garbage discharge prohibitions must be posted for the information of crew and passengers.

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Hopefully, MARPOL 73/78 will help prevent beach scenes like this.

MARPOL ANNEX V
GARBAGE DISCHARGE RESTRICTIONS

GARBAGE TYPE	DISCHARGE
Plastics - including synthetic ropes fishing nets and plastic bags	Prohibited in all areas
Floating dunnage, lining and packing materials	Prohibited less than 25 miles from nearest land
Food waste, paper, rags, glass, metal, bottles, crockery and similar refuse	Prohibited less than 12 miles from nearest land
Pulverized or ground food waste, paper, rags, glass etc.	Prohibited less than 3 miles from nearest land

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The United States Department of Agriculture's Animal and Plant Health Inspection Service is a major source of information on possible Annex V violations. DOA regulations prohibit vessels which have called at foreign ports from bringing ashore for disposal food wastes or waste which has been exposed to this food without receiving special treatment. The objective is to prevent the introduction into the United States of bacteria or insects which could be harmful to plants or animals.

DOA inspectors board almost all vessels which have called at foreign ports. They watch for violations of Annex V and bring them to the attention of the Coast Guard captain of the port.

Guidance on the Coast Guard enforcement of Annex V can be found in Commandant Instruction M16450.30, dated May 31, 1989, MARPOL 73/78 Annex V enforcement policies and procedures for the prevention of pollution by garbage from ships.

Reception facilities

It is required by 33 CFR part 158 that terminals and ports which normally receive and conduct commerce with vessels have the ability to receive their wastes.

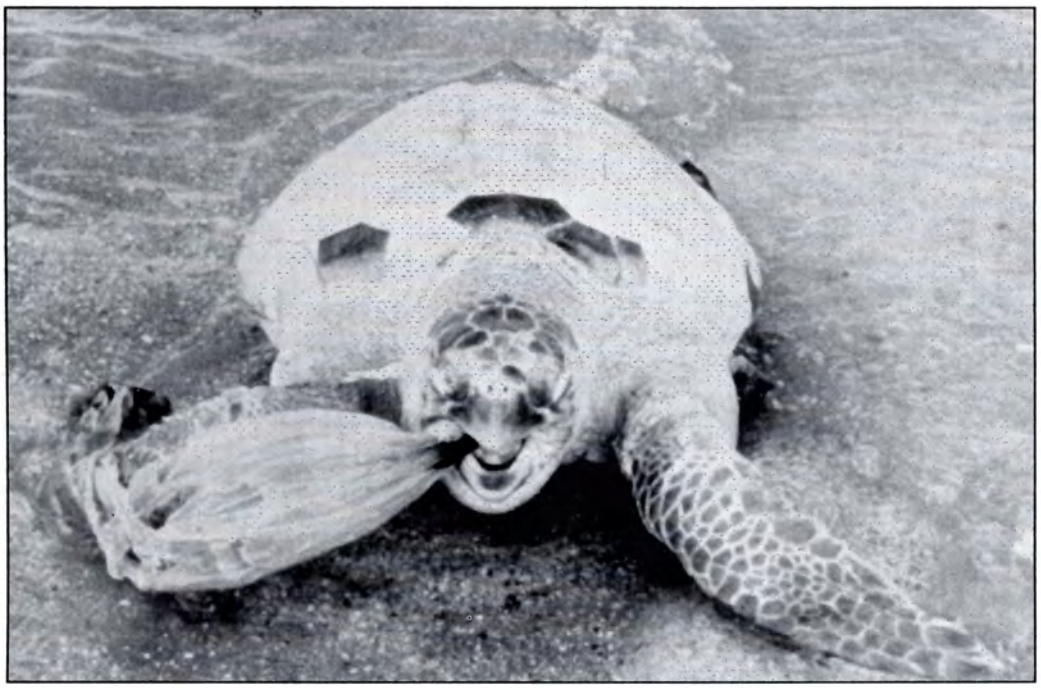
Reception facilities are required to obtain a Coast Guard-issued Certificate of Adequacy. The Coast Guard periodically publishes a listing of these facilities. (The most recent listing was published in the *Federal Register* on April 10, 1991.) Vessels may be denied entry to ports not having such certificates.

Guidance on facility administration can be found in Commandant Instruction M16450.27, dated October 2, 1985, guidance and procedures for administering and enforcing the Oily Waste Reception Facility Program; Commandant Instruction M16450.29, dated March 21, 1987, guidance and procedures for administering and enforcing the Noxious Liquid Substance Waste Reception Program; and Commandant Instruction M16450.31, dated May 31, 1989, MARPOL 73/78 Annex V Garbage Reception Facility Certification and Enforcement Program. Guidance for voluntary reporting of waste reception facility inadequacy is in NVIC 4-87.

Special areas

Certain waters have been designated as "special areas," where discharges are prohibited or further limited. This designation is made by Annex I, II or V, and is not in force until IMO has determined that an adequate number of waste reception facilities are available.

Currently the Mediterranean Sea, Baltic Sea, Black Sea, Persian Gulf and North Sea have been designated as special areas. An effort is underway to obtain this designation for the Wider Caribbean.



The proliferation of plastic waste in waterways should be reduced by Annex III

Enforcement

As the United States enforcement agent for MARPOL, the Coast Guard has the responsibility to ensure that United States ships, and foreign party and foreign non-party ships visiting United States ports and operating on waters subject to United States jurisdiction comply with annexes adopted by this country.

The Coast Guard checks on MARPOL 73/78 compliance as part of its vessel-boarding program. It also inspects facilities where cargo and waste is discharged. It investigates reports of illegal discharges and encourages the support of industry, the public and other government agencies. Increased use is being made of aerial surveillance to detect violators. In 1991, the Coast Guard will obtain 85 additional positions for MARPOL 73/78 promotion and enforcement.

Impact

It is difficult to quantify the impact MARPOL 73/78 requirements have on marine environmental protection. However, in a 1990 report on the state of the marine environment, the United Nations Group of Experts on the Scientific Aspects of Marine Pollution estimated that, ". . .without the application of these regulatory measures, as much as eight to ten million tonnes of oil would enter the sea directly each year as a result of pumping out oil-contaminated tank cleaning or ballast water." It is important to note that the estimate concerns intentional, not accidental, discharges into our marine environment.

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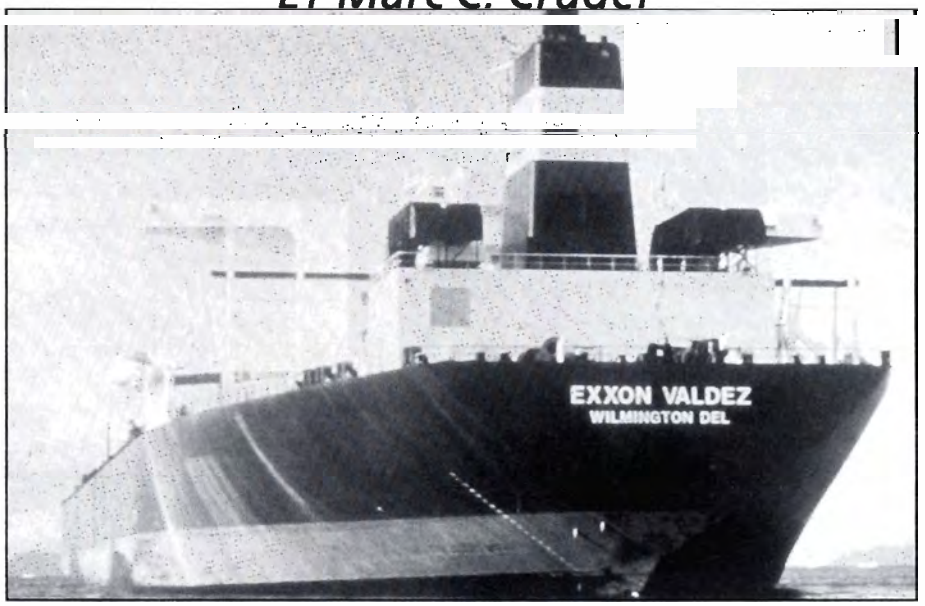
Preventing spills

LT Marc C. Cruder



On March 24, 1989, the tanker Exxon Valdez ran aground on a reef in Prince William Sound, Alaska, spilling 11 million gallons of oil -- the largest spill ever in United States waters.

Improved tank vessel designs will help reduce the risk of oil pollution, according to a recent study by the National Academy of Sciences. The Coast Guard commissioned NAS to assess how alternative tank vessel designs could improve marine safety and environmental protection in 1989.

Subsequently, under the Oil Pollution Act of 1990 (OPA 90), Congress assigned the Secretary of Transportation to determine the effectiveness of other operational and structural tank vessel requirements compared to double hulls, based upon input by NAS. This determination is to be reported back to Congress,along with recommendations for legislative action.

The NAS Marine Board established an ad hoc committee on tank vessel design chaired by Professor Henry Marcus of the Massachusetts Institute of Technology. The committee conducted a comprehensive review of the safety, economic and environmental implications of alternative designs to determine how these designs might affect the overall consequences of accidents. Seventeen designs were evaluated for feasibility and effectiveness, with seven further studied for cost effectiveness.

NAS report

The NAS report, entitled, "Tanker spills: prevention by design," was published on February 25, 1991. It is being reviewed by the Coast Guard.

The report concluded that:

- **Improved designs will reduce, but not eliminate the risk of oil pollution**
  Accidental oil spills cause 20 percent of all marine oil pollution. In United States waters, grounding is the predominant accident. No single type is predominant world wide.

- **Existing designs are inadequate.**
  Increased emphasis must be placed on corrosion control, the adequacy of structural strength and on the use of appropriate construction steels. A concerted action by the Coast Guard through the IMO and ship classification societies will be needed to bring about timely change.

- **Double hulls should reduce pollution from collisions and groundings.**
  The full implementation of OPA 90 requirements in 2015 should decrease accidental spillage in United States waters by half at an added transportation cost of $700 million (1¢/gallon). However, for some time to come, most vessels visiting United States ports will only have single hulls.Additional measures can reduce risks from these vessels until their phase-out is complete.

- **No consensus on equivalent alternative to double hulls.**
  The study noted that one design, incorporating an oil-tight deck separating upper and lower tiers of tanks, when used in conjunction with double sides, could perform better than double hulls in certain instances, but worse in others. More research is needed before this design concept can be endorsed as an equivalent.

- **A comprehensive research program should be undertaken.**
  Since sufficient data and precise cause-effect relationships are not yet available, educated assumptions had to be used in this and other studies on the subject.

  OPA 90 mandates a research program, which should be coordinated with foreign research centers and the IMO so that far-reaching decisions can be made on the future of oil transportation by tanker.

The Coast Guard is presenting the findings of the NAS report to the Maritime Safety Committee and the Marine Environmental Protection Committee of IMO in May and July, 1991, as part of related efforts to amend MARPOL 73/78. A final report based upon the NAS study and the outcome of the IMO proceedings is expected to go to Congress in the fall of 1991.

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On February 9, 1990, ,the tanker ~~American Trader~~ spilled nearly 400,000 gallons of Alaska crude oil off Huntington Beach, California, after puncturing its hull with its own anchor while maneuvering into an offshore mooring.

Refining double hulls

Mr. Stephen M. Shapiro

The Coast Guard is refining its proposed rules for designing double-hull tank vessels according to the requirements of the Oil Pollution Act of 1990 (OPA 90).

Interim guidance

OPA 90 requires tank vessels carrying oil that are built under contracts awarded June 30, 1990, and later to have double hulls. The law also establishes a timetable to require existing vessels to have double hulls.

The law does not provide a technical definition of "double hulls," which produced considerable uncertainty about how to design a double-hull tank vessel that would be acceptable to the Coast Guard.

In September 1990, the Coast Guard issued Navigation and Vessel Inspection Circular (NVIC) 2-90 to provide interim guidance on double-hull designs. This guidance includes minimum separation distances between the inner and outer hulls.

Vessels built to the interim guidelines will be considered as meeting the double-hull requirements of OPA 90, even if the final rules should contain different standards.

Proposed rules and comments

The Coast Guard published a notice of proposed rulemaking on double hulls in the *Federal Register* on December 5, 1990. This notice is generally consistent with the guidance in NVIC 2-90.

The public comment period closed on April 1, 1991. The comments received contain many useful suggestions on various specific requirements in the notice, as well as recommendations that additional related issues be considered for inclusion in the final rule.

Points raised included:

- **Dimensions**
  Many suggestions were offered concerning the minimum spacing

Double side of tanker holds only ballast water. Handholds are for inspectors to scale the 40-foot shaft.

Double-hulled tanker anchored off Staten Island, New York. *Photos by LCDR Steve Ciccalone*

between the inner and outer hulls. Acceptance was requested for existing double-hull vessels, without upgrading to the spacing required for new vessels.

- **Major conversions**
  Vessels undergoing major conversions must immediately have double hulls. Additional guidance for making major conversion determinations has been requested.

  The Towing Safety Advisory Committee (TSAC) will consider recommendations to the Coast Guard on such guidance, particularly for barges. Owners unsure of the status of upcoming work on their vessels should request a determination from Commandant (G-MVI-1) in writing as soon as possible.

- **Fuel tanks**
  Several recommendations were made to extend double-hull protection to fuel tanks.

- **Piping**
  It was suggested that oil piping be prohibited in protective spaces.

- **Venting**
  Requirements were recommended to ensure adequate ventilation of protective spaces.

- **Corrosion**
  Provisions were suggested to require adequate coatings and corrosion-control systems.

Summary

Along with maintenance and inspection, pollution prevention is a vital factor to consider when designing double-hull tank vessels. Good designs must address all aspects of construction, operation, inspection, maintenance and pollution prevention for the entire life-cycle of the vessel.

Final rules on double hulls should be published by the end of 1991.

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Major conversions under OPA 90

LCDR Marvin Pontiff

The Oil Pollution Act of 1990 (OPA 90) calls for the immediate installation of double hulls on newly constructed tank vessels operating in United States waters and tank vessels undergoing major conversions.

What determines a major conversion? How is a major conversion defined?

It is hoped that the following information will clarify the application of OPA 90 to existing vessels that have previously undergone major conversions or on which a major conversion is anticipated. The data is based on a recent policy letter distributed by the Merchant Vessel Inspection and Documentation Division of the Office of Marine Safety, Security and Environmental Protection.

Determinations

Major conversion determinations establish a vessel's age for the application of the double-hull requirements under OPA 90. The Coast Guard makes determinations for all United States vessels and foreign-flag vessels operating in United States waters based on criteria in title 46 United States code (USC) 2101 (14a). This law was not amended by OPA 90.

Under OPA 90, a vessel's age is determined from the date on which it:

(1) was delivered after original construction,

(2) was delivered after completion of a major conversion, or

(3) had its appraised salvage value determined by the Coast Guard and is qualified for documentation under section 4136 of the revised statutes of title 46 U.S.C. 2101 (14).

According to the policy letter, Commandant (G-MVI) will decide whether vessel modifications on oil tankers and barges meet the criteria for major conversions under OPA 90. The decision is being made at this level to ensure consistency, but this authority may be delegated at some future date to the appropriate Officer in Charge, Marine Inspection (OCMI).

Definition

According to title 46 USC 2101(14a), a major conversion:

(a) substantially changes the dimensions or carrying capacity of the vessel,

(b) changes the type of the vessel,

(c) substantially prolongs the life of the vessel, or

(d) otherwise so changes the vessel that it is essentially new, as decided by the secretary of transportation.

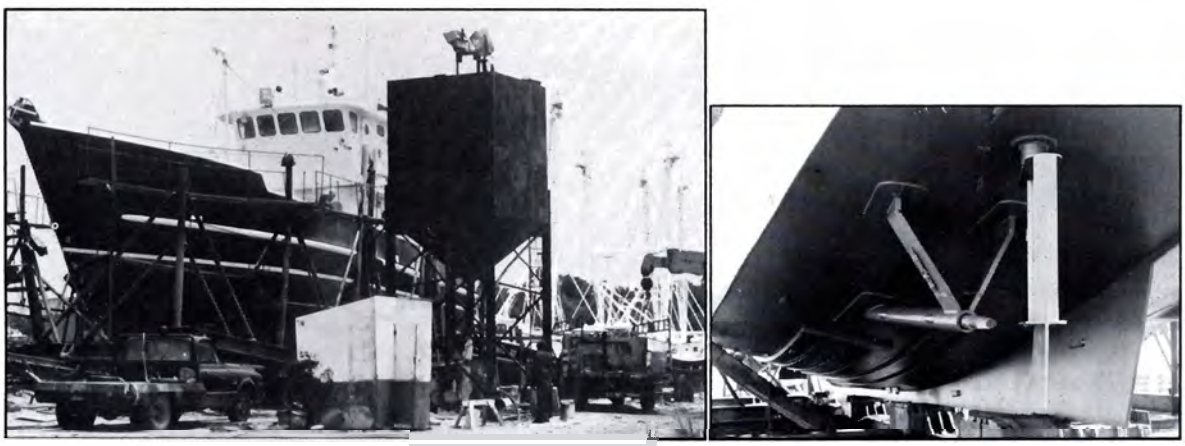
This is the same criteria that has been used in the past for other major conversion determinations under the International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended; MARPOL 73/78 (see page 15); and certain NVICs, including 10-81 and 10-82. These NVICs involve inspection of reflagged vessels and inspections conducted by the American Bureau of Shipping (ABS), respectively.

Case-by-case

Major conversion determinations involve some subjectivity, as each case is unique. Determinations are normally handled case-by-case based on stated criteria, depending on the specific circumstances.

G-MVI has already made several such determinations, especially in cases involving changes in cargo-carrying capacity. Modifications involving substantial decreases in such capacity are treated similarly as those involving increases.

There has been a strong commitment to maintain consistency in each case. Nevertheless, several areas of major conversion determination remain unresolved, and will be addressed either by response to specific inquiries or in the double-hull rulemaking in progress.



Conversion of the small inland tanker, M/V Lady Joan, was begun just prior to the June 30, 1990, cutoff date for application of the OPA 1990 double-hull requirements. Therefore, it may continue to operate with a single hull until January 1, 2015.

Upon completion of a major conversion, the supplement to the International Oil Pollution Prevention Certificate, section 1, entitled "Particulars of ship," should be annotated to indicate the date of a major conversion and the status of the ship as either new or existing. On vessels where past conversions were made and the applicability of OPA 90 is questioned, this certificate will be consulted when determining major conversion status.

Purpose

The purpose of major conversion determinations, in general, is to require a vessel to upgrade, to the extent reasonable and practical, to current standards when undergoing modification.

If a vessel had completed a conversion prior to OPA 90, which was determined to be major, the vessel should have been required to upgrade to current standards. If it was determined not to be major and the vessel was not upgraded, it would be inappropriate to turn around and determine that it was a major conversion now.

Plan review

NVIC 10-82, change 2, addresses the acceptance of plan review and inspection tasks performed by ABS for new construction or major modification of United States vessels. The legal criteria for a major modification is now the same for an application of NVIC 10-82 and OPA 90.

For the most part, NVIC 10-82 allows decisions involving the acceptance of such plan reviews by ABS to be made by local OCMIs. Past determinations under NVIC 10-82 involving conversions before OPA 90 may not be consistent with today's interpretations. **The Coast Guard will not necessarily be bound to past determinations in future cases.**

Should a vessel owner claim that a past major conversion determination made under NVIC 10-82 exempts the vessel from OPA 90, it will be reviewed separately.

Conclusion

In order to avoid confusion, OCMIs have been directed to refer alterations to tank vessels that appear to be major conversions to Commandant (G-MVI) for determination, instead of conducting it locally under the NVIC. The OCMI may continue to decide who should do plan reviews for minor conversions not involving the addition of new hull body sections to vessels.

The provision of the policy letter will be incorporated in a future change to the *Coast Guard Marine Safety Manual*

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Corrosion control

LCDR Brian Salerno

"For want of a nail. . .," the old saying goes, " . . . the kingdom was lost." Certainly, there are more glamorous aspects to tanker safety and environmental protection than corrosion control. However, to ignore the potential for corrosion in tankers is to invite dire consequences.

For example, a foreign-flag tankship with severe storm damage recently limped into a West Coast port. Corrosion had eaten through several places on the deck, as well as many watertight fittings. Bulkheads separating cargo tanks from segregated ballast tanks had also deteriorated, resulting in ballast contamination.

This was not a dramatic incident. It didn't make national headlines. There was no loss of life and no oil spilled -- but there could have been. In fact, there might have been a major casualty because of the vessel's lack of proper maintenance, including corrosion control measures. The vessel was structurally weakened by general corrosion, making it extremely susceptible to storm damage, almost to the point of sinking.

Corrosion

Corrosion can take several forms: general wastage, pitting, grooving and galvanic action on weld material. It can occur internally or externally on the vessel's hull.

Each type of corrosion has its particular causes, and more than one type can attack any given tank. Yet, each form of corrosion is controllable by specific measures.

Traditionally, tanker operators have faced a choice -- either protect the structure of the vessel from all forms of corrosion, or replace steel as it corrodes beyond acceptable limits.

On today's ships, however, there is little or no margin allowed for corrosion.

Control measures

The type of corrosion control depends upon whether the tank is a cargo or ballast space. The most predominate means of corrosion control used in either space is special coatings, although the type of coating varies in each case.

Cargo tank coatings must be compatible with the commodities carried. In some cases, the cargo itself may serve as a preservative.

The most serious corrosion problems, however, almost always occur in saltwater ballast tanks, which are protected against corrosion in three ways: with coatings, with sacrificial anodes, or with a combination of the two. And the coatings may be either hard or soft.

Hard coatings

Hard coatings include various epoxies that form a barrier between the steel and tank atmosphere. These must be examined regularly to catch cracks that occur as the vessel works in a seaway, exposing the underlying metal to saltwater ballast and salty air. Under these conditions, the steel under a coating crack can become severely corroded in a matter of months.

Corrosion in structural member of tanker ballast tank
Photo by LCDR Steve Ciccalone

Tank vessel structures are constantly exposed to the corrosive effects of salt water.

Photo by CDR Mike Bowen, inspection chief, Marine Safety Office, Houston, Texas.

Another common hard coating is inorganic zinc, which acts as an anode, protecting the structural steel. Typically applied during new construction, inorganic zinc is difficult to replace, especially if there has been any pitting in the steel.

Soft coatings

Soft coatings, including lanolin-based "float coats," are less expensive than hard coatings, but also less effective. They have serious drawbacks in that they mask structural defects, such as cracks, and make tank entry considerably more dangerous. (Ask any inspector how he feels about being precariously perched 60 feet up in a tank slippery with wool grease, and you will understand why it is known as "inspector repellent.")

Anodes

Sacrificial anodes (zinc) are commonly used to protect the steel structure. However, they only work when the tank is filled with salt water (an electrolyte), and then only after several days, allowing time for galvanic polarization to develop.

Unfortunately, corrosion rates may be high while this process is occurring. The anodes are also ineffective at protecting the underdeck, which is not immersed in ballast water, but is exposed to moist, salt-laden air.

Many operators use anodes as a back-up to a hard coating system. Wastage of the anodes indicates that the coating is beginning to break down. This approach takes advantage of the relative merits of both systems, and mitigates the weaknesses of each. (Soft coatings, however, cover anodes, making them ineffective.)

Tanker operators generally agree that coatings are essential, and most use an anode back-up. Nevertheless, there is a distinct minority who disagree.

Reduced scantlings

The cost of building a tank vessel is largely depends on the weight of steel used in construction. To minimize costs, designers and builders have become more sophisticated during the past 20 years in reducing excess steel. While larger, today's tankers are lighter and more flexible than their predecessors.

Classification society rules generally permit a 10 percent reduction in the dimensions of structural components if the vessel is coated for corrosion prevention. Combined with other modern shipbuilding techniques, this reduction greatly reduces the margin for corrosion.

Continued on page 28

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The corrosion margin that used to be available in yesterday's overbuilt ships is now taken "up-front" on today's lighter vessels. With the disappearance of this margin for safety, tanker operators cannot afford to wait for apparent problems to institute corrosion-control measures.

Replacing steel costs more than applying coatings. Also, recent legislation will make corrosion control even more imperative.

Double hulls

The Oil Pollution Act of 1990 (OPA '90) requires that new tankers have double hulls and that existing tankers be retrofitted. This will result in about three times the internal surface area of cargo blocks that must be maintained.

Ballast will be carried in the double-hull space with all of its corrosion concerns. In all likelihood, double-hull ships will also be built with the corrosion allowance taken "up front."

Increased tank maintenance, repair and inspection could be largely offset by improved worker access figured in during the design stage. Based on this concern, the Coast Guard has proposed a minimum of two meters separation between hulls. Overall, access to the upper reaches of ballast tanks should improve compared to single-skin ships

Coast Guard policy

The Coast Guard is moving toward more aggressive corrosion-control measures - particularly on vessels constructed with reduced scantlings.

Policy is being developed to require assessments of corrosion-control measures during periodic structural examinations.

Vessels with soft coatings in ballast tanks will most likely be required to remove them to facilitate structural examinations. Otherwise, credit for the required internal structural examination might not be granted.

Finally, OPA '90 mandates hull structural gauging requirements that will apply to United States vessels and to foreign vessels operating in United States ports.

Clearly, the importance of corrosion- control measures to maintain a tanker's access to United States markets cannot be overstated.

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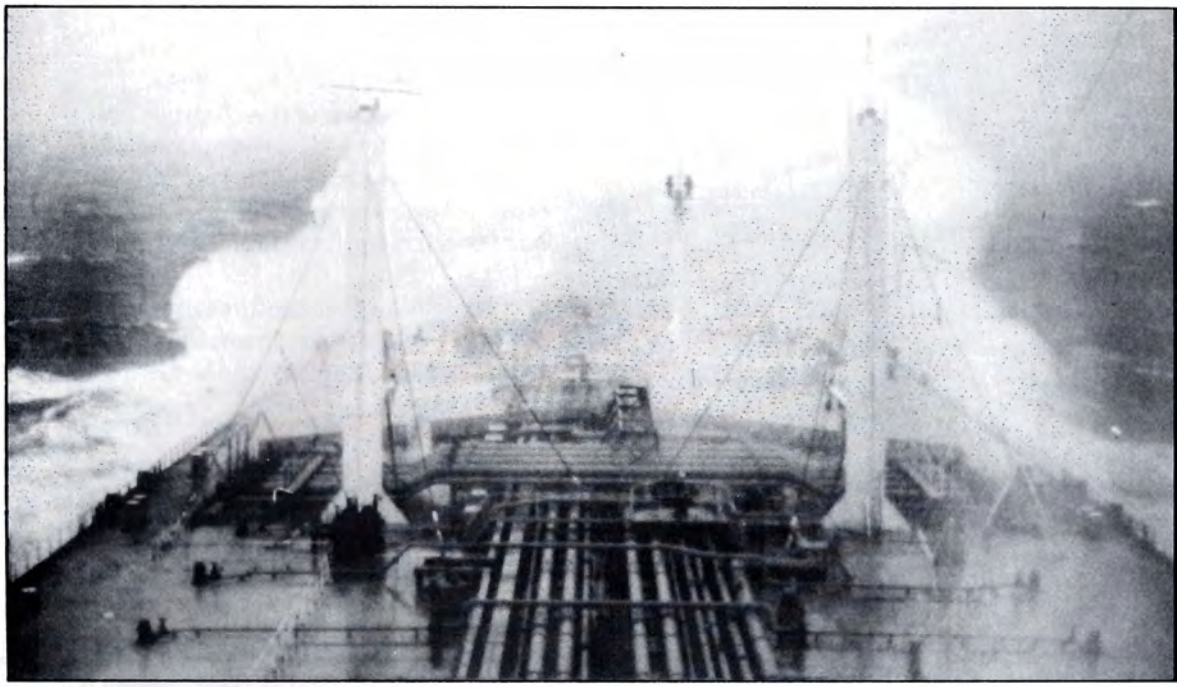
Tankers like the Brazil Pride have gigantic surfaces exposed to corrosive elements.

Photo courtesy of Texaco



TAPs tankers often endure rough weather in the Gulf of Alaska.

A look at Alaska tanker failures

LCDR Stanford Deno

While vessels in the Trans-Alaska Pipeline Service **(TAPS)** comprised only 13 percent of the United **States** fleet in 1989, these vessels accounted for **59** percent of the hull fractures reported to **Coast** Guard headquarters. This alarming fact **was** the impetus for the *TAPS tanker structural failure study* published on June 25, 1990.

The TAPS study was based on an extensive **review** of past reports from 200 vessel files on 69 **vessels**, as well as interviews with 14 operators of **TAPS** vessels. Work on the study began in April **1988.**

Results

The TAPS study determined that hull cracks were generally attributed to:

(1) inadequate design of structural details,
(2) poor workmanship and quality control,
(3) the use of high tensile steel combined with the above two,
(4) lack of maintenance on corrosion-control systems, and
(5) harsh environment in the Gulf of Alaska.

The study found that certain vessel classes have the greatest number of structural failures. The *Atigun Pass* and *American Sun* classes accounted for 26.3 percent and 12.8 percent, respectively, of the documented failures used in the analysis.

Recommendations

Three of the most important recommendations made by the TAPS study are:

(1) to conduct structural inspections of TAPS vessels more frequently,
(2) to require Critical Area Inspection Plans (CAIPs) for all TAPS vessels, and
(3) to require immediate repairs of all structural failures in critical areas.

These recommendations have been adopted by the Coast Guard.

Coast Guard actions

Structural inspections

The Coast Guard now requires annual cargo block surveys on every TAPS tanker. In addition, the *Atigun Pass* class ships are required to survey

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Portion of 20-foot long fracture in ballast tank bottom of TAPs tanker. Crack was 14 inches from an oil tank.

Continued from page 29

their critical areas as defined in their CAIPs every six months.

The Office of Marine Safety, Security and Environmental Protection has reestablished and is expanding the traveling inspection staff, which now attends TAPS vessel drydockings, cargo block surveys and repair periods, whenever possible. Their experience and historical knowledge provides continuity for Coast Guard field inspectors, and benefits the overall safety of TAPS vessels.

Critical Areas Inspection Plans

CAIPs are management tools to track historical performances of vessels, identify problem areas and provide greater focus to periodic structural examinations. All TAPS tankers are required to have them.

CAIPs were outlined in a working paper presented to the TAPS operators at a February 13, 1991, joint meeting at the American Bureau of Shipping (ABS) headquarters. A navigation and vessel inspection circular (NVIC) is being developed to give further guidance on standardization and expectations for CAIPs.

A vessel's CAIP contains an overall perspective on its structural history, and guides owners, class societies and Coast Guard inspectors to areas with active cracking that require closer inspection.

Structural failure repairs

The structural failure reporting system has been improved. Structural failures are now treated as casualties and are entered into the casualty data base.

Class I as well as some class II structural failures are required to be repaired immediately upon discovery. The repairs for Class I failures now must be reviewed by both ABS and Coast Guard headquarters for final approval.

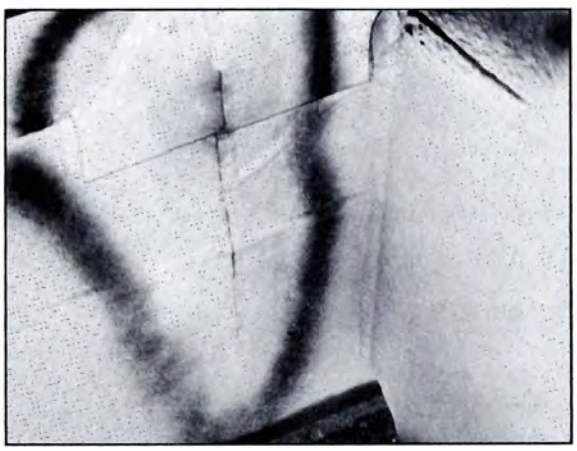
The reporting system ensures that repairs are not only evaluated for themselves, but also in relation to the history of the vessel and other similar repairs.

TAPS vessels

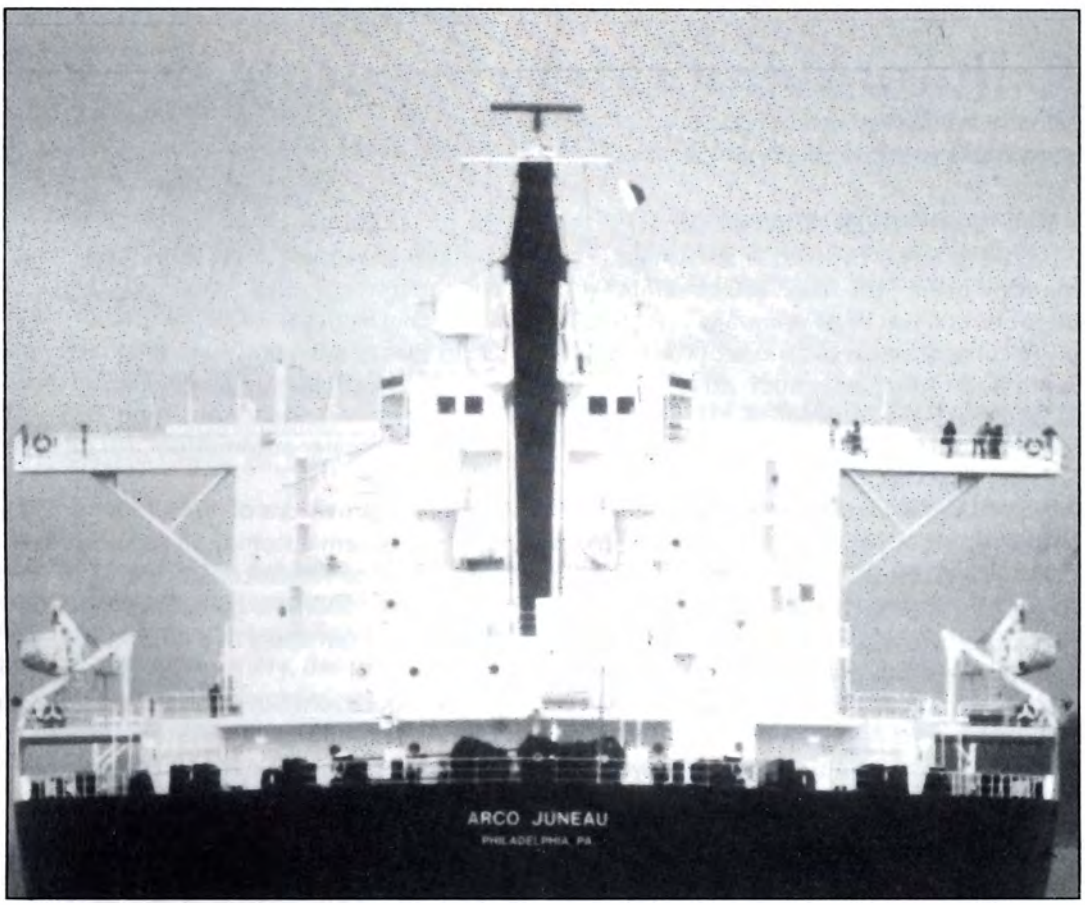
Between 1984 and 1989, there were 69 United States-flag and seven foreign- flag tank vessels involved in the TAPS trade through the port of Valdez. As of September 1990, there were only 44 United States- and five foreign-flag vessels. (This data is based on the number of vessels that made a port call in Valdez between September 1989 and September 1990.)

Coast Guard and the Maritime Administration officials have discussed this decline, especially as it relates to vessels qualified for Jones Act trade. This act specifies that only United States flag vessels can trade between United States ports.

TAPS oil cannot be sold to foreign interests. Therefore, TAPS oil must be carried on United States-flag tankers. (Foreign-flag tankers trading in Valdez carry the oil to St. Croix, United States Virgin Islands, which is not covered in the Jones Act.)



Fracture travels through bottom longitudinal bracket. Photos on this page by LCDR Steve Ciccalone.



TAPs tanker Arco Juneau

The Coast Guard is aware of the consequences of removing qualified Jones Act vessels from the TAPS trade for repairs. This concern was expressed in an ALERT memorandum on January 21, 1991, informing the secretary of the Department of Transportation that the loss of vessels for TAPS service due to structural conditions was possible.

In addition, discussions with TAPS operators revealed that there are no plans for replacement of the fleet by new construction. The operators feel that new construction programs were economically unfeasible without new oil fields opening in Alaska.

Industry involvement

Most vessels in TAPS service are classed by ABS, which establishes and manages standards, known as rules, for the design, construction and survey of ships.

The Coast Guard and ABS have coordinated efforts on field guidance to surveyors and inspectors, and have established joint procedures for the review of fracture repair proposals, resolutions of the differences in classing structural failures and common goals for the TAPS vessel programs. These joint projects have fostered cooperative team efforts among all concerned.

Inspection report

The Compliance and Enforcement Branch of the Merchant Vessel Inspection and Documentation Division is now preparing a report on Coast Guard inspection efforts since the TAPS study.

LCDR Stanford Deno is a staff marine inspector with the Compliance and Enforcement Branch of the Merchant Vessel Inspection and Documentation Division of the Coast Guard's Office of Marine Safety, Security and Environmental Protection. Telephone: (202) 267-1464.

Improving safety in automation

LT William R. Marhoffer

In the film, "2001: A Space Odyssey," the spaceship *Discovery* is crippled when its vital automation system - the HAL 9000 computer -- malfunctions and has to be manually disabled. While the consequences of failure of today's shipboard automation may not be this spectacular, they are very real.

During 1985 and 1986, automation was a factor in at least 78 marine casualties on United States-flag vessels, resulting in a known $3.2 million in damages. The Coast Guard and the marine industry recognize that automated vital system failures pose grave hazards to personnel, navigation safety and the marine environment.

Regulations and NVICs

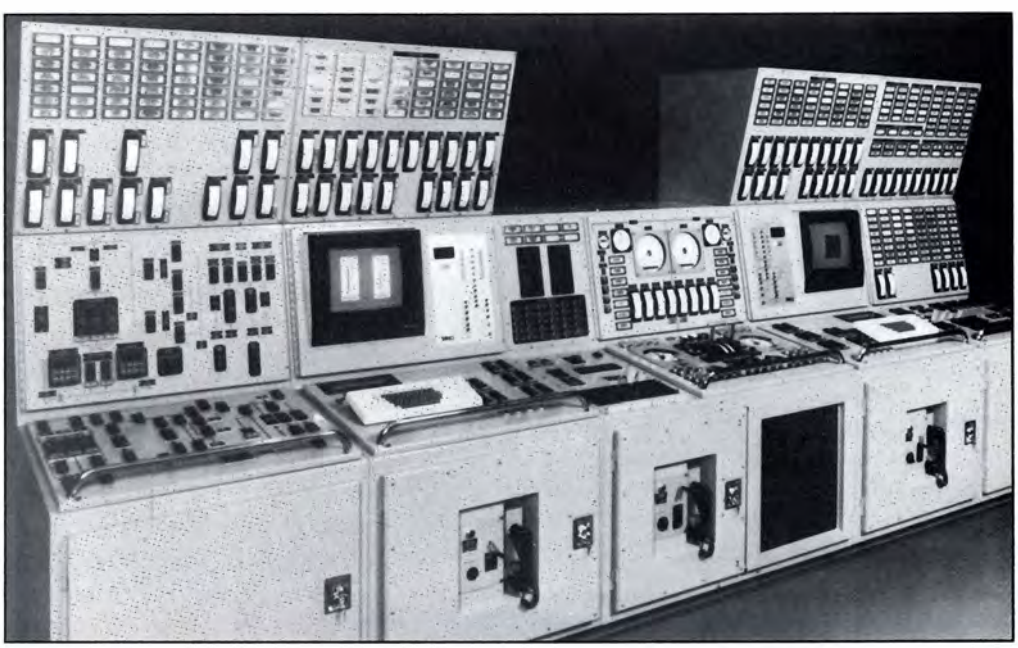
Current regulations for automated vital systems on most self-propelled vessels of 500 gross tons and over are found in title 46, Code of Federal Regulations (CFR), part 62 -- "Vital system automation." These regulations were published in the *Federal Register* on May 18, 1988. (A correction clarifying flooding-safety requirements for minimally-attended machinery plants was published in the *Federal Register* on June 28, 1988.)

The vital system automation regulations apply to all vessels contracted after August 16, 1988, and supersede the guidance in the Navigation and Vessel Inspection Circular (NVIC) 1-69 -- "Automated main and auxiliary machinery;" 6-84 -- "Automated main and auxiliary machinery, supplemental guidance on;" and 7-73 -- "Main propulsion boiler automation" **for new vessels.**

Under the provisions of 46 CFR section 50.05-1, the vital system automation regulations are not retroactive to vessels contracted on or before August 16, 1988. The guidelines in NVICs 1-69, 5-84 and 7-73 still apply to those vessels.

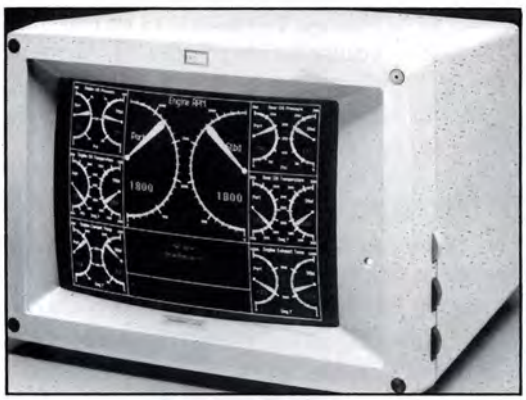
These regulations have no effect on the contents of NVIC 1-78 change 1 - "Automation of offshore supply vessels of 100 gross tons and over," because these vessels are not addressed by 46 CFR part 62.

Changes are planned for certain automation and control provisions of NVICs 6-72, 10-81, 8-84 and 11-84 to delete references to NVICs 1-69, 6-84 and 7-73, and to incorporate the requirements of the vital system automation regulations.



Automated machinery plant control and monitoring system for tank vessels.

Photo courtesy of TANO Marine Systems



Color display of integrated instruments and alarms by Vessel Information Systems, Inc., Seattle, Washington

System design

The elements contained in a shipboard machinery automation system depends upon the service of the ship, the nature and arrangement of the machinery, desired manning levels and the automation technology (electronic, electric relay, pneumatic, hydraulic, mechanical, etc.).

In order to avoid restricting the use of new technology, the vital system automation regulations contain a minimum of equipment construction requirements. These regulations rely upon performance standards and testing to establish a minimum acceptable level of safety. The regulations aim to ensure that safety is not compromised by automation or reduced manning.

The safety of a vessel with automated vital systems should be at least equal to that of a vessel with its vital systems under direct manual control.

To achieve this goal, the regulations require:

1) unsafe consequences of automation or remote control system failure to be minimized by design, and that failures be limited to failsafe states (predetermined conditions of least critical consequence);

2) prompt alerting of a responsible member of the crew, either directly by personal observation or indirectly by reliable instruments and alarms, of machinery failure, fire or flooding;

3) an alternate means to operate the vessel safely and to counteract the effects of machinery failure, fire or flooding; and

4) an indication at a manned control location of the status of the operation of equipment controlled from that location.

Applicability

According to section 62.01-5(a) of part 62, the vital system automation regulations are not applicable to mobile offshore drilling units (MODUs), offshore supply vessels (OSVs), non-self-propelled vessels, dynamically-supported craft (DSCs), small passenger vessels under 100 gross tons, or self-propelled vessels under 500 gross tons, which are certificated under 46 CFR subchapters D, I or U.

The Coast Guard will continue to address automation on these types of vessels on a case-by-case basis during plan reviews. Specific requirements of part 62 may be considered applicable to particular vital systems on certain of these vessels, such as ballast-control systems on MODUs and active fin-control systems on hydrofoil DSCs.

There has been some confusion regarding the applicability of the regulations in cases where vital systems have been automated, remotely monitored or controlled with no manning reduction in mind. It is clearly stated in sections 62.01-5(b) and (c) of part 62 that the regulations apply to vital systems or equipment that are automatically controlled or monitored, remotely controlled or monitored, or automated for the purpose of reducing manning.

Automation can fail with potentially disastrous consequences, regardless of the vessel's manning. The vital systems automation regulations apply to vessels which either automatically or remotely control or monitor vital systems, even where no reduction in manning is desired. (This is consistent with Safety of Life at Sea (SOLAS) regulation II-1/31, which also contains requirements for vessels that automate vital systems, as an option, without reduced manning.

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Part 62 is also applicable where vital systems are remotely monitored, but not automatically or remotely controlled (as in an isolated operating station). The crew relies upon instruments and alarms provided to remote stations as extensions of their own senses and as sources of information for making decisions.

For example, an alarm panel installed at a centralized main control station in the engineroom would be subject to review under part 62 [specificially the environmental design standards of section 62.25-30, alarm system requirements of 62.25-20(e), powering requirements of 62.30-5(c), etc.], regardless of the intended level of manning.

The requirements of subpart 62.50 of part 62 generally apply to vessels automated to permit a reduction in manning, i.e., minimally attended or periodically unattended machinery plants. However, section 62.01-5(d) applies many of the requirements of section 62.50-20 to any vessel where the main propulsion or ship-service electrical generating plants are automatically or remotely controlled from a control room.

This is an interpretation of SOLAS regulations II-1/31.3 and 48, and is based upon the assumption that an enclosed control room partially or completely isolates the operator from the machinery space environment. This regulation **does not require** enclosed control rooms, nor does it apply to vessels with open control stations where reduced manning is not desired.

Specific regulations

Sections 62.50-20 and 62.50-30 specify additional requirements for minimally attended and periodically unattended* machinery plants, respectively.

These requirements are in addition to the rest of the technical requirements of part 62. Similarly, the requirements of section 62.50-30 for a periodically unattended machinery plant are in addition to those of sectrion 62.50-20 for a minimally attended machinery plant.

Where manning is reduced, the crew relies more on automated equipment. Therefore, unattended machinery plants require systems that act automatically until the crew can take action in the event of a failure or emergency.

Section 62.35-5(e) (3) of part 62 states that failure of a remote propulsion control system must be alarmed on the navigating bridge and in the machinery spaces. The loss of control power is not the only cause to consider when evaluating failures of remote propulsion controls for compliance with this regulation. Other causes, such as loss of feedback signal, open wiper contact on a potentiometer or computer malfunction, can result in casualties. This issue was considered carefully during the development of the vital system automation regulations, because propulsion control casualties to United States flag vessels alone resulted in at least $1.3 million in damages in 1985 and 1986.

Further information

For policy guidance or other information concerning the automation regulations, write to Commandant (G-MTH-2), U.S. Coast Guard Headquarters, or call (202) 267-2206.

Lt. William R. Marhoffer is an electrical engineer and the automation project officer in the Engineering Branch of the Marine Technical and Hazardous Materials Division of the Coast Guard's Office of Marine Safety, Security and Environmental Protection. Telephone: (202) 267-2206.

Minimally attended plants
are automated, but not to the extent that they can be left unattended.

Periodically unattended plants
are automated to the degree that they are self-regulating and self-monitoring. They can be safely left unattended for short periods of time.

Safety advisory

Thermal trip interference in GE molded-case circuit breakers

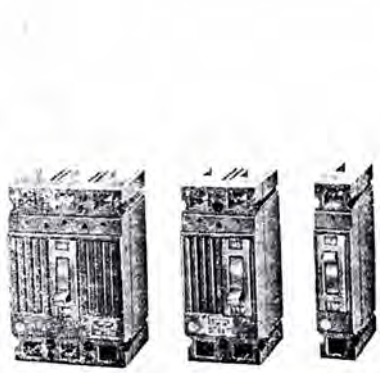
A problem concerning mechanical interference with the thermal trip function in certain General Electric Company (GE) molded-case circuit breakers was recently brought to the Coast Guard's attention.

A manufacturing deviation in types TED and THED three-pole molded-case circuit breakers manufactured by GE's Electrical Distribution and Control Division has caused failures of the thermal overcurrent trip function on pole C of the breakers, when they are equipped with undervoltage release devices (UVRs).

The manufacturer has determined that the cause of the failures was factory misorientation of the calibration screw spring clips on the thermal trip elements, resulting in mechanical interference between the C-pole thermal trip elements and installed UVRs.

Manufacturer's tests indicate that as long as the breakers contain misoriented spring clips, they are prone to failure on the C-pole if UVRs are installed. However, UVR testing does not detect this condition because the misoriented spring clips only interfere with thermal overcurrent trip operation, not with the operation of the UVR. Also, thermal overcurrent trip testing cannot be considered conclusive for UVR-equipped breakers if the problem is not apparent.

According to GE, the problem is limited to the thermal overcurrent trip function on the C-pole of UVR-equipped three-pole TED and THED molded-case circuit breakers. However, this could prevent a UVR-equipped breaker from tripping on a low-level overload solely on phase C, due, for example, to a high-impedance arcing phase C-to-ground fault or the combined current of multiple single phase loads connected to phase C.



One-pole, two-pole and three-pole General Electric TED and THED molded-case circuit breakers.

The Coast Guard does not know how many, if any, of the faulty breakers are in marine service. The intent of this advisory is to encourage ship-owners and operators to examine their vessels for these breakers.

Should any be found, the safest course of action is to send all UVR-equipped TED and THED molded-case breakers to GE's Electrical Distribution and Control Division for testing and repair as necessary.

Any questions concerning this advisory should be addressed to Commandant (G-MTH-2), Coast Guard headquarters, telephone: (202) 267-2206.

New fuel discharge system

Mr. Charles B. Cherrix

Bulk fuel can now be discharged from large tankers across an unimproved beach to inshore locations, thanks to a new commercially-produced offshore petroleum discharge system (OPDS).

The system was developed in response to a Navy requirement for a high-capacity, all-weather petroleum discharge system that can be installed rapidly and deliver multiple petroleum products, such as JP-5, JP-8 or diesel fuel (marine), to Army and Marine shore forces.

ODPS tankers

In cooperation with the Navy, the Maritime Administration provided the necessary design and construction expertise to convert three commercially-built bulk-oil carriers into OPDS tankers. All three ships were part of the administration's national defense reserve fleet before their conversion. They are now part of the ready reserve force.

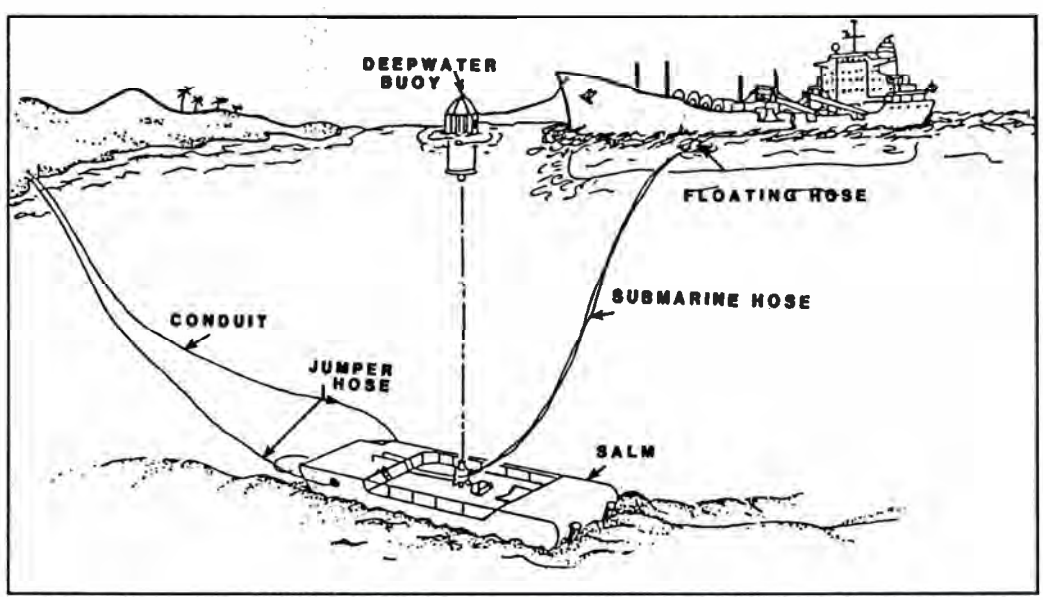
The first vessel to have the system installed was the *SS Potomac* (OPDS 1), a 28,000-ton tanker built in 1957. After the system was successfully demonstrated on the *Potomac*, the *SS American Osprey*, a 34,000-ton vessel built in 1958, was converted to OPDS 2. The third vessel to be selected for conversion was the *SS Chesapeake*, a 50,000-ton tanker built in 1964.

System elements

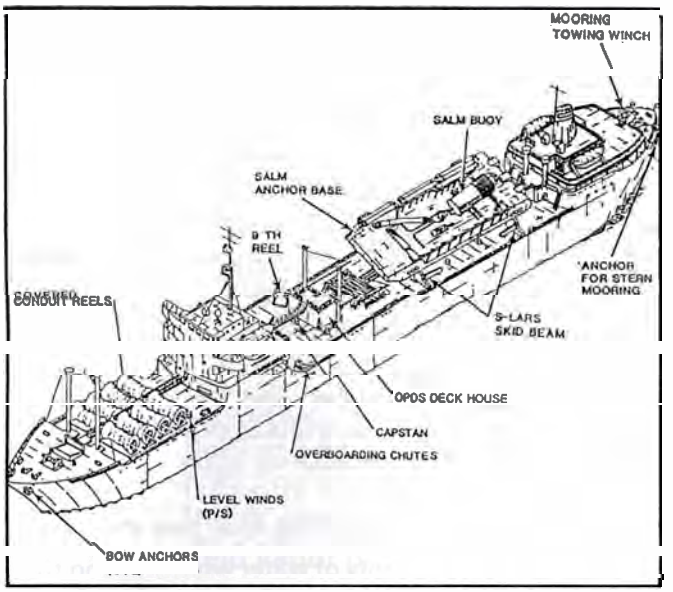
The three basic elements of the discharge systems are:

- converted tanker for transportation and deployment,
- hose system with handling equipment,
- and single anchor leg mooring (SALM) system.

The tanker's deck space is refitted with a transporting, launching and retrieval structure for the 750-LT SALM and large reels to carry the flexible conduit. The ship is heeled over 12 degrees to port before the SALM is deployed from the launching structure. Some of the cargo tanks were converted to heeling tanks for the launch and retrieval of the SALM.



Offshore petroleum discharge system (OPDS)



OPDS tanker arrangement

Operation

The OPDS is designed to begin operations within 48 hours after arriving on station. Personnel can install a mooring system in five-foot wave heights, 16-knot winds and a 1.5-knot current, and deploy up to four miles of hose from the ship-to-shore.

The cargo-pumping operation of 1,200,000 gallons per 20-hour day can begin while the SALM is being prepared for launching. After the launching and installation of the mooring system, the hose connections are transferred to the SALM.

After the system is in place and the ship's cargo tanks are being emptied, other tankers are brought alongside the OPDS vessel to provide a continuous flow of fuel ashore. The system can operate in up to 12-foot wave heights, 40-knot winds, four-knot currents and 1.5-knot cross currents.

OPDS 1 and OPDS 2 were activated for Desert Storm and are in the Middle East. The *SS Chesapeake* incorporates all of the lessons learned from the first two vessels, and should provide the Navy with a superior OPDS for many years to come.

Editor's note: The OPDS system was designed for military use only. It is not intended for commercial application.

Mr. Charles B. Cherrix is chief of the Naval Architecture Division of the Office of Ship Construction of the Maritime Administration. Telephone: (202) 366-5836.

OPDS tanker

Chemical of the month

1/C Scott Rogerson

Diethanolamine

Commonly referred to as DEA, diethanolamine is an oily liquid or crystal-like solid with a slight dead fish or ammonia-like odor. The liquid is irritating to the skin and highly corrosive to the eyes. All contact and inhalation should be avoided.

Diethanolamine has many industrial uses. It is used in liquid detergents, emulsion paints, cutting oils, shampoos, cleaners and polishes, and textile specialties. It is also used as an absorbent for acid gases, a chemical intermediate for resins and plasticizers, a humectant, dispersing agent and for solubilizing 2,4-D.

Exposure Precautions

Should diethanolamine be accidentally discharged, all bystanders should be cleared immediately from the area . Next, the discharge should be stopped. If possible, large spills should be covered with sodium bisulfate, sprayed with a large amount of water and washed up.

The National Response Center (800-424-8802) and local fire department should be called. Local health and pollution-control agencies should be notified, and in the case of a spill in natural waters, wildlife officials and operators of area water intakes should also be notified.

The amine can be dangerous if it enters water intakes and harmful to aquatic life if concentrations exceed 2100 ppm in 24 hours.

Anyone working in the area must wear a chemical protective suit, including rubber gloves, and use a full face mask or amine vapor mask.

A doctor should be notified in case of exposure to DEA. Short-term exposure can irritate eyes and skin, and cause coughing, nausea, headaches and smothering sensations.

If contact is made with the liquid, all contaminated clothing should be removed and the affected area gently flushed with water for 15 minutes. Clothing should be washed thoroughly before wearing again.

If the chemical gets in the eyes, they should be flushed with plenty of water while holding the eyelids open.

If diethanolamine is swallowed and the victim is conscious, he or she should drink water or milk, and induce vomiting. If unconscious or having convulsions, he or she should be kept warm while waiting for professional attention.

Fire precautions

Fires involving diethanolamine should be extinguished with dry chemicals, alcohol foam, carbon dioxide or water fog. Regular water or foam should not be used, because they could cause frothing.

Fire fighters should wear goggled, rubber overclothing, including gloves, and breathing apparatus as protection against toxic combustion vapors. Containers in the area should be cooled with water.

Regulations

Diethanolamine is regulated by the Coast Guard as a subchapter O commodity for shipment by tank barge and tankship (parts 151 and 153, respectively,) of title 46 of the Code of Federal Regulations.

The Department of Transportation does not require any special labeling of the chemical when it is being transported. However, diethanolamine should be stored in ambient temperatures and should have open ventilation whenever possible.

Diethanolamine

Chemical name:	Diethanolamine
Formula:	$(HOCH_2CH_2)_2NH$
Synonyms:	DEA; di(2-hydroxyethyl) amine; 2,2'-iminodiethanol
Chemical family	Amine
Physical description	Thick colorless liquid White solid Ammonia-like odor

Physical properties:

Boiling point:	268°C (514°F)
Freezing point:	28°C (82°F)
Vapor pressure:	Less than 0.1 mm Hg at 20°C (68°F)
Reid vapor pressure:	0.97 psia
Threshold limit value:	3 ppm
Flammability limits in air:	1.6% (calculated) 9.8% (estimated)

Combustion properties:

Flashpoint (c. c.):	306°F
Autoignition temperature:	1224°F

Densities:

Vapor (air = 1):	3.65
Specific gravity:	1.09
Solubility in water:	Complete
USCG Regulations:	46 CFR subchapter O

Identifiers:

IMO class:	Not listed
U.N. number:	Unassigned
DOT ID No.:	Data not available
CHRIS Code:	DEA
CAS Registry No.:	111-42-2
Cargo compatibility group:	8 (Alkanolamine)

NFPA:

Health hazard:	1
Flammability:	1
Reactivity:	0

Scott Rogerson was a first class cadet at the Coast Guard Academy when this article was written as a special chemistry project for LCDR T. Chuba.

Nautical queries

July-August, 1991

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. Any unusual or new vibration in the hull or propeller shafting can be an indication of_____

A clutch slip.
B. slightly overheated shaft bearings.
C. high engine speed in deep water.
D. propeller unbalance.

2. The purpose of an evaporator's three-way solenoid valve is to_____

A. prevent excessively saline distillate from entering the freshwater system.
B. drain the evaporator first-effect only.
C. drain the evaporator second-effect only.
D. allow the evaporator's first and second effects to be drained with one valve.

3. Coast Guard regulations (46 CFR 113) require refrigerated space that can be locked from the outside so that it cannot be opened from the inside to have an audible alarm which rings in ____

A. the chief steward's berthing quarters.
B. the galley.
C. the wheelhouse
D. a manned location.

4. An indication of excessive soot on boiler water tube surfaces is _____

A. low stack temperature.
B. high stack temperature
C. high feedwater temperature.
D. high superheater outlet temperature.

5. On all vessels equipped with refrigeration units of over 20-cubic-feet capacity, _____

A, a gas mask suitable for protection against each refrigerant used, or a self-contained breathing apparatus must be provided.
B. it is the sole responsibility of the chief engineer to ascertain that all members of the engineering department are familiar with the use of gas masks or breathing apparatus.
C. spare charges shall be carried for at least 50 percent of each size and variety of gas mask and/or self-contained breathing apparatus.
D. all of the above.

6. The trim of a vessel is the _____

A. value of the mean draft.
B. degree of list.
C. amount of roll.
D. difference in fore and aft drafts.

7. Reduction gears require routine maintenance and inspection, which consists of_____

A. checking the oil level.
B. checking the casing for leaks
C. cleaning the filter strainers
D. all of the above.

8. If a soot blower element does not revolve freely, the most likely cause would be _____

A. a seized blower head bearing.
B. an improper blowing arc cam setting.
C. warpage.
D. any of the above.

9. Coast Guard regulations (46 CFR 112) require that the emergency diesel fuel tank be able to supply fuel to a fully loaded engine for at least_____

A. 2 hours.
B. 4 hours.
C. 6 hours.
D. 12 hours.

Deck

1 The Letter R followed by one or more numbers indicates _____

A. a vessel's identity.
B. bearing.
C. visibility.
D. distance.

2. What VHF channel does the Coast Guard use to broadcast routine weather reports?

A. 13 or 14.
B. 16 or 17.
C. 21 or 22.
D. 44 or 45.

3. Prior to the ship's sailing, the operating cord on each inflatable liferaft should be _____

A. made fast to the raft stowage cradle or to a secure object nearby.
B. checked to see if they are unattached.
C. coiled neatly on the raft container.
D. faked on deck and led through a chock.

4. What statement about exposure suits is true?

A. The suit will not automatically turn an unconscious person face-up in the water.
B. The exposure suit seals in body heat and provides protection against hypothermia for weeks.
C. The suit is flameproof and provides protection to the wearer while swimming through burning oil.
D. The wearer of the suit is severely restricted in body movement and the suit should be donned just before abandoning ship.

5. Lines on a chart which connect points of equal magnetic variation are called _____

A. magnetic latitudes.
B. magnetic declinations
C. dip
D. isogonic lines

6. The thin, whitish, high clouds composed of ice crystals, popularly known as "mare's tails" are _____

A.- cirrostratus.
B. cirrocumulus.
C. cumulonimbus.
D. nimbostratus.

7. Which of the following publications requires infrequent corrections?

A. *List of Lights.*
B. *Coast Pilot.*
C. *Sailing Directions (Planning Guide).*
D. *Radio Navigational Aids*

8. Your chart indicates that there is an isolated rock and names the rock using vertical letters. This indicates the _____

A.
B. rock is visible at low-water springs only.
rock is a hazard to deep-draft vessels only.
C.
D. rock is dry at high water.
exact position of the rock is doubtful.

9. You are swinging ship to calibrate the RDF. The RDF gyro bearing is 054°. at the same time, the visual bearing is 055° pgc. The gyro error is 1°E. At the time of the bearings, the heading was 139° pgc. Which statement about the calibration is true?

A. One degree must be added to all RDF bearings.
B. One degree must be subtracted from a RDF bearing of 055°T.
C. One degree must be added to all RDF bearings of 276° relative.
D. One degree must be subtracted from RDF bearings when on a course of 140°T.

Answers

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

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

Keynotes July-August, 1991

Notice

CGD 91-018, Lists of ports or terminals holding Certificates of Adequacy (April 10)

ACTION: Notice of holders of Certificates of Adequacy.

Federal Register (Vol. 56, 14562) publishes lists of all U.S. ports and terminals holding valid Certificates of Adequacy issued as evidence that their facilities meet the requirements of Annexes I, II and V of the 1978 Protocol to MARPOL 73/78.

These lists themselves meet the requirements of the Act to Prevent Pollution from Ships and of regulations issued under it, to aid owners, operators and agents of ships in location ports and terminals with facilities capable of accepting residues and mixtures containing oil or noxious liquid substances, or of accepting garbage from seagoing ships. The Coast Guard expects that ships' readier access to these facilities will reduce their discharges of oil, noxious liquid substances and garbage into the waters.

EFFECTIVE DATE: The notice was effective April 10, 1991. The lists in the notice include all Certificates of Adequacy issued and effective as of September 24, 1990.

For further information, contact: LT Kelly Hoyle, Marine Environmental Protection Division, (202) 267-0518.

Withdrawal notice

CGD 84-098, Revision of the regulations on outer continental shelf activities (33 CFR Parts 140, 142, 143, 144, 145, 146 and 147) RIN 2115-AB74 (April 16)

On March 7, 1985, an advance notice of proposed rulemaking addressing revisions to the regulations for outer continental shelf activities was published in the *Federal Register* (50 FR 9290). The primary purposes of this rulemaking were to address new developments in the offshore industry and numerous recommendations derived from investigations of casualties on the outer continental shelf.

Two sections of this rulemaking were "broken off" and included in separate rulemaking. The first, addressing self inspection of fixed platforms, was published as a final rule on May 26, 1988 (53 FR 18977); the second, addressing emergency evacuation plans, was published as a final rule on May 18, 1989 (54 FR 21566).

The remaining issues include new requirements for lifesaving, fire protection, work place safety, survival training, drills and hazardous materials used as stores on fixed outer continental shelf facilities.

This proposed rulemaking is being withdrawn because of the changing priorities and shift of resources within the Coast Guard necessary to respond to the Congressional mandates of the Oil Pollution Act, 1990. Work will continue with the National Offshore Safety Advisory Committee as resources permit, with the intent of redocketing this regulatory project at a later date.

EFFECTIVE DATE: April 16, 1991

For further information, contact: Mr. Jim Magill, Offshore Activities Branch, (202) 267-2307.

Applications

CDG 91-020, Commercial Fishing Industry Vessel Advisory Committee (April 24)

The Coast Guard seeks applications for appointment to membership on the Commercial Fishing Industry Vessel Advisory Committee established by the Coast Guard as required by the Commercial Fishing Industry Vessel Safety Act of 1988. The committee acts in an advisory capacity to the secretary of Transportation and

the commandant of the Coast Guard on matters concerning commercial fishing vessel safety.

Applications will be considered for six expiring terms on the 17-member committee. The vacancies exist in commercial fishing industry, general public, education/training and insurance underwriting representations. Membership is for three years. Individuals who submitted applications in response to the notice in the *Federal Register* on May 29, 1990, must reapply.

To achieve the balance of membership required by the Federal Advisory Committee Act, the Coast Guard is especially interested in receiving applications from minorities and women. Committee members serve without compensation from the federal government, although travel reimbursement and per diem is provided. The committee normally meets in Washington, D.C., with subcommittee meetings for specific problems on an as-required basis.

DATE: Applications must be received by August 1, 1991.

ADDRESSES: Applicants should write to Commandant (G-MTH/12), U.S. Coast Guard Headquarters, 2100 Second Street, S.W., Washington, D.C. 20593-0001.

For further information, contact: Ms. Arlene Whittington, Marine Technical and Hazardous Materials Division, Room 1218, Coast Guard Headquarters, (202) 267-0004.

Final rule

CGD 86-067e, Programs for chemical drug and alcohol testing of commercial vessel personnel; delay of implementation dates (46 CFR Part 16) RIN 2115-AD74 (April 24)

The Coast Guard announces a delay in the effective date of regulations government drug testing insofar as those regulations would require testing of persons onboard U.S. vessels in waters that are subject to the jurisdiction of a foreign government. Under this final rule, employees must become subject to testing no later than January 2, 1993. This delay is adopted to allow negotiations with foreign governments to continue in an orderly, effective fashion.

DATE: This rule is effective April 24, 1991.

For further information, contact: LCDR T.A. Murphy, Marine Investigation Division, Office of Marine Safety, Security and Environmental Protection, Coast Guard Headquarters, (202) 267-2215.

Final rule

CGD 90-054, Pollution-prevention requirements of Annex V of MARPOL 73/78 (33 CFR Part 151) RIN 2115-AD64 (April 29)

This final rule amends the rules that carry out Annex V of MARPOL 73/78. This rule is necessary because on February 18, 1991, two amendments to the Annex became effective internationally. Like those amendments, this rule designates the north Sea as a special area under the Annex and eliminates the previous exemption under the Annex for the loss of synthetic material incidental to the repair of fishing nets.

DATE: This rule is effective on May 29, 1991.

For further information, contact: LT James H. McDowell, project manger, Office of Marine Safety, Security and Environmental Protection (G-MPS-3), (202) 267-0491, between 7 a.m. and 3:30 p.m., Monday through Friday, except federal holidays.

Final rule

CGD-90-016, Deepwater port radar beacons (33 CFR Part 149) RIN 2115-AD53 (May 7)

The Coast Guard is modifying the radar beacon regulations for deepwater ports to require transmission in both the X-band and S-band, eliminate the sweep requirements and have a programmed off time for frequency agile radar beacons. This change is needed to improve the effectiveness of radar beacons for navigation.

DATE: July 8, 1991

For further information, contact: Mr. Gary W. Chappell, Office of Marine Safety, Security and Environmental Protection (G-MPS-3), (202-267-0491, between 7 a.m. and 3:30 p.m., Monday through Friday, except federal holidays.

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Proposed rule

CGD -90-071, Tank level or pressure monitoring devices (46 CFR Part 32) RIN 2115-AD69 (May 7)

The Coast Guard is soliciting comments relating to tank level or pressure monitoring devices on tank vessels carrying oil. Regulations to require installation of these devices on tank vessels are mandated by the Oil Pollution Act of 1990. The purpose is to reduce the impact of oil spillage.

DATE: Comments must be received by October 4, 1991.

ADDRESSES: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA-2/) (CGD 90-71), Coast Guard Headquarters, or delivered to room 3406, (202)-267-1477.

For further information, contact: Mr. Thomas J. Felleisen, Marine Technical and Hazardous Materials Division (202) 267-1217.

Meeting

CGD 91-033, Towing Safety Advisory Committee (TSAC) meeting (May 16)

The full TSAC Committee meeting will be held from 9 a.m. to 4 p.m, Thursday, July 18, 1991, in room 2415, Coast Guard headquarters. It is open to the public.

Reports will be heard from the subcommittees on personnel manning and licensing; tug-barge construction, certification and operations; personnel safety and workplace standards; and Oil Pollution Act of 1990 implementation. These subcommittees will hold public meetings from 1 to 4 p.m., Wednesday, July 17, in room 2415. Individuals wishing to present oral statements at the meeting should notify the TSAC executive director the day before the meeting.

For further information, contact: Ms. Jo Pensivy, executive director, TSAC, room 2412, Coast Guard headquarters (G-MP-4), (202) 267-1406.

New publications July-August, 1991

Cape Cod Maritime Disasters

Extending 40 miles out into the Atlantic , Cape Cod has been a natural enemy of ships since man began sailing in these waters early in the seventeenth century. Surrounding waters contain the remains of thousands of shipwrecks, from three-masted barks to modern freighters.

A lifelong resident of Cape Cod and veteran news photographer along the New England coast, William P. Quinn traces shipwrecks and disasters around the Cape, Nantucket and Marthas Vineyard in authentic, colorful detail in this magnificently illustrated volume, *Cape Cod Maritime Disasters*.

There are more than 200 photographs, line drawings and other illustrations of ship groundings, sinkings, fires and explosions dating from the middle 1880s to the present. Dramatic sea and air rescues, life-saving crews in action, horrendous storms at sea, stranded vessels of all sizes, ages and descriptions are all highlighted in this thrilling chronicle.

The narration covers numerous first-hand stories of Cape Cod shipwrecks and other disasters at sea. Historical accounts of the U.S. Life Saving Service, Cape Cod lightships, lighthouses and Coast Guard stations are included, along with descriptions of square riggers and schooners, the steamboat era, and the effects of the roaring 20s, prohibition and world wars on the peninsula. Old and new rescue techniques and shipboard damage control equipment also are discussed.

Cape Cod Maritime Disasters was published in 1990 by Lower Cape Publishing, P.O. Box 901, Orleans, Massachusetts 02653. It costs $35.

(Opposite page - The grounding of the Newport trawler Palestine on Long Nook beach in Truro on August 25, 1940, is featured in the book. A faulty compass was to blame for the accident. Coast Guard cutters Harriet Lane and Travis pulled the vessel off shore into deep water after two days of work.)


PALESTINE